

LONGHORN ARMY AMMUNITION PLANT

KARNACK, TEXAS

ADMINISTRATIVE RECORD

VOLUME 3 of 5

1989

**Bate Stamp Numbers
002570 - 003041**

Prepared for:

**Department of the Army
Longhorn Army Ammunition Plant
Marshall, Texas 75671-1059**

1995

**LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
ADMINISTRATIVE RECORD - CHRONOLOGICAL INDEX**

VOLUME 3 of 5

1989

**D. Title: Final Report - Phase I RCRA Facility Investigation (RFI)
Active Burning Ground and Unlined Evaporation Pond
Volume 4 - Appendixes L through BB**

Group(s): 2 (Partial)

Site(s): LHAAP-18 & LHAAP-24 Burning Ground / Washout Pond & Evaporation Pond

Location: Longhorn Army Ammunition Plant, Marshall, Texas

Agency: U.S. Army Corps Of Engineers, Fort Worth District

Author(s): U.S. Army Corps Of Engineers, Fort Worth District

Recipient: U.S. Army Corps Of Engineers, Huntsville Division

Date: July, 1989

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July 12, 1995

RCRA FACILITY INVESTIGATION
-FOR-
ACTIVE BURNING GROUND
-AND-
UNLINED EVAPORATION POND

PHASE I

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

VOLUME 4
(APPENDICES L THROUGH BB)

-PREPARED FOR-
U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

-PREPARED BY-
U.S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

JULY 1989

APPENDIX L

LOGS OF BORINGS AND WELL INSTALLATION DETAILS FOR
USAEHA, USATHAMA, AND USACE (CDM) MONITORING WELLS

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002572

PROJECT 38-26-0104 DATE 24 Jan 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
 DRILL RIG Acker II BORE HOLE 1
 Page 1 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
5	BS	Medium brown silty sand, fine in grain size.	Hit stone.
		Stone	Possible backfill for berm of pond.
	ST	Medium brown fine silty sand with some clay	Very moist
10			
		Tan fine silty sand with some clay	Wet - auger sat for 2 days before finishing.
	BS		
15		Medium brown silty sand with clay	Damp

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002573

DRILLING LOG

PROJECT 38-26-0104

DATE 24 Jan 80

LOCATION Longhorn AAP

DRILLERS 1LT Corbitt
Mr. Kestner

DRILL RIG Acker II

BORE HOLE 1
Page 2 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		Med brown silty sand with clay	WT
20			
25			
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002574

DRILLING LOG

PROJECT 38-26-0104DATE 24 Jan 80LOCATION Longhorn AAPDRILLERS LT Corbitt, Mr. KestnerDRILL RIG Acker IIBORE HOLE 1

Page 3 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
35		Medium brown silty sand with clay	
40			
	MB		
45			

DRILLING LOG

002575

DATE 24 Jan 80

DRILLERS LT Corbitt, Mr. Kestner

BORE HOLE 1

Page 4 of 4

[illegible]

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002576

DRILLING LOG

PROJECT 38-26-0104

DATE 24 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II

BORE HOLE 2

Page 1 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
5		Medium brown fine silty sand.	Fairly dry.
10	BS	Brick red fine silty sand with some clay	Fairly dry Getting wet
15		Tan fine silty sand with some clay	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002577

PROJECT 38-26-0104

DATE 24 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II

BORE HOLE 2

Page 2 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
20		Tan fine silty sand with some clay	Getting wet
25			WT
30		Light tan silty sand with very little clay	Wet

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002578

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
Top of berm
 DRILL RIG Acker II BORE HOLE 2
 Page 3 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
35		Light tan silty sand with very little clay	
40			
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002579

DRILLING LOG

PROJECT 38-26-0104DATE 24 Jan 80LOCATION Longhorn AAPDRILLERS LT Corbitt, Mr. KestnerTop of bermDRILL RIG Acker IIBORE HOLE 2

Page 4 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
50		Light tan silty sand with very little clay	Well 52' deep
55		Tan clay, medium plastic	
		Bottom of hole	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002580

DRILLING LOG

PROJECT 38-26-0104

DATE 25 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

North side of rocket. Wash rock.
Surface disturbed

DRILL RIG Acker II

BORE HOLE 3

Page 1 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
5		Medium brown fine silty sand.	Damp
	BS	Tan fine silty sand with some clay.	
10			
	BS		
15			Water running out of hole.

DRILLING LOG

002581

DATE 25 Jan 80

DRILLERS LT Corbitt, Mr. Kestner

North side of rocket. Wash rock.

Surface disturbed.

DRILL RIG Acker II

BORE HOLE 3

Page 2 of 4

SAMPLE TYPE		DEPTH	DESCRIPTION	REMARKS
BLOWS PER 6 IN.				
			Tan fine silty sand with some clay	
		20		
		25		
		30		

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002583

DRILLING LOG

PROJECT 38-26-0104

DATE 25 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

North side of Rocket. Wash rack.

Surface disturbed

DRILL RIG Acker II

BORE HOLE 3

Page 4 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
45		Medium brown silty clay.	Hangs to auger
50		Bottom of hole	WT

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002584

PROJECT 38-26-0104 DATE 26 Jan 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
10 feet to east side of road
 DRILL RIG Acker II BORE HOLE 4

Page 2 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
		Tan fine silty sand with some clay	
			Water.
			WT
20			
25			
30			

USAEHA Form 95, 12 Aug 74

Page 1 of 4 missing in all copies provided.

DRILLING LOG

PROJECT 38-26-0104

DATE 26 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

10 feet to east side of road

DRILL RIG Acker II

BORE HOLE 4

Page 3 of 4

DEPTH		SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
			Tan fine silty sand with some clay	
35		MB		
40				
45				

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002586

PROJECT 38-26-0104

DATE 26 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

10 feet to east side of road

DRILL RIG Acker II

BORE HOLE 4

Page 4 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		Tan fine silty sand with some clay	Hangs to auger
		Medium brown silty clay.	
		Bottom of hole	
50			
55			
60			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002587

PROJECT 38-26-0104

DATE 26 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II

BORE HOLE 5

Page 1 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
5		Gravel, reddish in color	Fairly dry
		Medium brown, silty sand	
	MB	Tan silty sand with some clay	
	MB	Brown fine sand silt	
	MB	Brick red fine silty sand with some clay.	
10			
15	MB 14-16'	Tan silty fine sand with clay.	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002588

PROJECT 38-26-0104

DATE 26 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II

BORE HOLE 5

Page 2 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
		Tan silty fine sand with clay	
20			
25			WT
30			Wet

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002589

PROJECT 38-26-0104

DATE 26 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II

BORE HOLE 5

Page 3 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
35		Tan silty fine sand with clay	
40			
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002590

PROJECT 38-26-0104 DATE 26 Jan 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
 DRILL RIG Acker II BORE HOLE 5
 Page 4 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
45		Medium brown silty clay.	Hangs to auger.
50			
55			
60		Bottom of hole	Well depth 60 feet

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002591

DRILLING LOG

PROJECT 38-26-0104

DATE 26 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II

BORE HOLE

6
Page 1 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		Medium brown silty sand.	Moist
5	BS	Brown silty sand	
10	BS	Brick red silty clay with fine sand	
		Light tan silty fine sand with some clay.	Moist
	BS		
15			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002592

PROJECT 38-26-0104 DATE 25 Jan 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
Top of berm
 DRILL RIG Acker II BORE HOLE 6
 Page 2 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
20		Light tan silty fine sand with some clay.	Water
25			
30	BS 29-31 ft	Light tan sandy silt	Water

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002593

PROJECT 28-26-0104

DATE 26 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II

BORE HOLE 6

Page 3 of 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
—	BS	Light tan sandy silt	
—			
—			
—			
—			
35			
—			
—			
—			
—			
40			
—			
—			
—			
45			
		Medium brown silty clay	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002594

DRILLING LOG

PROJECT 38-26-0104

DATE 26 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II

BORE HOLE 6

Page 4 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
50		Gray fine sandy clay	Well depth
55			
60		BOTTOM OF HOLE	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002595

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
Edge of Road
 DRILL RIG Acker II BORE HOLE 7
 Page 1 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
		Medium brown silty sand	
		Tan silty sand, fine	Moist Moist
5	BS		
10	BS		
15			Water

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002596

PROJECT 38-26-0104

DATE 27 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II

BORE HOLE 7

Page 2 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
	BS	Tan silty sand, fine	Moist
20			
30			Water
35			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002597

PROJECT 38-26-0104

DATE 27 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II

BORE HOLE 7

Page 3 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
40		Tan silty sand, fine	Moist
45		Tan fine silty sand w clay	
		Gray fine sandy clay	
50		BOTTOM OF HOLE	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002598

DRILLING LOG

PROJECT 38-26-0104

DATE 27 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II

BORE HOLE 7
Page 4 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
55			
60			Well depth

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
Top of Berm
 DRILL RIG Acker II BORE HOLE 8
 Page 1 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
5		Medium Brown silty sand; some clay	Moist
	MB		
10		Brown fine silty sand	
	MB		
15		Tan fine silty sand w some clay	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002600

DRILLING LOG

PROJECT 38-26-0104DATE 27 Jan 80LOCATION Longhorn AAPDRILLERS LT Corbitt, Mr. KestnerTop of BermDRILL RIG Acker IIBORE HOLE 8

Page 2 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
	MB	Tan fine silty sand, w some clay	
20			
	MB		
25			
		Medium to fine sandy silt	
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002601

PROJECT 38-26-0104

DATE 27 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II

BORE HOLE 8
Page 3 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
40			
45		Tan silty clay	
	MB		
50			

US ARMY ENVIRONMENTAL HYGIENE AGENCY.

DRILLING LOG

002602

PROJECT 38-26-0104

DATE 27 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II

BORE HOLE 8

Page 4 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
55		Tan silty clay	
		Gray sandy clay	
60		BOTTOM OF HOLE	Well depth

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002603

PROJECT 38-26-0104

DATE 28 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II

BORE HOLE 9

Page 1 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		Tan fine silty sand	
	MB		
5		Brown fine silty sand	
	MB		
10			
	MB		
		Tan fine silty sand w some clay	
	MB		
15			

002604

Page 2 of 4

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002605

PROJECT 38-26-0104

DATE 28 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II

BORE HOLE 9

Page 3 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		Tan fine silty sand w some clay	
35			
40			
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002606

DRILLING LOG

PROJECT 38-26-0104

DATE 28 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II

BORE HOLE 9

Page 4 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		tan fine silty sand w some clay	
		Brick red & gray silty clay	Wet
50			
55			Well depth
		Brown fine silty sand w clay	Dry
60		BOTTOM OF HOLE	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002607

PROJECT 38-26-0104

DATE 28 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II

BORE HOLE 10

Page 1 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
5		Brown silty sand	Moist
10		Tan fine silty sand w some clay	Moist
15			

002608

Page 2 of 4

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002609

PROJECT 38-26-0104

DATE 28 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II

BORE HOLE 10
Page 3 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
35			
40		Medium brown clay	
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002610

PROJECT 38-26-0104

DATE 28 Jan 80

LOCATION Longhorn AAP
Top of Berm

DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II

BORE HOLE 10

Page 4 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
	PB	Medium brown clay	
50			Well depth
55		BOTTOM OF HOLE	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002611

PROJECT 38-26-0104

DATE 28 Jan 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II

BORE HOLE 11

Page 1 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
5		Medium Brown silty sand	
10		Brick red firm silty sand	
15		Tan firm silty sand	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002612

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80
LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
DRILL RIG Acker II BORE HOLE 11'
Page 2 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
20		Tan firm silty sand	
25			Getting wet
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002613

PROJECT 38-26-0104DATE 28 Jan 80LOCATION Longhorn AAPDRILLERS LT Corbitt, Mr. KestnerDRILL RIG Acker IIBORE HOLE 11

Page 3 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
35		Tan firm silty sand	
40			
45			

DRILLING LOG

002614

DATE 28 Jan 80

DRILLERS

BORE HOLE 11

Page 4 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
		Tan firm silty sand	Dry
		Brick red silty clay	
50		BOTTOM OF HOLE	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002615

DRILLING LOG

PROJECT 38-26-0104

DATE 2 Feb 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestne

Old Road Bed to Burning Cage

DRILL RIG Acker II

BORE HOLE 21

Page 1 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		Brick red gravel & silty sand w some clay	Damp
		Brown silty sand w clay	
		Tan silty sand w clay	
5		Brick red silty sand w clay	
		Tan silty sand	
10		Dark tan silty sand w some clay	
15			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002616

PROJECT 38-26-0104 DATE 2 Feb 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
Old Road Bed to Burning Cage
 DRILL RIG Acker II BORE HOLE 21
 Page 2 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
20		Dark tan silty sand w some clay	Getting wet; Water level
25			
30			Wet

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002617

PROJECT 38-26-0104 DATE 2 Feb 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
Old Road Bed to Burning Cage
 DRILL RIG Acker II BORE HOLE 21

Page 3 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
35		Dark tan silty sand w some clay	
40		Tan intermixed w gray silty clay	
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002618

DRILLING LOG

PROJECT 38-26-0104DATE 2 Feb 80LOCATION Longhorn AAPDRILLERS LT Corbitt, Mr. KestnerOld Road Bed to Burning CageDRILL RIG Acker IIBORE HOLE 21

Page 4 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
		Tan intermixed w-gray silty clay	
50		BOTTOM OF HOLE	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002619

PROJECT 38-26-0104

DATE 2 Feb 80

LOCATION Longhorn AAP

DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II

BORE HOLE 22

Page 2 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
20		Tan silty sand	
25			
30			
			Water

DRILLING LOG

PROJECT 38-26-0104 DATE 2 Feb 80
LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
DRILL RIG Acker II BORE HOLE 22

Page 1 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		Medium brown silty sand w some clay	
		Brown silty sand w some clay	
5			
		Tan silty sand	
10			
15			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

002621

DRILLING LOG

PROJECT 38-26-0104 DATE 2 Feb 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
 DRILL RIG Acker II BORE HOLE 22
 Page 3 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
35		Tan silty sand	Hangs to auger
40		Gray sandy clay	
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

002622

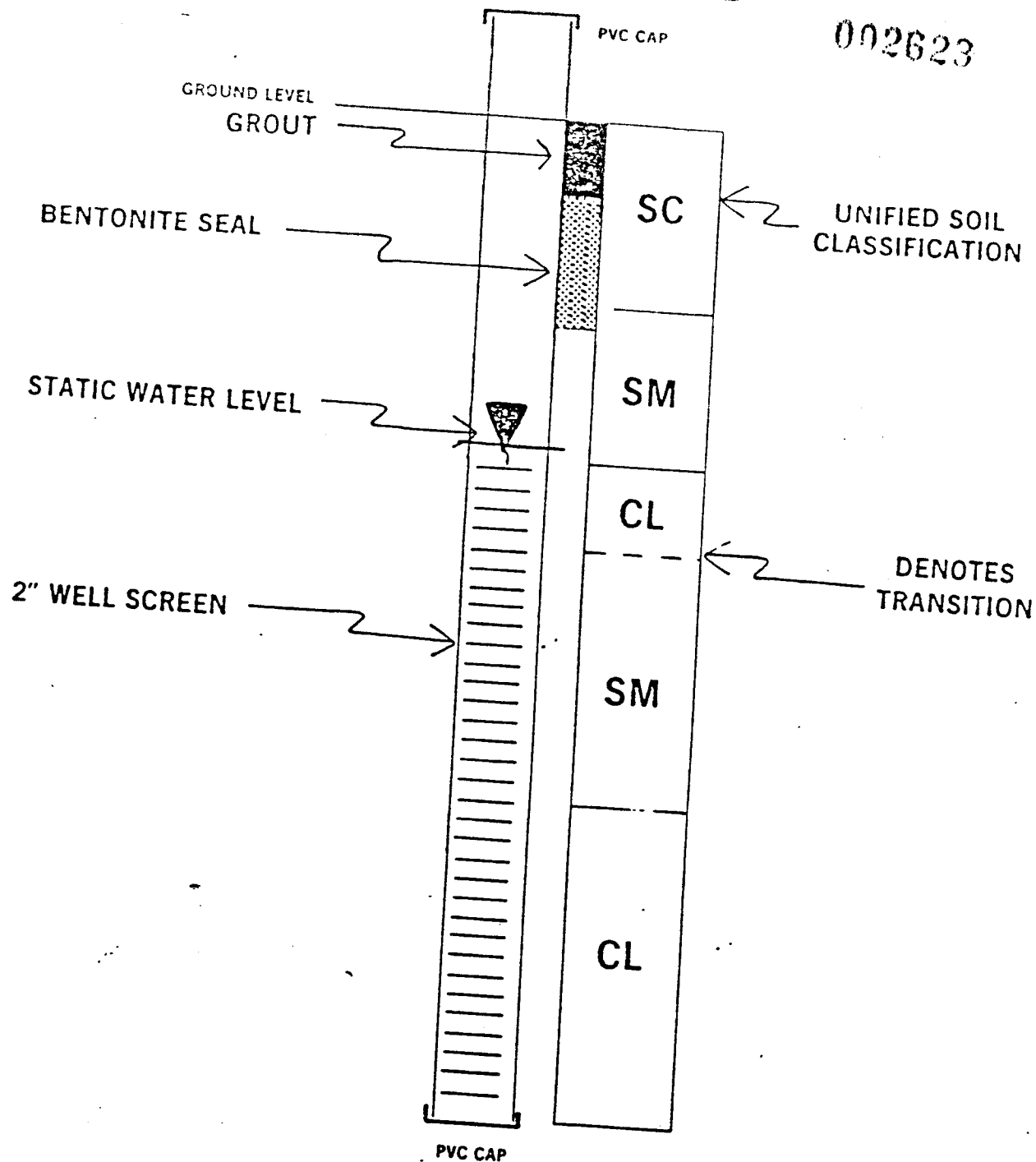
PROJECT 38-26-0104 DATE 2 Feb 80
 LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner
 DRILL RIG Acker II BORE HOLE 22

Page 4 of 4

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
		Gray sandy clay	Hangs to auger
50		BOTTOM OF HOLE	

TYPICAL WELL LEGEND

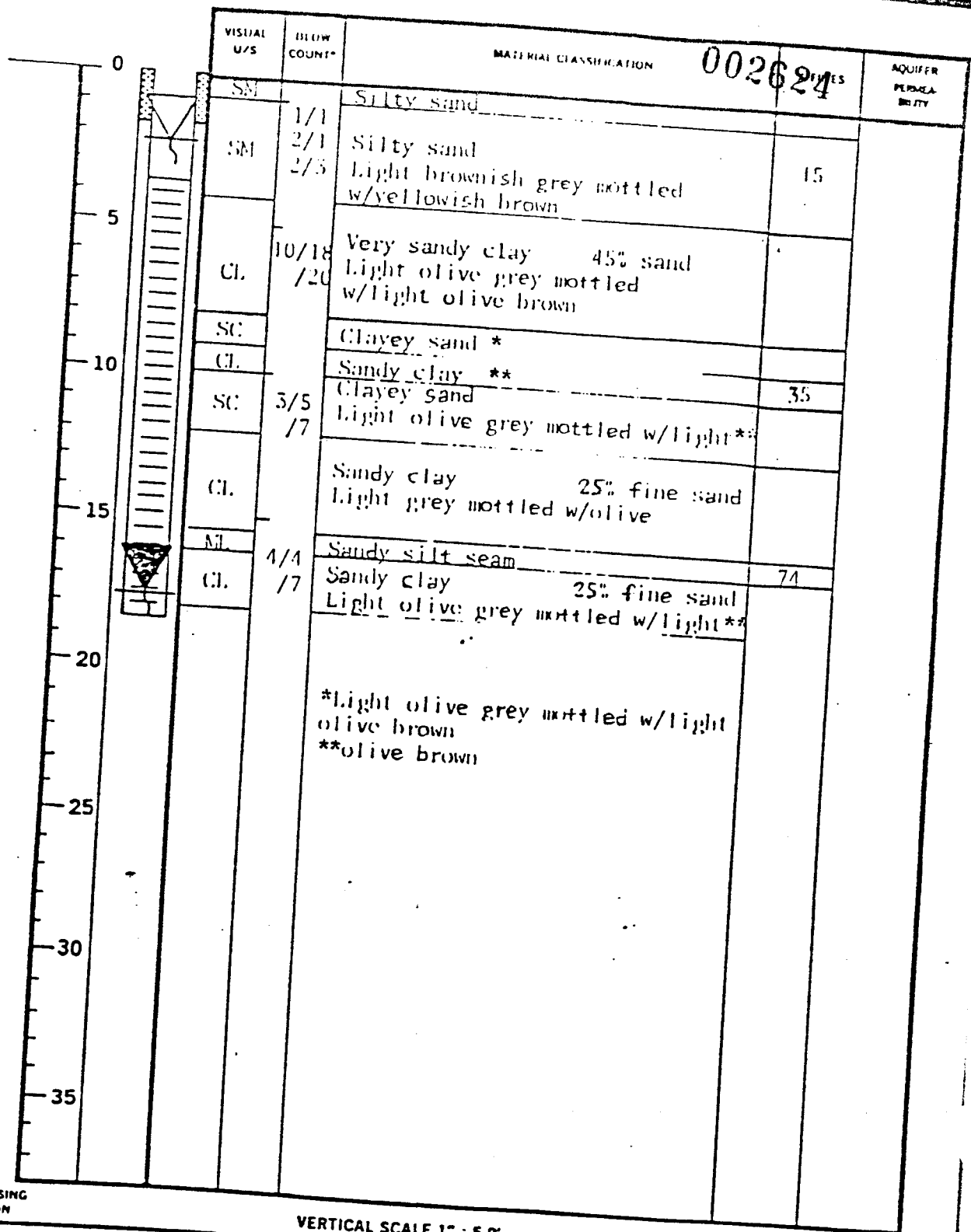
002623



SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

CONTAMINATION SURVEY
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND



*BLOWS PER 6 INCH USING
18 24 or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

WELL 101 DATE DRILLED 6/24/82
STUDY AREA Active Burning Grounds
ELEVATION TOP OF STEEL CASING = 197.28
ELEVATION TOP OF PVC RISER = 197.09
ELEVATION OF GROUND SURFACE = 195.84

SOURCE ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

CONTAMINATION SURVEY
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND

002625

0	VISUAL U/S	BLOW COUNT*	MATERIAL CLASSIFICATION	% FINES	AQUIFER PERME- ABILITY
	SM		Silty sand		
	SM	1/2	Silty sand		
		2/2	Yellowish red		
	SM- SC	2/5	Slightly clayey silty sand	12	
5			15% clay Olive brown 15% silt	30	
		3/6	Sandy clay	25% fine sand	
	CL	0/10 12/12	Light brownish grey mottled w/yellowish brown		
10			Clayey sand		
	SC		Light brownish grey mottled w/ yellowish brown	20	
15			Silty sand w/seams	80% silty sand mixture	
	SM + CL	3/3 3/7 5/4	of clay Light yellowish brown Sandy clay	71.2 50.6 32.7	9.9 x 10 ⁻⁵ ft/min
20			40% fine sand		
	CL	2/2	Sandy clay	40% fine sand	
	SM	3/6	Light brownish grey mottled with*		
		8/9	Silty sand seam	25	
25	CL		Sandy clay		
			Light brownish grey mottled w/yellowish brown		
	CL	5/6	Clay w/seam of iron rock		
		7/15 /20	Sandy clay w/seams of silty sand		
30	CL+ SM		Light grey Olive yellow	70% clay 30% silty sand	
	CL	9/7 /8	Sandy clay	63.6	
35			* with yellowish brown ** Silt sand mixture (ML-SM)		

*BLOWS PER 6 INCH USING
18, 24, or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

WELL 102 DATE DRILLED 6/25/82
STUDY AREA Active Burning Grounds

ELEVATION TOP OF STEEL CASING = 194.53
ELEVATION TOP OF PVC RISER = 193.63
ELEVATION OF GROUND SURFACE = 191.34

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

CONTAMINATION SURVEY
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND

002626

0 5 10 15 20 25 30 35	VISUAL U/S	BLOW COUNT*	MATERIAL CLASSIFICATION	% FINES	AQUIFER PERME- ABILITY
	SM-SP	4/5 4/5	Silty sand Yellowish brown	10	
	CL	7/8 5/8	Slightly sandy clay 20% fine sand Pale brown mottled w/yellowish brown		
	CL	7/11 11/11	Slightly sandy clay 10% fine sand Pale brown mottled w/yellowish brown		
	SM	5/6 7/9 8/8	Silty sand Pale brown mottled with yellowish brown	15	
	ML		Sandy clay & silt 20% fine sand mixture Pale brown w/yellowish brown		
	SM	8/8	Silty sand		
	CL	8/8	Yellowish brown	23.0	
	CL	12/20	Clay w/silty sand seams	53.2	
	ML-SM		Sandy silt mixture Pale brown mottled w/yellowish brown		
	CL	3/4	Clay		
	SM	10/20	Silty sand Pale brown mottled w/yellowish brown	26.3	
	CL	3/5 5/5 5/5	Clay Pale brown & yellowish red		

*BLOWS PER 6 INCH USING
18, 24, or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

WELL 109 DATE DRILLED 6/10/82
STUDY AREA Active Burning Grounds

ELEVATION TOP OF STEEL CASING = 196.90

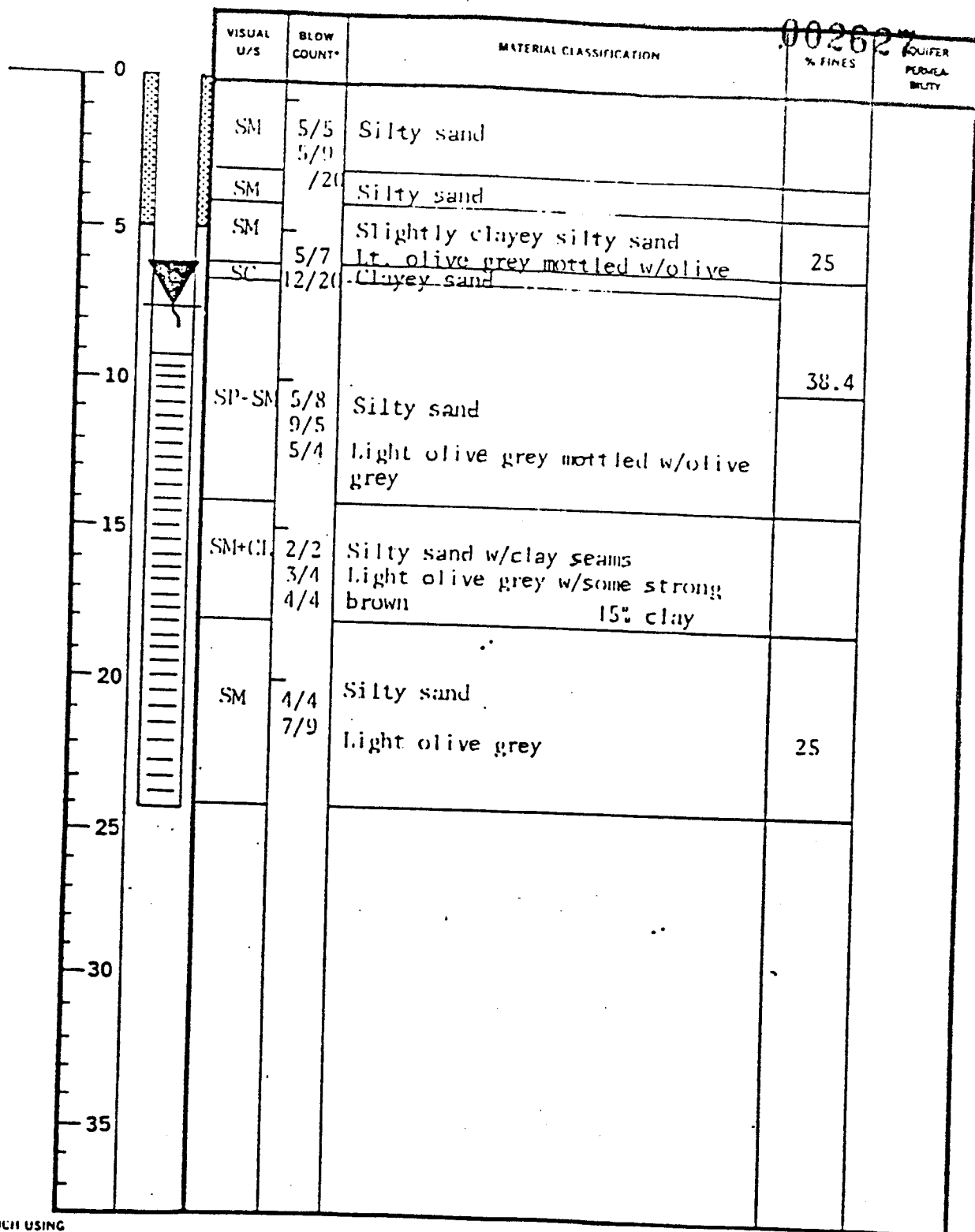
ELEVATION TOP OF PVC RISER = 196.72

ELEVATION OF GROUND SURFACE = 193.94

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. 1983

CONTAMINATION SURVEY
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND



*BLOWS PER 6 INCH USING
10, 24 or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

WELL 120 DATE DRILLED 6/26/82
 STUDY AREA Active Burning Grounds
 ELEVATION TOP OF STEEL CASING = 183.08
 ELEVATION TOP OF PVC RISER = 182.85
 ELEVATION OF GROUND SURFACE = 216.28

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

CONTAMINATION SURVEY
 LONGHORN ARMY AMMUNITION PLANT
 MARSHALL, TEXAS
 U. S. ARMY TOXIC AND HAZARDOUS
 MATERIALS AGENCY
 ABERDEEN PROVING GROUND, MARYLAND

002628

002628

	VISUAL U/S	BLOW COUNT*	MATERIAL CLASSIFICATION	% FINES	AQUIFER PERME- ABILITY	
0	SM	2/1	Silty sand *	15		
	SC	2/4 4/6	Clayey sand Light yellowish brown mottled w/yellowish brown	20		
5	SM		Slightly silty sand	10		
	CL	2/3	Seam of sandy clay	32.2		
	SC	7/8	Clayey sand **			
	CL	9/9	Seam of sandy clay ¹ 70% fine sand		1.2 x 10 ⁻³ ft/min	
	SC		Clayey sand			
10	SM	5/5	Silty sand Olive	25.4		
	SM	5/9 10/6	Slightly clayey silty sand	40		
	IL-SM		Very sandy silt ***	58.6		
15	SM+		Silty sand w/clay seams			
	CL					
	CL	3/7	Clay lt. olive grey w/olive			
	SM	7/9	Silty sand seam			
	CL	9/10 10/12 /18	Sandy clay 20% fine sand light olive grey mottled w/olive			
20			*Light yellowish brown **Light yellowish brown mottled w/yellowish brown ***Yellowish brown ¹ Pinkish grey			
25						
30						
35						

*BLOWS PER 6 INCH USING
18, 24, or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

WELL 123 DATE DRILLED 6/26/82
 STUDY AREA Active Burning Grounds
 ELEVATION TOP OF STEEL CASING = 186.13
 ELEVATION TOP OF PVC RISER = 185.03
 ELEVATION OF GROUND SURFACE = 183.55

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

CONTAMINATION SURVEY
 LONGHORN ARMY AMMUNITION PLANT
 MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
 MATERIALS AGENCY
 ABERDEEN PROVING GROUND, MARYLAND

002629

	VISUAL U/S	BLOW COUNT*	MATERIAL CLASSIFICATION	% FINES	AQUIFER PERMEABILITY
0	SC		Silty sand		
	SC	5/8	Dark yellowish brown clayey sand		
		4/3	Silty sand	15	
	SM		Dark yellowish brown		
5	SC		Slightly clayey sand	12	
	ML	3/12	Very sandy silt	66.4	
		25/20	Very pale brown w/brownish yellow	60.7	
	SC		Clayey sand seam *		
10	SM	9/8	Slightly silty sand	14.2	6.9 x 10 ⁻³ ft/min
		7/6	Dark yellowish brown		
15	CL		Sandy clay 20% fine sand		
		3/5	Light grey mottled with brownish yellow		
		7/9			
20	SM	1/2	Silty sand	33.4	
		3/3			
25			Light grey mottled with brownish yellow		
		3/5		41.3	
		/5			
30			*Light grey and brownish yellow		
35					

*BLOWS PER 6 INCH USING
18 24, or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

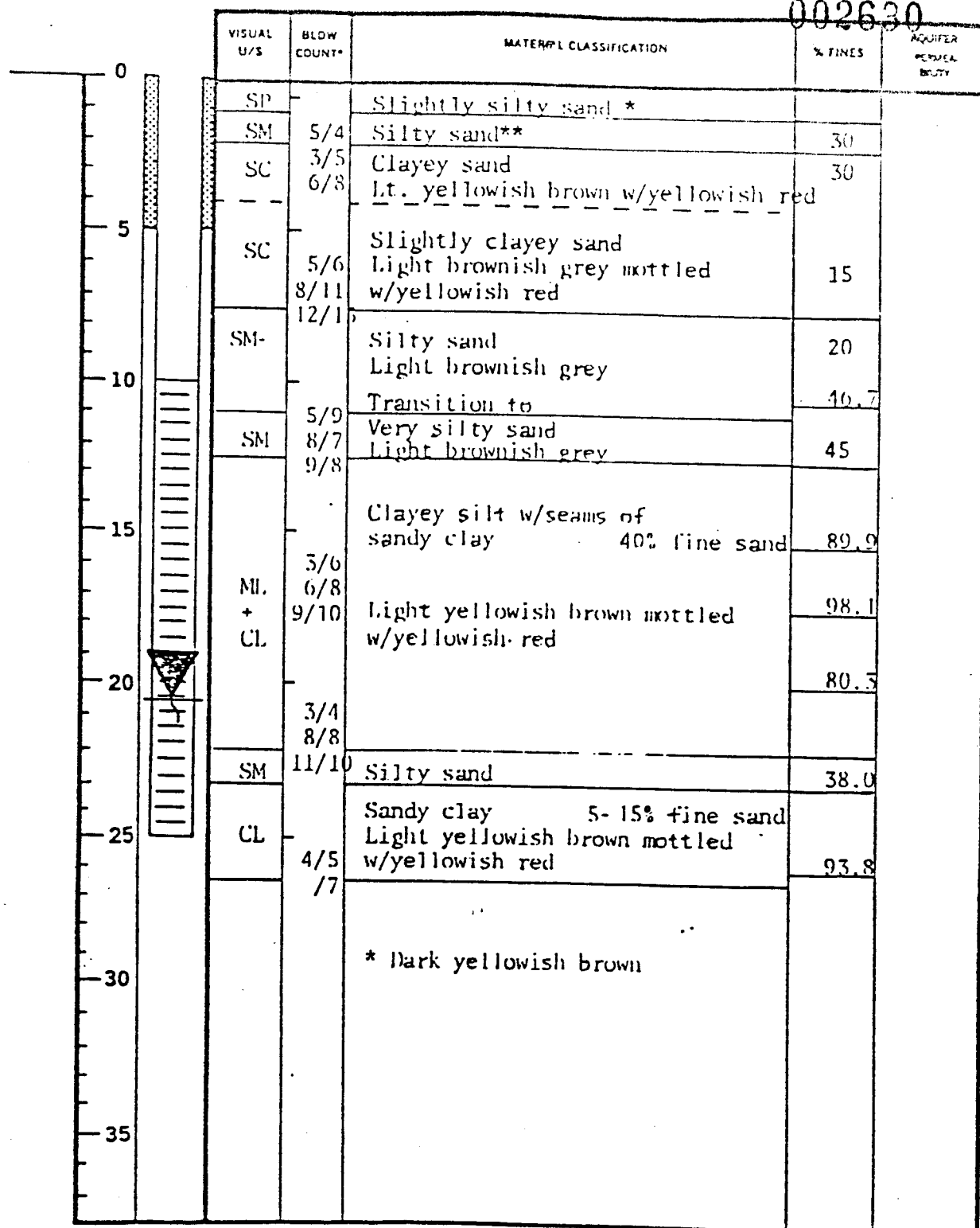
WELL 124 DATE DRILLED 7/10/82
 STUDY AREA Active Burning Grounds
 ELEVATION TOP OF STEEL CASING = 186.16
 ELEVATION TOP OF PVC RISER = 185.24
 ELEVATION OF GROUND SURFACE = 183.05

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

CONTAMINATION SURVEY
 LONGHORN ARMY AMMUNITION PLANT
 MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
 MATERIALS AGENCY
 ABERDEEN PROVING GROUND, MARYLAND

002630



*BLOWS PER 6 INCH USING
18, 24 or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

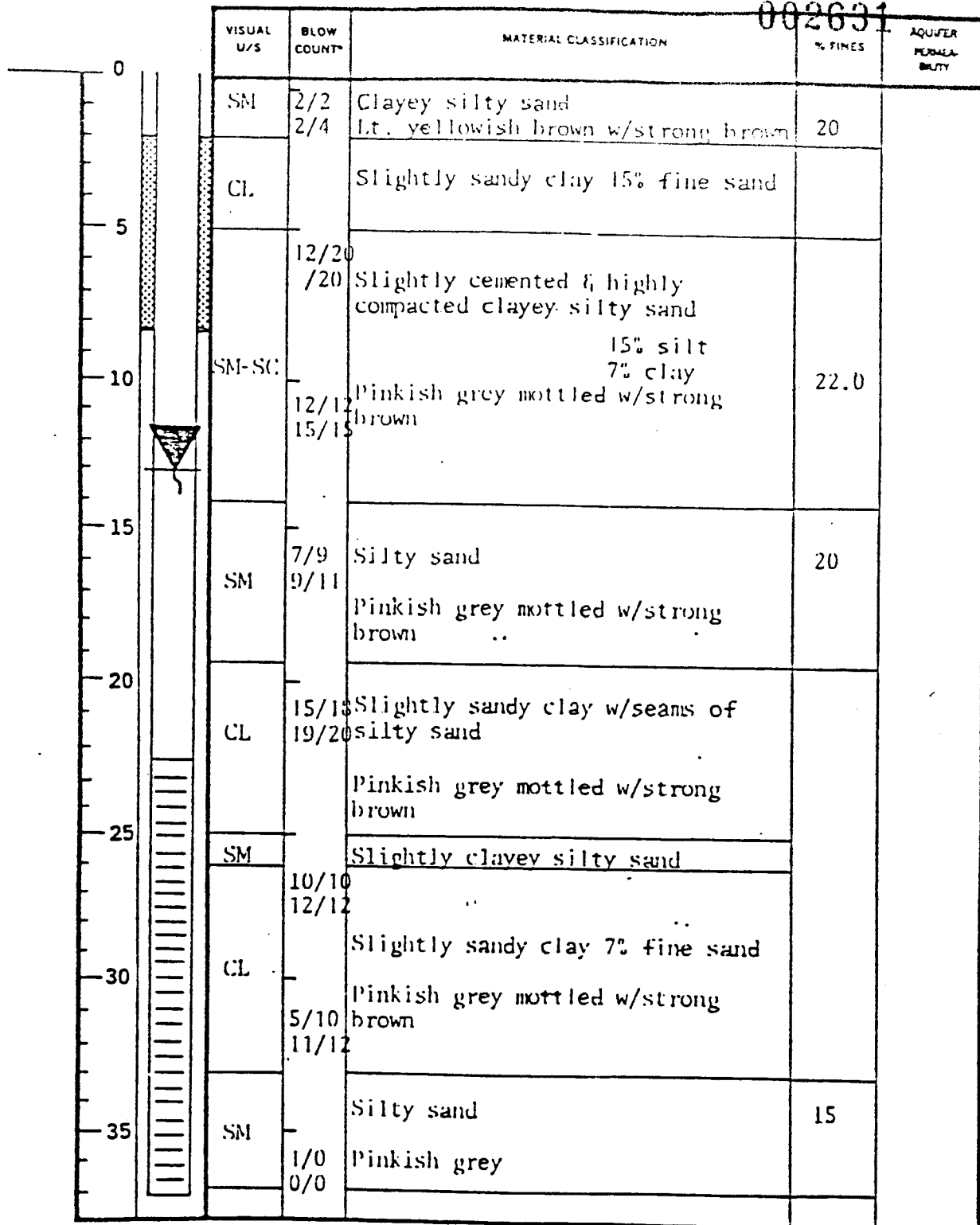
WELL 125 DATE DRILLED 6/10/82
 STUDY AREA Active Burning Grounds
 ELEVATION TOP OF STEEL CASING = 196.04
 ELEVATION TOP OF PVC RISER = 194.99
 ELEVATION OF GROUND SURFACE = 195.01

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

CONTAMINATION SURVEY
 LONGHORN ARMY AMMUNITION PLANT
 MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
 MATERIALS AGENCY
 ABERDEEN PROVING GROUND, MARYLAND

002631



*BLOWS PER 6 INCH USING
18, 24, or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

WELL 126 DATE DRILLED 6/28/82

STUDY AREA Active Burning Grounds

ELEVATION TOP OF STEEL CASING = 199.10

ELEVATION TOP OF PVC RISER = 198.68

ELEVATION OF GROUND SURFACE = 196.21

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

CONTAMINATION SURVEY
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND

002632

	VISUAL U/S	BLOW COUNT*	MATERIAL CLASSIFICATION	% FINES	AQUIFER PERME- ABILITY
0	SM		Silty sand		
	SM	4/5 /4	Very silty sand Strong brown	30	
5	CL		Very sandy clay 40% fine sand Pale brown & red		
		4/5 11/12			
	SC		Clayey sand Light grey mottled with yellowish brown	20	
10	SM	4/7	Silty sand		
	SC	9/10	Clayey sand Light grey mottled with yellowish brown	20	
15					
	SM	7/7 9/9	Silty sand Very pale brown mottled with strong brown	15 12.4	9.7 x 10 ⁻³ ft/min
20	SC	3/3 3/3	Clayey sand Very pale brown mottled with strong brown		
25	CL		Sandy clay seam		
	SM	10/14	Silty sand-lt. yellowish brown	31.2	
	CL	7/7	Slightly sandy clay 15% fine sand		
30			Clayey sandy silt 35% fine sand	74.4	
	ML	2/3 2/4	light grey mottled with yellowish brown	61.9	
35	SM				
	ML-CL	7/10 /15	Clayey silt seams	65.7	

*BLOWS PER 6 INCH USING
18, 24 or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

WELL 129 DATE DRILLED 7/10/82
 STUDY AREA Active Burning Grounds
 ELEVATION TOP OF STEEL CASING = 196.93
 ELEVATION TOP OF PVC RISER = 196.38
 ELEVATION OF GROUND SURFACE = 194.06

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. 1983

CONTAMINATION SURVEY
 LONGHORN ARMY AMMUNITION PLANT
 MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
 MATERIALS AGENCY
 ABERDEEN PROVING GROUND, MARYLAND

002633

	VISUAL U/S	BLOW COUNT*	MATERIAL CLASSIFICATION	% FINES	AQUIFER PERME- ABILITY
0	SM	8/7	Silty sand		
	SM	6/4	Silty sand		
	CL-MI	5/6	lt. brownish grey w/yellowish red Sandy silty clay 20% fine sand Reddish grey mottled w/yellowish red		
5	SC	2/3	Clayey sand		
		4/8			
		1/12			
10	SM	6/6	Silty sand Grey mottled w/reddish brown	38.8	
		7/7			
		6/6			
15	SM	4/6	Silty sand		
		6/6	Grey w/some reddish brown	30	
20	SM+CL	2/4	Silty sand w/clay seams		
		5/12	Grey mottled w/reddish brown		
	CL	9/10	Sandy clay 25% sand Grey mottled w/reddish brown		
25					
30					
35					

*BLOWS PER 6 INCH USING
18, 24 or 36 SPLITSPOON

VERTICAL SCALE 1" = 5.0'

WELL 130 DATE DRILLED 6/7/82
 STUDY AREA Flashing Area
 ELEVATION TOP OF STEEL CASING = 177.36
 ELEVATION TOP OF PVC RISER = 176.71
 ELEVATION OF GROUND SURFACE = 174.41

SOURCE: ENVIRONMENTAL PROTECTION SYSTEMS, INC. - 1983

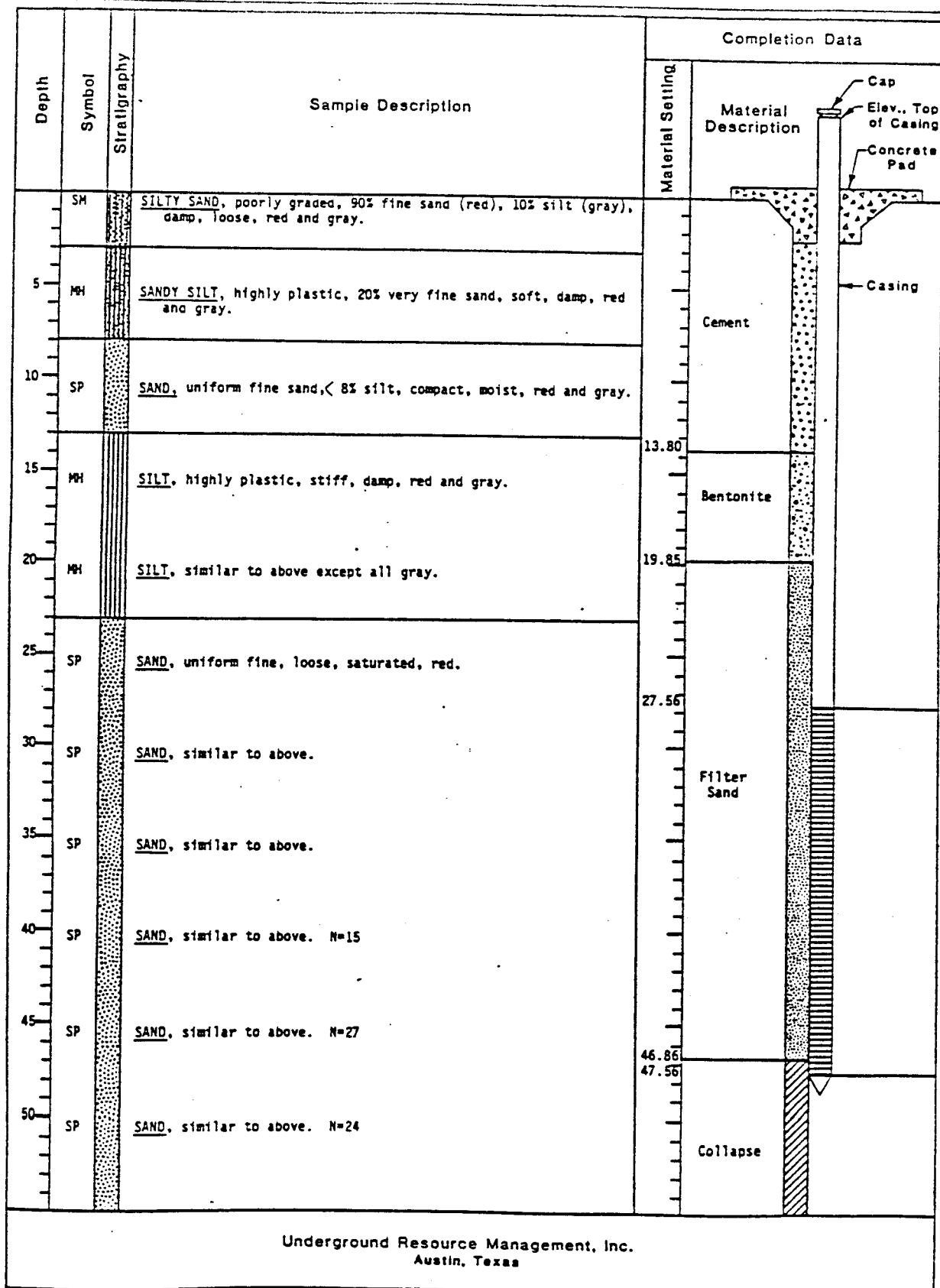
CONTAMINATION SURVEY
 LONGHORN ARMY AMMUNITION PLANT
 MARSHALL, TEXAS

U. S. ARMY TOXIC AND HAZARDOUS
 MATERIALS AGENCY
 ABERDEEN PROVING GROUND, MARYLAND

Monitor Well Installation

002634

Client: Camp Dresser & McKee, Inc. Job No.: 84-694 Date Drilled: 7/17-19/84 Well No.: C-1
 Site: L.A.P., Karnack, Texas Elevation: Pad Top of PVC Casing _____
 Total Depth: 55.5 feet Casing Size & Type: 4" ID, Sch. 80 PVC, Flush Joints Screen Size: 4" ID, 20" x 20" slots
 Comments: Additional 10' of screened by use of coupling joint secured with pop rivets.



Monitor Well Installation

002635

Client: Camp, Dresser & McKee, Inc. Job No.: 84-894 Date Drilled: 7/17-19/84 Well No.: C-1
 Site: L.A.P., Karnack, Texas Elevation: Pad _____ Top of PVC Casing _____
 Total Depth: 56.5 feet Casing Size & Type: 4" ID Sch. 80 PVC, Flush Joint Screen Size: 4" ID, 0.12" slots
 Comments: _____

Depth	Symbol	Stratigraphy	Sample Description	Completion Data	
				Material Setting	Material Description
55	SP		SAND, similar to above. N=47		
56.5				Collapse	
60					
65					
70					
75					
80					
85					
90					
95					
100					

Underground Resource Management, Inc.
Austin, Texas



Monitor Well Installation

002636

Client: Camp, Dresser & McKee, Inc. Job No.: 84-894 Date Drilled: 7/29-30/84 Well No.: C-2
Site: L.A.P., Karnack, Texas Elevation: Pad Top of PVC Casing
Total Depth: 32 feet Casing Size & Type: 4" ID Sch. 80 PVC, Flush Joint Screen Size: 4" x 10, 0.10" slots
Comments:

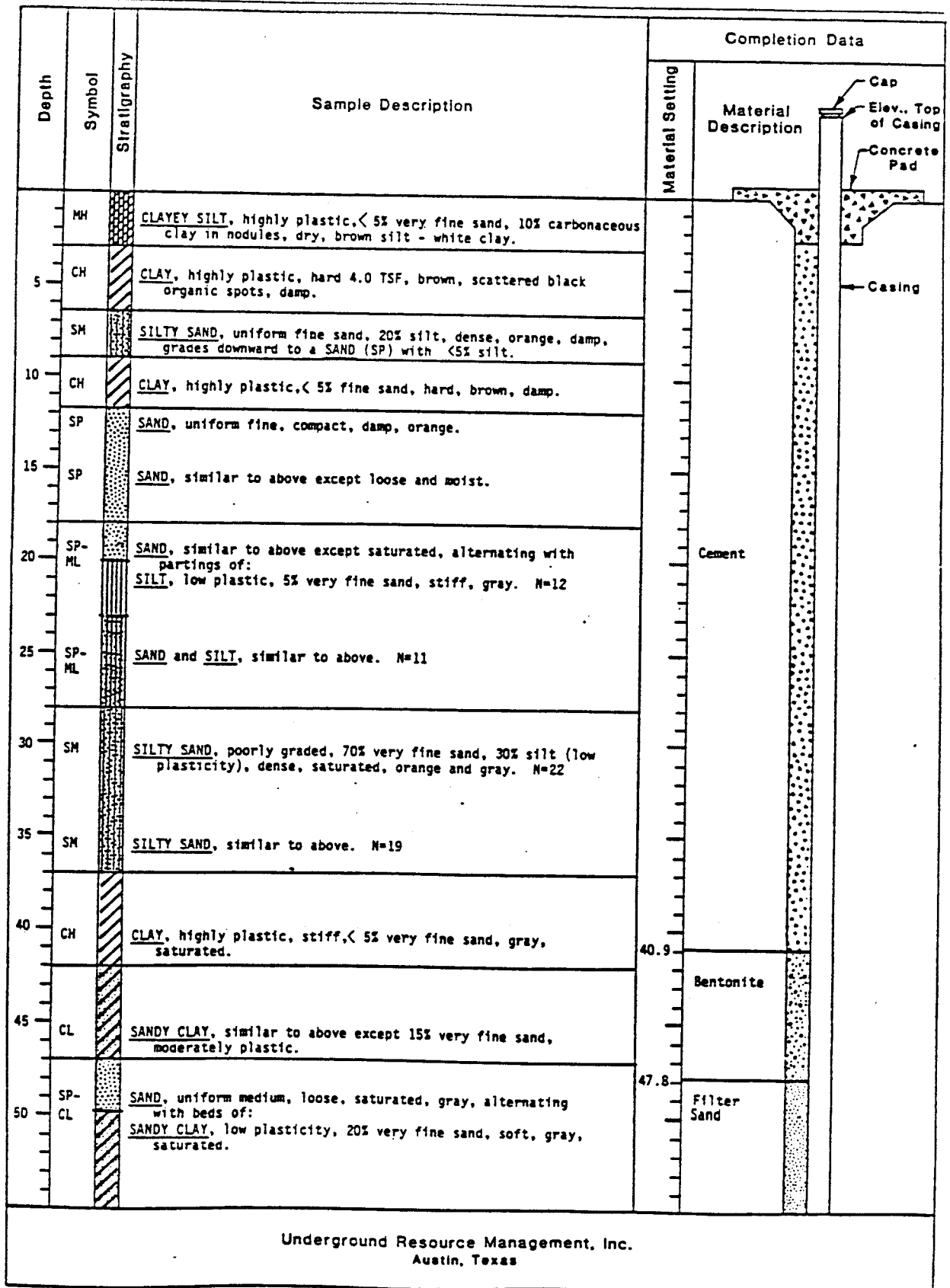
Depth	Symbol	Stratigraphy	Sample Description	Completion Data	
				Material Setting	Material Description
	MH		SILT, highly plastic, soft, tan, dry.		
5	SP		SAND, uniform fine to very fine, loose, gray, saturated.		Cement
10	SP		SAND, similar to above.	8.75	Bentonite
15	SP		SAND, similar to above except < 5% silt, more compact.	13.8	
20	SP		SAND, similar to above except brown.	17.9	Filter Sand
25	SP		SAND, similar to above.		Screen
	SH		SILTY SAND, similar to above except 20% silt, compact.	27.9	
30	SP		SAND, Uniform medium sand, loose, saturated, green, lignite at 31.8 feet.		Collapse
35					
40					
45					
50					

Underground Resource Management, Inc.
Austin, Texas

Monitor Well Installation

002637

Client: Camp, Dresser & McKee, Inc. Job No.: 84-294 Date Drilled: 7/21-22/84 Well No.: C-3
 Site: 1 A D Karmark, Texas Elevation: Pad Top of PVC Casing _____
 Total Depth: 63.7' Casing Size & Type: 4" ID Sch. 80 PVC, Flush Joint Screen Size: 4" ID, .010" slots
 Comments: _____



Monitor Well Installation

002638



Client: Camp, Dresser & McKee, Inc. Job No.: 84-894 Date Drilled: 7/21-22/84 Well No.: C-3
 Site: L.A.P., Karnack, Texas Elevation: Pad Top of PVC Casing _____
 Total Depth: 63.7' Casing Size & Type: 4" ID Sch. 80 PVC, Flush Joint Screen Size: 4" x 12" .015" slots
 Comments: _____

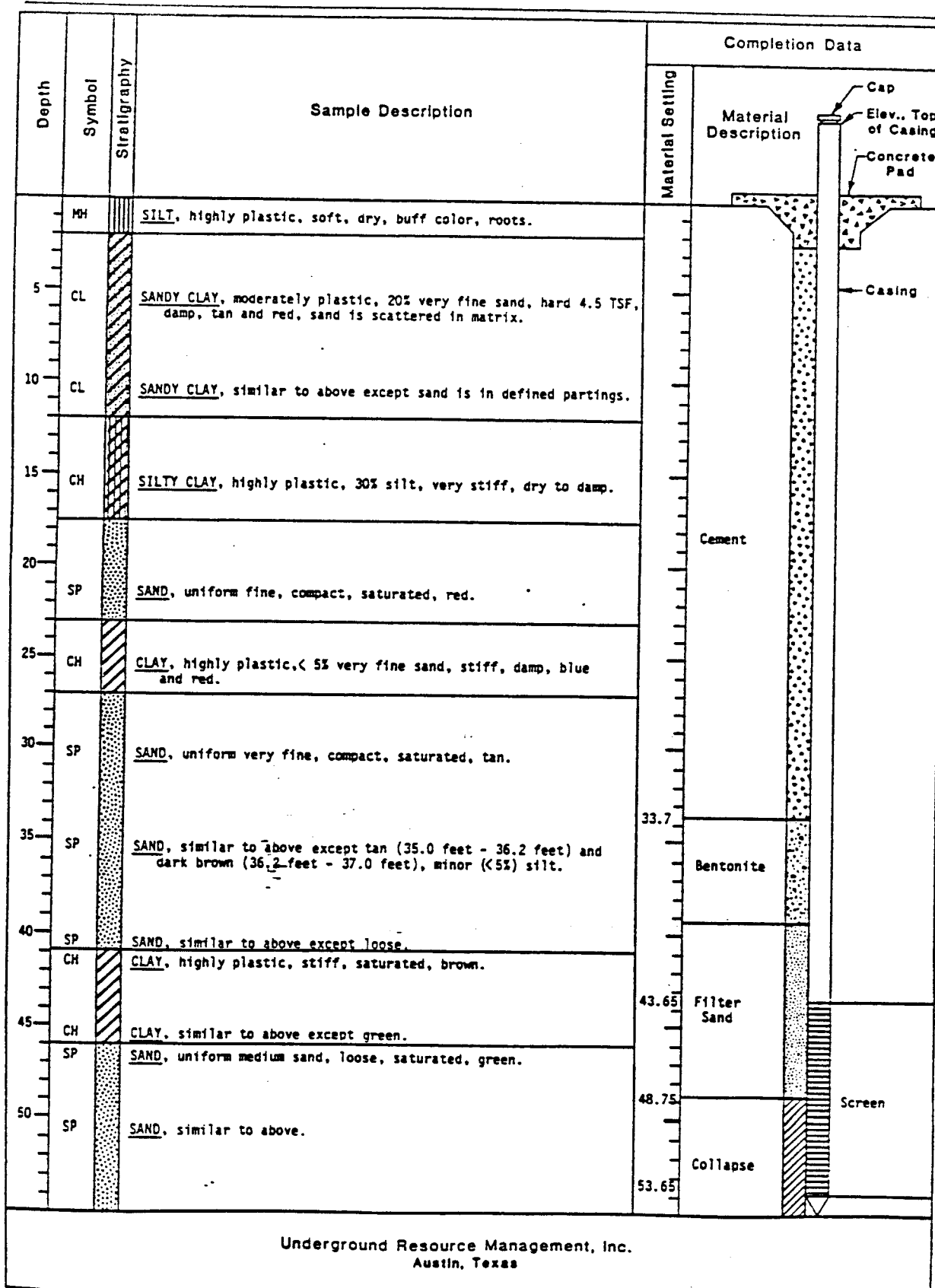
Depth	Symbol	Stratigraphy	Sample Description	Completion Data	
				Material Setting	Material Description
55	SP-CL			51	
	SP		<u>SAND</u> , uniform medium sand, loose, saturated, gray.		Filter Sand
60	CH		<u>CLAY</u> , highly plastic, hard, saturated, dark green.	61	Screen
				62	Collapse
65					
70					
75					
80					
85					
90					
100					
110					

Underground Resource Management, Inc.
Austin, Texas

Monitor Well Installation

002639

Client: Camp, Dresser & McKee, Inc. Job No.: 84-894 Date Drilled: 7/25-26/84 Well No.: C-4
 Site: L.A.P., Karnack, Texas Elevation: Pad Top of PVC Casing _____
 Total Depth: 55.5 feet Casing Size & Type: 4" ID, Sch. 80 PVC, Flush Joint Screen Size: 4" ID, 0.10" slots
 Comments: _____





Monitor Well Installation

002640

Client: Camp, Dresser & McKee, Inc. Job No.: 84-894 Date Drilled: 7/25-26/84 Well No.: C-4
Site: L.A.P., Karnack, Texas Elevation: Pad Top of PVC Casing:
Total Depth: 55.5 feet Casing Size & Type: 4" ID Sch. 80 PVC, Flush Joint Screen Size: 4" ID, 0.12" slots
Comments:

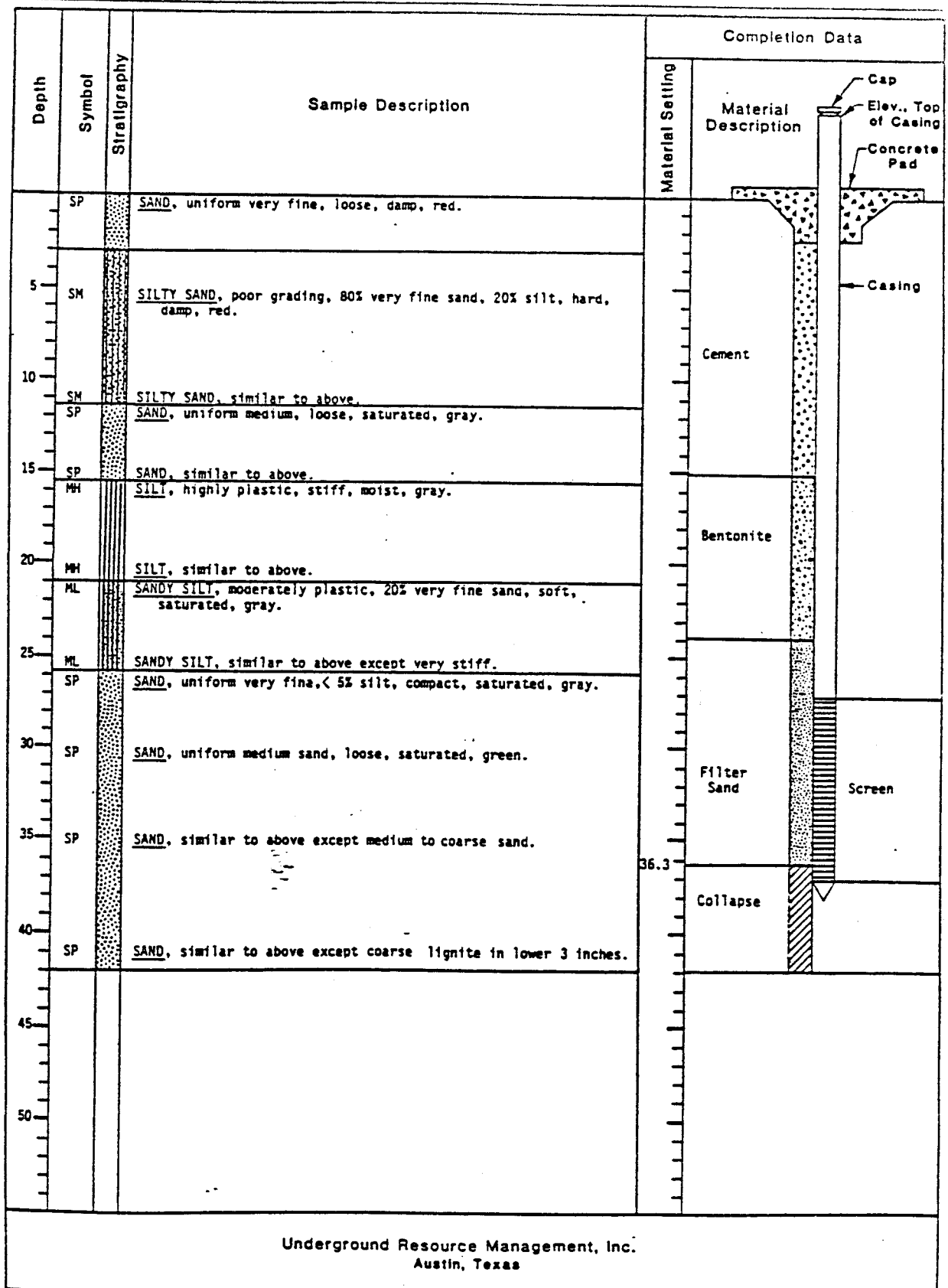
Depth	Symbol	Stratigraphy	Sample Description	Completion Data	
				Material Setting	Material Description
	SP		SAND, similar to above.		
55	SP		SAND, similar to above except coarse and sub-angular (55.3 - 55.4 lignite).		
	CH		CLAY, highly plastic, soft, saturated, blue.		
60					
65					
70					
75					
80					
85					
90					
95					
100					

