COPY

Matrix Environmental Southeast, Inc.

Abbott Laboratories

Abbott Laboratories Facility
Laurinburg, North Carolina

Comprehensive Site Assessment
Groundwater Incident No. 518280

June 2003

Prepared for:

Abbott Laboratories
Corporate Environmental Services
200 Abbott Park Road
Abbott Park, Illinois 60064
(847)-937-0863

Prepared by:

Matrix Environmental Southeast, Inc.
357 North Milwaukee Avenue, Suite A
Libertyville, Illinois 60048
(847)-367-6835

Appendices Not Included

DIVISION OF WATER QUALITY

Certification for the Submittal of a Comprehensive Site Assessment

Responsible Party: Abbott Laboratories
Contact Person: Mr. Curtis Michols
Address: 200 Abbott Park Road
City: Abbott Park **State:** IL **Zip Code:** 60064
Site Name: Abbott Laboratories - Laurinburg
Address: 16900 N. US 15/401 Bypass
City: Laurinburg **State:** NC **Zip Code:** 28353
Groundwater Incident Number: 518280 **Site Priority Ranking:** B

I, Charla Reinganum, a Professional Engineer/Licensed Geologist (circle one) for Matrix Environmental Southeast, Inc. (firm or company of employment) do hereby certify that the information indicated below is enclosed as part of the required Comprehensive Site Assessment (CSA) and that to the best of my knowledge the data, assessments, conclusions, recommendations and other associated materials are correct, complete and accurate.

(Each item must be initialed by the certifying licensed professional)

1. CBR The source of the contamination has been identified. A list of all potential sources of the contamination is attached.
2. CBR Imminent hazards to public health and safety have been identified.
3. CBR Potential receptors and significant exposure pathways have been identified.
4. CBR Geological and hydrogeological features influencing the movement of groundwater have been identified. The chemical and physical character of the contaminants have been identified.
5. CBR The CSA sufficiently characterizes the cause, significance and extent of groundwater and soil contamination such that a Corrective Action Plan can be developed.

If any of the above statements have been altered or items not initialed, provide a detailed explanation. Failure to initial any item or to provide written justification for the lack thereof will result in immediate return of the CSA to the responsible party.

(Please Affix Seal and Signature)

NORTH CAROLINA PROFESSIONAL SEAL 028693 ENGINEER CHARLA B. REINGANUM

6/11/03

Matrix Environmental Southeast, Inc.

Abbott Laboratories

Abbott Laboratories Facility
Laurinburg, North Carolina

Comprehensive Site Assessment
Groundwater Incident No. 518280

June 2003

Release Date: 30 January 2001
Quantity: 1,500 Gallons of No. 2 Fuel Oil
Source: Subsurface AST Piping
Latitude: 34.799605992
Longitude: -79.454220773

Responsible Party:

Curtis Michols
Senior Environmental Specialist
Abbott Laboratories
Corporate Environmental Services
200 Abbott Park Road
Abbott Park, Illinois 60064
(847)-937-0863

NORTH CAROLINA PROFESSIONAL SEAL 028693 ENGINEER CHARLA B. REINGANUM
6/11/03

Prepared by:

Charla Reinganum, P.E.
Matrix Environmental Southeast, Inc.
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(847)-367-6835

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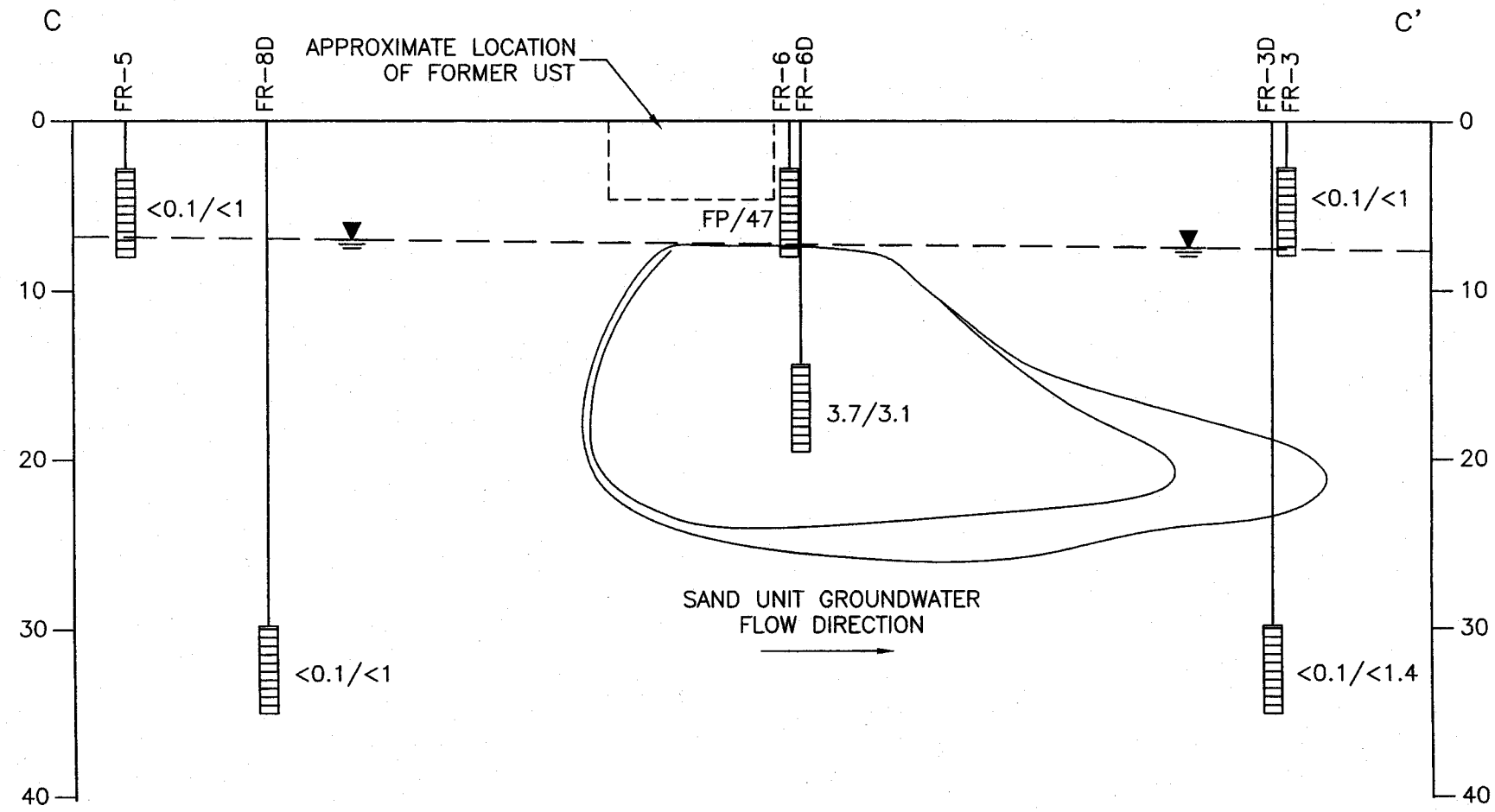
7-7 Phase II Monitoring Well Installation Location Rationale

7-8 Summary of Groundwater BTEX Analytical Data



LEGEND

FP FREE PRODUCT

WATER TABLE

BOUNDARY OF BENZENE PLUME AT 1 ug/L MAY 2001

BOUNDARY OF BENZENE PLUME AT 1 ug/L APRIL 2003

NOTES:

1. WELL POINT DATA COLLECTED 10/2000.
2. MONITORING WELL DATA COLLECTED 12/2000 OR 5/2001.
3. BENZENE CONCENTRATIONS REPORTED IN ug/L.

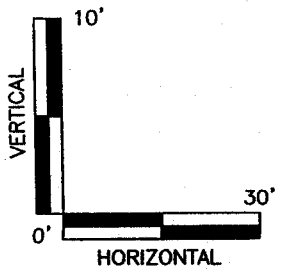


FIGURE 7-13

Matrix Environmental Southeast, Inc.
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Cross Section C-C' 2001 and 2003
Benzene Groundwater Plume
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

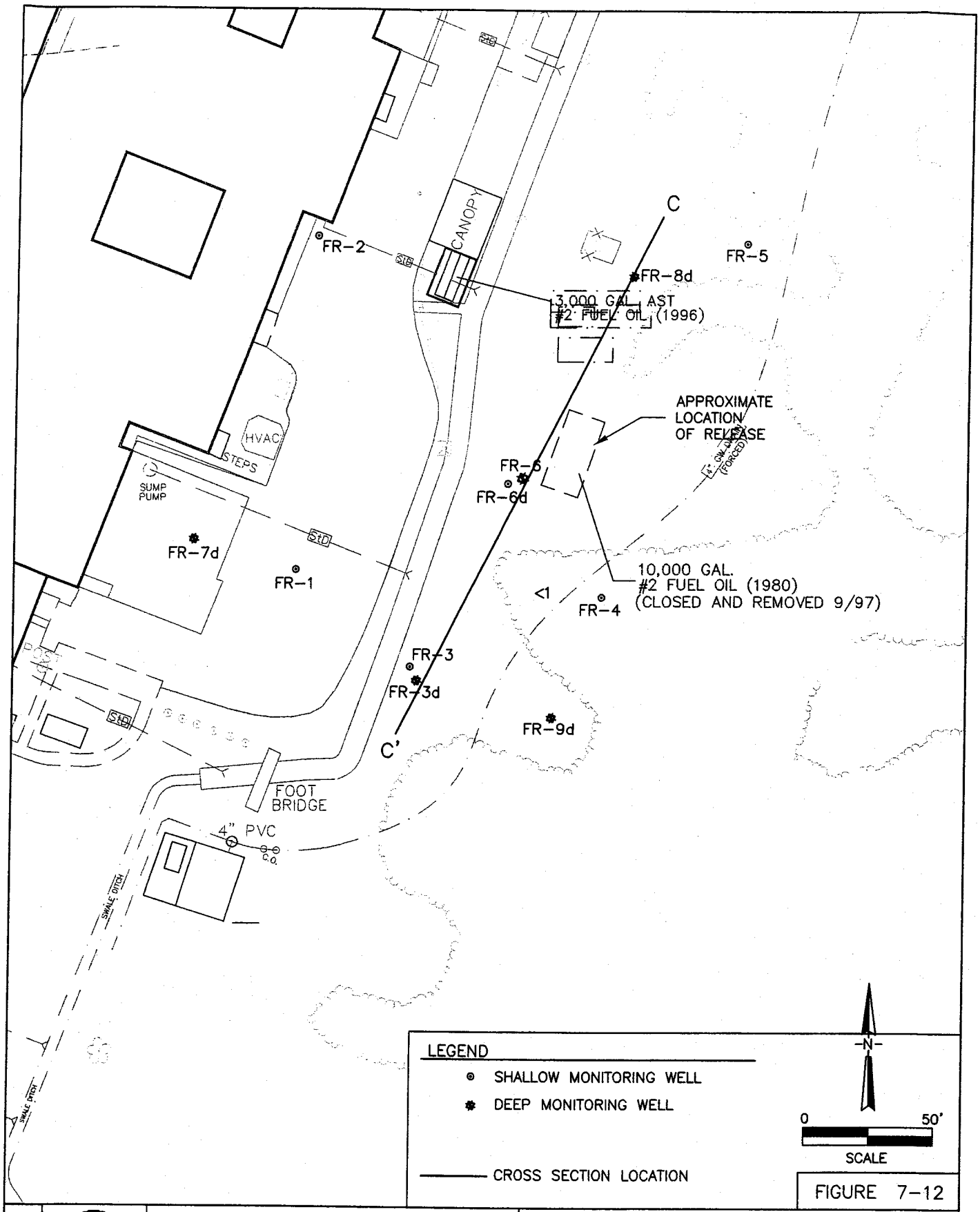

FIGURE 7-12

Matrix Environmental Southeast, Inc.
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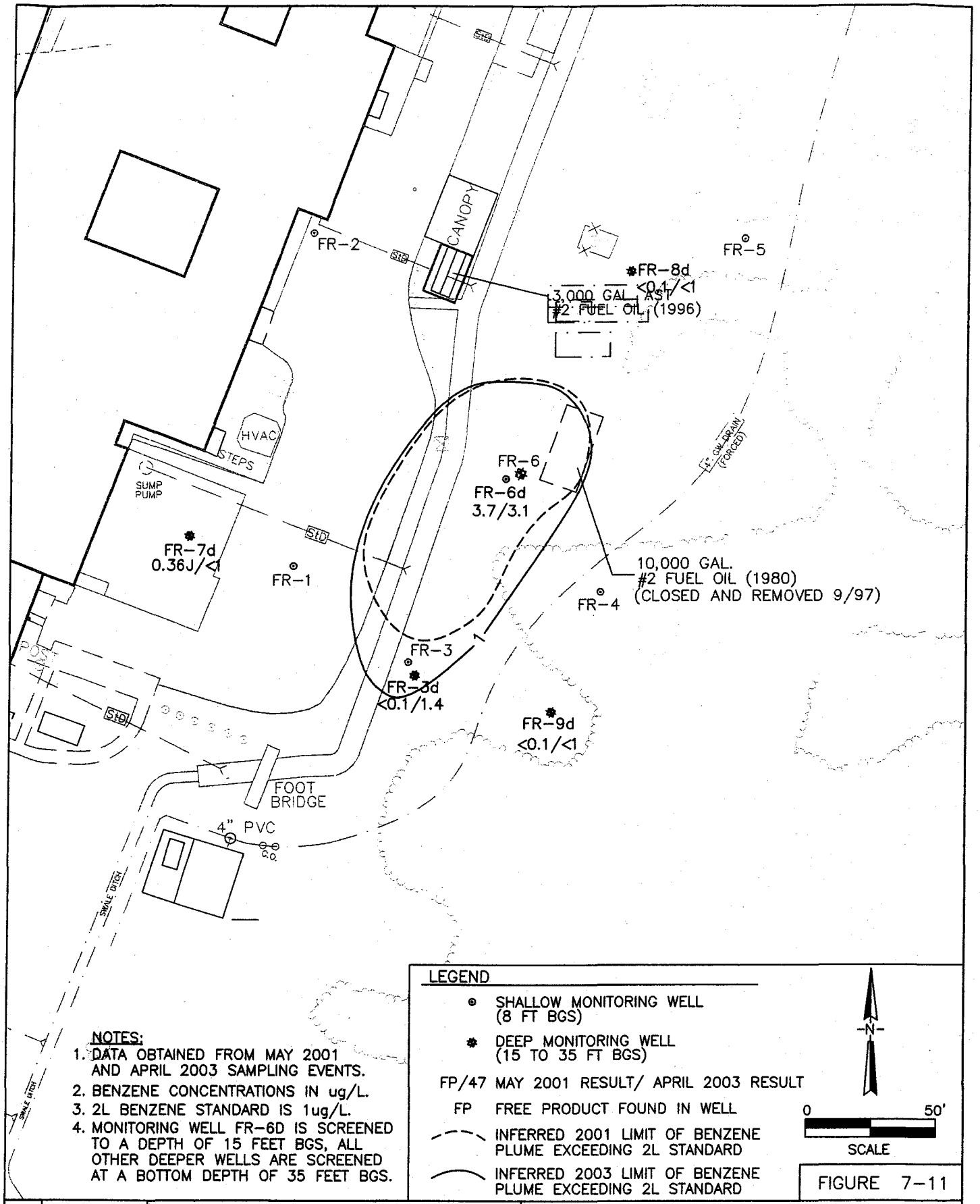
2001 TO 2003 BENZENE GROUNDWATER PLUME
CROSS-SECTION LOCATIONS
ABBOTT LABORATORIES
FUEL OIL
Laurinburg, North Carolina



NOTES:
1. DATA OBTAINED FROM MAY 2001 AND APRIL 2003 SAMPLING EVENTS.
2. BENZENE CONCENTRATIONS IN ug/L.
3. 2L BENZENE STANDARD IS 1ug/L.
4. MONITORING WELL FR-6D IS SCREENED TO A DEPTH OF 15 FEET BGS, ALL OTHER DEEPER WELLS ARE SCREENED AT A BOTTOM DEPTH OF 35 FEET BGS.

FIGURE 7-11

Matrix Environmental Southeast, Inc.
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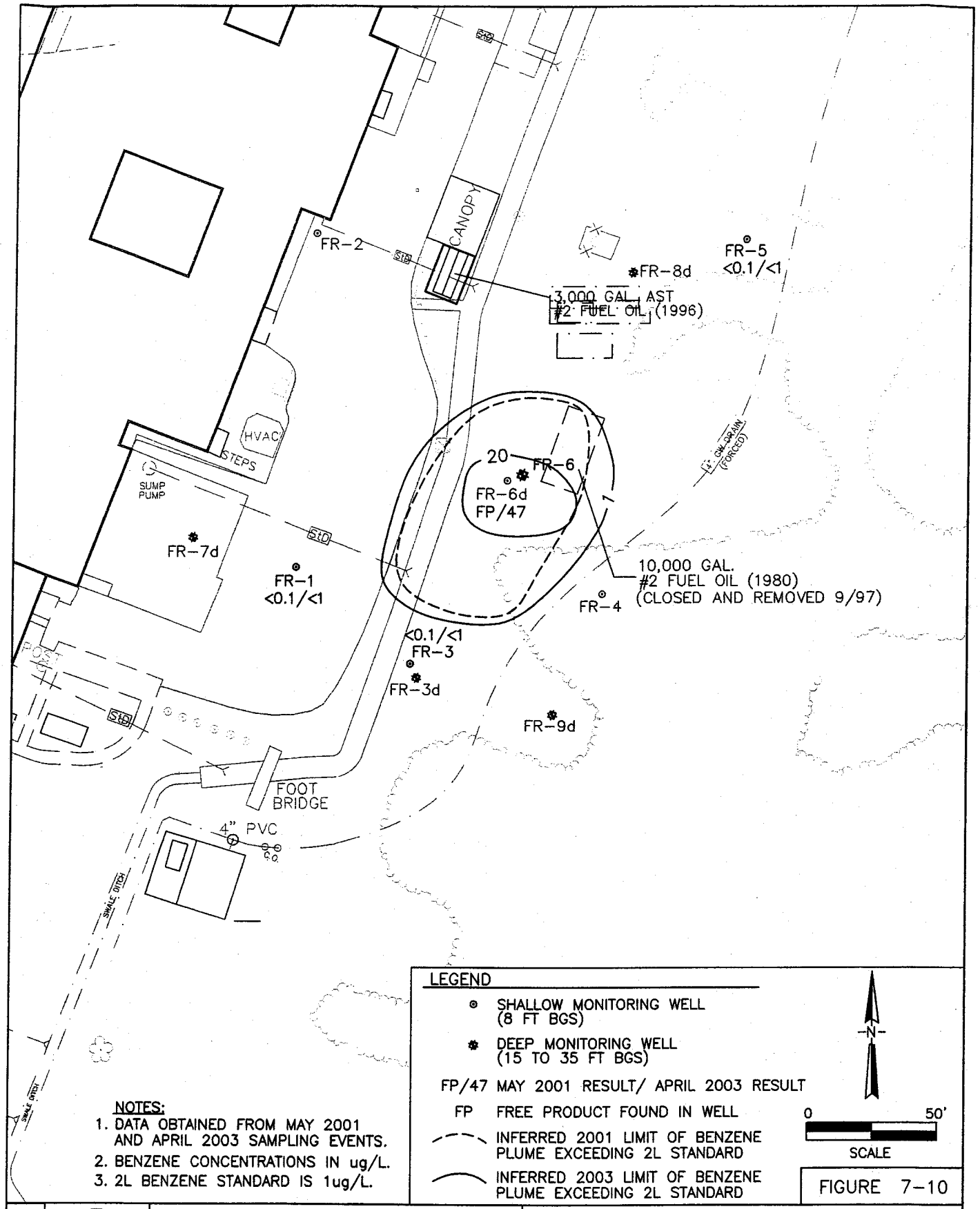
2001 to 2003 Deep Benzene Groundwater Plume
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina



NOTES:
1. DATA OBTAINED FROM MAY 2001 AND APRIL 2003 SAMPLING EVENTS.
2. BENZENE CONCENTRATIONS IN ug/L.
3. 2L BENZENE STANDARD IS 1ug/L.

