

GW - 28

REPORTS

YEAR(S):

1994

**Table 6-1. Observation Trench Soil Samples:
Soil Total Chromium and Lead Concentrations**

Sample Location	Total Chromium (mg/kg)	Lead (mg/kg)
TRA-5A	6	3
TRA-5B	8	3
TRA-7A	11	3
TRA-7B	11	4
TRA-9A	8	3
TRA-9B	14	4
TRB-5A	17	7
TRB-5B	20	6
TRB-7A	13	5
TRB-7A(dup)	8	4
TRB-7B	13	5
TRB-9A	10	3
TRB-9A(dup)	23	2
TRB-9B	11	3
TRC-5A	14	7
TRC-5B	16	8
TRC-7A	14	2
TRC-7B	13	5
TRC-9A	12	4
TRC-9B	14	4
TRD-5A	19	9
TRD-5B	18	11
TRD-5C	17	8
TRD-7A	18	10
TRD-7B	5	2
TRD-7C	5	2
TRD-9A	12	4
TRD-9B	11	4
TRD-9C	6	4
AVG	12.7	4.8

Table 6-2. Observation Trench Soil Sample PID Analyses

Location	Sample	PID reading (ppm)
Trench A	TRA-5A	2.0
	TRA-5B	2.0
	TRA-7A	1.0
	TRA-7B	2.0
	TRA-9A	0.4
	TRA-9B	1.0
Trench B	TRB-5A	6.0
	TRB-5B	2.0
	TRB-7A	4.0
	TRB-7B	2.0
	TRB-9A	4.0
	TRB-9B	0.0
Trench C	TRC-5A	12.0
	TRC-5B	27.0
	TRC-7A	12.0
	TRC-7B	12.0
	TRC-9A	428.0
	TRC-9B	171.0
Trench D	TRD-5A	6.0
	TRD-5B	6.0
	TRD-5C	92.0
	TRD-7A	12.0
	TRD-7B	10.0
	TRD-7C	634.0
	TRD-9A	15.0
	TRD-9B	5.0
	TRD-9C	323.0

Table 6-3. Observation Trench Soil Samples: Summary of Organic Analyses

Sample Location	Benzene (ug/kg)	Ethylbenzene (ug/kg)	Toluene (ug/kg)	Xylene (ug/kg)	Semivolatiles (1,2) (mg/kg)
TRA-5A	< 6	< 6	< 6	< 6	ND
TRA-5B	< 5	< 5	< 5	< 5	ND
TRA-7A	< 5	< 5	< 5	< 5	ND
TRA-7B	< 5	< 5	< 5	< 5	ND
TRA-9A	< 5	< 5	< 5	< 5	ND
TRA-9B	< 5	< 5	< 5	< 5	ND
TRB-5A	< 5	< 5	< 5	< 5	ND
TRB-5B	< 5	< 5	< 5	< 5	ND
TRB-7A	< 5	< 5	< 5	< 5	ND
TRB-7A(dup)	< 5	< 5	< 5	< 5	ND
TRB-7B	< 5	< 5	< 5	< 5	ND
TRB-9A	< 5	< 5	< 5	< 5	ND
TRB-9A(dup)	< 5	< 5	< 5	< 5	ND
TRB-9B	< 5	< 5	< 5	< 5	ND
TRC-5A	< 5	< 5	< 5	< 5	ND
TRC-5B	< 5	< 5	< 5	< 5	ND
TRC-7A	< 5	< 5	< 5	< 5	ND
TRC-7B	< 5	< 5	< 5	< 5	ND
TRC-9A	< 5	< 5	< 5	< 5	ND
TRC-9B	< 5	< 5	< 5	< 5	ND
TRD-5A	< 5	< 5	< 5	< 5	ND
TRD-5B	< 5	< 5	< 5	< 5	ND
TRD-5C	< 5	14	< 5	< 5	ND
TRD-7A	< 5	< 5	< 5	< 5	ND
TRD-7B	< 5	14	< 5	< 5	ND
TRD-7C	255	16600	< 8	2090	1-methylnaphthalene - 13.0 2-methylnaphthalene - 24.0 naphthalene - 9.0 phenanthrene - 7.0
TRD-9A	< 5	< 5	< 5	< 5	ND
TRD-9B	< 5	< 5	< 5	< 5	ND
TRD-9C	< 5	< 5	< 5	< 5	ND

(1) Semivolatile constituent detection limits ranged from 0.5 to 3.0 mg/kg.

(2) Di-n-butylphthalate also reported as sole contaminant (apparent laboratory artifact) in 8 of 29 samples

Table 6-4. Soil Boring Samples: Total Chromium and Lead Concentrations

Location	Depth (ft)(1)	Total Chromium (mg/kg)	Lead (mg/kg)
BG-6	4-5	8	4
A-11	5.5-6.5	8	4
A-12	5.5-6.5	13	4
A-13	5-7	12	6
A-13	7-9	12	6
A-13	9-11	12	5
A-13	11-13	11	5
A-13	13-15	12	4
A-14	5.5-6.5	10	8
A-15	5.5-6.5	8	6
A-16	5-7	9	4
A-16	7-9	9	4
A-16	9-11	10	5
A-16	11-13	13	6
A-16	13-15	16	11
A-17	5.5-6.5	10	3
B-11	5.5-6.5	13	6
B-12	5.5-6.5	13	8
B-13	5-7	13	5
B-13	7-9	11	4
B-13	9-11	16	7
B-13	11-13	12	4
B-13	13-15	12	3
B-14	5.5-6.5	14	5

(1) Depth from original land surface (visually approximated).