Underground Resource Management, Inc.
Austin, Texas



Monitor Well Installation

Client: Camp, Dresser & McKee, Inc. Job No.: 84-894 Date Drilled: 7/27-28/84 Well No.: 002641
Site: L.A.P., Karnack, Texas Elevation: Pad Top of PVC Casing _____
Total Depth: 42' Casing Size & Type: 4" ID Sch. 80 PVC, Flush Joint Screen Size: 4" ID, .010" slots
Comments: _____

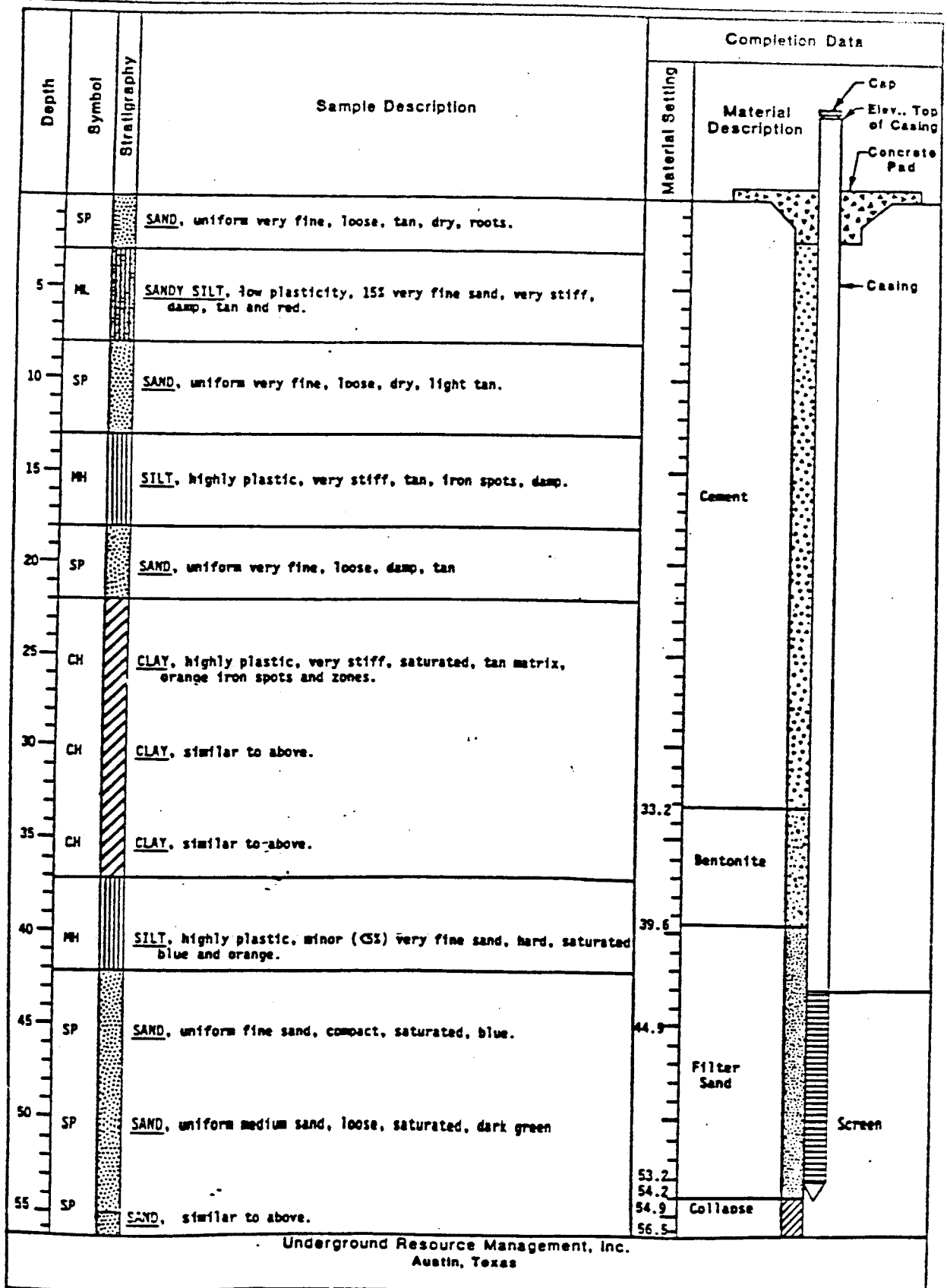




Monitor Well Installation

002642

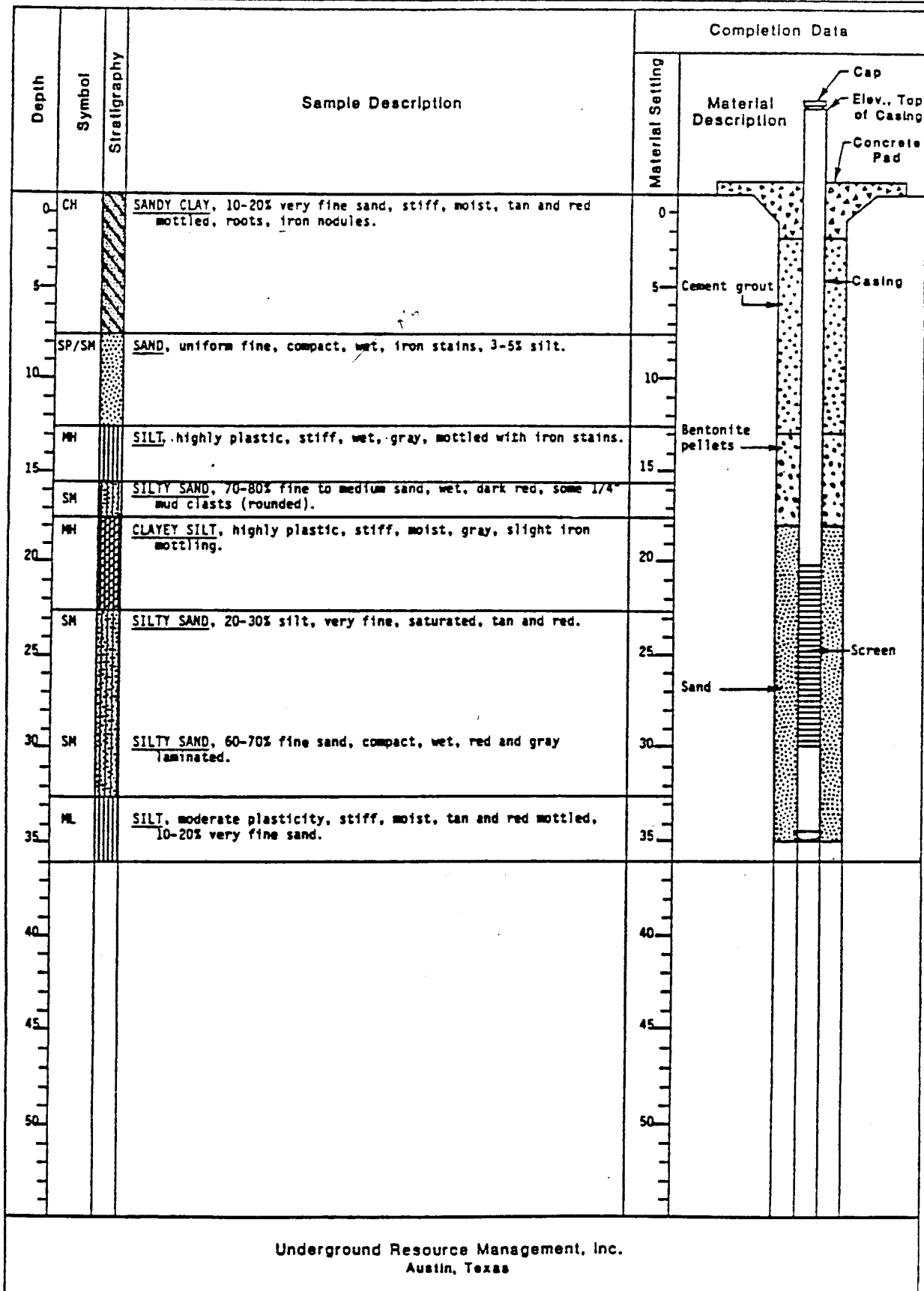
Client: Camp, Dresser & McKee, Inc. Job No.: 84-854 Date Drilled: 7/19-20/84 Well No.: 5-2
Site: L. A. P., Karnack, Texas Elevation: Pad Top of PVC Casing _____
Total Depth: 56.5 feet Casing Size & Type: 4" ID Sch. 80 PVC, Flush Joint Screen Size: 4" ID 60" slots
Comments: _____



Monitor Well Installation

002643

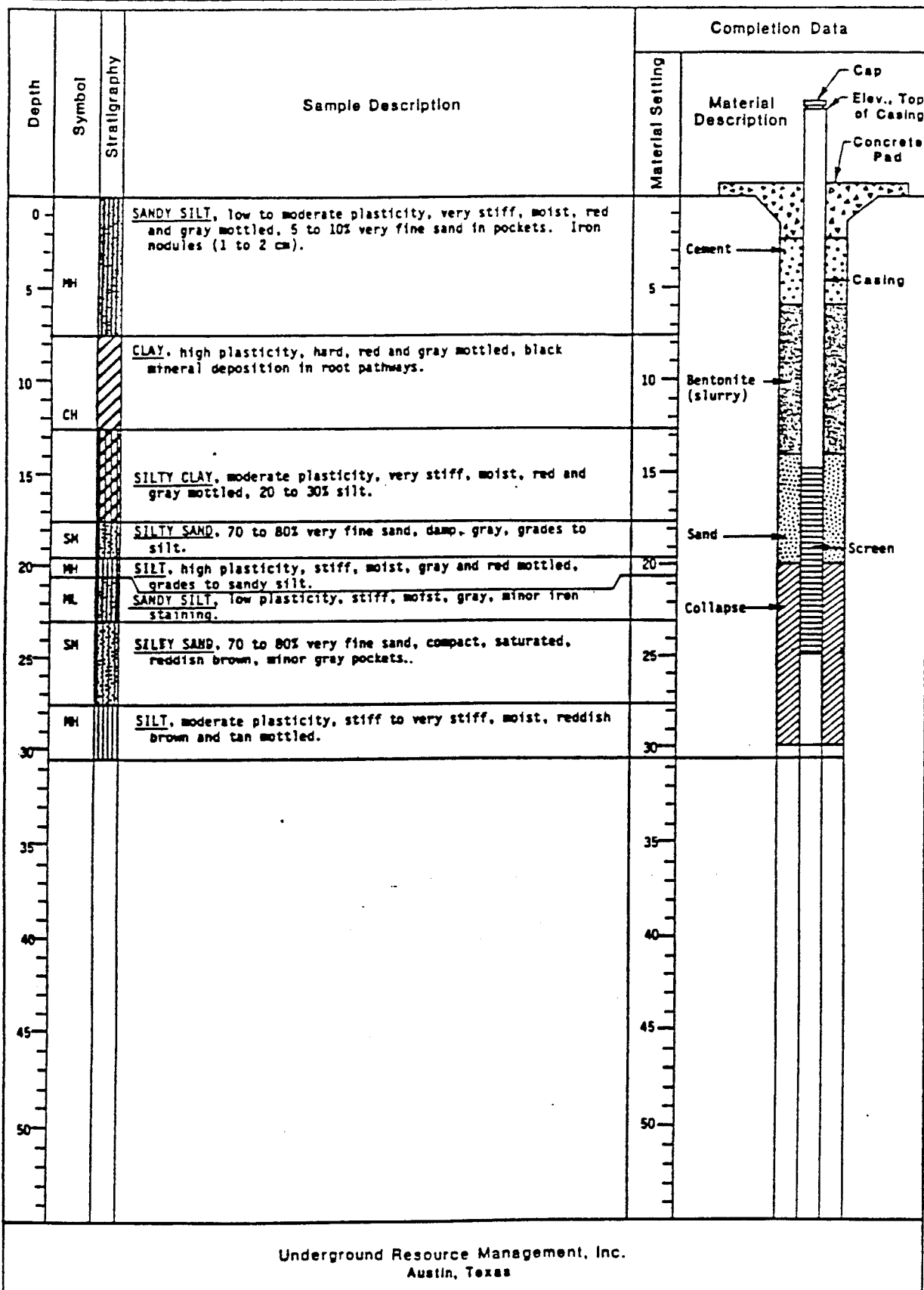
Client: Camp Dresser & McKee Job No.: J85-874 Date Drilled: 2/1/85 Well No.: C-7
 Site: LHAPP Elevation: GL Top of PVC Casing: _____
 Total Depth: 35 feet Casing Size & Type: 4-inch Schedule 40 Flush-joint Threaded PVC Screen Size: 010 PWS
 Comments: _____



002644

Monitor Well Installation

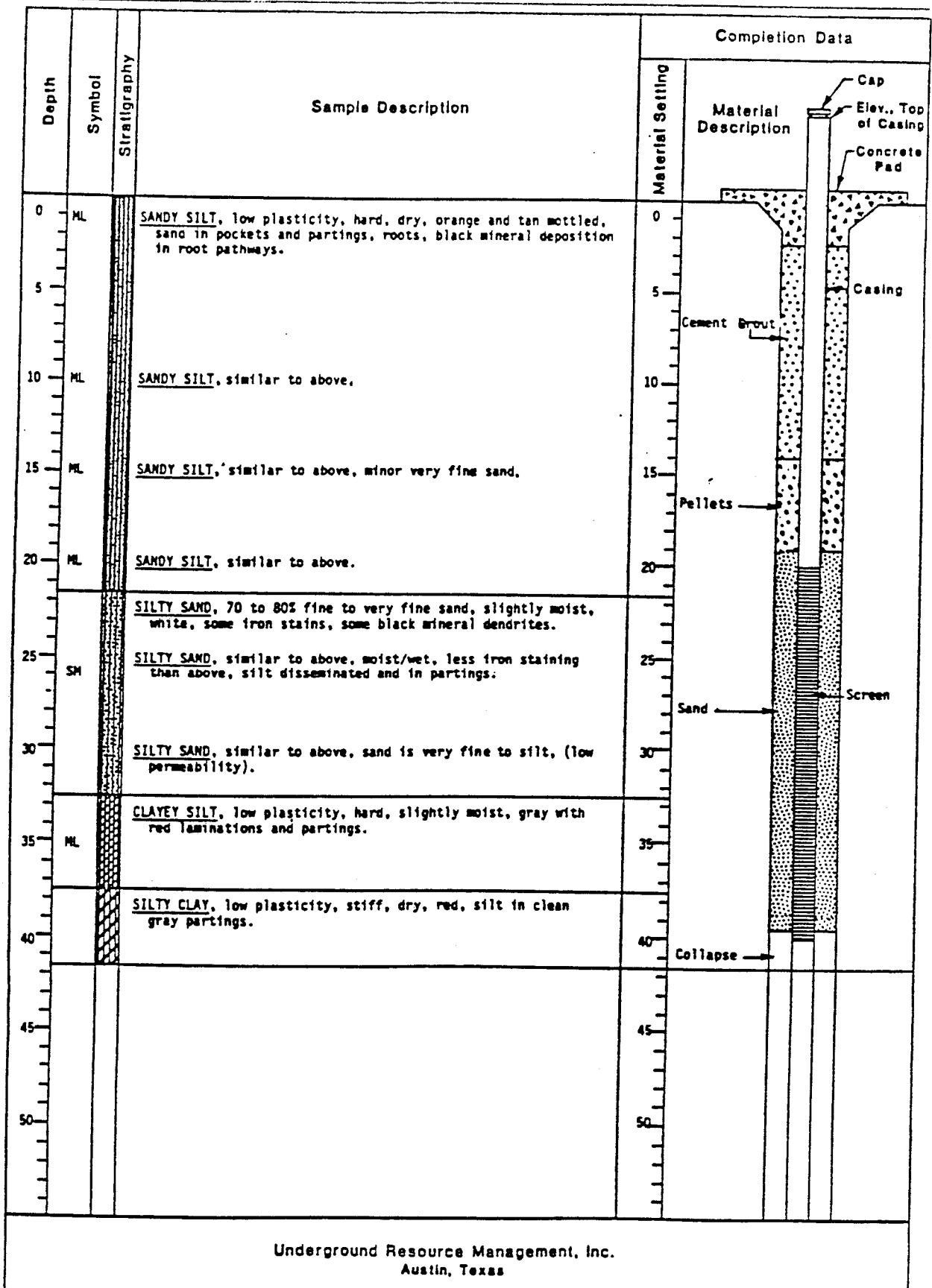
Client: Camp, Dresser & McKee Job No.: 385-B74 Date Drilled: 7/26/85 Well No.: C-2
 Site: Karnack, Texas Elevation: GL Top of PVC Casing _____
 Total Depth: 30 feet Casing Size & Type: 4-inch Flush-Joint Threaded PVC Screen Size: 20
 Comments: _____



Monitor Well Installation

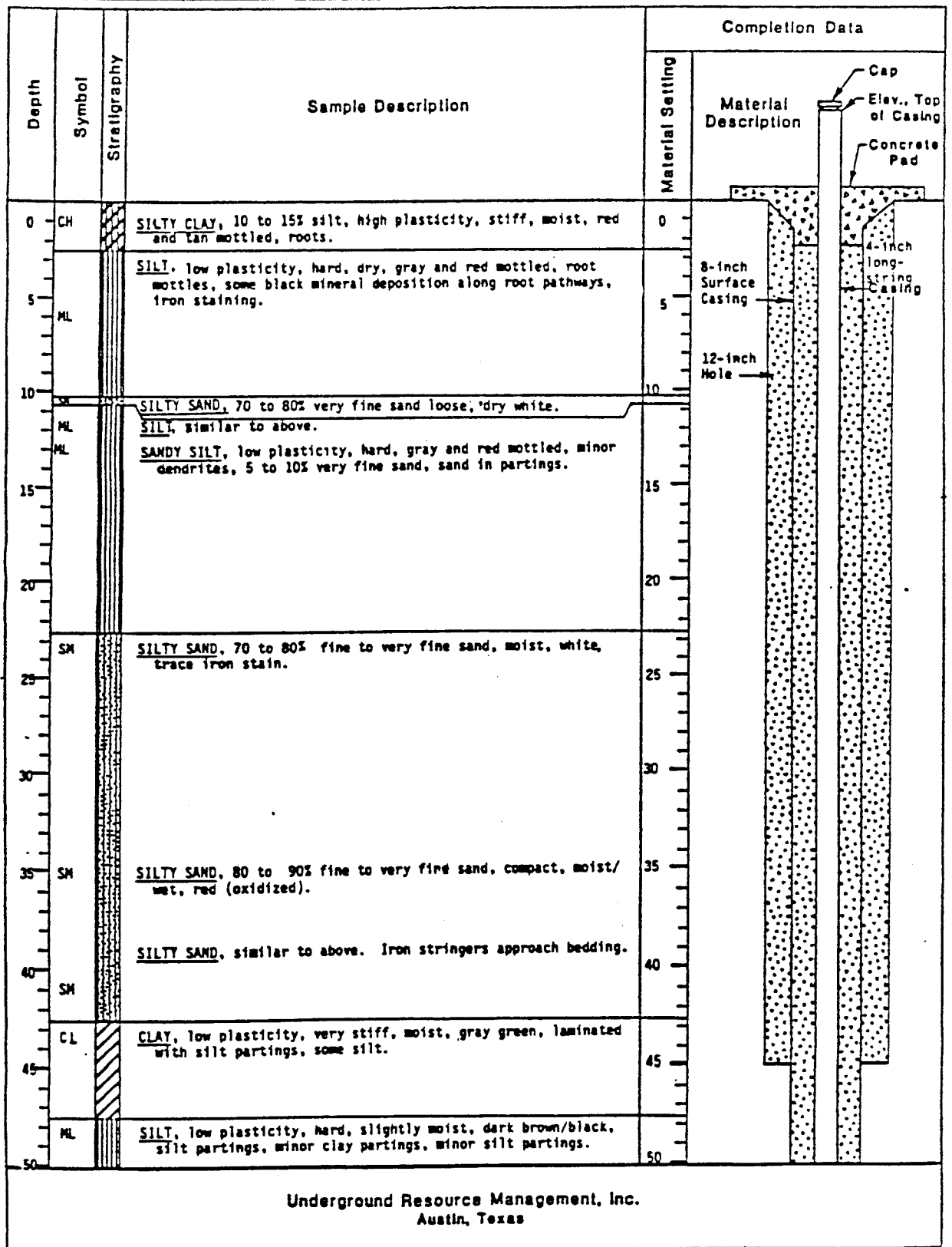
002645

Client: Camp, Dresser & McKee Job No.: 085-874 Date Drilled: 1/31/85 Well No.: C-9
 Site: Karnack, Texas Elevation: GL Top of PVC Casing _____
 Total Depth: 41.5 feet Casing Size & Type: 4-inch Flush-joint Threaded PVC Screen Size: .010 Millislot
 Comments: _____



Monitor Well Installation

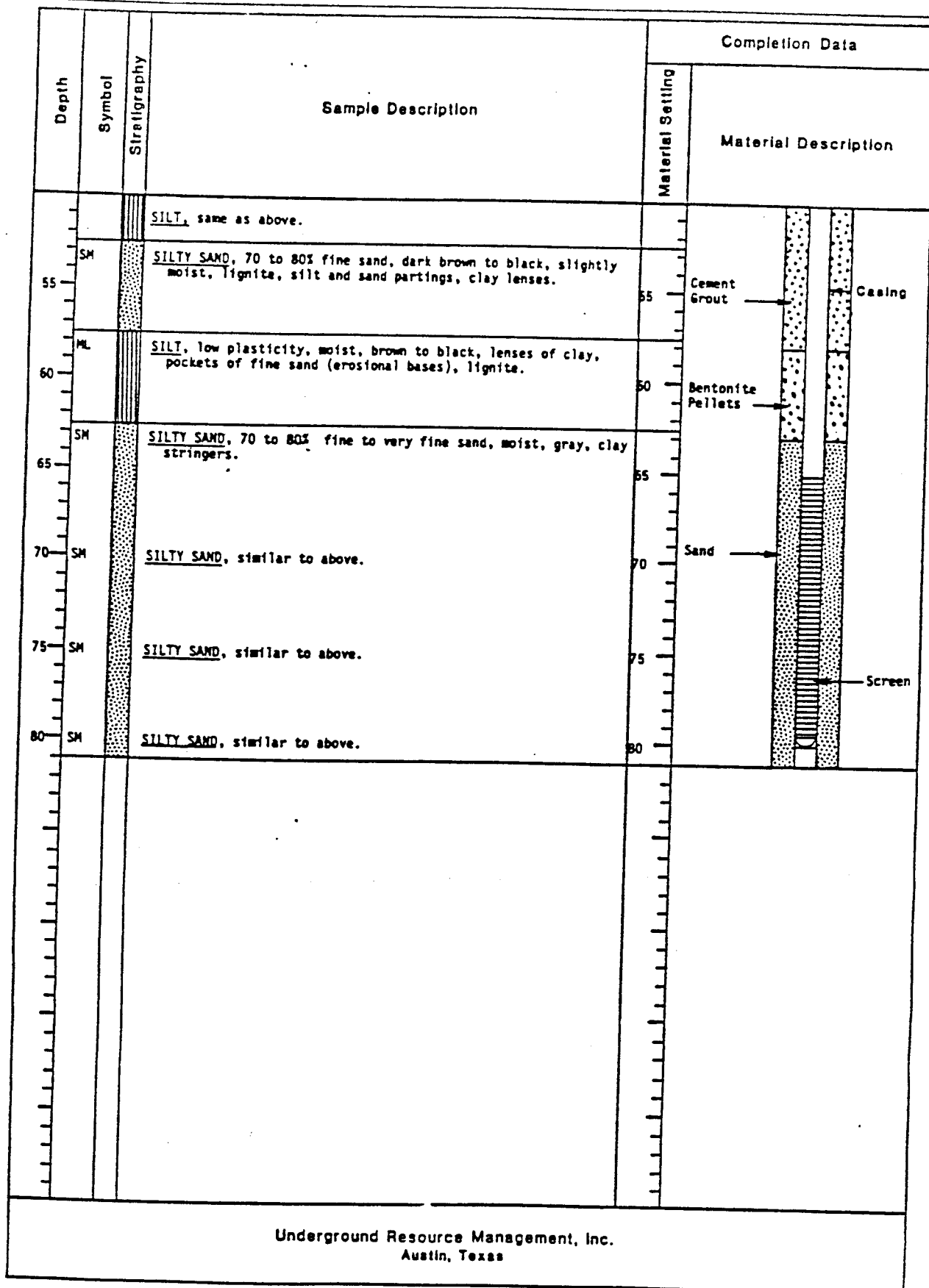
Client: Camp, Dresser & McKee Job No.: JB5-874 Date Drilled: 2/23-2/29/86 Well No.: C-108
 Site: LWAAP Elevation: GL Top of PVC Casing
 Total Depth: 81 feet Casing Size & Type: 8-inch Schedule 40 BE Surface Casing, 4-inch Flush-joint Threaded Screen Size: 0.12 Millislot
 Comments: Schedule 40 PVC Long-string



Monitor Well Installation

002647

Client: Cam, Dresser & McFae Job No.: 085-874 Date Drilled: 2/25-2/29/85 Well No.: C-108
 Site: 14242 Elevation: GL Top of PVC Casing _____
 Total Depth: 81 feet Casing Size & Type: 8-inch Schedule 40 BS Surface Screen Size: 0.10 mm slot
 Comments: Casing, 4-inch Flush-Joint Threaded
Schedule 40 PVC Long-string



APPENDIX M

DRILL REQUEST FOR WELLS MW-1 THROUGH MW-6

DISPOSITION FORM

For use of this form, see AR 340-15 the proponent agency is TAGO

REFERENCE OR OFFICE SYMBOL

CESWF-ED-GG (415-10f)

SUBJECT

Request for Installation of Six Compliance Ground-Water Monitoring Wells at Longhorn Army Ammunition Plant, Marshall, TX

TO/ THRU CESWF-ED-G

FROM CESWF-ED-GG

DATE 5 August 1987
FITZGERALD/rg/4-3221

CMT 1

TO CESWF-ED-GG (Field Investigation Unit)

1. Request six monitoring wells (MW-1 thru MW-6) be installed at the locations shown on the boring layout.
2. These are compliance monitoring wells to be used for sampling ground water that may still be contaminated with volatile organics and explosives. It is important that all downhole equipment be free of grease, oil, and dirt. Therefore, all downhole equipment shall be ~~steam~~ cleaned prior to drilling each boring. Hand held sampling tools may be washed with a household detergent and rinsed with water to prevent cross-contamination with soil samples.
3. Drill borings using an 8-inch diameter auger.
4. Borings are to be drilled completely dry. If water is required for drilling, it should be unchlorinated and can be obtained from LHAAP fire hydrants. If a drill mud must be used, it will be pure bentonite with no additives.
5. Note when ground water is encountered.
6. Drill all borings at least 15 feet below water level. It is desirable to screen the bottom of the "silty sand" unit shown on the attached profiles, just above the clay unit identified at the base of each of the previously drilled borings. Anticipated boring depths will range from 40 to 45 feet.
7. Take jar samples using 1-quart glass Mason jars every 2 feet for the first 10 feet, then every 5 feet or change of material for the remainder of the hole. These samples will be used for soil classification analyses only. No special preservation or delivery schedules are required.
8. In addition to the soil samples to be taken for soil classification analyses, take a soil sample at both 2 and 10 feet for chemical analyses. In boring MW-4, take two samples at the 10-foot depth to be used as a duplicate for laboratory analysis. Wear disposable rubber gloves when taking these samples. A single sample shall consist of two 1-liter jar samples. Fill each glass jar completely, seal tightly with teflon-lined lid and tape, label, and store inverted on ice until delivered to the laboratory for analysis. Fill out chain of custody form, enclose in ice chest, and ship to Southwestern Division Laboratory, 4815 Cass Street, Dallas, TX 75235, within 24 hours of taking samples.
9. Construct the monitoring wells in accordance with the attached detail. Steam clean well materials inside and outside prior to installation. No glue is to be used. If centralizers are required to keep the well centered, place above the well screen.
10. Develop the well 48 hours after grouting using surge block and/or bailer. Dispose of water removed from well far enough away so it won't run back down the boring. Develop a minimum of 4 hours, until water is clear and free of sediment.

SWF-ED-GG

5 August 1987

SUBJECT: Request for Installation of Six Compliance Ground-Water Monitoring Wells at
Longhorn Army Ammunition Plant, Marshall, TX

11. Safety Procedures:

a. Ground-Water contamination that has been identified has been due to methylene chloride and trichloroethylene, both volatile organics. Concentrations in the ground water have exceeded 1,000,000 ppb for methylene chloride and 100,000 ppb for trichloroethylene. It is therefore important to monitor the breathing space around the drill rig during drilling. Gas detector tubes have been provided for this. Following the manufacturer's directions, take a reading for both methylene chloride and trichloroethylene at least every 10 feet of borehole advancement and record the readings on the boring log. Drilling operations shall be shut down and personnel shall leave the area under either of the following two conditions:

- (1) Methylene Chloride - Average concentration exceeds 500 ppm over an 8-hour period
- (2) Trichloroethylene - Average concentration exceeds 100 ppm over an 8-hour period

Do not resume drilling until further instructions are given from the office.

b. High concentrations of these volatile organics can irritate the skin and eyes. Disposable rubber gloves should be worn when prolonged skin exposure is expected during drilling and sampling procedures. If the skin becomes wet, wash promptly with soap and water. If the eyes are contacted, irrigate immediately with a lot of clear water. Seek medical help immediately.

c. If swallowed, induce vomiting with Ipecac. Seek medical help immediately.

d. A telephone is located in Burning Grounds office by the gate. The Morton Thiokol Environmental Office can be called for any emergency situation. Other emergency numbers are also listed below.

Morton Thiokol Environmental Office	2774
Ambulance	0
Fire Department	17

12. Deliver all jar samples intended for soil classification analyses to Southwestern Division Laboratory.

13. Provide a lithologic log and well construction details for each well to the Chief, Engineering Geology Section, when all installations are complete.

14. Charges will be made to RA7213769080176.

4 Atchs

HAROLD C. BARNETT
Acting Chief, Engineering Geology Section

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APPENDIX N

LOGS OF BORINGS MW-1A AND MW-1 THROUGH MW-15

DRILLING LOG		DIVISION	INSTALLATION	SHEET		
		SWD	FWD	1 OF 2 SHEETS		
1. PROJECT GROUND-WATER MONITORING WELLS			10. SIZE AND TYPE OF BIT 10" AUGER			
2. LOCATION (Coordinates or Station) LONGHORN AAP			11. DATUM FOR ELEVATION SHOWN (TBM = MSL)			
3. DRILLING AGENCY USCE			12. MANUFACTURER'S DESIGNATION OF DRILL FALLING 1500			
4. HOLE NO. (As shown on drawing title and file number) MW-1A			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 19 0			
5. NAME OF DRILLER T. SUTTS			14. TOTAL NUMBER CORE BOXES N/A			
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
7. THICKNESS OF OVERBURDEN			16. DATE HOLE 10 SEPT. 87 11 SEPT. 87			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE 198 ±			
9. TOTAL DEPTH OF HOLE 53.0'			18. TOTAL CORE RECOVERY FOR BORING N/A			
			19. SIGNATURE OF INSPECTOR Jackie R. Stuber			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.0		0.0' To 0.8'		A	1. WATER LEVEL: NOTE: FREE WATER BEGAN ENTERING BORING DURING DRILLING FROM 22.0' ± - 24.0' ±
			SAND: FINE GRAINED; RED; MEDIUM; DRY; SILTY; WITH SMALL GRAVEL & SANDSTONE FRAGMENTS		B	
			0.8' To 3.0'		C	
			CLAY: MEDIUM PLASTICITY; RED & GRAY; STIFF; MOIST; SANDY		D	2. JAR SAMPLES:
			3.0' To 4.0'		E	A: 0.0' - 0.8'
			SILT: LOW PLASTICITY; LIGHT BROWN WITH RED; STIFF; DAMP; VERY SANDY		F	B: 0.8' - 3.0'
			4.0' To 9.0'		G	C: 3.0' - 4.0'
			CLAY:		H	D: 4.0' - 7.2'
			4.0' - 8.5': MEDIUM PLASTICITY; RED WITH LIGHT GRAY WITH SOME YELLOW FROM 7.2'; VERY STIFF-HARD; DAMP; SLIGHTLY SANDY		I	E: 7.2' - 8.5'
			8.5' - 9.0': LOW-MEDIUM PLASTICITY; RED, YELLOWISH BROWN & LIGHT GRAY; STIFF-VERY STIFF; DAMP; VERY SILTY; SLIGHTLY SANDY		J	F: 8.5' - 9.0'
			9.0' To 12.0'		K	G: 9.0' - 12.0'
			SILT: LOW PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; MOIST-VERY MOIST; VERY SANDY		L	H: 12.0' - 14.0'
			12.0' To 14.0'		M	I: 14.0' - 16.3'
			CLAY: MEDIUM-HIGH PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; VERY STIFF; DAMP; SLIGHTLY SILTY; WITH CARBON STAINING		N	J: 16.3' - 17.5'
			14.0' To 16.3'		O	K: 17.5' - 22.5'
			SILT: LOW PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; VERY MOIST; SANDY		P	L: 22.5' - 24.0'
			16.3' To 17.5'			M: 24.0' - 29.0'
			CLAY: MEDIUM PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; STIFF; MOIST; SILTY; WITH TRACE OF FINE SAND			N: 29.0' - 30.8'
			17.5' To 30.8'			O: 30.8' - 36.0'
			SAND: FINE GRAINED; YELLOWISH BROWN WITH			P: 36.0' - 40.2'
						Q: 40.2' - 44.0'
						R: 44.0' - 49.0'
						S: 49.0' - 53.0'
						3. DRILLING: 10" FLIGHT AUGER: 0.0' - 41.0' NOTE: SET STEEL CASING TO 41.0'; 8" FLIGHT AUGER: 41.0' - 53.0' NOTE: BORING WAS GROUTED AS CASING WAS PULLED.
						4. LOCATION: NOTE: BORING WAS DRILLED 135° S35° E OF MW-1.

DRILLING LOG		DIVISION		INSTALLATION		SHEET 2 OF 2 SHEETS	
1. PROJECT GROUND-WATER MONITORING WELLS				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinate or Station) LONGHORN AAP.				11. DAYUM FOR ELEVATION SHOWN (TBM or ASL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) MW-1A				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE		10 SEPT. '87 11 SEPT. '87	
9. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING		%	
				19. SIGNATURE OF INSPECTOR Jackie R. Stokard			
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIAL (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
			LIGHT GRAY; MEDIUM; VERY SILTY; VERY MOIST TO WET FROM 22.5' ± TO SATURATED FROM 24.0' ± 30.8' TO 36.0'		Q		
			CLAY: MEDIUM-HIGH PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; STIFF; MOIST; SILTY 36.0' TO 40.2'		R		
			SAND: FINE GRAINED; YELLOWISH BROWN; MEDIUM; SATURATED; VERY SILTY 40.2' TO 53.0' T.D.		S		
	53.0		CLAY: 40.2' - 44.0': LOW-MEDIUM PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY & ORANGE; STIFF; DAMP; VERY SILTY; SANDY 44.0' - 53.0': MEDIUM- HIGH PLASTICITY; LIGHT BLUE GRAY WITH SOME YELLOWISH BROWN; STIFF- VERY STIFF; DAMP; WITH OCCASIONAL SILTY SAND LAMINATION T.D. 53.0'				
	60						
	80						

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DRILLING LOG		DIVISION	INSTALLATION		SHEET	
		SWD	FWD		1 OF 1 SHEETS	
1. PROJECT			10. SIZE AND TYPE OF BIT 10" AUGER			
2. LOCATION (Coordinates or Station)			11. DATUM FOR ELEVATION SHOWN (FWD = MSL)			
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and title number)			13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE			15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN			16. DATE HOLE			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE			
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING			
			19. SIGNATURE OF INSPECTOR			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIAL (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.0		0.0' To 3.0'		A	1. WATER LEVEL:
			SAND: FINE GRAINED;		B	NOTE: FREE WATER
			REDDISH BROWN; MEDIUM		C	BEGAN ENTERING
			DRY; SILTY; CLAYEY FROM		D	BORING AT 22.0' ±
			2.0' - 3.0'		E	LEVEL WAS AT
			3.0' To 8.0'		F	23.0' AFTER 24 HRS
			CLAY:		G	2. JAR SAMPLES:
			3.0' - 6.0': MEDIUM-HIGH		H	A: 0.0' - 2.0'
			PLASTICITY; RED & LIGHT		I	B: 2.0' - 3.0'
			GRAY TO RED FROM 4.0'		J	C: 3.0' - 4.0'
			VERY STIFF - HARD; DAMP;		K	D: 4.0' - 6.0'
			TRACE OF SILTY SAND TO		L	E: 6.0' - 8.0'
			4.0' ±		M	F: 8.0' - 10.0'
			6.0' - 8.0': LOW-MEDIUM			G: 10.0' - 15.0'
			PLASTICITY; YELLOWISH			H: 15.0' - 20.0'
			BROWN WITH LIGHT GRAY;			I: 20.0' - 24.2'
			STIFF; DAMP; VERY SILTY;			J: 24.2' - 26.5'
			SANDY			K: 26.5' - 31.5'
			8.0' To 24.2'			L: 31.5' - 34.4'
			SILT:			M: 34.4' - 38.0'
			8.0' - 20.0': LOW PLAS-			3. JAR SAMPLES:
			TICITY; YELLOWISH BROWN			(CHEMICAL TESTS)
			WITH LIGHT GRAY; MEDIUM			CH-1 & 1A: 2.0'
			MOIST; SANDY; VERY CLAY-			CH-2 & 2A: 10.0'
			EY WITH THIN SILTY CLAY			4. DRILLING:
			LAMINATIONS			10" FLIGHT AUGER:
			20.0' - 24.2': LOW PLAS-			0.0' - 37.0'
			TICITY; YELLOWISH BROWN			NOTE: BORING BE-
			WITH LIGHT GRAY; VERY			GAN SQUEEZING
			MOIST - WET; SANDY			IN FROM 21.0' ±
			24.2' To 26.5'			NOTE: SET 8"
			SAND: FINE GRAINED;			STEEL CASING TO
			YELLOWISH BROWN;			37.0'
			SATURATED; VERY SILTY			8" FLIGHT AUGER:
			26.5' To 34.4'			37.0' - 38.0'
			CLAY: MEDIUM-HIGH PLAS-			5. NOTE: MONITORING
			TICITY; LIGHT GRAY WITH			WELL WAS COM-
			YELLOWISH BROWN;			PLETED & DEVELOPED
			VERY STIFF; DAMP; WITH			10 SEPT. 87; RE-
			SCATTERED SILTY SAND			FER TO CONSTRUCTION
			LAMINATIONS			DETAIL SHEET.
			34.4' To 38.0' T.D.			6. NOTE: GAS DETECTOR
			SILT: LOW-MEDIUM PLAS-			TUBES WERE USED
			TICITY; YELLOWISH BROWN			TO MONITOR METHYLENE
			SATURATED; SANDY; MOD-			CHLORIDE & TRICHLORO
			ERATELY CLAYEY			ETHYLENE EVERY
			T.D. 38.0'			10.0' OF BOREHOLE
						ADVANCEMENT; NO
						MEASURABLE
						AMOUNTS WERE
						PRESENT.

DRILLING LOG		DIVISION	INSTALLATION	SHEET		
		SWD	FWD	1 OF 2 SHEETS		
1. PROJECT GROUND-WATER MONITORING WELLS			10. SIZE AND TYPE OF BIT 8" AUGER			
2. LOCATION (Coordinates or Station) LONGHORN AAP			11. DATUM FOR ELEVATION SHOWN (BSN = MSL)			
3. DRILLING AGENCY USCE			12. MANUFACTURER'S DESIGNATION OF DRILL FALLING 1500			
4. HOLE NO. (As shown on drawing title and file number) MW-2			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		18 0	
5. NAME OF DRILLER T. SUITS			14. TOTAL NUMBER CORE BOXES		N/A	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
7. THICKNESS OF OVERBURDEN			16. DATE MOLE		27 AUG. 87 28 AUG. 87	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE		195.18	
9. TOTAL DEPTH OF HOLE 40.4'			18. TOTAL CORE RECOVERY FOR BORING		N/A	
			19. SIGNATURE OF INSPECTOR Jackie R. Stoen			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
0.0			0.0' To 2.0' SAND: FINE GRAINED; REDDISH BROWN; MEDIUM; DRY; VERY SILTY		A	1. WATER LEVEL; NOTE: FREE WATER BEGAN ENTERING BORING AT 20.8'; LEVEL WAS AT 20.7" AFTER 24 HRS.
			2.0' To 19.2' CLAY: 2.0' - 6.0': MEDIUM- HIGH PLASTICITY; RED WITH LIGHT GRAY TO REDDISH BROWN FROM 4.0'; VERY STIFF- HARD DOWN TO VERY STIFF FROM 4.0'; DAMP; TRACE OF SILTY SAND TO NO SAND FROM 4.0'		B	
			6.0' - 14.2': MEDIUM PLAS- TICITY; REDDISH BROWN, YELLOWISH BROWN & LIGHT GRAY; STIFF; MOIST; VERY SILTY; SLIGHTLY SANDY		C	
			14.2' - 19.2': Low-MEDIUM PLASTICITY; REDDISH BROWN WITH LIGHT GRAY; MEDIUM; VERY MOIST; VERY SANDY; WITH LAMI- NATIONS OF FINE SAND		D	
			19.2' To 27.0' SILT: Low PLASTICITY; YELLOWISH BROWN; MEDIUM; WET TO SATURAT- ED FROM 20.4' TO VERY MOIST FROM 26.0'; SANDY TO VERY SANDY		E	
			27.0' To 34.0' CLAY: MEDIUM-HIGH PLASTICITY; YELLOWISH BROWN & LIGHT GRAY; STIFF; MOIST; SLIGHTLY SILTY		F	
			34.0' To 39.9' SILT: Low to MEDIUM PLAS- TICITY FROM 38.0'; YELLOWISH BROWN WITH LIGHT GRAY TO YELLOWISH BROWN & REDDISH BROWN FROM 38.0'; MEDIUM; VERY MOIST; VERY SANDY; CLAYEY FROM 38.0'; WITH ABUNDANT		G	
					H	2. JAR SAMPLES: A: 0.0' - 2.0' B: 2.0' - 4.0' C: 4.0' - 6.0' D: 6.0' - 8.0' E: 8.0' - 10.0' F: 10.0' - 14.2' G: 14.2' - 19.2' H: 19.2' - 20.4' I: 20.4' - 26.0' J: 26.0' - 27.0' K: 27.0' - 34.0' L: 34.0' - 38.0' M: 38.0' - 39.9' N: 39.9' - 40.4'
					I	3. JAR SAMPLES (CHEMICAL TESTS): CH-1 & 1A: 2.0' CH-2 & 2A: 10.0'
					J	4. DRILLING: 10" FLIGHT AUGER: 0.0' - 40.0' NOTE: BORING BE- GAN SQUEEZING IN FROM 20.0'
					K	NOTE: SET 8" STEEL CASING TO 40.0' 8" FLIGHT AUGER: 40.0' - 40.4'
					L	5. NOTE: MONITORING WELL WAS COM- PLETED & DEVELOP- ED ON 1 SEPT. 87; REFER TO CON- STRUCTION DETAIL SHEET.
					M	6. NOTE: GAS DE- TECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLOROETHY- LENE EVERY 10.0'

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DRILLING LOG		DIVISION	INSTALLATION	SHEET		
		SWD	FWD	1 OF 2 SHEETS		
1. PROJECT GROUND-WATER MONITORING WELLS			10. SIZE AND TYPE OF BIT 10" AUGER			
2. LOCATION (Coordinates or Station) LONGHORN AAP			11. DATUM FOR ELEVATION SHOWN (TBM = MSL)			
3. DRILLING AGENCY USCE			12. MANUFACTURER'S DESIGNATION OF DRILL FALLING 1500			
4. HOLE NO. (As shown on drawing title and file number) MW-3			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		15	
			DISTURBED		0	
5. NAME OF DRILLER T. SVITS			14. TOTAL NUMBER CORE BOXES N/A			
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 11 SEPT. 87 COMPLETED 12 SEPT. 87			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE 194.02			
9. TOTAL DEPTH OF HOLE 46.0'			18. TOTAL CORE RECOVERY FOR BORING N/A			
			19. SIGNATURE OF INSPECTOR JACKIE K. JOHAN			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.0		0.0' TO 2.0' SAND: FINE GRAINED; LIGHT BROWN; MEDIUM; DRY; VERY SILTY		A	1. WATER LEVEL: NOTE: MATERIAL BECAME VERY MOIST TO WET FROM 16.0' DURING DRILLING. LEVEL WAS 22.1' 24 HRS. AFTER WELL DEVELOPMENT.
			2.0' TO 8.2' SILT: MEDIUM PLASTICITY TO LOW PLASTICITY FROM 4.0'; YELLOWISH BROWN WITH LIGHT GRAY WITH RED FROM 4.0'; STIFF; DAMP; SLIGHTLY SANDY TO SANDY FROM 4.0'		B	
			8.2' TO 15.0' SAND: FINE GRAINED; YELLOWISH BROWN; MEDIUM; DAMP; SILTY		C	
			15.0' TO 20.5' SILT: LOW PLASTICITY; YELLOWISH BROWN; VERY MOIST TO WET FROM 17.5'; MEDIUM; VERY SANDY; WITH OCCASIONAL CLAY LAMINATION		D	
			20.5' TO 29.0' SAND: FINE GRAINED; LIGHT GRAY WITH YELLOWISH BROWN; MEDIUM; VERY MOIST-WET; VERY SILTY; (BORDERS A SANDY SILT)		E	2. JAR SAMPLES: A: 0.0' - 2.0' B: 2.0' - 4.0' C: 4.0' - 6.0' D: 6.0' - 8.2' E: 8.2' - 10.0' F: 10.0' - 15.0' G: 15.0' - 17.5' H: 17.5' - 20.5' I: 20.5' - 25.5' J: 25.5' - 29.0' K: 29.0' - 34.0' L: 34.0' - 37.8' M: 37.8' - 39.4' N: 39.4' - 43.5' O: 43.5' - 46.0'
					F	
					G	
					H	
					I	3. JAR SAMPLES: (CHEMICAL TESTS) CH-1 & 1A: 2.0' CH-2 & 2A: 10.0' CH-3 & 3A: 15.0'
					J	
					K	4. DRILLING: 10" FLIGHT AUGER: 0.0' - 45.5' NOTE: SET 8" STEEL CASING TO 45.5' 8" FLIGHT AUGER: 45.5' - 46.0' NOTE: BORING BEGAN SQUEEZING IN FROM 16.0'
					L	
					M	
			37.8' TO 39.4' CLAY: MEDIUM PLASTICITY; REDDISH BROWN; MEDIUM; VERY MOIST; VERY SILTY			

DRILLING LOG		DIVISION		INSTALLATION		SHEET 2 OF 2 SHEETS	
1. PROJECT GROUND-WATER MONITORING WELLS				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station) LONGHORN AAP				11. DATUM FOR ELEVATION SHOWN (TBM = MSL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE		11 SEPT. 87 12 SEPT. 87	
9. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING			
				19. SIGNATURE OF INSPECTOR <i>Justin R. Hobbs</i>			
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
			SLIGHTLY SANDY 39.4' TO 43.5'		N	5. NOTE: MONITORING WELL WAS COMPLETED & DEVELOPED ON 14 SEPT; REFER TO CONSTRUCTION DETAIL SHEET.	
			SILT: LOW-MEDIUM PLASTICITY; YELLOWISH BROWN; MEDIUM; WET; CLAYEY. SANDY 43.5' TO 46.0' T.D.		O	6. NOTE: GAS DETECTOR TUBES WERE USED IN WORK AREA TO MONITOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT; NO MEASURABLE AMOUNTS WERE PRESENT.	
	46.0		SAND: FINE GRAINED; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; WET; VERY SILTY; (BORDERS A SANDY SILT) T.D. 46.0'				
	60						
	80						

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DRILLING LOG		DIVISION		INSTALLATION		Hole No. MW-4	
		SWD		FWD		SHEET 1 OF 2 SHEETS	
1. PROJECT GROUND-WATER MONITORING WELLS				10. SIZE AND TYPE OF BIT 10" AUGER			
2. LOCATION (Coordinates or Station) LONGHORN AAP				11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY USCE				12. MANUFACTURER'S DESIGNATION OF DRILL FAIRING 1500			
4. HOLE NO. (As shown on drawing title and file number) MW-4				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED 24 UNDISTURBED 0	
5. NAME OF DRILLER T. SUITS				14. TOTAL NUMBER CORE BOXES N/A			
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED 15 SEPT. 87 COMPLETED 16 SEPT. 87	
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE 195.77		18. TOTAL CORE RECOVERY FOR BORING N/A	
9. TOTAL DEPTH OF HOLE 43.6'				19. SIGNATURE OF INSPECTOR <i>Jack R. Stobbs</i>			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIAL (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
0.0			2.0' to 2.0' ± SAND FILL: FINE GRAINED; LIGHT REDDISH BROWN; MEDIUM-DENSE; DRY; VERY SILTY; WITH SCATTERED GRAVEL, SANDSTONE & ASPHALT FRAGMENTS		A	1. WATER LEVEL: NOTE: FREE WATER ENTERING FROM 15.0' ± WITH BORING SQUEEZING IN. LEVEL IN WELL AFTER COMPLETION - 24 HRS. WAS 23.0'	
			2.0' ± to 8.0' ± SILT FILL: 2.0' ± - 4.0': LOW PLASTICITY; GRAY; MEDIUM-STIFF; DAMP; VERY SANDY		B		
			4.0' - 8.0' ±: MEDIUM PLASTICITY; YELLOWISH BROWN & LIGHT GRAY TO LIGHT GRAY WITH YELLOWISH BROWN FROM 6.0'; MEDIUM; VERY MOIST-WET; CLAYEY; WITH TRACE OF SAND		C		
			8.0' ± to 17.1' SILT: LOW PLASTICITY; YELLOWISH BROWN; MEDIUM-STIFF; VERY MOIST TO WET FROM 15.0'; VERY SANDY		D	2. JAR SAMPLES: A: 0.0' - 2.0' B: 2.0' - 4.0' C: 4.0' - 6.0' D: 6.0' - 8.0' E: 8.0' - 10.0' F: 10.0' - 15.0' G: 15.0' - 17.1' H: 17.1' - 19.9' I: 19.9' - 21.9' J: 21.9' - 26.9' K: 26.9' - 29.0' L: 29.0' - 32.3' M: 32.3' - 38.1' N: 38.1' - 42.0' O: 42.0' - 43.0' P: 43.0' - 43.6'	
			17.1' to 19.9' SAND: FINE GRAINED; ORANGE & LIGHT GRAY; MEDIUM; WET; VERY SILTY (BORDERS A SANDY SILT)		E		
			19.9' to 21.9' CLAY: MEDIUM-HIGH PLASTICITY; RED, YELLOWISH BROWN & LIGHT GRAY; STIFF; MOIST; WITH OCCASIONAL SANDY SILT LAMINATION		F		
			21.9' to 29.0' SILT: LOW PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; WET; SANDY; VERY CLAYEY FROM 26.9'		G		
			29.0' to 32.3' CLAY: MEDIUM-HIGH PLASTICITY; YELLOWISH BROWN & LIGHT GRAY; STIFF - VERY STIFF; DAMP		H		
			32.3' to 38.1' SILT: LOW-MEDIUM PLASTICITY; YELLOWISH BROWN & LIGHT GRAY; MEDIUM-STIFF; MOIST; CLAYEY; SANDY		I	3. JAR SAMPLES: (CHEMICAL TESTS): CH-1 & 1A: 2.0' CH-2, 2A, 2C & 2D: 10.0' CH-3 & 3A: 15.0'	
					J	4. DRILLING: 10" FLIGHT AUGER: 0.0' - 43.6' NOTE: SET 8" STEEL CASING TO 43.0' & CLEANED OUT WITH 8" AUGER	
					K		
					L	5. NOTE: MONITORING WELL WAS COMPLETED & DEVELOPED ON 18 SEPT. 87; REFER TO CONSTRUCTION DETAIL SHEET.	
					M		
					N		

002659

Hole No. MW-4

DRILLING LOG		DIVISION		INSTALLATION		SHEET 2 OF 2 SHEETS	
1. PROJECT				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station) LONGHORN AAP				11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) MW-4				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		14. TOTAL NUMBER CORE BOXES	
5. NAME OF DRILLER				15. ELEVATION GROUND WATER		16. DATE HOLE STARTED 15 SEPT. 87 COMPLETED 16 SEPT. 87	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				17. ELEVATION TOP OF HOLE			
7. THICKNESS OF OVERBURDEN				18. TOTAL CORE RECOVERY FOR BORING			
8. DEPTH DRILLED INTO ROCK				19. SIGNATURE OF INSPECTOR Jackie R. Stiles			
9. TOTAL DEPTH OF HOLE							
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVER- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
			38.1' To 43.0'			6. NOTE: GAS DE-TECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLORO-ETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT. NO MEASURABLE AMOUNT WERE PRESENT IN THE WORK AREA.	
	43.6		SAND: 38.1'-42.0': FINE GRAINED, YELLOWISH BROWN; MEDIUM; SATURATED; SILTY 42.0'-43.0': FINE GRAINED; ORANGE WITH BLACK CARBONACEOUS STAINS; MEDIUM; VERY MOIST; CLAYEY 43.0' To 43.6' T.D. CLAY: MEDIUM-HIGH PLASTICITY; ORANGE, YELLOWISH BROWN & LIGHT GRAY; STIFF; DAMP; WITH TRACE OF SANDY SILT T.D. 43.6'		0 P		
	60						
	80						

002660

Hole No. MW-5

DRILLING LOG		DIVISION	INSTALLATION	SHEET		
		SWD	FWD	1 OF 2 SHEETS		
1. PROJECT GROUND-WATER MONITORING WELLS			10. SIZE AND TYPE OF BIT 10" AUGER			
2. LOCATION (Coordinates or Station) LONGHORN AAP			11. DATUM FOR ELEVATION SHOWN (TBM = MSL)			
3. DRILLING AGENCY HISCE			12. MANUFACTURER'S DESIGNATION OF DRILL FALLING 1500			
4. HOLE NO. (As shown on drawing title and file number) MW-5			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 21			
5. NAME OF DRILLER T. SUITS			14. TOTAL NUMBER CORE BOXES N/A			
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
7. THICKNESS OF OVERBURDEN			16. DATE MOLE 21 SEPT. 87			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF MOLE 193.34			
9. TOTAL DEPTH OF HOLE 40.8			18. TOTAL CORE RECOVERY FOR BORING N/A			
			19. SIGNATURE OF INSPECTOR John R. [Signature]			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
0.0	0.0'		0.0' To 2.0' SAND: FINE GRAINED; REDDISH BROWN; DENSE; DRY; VERY SILTY (BORDERS A SANDY SILT)		A	1. WATER LEVEL: NOTE: FREE WATER BEGAN ENTERING BORING AT 19.0' ± WITH BORING SQUEEZING IN AT 19.0' ±; LEVEL IN WELL 24 HRS. AFTER COMPLETION WAS 21.3'
	2.0'		2.0' To 3.6' SILT: LOW PLASTICITY; REDDISH BROWN; HARD; DAMP; VERY SANDY		B	
	3.6'		3.6' To 5.4' SAND: FINE GRAINED; LIGHT BROWN; MEDIUM; DAMP; SILTY		C	
	5.4'		5.4' To 7.0' CLAY: MEDIUM PLASTICITY; LIGHT GRAY WITH RED; STIFF-VERY STIFF; DAMP; SILTY & SANDY		D	
	7.0'		7.0' To 9.0' SAND: FINE GRAINED; BROWN-YELLOWISH BROWN; MEDIUM; DAMP; SILTY		E	
	9.0'		9.0' To 11.2' SILT: LOW PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM-STIFF; MOIST; SANDY		F	
	11.2'		11.2' To 28.0' SAND: FINE GRAINED; LIGHT BROWN; MEDIUM; DAMP TO VERY MOIST FROM 16.2' TO WET FROM 19.5' ±; SLIGHTLY SILTY TO SILTY FROM 16.2'		G	
	28.0'		28.0' To 29.8' CLAY: MEDIUM-HIGH PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; VERY STIFF; DAMP		H	
	29.8'		29.8' To 31.5' SAND: FINE GRAINED; LIGHT GRAY WITH YELLOWISH BROWN; MEDIUM; WET; SILTY		I	
	31.5'		31.5' To 34.5' CLAY: MEDIUM-HIGH PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; VERY STIFF; DAMP		J	
	34.5'		34.5' To 36.4' SILT: MEDIUM PLASTICITY;		K	
					L	
					M	
					N	
					O	
						3. JAR SAMPLES: (CHEMICAL TESTS) CH-1 & 1A: 2.0' CH-2 & 2A: 10.0' CH-3 & 3A: 17.0'
						4. DRILLING: 10" FLIGHT AUGER: 0.0' - 40.0' NOTE: SET 8" STEEL CASING TO 40.0' 8" FLIGHT AUGER: 40.0' - 40.8'
						5. NOTE: MONITORING WELL WAS COMPLETED & DEVELOPED ON 22 SEPT. 87; REFER TO CONSTRUCTION DETAIL SHEET.

002661

DRILLING LOG		DIVISION		INSTALLATION		SHEET 2 OF 2 SHEETS	
1. PROJECT GROUND-WATER MONITORING WELLS				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station) LONGHORN AAP.				11. DATUM FOR ELEVATION SHOWN (FSM or MSL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) MW-5				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				16. DATE HOLE STARTED 21 SEPT. 87 COMPLETED 21 SEPT. 87		17. ELEVATION TOP OF HOLE	
7. THICKNESS OF OVERBURDEN				18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR Jackie R. Stokes	
8. DEPTH DRILLED INTO ROCK				19. SIGNATURE OF INSPECTOR		20. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE				20. SIGNATURE OF INSPECTOR		21. SIGNATURE OF INSPECTOR	
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
	40.8		LIGHT GRAY & YELLOWISH BROWN WITH BLACK CARBONACEOUS STAINING; MEDIUM; VERY MOIST; CLAYEY; SLIGHTLY SANDY 36.4' TO 40.8' T.D.			6. NOTE: GAS DE- TECTOR TUBES WERE USED TO MONITOR WORK AREA FOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCE- MENT. NO MEASUR- ABLE AMOUNTS WERE PRESENT.	
	60		SILT: LOW PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; WET; VERY SANDY T.D. 40.8'				
	80						

002662

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 2 SHEETS		
1. PROJECT GROUND-WATER MONITORING WELLS			10. SIZE AND TYPE OF BIT 10" AUGER			
2. LOCATION (Coordinates or Station) LONGHORN AAP			11. DATUM FOR ELEVATION SHOWN (TBM = MSL)			
3. DRILLING AGENCY USCE			12. MANUFACTURER'S DESIGNATION OF DRILL FALLING 1500			
4. HOLE NO. (As shown on drawing title and file number) MW-6			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		14. TOTAL NUMBER CORE BOXES	
			20		N/A	
5. NAME OF DRILLER T. SUITS			15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			16. DATE HOLE STARTED 23 SEPT. 87 COMPLETED 23 SEPT. 87			
7. THICKNESS OF OVERBURDEN			17. ELEVATION TOP OF HOLE 190.26			
8. DEPTH DRILLED INTO ROCK			18. TOTAL CORE RECOVERY FOR BORING N/A			
9. TOTAL DEPTH OF HOLE 45.8'			19. SIGNATURE OF INSPECTOR James R. Hobbs			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, motor loss, depth of weathering, etc., if significant)
0.0	0.0		0.0' TO 1.7' SAND: FINE GRAINED; REDDISH BROWN; DENSE; DRY; VERY SILTY		A	1. WATER LEVEL: NOTE: FREE WATER ENTERED BORING FROM 18.0' ± DURING DRILLING WITH BORING SQUEEZING IN FROM 12.0' ±; LEVEL 24 HRS. AFTER COMPLETION WAS AT 18.8'
			1.7' TO 5.0' CLAY: MEDIUM PLASTICITY; LIGHT GRAY & RED; HARD; DRY-DAMP; SILTY		B	
			5.0' TO 9.1' SILT: LOW PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN TO YELLOWISH BROWN FROM 7.1'; VERY STIFF TO STIFF FROM 7.1'; DAMP TO MOIST FROM 7.1'; SANDY TO VERY SANDY FROM 7.1'		C	
			9.1' TO 13.9' SAND: FINE GRAINED; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; MOIST; SILTY		D	
			13.9' TO 18.0' SILT: MEDIUM PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; STIFF; MOIST; CLAYEY; SLIGHTLY SANDY		E	2. WAR SAMPLES: A: 0.0' - 1.7' B: 1.7' - 3.7' C: 3.7' - 5.0' D: 5.0' - 7.1' E: 7.1' - 9.1' F: 9.1' - 13.9' G: 13.9' - 18.0' H: 18.0' - 19.5' I: 19.5' - 22.0' J: 22.0' - 27.0' K: 27.0' - 32.0' L: 32.0' - 37.0' M: 37.0' - 42.2' N: 42.2' - 45.8'
			18.0' TO 19.5' SAND: FINE-MEDIUM GRAINED; LIGHT GRAY & YELLOWISH BROWN; MEDIUM; SATURATED; SLIGHTLY SILTY		F	
			19.5' TO 22.0' SILT: MEDIUM PLASTICITY; LIGHT GRAY & YELLOWISH BROWN; MEDIUM-STIFF; MOIST-VERY MOIST; CLAYEY; WITH TRACE OF FINE SAND		G	
			22.0' TO 37.0' CLAY: MEDIUM-HIGH PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; STIFF-VERY STIFF; DAMP		H	3. WAR SAMPLES: (CHEMICAL TESTS): CH-1 & 1A: 2.0' CH-2 & 2A: 10.0' CH-3 & 3A: 18.0'
			37.0' TO 42.2' SILT: MEDIUM PLASTICITY; LIGHT BLUE GRAY; WITH YELLOWISH BROWN; MEDIUM-STIFF; VERY MOIST; CLAYEY; WITH TRACE OF FINE SAND		I	
					J	4. DRILLING: 10" FLIGHT AUGER: 0.0' - 45.0' NOTE: SET 8" STEEL CASING TO 45.0' 8" FLIGHT AUGER: 45.0' - 45.8'
					K	
					L	5. NOTE: MONITORING WELL WAS COMPLETED & DEVELOPED ON 24 SEPT. 87; REFER TO CONSTRUCTION DETAIL SHEET.
					M	

002663

DRILLING LOG		DIVISION		INSTALLATION		SHEET 2 OF 2 SHEETS	
1. PROJECT GROUND-WATER MONITORING WELLS				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station) LONGHORN AAP				11. DATUM FOR ELEVATION SHOWN (TBM = MSL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) MW-6				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE STARTED 23 SEPT. 87 COMPLETED 23 SEPT. 87			
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE			
9. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING			
				19. SIGNATURE OF INSPECTOR James R. Stoken			
ELEVATION e	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
	45.8		42.2' TO 45.8' T.D. SAND: FINE GRAINED; GRAY: MEDIUM; SATURATED; SILTY T.D. 45.8'		N	6. NOTE: GAS DE-TECTOR TUBES WERE USED TO MONITOR WORK AREA FOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT; NO MEASURABLE AMOUNTS WERE PRESENT.	
	60						
	80						

002664

DRILLING LOG		DIVISION	INSTALLATION	Hole No.	SHEET	
1. PROJECT LONGHORN AAP		SWD	FWD	MW-7	I	
2. LOCATION (Coordinates or Station)		10. SIZE AND TYPE OF BIT 10" AUGER				
3. DRILLING AGENCY USCE		11. DATUM FOR ELEVATION KNOWN (TBM - BSL)				
4. HOLE NO. (As shown on drawing title and file number) MW-7		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500				
5. NAME OF DRILLER T. Suits		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 13 DISTURBED 0 UNDISTURBED				
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		14. TOTAL NUMBER CORE BOXES N/A				
7. THICKNESS OF OVERBURDEN		15. ELEVATION GROUND WATER SEE REMARKS COLUMN				
8. DEPTH DRILLED INTO ROCK		16. DATE HOLE 29 JUNE '88 STARTED 27 JUNE '88 COMPLETED				
9. TOTAL DEPTH OF HOLE 36.0'		17. ELEVATION TOP OF HOLE 186.62				
		18. TOTAL CORE RECOVERY FOR BORING N/A				
		19. SIGNATURE OF INSPECTOR James R. [Signature]				
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.0		2.0' TO 2.0'		A	1. WATER LEVEL:
			SILT:		B	NOTE: FREE WATER ENTERED BORING DURING DRILLING FROM 15.0' ±. LEVEL IN MONITORING WELL AFTER 24 HRS. WAS 12.7'
			0.0' - 1.0': LOOSE, DRY; CLAYEY; WITH SOME SAND; REDDISH BROWN		C	
			1.0' - 2.0': LOOSE; SLIGHTLY MOIST; WITH VERY FINE SAND; REDDISH BROWN		D	2. JAR SAMPLES:
			2.0' TO 10.0'		E	(SOIL CLASSIFICATION)
			CLAY:		F	A: 0.0' - 1.0'
			2.0' - 4.5': VERY STIFF; HIGH PLASTICITY; SLIGHTLY SILTY; REDDISH BROWN TO TAN		G	B: 1.0' - 2.0'
			4.5' - 6.5': STIFF; MEDIUM-HIGH PLASTICITY; SILTY; SLIGHTLY MOIST; YELLOWISH BROWN TO LIGHT GRAY		H	C: 2.0' - 4.5'
			6.5' - 8.0': STIFF; MEDIUM-HIGH PLASTICITY; SILTY; SLIGHTLY MOIST; LIGHT GRAY TO YELLOWISH BROWN		I	D: 4.5' - 6.5'
			8.0' - 10.0': MEDIUM-STIFF; MEDIUM PLASTICITY; SLIGHTLY MOIST; SANDY; YELLOWISH BROWN TO LIGHT GRAY		J	E: 6.5' - 8.0'
			10.0' TO 17.0'		K	F: 8.0' - 10.0'
			SAND:		L	G: 10.0' - 15.0'
			10.0' - 15.0': FINE; DENSE; MOIST; CLAYEY; YELLOWISH BROWN		M	H: 15.0' - 17.0'
			15.0' - 17.0': DENSE; WET; WITH SOME CLAY & SILT; YELLOWISH BROWN			I: 17.0' - 19.0'
			17.0' TO 19.0'			J: 19.0' - 21.0'
			CLAY: MEDIUM-STIFF; MEDIUM PLASTICITY; MOIST; SILTY TO SANDY; GRAY TO YELLOWISH BROWN			K: 21.0' - 27.0'
			19.0' TO 21.0'			L: 27.0' - 32.0'
			SAND: DENSE; WET; SILTY; CLAYEY; YELLOWISH BROWN			M: 32.0' - 36.0'
			21.0' TO 36.0' T.D.			CHEMICAL TESTS:
			CLAY:			C-1 & 1A: 2.0'
			21.0' - 27.0': MEDIUM-HIGH PLASTICITY; MOIST; STIFF; SILTY TO SANDY IN ZONES TO 29.0'; BLUE GRAY, RED & YELLOWISH BROWN			C-2 & 2A: 10.0'
			27.0' - 36.0': HIGH PLASTICITY; STIFF; MOIST; SILTY; BLUE GRAY WITH YELLOWISH BROWN TO BLUE GRAY FROM 32.0'			
			T.D. 36.0'			3. DRILLING:
						10" FLIGHT AUGER: 0.0' - 36.0'
						4. NOTE: MONITORING WELL IS TO BE SET IN OFFSET BORING.
						5. NOTE: GAS DETECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT. NO MEASURABLE AMOUNTS WERE PRESENT. NO ODOR WAS DETECTED DURING DRILLING.
						6. NOTE: MATERIAL WAS CLASSIFIED BY GEOL. LACY.