FIGURE 7-10

Matrix Environmental Southeast, Inc.
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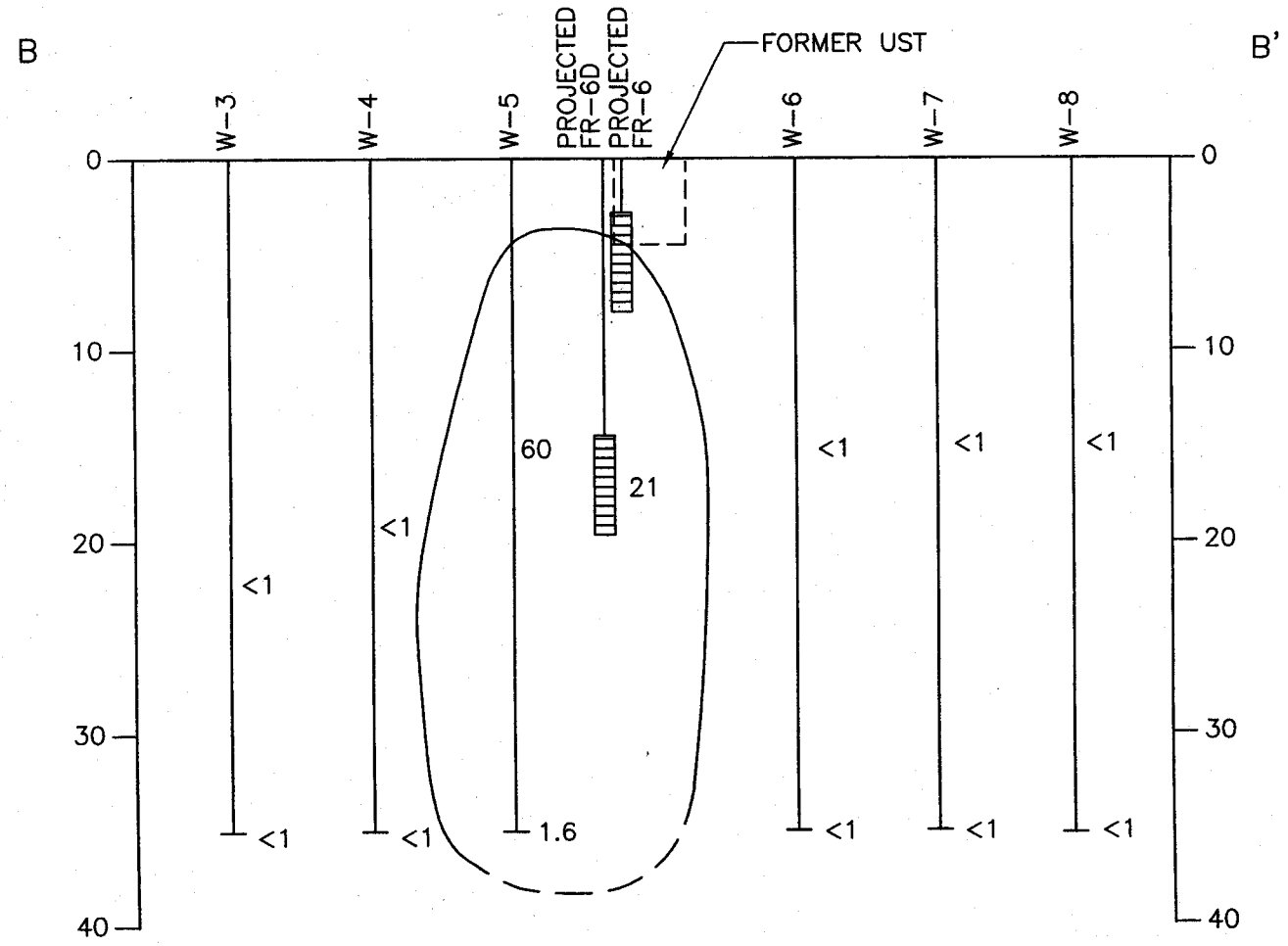
Libertyville, Illinois 60048

2001 to 2003 Shallow Benzene Groundwater Plume
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina



LEGEND

BOUNDARY OF BENZENE PLUME AT 1 ug/L MAY 2001

NOTES:

1. WELL POINT DATA COLLECTED 10/2000.
2. MONITORING WELL DATA COLLECTED 12/2000 OR 5/2001.
3. BENZENE CONCENTRATIONS REPORTED IN ug/L.

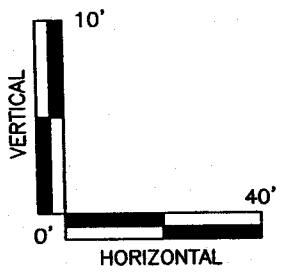


FIGURE 7-9

Matrix Environmental Southeast, Inc.
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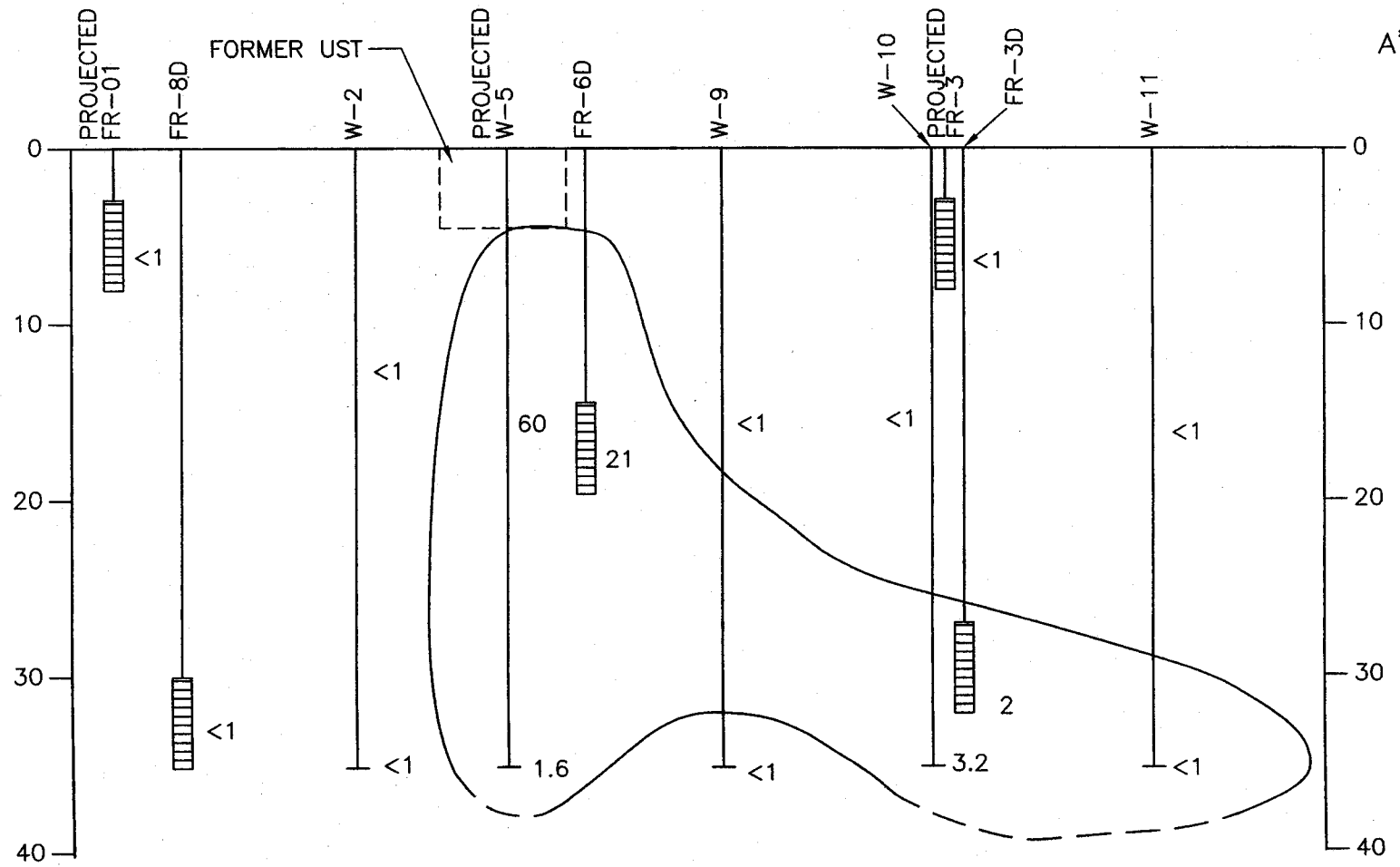
Cross Section B-B'
2000 Benzene Groundwater Plume
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina



LEGEND

BOUNDARY OF BENZENE PLUME AT 1 ug/L

NOTES:

1. WELL POINT DATA COLLECTED 10/2000.
2. MONITORING WELL DATA COLLECTED 12/2000 OR 5/2001.
3. BENZENE CONCENTRATIONS REPORTED IN ug/L.

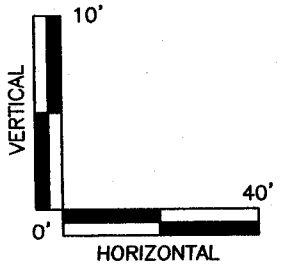


FIGURE 7-8

Matrix Environmental Southeast, Inc.
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Libertyville, Illinois 60048

Cross Section A-A'
2000 Benzene Groundwater Plume
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

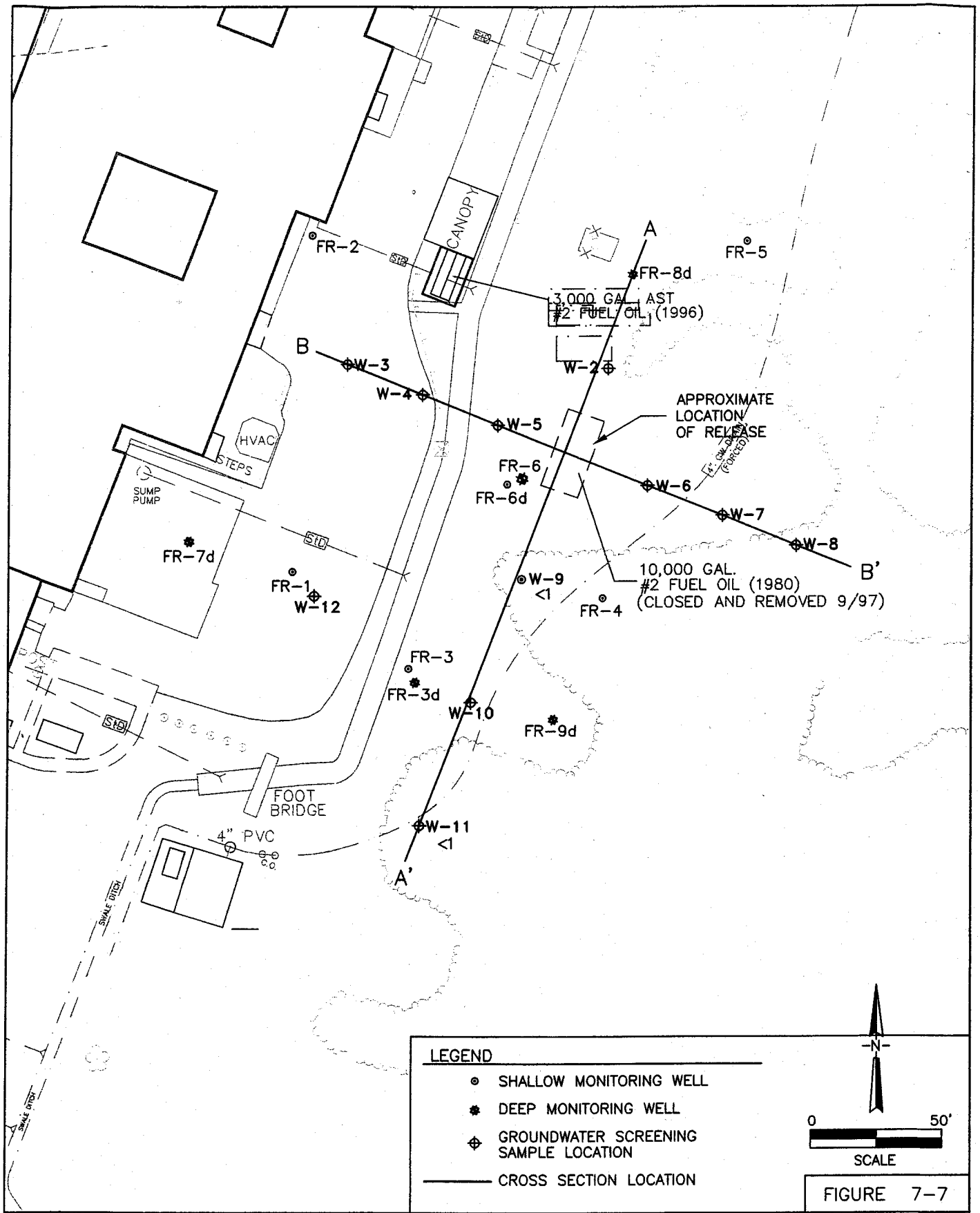

FIGURE 7-7

Matrix Environmental Southeast, Inc.
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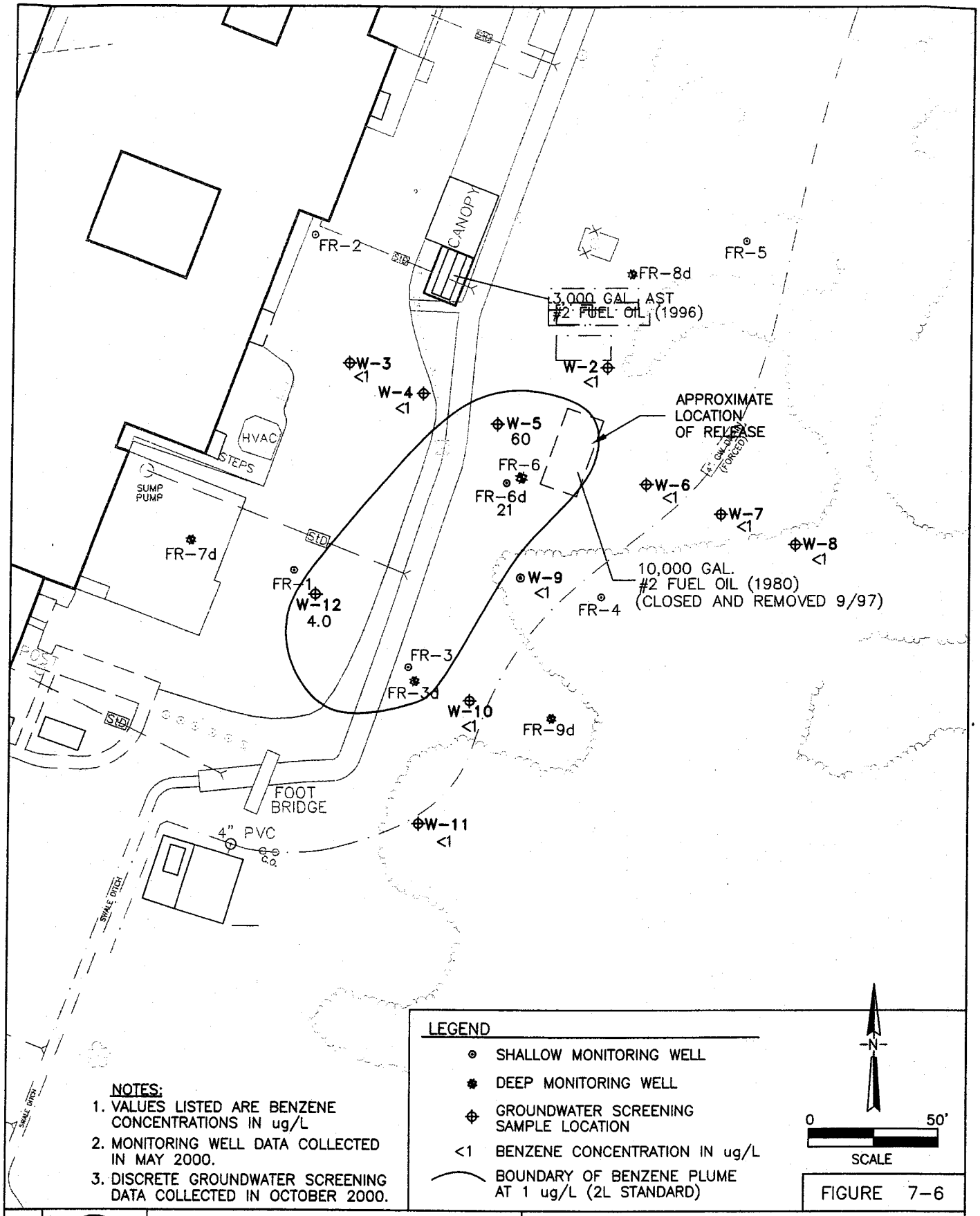
Libertyville, Illinois 60048

2000 BENZENE GROUNDWATER PLUME
CROSS-SECTION LOCATIONS
ABBOTT LABORATORIES
FUEL OIL
Laurinburg, North Carolina



NOTES:
1. VALUES LISTED ARE BENZENE CONCENTRATIONS IN ug/L
2. MONITORING WELL DATA COLLECTED IN MAY 2000.
3. DISCRETE GROUNDWATER SCREENING DATA COLLECTED IN OCTOBER 2000.

FIGURE 7-6

Matrix Environmental Southeast, Inc.
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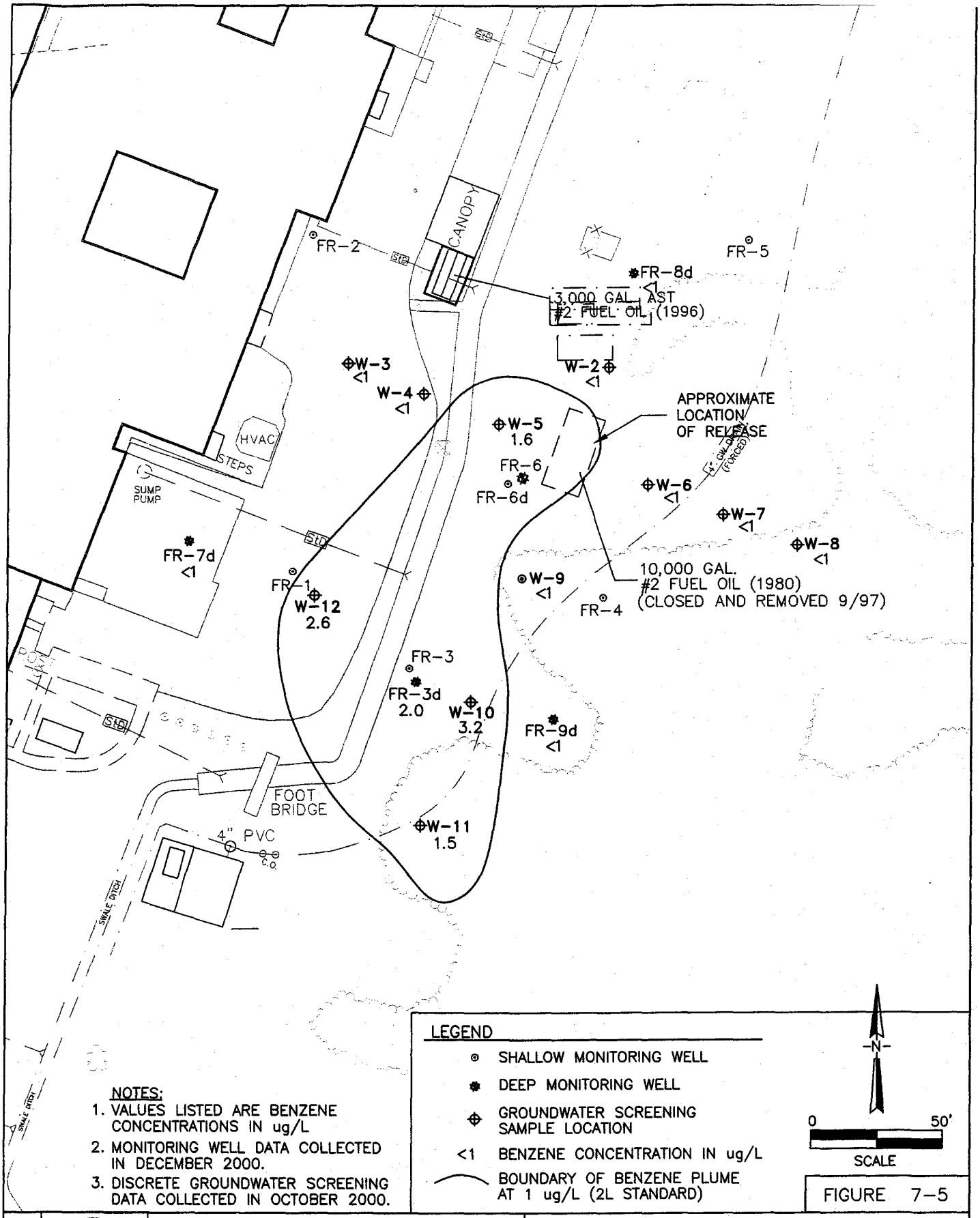
Libertyville, Illinois 60048

2000 Benzene Groundwater Plume – 15 Feet BGS
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina



NOTES:
1. VALUES LISTED ARE BENZENE CONCENTRATIONS IN ug/L
2. MONITORING WELL DATA COLLECTED IN DECEMBER 2000.
3. DISCRETE GROUNDWATER SCREENING DATA COLLECTED IN OCTOBER 2000.