Table 6-4. Soil Boring Samples: Total Chromium and Lead Concentrations (continued)

Location	Depth (ft)(1)	Total Chromium (mg/kg)	Lead (mg/kg)
C-11	5.5-6.5	11	5
C-11	5.5-6.5(dup)	12	5
C-12	5.5-6.5	23	11
C-13	5-7	18	8
C-13	7-9	11	4
C-13	9-11	11	4
C-13	11-13	6	5
C-13	13-15	18	4
C-14	5.5-6.5	12	4
C-15	5-7	15	8
C-15	5-7(dup)	18	11
C-15	7-9	13	6
C-15	9-11	12	6
C-15	11-13	10	6
C-15	13-15	10	5
C-15	13-15(dup)	10	5
C-16	5.5-6.5	11	6
C-17	5.5-6.5	24	10
C-18	5.5-6.5	9	4
D-11	5-7	22	10
D-11	7-9	9	3
D-11	9-11	7	2
D-11	11-13	14	3
D-11	13-15	9	4
D-12	5.5-6.5	18	8
D-12	5.5-6.5(dup)	18	8
D-14	5-7	19	8
D-14	7-9	14	5
D-14	9-11	9	2
D-14	11-13	5	2
D-14	13-15	10	4
D-15	5-7	23	9
D-15	7-9	12	4
D-15	9-11	11	4
D-15	11-13	8	3
D-15	13-15	11	4
AVGS.		10.0	4.4

(1) Depth from original land surface (visually approximated).

Table 6-5. Soil Boring Samples: BTEX Concentrations

Location	Depth (ft)(1)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	Toluene (ug/kg)	Xylenes (2) (ug/kg)	Total BTEX (ug/kg)
A-13	5-7	< 6.0	< 6.0	< 6.0	< 6.0	-
	7-9	< 6.0	< 6.0	< 6.0	< 6.0	-
	9-11	< 6.0	< 6.0	< 6.0	< 6.0	-
	11-13	< 6.0	< 6.0	< 6.0	< 6.0	-
	13-15	< 6.0	1160	< 6.0	291	1451
A-16	5-7	< 6.0	< 6.0	< 6.0	< 6.0	-
	7-9	< 6.0	< 6.0	< 6.0	< 6.0	-
	9-11	< 6.0	< 6.0	< 6.0	< 6.0	-
	11-13	< 6.0	< 6.0	< 6.0	< 6.0	-
	13-15	< 6.0	< 6.0	< 6.0	< 6.0	-
B-13	5-7	< 6.0	< 6.0	< 6.0	< 6.0	-
	7-9	< 6.0	< 6.0	< 6.0	< 6.0	-
	9-11	< 6.0	< 6.0	< 6.0	< 6.0	-
	11-13	< 6.0	< 6.0	< 6.0	< 6.0	-
	13-15	< 6.0	< 6.0	< 6.0	< 6.0	-
C-13	5-7	< 6.0	26	< 6.0	6	32
	7-9	17	26	< 6.0	30	73
	9-11	< 6.0	< 6.0	< 6.0	26	26
	11-13	< 6.0	9	< 6.0	33	42
	13-15	< 6.0	< 6.0	< 6.0	21	21
C-15	5-7	< 6.0	< 6.0	< 6.0	< 6.0	-
	7-9	< 10	33	< 10	192	225
	9-11	< 30	190	15	1330	1535
	11-13	< 60	950	80	11810	12840
	13-15	230	10700	260	11320	22510
	13-15 (dup)	170	14400	210	15380	30160

(1) Depth from original land surface (visually approximated)

(2) Total xylenes

Table 6-5. Soil Boring Samples: BTEX Concentrations (continued)

Location	Depth (ft)(1)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	Toluene (ug/kg)	Xylenes (2) (ug/kg)	Total BTEX (ug/kg)
D-11	5-7	< 6.0	< 6.0	< 6.0	< 6.0	-
	7-9	< 6.0	< 6.0	< 6.0	< 6.0	-
	9-11	< 6.0	< 6.0	< 6.0	< 6.0	-
	11-13	< 6.0	< 6.0	< 6.0	< 6.0	-
	13-15	< 10	23	< 10	< 10	23
D-14	5-7	< 6.0	< 6.0	< 6.0	< 6.0	-
	7-9	< 6.0	< 6.0	< 6.0	< 6.0	-
	9-11	< 6.0	< 6.0	< 6.0	< 6.0	-
	11-13	< 6.0	< 6.0	< 6.0	< 6.0	-
	13-15	< 10	118	< 10	< 10	118
D-15	5-7	< 10	< 10	< 10	< 10	-
	7-9	< 6.0	< 6.0	< 6.0	< 6.0	-
	9-11	< 6.0	< 6.0	< 6.0	< 6.0	-
	11-13	< 6.0	< 6.0	< 6.0	< 6.0	-
	13-15	< 600 (3)	3150	< 600 (3)	3200	6350

(1) Depth from original land surface (visually approximated)

(2) Total detected xylenes\

(3) Method detection limit elevated due to matrix interference

Table 6-6. NCL RFI Soil Boring Samples: SVOA Concentrations (mg/kg)

