Appendix C

Well Construction and Boring Logs

APPENDIX C

GEOLOGIC LOGS, WELL CONSTRUCTION DETAILS, AND WELL CONSTRUCTION DIAGRAMS

From:

Luhdorff and Scalmanini, 1987

Groundwater Technology, Inc. 1990

Metcalf and Eddy, 1992

Ecology and Environment, Inc.

Bechtel National, Inc.

F028 00005

LUHDORFF & SCALMANINI

Consulting Engineers

PRELIMINARY ASSESSMENT REPORT AND WORK PLAN FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY

1399-001

PRELIMINARY ASSESSMENT REPORT
AND
WORK PLAN
FOR
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Prepared for:

Frontier Fertilizer Company
Davis, California

Prepared by:

Luhdorff and Scalmanini
Consulting Engineers
Woodland, California

November, 1987

1 of 194

TABLE 2.5

Summary of Monitoring Well Contruction Details
Frontier Fertilizer Company

	MW1	MW2	MW3	MW4	MW5	MW6	MW7	MW8A	MW8B	MW9A	MW9B	MW9C	MW10A	MW10B	MW10C
WELL NUMBER (BN/2E-12)	F2M	K1M	K2M	K3M	K4M	K5M	F3M	K6M	K7M	K11M	K12M	K13M	K10M	K8M	K9M
YED ELEVATION (TOC)	33.74	32.57	33.21	33.03	32.34	32.91	34.39	33.40	33.40	30.95	30.96	30.94	31.28	31.28	31.34
DEPTH	40	46.2	55	39	33	52	148	150	150	46	76	140	46	84	142
ETED DEPTH	30	43	53	32.5	24	52	144	90	150	44	76	126	44	82	124
G TYPE- PVC	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH40	SCH 40	SCH 40
G DIAMETER- INCHES	4	4	4	4	4	4	2	2	2	4	4	4	4	4	4
N SLOT SIZE	.050	.050	.050	.050	.050	.050	.050	.050	.050	.040	.040	.040	.040	.040	.040
N DEPTH	20/30	13/43	13/53	15/32.5	14/24	13/23; 35/53	94/114	20/40; 60/80	100/140	34/44	66/76	116/126	34/44	72/82	114/124
NCE SEAL- GROUT W/ 5% BENTONITE	0/13	0/7	0/7	0/10	0/7	0/7	0/74	0/10	0/10	0/25	0/57	0/107	0/29	0/64	0/110
MEDIATE SEAL- BENTONITE PELLETS	13/16	7/9	7/9	10/12.5	7/9	7/9	N/A	N/A	85/95 (4)	25/30	57/61	107/112	29/32	64/69	N/A
R SEAL- GROUT W/ 5% BENTONITE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	85/95	N/A	N/A	N/A	135/140	N/A	N/A	140/145
EL PACK	17/40	9/43	9/55	12.5/39	9/33	9/52	74/148	10/85	95/150	30/46	61/76	112/135	32/46	69/84	110/140
WATER/AQUIFER DESIGNATION	S1	S1	S1	S1	S1	S1	A1	S2	A1	S1	S2	A1	S1	S2	A1
IC WATER LEVEL- DEPTH (3)	15.29	13.83	16.42	16.58	14.00	17.36	61.00	15.17	61.90	6.00	6.25	13.05	6.70	11.20	14.00
IC WATER LEVEL- ELEVATION	18.46	18.74	16.79	16.45	18.34	14.33	-26.61	14.23	-28.50	24.95	24.75	17.94	24.56	20.13	17.34
HARGE- GPM	.5	3	7	.75	3	6	1	1.5	1.5	5	7	28	3	.5	24.5
L DISSOLVED SOLIDS (1)	1700	3100	1980	1410	1380	1750; 1650 (5)	1425	1050	1150	2000	2590	1600	2250	1280	1700
2)	N/A	N/A	N/A	8	N/A	5	7.5	6	6	6	6.7	6.9	6.65	7.9	5.4

First shallow ground water or soil water; approximate depth, 35 to 45 feet
Second shallow ground water or soil water; approximate depth, 65 to 85 feet
First aquifer; approximate depth, 115 to 135 feet
Lower aquifers; approximate depth, below 150 feet

— Not available or not applicable

1. Total Dissolved Solids Concentration (mg/l) - Measured during initial purging and sampling
2. pH- Measured during initial purging and sampling
3. Static water levels listed in this table were obtained near the time of construction
4. Intermediate seal for MW2B consists of grout with 5 percent bentonite. The "lower seal" for MW2A for MW2B is equivalent to the "intermediate seal" for MW2B in this multiple completion borehole
5. A packer test was performed to isolate the upper and lower screen sections

TABLE 2.5
(continued)
Summary of Monitoring Well Contruction Details
Frontier Fertilizer Company

	MW5A	MW5B	MW5C	MW6A	MW6B	MW6C	MW7A	MW7B	MW7C
STATE WELL NUMBER (BN 2E-12)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SUPVEYED ELEVATION (TOC)	32.13	32.85	31.90	34.26	34.20	34.20	33.29	33.24	33.27
TOTAL DEPTH	42	56	92	42	62	92	42	58	98
COMPLETED DEPTH	40	54	90	40	60	90	40	56	96
CASING TYPE- PVC	SCH 40	SCH 40	SCH 40	SCH 40	STAINLESS	SCH 40	SCH 40	SCH 40	SCH 40
CASING DIAMETER- INCHES	4	4	4	4	4	4	4	4	4
SCREEN SLOT SIZE	.040	.040	.040	.040	.040	.040	.040	.040	.040
SCREEN DEPTH	10/30	34/44	70/80	12.5/30	40/50	70/80	12.5/30	36/46	76/86
SURFACE SEAL- GROUT W/ 5% BENTONITE	0/5	0/27	0/60	0/8	0/30	0/60	0/7	0/29	0/65
INTERMEDIATE SEAL- BENTONITE PELLETS	5/7	27/32	60/65	8/10	30/36	60/64	7/9	29/34	65/70
LOWER SEAL- GROUT W/ 5% BENTONITE	32/42	48/56	84/92	34/42	54/62	82/92	33/42	49/58	90/98
GRAVEL PACK	7/32	32/48	65/84	10/34	36/54	64/82	9/33	34/49	70/90
SOIL WATER/AQUIFER DESIGNATION	S1	S1	S2	S1	S1	S2	S1	S1	S2
STATIC WATER LEVEL- DEPTH	27.77	27.71	30.05	28.08	28.09	31.96	30.07	30.18	32.77
STATIC WATER LEVEL- ELEVATION	5.40	5.54	1.37	6.30	6.28	1.09	-.37	2.53	-1.64
DISCHARGE- GPM (6.)	1	2	.2	N/A	N/A	N/A	N/A	2	.5
TOTAL DISSOLVED SOLIDS (1.)	2000	1850	1400	N/A	N/A	N/A	N/A	N/A	1825
pH	NA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

S1-- First shallow ground water or soil water; approximate depth, 35 to 45 feet
S2-- Second shallow ground water or soil water; approximate depth, 65 to 85 feet
A1-- First aquifer; approximate depth, 115 to 135 feet
A2-- Lower aquifers; approximate depth, below 150 feet

NM-- Not measured

LUHDORFF & SCALMANINI
Consulting Engineers
Woodland, California 95695

CLIENT Frontier Fertilizer JOB NO. 85-7-008
PROJECT GW Monitoring EL. DATUM 33.40
DETAIL MW2 TWN/RANGE-SECTION 8N/2E-12
DATE 6/6/85 LOCATION Approx. 360ft. S of Rd. 32

WELL CONSTRUCTION (A) (B)	USCS LOG	GRAPHIC LOG	DEPTH	LITHOLOGIC DESCRIPTION	SOIL SAMPLE	REMARKS
	CL/ML			Dark Brown, Clayey Silt		
	SM			Brown, Silty, Fine Sand and Grey Clay		
	CL/ML		20	Yellowish Brown, Silty Clay, some Sand		(A) W.L. 21ft.
	CL/CH		40	Less Sand, contains Grey Clay		
			SM	Contains medium to coarse Sand		
			SM 60	contains medium to coarse Sand and Gravel		
	CL/ML		ML	Yellowish Brown, Silty Clay and Clayey Silt		(B) W.L. 61.9ft.
			SM 80	contains Sand and Gravel		
			CL	Yellowish Brown, Silty Clay		
			SM 100	contains medium-coarse Sand		
			CL			
	GW		120 GW SP	Grey, coarse Sand and Fine Gravel, contains some Brown and Grey Clay		
	CL/ML		140 ML	Yellowish Brown Clay, contains Sand and Fine Gravel		T.D. 150'
			160			

LOG OF DRILL HOLE BY H.L.W. PAGE 2 OF 2

LUHDORFF & SCALMANINI
Consulting Engineers
Woodland, California 95695

CLIENT Frontier Fertilizer
PROJECT GW Monitoring
DETAIL MW1
DATE 6/4/85
JOB NO. 85-7-008
EL. DATUM 34.39
TWN/RANGE-SECTION 8N/2E-12
LOCATION Approx. 800ft. N of Rd. 32

WELL CONSTRUCTION	USCS LOG	GRAPHIC LOG	DEPTH	LITHOLOGIC DESCRIPTION	SOIL SAMPLE	REMARKS
	CL/ML			Dark Brown, Silty Clay		
	CL/ML			Dark Brown, Clayey Silt with Grey Clay and some Sand		
	CL/CH		20	Yellowish Brown, Silty Clay with Grey Clay, and some Sand		
			40	Increased Grey Clay		
				Contains some Sand		
			60	Less Sand		W.L. 61ft.
	SM/SC		80	Yellowish Brown, Silty, Clayey, Fine-medium Sand		
	CL/CH			Yellowish Brown, Silty Clay with Grey Clay		
			100			
	GW		120	Grey, Sandy Gravel, contains some Yellowish Brown and Grey Clay		
				Grey Sandy Gravel		
			140	Yellowish Brown Clay,, contains Sand and Fine Gravel		T.D. 148'

FILE COPY

LOG OF DRILL HOLE BY H.L.W.

FIGURE
A4-9
(MW3A)

QUADRUPLICATE
Use of comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in
No. 244124

Notice of Intent No. _____
Local Permit No. or Date 86-006

State Well No. 8N/2E-K11M
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS, CALIFORNIA Zip 95695

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW3A
Well address if different from above _____
Township 8 NORTH Range 2 EAST Section 12
Distance from cities, roads, railroads, fences, etc. Approximately 50 ft. north of County Road 32A; approximately 2,300 ft. west of Race Boulevard/Interstate 80 interchange.

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [ ]
Irrigation [ ]
Industrial [ ]
Test Well [ ]
Stock [ ]
Municipal [ ]
Other MONITORING [X]

(5) EQUIPMENT:
Rotary [XX] Reverse [ ]
Cable [ ] Air [ ]
Other [ ] Bucket [ ]

(6) GRAVEL PACK: Lonestar
Yes [XX] No [ ] Size #3
Diameter of bore 8x9 12-5/8"
Packed from 29 30 to 46 ft.

(7) CASING INSTALLED:
Steel [ ] Plastic [XX] Concrete [ ]

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	34	4"	sch 40	34	44	.040

(8) PERFORATIONS:
Type of perforation or size of screen

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [XX] No [ ] If yes, to depth 30 29 ft.
Were strata sealed against pollution? Yes [X] No [ ] Interval _____ ft.
Method of sealing concrete grout/bentonite cement

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 6.0 (3/7/86) ft

(11) WELL TESTS:
Was well test made? Yes [X] No [ ] If yes, by whom? LSCE*
Type of test Pump [X] Bailer [ ] Air lift [ ]
Depth to water at start of test -6 ft. At end of test 32 ft
Discharge 5 gal/min after 3.5 hours Water temperature 67 F
Chemical analysis made? Yes [X] No [ ] If yes, by whom? LSCE*
Was electric log made? Yes [ ] No [ ] If yes, attach copy to this report

(12) WELL LOG: Total depth 46 ft. Depth of completed well 44 ft.

from ft.	to ft.	Formation (Describe by color, character, size of material)
0	15	SILTY CLAY (CL): dark grayish brown; topsoil
15	30	SILTY CLAY (CL/CH): olive brown: coarsens down to slightly sandy silty clay
30	45	SILTY SAND (SM): olive brown; fine to medium sand
45	65	SANDY SILTY CLAY (CL/CH): light olive brown; fine mica sand
65	110	SILTY CLAY and SANDY CLAY (CL/CH): light yellowish brown; fine sand with trace very coarse sand to fine gravel
110	140	SAND and GRAVEL (SP/GW); fine to very coarse sand; coarsens downward to basal clayey gravel
140	155	SANDY CLAY with GRAVEL (CL): fine to medium sand with fine gravel
155	170	CLAYEY SANDY GRAVEL (GW): fine gravel, medium to very coarse sand
170	180	SANDY CLAY (CL); olive yellow; fine to medium sand

Work started _____ 19__ Completed 1/24 19 86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED _____ (Well Driller)
NAME Layne Western Co., Inc. (Person, firm, or corporation) (Typed or printed)
Address P.O. Box 1326
City Woodland Zip 95695
License No. 452609 Date of this report _____

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*Luhdorff & Scalmanini, Consulting Engineers, Woodland, California

FIGURE
A4-9

[redacted]
Do not fill in

QUADRUPLICATE
Use of comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

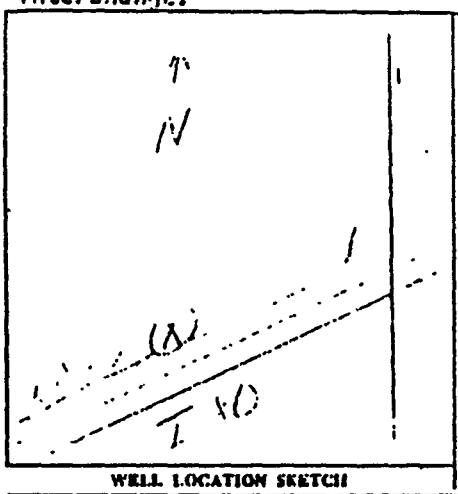
No. 244125

Notice of Intent No. _____
Local Permit No. or Date 86-001

State Well No. 8N/2E-K12M
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS CALIFORNIA Zip 95617

(2) LOCATION OF WELL (See instructions): County YOLO Owner's Well Number MW 3 B
Well address if different from above 8 NORTH
Township 8 NORTH Range 2 EAST Section 12
Distance from cities, roads, railroads, fences, etc. Approximately 50 ft. north of County Road 32A; approximately 2,300 ft. west of Mace Boulevard/Interstate 80 Interchange.



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☐ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK: Lonestar
Yes ☒ No ☐ Size #3
Diameter of hole 12-5/8"
Packed from 61 to 78 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	66	4	sch40	66	76	.040

(8) PERFORATIONS:
Type of perforations or size of screen

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 61 ft.
Were strata sealed against pollution? Yes ☒ No ☐ Interval _____ ft.
Method of sealing cement grout/bentonite

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 6.25 ft. (3/7/86) ft.

(11) WELL TESTS:
Was well test made? Yes ☒ No ☐ If yes, by whom? LSCE*
Type of test Pump ☒ Bailer ☐ Air lift ☐
Depth to water at start of test 6.5 ft. At end of test 47.5 ft.
Discharge 7 gal/min after 6.5 hours Water temperature 67
Chemical analysis made? Yes ☒ No ☐ If yes, by whom? LSCE*
Was electric log made? Yes ☐ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 78 ft. Depth of completed well 76 ft.

from ft	to ft	Formation (Describe by color, character, size of material)
0	15	SILTY CLAY (CL); dark grayish brown; topsoil
15	30	SILTY CLAY (CL/CH); olive brown; coarsens down to slightly sandy silty clay
30	45	SILTY SAND (SM); olive brown; fine to medium sand
45	65	SANDY SILTY CLAY (CL/CH); light olive brown; fine mica sand
65	110	SILTY CLAY and SANDY CLAY (CL/CH); light yellowish brown; fine sand with trace very coarse sand to fine gravel
110	140	SAND and GRAVEL (SP/GW); fine to very coarse sand; coarsens downward to basal clayey gravel
140	155	SANDY CLAY with GRAVEL (CL); fine to medium sand with fine gravel
155	170	CLAYEY SANDY GRAVEL (GW); fine gravel, medium to very coarse sand
170	180	SANDY CLAY (CL); olive yellow; fine to medium sand

Work started _____ 19__ Completed 1/23 19 86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed _____ (Well Driller)
NAME Layne Western Co., Inc. (Person, firm or corporation) (Typed or printed)
Address P.O. Box 1326
City Woodland Zip 95695
License No. 452609 Date of this report _____

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*Luhdorff & Scalmanini, Consulting Engineers, Woodland, California

FIGURE
A4-9
(MW3C)

QUADRUPLICATE
Use of comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

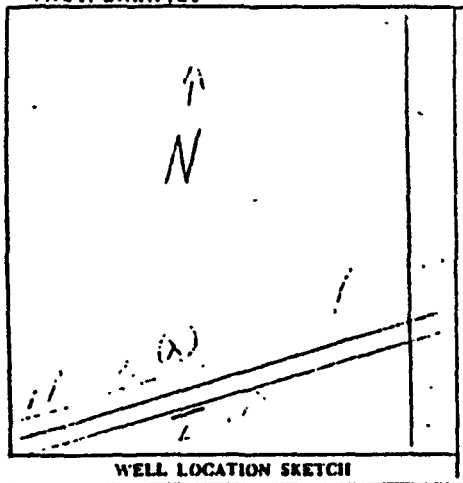
No. 244126

Notice of Intent No. _____
Local Permit No. or Date 86-093

State Well No. 8N/2E-K13M
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS CALIFORNIA Zip 95617

(2) LOCATION OF WELL. (See instructions):
County YOLO Owner's Well Number MB 3C
Well address if different from above
Township 8 NORTH Range 2 EAST Section 12
Distance from cities, roads, railroads, fences, etc. Approximately 50 ft. north of County Road 32A; approximately 2,300 ft. west of Mace Boulevard/Interstate 80 interchange.



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [ ]
Irrigation [ ]
Industrial [ ]
Test Well [ ]
Stock [ ]
Municipal [ ]
Other monitoring [X]

(5) EQUIPMENT:
Rotary [X] Reverse [ ]
Cable [ ] Air [ ]
Other [ ] Bucket [ ]

(6) GRAVEL PACK: Lonestar
Yes [X] No [ ] Size #3
Diameter of hole 8XX 12-5/8"
Packed from XXX112-135 ft.

(7) CASING INSTALLED:
Steel [ ] Plastic [X] Concrete [ ]

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	116	4"	sch40	116	126	.040

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 112 ft.
Were strata sealed against pollution? Yes [X] No [ ] Interval _____ ft.
Method of sealing cxxxxxxx grout/bentonite

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 13.05 ft. (3/7/86) ft.

(11) WELL TESTS:
Was well test made? Yes [X] No [ ] If yes, by whom? LSCE*
Type of test Pump [X] Bailer [ ] Air lift [ ]
Depth to water at start of test 12.4 ft. At end of test 67 ft.
Discharge 29 gal/min after 4 hours Water temperature 66
Chemical analysis made? Yes [X] No [ ] If yes, by whom? LSCE*
Was electric log made? Yes [X] No [ ] If yes, attach copy to this report

(12) WELL LOG: Total depth 180 ft. Depth of completed well 126 ft.

from ft	to ft.	Formation (Describe by color, character, size or material)
0	15	SILTY CLAY (CL); dark grayish brown; topsoil
15	30	SILTY CLAY (CL/CH); olive brown; coarsens down to slightly sandy silty clay
30	45	SILTY SAND (SM); olive brown; fine to medium sand
45	65	SANDY SILTY CLAY (CL/CH); light olive brown; fine mica sand
65	110	SILTY CLAY and SANDY CLAY (CL/CH); light yellowish brown; fine sand with trace very coarse sand to fine gravel
110	140	SAND and GRAVEL (SP/GW); fine to very coarse sand; coarsens downward to basal clayey gravel
140	155	SANDY CLAY with GRAVEL (CL); fine to medium sand with fine gravel
155	170	CLAYEY SANDY GRAVEL (GM); fine gravel; medium to very coarse sand
170	180	SANDY CLAY (CL); olive yellow; fine to medium sand

Work started _____ 19__ Completed 1/21 19 86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed _____ (Well Driller)
NAME Layne Western Co., Inc. (Person, firm, or corporation) (Typed or printed)
Address P.O. Box 1320
City Woodland Zip 95695
License No. 450360 Date of this report _____

DWR 188 (REV 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*Highway 80 [illegible] Davis, Yolo County, California

FIGURE
A4-9
(MW4A)

QUADRUPLICATE
Use of comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

Do not fill in
No. 244127

WATER WELL DRILLERS REPORT

Notice of Intent No.
Local Permit No. or Date 86-[illegible]
State Well No. 8N/2E-K10M
Other Well No.

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS CALIFORNIA Zip 95617

(2) LOCATION OF WELL (See instructions): HW-4A
County YOLO Owner's Well Number
Well address if different from above
Township 8N/10E Range 2 EAST Section 12
Distance from cities, roads, railroads, fences, etc. Approximately 337 ft north of County Road 32A; approximately 2,600 ft. West of Mace Boulevard/Interstate 80 Interchange

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☒

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK: Longstaff
Yes ☒ No ☐ Size
Diameter of bore
Packed from in. to ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	34	4	SCH40	34	44	.040

(8) PERFORATIONS:
Type of perforation or size of screen

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 32 ft.
Were strata sealed against pollution? Yes ☒ No ☐ Interval ft.
Method of sealing Grouted in [illegible]

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion [illegible] ft.

(11) WELL TESTS:
Was well test made? Yes ☒ No ☐ If yes, by whom? [illegible]
Type of test Pump ☒ Bailer ☐ Air lift ☐
Depth to water at start of test [illegible] ft. At end of test [illegible] ft.
Discharge 3 gal/min after 2 hours Water temperature [illegible]
Chemical analysis made? Yes ☐ No ☐ If yes, by whom? [illegible]
Was electric log made? Yes ☐ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 46 ft. Depth of completed well 44 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	15	SILTY CLAY (CL): dark yellowish brown: topsoil
15	25	SILTY CLAY (CL): dark yellowish brown
25	30	SANDY SILT (ML): light yellowish brown: fine to medium sand with trace of coarse sand
30	60	SILTY CLAY and SANDY SILTY CLAY (CL): light olive brown: fine sand with trace of coarse sand
60	65	SANDY SILT (ML): light olive brown: fine to medium sand
65	110	SILTY CLAY and SANDY SILTY CLAY (CL): light olive brown: fine to medium sand
110	130	GRAVEL (SP): fine gravel to 1/2": very coarse sand
130	145	SANDY SILTY CLAY (CL): light olive brown: fine to medium sand

Work started 19 Completed 1/11 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Signed (Well Driller)
NAME Layne Western Co., Inc.
(Person, firm, or corporation) (Typed or printed)
Address P.O. Box 1[illegible]
City Woodland Zip [illegible]
License No. [illegible] Date of this report

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

[illegible] California

FIGURE
A4-9
~~(MW4B)~~

QUADRUPLICATE
Use of comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

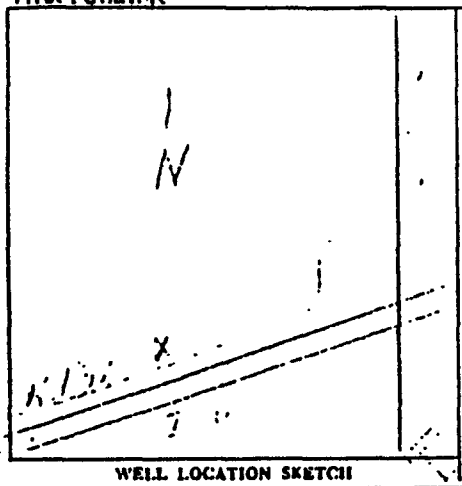
Do not fill in
No. 232167

State Well No. 8N/2E-K08M
Other Well No.

Notice of Intent No.
Local Permit No. or Date 86-004

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS CALIFORNIA Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW 4B
Well address if different from above
Township 8 NORTH Range 2 EAST Section 12
Distance from cities, roads, railroads, fences, etc. Approximately 330 ft. north of County Road 32A; approximately 2,600 ft. west of Mace Boulevard/Interstate 80 interchange



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☒

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK: Lonestar
Yes ☒ No ☐ Size #3
Diameter of hole XXX 12-5/8"
Packed from XX 69 to 84 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	XX	4"	sch40	72	82	.040
	72					

(8) PERFORATIONS:
Type of perforation or size of screen

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth XX 69 ft.
Were strata sealed against pollution? Yes ☒ No ☐ Interval ft.
Method of sealing XXXXXXXX grout/bentonite cement

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 11.2 ft. (3/7/86) ft.

(11) WELL TESTS:
Was well test made? Yes ☒ No ☐ If yes, by whom? LSCE*
Type of test Pump ☒ Bailer ☐ Air lift ☐
Depth to water at start of test 11.2 ft. At end of test 71.0 ft
Discharge 5 gal/min after 5 hours Water temperature 66
Chemical analysis made? Yes ☒ No ☐ If yes, by whom? LSCE*
Was electric log made? Yes XXX No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 84 ft. Depth of completed well 82 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	15	SILTY CLAY (CL); dark yellowish brown; topsoil
15	25	SILTY CLAY (CL); dark yellowish brow
25	30	SANDY SILT (ML); light yellowish brown; fine to medium sand with trace of coarse sand
30	60	SILTY CLAY and SANDY SILTY CLAY (CL); light olive brown; fine sand with trace of coarse sand
60	65	SANDY SILT (ML); light olive brown; fine to medium sand
65	110	SILTY CLAY and SANDY SILTY CLAY (CL); light olive brown; fine to medium sand
110	130	GRAVEL (SP); fine gravel to 1/2"; very coarse sand
130	145	SANDY SILTY CLAY (CL); light olive brown; fine to medium sand

Work started 19 Completed 1/17 19 86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
SIGNED (Well Driller)
NAME Layne Western Co., Inc. (Person, firm, or corporation) (Typed or printed)
Address P.O. Box 1326
City Woodland Zip 95695
License No. 452600 Date of this report

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*Luhdorff & Scalmanini, Consulting Engineers, Woodland, California

FIGURE
A4-9
~~(MW4C)~~

QUADRUPLICATE
use of comply with
local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

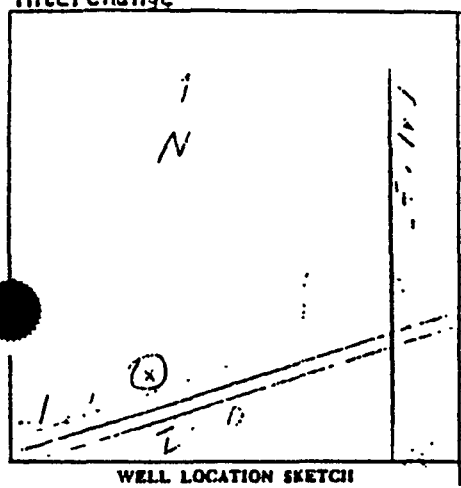
Do not fill in
No. 232168

Notice of Intent No. _____
Local Permit No. or Date 86-002

State Well No. 8N/2E-K09M
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1046
City DAVIS, CALIFORNIA Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW 4C
Well address if different from above _____
Township 8 NORTH Range 2 EAST Section 12
Distance from cities, roads, railroads, fences, etc. Approximately 330 ft. north of County Road 32A; approximately 2,600 ft. west of Mace Boulevard/Interstate 80 interchange



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☒

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK: Lonestar
Yes ☒ No ☐ Size #3
Diameter of hole XXX 12-5/8"
Packed from XXX 110 140 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	114	4"	sch40	114	124	.040

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth XXX 110 ft.
Were strata sealed against pollution? Yes ☒ No ☐ Interval _____ ft.
Method of seating XXXXXXX grout/bentonite cement

(10) WATER LEVELS:
Depth of first water, if known _____ ft
Standing level after well completion 14.0 ft. (3/7/86) ft.

(11) WELL TESTS:
Was well test made? Yes ☒ No ☐ If yes, by whom? LSCE*
Type of test Pump ☒ Bailer ☐ Air lift ☐
Depth to water at start of test 27.7 ft. At end of test 57 ft
Discharge 24.5 gal/min after 1 hours Water temperature _____
Chemical analysis made? Yes ☒ No ☐ If yes, by whom? LSCE*
Was electric log made? Yes ☒ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 145 ft Depth of completed well 124 ft.

from ft	to ft.	Formation (Describe by color, character, size or material)
0	15	SILTY CLAY (CL); dark yellowish brown; topsoil
15	25	SILTY CLAY (CL); dark yellowish brown
25	30	SANDY SILT (ML); light yellowish brown; fine to medium sand with trace of coarse sand
30	60	SILTY CLAY and SANDY SILTY CLAY (CL) light olive brown; fine sand with trace of coarse sand
60	65	SANDY SILT (ML); light olive brown; fine to medium sand
65	110	SILTY CLAY and SANDY SILTY CLAY (CL) light olive brown; fine to medium sand
110	130	GRAVEL (SP); fine gravel to 1/2"; very coarse sand
130	145	SANDY SILTY CLAY (CL); light olive brown; fine to medium sand

Work started _____ 19__ Completed 1/14 1986

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed _____ (Well Driller)
NAME Layne Western Co., Inc. (Person, firm, or corporation) (Typed or printed)
Address P.O. Box 1326
City Woodland Zip 95695
License No. 452600 Date of this report _____

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM
*Luhdorff & Scalmanini, Consulting Engineers, Woodland, California

FIGURE A4-10

~~(MW5)~~

Do not fill in

No. 181366

.NAL

le with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

ce of Intent No.

al Permit No. or Date 86-001

State Well No.