LEGEND
- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- GROUNDWATER SCREENING SAMPLE LOCATION
- <1 BENZENE CONCENTRATION IN ug/L
- BOUNDARY OF BENZENE PLUME AT 1 ug/L (2L STANDARD)

-N-

0 50'
SCALE

FIGURE 7-5

Matrix Environmental Southeast, Inc.
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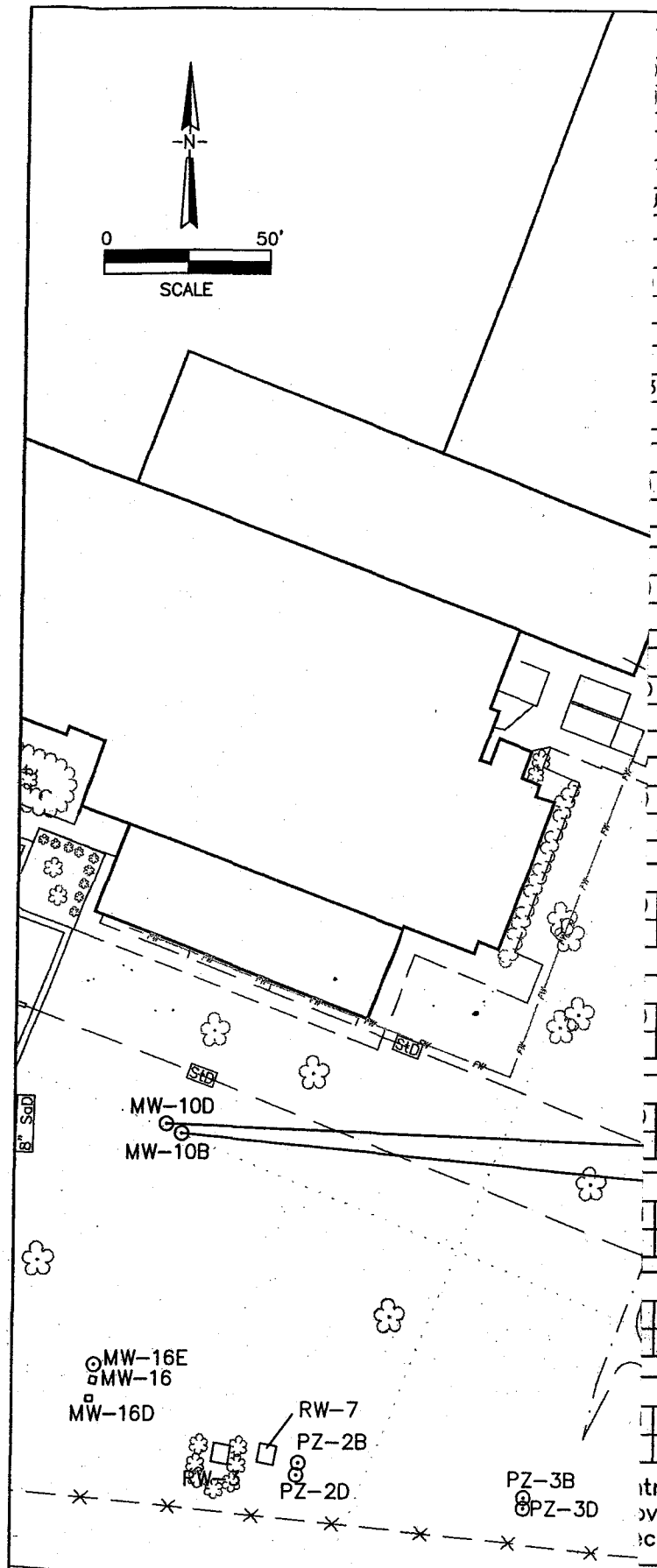
Libertyville, Illinois 60048

2000 Benzene Groundwater Plume – 35 Feet BGS
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina



FR-5

SEP-01	MAR-02	SEP-02	APR-03
0.1 U	1 U	NS	1 U

FR-9D

MAY-01	SEP-01	MAR-02	SEP-02	APR-03
0.1 U	0.1 U	1 U	2.3	1 U

FR-6D

DEC-00	MAY-01	SEP-01	MAR-02	SEP-02	APR-03
17	3.7	17	4.2	26	3.1

FR-7D

MAY-01	SEP-01	MAR-02	SEP-02	APR-03
0.36 J	0.42 J	0.40 J	1.6	1 U

FR-1

MAY-01	SEP-01	MAR-02	SEP-02	APR-03
0.1 U	0.1 U	1 U	NS	1 U

FR-8D

MAY-01	SEP-01	MAR-02	SEP-02	APR-03
0.1 U	0.1 U	1 U	0.21 U	1 U

FR-3

MAY-01	SEP-01	MAR-02	SEP-02	APR-03
0.1 U	0.1 U	1 U	NS	1 U

FR-3D

MAY-01	SEP-01	MAR-02	SEP-02	APR-03
0.1 U	1.6	2.5	0.53 J	1.4

MW-10D

SEP-01	MAR-02	SEP-02	APR-03
0.0507 J	1 U	0.2 U	1 U

MW-10B

SEP-01	MAR-02	SEP-02	APR-03
0.0465 U	1 U	0.2 U	1 U

MW-20B

SEP-01	MAR-02	SEP-02	APR-03
0.0465 U	1 U	0.2 U	1 U

ıtration.
ove reported value.
cause well dry.

FIGURE 7-4

Benzene Groundwater Analytical Results
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

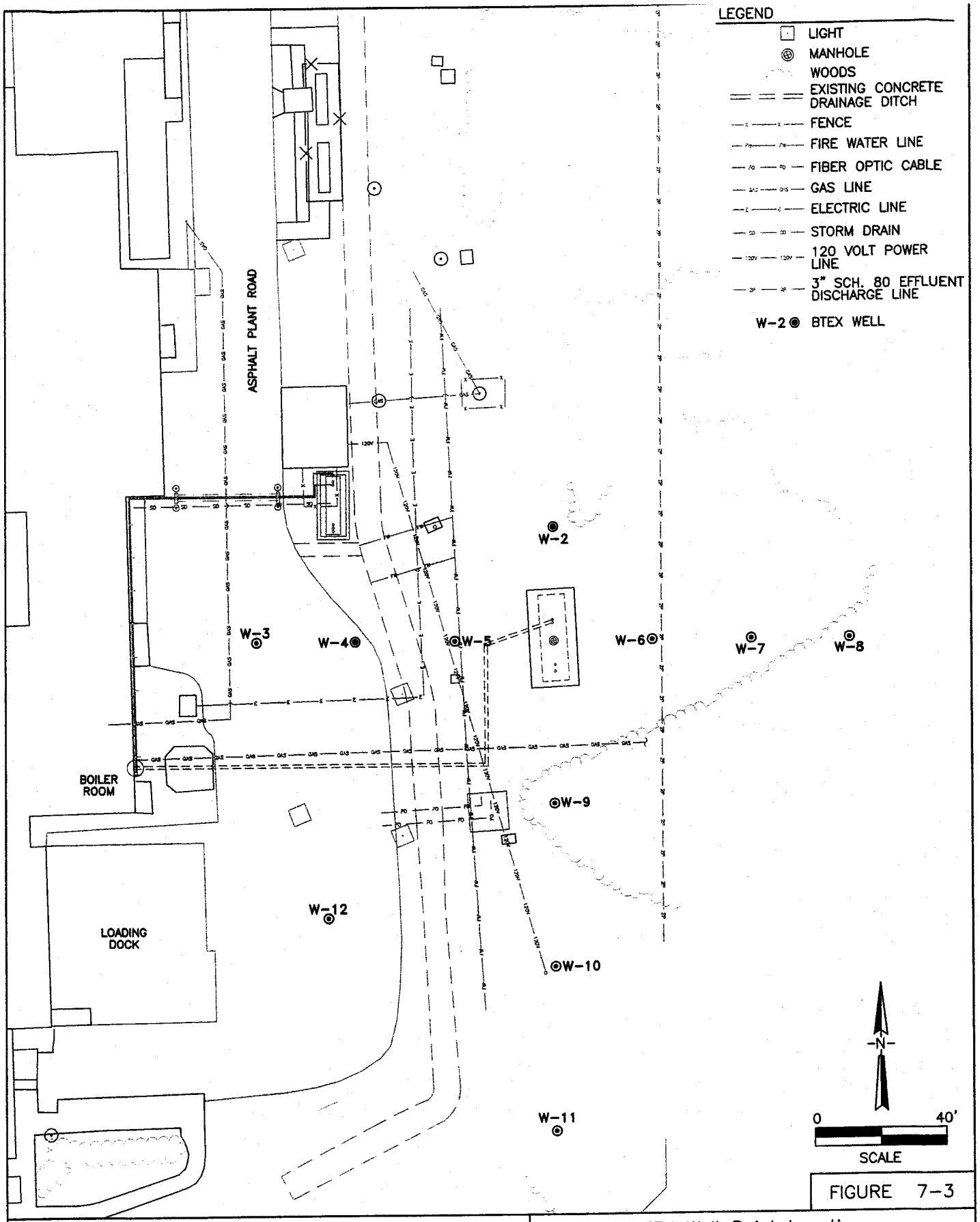


FIGURE 7-3

Matrix Environmental Southeast, Inc.
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BTEX Well Point Locations
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

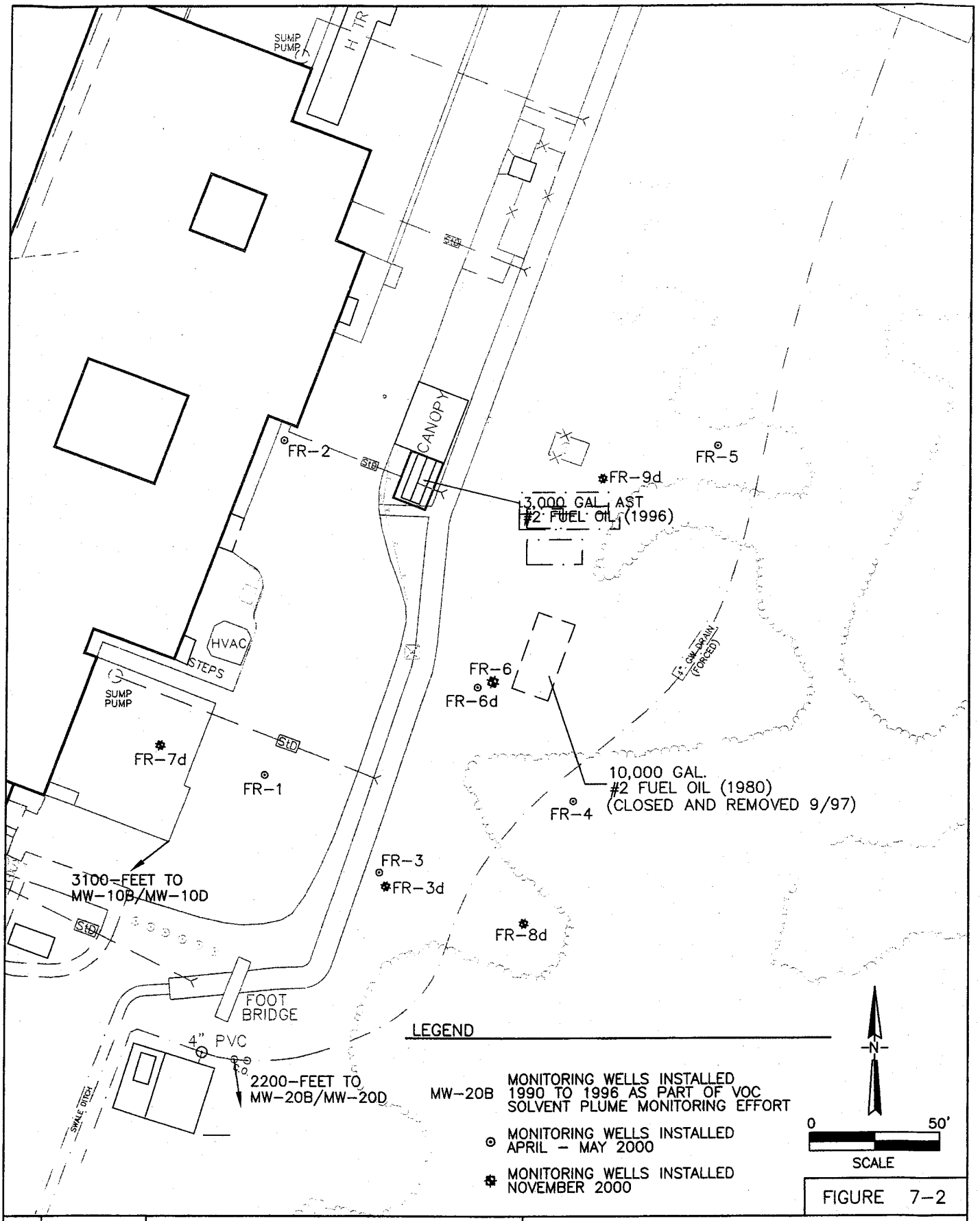

FIGURE 7-2

Matrix Environmental Southeast, Inc.
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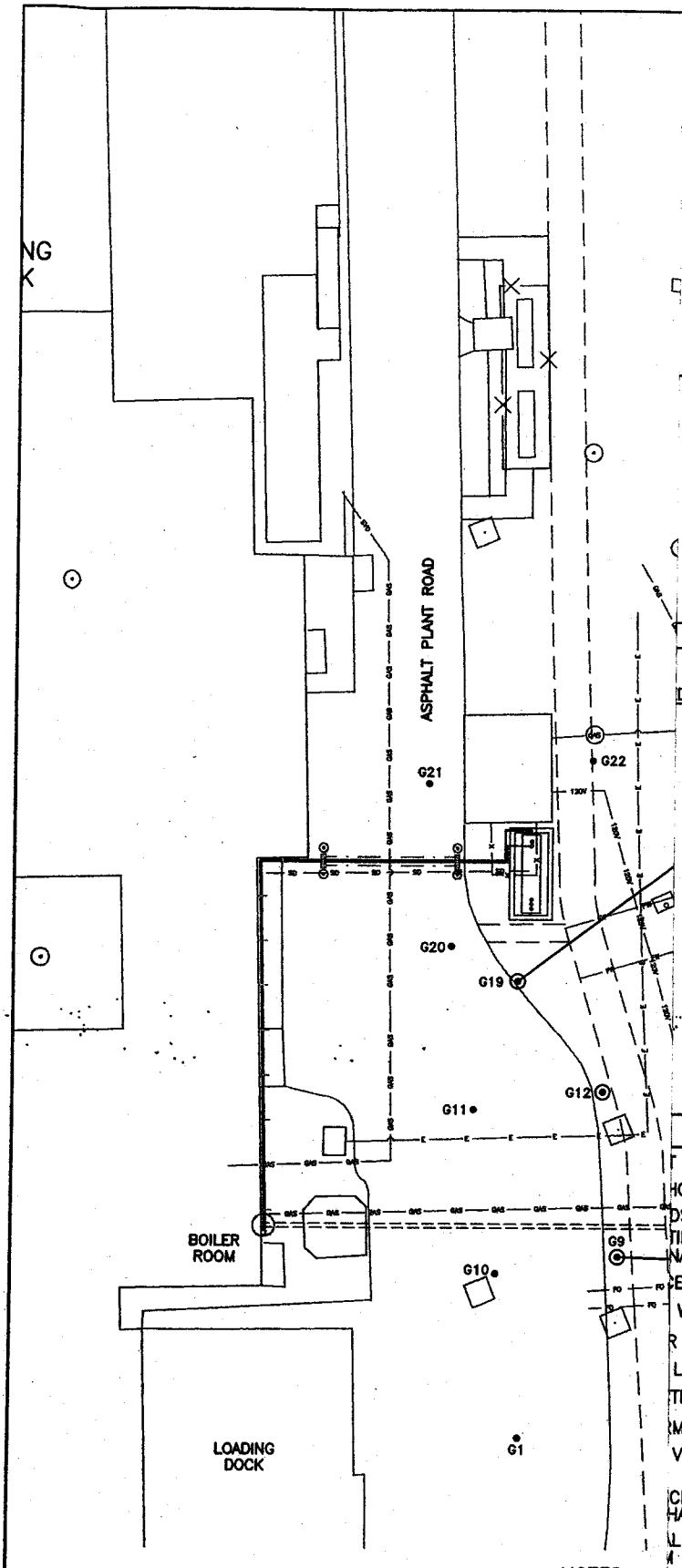
Fuel Oil Release Monitoring Well Network
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina



D	5 TO 7 JUL-02 UNSATURATED	7 TO 9 JUL-02 UNSATURATED	7 TO 9 NOV-00 SATURATED	ACTION LEVEL
	7.2 U	250		10,000
				40
			63.4	1.8
			16.2 J	7,000
			53.2 J	8,000
			6.11 J	3,000
			23 J	4,000
			44.2	580
			178 J	8,000
			1,380	3,000
			457	60,000

D	5 TO 7 JUL-02 UNSATURATED	7 TO 9 JUL-02 UNSATURATED	7 TO 9 NOV-00 SATURATED	7 TO 9 JUL-02 UNSATURATED	ACTION LEVEL
	250	210			10,000
					40
			63.2	0.68 U	1.8
			0.31 U	7.1	7,000
			3.22 J	0.79 U	7.4
			152 J	17	240
			NA	52	5,000
			NA	32	5,000
			1,180 J	NA	5,000
			413 J	10	2,000
			1,070 J	29	7,000
			3,410 J		8,000
			467 J	9.3	3,000
			1,010 J	0.99 U	4,000
			1,410	46	580
			474		8,000
			699		44,000
			5,170		3,000
			1,410		60,000
			212 J		286,000

NOTES:
1. TPH GR
2. TPH DR
3. ACTION
4. RESULTS
DETECTI
5. SOIL SA
(APRIL 2
DURING

FIGURE 6-1

Soil Sampling Analytical Results
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

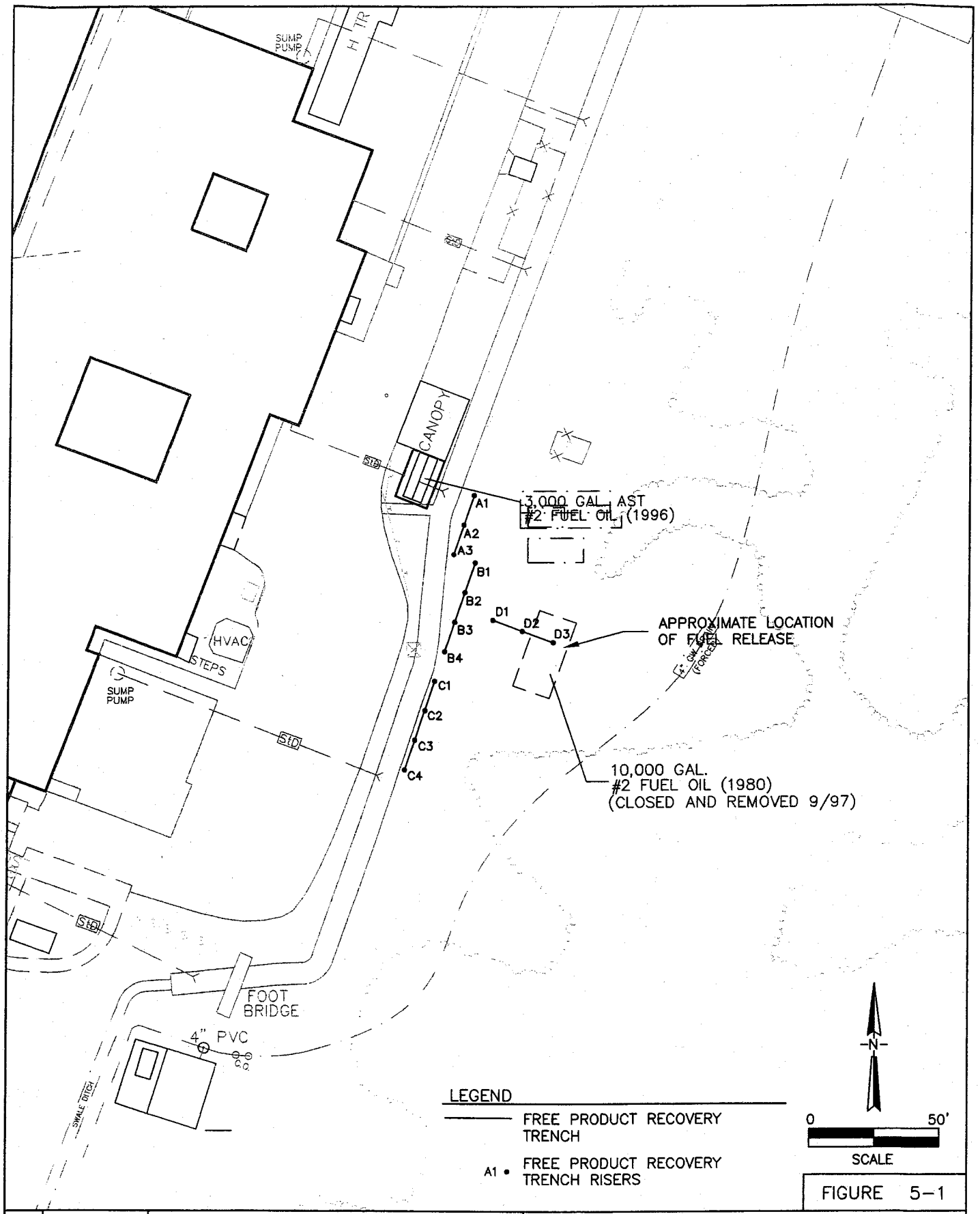


FIGURE 5-1

Matrix Environmental Southeast, Inc.
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Libertyville, Illinois 60048