Location	A-13	C-13			C-15			D-11	D-14	D-15
Depth Interval (ft)	13-15	5-7	7-9	9-11	11-13	13-15	7-9	9-11	11-13	13-15
Constituent:										
acenaphthene	<1.2	<1.2	<1.1	<1.1	0.8(a)	<1.3	<1.1	2.4	<1.1	<1.2
anthracene	<1.2	<1.2	3.1	<1.1	<1.1	<1.3	<1.1	0.7(a)	1.1	<1.2
dibenzofuran	1.5	4.0	5.0	2.0	<1.1	<1.3	1.3	1.9	3.6	5.1
fluorene	1.3	2.8	3.4	1.3	<1.1	<1.3	1.2	1.6	3.2	5.5
1-methylnaphthalene	8.0	<1.1	7.0	<1.1	1.4	1.9	4.0	14.4	17.0	34.0
2-methylnaphthalene	5.0	2.5	<1.1	<1.1	<1.1	<1.3	<1.1	<1.1	14.5	41.3
naphthalene	0.9(a)	<1.2	<1.1	<1.1	<1.1	<1.3	<1.1	0.6(a)	6.9	9.0
phenanthrene	2.9	3.7	<1.1	0.6(a)	<1.1	<1.3	0.8(a)	4.1	8.3	10.9
pyrene	<1.2	<1.2	<1.1	<1.1	<1.1	<1.3	<1.1	<1.1	1.1	1.5
Total detected SVOAs	19.6	13.0	18.5	3.9	2.2	1.9	7.3	25.7	55.7	107.3
							4.8	11.3		71.8

(a) Estimated concentration; constituent meets identification criteria, but was below detection limit.

PROJECT:	327-94-002
LOCATION:	NAVALO REFINERY, ARTESA, NM
APPE:	
DRAWN BY:	TLH
DATE:	7/21/94
	FIGURE 6-2

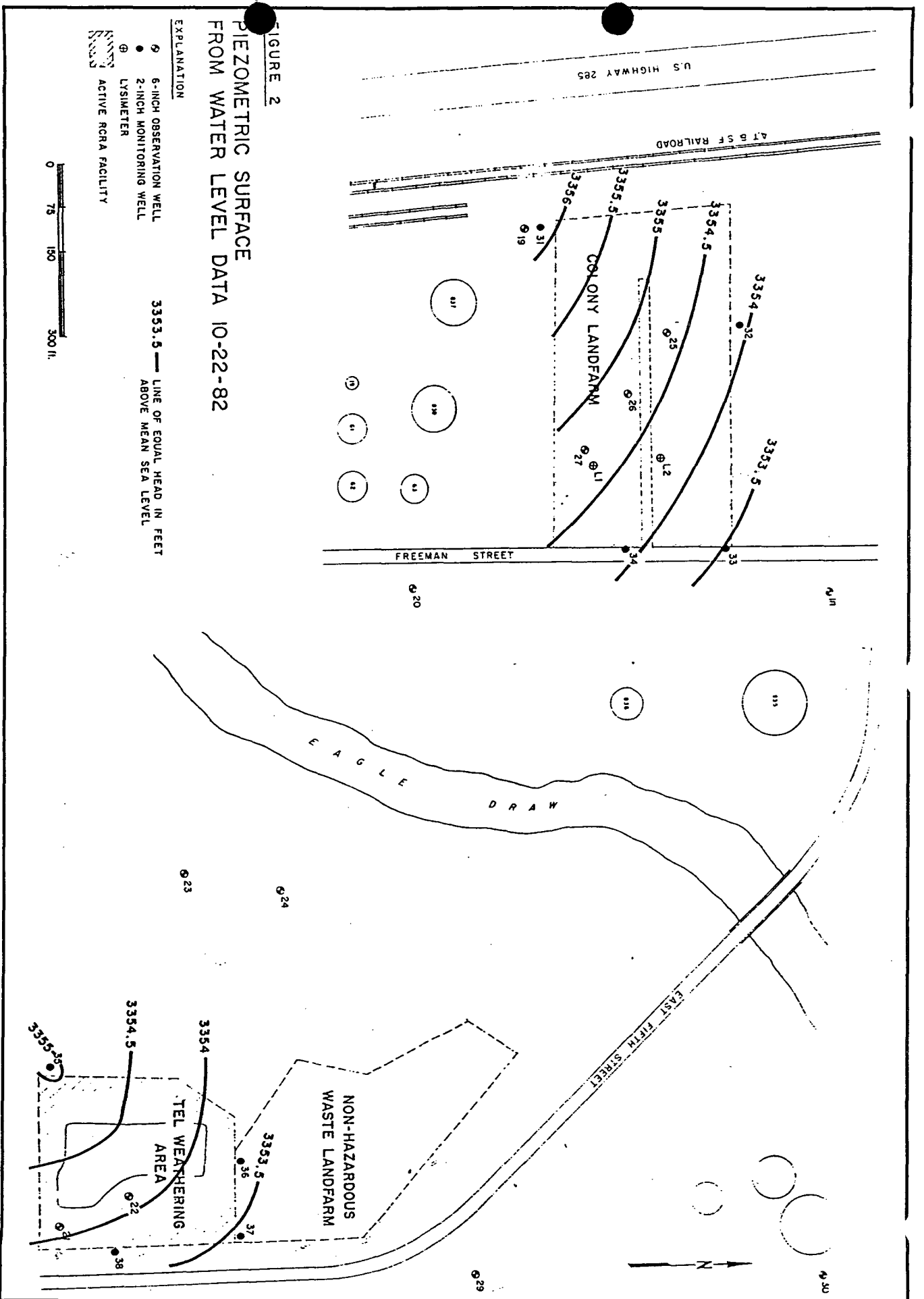
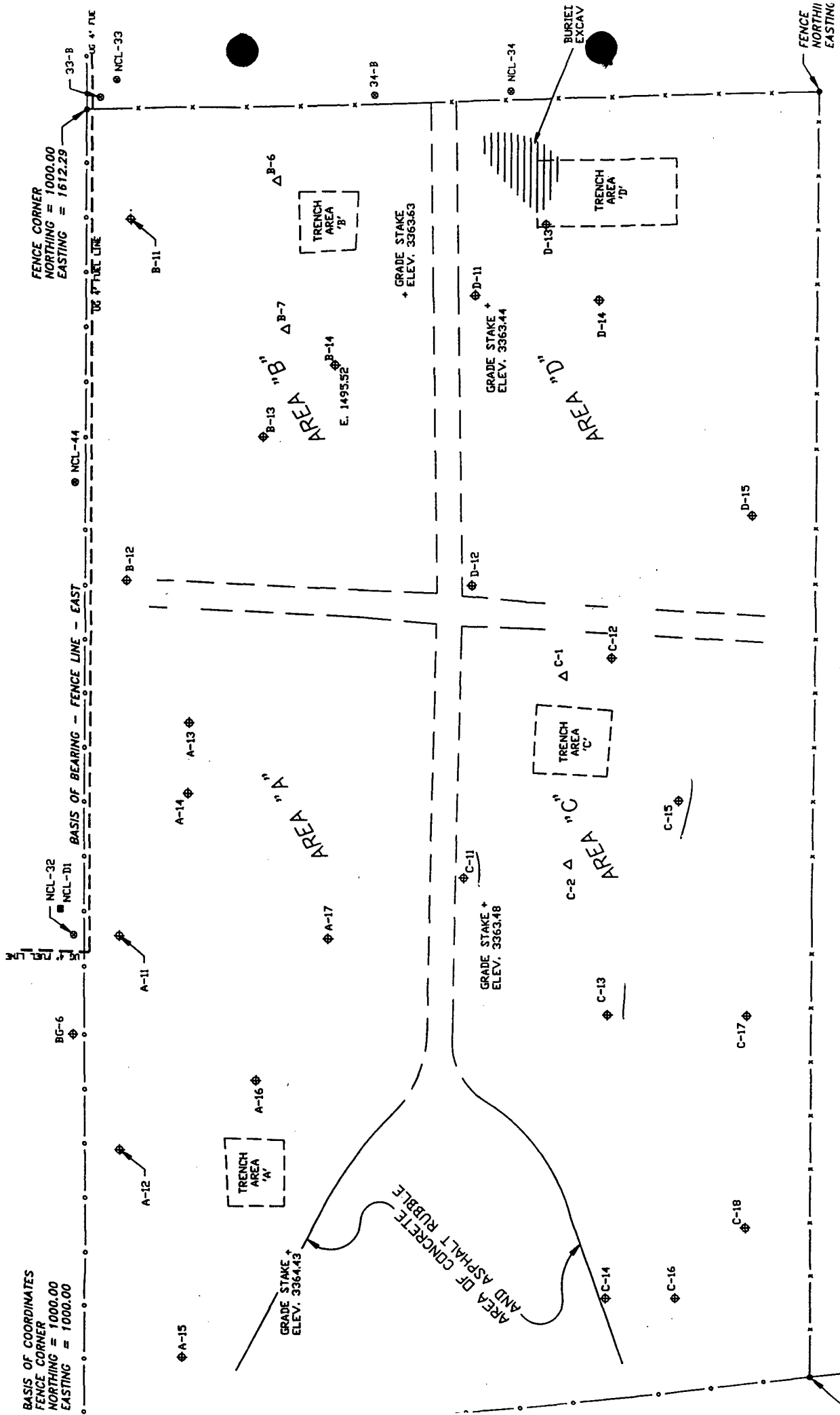