Other Well No.

) OWNER:

Name FRONTIER FERTILIZER COMPANY

Address P.O. BOX 1048

City DAVIS Zip 95617

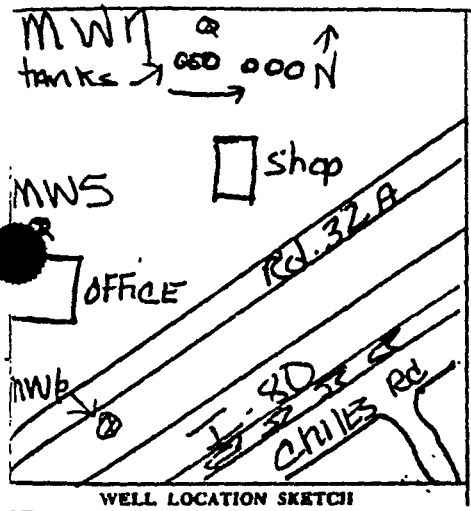
) LOCATION OF WELL (See instructions):

County YOLO Owner's Well Number MW5A

Well address if different from above

Township 8N Range 2E Section 12

Distance from cities, roads, railroads, fences, etc.



WELL LOCATION SKETCH

(3) TYPE OF WORK:

New Well ☒ Deepening ☐

Reconstruction ☐

Reconditioning ☐

Horizontal Well ☐

Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic ☐

Irrigation ☐

Industrial ☐

Test Well ☐

Stock ☐

Municipal ☐

Other monitoring ☒

) EQUIPMENT:

Rotary ☐ Reverse ☐

Cable ☐ Air ☐

Other ☒ AUGER Bucket ☐

(6) GRAVEL PACK:

Yes ☒ No ☐ Size 12 x 20

Diameter of bore 10"

Packed from 7 to 32 ft.

) CASING INSTALLED:

Steel ☐ Plastic ☐ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	10	4	sch40	10	30	.040
30	40	4	sch40	10		

(8) PERFORATIONS:

Type of perforation or size of screen

) WELL SEAL:

Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 7 ft.

Were strata sealed against pollution? Yes ☒ No ☐ Interval ft.

Method of sealing grout

(10) WATER LEVELS:

Depth of first water, if known ft.

Standing level after well completion 26.7 ft.

WELL TESTS:

Was well test made? Yes ☐ No ☐ If yes, by whom?

Type of test Pump ☐ Bailer ☐ Air lift ☐

Depth to water at start of test ft. At end of test ft

Discharge gal/min after hours Water temperature

Chemical analysis made? Yes ☐ No ☐ If yes, by whom?

Was electric log made? Yes ☐ No ☒ If yes, attach copy to this report

(12) WELL LOG:

Total depth 42 ft. Depth of completed well 40 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	1	sand gravel
1	22	silty clay
22	32	sandy silt
32	34	silty clay
34	37	sandy silt
37	40	sand clay

Work started 7-1 19 87 Completed 7-24 19 87

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed Kenneth W Worster (Well Driller)

NAME LAYNE WESTERN COMPANY, INC. (Person, firm, or corporation) (Typed or printed)

Address P.O. BOX 1326

City WOODLAND Zip 95695

License No. 510011 Date of this report 11-25-87

FIGURE
A4-10
(MW5)

ORIGINAL
e with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

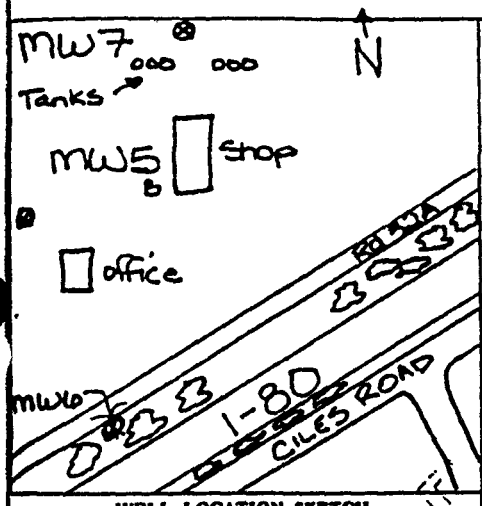
Do not fill in
No. 181367

Notice of Intent No. _____
Local Permit No. or Date 86-001

State Well No. _____
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW5B
Well address if different from above _____
Township 8N Range 2E Section 12
Distance from cities, roads, railroads, fences, etc. _____



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☑

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☐
Other ☐ auger Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size 12 x 20
Diameter of bore 10"
Packed from 32 to 48 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☐ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	34	4	sch40	34	44	.040
44	54	4	sch40			

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 27 ft.
Were strata sealed against pollution? Yes ☑ No ☐ Interval _____ ft.
Method of sealing grout

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 27.3 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom? _____
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test _____ ft. At end of test _____ ft.
Discharge _____ gal/min after _____ hours Water temperature _____
Chemical analysis made? Yes ☐ No ☐ If yes, by whom? _____
Was electric log made? Yes ☐ No ☑ If yes, attach copy to this report

(12) WELL LOG: Total depth 56 ft. Depth of completed well 54 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	1	sand gravel
1	22	silty clay
22	32	sandy silt
32	34	silty clay
34	37	sandy silt
37	43	sand clay
43	45	sand silt
45	54	silty clay

Work started 7-1 19 87 Completed 7-24 19 8

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Signed Kenneth W. Foster (Well Driller)
NAME LAYNE WESTERN COMPANY, INC. (Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 1326
City WOODLAND Zip 95695
License No. 510011 Date of this report 11-25-87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

FIGURE
A4-10
(MW5)

ORIGINAL
with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

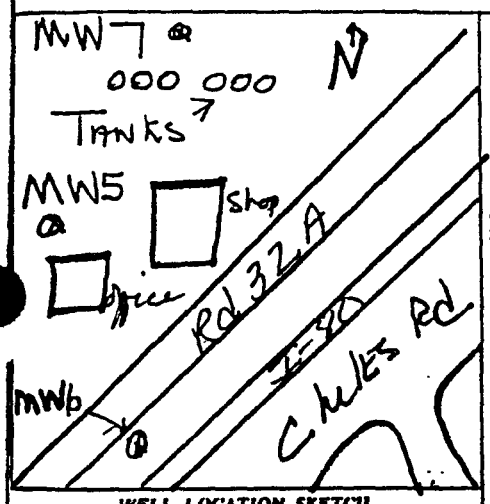
Do not fill in
No. 181370

Notice of Intent No. _____
Local Permit No. or Date 86-001

State Well No. _____
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER COMPANY
Address P.O. BOX 1048
City DAVIS Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW5C
Well address if different from above _____
Township 8N Range 2E Section 12
Distance from cities, roads, railroads, fences, etc. _____



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☑

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☐
Other ☑ auger Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size 12x20
Diameter of hole 10"
Packed from 65 to 80 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☑ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	70	4	sch40	70	80	.040
80	90	4	sch40			

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 60 ft.
Were strata sealed against pollution? Yes ☑ No ☐ Interval _____ ft.
Method of sealing grout

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 30.5 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom? _____
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test _____ ft. At end of test _____ ft.
Discharge _____ gal/min after _____ hours Water temperature _____
Chemical analysis made? Yes ☐ No ☐ If yes, by whom? _____
Was electric log made? Yes ☑ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 94 ft. Depth of completed well 90 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	1	sand gravel
1	22	silty clay
22	32	sandy silt
32	34	silty clay
34	37	sandy silt
37	43	sand clay
43	45	sand silt
45	54.5	silty clay
54.5	57.5	sandy silt
57.5	74	silty clay
74	79	sandy silt
79	87	silty clay
87	89	sandy silt
89	94	silty clay

TEST HOLE 7-2-87

Work started 7-1 19-87 Completed 7-24-87 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED Kenneth W Worster (Well Driller)

NAME LAYNE WESTERN COMPANY, INC. (Person, firm or corporation) (Typed or printed)
Address P.O. BOX 1326
City WOODLAND Zip 95695
License No. 510011 Date of this report 11-25-87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

FIGURE - A4-11 (MW6)

ORIGINAL with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

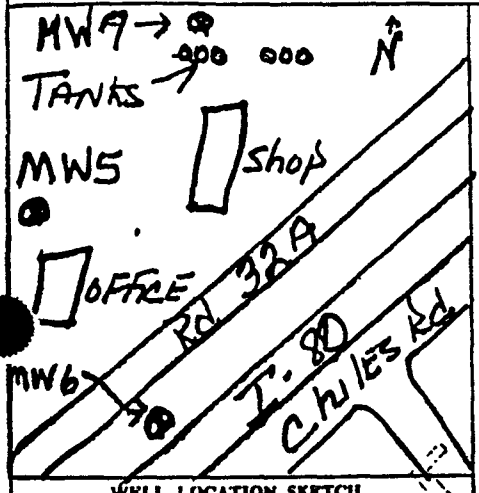
No. 181365

Notice of Intent No. _____
Local Permit No. or Date 86-001

State Well No. _____
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW6A
Well address if different from above _____
Township 8N Range 2E Section 12
Distance from cities, roads, railroads, fences, etc. _____



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☑

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☐
Other auger Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size 12 x 20
Diameter of bore 10"
Packed from 10 ft. to 34 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☐ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	12.5	4	sch40	12.5	30	.040
30	40	4	sch40			

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 10 ft.
Were strata sealed against pollution? Yes ☑ No ☐ Interval _____ ft.
Method of sealing grout

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 27.9 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom? _____
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test _____ ft. At end of test _____ ft
Discharge _____ gal/min after _____ hours Water temperature _____
Chemical analysis made? Yes ☐ No ☐ If yes, by whom? _____
Was electric log made? Yes ☐ No ☑ If yes, attach copy to this report

(12) WELL LOG: Total depth 42 ft. Depth of completed well 40 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	3.5	silty sand
3.5	11.5	clay, silty clay
11.5	16.5	silty clay sand
16.5	21.5	silty clay
21.5	27.25	clay & sand
27.25	30.25	silty sand
30.25	38	silty clay
38	42	sandy silty clay

Work started 10-7 19 87 Completed 10-22 19 87

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed Kenneth W. Worster (Well Driller)
NAME LAYNE WESTERN COMPANY, INC. (Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 1326
City WOODLAND Zip 95695
License No. 510011 Date of this report 11-25-87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

A4-11
(MW6)
Do not fill in

No. 181364

ORIGINAL
with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

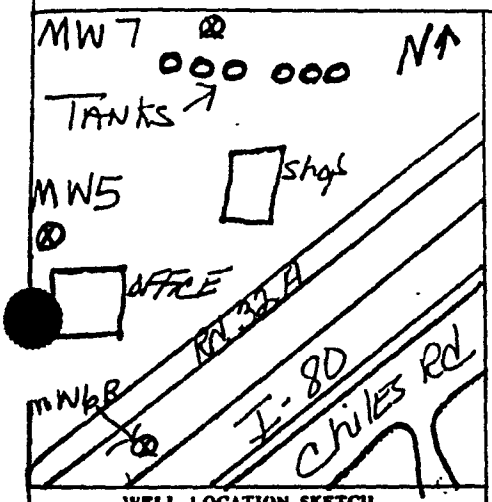
WATER WELL DRILLERS REPORT

State Well No.
Other Well No.

Point of Interest No.
Local Permit No. or Date 86-001

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW6B
Well address if different from above
Township 8N Range 2E Section 12
Distance from cities, roads, railroads, fences, etc.



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☒

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☐
Other ☒ auger Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size 12 x 20
Diameter of bore 10"
Packed from 36 to 54 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☑ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall
0	40	4	sch40
50	60	4	sch40

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Slot size
40	50	.040 *

* STAINLESS STEEL SCREEN

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 30 ft.
Were strata sealed against pollution? Yes ☑ No ☐ Interval ft.
Method of sealing grout

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 27.9 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom?
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test ft. At end of test ft
Discharge gal/min after hours Water temperature
Chemical analysis made? Yes ☐ No ☐ If yes, by whom?
Was electric log made? Yes ☐ No ☑ If yes, attach copy to this report

(12) WELL LOG: Total depth 62 ft. Depth of completed well 60 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	3.5	silty sand
3.5	11.5	clay, silty clay
11.5	16.5	silty clay sand
16.5	21.5	silty clay
21.5	27.25	clay & sand
27.25	30.25	silty sand
30.25	38	silty clay
38	43.5	sandy/silty clay
43.5	46	silty sand
46	48.5	sand and clay
48.5	56.5	silty clay
56.5	62	silty clay

Work started 10-7 19 87 Completed 10-22 19 87

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed Kenneth W Worster (Well Driller)
NAME LAYNE WESTERN COMPANY, INC.
(Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 1326
City WOODLAND Zip 95695
License No. 510011 Date of this report 11-24-87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

FIGURE
A4-11
(MW6)

GINAL
ith DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

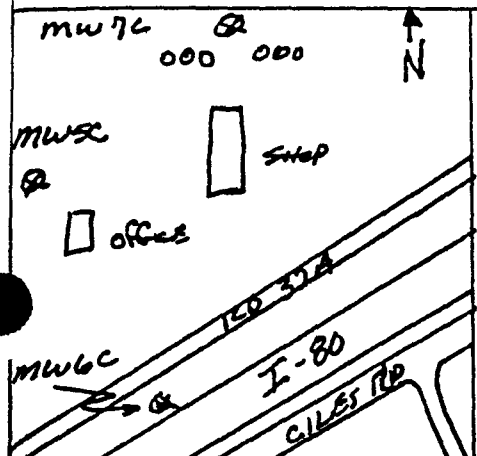
Do not fill in
No. 181363

ice of Intent No. _____
al Permit No. or Date 86-001

State Well No. _____
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City WOODLAND Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW6C
Well address if different from above _____
Township 8N Range 2E Section 12
Distance from cities, roads, railroads, fences, etc. _____



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other MONITORING ☑

(5) EQUIPMENT:
Rotary ☑ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size 12 x 20
Diameter of bore 10
Packed from 70 to 80 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☑ Concrete ☐

(8) PERFORATIONS:
Type of perforations or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	70	4	sch40	70	80	.040
80	90	4	sch40			

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 60 ft.
Were strata sealed against pollution? Yes ☑ No ☐ Interval _____ ft.
Method of sealing GROUT

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 33.1 ft

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom? _____
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test _____ ft. At end of test _____ ft
Discharge _____ gal/min after _____ hours Water temperature _____
Chemical analysis made? Yes ☐ No ☐ If yes, by whom? _____
Was electric log made? Yes ☑ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 93.5 ft. Depth of completed well 90 ft.

from ft	to ft.	Formation (Describe by color, character, size or material)
0	3.5	silty sand
3.5	11.5	clay, silty clay
11.5	16.5	silty clay sand
16.5	21.5	silty clay
21.5	27.25	clay & sand
27.5	30.25	silty sand
30.25	38	silty clay
38	43.5	sandy silty caly
43.5	46	silty sand
46	48.5	sand and clay
48.5	56.5	silty clay
56.5	63.5	silty clay
63.5	73.5	silty clay
73.5	79.5	silty sand
79.5	85.5	silty clay
85.5	91.5	silty clay & sand
91.5	93.5	silty clay

TESTHOLE 7-8-87

Work started 10-7 19 87 Completed 10-22 19 87

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed Bennett W Woosley
(Well Driller)

NAME LAYNE WESTERN COMPANY, INC.
(Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 1326
City WOODLAND Zip 95695
License No. 510011 Date of this report 11-24-87

DWR 188 (REV 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

19. 1 205

FIGURE A4-12
(MW7)

ORIGINAL
s with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

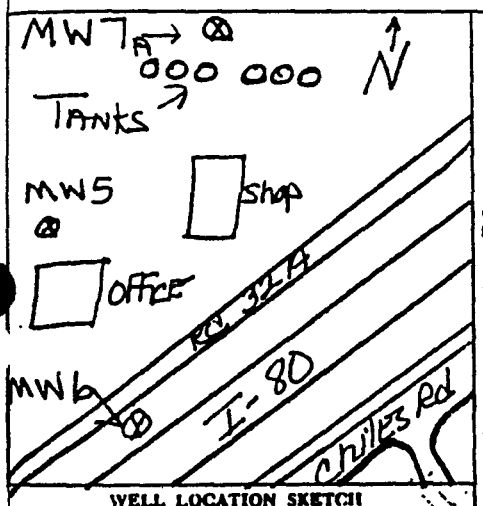
Do not fill in
No. 181369

Notice of Intent No. _____
Local Permit No. or Date 86-001

State Well No. _____
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER COMPANY
Address P.O. BOX 1048
City DAVIS Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO COUNTY Owner's Well Number MW7A
Well address if different from above _____
Township 8N Range 2E Section 12
Distance from cities, roads, railroads, fences, etc. _____



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☒

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☐
Other ☑ Auger Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size 12 x 20
Diameter of bore 10"
Packed from 9 to 33 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☑ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	12.5	4	sch40	12.5	30	.040
30	40	4	sch40			

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 7 ft.
Were strata sealed against pollution? Yes ☑ No ☐ Interval _____ ft.
Method of sealing grout

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 33.6 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom? _____
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test _____ ft. At end of test _____ ft
Discharge _____ gal/min after _____ hours Water temperature _____
Chemical analysis made? Yes ☐ No ☐ If yes, by whom? _____
Was electric log made? Yes ☐ No ☑ If yes, attach copy to this report

(12) WELL LOG: Total depth 42 ft. Depth of completed well 40 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	24.5	silty/clay
24.5	28.8	silty/sand
28.8	39.7	silty clay
39.7	42.0	silty clay

Work started 7-27 19 87 Completed 8-3 19 87

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
SIGNED Kenneth W Worsley
(Well Driller)
NAME LAYNE WESTERN COMPANY, INC.
(Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 1326
City WOODLAND Zip 95695
License No. 510011 Date of this report 11-25-87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

FIGURE A4-12
(MW7)

ORIGINAL
with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

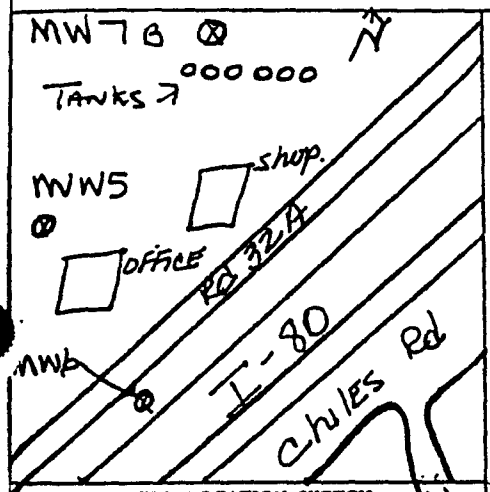
Do not fill in
No. 181368

Notice of Intent No. _____
Local Permit No. or Date 86-001

State Well No. _____
Other Well No. _____

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW7B
Well address if different from above _____
Township 8N Range 2E Section 12
Distance from cities, roads, railroads, fences, etc. _____



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other monitoring ☒

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☐
Other ☑ auger Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size 12 x 20
Diameter of bore 10
Packed from 34 to 49 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☑ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	36	4	sch40	36	46	.040
46	56	4	sch40			

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 29 ft.
Were strata sealed against pollution? Yes ☑ No ☐ Interval _____ ft.
Method of sealing grout

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion 30.7 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom? _____
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test _____ ft. At end of test _____ ft
Discharge _____ gal/min after _____ hours Water temperature _____
Chemical analysis made? Yes ☐ No ☐ If yes, by whom? _____
Was electric log made? Yes ☐ No ☑ If yes, attach copy to this report

(12) WELL LOG: Total depth 58 ft. Depth of completed well 56 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	24.5	silty clay
24.5	28.8	silty sand
28.8	39.7	silty clay
39.7	43.8	silty clay
43.8	46.5	silty clay
46.5	48	silty sand
48	58	silty clay

Work started 7-27 19 87 Completed 8-3 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
SIGNED Kenneth W Foster (Well Driller)
NAME LAYNE WESTERN COMPANY, INC. (Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 1328
City WOODLAND Zip 95695
License No. 510011 Date of this report 11-25-87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

(MW7)
Do not fill in
No. 181361

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

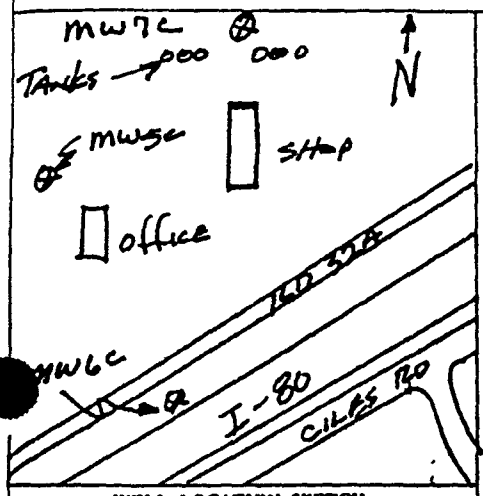
WATER WELL DRILLERS REPORT

Point of Interest No.
Permit No. or D86-001

State Well No.
Other Well No.

(1) OWNER: Name FRONTIER FERTILIZER
Address P.O. BOX 1048
City DAVIS Zip 95617

(2) LOCATION OF WELL (See instructions):
County YOLO Owner's Well Number MW7C
Well address if different from above
Township 8N Range 2E Section 12
Distance from cities, roads, railroads, fences, etc.



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other MON MONITOR ☑

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☐
Other ✓ Augur Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size 12 x 20
Diameter of bore 10
Packed from 70 to 90 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☑ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	76	4	sch40	76	86	.040
86	96	4	sch40			

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 65 ft.
Were strata sealed against pollution? Yes ☑ No ☐ Interval ft.
Method of sealing GROUT

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 34.9 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom?
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test ft. At end of test ft
Discharge gal/min after hours Water temperature
Chemical analysis made? Yes ☐ No ☐ If yes, by whom?
Was electric log made? Yes ☑ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 98 ft. Depth of completed well 96 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	24.5	silty/clay
24.5	28.8	silty/sand
28.8	39.7	silty clay
39.7	43.8	silty clay
43.8	46.5	silty clay
46.5	48	silty sand
48	64.5	silty clay
64.5	65.8	sand & clay
65.8	69.5	silty sand
69.5	71.6	sand & clay
71.6	87.5	silty sand
87.5	95.5	silty clay

TEST HOLE 7-6,7-87

Work started 7-27 19 87 Completed 8-3 19 87

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed Kenneth W Worster (Well Driller)
NAME LAYNE WESTERN COMPANY, INC. (Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 1326
City WOODLAND Zip 95695
License No. 510011 Date of this report 11-24-87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

028 00009

GROUNDWATER TECHNOLOGY, INC.
1401 Halyard Drive, Suite 140, West Sacramento, CA 95691, (916) 372-4700
FAX (916) 372-8781

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FRONTIER FERTILIZER/MACE RANCH PARK
DAVIS, CALIFORNIA

February 15, 1990

Prepared for:

Ramco Enterprises, Inc.
1450 Harbor Boulevard
West Sacramento, CA 95691

Prepared by:

GROUNDWATER TECHNOLOGY, INC.
1401 Halyard Drive, Suite 140
West Sacramento, CA 95691

DANIEL R. TORMEY, Ph.D.
Senior Project Geologist

ANDREW W. BAKINOWSKI
Senior Environmental Geologist
District Manager

E. K. SIMONIS
California Registered
Geologist, No. 4422

202/899-7029

REGISTERED GEOLOGIST
EDWARDAS (ED) K. SIMONIS
No. 4422
STATE OF CALIFORNIA

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 7D

Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, Ca. Project Number 202/899-7029
Date Drilled 12/11,20/89 Total Depth of Hole 130 ft Diameter 12 in.& 8in
Surface Elevation _____ Water Level Initial 110 ft 24-hour _____
Screen: Dia. 4 in. Length 10 ft. Slot Size .020 in.
Casing: Dia. 4 in. Length 114 ft. Type PVC
Drilling Company All Terrain Drilling Method Mud Rotary
Driller R. Manley Log by M. Ostendorf & P. Price
Geologist / Engineer E.K. Simonis License No. P.G. #4422

Sketch Map

SEE SITE PLAN

Notes: continuous soil coring from 80 ft. to 130 ft.

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					12/11-12/89 Drilled to 80 ft. and set steel conductor casing
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					

SEE LOGS FOR MW-7A, MW-7B, MW-7C (ISCE 1987 REPORT)

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 7D

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26				SEE LOGS MW-7A, MW-7B, MW-7C (LSCE 1987 REPORT)	
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 7D

Drilling Log

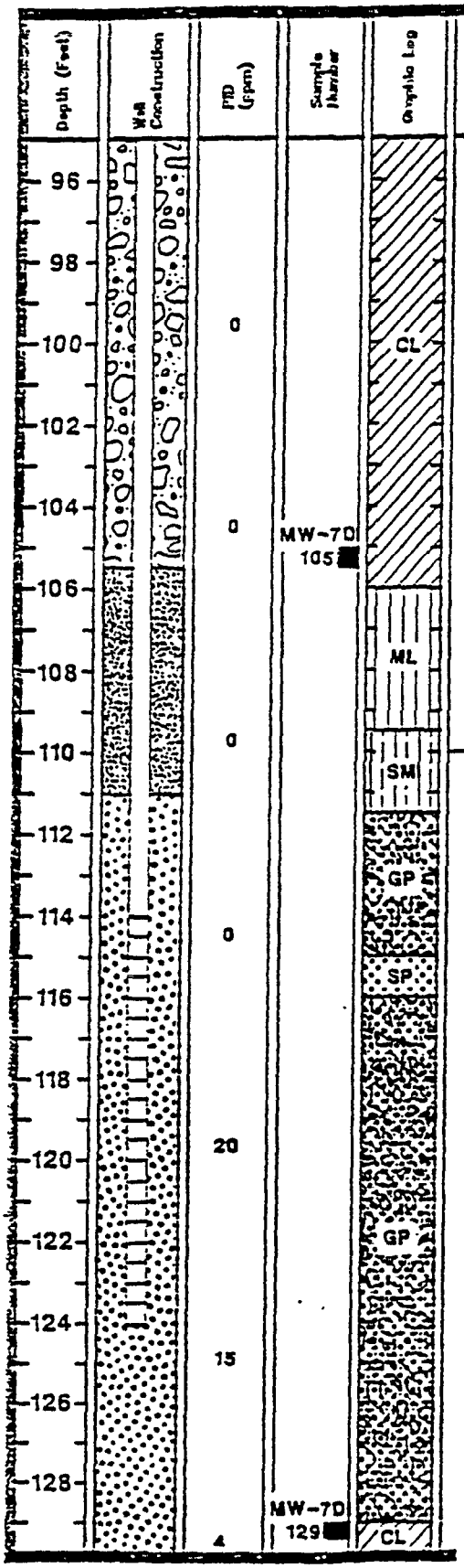
Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
62				SEE LOG FOR MW-7C (ISCE 1987 REPORT)	
64					
66					
68					
70					
72					
74					
76					
78					
80				CL	12/20/89 Drilled below casing, began logging continuous core Tan-brown clay (moist)
				SW	Gray, fine to medium sand (wet)
82				SM	Brown, silty, very fine sand (wet)
84		0		CL	Tan-brown, sandy clay (wet)
86					(grades silty and moist)
88					
90		0			
92					
94		0			

5/88 REV. 8

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 7D

Drilling Log



Description/Soil Classification (Color, Texture, Structures)

Tan-brown, silty clay (con't)

Tan-brown, gray mottled, clayey silt (moist)

Encountered water 12/20/89 (0900 hours)

Tan-gray, mottled, silty, fine sand (moist)

Brown, sandy, coarse gravel (wet)

Brown, medium sand (wet)

Brown, sandy, fine sand (wet)

Brown-tan clay (moist)

End of boring, installed monitoring well

6/88 REV. 8

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well **8A**

Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, CA Project Number 202/899-7029
Date Drilled 12/12/89 Total Depth of Hole 50 ft. Diameter 8 in.
Surface Elevation ____ Water Level Initial 39 ft. 24-hour ____
Screen: Dia. 4 in. Length 25 ft. Slot Size 0.020 in.
Casing: Dia. 4 in. Length 26 ft. Type PVC
Drilling Company Sierra Pacific Drilling Method hollow-stem auger
Driller E. Fruehauf Log by P. Price
Geologist / Engineer E.K. Simonis License No. #4422

Sketch Map

SEE SITE PLAN

Notes:

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 8A

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

5/86 REV. 8

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 8B

Drilling L

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, Ca. Project Number 202/899-7029
Date Drilled 12/21/89 Total Depth of Hole 90 ft. Diameter 8 in.
Surface Elevation ____ Water Level Initial 81.5 ft. 24-hour ____
Screen: Dia. 4 in. Length 10 ft. Slot Size .020 in.
Casing: Dia. 4 in. Length 80 ft. Type PVC
Drilling Company All Terrain Drilling Method Mud Rotary
Driller R. Manley Log by P. Price
Geologist / Engineer E.F. Simonis License No. R.G. #4422

Sketch Map

SEE SITE PLAN

Notes: continuous soil sampling by coring

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					Dark brown, clayey silt (damp)
2				ML	
4					
6					Dark gray, silty clay (damp)
8				CL	
10		0			
12				ML	Light brown, clayey silt (moist)
14				SM	Light brown, clayey, silty, fine sand (moist) (grades more silty)
16					Light brown, silty clay (damp)
18				CL	
20		0			(grades more silty)
22				ML	Tan-brown, clayey silt (moist)
24				ML	Tan-brown, clayey, sandy silt (moist)

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 8B

Drilling Lo

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26				ML	Tan-brown, clayey, sandy silt (con't)
28					(grades more sandy)
30				CL	Tan, orange, and gray mottled, silty clay (moist) (organic matter and oxide stains)
32					
34					
36					
38				ML	Brown-tan, clayey, sandy silt (moist)
40					
42			MW-8B 42	SM	Light brown, silty, fine sand (moist)
44					
46					(grades clayey)
48				ML	Gray-brown, clayey silt (moist)
50		0			
52					
54				ML	Brown, gray mottled, clayey, sandy silt (damp)
56				SM	Brown, clayey, silty, fine sand (moist)
58		0		ML	Brown, gray mottled, clayey silt (moist)

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 8B

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
					Brown, gray mottled, clayey silt (con't)
62				ML	
64				SM	Brown-gray, silty, fine sand (moist)
				CL	Light brown, silty clay (moist)
66				SM	Brown-gray, silty, fine to medium sand (moist) (grades finer)
68				ML	Brown, sandy silt (moist)
70		0		SM	Brown, clayey, silty, fine sand (moist)
72				CL	Brown, gray mottled, silty clay (moist)
74					
76				ML	Brown, clayey, sandy silt (moist)
				SM	Brown, silty, fine sand (moist)
78				ML	Brown, gray mottled, clayey, sandy silt (moist)
80		2			
					Encountered water 12/21/89 (1130 hours)
82			MW-8B 82		Gray, silty, fine sand (wet) (grades to medium sand)
84				SM	(grades brown and moist)
86					(grades clayey)
88				ML	Brown, gray mottled, clayey, sandy silt (moist)
90		0		CL	Gray, silty clay (moist) End of boring, installed monitoring well
92					
94					

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GROUNDWATER TECHNOLOGY, INC.