Location of Free Product Recovery Trenches
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

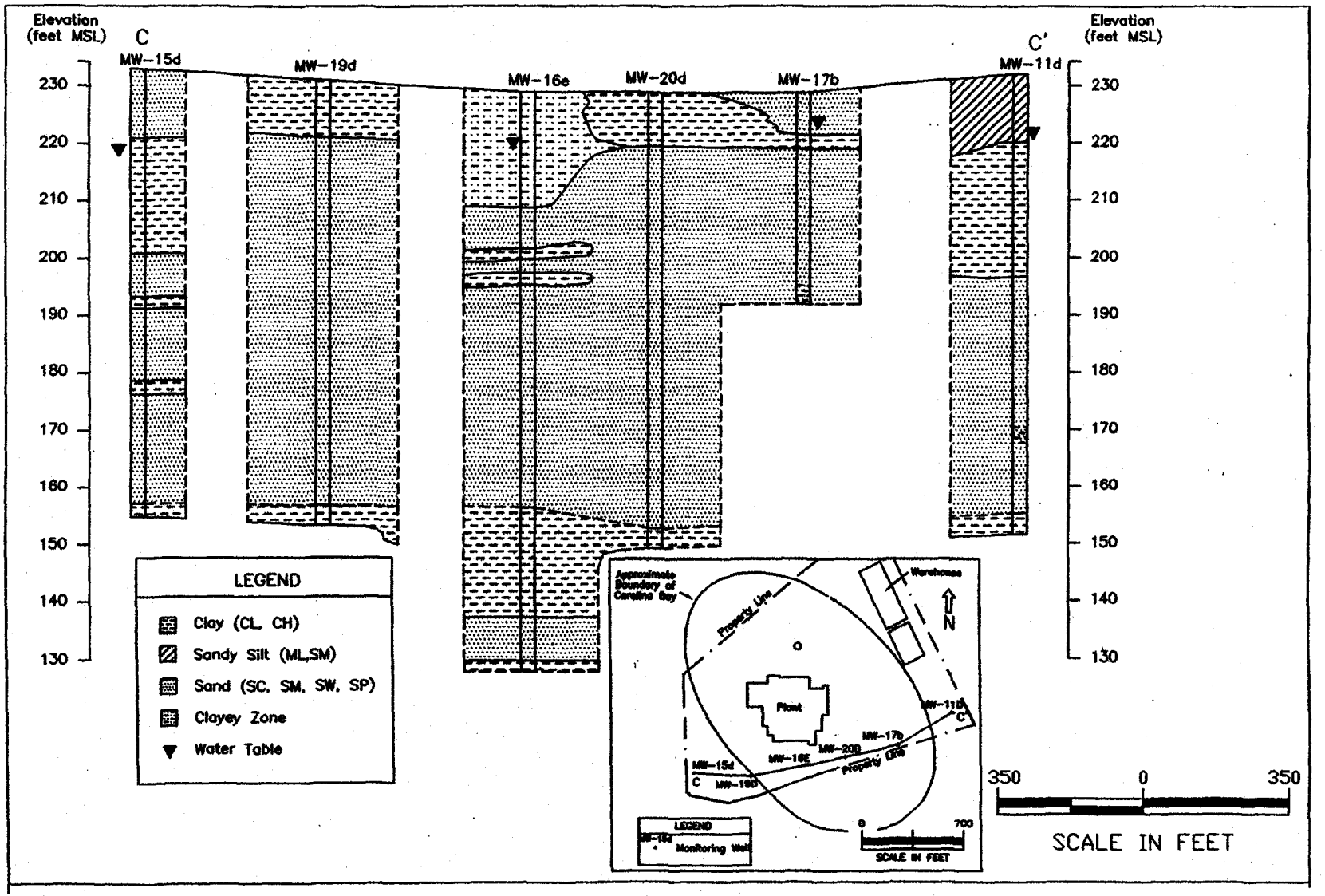

Figure 4-3

Matrix Environmental Southeast, Inc.
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Geologic Cross Section C-C'
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

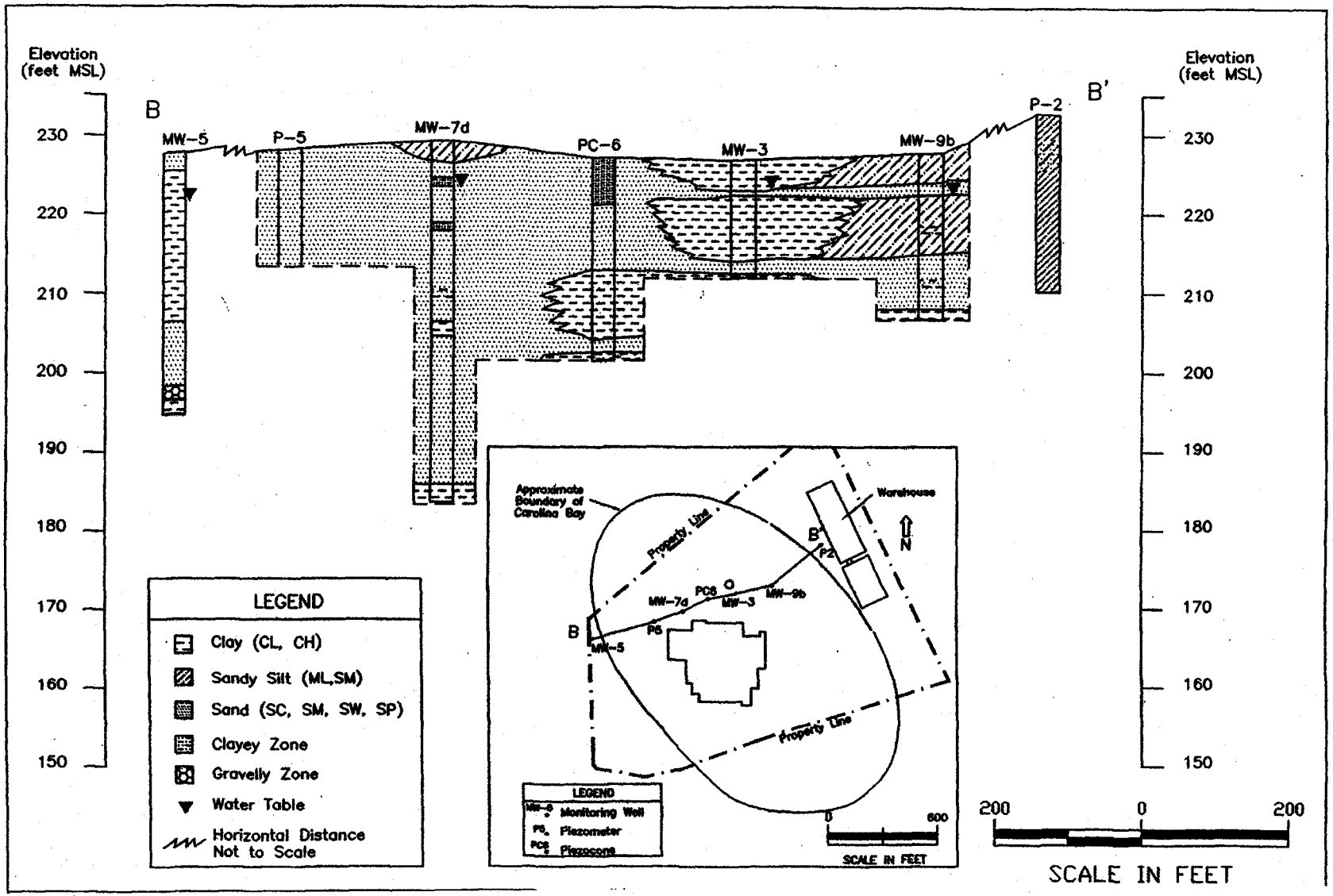

Figure 4-2

Matrix Environmental Southeast, Inc.
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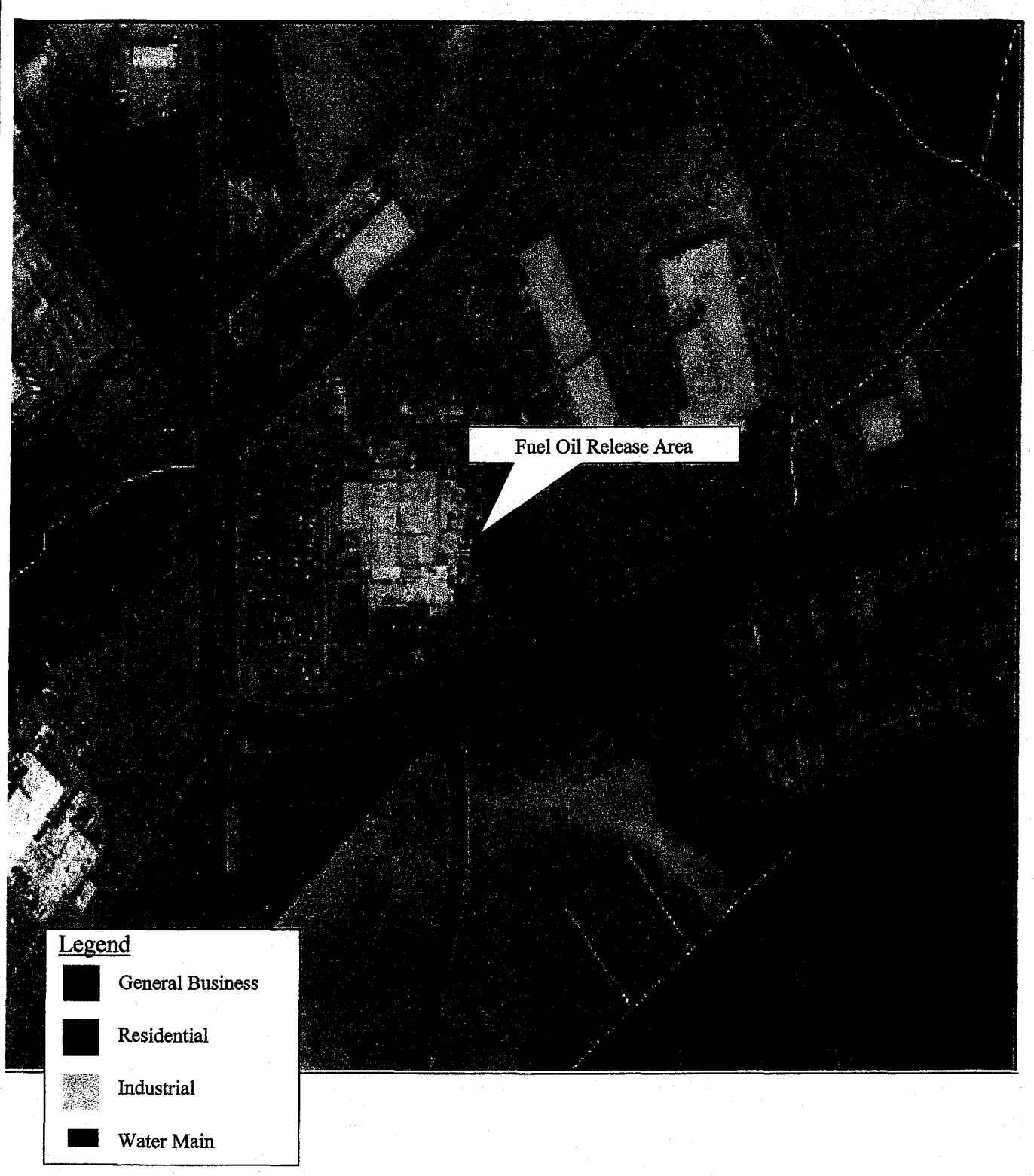
Libertyville, Illinois 60048

Geologic Cross Section B-B'
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina



Source: City of Laurinburg GIS System

Figure 2-7

Matrix Environmental Southeast, Inc.
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Libertyville, Illinois 60048

Zoning Map
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

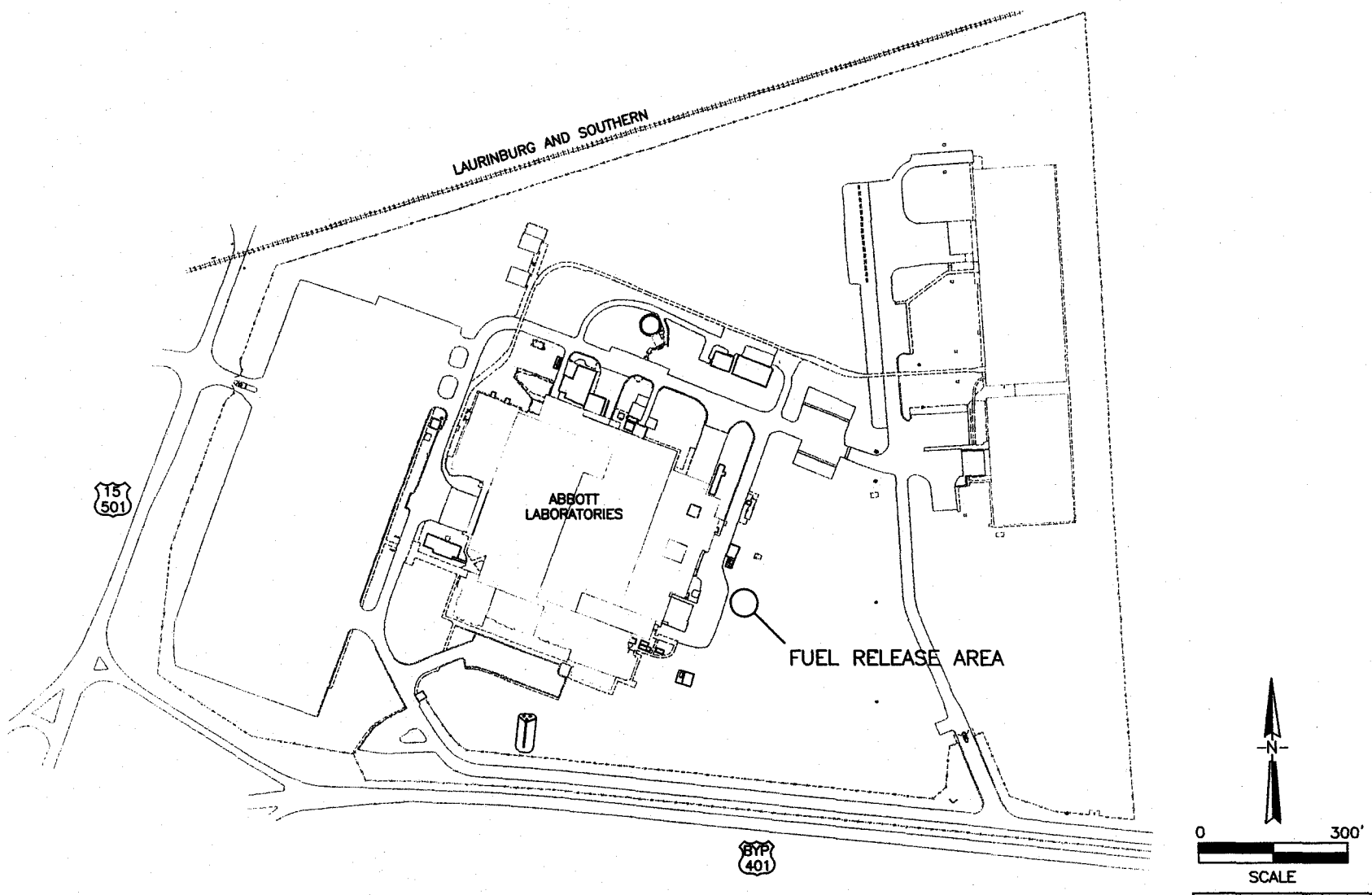

FIGURE 2-2

Matrix Environmental Southeast, Inc.
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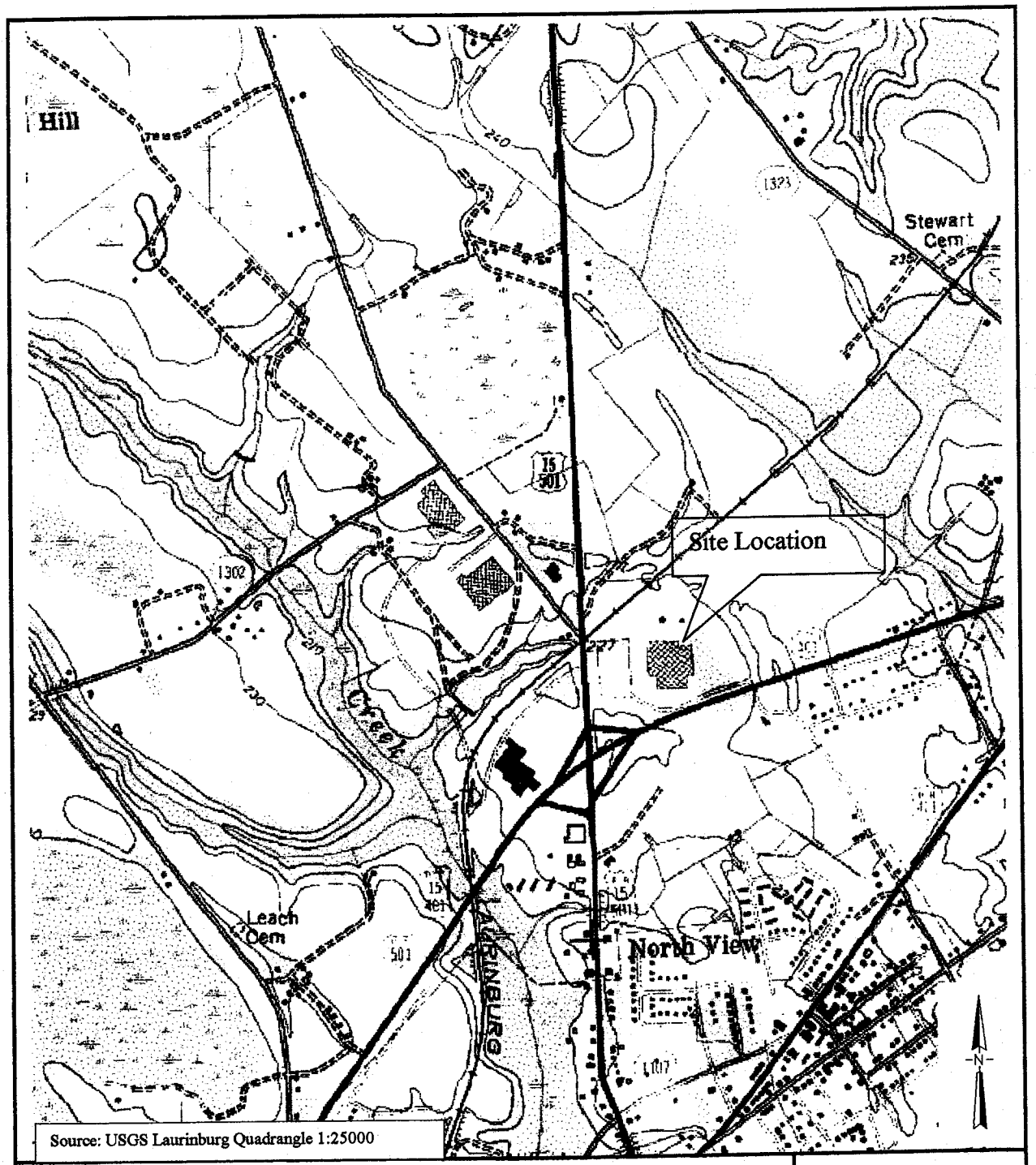
Libertyville, Illinois 60048

Fuel Release Area
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina



Source: USGS Laurinburg Quadrangle 1:25000

miles 0 0.5 1.0

Figure 2-1

Matrix Environmental Southeast, Inc.
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Libertyville, Illinois 60048

Facility Location Map
Fuel Oil Release
Abbott Laboratories
Laurinburg, North Carolina

TABLE 7-8

SUMMARY OF GROUNDWATER BTEX ANALYTICAL DATA
(Page 6 of 6)

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Parameter	*2L*	*MW-20B*				
(in ug/L)	*Standard* [1]	*May-01*	*Sep-01*	*Mar-02*	*Sep-02*	*Apr-03*
Benzene	1	0.1 U	0.0465 U	1 U	0.2 U	1 U
Ethylbenzene	29	0.14 U	0.0469 U	1 U	0.2 U	1 U
Toluene	1,000	0.13 U	0.0236 U	1 U	0.21 U	1 U
Xylenes (total)	530	0.27 U	0.0869 UJ	2 U	0.39 U [3]	1 U

Key:
ug/L = microgram per liter
U = Constituent not detected at a concentration above the reported value
J = Reported value is estimated
NS = Not sampled due to well being dry
[redacted] = Indicates that the detected concentration exceeds the 2L standard

Notes:
[1] North Carolina 2L standards taken from 15A NCAC 2L .0202.
[2] Reported concentration is the maximum detected concentration or the minimum detection limit of the sample and its duplicate
[3] Reported detection limit is the maximum detection limit reported for m-&p-xylenes and o-xylenes.