Figure 7-3. Groundwater elevations, North Colony Landfarm, 10/22/82 (Geraghty & Miller, 1982).

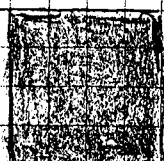


RE/SPEC INC.
 3824 JET DRIVE
 P.O. BOX 725
 RAPID CITY

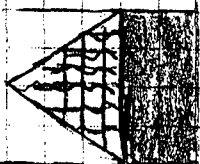
EXPLANATION
 ◆ RFI BORING LOCATIONS

Surface

A-15



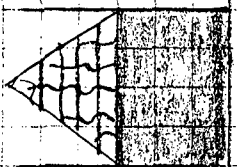
A-12



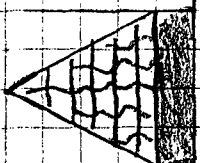
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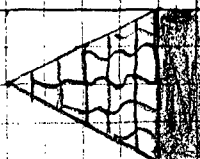
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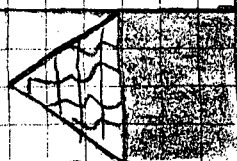
A-11



A-14



A-13



15

13

11

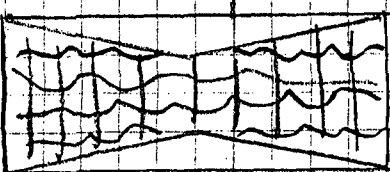
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7

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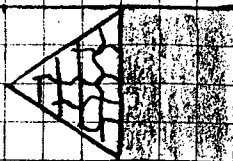
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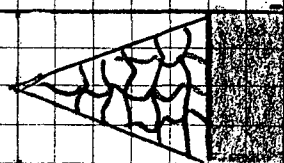