Monitoring Well **9A** Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, CA Project Number 202/899-7029
Date Drilled 12/13/89 Total Depth of Hole 45 ft. Diameter 8 in.
Surface Elevation ____ Water Level Initial 35 ft. 24-hour ____
Screen: Dia. 4 in. Length 20 ft. Slot Size 0.020 in.
Casing: Dia. 4 in. Length 25 ft. Type PVC
Drilling Company Sierra Pacific Drilling Method hollow-stem auger
Driller E. Fruehauf Log by P. Price
Geologist / Engineer E.K. Simonis License No. #4422

Sketch Map

SEE SITE PLAN

Notes:

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 9A

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 9B

Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, Ca. Project Number 202/899-7029
Date Drilled 12/21/89 Total Depth of Hole 81 ft. Diameter 8 in.
Surface Elevation Water Level Initial 24-hour
Screen: Dia. 4 in. Length 10 ft. Slot Size .020 in.
Casing: Dia. 4 in. Length 71 ft. Type PVC
Drilling Company All Terrain Drilling Method Mud Rotary
Driller R. Manley Log by B. Price
Geologist / Engineer E.H. Simonis License No. R.G. #4422

Sketch Map

SEE SITE PLAN

Notes: soil not sampled. See log for MW-9C

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					
2					
4					
6					
8					
10					
12				SEE LOG FOR MW-9C	
14					
16					
18					
20					
22					
24					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 9B

Drilling Log

Depth (feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					
28					
30					
32					
34					
36					
38					
40				SEE LOG FOR MW-9C	
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 9B

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
62				SEE LOG FOR MW-9C	
64					
66					
68					
70					
72					
74					
76					
78					
80					
82					
84					
86					
88					
90					
92					
94					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 9C

Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, Ca. Project Number 202/899-7029
Date Drilled 12/12-13/89 Total Depth of Hole 120 ft. Diameter 8 in.
Surface Elevation ____ Water Level Initial ____ 24-hour ____
Screen: Dia. 4 in. Length 10 ft. Slot Size .020 in.
Casing: Dia. 4 in. Length 115 ft. Type PVC
Drilling Company All Terrain Drilling Method Mud Rotary
Driller R. Manley Log by M. Ostendorf
Geologist / Engineer R.E. Simonis License No. R.G. #4422

Sketch Map

SEE SITE PLAN

Notes: continuous soil sampling by coring

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					Dark brown, clayey silt (dry)
2				ML	
4					(grades moist and darker)
6					Dark brown clay (moist)
8					
10					
12				CL	
14					
16					
18					
20					
22					(grades lighter) (some silt and sand)
24				CL	Tan-brown, silty clay (moist)

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 9C

Drilling L

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					Tan-brown, silty clay (con't) (oxidation stains and black organic matter)
28				CL	
30					(some medium sand)
32					
34			MW-9C 34	CL	Green-brown clay (moist, with red oxidation staining)
					Brown, clayey, fine sand (moist)
36				SM	
38					
40					Dark brown, fine to medium sand (wet)
42				SW	
44					(grades finer)
46					Brown, gray mottled clay (moist)
48					
50					(dry)
52				CL	
54		0			(silty, moist)
56					
58		0			

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 9C

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
					Brown, gray mottled clay (con't)
62				CL	
64		0	MW-9C 65		Tan-brown, clayey, fine sand
66				SM	
68					Tan-brown, sandy clay (moist)
70		0			
72				CL	
74		0			(grades silty)
76					
78					Brown, clayey, fine sand (wet)
80				SM	
82					Tan-brown clay (moist)
84					(grades silty)
86					
88				CL	
90		0			
92					
94					

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GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 9C

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
96					Tan-brown, silty clay (con't)
98					
100		0			
102				CL	
104					(grades more silty)
106					
108					
110		0			Brown, clayey, fine sand (wet)
112				SM	(grades less clayey)
114					Brown, sandy, coarse gravel
116					
118				GW	
120					
122					
124					Brown sand
126				SP	
128					(grades clayey)
				CL	Tan clay
					End of boring, installed monitoring well

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 10A

Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, CA Project Number 202/899-7029
Date Drilled 12/15/89 Total Depth of Hole 30 ft. Diameter 8 in.
Surface Elevation ____ Water Level Initial 39 ft. 24-hour ____
Screen: Dia. 4 in. Length 25 ft. Slot Size 0.020 in.
Casing: Dia. 4 in. Length 26 ft. Type PVC
Drilling Company Sierra Pacific Drilling Method hollow-stem auger
Driller E. Fruehauf Log by P. Price
Geologist / Engineer E.K. Simonis License No. #4422

Sketch Map

SEE SITE PLAN

Notes:

Depth (feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well **10A**

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 10B

Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, Ca. Project Number 202/899-7029
Date Drilled 12/14-15/89 Total Depth of Hole 90 ft. Diameter
Surface Elevation Water Level Initial 24-hour
Screen: Dia. 4 in. Length 15 ft. Slot Size .020 in.
Casing: Dia. 4 in. Length 65 ft. Type PVC
Drilling Company All Terrain Drilling Method Mud Rotary
Driller R. Manley Log by M. Ostendorf
Geologist / Engineer E.K. Simonis License No. P.G. #4422

Sketch Map

SEE SITE PLAN

Notes: continuous soil sampling by coring

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					Brown, sandy silt (dry) (organic matter)
2					
4				ML	(grades darker, clayey, and moist)
6					
8					Dark brown, silty clay (moist)
10				CL	
12					
14					Brown, silty, fine sand
16				SM	
18					Tan-brown, sandy silt (grades clayey) (black organic matter)
20				ML	
22					
24				SM	Tan-brown, clayey, fine sand

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well **10B**

Drilling L

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
				SM	Tan-brown, clayey, fine sand (con't)
26					Tan-brown, sandy clay
28					
30					(orange and gray mottling, oxide stains)
32				CL	
34					
36					
38					Tan-brown, sandy, clayey silt
40				ML	
					Tan-brown, silty, fine sand
42				SM	
44				SP	Brown, fine sand (wet)
46					Tan, orange and gray mottled, sandy clay
48			MW-10B 48		(grades silty, less, sandy)
50				CL	
52					
54					
56				SM	Tan-brown, silty, very fine sand (moist)
58				CL	Tan-brown, sandy, silty clay (moist)

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GROUNDWATER TECHNOLOGY, INC.

Monitoring Well **10B**

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
					Tan-brown, sandy, silty clay (con't)
62					
64				CL	
		0			(grades sandier, less silty)
66					
68		0		SP	Brown, fine sand (wet)
				SM	Tan-brown, clayey, silty sand
70				ML	Brown, sandy silt (wet)
			MW-10B 71		
72					Tan-brown, silty clay (moist) (mottled orange and gray)
74				CL	
76					
				SM	Dark brown, fine sand (wet)
78					Brown, silty clay (moist)
80		0			(orange and gray mottling)
82					
84				CL	
86					
88					
90					End of boring, installed monitoring well
92					
94					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well **11A** — Drilling Log

Project: Ramco/Frontier — Owner: Ramco Enterprises, Inc.
Location: Davis, CA — Project Number: 202/800-7020
Date Drilled: 12/14/89 — Total Depth of Hole: 45 ft. — Diameter: 8 in.
Surface Elevation: — Water Level Initial: 35 ft. 24-hour:
Screen: Dia. 4 in. — Length 20 ft. — Slot Size 0.020 in.
Casing: Dia. 4 in. — Length 26 ft. — Type PVC
Drilling Company: Sierra Pacific — Drilling Method: hollow-stem auger
Driller: E. Fruehauf — Log by: P. Price
Geologist / Engineer: E.K. Simonis — License No. #4422

Sketch Map

SEE SITE PLAN

Notes:

Depth (feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well **11A**

Drilling Lo

Depth (feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 11B

Drilling Log

Project: Ramco/Frontier Owner: Ramco Enterprises, Inc.
Location: Davis, Ca. Project Number: 202/899-7029
Date Drilled: 12/28/89 Total Depth of Hole: 90 ft. Diameter: 8 in.
Surface Elevation: ____ Water Level Initial: ____ 24-hour: ____
Screen: Dia. 4 in. Length 10 ft. Slot Size .020 in.
Casing: Dia. 4 in. Length 65 ft. Type PVC
Drilling Company: All Terrain Drilling Method: Mud Rotary
Driller: R. Manley Log by: D. Tormey
Geologist / Engineer: E.K. Simonis License No. P.G. #4422

Sketch Map

SEE SITE PLAN

Notes: continuous soil sampling by coring

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0				ML	Dark brown, sandy silt (organic matter)
2				CL	Dark green, brown mottled, silty clay
4					
6					
8					
10					(grades less silty)
12				CL	Light brown, silty clay
14				SM	Light brown, silty sand
16				CL	Light brown clay
18					
20					(lithic clasts)
22					(grades silty)
24					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 11B

Drilling Lo

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26				CL	Light brown clay (con't) (white lithic clasts, organic matter, and light brown mottling)
28					
30					
32				SM	Silty sand Light brown clay (white lithic clasts, black organic matter, brown mottling, occasional silty sand)
34					
36				CL	
38					
40					(grades siltier)
42					Light brown, fine sand (white and black lithic clasts wet)
44				SP	(medium grain)
46					Light brown, green mottled clay
48					
50					
52				CL	
54					
56					(mottling decreases)
58					(mottling increases, white lithics)

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 11B

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
					Light brown, green mottled clay (con't)
62				CL	
64					
					Light brown, silty sand (moist)
66				SM	(grades coarser, wet)
					(grades finer)
68					Light brown, silty clay
70				CL	
					(fine grained sand lenses)
72					Light brown, green and black mottled clay
74					
76					
78					(fine grained sand lenses)
80				CL	
82					(fine grained sand and silt lenses)
84					
					(silty sand lenses)
86					Light brown, silty clay
				CL	
88					Light brown, silty sand (moist)
				SM	
90					End of boring, installed monitoring well
92					
94					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 12A

Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, CA Project Number 202/899-7029
Date Drilled 12/14/89 Total Depth of Hole 45 ft. Diameter 8 in.
Surface Elevation ____ Water Level Initial 36 ft. 24-hour ____
Screen: Dia. 4 in. Length 20 ft. Slot Size 0.020 in.
Casing: Dia. 4 in. Length 26 ft. Type PVC
Drilling Company Sierra Pacific Drilling Method hollow-stem auger
Driller E. Fruehauf Log by P. Price
Geologist / Engineer E.K. Simonis License No. #4422

Sketch Map

SEE SITE PLAN

Notes:

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					

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GROUNDWATER TECHNOLOGY, INC.

Monitoring Well **12A**

Drilling Log

Depth (feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 12B

Drilling Log

Project Ramco/Frontier Owner Ramco Enterprises, Inc.
Location Davis, Ca. Project Number 202/899-7029
Date Drilled 12/27/89 Total Depth of Hole 90 ft. Diameter 8 in.
Surface Elevation ____ Water Level Initial ____ 24-hour ____
Screen: Dia. 4 in. Length 10 ft. Slot Size .020 in.
Casing: Dia. 4 in. Length 67 ft. Type PVC
Drilling Company All Terrain Drilling Method Mud Rotary
Driller R. Manley Log by D. Tormey
Geologist / Engineer E.K. Simonis License No. P.G. #4422

Sketch Map

SEE SITE PLAN

Notes: continuous soil sampling by coring

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					Dark brown, sandy silt (dry, organic matter)
2				ML	
4					Dark brown, fine sand (organic matter)
					(grades coarser)
6				SW	(grades finer)
					(grades silty)
8					Light brown clay (with silty sand stringers)
10					(more stringers)
12					
14					
16				CL	
18					
20					
22					
24					(white and black lithic clasts)

GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 12B

Drilling Lo

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					Light brown clay (con't)
28					
30				CL	
32					
34					
36					
38				ML	Light brown, sandy silt
40				SM	Light brown, silty sand
42				ML	Light brown, sandy silt
					Brown, medium to fine sand
44				SW	(grades finer)
46				ML	Light brown and green, sandy silt
					Light brown and green clay
48					
50					
52				CL	(lithic clasts)
54					(grades brown)
56					(grades silty)
58					

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GROUNDWATER TECHNOLOGY, INC.

Monitoring Well 12B

Drilling Lo

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
					Light brown clay (con't)
62				CL	
64					Light brown, silty sand (moist)
66				SM	(grades coarser, wet)
68					Light brown and green, silty clay (moist) (no silt)
70					
72				CL	(silty sand lens)
74					
76					
				SM	Light brown, silty sand (wet)
78					Light brown, green mottled, silty clay
80					(grades less silt, with silty sand stringers)
82					
84				CL	
86					
88					
90					End of boring, installed monitoring well
92					
94					

FINAL FOCUSED FEASIBILITY STUDY FRONTIER FERTILIZER SITE DAVIS, CALIFORNIA

Task Order No. 1-282-5.0-100060

Prepared for:
Department of Toxic Substances Control
Region 1
10151 Croydon Way
Sacramento, California 95827

By:
Metcalf & Eddy, Inc.
1772 Tribute Road, Suite 230
Sacramento, California 95815

OCTOBER 1992

M&E

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET 1 OF 2	BORING NO. MW-13A
SITE LOCATION: Frontier Fertilizer Davis, CA	JOB NO.: 6896-3		
	LOCATION: North of Frontier Fertilizer site	GROUND ELEV.	TOTAL DEPTH 50'
DRILL CONTRACTOR: Beylik Drilling	GEOLOGIST: James Taylor	BEGUN: 12-9-91 12:40	
DRILL RIG: Ingersoll Rand TH-10	DRILLER: Mike Mullins	FINISHED: 12-9-91 14:50	
HOLE SIZE: 6"	WEATHER: Clear and cool ~55° F Hi	GROUND WATER (DEPTH/ELEV.): 40'	
DRILLING METHOD: Hollow Stem Auger	DRILLING FLUID/SOURCE: None	TOP OF ROCK (DEPTH/ELEV.):	

DEPTH	SAMPLE TYPE/NO.	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR RQD	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
0					Logged from cuttings	12:40	CL/CH	Brown, firm to very firm, dry to slightly moist, silty clay. Medium plasticity.
5								
10								
15								
20								
25								
30					OVA-0 All samples	13:16	CH	

SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER	NOTES: 12-9-91	BORING NO. MW-13A

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET	BORING NO.
SITE LOCATION:	JOB NO.: 6896-3	2 OF 2	MW-13A
Frontier Fertilizer Davis, CA	LOCATION: North of Frontier Fertilizer site	GROUND ELEV.	TOTAL DEPTH 50'

DEPTH	SAMPLE TYPE/NO.	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR ROP	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
30					Logged from cuttings		CL/CH	Brown, firm to very firm, dry to slightly moist, silty clay. Medium plasticity.
35								
					Groundwater table ▽	14:10		
40								
45	MW-13A-45.5			100	Collect split spoon sample	14:18	SM	Brown, soft, wet, silty sand ~60% fine grain sand.
							ML/CL	
50				90	Collect split spoon sample T.D. @50'	14:35	CL/CH	Gray, brown, firm to very firm, slightly moist to moist, silty clay Medium to high plasticity.
55					OVA-0 All samples			
60								
65								

SAMPLE TYPES	NOTES: 12-9-91	BORING NO.:
SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER		MW-13A

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET 1 OF 3	BORING NO. MW-13B
SITE LOCATION: Frontier Fertilizer Davis, CA	JOB NO.: 6896-3		
	LOCATION: North of Frontier Fertilizer site	GROUND ELEV.	TOTAL DEPTH 88'
DRILL CONTRACTOR: Beylik Drilling	GEOLOGIST: James Taylor	BEGUN: 12-4-91 11:50	
DRILL RIG: Ingersoll Rand TH-10	DRILLER: Mike Mullins	FINISHED: 12-5-91 8:37	
HOLE SIZE: 6"	WEATHER: Clear and cool ~60° F	GROUND WATER (DEPTH/ELEV.):	
DRILLING METHOD: Mud Rotary	DRILLING FLUID/SOURCE: Bentonite Mud	TOP OF ROCK (DEPTH/ELEV.):	

DEPTH	SAMPLE TYPE/NO.	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR RQD	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
0								
5								
10					Surface conductor set @10'	14:16		
15								
20						14:30		
25					Cuttings indicate CH		CH	Buff, moist, very firm silty clay Highly plastic.
30					OVA-0	14:53		

SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER	NOTES: 12-4-91	BORING NO. MW-13B

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET	BORING NO.
SITE LOCATION:	JOB NO.: 6896-3	2 OF 3	MW-13B
Frontier Fertilizer Davis, CA	LOCATION: North of Frontier Fertilizer site	GROUND ELEV	TOTAL DEPTH 88'

DEPTH	SAMPLE TYPE/NO.	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR ROP	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
30								
35								
40						15:05		
45					Run 5' core barrel	15:21	ML/CL	Brown, soft, wet, silty sand ~50% fine grain sand.
	Duplicate MW-13B-46.0 MW-13B-100				Collect 2-6" brass liners		SM	46'
				100			CL	47'
							ML	48.5'
50						15:34	CL	49'
55								
60								
65					OVA-0			

SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER	NOTES: 12-4-91	BORING NO.: MW-13B

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET	BORING NO.
SITE LOCATION:	JOB NO.: 6896-3	3 OF 3	MW-13B
Frontier Fertilizer Davis, CA	LOCATION: North of Frontier Fertilizer site	GROUND ELEV.	TOTAL DEPTH 88'

DEPTH	SAMPLE TYPE/NO.	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR ROP	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
65								
70						16:29		
75								
80					Stop drilling	16:50	CH	Brown to gray, firm, slightly moist silty clay. High plasticity.
					12-5-91 Start drilling	7:50		
				100	Run 5' core barrel		ML/SM	Brown, moist, soft to firm, sandy silt, silty sand. Fine grain sand ~50%. Minor clay, low plasticity.
	MW-13B-83.0							
85						8:10	CH	Very firm.
							CL	Firm.
				100			CH	Very firm.
					T.D. @88'	8:25		
90					OVA-0			
95								
100								

SAMPLE TYPES	NOTES: 12-4-91 and 12-5-91	BORING NO.:
SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER		MW-13B

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET 1 OF 4	BORING NO. MW-13C
SITE LOCATION: Frontier Fertilizer Davis, CA	JOB NO.: 6896-3		
	LOCATION: North of Frontier Fertilizer site	GROUND ELEV.	TOTAL DEPTH 137'
DRILL CONTRACTOR: Beylik Drilling	GEOLOGIST: James Taylor	BEGUN: 11-18-91 14:30	
DRILL RIG: Ingersoll Rand TH-10	DRILLER: Mike Mullins	FINISHED: 11-27-91 15:00	
HOLE SIZE: 6"	WEATHER: Clear and cool ~65° F Hi	GROUND WATER (DEPTH/ELEV.):	
DRILLING METHOD: Mud Rotary	DRILLING FLUID/SOURCE: Bentonite Mud	TOP OF ROCK (DEPTH/ELEV.):	

DEPTH	SAMPLE TYPE/NO.	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR RQD	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
0								
5								
					Surface conductor set @10'			
10					Viscosity 37 sec.	16:30	CL/CH	Gray, slightly moist, firm, dense, medium to high plasticity, silty clay – grading into brown, moist, firm, clayey silt. Low plasticity.
				100			ML/CL	
15					11-19-91	16:40		
					Lost circulation	8:05		
				60	Lost 400 gals. mud, will pull up. Mix more mud.		CH	Light brown, moist to very moist, firm, medium to high plasticity silty clay.
20						9:20		
				100			CH	Gray to light brown, moist to very moist, silty clay, medium to high plasticity.
25						9:30		
				100			CH	Buff, moist, very firm, silty clay, with black streaks, void fillings. Highly plastic.
30					OVA-0 All samples	10:05		

SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE O=OTHER	NOTES: 11-18-91	BORING NO.: MW-13C

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET	BORING NO.
SITE LOCATION:	JOB NO.: 6896-3	2 OF 4	MW-13C
Frontier Fertilizer Davis, CA	LOCATION: North of Frontier Fertilizer site	GROUND ELEV.	TOTAL DEPTH 137'

DEPTH	SAMPLE TYPE/NO.	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR ROP	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
30						10:30	CH	Buff to gray, dry to moist, very firm, silty clay. High plasticity with orange, gray, black, and white motteling, void fillings.
				60				
35						12:10		
					45 sec. viscosity 8.7 lbs/gal		ML	Light brown, moist to very moist, firm, clayey silt, low plasticity, motteled with orange, gray, white, and black void fillings.
				80				
40						12:25		
				100				43'
					Collect 2-6" brass liners			
45	MW-13C-44.0 MW-13C-45.5					12:40	SM	Brown, very moist to wet, loose to firm, fine grain silty sand, minor clay, ~60% fine sand.
					Poor recovery Shoe plugged			
				5%			SM	Wet, brown, loose, fine to medium, silty sand, 60% fine, 20% medium, and 20% silt.
50						12:55		
				100			ML CL CH	Grades into light orange brown to gray, firm, moist, silty clay. High plasticity, motteled with gray and light orange.
55						13:05		
				80			CH	Light orange brown to gray, firm, moist, silty clay. High plasticity, motteled with gray and light orange.
60						14:40		
				100			CH	Light brown, moist, firm, silty clay, with minor white void fillings. High plasticity.
65					OVA-0 All samples			

SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER	NOTES: 11-19-91	BORING NO.: MW-13C

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET	BORING NO.
SITE LOCATION:	JOB NO.: 6896-3	3 OF 4	MW-13C
Frontier Fertilizer Davis, CA	LOCATION: North of Frontier Fertilizer site	GROUND ELEV.	TOTAL DEPTH 137'

DEPTH	SAMPLE TYPE/NO.	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR ROP	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
65					Lost mud again Viscosity–80 sec.	14:55	CH	Light brown, moist, firm, silty clay. High plasticity.
				100				
							ML/SM	Light brown, wet, soft, clayey, silty sand, sandy silt lenticular with fine to medium sand ~ 50% clay. High plasticity.
70						16:18	CH	
				100				
								Minor silty sand lenses with fine sand, minor white void fillings.
75						16:35		
				95				
							ML	Light brown, wet, soft, clayey, sandy silt, 30% fine sand.
80					16:45–stop drilling 11–20–91	9:22	CH	grades into
				80			ML/SM	Brown, moist to wet, soft, sandy silt, silty sand. Minor clay with 50% fine grain sand.
85	MW-13C-84.0 MW-13C-84.5				Collect 2–6" brass liners	9:30	CH	Light brown, slightly moist, firm, silty clay, high plasticity, with black root casts and gray void fillings (minor).
				95				
90						9:40		
				80	OVA–0 All samples		CH	Light brown, slightly moist, firm, silty clay, high plasticity, with black root casts and gray void fillings (minor).
95					Stop drilling @95' install 10" conductor casing	9:50 11:54		
				100	11–27–91 continue coring		CH	Light brown, slightly moist, firm, silty clay, high plasticity, with black root casts and gray void fillings (minor).
100					Viscosity–42 sec.	12:10		

SAMPLE TYPES	NOTES: 11–19–91 and 11–27–91	BORING NO.
SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER		MW-13C

Metcalf & Eddy, Inc.
Engineers

GEOLOGIC LOG

M&E

PROJECT: Frontier Fertilizer FRI		SHEET	BORING NO
SITE LOCATION:	JOB NO.: 6896-3	4 OF 4	MW-13C
Frontier Fertilizer Davis, CA	LOCATION North of Frontier Fertilizer site	GROUND ELEV.	TOTAL DEPTH 137'

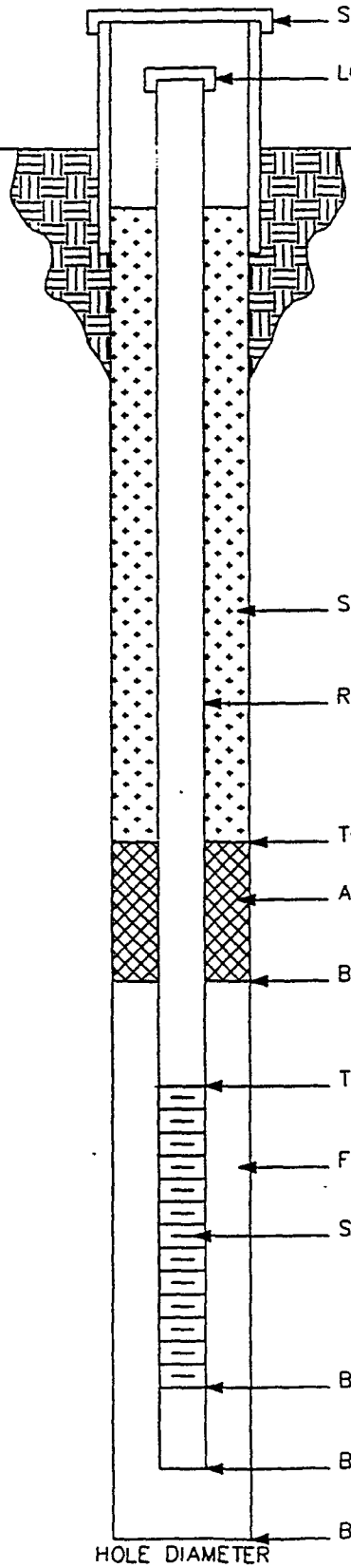
DEPTH	SAMPLE TYPE/NO	CORING INTERVALS	BLOW COUNT (per 6 inches)	% RECOVERY OR ROP	NOTES: PRODUCT ODOR, HNu DEFLECTION, ETC.	TIME LOG	USCS LOG	STRATIGRAPHIC DESCRIPTION
100						12:10	CH/CL	Light brown, slightly moist, firm, silty clay, high plasticity, with black root casts and gray void fillings (minor) getting siltier.
				100				
105						12.17	CL/ML	Light brown, firm to soft, moist to very moist, clayey silt, silty clay, low plasticity.
				100+1'			ML/SM	Grading into silty sand, sandy silt, very moist to wet, with ~50% fine grain sand.
110						12:52		
				60	Poor recovery			113'
							SM	Wet, coarse sand, did not get recovery of loose coarses sand, minor gravel
115	MW-13C-114 0				Collect 1-6" brass liner	13.19		Gravel sample from mud tank indicates rounded, wet, coarse sand, fine to medium gravel, minor coarse gravel material in shoe has a silty sand material, minor cobbles
				10			SP/GP	
120	MW-13C-119 5				Collect 1-6" brass liner	13:53		
				0	Increase viscosity-56 sec. No recovery Shoe clogged with cobble.			
125						14:25		
				0	No recovery Shoe clogged with cobble.			
130						14 50	CH/CL	No recovery due to cobbles plugging shoe Bit stopped chattering. Material in shoe indicates that the base of the aquifer has been encountered Material on shoe is light brown, moist, firm, silty clay, medium to high plasticity
				0	OVA-0 All samples			
135					Core to 137 0'-T.D	15 00		