TABLE 7-8

SUMMARY OF GROUNDWATER BTEX ANALYTICAL DATA
(Page 5 of 6)

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Parameter	2L	MW-10B					MW-10D				
(in ug/L)	Standard [1]	May-01	Sep-01	Mar-02	Sep-02	Apr-03	May-01	Sep-01	Mar-02	Sep-02	Apr-03
Benzene	1	0.1 U	0.0465 U	1 U	0.2 U	1 U	0.1 U	0.0507 J	1 U	0.2 U	1 U
Ethylbenzene	29	0.14 U	0.0469 U	1 U	0.2 U	1 U	0.14 U	0.0469 U	1 U	0.2 U	1 U
Toluene	1,000	0.13 U	0.0236 U	1 U	0.21 U	1 U	0.13 U	0.0236 U	1 U	0.21 U	1 U
Xylenes (total)	530	0.27 U	0.0869 U	2 U	0.39 U [3]	1 U	0.27 U	0.0869 U	2 U	0.39 U [3]	1 U

Key:
ug/L = microgram per liter
U = Constituent not detected at a concentration above the reported value
J = Reported value is estimated
NS = Not sampled due to well being dry
= Indicates that the detected concentration exceeds the 2L standard

Notes:
[1] North Carolina 2L standards taken from 15A NCAC 2L .0202.
[2] Reported concentration is the maximum detected concentration or the minimum detection limit of the sample and its duplicate
[3] Reported detection limit is the maximum detection limit reported for m-&p-xylenes and o-xylenes.

TABLE 7-8

SUMMARY OF GROUNDWATER BTEX ANALYTICAL DATA
(Page 4 of 6)

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Parameter	2L	FR-8D						FR-9D					
(in ug/L)	Standard [1]	Dec-00	May-01	Sep-01	Mar-02	Sep-02	Apr-03	Dec-00	May-01	Sep-01	Mar-02	Sep-02	Apr-03
Benzene	1	1 U	0.1 U	0.1 U	1 U	0.21 U	1 U	1 U	0.1 U	0.1 U	1 U	2.3	1 U
Ethylbenzene	29	1 U	0.14 U	0.14 U	1 U	0.12 U	1 U	1 U	0.14 U	0.14 U	1 U	0.12 U	1 U
Toluene	1,000	1 U	0.13 U	0.13 U	1 U	0.16 U	1 U	1 U	0.13 U	0.13 U	1 U	0.16 U	1 U
Xylenes (total)	530	2 U	0.27 U	0.27 U	2 U	0.53 U	1 U	2 U	0.27 U	0.27 U	2 U	0.53 U	1 U

Key:
ug/L = microgram per liter
U = Constituent not detected at a concentration above the reported value
J = Reported value is estimated
NS = Not sampled due to well being dry
[redacted] = Indicates that the detected concentration exceeds the 2L standard

Notes:
[1] North Carolina 2L standards taken from 15A NCAC 2L .0202.
[2] Reported concentration is the maximum detected concentration or the minimum detection limit of the sample and its duplicate
[3] Reported detection limit is the maximum detection limit reported for m-&p-xylenes and o-xylenes.

TABLE 7-8

SUMMARY OF GROUNDWATER BTEX ANALYTICAL DATA
(Page 3 of 6)

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Parameter	2L	FR-6D							FR-7D					
(in ug/L)	Standard [1]	May-00	Dec-00	May-01	Sep-01	Mar-02	Sep-02	Apr-03 [2]	Dec-00	May-01	Sep-01	Mar-02	Sep-02	Apr-03
Benzene	1	**21**	**17**	**3.7**	**17**	**4.2**	**26**	**3.1**	1 U	0.36 J	0.42 J	0.40 J	1.6	1 U
Ethylbenzene	29	1.9	1 U	0.14 U	2.7	1 U	5.7	1 U	1 U	0.14 U	0.14 U		0.12 U	1 U
Toluene	1,000	11	2.2	0.13 U	0.44 J	1 U	1.4	1 U	1 U	0.13 U	0.13 U		0.16 U	1 U
Xylenes (total)	530	10	2 U	0.27 U	0.27 U	2 U	0.53 U	1 U	2 U	0.27 U	0.27 U		0.53 U	1 U

Key:
ug/L = microgram per liter
U = Constituent not detected at a concentration above the reported value
J = Reported value is estimated
NS = Not sampled due to well being dry
[ ] = Indicates that the detected concentration exceeds the 2L standard

Notes:
[1] North Carolina 2L standards taken from 15A NCAC 2L .0202.
[2] Reported concentration is the maximum detected concentration or the minimum detection limit of the sample and its duplicate
[3] Reported detection limit is the maximum detection limit reported for m-&p-xylenes and o-xylenes.

TABLE 7-5
SUMMARY OF GROUNDWATER TENTATIVELY IDENTIFIED COMPOUNDS ANALYTICAL RESULTS – MAY 2000

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Well ID	Compound	Retention Time	Estimated Concentration (µg/L)
FR-1	1 (3H) -Isobenzofuranone	8.923	3.8 NJ
	9,10-Anthracenedione	13.747	6.0 NJ
FR-2	1 (3H) -Isobenzofuranone	8.922	8.1 NJ
	Menadione	10.429	9.1 NJ
	1-Napthalenemethanol	10.936	12 NJ
	Unknown Naphthalenemethanol	10.974	9.9 NJ
	Unknown Naphthalenecarboxyl	11.711	8.8 NJ
	1-Naphthalenecarboxylic acid	11.807	12 NJ
	Phenol, 2,6-bis (1,1-dimethy)	12.336	11 NJ
	Methyldibenzothiophene	13.036	8.2 NJ
	1H-Phenalen-1-one	13.378	10 NJ
FR-3	2H-1-Benzopyran-2-one	9.765	7.4 NJ
	Menadione	10.428	7.4 NJ
	Unknown Naphthalenecarboxyl	11.710	8.7 NJ
	1-Naphthalenecarboxylic acid	11.801	13 NJ
	Phenol, 2,6-bis (1,1-dimethy...)	12.340	9.8 NJ
	Naphthaleneacetic acid	12.618	9.4 NJ
	Methyldibenzothiophene	13.040	7.4 NJ
	1H-Phenalen-1-one	13.377	12 NJ
FR-4	Ethanone, 1-(7-hydroxy-5-me...)	12.698	3.0 NJ
	Unknown Organic Acid	13.526	4.8 NJ
	Unknown Organic Acid	14.557	8.2 NJ
	Unknown Hydrocarbon	18.147	15 NJ
	Unknown Hydrocarbon	19.007	8.2 NJ
	Unknown Hydrocarbon	20.092	4.6 NJ
FR-5	Unknown Organic Acid	2.484	3.5 NJ
	1 (3H)-Isobenzofuranone	8.927	3.6 NJ
	2H-1-Benzopyran-2-one	9.429	2.3 NJ
	1H-Phenalen-1-one	13.377	3.4 NJ
FR-6d	Indane	5.349	4.8 NJ
	2,3-Dihydro-1-methylindene	6.797	2.0 NJ
	Phenol, 2,4,6-trimethyl-	8.052	2.7 NJ
	Methylcarbazole	13.421	2.4 NJ
D-99	Unknown Alkylated Benzene	4.752	3.2 NJ
	Indane	5.340	7.2 NJ
	Indan, 1-methyl-	6.793	6.3 NJ
	Benzene, cyclobuytl-	6.942	5.9 NJ
	1H-Indene, 2,3-dihydro-1,6-	8.053	3.4 NJ
	1H-Inden-1-one, 2,3-dihydro	8.235	2.4 NJ
	Benzaldehyde, ethyl-	8.582	2.3 NJ
	1,1'-Biphenyl, 4,4'-difluor	8.935	2.2 NJ
	Naphthalene, 1-(2-propenyl)	11.109	2.4 NJ
D-99 (Cont.)	3,3'-Dimethylbiphenyl	11.953	2.1 NJ
	1H-Phenalene	12.610	2.1 NJ
	[1,1'-Biphenyl]-4-carboxald	12.690	2.9 NJ
	Carbazole	12.893	2.2 NJ
	Ethanone, 2,2-dimethoxy-1,2	13.176	2.2 NJ
	1H-Phenalen-1-one	13.374	2.3 NJ
	Methylcarbazole	13.417	3.6 NJ

NJ = The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Additional compounds were "tentatively identified;" however the compounds were not identified by name and thus have not been listed in the Table.

NOTE: Data table prepared by URS Corporation.

TABLE 7-4
SUMMARY OF GROUNDWATER VOC, SVOC, AND PETROLEUM HYDROCARBON GROUNDWATER ANALYTICAL RESULTS – MAY 2000

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Analyte	2L[1] Standard	FR-1	FR-2	FR-3	FR-4	FR-5	FR-6d	Duplicate of FR-6d (D-99)
Volatile Organic Compounds (µg/L) - EPA Method 602								
Benzene	1	<1.0	0.81J	<1.0	<1.0	<1.0	**21**	**18**
Toluene	1000	<1.0	0.26J	<1.0	0.14J	<1.0	1.9	1.6
Ethylbenzene	29	<1.0	0.32J	<1.0	<1.0	<1.0	11	9.4
Xylenes	530	<2.0	0.53J	<2.0	<2.0	<2.0	10	8.9
Semi-Volatile Organic Compounds - Acid Extractable Organics (µg/L) - EPA Method 625								
2,4-Dimethylphenol	140	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	1.7 J	2.1 J
Phenol	300	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	1.4 J	1.1 J
Semi-Volatile Organic Compounds - Base Neutral Compounds (µg/L) - EPA Method 625								
Acenaphththene	80	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	0.44 J	0.88 J
bis (2-Ethylhexyl) phthalate	3	<10 UJ	0.70 J	0.83 J	1.8 J	1.4 J	0.59 J	0.48 J
Fluorene	280	<10 UJ	0.68 J	0.45 J	<10 UJ	<10 UJ	<10 UJ	<10 UJ
Phenanthrene	210	<10 UJ	2.3 J	0.78 J	<10 UJ	<10 UJ	<10 UJ	<10 UJ
Pyrene	210	0.62 J	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ
Volatile Petroleum Hydrocarbons (mg/L) - MADEP VPH								
C5-C8 Aliphatic Hydrocarbons	0.42	<0.040	<0.040	<0.040	<0.040	<0.040	0.050	0.050
C9-C12 Aliphatic Hydrocarbons	4.2	<0.010	0.030	<0.010	<0.010	<0.010	0.14	0.14
C9-C10 Aromatic Hydrocarbons	0.21	0.15	0.090	0.060	<0.010	0.010	0.15	0.15
Extractable Petroleum Hydrocarbons (mg/L) - MADEP EPH								
C9-C18 Aliphatic Hydrocarbons	4.2	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ
C19-C36 Aliphatic Hydrocarbons	42.0	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ
C11-C22 Aliphatic Hydrocarbons		<0.10 UJ	0.14 J	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ

[1] NC Department of Environment and Natural Resources 15A NCAC 2L Groundwater Standards and Interim Groundwater Standards.
Additional analytes have been analyzed for. Only compounds with positive results have been listed in the table.
All results and standards are in micrograms/liter (µg/L) except VPH and EPH results and standards, which are in milligrams/liter (mg/L).
Results shown in bold are above the 15A NCAC 2L Standards or Interim Groundwater Standards.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample. VOC results with J flags indicate results which were lower than the laboratory reporting limit but greater than the method detection limit. All other analytical flags are discussed in the *Data Validation Report* found in
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
NA = Not applicable.

NOTE: Data table prepared by URS Corporation.

TABLE 7-3

MONITORING WELL CONSTRUCTION DATA

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Well ID	*Scheduled Activities*	*Ground Elevation (MSL)*	*TOC Elevation (MSL)*	*Screening Interval [1] (in ft)*	*Casing Diameter (in inches)*
FR-1	Elevation & Sample	227.02	227.02	3 - 8	2
FR-2	Elevation	227.01	227.01	3 - 8	2
FR-3	Elevation & Sample	228.17	230.17	3 - 8	2
FR-4	Elevation	228.15	230.15	3 - 8	2
FR-5	Elevation & Sample	228.69	230.69	3 - 8	2
FR-6d	Elevation & Sample	228.62	230.62	14.5 - 19.5	2
FR-3d	Elevation & Sample	227.17	229.67	29 - 35	0.5
FR-7d	Elevation & Sample	226.45	226.45	29 - 35	0.5
FR-8d	Elevation & Sample	228.32	230.82	29 - 35	0.5
FR-9d	Elevation & Sample	228.31	230.81	29 - 35	0.5
FR-6	Elevation & Sample	228.66	230.66	3 - 8	2
MW-10B	Elevation & Sample	229.40	229.06	16.5 – 26.5	2
MW-10D	Elevation & Sample	[2]	228.65	30 – 40	2
MW-20B	Elevation & Sample	228.87	228.62	17 - 27	2

Key:
ft = feet
MSL = Mean Sea Level

Notes:
[1] Screening intervals listed are based on the depth in feet from the ground surface.
[2] The ground surface elevation is not reported on the well installation log, the screening interval is based on the depth in feet from the ground surface.

TABLE 7-2
SUMMARY OF GROUNDWATER BTEX IMMUNOASSAY SCREENING RESULTS – APRIL 2000

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Sample Location	BTEX Result (ppm)	Description
G1	ND	Very cloudy, no odor, rusty color-would not drain
G2	≤ 0.6	Slightly cloudy, no odor
G3	≤ 0.6	Fairly clear, no odor
G4	ND	Sample location dry
G5	ND	Sample location dry
G6	≤ 0.6	Cloudy
G7	≤ 0.6	Cloudy
G8	ND	Sample location dry
G9	≤ 0.6	Cloudy, mild odor
G10	ND	Sample location dry
G11	≤ 0.6	Slightly clear, little to no odor
G12	0.6 - 2	Slightly cloudy, mild to little odor
G13	0.6 - 2	Free-product visible, strong odor
G14	0.6 - 2	Cloudy, mild odor
G15	ND	Sample location dry
G16	≤ 0.6	Somewhat cloudy, no odor
G17	≤ 0.6	Cloudy, no odor
G18	≤ 0.6	Extremely cloudy, no odor
G19	2	Extremely cloudy, mild odor, free-product sheen visible
G20	≤ 0.6	Clear, no odor
G21	ND	Sample location dry
G22	≤ 0.6	Somewhat cloudy, no odor
G23	≤ 0.6	Extremely cloudy, no odor
G24	0.6 - 2	Cloudy, no odor, free product sheen visible
G25	ND	Very cloudy, no odor, rusty color-would not drain
Riser A2	≤ 0.6	Clear, slight odor and sheen.
Riser B4	≤ 0.6	Clear, slight odor.
Riser C1	≤ 0.6	Free-product visible, strong odor.
Riser C3	≤ 0.6	Clear sample, mild odor.

ND = Not detected
BTEX = Benzene, Toluene, Ethyl benzene, and Xylene
ppm = parts per million

NOTE: Data table prepared by URS Corporation.

TABLE 7-1

SUMMARY OF GROUNDWATER SAMPLING EFFORT METHODS

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Sample Location	Sample Date	Purpose	Sample Type	Collection Method	Sampling Interval (in ft bgs)	Laboratory Analysis
Temporary wellpoints G1 through G25 Risers A2, B4, C1, C3	April, 2000	Gridded BTEX groundwater screening in vicinity of fuel oil release to assess impacts	Groundwater	Collected directly from accumulation in borehole	4 to 8	None. Immuoassay field test kits.
Monitoring wells FR-1, FR-2, FR-3, FR-4, FR-5	May, 2000	Delineate shallow groundwater impacts	Groundwater	Purge and stabilize well prior to sampling	3 to 8	VOCs (EPA Method 602) SVOCs (EPA Method 625) MADEP VPH MADEP EPH
Temporary wellpoints W-2 to W-12	October, 2000	Determine locations for installation of deep monitoring wells	Groundwater	Collected directly from accumulation in borehole	15 and 35	BTEX (EPA Method 602)
Monitoring wells FR-3d, FR-7d, FR-8d, FR-9d	December, 2000	Delineate deep groundwater impacts	Groundwater	Purge and stabilize well prior to sampling	29 to 35	BTEX (EPA Method 602)
Monitoring wells FR-1, FR-2, FR-3, FR-4, FR-5, FR-3d, FR-6d, FR-7d, FR-8d, FR-9d, MW-10B, MW-10D, MW-20B	May, 2001	Sem-annual groundwater plume monitoring	Groundwater	Purge and stabilize well prior to sampling	3 to 8 15 to 20 29 to 35	BTEX (EPA Method 602)
Monitoring wells FR-1, FR-2, FR-3, FR-4, FR-5, FR-3d, FR-6d, FR-7d, FR-8d, FR-9d, MW-10B, MW-10D, MW-20B	October, 2001	Sem-annual groundwater plume monitoring	Groundwater	Purge and stabilize well prior to sampling	3 to 8 15 to 20 29 to 35	BTEX (EPA Method 602)
Monitoring wells FR-1, FR-2, FR-3, FR-4, FR-5, FR-3d, FR-6d, FR-7d, FR-8d, FR-9d, MW-10B, MW-10D, MW-20B	March, 2002	Sem-annual groundwater plume monitoring	Groundwater	Purge and stabilize well prior to sampling	3 to 8 15 to 20 29 to 35	BTEX (EPA Method 602)
Monitoring wells FR-1, FR-2, FR-3, FR-4, FR-5, FR-3d, FR-6d, FR-7d, FR-8d, FR-9d, MW-10B, MW-10D, MW-20B	September, 2002	Sem-annual groundwater plume monitoring	Groundwater	Purge and stabilize well prior to sampling	3 to 8 15 to 20 29 to 35	BTEX (EPA Method 602)
Monitoring wells FR-1, FR-2, FR-3, FR-4, FR-5, FR-6, FR-3d, FR-6d, FR-7d, FR-8d, FR-9d, MW-10B, MW-10D, MW-20B	March, 2003	Sem-annual groundwater plume monitoring	Groundwater	Purge and stabilize well prior to sampling	3 to 8 15 to 20 29 to 35	BTEX (EPA Method 602)

Key:
bgs =below ground surface
BTEX = Benzene, Toluene, Ethyl benzene, Xylenes
VOC =Volatile Organic Compound
SVOC =Semivolatile Organic Compound
MADEP VPH = Massachusetts Department of Environmental Protection Volatile Petroleum Hydroccarbon
MADEP EPH = Massachusetts Department of Environmental Protection Extractable Petroleum Hydrocarbon

TABLE 6-8

SUMMARY OF SOIL TPH DRO ANALYTICAL RESULTS -- JULY 2002

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Sampling Location: *Sample Depth (in ft bgs):* *Sample ID:* *Sample Date:* *Lab ID:* *Parameter*	*Units*	*G19* *5 to 7* *ALLSIG19 5-7* *7/24/2002* *210958-3*	*G19* *7 to 9* *ALLSIG19 7-9* *7/24/2002* *210958-4*	*G8* *5 to 7* *ALLSIG8 5-7* *7/24/2002* *210958-1*	*G8* *7 to 9* *ALLSIG8 7-9* *7/24/2002* *210958-2*	*Total Petroleum Hydrocarbon Action Level [1] (in mg/kg)*
Total Petroleum Hydrocarbons Diesel Range Organics	(mg/kg)	7.2 U	250	250	210	40
% Solids	%	85.2	85.2	81.3	86.4	

Key:
mg/kg = milligrams per kilogram
ft = feet
bgs = below ground surface
NE = Not Established
= Detected concentration exceeds Total Petroleum Hydrocarbon Action Level
U = Not detected above reported level

Notes:
[1] Values obtained from *Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater*, State of North Carolina Department of Environment and Natural Resources, Division of Water Quality Groundwater Section, July 2000.