Surface

B-12



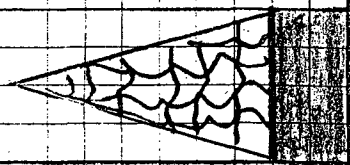
B-13



B-14



B-11

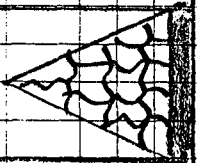


1
3
5
7
9
11
13
15

C-14



C-16



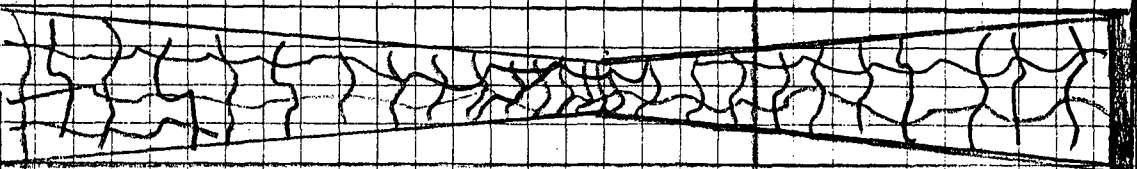
C-18



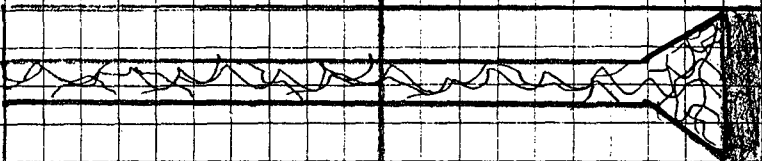
C-17



C-13



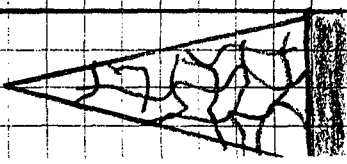
C-11



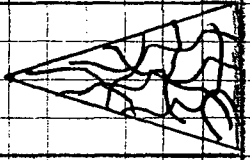
C-15



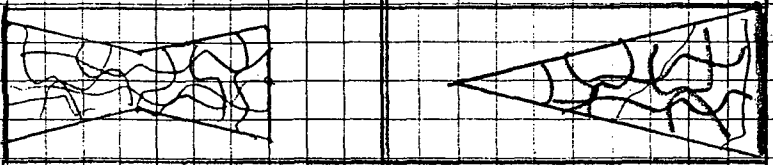
C-19



D-11



D-12



D-15



D-14



15

13

11

9

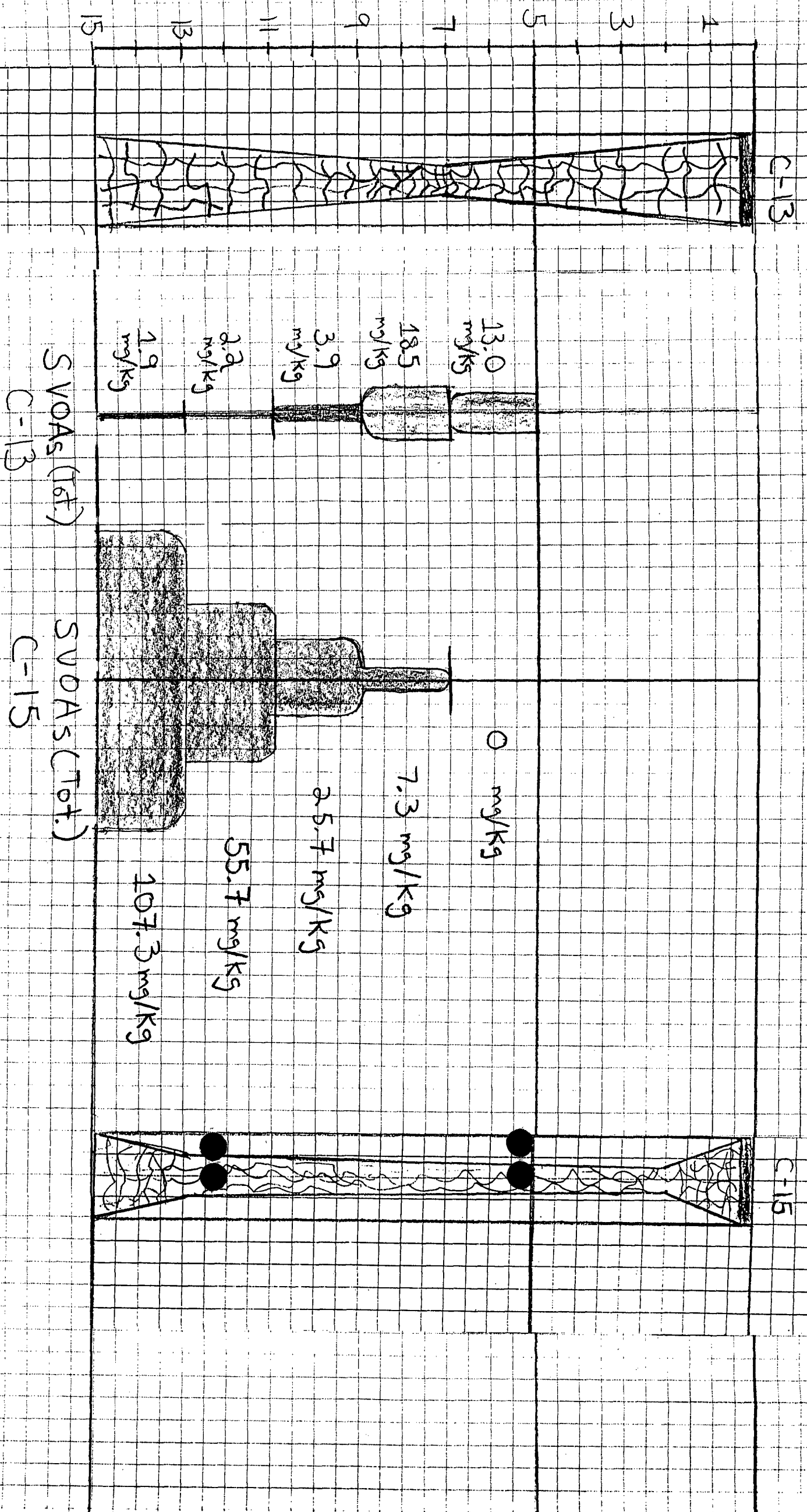
7

5

3

1





BORING LOG

PROJECT: 622093002-252 (NR-A15)
 CLIENT: Navajo Refinery
 BORING NUMBER: A-15
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/09/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-2.0' Waste Residual Layer	1			
2.0-10.0' CLAYEY SAND, tan, slightly moist to dry, dense. -white mottling caused by carbonate replacement begins @ 4.0' and increases with depth.	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-A12)
 CLIENT: Navajo Refinery
 BORING NUMBER: A-12
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/09/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-1.0' Waste Residual Layer	1			
1.0-2.5' CLAYEY SAND, brown with grey hydrocarbon discoloration, slightly moist, dense, strong hydrocarbon odor weakens with depth.	2			
	3			
2.5-5.0' SITLY SAND, tan, dry, dense, no hydrocarbon odor.	4			
	5			
5.0-10.0' CLAYEY SAND, light brown with white mottling, dry, dense. -white mottling increases with depth -caliche pebbles noted near 7.0'	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-A16)
 CLIENT: Navajo Refinery
 BORING NUMBER: A-16
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/10/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 19.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-2.0' Waste Residual Layer	1			
2.0-3.0' CLAYEY SAND, black hydrocarbon discoloration, slightly moist, dense, strong hydrocarbon odor weakens with depth.	2			
	3			
3.0-5.0' SILTY SAND, tan, dry, dense, no hydrocarbon odor. -white mottling (caliche)	4			
	5			
5.0-14.0' CLAYEY SAND, tan to brown, slightly moist, dense.	6			
	7			
14.0-15.5' CLAYEY GRAVEL, caliche gravel-sand-clay mix, moist, dense. -strong hydrocarbon odor and black discoloration	8			
	9			
15.5-19.0' SANDY CLAY, brown, slightly moist, firm to stiff. -no hydrocarbon odor or discoloration	10			
	11			
	12			
	13			
	14			
	15			
	16			
	17			
	18			
	19			

BORING LOG

PROJECT: 622093002-252 (NR-A17)
 CLIENT: Navajo Refinery
 BORING NUMBER: A-17
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/10/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-1.5' Water Residual Layer	1			
1.5-3.0' CLAY, black hydrocarbon discoloration, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
	3			
3.0-10.0' CLAYEY SAND, brown to light brown, slightly moist to dry, dense, no hydrocarbon odor. -occasional small pockets of fine white sand -caliche pebbles noted from 5.0-10.0'	4			
	5			
	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-A11)
 CLIENT: Navajo Refinery
 BORING NUMBER: A-11