SAMPLE TYPES	NOTES .11-27-91	BORING NO
SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER		MW-13C

GROUNDWATER WELL INSTALLATION	PROJECT: Frontier Fertilizer FRI JOB NO. 6896-3	WELL NO. MW-13A
DRILLING CONTRACTOR: Beylik Drilling, Inc.	CLIENT: CAL-EPA Dept. of Toxic Substances Control	

BEGUN: 12/9/91	SUPERVISOR: James Taylor	WELL SITE: North of Frontier Fertilizer Site	WATER LEVEL: DEPTH/ELEV.
FINISHED: 12/10/91	DRILLER: Mike Mullins		N\A

DEPTH IN FEET



STEEL RISER W/LOCKING LID

LOCKING WELL CAP

GROUND SURFACE

GENERALIZED GEOLOGIC LOG (NTS)

SANITARY SEAL: . TYPE: Cement-Bentonite Grout

RISER CASING: . DIA.: 4" TYPE: Sch 40 PVC Blank

TOP OF SEAL 31.2

ANNULAR SEAL: . TYPE: 1/4" Bentonite Pellets

BOTTOM OF SEAL 34.5

TOP OF SCREEN 36.5

FILTER MATERIAL: . TYPE: #1/20 Sand Lonestar

SCREEN: . DIA.: 4" TYPE: Sch 40 PVC

SLOT SIZE: .010 TYPE: Cut

BOTTOM OF SCREEN 51.5

BOTTOM OF ENDPLUG 52

BOTTOM OF HOLE 53

METHOD DRILLED:
Hollow Stem Auger
Ingersoll Rand TH10

METHOD DEVELOPED:
Surge & Bail

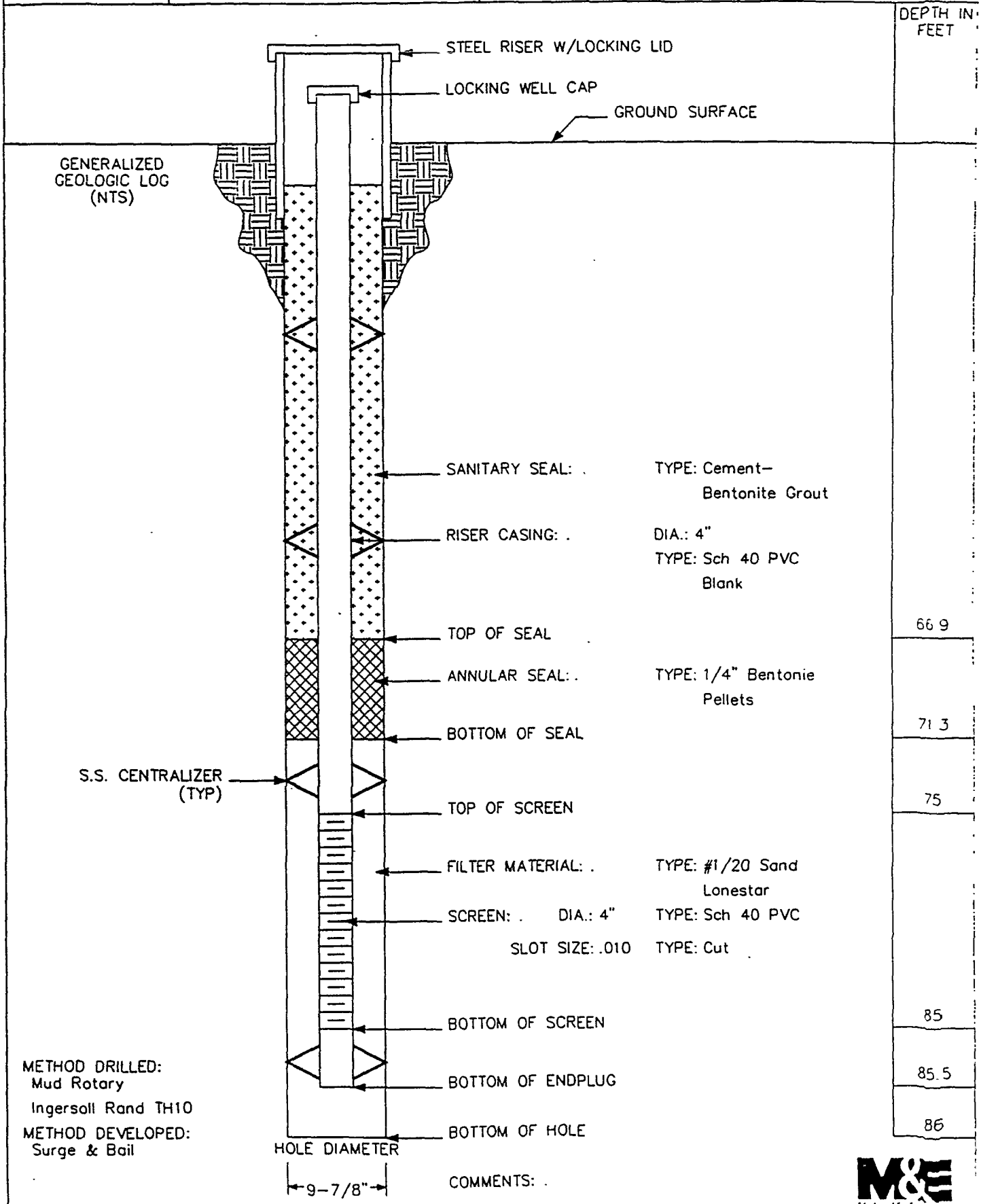
HOLE DIAMETER
10-1/4"

COMMENTS: .

M&E

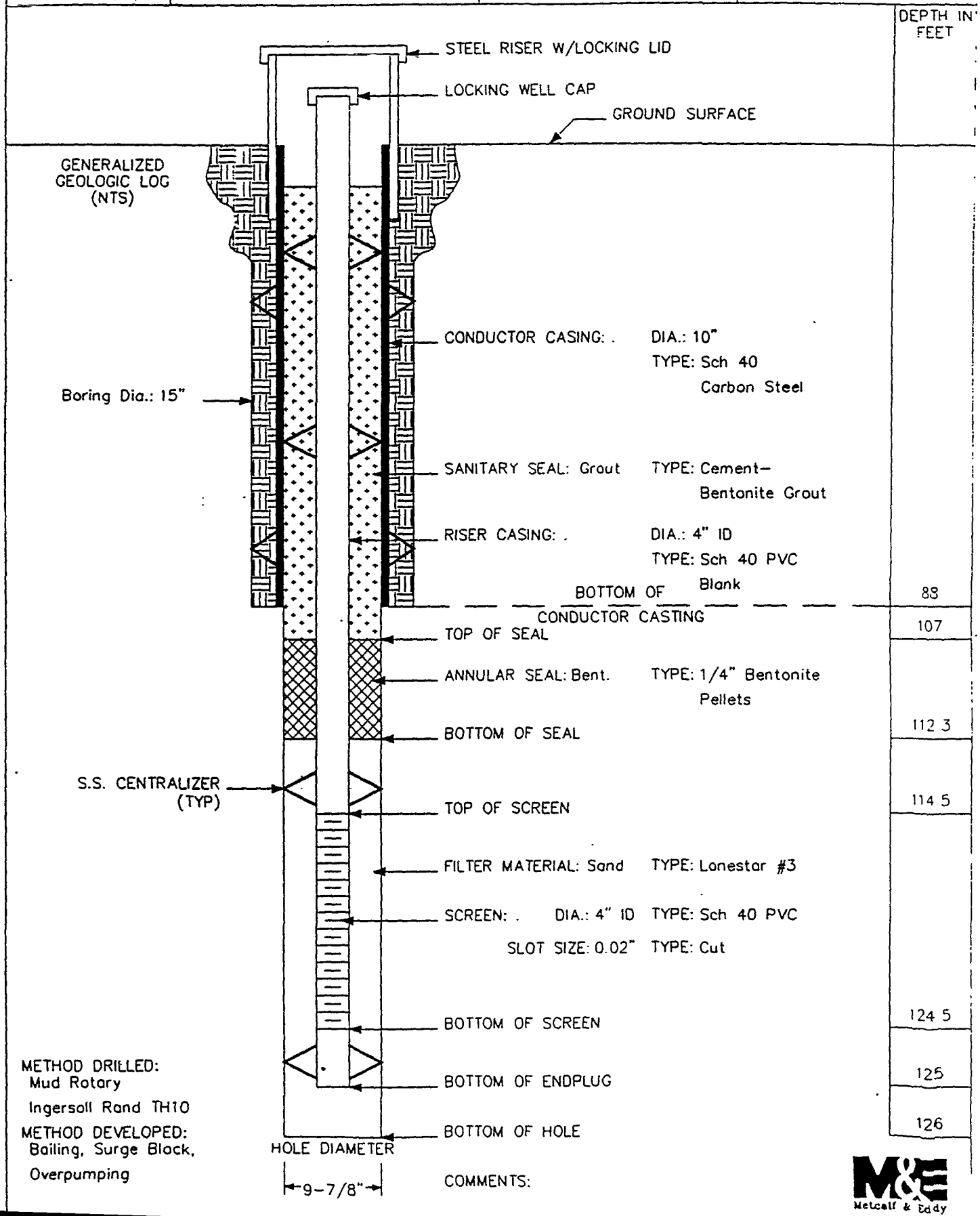
GROUNDWATER WELL INSTALLATION.	PROJECT: Frontier Fertilizer FRI JOB NO. 6896-3	WELL NO. MW-13B
DRILLING CONTRACTOR: Beylik Drilling, Inc.	CLIENT: CAL-EPA Dept. of Toxic Substance Control	

BEGUN: 12/4/91	SUPERVISOR: James Taylor	WELL SITE: North of Frontier Fertilizer Site	WATER LEVEL: DEPTH/ELEV.
FINISHED: 12/6/91	DRILLER: Mike Mullins		N\A



GROUNDWATER WELL INSTALLATION	PROJECT: Frontier Fertilizer FRI JOB NO. 6896-3	WELL NO. MW-13C
DRILLING CONTRACTOR: Beylik Drilling, Inc.	CLIENT: CAL-EPA Dept. of Toxic Substance Control	

BEGUN: 11/18/91	SUPERVISOR: James Taylor	WELL SITE: North of Frontier Fertilizer Site	WATER LEVEL: DEPTH/ELEV.
FINISHED: 12/3/91	DRILLER: Mike Mullins		N\A



ECOLOGY AND ENVIRONMENT, INC.

Boring Logs and Well Construction Diagrams

1995 Field Program

ecology & environment, inc.

BORING NUMBER I-1 YREF-028-00942

028 00164

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/18/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: John Whitaker
diameter: (borehole 10" (8" pilot)) 4" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1308	Portland cement seal Type I and II, 0' to 19' BGS
	5			Medium brown, slightly silty clay, plastic, slightly moist.	CL		
						1314	4-inch diameter, 25-ft. schedule 80 PVC riser
	10			Same as above.	CL		
	15					1317	
	20			Medium yellow-brown silty clay.	CL	1320	10 gallons of bentonite pellet seal, starts at 19 feet bgs
	25					1358	Filter pack is #2/12 sand, 35 bags
	30			Medium yellow-brown silty clay, moist.	CL	1359	65-ft. Schedule 80 PVC screen, .020-inch slotted, 4-inch diameter, from 25' to 90' BGS
	35			Light yellow-brown silty clay, wet.	CL	1403	
	40						

FILE COPY

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/18/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: John Whitaker
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45			Medium yellow-brown, silty clay, moist.	CL	1406	
	50					1409	
	55					1412	
	60					1414	
	65						
	70					1422	
	75					1429	
	80					1432	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/18/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: John Whitaker
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
	85					1438	
	90					1440	
							3 ft schedule 80 PVC sump 4" diameter
TD = 93'						1443	
	95						
	100						
	105						
	110						
	115						
	120						

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BORING NUMBER I-2

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/19/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot)) 4" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1552	
				Dark brown gravelly sands with some silts.			
	5						Grout: 0' to 19' BGS
				Dark brown silty clay, plastic.			
	10					1600	
				Same as above, except less silt			25 ft. of schedule 80 PVC riser pipe, 4-in. diameter
	15						
	20			Dark brown clays with minor silts, moist, plastic.		1604	2 x 50 lb. bags of bentonite pellets
	25			Brown clays with minor silts, moist, plastic.		1606	Filter pack is #2/12 sand, 33 bags / 100 lbs.
							65 ft. PVC screen, 4-in diameter 020 in. slotted from 25' to 90' BGS
				Same as above.			
	30			Yellowish brown clays with minor silts, moist, plastic.			
						1610	
	35						
				Wet, yellow / brown silty clays		1612	
	40						

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/18/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
				Same as above except color is more yellow		1614	
	45						
						1616	
	50						
						1620	
	55						
						1624	
	60						
						1627	
	65						
						1630	
	70						
						1633	
	75						
						1635	
	80						

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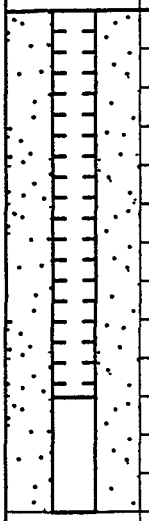
BORING NUMBER I-2

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/18/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
						1638	
	85						
						1642	
	90						3 ft. schedule 80 PVC sump 4" diameter
TD = 93'						1645	
	95						
	100						
	105						
	110						
	115						
	120						

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/21/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot)) 4" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1600	
				Dark brown silty clay with gravel			
				Dark brown silty slightly plastic		1602	
	5						
				Brown silty clay, plastic.			
						1604	Grout. 0' to 18.5' BGS
	10						
				Brown clays with minor silts, plastic			
						1607	
	15						
				Same as above			
	20					1609	2 x 50 lb bags of bentonite pellets
				Same as above, except more moisture content.			
						1611	
	25						65 ft. PVC screen 4-in diameter 020 in slotted from 25 to 90 BGS
				Same as above			
						1613	Sand filter pack, #2/12 sand 30 bags
	30						
				Very few cuttings, will discontinue logging		1616	
	35						
						1618	
	40						

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/??/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
						1620	
	45						
						1623	
	50						
						1626	
	55						
						1629	
	60						
						1632	
	65						
						1635	
	70						
						1640	
	75						
	80					1642	

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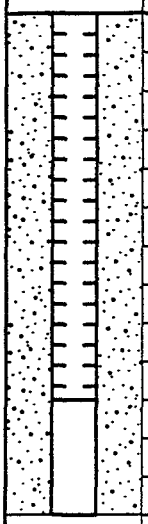
BORING NUMBER I-3

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/??/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
						1646	
	85						
						1648	
	90						3 ft. schedule 80 PVC sump, 4" diameter
						1652	
TD = 93'							
	95						
	100						
	105						
	110						
	115						
	120						

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BORING NUMBER I-4

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft)
completion date. 5/22/95
location. northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter (borehole 10" (8" pilot)) 4" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						0755 spud	
	5					0758	
	10					0801	Grout. 0' to 18' BGS
	15					0803	
	20					0805	Bentonite seal 2 bags of 3/8 n chips from 18' to 22 5' BGS
	25					0807	
	30					0810	
	35					0812	
	40					0814	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/22/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45					0816	
	50					0817	
	55					0819	
							Screen: 4-in. schedule 80 PVC, .020-in. slot, for 65 feet from 25' to 90'
	60					0820	
							Filter pack is #2/12 sand, 32 bags to 22.5'
	65					0822	
	70					0824	
	75					0826	
	80					0828	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/22/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
	85					0830	
	90					0832	
						0835	
TD = 93.5'							
	95						
	100						
	105						
	110						
	115						
	120						

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BORING NUMBER I-5

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/23/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot)) 4" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						0741	
				Dark brown silty clay with gravel to 1 5-in diameter	CL		
	5						
				Dark brown clay with minor silt, plastic, thin layer contained by sand	CL	0744	
	10						
				Brown clay with minor silts, plastic	CL		
						0746	
	15						
				Same as above, slightly lighter in color	CL	0748	
	20						100 pounds of bentonite pellets 3/8 in diameter, from 18 5' to 23'
				Yellowish brown clay, plastic	CL		
						0750	Sand pack starts at 23' BGS 30 bags of #2/12 sand
	25						65 feet of 4-in diameter 020 slotted PVC screen
				Same as above, except more moist.		0752	
	30						
						0754	
	35						
						0801	
	40						

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/23/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
						0803	
	45						
						0805	
	50						
						0807	
	55						
						0808	
	60						
						0809	
	65						
						0810	
	70						
						0812	
	75						
						0814	
	80						

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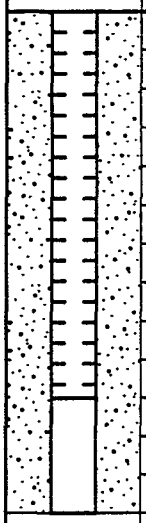
Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/23/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
						0816	
	85						
						0818	
	90						3 ft. schedule 80 PVC sump. 4" diameter
						0821	
TD = 93'							
	95						
	100						
	105						
	110						
	115						
	120						

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BORING NUMBER 1-6

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft)
completion date. 5/24/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot)) 4" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						0755	
				Dark brown silty clay with gravel to 1 5-in diameter	CL		Portland cement grout cap, 0' to 19' BGS
						0758	
	5						
				Brown silty clay with small amount of large-grained sands plastic	CL		
						0800	
	10						
				Brown clay with minor silt, plastic	CL		
						0802	
	15						
				Same as above except lighter in color	CL		
						0804	
	20						100 pounds of bentonite pellets between 19' and 23' BGS
				Same as above, except more moisture content.	CL	0805	
							Sand filter pack between 23' and 93 BGS, #2/12 sand 31 bags
	25			Slightly moist, yellowish brown clay with minor silts, very plastic.	CL		
						0808	
	30						
				Same as above			
						0810	
	35						
						0812	
	40						

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Lithologic Log: Frontier Fertilizer

elevation. (ground level _____ ft)
completion date: 5/24/95
location: northing _____, easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
						0813	
	45						
						0816	
	50						
						0817	
	55						
						0820	
	60						
						0822	
	65						
						0824	
	70						
						0825	
	75						
						0828	
	80						

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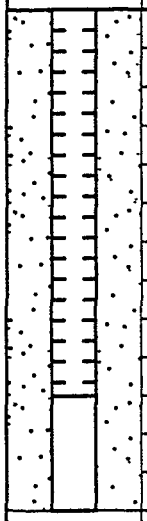
BORING NUMBER I-6

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft)
completion date: 5/24/95
location: northing _____, easting _____

drilling contractor, method WDC, auger
logger: Paul Martin
diameter: (borehole 10" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
						0830	
	85						
						0832	
	90						3 ft schedule 80 PVC sump 4" diameter
TD = 93'						0834	
	95						
	100						
	105						
	110						
	115						
	120						

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/22/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1245	spud on 4/21/95
				Dark brown (5YR 3/4), loamy silt, root hairs, damp	OL		
	5					1246	
				Dark red brown to medium brown (5YR 4/4), clayey silt, very moist, soft, plastic	ML		
							Grout 9 bags of Portland (at 0930 on 4/22/95)
	10					1247	
				Same as above, but also dusky brown (10YR 2/2)	ML		
	15					1249	
				Same as above	ML		
	20					1252	
	25		6/13/19 23.5'–25'	Mottled dark yellow orange to dark yellow brown (10YR 6/6 to 4/2), clayey sandy silt, crumbly to silty, very fine-grained sand, damp, stiff, plastic	ML	1254	Bentonite seal one 5-gallon pail of 1/4-inch bentonite pellets
	30		6/10/13 28.5'–30'	Mottled yellow brown to medium brown (10YR 5/4 to 5YR 4/4), very fine-grained, silty, sand, local dark brown splotches, moist, slightly plastic	ML	1306	Filter pack is #2/12 sand 13 to 17 bags from 28.9' BGS to bottom of hole (TD)
	35		7/12/13 33.5'–35'	Same as above in color, grades finer in grain size to clayey silt, stiff, slightly plastic, damp, trace of very fine-grained sand	ML	1312	
	40		4/5/7 38.5'–40	Light to medium brown (5YR 5/6 – 4/4 – 3/4), clayey silt to silty clay, soft very plastic, moist, trace of very fine-grained sand	ML	1325	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/22/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HCA, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45		7/10/10 43.5'–45'	Silty sand to sand, very fine- to medium-grained, medium brown (5YR 3/4), moist to wet very slightly plastic, trace of mica flakes (very fine-grained)	SM	1336	
	50		18/17/22 48.5'–50'	Sandy, clayey silt, medium yellow brown to medium brown (10YR 5/4 to 5YR 4/4) wet, soft, plastic	ML	1350	
TD = 53.5'						1407	
	55						
	60						
	65						
	70						
	75						
	80						

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BORING NUMBER X-1B

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/25/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1215 spud on 4/22/95	
				Sand, dusky brown (5YR 2/2), medium- to coarse-grained, 5% black rounded granules, no organics, damp, loose, soft.	SP		
	5					1217	
	10					1220	
				Clayey silt to silty clay, medium gray brown (5YR 3/4 – 3/2),moist, damp, plastic, soft.	CL		
	15					1223	
				Clayey, sandy silt, medium brown (5YR 3/4), stiffer than previous interval, damp, plastic.	ML		
	20					1225	
	25					1231	
	30					1240	
	35			Clayey silt, pale yellow brown (10YR 6/2), wet, very soft and sticky.	CL	1243	
	40					1253	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/25/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HSA, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45					1255	
	50					1307	
	55					1312	Bentonite seal, 20 gallons of slurry (at 0830 on 4/25/95)
	60					1330	Transition sand: ~1 bag of #60 sand from 60.5' to 63' BGS
	65		5/8/12 63.5'–65'	Sandy silt to silty sand, medium yellow brown to medium brown (10YR 5/4 – 5YR 3/4), trace of gravel, also clayey, damp, stiff, slightly plastic.	SM	1400	Sample taken without sleeves
							Filter pack: ~17 bags of #2/12 sand from 63' to TD
	70		3/6/11 68.5'–70'	Silty sand to sand, dark yellow brown (10YR 4/2), very fine- to medium-grained, moist, stiff, weakly plastic, locally crumbly.	SM	1415	
	75					1430	
	80		5/9/10 78.5'–80'	Silty sand to clayey sand, dark yellow brown to medium brown (10YR 4/2 to 5YR 3/4), very fine- to fine-grained, moist, stiff, plastic.	ML	1440 (break)	Sample taken without sleeves

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BORING NUMBER X-1B

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/25/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HSA, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
	85					1510	
							Slough from 89' to TD at 90 BGS
			6/10/15 88 5'–90'	Clayey silt, dark yellow brown (10YR 4/2), moist, stiff, plastic	CL		Sample taken without sleeves
TD = 90'	90					1515	
							Hole sloughed 1 foot overnight
	95						
	100						
	105						
	110						
	115						
	120						

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BORING NUMBER X-1C

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/3/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HSA, auger
logger: Tim Colen
diameter: (borehole 12") 8" pilot

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1545	spud on 4/29/95
							No samples 'til 105' BGS
	5					1550	
							5-inch schedule 80 PVC riser and sump (3-ft.); 20' stainless 0.20-in wire wrap screen
	10					1555	
	15					1600	
	20					1603	
							Grout: 36 bags of Portland from approx. 100' BGS
	25					1606	
	30					1622	
	35					1658	
	40					1705	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/3/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HSA, auger
logger: Tim Colen
diameter: (borehole 8") 5" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45					1708	
	50					1713	
	55					1716	
	60					1722	End of shift 4/29/95
	65					0956	Start shift 5/1/95
	70					0957	
	75					0959	
	80					1002	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/3/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot)) 5" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
	85					1010	
	90					1015	
	95					1025	
							Bentonite seal, 20 gallons of slurry, calculated volume = 5 feet
	100					1100	
			9/20/32 103.5'–105'	**TO 104'** : Sand, trace of silt, fine- to medium-grained, dark yellow brown (10YR 4/2). Some grains are dark gray / dark green gray. Wet, soft, weak plasticity.	SM		Sample without sleeves at 1315
	105			**TO 105'** : Clayey silt to sandy silt, dark yellow brown (10YR 4/2). Almost hard, stiff, damp, plastic.	ML / CL	1106	Transition sand: 2 bags of #60 sand from 105.5' to 108' BGS
			11/24/28 108.5'–110'	**108.5' TO 110'** : Silty sand to sand, very fine- to medium-grained. Mottled light blue gray to dark yellow brown (5B 7/1 to 10YR 4/2); wet, varies from weak to very plastic.	SM	1307	Nose at 110' BGS has blue-gray sandy gravel, trace of silty. Gravel to 1/8" subrounded; medium- to coarse-grained sand fragments are dark blue gray
	110						
			27/50=3" 112.5'–113.5'	Sand to gravelly sand. Sand is medium- to very coarse-grained, subangular to subrounded, granitic, a few fines, dark yellow brown overall with salt & pepper color. Gravel fragments are 1/4" to 1-1/4" diameter and subrounded to rounded, blue gray to dark gray. Gravelly sand has more fines up to silty, saturated.	GM		
	115					1500	
	120						

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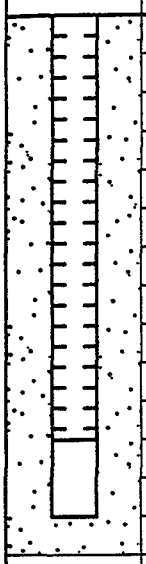
Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft)
completion date: 5/3/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HSA, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot)) 5" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	120						Filter pack. 18 bags of #2/12 sand from 108' to134' BGS
	125					1514	
	130					1517	5/1/95 Trip out 8"s TD will be ~134' BGS, but the gravel/sand is heaving will ream to TD with 12"s Reamed to 134' BGS with 12-inch augers (at 1145 on 5/2/95)
TD = 134'	135						
	140						
	145						
	150						
	155						
	160						

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BORING NUMBER X-2A

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/26/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1247	spud on 4/25/95
							Grout: 10 bags of Portland
	5			Sandy silt. Sand is very fine- to fine-grained, gray-brown (5YR 3/2), organic with root hairs, soft, plastic, moist.	ML	1350	
	10					1355	
				Same as above, but drier, more crumbly, less plastic.	ML		
	15					1358	
	20					1400	
				Silty sand to sand, very fine- to medium-grained, medium yellow brown to medium brown (10YR 5/4 to 5YR4/4), almost dry, very loose.	SM		
	25					1403	Seal: one 5-gallon pail of 1/4-inch bentonite pellets from 24' to 28' BGS (at 1100 on 4/26/95)
				Sandy silt, medium brown (5YR 4/4), stiff, damp, very little plasticity.	SM		
			8/12/14 28.5'–30'	Silty sand to sand, very fine- to medium-grained, locally clayey. Mottled, medium dark yellow brown (10YR 5/4–4/2), clayey portion is wet and plastic, sand is not.	SM		
	30					1410	Note: The soil in this hole is noticeably drier than in previous borings Sample without sleeves
	35					1415	
							Filter pack is #2/12 sand, 17 bags from 28' BGS to bottom of hole (TD)
			5/7/12 38.5'–40	Clayey sand, silty sand, sand, very fine- to medium-grained, medium yellow brown (10YR 5/4), wet, ranges from stiff to plastic.	SM		
	40					1430	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/26/95
location northing _____ , easting _____

drilling contractor, method: WDC, auger
logger Tim Colen
diameter (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45				SM – SC	1457	Note Sand in slough barrel at 48 5' BGS
	50		6/8/15 48 5'–50'	Clayey and silty sand, sand grades to clayey silt, silty clay, dark yellow brown (10YR 4/2) Sand is generally very fine- to fine-grained, thin lens of medium-grained sandy soil, less plastic than the clayey soil	CL	1507	
TD = 53.5'	55						
	60						
	65						
	70						
	75						
	80						