002665

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT LONGHORN AAP		SWD		FWD		MW-8	
2. LOCATION (County, State or Station) GROUND-WATER MONITORING WELLS				10. SIZE AND TYPE OF BIT 10" AUGER		SHEET 1 OF 1 SHEETS	
3. DRILLING AGENCY USCE				11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
4. HOLE NO. (As shown on drawing title and file number) MW-8				12. MANUFACTURER'S DESIGNATION OF DRILL FALING 1500			
5. NAME OF DRILLER T. SUITS				13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN		DISTURBED 18 UNDISTURBED 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				14. TOTAL NUMBER CORE BOXES N/A			
7. THICKNESS OF OVERBURDEN				15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
8. DEPTH DRILLED INTO ROCK				16. DATE HOLE STARTED 13 JULY 88 COMPLETED 13 JULY 88			
9. TOTAL DEPTH OF HOLE 32.0'				17. ELEVATION TOP OF HOLE 185.47'			
				18. TOTAL CORE RECOVERY FOR BORING N/A			
				19. SIGNATURE OF INSPECTOR <i>Jackie R. Hoban</i>			

ELEVATION c	DEPTH b	LEGEND e	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVER- ERY f	BOX OR SAMPLE NO. g	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) h
	0.0		0.0' To 0.1' SILT: LOW PLASTICITY; DARK BROWN; LOOSE; DRY; SANDY		A	1. WATER LEVEL: NOTE: FREE WATER ENTERED BORING DURING DRILLING FROM 9.5' LEVEL IN WELL AFTER 24 HRS. WAS 11.5'
			0.1' To 5.6' CLAY: 0.1' - 1.8': MEDIUM PLASTICITY; RED; HARD; DRY-DAMP; SLIGHTLY SANDY		B	
			1.8' - 5.6': LOW-MEDIUM PLASTICITY; YELLOWISH BROWN & LIGHT GRAY WITH RED; HARD; DRY-DAMP; SANDY		C	
			5.6' To 9.5' SILT: LOW PLASTICITY; YELLOWISH BROWN & LIGHT GRAY; STIFF; DAMP-MOIST TO MOIST FROM 7.6'; SANDY; CLAYEY		D	2. JAR SAMPLES: (SOIL CLASSIFICATION) A: 0.1' - 1.8' B: 1.8' - 3.8' C: 3.8' - 5.6' D: 5.6' - 7.6' E: 7.6' - 9.5' F: 9.5' - 11.5' G: 11.5' - 13.8' H: 13.8' - 14.4' I: 14.4' - 17.5' J: 17.5' - 18.4' K: 18.4' - 23.4' L: 23.4' - 28.0' M: 28.0' - 30.0' N: 30.0' - 32.0'
			9.5' To 13.8' SAND: FINE GRAINED; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; WET TO SATURATED FROM 11.5'; SILTY		E	
			13.8' To 14.4' CLAY: LOW-MEDIUM PLASTICITY; LIGHT BLUE & YELLOWISH BROWN; STIFF; MOIST; VERY SILTY; MODERATELY SANDY		F	
			14.4' To 17.5' SILT: LOW PLASTICITY; YELLOWISH BROWN & LIGHT GRAY; MEDIUM; WET; SANDY		G	
			17.5' To 18.4' CLAY: MEDIUM-HIGH PLASTICITY; LIGHT BLUE GRAY & YELLOWISH BROWN; VERY STIFF; DAMP		H	
			18.4' To 28.0' SILT: LOW PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; MEDIUM; VERY MOIST-WET; SANDY		I	3. DRILLING: 10" FLIGHT AUGER: 0.0' - 32.0' NOTE: SET 8" STEEL CASING TO 32.0' & CLEANED OUT. SET MONITORING WELL & PLACED SAND FILTER & BENTONITE SEAL AS CASING WAS REMOVED. GROUTED TO SURFACE NOTE: REFER TO CONSTRUCTION DETAIL SHEET.
			28.0' To 32.0' T.D. CLAY: MEDIUM-HIGH PLASTICITY; LIGHT BLUE GRAY & YELLOWISH BROWN; STIFF-VERY STIFF TO VERY STIFF FROM 30.0'; MOIST TO DAMP FROM 30.0'; WITH TRACE OF SILT & FINE SAND TO 30.0' T.D. 32.0'		J	4. JAR SAMPLES: (CHEMICAL TESTS) C-1 & 1A: 2.0' C-2 & 2A: 10.0'
					K	5. NOTE: GAS DETECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT. NO MEASURABLE AMOUNTS WERE PRESENT. NO ODOR WAS DETECTED.
					L	6. SURVEYED CO-ORDINATES: X: 3,040,110.04 Y: 380,189.97
					M	
					N	

DRILLING LOG		Division		INSTALLATION		SHEET	
1. PROJECT LONGHORN AAP.		SWD		FWD		1 OF 1 SHEETS	
2. LOCATION (Coordinates or Station)				10. SIZE AND TYPE OF BIT 10" AUGER		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY GROUND-WATER MONITORING WELLS				12. MANUFACTURER'S DESIGNATION OF DRAIL FAILING 1500			
4. HOLE NO. (As shown on drawing title and file number) MW-9				13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN		DISTURBED 18 UNDISTURBED 0	
5. NAME OF DRILLER T. S. LITS				14. TOTAL NUMBER CORE BOXES N/A			
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE 7 JULY 88		COMPLETED 8 JULY 88	
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE 182.58			
9. TOTAL DEPTH OF HOLE 27.0				18. TOTAL CORE RECOVERY FOR BORING N/A		19. SIGNATURE OF INSPECTOR James R. [Signature]	
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
	0.0		0.0' TO 0.5' SILT: LOW PLASTICITY; REDDISH BROWN; STIFF; DAMP; VERY SANDY (BORDERS A SILTY SAND)		A	1. WATER LEVEL: NOTE: FREE WATER ENTERED BORING DURING DRILLING FROM 9.0' LEVEL IN WELL AFTER 24 HRS. WAS 8.8	
			0.5' TO 7.3' CLAY: 0.5' - 2.5': MEDIUM-HIGH PLASTICITY; RED WITH YELLOW; VERY STIFF-HARD; DAMP; TRACE OF SAND		B		
			2.5' - 4.0': MEDIUM PLASTICITY; RED & LIGHT GRAY; HARD; DRY; SLIGHTLY SANDY		C		
			4.0' - 6.0': MEDIUM PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; HARD; DRY-DAMP; SILTY; WITH TRACE OF FINE SAND		D		
			6.0' - 7.3': LOW PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; STIFF; MOIST; VERY SANDY		E	2. JAR SAMPLES: (SOIL CLASSIFICATION)	
			7.3' TO 12.5' SAND: FINE-MEDIUM GRAINED; YELLOWISH BROWN; MEDIUM; VERY MOIST TO SATURATED FROM 9.0'; VERY SILTY TO SLIGHTLY SILTY FROM 9.0'		F	A: 0.0' - 0.5'	
			12.5' TO 13.1' CLAY: HIGH PLASTICITY; LIGHT BLUE GRAY & YELLOWISH BROWN; STIFF; MOIST; WITH A WEAK ODOR		G	B: 0.5' - 2.5'	
			13.1' TO 16.0' SAND: FINE-MEDIUM GRAINED; YELLOWISH BROWN; MEDIUM; SATURATED; SILTY; WITH A WEAK ODOR		H	C: 2.5' - 4.0'	
			16.0' TO 27.0' T.D. CLAY: (WITH A WEAK ODOR) 16.0' - 19.0': HIGH PLASTICITY; LIGHT BLUE GRAY WITH YELLOWISH BROWN; VERY STIFF; DAMP		I	D: 4.0' - 6.0'	
			19.0' - 26.0': LOW-MEDIUM PLASTICITY; LIGHT BLUE GRAY WITH YELLOWISH BROWN; STIFF TO MEDIUM FROM 24.0'; MOIST TO VERY MOIST FROM 24.0'; VERY SILTY; SANDY		J	E: 6.0' - 7.3'	
			26.0' - 27.0': HIGH PLASTICITY; LIGHT BLUE & YELLOWISH BROWN; HARD; DAMP		K	F: 7.3' - 9.0'	
			T.D. 27.0'		L	G: 9.0' - 11.0'	
					M	H: 11.0' - 12.5'	
					N	I: 12.5' - 13.1'	
						J: 13.1' - 16.0'	
						K: 16.0' - 19.0'	
						L: 19.0' - 24.0'	
						M: 24.0' - 26.0'	
						N: 26.0' - 27.0'	
						(CHEMICAL TESTS) C-1 & 1A: 2.0' C-2 & 2A: 10.0'	
						3. DRILLING: 10" FLIGHT AUGER: 0.0' - 27.0' NOTE: SET 8" STEEL CASING TO 27.0' & CLEANED OUT. SET MONITORING WELL & PLACED SAND FILTER & BENTONITE SEAL AS CASING WAS REMOVED; GROUTED TO SURFACE. NOTE: REFER TO CONSTRUCTION DETAIL SHEET.	
						4. NOTE: GAS DETECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLORETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT. NO MEASURABLE AMOUNTS WERE PRESENT. NOTE: A WEAK ODOR WAS DETECTED IN JAR SAMPLES FROM 12.5' - 27.0'	
						5. SURVEYED COORDINATES: X: 3,040,119.45' Y: 380,467.44'	

DRILLING LOG		DIVISION	INSTALLATION	SHEET		
1. PROJECT LONGHORN AAP.		SWD	FWD	I OF I SHEETS		
2. LOCATION (Coordinates or Station) GROUND-WATER MONITORING WELLS		10. SIZE AND TYPE OF BIT 10" AUGER				
3. DRILLING AGENCY USCE		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)				
4. HOLE NO. (As shown on drawing title and file number) MW-10		12. MANUFACTURER'S DESIGNATION OF DRILL FALING 1500				
5. NAME OF DRILLER T. SUTTS		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 17 UNDISTURBED 0				
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		14. TOTAL NUMBER CORE BOXES N/A				
7. THICKNESS OF OVERBURDEN		15. ELEVATION GROUND WATER SEE REMARKS COLUMN				
8. DEPTH DRILLED INTO ROCK		16. DATE HOLE STARTED 18 JULY '88 COMPLETED 18 JULY '88				
9. TOTAL DEPTH OF HOLE 34.5'		17. ELEVATION TOP OF HOLE 176.23'				
		18. TOTAL CORE RECOVERY FOR BORING N/A %				
		19. SIGNATURE OF INSPECTOR <i>Jackie R. Stiles</i>				
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of monitoring, etc., if significant) g
0.0			0.0' TO 1.0' SILT: LOW PLASTICITY; LIGHT BROWN; HARD; DRY; VERY SANDY		A	1. WATER LEVEL: NOTE: FREE WATER ENTERED BORING DURING DRILLING FROM 7.2' ±; LEVEL IN WELL AFTER 24 HRS. WAS 5.5'
			1.0' TO 7.2' CLAY: 1.0' - 3.0': MEDIUM PLASTICITY; LIGHT GRAY WITH RED & YELLOWISH BROWN; HARD; DRY-CLAMP; SLIGHTLY SANDY		B	
			3.0' - 7.2': MEDIUM PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; STIFF-VERY STIFF; MOIST; VERY SILTY; SLIGHTLY SANDY		C	
			7.2' TO 32.0' SAND: 7.2' - 13.0': FINE GRAINED; LIGHT GRAY & YELLOWISH BROWN; MEDIUM; SATURATED; VERY SILTY TO SILTY FROM 9.2'		D	2. LAR SAMPLES: (SOIL CLASSIFICATION) A: 0.0' - 1.0' B: 1.0' - 3.0' C: 3.0' - 5.1' D: 5.1' - 7.2' E: 7.2' - 9.2' F: 9.2' - 11.2' G: 11.2' - 13.0' H: 13.0' - 18.0' I: 18.0' - 19.5' J: 19.5' - 23.5' K: 23.5' - 28.5' L: 28.5' - 32.0' M: 32.0' - 34.5'
			13.0' - 19.5': FINE GRAINED; LIGHT GRAY & YELLOWISH BROWN; MEDIUM; MOIST; VERY SILTY (BORDERS A SANDY SILT)		E	
			19.5' - 23.5': FINE GRAINED; YELLOWISH BROWN; MEDIUM; SATURATED; SLIGHTLY SILTY		F	
			23.5' - 32.0': FINE GRAINED; GRAY; MEDIUM; VERY MOIST-WET; VERY SILTY		G	
			32.0' TO 34.5' T.D. SILT: LOW PLASTICITY; GRAY; MEDIUM-STIFF; MOIST-VERY MOIST; VERY SANDY, WITH THIN SANDY CLAY SEAMS		H	
			T.D. 34.5'		I	3. DRILLING: 10" FLIGHT AUGER: 0.0' - 34.5' NOTE: SET 8" STEEL CASING TO 34.5' & CLEANED OUT. SET MONITORING WELL & PLACED SAND FILTER & BENTONITE SEAL AS CASING WAS REMOVED. GROUTED TO SURFACE. NOTE: REFER TO CONSTRUCTION DETAIL SHEET.
					J	
					K	
					L	4. NOTE: GAS DETECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT. NO MEASURABLE AMOUNTS WERE PRESENT. NO ODOR WAS DETECTED.
						5. SURVEYED CO-ORDINATES: X: 3,039,841.24 Y: 380,650.29

002668

DRILLING LOG		DIVISION	INSTALLATION		SHEET 1 OF 1 SHEETS	
1. PROJECT <u>LONGHORN AAP</u>			2. LOCATION (Coordinate or Station) <u>GROUND-WATER MONITORING WELLS</u>		3. DRILLING AGENCY <u>USCE</u>	
4. HOLE NO. (As shown on drawing title and file number) <u>MW-11</u>			10. SIZE AND TYPE OF BIT <u>10" AUGER</u>		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
5. NAME OF DRILLER <u>T. SUITS</u>			12. MANUFACTURER'S DESIGNATION OF DRILL <u>FALLING 1500</u>		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN <u>12</u>	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			14. TOTAL NUMBER CORE BOXES <u>N/A</u>		15. ELEVATION GROUND WATER <u>SEE REMARKS COLUMN</u>	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE <u>21 JULY '88</u>		17. ELEVATION TOP OF HOLE <u>176.52</u>	
8. DEPTH DRILLED INTO ROCK			18. TOTAL CORE RECOVERY FOR BORING <u>N/A</u>		19. SIGNATURE OF INSPECTOR <u>Jackie R. Hobbs</u>	
9. TOTAL DEPTH OF HOLE <u>11.6'</u>						
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.0		<u>2.0' TO 0.4'</u> <u>SAND: FINE GRAINED;</u> <u>LIGHT BROWN; DENSE;</u> <u>DRY; VERY SILTY</u>		A	1. <u>WATER LEVEL:</u>
			<u>0.4' TO 1.9'</u> <u>SILT: LOW PLASTICITY;</u> <u>LIGHT BROWN &</u> <u>YELLOWISH BROWN;</u> <u>HARD; DRY; VERY SANDY</u>		B	<u>NOTE: FREE WATER</u> <u>ENTERED BORING DURING</u> <u>DRILLING FROM</u> <u>6.0'±; LEVEL IN</u> <u>WELL AFTER 24 HR.</u> <u>WAS AT 6.0'</u>
			<u>1.9' TO 5.0'</u> <u>CLAY: MEDIUM PLASTICITY</u> <u>TO LOW PLASTICITY</u> <u>FROM 3.9'; LIGHT GRAY,</u> <u>RED, ORANGE & YELLOWISH</u> <u>BROWN; VERY STIFF TO</u> <u>HARD; DAMP; SLIGHTLY</u> <u>SANDY & SILTY TO SANDY</u> <u>& SILTY FROM 3.9'</u>		C	
			<u>5.0' TO 11.6' T.D.</u> <u>SAND: FINE GRAINED;</u> <u>LIGHT GRAY & YELLOWISH</u> <u>BROWN; MEDIUM; VERY</u> <u>MOIST TO WET FROM</u> <u>6.0' TO SATURATED FROM</u> <u>8.0'; SILTY</u> <u>T.D. 11.6'</u>		D	
	11.6				E	2. <u>JAR SAMPLES:</u> <u>(SOIL CLASSIFICATION)</u> <u>A: 0.0' - 0.4'</u> <u>B: 0.4' - 1.9'</u> <u>C: 1.9' - 3.9'</u> <u>D: 3.9' - 5.0'</u> <u>E: 5.0' - 6.0'</u> <u>F: 6.0' - 8.0'</u> <u>G: 8.0' - 10.0'</u> <u>H: 10.0' - 11.6'</u> <u>(CHEMICAL SAMPLES)</u> <u>C-1 & 1A: 2.0'</u> <u>C-2 & 2A: 10.0'</u>
	20				F	3. <u>DRILLING:</u> <u>10" FLIGHT AUGER:</u> <u>0.0' - 11.6'</u> <u>NOTE: SET 8" STEEL</u> <u>CASING TO 11.6' &</u> <u>CLEANED OUT. SET</u> <u>MONITORING WELL &</u> <u>PLACED SAND FILTER</u> <u>& BENTONITE SEAL</u> <u>AS CASING WAS RE-</u> <u>MOVED. GROUTED</u> <u>TO SURFACE. NOTE:</u> <u>REFER TO CONSTRUCTION</u> <u>DETAIL SHEET.</u>
	20				G	4. <u>NOTE: GAS DETECTOR</u> <u>TUBES WERE USED TO</u> <u>MONITOR METHYLENE</u> <u>CHLORIDE & TRICHLORO</u> <u>ETHYLENE EVERY 10.0</u> <u>OF BOREHOLE ADVANCE-</u> <u>MENT. NO MEASURABLE</u> <u>AMOUNTS WERE PRESENT.</u> <u>NO ODOR WAS DETECTED.</u>
	20				H	5. <u>SURVEYED COORDI-</u> <u>NATES:</u> <u>X: 3,040.098.51</u> <u>Y: 380.914.88</u>

002669

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS		
1. PROJECT LONGHORN AAP			10. SIZE AND TYPE OF BIT 10" AUGER			
2. LOCATION (Coordinates or Station) GROUND-WATER MONITORING WELLS			11. DATUM FOR ELEVATION SHOWN (BSN or MSL)			
3. DRILLING AGENCY USCE			12. MANUFACTURER'S DESIGNATION OF DRILL FALLING 1500			
4. HOLE NO. (As shown on drawing title and file number) MW-12			13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN		DISTURBED 16	
5. NAME OF DRILLER T. SUITS			14. TOTAL NUMBER CORE BOXES		N/A	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER		SEE REMARKS COLUMN	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE		STARTED 26 July 88	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE		176.77	
9. TOTAL DEPTH OF HOLE 28.8'			18. TOTAL CORE RECOVERY FOR BORING		N/A	
			19. SIGNATURE OF INSPECTOR		James R. Hobbs	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIAL (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.0		0.0' TO 0.7'		A	1. WATER LEVEL:
			SILT: LOW PLASTICITY; LIGHT BROWN; HARD; DRY; VERY SANDY		B	NOTE: FREE WATER ENTERED BORING DURING DRILLING FROM 7.0'± LEVEL IN WELL AFTER 24 HRS. WAS AT 6.0'
			0.7' TO 6.0'		C	
			CLAY:		D	
			0.7' - 4.0': MEDIUM PLASTICITY; LIGHT GRAY WITH LIGHT BROWN & YELLOWISH BROWN; VERY STIFF - HARD; DAMP; SILTY; SLIGHTLY SANDY		E	2. JAR SAMPLES:
			4.0' - 6.0': MEDIUM PLASTICITY; GRAYISH BROWN WITH YELLOWISH BROWN; STIFF - VERY STIFF; MOIST; SILTY; SLIGHTLY SANDY		F	(SOIL CLASSIFICATION)
			6.0' TO 8.0'		G	A: 0.0' - 0.7'
			SILT:		H	B: 0.7' - 2.7'
			6.0' - 7.0': LOW-MEDIUM PLASTICITY; LIGHT GRAY, BROWN & YELLOWISH BROWN; STIFF; MOIST - VERY MOIST; INTER-BEDDED SANDY SILT & SILTY CLAY		I	C: 2.7' - 4.0'
			7.0' - 8.0': LOW PLASTICITY; LIGHT GRAY & LIGHT BROWN WITH YELLOWISH BROWN; MEDIUM; WET; VERY SANDY; INTERBEDDED SANDY SILT & CLAYEY SILT; WITH A WEAK ODOR		J	D: 4.0' - 6.0'
			8.0' TO 10.0'		K	E: 6.0' - 7.0'
			SAND: FINE GRAINED; LIGHT BROWN & YELLOWISH BROWN; MEDIUM; SATURATED; SILTY; WITH A WEAK ODOR.		L	F: 7.0' - 8.0'
			10.0' TO 12.0'			G: 8.0' - 10.0'
			SILT: LOW PLASTICITY; LIGHT BLUE GRAY WITH YELLOWISH BROWN; MEDIUM; WET; VERY SANDY; WITH A WEAK ODOR.			H: 10.0' - 12.0'
			12.0' TO 27.0'			I: 12.0' - 17.0'
			SAND: FINE GRAINED; LIGHT BROWN TO LIGHT BLUE GRAY & YELLOWISH BROWN FROM 17.0'; MEDIUM; WET; SILTY TO VERY SILTY FROM 17.0'; WITH A WEAK ODOR			J: 17.0' - 22.0'
			27.0' TO 28.8' T.D.			K: 22.0' - 27.0'
			SILT: LOW PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; MEDIUM; VERY SANDY; SATURATED; WITH A WEAK ODOR.			L: 27.0' - 28.8'
			T.D. 28.8'			(CHEMICAL SAMPLES)
						C-1 & 1A: 2.0'
						C-2 & 2A: 10.0'
						3. DRILLING:
						10" FLIGHT AUGER: 0.0' - 28.8'
						NOTE: SET 8" STEEL CASING TO 28.8' & CLEANED OUT. SET MONITORING WELL & PLACED SAND FILTER & BENTONITE SEAL AS CASING WAS REMOVED. GROUTED TO SURFACE. NOTE: REFER TO CONSTRUCTION DETAIL SHEET.
						4. NOTE: GAS DETECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT. NO MEASURABLE AMOUNTS WERE PRESENT.
						NOTE: A WEAK ODOR WAS DETECTED IN SOIL SAMPLES & A WEAK TO MEDIUM - STRONG ODOR IN BAILING & DEVELOPING WELL.

002670

DRILLING LOG		DIVISION	INSTALLATION		SHEET	
		SWD	FWD		1 OF 2 SHEETS	
1. PROJECT LONGHORN AAP			10. SIZE AND TYPE OF BIT 10" AUGER: 9 7/8" ROCKBIT			
2. LOCATION (Coordinates or Station)			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY USCE			12. MANUFACTURER'S DESIGNATION OF DRILL FALLING 1500			
4. HOLE NO. (As shown on drawing title and title number) MW-13			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED 16	UNDISTURBED 0
5. NAME OF DRILLER T. SULTS			14. TOTAL NUMBER CORE BOXES N/A			
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
7. THICKNESS OF OVERBURDEN			16. DATE HOLE		STARTED 13 SEPT. 88	COMPLETED 15 SEPT. 88
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE		174.64	
9. TOTAL DEPTH OF HOLE 46.0'			18. TOTAL CORE RECOVERY FOR BORING		N/A	
			19. SIGNATURE OF INSPECTOR Jackie R. [Signature]			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
0.0	0.0		2.0' TO 2.7'		A	1. WATER LEVEL: NOTE: AUGERED INTO FREE WATER AT 5.5' ±. LEVEL IN WELL AFTER 24 HRS. WAS 9.4'
			SILT: LOW PLASTICITY; LIGHT BROWN WITH YELLOWISH BROWN; STIFF; MOIST; VERY SANDY		B	
			0.7' TO 5.5'		C	
			CLAY:		D	
			2.7' - 3.5': MEDIUM-HIGH PLASTICITY; LIGHT GRAY & RED; HARD; DAMP; SLIGHTLY SILTY		E	2. JAR SAMPLES: (SOIL CLASSIFICATION)
			3.5' - 5.5': LOW-MEDIUM PLASTICITY; LIGHT GRAY & YELLOWISH BROWN; VERY STIFF; DAMP; VERY SILTY; SANDY		F	A: 0.0' - 0.7'
			5.5' TO 26.0'		G	B: 0.7' - 2.7'
			SAND:			C: 2.7' - 3.5'
			5.5' - 6.5': FINE GRAINED; LIGHT GRAY WITH YELLOWISH BROWN; MEDIUM; WET; SILTY			D: 3.5' - 5.5'
			6.5' - 17.0': FINE GRAINED; LIGHT GRAY WITH YELLOWISH BROWN TO LIGHT BLUE GRAY FROM 8.5'; MEDIUM; SATURATED; SILTY			E: 5.5' - 6.5'
			17.0' - 26.0': FINE GRAINED; YELLOWISH BROWN WITH LIGHT BLUE GRAY FROM 22.0'; MEDIUM; WET; SLIGHTLY CLAYEY; VERY SILTY (BORDERS A SANDY SILT); SLIGHTLY CARBONACEOUS FROM 22.0'			F: 6.5' - 8.5'
			26.0' TO 28.0'			G: 8.5' - 13.5'
			SILT: LOW PLASTICITY; WITH THIN LAMINATIONS OF PLASTIC SILT; LIGHT BLUE GRAY & YELLOWISH BROWN; MEDIUM; WET; VERY SANDY			H: 13.5' - 17.0'
			28.0' TO 30.0' ±			I: 17.0' - 22.0'
			CLAY: MEDIUM-HIGH PLASTICITY LAMINATIONS INTERBEDDED WITH SANDY SILT LAMINATIONS. LIGHT BLUE GRAY WITH YELLOWISH BROWN; MEDIUM; VERY MOIST; SILTY			J: 22.0' - 26.0'
			30.0' ± TO 46.0' T.D.			K: 26.0' - 28.0'
			SAND: FINE GRAINED; LIGHT GRAY; SATURATED; WITH CARBON MATTER			L: 28.0' - 29.0'
						(CHEMICAL SAMPLES) C-1 & 1A: 2.0' C-2 & 2A: 10.0'
						3. DRILLING: 10" FLIGHT AUGER: 0.0' - 29.0' NOTE: SET 8" CASING TO 29.0' & CEMENTED IN PLACE. 9 7/8" ROCKBIT: 29.0' - 46.0' NOTE: USED BENTONITE MUD. NOTE: ALL DRILL MUD WAS FLUSHED FROM WELL & MONITORING WELL WAS PLACED & SAND FILTER & BENTONITE SEAL WAS PLACED & BORING WAS GROUTED TO SURFACE. NOTE: REFER TO CONSTRUCTION DETAIL SHEET.
						4. NOTE: MW-13 WAS SET 10 SW OF C-2.

DRILLING LOG		DIVISION	INSTALLATION	Hole No. MW-13	SHEET 2 OF 2 SHEETS
1. PROJECT LONGHORN AAP			10. SIZE AND TYPE OF BIT		
2. LOCATION (Coordinates or Station)			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL		
4. HOLE NO. (As shown on drawing title and file number) MW-13			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 13 SEPT. 88 COMPLETED 15 SEPT. 88		
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE		
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING %		
			19. SIGNATURE OF INSPECTOR <i>Joseph R. Hobbs</i>		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	46.0		T.D. 46.0'			5. NOTE: GAS DETECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT. NO MEASURABLE AMOUNTS WERE PRESENT. NOTE: NO ODOR WAS DETECTED IN SOIL SAMPLES.
	60					
	80					

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 2 SHEETS		
1. PROJECT LONGHORN AAP.		SWD	FWD	10. SIZE AND TYPE OF BIT 10" AUGER		
2. LOCATION (Coordinates or Station) GROUND-WATER MONITORING WELLS				11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
3. DRILLING AGENCY USCE				12. MANUFACTURER'S DESIGNATION OF DRILL FALLING 1500		
4. HOLE NO. (As shown on drawing title and file number) MW-14				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 21 0		
5. NAME OF DRILLER T. SUITS				14. TOTAL NUMBER CORE BOXES N/A		
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER SEE REMARKS COLUMN		
7. THICKNESS OF OVERBURDEN				16. DATE HOLE STARTED 2 AUG. 88 COMPLETED 9 AUG. 88		
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE 180.93		
9. TOTAL DEPTH OF HOLE 51.0'				18. TOTAL CORE RECOVERY FOR BORING N/A		
				19. SIGNATURE OF INSPECTOR Jackie R. Hobbs		
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
0.0			0.0' to 1.9' SILT FILL: LOW PLASTICITY; LIGHT REDDISH BROWN; HARD; DRY; VERY SANDY; WITH FERRUGINOUS NODULES & CONCRETIONS		A	1. WATER LEVEL: NOTE: FREE WATER ENTERED BORING DURING DRILLING FROM 11.0' LEVEL IN WELL AFTER 24 HRS. WAS AT 10.0'
			1.9' to 7.0' SILT: 1.9' - 5.0': LOW PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM-STIFF; MOIST; VERY SANDY (BORDERS A SILTY SAND; CONTAINS A VERY WEAK ODOR.		B	
			5.0' - 7.0': LOW PLASTICITY; YELLOWISH BROWN & LIGHT GRAY; STIFF; DAMP; CLAYEY; SANDY; CONTAINS A VERY WEAK ODOR		C	
			7.0' to 20.0' SAND: 7.0' - 11.0': FINE GRAINED; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; VERY MOIST TO WET FROM 9.0' ±; VERY SILTY TO SLIGHTLY SILTY FROM 9.0'; CONTAINS A VERY WEAK ODOR		D	2. JAR SAMPLES: (SOIL CLASSIFICATION)
			11.0' - 20.0': FINE GRAINED; YELLOW, YELLOWISH BROWN & LIGHT GRAY; MEDIUM; WET-SATURATED; VERY SILTY; CONTAINS A WEAK ODOR		E	A: 0.0' - 1.9'
					F	B: 1.9' - 3.9'
					G	C: 3.9' - 5.0'
					H	D: 5.0' - 7.0'
					I	E: 7.0' - 9.0'
					J	F: 9.0' - 11.0'
					K	G: 11.0' - 16.0'
					L	H: 16.0' - 20.0'
					M	I: 20.0' - 22.5'
					N	J: 22.5' - 23.8'
					O	K: 23.8' - 26.0'
						L: 26.0' - 27.8'
						M: 27.8' - 32.8'
						N: 32.8' - 37.8'
						O: 37.8' - 42.8'
						P: 42.8' - 47.8'
						Q: 47.8' - 51.0'
						(CHEMICAL SAMPLES)
						C-1 & 1A: 2.0'
						C-2 & 2A: 10.0'
			20.0' to 23.8' SILT: 20.0' - 22.5': LOW PLASTICITY; YELLOWISH BROWN & LIGHT GRAY; MEDIUM; WET; VERY SANDY (BORDERS A SILTY SAND); CONTAINS A VERY WEAK ODOR.			3. DRILLING: 10" FLIGHT AUGER: 0.0' - 28.0' NOTE: SET 8" PVC CASING TO 28.0' & CEMENTED IN PLACE; NOTE: CEMENT PLUG WAS ROCK BITTED OUT. 8" FLIGHT AUGER 28.0' - 50.0' NOTE: BENTONITE DRILL MUD WAS USED & BORING WAS "MUDDER OFF" & 7 7/8" ROCK- BIT WAS USED FROM 50.0' - 51.0'
			22.5' - 23.8': LOW-MEDIUM PLASTICITY; LIGHT BLUE GRAY; MEDIUM-STIFF; VERY MOIST; CLAYEY; SANDY; CONTAINS A VERY WEAK ODOR			MONITOR WELL WAS SET & SAND FILTER WAS PLACED AFTER DRILL MUD WAS FLUSHED OUT. THE BENTONITE SEAL WAS PLACED & BORING WAS GROUTED TO SURFACE. NOTE: RE- FER TO CONSTRUCTION
			23.8' to 26.0' SAND: FINE GRAINED; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; VERY MOIST-WET; VERY SILTY; CONTAINS A VERY WEAK ODOR			
			26.0' to 27.8' CLAY: LOW PLASTICITY;			

Hole No. MW-14

DRILLING LOG		DIVISION	INSTALLATION	SHEET <u>2</u> OF <u>2</u> SHEETS
1. PROJECT <u>LONGHORN AAP.</u>			10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinate or Station) <u>GROUND-WATER MONITORING WELLS</u>			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number) <u>MW-14</u>			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED <u>2 AUG. 88</u> COMPLETED <u>9 AUG. 88</u>	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING	
			19. SIGNATURE OF INSPECTOR <u>Jack R. Stiles</u>	

002674

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			LIGHT BLUE GRAY & YELLOWISH BROWN; MEDIUM- STIFF; VERY MOIST; VERY SILTY; SANDY; CONTAINS A VERY WEAK ODOR. 27.8' TO 51.0' T.D.			DETAIL SHEET.
			SAND: 27.8'-32.8': FINE GRAINED; LIGHT BLUE GRAY & YELLOWISH BROWN; MEDIUM; SATURATED; SILTY; CONTAINS A WEAK ODOR		P	4. NOTE: GAS DETECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLORO- ETHYLENE EVERY 10.0 OF BOREHOLE ADVANCE- MENT. NO MEASURABLE AMOUNTS WERE PRESENT
			32.8'-51.0': FINE-MEDIUM GRAINED; LIGHT BLUE GRAY & YELLOWISH BROWN TO LIGHT GRAY WITH CHOCOLATE BROWN FROM 47.8'; MEDIUM-DENSE; SATURATED; SLIGHTLY SILTY; WITH CARBON MATTER. T.D. 51.0'		Q	NOTE: A WEAK ODOR WAS DETECTED IN SOIL SAMPLES TO 32.8'
	51.0					
	60					

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT LONGHORN AAP		SWD		FWD		1 OF 2 SHEETS	
2. LOCATION (Coordinates or Station)				10. SIZE AND TYPE OF BIT 10" AUGER			
3. DRILLING AGENCY USCE				11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
4. HOLE NO. (As shown on drawing title and file number) MW-15				12. MANUFACTURER'S DESIGNATION OF DRILL FAIRING 1500			
5. NAME OF DRILLER T. SUTTS				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED 20 UNDISTURBED 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				14. TOTAL NUMBER CORE BOXES N/A			
7. THICKNESS OF OVERBURDEN				15. ELEVATION GROUND WATER SEE REMARKS COLUMN			
8. DEPTH DRILLED INTO ROCK				16. DATE HOLE 29 AUG. 88		COMPLETED 30 AUG. 88	
9. TOTAL DEPTH OF HOLE 69.5'				17. ELEVATION TOP OF HOLE 195.70			
				18. TOTAL CORE RECOVERY FOR BORING N/A		1	
				19. SIGNATURE OF INSPECTOR <i>Jackie R. Hoban</i>			
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
	0.0		0.0' TO 0.7' SAND: FINE GRAINED; BROWN; MEDIUM; DRY-DAMP; VERY SILTY (BORDERS A SANDY SILT)		A	1. WATER LEVEL:	
			0.7' TO 17.0' CLAY: 0.7' - 2.0': LOW PLASTICITY; YELLOWISH BROWN WITH RED; VERY STIFF; DAMP; VERY SILTY; SANDY; WITH SCATTERED CARBON STAINS		B	NOTE: AUGERED INTO FREE WATER AT 20.0' ±; LEVEL IN WELL AFTER 24 HRS. WAS 26.5'	
			2.0' - 5.8': MEDIUM-HIGH PLASTICITY; RED WITH LIGHT GRAY; HARD; DAMP; WITH TRACE OF SAND & SILT; WITH ABUNDANT CARBON STAINS FROM 4.0'		C		
			5.8' - 12.0': MEDIUM PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; STIFF; MOIST; VERY SILTY; SLIGHTLY SANDY		D	2. JAR SAMPLES: (SOIL CLASSIFICATION)	
			12.0' - 17.0': LOW-MEDIUM PLASTICITY; YELLOWISH BROWN, REDDISH BROWN & LIGHT GRAY; MEDIUM; VERY MOIST; SILTY; VERY SANDY		E	A: 0.0' - 0.7'	
					F	B: 0.7' - 2.0'	
					G	C: 2.0' - 4.0'	
					H	D: 4.0' - 5.8'	
					I	E: 5.8' - 10.8'	
					J	F: 10.8' - 12.0'	
					K	G: 12.0' - 17.0'	
					L	H: 17.0' - 20.0'	
					M	I: 20.0' - 23.0'	
					N	J: 23.0' - 25.5'	
						K: 25.5' - 30.5'	
						L: 30.5' - 31.5'	
						M: 31.5' - 36.5'	
						N: 36.5' - 40.0'	
						O: 40.0' - 46.5'	
						P: 46.5' - 47.0'	
						(CHEMICAL SAMPLES)	
						C-1 & 1A: 2.0'	
						C-2 & 2A: 10.0'	
			17.0' TO 25.5' SILT: LOW PLASTICITY; YELLOWISH BROWN WITH LIGHT GRAY; MEDIUM; VERY MOIST - WET TO SATURATED AT 20.0' ±; SANDY TO VERY SANDY FROM 23.0' (BORDERS A SAND FROM 23.0')		I	3. DRILLING:	
			25.5' TO 31.5' CLAY: MEDIUM-HIGH PLASTICITY; LIGHT GRAY WITH YELLOWISH BROWN; STIFF; MOIST; SLIGHTLY SILTY; CONTAINS A WEAK ODOR		J	10" FLIGHT AUGER: 0.0' - 41.0'	
			31.5' TO 40.0' SILT: LOW PLASTICITY; YELLOWISH BROWN; WET-SATURATED; MEDIUM; VERY SANDY WITH SILTY SAND SEAMS (BORDERS A SAND); CONTAINS A WEAK ODOR.		K	NOTE: SET 8" CASING TO 42.0' & CEMENTED IN PLACE.	
					L	8" FLIGHT AUGER: 41.0' - 47.0'	
					M	7 7/8" ROCKBIT W/ BENTONITE MUD: 47.0' - 69.5'	
					N	NOTE: MONITOR WELL WAS SET & SAND FILTER WAS PLACED AFTER ALL DRILL MUD WAS WASHED OUT. THE BENTONITE SEAL WAS PLACED & BORING WAS GROUTED TO SURFACE. NOTE: REFER TO CONSTRUCTION DETAIL SHEET.	
						4. NOTE: MW-15 WAS SET 10' WEST OF MW-2.	

DRILLING LOG		DIVISION		INSTALLATION		SHEET 2 OF 2 SHEETS	
1. PROJECT LONGHORN AAP.				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)				11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) MW-15				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK				29 AUG. '88		30 AUG. '88	
9. TOTAL DEPTH OF HOLE				17. ELEVATION TOP OF HOLE			
				18. TOTAL CORE RECOVERY FOR BORING %			
				19. SIGNATURE OF INSPECTOR Jasbir R. [Signature]			
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
			40.0' TO 46.5' CLAY: MEDIUM-HIGH PLASTICITY; LIGHT GRAY & BLUE GRAY WITH YELLOWISH BROWN; STIFF-VERY STIFF; DAMP-MOIST; SLIGHTLY SILTY; CONTAINS A VERY WEAK ODOR.		0	5. NOTE: GAS DETECTOR TUBES WERE USED TO MONITOR METHYLENE CHLORIDE & TRICHLOROETHYLENE EVERY 10.0' OF BOREHOLE ADVANCEMENT. NO MEASURABLE AMOUNTS WERE PRESENT. SOME ODOR WAS DETECTED IN SOIL SAMPLES FROM 25.5' TO 46.5'	
			46.5' TO 69.5' T.D. SAND: FINE GRAINED; LIGHT GRAY-LIGHT BLUE GRAY; MEDIUM; WET-SATURATED; VERY SILTY; WITH CARBON MATTER; WITH NO ODOR. (ROCK BITTED FROM 47.0')		P		
						7 1/8" Rockbit	
	60						
	69.5		T.D. 69.5'				
	80						

002677

106-46-7-----1,3-Dichlorobenzene	
547-73-1-----1,4-Dichlorobenzene	

25
25

U
U

002678

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B-1394(MW-15)

Lab Name: SWL - TULSAContract: SWCORPLab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21381Sample wt/vol: 2.0 (g/mL) MLLab File ID: C3094Level: (low/med) LOWDate Received: 09/22/88

% Moisture: not dec. _____

Date Analyzed: 10/13/88Column (pack/cap) CAFDilution Factor: 1.0Number TICs found: 2

CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 354234	ETHANE, 1,2-DICHLORO-1,1,2-T	3.57	240	J
2. 76131	ETHANE, 1,1,2-TRICHLORO-1,2,	3.82	6800	J



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.40d

DATE: 10-14-88

SAMPLE MATRIX: WATER
SWLO # 21381
DATE SUBMITTED: 09-22-88
CLIENT I.D.: 8-1394 (MW-15) 9/19/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	185.0 mg/L	10-14-88	RY	SWB46-9020

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SWB46 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hoover

TULSA BRANCH
1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002680

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-12-88

SWLO#: 21394 (mw-15)

SAMPLE ID: 8-1394

COMPOUNDS

RESULTS
ug/L

HMX	26.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	14.0 U
2,4 DNT	10.0 U

U indicates detection limit

PAGE 2

2

LABORATORY • Santa Fe, New Mexico 87201

REPORT OF ANALYSIS

OUT OF STATE 800/545-2188

LAB #

88-09-412

SAMPLE IDENTIFICATION

DATE COLLECTED

TYPE OF ANALYSIS

ug/liter

#MW-1 8-1391

09/19/88

Volatile Organics

()

#MW-2 8-1392

09/19/88

Total Organic Halogens

1300 (mg/liter)

#MW-6 8-1393

09/19/88

2,4,6 Trinitrotoluene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
INX
RDX
Tetryl

<10
<10
<20
<20
<20
<50

#MW-15 8-1394

09/19/88

2,4,6 Trinitrotoluene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
INX
RDX
Tetryl

<10
<10
<20
<20
<20
<50

002681

002682

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSAContract: SWCORP

8-1459(C-2)

Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21457Sample wt/vol: 5.0 (g/mL) MLLab File ID: C2943Level: (low/med) LOWDate Received: 09/28/88

% Moisture: not dec. _____

Date Analyzed: 10/04/88Column: (pack/cap) CAPDilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	3	J
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	17	
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	0.8	J
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U
75-69-4	Dichlorodifluoromethane	10	U
95-50-1	1,2-Dichlorobenzene	10	U

FORM I VOA

1/87 Rev.

002683

106-46-7-----1,3-Dichlorobenzene	10	U
547-73-1-----1,4-Dichlorobenzene	10	U

002684

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

8-1459(C-2)

Site Name: SWL - TULSA Contract: SWCORP
Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
Matrix: (soil/water) WATER Lab Sample ID: 21457
Sample wt/vol: 5.0 (g/mL) ML Lab File ID: C2943
Level: (low/med) LOW Date Received: 09/28/88
% Moisture: not dec. _____ Date Analyzed: 10/04/88
Column (pack/cap) CAP Dilution Factor: 1.0

Number TICs found: 1CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN COMPOUND	2.82	5	J

002685



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.45a

DATE: 10-25-88

SAMPLE MATRIX: WATER
SWLO # 21457
DATE SUBMITTED: 09-28-88
CLIENT I.D.: 8-1459 (C-2) 9/26/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	0.03 mg/L	10-25-88	RY	SW846-9020

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SW846 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Houser

TULSA BRANCH
1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002686

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-12-88

SWLO#: 21457

SAMPLE ID: 8-1459 (C-2)

COMPOUNDS	RESULTS ug/L
HMX	26.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	14.0 U
2,4 DNT	10.0 U

U indicates detection limit

002687

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSAContract: SWCORP

8-1461(C-3)

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____Matrix: (soil/water) WATERLab Sample ID: 21458Sample wt/vol: 5.0 (g/mL) MLLab File ID: C2944Level: (low/med) LOWDate Received: 09/28/88

% Moisture: not dec. _____

Date Analyzed: 10/04/88Column: (pack/cap) CAPDilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U
75-69-4	Dichlorodifluoromethane	10	U
95-50-1	1,2-Dichlorobenzene	10	U

FORM I VOA

1/87 Rev.

106-46-7-----1,3-Dichlorobenzene	10	U
547-73-1-----1,4-Dichlorobenzene	10	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

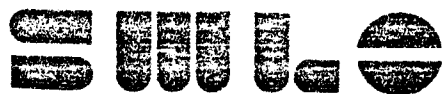
EPA SAMPLE NO.

B-1461(C-3)

Lab Name: SWL - TULSA Contract: SWCORP
Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
Matrix: (soil/water) WATER Lab Sample ID: 21458
Sample wt/vol: 5.0 (g/mL) ML Lab File ID: C2944
Level: (low/med) LOW Date Received: 09/28/88
% Moisture: not dec. _____ Date Analyzed: 10/04/88
Column (pack/cap) CAP Dilution Factor: 1.0

Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.45b

DATE: 10-25-88

SAMPLE MATRIX: WATER
SWLO # 21458
DATE SUBMITTED: 09-28-88
CLIENT I.D.: B-1461 (C-3) 9/26/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	0.24 mg/L	10-25-88	RY	SWB46-9020

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SWB46 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Haver

TULSA BRANCH
1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002691

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-12-88

SWLO#: 21458

SAMPLE ID: 8-1461 (C-3)

COMPOUNDS	RESULTS ug/L
HMX	26.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	14.0 U
2,4 DNT	10.0 U

U indicates detection limit

002692

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSAContract: SWCORP

8-1462(EQBLK)

Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21459Sample wt/vol: 5.0 (g/mL) MLLab File ID: C2945Level: (low/med) LOWDate Received: 09/28/88

% Moisture: not dec. _____

Date Analyzed: 10/04/88Column: (pack/cap) CAPDilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	10	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	3	BJ
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	0.9	J
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	0.4	J
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U
75-69-4	Dichlorodifluoromethane	10	U
95-50-1	1,2-Dichlorobenzene	10	U

FORM I VOA

1/87 Rev.

002693

106-46-7-----1,3-Dichlorobenzene	10	U
547-73-1-----1,4-Dichlorobenzene	10	U

002694

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

8-1462(EQBLK)

Lab Name: SWL - TULSAContract: SWCORPLab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21459Sample wt/vol: 5.0 (g/mL) MLLab File ID: C2945Level: (low/med) LOWDate Received: 09/28/88

% Moisture: not dec. _____

Date Analyzed: 10/04/88Column (pack/cap) CAFDilution Factor: 1.0Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002695

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSAContract: SWCORP

8-1463(C-4)

Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21460Sample wt/vol: 5.0 (g/mL) MLLab File ID: C2946Level: (low/med) LOWDate Received: 09/28/88

% Moisture: not dec. _____

Date Analyzed: 10/04/88Column: (pack/cap) CAPDilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS:		Q
		(ug/L or ug/Kg)	UG/L	
74-87-3	Chloromethane	10	U	
74-83-9	Bromomethane	10	U	
75-01-4	Vinyl Chloride	10	U	
75-00-3	Chloroethane	10	U	
75-09-2	Methylene Chloride	5	U	
67-64-1	Acetone	10	U	
75-15-0	Carbon Disulfide	5	U	
75-35-4	1,1-Dichloroethene	5	U	
75-34-3	1,1-Dichloroethane	5	U	
540-59-0	1,2-Dichloroethene (total)	5	U	
67-66-3	Chloroform	5	U	
107-06-2	1,2-Dichloroethane	5	U	
78-93-3	2-Butanone	10	U	
71-55-6	1,1,1-Trichloroethane	5	U	
56-23-5	Carbon Tetrachloride	5	U	
108-05-4	Vinyl Acetate	10	U	
75-27-4	Bromodichloromethane	5	U	
78-87-5	1,2-Dichloropropane	5	U	
10061-01-5	cis-1,3-Dichloropropene	5	U	
79-01-6	Trichloroethene	9		
124-48-1	Dibromochloromethane	5	U	
79-00-5	1,1,2-Trichloroethane	5	U	
71-43-2	Benzene	5	U	
10061-02-6	Trans-1,3-Dichloropropene	5	U	
75-25-2	Bromoform	5	U	
108-10-1	4-Methyl-2-Pentanone	10	U	
591-78-6	2-Hexanone	10	U	
127-18-4	Tetrachloroethene	50		
79-34-5	1,1,2,2-Tetrachloroethane	5	U	
108-88-3	Toluene	5	U	
108-90-7	Chlorobenzene	5	U	
100-41-4	Ethylbenzene	5	U	
100-42-5	Styrene	5	U	
1330-20-7	Xylene (total)	5	U	
75-69-4	Dichlorodifluoromethane	10	U	
95-50-1	1,2-Dichlorobenzene	10	U	

FORM I VOA

1/87 Rev.

002696

106-46-7-----1,3-Dichlorobenzene	10	U
547-73-1-----1,4-Dichlorobenzene	10	U

002697

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

8-1463(C-4)

Lab Name: SWL - TULSAContract: SWCORPLab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21460Sample wt/vol: 5.0 (g/mL) MLLab File ID: C2946Level: (low/med) LOWDate Received: 09/28/88

% Moisture: not dec. _____

Date Analyzed: 10/04/88Column (pack/cap) CAPDilution Factor: 1.0Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====



IN STATE 505/506/507-11
OUT OF STATE 800/545-2188

CEP, Inc.

REPORT

Results by Sample

RECEIVED: 09/29/88

SAMPLE ID #C-4 8-1463

FRACTION 01A TEST CODE VDA

Date & Time Collected 09/26/88

NAME Volatile Organics EPA-624
Category WATER

NOTES AND DEFINITIONS FOR THIS REPORT

All results reported in ug/liter unless otherwise specified.

002698



Controls for Environmental Pollution, Inc.
P.O. BOX 1051 • Santa Fe, New Mexico 87502

PAGE 2

RECEIVED: 09/29/88

CEP, Inc.

REPORT

Results by Sample

IN STATE 505/902 90411
OUT OF STATE 800/545-2188

LAB # 88-09-557

SAMPLE ID #C-4 8-1463

FRACTION Q1A TEST CODE VDA

NAME Volatile Organics EPA-624

Date & Time Collected 09/26/88

Category WATER

CAS #	Compound name	Result
74-87-3	Chloromethane	<10
74-83-9	Bromomethane	<10
75-01-4	Vinyl Chloride	<10
75-00-3	Chloroethane	<10
75-09-2	Methylene Chloride	<2.8
75-35-4	1,1-Dichloroethane	<2.8
75-34-3	1,1-Dichloroethane	<4.7
156-60-5	Trans-1,2-Dichloroethene	<1.6
67-66-3	Chloroform	<1.6
107-06-2	1,2-Dichloroethane	<2.8
75-69-4	Trichlorofluoromethane	<5.0
71-55-6	1,1,1-Trichloroethane	<3.8
56-23-5	Carbon Tetrachloride	<2.8
75-27-4	Bromodichloromethane	<2.2
79-34-5	1,1,2,2-Tetrachloroethane	<6.9
78-87-5	1,2-Dichloropropane	<6.0
10061-02-6	Trans-1,3-dichloropropene	<5.0
79-01-6	Trichloroethene	<1.9
124-48-1	Dibromochloromethane	<3.1
75-00-5	1,1,2-Trichloroethane	<5.0
127-18-4	Tetrachloroethene	<4.1
10061-01-5	cis-1,3-Dichloropropene	<5.0
110-75-8	2-Chloroethylvinylether	<5.0
75-25-2	Bromoform	<4.7
71-43-2	Benzene	<4.4
75-50-1	1,2-Dichlorobenzene	<5.0
100-90-7	Chlorobenzene	<6.0
541-73-1	1,3-Dichlorobenzene	<5.0
106-46-7	1,4-Dichlorobenzene	<5.0
108-88-3	Toluene	<6.0
100-41-4	Ethylbenzene	<7.2

002700



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.45c

DATE: 10-25-88

SAMPLE MATRIX: WATER
SWLO # 21460
DATE SUBMITTED: 09-28-88
CLIENT I.D.: 8-1463 (C-4) 9/26/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	0.05 mg/L	10-25-88	RY	SW846-9020

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SW846 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hoover

TULSA BRANCH
1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

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INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002701

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-12-88

SWLO#: 21460

SAMPLE ID: 8-1463 (C-4)

COMPOUNDS	RESULTS ug/L
HMX	26.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	14.0 U
2,4 DNT	10.0 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSAContract: SWCORP

8-1464(C-5)

Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21461Sample wt/vol: 5.0 (g/mL) MLLab File ID: C2947Level: (low/med) LOWDate Received: 09/28/88

% Moisture: not dec. _____

Date Analyzed: 10/04/88Column: (pack/cap) CAPDilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg) <u>UG/L</u>	<u>Q</u>
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	110	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	77	
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U
75-69-4	Dichlorodifluoromethane	10	U
95-50-1	1,2-Dichlorobenzene	10	U

106-46-7-----1,3-Dichlorobenzene	10	U
547-73-1-----1,4-Dichlorobenzene	10	U

002704

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

8-1464(C-5)

Lab Name: SWL - TULSA Contract: SWCORP
Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
Matrix: (soil/water) WATER Lab Sample ID: 21461
Sample wt/vol: 5.0 (g/mL) ML Lab File ID: C2947
Level: (low/med) LOW Date Received: 09/28/88
% Moisture: not dec. _____ Date Analyzed: 10/04/88
Column (pack/cap) CAP Dilution Factor: 1.0

Number TICs found: 1CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN FREON	3.78	5	J

002705



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.45d

DATE: 10-25-88

SAMPLE MATRIX: WATER
SWLO # 21461
DATE SUBMITTED: 09-28-88
CLIENT I.D.: B-1464 (C-5) 9/26/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	0.03 mg/L	10-25-88	RY	SW846-9020

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SW846 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hower

TULSA BRANCH
1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064



C.E. Environmental Pollution, Inc.
P.O. BOX 5351 • Santa Fe, New Mexico 87502

PAGE 4

RECEIVED: 09/29/88

CEP, Inc. REPORT

Results by Sample

STATE 005/3029641
OUT OF STATE 800/545-2188

LAB # 88-09-557

SAMPLE ID #C-5 8-1464 SAMPLE # 02 FRACTIONS: A
Date & Time Collected 09/26/88 Category WATER
TOX 1 65 ug/liter

SAMPLE ID #MW-11 8-1465 SAMPLE # 03 FRACTIONS: A
Date & Time Collected 09/26/88 Category WATER
TOX 1 800 ug/liter

002706

002707

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-12-88

SWLO#: 21461

SAMPLE ID: 8-1464 (C-S)

COMPOUNDS

RESULTS
ug/L

HMX	26.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	14.0 U
2,4 DNT	10.0 U

U indicates detection limit

002708



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
 U.S. ARMY CORPS OF ENGINEERS
 POST OFFICE BOX 36045
 DALLAS, TEXAS 75235-8011
 ATTN: CATHY HUTCHINS

REPORT: SAP5013.41e

DATE: 10-14-88

SAMPLE MATRIX: WATER
 SWLD # 21425
 DATE SUBMITTED: 09-24-88
 CLIENT I.D.: B-1420 (109) 8/22/88

<u>PARAMETER</u>	<u>RESULTS</u>		<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	12.7	mg/L	10-14-88	RY	SW846-9020
<u>TOTAL METALS</u>					
ARSENIC	0.002	U mg/L	10-06-88	KS	SM 303E
BARIUM	2.7	mg/L	10-05-88	KS	SM 303C
CADMIUM	0.01	U mg/L	10-04-88	KS	SM 310A
CHROMIUM	0.12	mg/L	10-05-88	KS	SM 312A
LEAD	0.1	U mg/L	10-04-88	KS	SM 316A
MERCURY	0.002	U mg/L	10-06-88	KS	SM 320A
NICKEL	0.05	U mg/L	10-05-88	KS	SM 321A
SELENIUM	0.002	U mg/L	10-06-88	KS	SM 323A
SILVER	0.05	U mg/L	10-04-88	KS	SM 324A
ZINC	0.04	mg/L	10-05-88	KS	SM 328A

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SW846 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hoover

TULSA BRANCH
 1700 W. Albany, Suite C
 Broken Arrow, OK 74012
 (918) 251-2858

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
 INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
 P.O. Box 368
 Cushing, Okla. 74023
 (918) 225-1064

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

002709

EPA SAMPLE NO.

8-1420(109)

Lab Name: SWL - TULSA Contract: SWCORP

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 21425

Sample wt/vol: 3.9 (g/mL) ML Lab File ID: C2904

Level: (low/med) LOW Date Received: 09/24/88

% Moisture: not dec. _____ Date Analyzed: 09/30/88

Column: (pack/cap) CAP Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg) <u>UG/L</u>	<u>Q</u>
74-87-3	Chloromethane	13	U
74-83-9	Bromomethane	13	U
75-01-4	Vinyl Chloride	13	U
75-00-3	Chloroethane	13	U
75-09-2	Methylene Chloride	9	B
67-64-1	Acetone	13	U
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	11	
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	13	U
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	13	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	190	
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	13	U
591-78-6	2-Hexanone	13	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	6	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Xylene (total)	6	U
75-69-4	Dichlorodifluoromethane	13	U
95-50-1	1,2-Dichlorobenzene	13	U

002710

106-46-7-----1,3-Dichlorobenzene
547-73-1-----1,4-Dichlorobenzene

13 U
13 U

002711

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

B-1420(109)

Lab Name: SWL - TULSAContract: SWCORPLab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21425Sample wt/vol: 3.9 (g/mL) MLLab File ID: C2904Level: (low/med) LOWDate Received: 09/24/88

% Moisture: not dec. _____

Date Analyzed: 09/30/88Column (pack/cap) CAPDilution Factor: 1.00Number TICs found: 8CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 76131	Ethane, 1,1,2-trichloro-1,2,	3.87	310	J
2. 76131	Ethane, 1,1,2-trichloro-1,2,	4.07	200	J
3.	UNKNOWN HYDROCARBON	17.42	9	J
4.	UNKNOWN HYDROCARBON	18.67	17	J
5.	UNKNOWN COMPOUND	18.84	5	J
6.	UNKNOWN COMPOUND	19.27	5	J
7.	UNKNOWN COMPOUND	19.47	9	J
8.	UNKNOWN HYDROCARBON	19.79	18	J

002712

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-12-88

SWLO#: 21420

SAMPLE ID: 8-1420 (109)

COMPOUNDS

RESULTS
ug/L

HMX	26.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	14.0 U
2,4 DNT	10.0 U

U indicates detection limit

002713

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B-1479(120)

Lab Name: SWL - TULSAContract: SWCORPLab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21538Sample wt/vol: 0.002 (g/mL) MLLab File ID: 10503Level: (low/med) LOWDate Received: 09/30/88

% Moisture: not dec. _____

Date Analyzed: 10/08/88Column: (pack/cap) CAPDilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3	Chloromethane	25000	U
74-83-9	Bromomethane	25000	U
75-01-4	Vinyl Chloride	25000	U
75-00-3	Chloroethane	25000	U
75-09-2	Methylene Chloride	310000	
67-64-1	Acetone	25000	U
75-15-0	Carbon Disulfide	13000	U
75-35-4	1,1-Dichloroethene	13000	U
75-34-3	1,1-Dichloroethane	13000	U
540-59-0	1,2-Dichloroethene (total)	13000	U
67-66-3	Chloroform	13000	U
107-06-2	1,2-Dichloroethane	13000	U
78-93-3	2-Butanone	25000	U
71-55-6	1,1,1-Trichloroethane	13000	U
56-23-5	Carbon Tetrachloride	13000	U
108-05-4	Vinyl Acetate	25000	U
75-27-4	Bromodichloromethane	13000	U
78-87-5	1,2-Dichloropropane	13000	U
10061-01-5	cis-1,3-Dichloropropene	13000	U
79-01-6	Trichloroethene	32000	
124-48-1	Dibromochloromethane	13000	U
79-00-5	1,1,2-Trichloroethane	13000	U
71-43-2	Benzene	13000	U
10061-02-6	Trans-1,3-Dichloropropene	13000	U
75-25-2	Bromoform	13000	U
108-10-1	4-Methyl-2-Pentanone	25000	U
591-78-6	2-Hexanone	25000	U
127-18-4	Tetrachloroethene	13000	U
79-34-5	1,1,2,2-Tetrachloroethane	13000	U
108-88-3	Toluene	13000	U
108-90-7	Chlorobenzene	13000	U
100-41-4	Ethylbenzene	13000	U
100-42-5	Styrene	13000	U
1330-20-7	Xylene (total)	13000	U
75-69-4	Dichlorodifluoromethane	25000	U
95-50-1	1,2-Dichlorobenzene	25000	U

FORM I VOA .