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/09/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.5' Waste Residual Layer	1			
0.5-2.5' CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
	3			
	4			
2.5-10.0' CLAYEY SAND, light brown, dry, dense, no hydrocarbon odor - some white mottling (caliche) from 8-10' - percent sand increases with depth	5			
	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 62209302.252 (A14)
 CLIENT: Navajo Refinery
 BORING NUMBER: A14
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/10/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.5' Waste Residual Layer.	1			
0.5-2.5' SANDY CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
	3			
2.5-5.0' SANDY CLAY, light brown, dry, stiff, no hydrocarbon odor.	4			
	5			
5.0-10.0' CLAYEY SAND, light brown to brown, slightly moist, stiff.	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 62209302.252 (A13)
 CLIENT: Navajo Refinery
 BORING NUMBER: A13
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/10/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 19.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-1.5' Waste Residual Layer.	1			
1.5-3.0' CLAY, black hydrocarbon discoloration grading to grey, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
	3			
3.0-13.0' CLAYEY SAND, light grey to light brown, slightly moist, dense, no hydrocarbon odor.	4			
	5			
13.0-19.0' CLAY, grey with small pockets of fine white sand, hydrocarbon odor noted, slightly moist, stiff.	6			
- caliche gravel seams noted between 15.0' and 18.0'	7			
- gravel 1/2-1.0" diameter	8			
- gravel seams are pathway for contaminant	9			
- no hydrocarbon odor from 18.0' to 19.0'	10			
	11			
	12			
	13			
	14			
	15			
	16			
	17			
	18			
	19			

BORING LOG

PROJECT: 62209302.252 (B12)
 CLIENT: Navajo Refinery
 BORING NUMBER: B12
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/10/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-1.5' Waste Residual Layer.	1			
1.5-9.0' CLAY, black hydrocarbon discoloration grading to natural brown color by 3.0', slightly moist to dry, stiff, strong hydrocarbon odor weakens with depth. - percent sand content increases with depth.	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-B13)
 CLIENT: Navajo Refinery
 BORING NUMBER: B-13
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/10/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 15.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-1.0' Waste Residual Layer	1			
1.0-2.5' CLAY, black hydrocarbon discoloration, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
2.5-3.5' CLAYEY SAND, brown with grey hydrocarbon discoloration slightly moist, medium dense, weak hydrocarbon odor.	3			
	4			
	5			
3.5-15.0' CLAYEY SAND, brown, slightly moist, dense to very dense. -color changes to greenish grey between 7.0' and 9.5', no hydrocarbon odor -color change to grey with streaks of white carbonate sand form 11.0-15.0' -no hydrocarbons detected by visual or olfactory check	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			