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BORING NUMBER X-2B

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/28/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1415 spud on 4/26/95	
				Silt, grayish brown (5YR 3/2), organic, stiff, damp, weak plasticity.	OL		
	5					1418	
				Sandy silt, clayey silt, grayish brown (5YR 3/2), moister than above sample, more plastic.	MH / CL		
	10					1423	
				Silty sand to sand, very fine- to fine-grained, medium brown (5YR 3/4), dry, loose, soft.	SM		
	15					1425	
				Sandy silt, medium brown (5YR 3/4), stiffer, less plastic, damp.	ML		
							Grout: 17 bags of Portland cement
	20					1428	
				Silty sand to clayey sand, dark yellow brown (10YR 4/2), very fine- to fine-grained, trace of granules, stiff.	ML		
	25					1431	
	30					1434	
	35					1439	
	40					1443	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/28/95
location: northing _____ . easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45					1447	
	50					1451	
	55		9/18/22 53.5'–55'	Silty clay grades to sandy clay. Silt–sand–gravel mixture at 55', dark yellow brown (10YR 4/2), stiff, very plastic, grades to softer, less plastic.	CL / ML SM	1505	
	60		6/8/19 58.5'–60'	Clayey silt to silty clay, locally sandy, very fine- to fine-grained, dark yellow brown (10YR 4/2), soft, very plastic, wet.	CL	1525	
							Bentonite slurry seal: 20 gallons to approx. 62' (calculated volume)
	65		6/14/19 63.5'–65'	Silty clay to clayey silt, locally sandy silt; 3-inch lens of either gravel fragments or paleo-caliche (?), medium yellow brown (10YR 5/4), stiff, moderate to very plastic, damp.	CL	1535	
							Transition sand: 1 bag of #60 sand to 66.5' BGS
	70		6/8/15 68.5'–70'	Sandy, clayey silt grades down to silty sand, lenses of sand predominantly very fine- to fine-grained, lenses are dark olive green-brown, medium-grained, dark yellow brown to medium brown (10YR 4/2 to 5YR 3/4). Moist, weak plasticity in sand, silt is more plastic.	ML SM	1555	
							Filter pack: 16 bags of #2/12 sand to 69' BGS
	75		5/10/15 73.5'–75'	Clayey silt to sandy silt, dark yellow brown to medium brown (10YR 4/2 – 5YR 3/4), moist, very plastic.	ML	1610	
	80						

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BORING NUMBER X-2B

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/28/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
	85				SM		
	90		4/14 90'–91'	Sand, fine- to medium-grained <10% silt or clay, moderately well sorted olive gray to gray brown (5Y 3/2 to 5YR 3/2), wet, soft, not plastic	SM CL	1640	Split spoon sank into sand driven sample 1 ft. Appears that contact with clay is at 91'
TD = 94'	95						
	100						
	105						
	110						
	115						
	120						

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BORING NUMBER X-3A

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/6/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HSA, auger
logger: John Whitaker
diameter (borehole 12" (8" pilot)) 5" well

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1030	spud on 5/5/95
	5						Grout. 8 bags of Portland
	10					1040	
							Well casing 6-in schedule 80 PVC. 0'–30' riser
	15						
	20					1043	
							Bentonite seal one 5-gallon pail of 1/4" pellets
	25					1046	
							Transition sand one bag of #60 sand 27'–28'
	30		7/12/14	Medium yellow-brown to dark yellow-brown silty clay and sandy clay at bottom with coarse-grained sand lens in middle (approx. 2" thick), sand is quartz, feldspar, and black grains, dry; clay is stiff, plastic, damp	CL SM CL	1050	Filter pack. #2/12 sand from 28' to 53'
	35		7/9/11	Medium yellow-brown, very stiff, silty clay, moderately plastic, slightly damp	CL	1100	
	40		8/10/14			1120	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/6/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HSA, auger
logger: John Whitaker
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40		8/10/14	Mottled, medium yellow-brown, silty, sandy clay; low to moderately plastic grayish patches, soft, damp.	CL	1120	Screen from 30' to 50', stainless, 0.20" wire wrap
	45		9/14/19	Dark, yellow-brown, silty sand, medium- to fine-grained, granitic, loose, wet.	SM	1143	3-ft. sump, schedule 80 PVC
	50		8/10/15	Mottled, medium yellow-brown, silty clay, low to moderately plastic, stiff, damp.	CL	1200	
TD = 53'	55						
	60						
	65						
	70						
	75						
	80						

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BORING NUMBER X-3B

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/11/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1325 spud on 5/9/95	
				Brown silt, moist, organic (root hairs)			
	5					1328	
				Samples not taken, soil not logged.			
	10					1330	
	15					1333	
	20					1336	
	25					1339	
	30					1342	
	35					1345	
	40					1348	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/11/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45					1352	
	50					1355	
							Bentonite seal: 20 gallons slurry 1750 End of shift 5/10
	55					1358	
	60					1402	Transition sand: 2 bags of #60 sand from 60' to 62' BGS
	65		4/11/18 63.5'–65'	Sandy silt to silt, medium yellow brown (10YR 5/4), sand <10% very fine- to fine-grained, moist, very plastic, locally clayey, soft..	ML	1405	Filter pack: 17 bags of #2/12 sand to 63' BGS
	70		6/7/10 68.5'–70'	Silty sand, sand in thin 1/2-in. lens, very fine- to medium-grained, medium to dark yellow brown (10YR 5/4–4/2), mottled with grayish patches, moist, moderately to very plastic.	SM	1429	Note: Little sand was seen in the samples from the split spoon, yet it was much more abundant on the flights of the 8-inch augers when they were pulled
	75					1445	
	80					1455	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/11/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Paul Martin
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						Screen 25 feet of 6-inch stainless 0 02-in wire wrap
	85		7/12/22 83 5'–85'	Sandy silt to clayey silt, mottled with gray patches, medium to dark yellow brown (10YR 5/4–4/2), moist, very plastic Sand is very fine-grained, <10% stiff	ML	1507	
	90		9/12/22 88.5'–90'	Clayey silt to silty clay medium yellow brown (10YR 5/4), stiff, moist, very plastic, trace of very fine-grained sand	CL	1535	6-inch sump, 3 ft. schedule 80 PVC
TD = 93'							
	95						
	100						
	105						
	110						
	115						
	120						

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BORING NUMBER X-4A

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/29/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1415	spud on 4/28/95
				RAIN			
	5					1417	
	10					1420	
				0 TO 25' Alternating sandy silts, clayey silts and silty clays	CL		
	15					1425	
				15 TO 20' Distinctive reddish silty sand (fine-grained), loose, dry	ML		
	20					1430	
	25					1435	Bentonite seal two 5-gallon pails of 1/4-inch bentonite pellets
							Filter pack from 26' BGS to bottom of hole (TD)
	30		6/11/12 28.5'–30'	Silty sand to sand, very fine- to medium-grained, usually fine-grained, medium to dark yellow brown (10YR 5/4 – 4/2), moist, weak, plastic soft. Sand occurs as 1" to 3" lenses	SM / ML	1440	
	35					1443	
	40		Soft – no blows 38.5'–40'	Generally same as above	SM / ML	1450	Sampler fell under own weight

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/29/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45						
	50		5/11/16 48.5'–50'	Sandy silt to clayey silt, dark yellow brown to medium brown (10YR 4/2 to 5YR 3/4), locally sandier 1-inch lenses, fine-grained, moist, stiff, plastic.	CL	1520	
TD = 53'	55		11/17/18 53.5'–55'	Sandy to clayey silt, medium brown (5YR 3/4), very stiff, almost hard, moist, weak plasticity	ML	1541	
	60						
	65						
	70						
	75						
	80						

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/5/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1432 spud on 5/3/95	
				Clayey silt to silt, dark yellow brown (10YR 4/2), organic, damp, very plastic, soft.	CL		
	5					1433	
							Well casing: 6-inch schedule 80 PVC, 0' to 68' BGS riser
	10					1435	
	15			Silt, dark yellow brown to gray-brown (10YR 4/2 to 5YR 3/2), stiffer, less plastic, damp.	ML	1437	
	20					1439	
				Sand, medium yellow brown to medium brown (10YR 5/4 to 5YR 4/4), fine- to medium-grained, drier, soft, loose, not plastic.	SM		
	25					1442	
				Sandy silt, medium brown (5YR 4/4), stiff, damp, weak plasticity, sand is very fine-grained, ~5%.	ML		
	30			Sandy clay, medium yellow brown (10YR 5/4), softer, moist, plastic, sand is fine- to medium-grained, <10%.	CL	1445	
	35					1450	
	40					1453	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/5/95
location: northing _____ , easting _____

drilling contractor, method: WDC/HSA, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40						
	45					1455	
	50					1456	
	55					1458	
	60					1459	Bentonite seal, 20 gallons of slurry
	65					1502	Transition sand: 2 bags of #60 sand from 63.5' to 66' BGS Filter pack: 14 bags of #2/12 sand from 66' to 91' BGS
	70		7/9/13 68.5'–70'	**68.5' TO 69.5'** : Silty sand to sand, very fine- to fine-grained, mottled light gray and dark yellow brown (10YR 4/2), moist, soft, weakly plastic, almost loose. ***See log for additional description***	SM CL	1530	Screen from 68' to 88' BGS, stainless, .020-in. wire wrap
	75		7/8/10 73.5'–75'	Silty sand – same as above.	SM	1602	
	80						

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/5/95
location: northing _____, easting _____

drilling contractor, method: WDC/HSA, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						
	85					1623	
	90		6/11/14 88 5'–90'	Sandy silt to silt, medium yellow brown (10YR 5/4), soft, moist, plastic, sand is very fine-grained	SM	1642	Sump 3-ft. of 6-in schedule 80 PVC
	95		6/8/9 93.5'–95'	Same as above with a trace of gravel, 1/4" to 1" diameter, subangular to subrounded	SP	1735	End of shift on 5/3/95 Pilot hole to 95' BGS with 8" augers Reamed to 91' BGS with 12" augers (at 1030 on 5/4/95)
	100						
	105						
	110						
	115						
	120						

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BORING NUMBER AW-2B

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/20/95
location: northing _____, easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
				Dark red-brown silt with <10% gravel, grades to gray-brown.		0940 spud on 4/18/95	
							Work conducted in Level B
	5						
				Gray brown silty clay, slightly moist, very plastic, soft, no apparent sand.	CL		
	10					0945	
				Dark gray brown silty clay, as above.	CL		
	15					0947	
				Grades to lighter brown silty clay to clayey silt; very plastic, soft, moisture increases.	CL ML		
	20					0950	
	25			Dark yellow brown.			
	30					1017	
				Medium dark brown silty clay to clayey silt. Hammer is dripping wet. Very plastic, becoming stiffer	CL		
	35					1020	
							Hammer stuck. Resume drilling at 1047
	40					1050	

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/20/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40			Mottled dark to medium brown clayey silt / silty clay with local patches of very dark brown silt, very plastic, soft to medium stiffness, moist.	ML / CL		
	45					1057	
	50					1059	Grout is 20 bags of Portland
	55					1104	
	60		11/14/21 58.5'–60'	Medium red brown clayey silt, trace of fine-grained sand, moist, stiff, very plastic	ML	1110	Lunch break
	65		12/15/25 63.5'–65'	Mottled orange-brown to light to medium brown clayey silt with medium gray blotches of clayey silt. At 65' contact with olive-greenish brown, very fine- to medium-grained, well sorted sand (5Y 5/6)		1320	Bentonite seal 20 gallons of slurry
	70		6/6/9 68.5'–70'	Mottled dark yellow orange (10YR 6/6) and medium brown (5YR 4/4) clayey sandy silt, moist, stiff, plastic. Interbedded with lenses dark olive gray, very fine- to fine-grained sand, locally medium-grained, well sorted	SC / ML	1345	Transition sand 1 bag of #60 sand to approx. 69' BGS Filter pack. ~13 bags of #2/12 sand from ~71' to TD
	75					1400	
	80					1410	

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BORING NUMBER AW-2B

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 4/20/95
location northing _____, easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80					1410	
	85					1415	
	90		7/12/19 88 5'–90'	Olive to dark yellow brown (10 YR 4/2) green silty sand with mica flakes sand is fine- to medium-grained, wet, very slight plasticity	SC	1440	
							Break
	95		5/14/19 93 5'–95'	Medium red brown (10R 4/6) to medium brown (5YR 4/4) clayey silt to sandy clayey silt, stiff, moderately plastic, damp *Note Contact at 94' BGS with sand described at 90' BGS.*	CL	1540	Out of air end of shift (EOS) at 1635 Pulled approx. 50 feet of 8-inch auger out of hole (4/19/95)
TD = 97.5'							
	100						
	105						
	110						
	115						
	120						

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Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/9/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
						1240 spud on 5/6/95	
				Silt, organic, medium brown (5YR 3/4), soft, moist, very plastic.	ML		
	5					1242	
							65 feet of 6-inch schedule 80 PVC blank casing
	10					1244	
	15					1246	
				Silty sand to sand, very fine- to fine-grained, soft, loose, very weak plasticity, damp, medium brown (5YR 3/4)	SM		
	20					1248	
				Characteristic, reddish brown, silty sand to sand, drier, soft, loose, not plastic.	SM		
	25					1251	
	30					1253	
	35					1257	
				Clayey silt to silt, medium brown (5YR 4/4), soft, moist, moderately plastic.	ML		
	40					1300	

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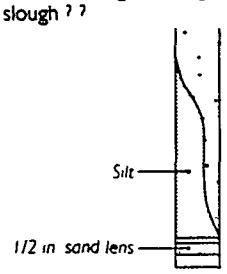
Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft.)
completion date: 5/9/95
location: northing _____ , easting _____

drilling contractor, method: WDC, auger
logger: Tim Colen
diameter: (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure . . .)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	40			Sand			43' sand lens Augers dropped approximately 1 ft.
	45					1303	
	50					1308	
	55					1310	Augers and center rod hung up
							Bentonite seal, 20 gallons of slurry from about 55' to 60' BGS
	60					1330	
							Transition sand 2 bags of #60 sand from 60' to 62' BGS
							Filter pack. 17 bags of #2/12 sand to 62' BGS
	65		4/13/28 63.5'–65'	Sand, very fine- to medium-grained, trace of subangular gravel (1/8" to 1/4" diameter), locally silty, granitic, wet, loose, not plastic, generally dark yellow brown (10YR 4/2)	SM SP	1355	Samples without sleeves
	70		8/15/16 68.5'–70'	Sand to silty sand, very fine- to medium-grained, granitic, interbedded with sand to clayey silt. Medium to dark yellow brown (10YR 5/4 to 4/2), wet. Sand is soft and loose silt is stiffer, very plastic.	SM	1413	Note Split spoon has an angled wedge of sand slough ? ?
	75						
	80						



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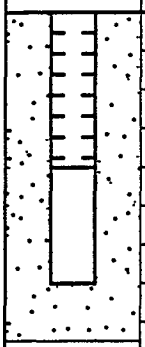
BORING NUMBER MW-9B

Lithologic Log: Frontier Fertilizer

elevation: (ground level _____ ft)
completion date: 5/9/95
location: northing _____, easting _____

drilling contractor, method: WDC/HSA, auger
logger: Tim Colen
diameter (borehole 12" (8" pilot))

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content, structure...)	USCS	Pilot Boring Time	SAMPLE NUMBERS and COMMENTS
	80						Screen 20', 6-in stainless 0.02-in wire wrap, 64' to 84' BGS
	85		14/17/23 83.5'–85'	Interbedded silts, sandy silts and sand. Sample barrel appears quite similar to sample at 70'. Sand is very fine- to medium-grained granitic wet, loose. Silt is stiff plastic dark yellow brown (10YR 4/2), moist.	SM SP	1445	Sump 3-ft. of 6-in schedule 80 PVC
TD = 88.5'							Reamed to 89' BGS (5/8/95)
	90						
	95						
	100						
	105						
	110						
	115						
	120						

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BECHTEL NATIONAL, INC.

Boring Logs and Well Construction Diagrams

1995 Field Program

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	1 of 2	B-1

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER	200 ft West of MW-1	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
6-27-95	6-29-95	Water Development	CME 85	8"	118.5	—	118.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—		22.90 ft 6-27-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R. P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			Sample #								0-2' Sandy Clay (CL), light brown, some silt, organic, plastic, dry	Drilling with 8" diameter hollow stem flight auger
								5				
											2-35' Silty Clay (CL), brown to gray brown, mod. plastic, moist.	All soil descriptions from cuttings
								10				
											14-18' Some sand	
								15	CL		15-23' Greenish brown.	
											24-26' Some sand	
								20			23-33' olive brown	Groundwater level at 22.90'; measured after Hydropunch II (HP) sample in S1 water zone.
								25				
								30				Soil wet at 33'
								35			35-42' Clayey Silt (ML), olive brown, plastic, wet.	
HP	4.0'	6 vials	B1-A1					40	ML		42-46' Sandy Silt (ML), olive brown, fine-grained sand, plastic, wet	Hydropunch II Screen interval 42-44'. 6 40 ml vials
								45				
											46-66' Silty Clay (CL), olive brown, mod. plastic, wet	
								50				Groundwater level 51.3' in S2 water zone. measured after Hydropunch II; 6-28-95
								55			54-59' Some sand	
								60	CL			
								65			66-75' Sandy Silt (ML), green-brown, fine-grained sand, plastic, wet.	Hydropunch II Screen 69.5-72.5, 6 40 ml vials
HP	4.0'	6v	B1-B1					70	ML			

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: FRONTIER FERTILIZER, DAVIS CA

HOLE NO. B-1

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20576-028	2 of 2	B-1

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "/6" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
HP	4'	6v.	B1-B1					70			66-75' Sandy Silt(ML), green-brown, fine-grained sand, plastic, wet	
								75	ML		75-83' Clayey Silt(ML), green-brown, plastic, soft, wet	
								80				
								85			83-112' Silty Clay (CL), green-brwn; mod. plastic, soft, wet.	
								90				
								95	CL			
								100			105-112' Some fine-grained sand.	
								105				
								110				
								115	GP		112-118.5' Sandy Gravel (GP) brwn, fine to coarse-grained sand, gravel to 1-inch diameter, dense, wet, some silt.	Backfilled hole with cement-bentonite grout
HP	3'	12v	B1-C1								Total Depth 118.5 ft	Hydropunch II Screen 119.5-121.5 - 12 40 ml vials

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: FRONTIER FERTILIZER, DAVIS CA.

HOLE NO. B-1

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20576-028	1 of 1	B-2

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER	200 ft East of MW-12A	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
6-27-95	6-29-95	Water Development	CME 85	8"	64	—	64

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—		24.10 ft 6-28-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R.P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			Sample #						CL		0-2' Sandy Silty Clay (CL), light brown, organic, plastic, dry.	Drilling with 8" diameter hollow stem flight auger
								5	SC		2-7' Clayey Sand (SC), gray-brown, fine-grained sand, moist.	
								10			7-40' Silty Clay (CL), gray-brown, mod. plastic, stiff, moist.	All soil descriptions from cuttings.
								15			7-10' Some sand.	
											10-40' olive green	
								20				
								25	CL		27' Wet soil	Groundwater level 26.7' measured after HP sample s1 zone
								30				
								35				
								40			40-46' Clayey Silt (ML), olive brown, some fine-grained sand, soft, plastic, wet.	Hydropunch II Screen 42.0-44.5. 6 40ml vials.
HP	4.5	6 vials	B2-A1						ML			
								45			46-63' Silty Clay (CL), olive brown, soft, mod. plastic, wet	
								50				
								55				
								60			63-64 Silty Sand (SM), green-brown, fine-grained sand, soupy, wet.	Backfilled hole with cement-bentonite grout
									SM			
HP	4.0	6 v.	B2-B2								Total depth 64.0 ft	Hydropunch II Screen 65.5-68.0 ; 6 40ml vials

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: FRONTIER FERTILIZER, DAVIS CA

HOLE NO. B-2

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	1 of 2	B-3

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER	300 ft East of MW-12A	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
6-28-95	7-5-95	Water Development	CME 85	8"	118.5	—	118.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—		21.50 ft 7-5-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R.P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			Sample #						CL		0-3' Sandy Silty Clay (CL) light brown, organic, plastic, dry.	Drilling with 8" diameter hollow stem flight auger
								5	SM		3-7' Silty Sand (SM), brown, fine-grained sand, moist	
								10			7-14' Sandy Clay (CL), gray brown, fine-grained sand, plastic, moist.	All soil descriptions from cuttings
								15			14-42' Silty Clay (CL), green-brown, stiff, plastic, moist	
								20				Groundwater level at 20.50 ft in S1 zone 6-29-95
								25	CL			
								30				
								35				
								40				
HP	4.0	12 vials	B3-F1 B3-E1					45	SM		42-47' Silty Sand (SM), olive brown, with some gravel, dense, saturated	Hydropunch II Screen 460-47.5', 12 40 ml vials
								50			47-68' Silty Clay (CL) olive brown, some sand, plastic, saturated	
								55				
								60	CL		63' More sand	Groundwater level 60.30' in S2 zone 6-30-95
								65			68-72' Sandy Silt (ML), olive brown, fine-grained sand, plastic, saturated	
HP	4.0	12 L	B3-B1					70	ML			

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO.

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	2 of 2	B-3

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
HP	4.0	6 r.	B3-B1					70	ML		72-111' Silty Clay (CL), olive-brown, some fine-grained sand, mod. plastic, saturated.	Hydropunch II Screen 69.5-72.5, 6 40 ml vials
								75				Gr
								80				
								85				
								90	CL			Groundwater level 91.7' in A1 aquifer, 7-5-95
								95				
								100			103'-111' stiff, highly plastic	
								105				
								110			111-118.5' Sandy Gravel (GP) brown, fine to coarse sand, rounded gravels, black lithic fragments, dense, some silt, wet.	Backfilled hole with cement-bentonite grout.
								115	GP			
HP	4.0	12 r.	B3-C1					120			Total Depth 118.5 ft.	Hydropunch II screen, 120.5-122.5, 12 40 ml vials.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: FRONTIER FERTILIZER, DAVIS, CA

HOLE NO. B-3

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	1 of 2	B-4

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER	100 ft West of MW-1	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
6-30-95	7-6-95	Water Development	CME 85	8"		—	118.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—			—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R. P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			Sample #								0-2' Sandy Clay (CL), light brown, some silt, organic, plastic, dry	Drilling with 8" diameter hollow-stem auger.
								5			2-39' Silty Clay (CL), gray brown, soft, plastic, moist	All soil descriptions from cuttings.
								10			9-29' Green-brown, stiff	
								15				
									CL			
								20			23-27 Some sand	Water level 23.35 in S1 zone, 6-29-95. Soil wet at 27'
								25				
								30			29-39' olive green, higher plasticity	
								35				
								40			39-53' Sandy Silt (ML) olive-brown, saturated, plastic, fine-grained sand.	
HP	4.0	6 vials	B4-A1									Hydropunch II screen interval 41-44'; 6 40 ml vials.
								45	ML			
								50				
								55			53-67' Silty Clay (CL), olive-brown, some sand, mod. plastic, wet	
								60	CL			
								65			67-75' Sandy Silt (ML) olive-brown, fine-grained sand, plastic, wet	
HP	4.0	6	B4-B1					70	ML			

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: FRONTIER FERTILIZER, DAVIS, CA.

HOLE NO. B-4

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	2 of 2	B-4

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
HP	4.0	6 ft.	B4-B1					70	ML		67-75' Sandy Silt (ML)	Hydropunch II screen interval 69.5-72.5'; 6 40 ml vials
								75			75-85' Sandy Clay (CL), olive brown, plastic, some fine-grained sand, wet.	
								80				
								85			85-111' Silty Clay (CL), olive brown, plastic, stiff, wet.	
								90				
								95	CL		95-100' Some fine-grained sand.	
								100				
								105				Ground water level 108.4' in A1 aquifer 7-6-95.
								110				
								115	GP		Sandy Gravel (GP), gray, fine to coarse grained sand, some silt, sub-rounded gravel to 1.5 inch dia., dense, wet	Backfilled hole with cement-bentonite grout.
HP	1.5	12 ft	B4-C1					120			Total depth 118.5 ft	Hydropunch II screen 119.5-120.0'
			B4-E1									

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO. B-4

BECHTEL

GEOLOGIC DRILL LOG

PROJECT: FRONTIER FERTILIZER	JOB NO.: 20376-028	SHEET NO.: 1 of 2	HOLE NO.: B-5
SITE: FRONTIER FERTILIZER	COORDINATES: 300 ft North of MW 11A	ANGLE FROM HORIZ.: 90	BEARING: —

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7-7-95	7-8-95	Water Development	CME 85	8"	108.5		108.5 ft

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—		27.55 ft 7-8-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R.P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
											0-3' Sandy Silty Clay (CL), light brown, organic, plastic, dry	Drilling with 8" diameter hollow stem auger.
								5			3-40' Silty Clay (CL), brown, plastic, moist.	
								10				All soil descriptions from cuttings
								15	CL		18' green-brown	
								20			23' Increase in silt with some fine-grained sand	wet soil at ~23'.
								25				
								30			30' olive-brown	
								35				
								40				Groundwater level at 27.85 in S1 zone 7-7-95
HP	4.0'	6 vials	B5-A1						SM		40-45' Silty Sand (SM), olive brown, fine to medium-grained, wet.	
								45			45-67' Silty Clay (CL) olive brown, stiff, wet to moist	Hydropunch II screen interval 42-44' 6 40 ml vials
								50				
								55	CL			
								60				
								65				water level 34.0' in S2 zone, 7-7-95
HP	4.0'	6	B5-B1					70	SM		67-75 Silty Sand (SM)	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: FRONTIER FERTILIZER, DAVIS, CA

HOLE NO.: B-5

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	2 of 2	B-5

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
HP	4.0'	6	B5-B1					70	SM		67-75 Silty Sand (SM) olive brown, fine to medium-grained, some clay, wet.	Hydropunch II screen interval 69.5-72.5'; 6 vials, 40ml.
								75			75-103 Sandy Silt (ML) olive brown, fine-grained sand, slight plastic, few pea gravel, some clay, wet.	
								80				
								85	ML			
								90				Groundwater level 99.0' in A1 zone, 7-7-95
								95			103-108.5' Sandy Gravel (GP), brown, fine to coarse sand, gravel to 1.5" dia, subrounded clasts, some silt, dense, wet.	
								100				Backfilled hole with bentonite-cement grout
HP	8.5'	6 vials	B5-C1					105	GP			Hydropunch II screen interval 106.5-108.5'; 6 40ml vials
								110			Total Depth 108.5 ft.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: FRONTIER FERTILIZER

HOLE NO: B-5

BECHTEL

GEOLOGIC DRILL LOG

PROJECT: FRONTIER FERTILIZER	JOB NO.: 20376-028	SHEET NO.: 1 of 1	HOLE NO.: B-6
SITE: FRONTIER FERTILIZER	COORDINATES: 300 ft North of MW 12 A	ANGLE FROM HORIZ.: 90	BEARING: —

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7-7-95		Water Development	CME 85	8"	68.5	—	68.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—	—	27.50 ft 7-7-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R.P. Bilio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
									CL / ML		0-2' Sandy Silty Clay (CL) light brown, organic, plastic, dry.	Drilling with 8" dia. hollow stem auger.
								5			2-5' Sandy Silt (ML) brown, fine-grained sand, moist.	All soil descriptions from cuttings.
								10			5-38' Silty Clay (CL), brown, plastic, moist.	
								15			12-18' gray-brown, some sand.	
								20	CL		18-27' green brown	
								25			27-38' olive brown	
								30				Groundwater level 27.50' in S1 zone, 7-7-95.
								35				
HP	4.0'	6 vials	B6-A1					40	SM		38-46' Silty Sand (SM), olive brown, fine to medium grained, wet.	Hydropunch II screen interval 42.0-44.0'; 6 vials, 40 ml
								45			46-63' Silty Clay (CL), olive brown, plastic, moist.	
								50				
								55	CL			Backfilled hole with cement-bentonite grout.
								60			63-67' Sandy Silt (ML), olive brown, fine-grained sand, wet	water level 66' in S2 zone.
								65			67-68.5' Silty Sand (SM), brown, fine-grained, mod. dense, wet.	Hydropunch II screen interval 69.5-72.5'
HP	4.0	6 vials	B6-B1					70	SM		Total Depth 68.5 ft	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO. B-6

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	1 of 1	B-7

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER	200 ft North of MW 11A		

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7-10-95	7-11-95	Water Development	CME 85	8"	68.5	—	68.5'

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—		27.56' 7-10-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R.P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
								5, 10, 15, 20, 25, 30	CL		0-2' Sandy Silty Clay (CL) light brown, organic, plastic, dry. 2-35' Silty clay (CL) brown to gray brown, plastic, moist. 13-35' green brown, stiff	Drilling with 8" diameter hollow stem auger. All soil description from cuttings. Groundwater level 27.56' in S1 unit, 7-10-95
								35			35-45' Silty Sand (SM), brown fine to medium grained, wet	
HP	4.0'	12 vials	B7-A1					40	SM			Hydropunch II screen interval 40.0-44.0', 12 vials, 40 ml
								45, 50, 55	CL		45-62 Silty Clay (CL), olive brown, stiff, plastic, moist	water level in S2 unit 47.50', 7-10-95
								60, 65	SM		62-68.5 Silty Sand (SM), olive brown, fine to medium grained, wet.	Backfilled hole with cement-bentonite grout. Hydropunch II screen 70.5-72.5
HP	4.0	6	B7-B1								Total Depth 68.5 ft	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO. B-7