1/87 Rev.

002714

106-46-7-----1,3-Dichlorobenzene	25000	U
547-73-1-----1,4-Dichlorobenzene	25000	U

002715

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

8-1479(120)

Site Name: SWL - TULSA Contract: SWCORPLab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____Matrix: (soil/water) WATER Lab Sample ID: 21538Sample wt/vol: 0.002 (g/mL) ML Lab File ID: 10503Level: (low/med) LOW Date Received: 09/30/88% Moisture: not dec. _____ Date Analyzed: 10/08/88Column (pack/cap) CAP Dilution Factor: 1.0Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002716



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.47a

DATE: 10-27-88

SAMPLE MATRIX: WATER
SWLO # 21538
DATE SUBMITTED: 09-30-88
CLIENT I.D.: 8-1479 (120) 9/27/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	2011.0 mg/L	10-27-88	RY	SWB46-9020
NITRATE	735.0 mg/L	10-05-88	SM	SM 429

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SWB46 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hoover

TULSA BRANCH
1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002717

EXPLOSIVES BY HFLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-10-88

SWLO#: 21538

SAMPLE ID: 8-1479 (120)

COMPOUNDS	RESULTS ug/L
HMX	14.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	26.0 U
2,4 DNT	10.0 U

U indicates detection limit

002718

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Name: SWL - TULSA Contract: SWCORP 8-1421(123)
 Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
 Matrix: (soil/water) WATER Lab Sample ID: 21426
 Sample wt/vol: 5.0 (g/mL) ML Lab File ID: C2905
 Level: (low/med) LOW Date Received: 09/24/88
 % Moisture: not dec. _____ Date Analyzed: 09/30/88
 Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>		Q
74-87-3	-----Chloromethane	10	U	
74-83-9	-----Bromomethane	10	U	
75-01-4	-----Vinyl Chloride	10	U	
75-00-3	-----Chloroethane	10	U	
75-09-2	-----Methylene Chloride	5	U	
67-64-1	-----Acetone	10	U	
75-15-0	-----Carbon Disulfide	5	U	
75-35-4	-----1,1-Dichloroethene	5	U	
75-34-3	-----1,1-Dichloroethane	5	U	
540-59-0	-----1,2-Dichloroethene (total)	5	U	
67-66-3	-----Chloroform	5	U	
107-06-2	-----1,2-Dichloroethane	5	U	
78-93-3	-----2-Butanone	10	U	
71-55-6	-----1,1,1-Trichloroethane	5	U	
56-23-5	-----Carbon Tetrachloride	5	U	
108-05-4	-----Vinyl Acetate	10	U	
75-27-4	-----Bromodichloromethane	5	U	
78-87-5	-----1,2-Dichloropropane	5	U	
10061-01-5	-----cis-1,3-Dichloropropene	5	U	
79-01-6	-----Trichloroethene	5	U	
124-48-1	-----Dibromochloromethane	5	U	
79-00-5	-----1,1,2-Trichloroethane	5	U	
71-43-2	-----Benzene	5	U	
10061-02-6	-----Trans-1,3-Dichloropropene	5	U	
75-25-2	-----Bromoform	5	U	
108-10-1	-----4-Methyl-2-Pentanone	10	U	
591-78-6	-----2-Hexanone	10	U	
127-18-4	-----Tetrachloroethene	5	U	
79-34-5	-----1,1,2,2-Tetrachloroethane	5	U	
108-88-3	-----Toluene	5	U	
108-90-7	-----Chlorobenzene	5	U	
100-41-4	-----Ethylbenzene	5	U	
100-42-5	-----Styrene	5	U	
1330-20-7	-----Xylene (total)	5	U	
75-69-4	-----Dichlorodifluoromethane	10	U	
95-50-1	-----1,2-Dichlorobenzene	10	U	

FORM I VOA

1/87 Rev.

106-46-7-----1,3-Dichlorobenzene_____
547-73-1-----1,4-Dichlorobenzene_____

002719
10 U

002720

. 1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

8-1421(123)

Job Name: SWL - TULSAContract: SWCORPLab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21426Sample wt/vol: 5.0 (g/mL) MLLab File ID: C2905Level: (low/med) LOWDate Received: 09/24/88

% Moisture: not dec. _____

Date Analyzed: 09/30/88Column (pack/cap) CAPDilution Factor: 1.0Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
-----	-----	-----	-----	-----

002721



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.41f

DATE: 10-14-88

SAMPLE MATRIX: WATER
SWLO # 21426
DATE SUBMITTED: 09-24-88
CLIENT I.D.: 8-1421 (123) 8/22/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	0.02 mg/L	10-14-88	RY	SW846-9020

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SW846 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hoover

TULSA BRANCH
1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

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Cushing, Okla. 74023
(918) 225-1064

002722



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.47e

DATE: 10-27-88

SAMPLE MATRIX: WATER
SWLO # 21542
DATE SUBMITTED: 09-30-88
CLIENT I.D.: 8-1421 (123) 9/21/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
CHLORIDE	13.8 mg/L	10-05-88	SM	SM 429

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SWB46 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hoover

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Broken Arrow, OK 74012
(918) 251-2858

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P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002723

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-12-88

SWLO#: 21426

SAMPLE ID: 8-1421 (123)

COMPOUNDS

RESULTS

ug/L

HMX	26.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	14.0 U
2,4 DNT	10.0 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. **002724**

8-1422(124)

Lab Name: SWL - TULSA

Contract: SWCORP

Lab Code: SWOK

Case No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATER

Lab Sample ID: 21427

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C2906

Level: (low/med) LOW

Date Received: 09/24/88

% Moisture: not dec. _____

Date Analyzed: 09/30/88

Column: (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	80	
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	0.4	J
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U
75-69-4	Dichlorodifluoromethane	10	U
95-50-1	1,2-Dichlorobenzene	10	U

FORM I VOA

1/87 Rev.

002725

106-46-7-----1,3-Dichlorobenzene	10	U
547-73-1-----1,4-Dichlorobenzene	10	U

002726

• 1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

8-1422(124)

Name: SWL - TULSA Contract: SWCORPLab Code: SWOK Case No.: SWCORP SAS No.: SDG No.: Matrix: (soil/water) WATER Lab Sample ID: 21427Sample wt/vol: 5.0 (g/mL) ML Lab File ID: C2906Level: (low/med) LOW Date Received: 09/24/88% Moisture: not dec. Date Analyzed: 09/30/88Column (pack/cap) CAF Dilution Factor: 1.0Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002727



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.41g

DATE: 10-14-88

SAMPLE MATRIX: WATER
SWLO # 21427
DATE SUBMITTED: 09-24-88
CLIENT I.D.: B-1422 (124) 8/22/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	0.04 mg/L	10-14-88	RY	SWB46-9020

U Indicates the compound was analyzed for but not detected above that level.

SM STANDARD METHODS, 16TH EDITION

SWB46 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hoover

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1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

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INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002728

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-12-88

SWLO#: 21427

SAMPLE ID: 8-1422 (124)

COMPOUNDS	RESULTS ug/L
HMX	26.0 U
RDX	22.0 U
TETRYL	26.0 U
TNT	14.0 U
2,4 DNT	10.0 U

U indicates detection limit

Controls for Environmental Pollution, Inc.
 11110X 5351 • Santa Fe, New Mexico 87502

11111 X 5351 • Santa Fe, New Mexico 87502

REPORT OF ANALYSIS

IN STATE 505/982-9111
OUT OF STATE 800/545-2188

LAB #

88-09-480

SAMPLE IDENTIFICATION

44-1987-103

DATE COLLECTED

09/24/60

TYPE OF ANALYSIS

2,4,6-Trinitrotoluene

2,4-Dinitrotoluene

2,4-Dinitrotoluene

2,6-Dinitrotoluene

XIII

RDX

Tetryl

8-1428 OT-MMH

09/22/88

Volatile Organics

mg/liter

OTC

012

020

020

020

050

$$=$$

002729

002730

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

8-1423(125)

Lab Name: SWL - TULSAContract: SWCORPLab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) WATERLab Sample ID: 21428Sample wt/vol: 0.50 (g/mL) MLLab File ID: C2935Level: (low/med) LOWDate Received: 09/24/88

% Moisture: not dec. _____

Date Analyzed: 10/04/88Column: (pack/cap) CAPDilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3	-----Chloromethane	100	U
74-83-9	-----Bromomethane	100	U
75-01-4	-----Vinyl Chloride	100	U
75-00-3	-----Chloroethane	100	U
75-09-2	-----Methylene Chloride	50	U
67-64-1	-----Acetone	100	U
75-15-0	-----Carbon Disulfide	50	U
75-35-4	-----1,1-Dichloroethene	50	U
75-34-3	-----1,1-Dichloroethane	50	U
540-59-0	-----1,2-Dichloroethene (total)	50	U
67-66-3	-----Chloroform	27	BJ
107-06-2	-----1,2-Dichloroethane	50	U
78-93-3	-----2-Butanone	100	U
71-55-6	-----1,1,1-Trichloroethane	50	U
56-23-5	-----Carbon Tetrachloride	50	U
108-05-4	-----Vinyl Acetate	100	U
75-27-4	-----Bromodichloromethane	50	U
78-87-5	-----1,2-Dichloropropane	50	U
10061-01-5	-----cis-1,3-Dichloropropene	50	U
79-01-6	-----Trichloroethene	50	U
124-48-1	-----Dibromochloromethane	50	U
79-00-5	-----1,1,2-Trichloroethane	50	U
71-43-2	-----Benzene	50	U
10061-02-6	-----Trans-1,3-Dichloropropene	50	U
75-25-2	-----Bromoform	50	U
108-10-1	-----4-Methyl-2-Pentanone	100	U
591-78-6	-----2-Hexanone	100	U
127-18-4	-----Tetrachloroethene	2	J
79-34-5	-----1,1,2,2-Tetrachloroethane	50	U
108-88-3	-----Toluene	50	U
108-90-7	-----Chlorobenzene	50	U
100-41-4	-----Ethylbenzene	50	U
100-42-5	-----Styrene	50	U
1330-20-7	-----Xylene (total)	5	J
75-69-4	-----Dichlorodifluoromethane	100	U
95-50-1	-----1,2-Dichlorobenzene	8	J

FORM I VOA

1/87 Rev.

002731

106-46-7-----1,3-Dichlorobenzene
547-73-1-----1,4-Dichlorobenzene

7 J
8 J

002732

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

6-1423(125)

Name: SWL - TULSA Contract: SWCORPLab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____Matrix: (soil/water) WATER Lab Sample ID: 21428Sample wt/vol: 0.50 (g/mL) ML Lab File ID: C2935Level: (low/med) LOW Date Received: 09/24/88% Moisture: not dec. _____ Date Analyzed: 10/04/88Column (pack/cap) CAP Dilution Factor: 1.0Number TICs found: 2CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN COMPOUND	3.65	150	J
2. 76131	Ethane, 1,1,2-trichloro-1,2,	3.87	9700	J

002733



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: CATHY HUTCHINS

REPORT: SAP5013.41h

DATE: 10-14-88

SAMPLE MATRIX: WATER
SWLO # 21428
DATE SUBMITTED: 09-24-88
CLIENT I.D.: B-1423 (125) 8/22/88

<u>PARAMETER</u>	<u>RESULTS</u>	<u>DATE ANALYZED</u>	<u>ANALYST</u>	<u>METHOD REFERENCE</u>
TOTAL ORGANIC HALOGENS	2.0 mg/L	10-14-88	RY	SW846-9020

U Indicates the compound was analyzed for but not detected
above that level.

SM STANDARD METHODS, 16TH EDITION

SW846 EPA METHODOLOGY

Southwest Laboratory of Oklahoma

BY Chuck Hoover

TULSA BRANCH
1700 W. Albany, Suite C
Broken Arrow, OK 74012
(918) 251-2858

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INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

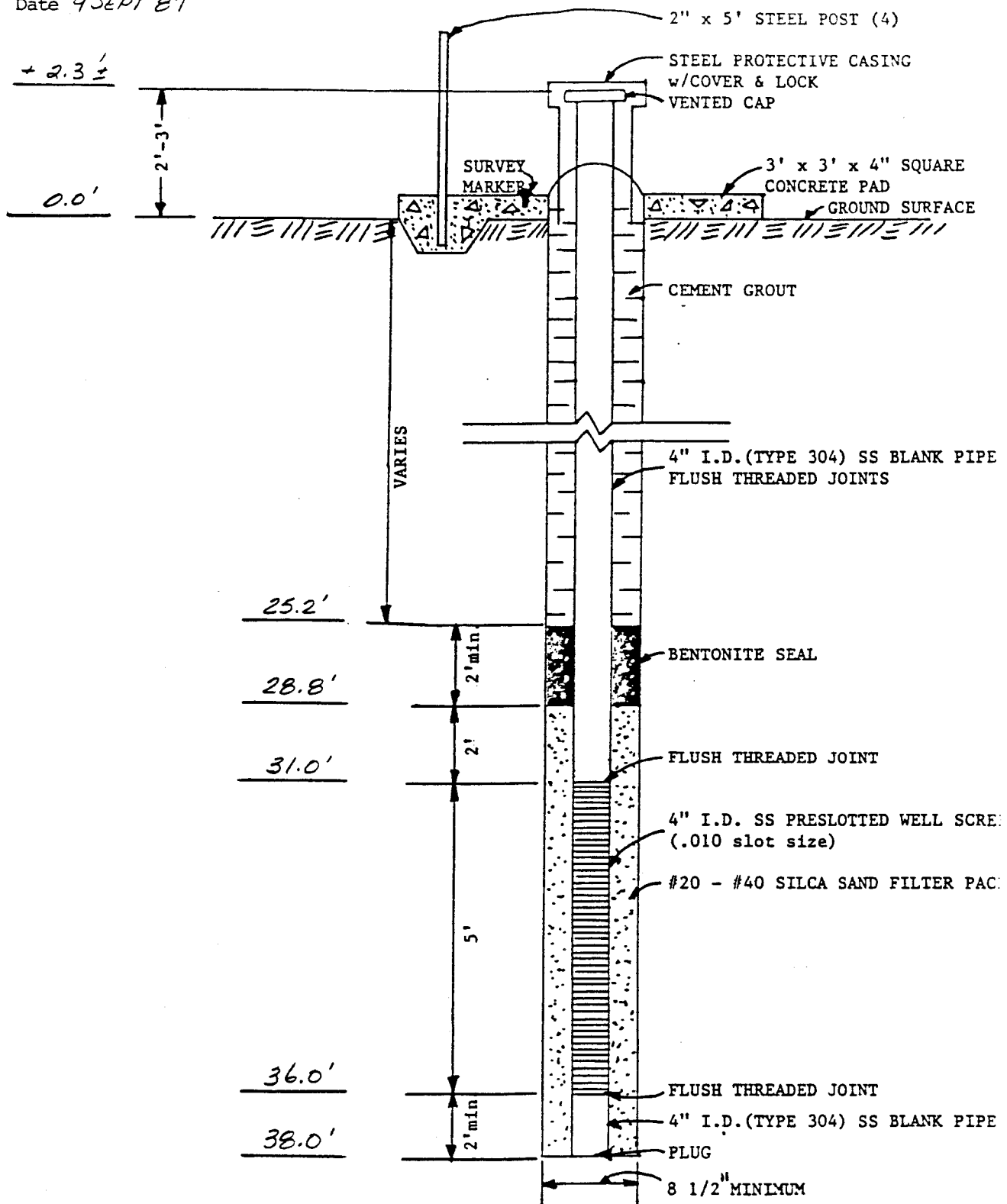
002734

APPENDIX 0

WELL INSTALLATION DETAILS FOR MW-1 THROUGH MW-15

002735

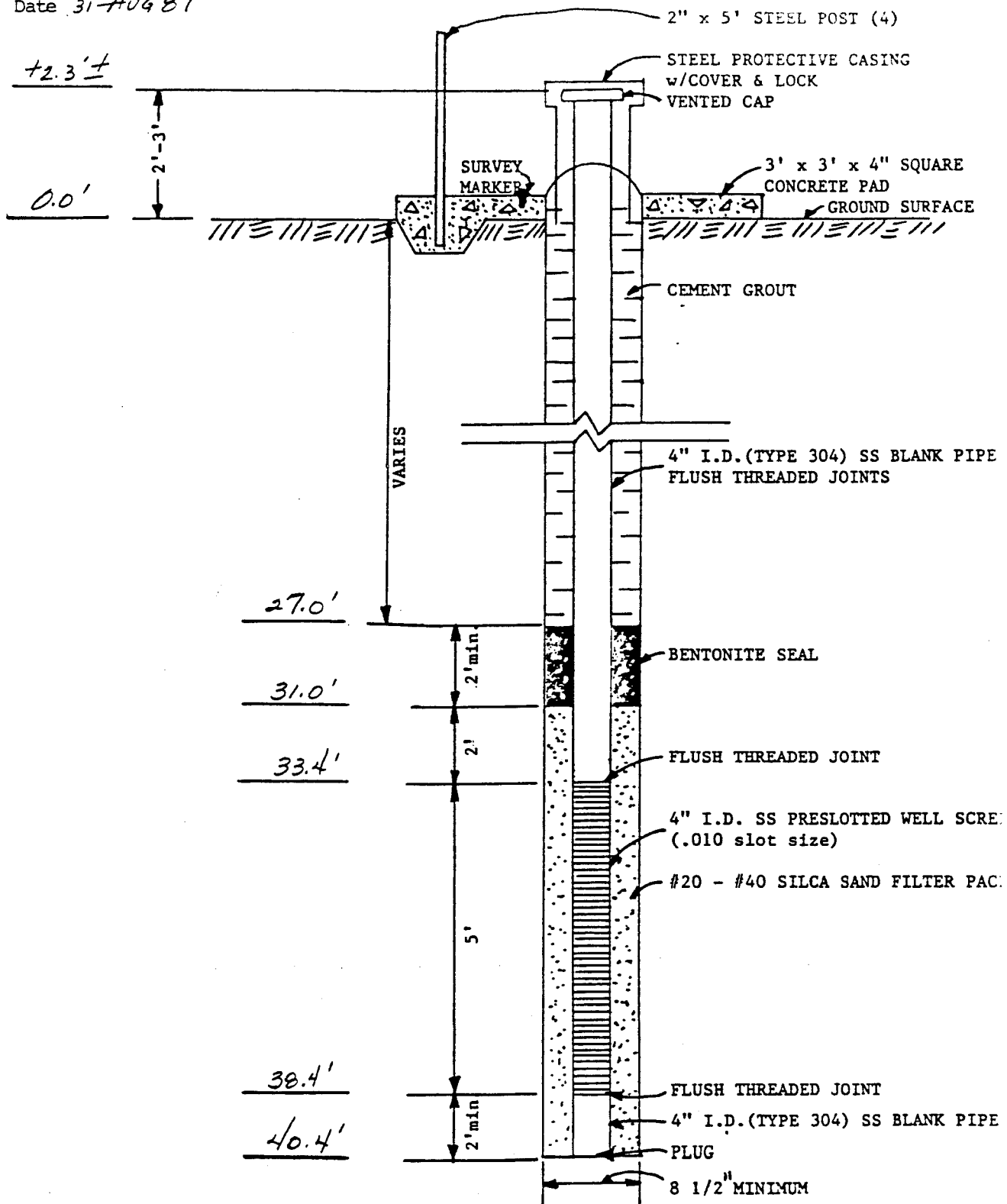
LONGHORN AAP
MW - /
Date 9 SEPT 87



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

002736

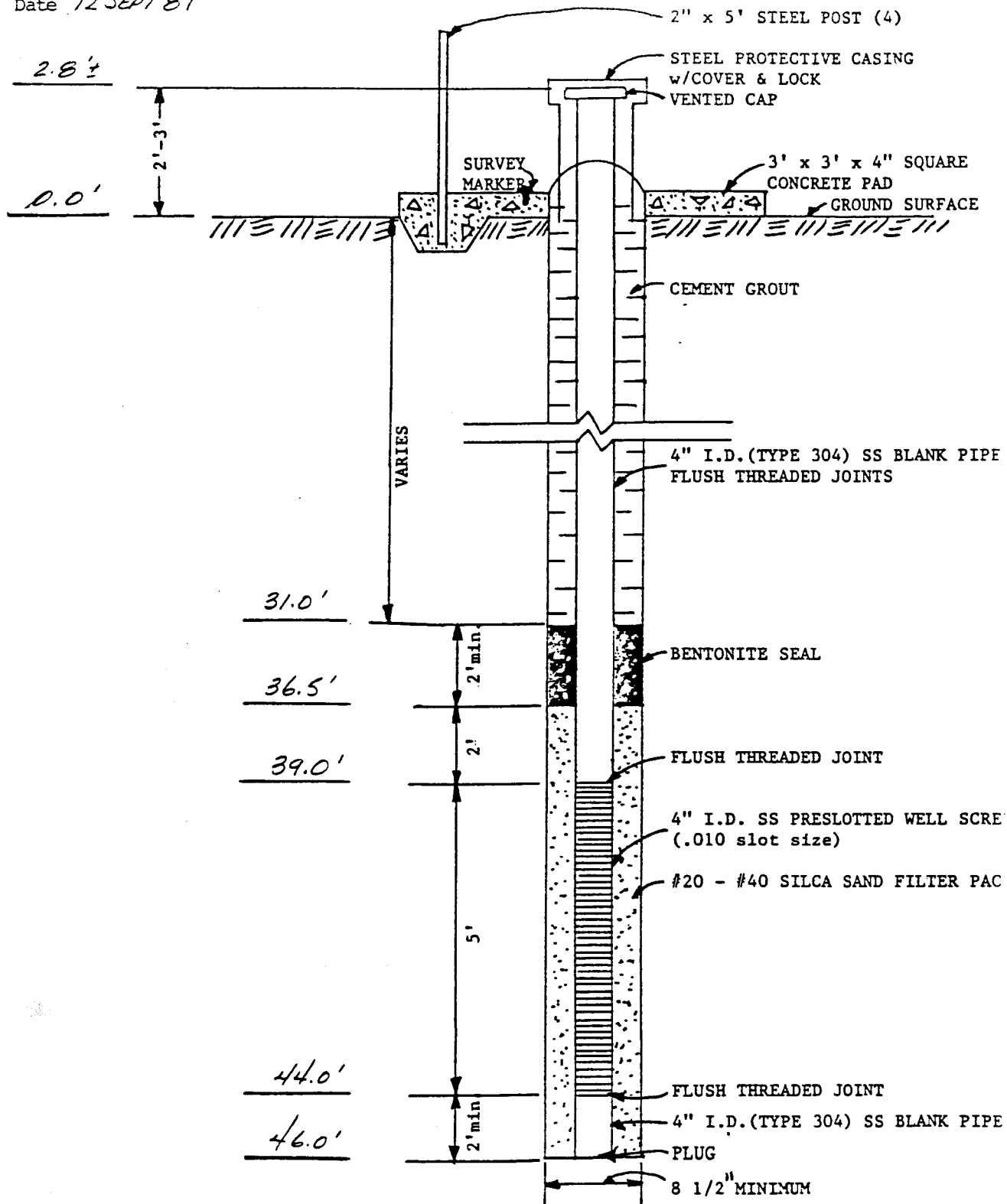
LONGHORN AAP
MW - 2
Date 31-AUG 87



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

002737

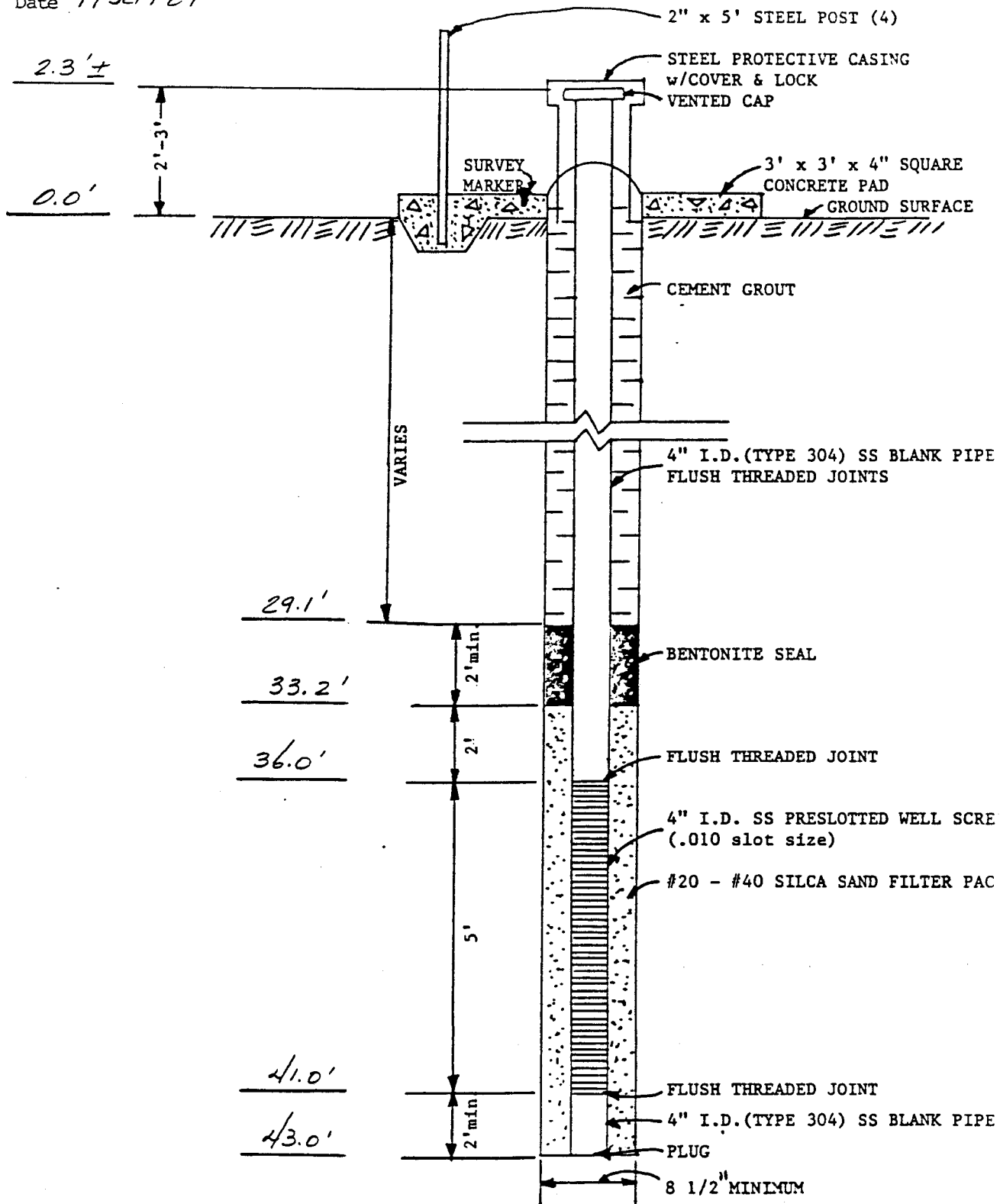
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MW - 3
Date 12 SEPT 87



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

002738

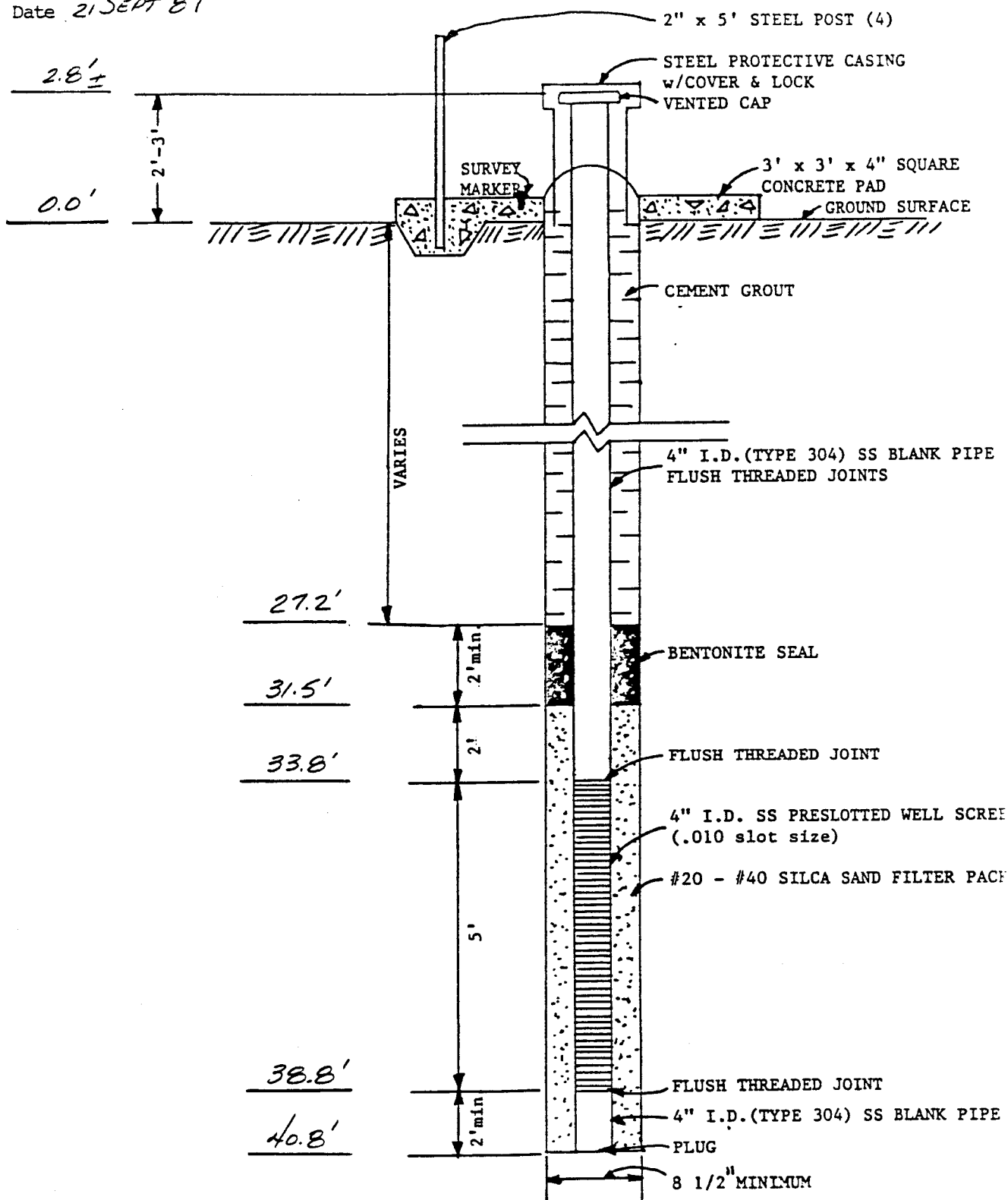
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MW - 4
Date 17 SEPT 87



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

002739

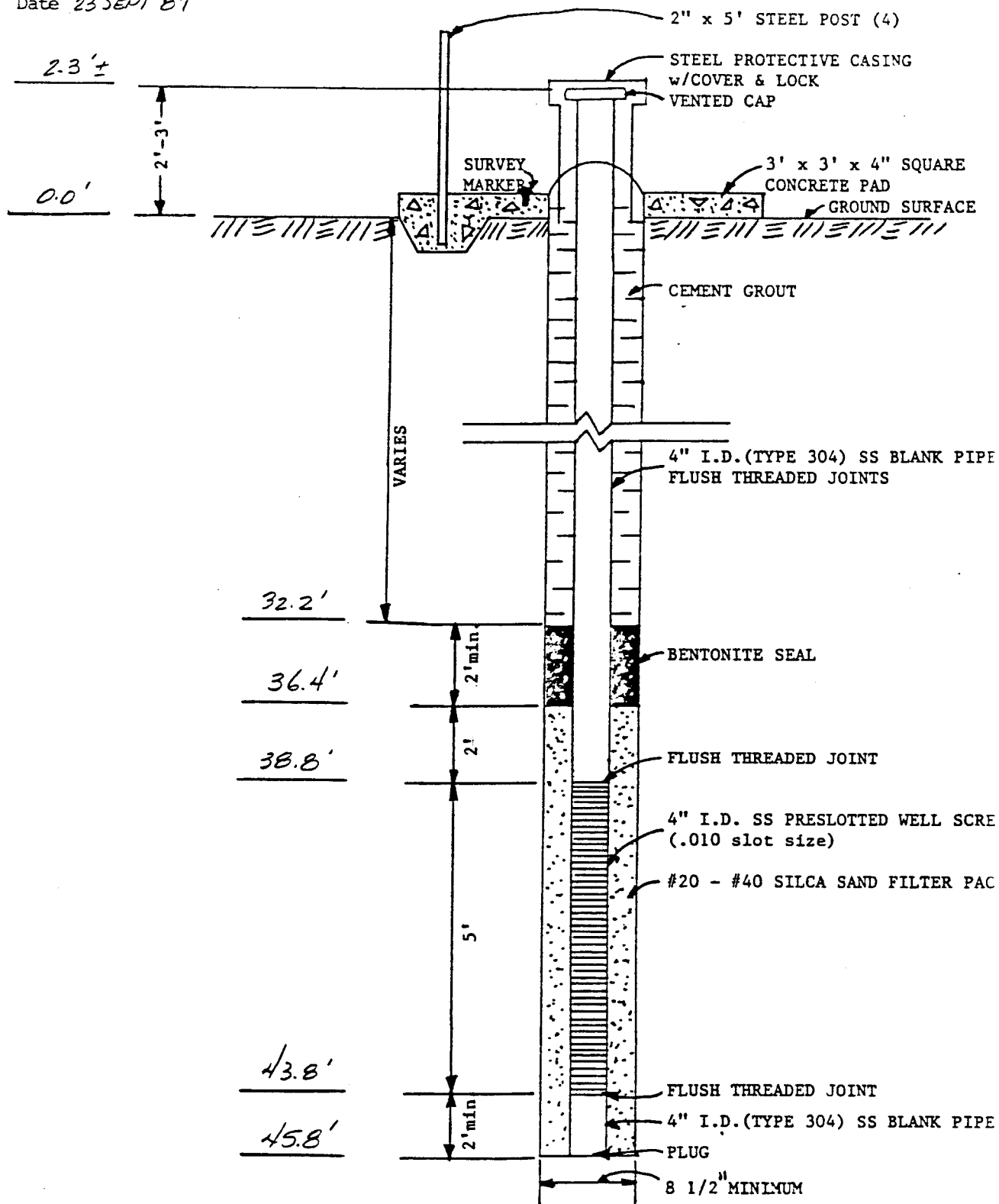
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MW - 5
Date 21 SEPT 87



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

LONGHORN AAP
 MW - 6
 Date 23 SEPT 87

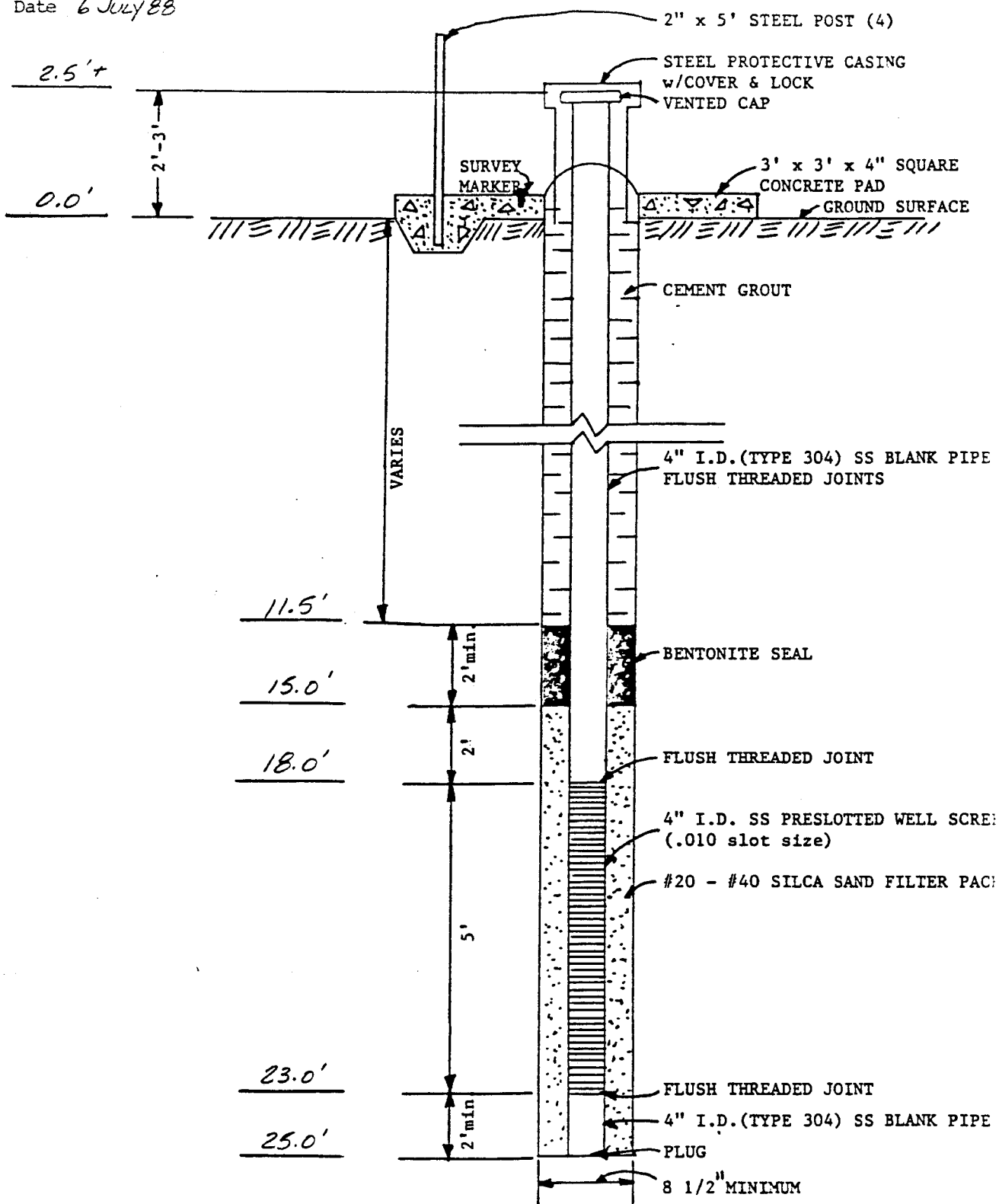
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TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

002741

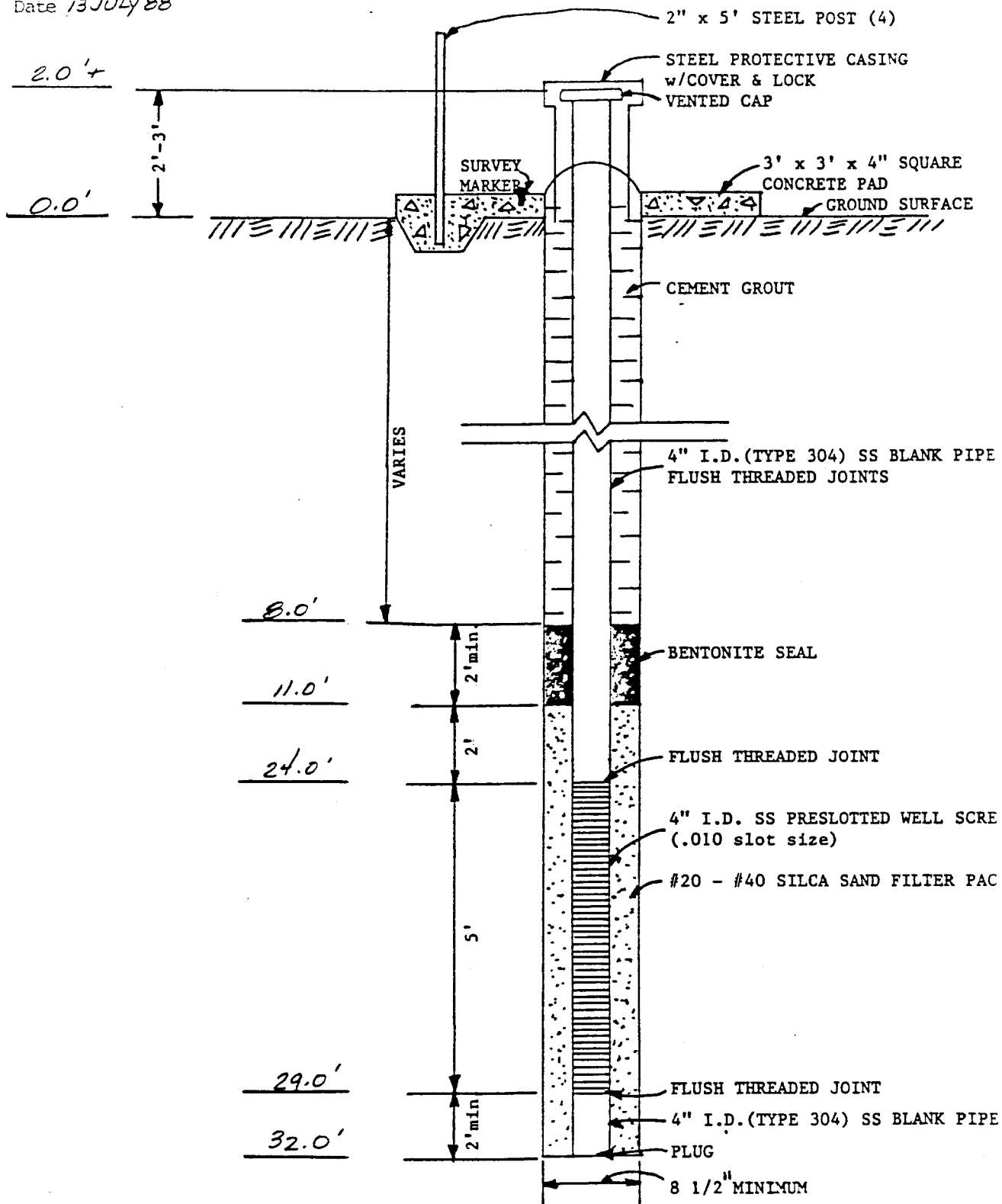
LONGHORN AAP
MW - 7
Date 6 July 88



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

LONGHORN AAP
MW - 8
Date 13 JULY 88

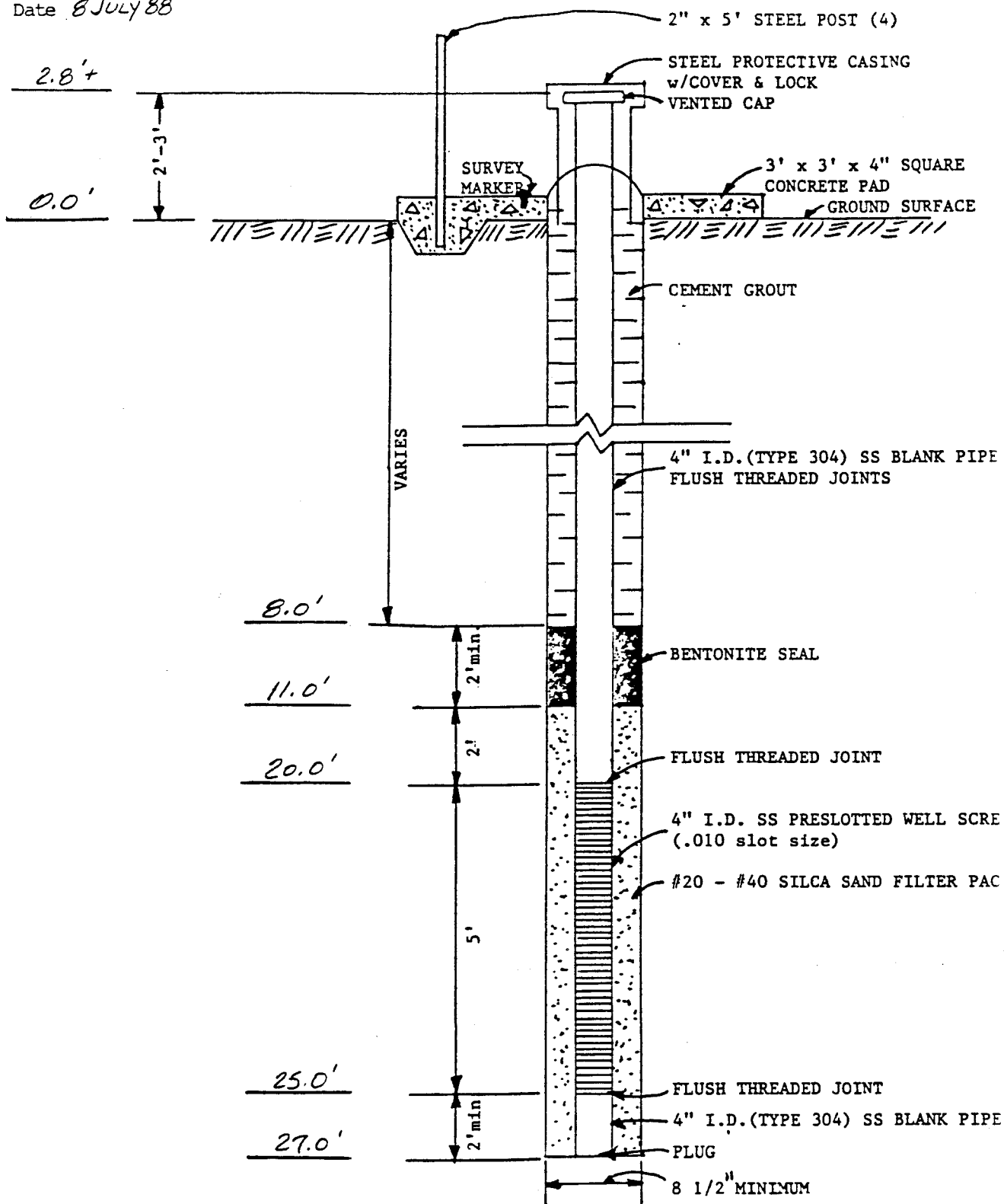
002742



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

LONGHORN AAP
MW -9
Date 8 JULY 88

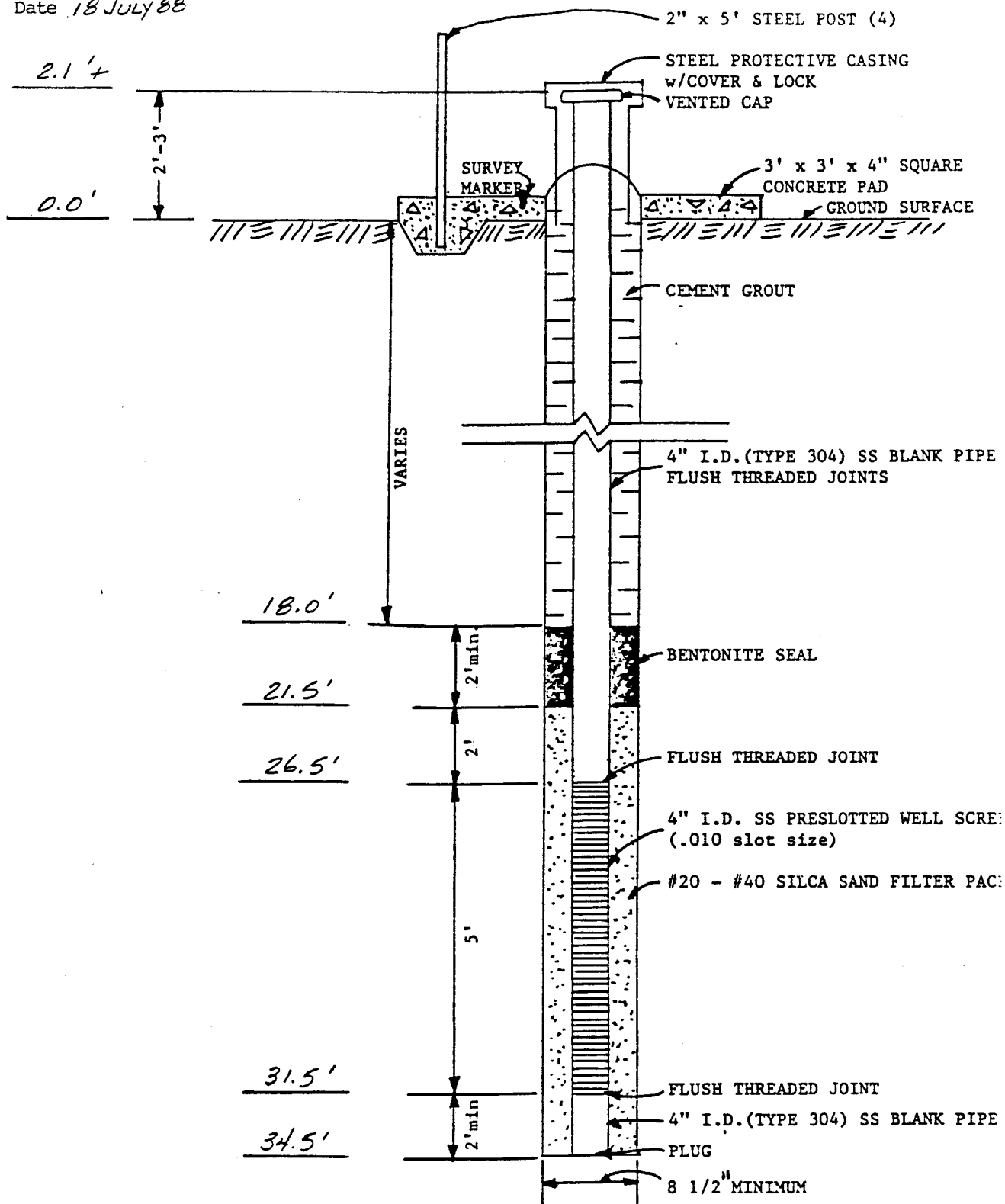
002743



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

11744

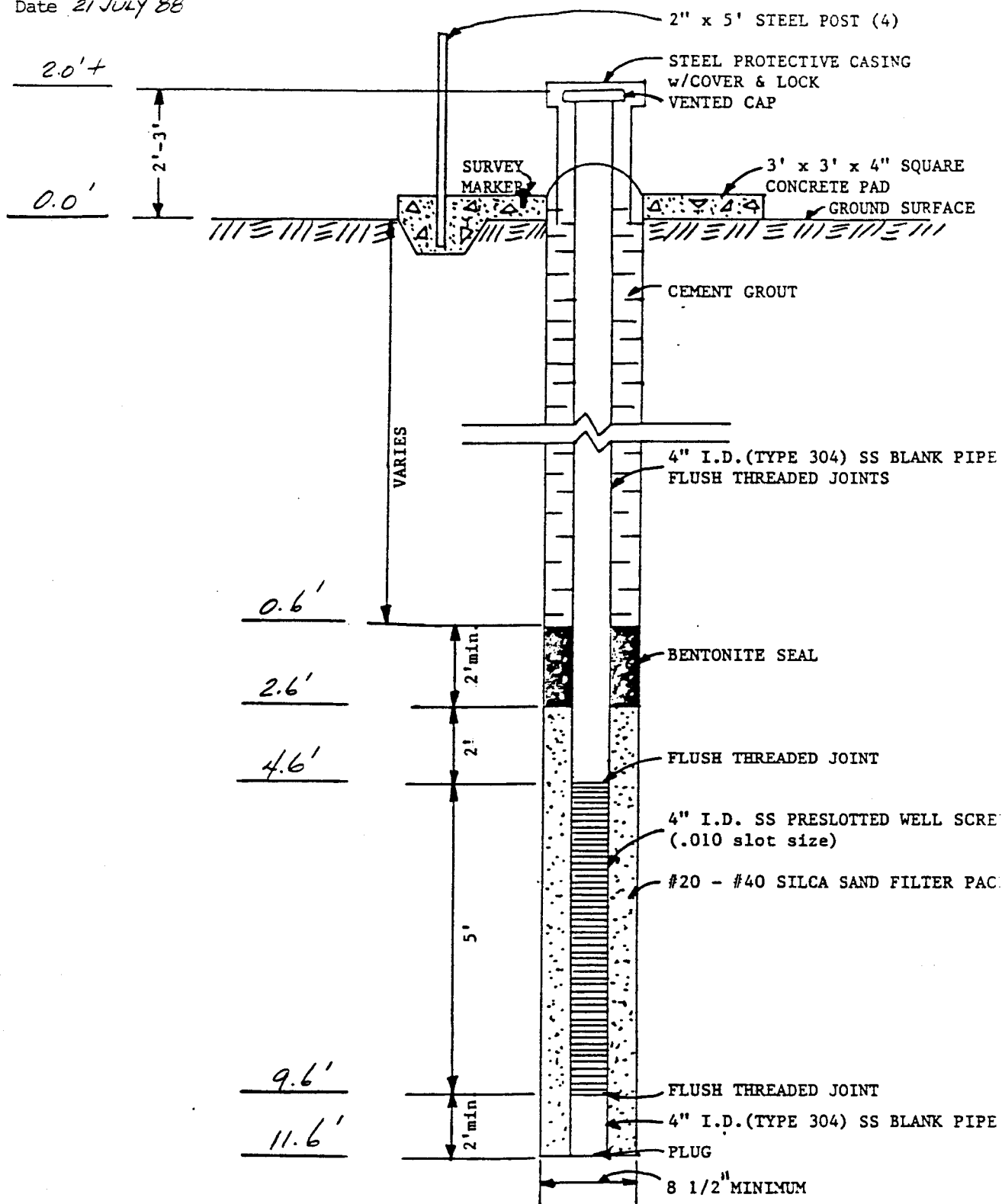
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MW - 10
Date 18 July 88