BORING LOG

PROJECT: 62209302.252 (B14)
 CLIENT: Navajo Refinery
 BORING NUMBER: B14
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/10/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-1.0' Waste Residual Layer.	1			
1.0-4.0' CLAY/ SANDY CLAY, black hydrocarbon discoloration grading to light grey color, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2 3			
4.0-5.5' CLAYEY SAND, tan, slightly moist, dense, no hydrocarbon odor.	4			
5.5-10.0' SILTY/ SANDY CLAY, grey to greenish grey, stiff, slightly moist. - no hydrocarbon discoloration or odor	5			
	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 62209302.252 (B11)
 CLIENT: Navajo Refinery
 BORING NUMBER: B11
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/10/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-1.0' Waste Residual Layer.	1			
1.0-4.5' CLAY, black hydrocarbon discoloration grading to natural brown color by 2.75', slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
	3			
4.5-7.5' CLAYEY SAND, brown to light grey, dry to slightly moist, dense, no hydrocarbon odor.	4			
	5			
7.5-10.0' SANDY CLAY, light grey, dry, stiff - orange ferruginous staining noted - small caliche pebbles noted	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-C14)
 CLIENT: Navajo Refinery
 BORING NUMBER: C-14
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

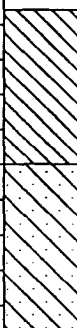
SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.5' Waste Residual Layer	1			
0.5-4.5' CLAYEY SAND, black hydrocarbon discoloration grading to grey with depth, slightly moist, dense, strong hydrocarbon odor weakens with depth.	2			
	3			
	4			
4.5-5.0' SILTY SAND, light grey, dry, very dense, no hydrocarbon odor.	5			
5.0-10.0' SANDY CLAY, grey to light grey, dry, soft. -hydrocarbon odor detected @ 6.0' and increases in strength with depth	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-C16)
CLIENT: Navajo Refinery
BORING NUMBER: C-16
EXCAVATED POND:
FIRST ENCOUNTERED WATER:
DATE COMPLETED: 05/11/94

SHEET: 1 of 1
DRILLED BY: Precision Eng.
LOGGED BY: PWC
SURF. ELEV:
TOTAL DEPTH: 10.0'

DESCRIPTION		DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.25'	Waste Residual Layer	1			
0.25-2.5'	CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
		3			
2.5-5.0'	CLAYEY SAND, brown to light brown, dry, dense, no hydrocarbon odor.	4			
		5			
5.0-10.0'	SILTY CLAY, greenish grey, slightly moist, stiff. -caliche replacement increases with depth giving a milky mottling to the clay	6			
		7			
		8			
		9			
		10			



BORING LOG

PROJECT: 622093002-252 (NR-C18)
 CLIENT: Navajo Refinery
 BORING NUMBER: C-18
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.5' Waste Residual Layer	1			
0.5-2.0' CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff to hard. -strong hydrocarbon odor weakens with depth	2			
2.0-7.5' CLAYEY SAND brown to light brown, dry, dense, no hydrocarbon odor.	3			
7.5-10.0' CLAYEY SAND, greenish grey, slightly moist, dense. -hydrocarbon odor begins @ 7.5' and strength increases with depth -gypsum replacement gives milky white streaking to clayey sand	4			
	5			
	6			
	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-C17)
 CLIENT: Navajo Refinery
 BORING NUMBER: C-17
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.25' Waste Residual Layer	1			
0.25-2.5' CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
	3			
2.5-4.5' CLAYEY SAND, grey hydrocarbon discoloration, slightly moist, dense, weak hydrocarbon odor.	4			
	5			
4.5-6.0' CLAYEY SAND, brown, slightly moist, dense. -no hydrocarbon discoloration or odor	6			
	7			
6.0-10.0' SILTY/SANDY CLAY, greenish grey, slightly moist, stiff to soft. -caliche replacement increases with depth -hydrocarbon discoloration (black) and odor reappear @ 9.0' and increase with depth	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-C13)
 CLIENT: Navajo Refinery
 BORING NUMBER: C-13
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 15.0'

DESCRIPTION

0-0.25' Waste Residual Layer

0.25'-2.0' CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor weakens with depth.

2.0-15.0' CLAYEY SAND, grey hydrocarbon discolorations grading to dark grey with depth, dry, dense to very dense.
 -gypsum replacment starts @ 8.0' and increases with depth producing a milky white mottling
 -hydrocarbon odor initially weakens to 7.0' then increases in strength

DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

BORING LOG

PROJECT: 622093002-252 (NR-C11)
 CLIENT: Navajo Refinery
 BORING NUMBER: C-11
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.5' Waste Residual Layer	1			
0.5-1.5' CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
	3			
1.5-7.0' CLAYEY SAND, brown with grey hydrocarbon discoloration mottling, dry, dense. -grey color lightens with depth	4			
	5			
	6			
7.0-10.0' SILTY SAND, grey hydrocarbon discoloration, dry, very dense, weak hydrocarbon odor. -carbonate replacement increases with depth	7			
	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-C15)
 CLIENT: Navajo Refinery
 BORING NUMBER: C-15
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 15.0'

DESCRIPTION		DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.25'	Waste Residual layer	1			
0.25'-2.0'	CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
		3			
		4			
2.0-5.0'	CLAYEY SAND, brown with grey hydrocarbon mottling, slightly moist, dense. -hydrocarbon discoloration and odor decreases initially with depth then increase towards 5.0'	5			
		6			
5.0-13.0'	CLAYEY SAND, grey hydrocarbon discoloration, slightly moist, medium dense.	7			
		8			
		9			
		10			
		11			
		12			
13.0-15.0'	SITLY SAND, grey hydrocarbon discoloration, dry, very dense. -carbonate replacement increases with depth, strong hydrocarbon odor	13			
		14			
		15			

BORING LOG

PROJECT: 622093002-252 (NR-C12)

CLIENT: Navajo Refinery

BORING NUMBER: C-12

EXCAVATED POND:

FIRST ENCOUNTERED WATER:

DATE COMPLETED: 05/11/94

SHEET: 1 of 1

DRILLED BY: Precision Eng.