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	OF	B-8

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER	500 ft North of MW-12A		

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7-10-95	7-11-95	Water Development	CME 85	8"	68.5	—	68.5'

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—		39.10 ft 7-10-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R. P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
											0-2' Sandy Clay (CL) light brown, organic, plastic, dry	Drilling with 8" diameter hollow stem auger.
								5			2-7' Sandy Silt (ML), brown, fine-grained sand, moist.	
								10			7-35' Silty Clay (CL), brown, plastic, moist.	All soil descriptions from cuttings.
								15	CL		13-16' gray-brown	
											16-35' green-brown, stiff	
								20				wet soil at 23.5'
								25				
								30				
								35	ML		35-42' Sandy Silt (ML), brown fine-grained sand, wet.	
HP	4.0	12 Y.	88-A1 88-E1					40				water level 39.10' in S1 zone.
									CL		42-45' Silty Clay (CL) olive brown, stiff, plastic, moist.	
								45	ML		45-50' Clayey Silt (ML), olive brown, mod. plastic, moist	
								50			50-60' Silty Clay (CL), olive brown, stiff, plastic, moist.	
								55				Water level 61.45 in S2 zone, 7-10-95
								60			60-66' Sandy Silt (ML) brown fine-grained sand, wet.	Back filled hole with cement-bentonite grout
								65			66-68.5' Silty Sand (SM), brown fine to coarse-grained, wet.	
HP	4.0	6	88-B1					70			Total Depth 68.5 ft	Hydropunch screen 69.5-72.5'

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: FRONTIER FERTILIZER

HOLE NO. B-8

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	of	B-9

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER	150 ft North of MW-12A	90	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7-12-95	7-12-95	water Development	CME 85	8"	68.5	—	68.5 ft

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—		29.27 ft 7-12-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R. P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
									CL		0-2' Sandy Silty Clay (CL), light brown, organic, plastic, dry.	Drilling with 8" diameter hollow stem flight augers
								5	ML		2-13' Sandy Silt (ML), brown, fine-grained sand, moist	All soil descriptions from cuttings.
								10			8-13' gray-brown, some pea gravel	
											13-37' Silty Clay (CL), green-brown, plastic, moist.	
								15				
								20				
								25	CL		30-37' olive-brown, stiff	Groundwater level 29.27 ft in S1 zone, 7-12-95
								30				
								35				
											37-50' Gravelly Silty Sand (SM), brown, dense, fine to coarse sand, wet.	
HP	4.0	6 vals	B9-A1					40	SM			Hydropunch II screen 42-44'.
								45				
								50			50-60' Silty Clay (CL), olive-brown stiff, plastic, moist.	water level 64.8' in S2 zone, 7-12-95
								55	CL			Backfilled hole with cement-bentonite grout.
								60	ML		60-65' Clayey Silt (ML) olive brown, soft, mod plastic, moist.	
								65			65-68.5' Silty Sand (SM), brown, wet.	Hydropunch II screen 69.5-72.0'
HP	4.0	6	B9-B1					70			Total Depth 68.5 ft	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO. B-9

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	1 of 1	B-10

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER	100 ft E of MW-12A	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7-12-95	7-12-95	WATER DEVELOPMENT	CME 85	8"	68.5	—	68.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—	—		30.85, 7-12-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	R.P. BISIO

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
									CL		0-2' Sandy Silty Clay (CL), light brown, organic, plastic, dry.	Drilling with 8" diameter hollow stem flight auger
								5	ML		2-5' Sandy Silt (ML) brown, fine sand, moist.	
								10	CL		5-35' Silty Clay (CL), brown, plastic, moist.	All soil descriptions from cuttings
								15			12-20' Gray-brown, few gravel to 1/4".	
								20			17-35 Stiff. 20-35 Olive brown.	
								25				
								30				Groundwater level 30.85' in S1 zone 7-12-95
								35			35-38' Silty Clay (CL), olive brown, soft, plastic, wet.	
HP	4.0	6 units	B10-B1					40	SM		38-48' Silty Sand (SM), brown, fine-grained sand, wet.	Hydropunch II screen 42-44'
								45				
								50	CL		48-60' Silty Clay (CL) olive brown, plastic, moist to wet.	
								55				Water level 49' in S2 zone 7-12-95
								60			60-68.5 Sandy Silt (ML), brown, fine sand, wet.	Backfilled hole with cement-bentonite grout.
								65	ML			Hydropunch II screen 69.5-72.5'
HP	4.0	6 units	B10-B1					70			Total Depth 68.5 ft.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO. B-10

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	1 of 2	OW-1C

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER		90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7-13-95	7-17-95	Water Development	CME 85	8"	139.0	—	139.0 ft

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—			45.2' 7-18-95	—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—		R.P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
									CL		0-2' Sandy Clay (CL), light brown, some silt, organic, plastic, dry.	Drilling with 8" diameter hollow stem flight auger; pilot hole for 12" dia well.
								5	ML		2-7' Sandy Silt (ML), mottled gray and brown, slightly plastic, fine sand, moist	
								10			7-42.5' Silty Clay (CL), gray-brown, plastic, moist.	Soil discriptions: 0-19' from soil cuttings; 19-124' & 134-139 from core sampling.
								15			16' Green-brown	
5' long split tube core barrel; 2 3/4" diameter steel bit.	5.0	5.0	100%					20	CL		23' Mottled brown and green 24' Lower depth of root casts	
	5.0	5.0	100%					25			28' Clayey silt (ML), about 3" thick.	
	5.0	5.0	100%					30			30' More moisture, higher plasticity below 30'.	
	5.0	5.0	100%					35			30-42.5' Mottled tan, green, brown and gray; numerous white salts	Groundwater level at 38 ft in S1 zone 7-13-95.
	5.0	5.0	100%					40			38' Sandy blobs, gray 39' More moisture.	Water Bearing Strata
	5.0	4.0	80%					45	SM		42.5-46.5' Silty Sand (SM) brown, fine-to coarse-grained, 40% silt, little gravel, loose, wet.	Zone / Depths S1 42.5-58.5 S2 68.0-89.0 A1 108.0-137.5
	5.0	5.0	100%					50	ML CL		46.5-49.0' Sandy Silt (ML), brown, fine sand, wet. 49.0-54.0' Silty Clay (CL), mottled gray, tan, brown, stiff, plastic, moist.	
	5.0	5.0	100%					55	ML SM		54.0-56.0' Sandy Silt (ML), brown, moist.	Groundwater level at 45.2 in A1 zone, 7-18-95
	5.0	5.0	100%					60	CL		56.0-58.5' Silty Sand (SM), brown, fine to medium-grained, 40% silt, firm, wet.	
	5.0	5.0	100%					65			58.5-68.0' Silty Clay (CL), olive brown, white salts, stiff, plastic, wet	
								70	SM			

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: 90 ft West of MW-1

HOLE NO. OW-1C

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Frontier Fertilizer	20376-028-	2 of 2	OW-1C

Sampler Type and Diameter	Sampler Advance Length Core Run	Sample Recovery / Core Recovery	Sample Blows "N" / Percent Core Recovery	Water Pressure Tests: Loss in G.P.M.	Pressure P.S.I.	Time in Minutes	Elevation	Depth	Graphic Log	Sample	Description and Classification	Notes on: Water Levels, Water Return, Character of Drilling, Etc.
Split tube core barrel, 5 ft long; 2 3/4" diameter steel bit.	5.0	5.0	100%					70	ML, SM		68.0-72.0' Silty Sand (SM), mottled brown and tan, with sandy silt (ML) interbed, fine to medium grained, loose, wet.	
	5.0	5.0	100%					75	CL, SM		72.0-77.0' Silty Clay (CL), stiff plastic, moist.	
	5.0	0.0	0%					80	SP		77.0-79.0' Silty Sand (SM), as above. 79.0-89.0' Sand (SP), brown, up to 15% silt, poorly graded, fine to med-grained; sub-rounded clasts of 80% quartz, dark grains 15%, mica 5%; loose, wet.	
	5.0	5.0	100%					85				
	5.0	5.0	100%					90			89-100' Silty Clay (CL), mottled green, brown and gray, stiff, plastic, moist	
	5.0	5.0	100%					95				
	5.0	5.0	100%					100	CL		108-109' Sandy Silt (ML) mottled gray and brown, 30% sand, 5% gravel, moist	
	5.0	5.0	100%					105			109-112' Sand (SP) mottled gray and brown, 10% silt, 10% pea gravel; loose, wet, fine-grained sand.	
	5.0	4.2						110	ML, SP, CL		112-113' Silty Clay (CL), stiff, moist	
	5.0	2.5	50%					115	SP, SM		113-116.5' Sand (SP), gray, med. to coarse-grained, loose, wet. 116.5-117.0' Silty Sand, gray, wet.	124-134' not sampled with core barrel.
	5.0	2.5	50%					120	SW		117.0-121.5' Gravelly Sand (SW), gray, 40% sub-rounded gravel to 1" dia.; fine to coarse sand, loose, wet	
								125			121.5-137.5' Sandy Gravel (GP) gray and brown, fine to coarse sand 40%; 3" dia. clasts of quartz, chert, dark fragments, subrounded, loose to dense, wet.	
								130	GP			
Split t. c.b.	5.0	1.5						135	CL		137.5-139.0' Silty Clay (CL), mottled green, brown, gray, stiff, plastic, moist.	Boring completed as well OW-1C; refer to well construction log.
											Total Depth 139.0 ft	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: 90 ft West of MW-1

HOLE NO.: OW-1C

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	1 of 2	OW-2C

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
FRONTIER FERTILIZER		90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7-20-95		Water Development	CME 85	8"	142.0	—	142.0 ft

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
—	—	—				—

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—		R.P. Bisio

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
								5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70	CL; SM; CL; SP; CL; SM; CL; SM; CL; SM		0-2' Sandy Silty Clay (CL), light brown, little sand, organic, plastic, dry. 2-7' Silty Clay (CL), brown, plastic, moist. 7-17' Gray-brown, stiff. 17-34' Green brown, stiff. 34-37' Mottled brown and gray; slickensides, soft, MnO² stains. 37-42' Silty Sand (SM) mottled gray & brown, 45% silt, fine sand, loose, wet. 42-43' Silty Clay (CL), 15% sand, plastic, moist 43-46' Gravelly Sand (SP), brown-gray, fine to coarse sand, gravel to 1-inch diameter. 46-57.5' Silty Clay (CL) mottled brown & gray, few pea gravel, stiff, plastic, moist. 57.5-59' Silty Sand (SM), loose, wet. 59-64' Silty clay (CL), plastic, moist 64-66' Silty Sand (SM), 45% silt, loose, wet. 66-68' Sandy Clay (CL), 25% sand, soft, plastic 68-70' Silty Sand (SM), 40% silt, loose, wet	Drilling with 8-inch dia hollow stem auger; pilot hole for 12" dia. well Soil descriptions: 0-34' from soil cuttings; 34-119' and 137-142' from core sampling. water level 39' 7-20-39 in S1 44'-6 ft sand flowed into hollow stem auger Water Bearing Strata Zone / Depths S1 37.0-59.0 S2 64.0-169.0 A1 113.0-137.0
Split tube core barrel 5' long; 2¾" dia bit	5.0	5.0	100%									
	5.0	3.0	60%									
	5.0	1.0	20%									
	5.0	5.0	100%									
	5.0	5.0	100%									
	5.0	5.0	100%									
	5.0	5.0	100%									

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: 190 ft North of MW-11A

HOLE NO.: OW-2C

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FRONTIER FERTILIZER	20376-028	2 of 2	OW-2C

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS (%) G.P.M.	PRESSURE P.S.I.	TIME (IN MINUTES)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
Split tube core barrel 5' long; 2 3/4" dia steel bit	5.0	2.0	40%					70	ML		70-73.5' Sandy Silt (ML), mottled gray, brown, tan; 35% fine sand, loose, wet.	
	5.0	5.0	100%					75	SM, CL, ML		73.5-74.5' Silty Sand (SM) 40% silt. 74.5-76.5' Silty Clay (CL), 20% sand.	
	5.0	5.0	100%					80	SM		76.5-78.5' Sandy Silt (ML), 30% sand 78.5-81' Silty Sand (SM), 45% silt.	
	5.0	2.5	50%					85	CL		81.0-85.5' Sandy Silty Clay (CL) mottled gray, tan & brown, 15% sand, 5% pebbles, stiff, plastic.	
	5.0	3.5	70%					90	SM		85.5-99.0' Silty Sand (SM), gray-brown, up to 25% silt, fine to coarse sand. clasts of quartz, feldspar, mica, & dark lithic fragments; loose to firm, wet	94'- 4 ft sand inflow into hollow stem auger.
	5.0	3.0	60%					95				99'- 3 ft sand inflow.
	5.0	2.0	40%					100	SP		99.0-109.0' Sand (SP), gray-brown, fine to coarse-grained, mod. well graded; some gravel; loose, wet.	104'- 8 ft sand inflow.
	5.0	4.0	80%					105				
	5.0	4.0	80%					110	CL		109-113' Sandy Silty Clay (CL), mottled brown, tan, gray; stiff, plastic, moist.	113'- 18 ft sand inflow
	5.0	3.0	60%					115	SM		113-118.5' Silty Sand (SM), gray, fine to coarse sand; 10% gravel to 1" dia.; loose, wet.	
								120	GP		118.5-120' Sandy Gravel (GP) gray, fine to coarse sand, dense. 120-137' Sand (SP), gray, with gravel, loose, wet.	119.0-137.0' not sampled with core barrel.
								125	SP			
								130				
								135			137-140' Silty Clay (CL) mottled gray, green & brown, stiff, plastic	
s.t. barrel	5.0	4.0	80%					140	CL, SP		140-142' Sand (SP) gray, fine-grained, loose, wet	
											Total Depth 142.0 ft	Boring completed as well OW-2C. refer to well construction log

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: 190 ft North of MW-11A

HOLE NO.: OW-2C

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Frontier Fertilizer	20376-028	1 of 2	OW-3C

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Frontier Fertilizer		90°	

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7/26/95	7/26/95	Water Development	CME 85	8.25"	139.0	–	139.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
		C.M.Obi

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
								5, 10, 15, 20, 25, 30	CL		0-35.9 ft SILTY CLAY (CL) mottled medium brown and light gray, firm, moderate plasticity, 10% coarse sand, moist.	Drilled with 8.25 in OD hollow-stem augers.
												Soil descriptions: 0-34 ft from soil cuttings; 34-139 ft from core samples.
											35.9-39.1 ft SANDY SILT (ML) mottled medium brown and light gray, ~~firm, moderate~~ soft, low plasticity, 40% fine to coarse sand, wet.	Core sampler is 5 ft long, 4 in OD, and 2.5 in ID
SS	5.0	4.8						35	ML		39.1-40.0 ft SILTY SAND (SM) medium brown, fine to medium sand, 40% silt, loose, wet.	Heaving sand at 44, 64, 104, and 114 ft.
SS	5.0	1.5						40	SM			
SS	5.0	0						45	SP		40.0-48.5 ft SAND (SP) dark gray, medium to coarse sand, 10% fine sand, 5% gravel to 0.5 in, 5% silt, loose, wet	
SS	5.0	2.0						50	CL		48.5-62.3 ft CLAY (CL) mottled olive brown and medium gray, hard, moderate plasticity, block texture, moist.	
SS	5.0	5.0						55				
SS	5.0	4.2						60				
								65	SP		62.3-84.5 ft SAND (SP) mottled medium brown and medium gray, fine to medium sand, dense, cemented, wet.	
								70				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO. OW-3C

BECHTEL

GEOLOGIC DRILL LOG

PROJECT: Frontier Fertilizer | JOB NO. 20376-028 | SHEET NO. 2 of 2 | HOLE NO. OW-3C

Sampler Type and Diameter	Sampler Advance Length Core Run	Sample Recovery / Core Recovery	Sample Blows "N" / Percent Core Recovery	Water Pressure Tests: Loss in G.P.M.	Pressure P.S.I.	Time in Minutes	Elevation	Depth	Graphic Log	Sample	Description and Classification	Notes on: Water Levels, Water Return, Character of Drilling, Etc.
								70			62.3-84.5 ft SAND (SP) see previous page for description	
								75				
								80	SP		84.5-94.0 ft CLAY (CL) reddish brown, hard, blocky texture, moderate plasticity, locally up to 40% fine to medium sand and silt, moist/wet.	
SS	4.0	3.6						85				
SS	5.0	1.8						90	CL		94.0-99.5 ft SANDY SILT (ML) mottled reddish brown and medium gray, firm, low plasticity, 40% fine to medium sand, wet.	
SS	5.0	2.6						95	ML		99.5-100.0 ft SAND (SW) brownish red, fine to coarse sand, loose, wet	
SS	5.0	3.5						100	SM		100.0-102.3 SILTY SAND (SM) reddish brown and medium gray laminations ⅛-in thick of fine to medium sand with 20% silt, dense, wet.	
									GM		102.3-104.7 ft SILTY GRAVEL (GM) olive brown mixed subangular to subrounded gravel to 2 in, coarse sand, 30% silt, dense, moist/wet	with 20% fine to
SS	5.0	2.7						105	CL		104.7-109.3 ft CLAY (CL) light yellowish brown to olive brown, hard, blocky texture, moist/wet.	
SS	5.0	3.8						110				
								115			109.3-134.0 ft SAND (SP) dark grayish brown, fine to medium sand, 10% coarse sand, 5% silt, trace subrounded gravel to 2 in, loose, wet.	
								120	SP			
								125				
								130				
								135	CL		134.0-139.0 ft CLAY (CL) mottled reddish brown and brownish gray; stiff, blocky, moderate plasticity, moist/wet	
SS	4.0	1.6						140			TOTAL DEPTH = 139 FT.	Boring was reamed to 12-in diameter upon completion and a monitoring well was installed
								145				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO. OW-3C

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Frontier Fertilizer	20376-028	1 of 2	OW-4C

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Frontier Fertilizer		90°	

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
7/31/95	8/1/95	Water Development	CME 85	8.25	147.0	0.0	147.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
		C.M. Obi

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
								5, 10, 15, 20, 25, 30	CL		0-43.0 ft SILTY CLAY (CL): mottled yellowish brown and grayish brown, firm, low to moderate plasticity, 0-40% silt, 0-5' dry, 5-41' moist, 41-43' wet.	Drilled with 8.25 in OD hollow-stem augers. Soil descriptions: 0-34 ft from soil cuttings; 34-147 ft from core sampled. Core sampler is 5 ft long, 4 in OD, and 2.5 in ID. Heaving sand at 64 and 114 ft.
	5.0	5.0	100%					35				
	5.0	5.0	100%					40			43.0-43.5 ft SAND (SP): dark grayish brown, medium to coarse sand, loose, wet.	
	5.0	5.0	100%					45	CL		43.5-61.7 ft SILTY CLAY (CL): mottled yellowish brown and grayish brown, firm, moderate plasticity, 20-40% silt, wet. At 57.0 ft: thin (1-in) seam of gravelly clay.	
	5.0	5.0	100%					50				
	5.0	5.0	100%					55				
	5.0	5.0	100%					60				
								65	SM		61.7-86.0 ft SILTY SAND (SM): dary greenish gray, fine to medium sand, 20-30% silt, loose, wet.	
								70				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE

HOLE NO. OW-4C

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Frontier Fertilizer	20376-028	2 of 2	OW-4C

Sampler Type and Diameter	Sampler Advance Length Core Run	Sample Recovery Core Recovery	Sample Blows "N" / Percent Core Recovery	Water Pressure Tests: Loss in G.P.M.	Pressure P.S.I.	Time in Minutes	Elevation	Depth	Graphic Log	Sample	Description and Classification	Notes on: Water Levels, Water Return, Character of Drilling, Etc.
								70			61.7-86.0 ft SILTY SAND (SM) see description on previous page.	
								75	SM			
								80				
								85				
	2.0	2.0	100%								86.0-110.0 ft CLAY (CL): mottled yellowish brown and grayish brown, firm, moderate plasticity, wet	
	5.0	0.1	2%					90				
	5.0	5.0	100%					95	CL			
	5.0	5.0	100%					100				
	5.0	5.0	100%					105				
	5.0	3.0	60%					110			110.0-143.0 ft SAND (SP) dark olive brown, varies from fine to medium sand, to medium to coarse sand, to gravel, sands loose, gravel dense, wet.	
								115				
								120				
								125	SP			
								130				
								135				
	6.0	6.0	100%					140			143.0-147.0 ft CLAY (CL): light yellowish brown, stiff to hard, moderate plasticity, wet.	Boring was reamed to 12-in diameter upon completion and a monitoring well was installed.
	5.0	4.0	80%					145	CL			
											TOTAL DEPTH: 147 FT.	

SS = SPLIT SPOON; ST = SHELBY TUBE; B = BENNIGSON; P = PITCHER; O = OTHER

SITE

HOLE NO. OW-4C

MONITORING WELL

PROJECT	WELL NO.
FRONTIER FERTILIZER	OW-1A

JOB NO.	SITE	COORDINATES
20376-028	Frontier site, DAVIS, CA	

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
7-19-95	7-19-95	R.P. BISIO	Top of ground surface

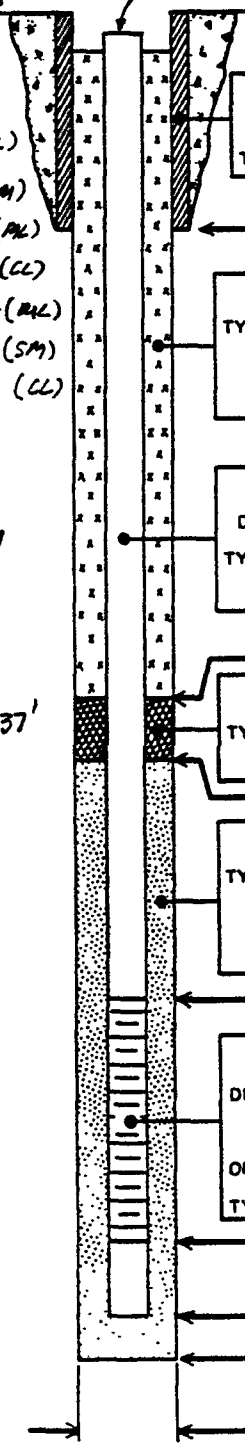
DEPTH	ELEV.

GENERALIZED GEOLOGIC LOG

0-2' Sandy Clay (CL)
2-7' Sandy Silt (ML)
7-42.5' Silty Clay (CL)
42.5-46.5' Silty Sand (SM)
46.5-49.0' Sandy Silt (ML)
49.0-54.0' Silty Clay (CL)
54.0-56.0' Sandy Silt (ML)
56.0-58.5' Silty Sand (SM)
58.5-59.0' Silty Clay (CL)

Refer to geologic log OW-1C for detailed stratigraphy.

Groundwater level 27.37' bgs, 7-21-95



ELEVATION - TOP OF RISER CASING S.L. 2.05'

GROUND SURFACE — 0.0

SURFACE CASING
DIA: 8-inch
TYPE: Steel with lockable cap.

BOTTOM OF SURFACE CASING — 2.6

BACKFILL MATERIAL
TYPE: Cement-bentonite grout

RISER CASING
DIA. 4-inch
TYPE: PVC Schedule 40
Threaded, flush joint with cap

TOP OF SEAL — 36.0

ANNULAR SEAL
TYPE: Fine-grained 0/30 silica sand with cement-bentonite grout

TOP OF FILTER PACK — 39.0

FILTER PACK
TYPE: RMC Lonestar Monterey Sand #2/12
Clean, rounded, silica sand.

TOP OF SCREEN — 42.0

SCREEN
DIA 4-inch
TYPE PVC, Schedule 40
Threaded, flush joint
OPENINGS WIDTH 0.020" 3" long, 1/4" c/c
TYPE Machine slotted

BOTTOM OF SCREEN — 57.0

BOTTOM OF SUMP — 59.0

BOTTOM OF HOLE — 59.0

HOLE DIA 12 inch

MONITORING WELL

PROJECT: FRONTIER FERTILIZER		WELL NO. OW-1B
JOB NO. 20376-028	SITE: Frontier Fertilizer, Davis, CA	COORDINATES:
BEGUN: 7-17-95	COMPLETED: 7-19-95	PREPARED BY: R.P. Bisio
REFERENCE POINT FOR MEASUREMENTS: Top of ground surface		

DEPTH | ELEV.

ELEVATION - TOP OF RISER CASING: S.U. 2.18'

GROUND SURFACE

GENERALIZED GEOLOGIC LOG

0-2' Sandy Clay (CL)
2-7' Sandy Silt (ML)
7-42.5' Silty Clay (CL)
42.5-46.5' Silty Sand (SM)
46.5-49.0' Sandy Silt (ML)
49.0-54.0' Silty Clay (CL)
54.0-56.0' Sandy Silt (ML)
56.0-58.5' Silty Sand (SM)
58.5-68.0' Silty Clay (CL)
68.0-72.0' Silty Sand (SM)
72.0-77.0' Silty Clay (CL)
77.0-79.0' Silty Sand (SM)
79.0-89.0' Sand (SP)
89.0-90.0' Silty Clay (CL)

Refer to geologic log OW-1C for detailed stratigraphy.

Groundwater level 42.93 bgs, 7-21-95

SURFACE CASING
DIA: 8-inch
TYPE: Steel with lockable cap

BOTTOM OF SURFACE CASING — 2.4

BACKFILL MATERIAL
TYPE: Cement-bentonite grout

RISER CASING
DIA. 4-inch
TYPE: PVC schedule 40
Threaded, flush joint with cap

TOP OF SEAL — 62.0

ANNULAR SEAL
TYPE: Fine-grained 0/30 silica sand with cement-bentonite grout

TOP OF FILTER PACK — 65.0

FILTER PACK
TYPE: RMC Lonestar Monterey Sand 2/12
Clean, rounded silica sand

TOP OF SCREEN — 68.0

SCREEN
DIA 4-inch
TYPE PVC schedule 40
Threaded, flush joint.
OPENINGS WIDTH 0.020 inch, 3" long, 1/4" c/c
TYPE Machine slotted.

BOTTOM OF SCREEN — 88.0

BOTTOM OF SUMP — 88.0

BOTTOM OF HOLE — 90.0

HOLE DIA 12 inch

MONITORING WELL

PROJECT	WELL NO.
FRONTIER FERTILIZER	OW-1C

JOB NO.	SITE	COORDINATES
20376-020	Frontier Fertilizer, Davis	

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
7-13-95	7-17-95	R.P. Bisio	Top of ground surface

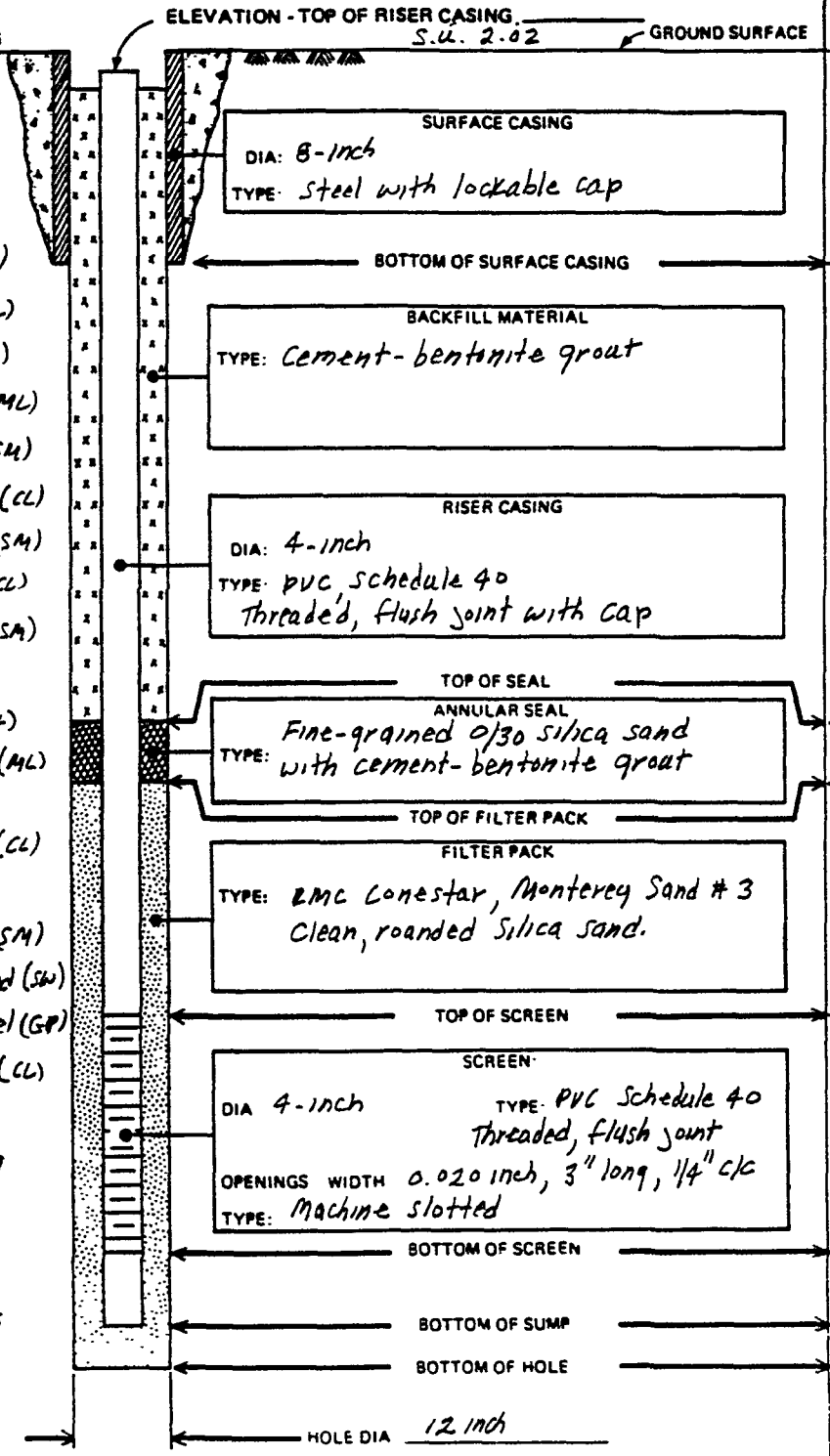
Groundwater level 45.2' bgs 7-18-95

GENERALIZED GEOLOGIC LOG

0-2' Sandy Clay (CL)
2-7' Sandy Silt (ML)
7-42.5' Silty Clay (CL)
42.5-46.5 Silty Sand (SM)
46.5-49.0' Sandy Silt (ML)
49.0-54.0 Silty Clay (CL)
54.0-56.0' Sandy Silt (ML)
56.0-58.5' Silty Sand (SM)
58.5-68.0' Silty Clay (CL)
68.0-72.0' Silty Sand (SM)
72.0-77.0' Silty Clay (CL)
77.0-79.0' Silty Sand (SM)
79.0-89.0' Sand (SP)
89-108' Silty Clay (CL)
108.0-109.0' Sandy Silt (ML)
109.0-112.0' Sand (SP)
112.0-113.0' Silty Clay (CL)
113.0-116.5 Sand (SP)
116.5-117.0 Silty Sand (SM)
117.0-121.5 Gravelly Sand (SW)
121.5-137.5 Sandy Gravel (GP)
137.5-139.0 Silty Clay (CL)

Refer to geologic log OW-1C for detailed stratigraphy.