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

002745

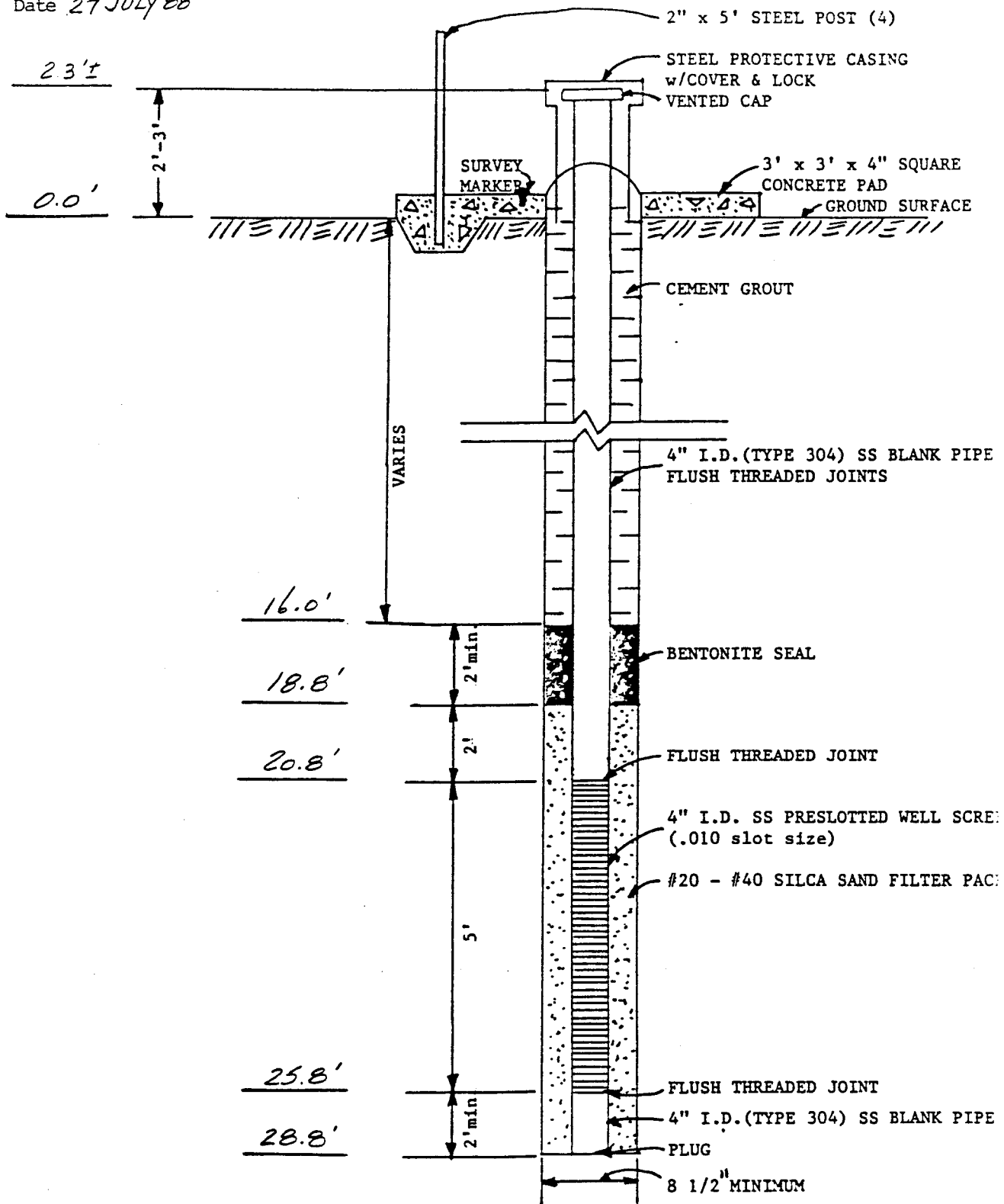
LONGHORN AAP
MW - 11
Date 21 JULY 88



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

LONGHORN AAP
 MW - 12
 Date 27 JULY 88

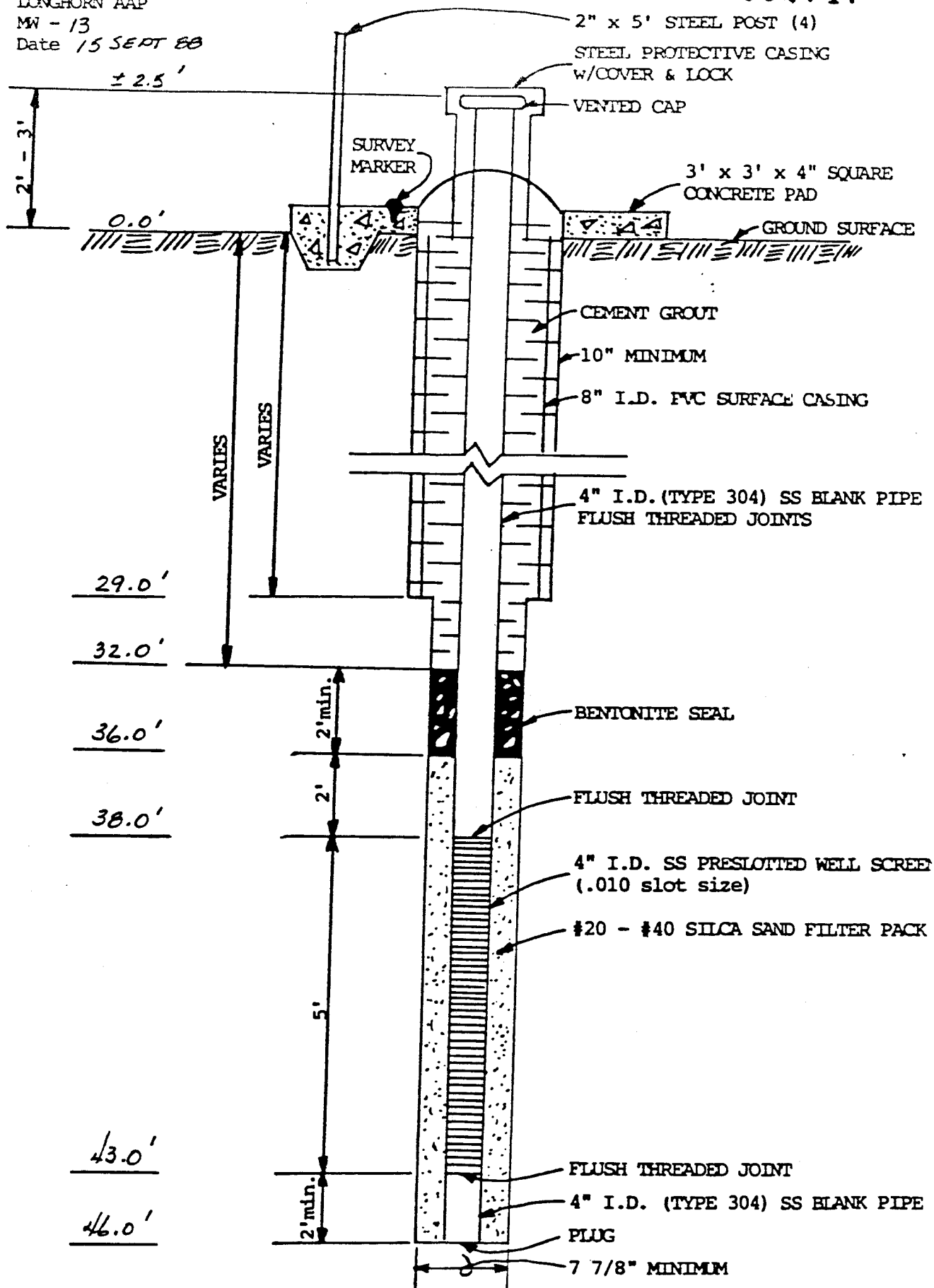
002746



TYPICAL CONSTRUCTION DETAIL FOR MONITORING WELL

002747

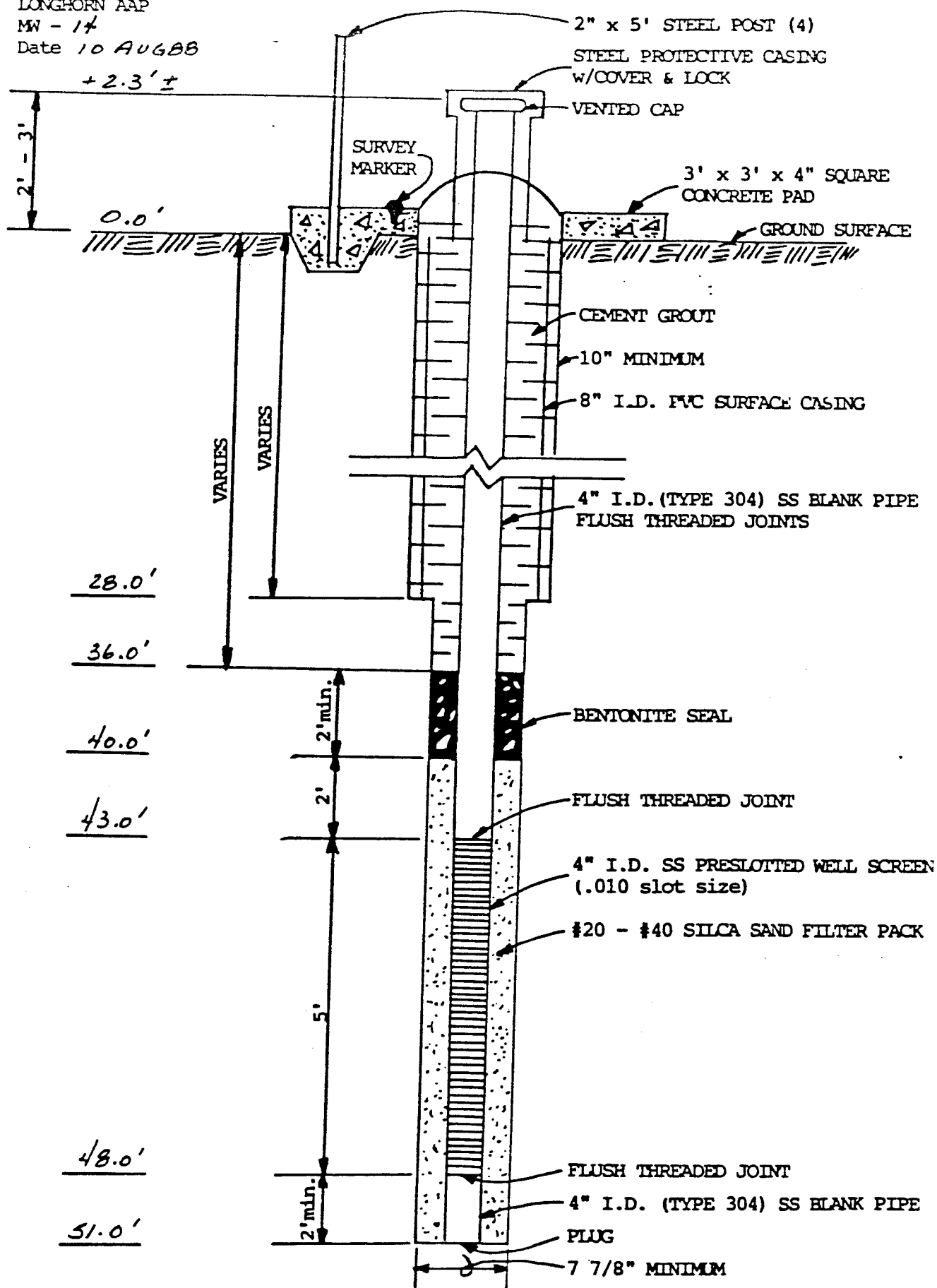
LONGHORN AAP
MW - 13
Date 15 SEPT 88



TYPICAL CONSTRUCTION DETAIL FOR DEEP MONITORING WELL

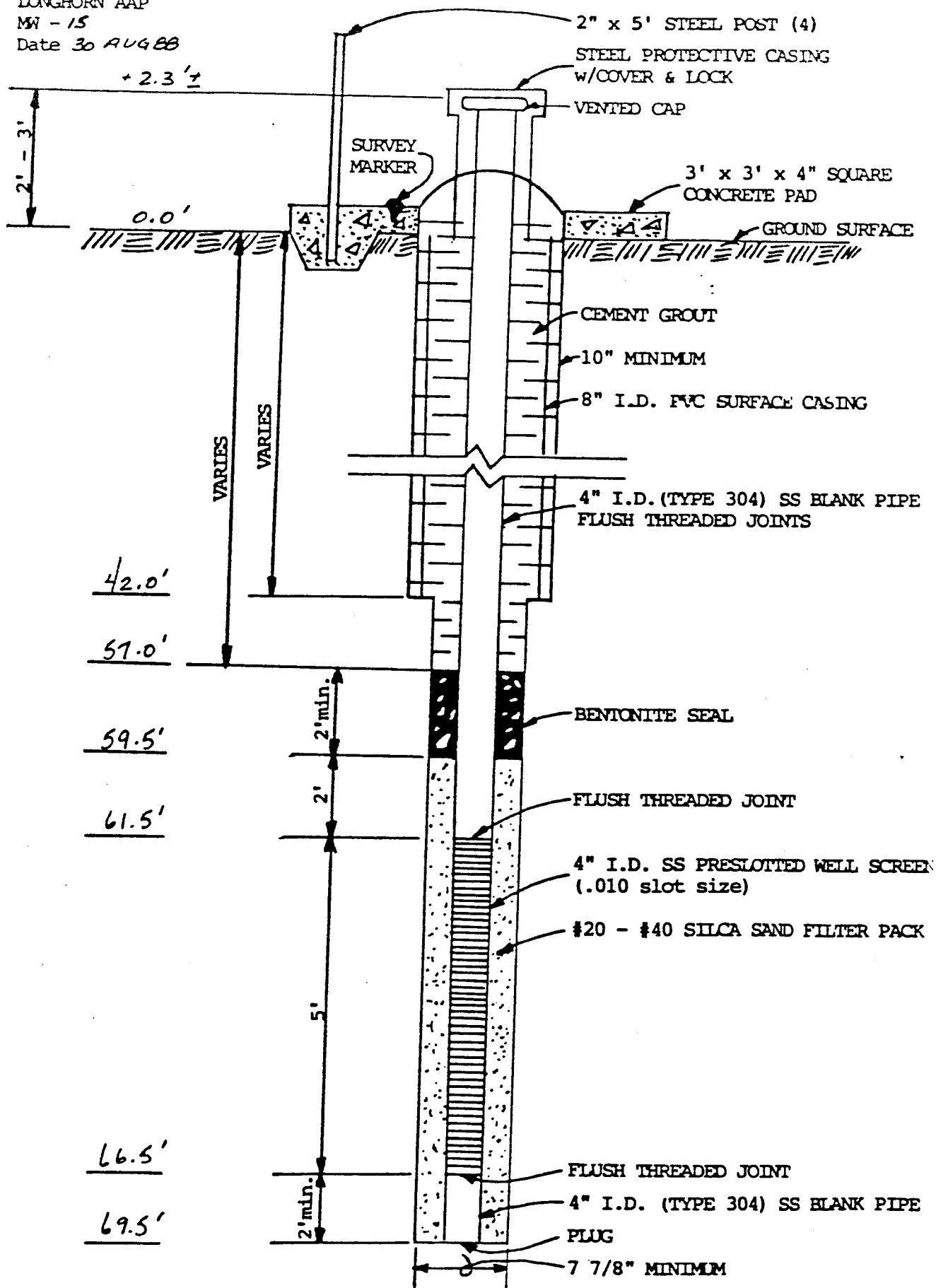
002748

LONGHORN AAP
MW - 14
Date 10 AUG 88



TYPICAL CONSTRUCTION DETAIL FOR DEEP MONITORING WELL

LONGHORN AAP
MW - 15
Date 30 AUG 88



TYPICAL CONSTRUCTION DETAIL FOR DEEP MONITORING WELL

750

002750

APPENDIX P

**LABORATORY RESULTS FOR CHEMICAL SOIL SAMPLES FROM
WELL BORINGS MW-1 THROUGH MW-6**

002751

SWDEB-GL Report No. 14543

TABLE 1
Results of Chemical Analyses of Soil Samples

Longhorn Army Recreational Plant

BORING NO.	DEPTH FT.	SWD No.	Ag	As	Ba	Cd	Cr	Hg	Ni	Pb	Se	Zn
Minimum Reported Concentration			0.5	1.0	20.0	0.5	5.0	0.1	1.0	1.0	0.1	1.0
Results reported in mg/Kg												
MW-2	2.0'	7- 528	<0.5	2.9	27	<0.5	15	<0.1	7.6	21	0.2	49
MW-2	10.0'	7- 529	<0.5	1.3	58	<0.5	5.2	<0.1	14	50	<0.1	41
MW-1	2.0'	7- 530	<0.5	1.6	27	<0.5	10	<0.1	5.3	10	0.1	9.0
MW-1	10.0'	7- 531	<0.5	1.1	27	<0.5	<5.0	<0.1	6.9	5.0	<0.1	21
MW-3	2.0'	7- 532	<0.5	<1.0	21	<0.5	10	<0.1	5.4	4.1	0.1	7.9
MW-3	10.0'	7- 533	<0.5	<1.0	<20	<0.5	<5.0	<0.1	4.0	5.5	<0.1	7.6
MW-3	15.0'	7- 534	<0.5	1.2	<20	<0.5	<5.0	<0.1	5.3	7.0	<0.1	11
MW-4	2.0'	7- 535	<0.5	2.8	<20	<0.5	19	<0.1	4.3	14	<0.1	5.4
MW-4	10.0'	7- 536	<0.5	<1.0	31	<0.5	<5.0	<0.1	3.8	1.8	<0.1	5.5
MW-4	15.0'	7- 537	<0.5	1.0	26	<0.5	<5.0	<0.1	4.6	7.4	<0.1	7.4
MW-5	2.0'	7- 610	0.8	<1.0	73	<0.5	10	<0.1	8.4	6.7	<0.1	16
MW-5	10.0'	7- 611	<0.5	<1.0	57	<0.5	<5.0	<0.1	4.7	2.5	<0.1	13
MW-5	17.0'	7- 612	<0.5	1.6	68	<0.5	5.8	<0.1	7.6	7.5	<0.1	16
MW-6	2.0'	7- 613	<0.5	1.4	68	0.8	10	<0.1	8.6	12	<0.1	17
MW-6	10.0'	7- 614	<0.5	<1.0	59	<0.5	<5.0	<0.1	2.7	5.0	<0.1	11
MW-6	18.0'	7- 615	<0.5	<1.0	29	0.8	7.4	<0.1	3.5	5.0	<0.1	16
Mean Percent Recovery of Matrix Spikes			86%	104%	78%	102%	102%	103%	97%	96%	77%	92%
Mean Relative Percent Differences of Matrix Spike Repeats			3%	15%	3%	1%	2%	0%	2%	4%	6%	1%

002752



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.27

DATE: 10-01-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14035

DATE SUBMITTED: 09-10-87

DATE ANALYZED: 09-29-87

METHOD REFERENCE: SWB46-B240 EPA METHODOLOGY

CLIENT I.D.: MW-1 (7-530) CH-1 2.0' 9/3/87

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

(MW-1) 2.0'

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	10 U	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

SURROGATE PERCENT RECOVERY:

Toluene-d8 = 94 Bromofluorobenzene = 106 1,2-Dichloroethane-d4 = 88

NOTE: U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

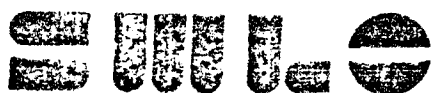
BY Robert Harris

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla 74146
(918) 665-0680

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002753



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.27a

DATE: 09-10-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14035

DATE SUBMITTED: 09-10-87

DATE EXTRACTED: 09-16-87

DATE ANALYZED: 09-18-87

CLIENT I.D.: MW-1 (7-530) CH-1 2.0' 9/3/87 (MW-1) 2.0'

EXPLOSIVESRESULTS (ug/g)

TNT.....<0.05
2-4 DNT.....<0.05
2-6 DNT.....<0.05
RDX.....<0.05
HMX..... 0.31*
TETRYL.....<0.05

*Duplicate sample had RPD of 32.4% for HMX.

Southwest Laboratory of Oklahoma

BY Robert Markes

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla. 74148
(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002754



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAF1013.28

DATE: 10-01-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14036

DATE SUBMITTED: 09-10-87

DATE ANALYZED: 09-25-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: MW-1 (7-531) CH-2 10.0' 9/3/87

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

(MW-1) 10.0'

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	10 U	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

SURROGATE PERCENT RECOVERY:

Toluene-d8 = 107 Bromofluorobenzene = 110 1,2-Dichloroethane-d4 = 104

NOTE: U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

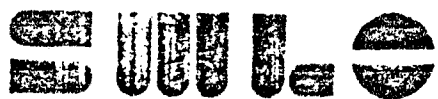
BY *Rolaf Harris*

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla. 74148
(918) 665-0680

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P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002755



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.28a

DATE: 09-10-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14036

DATE SUBMITTED: 09-10-87

DATE EXTRACTED: 09-16-87

DATE ANALYZED: 09-18-87

CLIENT I.D.: MW-1 (7-531) CH-2 10.0' 9/3/87 (MW-1) 10.0'

EXPLOSIVES

RESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDY.....	<0.05
HMX.....	0.21
TETRYL.....	<0.05

Southwest Laboratory of Oklahoma

BY Robert Harris

TULSA BRANCH
10926 E 55th Pl.
Tulsa, Okla. 74146
(918) 665-0680

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064



002756

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.25

DATE: 10-01-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 13779

DATE SUBMITTED: 09-01-87

DATE ANALYZED: 09-08-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-528 8/27/87 CH-1A 2.0'

(MW-2) 2.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
ETHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	10 U	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
CHROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

! ARROGATE PERCENT RECOVERY:

Toluene-d8 = 101 Bromofluorobenzene = 90 1,2-Dichloroethane-d4 = 95

NOTE: U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY Rafael Martinez

TULSA BRANCH
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(918) 665-0680

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
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CUSHING BRANCH
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Cushing, Okla. 74023
(918) 225-1064

002757



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.25a

DATE: 09-10-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLD # 13779

DATE SUBMITTED: 09-01-87

DATE EXTRACTED: 09-16-87

DATE ANALYZED: 09-18-87

CLIENT I.D.: 7-528 8/27/87 CH-1A 2.0' (MW-2) 2.0'

EXPLOSIVES

RESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDX.....	<0.05
HMX.....	0.28
TETRYL.....	<0.05

Southwest Laboratory of Oklahoma

BY Robert Harkins

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CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.26

DATE: 10-01-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 13780

DATE SUBMITTED: 09-01-87

DATE ANALYZED: 09-08-87

METHOD REFERENCE: SW846-8240, EPA METHODOLOGY

CLIENT I.D.: 7-529 8/27/87 CH-2A 10.0'

(MW-2) 10.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	10 U	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

SURROGATE PERCENT RECOVERY:

Toluene-d8 = 101 Bromofluorobenzene = 93 1,2-Dichloroethane-d4 = 95

NOTE: U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY

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Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAF1013.26a

DATE: 09-10-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 13780

DATE SUBMITTED: 09-01-87

DATE EXTRACTED: 09-16-87

DATE ANALYZED: 09-18-87

CLIENT I.D.: 7-529 B/27/87 CH-2A 10.0' (MW-2) 10.0'

EXPLOSIVESRESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDX.....	<0.05
HMX.....	0.18
TETRYL.....	<0.05

Southwest Laboratory of Oklahoma

BY Robert R. R. R.

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Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.29

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14419

DATE SUBMITTED: 09-18-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-532 (MW-3) CH-1 2.0' 9/11/87 14:45 (MW-3) 2.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPE)

VOLATILESRESULTSVOLATILESRESULTS

CHLOROMETHANE 10 U
BROMOMETHANE 10 U
VINYL CHLORIDE 10 U
CHLOROETHANE 10 U
METHYLENE CHLORIDE 5 U
ACETONE 10 U
CARBON DISULFIDE 5 U
1,1-DICHLOROETHENE 5 U
1,1-DICHLOROETHANE 5 U
TRANS-1,2-DICHLOROETHENE 5 U
CHLOROFORM 5 U
1,2-DICHLOROETHANE 5 U
2-BUTANONE 10 U
1,1,1-TRICHLOROETHANE 5 U
CARBON TETRACHLORIDE 5 U
VINYL ACETATE 10 U
BROMODICHLOROMETHANE 5 U
ACROLEIN 100 U
ACRYLONITRILE 100 U

1,1,2,2-TETRACHLOROETHANE 5 U
1,2-DICHLOROPROPANE 5 U
TRANS-1,3-DICHLOROPROPENE 5 U
TRICHLOROETHENE 5 U
DIBROMOCHLOROMETHANE 5 U
1,1,2-TRICHLOROETHANE 5 U
BENZENE 5 U
CIS-1,3-DICHLOROPROPENE 5 U
2-CHLOROETHYL VINYLETHYER 10 U
BROMOFORM 5 U
2-HEXANONE 10 U
4-METHYL-2-PENTANONE 10 U
TETRACHLOROETHENE 5 U
TOLUENE 5 U
CHLOROBENZENE 5 U
ETHYLBENZENE 5 U
STYRENE 5 U
TOTAL XYLENES 5 U
TRICHLOROFLUOROMETHANE 10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY Robert Morris

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U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.29a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14419

DATE SUBMITTED: 09-18-87

DATE EXTRACTED: 09-28-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-532 (MW-3) CH-1 2.0' 9/11/87 14:45 (MW-3) 2.0'

EXPLOSIVES

RESULTS (ug/g)

TNT.....<0.05
2-4 DNT.....<0.05
2-6 DNT.....<0.05
RDX.....0.22
HMX.....<0.05
TETRYL.....<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

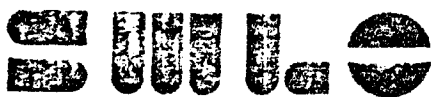
Southwest Laboratory of Oklahoma

BY Robert Heltis

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(918) 665-0680

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CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.30

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLD # 14420

DATE SUBMITTED: 09-18-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-8240, EPA METHODOLOGY

CLIENT I.D.: 7-533 (MW-3) CH-2 10.0' 9/11/87 15:20 (MW-3) 10.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	28	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY *Robert Harris*

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Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.30a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14420

DATE SUBMITTED: 09-18-87

DATE EXTRACTED: 09-28-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-533 (MW-3) CH-2 10.0' 9/11/87 15:20 (MW-3) 10.0'

EXPLOSIVESRESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDX.....	<0.05
HMX.....	<0.05
TETRYL.....	<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

BY

Robert H. Harris

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Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.31

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14421

DATE SUBMITTED: 09-18-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-8240, EPA METHODOLOGY

CLIENT I.D.: 7-534 (MW-3) CH-3 15.0' 9/11/87 15:40

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	20	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY *Robert Harris*

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Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAF1013.31a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL
SWLO # 14421

DATE SUBMITTED: 09-18-87

DATE EXTRACTED: 09-28-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-534 (MW-3) CH-3 15.0' 9/11/87 15:40

EXPLOSIVESRESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDX.....	<0.05
HMX.....	<0.05
TETRYL.....	<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

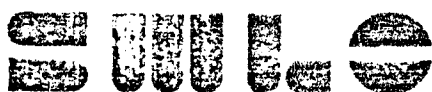
BY Robert Harris

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(918) 665-0680

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CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.32

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14422

DATE SUBMITTED: 09-18-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-535 (MW-4) CH-1 2.0' 9/15/87 12:10 (MW-4) 2.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	10 U	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY *Robert Harris*

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(918) 665-0680

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(918) 225-1064

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Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.32a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14422

DATE SUBMITTED: 09-18-87

DATE EXTRACTED: 09-28-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-535 (MW-4) CH-1 2.0' 9/15/87 12:10

(MW-4) 2.0'

EXPLOSIVES

RESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDX.....	<0.05
HMX.....	<0.05
TETRYL.....	<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

BY Robert Morris

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(918) 665-0680

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U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAF1013.33

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14423

DATE SUBMITTED: 09-18-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-536 (MW-4) CH-2 10.0' 9/15/87 12:41

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

(mw-4) 10.0'

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	38	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY

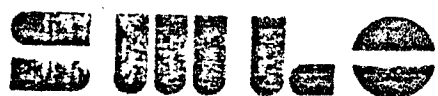
Robert F. Harris

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla. 74146
(918) 665-0680

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002769



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.33a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14423

DATE SUBMITTED: 09-18-87

DATE EXTRACTED: 09-28-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-536 (MW-4) CH-2 10.0' 9/15/87 12:41 (mw-4) 10.0'

EXPLOSIVES

RESULTS (ug/g)

TNT.....<0.05
2-4 DNT.....<0.05
2-6 DNT.....<0.05
RDX.....<0.05
HMX.....<0.05
TETRYL.....<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

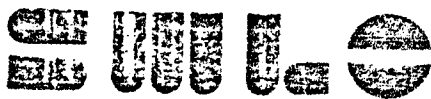
Southwest Laboratory of Oklahoma

BY Robert Norris

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla. 74148
(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064



002770
Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.34

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL
SWLO # 14424

DATE SUBMITTED: 09-18-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-537 (MW-4) CH-3 15.0' 9/15/87 14:02

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

(mw-4) 15.0'

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	33	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

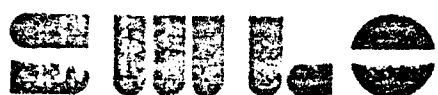
BY Robert Harris

TULSA BRANCH
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(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
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(918) 225-1064

002771



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.34a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14424

DATE SUBMITTED: 09-18-87

DATE EXTRACTED: 09-28-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-537 (MW-4) CH-3 15.0' 9/15/87 14:02 (mw-4) 15.0'

EXPLOSIVES

RESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDX.....	<0.05
HMX.....	<0.05
TETRYL.....	<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

BY Robert Harris

TULSA BRANCH
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(918) 665-0680

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002772

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.36

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14717

DATE SUBMITTED: 09-26-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-610 (CH-1) 2.0' 9/21/87

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

(MW-5) 2.0'

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	10 U	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

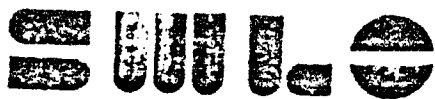
Southwest Laboratory of Oklahoma

BY Robert Morris

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla. 74146
(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
 U.S. ARMY CORPS OF ENGINEERS
 POST OFFICE BOX 36045
 DALLAS, TEXAS 75235-8011
 ATTN: JEFF TYE

REPORT: SAP1013.36a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL
 SWLO # 14717

DATE SUBMITTED: 09-26-87

DATE EXTRACTED: 10-09-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-610 (CH-1) 2.0' 9/21/87

(MW-5) 2.0'

EXPLOSIVESRESULTS (ug/g)

TNT.....<0.05
 2-4 DNT.....<0.05
 2-6 DNT.....<0.05
 RDX.....<0.05
 HMX.....<0.05
 TETRYL.....<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

BY Robert Nalley

TULSA BRANCH
 10926 E. 55th Pl.
 Tulsa, Okla. 74146
 (918) 665-0680

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CUSHING BRANCH
 P.O. Box 368
 Cushing, Okla. 74023
 (918) 225-1064



002774

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.37

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14718

DATE SUBMITTED: 09-26-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-8240, EPA METHODOLOGY

CLIENT I.D.: 7-611 (CH-2) 10.0' 9/21/87

(mw-5) 10.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	19	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY *Robert Habbis*

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla. 74146
(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002775



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.37a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14718

DATE SUBMITTED: 09-26-87

DATE EXTRACTED: 10-09-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-611 (CH-2) 10.0' 9/21/87

(mw-5) 10.0'

EXPLOSIVES

RESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDX.....	<0.05
HMX.....	<0.05
TETRYL.....	<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

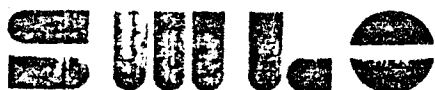
Southwest Laboratory of Oklahoma

BY *Rahel Morris*

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla. 74148
(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064



002776

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.38

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14719

DATE SUBMITTED: 09-26-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-612 (CH-3) 17.0' 9/21/87

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

(mw-5) 17.0'

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	34	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY Robert Morris

TULSA BRANCH
10926 E. 55th Pl.
Tulsa, Okla 74148
(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
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(918) 225-1064



002777

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.38a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14719

DATE SUBMITTED: 09-26-87

DATE EXTRACTED: 10-09-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-612 (CH-3) 17.0' 9/21/87

(MW-5) 17.0'

EXPLOSIVESRESULTS (ug/g)

TNT.....	<0.05
2-4 DNT.....	<0.05
2-6 DNT.....	<0.05
RDX.....	<0.05
HMX.....	<0.05
TETRYL.....	<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

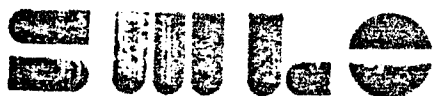
BY

Robert Morris

TULSA BRANCH
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Tulsa, Okla 74148
(918) 665-0680

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CUSHING BRANCH
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(918) 225-1064



002778

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAF1013.39

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14720

DATE SUBMITTED: 09-26-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-613 (CH-1) 2.0' 9/21/87

(mw-6) 2.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	12	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

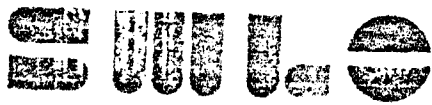
Southwest Laboratory of Oklahoma

BY Robert Harris

TULSA BRANCH
10926 E. 55th Pl.
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OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND ARE NOT NECESSARILY
INDICATIVE OF THE QUALITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS.

CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
 U.S. ARMY CORPS OF ENGINEERS
 POST OFFICE BOX 36045
 DALLAS, TEXAS 75235-8011
 ATTN: JEFF TYE

REPORT: SAP1013.39a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14720

DATE SUBMITTED: 09-26-87

DATE EXTRACTED: 10-09-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-613 (CH-1) 2.0' 9/21/87

(mw-6) 2.0'

EXPLOSIVES

RESULTS (ug/g)

TNT.....<0.05
 2-4 DNT.....<0.05
 2-6 DNT.....<0.05
 RDX.....<0.05
 HMX.....<0.05
 TETRYL.....<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

BY

Robert Harris

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 Cushing, Okla. 74023
 (918) 225-1064



002780

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAF1013.40

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14721

DATE SUBMITTED: 09-26-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SW846-B240, EPA METHODOLOGY

CLIENT I.D.: 7-614 (CH-2) 10.0' 9/21/87

(MW-6) 10.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	28	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLOROBENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

U indicates the compound was analyzed for but not detected above that level.

Southwest Laboratory of Oklahoma

BY Robert H. H. H.

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064



002781

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.40a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14721

DATE SUBMITTED: 09-26-87

DATE EXTRACTED: 10-09-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-614 (CH-2) 10.0' 9/21/87

(MW-6) 10.0'

EXPLOSIVESRESULTS (ug/g)

TNT.....<0.05
2-4 DNT.....<0.05
2-6 DNT.....<0.05
RDX.....<0.05
HMX.....<0.05
TETRYL.....<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

BY Robert Harris

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10926 E. 55th Pl.
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(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064

002782



Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.41

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14722

DATE SUBMITTED: 09-26-87

DATE ANALYZED: 10-10-87

METHOD REFERENCE: SWB46-8240, EPA METHODOLOGY

CLIENT I.D.: 7-615 (CH-3) 18.0' 9/21/87

(MW-6) 18.0'

RESULTS REPORTED IN ug/Kg OR Parts Per Billion (PPB)

<u>VOLATILES</u>	<u>RESULTS</u>	<u>VOLATILES</u>	<u>RESULTS</u>
CHLOROMETHANE	10 U	1,1,2,2-TETRACHLOROETHANE	5 U
BROMOMETHANE	10 U	1,2-DICHLOROPROPANE	5 U
VINYL CHLORIDE	10 U	TRANS-1,3-DICHLOROPROPENE	5 U
CHLOROETHANE	10 U	TRICHLOROETHENE	5 U
METHYLENE CHLORIDE	5 U	DIBROMOCHLOROMETHANE	5 U
ACETONE	26	1,1,2-TRICHLOROETHANE	5 U
CARBON DISULFIDE	5 U	BENZENE	5 U
1,1-DICHLOROETHENE	5 U	CIS-1,3-DICHLOROPROPENE	5 U
1,1-DICHLOROETHANE	5 U	2-CHLOROETHYL VINYLETHER	10 U
TRANS-1,2-DICHLOROETHENE	5 U	BROMOFORM	5 U
CHLOROFORM	5 U	2-HEXANONE	10 U
1,2-DICHLOROETHANE	5 U	4-METHYL-2-PENTANONE	10 U
2-BUTANONE	10 U	TETRACHLOROETHENE	5 U
1,1,1-TRICHLOROETHANE	5 U	TOLUENE	5 U
CARBON TETRACHLORIDE	5 U	CHLORO BENZENE	5 U
VINYL ACETATE	10 U	ETHYLBENZENE	5 U
BROMODICHLOROMETHANE	5 U	STYRENE	5 U
ACROLEIN	100 U	TOTAL XYLENES	5 U
ACRYLONITRILE	100 U	TRICHLOROFLUOROMETHANE	10 U

NOTE: Acetone is a common laboratory contaminant. The normal allowable level of such a contaminant is five times the detection limit reported. Acetone reported in some of the samples was at levels less than five times the detection limit, therefore, the reported number may not be significant.

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Southwest Laboratory of Oklahoma

BY *Robert Natter*

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(918) 665-0680

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CUSHING BRANCH
P.O. Box 368
Cushing, Okla. 74023
(918) 225-1064



002783

Southwest Laboratory of Oklahoma

CLIENT: SOUTHWESTERN DIVISION LABORATORY
U.S. ARMY CORPS OF ENGINEERS
POST OFFICE BOX 36045
DALLAS, TEXAS 75235-8011
ATTN: JEFF TYE

REPORT: SAP1013.41a

DATE: 10-27-87

SUBJECT: SAMPLE FOR ANALYSIS

SAMPLE MATRIX: SOIL

SWLO # 14722

DATE SUBMITTED: 09-26-87

DATE EXTRACTED: 10-09-87

DATE ANALYZED: 10-26-87

CLIENT I.D.: 7-615 (CH-3) 18.0' 9/21/87

(MW-6) 18.0'

EXPLOSIVESRESULTS (ug/g)

TNT.....<0.05
2-4 DNT.....<0.05
2-6 DNT.....<0.05
RDX.....<0.05
HMX.....<0.05
TETRYL.....<0.05

NOTE: Samples show a very large, broad peak where tetryl, nitroglycerine, and TNT elute. Broadness of peak would indicate it to be a matrix problem and the analyst will scan to verify. (Does not show on method blanks or standards).

Southwest Laboratory of Oklahoma

BY Robert Harris

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(918) 225-1064

002784

APPENDIX Q

DRILL REQUEST FOR STRATIGRAPHIC TEST BORINGS
3F-922 THROUGH 3F-924

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGO

REFERENCE OR OFFICE SYMBOL	SUBJECT
SWF-ED-G (415-10f)	Stratigraphic Test Borings for Ground-Water Quality Assessment, Longhorn Army Ammunition Plant, Marshall, TX

TP/ THRU CESWF-ED-GG FROM CESWF-ED-GG DATE 2 May 1988 CMT 1
CESWF-ED-G FITZGERALD/rg/4-3221

TO CESWF-ED-GG (Core Drill Unit)

1. Request three borings (3F-922 through 3F-924) be drilled and e-logged at the locations shown on the attached layout.
2. All persons performing the drilling and sampling described in this request will have had at least 40 hours of training in personnel protection and safety procedures for hazardous waste operations.
3. The purpose of these borings is to better determine stratigraphy to aid in placing additional monitoring wells in the area of the incinerator where ground water is highly contaminated with solvents. Boring 3F-922 is located upgradient from the site and should be drilled first. Boring 3F-923 is on the edge of the contaminant plume and should be drilled second. Boring 3F-924 is within the contaminant plume and should be drilled last.
4. Although no soil samples will be analyzed for chemical constituents, it is still important that all downhole equipment be free of grease, oil, and dirt. This should be done by steam cleaning all downhole equipment prior to drilling each boring.
5. Fishtail boring 3F-922 250 feet deep. Drilling depths for 3F-923 and 3F-924 will depend what is found in boring 3F-922 and will most likely extend only beneath the first confining bed identified in 3F-922. A clay layer is being sought that may be acting as a confining layer separating contaminated ground water above from clean ground water below. Therefore, it is important to mix a thick drill mud and maintain good circulation to avoid contaminating any lower aquifer unit when penetrating the confining bed in borings 3F-923 and 3F-924.
6. Water required for drilling must be nonchlorinated and may be obtained from LHAAP fire hydrants.
7. No samples shall be taken, but stratigraphy should be logged from the drill cuttings. Drill cuttings will be analyzed every 5 feet and any zones producing a strong odor should be noted.
8. After drilling is complete, run a resistivity log, a spontaneous potential log, and a natural gamma log the entire depth of the boring. After e-logging the boring, immediately backfill to within 10 feet of the surface with a heavy bentonite mud from the bottom of the boring upward. Backfill the top 10 feet with a neat bentonite cement grout. Then stake and label each boring location adequately so it can be surveyed at a later date.
9. The following safety procedures shall be followed while taking samples at the Active Burning Ground:
 - a. Ground-water contamination identified has been due to methylene chloride and trichloroethylene, both volatile organics. Concentrations in the ground water have exceeded 1,000,000 ppb for methylene chloride and 100,000 ppb for trichloroethylene. It is therefore important to monitor the breathing space around the drill rig during drilling. Gas detector tubes have been provided for this. Following the manufacturer's directions, take a reading

(SWF-ED-G

2 May 1988

SUBJECT: Stratigraphic Test Borings for Ground-Water Quality Assessment, Longhorn Army
Ammunition Plant, Marshall, TX

for both methylene chloride and trichloroethylene at least every 10 feet of borehole advancement and record the readings on the boring log. Drilling operations shall be shut down and personnel shall leave the area under either of the following two conditions:

- (1) Methylene Chloride - Average concentration exceeds 500 ppm
over an 8-hour period
- (2) Trichloroethylene - Average concentration exceeds 100 ppm
over an 8-hour period

Do not resume drilling until further instructions are given from the office.

b. High concentrations of these volatile organics can irritate the skin and eyes. Disposable rubber gloves should be worn when prolonged skin exposure is expected during drilling and sampling procedures. If the skin becomes wet, wash promptly with soap and water. If the eyes are contacted, irrigate immediately with a lot of clear water. Seek medical help immediately.

c. If swallowed, induce vomiting with Ipecac. Seek medical help immediately.

d. Telephone is located in Burning Grounds office by the gate. The Morton Thiokol Environmental Office can be called for any emergency situation. Other emergency numbers are also listed below.

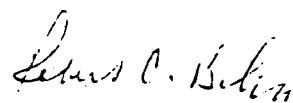
Morton Thiokol Environmental Office 2774

Ambulance 0

Fire Department 17

10. The Longhorn AAP P.O.C. is Mr. Don Maley, Chief Engineer, telephone (214) 679-2613.
11. Provide a lithologic log and e-logs for each boring to the Chief, Engineering Geology Section, when drilling is complete.
12. Charges will be made to RA8213829080176.

Atch



ROBERT C. BEHM
Chief, Engineering Geology Section

002787

APPENDIX R

DRILL REQUESTS FOR WELLS MW-7 THROUGH MW-15

DISPOSITION FORM

For use of this form, see AR 340 15, the proponent agency is TASS

REFERENCE OR OFFICE SYMBOL

CESWF-ED-GG (415-10f)

SUBJECT

Request for Stratigraphic Test Boring and Eight Ground-Water Monitoring Wells, Ground-Water Quality Assessment, Longhorn Army Ammunition Plant, Marshall, TX

TP/ THRU CESWF-ED-G *ky*FROM CESWF-ED-GG *RB*DATE 21 June 1988
FITZGERALD/rg/4-3221

CMT 1

TO CESWF-ED-GG (Core Drill Unit)

1. Request eight monitoring wells (MW-7 through MW-14) be installed and one boring (3F-925) be drilled and e-logged at the locations shown on the attached layout. Locations MW-7 through MW-11 and 3F-925 have been surveyed and are staked. Locate MW-12 through MW-14 as shown, drilling MW-13 and MW-14 10 feet from existing wells C-2 and 120, respectively.

2. All persons performing the drilling and sampling described in this request must have 40 hours of training in personnel protection and safety procedures for hazardous waste operations.

3. It is important that all downhole equipment be free of grease, oil, and dirt. Therefore, all downhole equipment shall be steam cleaned prior to drilling each boring. Hand-held sampling tools should be washed with a household detergent and rinsed with water to prevent cross-contamination with soil samples.

4. Any water required for drilling must be nonchlorinated and may be obtained from LHAAP fire hydrants.

5. Fishtail boring 3F-925 25 feet into clay shale. Estimated total depth is 150 feet. It is important to mix a thick drill mud and maintain good circulation to avoid cross-contaminating any lower aquifer units. Take no samples, but log the stratigraphy from the drill cuttings. Describe drill cuttings every 5 feet. Note any zones producing a strong odor. After drilling is complete, run a resistivity log, a spontaneous potential log, and a natural gamma log the entire depth of the boring. After e-logging, immediately backfill the boring to within 10 feet of the surface with a heavy bentonite mud placed from the bottom of the boring upward. Backfill the top 10 feet with a heat bentonite cement grout.

6. Drill well borings MW-7 through MW-12 using an 8-inch diameter auger. Drill borings completely dry, if possible. If a drill mud must be used, use pure bentonite with no additives. Note when ground water is encountered. Drill at least 15 feet below water level, screening wells at the base of the upper contaminated water-bearing zone. This zone consists of interbedded silts, sands, and clays in borings MW-7, MW-8, and MW-9, and is underlain by a light blue gray, medium to high plasticity clay. In borings MW-10, MW-11, and MW-12, this zone consists of alternating sands and silts underlain by a light gray silty plastic clay. Estimated drilling depths to these clays are:

MW- 7	32 feet
MW- 8	31 feet
MW- 9	27 feet
MW-10	31 feet
MW-11	11 feet
MW-12	27 feet

7. Wells MW-13 and MW-14 will be screened in the next lower aquifer underlying the upper contaminated zone. To avoid cross-contaminating the lower unit, auger far enough into the confining clay layer to set and cement casing. Once casing is set, proceed augering until at least 10 feet into underlying fine-grained silty sand, making sure that all water from the upper contaminated zone is removed prior to penetrating the confining clay. If a drill mud must be used, use pure bentonite with no additives. Estimated well depths are:

002789

SWF-ED-GG

21 June 1988

SUBJECT: Request for Stratigraphic Test Boring and Eight Ground-Water Monitoring Wells, Ground-Water Quality Assessment, Longhorn Army Ammunition Plant, Marshall, TX

MW-13	44 feet
MW-14	50 feet

8. On all wells, take jar samples using 1-quart glass Mason jars every 2 feet for the first 10 feet, then every 5 feet or change of material for the remainder of the hole. These samples will be used for soil classification analyses only. No special preservation or delivery schedules are required.

9. In addition to the soil samples to be taken for soil classification, take a soil sample at both 2 and 10 feet for chemical analysis. It is important to thoroughly cleanse the auger with a mild detergent, then rinse with distilled water, prior to entering the boring to obtain each of these samples. It is also important for the geologist to wear clean disposable rubber gloves and use clean sampling tools when handling each of these samples. A single sample shall consist of two 1-liter jar samples. Fill each jar completely and seal tightly with a teflon-lined lid. Label one jar for metals testing. Label the other jar for volatile organics and explosives testing. Fill labels out in indelible ink and completely seal with tape when affixing label to the jar. Store labeled jars inverted on ice until delivered to Southwestern Division Laboratory (SWDL).

10. Fill out chain of custody forms to accompany all chemical soil samples to SWDL. Deliver these samples, with appropriate chain of custody forms, to SWDL within 48 hours of being taken.

11. Construct the monitoring wells in accordance with the attached detail. Steam clean well materials inside and outside prior to installation. If centralizers are required to keep the well centered, place them above the well screen.

12. Develop the well 48 hours after grouting using surge block and/or bailer. Dispose of water removed from well far enough away so it won't run back down the boring. Develop a minimum of 4 hours, until water is clear and free of sediment.

13. Safety procedures:

a. Ground-water contamination that has been identified has been due to methylene chloride and trichloroethylene, both volatile organics. Concentrations in the ground water have exceeded 1,000,000 ppb for methylene chloride and 100,000 ppb for trichloroethylene. It is therefore important to monitor the breathing space around the drill rig during drilling. Gas detector tubes have been provided for this. Following the manufacturer's directions, take a reading for both methylene chloride and trichloroethylene at least every 10 feet of borehole advancement and record the readings on the boring log. Drilling operations shall be shut down and personnel shall leave the area under either of the following two conditions:

(1) Methylene Chloride - Average concentration exceeds 500 ppm over an 8-hour period

(2) Trichloroethylene - Average concentration exceeds 100 ppm over an 8-hour period

Do not resume drilling until further instructions are given from the office.

002790

SWF-ED-GG

21 June 1988

SUBJECT: Request for Stratigraphic Test Boring and Eight Ground-Water Monitoring Wells,
Ground-Water Quality Assessment, Longhorn Army Ammunition Plant, Marshall, TX

b. High concentrations of these volatile organics can irritate the skin and eyes. Disposable rubber gloves should be worn when prolonged skin exposure is expected during drilling and sampling procedures. If the skin becomes wet, wash promptly with soap and water. If the eyes are contacted, irrigate immediately with a lot of clear water. Seek medical help immediately.

c. If swallowed, induce vomiting with Ipecac. Seek medical help immediately.

d. A telephone is located in Burning Grounds office by the gate. The Morton Thiokol Environmental Office can be called for any emergency situation. Other emergency numbers are also listed below.

Morton Thiokol Environmental Office 2774

Ambulance 0

Fire Department 17

14. Deliver all jar samples intended for soil classification analyses to SWDL.

15. Provide e-logs, lithologic logs, and well construction details to the Chief, Engineering Geology Section, when all installations are complete.

16. Charge costs to RA8213829080176.

3 Atchs



ROBERT C. BEHM
Chief, Engineering Geology Section

2" x 5' STEEL POST (A)

STEEL PROTECTIVE CASING
W/ COVER & LOCK
VENTED CAP

0.0'

2'-3"

SURVEY MARKER

3' x 3' x 4' SQUARE CONCRETE PAD

GROUND SURFACE

CEMENT GROUT

VARIES

4" I.D. (TYPE 304) SS BLANK PIPE
FLUSH THREADED JOINTS

APPROX. WATER TABLE

BENTONITE SEAL

2' MIN.

2'

FLUSH THREADED JOINT

4" I.D. SS PRESLOTTED WELL SCREEN
(.010 SLOT SIZE)

SAND/GRAVEL FILTER PACK

5'

FLUSH THREADED JOINT

2'

4" I.D. (TYPE 304) SS BLANK PIPE
PLUS

8 1/2" MINIMUM

CONSTRUCTION DETAIL FOR MONITORING WELLS

Date

- VENTED CAP

SURVEY
MARKER

3' x 3' x 4" SQUARE
CONCRETE PAD

- GROUND SURFACE

- CEMENT GROUT

10" MINIMUM

8" I.D. PVC SURFACE CASING

4" I.D. (TYPE 304) SS BLANK PIPE
FLUSH THREADED JOINTS

-BENTONITE SEAL

FLUSH THREADED JOINT

4" I.D. SS PRESLOTTED WELL SCREEN
(.010 slot size)

- #20 - #40 SILCA SAND FILTER PACK

FLUSH THREADED JOINT

- 4" I.D. (TYPE 304) SS BLANK PIPE

PLUG

-7 7/8" MINIMUM

TYPICAL CONSTRUCTION DETAIL FOR DEEP MONITORING WELL

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
SWF-ED-GG (415-10f)	Drill Request for Monitoring Well Installation, Ground-Water Quality Assessment, Longhorn AAP, Marshall, TX
TO/ THRU CESWF-ED-G	FROM CESWF-ED-GG
DATE 13 July 1988	CMT 1
FITZGERALD/rg/4-3221	
TO CESWF-ED-GG (Core Drill Unit)	

1. Request one monitoring well (MW-15) be installed 10 feet west of existing well MW-2. Well installation is to take place only after boring 3F-925 has been drilled and e-logged.
2. All persons performing the drilling and sampling described in this request must have 40 hours of training in personnel protection and safety procedures for hazardous waste operations.
3. It is important that all downhole equipment be free of grease, oil, and dirt. Therefore, all downhole equipment shall be steam cleaned prior to drilling each boring. Handheld sampling tools should be washed with a household detergent and rinsed with water to prevent cross-contamination with soil samples.
4. Any water required for drilling must be nonchlorinated and may be obtained from LHAAP fire hydrants.
5. Drill well boring using an 8-inch diameter auger. Drill completely dry, if possible. If a drill mud must be used, use pure bentonite with no additives. Note when ground water and/or any odors are encountered. Screen well near the base of the next lower aquifer underlying the upper contaminated zone screened by MW-2. Drilling depth will depend on the e-log obtained from 3F-925 and materials encountered while drilling MW-15. Estimated depth is 70 feet.
6. Well MW-2 has shown extremely high concentrations of methylene chloride and trichloroethylene in the upper aquifer. Therefore, it is very important to avoid cross-contaminating the lower unit. To do this, auger far enough into the confining clay layer to set and cement casing. Once casing is set, proceed augering until at least 10 feet into underlying fine-grained silty sand, making sure that all water from the upper contaminated zone is removed prior to penetrating the confining clay. If a drill mud must be used, use pure bentonite with no additives.
7. Take jar samples every 5 feet or change of material for the entire depth of the hole. These samples will be used for soil classification analyses. No special preservation or delivery schedules are required.
8. In addition to the soil samples to be taken for soil classification, take a soil sample at both 2 and 10 feet for chemical analysis. It is important to thoroughly cleanse the auger with a mild detergent, then rinse with distilled water prior to entering the boring to obtain each of these samples. It is also important for the geologist to wear clean disposable rubber gloves and use clean sampling tools when handling each of these samples. A single sample shall consist of two ½-liter jar samples. Fill each jar completely and seal tightly with a teflon-lined lid. Label one jar for metals testing. Label the other jar for volatile organics testing. Fill labels out in indelible ink and completely seal with tape when affixing label to the jar. Store labeled jars inverted on ice until delivered to Southwestern Division Laboratory (SWDL).
9. Fill out chain of custody forms to accompany all chemical soil samples to SWDL. Deliver these samples, with appropriate chain of custody forms, to SWDL within 48 hours of being taken.

SWF-ED-GG

13 July 1988

SUBJECT: Drill Request for Monitoring Well Installation, Ground-Water Quality Assessment, Longhorn AAP, Marshall, TX

10. Construct the monitoring well in accordance with the attached detail. Steam clean well materials inside and outside prior to installation. If centralizers are required to keep the well centered, place them above the well screen.

11. Develop the well 48 hours after grouting using surge block and/or bailer. Dispose of water removed from well far enough away so it won't run back down the boring. Develop a minimum of 4 hours, until water is clear and free of sediment.

12. Safety procedures:

a. Ground-water contamination that has been identified has been due to methylene chloride and trichloroethylene, both volatile organics. Concentrations in the ground water have exceeded 1,000,000 ppb for methylene chloride and 100,000 ppb for trichloroethylene. It is therefore important to monitor the breathing space around the drill rig during drilling. Gas detector tubes have been provided for this. Following the manufacturer's directions, take a reading for both methylene chloride and trichloroethylene at least every 10 feet of borehole advancement and record the readings on the boring log. Drilling operations shall be shut down and personnel shall leave the area under either of the following two conditions:

(1) Methylene Chloride - Average concentration exceeds 500 ppm over an 8-hour period

(2) Trichloroethylene - Average concentration exceeds 100 ppm over an 8-hour period

Do not resume drilling until further instructions are given from the office.

b. High concentrations of these volatile organics can irritate the skin and eyes. Disposable rubber gloves should be worn when prolonged skin exposure is expected during drilling and sampling procedures. If the skin becomes wet, wash promptly with soap and water. If the eyes are contacted, irrigate immediately with a lot of clear water. Seek medical help immediately.

c. If swallowed, induce vomiting with Ipecac. Seek medical help immediately.

d. A telephone is located in Burning Grounds office by the gate. The Morton Thiokol Environmental Office can be called for any emergency situation. Other emergency numbers are also listed below

Morton Thiokol Environmental Office	2774
Ambulance	0
Fire Department	17

13. Deliver all jar samples intended for soil classification analyses to SWDL.

14. Provide lithologic log and well construction detail to the Chief, Engineering Geology Section, when installation is complete.

002795

SWF-ED-GG

13 July 1988

SUBJECT: Drill Request for Monitoring Well Installation, Ground-Water Quality Assessment,
Longhorn AAP, Marshall, TX

15. Charge costs to RA8213829080176.

Atch



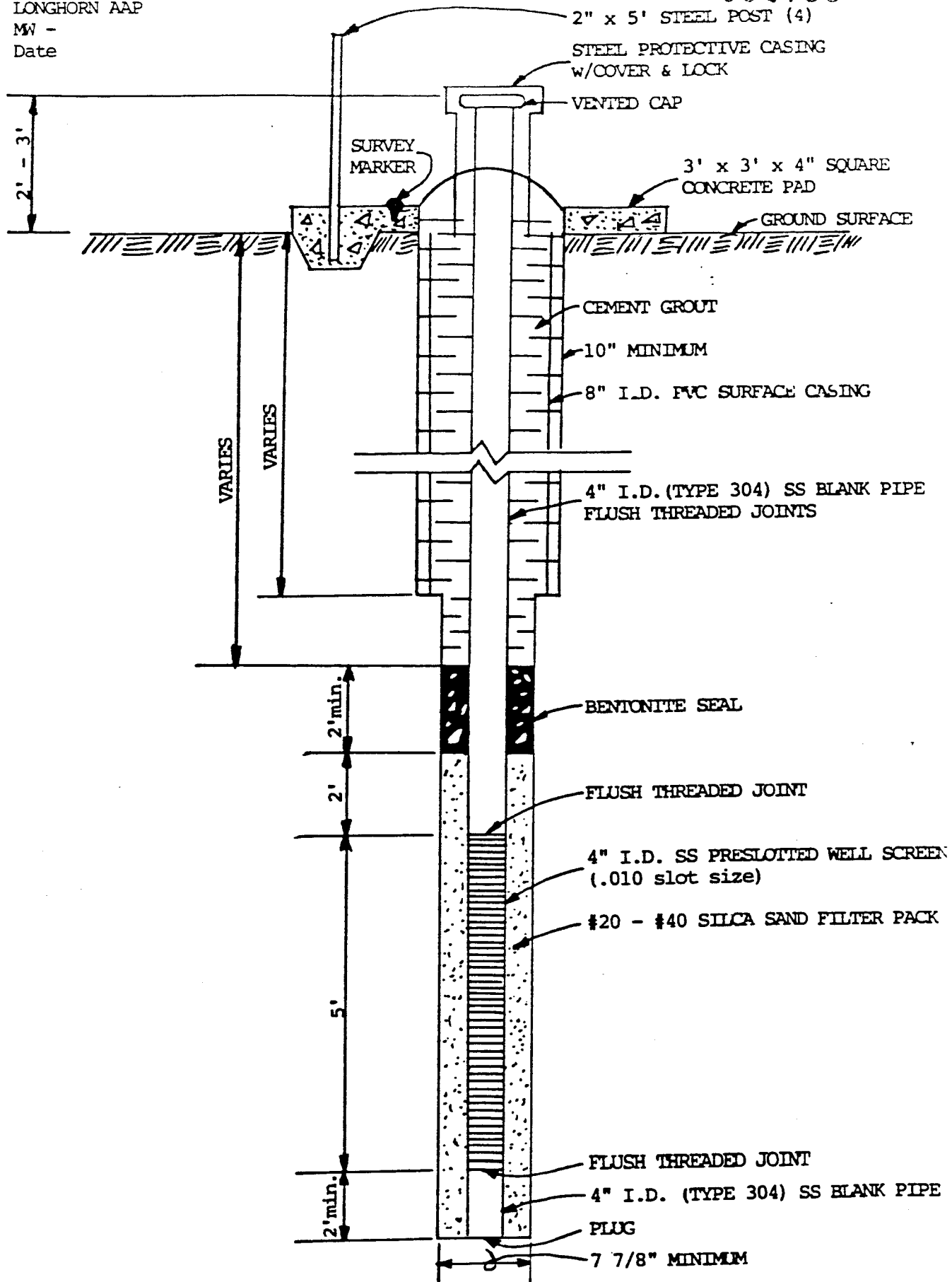
ROBERT C. BEHM
Chief, Engineering Geology Section

002796

LONGHORN AAP

MW -

Date



TYPICAL CONSTRUCTION DETAIL FOR DEEP MONITORING WELL

APPENDIX S

LABORATORY RESULTS FOR CHEMICAL SOIL SAMPLES FROM
WELL BORINGS MW-7 THROUGH MW-15

TABLE 1

SWDED-6L Report No. 14543

Results of Chemical Analyses of Soil Samples

Longhorn Army Ammunition Plant

BORING NO.	DEPTH FT.	SWD No.	Ag	As	Ba	Cd	Cr	Hg	Pb	Se	Ni	Zn
Minimum Reported Concentration			0.5	1.0	20.0	0.5	5.0	0.1	1.0	0.1	1.0	1.0
Results reported in mg/Kg												
MW-7	2.0'	8- 763	<0.50	<1.0	23	<0.50	<5.0	<0.1	4.5	<0.10	5.6	14
MW-7	10'	8- 764	1.6	<1.0	96	1.1	9.7	<0.1	11	<0.10	2.6	9.4
MW-9	2.0'	8- 838	<0.5	<1.0	51	1.9	<5.0	0.1	6.3	<0.10	1.9	5.5
MW-9	10'	8- 839	<0.5	1.4	29	0.9	<5.0	<0.1	3.1	<0.10	2.5	10
MW-8	2.0'	8- 863	<0.5	<1.0	28	1.5	<5.0	<0.1	6.4	<0.10	<1.0	7.5
MW-8	10'	8- 864	<0.5	<1.0	20	<0.5	<5.0	<0.1	1.6	<0.10	1.6	4.7

TABLE 1.

SWDED-BL Report No. 14543

Results of Chemical Analyses of Soil Samples

Longhorn Army Ammunition Plant

BORING NO.	DEPTH FT.	SWD No.	Ag	As	Ba	Cd	Cr	Hg	Pb	Se	Ni	Zn
Minimum Reported Concentration			0.5	1.0	20.0	0.5	5.0	0.1	1.0	0.1	1.0	1.0
Results reported in mg/Kg												
MW-10	2.0'	8- 884	<0.5	<1.0	<20	1.7	<5.0	<0.1	7.4	<0.10	<1.0	3.4
MW-10	10'	8- 885	<0.5	<1.0	<20	<0.5	<5.0	<0.1	1.0	<0.10	1.0	2.9
MW-11	2.0'	8- 886	<0.5	<1.0	43	1.6	<5.0	<0.1	4.5	<0.10	1.1	3.0
MW-11	10'	8- 887	<0.5	<1.0	<20	0.6	<5.0	<0.1	1.6	<0.10	<1.0	3.8
2-1 MW-12	2.0'	8- 912	<0.5	<1.0	180	3.3	8.0	<0.1	17	0.24	5.6	14
2-2 MW-12	10'	8- 913	<0.5	1.1	34	3.8	5.8	<0.1	7.1	<0.10	7.5	17
2-1 MW-14	2.0'	8- 1004	<0.5	1.2	200	3.2	9.9	<0.1	10	<0.10	5.5	12
2-2 MW-14	10'	8- 1005	<0.5	<1.0	28	3.1	5.6	<0.1	6.9	<0.10	5.6	13

TABLE 1

SWDEB-GL Report No. 14543

Results of Chemical Analyses of Soil Samples

Longhorn Army Ammunition Plant

BORING NO.	DEPTH FT.	SWD No.	Ag	As	Ba	Cd	Cr	Hg	Pb	Se
Minimum Reported Concentration			0.5	0.1	5.0	0.5	0.5	0.1	1.0	0.1
Results reported in mg/Kg										
MW-13	2'	8- 1366	0.51	0.78	11	4.8	5.8	<0.1	9.8	0.12
MW-13	10'	8- 1367	0.52	0.13	15	1.9	1.9	<0.1	2.6	<0.10

TABLE 1

GWDED-GL Report No. 14543

Results of Chemical Analyses of Soil Samples

Longhorn Army Ammunition Plant

BORING NO.	DEPTH FT.	SWD No.	Ag	As	Ba	Cd	Cr	Hg	Pb	Sa
Minimum Reported Concentration			0.5	1.0	20.0	0.5	5.0	0.1	1.0	0.1
Results reported in mg/Kg										
MW-15	2'	8- 1299	0.61	1.1	70	7.0	15	<0.1	13	<0.1
MW-15	15 10'	8- 1300	0.59	<1.0	92	4.2	5.4	<0.1	7.3	<0.1

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

002802

Lab Name: SWL - TULSA Contract: 8-763
 Lab Code: SWOK Case No.: SWCORP SAS No.: (C-1A,C-1)
 SDG No.: (MW-7) 2.0
 Matrix: (soil/water) SOIL Lab Sample ID: 19832
 Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9110
 Level: (low/med) LOW Date Received: 07/02/88
 % Moisture: not dec. 15 Date Analyzed: 07/06/88
 Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	Q
74-87-3	-----Chloromethane	12	U
74-83-9	-----Bromomethane	12	U
75-01-4	-----Vinyl Chloride	12	U
75-00-3	-----Chloroethane	12	U
75-09-2	-----Methylene Chloride	6	U
67-64-1	-----Acetone	6	J
75-15-0	-----Carbon Disulfide	6	U
75-35-4	-----1,1-Dichloroethene	6	U
75-34-3	-----1,1-Dichloroethane	6	U
540-59-0	-----1,2-Dichloroethene (total)	6	U
67-66-3	-----Chloroform	6	U
107-06-2	-----1,2-Dichloroethane	6	U
78-93-3	-----2-Butanone	12	U
71-55-6	-----1,1,1-Trichloroethane	6	U
56-23-5	-----Carbon Tetrachloride	6	U
108-05-4	-----Vinyl Acetate	12	U
75-27-4	-----Bromodichloromethane	6	U
78-87-5	-----1,2-Dichloropropane	6	U
10061-01-3	-----cis-1,3-Dichloropropene	6	U
79-01-6	-----Trichloroethene	0.9	J
124-48-1	-----Dibromochloromethane	6	U
79-00-5	-----1,1,2-Trichloroethane	6	U
71-43-2	-----Benzene	6	U
10061-02-6	-----Trans-1,3-Dichloropropene	6	U
75-25-2	-----Bromoform	6	U
108-10-1	-----4-Methyl-2-Pentanone	12	U
591-78-6	-----2-Hexanone	12	U
127-18-4	-----Tetrachloroethene	6	U
79-34-5	-----1,1,2,2-Tetrachloroethane	12	U
108-88-3	-----Toluene	6	U
108-90-7	-----Chlorobenzene	6	U
100-41-4	-----Ethylbenzene	6	U
100-42-5	-----Styrene	6	U
1330-20-7	-----Xylene (total)	6	U
75-69-4	-----Trichlorofluoromethane	12	U
95-50-1	-----1,2-Dichlorobenzene	12	U

106-46-7-----1,3-Dichlorobenzene	
547-73-1-----1,4-Dichlorobenzene	

12	002803
12	

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

002804 SAMPLE NO.

Name: SWL - TULSA Contract: _____

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDS No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 19832

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9110

Level: (low/med) LOW Date Received: 07/02/88

% Moisture: not dec. 15 Date Analyzed: 07/06/88

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 4889832	Bicyclo[3.1.1]hept-2-ene, 3,	24.87	29	J

002805

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-8

SWLO#: 19832

SAMPLE ID: 8-763 (MW-7) 2.0'

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
002806

Job Name: SWL - TULSA Contract: _____
Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
Matrix: (soil/water) SOIL Lab Sample ID: 19833
Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9111
Level: (low/med) LOW Date Received: 07/02/88
% Moisture: not dec. 21 Date Analyzed: 07/06/88
Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg)	UG/KG
74-87-3	Chloromethane	13	U
74-83-9	Bromomethane	13	U
75-01-4	Vinyl Chloride	13	U
75-00-3	Chloroethane	13	U
75-09-2	Methylene Chloride	6	U
67-64-1	Acetone	13	U
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	13	U
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	13	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-46-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	13	U
591-78-6	2-Hexanone	13	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	13	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Xylene (total)	6	U
75-69-4	Trichlorofluoromethane	13	U
95-50-1	1,2-Dichlorobenzene	13	U

106-46-7-----1,3-Dichlorobenzene	13	U
547-73-1-----1,4-Dichlorobenzene	13	U

002807

002808

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 19833

SAMPLE ID: 8-764 (MW-7) 10.0'

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

002809

EPA SAMPLE NO.

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDSSite Name: SWL - TULSA

Contract: _____

8-863

(mw-8/2.0)

Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOILLab Sample ID: 20153Sample wt/vol: 5.0 (g/mL) GLab File ID: 9479Level: (low/med) LOWDate Received: 07/16/88% Moisture: not dec. 17Date Analyzed: 07/26/88Column (pack/cap) PACKDilution Factor: 1.0Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002810

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 8-863 (mw-8/2.0)

SAMPLE ID: 20153

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

002811 FILE NO.

Name: SWL - TULSA

Contract: _____

8-864
(mw-8/10.0)

Lab Code: SWOK

Case No.: SWCORF

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOIL

Lab Sample ID: 20154

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: 9469

Level: (low/med) LOW

Date Received: 07/16/88

% Moisture: not dec. 19

Date Analyzed: 07/26/88

Column: (pack/cap) PACK

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	Q
---------	----------	--	---

74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	6	U
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	12	U
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	12	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
106-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Xylene (total)	6	U
75-69-4	Trichlorofluoromethane	12	U
95-50-1	1,2-Dichlorobenzene	12	U

002812

106-46-7-----1,3-Dichlorobenzene	
547-73-1-----1,4-Dichlorobenzene	

12	U
12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

002813
LABORATORY NO.

Lab Name: SWL - TULSA

Contract: _____

8-864

(mw-8/10.0)

Lab Code: SWOK

Case No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOIL

Lab Sample ID: 20154

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: 9469

Level: (low/med) LOW

Date Received: 07/16/88

% Moisture: not dec. 19

Date Analyzed: 07/26/88

Column (pack/cap) PACK

Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002814

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 8-864MS(mw-8/10.0)

SAMPLE ID: 20154MS

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

002815
EPA SAMPLE NO.

Name: SWL - TULSA

Contract: _____

8-838 MW9
(C-1,C-1A)2.0'

Lab Code: SWOK

Case No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOIL

Lab Sample ID: 20028

Sample wt/vol: 5.0 (g/mL) 6

Lab File ID: 9200

Level: (low/med) LOW

Date Received: 07/12/88

% Moisture: not dec. 18

Date Analyzed: 07/14/88

Column: (pack/cap) PACK

Dilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG Q

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	6	U
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	12	U
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	12	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Xylene (total)	6	U
75-69-4	Trichlorofluoromethane	12	U
95-50-1	1,2-Dichlorobenzene	12	U

002816

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 8-838 MW-9 2.0'

SAMPLE ID: 20028

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

002817

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: _____
Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
Matrix: (soil/water) SOIL Lab Sample ID: 20029
Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9359
Level: (low/med) LOW Date Received: 07/12/88
% Moisture: not dec. 19 Date Analyzed: 07/21/88
Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002818

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 8-839

MW-9 101

SAMPLE ID: 20029

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: SWCORP 8-884
(MW-10)2.0'

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 20273

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9589

Level: (low/med) LOW Date Received: 07/27/88

% Moisture: not dec. 19 Date Analyzed: 08/05/88

Column: (pack/cap) PACK Dilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	Q
---------	----------	---

74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	6	U
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	12	U
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	12	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	6	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Xylene (total)	6	U
75-69-4	Trichlorofluoromethane	12	U
95-50-1	1,2-Dichlorobenzene	12	U

002820

106-46-7-----1,3-Dichlorobenzene	12	U
547-73-1-----1,4-Dichlorobenzene	12	U

002821

1E

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: SWL - TULSA Contract: SWCORP 8-884
(mw-10)2.0'

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 20273

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9589

Level: (low/med) LOW Date Received: 07/27/88

% Moisture: not dec. 19 Date Analyzed: 08/05/88

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0 CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002822

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 8-884 (mw-10) 2.0'

SAMPLE ID: 20273

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

002823

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSAContract: SWCORP

8-885

(mtd-10) 10.0'

Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOILLab Sample ID: 20274Sample wt/vol: 5.0 (g/mL) 6Lab File ID: 9590Level: (low/med) LOWDate Received: 07/27/88% Moisture: not dec. 18Date Analyzed: 08/05/88Column: (pack/cap) PACKDilution Factor: 1.0

CAS NO.