LOGGED BY: PWC

SURF. ELEV:

TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-0.5' Waste Residual Layer	1			
0.5-5.0' SANDY/SILTY CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor weakens with depth. -natural brown color noted from 4.5-5.0'	2 3 4 5			
5.0-8.0' SANDY CLAY, brown, slightly moist, stiff, no hydrocarbon odor. -milky white streaks of carbonate in column	6			
8.0-10.0' SILTY SAND, greenish grey hydrocarbon discoloration, dry, dense, moderate hydrocarbon odor.	7 8 9 10			

BORING LOG

PROJECT: 622093002-252 (NR-D12)
 CLIENT: Navajo Refinery
 BORING NUMBER: D-12
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 10.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-2" Waste Residual Layer	1			
2"-1.0' CLAY, black hydrocarbon discoloration grading to grey with depth, slightly moist, stiff, strong hydrocarbon odor.	2			
	3			
1.0-6.5' CLAYEY SAND, brown with grey hydrocarbon mottling to 4.0' then brown, dry, dense. -hydrocarbon odor disappears below 4.0'	4			
	5			
6.5-8.5' CLAYEY SAND, grey hydrocarbon discoloration, dry, dense. -weak hydrocarbon odor	6			
	7			
8.5-10.0' SILTY SAND, light grey hydrocarbon discoloration, dry, very dense. -weak hydrocarbon odor -carbonate replacement noted	8			
	9			
	10			

BORING LOG

PROJECT: 622093002-252 (NR-D15)
 CLIENT: Navajo Refinery
 BORING NUMBER: D-15
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 15.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-4" Waste Residual Layer	1			
4"-1.5' CLAY, black hydrocarbon discoloration, slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
1.5-9.0' CLAYEY SAND, brown to 6.0' then grey hydrocarbon discoloration dominates matrix, slightly moist, dense.	3			
	4			
9.0-10.0' CLAYEY/SILTY SAND, transition zone, grey hydrocarbon discoloration, dry, dense, moderate hydrocarbon odor. -carbonate replacement gives milky color mottling	5			
	6			
10.0-15.0' SILTY SAND, light grey hydrocarbon discoloration mottled with milky white carbonate seems, dry, very dense. -hydrocarbon odor strengthens with depth	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			

BORING LOG

PROJECT: 622093002-252 (NR-D14)
 CLIENT: Navajo Refinery
 BORING NUMBER: D-14
 EXCAVATED POND:
 FIRST ENCOUNTERED WATER:
 DATE COMPLETED: 05/11/94

SHEET: 1 of 1
 DRILLED BY: Precision Eng.
 LOGGED BY: PWC
 SURF. ELEV:
 TOTAL DEPTH: 15.0'

DESCRIPTION	DEPTH (ft.)	SYMBOL	SAMPLE	WELL DESIGN
0-4" Waste Residual Layer	1			
4"-1.0' CLAY, black hydrocarbon discoloration slightly moist, stiff, strong hydrocarbon odor weakens with depth.	2			
	3			
1.0-5.0' CLAYEY SAND, brown, slightly moist, dense. -no hydrocarbon odor detected until 4.0' then increases in strength with depth	4			
	5			
5.0-9.0' CLAYEY SAND, brown to 6.0' then grading into a grey hydrocarbon discoloration, dry, dense. -hydrocarbon odor strengthens with depth	6			
	7			
9.0-10.0' SILTY SAND, milky white to light grey, dry, very dense. -carbonate replacement provides milky white color -moderate hydrocarbon odor	8			
	9			
10.0-15.0' SILTY SAND, milky white and grey to 14.0' then greenish grey hydrocarbon discoloration, slightly moist, dense. -thin caliche pebble seam throughout column -hydrocarbon odor very strong near 15.0'	10			
	11			
	12			
	13			
	14			
	15			

BORING LOG

PROJECT: 622093002-252 (NR-D11)

CLIENT: Navajo Refinery

BORING NUMBER: D-11

EXCAVATED POND:

FIRST ENCOUNTERED WATER:

DATE COMPLETED: 05/11/94

SHEET: 1 of 1

DRILLED BY: Precision Eng.

LOGGED BY: PWC

SURF. ELEV:

TOTAL DEPTH: 15.0'

DESCRIPTION

- | DEPTH (ft.) | SYMBOL | SAMPLE | WELL DESIGN |
|-------------|--|--------|-------------|
| 0-1" | Waste Residual Layer | | |
| 1"-2.0' | CLAY, black hydrocarbon discoloration grading to grey with depth, moist, stiff, strong hydrocarbon odor. | | |
| 2.0-9.0' | CLAYEY SAND, brown, dry to slightly moist, dense.
-hydrocarbon odor weakens and disappears by 3.0' below grade | | |
| 9.0-14.0' | SILTY SAND, light grey with milky white mottling, dry, dense.
-carbonate replacement provides milky white color
-mottling increases with depth | | |
| 14.0-15.0' | SILTY CLAY, black and grey hydrocarbon discoloration, slightly moist, firm.
-strong hydrocarbon odor | | |

BORING LOG

PROJECT: 622093002-252 (NR-BG6)

CLIENT: Navajo Refinery

BORING NUMBER: BG-6

EXCAVATED POND:

FIRST ENCOUNTERED WATER:

DATE COMPLETED: 05/11/94

SHEET: 1 of 1

DRILLED BY: Precision Eng.

LOGGED BY: PWC

SURF. ELEV:

TOTAL DEPTH: 5.0'

DESCRIPTION

DEPTH
(ft.)

SYMBOL

SAMPLE

WELL
DESIGN

0-5.0' SILTY SAND, tan, dry, loose to dense.
-carbonate replacement starts @ 4.0'