TABLE 6-7

VOC and SVOC SOIL ANALYTICAL RESULTS

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Sampling Location: / Sample Depth (in ft bgs): / Sample Date: / Sample Condition: / Parameter (in ug/kg)	G8 / 7 to 9 / 11/27/2000 / Saturated	G19 / 7 to 9 / 11/27/2000 / Saturated	G8 / 7 to 9 / 7/24/2002 / Unsaturated	Soil-to-Groundwater Maximum Contaminant Concentration Levels [1] (in ug/kg)
Volatile Organic Compounds				
1,2-Dichloroethane	63.2	63.4	0.68 U	1.8
Toluene	0.305 U	0.34 UJ	7.1	7,000
Tetrachloroethene	3.22 J	0.542 UJ	0.79 U	7.4
Ethylbenzene	152 J	0.474 UJ	17	240
m&p-Xylenes	NA	NA	52	5,000
o-Xylene	NA	NA	32	5,000
Total Xylenes	1,180 J	0.903 UJ	NA	5,000
Isopropylbenzene	128 J	0.513 UJ	6.1	2,000
n-Propylbenzene	413 J	0.834 UJ	10	2,000
1,3,5-Trimethylbenzene	1,070 J	16.2 J	29	7,000
1,2,4-Trimethylbenzene	3,410 J	53.2 J		8,000
sec-Butylbenzene	467 J	6.11 J	9.3	3,000
n-Butylbenzene	1,010 J	23 J	0.99 U	4,000
Naphthalene	1,410	44.2	46	580
Semi-Volatile Organic Compounds				
Acenapththene	474	178 J	NS	8,000
Fluorene	699	8.83 U	NS	44,000
2-Methylnaphthalene	5,170	1380	NS	3,000
Phenanthrene	1,410	457	NS	60,000
Pyrene	212 J	7.35 U	NS	286,000

Key:
ug/kg = micrograms per kilogram
ft = feet
bgs = below ground surface
UJ = Not detected above reported estimated level
U = Not detected above reported level
J = Estimated concentration
UJ = Not detected above estimated reported level

= Exceeds Guidance concentration
NS = Not sampled
NA = Not Analyzed

Notes:
[1] Values obtained from *Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater,* State of North Carolina Department of Environment and Natural Resources, Division of Water Quality Groundwater Section, July 2000.

TABLE 6-6
SUMMARY OF SOIL TPH DRO (7-8 FEET BGS) ANALYTICAL RESULTS – OCTOBER 2000

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Sample ID	Analyte				
	TPH DRO[1]	Diesel	Jet Fuel JP4	Kerosene	Lubricating Oil
G3	ND (1.76) U	ND (1.74)	ND (1.55)	ND (1.37)	ND (1.74)
G8	**517**	517	ND (15.0)	ND (13.3)	ND (16.9)
G19	**194**	194	ND (3.12)	ND (2.77)	ND (3.50)
G20	ND (3.65) U	ND (1.70)	ND (1.51)	ND (1.34)	ND (1.70)
G26	ND (3.16) U	ND (1.71)	ND (1.53)	ND (1.35)	ND (1.71)

[1] Total Petroleum Hydrocarbons, Diesel Range Organics
bgs = below ground surface
ND = Analyte not detected above method detection limit.
Method detection limits are shown in parentheses.
All results and method detection limits are in µg/g.
U = Blank contamination exists. The sample quantitation limit has been elevated to the concentration found in the sample and the sample has been designated as not present above this limit (ND).
NCDENR *Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater* action level for medium and high boiling point fuels is 40 mg/kg (40 µg/g) as TPH DRO.
Results shown in bold are above the action level for medium and high boiling point fuels.

NOTE: Data table prepared by URS Corporation.

TABLE 6-5
SUMMARY OF SOIL TPH DRO (7-8 FEET BGS)
ANALYTICAL RESULTS – APRIL 2000

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Sample ID	TPH DRO[1] (µg/g)	Diesel (µg/g)	Jet Fuel JP4 (µg/g)	Kerosene (µg/g)	Lubricating Oil (µg/g)
G7d	ND (3.52 U)	ND (2.68)	ND (1.39)	ND (0.806)	ND (2.68)
G8d	**1260**	1260	ND (27.1)	ND (15.8)	ND (52.4)
G9d	ND (12.2 U)	ND (12.2 U)	ND (1.34)	ND (0.777)	ND (2.58)
G12d	ND (5.47 U)	ND (2.60)	ND (1.35)	ND (0.783)	ND (2.60)
G13d	ND (34.4 U)	ND (34.4 U)	ND (1.41)	ND (0.821)	ND (2.73)
G14d	ND (4.41 U)	ND (2.65)	ND (1.37)	ND (0.796)	ND (2.65)
G17d	ND (7.34 U)	ND (1.78)	ND (1.59)	ND (1.41)	ND (1.78)
G18d	ND (6.13 U)	ND (2.66)	ND (1.38)	ND (0.801)	ND (2.66)
G19d	**52.5**	52.5	ND (1.37)	ND (0.796)	ND (2.65)

[1] Total Petroleum Hydrocarbons, Diesel Range Organics
Method detection limit shown in parenthesis.
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. Blank contamination exists.
NCDENR *Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other than Petroleum Underground Storage Tanks* clean-up level for medium and high boiling point fuels is 40 mg/kg (40 µg/g) as TPH DRO.
Results shown in bold are above the clean-up level for medium and high boiling point fuels.

NOTE: Data table prepared by URS Corporation.

TABLE 6-4
SUMMARY OF SOIL TPH DRO (4-5 FEET BGS) ANALYTICAL RESULTS – APRIL 2000

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Sample ID	TPH DRO[1] (µg/g)	Diesel (µg/g)	Jet Fuel JP4 (µg/g)	Kerosene (µg/g)	Lubricating Oil (µg/g)
G1	ND (9.09 U)	ND (1.71)	ND (1.53)	ND (1.36)	ND (1.71)
G2	ND (7.44 U)	ND (1.82)	ND (1.62)	ND (1.44)	ND (1.82)
G3	ND (5.27 U)	ND (1.77)	ND (1.58)	ND (1.40)	ND (1.77)
G4	ND (6.97 U)	ND (1.78)	ND (1.59)	ND (1.41)	ND (1.78)
G5	ND (6.49 U)	ND (2.86)	ND (1.48)	ND (0.861)	ND (2.86)
G6	ND (6.25 U)	ND (1.70)	ND (1.51)	ND (1.34)	ND (1.70)
G7	ND (5.75 U)	ND (1.74)	ND (1.55)	ND (1.37)	ND (1.74)
G8	ND (6.52 U)	ND (6.52 U)	ND (1.35)	ND (0.784)	ND (2.60)
G9	ND (39.3 U)	ND (39.3 U)	ND (1.36)	ND (0.793)	ND (2.64)
G10	ND (6.65 U)	ND (1.76)	ND (1.57)	ND (1.39)	ND (1.76)
G11	ND (8.72 U)	ND (1.81)	ND (1.61)	ND (1.43)	ND (1.81)
G12	ND (4.72 U)	ND (2.70)	ND (1.40)	ND (0.813)	ND (2.70)
G13	ND (21.0 U)	ND (21.0 U)	ND (1.36)	ND (0.789)	ND (2.62)
G14	ND (7.13 U)	ND (2.73)	ND (1.41)	ND (0.821)	ND (2.73)
G15	ND (6.20 U)	ND (2.70)	ND (1.40)	ND (0.813)	ND (2.70)
G16	ND (8.33 U)	ND (2.74)	ND (1.42)	ND (0.823)	ND (2.74)
G17	ND (9.64 U)	ND (2.67)	ND (1.38)	ND (0.803)	ND (2.67)
G18	ND (6.47 U)	ND (2.68)	ND (1.39)	ND (0.807)	ND (2.68)
G19	ND (5.89 U)	ND (1.78)	ND (1.59)	ND (1.41)	ND (1.78)
G20	ND (6.84 U)	ND (1.73)	ND (1.54)	ND (1.36)	ND (1.73)
G21	ND (6.93 U)	ND (1.76)	ND (1.57)	ND (1.39)	ND (1.76)
G22	ND (7.23 U)	ND (1.72)	ND (1.53)	ND (1.36)	ND (1.72)
G23	ND (6.33 U)	ND (1.72)	ND (1.53)	ND (1.36)	ND (1.72)
G24	ND (6.67 U)	ND (1.71)	ND (1.53)	ND (1.35)	ND (1.71)
G25	ND (5.60 U)	ND (1.73)	ND (1.54)	ND (1.37)	ND (1.73)

[1] Total Petroleum Hydrocarbons, Diesel Range Organics
Method detection limit shown in parenthesis.
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit. Blank contamination exists.
NCDENR *Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other than Petroleum Underground Storage Tanks* clean-up level for medium and high boiling point fuels is 40 mg/kg (40 µg/g) as TPH DRO.

NOTE: Data table prepared by URS Corporation.

TABLE 6-1

SUMMARY OF SOIL SAMPLING EFFORT METHODS

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Sample Location	Sample Date	Purpose	Sample Type	Collection Method	Depth of Sample (in ft bgs)	Depth to Water Table	Laboratory Analysis
G1 through G25	April 11 - 12, 2000	Gridded soil samples in vicinity of fuel oil release to assess impacts	Grab sample	DPT	4 to 5	3	TPH GRO (EPA Method 5030/ 8021B/8015)
							TPH DRO (EPA Method 3550/8015)
G7d, G8d, G9d, G12d, G13d, G14d, G17d, G18d, G19d	April 11 - 12, 2000	Evaluate potential vertical migration of fuel oil due to seasonal groundwater fluctuations	Grab sample	DPT	7 to 8	3	TPH GRO (EPA Method 5030/ 8021B/8015)
							TPH DRO (EPA Method 3550/8015)
G3 and G20	October 2, 2000	Define lateral extent of soil impacts	Grab sample	DPT	7 to 8	less than 8	TPH DRO (EPA Method 3550/8015)
G8 and G19	October 2, 2000	Reconfirm April 2000 results	Grab sample	DPT	7 to 8	less than 8	TPH DRO (EPA Method 3550/8015)
G26	October 2, 2000	Define extent of TPH DRO impacts west of G19	Grab sample	DPT	7 to 8	less than 8	TPH DRO (EPA Method 3550/8015)
G8 and G19	November 27, 2000	Speciation of VOCs and SVOCs in areas where TPH DRO soil screening levels exceeded	Grab sample	DPT	7 to 8	6 to 8	VOCs - SW846 8260
							SVOCs - SW846 8270
G8 and G19	July 24, 2002	Characterize unsaturated soils potential impact on groundwater migration pathway	Grab sample	DPT	5 to 7	10	TPH DRO (EPA Method 3550/8015)
G8 and G19	July 24, 2002	Characterize unsaturated soils potential impact on groundwater migration pathway	Grab sample	DPT	7 to 9	10	TPH DRO (EPA Method 3550/8015) and VOCs Method 5035/8260B for G8 only

Key:
TPH DRO =Total Petroleum Hydrocarbon Diesel Range Organics
TPH GRO = Total Petroleum Hydrocarbon Gasoline Range Organics
bgs =below ground surface
DPT = Direct Push Technology
VOC =Volatile Organic Compound
SVOC =Semivolatile Organic Compound

TABLE 5-2

APPARENT FREE PRODUCT MEASUREMENTS AT MONITORING WELL FR-6
(Page 2 of 2)

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Observation Date	*Free Product Thickness (in inches)*
07-Dec-01	0
17-Dec-01	0
21-Dec-01	0
31-Dec-01	0
07-Jan-02	0
15-Jan-02	0
22-Jan-02	0
31-Jan-02	0
09-Feb-02	0
14-Feb-02	0
22-Feb-02	0
28-Feb-02	0
07-Mar-02	0
14-Mar-02	0
22-Mar-02	0
31-Mar-02	0
10-Apr-02	Dry
06-May-01	Dry
10-Jun-02	Dry
03-Jul-02	Dry
07-Aug-02	Dry
04-Sep-02	Dry
10-Dec-02	0.08
08-Jan-03	0
05-Feb-03	0
05-Mar-03	0
02-Apr-03	0

Key:
NA = Not available

Note:
No free product thickness observed when well was dry.

TABLE 5-2

APPARENT FREE PRODUCT MEASUREMENTS AT MONITORING WELL FR-6
(Page 1 of 2)

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Observation Date	*Free Product Thickness (in inches)*
18-Dec-00	0.125
31-Dec-00	0.75
08-Jan-01	2.25
09-Jan-01	1.25
15-Jan-01	1.5
23-Jan-01	0
31-Jan-01	0.5
08-Feb-01	2
23-Feb-01	0
28-Feb-01	0
08-Mar-01	0
13-Mar-01	0
22-Mar-01	0
28-Mar-01	0
21-Apr-01	0.5
30-Apr-01	0
07-May-01	0
15-May-01	1
22-May-01	4
25-May-01	1
07-Jun-01	3
14-Jun-01	2
21-Jun-01	1
30-Jun-01	1
09-Jul-01	5
16-Jul-01	4
25-Jul-01	4
31-Jul-01	5
07-Aug-01	1
10-Aug-01	1
20-Aug-01	1
31-Aug-01	3
13-Sep-01	2.5
24-Sep-01	0.03
31-Oct-01	0
09-Nov-01	0
16-Nov-01	0
30-Nov-01	0

TABLE 5-1

APPARENT FREE PRODUCT MEASURED IN INSTALLED VERTICAL RISERS BETWEEN MARCH AND JULY 2000

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

	3/15	3/17	3/20	3/24	3/27	3/31	4/4	4/7	4/19	4/28	5/5	5/19	5/26	6/4	6/9	6/16	6/23	6/30	7/7	7/14	7/21
A1	*	*	*	*	*	*	*	*	*	*	*	*	*	R	R	*	R	R	R	R	R
A2	*	*	*	*	*	*	*	*	*	*	*	*	*	R	*	*	R	R	R	R	R
A3	*	*	*	*	*	*	*	*	*	*	*	*	*	R	*	*	R	R	R	*	R
B1	*	*	*	*	*	*	*	*	*	*	*	*	*	R	*	*	*	R	R	*	R
B2	*	*	*	*	*	*	*	*	*	*	*	*	*	R	*	*	*	R	R	*	R
B3	*	*	*	*	*	*	*	*	*	S	S	*	*	R	*	*	*	R	R	*	R
B4	*	*	*	*	*	*	*	*	*	*	S	*	*	R	S	*	*	R	R	*	R
B5	*	*	*	*	*	*	*	*	*	*	S	S	*	R	S	*	*	R	*	S	R
C1	*	1"	¼"	¼"	¼"	¼"	¼"	S	S	*	¼"	S	*	R	S	*	*	*	*	S	S
C2	*	*	*	*	*	*	*	*	*	½"	¾"	S	*	R	S	*	*	*	*	S	S
C3	*	*	*	*	*	*	*	*	*	*	*	S	*	R	S	*	*	*	*	S	S
D1	*	¼"	*	¼"	¼"	¼"	¼"	¼"	S	*	*	S	S	R	R	R	*	*	R	R	R
D2	*	*	*	*	*	*	*	*	*	S	*	*	*	R	R	S	*	R	R	R	R
D3	*	*	*	*	*	*	*	*	*	*	*	*	*	R	*	S	*	R	R	*	R

* = No free product visible
R = Riser dry (rocks visible)
S = Slight sheen

NOTE: Data table prepared by URS Corporation.

TABLE 3-1

PRIVATE WELL SURVEY

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Well Address	*Owner*	*Telephone*	*Well Use*
16140 Hillcrest Avenue	Mrs. George White	910-227-3271	Well is out of service in rear of vacant parcel. (House is serviced by municipal water hookup.)
16121 Omega Avenue	Mr. James Allen	910-318-1470	Well is reported in service, possibly for irrigation. No construction information is available. (House is serviced by municipal water hookup.)

TABLE 2-1

POTENTIAL GROUNDWATER CONTAMINATION SOURCE AREAS

FUEL OIL RELEASE CSA
ABBOTT LABORATORIES
LAURINBURG, NORTH CAROLINA

Potential Source Area		*Installation Date*	*Current Status*	*Description*
1	AST #1	1996	Active	8,000-gallon No. 2 Fuel Oil
2	AST #2	Unknown	Active	250-gallon diesel fuel
3	AST #3	1998	Active	3,000-gallon No. 2 Fuel Oil
4	AST #4	Unknown	Active	500-gallon No. 2 Fuel Oil (diesel generator)
5	AST #5	Unknown	Inactive	5,000-gallon Freon 113
6	UST #1	1970	Closed and filled in place during 1997	15,000-gallon No. 2 Fuel Oil
7	UST #2	1980	Closed and filled in place during 1997	10,000-gallon No. 2 Fuel Oil
8	Raw Materials Shed #1	Unknown	Inactive	Flammable virgin solvents storage area; inactive.
9	Raw Materials Shed #2	Unknown	Inactive	Raw materials storage area - toxics and oxidizers.
10	Hazardous Waste Storage Shed	Unknown	Inactive	Covered, RCRA-compliant waste storage area

References

Scotland County Tax Assessors Office, Laurinburg, North Carolina

United States Geological Survey Topographic Map 1985, 7.5 minute series, Laurinburg, North Carolina, sacel 1:23,000; U.S. Geological Survey, Denver, Colorado

Geologic Map of North Carolina, North Carolina Geological Survey, 1985

Schipf, Robert G. *Geology and Groundwater Resources of the Fayetteville Area.* North Carolina Department of Water Resources, Groundwater Bulletin, No. 3, 1961.

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Radian Engineering. *Free Product Recovery Report* for Abbott Laboratories, Laurinburg, North Carolina, March 30, 2000.

Radian Engineering. *Preliminary Site Characterization Report, Petroleum Release*, for Abbott Laboratories, Laurinburg, North Carolina, August 2000.

Radian Engineering. *Phase II Site Characterization Report for Petroleum Release* for Abbott Laboratories, Laurinburg, North Carolina, February 2001

Radian Engineering. *Semi-Annual Groundwater Monitoring Report for Petroleum Release* for Abbott Laboratories, Laurinburg, North Carolina, June 2001

Radian Engineering. *Semi-Annual Groundwater Monitoring Report for Petroleum Release* for Abbott Laboratories, Laurinburg, North Carolina, December 2001

URS Corporation – North Carolina. *Semi-Annual Groundwater Monitoring Report for Petroleum Release* for Abbott Laboratories, Laurinburg, North Carolina, June 2002

Matrix Environmental, Inc. *Semi-Annual Groundwater Monitoring Report for Petroleum Release* for Abbott Laboratories, Laurinburg, North Carolina, December 2002

NCDENR Division of Water Quality, Groundwater Section. *Guidelines for the Investigation and Remediation of Soil and Groundwater*, July 2000.

USEPA. *How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites*, EPA 510-R-96-001, September 1996.

There are four regulatory conditions that must be met to seek a natural attenuation remedy and waiver of onsite 2L standards (15 NCAC 2L.0106(l) and (k)), namely:

- All sources of contamination and free product have been removed or controlled.
- The time and direction of contaminant travel can be predicted with reasonable certainty.
- The contaminants have not and will not migrate onto adjacent properties.
- The 2L standards will be met at a location at least one year time of travel upgradient of an existing or foreseeable receptor.

It is anticipated that a corrective action plan (CAP) calling for monitored-natural attenuation for this incident will demonstrate compliance with each of these conditions based on the data presented in the CSA Report.

110 feet to 130 feet long by 60 feet wide. Overall, the groundwater data collected over a two-year period suggests a very stable benzene plume with no increasing downgradient benzene concentrations and the most heavily impacted areas remaining in close proximity to the source of the release.

During the most recent groundwater sampling event (April 2003), the reported concentration of ethyl benzene (46 μg/L) detected in a monitoring well that previously contained free product (monitoring well FR-6) exceeded the ethyl benzene 2L standard of 29 μg/L. This datum further suggests that the extent of groundwater impacts from the fuel oil release are very limited.

The site geology and hydrology have been characterized previously as part of the remediation of a solvent plume onsite. The uppermost aquifer coincides with clayey sand deposits that occur in the upper 25 feet bgs. The principal aquifer underlying the fuel area is comprised of fine to coarse sand deposits located between the depths of approximately 25 feet bgs and an estimated 80 feet bgs. This sand aquifer is overlain and underlain by deposits that appear to be at least semi-confining. Site wide the average groundwater flow is estimated to be 0.02 feet/day in the shallow aquifer and 0.28 feet/day in the deeper sand unit. The direction of groundwater flow varies from southwesterly to southerly to southeasterly.

The completed receptor survey confirmed that all businesses and residences within 1,500 feet of the release area receive municipal water service from the City of Laurinburg. Two private residential wells that may be used for irrigation purposes were identified approximately 1,400 feet southeast of the release area.

Based on the results of this comprehensive site assessment, monitored natural attenuation potentially combined with a waiver of the benzene and ethyl benzene 2L standards on the Abbott property is the corrective action that Abbott will be proposed to address the groundwater impacts originating from the fuel oil release. Based on the current site conditions and the relatively low levels of benzene remaining in the groundwater, monitored natural attenuation is a cost-effective and appropriate approach to addressing the groundwater impacts.