Groundwater level bgs 45.74, 7-21-95



DEPTH	ELEV.
0.0	
2.6	
104.0	
108.0	
112.0	
137.0	
139.0	
139.0	

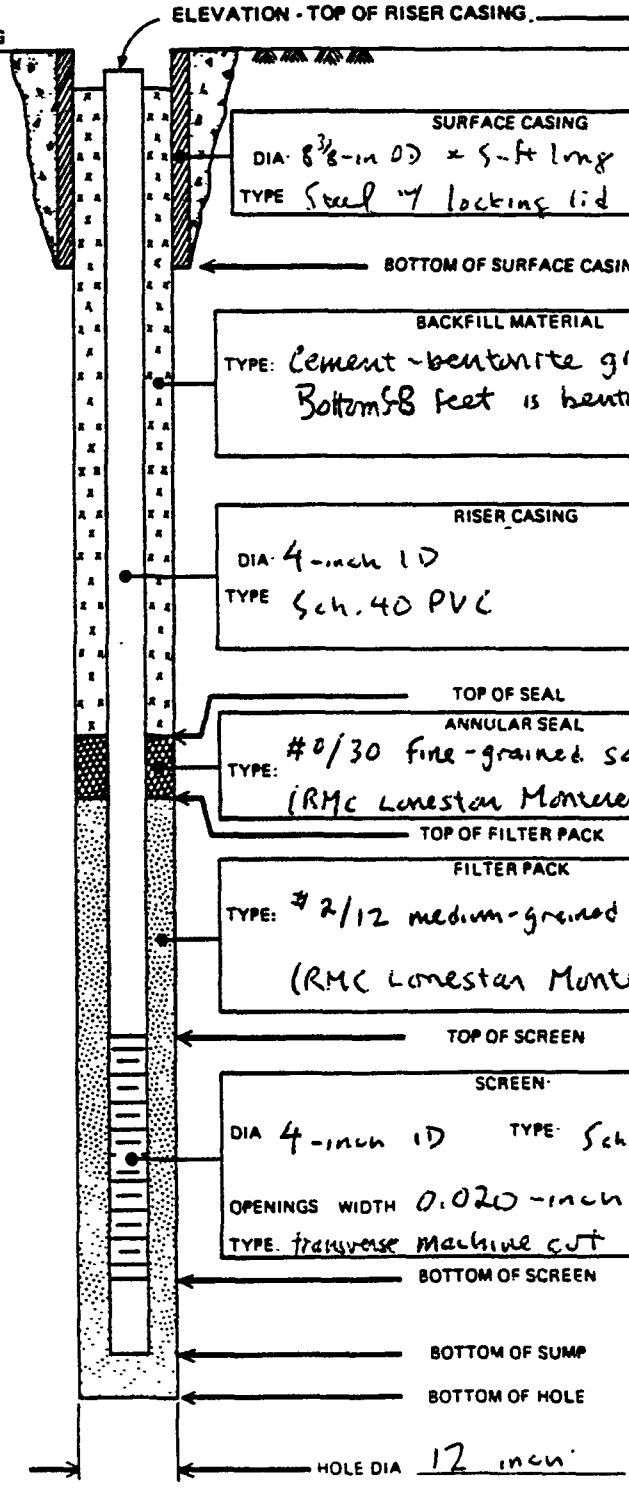
MONITORING WELL

PROJECT: Frontier Fertilizer		WELL NO.: OW-2A
JOB NO.: 20376-028	SITE: Frontier Fertilizer	COORDINATES:
BEGUN: 7/25/95	COMPLETED: 7/25/95	PREPARED BY: C.M. Obi
REFERENCE POINT FOR MEASUREMENTS:		

	DEPTH	ELEV.
Surface Casing	+2.4	
Well Casing	+2.1	
GROUND SURFACE	0	
BOTTOM OF SURFACE CASING	2.6	
TOP OF SEAL	33'	
TOP OF FILTER PACK	36'	
TOP OF SCREEN	39'	
BOTTOM OF SCREEN	59'	
BOTTOM OF SUMP	61'	
BOTTOM OF HOLE	61'	

GENERALIZED GEOLOGIC LOG

Refer to geologic log OW-2C for detailed stratigraphy.



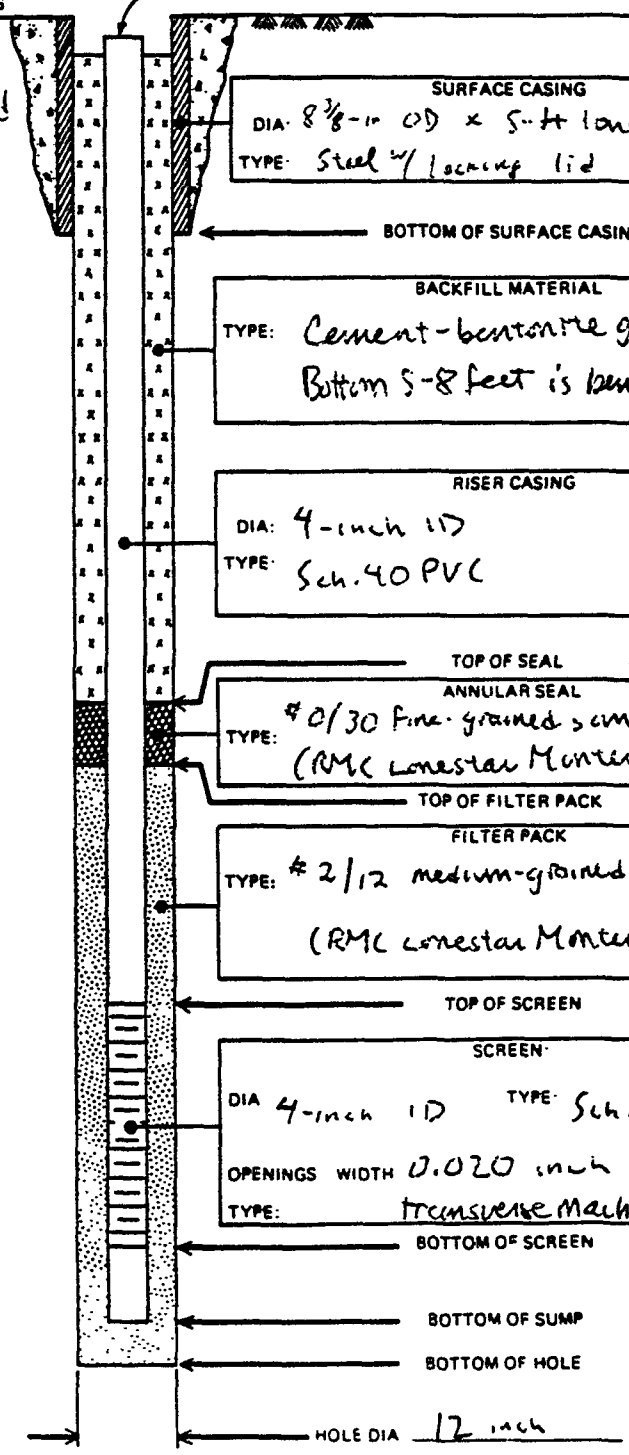
MONITORING WELL

PROJECT: Frontier Fertilizer		WELL NO.: OW-2B
JOB NO.: 20576-028	SITE: Frontier Fertilizer	COORDINATES:
BEGUN: 7/24/95	COMPLETED: 7/24/95	PREPARED BY: C. M. Obi
		REFERENCE POINT FOR MEASUREMENTS:

	DEPTH	ELEV.
Surface Casing	+2.4	
Well Casing	+2.1	
GROUND SURFACE	0	
BOTTOM OF SURFACE CASING	2.6	
TOP OF SEAL	59'	
TOP OF FILTER PACK	62'	
TOP OF SCREEN	64'	
BOTTOM OF SCREEN	109'	
BOTTOM OF SUMP	111'	
BOTTOM OF HOLE	111'	

GENERALIZED GEOLOGIC LOG

Refer to geologic log OW-2C for detailed stratigraphy.



MONITORING WELL

PROJECT	WELL NO.
Frontier fertilizer	OW-2C

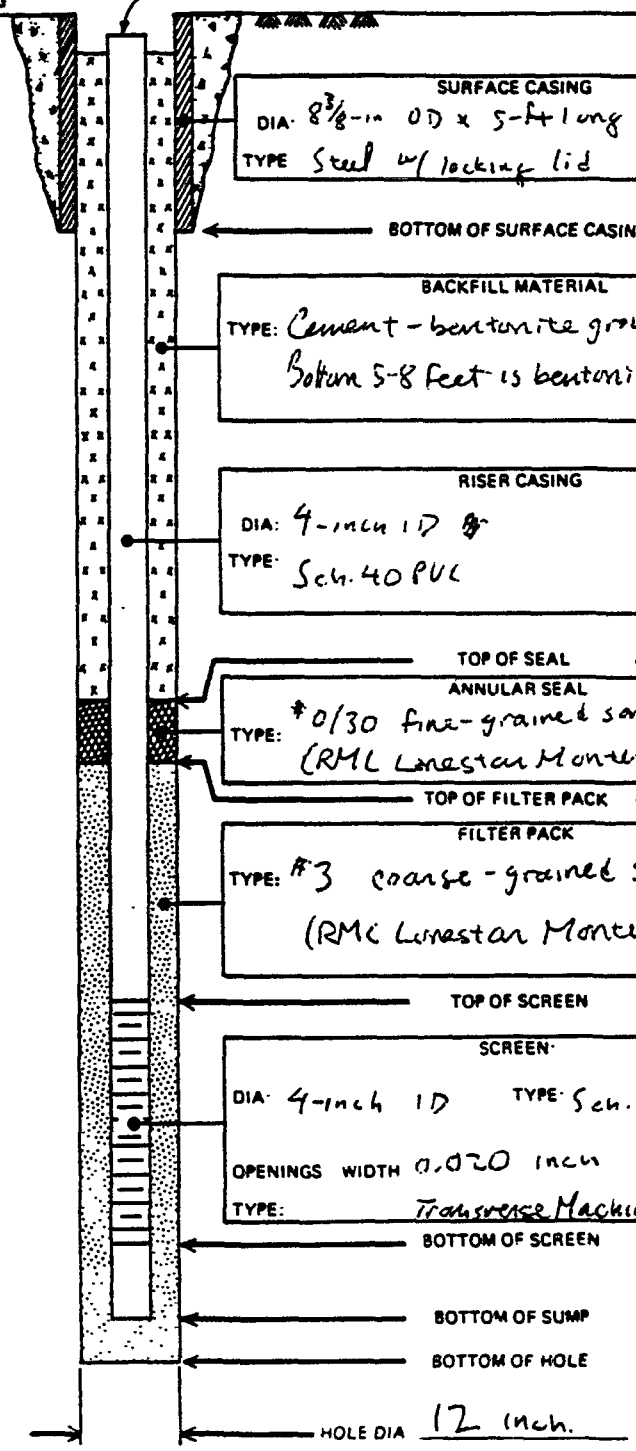
JOB NO.	SITE	COORDINATES
20376-028	Frontier fertilizer	

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
7/21/95	7/21/95	C.M. Obi.	

	DEPTH	ELEV.
Surface Casing	+2.5	
Well Casing	+2.2	
GROUND SURFACE	0	
BOTTOM OF SURFACE CASING	2.5	
TOP OF SEAL	109'	
TOP OF FILTER PACK	111'	
TOP OF SCREEN	113'	
BOTTOM OF SCREEN	138'	
BOTTOM OF SUMP	140 ~~138~~'	
BOTTOM OF HOLE	140'	

GENERALIZED GEOLOGIC LOG

Refer to geologic log OW-2C for detailed stratigraphy.



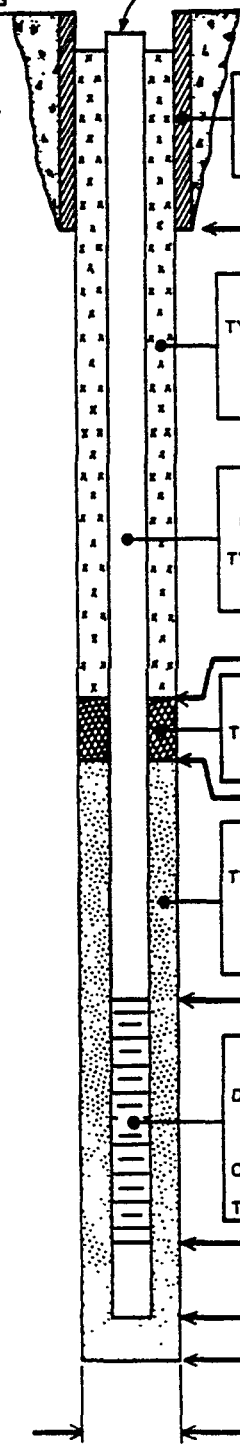
MONITORING WELL

PROJECT: Frontier Fertilizer			WELL NO. OW-3A
JOB NO. 20376-028	SITE: Frontier Fertilizer	COORDINATES	
BEGUN 7/31/95	COMPLETED 7/31/95	PREPARED BY C.M.-Ob.	REFERENCE POINT FOR MEASUREMENTS

	DEPTH	ELEV.
Surface Casing	+2.45	
Well Casing	+2.2	
GROUND SURFACE	0	

GENERALIZED GEOLOGIC LOG

See geologic log for OW-3C for detailed stratigraphy



ELEVATION - TOP OF RISER CASING

SURFACE CASING
DIA: 8 3/8-in OD x 5-ft long
TYPE: Steel w/ locking lid

BOTTOM OF SURFACE CASING — 2.55

BACKFILL MATERIAL
TYPE: Cement-bentonite grout
Bottom 5 ft is bentonite slurry

RISER CASING
DIA: 4-inch ID
TYPE: Sch. 40 PVC

TOP OF SEAL — 35'

ANNULAR SEAL
TYPE: #0/30 fine-grained sand (RMC Lonestar Monterey)

TOP OF FILTER PACK — 37'

FILTER PACK
TYPE: #2/12 medium-grained sand (RMC Lonestar Monterey)

TOP OF SCREEN — 39'

SCREEN
DIA: 4-inch ID TYPE: Sch. 40 PVC.
OPENINGS WIDTH: 0.020 inch
TYPE: Transverse machine cut

BOTTOM OF SCREEN — 49'

BOTTOM OF SUMP — 51'

BOTTOM OF HOLE — 51'

HOLE DIA: 12 inch

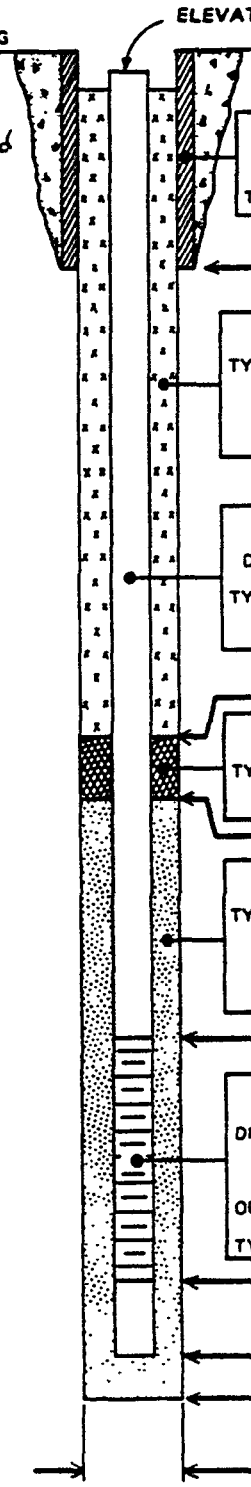
MONITORING WELL

PROJECT: Frontier Fertilizer		WELL NO.: OW-3B
JOB NO.: 20326-028	SITE: Frontier Fertilizer	COORDINATES:
BEGUN: 7/28/95	COMPLETED: 7/28/95	PREPARED BY: C.M. Obi
REFERENCE POINT FOR MEASUREMENTS:		

	DEPTH	ELEV.
Surface Casing	+2.5	
well Casing	+2.1	
GROUND SURFACE	0	

GENERALIZED GEOLOGIC LOG

See geologic log OW-3C for detailed stratigraphy.



ELEVATION - TOP OF RISER CASING

SURFACE CASING
DIA: 8 3/8-in OD x 5-ft long
TYPE: Steel w/ locking lid.

BOTTOM OF SURFACE CASING — 2.5

BACKFILL MATERIAL
TYPE: Cement-bentonite grout
Bottom 5-8 feet is bentonite slurry

RISER CASING
DIA. 4-inch ID
TYPE Sch. 40 PVC

TOP OF SEAL — 60'

ANNULAR SEAL
TYPE: #0/30 fine-grained sand (RMC Lonestar Monterey)

TOP OF FILTER PACK — 62.3'

FILTER PACK
TYPE: #2/12 medium-grained sand (RMC Lonestar Monterey)

TOP OF SCREEN — 64'

SCREEN
DIA 4-inch ID TYPE: Sch. 40 PVC
OPENINGS WIDTH 0.020-inch
TYPE: Transverse machine cut

BOTTOM OF SCREEN — 84'

BOTTOM OF SUMP — 86'

BOTTOM OF HOLE — 86'

HOLE DIA 12 inch

MONITORING WELL

PROJECT	WELL NO.
Frontier fertilizer	OW-3C

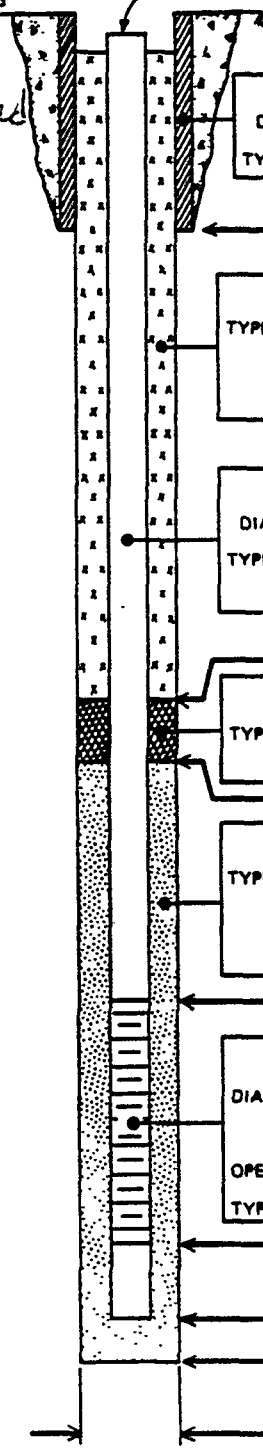
JOB NO.	SITE	COORDINATES
20376-028	Frontier Fertilizer	

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
7/27/95	7/27/95	C.M. Obi	

	DEPTH	ELEV.
Surface Casing	+2.45	
Well Casing	+2.3	

GENERALIZED GEOLOGIC LOG

See geologic log OW-3C for detailed stratigraphy



ELEVATION - TOP OF RISER CASING

GROUND SURFACE

SURFACE CASING
DIA: 8 3/8-in OD x 5-ft long
TYPE: Steel w/ locking lid

BOTTOM OF SURFACE CASING — 2.55

BACKFILL MATERIAL
TYPE: Cement-bentonite grout
Bottom 5-8 feet is bentonite slurry

RISER CASING
DIA: 4-inch ID
TYPE: Sch. 40 PVC

TOP OF SEAL — 97'

ANNULAR SEAL
TYPE: #0/30 fine-grained sand (RMC Lonestar Monterey)

99.5'

TOP OF FILTER PACK

FILTER PACK
TYPE: #3 coarse-grained sand (RMC Lonestar Monterey)

TOP OF SCREEN — 103'

SCREEN
DIA 4-inch ID TYPE Sch. 40 PVC
OPENINGS WIDTH 0.020 inch
TYPE. Transverse machine cut

BOTTOM OF SCREEN — 133'

BOTTOM OF SUMP — 135'

BOTTOM OF HOLE — 135'

HOLE DIA 12 inch

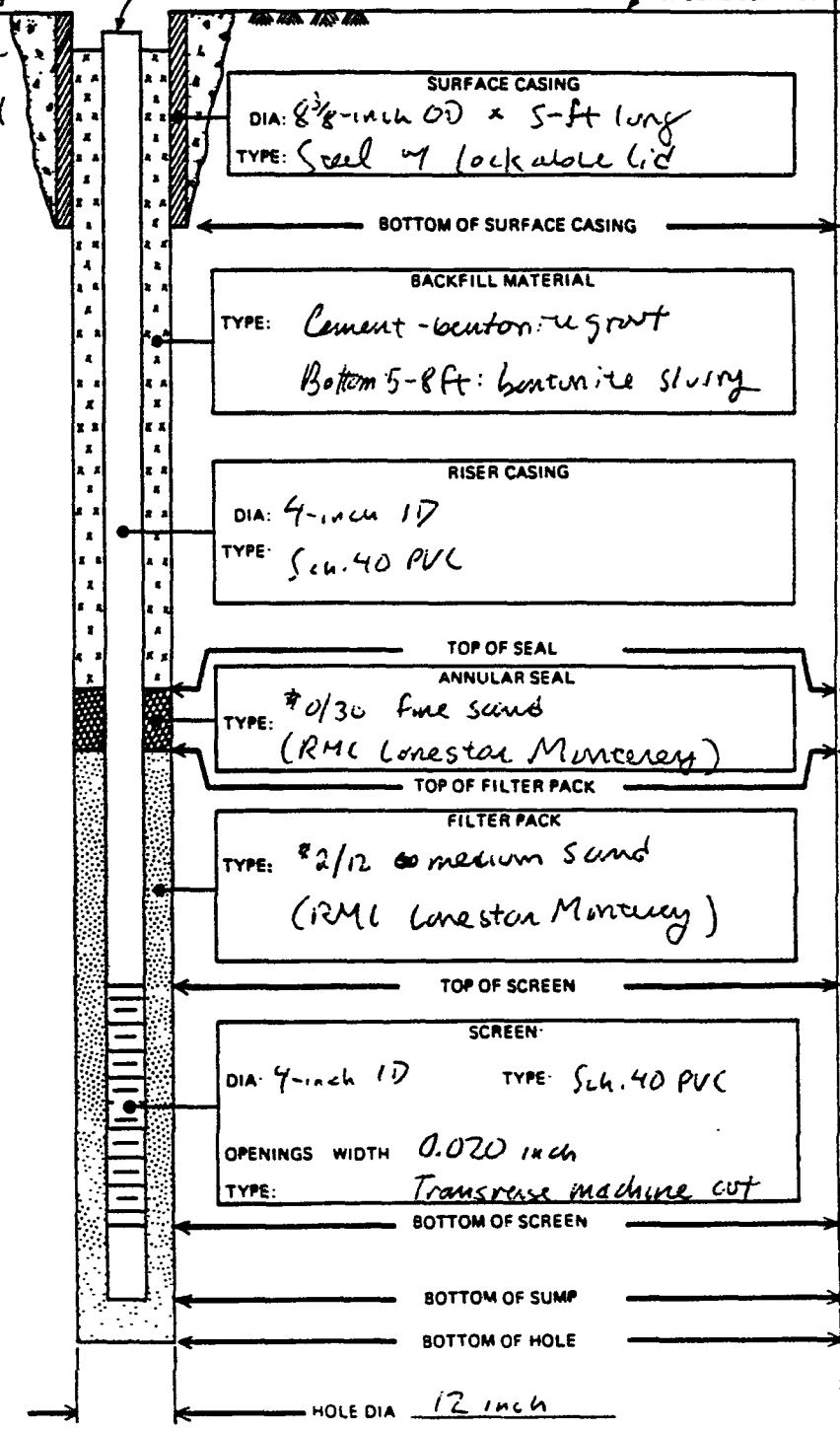
MONITORING WELL

PROJECT: Frontier Fertilizer		WELL NO.: OW-4A
JOB NO.: 20376-028	SITE: Frontier Fertilizer	COORDINATES:
BEGUN: 8/4/95	COMPLETED: 8/4/95	PREPARED BY: C. M. Obi
REFERENCE POINT FOR MEASUREMENTS:		

	DEPTH	ELEV
Surface Casing		
Well Casing		
GROUND SURFACE	0	
BOTTOM OF SURFACE CASING		
TOP OF SEAL	32	
TOP OF FILTER PACK	35	
TOP OF SCREEN	37	
BOTTOM OF SCREEN	47	
BOTTOM OF SUMP	49	
BOTTOM OF HOLE	49	

GENERALIZED GEOLOGIC LOG

See geologic drill log OW-4C for detailed stratigraphy.



MONITORING WELL

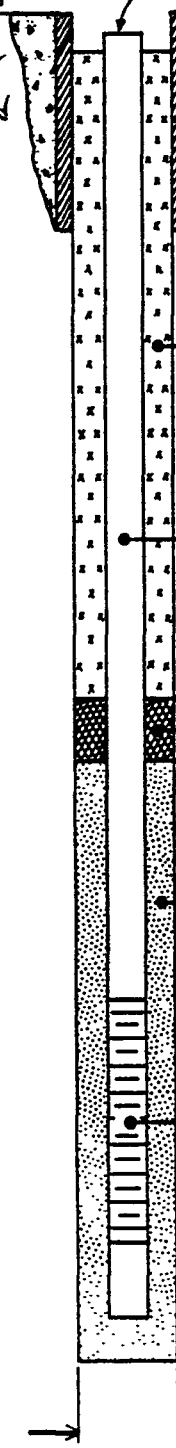
PROJECT: Frontier Fertilizer		WELL NO. OW-4B
JOB NO. 20376-078	SITE: Frontier Fertilizer	COORDINATES
BEGUN 8/3/95	COMPLETED 8/3/95	PREPARED BY C.M. Obi
REFERENCE POINT FOR MEASUREMENTS		

	DEPTH	ELEV
Surface Casing		
Well Casing		
GROUND SURFACE	0	
BOTTOM OF SURFACE CASING		
TOP OF SEAL	59	
TOP OF FILTER PACK	62	
TOP OF SCREEN	65	
BOTTOM OF SCREEN	85	
BOTTOM OF SUMP	87	
BOTTOM OF HOLE	87	

GENERALIZED GEOLOGIC LOG

See geologic drill log OW-4C for detailed stratigraphy.