COMPOUND

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Q

74-87-3-----	Chloromethane	12	U
74-83-9-----	Bromomethane	12	U
75-01-4-----	Vinyl Chloride	12	U
75-00-3-----	Chloroethane	12	U
75-09-2-----	Methylene Chloride	6	U
67-64-1-----	Acetone	12	U
75-15-0-----	Carbon Disulfide	6	U
75-35-4-----	1,1-Dichloroethene	6	U
75-34-3-----	1,1-Dichloroethane	6	U
540-59-0-----	1,2-Dichloroethene (total)	6	U
67-66-3-----	Chloroform	6	U
107-06-2-----	1,2-Dichloroethane	6	U
78-93-3-----	2-Butanone	12	U
71-55-6-----	1,1,1-Trichloroethane	6	U
56-23-5-----	Carbon Tetrachloride	6	U
108-05-4-----	Vinyl Acetate	12	U
75-27-4-----	Bromodichloromethane	6	U
78-87-5-----	1,2-Dichloropropane	6	U
10061-01-5-----	cis-1,3-Dichloropropene	6	U
79-01-6-----	Trichloroethene	44	U
124-48-1-----	Dibromochloromethane	6	U
79-00-5-----	1,1,2-Trichloroethane	6	U
71-43-2-----	Benzene	6	U
10061-02-6-----	Trans-1,3-Dichloropropene	6	U
75-25-2-----	Bromoform	6	U
108-10-1-----	4-Methyl-2-Pentanone	12	U
591-78-6-----	2-Hexanone	12	U
127-18-4-----	Tetrachloroethene	6	U
79-34-5-----	1,1,2,2-Tetrachloroethane	6	U
108-88-3-----	Toluene	6	U
108-90-7-----	Chlorobenzene	6	U
100-41-4-----	Ethylbenzene	6	U
100-42-5-----	Styrene	6	U
1330-20-7-----	Xylene (total)	6	U
75-69-4-----	Trichlorofluoromethane	12	U
95-50-1-----	1,2-Dichlorobenzene	12	U

002824

106-46-7-----1,3-Dichlorobenzene	12	10
547-73-1-----1,4-Dichlorobenzene	12	10

002825

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: SWCORP 8-665
(m10-10)10.0'

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 20274

Sample wt/vol: 5.0 (g/mL) 6 Lab File ID: 9590

Level: (low/med) LOW Date Received: 07/27/88

% Moisture: not dec. 18 Date Analyzed: 08/05/88

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002826

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 8-885 (mw-10) 10.0'

SAMPLE ID: 20274

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

002827

EPA SAMPLE NO.

Lab Name: SWL - TULSA

Contract: SWCORP

8-886

(m/w-11) 2.0'

Lab Code: SWOK

Case No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOIL

Lab Sample ID: 20275

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: 9591

Level: (low/med) LOW

Date Received: 07/27/88

% Moisture: not dec. 21

Date Analyzed: 08/05/88

Column: (pack/cap) PACK

Dilution Factor: 1.0

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG Q

74-87-3	-----Chloromethane	13	U
74-83-9	-----Bromomethane	13	U
75-01-4	-----Vinyl Chloride	13	U
75-00-3	-----Chloroethane	13	U
75-09-2	-----Methylene Chloride	6	U
67-64-1	-----Acetone	13	U
75-15-0	-----Carbon Disulfide	6	U
75-35-4	-----1,1-Dichloroethene	6	U
75-34-3	-----1,1-Dichloroethane	6	U
540-59-0	-----1,2-Dichloroethene (total)	6	U
67-66-3	-----Chloroform	6	U
107-06-2	-----1,2-Dichloroethane	6	U
78-93-3	-----2-Butanone	6	U
71-55-6	-----1,1,1-Trichloroethane	13	U
56-23-5	-----Carbon Tetrachloride	6	U
108-05-4	-----Vinyl Acetate	6	U
75-27-4	-----Bromodichloromethane	13	U
78-87-5	-----1,2-Dichloropropane	6	U
10061-01-5	-----cis-1,3-Dichloropropene	6	U
79-01-6	-----Trichloroethene	6	U
124-48-1	-----Dibromochloromethane	6	U
79-00-5	-----1,1,2-Trichloroethane	6	U
71-43-2	-----Benzene	6	U
10061-02-6	-----Trans-1,3-Dichloropropene	6	U
75-25-2	-----Bromoform	6	U
108-10-1	-----4-Methyl-2-Pentanone	6	U
591-78-6	-----2-Hexanone	13	U
127-18-4	-----Tetrachloroethene	13	U
79-34-5	-----1,1,2,2-Tetrachloroethane	6	U
108-88-3	-----Toluene	6	U
108-90-7	-----Chlorobenzene	6	U
100-41-4	-----Ethylbenzene	6	U
100-42-5	-----Styrene	6	U
1330-20-7	-----Xylene (total)	6	U
75-69-4	-----Trichlorofluoromethane	6	U
95-50-1	-----1,2-Dichlorobenzene	13	U
		13	U

002828

106-46-7-----1,3-Dichlorobenzene	13	U
547-73-1-----1,4-Dichlorobenzene	13	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

002829

EPA SAMPLE NO.

Lab Name: SWL - TULSA

Contract: SWCORP

8-886

(mw-11) 2.0'

Lab Code: SWOK

Case No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOIL

Lab Sample ID: 20275

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: 9591

Level: (low/med) LOW

Date Received: 07/27/88

% Moisture: not dec. 21

Date Analyzed: 08/05/88

Column (pack/cap) PACK

Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002830

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 8-886(mw-11)2.0'

SAMPLE ID: 20275

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

002831

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: SWCORP 8-587
(710-11) 10.0'

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 20276

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9592

Level: (low/med) LOW Date Received: 07/27/88

% Moisture: not dec. 20 Date Analyzed: 08/05/88

Column: (pack/cap) PACK Dilution Factor: 1.0

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) UG/KG Q

74-87-3-----	Chloromethane	13	U
74-83-9-----	Bromomethane	13	U
75-01-4-----	Vinyl Chloride	13	U
75-00-3-----	Chloroethane	13	U
75-09-2-----	Methylene Chloride	6	U
67-64-1-----	Acetone	13	U
75-15-0-----	Carbon Disulfide	6	U
75-35-4-----	1,1-Dichloroethene	6	U
75-34-3-----	1,1-Dichloroethane	6	U
540-59-0-----	1,2-Dichloroethene (total)	6	U
67-66-3-----	Chloroform	6	U
107-06-2-----	1,2-Dichloroethane	14	U
78-93-3-----	2-Butanone	13	U
71-55-6-----	1,1,1-Trichloroethane	6	U
56-23-5-----	Carbon Tetrachloride	6	U
108-05-4-----	Vinyl Acetate	13	U
75-27-4-----	Bromodichloromethane	6	U
78-87-5-----	1,2-Dichloropropane	6	U
10061-01-5-----	cis-1,3-Dichloropropene	6	U
79-01-6-----	Trichloroethene	140	U
124-48-1-----	Dibromochloromethane	6	U
79-00-5-----	1,1,2-Trichloroethane	6	U
71-43-2-----	Benzene	6	U
10061-02-6-----	Trans-1,3-Dichloropropene	6	U
75-25-2-----	Bromoform	6	U
108-10-1-----	4-Methyl-2-Pentanone	13	U
591-78-6-----	2-Hexanone	13	U
127-18-4-----	Tetrachloroethene	6	U
79-34-5-----	1,1,2,2-Tetrachloroethane	6	U
108-88-3-----	Toluene	6	U
108-90-7-----	Chlorobenzene	6	U
100-41-4-----	Ethylbenzene	6	U
100-42-5-----	Styrene	6	U
1330-20-7-----	Xylene (total)	6	U
75-69-4-----	Trichlorofluoromethane	13	U
95-50-1-----	1,2-Dichlorobenzene	13	U

002832

106-46-7-----1,3-Dichlorobenzene	13	U
547-73-1-----1,4-Dichlorobenzene	13	U

002833

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: SWCORP 8-887
(mw-11) 10.0'

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 20276

Sample wt/vol: 5.0 (g/mL) 6 Lab File ID: 9592

Level: (low/med) LOW Date Received: 07/27/88

% Moisture: not dec. 20 Date Analyzed: 08/05/88

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002834

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 07-29-88

SWLO#: 8-887(mw-11) 10.0'

SAMPLE ID: 20276

COMPOUNDS

RESULTS

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2.4 DNT	0.8 U
2.6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

002835
EPA SAMPLE NO.

Lab Name: <u>SWL - TULSA</u>	Contract: _____	8-912(C-1) (MW-12) 2.0'
Lab Code: <u>SWOK</u>	Case No.: <u>SWCORP</u>	SAS No.: _____ SDG No.: _____
Matrix: (soil/water) <u>SOIL</u>	Lab Sample ID: <u>20351</u>	
Sample wt/vol: <u>5.0</u> (g/mL) <u>G</u>	Lab File ID: <u>9618</u>	
Level: (low/med) <u>LOW</u>	Date Received: <u>07/30/88</u>	
% Moisture: not dec. <u>15</u>	Date Analyzed: <u>08/08/88</u>	
Column: (pack/cap) <u>PACK</u>	Dilution Factor: <u>1.0</u>	

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>		G
74-87-3	Chloromethane	12	U	
74-83-9	Bromomethane	12	U	
75-01-4	Vinyl Chloride	12	U	
75-00-3	Chloroethane	12	U	
75-09-2	Methylene Chloride	6	U	
67-64-1	Acetone	12	U	
75-15-0	Carbon Disulfide	6	U	
75-35-4	1,1-Dichloroethene	6	U	
75-34-3	1,1-Dichloroethane	6	U	
540-59-0	1,2-Dichloroethene (total)	6	U	
67-66-3	Chloroform	6	U	
107-06-2	1,2-Dichloroethane	6	U	
78-93-3	2-Butanone	12	U	
71-55-6	1,1,1-Trichloroethane	6	U	
56-23-5	Carbon Tetrachloride	6	U	
108-05-4	Vinyl Acetate	12	U	
75-27-4	Bromodichloromethane	6	U	
78-87-5	1,2-Dichloropropane	6	U	
10061-01-5	cis-1,3-Dichloropropene	6	U	
79-01-6	Trichloroethene	33		
124-48-1	Dibromochloromethane	6	U	
79-00-5	1,1,2-Trichloroethane	6	U	
71-43-2	Benzene	6	U	
10061-02-6	Trans-1,3-Dichloropropene	6	U	
75-25-2	Bromoform	6	U	
108-10-1	4-Methyl-2-Pentanone	12	U	
591-78-6	2-Hexanone	12	U	
127-18-4	Tetrachloroethene	6	U	
79-34-5	1,1,2,2-Tetrachloroethane	6	U	
108-88-3	Toluene	6	U	
108-90-7	Chlorobenzene	6	U	
100-41-4	Ethylbenzene	6	U	
100-42-5	Styrene	6	U	
1330-20-7	Xylene (total)	6	U	
75-69-4	Trichlorofluoromethane	12	U	
95-50-1	1,2-Dichlorobenzene	12	U	

002836

106-46-7-----1,3-Dichlorobenzene	12	10
547-73-1-----1,4-Dichlorobenzene	12	10

002837

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: _____
Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
Matrix: (soil/water) SOIL Lab Sample ID: 20351
Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9618
Level: (low/med) LOW Date Received: 07/30/88
% Moisture: not dec. 15 Date Analyzed: 08/08/88
Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002838

EXPLOSIVES BY HPLO
SOIL (ug/g)

CLIENT: SWCDE

DATE: 08-22-88

SWLO#: 20351

SAMPLE ID: 8-912 (C-1) MW-12 (2.0')

COMPOUNDS	RESULTS
HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2,4 DNT	0.8 U
2,6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: SWL - TULSA Contract: 8-913(C-2)
(MW-12) ID

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 20352

Sample wt/vol: 1.0 (g/mL) G Lab File ID: 9628

Level: (low/med) LOW Date Received: 07/30/88

% Moisture: not dec. 20 Date Analyzed: 08/09/88

Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>		Q
74-87-3	Chloromethane	63	U	
74-83-9	Bromomethane	63	U	
75-01-4	Vinyl Chloride	63	U	
75-00-3	Chloroethane	63	U	
75-09-2	Methylene Chloride	670	U	
67-64-1	Acetone	63	U	
75-15-0	Carbon Disulfide	31	U	
75-35-4	1,1-Dichloroethene	31	U	
75-34-3	1,1-Dichloroethane	31	U	
540-59-0	1,2-Dichloroethene (total)	31	U	
67-66-3	Chloroform	31	U	
107-06-2	1,2-Dichloroethane	31	U	
78-93-3	2-Butanone	63	U	
71-55-6	1,1,1-Trichloroethane	31	U	
56-23-5	Carbon Tetrachloride	31	U	
108-05-4	Vinyl Acetate	63	U	
75-27-4	Bromodichloromethane	31	U	
78-87-5	1,2-Dichloropropane	31	U	
10061-01-5	cis-1,3-Dichloropropene	31	U	
79-01-6	Trichloroethene	23	J	
124-48-1	Dibromochloromethane	31	U	
79-00-5	1,1,2-Trichloroethane	31	U	
71-43-2	Benzene	31	U	
10061-02-6	Trans-1,3-Dichloropropene	31	U	
75-25-2	Bromoform	31	U	
108-10-1	4-Methyl-2-Pentanone	63	U	
591-78-6	2-Hexanone	63	U	
127-18-4	Tetrachloroethene	31	U	
79-34-5	1,1,2,2-Tetrachloroethane	31	U	
108-88-3	Toluene	31	U	
108-90-7	Chlorobenzene	31	U	
100-41-4	Ethylbenzene	31	U	
100-42-5	Styrene	31	U	
1330-20-7	Xylene (total)	31	U	
75-69-4	Trichlorofluoromethane	63	U	
95-50-1	1,2-Dichlorobenzene	63	U	

002840

106-46-7-----1,3-Dichlorobenzene	63	U
547-73-1-----1,4-Dichlorobenzene	63	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

002841
EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: _____
Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
Matrix: (soil/water) SOIL Lab Sample ID: 20352
Sample wt/vol: 1.0 (g/mL) G Lab File ID: 9628
Level: (low/med) LOW Date Received: 07/30/88
% Moisture: not dec. 20 Date Analyzed: 08/09/88
Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002842

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWOCE

DATE: 08-22-88

SWLO#: 20352

SAMPLE ID: 8-913 (C-2) (MW-12) 10'

COMPOUNDS	RESULTS
HMX	1.6 U
RDX	1.2 U
TETRYL	5.5 U
TNT	0.8 U
2,4 DNT	0.8 U
2,6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

002843

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract:
 Lab Code: SWOK Case No.: SWCORF SAS No.: SDG No.:
 Matrix: (soil/water) SOIL Lab Sample ID: 21316
 Sample wt/vol: 5.0 (g/mL) G Lab File ID: 10337
 Level: (low/med) LOW Date Received: 09/20/88
 % Moisture: not dec. 22 Date Analyzed: 09/22/88
 Column: (pack/cap) CAF Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	Q
74-87-3	-----Chloromethane	13	U
74-83-9	-----Bromomethane	13	U
75-01-4	-----Vinyl Chloride	13	U
75-00-3	-----Chloroethane	13	U
75-09-2	-----Methylene Chloride	2	J
67-64-1	-----Acetone	44	
75-15-0	-----Carbon Disulfide	6	U
75-35-4	-----1,1-Dichloroethene	6	U
75-34-3	-----1,1-Dichloroethane	6	U
540-59-0	-----1,2-Dichloroethene (total)	6	U
67-66-3	-----Chloroform	6	U
107-06-2	-----1,2-Dichloroethane	6	U
78-93-3	-----2-Butanone	13	U
71-55-6	-----1,1,1-Trichloroethane	6	U
56-23-5	-----Carbon Tetrachloride	6	U
108-05-4	-----Vinyl Acetate	13	U
75-27-4	-----Bromodichloromethane	6	U
78-87-5	-----1,2-Dichloropropane	6	U
10061-01-5	-----cis-1,3-Dichloropropene	6	U
79-01-6	-----Trichloroethene	6	U
124-48-1	-----Dibromochloromethane	6	U
79-00-5	-----1,1,2-Trichloroethane	6	U
71-43-2	-----Benzene	6	U
10061-02-6	-----Trans-1,3-Dichloropropene	6	U
75-25-2	-----Bromoform	6	U
108-10-1	-----4-Methyl-2-Pentanone	13	U
591-78-6	-----2-Hexanone	13	U
127-18-4	-----Tetrachloroethene	6	U
79-34-5	-----1,1,2,2-Tetrachloroethane	6	U
108-88-3	-----Toluene	6	U
108-90-7	-----Chlorobenzene	6	U
100-41-4	-----Ethylbenzene	6	U
100-42-5	-----Styrene	6	U
1330-20-7	-----Xylene (total)	6	U
75-69-4	-----Dichlorodifluoromethane	13	U
95-50-1	-----1,2-Dichlorobenzene	13	U

002844

106-46-7-----1,3-Dichlorobenzene	
547-73-1-----1,4-Dichlorobenzene	

101
101

U
U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

002845

EPA SAMPLE NO.

o Name: SWL - TULSA

Contract: _____

8-1366(MW-13)
(2')

Lab Code: SWOK

Case No.: SWCORP

SAS No.: _____

SDS No.: _____

Matrix: (soil/water) SOIL

Lab Sample ID: 21316

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: 10337

Level: (low/med) LOW

Date Received: 09/20/88

% Moisture: not dec. 22

Date Analyzed: 09/22/88

Column (pack/cap) CAF

Dilution Factor: 1.0

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 123911	1,4-Dioxane (9CI)	8.40	6	BJ

002846

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-10-88

SWLO#: 21316

SAMPLE ID: 8-1366 (mw-13)(2')

COMPOUNDS

RESULTS
ug/Kg

HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2,4 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
002847

Lab Name: SWL - TULSA Contract: _____
 Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
 Matrix: (soil/water) SOIL Lab Sample ID: 21317
 Sample wt/vol: 5.0 (g/mL) 6 Lab File ID: 10338
 Level: (low/med) LOW Date Received: 09/20/88
 % Moisture: not dec. 21 Date Analyzed: 09/22/88
 Column: (pack/cap) CAF Dilution Factor: 1.0

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG Q

74-87-3	Chloromethane	13	U
74-83-9	Bromomethane	13	U
75-01-4	Vinyl Chloride	13	U
75-00-3	Chloroethane	13	U
75-09-2	Methylene Chloride	6	U
67-64-1	Acetone	23	
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	13	U
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	13	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	13	U
591-78-6	2-Hexanone	13	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	6	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Xylene (total)	6	U
75-69-4	Dichlorodifluoromethane	13	U
95-50-1	1,2-Dichlorobenzene	13	U

002848

106-46-7-----1,3-Dichlorobenzene

547-73-1-----1,4-Dichlorobenzene

13 U
13 U

002849

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Job Name: SWL - TULSA Contract: _____8-1367(MW-13)
(10)Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____Matrix: (soil/water) SOIL Lab Sample ID: 21317Sample wt/vol: 5.0 (g/mL) 6 Lab File ID: 10338Level: (low/med) LOW Date Received: 09/20/88% Moisture: not dec. 21 Date Analyzed: 09/22/88Column (pack/cap) CAP Dilution Factor: 1.0Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002850

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-10-88

SWLO#: 21317

SAMPLE ID: 8-1367 (mw-13) 10'

COMPOUNDS	RESULTS ug/Kg
HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2,4 DNT	0.8 U

U indicates detection limit

002851

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

S Name: SWL - TULSAContract: SWCORP

2-1004

(mw-14 2.0')

Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOILLab Sample ID: 2-1004Sample wt/vol: 5.0 (g/mL) 5Lab File ID: 9767Level: (low/med) LOWDate Received: 08/11/88% Moisture: not dec. 12Date Analyzed: 08/16/88Column: (pack/cap) PACKDilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) US/KG G

CAS NO.

COMPOUND

74-87-3-----	Chloromethane	11	U
74-83-9-----	Bromomethane	11	U
75-01-4-----	Vinyl Chloride	11	U
75-00-3-----	Chloroethane	11	U
75-09-2-----	Methylene Chloride	6	U
67-64-1-----	Acetone	31	U
75-15-0-----	Carbon Disulfide	6	U
75-35-4-----	1,1-Dichloroethene	6	U
75-34-3-----	1,1-Dichloroethane	6	U
540-59-0-----	1,2-Dichloroethene (total)	6	U
67-66-3-----	Chloroform	6	U
107-06-2-----	1,2-Dichloroethane	6	U
78-93-3-----	2-Butanone	11	U
71-55-6-----	1,1,1-Trichloroethane	6	U
56-23-5-----	Carbon Tetrachloride	6	U
108-05-4-----	Vinyl Acetate	11	U
75-27-4-----	Bromodichloromethane	6	U
78-67-5-----	1,2-Dichloropropane	6	U
10061-01-5-----	cis-1,3-Dichloropropene	6	U
79-01-6-----	Trichloroethene	6	U
124-48-1-----	Dibromochloromethane	6	U
79-00-5-----	1,1,2-Trichloroethane	6	U
71-43-2-----	Benzene	6	U
10061-02-6-----	Trans-1,3-Dichloropropene	6	U
75-25-2-----	Bromoform	6	U
108-10-1-----	4-Methyl-2-Pentanone	11	U
591-78-6-----	2-Hexanone	11	U
127-18-4-----	Tetrachloroethene	6	U
79-34-5-----	1,1,2,2-Tetrachloroethane	6	U
108-88-3-----	Toluene	0.6	U
108-90-7-----	Chlorobenzene	6	U
100-41-4-----	Ethylbenzene	6	U
100-42-5-----	Styrene	6	U
1330-20-7-----	Xylene (total)	6	U
75-69-4-----	Dichlorodifluoromethane	11	U
95-50-1-----	1,2-Dichlorobenzene	11	U

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002852

106-46-7-----1,3-Dichlorobenzene	11	1U
347-73-1-----1,4-Dichlorobenzene	11	1U

002853

EPA SAMPLE NO.

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: SWL - TULSA Contract: SWCORP E-1004
(MW-14 2.c)

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: E-1004

Sample wt/vol: 5.0 (g/mL) 6 Lab File ID: E767

Level: (low/med) LOW Date Received: 08/11/88

% Moisture: not dec. 12 Date Analyzed: 08/16/88

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

002854

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCDE

DATE: 08-22-88

SWLD#: 20648

SAMPLE ID: 8-1004 (mw-14) 2.0'

COMPOUNDS	RESULTS
HMX	1.6 U
RDX	1.2 U
TETRYL	5.5 U
TNT	0.8 U
2,4 DNT	0.8 U
2,6 DNT	0.8 U

U indicates detection limit

002855

EPA SAMPLE NO.

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Site Name: SWL - TULSA Contract: SWCORP S-1005
(mw-14 10')
 Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
 Matrix: (soil/water) SOIL Lab Sample ID: S-1005
 Sample wt/vol: 5.0 (g/mL) G Lab File ID: 9766
 Level: (low/med) LOW Date Received: 08/11/88
 % Moisture: not dec. 16 Date Analyzed: 08/16/88
 Column: (back/cap) BACK Dilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG G

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	G
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	680	E
67-64-1	Acetone	340	E
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	12	U
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	12	U
75-27-4	Bromodichloromethane	6	U
78-67-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	26	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	6	U
108-88-3	Toluene	0.5	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	3	U
1330-20-7	Xylene (total)	6	U
75-69-4	Dichlorodifluoromethane	12	U
95-50-1	1,2-Dichlorobenzene	12	U

106-16-7-----1,3-Dichlorobenzene	
54-77-1-----1,4-Dichlorobenzene	

002856
12 U
12 U

002857

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: SWL - TULSAContract: SWCORP

S-1005

(330-14 10')

Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOILLab Sample ID: S-1005Sample wt/vol: 5.0 (g/mL) GLab File ID: 9768Level: (low/med) LOWDate Received: 08/11/88% Moisture: not dec. 18Date Analyzed: 08/16/88Column (pack/cap) PACKDilution Factor: 1.0

CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/KGNumber TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	G
=====	=====	=====	=====	=====

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSAContract: SWCORP
8-1005DL
(MW-14 10')
Lab Code: SWCKCase No.: SWCORP

SAS No.: _____

SDS No.: _____

Matrix: (soil/water) SOILLab Sample ID: 8-1005DLSample wt/vol: 0.50 (g/mL) 9Lab File ID: 9790Level: (low/med) LOWDate Received: 08/11/88% Moisture: not dec. 18Date Analyzed: 08/17/88Column: (pack/cap) PACKDilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG 9

CAS NO.	COMPOUND		
74-87-3	Chloromethane	120	1U
74-83-9	Bromomethane	120	1U
75-01-4	Vinyl Chloride	120	1U
75-00-3	Chloroethane	120	1U
75-09-2	Methylene Chloride	1300	1DEF
67-64-1	Acetone	620	1D
75-15-0	Carbon Disulfide	61	1U
75-35-4	1,1-Dichloroethene	61	1U
75-34-3	1,1-Dichloroethane	61	1U
540-59-0	1,2-Dichloroethene (total)	61	1U
67-66-3	Chloroform	61	1U
107-06-2	1,2-Dichloroethane	61	1U
78-93-3	2-Butanone	120	1U
71-55-6	1,1,1-Trichloroethane	61	1U
56-23-3	Carbon Tetrachloride	61	1U
108-05-4	Vinyl Acetate	120	1U
75-27-4	Bromodichloromethane	61	1U
78-87-5	1,2-Dichloropropane	61	1U
10061-01-5	cis-1,3-Dichloropropene	61	1U
79-01-6	Trichloroethene	120	1DJ
124-46-1	Dibromochloromethane	61	1U
79-00-5	1,1,2-Trichloroethane	61	1U
71-43-2	Benzene	61	1U
10061-02-6	Trans-1,3-Dichloropropene	61	1U
75-25-2	Bromoform	61	1U
108-10-1	4-Methyl-2-Pentanone	120	1U
591-78-6	2-Hexanone	120	1U
127-18-4	Tetrachloroethene	61	1U
79-34-5	1,1,2,2-Tetrachloroethane	61	1U
108-88-3	Toluene	10	1BDJ
108-90-7	Chlorobenzene	61	1U
100-41-4	Ethylbenzene	61	1U
100-42-5	Styrene	61	1U
1330-20-7	Xylene (total)	61	1U
75-69-4	Dichlorodifluoromethane	120	1U
95-50-1	1,2-Dichlorobenzene	120	1U

002859

104-12-7-----1,3-Dichlorobenzene	120	10
517-11-1-----1,4-Dichlorobenzene	120	10

1E

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDSLab Name: SWL - TULSAContract: SWCORP8-10050'L
(mw-14 10')Lab Code: SWOKCase No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOILLab Sample ID: 8-10050LSample wt/vol: 0.50 (g/mL) 6Lab File ID: 9780Level: (low/med) LOWDate Received: 08/11/88% Moisture: not dec. 18Date Analyzed: 08/17/88Column (pack/cap) PACKDilution Factor: 1.0Number TICs found: 0CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====

14
VOLATILE ORGANICS ANALYSIS DATA SHEET

002861 EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: SWCORP 8-1005
(mw-14 10')

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 8-1005

Sample wt/vol: 4.0 (g/mL) G Lab File ID: 02335

Level: (low/med) MED Date Received: 08/11/88

% Moisture: not dec. 18 Date Analyzed: 08/23/88

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg) <u>UG/KG</u>	<u>G</u>
74-87-3	Chloromethane	1500	U
74-83-9	Bromomethane	1500	U
75-01-4	Vinyl Chloride	1500	U
75-00-3	Chloroethane	1500	U
75-09-2	Methylene Chloride	760	U
67-64-1	Acetone	1500	U
75-15-0	Carbon Disulfide	760	U
75-35-4	1,1-Dichloroethene	760	U
75-34-3	1,1-Dichloroethane	760	U
540-59-0	1,2-Dichloroethene (total)	760	U
67-66-3	Chloroform	760	U
107-06-2	1,2-Dichloroethane	760	U
78-93-3	2-Butanone	1500	U
71-55-6	1,1,1-Trichloroethane	760	U
56-23-5	Carbon Tetrachloride	760	U
108-05-4	Vinyl Acetate	1500	U
75-27-4	Bromodichloromethane	760	U
78-87-5	1,2-Dichloropropane	760	U
10061-01-5	cis-1,3-Dichloropropene	760	U
79-01-6	Trichloroethene	760	U
124-48-1	Dibromochloromethane	760	U
79-00-5	1,1,2-Trichloroethane	760	U
71-43-2	Benzene	760	U
10061-02-6	Trans-1,3-Dichloropropene	760	U
75-25-2	Bromoform	760	U
108-10-1	4-Methyl-2-Pentanone	1500	U
591-78-6	2-Hexanone	1500	U
127-18-4	Tetrachloroethene	760	U
79-34-5	1,1,2,2-Tetrachloroethane	1500	U
108-88-3	Toluene	760	U
108-90-7	Chlorobenzene	760	U
100-41-4	Ethylbenzene	760	U
100-42-5	Styrene	760	U
1330-20-7	Xylene (total)	760	U
75-69-4	Dichlorodifluoromethane	1500	U
95-50-1	1,2-Dichlorobenzene	1500	U

002862

106-46-7-----1,3-Dichlorobenzene	1500	U
547-73-1-----1,4-Dichlorobenzene	1500	U

002863

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: SWCORP 8-1005
(mw-14 10')

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 8-1005

Sample wt/vol: 4.0 (g/mL) 5 Lab File ID: C2335

Level: (low/med) MED Date Received: 08/11/88

% Moisture: not dec. 18 Date Analyzed: 08/23/88

Column (pack/cap) CAP Dilution Factor: 1.0

Number TICs found: 1CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN COMPOUND	17.95	760	J

002864

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 06-22-89

SWLO#: 20649

SAMPLE ID: 8-1005 (mw-14) 10'

COMPOUNDS	RESULTS
HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2,4 DNT	0.8 U
2,6 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

8-1299(MW-15)

2'

Name: SWL - TULSA

Contract: _____

Lab Code: SWOKCase No.: SWCORF

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOILLab Sample ID: 21055Sample wt/vol: 5.0 (g/mL) 6Lab File ID: 10117Level: (low/med) LOWDate Received: 09/08/88% Moisture: not dec. 18Date Analyzed: 09/08/88Column: (pack/cap) CAPDilution Factor: 1.0

CAS NO.

COMPOUND

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Q

74-87-3-----	Chloromethane	12	U
74-83-9-----	Bromomethane	12	U
75-01-4-----	Vinyl Chloride	12	U
75-00-3-----	Chloroethane	12	U
75-09-2-----	Methylene Chloride	6	U
67-64-1-----	Acetone	13	U
75-15-0-----	Carbon Disulfide	6	U
75-35-4-----	1,1-Dichloroethene	6	U
75-34-3-----	1,1-Dichloroethane	6	U
540-59-0-----	1,2-Dichloroethene (total)	6	U
67-66-3-----	Chloroform	6	U
107-06-2-----	1,2-Dichloroethane	6	U
78-93-3-----	2-Butanone	12	U
71-55-6-----	1,1,1-Trichloroethane	6	U
56-23-5-----	Carbon Tetrachloride	6	U
108-05-4-----	Vinyl Acetate	12	U
75-27-4-----	Bromodichloromethane	6	U
78-87-5-----	1,2-Dichloropropane	6	U
10061-01-5-----	cis-1,3-Dichloropropene	6	U
79-01-6-----	Trichloroethene	6	U
124-48-1-----	Dibromochloromethane	6	U
79-00-5-----	1,1,2-Trichloroethane	6	U
71-43-2-----	Benzene	6	U
10061-02-6-----	Trans-1,3-Dichloropropene	6	U
75-25-2-----	Bromoform	6	U
108-10-1-----	4-Methyl-2-Pentanone	12	U
591-78-6-----	2-Hexanone	12	U
127-18-4-----	Tetrachloroethene	6	U
79-34-5-----	1,1,2,2-Tetrachloroethane	6	U
108-68-3-----	Toluene	6	U
108-90-7-----	Chlorobenzene	6	U
100-41-4-----	Ethylbenzene	6	U
100-42-5-----	Styrene	6	U
1330-20-7-----	Xylene (total)	6	U
75-69-4-----	Dichlorodifluoromethane	12	U
95-50-1-----	1,2-Dichlorobenzene	12	U

106-46-7-----1,3-Dichlorobenzene	002866 ¹²	U
547-73-1-----1,4-Dichlorobenzene	002866 ¹²	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

002867

8-1299(MW-15)

2

Name: SWL - TULSA

Contract: _____

Lab Code: SWOK

Case No.: SWCORP

SAS No.: _____

SDG No.: _____

Matrix: (soil/water) SOIL

Lab Sample ID: 21055

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: 10117

Level: (low/med) LOW

Date Received: 09/08/88

% Moisture: not dec. 18

Date Analyzed: 09/08/88

Column (pack/cap) CAP

Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
-----	-----	-----	-----	-----

002868

EXPLOSIVES BY HPLC
SOIL (ug/g)

CLIENT: SWCOE

DATE: 10-10-88

SWLO#: 21055

SAMPLE ID: 8-1299 (mw-15)2'

COMPOUNDS	RESULTS ug/Kg
HMX	1.6 U
RDX	1.8 U
TETRYL	5.5 U
TNT	0.8 U
2,4 DNT	0.8 U

U indicates detection limit

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: _____

Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: 21056

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 10118

Level: (low/med) LOW Date Received: 09/08/88

% Moisture: not dec. 19 Date Analyzed: 09/08/88

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg)	UG/KG
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	6	U
67-64-1	Acetone	8	J
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	12	U
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	12	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	6	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Xylene (total)	6	U
75-69-4	Dichlorodifluoromethane	12	U
95-50-1	1,2-Dichlorobenzene	12	U

106-46-7-----1,3-Dichlorobenzene_____
547-73-1-----1,4-Dichlorobenzene_____

002870

12 U
12 U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

002871
EPA SAMPLE NO.

Lab Name: SWL - TULSA Contract: _____
Lab Code: SWOK Case No.: SWCORP SAS No.: _____ SDG No.: _____
Matrix: (soil/water) SOIL Lab Sample ID: 21056
Sample wt/vol: 5.0 (g/mL) G Lab File ID: 10118
Level: (low/med) LOW Date Received: 09/08/88
% Moisture: not dec. 19 Date Analyzed: 09/08/88
Column (pack/cap) CAP Dilution Factor: 1.0

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 76131	ETHANE, 1,1,2-TRICHLORO-1,2,	2.10	35	J

APPENDIX T

REQUEST FOR SLUG TESTING WELLS MW-1 THROUGH MW-15

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGO

REFERENCE OR OFFICE SYMBOL	SUBJECT
CESWF-ED-G (415-10f)	Request for Slug Tests - Ground-Water Quality Assessment, Longhorn Army Ammunition Plant, Marshall, TX

79 THRU CESWF-ED-G *W* FROM CESWF-ED-GG *HCB* DATE 18 August 1988 CMT 1
 TO CESWF-ED-GG (Core Drill Unit) FITZGERALD/rg/4-3221

1. Request 15 newly installed monitoring wells (MW-1 through MW-15) at the Active Burning Grounds be slug tested following the attached procedures. Well locations are shown on the attached layout.
2. All persons participating in these slug tests will have had at least 40 hours of training in personnel protection and safety procedures for hazardous waste operations.
3. Slug test wells in the following order: MW-15, MW-14, MW-13, MW-11, MW-10, MW-8, MW-7, MW-9, MW-12, MW-3, MW-5, MW-6, MW-4, MW-1, and MW-2. The purpose of this order is to test least likely contaminated wells first to decrease the chance of cross-contaminating wells.
4. Water removed from wells may be discharged on the ground a distance sufficiently away from the well to prevent the water from re-entering the well bore with the exception of the following wells: MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-14, and MW-15. Water removed from these eight wells should be contained in 55-gallon drums and be discharged to a sump to be designated by LHAAP. Point of contact for obtaining drums and locating an appropriate sump is Jerry Thurman, Morton Thiokol Environmental Office, telephone 679-2219.
5. Should wells recharge too quickly for taking at least the first 10 minutes of water level readings, start the slug test over by letting the static water level recover, then bail as much water as needed so that recovery is slow enough to record at least 10 water level readings.
6. The following safety procedures shall be followed while performing slug tests at the Active Burning Ground:
 - a. Ground-water contamination identified has been due to methylene chloride and trichloroethylene, both volatile organics. Concentrations in the ground water have exceeded 1,000,000 ppb for methylene chloride and 100,000 ppb for trichloroethylene. It is therefore important to monitor the breathing space around the drill rig during a slug test. Gas detector tubes have been provided for this. Following the manufacturer's directions, take a reading for both methylene chloride and trichloroethylene at least every hour during the slug test and record any readings on the field data sheet. Operations shall be shut down and personnel shall leave the area under either of the following two conditions:
 - (1) Methylene Chloride - Average concentration exceeds 500 ppm over an 8-hour period
 - (2) Trichloroethylene - Average concentration exceeds 100 ppm over an 8-hour period

Do not resume testing until further instructions are given from the office.

b. High concentrations of these volatile organics can irritate the skin and eyes. Disposable rubber gloves should be worn when prolonged skin exposure is expected during filling and sampling procedures. If the skin becomes wet, wash promptly with soap and water. If the eyes are contacted, irrigate immediately with a lot of clear water. Seek medical help immediately.

c. If swallowed, induce vomiting with Ipecac. Seek medical help immediately.

CESWF-ED-G

18 August 1988

SUBJECT: Request for Slug Tests - Ground-Water Quality Assessment, Longhorn Army Ammunition Plant, Marshall, TX

d. A telephone is located in Burning Grounds office by the gate. The Morton Thiokol Environmental Office can be called for any emergency situation. Other emergency numbers are also listed below.

Morton Thiokol Environmental Office 2774

Ambulance 0

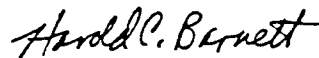
Fire Department 17

7. The LHAAP POC is Mr. Don Maley, Chief Engineer, telephone 214/679-2613.

8. Provide completed field data sheets to Chief, Engineering Geology Section, after all slug tests have been performed.

9. Charges will be made to RA8213829080176.

2 Atchs
)



HAROLD C. BARNETT

Acting Chief, Engineering Geology Section

SLUG TEST PROCEDURES:

1. Decontaminate bailer and length of sandline equivalent to well depth by steam cleaning using a nonphosphate detergent and rinsing with distilled water.
2. Decontaminate water level indicator probe and length of cable equivalent to well depth by thoroughly rinsing with distilled water.
3. Measure depth to bottom of the well (BOW) to nearest 0.01 foot using marked top of well casing as reference.
4. Measure static water level (SWL) to nearest 0.01 foot. Record time.
5. Compute 100 percent recovery water level (100 RWL) for fast recharging wells and 85 percent recovery water level (85 RWL) for slow recharging wells.

$$100 \text{ RWL} = \text{SWL}$$

$$85 \text{ RWL} = \text{BOW} - (0.85 \times \text{RWL}), \text{ where RWL} = \text{BOW} - \text{SWL}$$

6. Put bailer in bottom of the well.
7. Record water level with bailer in well (BWL). Record time.
8. Begin slug test when BWL = SWL. Remove bailer. Note time (t_0) and immediate water level (WL) after water is removed.
9. Record water level measurements every minute for the first 10 minutes, every 5 minutes for the next 20 minutes, then every 10 minutes for the next 30 minutes. If the well has not reached 85 percent recovery after 1 hour from t_0 , continue to read water levels at 20-minute increments for the next 2 hours, then every hour until complete.
10. Stop recording water levels after 100 percent recovery (100 RWL) is achieved in fast recharging wells, or 85 percent recovery (85 RWL) is achieved in slow recharging wells.
11. Record amount of water bailed from the well. Either calculate using $V = \pi r^2 L$, or measure amount collected.
12. Under "Remarks," note any problems or unusual characteristics while testing.
13. Person performing slug test should initial the data sheet.

002876

SLUG TEST
FIELD DATA SHEET

PROJECT:

1.	DATE					
2.	WELL NO.					
3.	Csg dia/Type					
4.	BCN					
5.	SWL					
6.	SWL Time					
7.	100 RWL					
8.	85 RWL					
9.	BWL					
10.	BWL Time					
11.	Amnt Bailed					
12.	SLUG TEST	→	→	→	→	→
	t ₀ /WL					
	every minute	→	→	→	→	→
	t ₁ /WL					
	t ₂ /WL					
	t ₃ /WL					
	t ₄ /WL					
	t ₅ /WL					
	t ₆ /WL					
	t ₇ /WL					
	t ₈ /WL					
	t ₉ /WL					
	t ₁₀ /WL					
	every 5 minutes	→	→	→	→	→
	t ₁₁ /WL					
	t ₁₂ /WL					
	t ₁₃ /WL					
	t ₁₄ /WL					
	every 10 minutes	→	→	→	→	→
	t ₁₅ /WL					
	t ₁₆ /WL					
	t ₁₇ /WL					
	every 20 minutes	→	→	→	→	→
	t ₁₈ /WL					
	t ₁₉ /WL					
	t ₂₀ /WL					
	t ₂₁ /WL					
	t ₂₂ /WL					
	t ₂₃ /WL					
13.	REMARKS					
14.	INITIALS					

APPENDIX U
COMPLETED SLUG TEST FIELD DATA SHEETS

SLUG TEST FIELD DATA SHEET

002878

PROJECT: LHMFP

1. DATE	9-19-88	9-20-88
2. WELL NO.	NW-15	NW-6
3. Csg dia/Type		
4. BCN	71.41	42.22
5. SWL	26.45	23.36
6. SWL Time	09:30	1302
7. 100 RWL	26.49	23.36
8. 85 RWL	33.23	26.19
9. BWL	26.00	21.88
10. BWL Time	09:42	1308
11. Amt Bailed	40 gal	15 gal
12. SLUG TEST		
t0/WL	951/23.0	1331/40.63
every minute		
t1/WL	0952/23.0	1332/39.70
t2/WL	0953/26.29	1333/39.55
t3/WL	0954/26.71	1334/39.25
t4/WL	0955/26.65	1335/39.00
t5/WL	0956/26.55	1336/38.72
t6/WL	0957/26.54	1337/38.67
t7/WL	0958/26.52	1338/38.56
t8/WL	0959/26.48	1339/38.43
t9/WL	1000/26.40	1340/38.30
t10/WL	1001/26.45	1341/38.21
every 5 minutes		
t11/WL		1346/37.68
t12/WL		1351/37.08
t13/WL		1356/36.59
t14/WL		1401/35.99
every 10 minutes		
t15/WL		1411/34.72
t16/WL		1423/33.54
t17/WL		1431/32.61
every 20 minutes		
t18/WL		1451/30.89
t19/WL		1511/29.45
t20/WL		1531/28.21
t21/WL		1551/27.28
t22/WL		1611/26.53
t23/WL		1631/25.93
13. REMARKS	V. Fast recharge	V. Strong odor Bailed dry
14. INITIALS	GRS	GRS

AFTER SAMPLING
SLOW RE-CHARGE

AFTER SAMPLING

SLUG TEST FIELD DATA SHEET

002879

PROJECT: LAMP

1.	DATE	9-20-88	→			
2.	WELL NO.	1.W-3	MW-4			
3.	Csg dia/Type	4" SS	→			
4.	BOW	49.30	45.02			
5.	SWL	25.74	25.25			
6.	SWL Time	1305	1445			
7.	100 RWL	25.74	25.25			
8.	85 RWL	29.28	28.22			
9.	BWL	24.10	24.32			
10.	BWL Time	1311	1449			
11.	Amt Boiled	21				
12.	SLUG TEST					
	t ₀ /WL	1317/46.71	1455/42.34			
	every minute					
	t ₁ /WL	1318/45.58	1456/41.04			
	t ₂ /WL	1319/44.60	1457/40.27			
	t ₃ /WL	1320/44.16	1458/39.40			
	t ₄ /WL	1321/43.63	1459/38.65			
	t ₅ /WL	1322/43.07	1500/37.82			
	t ₆ /WL	1323/42.78	1501/37.07			
	t ₇ /WL	1324/42.03	1502/36.01			
	t ₈ /WL	1325/41.58	1503/35.45			
	t ₉ /WL	1326/40.98	1504/34.72			
	t ₁₀ /WL	1327/40.38	1505/34.06			
	every 5 minutes					
	t ₁₁ /WL	1333/37.97	1510/32.34			
	t ₁₂ /WL	1338/35.85	1515/30.67			
	t ₁₃ /WL	1343/34.20	1520/29.34			
	t ₁₄ /WL	1348/32.88	1525/28.42			
	every 10 minutes					
	t ₁₅ /WL	1358/30.76	1535/27.23			
	t ₁₆ /WL	1408/29.94	1545/26.02			
	t ₁₇ /WL	1418/27.92	1555/25.65			
	every 20 minutes					
	t ₁₈ /WL	1438/26.63	1615/25.34			
	t ₁₉ /WL	1458/26.09				
	t ₂₀ /WL					
	t ₂₁ /WL					
	t ₂₂ /WL					
	t ₂₃ /WL					
13.	REMARKS		AFTER SAMPLING			
14.	INITIALS	GR.	GR.			

SLUG TEST FIELD DATA SHEET

002880

PROJECT:

1.	DATE	9-21-88	—————>			
2.	WELL NO.	MW-7	MW-9			
3.	Csg dia/Type	4" SS	—————>			
4.	BON	27.51	29.47			
5.	SWL	15.77	11.73			
6.	SWL TIME	0830	1235			
7.	100 RWL	15.77	11.73			
8.	85 RWL	17.53	14.39			
9.	70 RWL	14.99	10.87			
10.	BWL TIME	0834	1240			
11.	Am't Bailed	13 GAL	17 GAL			
12.	SLUG TEST					
	t ₀ /WL	0841/26.65	1246/27.45			
	every minute					
	t ₁ /WL	0842/26.51	1247/27.22			
	t ₂ /WL	0843/26.40	1248/26.93			
	t ₃ /WL	0844/26.28	1249/26.62			
	t ₄ /WL	0845/26.15	1250/26.33			
	t ₅ /WL	0846/26.03	1251/26.17			
	t ₆ /WL	0847/25.90	1252/25.90			
	t ₇ /WL	0848/25.81	1253/25.49			
	t ₈ /WL	0849/25.71	1254/25.26			
	t ₉ /WL	0850/25.62	1255/25.03			
	t ₁₀ /WL	0851/25.54	1256/24.90			
	every 5 minutes					
	t ₁₁ /WL	0856/25.01	1301/24.12			
	t ₁₂ /WL	0901/24.76	1306/23.77			
	t ₁₃ /WL	0906/24.45	1311/23.55			
	t ₁₄ /WL	0911/24.27	1316/23.37			
	every 10 minutes					
	t ₁₅ /WL	0921/23.74	1324/22.61			
	t ₁₆ /WL	0931/23.31	1336/22.07			
	t ₁₇ /WL	0941/22.97	1346/21.48			
	every 20 minutes					
	t ₁₈ /WL	1001/22.11	1406/20.37			
	t ₁₉ /WL	1021/21.52	1426/19.19			
	t ₂₀ /WL	1041/21.04	1446/18.34			
	t ₂₁ /WL	1101/20.60	1506/18.03			
	t ₂₂ /WL	1121/20.19	1526/17.93			
	t ₂₃ /WL	1141/19.82	1546/17.43			
	every 60 min.					
	t ₂₄ /WL	1241/18.88	1646/16.35			
13.	REMARKS	V. SLOW RECOV.	V. SLOW REC.			
	t ₂₄ /WL	1341/17.97	1746/15.76			
	t ₂₅ /WL	1441/17.10				
14.	INITIALS	JKS	GRJ			

SLUG TEST FIELD DATA SHEET

PROJECT: 002881

1.	DATE	9-22-88	9-26-88	9-27-88	
2.	WELL NO.	MW-12	MW-13	MW-8	MW-14
3.	Csg dia/Type	4" SS	4" SS	4" SS	4" SS
4.	BWL	36.55 ft	48.52 ft	33.44 ft	53.54 ft
5.	SWL	7.85	6.90	14.32	12.42
6.	SWL Time	0855	13.10	1015	1020
7.	100 RWL	7.85	6.90	14.32	12.42
8.	BS RWL	12.45	13.15	17.19	18.58
9.	BWL		4.5	13.09	12.04
10.	BWL Time		1315	1022	1022
11.	Amnt Bailed	24 GAL.	43 GAL.	186 GAL.	80 GAL.
12.	SLUG TEST				
	t ₀ /WL	0942/35.64	1323/44.10	1020/33.40	1034/17.02
	every minute				
	t ₁ /WL	0943/35.09	1324/41.84	1030/32.68	1035/15.91
	t ₂ /WL	0944/34.58	1325/39.10	1031/31.91	1036/14.82
	t ₃ /WL	0945/34.15	1326/37.07	1032/31.45	1037/14.12
	t ₄ /WL	0946/33.75	1327/34.93	1033/31.11	1038/13.72
	t ₅ /WL	0947/33.35	1328/32.87	1034/30.61	1039/13.58
	t ₆ /WL	0948/33.00	1329/31.05	1035/30.26	1040/13.37
	t ₇ /WL	0949/32.79	1330/29.47	1036/30.06	1041/13.24
	t ₈ /WL	0950/32.45	1331/27.89	1037/29.83	1042/13.12
	t ₉ /WL	0951/32.05	1332/26.28	1038/29.45	1043/13.04
	t ₁₀ /WL	0952/31.73	1333/25.09	1039/29.21	1044/12.96
	every 5 minutes				
	t ₁₁ /WL	0957/30.32	1338/19.47	1044/27.92	1049/12.78
	t ₁₂ /WL	1002/29.07	1343/15.59	1049/26.84	1054/12.62
	t ₁₃ /WL	1007/27.85	1348/13.01	1054/26.33	1059/12.54
	t ₁₄ /WL	1012/26.64	1353/11.02	1059/25.96	1104/12.49
	every 10 minutes				
	t ₁₅ /WL	1022/24.27	1403/08.90	1109/25.03	1114/12.42
	t ₁₆ /WL	1032/22.35	1413/07.95	1119/24.75	
	t ₁₇ /WL	1042/20.78	1423/07.54	1129/23.75	
	every 20 minutes				
	t ₁₈ /WL	1102/17.96	1443/07.30	1149/22.50	
	t ₁₉ /WL	1122/15.89	1503/07.12	1209/21.42	
	t ₂₀ /WL	1142/14.25	1523/06.98	1229/20.67	
	t ₂₁ /WL	1202/12.94	1543/06.94	1249/19.99	
	t ₂₂ /WL	1222/11.94		1309/19.39	
	t ₂₃ /WL	1242/11.10		1329/18.87	
	every 60 min.				
	t ₂₄ /WL	1342/09.42		1429/17.64	
13.	REMARKS	AFTER SAMPLING		BAILED DRY SLOW REC.	AFTER SAMPLING: FAST REC.
	t ₂₅ /WL	1442/08.63		1529/16.40	
	t ₂₆ /WL	1542/08.10			
14.	INITIALS	JRS	JRS	JRS	JRS

SLUG TEST FIELD DATA SHEET

002882

PROJECT: LHAAP

1.	DATE	9-28-88	→			
2.	WELL NO.	MW-11	MW-12			
3.	Csg dia/Type	4" SS	4" SS			
4.	BON	13.03 (D)	30.95 (T)			
5.	SWL	7.33	7.92			
6.	SWL Time	0857				
7.	100 RWL	7.33	7.92			
8.	85 RWL	8.19	11.38			
9.	BWL	7.27				
10.	BWL Time	0902				
11.	Am't Boiled	9.6A1	28 (dry)			
12.	SLUG TEST	→	→	→	→	→
	t ₀ /WL	0911/10.91	1032/30.70			
	every minute	→	→	→	→	→
	t ₁ /WL	0912/09.97	1033/27.65			
	t ₂ /WL	0913/09.57	1034/24.91			
	t ₃ /WL	0914/09.26	1035/22.88			
	t ₄ /WL	0915/08.90	1036/20.98			
	t ₅ /WL	0916/08.66	1037/19.32			
	t ₆ /WL	0917/08.28	1038/18.22			
	t ₇ /WL	0918/08.18	1039/17.33			
	t ₈ /WL	0919/08.01	1040/16.82			
	t ₉ /WL	0920/07.99	1041/16.48			
	t ₁₀ /WL	0921/07.97	1042/16.25			
	every 5 minutes	→	→	→	→	→
	t ₁₁ /WL	0926/07.98	1047/14.90			
	t ₁₂ /WL	0931/07.79	1052/13.65			
	t ₁₃ /WL	0936/07.74	1057/12.69			
	t ₁₄ /WL	0941/07.70	1102/12.21			
	every 10 minutes	→	→	→	→	→
	t ₁₅ /WL	0951/07.60	1112/11.86			
	t ₁₆ /WL	1001/07.52	1122/11.66			
	t ₁₇ /WL	1011/07.45	1132/11.47			
	every 20 minutes	→	→	→	→	→
	t ₁₈ /WL	1031/07.39	1152/11.38			
	t ₁₉ /WL	1051/07.33				
	t ₂₀ /WL					
	t ₂₁ /WL					
	t ₂₂ /WL					
	t ₂₃ /WL					
13.	REMARKS	AFTER SAMPLING V. SLOW RE- COVERY				
14.	INITIALS	JRS	JRS			

APPENDIX V

REQUEST FOR WATER SAMPLING 25 WELLS

DISPOSITION FORM

002884

For use of this form, see AR 340-15, the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL

CESWF-ED-GG (415-10f)

SUBJECT

Request for Water Sampling - Ground-Water Quality Assessment,
Longhorn Army Ammunition Plant, Marshall, TX

THRU CESWF-ED-GG

FROM CESWF-ED-GG

DATE 7 September 1988
FITZGERALD/rg/4-3221

CMT 1

TO CESWF-ED-GG (Core Drill Unit)

1. Request 25 monitoring wells at the Active Burning Grounds be sampled in accordance with the attached procedures. Well locations are shown on the attached layout.
2. All persons participating in this water sampling will have had 40 hours of training in personnel protection and safety procedures for hazardous waste operations.
3. Sample wells in the following order: MW-15, MW-14, MW-13, MW-11, MW-10, MW-8, MW-7, MW-9, MW-12, MW-3, MW-5, MW-6, MW-4, MW-1, MW-2, C-2, C-3, C-5, C-4, 109, 123, 124, 125, 129, and 120. The purpose of this order is to test least likely contaminated wells first to decrease the chance of cross-contaminating wells.
4. Water sampling may be combined with slug testing a well by performing the slug test first, then continuing to purge the well after the slug test is complete.
5. Water removed from wells during purging may be discharged on the ground a distance sufficiently away from the well to prevent the water from re-entering the well bore with the exception of the following wells: MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-14, MW-15, 129, and 120. Water removed from these 10 wells should be contained in 55-gallon drums and be discharged to a sump to be designated by LHAAP. POC for obtaining drums and locating appropriate sump is Jerry Thurman, Morton Thiokol Environmental Office, telephone 679-2219.
6. If a well bails dry during purging and is too slow recovering to sample on the same day, take samples the following day.
7. Persons taking water samples shall wear clean disposable rubber gloves for each well sampled. Gloves shall also be worn in the laboratory when preserving samples.
8. Fill out jar labels in indelible ink. Completely seal labels with clear tape when applying to sample bottles.
9. The parameters ph, conductivity, and temperature shall be measured twice while sampling a well. The measurements will be made at the start of sampling and again immediately after all samples have been taken. Record both sets of measurements on the Field Data Sheet only.
10. A water sample taken for ph, conductivity, and temperature shall serve two purposes. One is to measure these parameters in the laboratory. Record these measurements on the Field Data Form. The other purpose for taking this sample is to top off any samples in the laboratory that weren't overfilled in the field. Discard the sample once all samples for the well have been properly preserved and packaged for shipment.
11. Ice is available from Morton Thiokol, Inc., for packing samples. The POC is Jerry Thurman, telephone 679-2219.
12. Ship samples to Southwestern Division Laboratory the same day they are taken. The address and telephone number are: U.S. Army Corps of Engineers, Southwestern Division Laboratory, 4815 Cass Street, Dallas, Texas 75235-8011, telephone 214/905-9130.
13. The on-site laboratory is located in the Corps of Engineers field office building, telephone 679-2513. Debbie Fitzgerald will be present to assist in the first week of sampling.

DA FORM 2496
AUG 80

PREVIOUS EDITIONS WILL BE USED

GPO : 1987 O - 172-428

SWF-ED-GG

7 September 1988

SUBJECT: Request for Water Sampling - Ground-Water Quality Assessment, Longhorn Army
Ammunition Plant, Marshall, TX

14. The following safety procedures shall be followed while taking water samples at the Active Burning Ground:

a. Ground-water contamination identified has been due to methylene chloride and trichloroethylene, both volatile organics. Concentrations in the ground water have exceeded 1,000,000 ppb for methylene chloride and 100,000 ppb for trichloroethylene. It is therefore important to monitor the breathing space around the well during purging and sampling. Gas detector tubes have been provided for this. Following the manufacturer's directions, take a reading for both methylene chloride and trichloroethylene at least every hour during purging and record any readings on the Field Data Sheet. Operations shall be shut down and personnel shall leave the area under either of the following two conditions:

- (1) Methylene Chloride - Average concentration exceeds 500 ppm over an 8-hour period
- (2) Trichloroethylene - Average concentration exceeds 100 ppm over an 8-hour period

Do not resume sampling until further instructions are given from the office.

b. High concentrations of these volatile organics can irritate the skin and eyes. Disposable rubber gloves should be worn when prolonged skin exposure is expected during purging and sampling procedures. If the skin becomes wet, wash promptly with soap and water. If the eyes are contacted, irrigate immediately with a lot of clear water. Seek medical help immediately.

c. If swallowed, induce vomiting with Ipecac. Seek medical help immediately.

d. A telephone is located in Burning Grounds office by the gate. The Morton Thiokol Environmental Office can be called for any emergency situation. Other emergency numbers are also listed below.

Morton Thiokol Environmental Office 2774

Ambulance 0

Fire Department 17

15. The LHAAP POC is Mr. Don Maley, Chief Engineer, telephone 214/679-2613.

16. Provide copies of the completed Field Data Sheets, Field Data Forms, and Chain of Custody Forms to Chief, Engineering Geology Section, after all water samples have been taken.

17. Make charges to RA8213829080176.

Atchs



ROBERT C. BEHM
Chief, Engineering Geology Section

WATER SAMPLING PROCEDURES:DECONTAMINATION:

1. Water level measuring equipment shall be decontaminated prior to each use by thoroughly rinsing with distilled water.
2. Purging equipment shall be decontaminated prior to each use by steam cleaning with a nonphosphate detergent, then thoroughly rinsing with distilled water.
3. Water sampling equipment and laboratory equipment shall be decontaminated prior to each use using the following procedures:
 - a. Thoroughly wash with a nonphosphate detergent.
 - b. Rinse with tap water.
 - c. Rinse with dilute hydrochloric acid (10 parts distilled water to 1 part HCl).
 - d. Rinse with distilled water.
 - e. Rinse with pesticide grade hexane.
 - f. Rinse with pesticide grade methanol.

PURGING:

1. Decontaminate bailer and length of sandline equivalent to well depth by steam cleaning using a nonphosphate detergent and rinsing with distilled water.
2. Decontaminate water level indicator by thoroughly rinsing with distilled water.
3. Measure depth to bottom of the well to the nearest 0.01 foot using marked top of well casing as reference.
4. Measure depth to water to nearest 0.01 foot.
5. Calculate standing column of water in feet by subtracting depth to water from total depth of well.
6. Calculate number of gallons to be bailed by multiplying standing column of water by 3.

7. Begin bailing. Record start time.
8. Stop bailing when three casing volumes of water have been removed or the well goes dry, whichever occurs first. Record stop time.
9. Record approximate amount of water bailed.

SAMPLING:

1. Begin taking water samples after water level has recovered in well.
2. Record depth to water prior to sampling.
3. Record time begin sampling.
4. Record type of sampler (e.g., dedicated stainless steel, dedicated PVC, portable teflon, etc).
5. Collect samples in the following order:
 - a. pH/conductivity/temperature - collect in clean beaker. Measure immediately at time of collection. Recorded value of pH and conductivity should be an average of four readings. Discard sample.
 - b. Volatile organics (VOCs) - Overfill three 40 ml glass vials. No air or bubbles in sample. No agitation.
 - c. Total organic halides (TOX) - Overfill two glass liter bottles. Preservative to be added in laboratory.
 - d. Metals - Overfill one plastic liter bottle. Preservative to be added in laboratory.
 - e. Nitrite/Nitrate - Overfill one plastic liter bottle. Preservative to be added in laboratory.
 - f. Chloride - Overfill one plastic liter bottle.
 - g. Explosives - Overfill two glass liter bottles.
 - h. pH/Conductive/Temperature - Collect in clean beaker and measure as in Step a. Also fill one glass liter bottle for laboratory measurements.
6. Record time at end of sampling.
7. Describe recharge rate (e.g., immediate, fast, slow, etc).

8. Record number of each type of sample container taken. For example: three vials, four liter glass, and three liter plastic would be 3/4/3. Don't count the glass liter bottle taken for ph/conductivity/temperature because this sample will be discarded prior to shipment. However, do include duplicates and blanks.
9. Record the parameter for duplicates, travel blanks, or equipment blanks when taken.
10. Shipping information should be filled out after samples are preserved.
11. Under "Remarks," note any problems with the well structure or unusual characteristics while sampling.
12. Person collecting the samples should initial the data sheet.

DUPLICATES, TRAVEL BLANKS, AND EQUIPMENT BLANKS:

1. The sampling pattern for duplicates, travel blanks, and equipment blanks is shown on the attached table.
2. A duplicate sample consists of the same number and type of containers as taken for the original sample for a specific parameter. Duplicates are taken, preserved, and labeled in the same manner as the original sample, but have the word "duplicate" included on the label.
3. Travel blanks for a specific parameter consist of distilled water placed in the required number and types of containers for that parameter. These are placed in the ice chest prior to sampling a well. Travel blanks are then preserved and labeled in the same manner as the original sample, but have the words "travel blank" included on the label.
4. Equipment blanks for a specific parameter are taken from either the bailer used to purge a well or the portable bailer used to sample a well. An equipment blank is made after the equipment has been decontaminated but before the equipment is used at the well. The bailer is rinsed with distilled water. The rinsate is collected directly off the bailer in the number and types of containers specified for the parameter. Travel blanks are then preserved and labeled in the same manner as the original sample, but have the words "EQUIPMENT BLANK" included on the label. Specify either "PURGER" or "SAMPLER" on the label, also.
5. All blanks should be appropriately noted on the Field Data Sheet for the well where they are taken.
6. A separate Field Data Form and Chain of Custody record should be filled out for blanks taken at each well.

PRESERVATION:

1. Keep all samples packed in ice until delivered to SWD Laboratory.
2. Preserve samples at a laboratory set up on-site.
3. Preserve water samples in the following manner for the parameters specified.
 - a. Volatile Organic Compounds (VOCs) - No bubbles or air space in vials. Keep on ice at 4°C.
 - b. Total Organic Halides (TOX) - No bubbles or air space in bottles. Add enough sulfuric acid (H_2SO_4) to bring pH to <2. Add 1 ml sodium sulfite solution.
 - c. Metals (As, Ba, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn) - Add enough nitric acid (HNO_3) to bring pH to <2.
 - d. Nitrite/Nitrate - Add enough sulfuric acid (H_2SO_4) to bring pH to <2.
 - e. Chloride - Keep on ice at 4°C.
 - f. Explosives - Keep on ice at 4°C.
 - g. pH/Conductivity/Temperature - Make readings same as for the field. Record on Field Data Form. Discard sample after all other samples for well have been properly preserved.
4. Complete labels showing sample has been preserved and sign.