SECTION 8

CONCLUSION

The activities described in this CSA Report were undertaken to respond to the January 2000 No. 2 fuel oil release that occurred at the Abbott facility located in Laurinburg, North Carolina.

Initial response actions removed impacted soils, free product, and petroleum-impacted groundwater. Free product recovery from installed recovery trenches and a monitoring well located within the release area (monitoring well FR-6) successfully removed residual free product. Although apparent free product thickness (less than 1 inch) has been observed intermittently in monitoring well FR-6, based on the known fine grained nature of the upper aquifer and capillary fringe effects, these intermittent observations indicate the presence of an intermittent residual sheen on the water table and do not indicate the presence of true free product. As a result of the initial response and free product recovery activities, the sources of contamination and free product have been removed.

Soil and groundwater investigations were performed to determine the extent of the fuel oil release impacts. Although TPH DRO levels in soil samples collected from two discrete sampling locations (G8 and G19) exceed the Guidance action level for the soil-to-groundwater pathway, the totality of the data indicates that groundwater impacts from residual TPH DRO and individual non-BTEX constituents are not occurring. In addition, the soil data indicate that the source of the observed benzene groundwater impacts are originating from dissolved free product present in the groundwater and not an ongoing soil source. Therefore it is concluded that no further soil investigation and/or remediation is required.

Adverse benzene impacts have been observed in the groundwater and the benzene plume at concentrations in excess of the state 2L standard of 1 μg/L has been delineated. The maximum concentration of benzene observed in a monitoring well groundwater sample is 47 μg/L (monitoring well FR-6), during the April 2003 monitoring event. In the shallow portion of the aquifer, near the water table, the benzene plume is approximately 100 feet long by 70 feet wide. At the depth of 35 feet bgs, the lateral extent of the benzene groundwater plume ranged between

shown in Figures 7-10 and 7-11, respectively. Figure 7-12 presents the location of one cross sections along the inferred longitudinal centerline of the benzene groundwater plume that was used to evaluate the data and Figure 7-13 presents the cross sectional representations of the benzene groundwater based on the May 2001 and April 2003 data.

The benzene plume is observed to be stable throughout the semi-annual groundwater sampling period. The approximate lateral extent of the shallow benzene groundwater plume is 100 feet long by 70 feet wide, as shown in Figure 7-10. At the depth of 35 feet bgs, the lateral extent of the benzene groundwater plume ranged between 110 feet to 130 feet long by 60 feet wide.

The differences in the inferred benzene groundwater plume between the 2000, 2001, and 2003 data are marginal. The 2000 35 feet bgs benzene plume is inferred to be larger than that of 2001 and 2003 based on additional data points and nominal differences in the benzene concentrations observed at monitoring well FR-3D. Overall, the complete groundwater data set suggests a very stable benzene plume with no increasing downgradient benzene concentrations observed.

observed in any groundwater sample in exceedances of the 2L standards. Two sets of isocontour maps were prepared. The first set of isocontours combines the groundwater data collected from monitoring well and discrete well point sampling during May, October, and December 2000. The second set of isocontours presents the groundwater data collected from the first (May 2001) and most recent (April 2003) semi-annual monitoring well sampling events. Plume interpretation is provided below.

2000 Benzene Groundwater Plume Isocontours

As previously discussed, the 2000 groundwater data was primarily collected from the depth intervals of 15 feet bgs and 35 feet bgs. Based on the 2000 data, the inferred benzene groundwater plume at the 15 feet bgs and 35 feet bgs depths are shown in Figures 7-5 and 7-6, respectively. Figure 7-7 presents the location of two perpendicular cross sections used to evaluate the 2000 data and Figures 7-8 and 7-9 present the cross sectional representations of the benzene groundwater plume based on the 2000 data.

The approximate lateral extent of the benzene groundwater plume in 2000 at the depth of 15 feet bgs is 160 feet long by 60 feet wide, as shown in Figure 7-5. At the depth of 35 feet bgs, the lateral extent of the benzene groundwater plume in 2000 was approximately 200 feet long by 100 feet wide. The broadening of the benzene plume with depth is consistent with the observed increase in hydraulic conductivity within the deeper sand unit and the general southerly groundwater flow direction.

2001 to 2003 Benzene Groundwater Plume Isocontours

As previously discussed, semi-annual groundwater sampling has been performed since May 2001 in monitoring wells screened to depths of 8 feet bgs, 15 feet bgs, and 35 feet bgs. The groundwater monitoring data from May 2001 and April 2003 was selected to contour to evaluate the stability of the groundwater plume during this time period. Based on the data from these two monitoring events the inferred benzene groundwater plume in the shallow portion of the interbedded aquifer (to 8 feet bgs) and in the deeper sand aquifer (15 feet bgs to 35 feet bgs) are

January 2000 release and are also used to monitor the solvent groundwater plume. Details of monitoring well construction are provided in Table 7-3.

The following five semi-annual groundwater fuel oil release groundwater monitoring events have been performed: May 2001, October 2001, March 2002, September 2002, and March 2003. During each of these sampling events, water elevation measurements were measured at monitoring wells FR-2 and FR-4, however no groundwater analytical samples were collected since, as discussed in Section 7.2 above, initial groundwater analytical data indicated that these locations were unimpacted by the benzene groundwater plume. In addition, groundwater sampling of monitoring well FR-6 was not attempted prior to September 2002 due to the historic presence of free product in this shallow well. Purging and field data are presented in Appendix H.

The BTEX analytical groundwater data collected from all the fuel oil release monitoring well network for the period May 2000 through April 2003 is presented in Table 7-8. Benzene is the primary constituent of concern present in the groundwater and, with the exception of shallow monitoring well FR-6, the only constituent observed at concentration levels exceeding its 2L standard (1μ/L). The maximum concentration of benzene observed in any groundwater sample collected from a monitoring well is 47 μg/L, which was detected in monitoring well FR-6 during the April 2003 monitoring event. The benzene analytical groundwater results are presented in Figure 7-4.

At monitoring well FR-6, ethylbenzene was observed at 46 μg/L in April 2003, which exceeds the ethylbenzene 2L standard of 29 μg/L. Free product was observed in monitoring well FR-6 until September 2001 and groundwater sampling was first performed at this location in April 2003. The ethylbenzene analytical groundwater results are not presented graphically in this report since this constituent has only been detected in monitoring wells FR-6 and FR-6D.

7.6 GROUNDWATER RESULTS INTERPRETATION

Isocontour maps of the benzene groundwater data were prepared since, with the exception of one groundwater sample collected from monitoring well FR-6, benzene is the only constituent

The BTEX analytical results for these groundwater screening samples are presented in Table 7-6. Benzene was the only constituent observed at concentrations in excess of its 2L standard. Exceedances of the benzene 2L standard were observed in discrete groundwater samples collected from 15 feet bgs at W-5 and W-12 and were observed in discrete groundwater samples collected from 35 feet bgs at W-5, W-10, W-11, and W-12.

7.4 PHASE II MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING

On 27 November 2000, four deep groundwater monitoring wells (FR-3d, FR-7d, FR-8d, and FR-9d) were installed by DPT in the sand unit and one shallow well (FR-6) was installed by hollow stem auger in the interbedded unit. The location of these five wells are shown in Figure 7-2. The rationale for these well locations are summarized in Table 7-7. Well construction information is summarized in Table 7-3.

On 7 December 2000, the four new deep groundwater monitoring wells (FR-3d, FR-7d, FR-8d, and FR-9d) were sampled for BTEX. Monitoring well FR-6 was not sampled due to the presence of free product in the well. The groundwater elevation in each monitoring well was measured prior to purging. Purging and field data are presented in Appendix H.

The analytical results for this sampling round are presented and discussed with the semi-annual groundwater monitoring results, which is presented in Section 7.5 below.

7.5 SEMI-ANNUAL FUEL OIL RELEASE GROUNDWATER MONITORING PROGRAM

To proactively monitor the benzene groundwater plume associated with the fuel oil release, a semi-annual groundwater Fuel Oil Release Groundwater Monitoring Program was initiated in May 2001. The petroleum release monitoring well network is comprised of 14 monitoring wells (FR-1, -2, -3, -3D, -4, -5, -6, -6D, -7D, -8D, -9D, MW-10B, MW-10D, and MW-20B), as shown in Figure 7-2. Monitoring wells MW-10B, MW-10D, and MW-20B were installed prior to the

The BTEX, SVOC, petroleum hydrocarbon analytical results are summarized in Table 7-4. A summary of the tentatively identified compounds (TICs) identified in these groundwater samples is presented in Table 7-5.

As shown in Table 7-4, benzene, toluene, ethyl benzene, and total xylenes were detected in the groundwater samples. Benzene was the only constituent detected in exceedances of its 2L standard of 1 μg/L. The exceedances of the benzene 2L standard was observed in monitoring well FR-6d (21 μg/L) and suggests that the extent of adverse groundwater impacts is limited to the immediate vicinity of the fuel oil release.

Five SVOCs and limited VPHs and EPHs were detected in the groundwater samples as shown in Table 7-4. No exceedances of the 2L standards for these constituents were observed. The TICs identified in the groundwater samples include unknown ketones, alcohols, organic acids, aromatic hydrocarbons and polyaromatic hydrocarbons.

Based on the analytical results of this initial groundwater sampling event, it was concluded and approved by the NCDENR that subsequent groundwater sampling analysis would be limited to BTEX since benzene was the only constituent observed to be exceeding its 2L standard in the most heavily impacted portion of the fuel release groundwater plume.

7.3 PHASE II GROUNDWATER SCREENING

An additional round of groundwater screening was performed in October 2000 to assist in determining the placement of five additional monitoring wells. Groundwater screening samples were collected on 2 and 3 October 2000 from 11 DPT sample locations. Ten of the eleven sampling locations were placed along and perpendicular to the inferred fuel oil groundwater plume axis, as shown in Figure 7-3. The eleventh sample location, W-12, was placed near monitoring well FR-1. Two groundwater samples were collected at each location, one at a depth of approximately 15 feet bgs and the other at approximately 35 feet bgs.

The sample collection depths ranged from 4 feet bgs to 8 feet bgs. The water table depth at the time of sampling was approximately 3 feet bgs. During the sampling effort, very limited water accumulated in most holes and some holes remained dry, which may have occurred due to the low permeability of the interbedded layer.

A summary of the immunoassay field screening results is presented in Table 7-2.

The immunoassay field screening results were generally inconclusive. The detection limit of the test kits for BTEX was approximately 0.6 mg/L, which was too insensitive to adequately delineate the distribution of dissolved petroleum constituents. In addition, unusable turbid water or no water conditions were encountered at several sampling locations, thereby preventing representative sample collection and screening.

7.2 INITIAL MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING

Six monitoring wells were installed in between 28 April and 1 May 2000 in the fuel release area. The locations of the installed monitoring wells are shown in Figure 7-2 and a summary of the well construction information is presented in Table 7-3. The monitoring well installation logs are presented in Appendix G. Five of the wells were screened at the depth of 3 feet bgs to 8 feet bgs. Two of these shallow monitoring wells (FR-1 and FR-3) were located downgradient of the release area, along the inferred plume axis. Two additional shallow monitoring wells (FR-2 and FR-4) were located perpendicular to the inferred plume axis at locations slightly outside the inferred limits of the plume. Shallow monitoring well FR-5 was placed at an upgradient location. Monitoring well FR-6D was installed within the vicinity of the release area (and former UST pit) and was screened between 14.5 feet bgs and 19.5 feet bgs.

These six monitoring wells were sampled on 17 and 18 May 2000 for the following parameters: BTEX, SVOCs, volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH).

SECTION 7

GROUNDWATER INVESTIGATION

Groundwater investigations were performed initially in two rounds of field screening sampling followed by installation of monitoring wells. In addition, ongoing semi-annual groundwater sampling of the permanent monitoring wells installed as part of these efforts has been conducted since May 2001. A summary of the groundwater sampling activities are presented in Table 7-1, including date of sampling event, purpose of sampling event, location of groundwater samples, and sample collection procedures.

The groundwater sampling conducted in 2000 and 2001 was performed by Radian. URS-North Carolina of Morrisville, North Carolina (URS) performed the groundwater sampling in March of 2002. Matrix and Excel performed the groundwater sampling in September 2002 and April 2003. For the period 2000 through March 2002, STL-Tallahassee provided the laboratory analysis and for September 2002 through April 2003, STL-Chicago provided the laboratory analysis. The well installation procedures and sampling methods are presented in Appendix E.

The laboratory analytical results are presented in Appendix F. The groundwater analytical results were compared to the North Carolina Administrative Code subchapter 2L groundwater standards (the 2L standards, 15A NCAC 2L.0202). Details of each sampling event are presented below.

7.1 BTEX IMMUNOASSAY FIELD SCREENING

In April 2000, groundwater screening was performed using BTEX field immunoassay test kits manufactured by Strategic Diagnostics, Inc. The immunoassay test kits were used as a rapid and simple semi-quantitative method to determine the presence of BTEX in the groundwater samples. This field screening was attempted at the same 25 locations at which soil sampling was performed initially, as shown in Figure 7-1. The sampling locations were advanced using direct push technology (DPT) and plastic tubing was used to manually collect groundwater from the bottom of the advanced rod.

- The laboratory chromatographs for the July 2002 data were reviewed and indicate that the TPH DRO from both locations represent the same type of fuel. In addition, the fuel appears to be slightly weathered suggesting it may have been present prior to January 2000. (See Appendix F for chromatographs.)

- Benzene, the primary constituent detected in the groundwater in excess of groundwater standards, which are used to derive the Guidance soil-to-groundwater action levels, has not been detected in any of the saturated or unsaturated soil samples. (See Section 7.0 below for presentation of groundwater data.)

- No volatile petroleum hydrocarbon or extractable petroleum hydrocarbon groundwater standards have been exceeded. If the TPH DRO were adversely impacting the groundwater, exceedances of these standards would be expected to be observed. (See Section 7.0 below for presentation of groundwater data.)

- No individual constituent soil-to-groundwater pathway action levels were exceeded in the unsaturated sample collected in July 2002.

In sum, although the Guidance action level for TPH DRO soil-to-groundwater pathway was exceeded at both sample locations G8 and G19 in unsaturated soil samples, the totality of the data indicates that groundwater impacts from residual TPH DRO and individual non-BTEX constituents are not occurring. In addition, the soil data indicate that the source of the observed benzene groundwater impacts are originating from dissolved free product present in the groundwater and not an ongoing soil source. Therefore, it is concluded that no further soil investigation and/or remediation is required.

The TPH DRO soil analytical results for this sampling round are presented in Table 6-8; the VOC soil analytical results are presented in Table 6-7. The observed TPH DRO concentrations exceeded the Guidance action levels in three samples (G8 [both depth intervals] and G19 [at the 7 feet bgs to 9 feet bgs depth interval]). However no VOC exceedances of the Guidance action levels were observed.

6.3 SOIL RESULTS INTERPRETATION

Interpretation of the soil analytical results is limited by the fact that the soil samples collected in 2000 were saturated samples. The primary purpose of evaluating soil samples is to determine if migration of contaminants from unsaturated soils into the groundwater is occurring at potentially unacceptable levels. Consequently, the 2000 soil data cannot be compared directly to the Guidance action levels since the analytical results reflect a combination of aqueous phase contaminants and contaminants absorbed to the soil matrix. For this same reason, the saturated soil analytical results observed to be below the Guidance action levels indicate that the unsaturated soils are unlikely to exceed the Guidance action levels. Therefore, based on the TPH GRO saturated soil analytical results, the soils are not adversely impacted by TPH GRO.

Potentially impacted unsaturated soils with reported TPH DRO concentrations above the Guidance action level were observed at sample location G8, which is located slightly south of the fuel release area, and at sample location G19, which is located approximately 70 feet upgradient of the fuel release area and within approximately 20 feet of the 3,000-gallon AST. As detailed below, several lines of evidence indicate that the TPH DRO concentrations observed at G8 and G19 are not related to the January 2000 fuel release and are not a continuing source of groundwater contamination.

- Analytical results from sample locations G8 and G19 appear to be relatively isolated. No detectable levels of TPH DRO at the three sampling locations located between G8 and G19 (G13, G9, and G12) were observed, suggesting that the observed TPH DRO concentrations are related to activities independent of the January 2000 fuel release.

locations were sampled at this depth interval (G3, G20 and the new location G26). In November 2000, VOC and SVOC saturated soil samples were collected at sample locations G8 and G19 at the 7 feet bgs to 8 feet bgs depth interval.

The TPH GRO April 2000 saturated soil sample analytical results are presented in Tables 6-2 and 6-3. TPH GRO was detected at three soil sample locations (G9 [4 feet bgs to 5 feet bgs], G8 [7 feet bgs to 8 feet bgs], and G13 [7 feet bgs to 8 feet bgs]). TPH GRO was not detected in any sample above the Guidance action level of 10 mg/kg. The TPH DRO April 2000 soil sample analytical results are presented in Tables 6-4 and 6-5. TPH DRO was detected in only two samples (G8 [7 feet bgs to 8 feet bgs], and G13 [7 feet bgs to 8 feet bgs]) and was reported at concentrations above the Guidance action level for TPH DRO (40 mg/kg).

The October 2000 TPH DRO saturated soil analytical results are presented in Table 6-6. The TPH DRO Guidance action level again was exceeded at sampling locations G8 and G19d at a depth of 7 feet bgs to 8 feet bgs.

The November 2000 VOC and SVOC saturated soil analytical results are summarized in Table 6-7. In the soil sample collected at G8, two VOCs, 1,2-dichloroethane and naphthalene, and one SVOC, 2-methylnaphthalene, were detected at concentrations above their respective Guidance action levels. In the soil sample collected at G19, only 1,2-dichloroethane was detected at a concentration above its Guidance action level.

6.2 2002 SAMPLING

In July 2002, additional soil samples were collected from sample locations G8 and G19 to characterize the unsaturated soil at these locations since the previous soil samples were collected as saturated soil samples. TPH DRO soil samples were collected at both locations at the 5 feet bgs to 7 feet bgs and at the 7 feet bgs to 9 feet bgs depth intervals. One VOC soil sample also was collected at sample location G8 at the 7 feet bgs to 9 feet bgs depth intervals. The depth to the water table during this sampling event was 10 feet bgs.

SECTION 6

SOIL INVESTIGATIONS

Three separate soil sampling efforts have been undertaken to characterize residual impacts associated with the fuel oil release as part of the Comprehensive Site Assessment. Table 6-1 summarizes the soil sampling effort methods and includes the following information: date of soil sample collection, sampling rationale, type of soil sample, sample collection method, collection depth of soil sample, laboratory analyses performed, and soil sample location identification. The locations of all the soil samples collected are shown in Figure 6-1. Analytical results were compared to the action levels presented in the *Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater* (the Guidance, NCDENR Division of Water Quality Groundwater Section, July 2000).

The soil sampling efforts conducted in 2000 were performed by Radian Engineering of Research Triangle Park, North Carolina (Radian). The 2000 collected samples were analyzed by STL Laboratories of Austin, Texas (STL-Austin). The soil sampling effort conducted in 2002 was performed by Matrix and Excel Civil and Environmental Associates, PLLC of Gastonia, North Carolina (Excel) and the collected samples were analyzed by STL Laboratories of Chicago, Illinois (STL-Chicago). Sampling methods are described in Appendix E.

The soil laboratory analytical results are presented in Appendix F.

6.1 2000 SAMPLING

Three rounds of soil sampling were performed during 2000. In April 2000, saturated soil samples were collected from the 25 gridded sampling locations shown in Figure 6-1 (G1 through G25). The soil samples were analyzed for Total Petroleum Hydrocarbon Gasoline Range Organics (TPH GRO), which generally includes C_5 –C_{12} hydrocarbons, and for Total Petroleum Hydrocarbon Diesel Range Organics (TPH DRO), which generally includes C_9 –C_{28} hydrocarbons. In October 2000, additional TPH DRO saturated soil sampling was repeated at sampling locations G8 and G19 at the 7 feet bgs to 8 feet bgs depth interval and three additional

observed apparent free product thickness, and the physical phenomena that exaggerate the differences between apparent free product thickness and true free product thickness, it is reasonable to conclude that the free product data obtained from monitoring FR-6 since September 2001 is consistent with a residual sheen intermittently present on the water table rather than the presence of free product.

Approximately 3,000 gallons of petroleum-impacted groundwater were removed from the four trenches using a vacuum truck on 17 February 2000. On 15 March 2000, there was no indication of free product in any of the 14 vertical risers. Biweekly monitoring of the trenches was performed through July 2000 and included stick measurements using oil/water-finding paste. Table 5-1 summarizes the thickness of free product measured in the trench risers.