ELEVATION - TOP OF RISER CASING



SURFACE CASING
DIA: 9 3/8-inch OD x 5-ft long
TYPE: Steel w/ lockable lid

BACKFILL MATERIAL
TYPE: Cement-bentonite grout
Bottom 5-8 ft: bentonite slurry

RISER CASING
DIA: 4-inch ID
TYPE: Sch. 40 PVC

ANNULAR SEAL
TYPE: #0/30 fine sand (RMC Lonestar Monterey)

FILTER PACK
TYPE: #3 coarse sand (RMC Lonestar Monterey)

SCREEN:
DIA 4-inch ID TYPE: Sch. 40 PVC
OPENINGS WIDTH 0.020 inch
TYPE: Transverse machine cut

HOLE DIA 12 inch

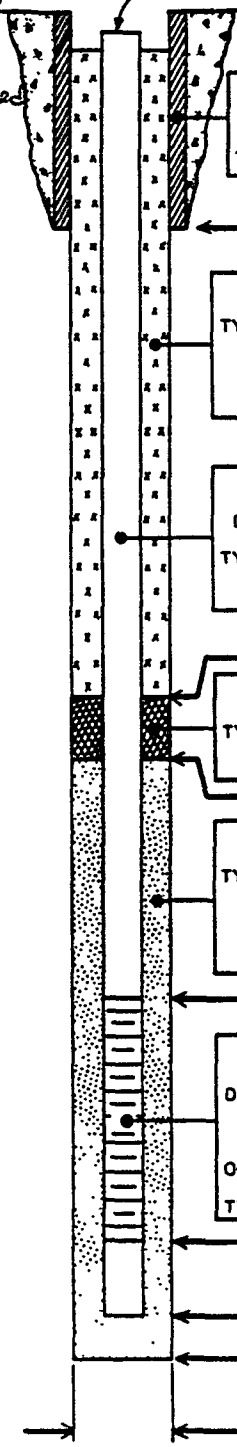
MONITORING WELL

PROJECT: Frontier Fertilizer		WELL NO.: OW-4C
JOB NO.: 20576-028	SITE: Frontier Fertilizer	COORDINATES:
BEGUN: 8/2/95	COMPLETED: 8/2/95	PREPARED BY: C. M. Obi.
REFERENCE POINT FOR MEASUREMENTS:		

	DEPTH	ELEV
Surface Casing		
Well Casing		
GROUND SURFACE	0	

GENERALIZED GEOLOGIC LOG

See geologic drill log for OW-4C for detailed stratigraphy.



ELEVATION - TOP OF RISER CASING

SURFACE CASING
DIA: 8 3/8-in OD x 5-ft long
TYPE: Steel w/ lockable lid

BOTTOM OF SURFACE CASING

BACKFILL MATERIAL
TYPE: Cement-bentonite grout
Bottom 5-8 ft: bentonite slurry

RISER CASING
DIA: 4-inch ID
TYPE: Sch. 40 PVC

TOP OF SEAL — 107

ANNULAR SEAL
TYPE: #0/30 fine sand (RMC Lonestar Monterey)

110

TOP OF FILTER PACK

FILTER PACK
TYPE: #3 coarse sand (RMC Lonestar Monterey)

TOP OF SCREEN — 113

SCREEN
DIA 4-inch ID TYPE Sch. 40 PVC
OPENINGS WIDTH 0.020 inch
TYPE Transverse machine cut

BOTTOM OF SCREEN

BOTTOM OF SUMP — 145

BOTTOM OF HOLE — 147

HOLE DIA 12 inch

Appendix D

Well Development Logs

WELL DEVELOPMENT

PROJECT	WELL NO.
EPA ARCSWEST	DW-1A
JOB NO. 20376.028/043 — SITE Front Unfertilized	PREPARED BY C-Oli

METHOD

- ✓ PUMP: submersible
- ✓ BAILER: 3" dia × 10'
- GAS: _____
- ✓ OTHER: 3½" dia swab

DEVELOPMENT CRITERIA

Clear & free of sediment if possible

REMARKS.

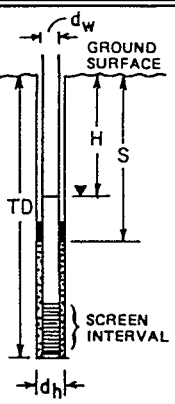
8/3 developer was Alan Harrison of Water Development
8/11 developer was Danny Vanderbergh of Water Development

HOLE DIAMETER d_h = 1.0'

WELL CASING
INSIDE DIAMETER $d_w ID$ = 0.33'
OUTSIDE DIAMETER $d_w OD$ = 0.33'

DEPTH TO:
WATER LEVEL b.g.s. H = 28.7
BASE OF SEAL S = 39
BASE OF WELL TD = 59

EST. FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi \left(\frac{d_w ID}{2}\right)^2 (TD - H) = 3.14 \left(\frac{0.33}{2}\right)^2 (59 - 28.7) =$ 2.6 ft^3

FILTER PACK PORE VOLUME $= V_f = \pi \left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_w OD}{2}\right)^2\right] (TD - (S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14 \left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33}{2}\right)^2\right] (59 - 39)(0.3) =$ 4.2 ft^3

TOTAL WELL VOLUME $= V_T = V_f + V_a = 2.6 + 4.2 =$ 6.8 $ft^3 \times 7.48 =$ 51 gal.

DEVELOPMENT LOG:

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS:
8/3	14:33	15:48	bailer	140 gal	140					bailed, dry swabbed, bailed dry
"		16:00	bailer	70	210					bailed dry
"		16:18	bailer	45	255	5.0				bailed dry
8/11	09:50	11:00	bailer	100	355					3½" bailer had no pressure
"	11:25	12:35	pump	150	505	9.9				2.2 gpm → ~ 4.3' drawdown
										slightly cloudy, no sediment

WELL DEVELOPMENT

PROJECT	WELL NO.
EPA ARCSWEST	OW-1B
JOB NO. 20376.028/043	SITE Frontier fertilizer
	PREPARED BY C.O.B.

METHOD

- ✓ PUMP: Grundfos Redi-flo II 2¾" OD
- ✓ BAILER: 3" dia × 10'
- GAS: ____
- ✓ OTHER: 3½" dia. swab

DEVELOPMENT CRITERIA

Clear and free of sediment if possible

REMARKS.

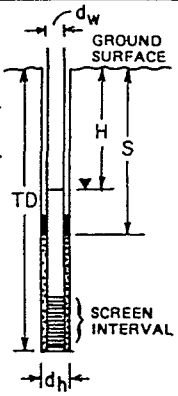
8/3 developer was Alan Hanson of Water Development
8/4 developer was Danny Vanderbiesen of Water Development

HOLE DIAMETER d_h = 1.0'

WELL CASING
INSIDE DIAMETER d_wID = 0.33'
OUTSIDE DIAMETER d_wOD = 0.33'

DEPTH TO:
WATER LEVEL bgs H = 43.8
BASE OF SEAL S = 65
BASE OF WELL TD = 90

EST. FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi\left(\frac{d_wID}{2}\right)^2 (TD-H) = 3.14\left(\frac{0.33}{2}\right)^2(90-43.8) =$ 4.0 ft³

FILTER PACK PORE VOLUME $= V_f = \pi\left[\left(\frac{d_h}{2}\right)^2-\left(\frac{d_wOD}{2}\right)^2\right](TD-(S\text{ or }H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14\left[\left(\frac{1.0}{2}\right)^2-\left(\frac{0.33}{2}\right)^2\right](90-65)(0.3) =$ 5.2 ft³

TOTAL WELL VOLUME $= V_T = V_f + V_a =$ 9.0 + 5.2 = 9.2 ft³ × 7.48 = 69 gal.

DEVELOPMENT LOG:

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS:
8/3	11:31	12:40	bailer	65 gal	65					muddy & opaque, sediment
"	13:08	13:12	pump	35 gal	100					4.8 gpm, pumped dry
										slow recovery (0.1/min)
"		15:48		19 gal	119					pumped dry opaque / sediment
"		16:00		27 gal	146	2.1				pumped dry opaque / sediment
8/11	11:15	12:48	bailer	120 gal	266	3.9				3" bailer. Last two were
										not full. Cloudy, some fines

WELL DEVELOPMENT

PROJECT	WELL NO.
EPA ARCS WEST	OW-1C
JOB NO. 20376.028/043 — SITE Frontier Fertilizer	PREPARED BY C.Obi

METHOD

- ✓ PUMP: Grundfos Rock Flow II 2¾" OD
- ✓ BAILER: 3" dia x 10'
- GAS: ____
- ✓ OTHER: 3½" dia swab

DEVELOPMENT CRITERIA

Clear & free of sediment if possible

REMARKS

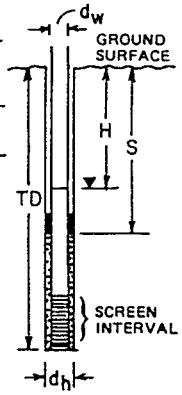
Alan Harrison of ~~Layne Environment~~ Water Development was developer.

HOLE DIAMETER d_h = 1.0'

WELL CASING
INSIDE DIAMETER d_wID = 0.33'
OUTSIDE DIAMETER d_wOD = 0.33'

DEPTH TO:
WATER LEVEL b.g.s. H = 47.3'
BASE OF SEAL S = 108'
BASE OF WELL TD = 139'

EST. FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi \left(\frac{d_w ID}{2}\right)^2 (TD - H) = 3.14 \left(\frac{0.33}{2}\right)^2 (139 - 47) =$ 7.9 ft^3

FILTER PACK PORE VOLUME $= V_f = \pi \left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_w OD}{2}\right)^2\right] (TD - (S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14 \left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33}{2}\right)^2\right] (139 - 108)(0.3) =$ 6.5 ft^3

TOTAL WELL VOLUME $= V_T = V_f + V_a = 7.9 + 6.5 =$ 14.4 $ft^3 \times 7.48 =$ 108 gal.

DEVELOPMENT LOG:

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS:
8/3	08:31	09:26	bailer	50 gal	50					muddy & opaque, surveyed
"	10:10	10:38	pump	523 gal	573	5.3				12.8 gpm, 1.06' drawdown
										slightly cloudy, no sediment

WELL DEVELOPMENT

PROJECT	EPA ARCSWEST
WELL NO	OW-2A
JOB NO	20576.028/043
SITE	Frontier Fertilizer
PREPARED BY	C. Oi

METHOD

- ✓ PUMP 3½" dia
- ✓ BAILER 3½" dia × 8½'
- GAS
- ✓ OTHER swab

DEVELOPMENT CRITERIA

Clear and free of sediment if possible

REMARKS

Developer was Danny Vandenscegh of Water Development

HOLE DIAMETER d_h = 1.0

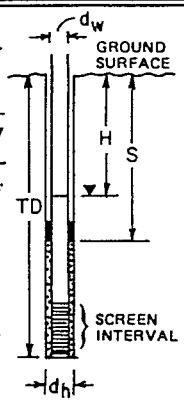
WELL CASING
INSIDE DIAMETER d_wID = 0.33'
OUTSIDE DIAMETER d_wOD = 0.33'

DEPTH TO WATER LEVEL H = 31.6'

BASE OF SEAL S = 36

BASE OF WELL TD = 61

EST FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi\left(\frac{d_wID}{2}\right)^2(TD-H) = 3.14\left(\frac{0.33'}{2}\right)^2(61 - 31.6) = 2.5$

FILTER PACK PORE VOLUME $= V_f = \pi\left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_wOD}{2}\right)^2\right](TD-(S\text{ or }H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14\left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33'}{2}\right)^2\right](61-36)(0.3) = 5.2$

TOTAL WELL VOLUME $= V_T = V_f + V_a = 2.5 + 5.2 = 7.7\ ft^3 \times 7.48 = 58$ gal.

DEVELOPMENT LOG					CUMULATIVE TOTAL REMOVED		WATER CHARACTER			COMMENTS
DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	GAL/LITERS	WELL VOLUMES	pH	CONDUCTIVITY	TURBIDITY	
3/8	16 12	17 26	bailer	70 gal	70					3½" bailer has no problem
										muddy and opaque
"	17.26	18 06	pump	132 gal	202	3.5				3.3 gpm → 9.28' drawdown
										and falling slowly
										(~0.02'/min)
										slightly cloudy, no sediment

WELL DEVELOPMENT

PROJECT	WELL NO
EPA ARCS WEST	OW-23
JOB NO: 20376.028/043 — SITE: Frontier Fertilizer	PREPARED BY: C. Oh

METHOD

- ✓ PUMP: Submersible
- ✓ BAILER: $3\frac{1}{2}'' \times 8\frac{1}{2}'$
- GAS: ____
- ✓ OTHER: Swab

DEVELOPMENT CRITERIA

Clear & sediment free if possible

REMARKS

Developer was Danny Vandenhoegen of Water Development

HOLE DIAMETER d_h = 10'

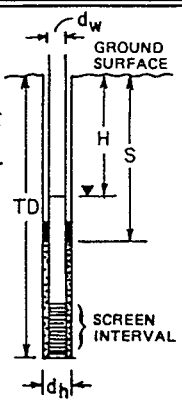
WELL CASING
INSIDE DIAMETER d_wID = 0.33'
OUTSIDE DIAMETER d_wOD = 0.33'

DEPTH TO WATER LEVEL b.g.s. H = ~~47.6~~ 46

BASE OF SEAL S = 62

BASE OF WELL TD = 111

EST FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi\left(\frac{d_wID}{2}\right)^2(TD-H) = 3.14\left(\frac{0.33'}{2}\right)^2(111-\cancel{47.6}\ 46) =$ 5.6

FILTER PACK PORE VOLUME $= V_f = \pi\left[\left(\frac{d_h}{2}\right)^2-\left(\frac{d_wOD}{2}\right)^2\right](TD-(S\text{ or }H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14\left[\left(\frac{1.0}{2}\right)^2-\left(\frac{0.33}{2}\right)^2\right](111-62)(0.3) =$ 10.3

TOTAL WELL VOLUME $= V_T = V_f + V_a = 5.6 + 10.3 =$ ~~16.0~~ 15.9 $ft^3 \times 7.48 =$ ~~120~~ 119 gal.

DEVELOPMENT LOG					CUMULATIVE TOTAL REMOVED		WATER CHARACTER			COMMENTS
DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	GAL/LITERS	WELL VOLUMES	pH	CONDUCTIVITY	TURBIDITY	
8/9	11:35	13:03	bailer	65 gal	65					$3\frac{1}{2}''$ bailer ~1' above bottom
"	14:12	14:41	pump							9.8 gpm → 2.45' drawdown
										clear, no sediment
"	14:41	14:57	pump	492 gal	557	4.7				10 gpm → 5.38' drawdown
										and falling, clearing water
										no sediment

WELL DEVELOPMENT

PROJECT	WELL NO.
EPA ARCSWEST	OW-2C
JOB NO. 20376.028/043 — SITE Frontier Fertilizer	PREPARED BY C-Obi

METHOD

- ✓ PUMP: Submersible 3½" dia × 8½'
- ✓ BAILER: 3" dia × 8½'
- GAS: ____
- ✓ OTHER: Swab

DEVELOPMENT CRITERIA

Clear and free of sediment if possible

REMARKS

Developer was Danny Vanderboegh of Water Development

HOLE DIAMETER d_h = 1.0'

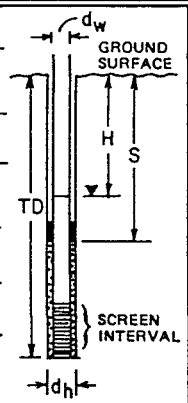
WELL CASING
INSIDE DIAMETER d_wID = 0.33'
OUTSIDE DIAMETER d_wOD = 0.33'

DEPTH TO WATER LEVEL H = 45.1

BASE OF SEAL S = 111

BASE OF WELL TD = 140

EST. FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi \left(\frac{d_w ID}{2}\right)^2 (TD - H) = 3.14 \left(\frac{0.33}{2}\right)^2 (140 - 45.1) =$ 3.1 ft³

FILTER PACK PORE VOLUME $= V_f = \pi \left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_w OD}{2}\right)^2\right] (TD - (S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14 \left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33}{2}\right)^2\right] (140 - 111)(0.3) =$ 6.1 ft³

TOTAL WELL VOLUME $= V_T = V_f + V_a =$ 8.1 + 6.1 = 14.2 ft³ × 7.48 = 106 gal.

DEVELOPMENT LOG.

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	CONDUCTIVITY	TURBIDITY	COMMENTS:
8/4	12:20	14:27	bailer	85 gal	85					muddy + opaque, solarized
"	15:20		pump	157 gal	242					3½" bailer sticks ~15' above bottom
										3" bailer has no problem
										pump burns out
8/8	08:55	09:43	pump	565 gal	807	7.6				clear + sediment free
										13 gpm → 3.2' drawdown ?

WELL DEVELOPMENT

PROJECT	WELL NO.
EPA ARCS WEST	OW-3A
JOB NO: 20372.028/043 — SITE: Frontier fertilizer	PREPARED BY: C.O.D.

METHOD

- ✓ PUMP: Submersible
- ✓ BAILER: $3\frac{1}{2}'' \times 8\frac{1}{2}''$
- GAS: ____
- ✓ OTHER: Swab

DEVELOPMENT CRITERIA

Clear and sediment free if possible

REMARKS

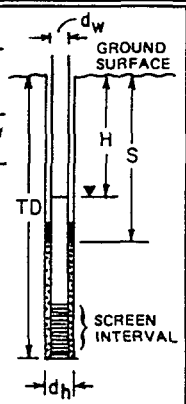
Developer was Danny Vandenbergh of Water Development

HOLE DIAMETER d_h = 10"

WELL CASING
INSIDE DIAMETER $d_w ID$ = 0.33'
OUTSIDE DIAMETER $d_w OD$ = 0.33'

DEPTH TO:
WATER LEVEL b.g.s. H = 29.9
BASE OF SEAL S = 37
BASE OF WELL TD = 51

EST. FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION:

CASING VOLUME $= V_c = \pi \left(\frac{d_w ID}{2}\right)^2 (TD - H) = 3.14 \left(\frac{0.33}{2}\right)^2 (51 - 29.9) =$ 1.8

FILTER PACK PORE VOLUME $= V_f = \pi \left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_w OD}{2}\right)^2\right] (TD - (S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14 \left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33}{2}\right)^2\right] (51 - 37)(0.3) =$ 2.[illegible]

TOTAL WELL VOLUME $= V_T = V_f + V_a = 1.8 + 2.9 =$ 4.7 $ft^3 \times 7.48 =$ 35 gal.

DEVELOPMENT LOG:

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS:
8/9	15:42	16:45	bailer	90 gal	90				-	$3\frac{1}{2}''$ bailer no problem, s[illegible]
										muddy opaque
"	17:12	18:00	pump	250	340	9.7				cloudy, no sediment
										5.5 gpm → 2.8' drawdown
										and slowly fall[illegible]

WELL DEVELOPMENT

PROJECT	WELL NO.
EPA ARCSWEST	DW-3B
JOB NO. 20372 029/043 — SITE Frontier Fertilizer	PREPARED BY C-Ob.

METHOD

- ✓ PUMP: submersible
- ✓ BAILER: 3½" x 8½'
- CAS: _____
- ✓ OTHER: swab

DEVELOPMENT CRITERIA

Clear and sediment free if possible

REMARKS

Developer was Danny Vanderbeek of Water Development

HOLE DIAMETER d_h = 1.0'

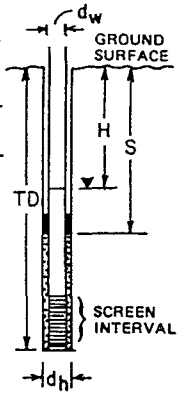
WELL CASING
INSIDE DIAMETER $d_w ID$ = 0.33'
OUTSIDE DIAMETER $d_w OD$ = 0.33'

DEPTH TO WATER LEVEL b.g.s. H = 30.7

BASE OF SEAL S = 62.3

BASE OF WELL TD = 86

EST FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi \left(\frac{d_w ID}{2}\right)^2 (TD - H) = 3.14 \left(\frac{0.33}{2}\right)^2 (86 - 30.7) =$ 4.7

FILTER PACK PORE VOLUME $= V_f = \pi \left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_w OD}{2}\right)^2\right] (TD - (S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14 \left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33}{2}\right)^2\right] (86 - 62.3)(0.3) =$ 5.0

TOTAL WELL VOLUME $= V_T = V_f + V_a =$ 4.7 + 5.0 = 9.7 ft^3 x 7.48 = 73 gal.

DEVELOPMENT LOG

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS
3/9	11:00	12:40	bailer	90 gal	90					3½" bailer has no problem pulling
"	13:01	14:43	pump	210	300	4.1				but no sediment
										cloudy, no sediment
										1.65 gpm → 19.9' drawdown
										2.2 gpm → 27.9' drawdown
										and slowly falling

WELL DEVELOPMENT

PROJECT	EPA ARCSWEST
WELL NO	8W-3C
JOB NO	20312-028/043
SITE	Frontier fertilizer
PREPARED BY	C. Oh

METHOD

- ✓ PUMP: submersible
- ✓ BAILER: 3½" dia × 8½"
- CAS: _____
- ✓ OTHER: 3½" Swab

DEVELOPMENT CRITERIA

Clear and sediment free if possible

REMARKS

Developer was Danny Vandenberg of Water Development

HOLE DIAMETER d_h = 1.0'

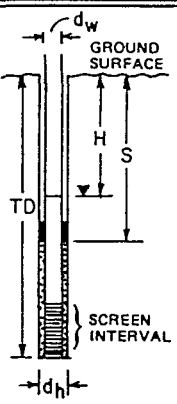
WELL CASING
INSIDE DIAMETER d_wID = 0.33'
OUTSIDE DIAMETER d_wOD = 0.33'

DEPTH TO WATER LEVEL b.g.s H = 46.3

BASE OF SEAL S = 99.5

BASE OF WELL TD = 135

EST FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi \left(\frac{d_wID}{2}\right)^2 (TD - H) = 3.14 \left(\frac{0.33'}{2}\right)^2 (135 - 46.3) =$ 7.5

FILTER PACK PORE VOLUME $= V_f = \pi \left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_wOD}{2}\right)^2\right] (TD - (S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14 \left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33}{2}\right)^2\right] (135 - 99.5)(0.3) =$ 7.5

TOTAL WELL VOLUME $= V_T = V_f + V_a =$ 7.5 + 7.5 = 15 ft^3 × 7.48 = 112 gal.

DEVELOPMENT LOG

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS
8/7	07:36	09:00	bailer	75 gal	75					3½" bailer has no pronum
"	09:29	09:49	pump							10.4 gpm → 0.74' drawdown
"	09:49	10:09	pump	480	555	5.0				13 gpm → 0.88' drawdown
										slightly cloudy, no sediment

WELL DEVELOPMENT

PROJECT	WELL NO.
EPA ARCSWEST	OW-4A
JOB NO 20372.028/043 — SITE Frontier fertilizer	PREPARED BY C. Oki

METHOD

- ✗ PUMP
- ✓ BAILER 3½" x 8½'
- GAS
- ✓ OTHER Swab

DEVELOPMENT CRITERIA

Clear and sediment free if possible

REMARKS

Developer was Danny Vanderkoegh of Water Development

HOLE DIAMETER d_h = 1.0

WELL CASING INSIDE DIAMETER d_wID = 0.33

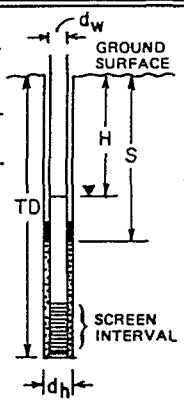
OUTSIDE DIAMETER d_wOD = 0.33

DEPTH TO WATER LEVEL b.g.s. H = 28.5

BASE OF SEAL S = 35

BASE OF WELL TD = 49

EST. FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi \left(\frac{d_wID}{2}\right)^2 (TD-H) = 3.14\left(\frac{0.33}{2}\right)^2(49-28.5) =$ 1.8

FILTER PACK PORE VOLUME $= V_f = \pi\left[\left(\frac{d_h}{2}\right)^2-\left(\frac{d_wOD}{2}\right)^2\right](TD-(S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14\left[\left(\frac{1.0}{2}\right)^2-\left(\frac{0.33}{2}\right)^2\right](49-35)(0.3) =$ 2.9

TOTAL WELL VOLUME $= V_T = V_f + V_a =$ 1.8 + 2.9 = 4.7 ft^3 x 7.48 = 35 gal.

DEVELOPMENT LOG

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS:
8/10	13:55	16:15	bailer	300 gal	300	8.6				3½" bailer has no plunger
										muddy, sediment
										clears up Bailing causes
										only ~2' drawdown with
										quick recovery

WELL DEVELOPMENT

PROJECT	WELL NO.
EPA ARCSWEST	OW-4B
JOB NO 20372.028/0't3 — SITE Frontier Fertilizer	PREPARED BY C. Oki

METHOD

- PUMP
- ✓ BAILER $3\frac{1}{2}'' \times 8\frac{1}{2}'$
- GAS
- ✓ OTHER Swab

DEVELOPMENT CRITERIA

Clear and sediment free if possible

REMARKS

Developer was Danny Vandenbrugh of Water Development

HOLE DIAMETER d_h = 1.0'

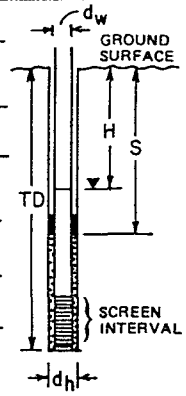
WELL CASING
INSIDE DIAMETER $d_w ID$ = 0.33
OUTSIDE DIAMETER $d_w OD$ = 0.33

DEPTH TO WATER LEVEL bgs. H = 34.4

BASE OF SEAL S = 62

BASE OF WELL TD = 87

EST. FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION

CASING VOLUME $= V_c = \pi \left(\frac{d_w ID}{2}\right)^2 (TD - H) = 3.14 \left(\frac{0.33}{2}\right)^2 (87 - 34.4) =$ 4.5

FILTER PACK PORE VOLUME $= V_f = \pi \left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_w OD}{2}\right)^2\right] (TD - (S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14 \left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33}{2}\right)^2\right] (87 - 62)(0.3) =$ 5.2

TOTAL WELL VOLUME $= V_T = V_f + V_a =$ 4.5 + 5.2 = 9.7 ft^3 x 7.48 = 73 gal.

DEVELOPMENT LOG.

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS:
3/10	16 45	18:13	bailer	110 gal	110	1.5				$3\frac{1}{2}'$ bailer is tight 20' above bottom
										and at very bottom
										muddy quickly improves
										to cloudy, no sediment
										last bailers were not full
3/11	07:08	08:34	bailer	150 gal	260	3.6				last bailers were not full
										clearing, v. little fine sand

WELL DEVELOPMENT

PROJECT	EPA ARCSWEST
WELL NO	OW-4C
JOB NO	20372.028/043
SITE	Frontier Fertilizer
PREPARED BY	C. Obi

METHOD

- ✓ PUMP: submersible
- ✓ BAILER: 3½" x 8½'
- GAS: _____
- ✓ OTHER: Swab

DEVELOPMENT CRITERIA

Clear and sediment free if possible

REMARKS

Developer was Danny Vandenbergh of Water Development

HOLE DIAMETER d_h = 10

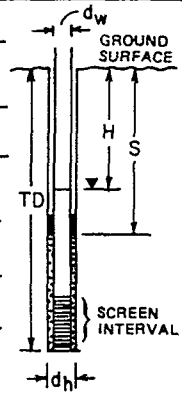
WELL CASING
INSIDE DIAMETER $d_w ID$ = 0.33
OUTSIDE DIAMETER $d_w OD$ = 0.33

DEPTH TO WATER LEVEL bgs H = 46.3?

BASE OF SEAL S = 110

BASE OF WELL TD = 145

EST FILTER PACK POROSITY P = 30%



WELL VOLUME CALCULATION-

CASING VOLUME $= V_c = \pi \left(\frac{d_w ID}{2}\right)^2 (TD - H) = 3.14 \left(\frac{0.33}{2}\right)^2 (145 - 46.3) =$ 7.1

FILTER PACK PORE VOLUME $= V_f = \pi \left[\left(\frac{d_h}{2}\right)^2 - \left(\frac{d_w OD}{2}\right)^2\right] (TD - (S \text{ or } H)^*)(P) =$

(* if S>H use S, if S<H use H.)

$3.14 \left[\left(\frac{1.0}{2}\right)^2 - \left(\frac{0.33}{2}\right)^2\right] (145 - 110)(0.3) =$ 7.3

TOTAL WELL VOLUME $= V_T = V_f + V_a = 8.4 + 7.3 =$ 15.7 $ft^3 \times 7.48 =$ 117 gal.

DEVELOPMENT LOG

DATE	TIME BEGUN	TIME FINISH	METHOD	WATER REMOVED	CUMULATIVE TOTAL REMOVED GAL/LITERS	CUMULATIVE TOTAL REMOVED WELL VOLUMES	WATER CHARACTER pH	WATER CHARACTER CONDUCTIVITY	WATER CHARACTER TURBIDITY	COMMENTS:
8/10	07:15	08:40	bailer	85 gal	85					3½" bailer has no p[illegible]
										muddy, little se[illegible]
										bailing caused much d[illegible]
"	09:16	11:29	pump	247 gal	332					2.2 gpm → ~54' d[illegible]
"	11:29	12:35	pump	170	502	4.3				2.6 gpm → ~61' d[illegible]
										slightly cloudy, [illegible]

Appendix E

Frontier Fertilizer Data Base

(Not provided with Draft Final RI dated August 1996)