SHIPPING:

1. Pack all containers securely in ice chest, one well per chest. Include blanks for that well number.
2. Fill chest completely with ice.
3. Record chest number, strap number, and bus bill number on Field Data Sheet and Field Data Form. Fill out and sign Chain of Custody Form.
4. Make two copies of Field Data form and Chain of Custody Form.
5. Enclose a sealed plastic bag containing one copy each of Field Data Form and Chain of Custody Form in ice chest.
6. Close chest and secure with shipping strap.

7. Apply appropriate labels for shipping. Ship ice chests by bus each night to SWD Lab. Call SWD the following morning to tell them how many ice chests were sent.

RECORDKEEPING.

1. Three forms will be filled out for each well sampled. These are Field Data Sheet, Field Data Form, and Chain of Custody Form.

2. Copies of each form will be distributed in the following manner:

a. Field Data Sheet - One field copy
- One copy to CESWF-ED-GG

b. Field Data Form - One field copy
- One copy to CESWF-ED-GG
- One copy to CESWD-ED-GL

c. Chain of Custody
Form - One field copy
- One copy to CESWF-ED-GG
- One copy to CESWD-ED-GL

3. All bus tickets will be kept in the field.

002891

SAMPLING PLAN
- FOR -

DUPLICATES, TRAVEL BLANKS, & EQUIPMENT BLANKS

WELL NO.	PARAMETER					
	VOCs	TOX	Metals	N/N	CI	EXPI.
MW-1	D					
MW-2		D				
MW-3				D		
MW-4			D			
MW-5					D	
MW-6						D
MW-7	T					
MW-8			E			
MW-9			E			
MW-10	D					
MW-11		D				
MW-12			D			
MW-13				D		
MW-14					D	
MW-15						D
C-2			T			
C-3	E					
C-4	D					
C-5		D				
109			D			
120				D		
123					D	
124						D
125	T					
129						

D = duplicate

T = travel blank

E = equipment blank

002892

SAMPLE CONTAINER
- AND -
PRESERVATION PLAN

VIALS

3	40 ml	VOCs	4°C, Full
---	-------	------	-----------

GLASS

2	Liter	Tox	Full, pH < 2 w/ H ₂ SO ₄ , 1 ml Sodium Sulfite
---	-------	-----	--

2	Liter	Explosives	4°C
---	-------	------------	-----

1	Liter	pH/Cond/Temp	Dispose
---	-------	--------------	---------

PLASTIC

1	Liter	Metals (As, Ba, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn)	pH < 2 w/ HNO ₃
---	-------	--	----------------------------

1	Liter	Nitrite/Nitrate	pH < 2 w/ H ₂ SO ₄
---	-------	-----------------	--

1	Liter	Chloride	4°C
---	-------	----------	-----

002893

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location _____ Date _____

Site _____ Well number _____

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	_____	_____
vial	_____	_____

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO ₃	_____
metals, total *	_____
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	_____
sulfate	_____
TOX	_____
nitrate	_____
volatile organics	_____
semi-organics	_____
total hydrocarbons	_____
BTX	_____
EXPLOSIVES	_____

volatile organics

regular detection limits _____

0.5 ppb detection limits _____

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,

Na, Ca, Cu

* _____ (all of the above)

CUSTODY RECORD
signature and title

Relinquished by

Received by

Date

Time

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

WATER SAMPLING FIELD DATA SHEET

PROJECT:

002894

A. PURGING —						
1.	DATE					
2.	WELL NO.					
3.	CSQ DIA/TYPE					
4.	TOTAL DEPTH					
5.	DEPTH TO WATER					
6.	WATER IN FT.					
7.	GALS. TO PURGE					
8.	START TIME					
9.	STOP TIME					
10.	AMT. BAILED					
B. SAMPLING —						
1.	DATE					
2.	DEPTH TO WATER					
3.	BAILER TYPE					
4.	START TIME					
5.	MEASUREMENTS					
	pH					
	TEMP °C					
	COND. µS					
6.	STOP TIME					
7.	MEASUREMENTS					
	pH					
	TEMP °C					
	COND µS					
8.	RECHARGE					
9.	SAMPLE TYPES					
10.	DUPLICATES					
11.	TRAVEL BLANKS					
12.	EQUIP BLANKS					
13.	COOLER NO.					
14.	STRAP NO.					
15.	BUS BILL NO.					
REMARKS						
INITIALS						

002895

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location _____ Date _____

Site _____ Type of sample _____

Well number _____ Csg diameter _____ Csg type _____

Rate of recharge _____

Riser elevation _____

Depth to water
from top of casing _____ Time of measurement _____Depth to water
at time of sampling _____ Time of sampling _____

Water table _____ Measuring device _____

pH _____ Time of measurement _____

Meter type and model _____

Conductivity, unhos/cm _____ Time of measurement _____

Meter type and model _____ Temperature _____

Chest # _____ Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

Sample collector _____

WELL DEPTHS AND SCREENED INTERVALS

WELL No.	WELL DEPTH*	*DEPTH TO BOTTOM OF SCREEN	*DEPTH TO TOP OF SCREEN
mw-1	39.51	37.51	32.51
mw-2	42.22	40.22	35.22
mw-3	48.49	46.49	41.49
mw-4	44.54	42.54	37.54
mw-5	42.66	40.66	35.66
mw-6	47.72	45.72	40.72
mw-7	27.5	25.5	20.5
mw-8	34.0	32.0	27.0
mw-9	29.8	27.8	22.8
mw-10	36.6	34.6	29.6
mw-11	13.6	11.6	6.6
mw-12	31.1	29.1	24.1
mw-13	Boring log not received to date		
mw-14	53.3	51.3	46.3
mw-15	Boring log not received to date		
C-2	33.93	29.83	19.83
C-3	65.61	62.91	52.91
C-4	57.65	55.80	45.80
C-5	43.77	39.07	29.07
109	37.81	37.81	22.81
120	27.38	27.38	12.38
123	22.83	21.13	6.13
124	29.39	28.09	13.09
125	27.95	27.95	12.95
129	38.33	37.43	22.43

*Depths are measured in feet from top of well riser.

002897

APPENDIX W
COMPLETED WATER SAMPLING FIELD DATA SHEETS

WATER SAMPLING
FIELD DATA SHEET

PROJECT: L/HAPP

WATER SAMPLING FIELD DATA SHEET					
PROJECT: L/HAPP					
A. PURGING —					
1. DATE	9/19/88			9/19/88	
2. WELL NO.	MW-15	MW-2	MW-1	MW-6	MW-5
3. CSG DIA/TYPE	4" SS				
4. TOTAL DEPTH	71.62 (T)	42.54 (T)	40.07 (T)	47.66 (T)	43.34 (T)
5. DEPTH TO WATER	26.59	23.36	25.39	21.47	24.42
6. WATER IN FT.	45.03	19.18	14.66	26.19	18.92
7. GALS. TO PURGE	135	57	45	78	57
8. START TIME	1015	1308	1524	1115	1512
9. STOP TIME	1041	—	1527	1124	1519
10. AMT. BAILED	148 gal	15 gal (dry) @ 20.63	16 gal (dry) @ 37.00	28 gal (dry) @ 40.42	20 gal (dry) @ 39.52
B. SAMPLING —					
1. DATE	9/18/88	9/19/88	9/19/88	9/19/88	9/20/88
2. DEPTH TO WATER	26.59	23.56	25.22	28.55	24.59
3. BAILER TYPE	DED SS	DED SS	DED SS	DED SS	DED SS
4. START TIME	1106	0811	0903	1313	0946
5. MEASUREMENTS					
PH	6.3	6.2	6.7	6.4	5.4
TEMP °C	25.0	22.0	22.0	23.0	21.0
COND. µS	624 µS	2.38 MS	2.48 MS	2.38 MS	1501 µS
6. STOP TIME	1143	0837	0935	1400	1015
7. MEASUREMENTS					
PH	6.3	6.3	6.8	6.4	5.5
TEMP °C	22.0	22.5	22.0	23.0	21.0
COND. µS	620 µS	2.48 MS	2.44 MS	2.04 MS	1510 µS
8. RECHARGE	IMMED	V. SLOW	MOD.		
9. SAMPLE TYPES	6/3/3	6/3/3	4/3/6	6/3/3	4/4/3
10. DUPLICATES	EXPLOSIVES	TOX	VOC	EXPLOSIVES	Chloride
11. TRAVEL BLANKS	—	—	—	—	—
12. EQUIP BLANKS	—	—	—	—	—
13. COOLER NO.	C-1	C-14	C-15	C-10	C-11
14. STRAP NO.	—	—	—	—	—
15. BUS BILL NO.	—	—	—	—	—
REMARKS					
	First temperature was made too late after sample taken	Sampled 1 day after slug test rec. V. strong odor	V. strong odor	V. murky during purging	
INITIALS					
	DLK	DCF	gls	gls	DCF

WATER SAMPLING FIELD DATA SHEET

002899

PROJECT: LHAAP

A. PURGING —					
1. DATE	9/19/88	9/20/88	9/20/88	9/20/88	9/20/88
2. WELL NO.	125	MW-4	MW-3	125	109
3. CSG DIA/TYPER	2" PVC	4" SS	4" SS	2" PVC	2" PVC
4. TOTAL DEPTH	27.95	45.02 (T)	49.30 (T)	28.44 (T)	38.20 (T)
5. DEPTH TO WATER	25.41	25.11	25.74	25.48	24.91
6. WATER IN FT.	2.54	19.91	23.56	2.96	13.29
7. GALS. TO PURGE	8	60	72	9	40
8. START TIME	1519	1015	1311	0909	0921
9. STOP TIME	1521	1025	1317	0914	0934
10. AMT. BAILED	2 gal (dry)	20 gal (dry)	21 (dry)	1 gal (dry)	3.5 gal (dry)
	@ 27.95	@ 42.06	@ 46.71	@ 28.44	@ 38.20
B. SAMPLING —					
1. DATE	9/20/88	9/20/88	9/20/88	9/20/88	9/20/88
2. DEPTH TO WATER		25.25	25.65	25.48	24.62
3. BAILER TYPE		DED SS	DED SS	DED PVC	DED PVC
4. START TIME		1345	1525	1031	1313
5. MEASUREMENTS					
pH		6.5	6.0	5.9	6.6
TEMP °C		22°C	23°C	21°C	23°C
COND. µS		318 ms	1867 µS	132 µS	3.28 ms
6. STOP TIME		1415	1550	1500	1440
7. MEASUREMENTS					
pH		6.6	6.1	5.9	6.7
TEMP °C		25°C	24°C	22°C	22.5°C
COND. µS		318 ms	1850 µS	110 µS	2.85 ms
8. RECHARGE		slow	slow	Full recharge about 4 hrs	mod
9. SAMPLE TYPES			4/4/3	4/3/6	4/4/3
10. DUPLICATES		metals	Nitrates	—	metals
11. TRAVEL BLANKS		—	—	VOC	—
12. EQUIP BLANKS		—	—	—	—
13. COOLER NO.		C-13	C-12	C-24	C-20
14. STRAP NO.		—	—	—	—
15. BUS BILL NO.		—	—	—	—
REMARKS					
		milky yellow @ sampling	Milky white/yellow sampled after slug test	Red during purging, v. murky, silty, reddish @ sampling	Tan, v. silty during purging, milky yellow, silty @ sampling
INITIALS					
		RCF	DCR	DCR	DCR

WATER SAMPLING FIELD DATA SHEET

002900

PROJECT: LHAAD

A. PURGING —						
1. DATE	9/21/88	9/21/88	9/21/88	9/21/88	9/21/88	
2. WELL NO.	129	124	123	M.W.-7	M.W.-9	
3. CSQ DIA/TYPER	2"/PVC	2"/PVC	2"/PVC	4"/SS	4"/SS	
4. TOTAL DEPTH	37.18 (T)	27.53 (T)	21.04 (T)	27.51 (T)	29.47 (T)	
5. DEPTH TO WATER	23.71	12.42	12.17	15.77	11.73	
6. WATER IN FT.	14.47	15.11	8.87	11.74	17.74	
7. GALS. TO PURGE	23	23	14	36	54	
8. START TIME	0923	1218	1245	0834	1240	
9. STOP TIME	1106	1234	1250	0841	1246	
10. AMT. BAILED	23	7 (dry) @ 25.87	2 (dry) @ 20.61	13 (dry) @ 26.65	17 (dry) @ 27.45	
B. SAMPLING —						
1. DATE	9/21/88	9/21/88	9/21/88	9/21/88	9/22/88	
2. DEPTH TO WATER	24.30	12.65	12.11	16.42	11.64	
3. BAILER TYPE	DED PVC	DED PVC	DED PVC	DED SS	DED SS	
4. START TIME	1117	1440	1525	1545	0955	
5. MEASUREMENTS						
	pH	5.8	5.7	7.1	3.2 *	6 w/ paper *
	TEMP °C	21.5°C	21.5°C	24°C	22°C	20°C
	COND. µS	986 µS	62 µS	335 µS	1472 µS	212 µS
6. STOP TIME	1141	1510	1655	1410	1015	
7. MEASUREMENTS						
	pH	5.8	5.7	7.4	3.3 *	5.5-6 w/ paper *
	TEMP °C	21°C	23°C	24°C	21.5°C	22°C
	COND. µS	1006 µS	64 µS	347 µS	1487 µS	204 µS
8. RECHARGE	FAST	MOD	SLOW	VERY SLOW	VERY SLOW	
9. SAMPLE TYPES	4/3/3	6/3/3	6/4/3	4/3/6	4/4/3	
10. DUPLICATES	—	EXPLOSIVES	Chloride	—	—	
11. TRAVEL BLANKS	—	—	—	VOC	—	
12. EQUIP BLANKS	—	—	—	—	METALS 9/21/88	
13. COOLER NO.	C-25	C-23	C-22	C-9	C-7	
14. STRAP NO.	—	—	—	—	—	
15. BUS BILL NO.	—	—	—	—	—	
* Meter broken						
REMARKS						
	LOT OF SILT during purging	Very silty @ purging & sampling	Silty @ purging & sampling	Sampled after slug test	EQUIP BLANK BAILER	
INITIALS						
	DCF	DCF	DCF	DCF	CLK	

WATER SAMPLING FIELD DATA SHEET

002901

PROJECT: LHAAP

A. PURGING —			
1. DATE	9-21-88	9-26-88	
2. WELL NO.	MW-10	MW-11	
3. CSQ DIA/TY	4" SS	4" SS	
4. TOTAL DEPTH	36.48 (T)	13.07	
5. DEPTH TO WATER	7.85	6.87	
6. WATER IN FT.	28.63	6.2	
7. GALS. TO PURGE	85.89	18.6	
8. START TIME	1458	1259	
9. STOP TIME	1507	1307	
10. AMT. BAILED	28 GAL	Bailed Dry	
	036AL		
B. SAMPLING —			
1. DATE	9/22/88	9-26-88	
2. DEPTH TO WATER	7.85	7.63	
3. BAILER TYPE	DED SS	SS	
4. START TIME	0905	1325	
5. MEASUREMENTS	→	→	
	pH	6 w/paper*	4.3
	TEMP °C	20 °C	26 °C
	COND. μS	995 μS	309 μS
6. STOP TIME	0930	1335	
7. MEASUREMENTS	→	→	
	pH	6-6.5 w/paper*	4.3
	TEMP °C	21 °C	25 °C
	COND. μS	992 μS	288 μS
8. RECHARGE	OVERNIGHT SLOW	FAST	
9. SAMPLE TYPES	4/3/6	6/3/3	
10. DUPLICATES	VOC	TOX	
11. TRAVEL BLANKS	—	—	
12. EQUIP BLANKS	—	—	
13. COOLER NO.	C-6	C-5	
14. STRAP NO.	—	—	
15. BUS BILL NO.	—	—	
	*METER		
	BROKEN		
REMARKS	Water milky in color Before Slug Test	Clear	
INITIALS	JRS/GW CLK	CK	

WATER SAMPLING FIELD DATA SHEET

002902

PROJECT:

LHRAP

A. PURGING					
1. DATE	9-25-88	9-25-88	9-25-88	9-25-88	9-26-88
2. WELL NO.	C-2	C-3	C-4	MW-13	C-5
3. CSG DIA/TY	4" PVC	4" PVC	4" PVC	4" SS	4" PVC
4. TOTAL DEPTH	29.65	62.49	55.24	48.52	39.32
5. DEPTH TO WATER	5.91	26.10	24.65	6.90	12.70
6. WATER IN FT.	23.74	36.39	30.59	41.62	26.62
7. GALS. TO PURGE	70 GAL.	108	91	124.86	79 gal
8. START TIME	0845 - 1 LOST BAILER	1337	1451	1315	0846
9. STOP TIME	1050	1415	1532	1402	0940
10. AMT. BAILED	70 gal	108 gal	91	dry	80
		@ 45.42	@ 39.81	@ 43	@ 26.51
B. SAMPLING					
1. DATE	9-25-88	9-25-88	9-26-88	9-26-88	9-26-88
2. DEPTH TO WATER	16.57	45.42	24.77	7.49	12.92
3. BAILER TYPE	Teflon	TEFLON	TEFLON	SS	TEFLON
4. START TIME	1100	1445	0845	0935	1010
5. MEASUREMENTS					
PH	6.1	6.1	5.9	7.3	6.5
TEMP °C	19°C	20°C	18.5°C	23.5°C	19°C
COND. µS	758 µS	1068 µS	212 µS	860 µS	386 µS
6. STOP TIME	1116	1500	0900	0955	1030
7. MEASUREMENTS					
PH	6.1	6.2	5.9	7.3	6.5
TEMP °C	19°C	20°C	18.5°C	22.5°C	18.5°C
COND. µS	755 µS	1055 µS	209 µS	859 µS	383 µS
8. RECHARGE	Fast	FAST	Fast	Fast	
9. SAMPLE TYPES	4/4/3	4/3/6	4/3/6	4/4/3	6/3/3
10. DUPLICATES			VOL	N/N	TOX
11. TRAVEL BLANKS	Metals				
12. EQUIP BLANKS		VOL			
13. COOLER NO.	C-16	C-17	C-18	C-3	C-19
14. STRAP NO.					
15. BUS BILL NO.					
REMARKS	BAILER CAME A LOOSE. Fast recovery. Salt water smell	dinky gray water	milky white in color	clear bailed dry	dirty gray water brown
INITIALS	JS	CK	CK	CK	CK

WATER SAMPLING
FIELD DATA SHEET

PROJECT: LHAAP

A. PURGING —	→	→	→	→
1. DATE	9-26-88	9-26-88	9-27-88	9-27-88
2. WELL NO.	MW-8	MW-14	120	MW-12
3. CSQ DIA/TYPER	4" SS	4" SS	2" PVC	4" SS
4. TOTAL DEPTH	33.44 (F)	53.78 (F)	27.14 (F)	30.95 (F)
5. DEPTH TO WATER	14.32	12.42	12.86	8.03
6. WATER IN FT.	17.11	40.36	14.28	22.92
7. GALS. TO PURGE	51.57	121.08	45	69
8. START TIME	1015	1422	0956	1258
9. STOP TIME	1022	1450	1001	1330
10. AMT. BAILED	18	120 gal	4	28 gal
		(0.17.23)	dry	dry
B. SAMPLING —	→	→	→	→
1. DATE	9-27-88	9-27-88	9-27-88	9-28-88
2. DEPTH TO WATER	14.13	12.41	20.00	7.92
3. BAILER TYPE	SS	SS	PVC	SS
4. START TIME	1350	0930	1420	0955
5. MEASUREMENTS	→	→	→	→
pH	5.2	6.1	* broken	4.5/5.7
TEMP °C	20.5°C	23.5°C	26°C	22.5°C
COND. µS	851 µS	*	589 mS	1172 µS
6. STOP TIME	1403	0947	1501	0906
7. MEASUREMENTS	→	→	→	→
pH	5.2	6.1	* broken	
TEMP °C	21°C	24°C	24.5°C	23°C
COND. µS	844 µS	*	6.00 mS	1173 µS
8. RECHARGE	Fast	Fast		
9. SAMPLE TYPES	4/4/3	4/4/3	4/4/3	4/4/3
10. DUPLICATES	—	CI	N/N	METALS
11. TRAVEL BLANKS	—	—	—	—
12. EQUIP BLANKS	Metals	—	—	—
13. COOLER NO.	C-8	C-2	C-2	C-4
14. STRAP NO.	—	—	—	—
15. BUS BILL NO.	—	—	—	—
REMARKS		* COND. METER BRAKES	* pH meter broken	
INITIALS	CLK	CLK	CLK	CLK

APPENDIX X

COMPLETED GROUND-WATER MONITORING WELL DATA FORMS

002905

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN Date 9-19-88
Site ACTIVE BURNING GROUNDS Type of sample GWQA
Well number MW-1 Csg diameter 4" Csg type SS
Rate of recharge Moderate
Riser elevation _____
Depth to water
from top of casing 25.39 Time of measurement 1524 (9/18/88)
Depth to water
at time of sampling 25.22 Time of sampling 0903 (9/19/88)
Water table _____ Measuring device Slope Indicator 51453
pH 6.8 Time of measurement Hanna 0624-00
Meter type and model 1650

Conductivity, unhos/cm 2.70 mS Time of measurement 1650
Meter type and model Cole Parmer 21058 Temperature 18°C
Chest # B-15 Strap # — Bus bill —

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 6.7 COND. 2.48 mS TEMP 22°C (0903)
pH 6.8 COND. 2.44 mS TEMP 22°C (0935)

Very strong odor. Milky white in color

Sample collector Deborah C. Fitzgerald

002906

GROUND WATER MONITORING WELL
FIELD DATA FORMLocation Longhorn Date 9/19/88Site Active Burning Ground Type of sample GWQAWell number MW-2 Csg diameter 4" Csg type SSRate of recharge Very Slow

Riser elevation _____

Depth to water
from top of casing 23.36 Time of measurement 1308 (9/18/88)Depth to water
at time of sampling 23.56 Time of sampling 0811 (9/19/88)Water table _____ Measuring device Slope Indicator 51453pH 6.6 Time of measurement 1700Meter type and model HANNA 0624-00Conductivity, unhos/cm 2.55 mS Time of measurement 1700Meter type and model COLE PARMER 21058 Temperature 14°CChest # C-14 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 6.2 COND. 2.38MS TEMP 22°C (0811)
pH 6.3 COND. 2.48MS TEMP 22.5°C (0837)

Very strong odor. Milky white in color

Sample collector O. Fitzguald

002907

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location Longhorn Date 9/20/88
Site Active Burning Ground Type of sample GWQA
Well number MW-3 Csg diameter 4" Csg type SS
Rate of recharge Slow
Riser elevation _____
Depth to water from top of casing 25.74 Time of measurement 1311
Depth to water at time of sampling 25.65 Time of sampling 1525
Water table _____ Measuring device Slope Indicator 51453
pH 6.2 Time of measurement 1630
Meter type and model Hanna 0624-00

Conductivity, unhos/cm 1864 uS Time of measurement 1630
Meter type and model Cole Parmer 2105B Temperature 24°C
Chest # C-12 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

Field values: pH 6.0 Cond. 1867 uS Temp 23°C (1525)
pH 6.1 Cond. 1850 uS Temp 24°C (1550)

Milky yellow

Sample collector

O Fitzgerald

002908

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location Longhorn Date 9/20/88
Site Active Burning Ground Type of sample GWQA
Well number MW-4 Csg diameter 4" Csg type SS
Rate of recharge Slow
Riser elevation _____
Depth to water from top of casing 25.11 Time of measurement 1015
Depth to water at time of sampling 25.25 Time of sampling 1345
Water table _____ Measuring device Slope Indicator 51453
pH 6.8 Time of measurement 1700
Meter type and model Hanna 0624-00

Conductivity, unhos/cm 3.28 mS Time of measurement 1700
Meter type and model Cole Parmer 2105B Temperature 21°C
Chest # C-13 Strap # — Bus bill —

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 6.5 Cond 3.18 mS Temp 22°C (134)
pH 6.6 Cond 3.18 mS Temp 25°C (1415)

Slightly milky white

Sample collector

O'Fitzgerald

002909

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location Longhorn Date 9/20/88
Site Active Burning Ground Type of sample GWQA
Well number MW-5 Csg diameter 4" Csg type SS
Rate of recharge Slow
Riser elevation _____
Depth to water from top of casing 24.42 Time of measurement 1512 (9/19/88)
Depth to water at time of sampling 24.59 Time of sampling 0940 (9/20/88)
Water table _____ Measuring device Slope Indicator 51453
pH 5.7 Time of measurement 1230
Meter type and model Hanna 0624-00

Conductivity, unhos/cm 1517 US Time of measurement 1230
Meter type and model Cole Parmer 21058 Temperature 23°C
Chest # C-11 Strap # — Bus bill —

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 5.4 Cond. 1501 US Temp 21°C (0940)
pH 5.5 Cond. 1510 US Temp 21°C (1015)

Slightly milky white in color

Sample collector D Fitzgerald

002910

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN Date 9-19-88
Site ACTIVE BURNING GROUNDS Type of sample GWQA
Well number MW-6 Csg diameter 4" Csg type SS
Rate of recharge Slow
Riser elevation _____
Depth to water from top of casing 21.47 Time of measurement 1115
Depth to water at time of sampling 28.55 Time of sampling 1313
Water table _____ Measuring device Slope Indicator 51453
pH 6.4 Time of measurement 1655
Meter type and model Hanna 0624-00

Conductivity, unhos/cm 2.21 mS Time of measurement 1655
Meter type and model Cole Parmer 2105B Temperature 15°C
Chest # C-10 Strap # — Bus bill —

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 6.4 COND. 2.38 mS TEMP 23°C (1313)
pH 6.4 COND. 2.04 mS TEMP 23°C (1400)

Very murky during purging
milky white in color. Slight odor

Sample collector D. Fitzgerald

002911

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location Longhorn Date 9/21/88
Site Active Burning Ground Type of sample GWQA
Well number mw-7 Csg diameter 4" Csg type SS
Rate of recharge Very slow
Riser elevation _____
Depth to water from top of casing 15.77 Time of measurement 0830
Depth to water at time of sampling 16.42 Time of sampling 1545
Water table _____ Measuring device Shpe Indicator 5145
pH * 6.5-7 Time of measurement 1750
Meter type and model pH test strips

Conductivity, unhos/cm 1492 uS Time of measurement 1750
Meter type and model Cole Parmer 21058 Temperature 18°C
Chest # C-9 Strap # — Bus bill —

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH ** Cond 1472 uS Temp 22°C (1545)
pH ** Cond. 1487 uS Temp 21.5°C (1410)

white milky color.

* pH meter broken for laboratory sample. pH paper used.
** pH meter broken in field. No pH paper available.

Readings were 3.2 & 3.3, respectively, w/ broken meter

Sample collector O Fitzgerald

002912

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN AAP Date 9-27-88
Site ACTIVE BURNING GROUND Type of sample GWQA
Well number MW-8 Csg diameter 4" Csg type SS
Rate of recharge FAST
Riser elevation _____
Depth to water
from top of casing 14.32 Time of measurement 1015 (9-26-88)
Depth to water
at time of sampling 14.13 Time of sampling 1350 (9-27-88)
Water table _____ Measuring device SLOPE INDICATOR 5145
pH * 6-6.5 Time of measurement 1525
Meter type and model HANNA 0624-00

Conductivity, unhos/cm 89045 Time of measurement 1525
Meter type and model HANNA 8333 Temperature 24°C
Chest # C-8 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 5.2 COND 857 uS TEMP 20.5°C (1350)
pH 5.2 COND 849 uS TEMP 21°C (1403)

EQUIPMENT BLANK ON METALS

* pH paper used in lab.

Sample collector Clara L. Kirby

002913

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN MAP Date 9/22/88
Site ACTIVE BURNING GROUND Type of sample GW&A
Well number MW9 Csg diameter 4" Csg type SS
Rate of recharge SLOW (VERY)
Riser elevation _____
Depth to water from top of casing 11.74 Time of measurement 1240 (9/21/88)
Depth to water at time of sampling 11.64 Time of sampling 0955 (9/22/88)
Water table _____ Measuring device SLOPE INDICATOR 514
pH 6 * Time of measurement 1114
Meter type and model pH TEST STRIPS

Conductivity, unhos/cm 21045 Time of measurement 1114
Meter type and model COLE PARMER 21058 Temperature 22.5°C
Chest # C-7 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 6 * COND 21245 TEMP 20°C
pH 5.5-6 * COND 20445 TEMP 22°C

SAMPLE FAIRLY CLEAR. EQUIP. BLANK TAKEN FOR
METAL (9/21/88), BAILER (PARSER).

* pH PAPER USED FOR pH READINGS.

Sample collector C.L. Kirby

002914

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN RAP Date 9/22/88
Site ACTIVE BURNING GROUND Type of sample GA/QA
Well number MW-10 Csg diameter 4" Csg type SS
Rate of recharge VERY SLOW
Riser elevation _____
Depth to water from top of casing 7.85 Time of measurement 1458 (9/21/88)
Depth to water at time of sampling 7.85 Time of sampling 0905 (9/22/88)
Water table _____ Measuring device SLOPE INDICATOR 514
pH 6.5 * Time of measurement 1135
Meter type and model pH TEST STRIPS
Conductivity, unhos/cm 962 uS Time of measurement 1135
Meter type and model COLE PARMER 21058 Temperature 20.5 °C
Chest # C-6 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 6 * COND 995 uS TEMP 20°C (0905)
pH 6-6.5 * COND 992 uS TEMP 21°C (0930)

SAMPLE IS CLEAR. DUPLICATES TAKEN FOR
VOC

*pH PAPER USED FOR ALL pH READINGS.

Sample collector

Jack R. Stebbins

002915

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN AAP Date 9-26-88
Site ACTIVE BURNING GROUND Type of sample GWQA
Well number MW-11 Csg diameter 4" Csg type SS
Rate of recharge FAST
Riser elevation _____
Depth to water
from top of casing 6.87 Time of measurement 1259
Depth to water
at time of sampling 7.63 Time of sampling 1325
Water table _____ Measuring device SLOPE INDICATOR 51453
pH 4.3 Time of measurement 1454
Meter type and model HANNA 0624-00

Conductivity, unhos/cm 316 uS Time of measurement 1454
Meter type and model COLE PARMER 21058 Temperature 24.5°C
Chest # C-5 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 4.3 COND 309 uS TEMP 26°C (1325)
pH 4.3 COND 288 uS TEMP 25°C (1335)

DUPLICATE ON TOX

Sample collector

Clara L. Kirby

002916

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN AAP Date 9-28-88
Site ACTIVE BURNING GROUNDS Type of sample GWQA
Well number MW-12 Csg diameter 4" Csg type SS
Rate of recharge FAST
Riser elevation _____
Depth to water
from top of casing 8.03 Time of measurement 1258 (9-27-88)
Depth to water
at time of sampling 7.92 Time of sampling 0855 (9-28-88)
Water table _____ Measuring device SLOPE INDICATOR 5145
pH 6 Time of measurement 0940
Meter type and model pH test strips

Conductivity, unhos/cm 1163 uS Time of measurement 0940
Meter type and model HANNA 8333 Temperature 22°C
Chest # C-4 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 5.7 COND 1172 uS TEMP 22.5°C (0855)
pH* COND 1173 uS TEMP 23°C (0906)

DUPLICATE ON METALS

* pH meter broke again

Sample collector Clara G. Kirby

002917

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONG HORN AAP Date 9-26-88
Site ACTIVE BURNING GROUND Type of sample GWQA
Well number MW-13 Csg diameter 4" Csg type SS
Rate of recharge FAST / MOD.
Riser elevation _____
Depth to water
from top of casing 6.90 Time of measurement 1315 (9-25-88)
Depth to water
at time of sampling 7.49 Time of sampling 0935 (9-26-88)
Water table _____ Measuring device SLOPE INDICATOR 51953
pH 6.7 Time of measurement 1530
Meter type and model HANNA 0624-00

Conductivity, unhos/cm _____ Time of measurement 1530
Meter type and model COLE PARMER 21058 Temperature 19°C
Chest # C-3 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES : pH 7.3 COND 860 uS TEMP 23.5°C (0935)
pH 7.3 COND 859 uS TEMP 22.5°C (0955)

DUPLICATE ON N/N SAMPLE

Sample collector

Clara L Kirby

002918

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN RAP Date 9-27-88
 Site ACTIVE BURNING GROUND Type of sample GWQA
 Well number MW-14 Csg diameter 4" Csg type SS
 Rate of recharge FAST TO MOD.
 Riser elevation _____
 Depth to water from top of casing 13.42 Time of measurement 1422 (9-26-88)
 Depth to water at time of sampling 12.41 Time of sampling 0930 (9-28-88)
 Water table _____ Measuring device SLOPE INDICATOR 51453
 pH ** 6.5-7 Time of measurement 1600
 Meter type and model HANNA 0624-0C

Conductivity, unhos/cm 1796 μ S in lab. Time of measurement 1600
 Meter type and model HANNA 8333 Temperature 19°C
 Chest # C-2 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 6.1 COND * Ø TEMP 23.5°C (0930)
 pH 6.1 COND * Ø TEMP 24°C (0947)

SLIGHT ODOR

Water reddish brown in color

DUPLICATE ON C1

* CONDUCTIVITY METER BROKEN ** pH paper used in lab.

Sample collector Clara L. Kirby

002919

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONAHORN Date 9/18/88
Site Active Burning Ground Type of sample GWQA
Well number: MW-15 Csg diameter 4" Csg type SS
Rate of recharge Immediate
Riser elevation _____
Depth to water
from top of casing 26.59 Time of measurement 1015
Depth to water
at time of sampling 26.59 Time of sampling 1106
Water table _____ Measuring device Slope Indicator 51453
pH 6.4 Time of measurement 1625
Meter type and model HANNA 0624-00

Conductivity, unhos/cm 694 μ S Time of measurement 1625
Meter type and model COLE PARMER 2105B Temperature 20°C
Chest # C-1 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 6.3 Cond 644 μ S Temp 25°C (1106)
pH 6.3 Cond 629 μ S Temp 22°C (1143)

Water is slightly cloudy/yellowish. V. faint odor

Sample collector D Fitzgerald

002920

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN AAP Date 9-25-88
Site ACTIVE BURNING GROUND Type of sample GWQA
Well number C-2 Csg diameter 4" Csg type ~~SS~~ PVC
Rate of recharge FAST
Riser elevation _____
Depth to water
from top of casing 5.91 Time of measurement 0845
Depth to water
at time of sampling 16.57 Time of sampling 1100
Water table _____ Measuring device SLOPE INDICATOR 5/453
pH 6.3 Time of measurement 1255
Meter type and model HANNA 0624-00

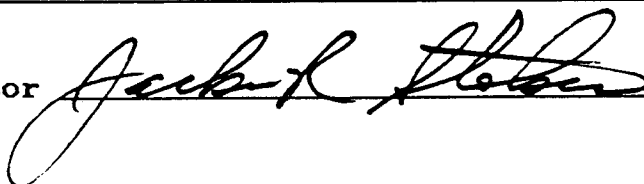
Conductivity, unhos/cm 734 uS Time of measurement 1255
Meter type and model COLE PARMER 210SP Temperature 18°C
Chest # C-16 Strap # — Bus bill —

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 6.1 COND 758 uS TEMP 19°C (1100)
pH 6.1 COND 755 uS TEMP 19°C (1116)

SALTY ODOR, VERY DIRTY WOULDN'T CLEAR UP.USED TEFLON BAILER TO SAMPLE WELL.TRAVEL BLANK ON METALS.

Sample collector



002921

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN AAP Date 9-25-88
Site ACTIVE BURNING GROUND Type of sample GWQA
Well number C-3 Csg diameter 4" Csg type PVC
Rate of recharge FAST-MOD.
Riser elevation _____
Depth to water
from top of casing 26.10 Time of measurement 1337
Depth to water
at time of sampling 45.42 Time of sampling 1945
Water table _____ Measuring device SLOPE INDICATOR 5145
pH 6.2 Time of measurement 1535
Meter type and model HANNA 0624-00

Conductivity, unhos/cm 1052 uS Time of measurement 1535
Meter type and model COLE PARMER Temperature 22°C
Chest # C-17 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 6.1 COND 1068 uS TEMP 20°C (1445)
pH 6.2 COND 1055 uS TEMP 20°C (1600)

WATER IS DINGY GRAY IN COLOR
USED TEFLON BAILER TO SAMPLE WELL.
EQUIPMENT BLANK ON VOC.

Sample collector Clara L. Kirby

002922

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN AAP Date 9-26-88
Site ACTIVE BURNING GROUND Type of sample GWA
Well number C-4 Csg diameter 4" Csg type PVC
Rate of recharge FAST
Riser elevation _____
Depth to water from top of casing 24.65 Time of measurement 1451 (9-25-88)
Depth to water at time of sampling 24.77 Time of sampling 0845 (9-26-88)
Water table _____ Measuring device SLOPE INDICATOR 5145
pH 6.0 Time of measurement 1510
Meter type and model HANNA 0624-00

Conductivity, unhos/cm 202 us Time of measurement 1510
Meter type and model COLE PARMER 21058 Temperature 19°C
Chest # C-18 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 5.9 COND 212 us TEMP 18.5°C (0845)
pH 5.9 COND 209 us TEMP 18.5°C (0900)

Milky white in color.

DUPLICATE ON VOC

TEFLON BAILER USED

Sample collector

Clara L. Kirby

002923

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location LONGHORN AAP Date 9-26-88
Site ACTIVE BURNING GROUND Type of sample GWQA
Well number C-5 Csg diameter _____ Csg type _____
Rate of recharge FAST
Riser elevation _____
Depth to water
from top of casing 12.70 Time of measurement 0846
Depth to water
at time of sampling 12.92 Time of sampling 1010
Water table _____ Measuring device SLOPE INDICATOR 5145
pH 6.7 Time of measurement 1358
Meter type and model HANNA 0624-00

Conductivity, unhos/cm 374 uS Time of measurement 1358
Meter type and model COLE PARMER 21058 Temperature 19°C
Chest # C-19 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

FIELD VALUES: pH 6.5 COND 386 uS TEMP 19°C (1010)
pH 6.5 COND 383 uS TEMP 18.5°C (1030)

DUPLICATES ON TOX
TEFLON BAILER USED

Sample collector Clara L. Kirby

002924

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location Longhorn Date 9/20/88
Site Active Burning Ground Type of sample GWQA
Well number 109 Csg diameter 2" Csg type PVC
Rate of recharge Moderate
Riser elevation _____
Depth to water from top of casing 24.91 Time of measurement 0921
Depth to water at time of sampling 24.62 Time of sampling 1313
Water table _____ Measuring device Slope Indicator 5145
pH 6.7 Time of measurement 1645
Meter type and model Hanna 0624-00

Conductivity, unhos/cm 2.85 mS Time of measurement 1645
Meter type and model Cole Parmer 21058 Temperature 22.5°C
Chest # C-20 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 6.6 Temp 23°C Cond. 3.28 mS (1313)
pH 6.7 Temp 22.5°C Cond. 2.85 mS (1440)

milky yellow. Silty

Sample collector J. Fitzgerald

002925

Sample collector Clara L. Kirby

002926

E-1421

GROUND WATER MONITORING WELL
FIELD DATA FORMLocation Longhorn Date 9/21/08Site Active Burning Ground Type of sample GWQAWell number 123 Csg diameter 2" Csg type PVCRate of recharge Slow

Riser elevation _____

Depth to water
from top of casing 12.17 Time of measurement 1245Depth to water
at time of sampling 12.11 Time of sampling 1525Water table _____ Measuring device Slope Indicator 5145pH * 6-7 Time of measurement 1736Meter type and model pH test stripsConductivity, unhos/cm 350 uS Time of measurement 1736Meter type and model Cole Parmer 21058 Temperature 22°CChest # C-22 Strap # — Bus bill —

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 7.1 Cond. 335 uS Temp 24°C (1525)
pH 7.4 Cond. 347 uS Temp 24°C (1455)Silty during purging & sampling. Cloudy* pH meter not working in laboratory. pH paper used insteadSample collector D. Fitzgeralde Per Per St H 9/21/08 1700

002927

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location Longhorn Date 9/20/88
Site Active Burning Ground Type of sample GWQA
Well number 125 Csg diameter 2" Csg type PVC
Rate of recharge Fast
Riser elevation _____
Depth to water from top of casing 25.48 Time of measurement 0909
Depth to water at time of sampling 25.48 Time of sampling 1034
Water table _____ Measuring device Slope Indicator 51453
pH 6.1 Time of measurement 1615
Meter type and model Hanna 0624-00

Conductivity, unhos/cm 115 uS Time of measurement 1615
Meter type and model Cole Parmer 21058 Temperature 17°C
Chest # C-24 Strap # — Bus bill —

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 5.9 Cond. 132 uS Temp 21°C (1034)
pH 5.9 Cond. 110 uS Temp 22°C (1500)

Very cloudy yellow/red. Silty

Sample collector O'Kittgerald

002928

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location Longhorn Date 9/21/88
Site Active Burning Ground Type of sample GWQA
Well number 124 Csg diameter 2" Csg type PVC
Rate of recharge Moderate
Riser elevation _____
Depth to water
from top of casing 12.42 Time of measurement 1218
Depth to water
at time of sampling 12.65 Time of sampling 1440
Water table _____ Measuring device Slope Indicator 51453
pH * 5-5.5 Time of measurement 1755
Meter type and model pH test strips

Conductivity, unhos/cm 66 us Time of measurement 1755
Meter type and model Cole Parmer 2105B Temperature 20°C
Chest # C-23 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 5.7 Cond. 62 us Temp 21.5°C (1440)
pH 5.7 Cond. 64 us Temp 23°C (1510)

Very silty during purging & sampling.

* pH meter not working for laboratory sample. pH paper used instead.

Sample collector D Fitzgerald

002929

GROUND WATER MONITORING WELL
FIELD DATA FORM

Location Longhorn Date 9/21/88
Site Active Burning Ground Type of sample GWQA
Well number 129 Csg diameter 2" Csg type PVC
Rate of recharge Fast
Riser elevation _____
Depth to water from top of casing 23.71 Time of measurement 0923
Depth to water at time of sampling 24.30 Time of sampling 1117
Water table _____ Measuring device Slope Indicator 51453
pH 6.0 Time of measurement 1415
Meter type and model Hanna 0624-00

Conductivity, unhos/cm 1051 uS Time of measurement 1415
Meter type and model Cole Parmer 2105B Temperature 21°C
Chest # C-25 Strap # _____ Bus bill _____

Notes concerning condition of well, odor, color, and any problems:

Field Values: pH 5.8 Cond. 986 uS Temp 21.5°C (1117)
pH 5.8 Cond. 1006 uS Temp 21°C (1141)

Very silty during purging & sampling. Slight odor

Sample collector D Yitzgevald

002930

APPENDIX Y

**COMPLETED GROUND-WATER MONITORING WELL
CHAIN OF CUSTODY FORMS**

002931

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONG HOAN Date 9-19-88Site ACTIVE BURNING GROUNDS Well number MW-1

Number of containers in shipment:

Parameters sampled:

	glass	plastic	pH	_____
liter	<u>4</u>	<u>3</u>	conductivity	_____
			TOC	_____
vial	<u>6</u>	_____	Hardness as CaCO ₃	_____
			metals, total *	☒
			COD	_____
			hexavalent chromium	_____
			alkalinity	_____
			chloride	☒
			sulfate	_____
			TOX	☒
			nitrate	☒
volatile organics			volatile organics	☒
-----			semi-organics	_____
regular detection limits ☒			total hydrocarbons	_____
0.5 ppb detection limits _____			BTX	_____
			EXPLOSIVES	☒

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* _____ (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Debra W Fitzgerald</u>	<u>C.F. Kirby</u>	<u>9/20/88</u>	<u>0730</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

002932

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/19/88Site Active Burning Ground Well number MW-2

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>6</u>	<u>3</u>
vial	<u>3</u>	<u>..</u>

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO ₃	_____
metals, total *	<u>✓</u>
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	<u>✓</u>
sulfate	_____
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	_____
total hydrocarbons	_____
BTX	_____
EXPLOSIVES	<u>✓</u>

volatile organics

 regular detection limits ✓
 0.5 ppb detection limits _____

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
 Na, Ca, Cu

* _____ (all of the above)

CUSTODY RECORD
signature and title

Relinquished by

Received by

Date

Time

Quinn FitzgeraldCh. Kirby9/20/880730

002933

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/20/88Site Active Burning Well number nw-3

Number of containers in shipment:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

Parameters sampled:

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO ₃	_____
metals, total *	☒
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	☒
sulfate	_____
TOX	☒
nitrate	☒
volatile organics	☒
semi-organics	_____
total hydrocarbons	_____
BTX	_____
EXPLOSIVES	☒

volatile organics

 regular detection limits ☒
 0.5 ppb detection limits _____

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
 Na, Ca, Cu

* _____ (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Dennis Fitzgerald</u>	_____	<u>9/22/88</u>	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002934

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/20/88

Site Active Burning Ground Well number MW-4

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Debra D Fitzgerald</u>	<u> </u>	<u>9/22/88</u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002935

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/20/88

Site Active Burning Ground Well number MW-5

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO ₃	_____
metals, total *	☒
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	☒
sulfate	_____
TOX	☒
nitrate	☒
volatile organics	☒
semi-organics	_____
total hydrocarbons	_____
BTX	_____
EXPLOSIVES	☒

volatile organics

regular detection limits ☒
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Daniel Fitzgerald</u>	_____	<u>9/22/88</u>	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002936

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN Date 9-19-88

Site ACTIVE BURNING GROUNDS Well number MW-6

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>6</u>	<u>3</u>
vial	<u>3</u>	<u> </u>

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO ₃	_____
metals, total *	<u>✓</u>
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	<u>✓</u>
sulfate	<u>✓</u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	_____
total hydrocarbons	_____
BTX	<u>✓</u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,

Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Dennis Gitzwald</u>	<u>G. Kirby</u>	<u>9/20/88</u>	<u>0730</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002937

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/21/88

Site Active Burning Ground Well number NW-7

Number of containers in shipment:

	glass	plastic
liter	<u>4</u>	<u>3</u>
vial	<u>6</u>	<u> </u>

Parameters sampled:

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO3	_____
metals, total *	☒
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	☒
sulfate	_____
TOX	☒
nitrate	☒
volatile organics	☒
semi-organics	_____
total hydrocarbons	_____
BTX	_____
EXPLOSIVES	☒

volatile organics

regular detection limits ☒
0.5 ppb detection limits ☐

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* _____ (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Deborah Fitzgerald</u>	_____	<u>9/22/88</u>	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002938

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn AAP Date 9-27-88

Site ACTIVE BURNING GROUND Well number MW-8

Number of containers in shipment:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

Parameters sampled:

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u> </u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,

Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kirby</u>	<u>→</u>	<u>9-27-88</u>	<u>1600</u>
<u>Clara L. Kirby</u>	<u> </u>	<u>9-29-88</u>	<u>0700</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002939

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9/22/88

Site ACTIVE BURNING GROUND Well number MW-9

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* (As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn) Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L Kirby</u>	<u>Clara L Kirby</u>	<u>9/22/88</u>	<u>1014</u>
<u>Clara L Kirby</u>	<u>→</u>	<u>9/23/88</u>	<u>1200</u>
<u>Clara L Kirby</u>	<u> </u>	<u>9/23/88</u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
- CHAIN OF CUSTODY FORM

002940

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONG HORN AAP Date 9/22/88

Site ACTIVE BURNING GROUND Well number MW-10

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>3</u>
vial	<u>6</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO3	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓

0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Sr, Ag, Zn, Fe, Mn, Mg, K,

Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Jack R. Hester</u>	<u>Clara L. Kirby</u>	<u>9/22/88</u>	<u>0930</u>
<u>Clara L. Kirby</u>	<u>→</u>	<u>9/23/88</u>	<u>1200</u>
<u>Clara L. Kirby</u>	<u> </u>	<u>9/23/88</u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002941

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-26-88

Site ACTIVE BURNING GROUND Well number MW-11

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>6</u>	<u>3</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kirby</u>	<u>→</u>	<u>9-26-88</u>	<u>1600</u>
<u>Clara L. Kirby</u>	<u>Raymond H. Hurd</u>	<u>9-27-88</u>	<u>0600</u>
<u> </u>	<u> </u>	<u>9-27-88</u>	<u>1200</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002942

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-28-88

Site ACTIVE BURNING GROUND Well number MW-12

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO3	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kiley</u>	<u>→</u>	<u>9-28-88</u>	<u>1600</u>
<u>Clara L. Kiley</u>	<u> </u>	<u>9-29-88</u>	<u>0700</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

002943

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-26-88Site ACTIVE BURNING GROUND Well number MW-13

Number of containers in shipment:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

Parameters sampled:

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO ₃	_____
metals, total *	<u>✓</u>
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	<u>✓</u>
sulfate	_____
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	_____
total hydrocarbons	_____
BTX	_____
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓0.5 ppb detection limits * As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,

Na, Ca, Cu

* (all of the above)CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kishy</u>	<u>→</u>	<u>9-26-88</u>	<u>1600</u>
<u>Clara L. Kishy</u>	<u>Raymond Harduth</u>	<u>9-27-88</u>	<u>0600</u>
<u> </u>	<u> </u>	<u>9-27-88</u>	<u>1200</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002944

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-27-88

Site ACTIVE BIRING GROUND Well number MW-14

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>3</u>
vial	<u>4</u>	<u> </u>

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO ₃	_____
metals, total *	<u>5</u>
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	<u>5</u>
sulfate	_____
TOX	<u>5</u>
nitrate	<u>5</u>
volatile organics	<u>5</u>
semi-organics	_____
total hydrocarbons	_____
BTX	_____
EXPLOSIVES	<u>5</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,

Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kiley</u>	<u>→</u>	<u>9-27-88</u>	<u>1600</u>
<u>Clara L. Kiley</u>	<u> </u>	<u>9-29-88</u>	<u>0700</u>
<u> </u>	<u> </u>	<u>9-29-88</u>	<u>1200</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002945

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/19/88

Site Active Burning Ground Well number MW-15

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>6</u>	<u>3</u>
vial	<u>3</u>	

pH	_____
conductivity	_____
TOC	_____
Hardness as CaCO3	_____
metals, total *	☒
COD	_____
hexavalent chromium	_____
alkalinity	_____
chloride	☒
sulfate	☒
TOX	☒
nitrate	☒
volatile organics	☒
semi-organics	_____
total hydrocarbons	_____
BTX	_____
EXPLOSIVES	☒

volatile organics

regular detection limits ☒
0.5 ppb detection limits _____

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* _____ (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Devin Ditzguald</u>	<u>C. Kirby</u>	<u>9/20/88</u>	<u>0730</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

002946

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-25-88Site ACTIVE BURNING GROUND Well number C-2

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

 regular detection limits ✓
 0.5 ppb detection limits
* As Ba Be, Cd Cr Pb Hg Ni Se Ag Zn Fe, Mn, Mg, K,

Na, Ca, Cu

* (all of the above)CUSTODY RECORD
signature and title

Relinquished by

Received by

Date

Time

Jack R. [Signature]
Clara L. Kirby
Clara L. Kirby
Raymond [Signature]
9-25-8813009-27-8806009-27-881200

002947

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-25-88Site ACTIVE BURNING GROUNDS Well number C-3

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>3</u>
vial	<u>6</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

 regular detection limits ✓
 0.5 ppb detection limits

* As, Ba, Be, Ca, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
 Na, Ca, Cu

* (all of the above)CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kirby</u>	<u>→</u>	<u>9-25-88</u>	<u>1600</u>
<u>Clara L. Kirby</u>	<u>Raymond H. Smith</u>	<u>9-27-88</u>	<u>0600</u>
<u> </u>	<u> </u>	<u>9-27-88</u>	<u>0200</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

002948

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-26-88Site ACTIVE BURNING GROUND Well number C-4

Number of containers in shipment:

Parameters sampled:

	glass	plastic	pH	_____
liter	<u>4</u>	<u>3</u>	conductivity	_____
vial	<u>6</u>	_____	TOC	_____
			Hardness as CaCO ₃	_____
			metals, total *	<u>✓</u>
			COD	_____
			hexavalent chromium	_____
			alkalinity	_____
			chloride	<u>✓</u>
			sulfate	_____
			TOX	<u>✓</u>
			nitrate	<u>✓</u>
volatile organics			volatile organics	<u>✓</u>
-----			semi-organics	_____
regular detection limits			total hydrocarbons	_____
0.5 ppb detection limits			BTX	_____
			EXPLOSIVES	<u>✓</u>

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn Fe, Mn, Mg, K,
Na, Ca, Cu

* _____ (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kirby</u>	<u>→</u>	<u>9-26-88</u>	<u>1600</u>
<u>Clara L. Kirby</u>	<u>Raymond Redditt</u>	<u>9-27-88</u>	<u>0600</u>
_____	_____	<u>9-27-88</u>	<u>1200</u>
_____	_____	_____	_____

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002949

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-26-88

Site ACTIVE BURNING GROUND Well number C-5

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>6</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kirby</u>	<u>→</u>	<u>9-26-88</u>	<u>1600</u>
<u>Clara L. Kirby</u>	<u>Raymond H. Smith</u>	<u>9-27-88</u>	<u>0600</u>
<u> </u>	<u> </u>	<u>9-27-88</u>	<u>1200</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002950

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Langhorn Date 9/20/88

Site Active Burning Ground Well number 109

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,

Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Deborah Fitzgerald</u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

002951

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location LONGHORN AAP Date 9-27-88Site ACTIVE BURING GROUND Well number 120

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u> </u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u> </u>
sulfate	<u> </u>
TOX	<u> </u>
nitrate	<u> </u>
volatile organics	<u> </u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u> </u>

volatile organics

 regular detection limits ✓
 0.5 ppb detection limits

 * As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
 Na, Ca, Cu
* (all of the above)CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Clara L. Kirby</u>	<u>→</u>	<u>9-27-88</u>	<u>1600</u>
<u>Clara L. Kirby</u>	<u> </u>	<u>9-29-88</u>	<u>0700</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002952

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/21/88

Site Active Burning Ground Well number 123

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>4</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Deborah C. Fitzgerald</u>	<u> </u>	<u>9/22/88</u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002953

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/21/88

Site Active Burning Ground Well number 124

Number of containers in shipment:

	glass	plastic
liter	<u>6</u>	<u>3</u>
vial	<u>3</u>	<u> </u>

Parameters sampled:

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO ₃	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Dennis Fitzgerald</u>	<u> </u>	<u>9/22/88</u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002954

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/20/88

Site Active Burning Ground Well number 125

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>4</u>	<u>3</u>
vial	<u>6</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO3	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u> </u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
KXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓

0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn, Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Deborah Fitzgerald</u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

GROUND WATER MONITORING WELL
CHAIN OF CUSTODY FORM

002955

FORT WORTH DISTRICT, CORPS OF ENGINEERS

Location Longhorn Date 9/21/88

Site Active Burning Ground Well number 129

Number of containers in shipment:

Parameters sampled:

	glass	plastic
liter	<u>3</u>	<u>3</u>
vial	<u>3</u>	<u> </u>

pH	<u> </u>
conductivity	<u> </u>
TOC	<u> </u>
Hardness as CaCO3	<u> </u>
metals, total *	<u>✓</u>
COD	<u> </u>
hexavalent chromium	<u> </u>
alkalinity	<u> </u>
chloride	<u>✓</u>
sulfate	<u> </u>
TOX	<u>✓</u>
nitrate	<u>✓</u>
volatile organics	<u>✓</u>
semi-organics	<u> </u>
total hydrocarbons	<u> </u>
BTX	<u> </u>
EXPLOSIVES	<u>✓</u>

volatile organics

regular detection limits ✓
0.5 ppb detection limits

* As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Zn Fe, Mn, Mg, K,
Na, Ca, Cu

* (all of the above)

CUSTODY RECORD
signature and title

Relinquished by	Received by	Date	Time
<u>Dwight C Fitzgerald</u>	<u> </u>	<u>9/22/88</u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

002956

APPENDIX Z

LABORATORY RESULTS FOR CHEMICAL ANALYSES OF WATER SAMPLES

002957

APPENDIX AA

LABORATORY SOIL CLASSIFICATION ANALYSES FOR MW-1 THROUGH MW-15

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWOED-6L REPORT NO. 14543 LONGHORN AAP

[illegible]

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SHED-6L REPORT NO. 14543 LONGHORN AAP

BORING NO.	SND NO.	FLD NO.	DEPTH, FT	GR	SA	FI	LL	PL	PI	LS	WC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
MN	1A	87/6524	J-R	44.0	-	49.0								
MN	1A	87/6525	J-S	49.0	-	53.0								
MN	1	87/6494	J-A	0.0	-	2.0								
MN	1	87/6495	J-B	2.0	-	3.0								
MN	1	87/6496	J-C	3.0	-	4.0								
MN	1	87/6497	J-D	4.0	-	6.0								
MN	1	87/6498	J-E	6.0	-	8.0								
MN	1	87/6499	J-F	8.0	-	10.0								
MN	1	87/6500	J-G	10.0	-	15.0								
MN	1	87/6501	J-H	15.0	-	20.0								
MN	1	87/6502	J-I	20.0	-	24.2	0	31	49	33	20	13	26.3	CL - SANDY LEAN CLAY, YELLOW, MOIST.
MN	1	87/6503	J-J	24.2	-	26.4	0	76	24			0	27.4	SM - SILTY SAND, YELLOW, MET.
MN	1	87/6504	J-K	26.5	-	31.5	0	18	82	30	11	19	17.9	CL - LEAN CLAY WITH SAND, GRAY AND RED, MOIST.
MN	1	87/6505	J-L	31.5	-	34.4	0	10	90	30	18	12	22.9	CL - LEAN CLAY, GRAY AND YELLOW, MOIST.
MN	1	87/6506	J-M	34.4	-	38.0								
MN	2	87/6288	J-A	0.0	-	2.0								
MN	2	87/6289	J-B	2.0	-	4.0								

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWED-6L REPORT NO. 14543 LONGHORN AAP

BORING NO.	SND NO.	FLD NO.	DEPTH, FT	GR	SA	FI	LL	PL	PI	LS	WC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
MN	2	87/6290	J-C	4.0 - 6.0										
MN	2	87/6291	J-D	6.0 - 8.0										
MN	2	87/6292	J-E	8.0 - 10.0										
MN	2	87/6293	J-F	10.0 - 14.2										
MN	2	87/6294	J-G	14.2 - 19.2										
MN	2	87/6295	J-H	19.2 - 20.4										
MN	2	87/6296	J-I	20.4 - 26.0	0	59	41			0	26.9			SM - SILTY SAND, OLIVE - BROWN, VERY MOIST.
MN	2	87/6297	J-J	26.0 - 27.0										
MN	2	87/6298	J-K	27.0 - 34.0	0	13	87	23	16	7	21.9			CL-ML - SILTY CLAY, LIGHT GRAY AND YELLOW, VERY MOIST.
MN	2	87/6299	J-L	34.0 - 38.0	0	30	70			0	22.9			ML - SANDY SILT, GRAY AND YELLOW, VERY MOIST.
MN	2	87/6300	J-M	38.0 - 39.9	0	21	79	24	18	6	21.9			CL-ML - SILTY CLAY WITH SAND, YELLOW - BROWN, MOIST.
MN	2	87/6301	J-N	39.9 - 40.4	0	3	97	73	16	57	26.0			CLAY-SHALE, GRAY, MOIST.
MN	3	87/6526	J-A	0.0 - 2.0										
MN	3	87/6527	J-B	2.0 - 4.0										
MN	3	87/6528	J-C	4.0 - 6.0										
MN	3	87/6529	J-D	6.0 - 8.2										
MN	3	87/6530	J-E	8.2 - 10.0										

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TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWED-6L REPORT NO. 14543 LONGHORN MAP

BORING NO.	SND NO.	FLD NO.	DEPTH, FT	GR	SA	FI	LL	PL	PI	LS	WC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
MN	3	87/6531 J-F	10.0 - 15.0											ML - SANDY SILT, GRAY, MOIST.
MN	3	87/6532 J-G	15.0 - 17.5											ML - SANDY SILT, GRAY, MOIST.
MN	3	87/6533 J-H	17.5 - 20.5											CL-HL - SILTY CLAY, YELLOW - BROWN, WET.
MN	3	87/6534 J-I	20.5 - 25.5	0	42	58				1	19.8			CL - LEAN CLAY WITH SAND, YELLOW - BROWN, VERY MOIST.
MN	3	87/6535 J-J	25.5 - 29.0	0	44	56				1	21.8			CL-HL - SILTY CLAY WITH SAND, YELLOW - BROWN, VERY MOIST.
MN	3	87/6536 J-K	29.0 - 34.0	0	14	86	25	19	6		25.3			ML - SANDY SILT, YELLOW - BROWN, VERY MOIST.
MN	3	87/6537 J-L	34.0 - 37.8	0	18	82	28	17	11		23.0			CL - LEAN CLAY WITH SAND, YELLOW - BROWN, VERY MOIST.
MN	3	87/6538 J-M	37.8 - 39.4	0	26	74	23	16	7		22.1			CL-HL - SILTY CLAY WITH SAND, YELLOW - BROWN, VERY MOIST.
MN	3	87/6539 J-N	39.4 - 43.5	0	34	66				1	26.1			ML - SANDY SILT, YELLOW - BROWN, VERY MOIST.
MN	3	87/6540 J-O	43.5 - 46.0	0	59	41				1	25.5			SM - SILTY SAND, YELLOW - BROWN, VERY MOIST.
MN	4	87/6541 J-A	0.0 - 2.0											
MN	4	87/6542 J-B	2.0 - 4.0											
MN	4	87/6543 J-C	4.0 - 6.0											
MN	4	87/6544 J-D	6.0 - 8.0											
MN	4	87/6545 J-E	8.0 - 10.0											
MN	4	87/6546 J-F	10.0 - 15.0											
MN	4	87/6547 J-G	15.0 - 17.1	1	42	57	26	17	9		23.0			CL - SANDY LEAN CLAY, YELLOW - BROWN, MOIST.