5.2 MONITORING WELL FR-6 FREE PRODUCT MONITORING AND RECOVERY

Monitoring well FR-6, which is located in the vicinity of the former UST pit, has been checked for the presence of free product from December 2000 through May 2003. Weekly inspections were performed for the period December 2000 through March 2002. Monthly inspections were initiated in April 2002 due to the absence of observed apparent free product and continued through May 2003. The apparent thickness of the free product measured at this location is presented in Table 5-2.

On 22 May 2001, approximately 4-inches of free product was observed in monitoring well FR-6. Approximately 24 gallons of petroleum-impacted groundwater was removed from monitoring well FR-6 using an Aggressive Fluid Vapor Recovery technology on 24 May 2001. During the period from June through September 2001, additional free product was manually removed from monitoring well FR-6 using a bailer.

For the period October 2001 through May 2003, apparent free product was observed in monitoring well FR-6 on two occasions (December 2001 and May 2003). In December 2001, the depth to the water table was slightly more than 6 feet bgs and in May 2003 it was slightly less than 3 feet bgs. During both monitoring events the apparent free product thickness observed was less than 1 inch. It is well established throughout the industry that the observed apparent thickness of free product measured in monitoring wells is usually much greater than the true thickness of the free product present in the aquifer. This exaggeration is most pronounced in media with strong capillary effects, such as the interbedded clays and silts present in the upper aquifer at this site (USEPA, 1996). Therefore, based on the intermittent nature of the apparent free product thickness, its occurrence at varying water table depths, the small magnitude of the

SECTION 5

FREE PRODUCT RECOVERY

As described below, there were two components of the free product recovery effort:

- Installation of four free product recovery trenches and free product recovery by vacuum truck.
- Free product monitoring and recovery at monitoring well FR-6.

5.1 FREE PRODUCT RECOVERY TRENCHES

Following the initial mitigation activities described in Section 2.3, four free product recovery trenches were installed in-between the release area and the concrete storm water drainage channel on 10 to 12 February 2000, as shown in Figure 5-1. The purpose of the trench installation was to recover free product and intercept further free product migration from the release area towards the concrete storm water ditch. A trench depth of 5 feet was selected to intersect the water table and free-floating product while minimizing the excavation size. Limiting the depth of the intercept trench also minimized the potential for smearing of free product across uncontaminated soils during recovery pumping operations.

The trenches were excavated to a depth of 5 feet. Perforated PVC pipe was placed on a layer of gravel in the bottom of each trench and connected to vertical risers also constructed of perforated PVC pipe. A total of 14 vertical risers were installed. The trenches were backfilled with gravel to a depth of 4 inches bgs to 6 inches bgs followed by backfilling with clean soil to grade.

During the trench installation, the excavation area was dewatered using a vacuum truck. A thin layer of free product was observed in the trench excavations during this period. The petroleum contaminated groundwater and free product removed during trench installation activities were stored onsite in a portable Frac tank.

southerly, and southwesterly. Localized hydraulic gradients in the vicinity of the fuel oil release have been observed to range from 0.004 foot/foot to 0.02 foot/foot.

Site wide the average groundwater flow is estimated to be 0.02 feet/day in the shallow aquifer and 0.28 feet/day in the deeper sand unit. In the vicinity of the fuel oil release area, higher average groundwater flows have been estimated, as presented in Appendix D. For purposes of calculating potential downgradient impacts, however, the site wide data provides a more comprehensive characterization of the aquifer characteristics and therefore is more appropriate to use.

aquifer is overlain and underlain by deposits that appear to be at least semi-confining. The bottom of the sand aquifer is confined by a clay layer encountered at a depth of approximately 80 feet bgs.

Aquifer tests (pumping tests) to determine the aquifers hydraulic conductivities were previously conducted as part of the design of the solvent release groundwater extraction and treatment system in 1995 and 1996. The pumping test on the upper confining layer conducted in January 1995 measured the hydraulic conductivity of the upper unit to be approximately 6.4×10^{-4} centimeters per second (cm/sec) (2 feet/day). The pumping test of the sand layer conducted in July 1996 measured the hydraulic conductivity of this lower unit to be approximately 8.9×10^{-3} cm/sec (25 feet/day). The pumping test results and calculations are presented in Appendix C.

As part of the remedial investigation performed in 1990, grain size analyzes were performed on soil samples collected from within the more permeable sand layers of the aquifer. The laboratory grain size results were used to estimate the specific yield for the formation by comparing the soil grain size to published specific yield values. For the fine-to-medium grained sands observed in the samples, an effective porosity (or specific yield) of 26% was estimated.

Water elevations have been recorded on several occasions site wide and in the monitoring wells installed as part of the fuel oil release assessment, as described in Section 7.0 below. The depth to the water table has ranged from less than 3 feet bgs at the time of the release to more than 8 feet bgs in September 2002. Water elevation data and groundwater contour maps for the fuel oil release groundwater sampling events were prepared and are presented in Appendix D. Site wide groundwater contour maps for April 2000 and September 2002 are also presented in Appendix D.

Site wide groundwater flow generally has been observed to be in a southerly direction in both the upper interbedded unit and the sand aquifer, although southeasterly and southwesterly flows also have been observed. Site wide an average hydraulic gradient of 0.003 foot/foot has been reported. As seen in the groundwater contour maps presented in Appendix D, localized groundwater flow in the vicinity of the fuel oil release has also varied between southeasterly,

Extensive geologic cross-sections of the site were prepared during the remedial investigations and are shown in Figures 4-1 through 4-3. The site geology is typical of the Sand Hills area of the Coastal Plain physiographic province. It is characterized by unconsolidated sediments that consist principally of sand, silt, and clay. The geologic profile within the Carolina bay reflects a relatively complex and variable stratigraphic sequence, especially in the upper 25 feet bgs. The stratigraphy of the upper 25 feet bgs is characterized by heterogeneity, with laterally discontinuous, interbedded sand and clay layers. Between 25 feet bgs and 80 feet bgs, the stratigraphy is predominantly sand with occasional clay lenses. A clay-confining layer begins at approximately 80 feet bgs.

In the vicinity of the fuel release area, the upper geologic unit is approximately 10 feet to 15 feet thick and is comprised of silty and clayey sand. This upper unit is underlain by fine, medium, and coarse sands that begin at approximately 10 feet bgs to 15 feet bgs. No borings at depths of greater than 35 feet bgs have been conducted in the fuel release area, but elsewhere on the site, the sandy unit extends to a depth of approximately 75 feet to 80 feet.

4.4 SITE HYDROLOGY

The site hydrology also was well characterized during remedial investigations and remedial design activities associated with the solvent release remediation. The uppermost aquifer coincides with clayey sand deposits that occur in the upper 25 feet bgs. The clayey sand comprising the aquifer is interbedded with lenses of clay and silt forming a complex and heterogeneous unit. At some locations, the clayey sand is overlain and underlain by discontinuous beds of clay and sandy clay that may be locally confining. Therefore, while the aquifer generally occurs under water table conditions, it can also exhibit the characteristics of a semi-confined aquifer in localized areas. Due to the upper aquifer's thin saturated thickness and heterogeneity, its principal function is to serve as a groundwater reservoir that recharges the underlying aquifer.

The principal aquifer underlying the fuel area is comprised of fine to coarse sand deposits located between the depths of approximately 25 feet bgs and an estimated 80 feet bgs. This sand

Two principal aquifers are present in the Laurinburg area: the surficial sand aquifer and the Middendorf formation. The surficial sand aquifer is the uppermost aquifer and is comprised predominantly of sand and clayey sand layers with clay lenses and occasional gravel lenses that supply water to shallow wells. Thin layers of sand generally are the best water-bearing zones within the aquifer, but do not yield large quantities of water. Groundwater in the surficial sand aquifer generally occurs under unconfined or water table conditions (Schipf, 1961). Groundwater in the surficial sand aquifer flows in the direction of lowest hydraulic head toward discharge areas, which typically include streams, swamps, and springs. The presence of laterally discontinuous clay lenses in the surficial sediments may result in isolated saturated zones or perched groundwater in the unsaturated zones (Schipf, 1961). The Middendorf formation underlies the surficial sediments and represents the most productive aquifer in the Laurinburg area. The Middendorf is composed of massive clay layers interbedded with numerous lenticular sand layers. The sand layers provide the most productive water-bearing zones, and groundwater occurring within the sand layer may be under confined conditions. The Middendorf aquifer supplies most of the groundwater used in the Laurinburg area (Schipf, 1961).

4.3 SITE GEOLOGY

The soils and geology of this site were characterized thoroughly during remedial investigations associated with the solvent release conducted between 1989 and 1993. Soil borings and well installation records from this period define soil types and lithology across the entire site. Additional information on soils and geology were obtained during soil sampling and monitoring well installation activities conducted in response to the January 2000 fuel release. In general, the recent data is in agreement with the historic soil and geologic information.

Prior review of aerial photographs and soil survey maps conducted as part of the remedial investigation indicates that the Abbott facility lies in a remnant Carolina Bay feature. Soils of the McColl series have been mapped within this bay (Soil Conservation Service, 1967). The McColl loam consists of poorly drained soils found in some Carolina Bays and is described as a grey sandy clay loam to sandy clay with brown, red, and grey mottles occurring at depths of two feet bgs or more.

SECTION 4

GEOLOGY AND HYDROGEOLOGY

4.1 REGIONAL GEOLOGY

The Abbott site lies within the Flatwoods section of the Coastal Plain physiographic province. This region is described as a gently dipping plain with a few sandy ridges. It is drained by slow moving streams that are often bordered by wider swamps (Schipf, 1961). Locally, the Coastal Plain contains shallow, southeast-trending, elliptical depressions of varying sizes, commonly called "Carolina Bays". These bays overly undisturbed Coastal Plain sediments and may be filled with peat and/or sand. The peat and/or sand reach a typical thickness of about nine feet. Below the fill, clayey sand and silty clay form the floor of the bays (Womack, 1981).

The Coastal Plain strata consist of surficial beds of sand and clay overlying sediments of the late Cretaceous-age Middendorf formation. The surficial sediments comprise alternating layers of unconsolidated fine-to-medium-grained clayey sands and clays. Gravel lenses have been reported in the surficial sands. In the Flatwoods section, surficial sediments have a maximum thickness of 30 feet and are not readily distinguished from underlying Cretaceous sediments. The Middendorf formation is the basal Coastal plain deposit and lies directly on volcanic rocks of the Carolina Slate Belt. This formation dips slightly toward the southeast and thickens to the southeast. The Middendorf attains a maximum thickness of about 250 feet to 300 feet in the Laurinburg area. It is characterized by laterally discontinuous layers of massive light-grey clay and layers of sand (Schipt, 1961). Some lignite may be present in the clay. Thin beds of sandstone and mudstone may also be present (Geologic Map of North Carolina, 1985).

4.2 REGIONAL HYDROGEOLOGY

Groundwater recharge in the Laurinburg area is derived from precipitation. The average annual precipitation rate is approximately 47 inches. Approximately one-third of the precipitation reaches the water table (Schipf, 1961). Groundwater recharge occurs in the interstream areas and discharge occurs in low-lying areas, typically rivers, creeks, swamps, and springs.

3.2 EXPOSURE PATHWAYS

Potential exposure pathways associated with this release are limited.

The primary exposure pathway of concern is associated with exposure to the groundwater. Currently all businesses and residences within 1,500 feet of the source area are serviced by municipal water, so ingestion of groundwater water is a not an actual pathway of concern. Groundwater at two private residences may be withdrawn and used for irrigation, which represents a limited potential for dermal and inhalation exposure.

Surface water is not a potential exposure pathway of concern. The petroleum-impacted water initially observed in the storm water channel at the time of the release was removed and the concrete-lined channel joints were sealed to prevent further seepage of petroleum-impacted groundwater. Therefore, since the fuel release source has been removed and infiltration into the drainage channel was eliminated, there is no longer a complete surface water exposure pathway associated with this release. In addition, since no off-site surface water impacts were observed at the time of the release, the surface water pathway can be eliminated as a potential pathway of concern.

The potential for direct exposure to petroleum residuals present in soils near the source area is extremely limited since visually impacted soils were removed during the initial response action and the release occurred approximately 8 feet bgs. Based on current and expected future use of the property for industrial/commercial purposes, potential exposure to the impacted soils would be limited to workers performing utility or construction activities.

SECTION 3

RECEPTOR INFORMATION

This section identifies receptors that potentially could be impacted by the fuel oil release.

3.1 GROUNDWATER AND SURFACE WATER USAGE

The City of Laurinburg provides municipal water service to the Abbott site and all the surrounding area within 1,500 feet of the fuel oil release area. The City of Laurinburg withdraws water from the Black Creek Aquifer at 10 wells located in southern and eastern Laurinburg, significantly further than 1,500 feet of the fuel oil release area. A public water line runs along U.S. Highway 401 immediately south of the Abbott site as shown in Figure 3-1. There are no designated wellhead protection areas within 1,500 feet of the fuel oil release source area.

A water supply well survey was performed in November 2002 and two private water supply wells located in the residential neighborhood situated to the east-southeast of the Abbott site were identified as being within 1,500 feet of the fuel oil release area, as shown in Figure 3-1. The residences at each location are serviced by municipal water. Previously this neighborhood was serviced by private wells and there are additional, abandoned private wells in this neighborhood at distances of greater than 1,500 feet of the fuel release area. The existing private wells are possibly used for irrigation purposes. Private well information within 1,500 feet of the fuel oil release area is summarized in Table 3-1.

An unnamed tributary of Leith Creek, which is located to the west-northwest of the source area as shown in Figure 3-1, is the only surface water body within 1,500 of the source area. The concrete-lined storm water channel initially impacted by the fuel oil release, which is located approximately 40 feet west of the fuel oil source area, receives surface runoff from the eastern portion of the Abbott site and eventually discharges into the unnamed tributary of Leith Creek. Leith Creek flows southeasterly and discharges into the Pee Dee River. No current water supply intakes are present on Leith Creek.

West: The Abbott site is bounded on the west by Highway 15-501. Eaton Corporation, which produces Golf Pride Grips, and Highlands Charter School are located immediately west of the highway. Farther west is undeveloped land and Leith Creek.

Currently the Abbott site is not in operation, and it is anticipated that its future use will be industrial or general business. In addition, future development of the immediately surrounding areas is anticipated to remain consistent with the current zoning of industrial/general business.

A Notice of Regulatory Requirements (NORR) was issued by the NCDENR to Abbott on 14 February 2000 since the release originated from an AST rather than an UST and, therefore, needed to meet NCDENR Groundwater Section requirements rather than Underground Storage Tank requirements. The NORR required Abbott to

- Take immediate action to terminate and control any further release.
- Submit a Free product Recovery Report within 45 days of the NORR.

In early February 2000, the joints of the concrete storm ditch within the 50-foot area of free product seepage were sealed using fast drying hydraulic cement to prevent ongoing free product seepage into the concrete storm water ditch.

Four free product recovery trenches also were installed in early February 2000 in the release area to intercept free product migrating from the release area toward the concrete storm water ditch. Approximately 3,000 gallons of petroleum-impacted groundwater were removed from the four trenches using a vacuum truck on 17 February 2000. Details of this free product recovery effort are presented in Section 5.0.

2.4 SURROUNDING LAND USE

The Abbott facility is situated in an area zoned for industrial and general business that is surrounded by commercial and residential zones, as shown on the zoning map presented in Figure 2-7. Surrounding property use is summarized below.

North: The Laurinburg and Southern Rail Road right-of-way forms the northern property border. North of the railroad tracks, is Nic's Pic Kwick #1 Amoco gasoline station, a Ryder Truck Rental Facility, and Jordan Warehouse. Further north are residences and undeveloped land.

East: Scotland Containers, Inc., a corrugated and specialty packaging service facility, abuts the Abbott site. East of Scotland Containers, Inc. is Case Equipment, a farm equipment supply company.

South: The Abbott Site is bounded to the south by the Highway 401 bypass and then a cotton field. Further south is the Northside square shopping center.

2.3 RELEASE RESPONSE

Within 24 hours of discovery, the release was reported to the North Carolina Division of Emergency Management (NCDEM), NCDENR Division of Water Quality, the National Response Center (NCR), and the Scotland County Local Emergency Planning Committee (LEPC).

On 31 January 2000, the incident was inspected by Dale Lopez of the NCDENR Surface Water Quality Branch, Roylin Hammond of the Scotland County LEPC, and Cedric Cherry of the NCDEM. Mr. Hammond and Mr. Cedric each prepared an Emergency Report Form for the incident and submitted them to the NCDEM. Copies of the Emergency Report Forms are included in Appendix A.

Upon discovery of the fuel oil release, absorbent pads were placed in the storm water channel to prevent the off-site migration of the fuel oil. Earthen dams also were constructed to recover fuel oil from the ditch. A series of test pits were excavated in the vicinity of the former UST pit. The locations of test pits found to contain free-floating petroleum product are shown in Figure 2-6.

During these initial mitigation activities, approximately 1,600 gallons of petroleum product and 18,200 gallons of petroleum-impacted water were removed from the test pits and storm water channel using a vacuum truck. These materials were disposed of by A&D Environmental Services of Archdale, North Carolina; copies of the waste disposal manifests are presented in Appendix B.

In addition, approximately 39 tons of petroleum-impacted soils were excavated from the former UST pit and the free product test pits. The excavated soil was stockpiled on 10-mil plastic sheeting, provided with secondary containment using hay bales, and covered with 10-mil plastic sheeting. The excavated soil was disposed of off-site by ES&J Enterprises of Autryville, North Carolina. Copies of the waste disposal manifests for the petroleum-impacted soils are included in Appendix B.

products, methylene chloride, and Freon 113. Currently *in situ* bioremediation of the most heavily impacted portions of the groundwater plume using Hydrogen Release Compound® (HRC®) is in progress and the off-site migration of the groundwater plume is controlled by a groundwater extraction and treatment system situated near the southern property boundary of the site.

2.2 FUEL RELEASE OVERVIEW

A release of No. 2 fuel oil was observed seeping into a concrete-lined storm water drainage channel located along the east side of the Abbott facility on 30 January 2000, as shown in Figure 2-5. It was determined that the release was a result of fuel oil being pumped to the subsurface through above ground piping from a nearby 3,000-gallon No. 2 fuel oil AST (AST #3) that had been recently cross-connected with abandoned underground piping from a former 10,000-gallon UST (UST #2). The uncapped end of the abandoned underground piping terminated at a depth of approximately 8 feet bgs to 10 feet bgs in the vicinity of the former UST #2 pit, which is the estimated depth of the release. Based on an inventory of the No. 2 fuel oil remaining in AST #3, the estimated quantity of the release was 1,500 gallons.

The water table was particularly high at the time of the release due to snowmelt from a 14-inch snowstorm. The bottom of the concrete channel is approximately 2.5 feet bgs and the shallow water table was observed to be approximately 2.0 feet bgs. The channel is located approximately 40 feet west of the release area and fuel oil was observed seeping into the channel along a 50-foot portion, as shown in Figure 2-6.

Several underground utilities are present in the vicinity of the fuel release, as shown in Figure 2-5, including a natural gas line, water lines, electrical power transmission cables, and fiber optic communication cables.

SECTION 2

SITE HISTORY AND SOURCE CHARACTERIZATION

This section presents an overview of the site history, surrounding land use, fuel release and assessment and corrective actions.

2.1 SITE HISTORY

The subject site is an approximately 50.75-acre single parcel located at 16900 North U.S. 15/401 Bypass, Laurinburg, Scotland County, North Carolina, as shown in Figure 2-1. The location of the Fuel Oil Release area is shown in Figure 2-2.

Abbott currently owns the subject site. Prior to 1968, the subject site was undeveloped and used for agriculture. In approximately 1968 Abbott purchased the subject site and constructed a medical device manufacturing facility. Typical products manufactured at the facility included sets for intravenous administration of drugs and health maintenance solutions. Abbott has operated the site continuously since the facility start-up in 1970 through June 2002, when manufacturing operations were discontinued. Currently, the site is no longer in operation, but is maintained under Abbott's control by on-site caretakers.

Ten potential groundwater contamination source areas are present at the site as listed in Table 2-1 and shown in Figure 2-3. The potential source areas include four petroleum-related and one Freon 113 AST, two former UST areas, and three hazardous materials storage sheds.

In addition, as shown in Figure 2-3, a former solvent evaporation pit, which operated from approximately 1970 through 1976, is present onsite. Groundwater impacts originating from this area are being addressed by Abbott through an Administrative Order of Consent with the NCDENR Division of Waste Management (Case #NCD 000 0040). Comprehensive subsurface investigations have shown that a VOC groundwater plume extends from the former evaporation pit area to near the southern boundary of the property, as shown in Figure 2-4. Primary components of the VOC groundwater plume include trichloroethene and its degradation daughter

Based on the results of this comprehensive site assessment, monitored natural attenuation possibly combined with a waiver of the benzene and ethyl benzene 2L standards on the Abbott property is the corrective action that will be proposed by Abbott to address the residual groundwater impacts originating from the fuel oil release.