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWDED-6L REPORT NO. 14543 LONGHORN MAP

BORING NO.	SND NO.	FLD NO.	DEPTH, FT	GR	SA	FJ	LL	PL	PI	LS	MC, 1	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
MW	4	87/6548	J-H	17.1 - 19.9	0	54	46				1	22.8		SM - SILTY SAND, BROWNISH - YELLOW, MOIST.
MW	4	87/6549	J-I	19.9 - 21.9										
MW	4	87/6550	J-J	21.9 - 26.9										
MW	4	87/6551	J-K	26.9 - 29.0	0	31	69	27	17	10		27.2		CL - SANDY LEAN CLAY, YELLOW - BROWN, WET.
MW	4	87/6552	J-L	29.0 - 32.2	0	8	92	51	18	33		25.9		CH - FAT CLAY, BROWNISH - YELLOW AND GRAY, MOIST.
MW	4	87/6553	J-M	32.2 - 38.1	0	21	79	29	16	13		21.4		CL - LEAN CLAY WITH SAND, YELLOW - BROWN AND GRAY, MOIST.
MW	4	87/6554	J-N	38.1 - 42.0	0	90	10			0		26.4		SP-SM - POORLY GRADED SAND WITH SILT, YELLOW - BROWN, WET.
MW	4	87/6555	J-O	42.0 - 43.0	0	62	38	40	19	21		20.7		SC - CLAYEY SAND, REDDISH - BROWNISH - YELLOW AND GRAY, MOIST.
MW	4	87/6556	J-P	43.0 - 43.6	0	15	85	30	14	16		23.8		CL - LEAN CLAY WITH SAND, REDDISH - YELLOW AND GRAY, MOIST.
MW	5	87/6800	J-A	0.0 - 2.0										
MW	5	87/6801	J-B	2.0 - 3.6										
MW	5	87/6802	J-C	3.6 - 5.4										
MW	5	87/6803	J-D	5.4 - 7.0										
MW	5	87/6804	J-E	7.0 - 9.0										
MW	5	87/6805	J-F	9.0 - 11.2										
MW	5	87/6806	J-G	11.2 - 16.2										
MW	5	87/6807	J-H	16.2 - 19.5										

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TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWDED-BL REPORT NO. 14543 LONGHORN AAP

BORING	NO.	SND NO.	FLD NO.	DEPTH, FT	BR	SA	F1	LL	PL	P1	LS	WC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
NW	5	87/6808	J-I	19.5 - 24.5	0	58	42	1				23.3			SM - SILTY SAND, YELLOW - BROWN, MOIST.
NW	5	87/6809	J-J	24.5 - 28.0	0	64	36	0				24.0			SM - SILTY SAND, YELLOW - BROWN, MOIST.
NW	5	87/6810	J-K	28.0 - 29.8	0	8	92	32	15	17		25.6			CL - LEAN CLAY, GRAY, MOIST.
NW	5	87/6811	J-L	29.8 - 31.5	0	58	42	0				26.4			SM - SILTY SAND, GRAY, MOIST.
NW	5	87/6812	J-M	31.5 - 34.5	0	8	92	31	15	16		24.9			CL - LEAN CLAY, GRAY WITH YELLOW, MOIST.
NW	5	87/6813	J-N	34.5 - 36.4	0	20	80	25	16	9		22.2			CL - LEAN CLAY WITH SAND, BROWN, MOIST.
NW	5	87/6814	J-O	36.4 - 40.8	0	39	61	28	21	7		25.5			CL-ML - SANDY SILTY CLAY, BROWNISH - YELLOW, MOIST.
NW	6	87/6815	J-A	0.0 - 1.7											
NW	6	87/6816	J-B	1.7 - 3.7											
NW	6	87/6817	J-C	3.7 - 5.0											
NW	6	87/6818	J-D	5.0 - 7.1											
NW	6	87/6819	J-E	7.1 - 9.1											
NW	6	87/6820	J-F	9.1 - 13.9											
NW	6	87/6821	J-G	13.9 - 18.0											
NW	6	87/6822	J-H	18.0 - 19.5	0	65	35	2				23.7			SM - SILTY SAND, YELLOW - BROWN, MOIST.
NW	6	87/6823	J-I	19.5 - 22.0	0	21	79	31	23	8		32.3			ML - SILT WITH SAND, YELLOW - BROWN, MET.
NW	6	87/6824	J-J	22.0 - 27.0											

TABLE 1

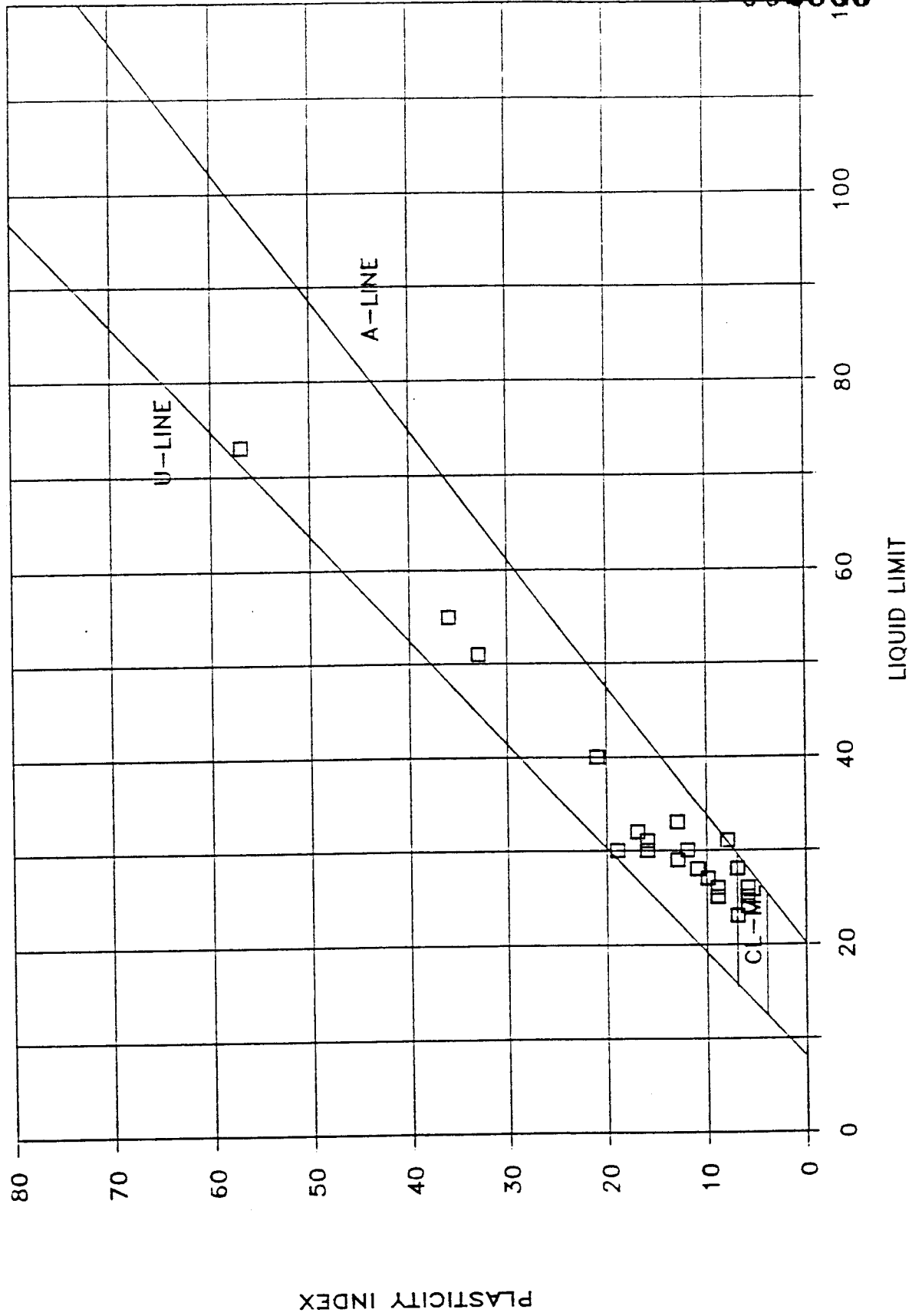
RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWED-6L REPORT NO. 14543 LONGHORN ARP

BORING NO.	SND NO.	FLD NO.	DEPTH, FT	GR	SA	F1	LL	PL	P1	LS	MC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
MW	6	87/6825 J-K	27.0 - 32.0	0	5	95	55	19	36		26.7			CH CL - FAT CLAY, BROWN, MOIST.
MW	6	87/6826 J-L	32.0 - 37.0											
MW	6	87/6827 J-M	37.0 - 42.2	0	18	82	26	20	6		24.6			CL-ML - SILTY CLAY WITH SAND, GRAY, MOIST.
MW	6	87/6828 J-N	42.2 - 43.8	0	42	58				2	27.9			ML - SANDY SILT, DARK GRAY, MOIST.

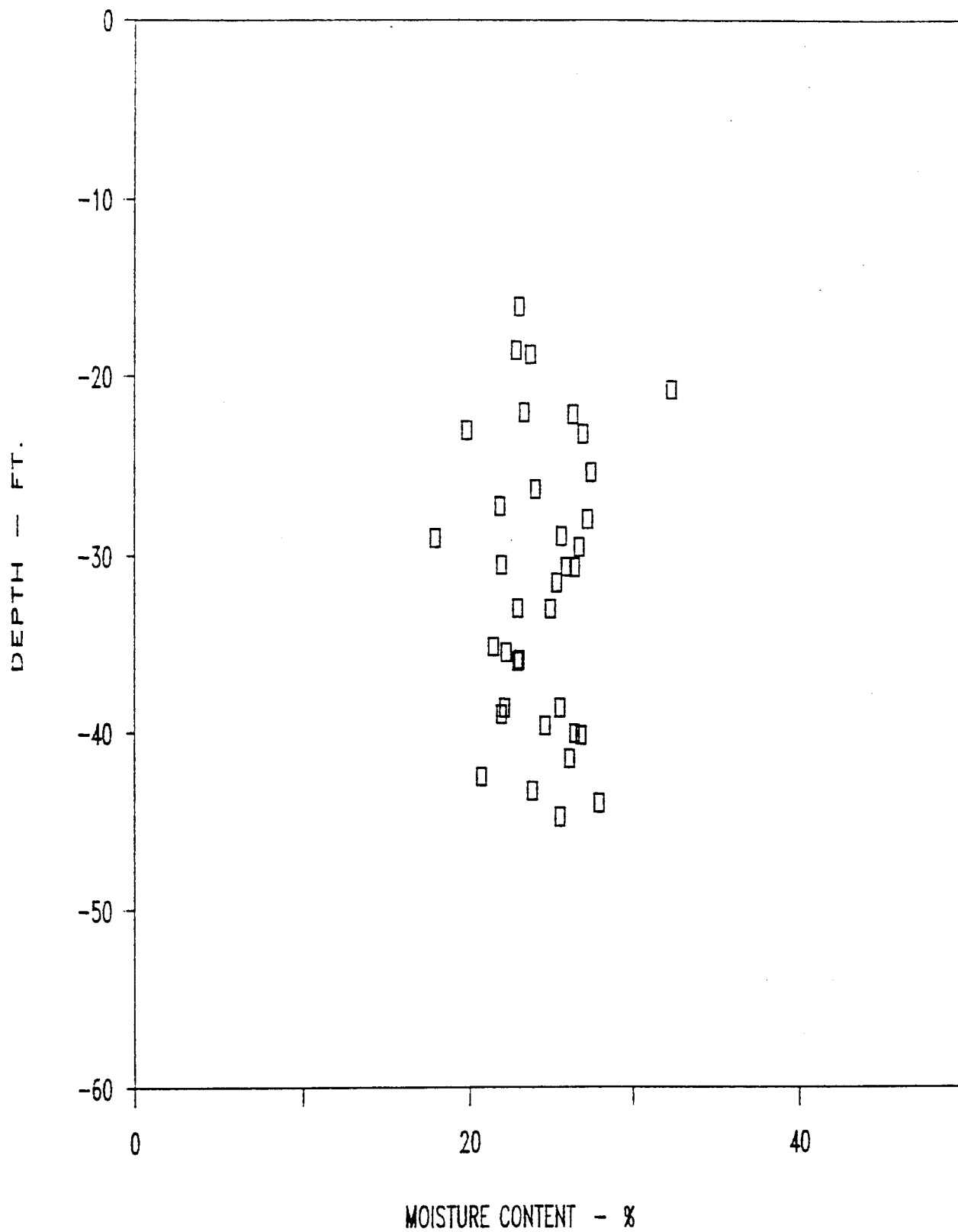
PLASTICITY CHART

LONGHORN AAP - MONITORING WELLS



MOISTURE CONTENT VS DEPTH 002966

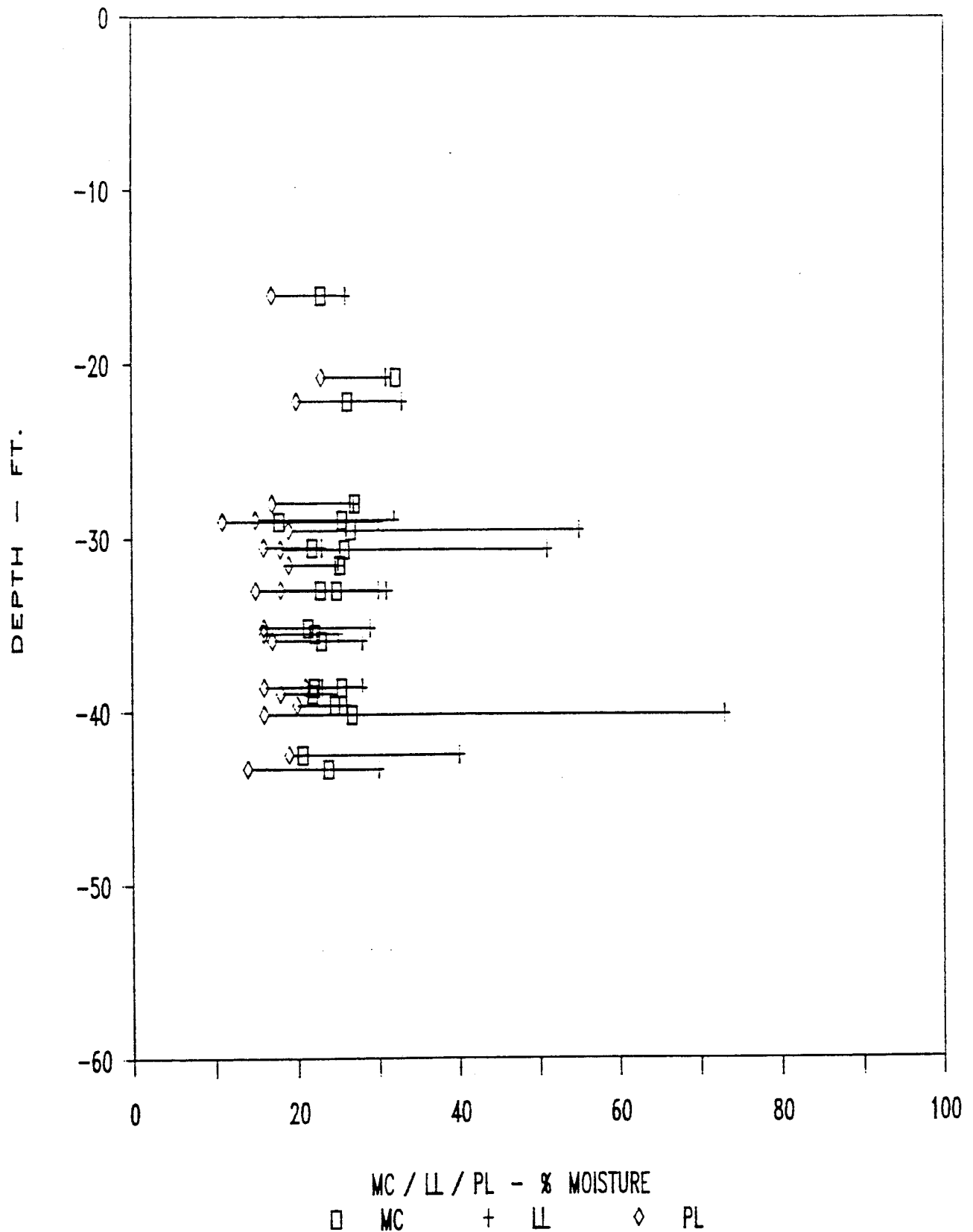
LONGHORN AAP - MONITORING WELLS



MC / LL / PL VS DEPTH

002967

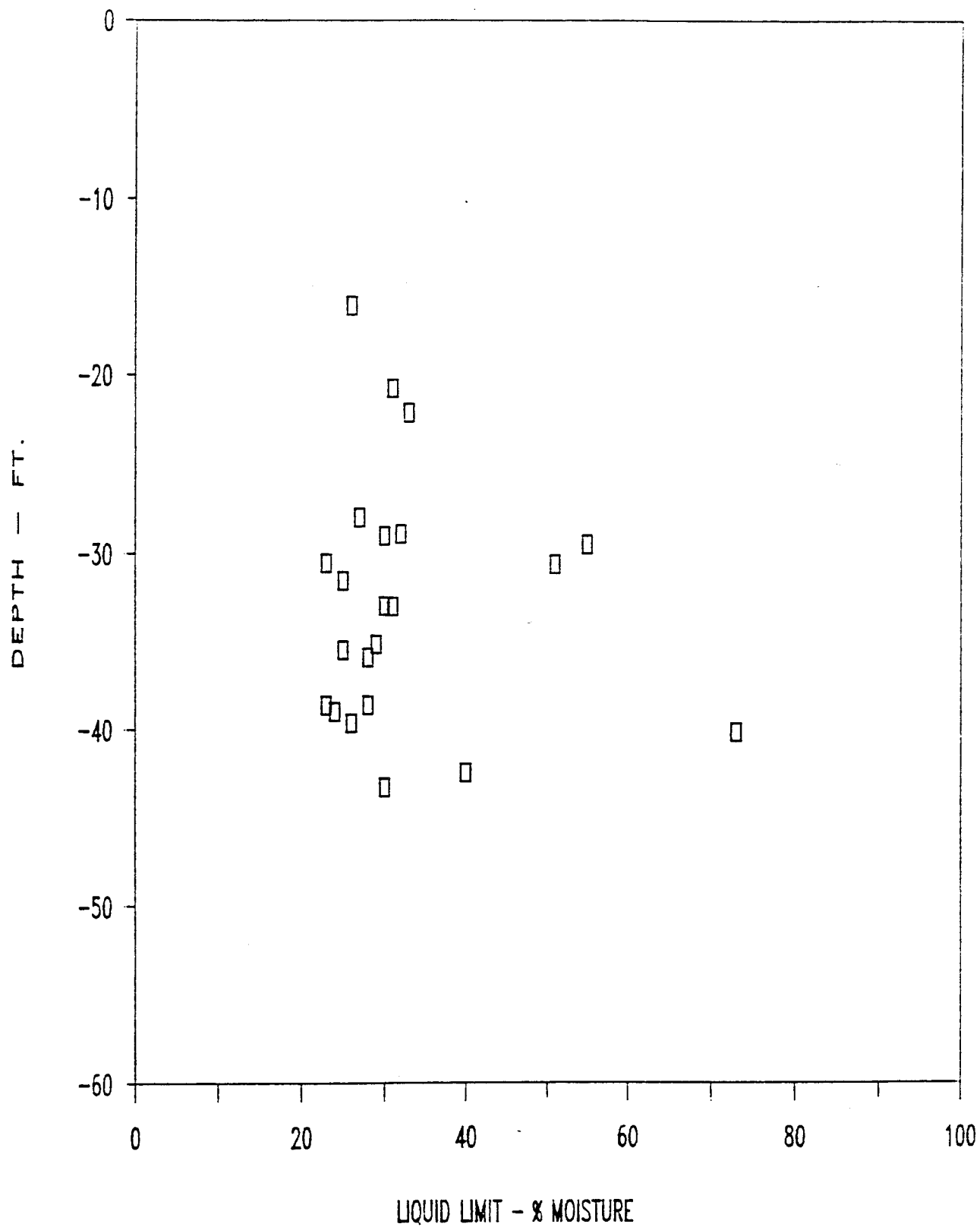
LONGHORN AAP - MONITORING WELLS



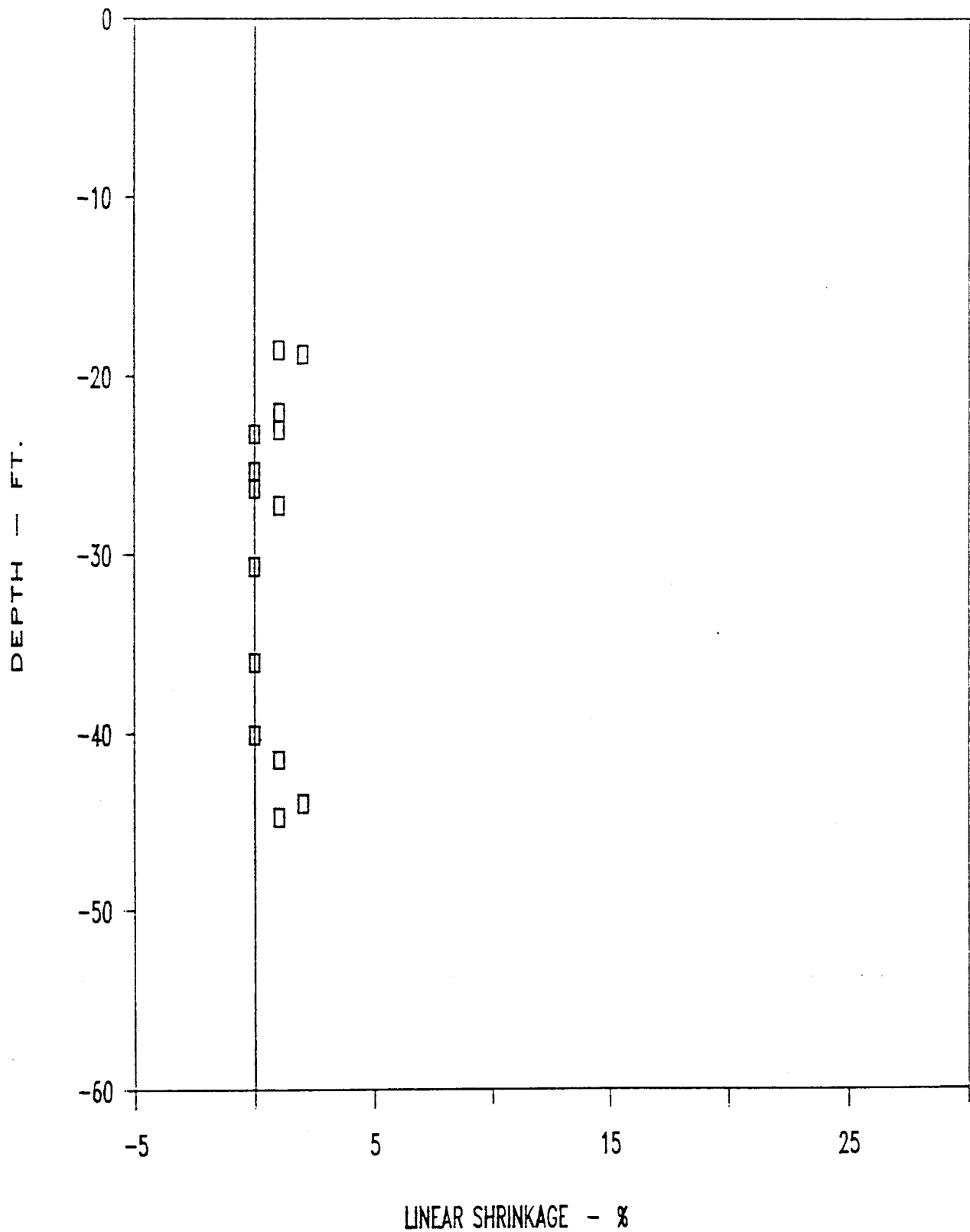
LIQUID LIMIT VS DEPTH

002968

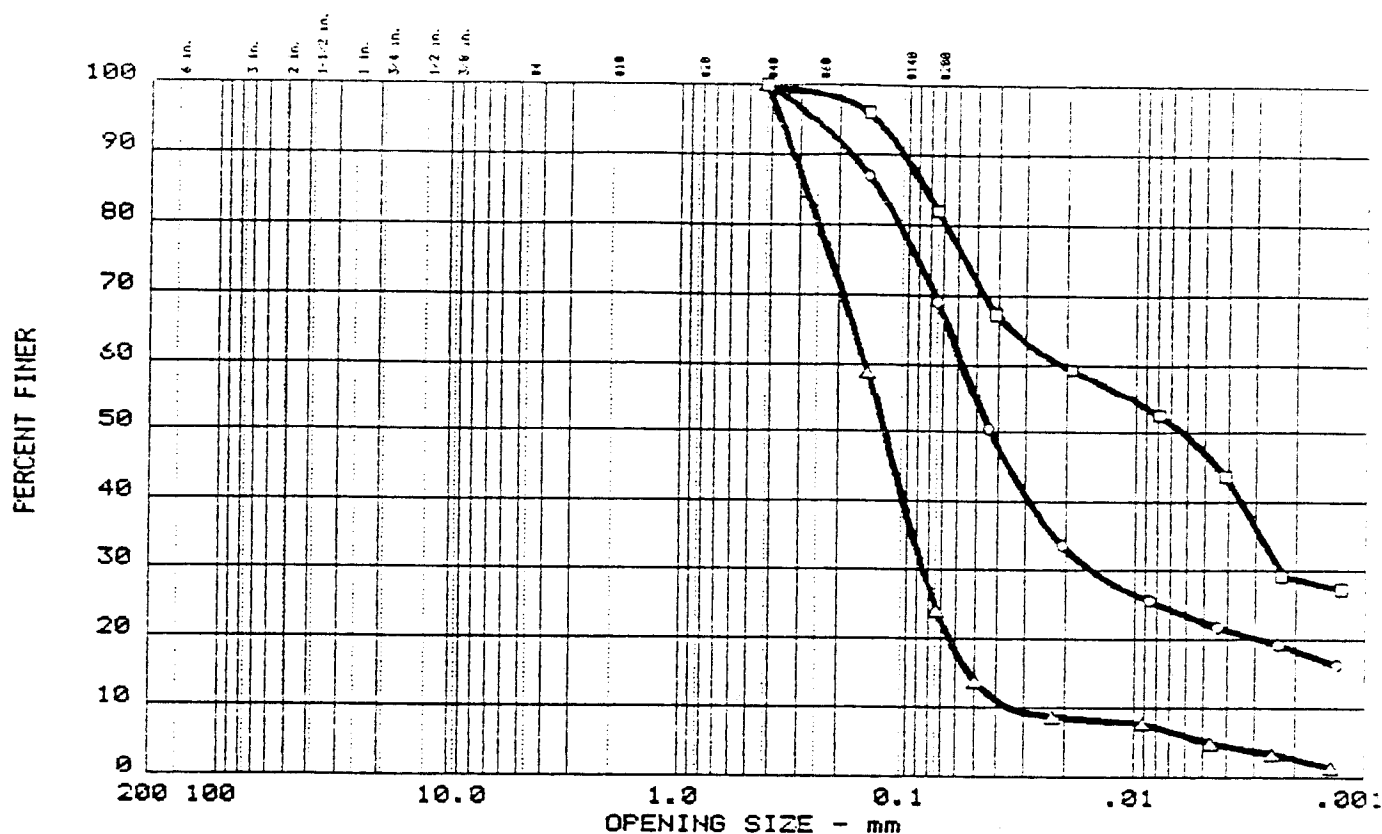
LONGHORN AAP - MONITORING WELLS



LONGHORN AAP - MONITORING WELLS



GRAIN SIZE DISTRIBUTION TEST REPORT

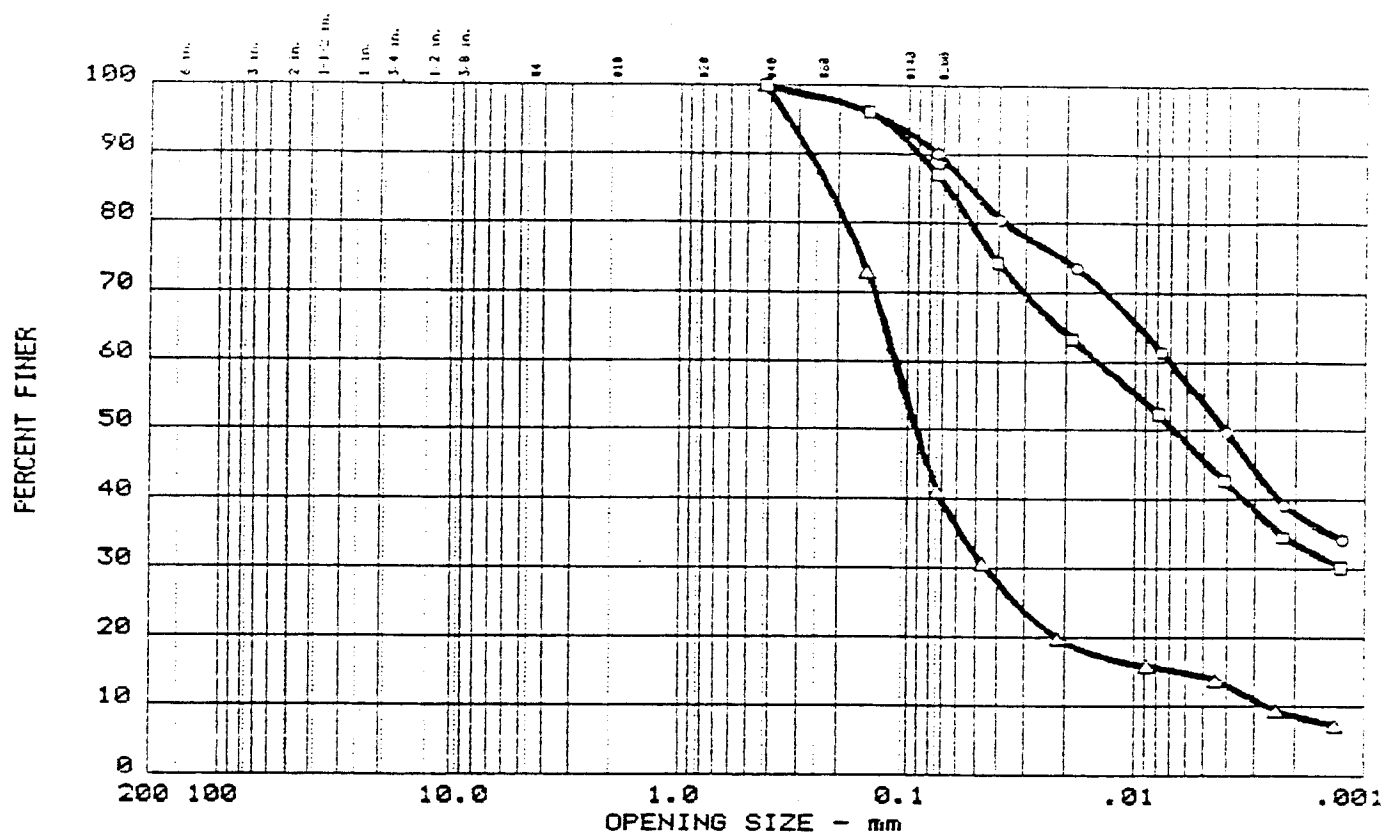


	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	31.0	46.7	22.3
Δ	0.0	0.0	76.0	18.7	5.3
□	0.0	0.0	18.0	35.1	46.9

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ CL		33	13					
Δ SM		NP		0.15	0.085	0.0337	1.40	4.5
□ CL		30	19					

MATERIAL DESCRIPTION	TYPE OF TEST
○ SANDY LEAN CLAY Δ SILTY SAND □ LEAN CLAY WITH SAND	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543 Project: LONGHORN AAP ○ Location: MW-1, J-I, 20.0'-24.2', SWD 87/6502 Δ Location: MW-1, J-J, 24.2'-26.4', SWD 87/6503 □ Location: MW-1, J-K, 26.5'-31.5', SWD 87/6504 Date: MARCH, 1988	Remarks: SWD 87/6503 LS: 0
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	

GRAIN SIZE DISTRIBUTION TEST REPORT



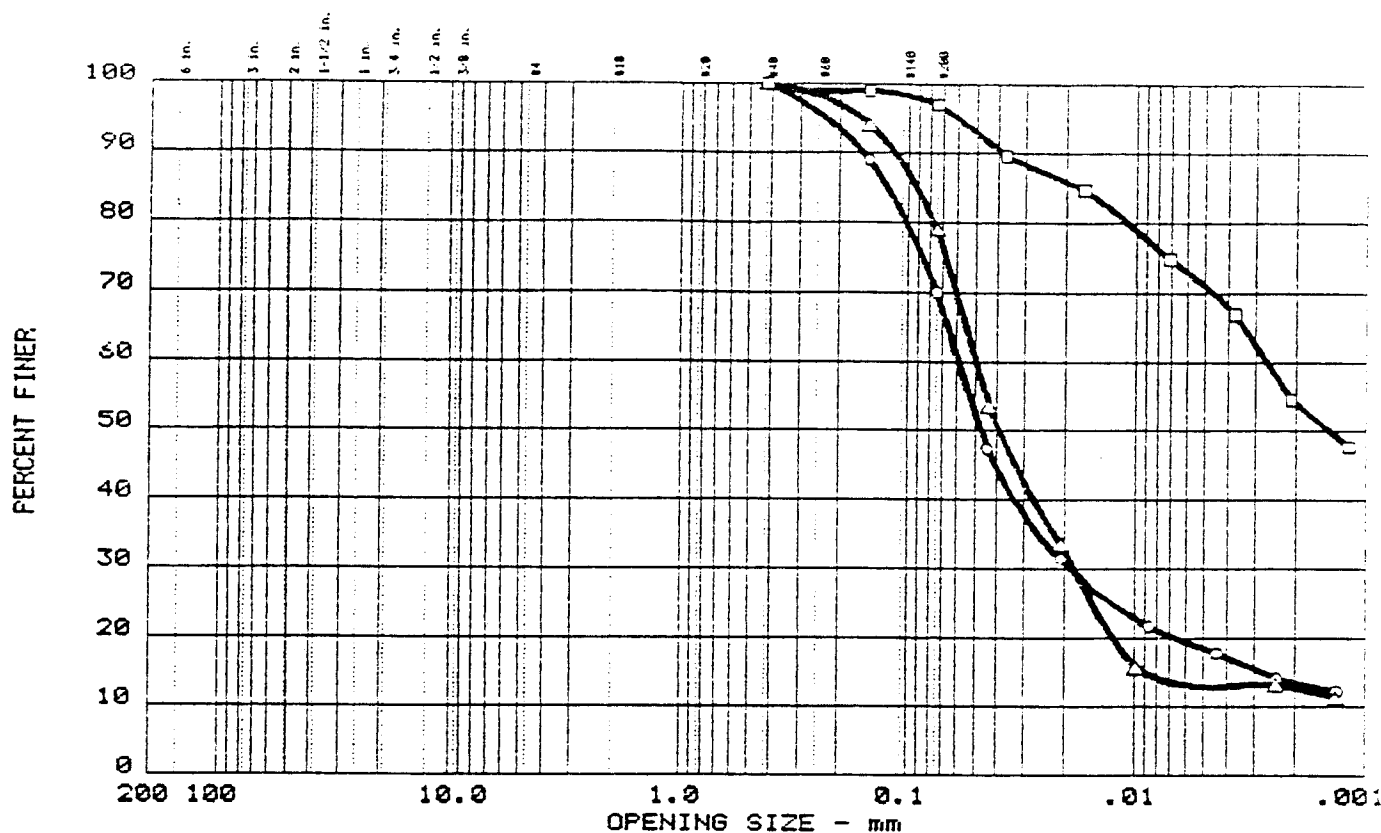
	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	10.0	36.2	53.8
Δ	0.0	0.0	59.0	26.7	14.3
□	0.0	0.0	13.0	41.5	45.5

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ CL		30	12					
Δ SM				0.11	0.044	0.0026	6.68	43.2
□ CL-ML		23	7					

MATERIAL DESCRIPTION	TYPE OF TEST
○ LEAN CLAY Δ SILTY SAND □ SILTY CLAY	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543 Project: LONGHORN AAP ○ Location: MW-1, J-L, 31.5'-34.4', SWD 87/6505 Δ Location: MW-2, J-I, 20.4'-26.0', SWD 87/6296 □ Location: MW-2, J-K, 27.0'-34.0', SWD 87/6298 Date: MARCH, 1988	Remarks: SWD 87/6296 LS: 0
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. <u>7</u>

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GRAIN SIZE DISTRIBUTION TEST REPORT



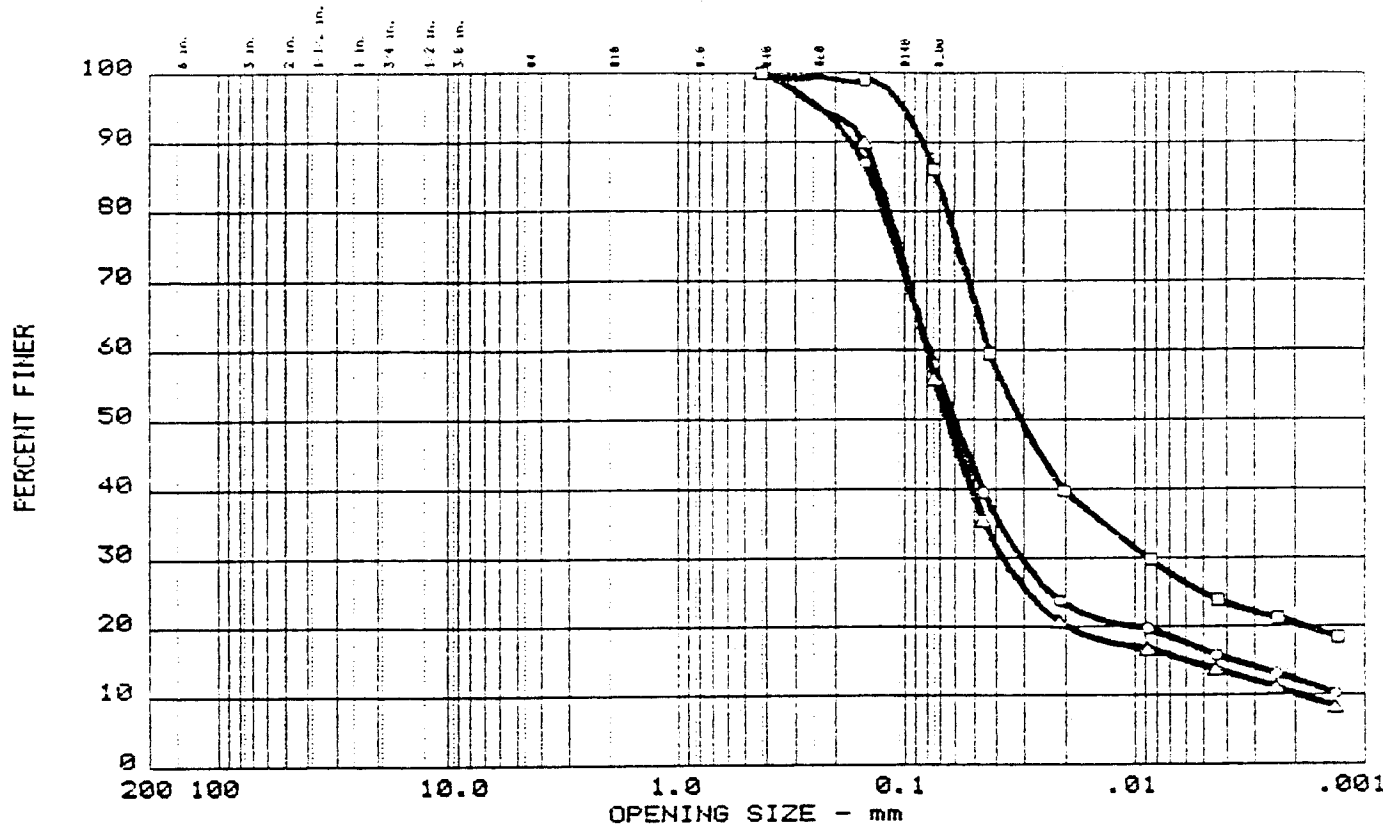
	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	30.0	51.6	18.4
Δ	0.0	0.0	21.0	66.1	12.9
□	0.0	0.0	3.0	26.0	71.0

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ ML		NP						
Δ CL-ML		24	6					
□		73	57					

MATERIAL DESCRIPTION	TYPE OF TEST
○ SANDY SILT	ASTM D 422-63(72)
Δ SILTY CLAY WITH SAND	Hydrometer analysis
□ CLAY-SHALE	Mechanical analysis
Project No.: SWD NO. 14543	Remarks:
Project: LONGHORN AAP	SWD 87/6299 LS: 0
○ Location: MW-2, J-L, 34.0'-38.0', SWD 87/6299	
Δ Location: MW-2, J-M, 38.0'-39.9', SWD 87/6300	
□ Location: MW-2, J-N, 39.9'-40.4', SWD 87/6301	
Date: MARCH, 1988	
GRAIN SIZE DISTRIBUTION TEST REPORT	
CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 8

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GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	42.0	41.5	16.5
Δ	0.0	0.0	44.0	41.7	14.3
□	0.0	0.0	14.0	61.2	24.8

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ ML		NP						
Δ ML		NP		0.08	0.037	0.0019	9.33	42.7
□ CL-ML		25	6					

MATERIAL DESCRIPTION	TYPE OF TEST
○ SANDY SILT	ASTM D 422-63(72)
Δ SANDY SILT	Hydrometer analysis
□ SILTY CLAY	Mechanical analysis

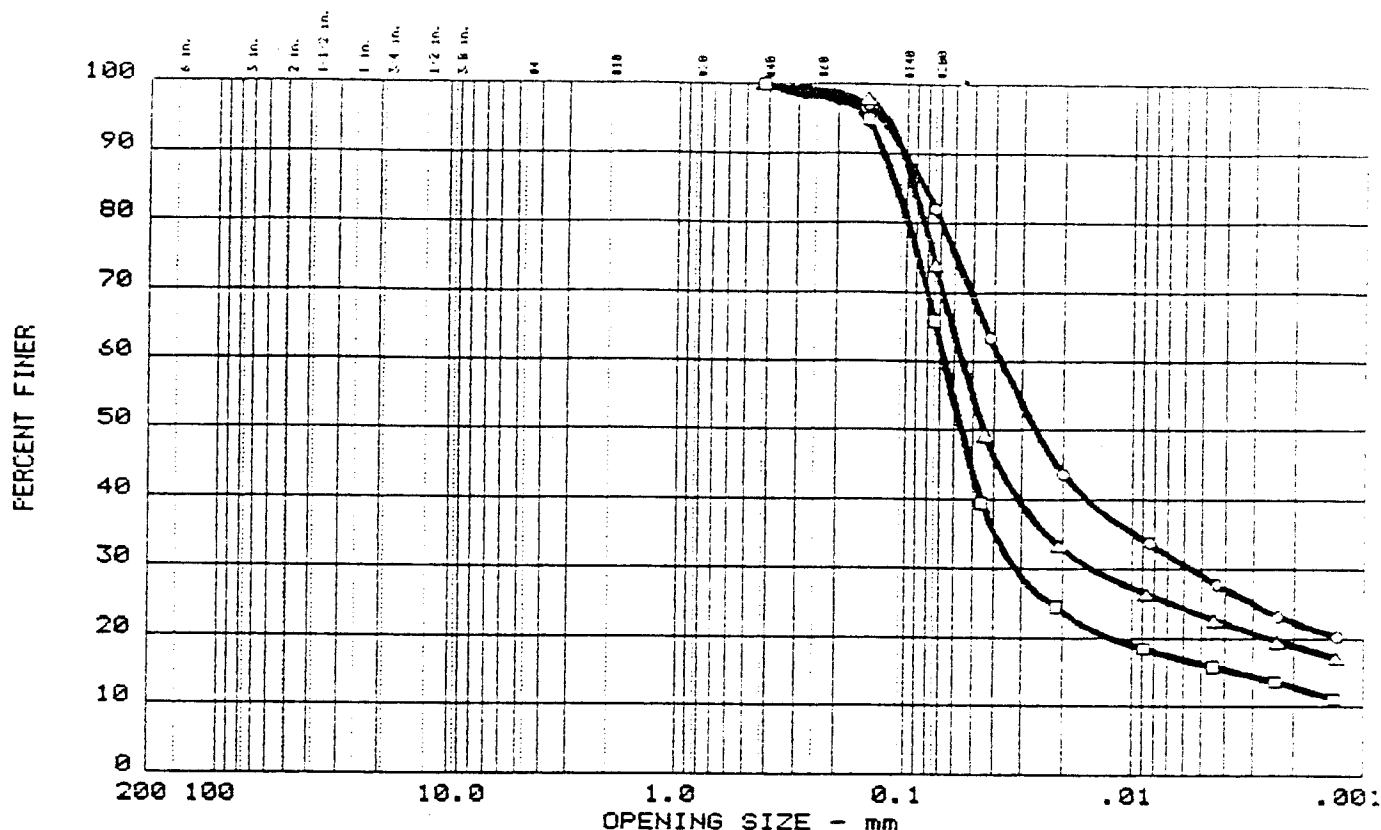
Project No.: SWD NO. 14543
 Project: LONGHORN AAP
 ○ Location: MW-3, J-I, 20.5'-25.5', SWD 87/6534
 Δ Location: MW-3, J-J, 25.5'-29.0', SWD 87/6535
 □ Location: MW-3, J-K, 29.0'-34.0', SWD 87/6536
 Date: MARCH, 1988

Remarks:
 SWD 87/6534 LS: 1
 SWD 87/6535 LS: 1

GRAIN SIZE DISTRIBUTION TEST REPORT
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GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	18.0	53.0	29.0
Δ	0.0	0.0	26.0	50.7	23.3
□	0.0	0.0	34.0	49.8	16.2

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ CL		28	11					
Δ CL-ML		23	7					
□ ML		NP						

MATERIAL DESCRIPTION	TYPE OF TEST
○ LEAN CLAY WITH SAND	ASTM D 422-63(72)
Δ SILTY CLAY WITH SAND	Hydrometer analysis
□ SANDY SILT	Mechanical analysis

Project No.: SWD NO. 14543
 Project: LONGHORN AAP
 ○ Location: MW-3, J-L, 34.0'-37.8', SWD 87/6537
 Δ Location: MW-3, J-M, 37.8'-39.4', SWD 87/6538
 □ Location: MW-3, J-N, 39.4'-43.5', SWD 87/6539
 Date: MARCH, 1988

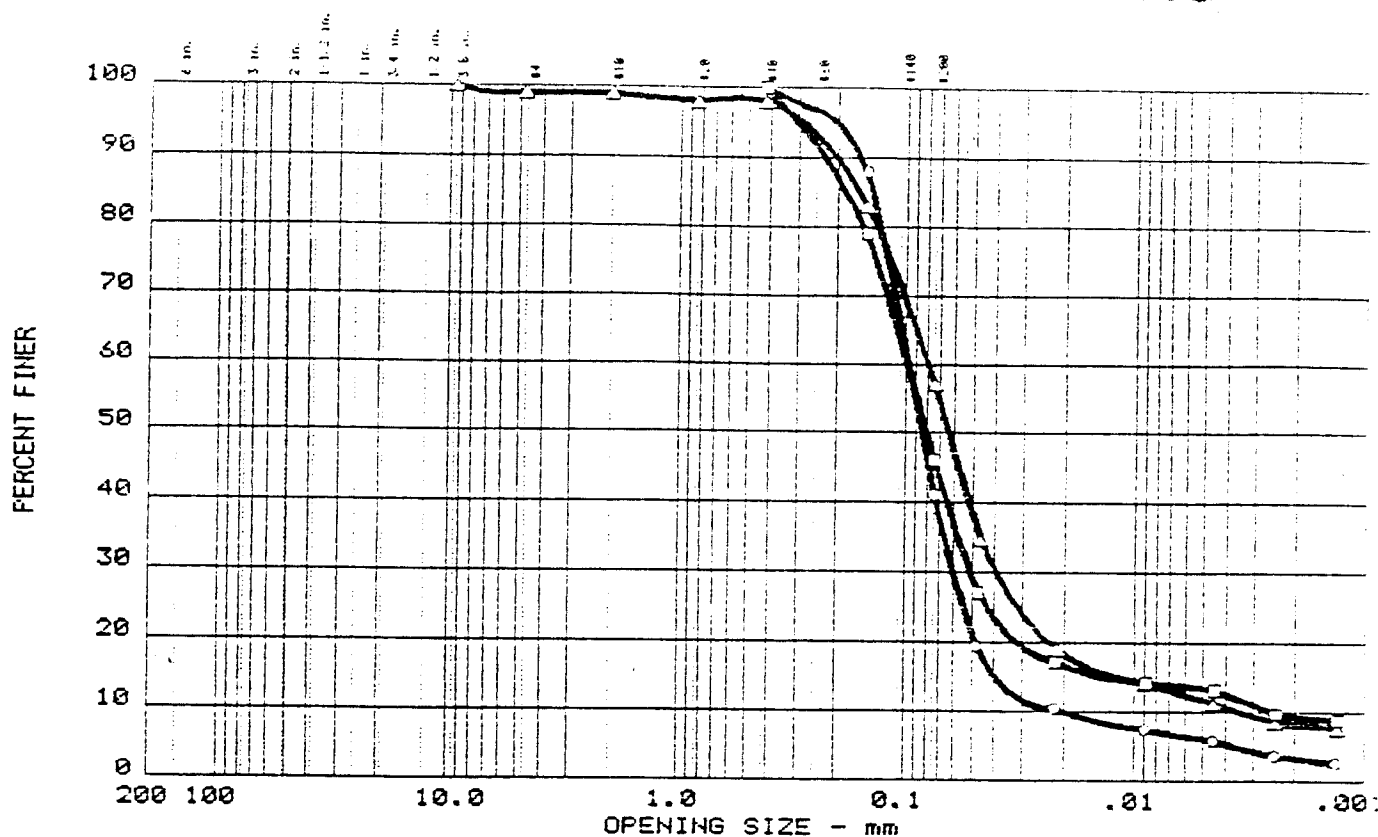
Remarks:

SWD 87/6539 LS: 1

GRAIN SIZE DISTRIBUTION TEST REPORT
 CORPS OF ENGINEERS - SOUTHWESTERN

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GRAIN SIZE DISTRIBUTION TEST REPORT 002975

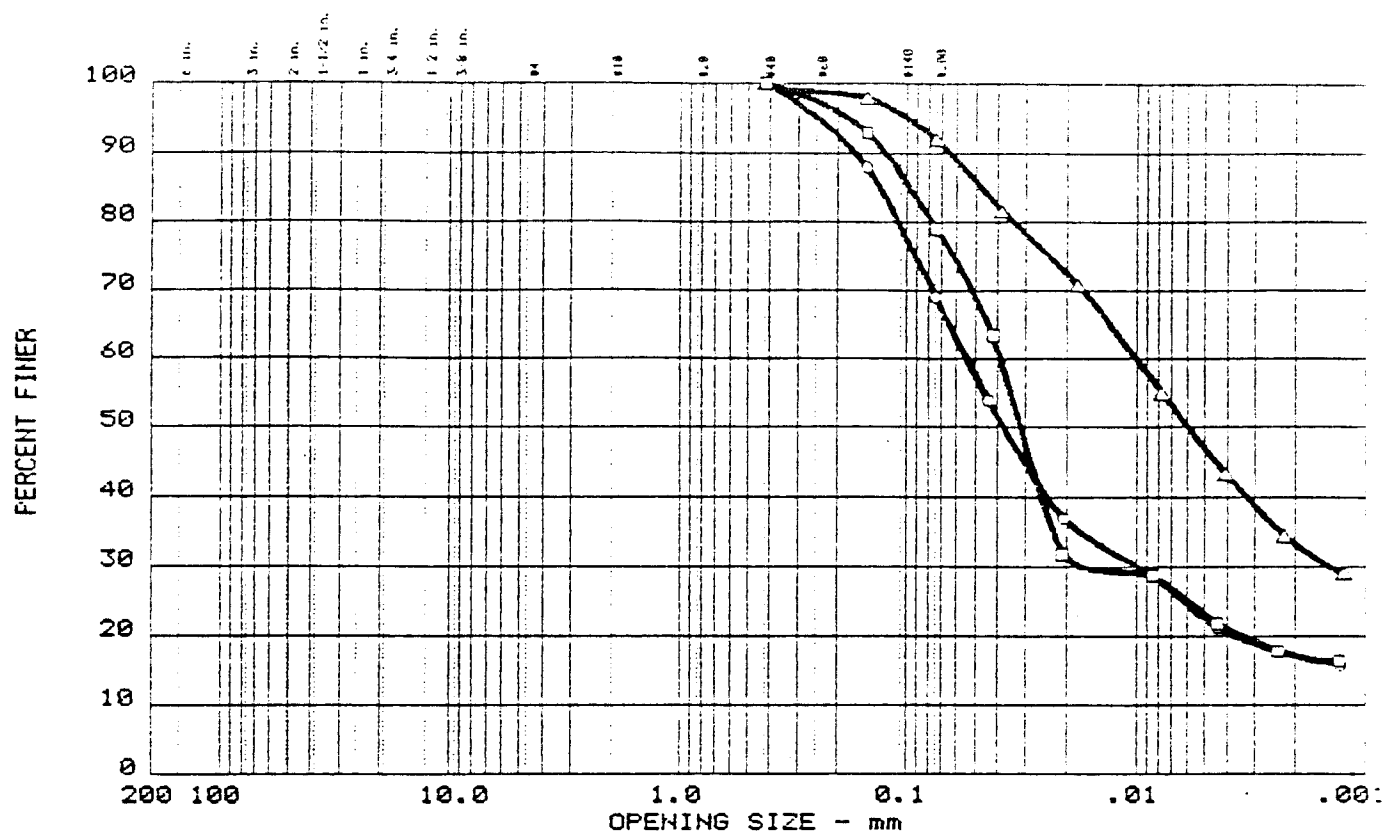


%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○ 0.0	0.0	59.0	34.9	6.1
Δ 0.0	1.0	42.0	45.0	11.7
□ 0.0	0.0	54.0	32.6	13.4

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ SM		NP		0.10	0.061	0.0201	1.90	4.8
Δ CL		26	9	0.08	0.040	0.0034	5.87	23.5
□ SM		NP		0.10	0.051	0.0024	11.16	41.0

MATERIAL DESCRIPTION	TYPE OF TEST
○ SILTY SAND	ASTM D 422-63(72)
Δ SANDY LEAN CLAY	Hydrometer analysis
□ SILTY SAND	Mechanical analysis
Project No.: SWD NO. 14543	Remarks:
Project: LONGHORN AAP	SWD 87/6540 LS: 1
○ Location: MW-3, J-0, 43.5'-46.0', SWD 87/6540	
Δ Location: MW-4, J-6, 15.0'-17.1', SWD 87/6547	
□ Location: MW-4, J-H, 17.1'-19.9', SWD 87/6548	SWD 87/6548 LS: 1
Date: MARCH, 1988	
GRAIN SIZE DISTRIBUTION TEST REPORT	
CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 11

GRAIN SIZE DISTRIBUTION TEST REPORT

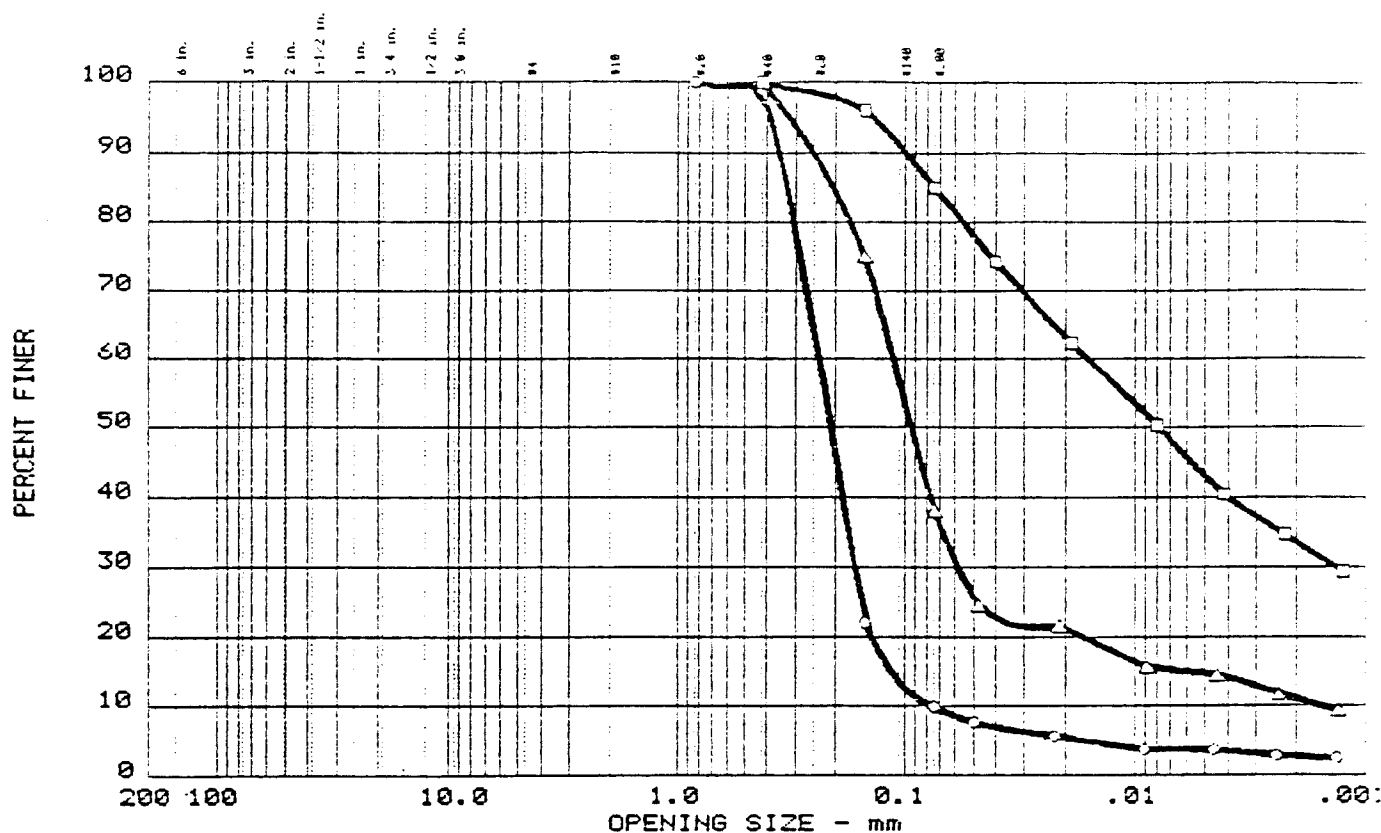


%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○ 0.0	0.0	31.0	46.5	22.5
Δ 0.0	0.0	8.0	45.1	46.9
□ 0.0	0.0	21.0	55.8	23.2

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ CL		27	10					
Δ CH		51	33					
□ CL		29	13					

MATERIAL DESCRIPTION	TYPE OF TEST
○ SANDY LEAN CLAY Δ FAT CLAY □ LEAN CLAY WITH SAND	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543 Project: LONGHORN AAP ○ Location: MW-4, J-K, 26.9'-29.0', SWD 87/6551 Δ Location: MW-4, J-L, 29.0'-32.2', SWD 87/6552 □ Location: MW-4, J-M, 32.2'-38.1', SWD 87/6553 Date: MARCH, 1988	Remarks:
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 12

GRAIN SIZE DISTRIBUTION TEST REPORT

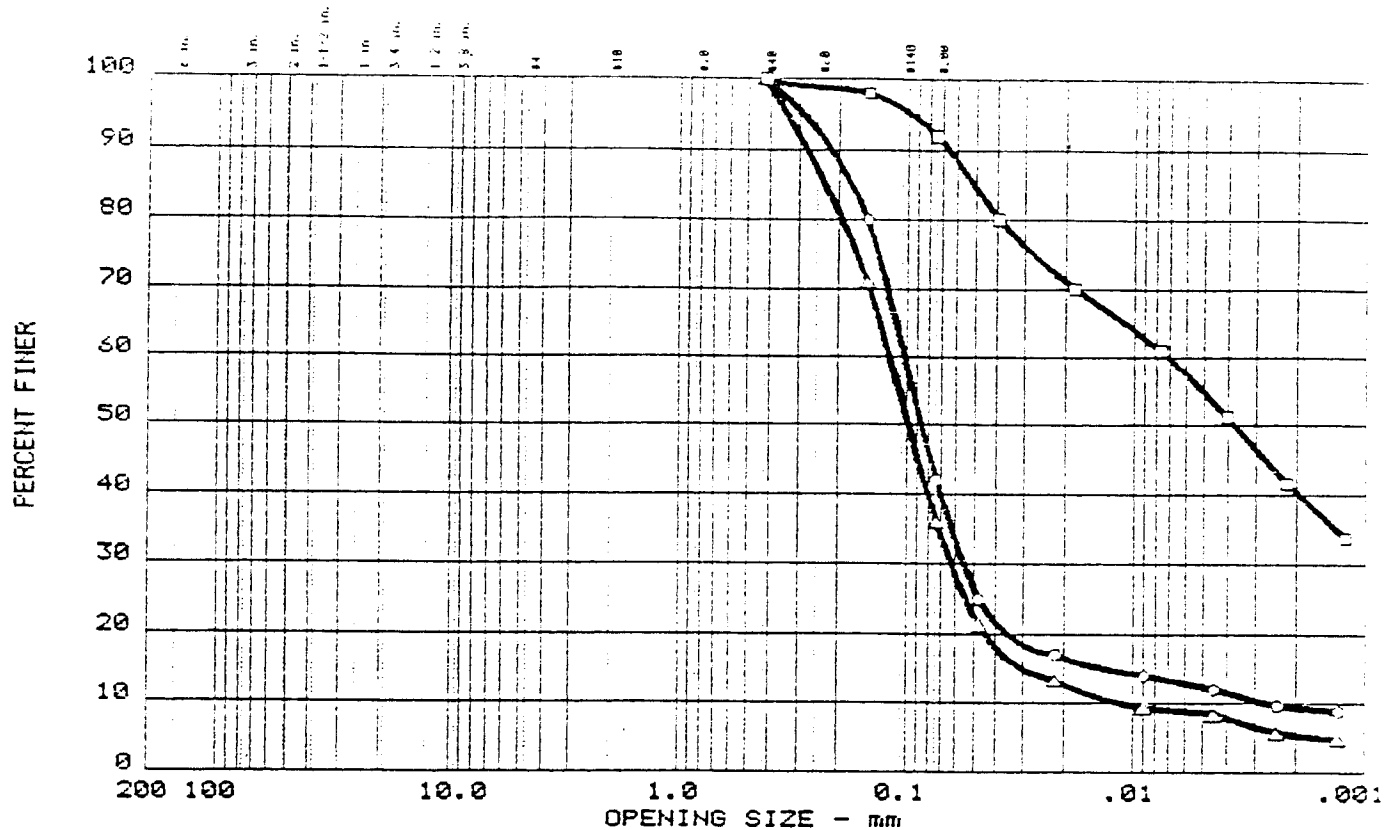


%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○ 0.0	0.0	90.0	6.3	3.7
△ 0.0	0.0	62.0	23.3	14.7
□ 0.0	0.0	15.0	42.0	43.0

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ SP-SM		NP		0.24	0.165	0.0739	1.56	3.2
△ SC		40	21	0.11	0.059	0.0015	20.00	76.2
□ CL		30	16					

MATERIAL DESCRIPTION	TYPE OF TEST
○ POORLY GRADED SAND WITH SILT △ CLAYEY SAND □ LEAN CLAY WITH SAND	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543 Project: LONGHORN AAP ○ Location: MW-4, J-N, 38.1'-42.0', SWD 87/6554 △ Location: MW-4, J-O, 42.0'-43.0', SWD 87/6555 □ Location: MW-4, J-P, 43.0'-43.6', SWD 87/6556 Date: MARCH, 1988	Remarks: SWD 87/6554 LS: 0
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	58.0	29.6	12.4
△	0.0	0.0	64.0	27.4	8.6
□	0.0	0.0	8.0	37.3	54.7

	USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○	SM		NP		0.10	0.055	0.0027	11.32	38.5
△	SM		NP		0.12	0.063	0.0113	2.99	10.6
□	CL		32	17					

MATERIAL DESCRIPTION	TYPE OF TEST
☐ SILTY SAND	ASTM D 422-63(72)
☐ SILTY SAND	Hydrometer analysis
☐ LEAN CLAY	Mechanical analysis

Project No.: SWD NO. 14543

Project: LONGHORN AAP

0 Location: MW-5, J-I, 19.5'-24.5', SWD 87/6808

Δ Location: MW-5, J-J, 24.5'-28.0', SWD 87/6809

□ Location: MW-5, J-K, 28.0'-29.8', SWD 87/6810

Date: MARCH, 1988

Remarks:

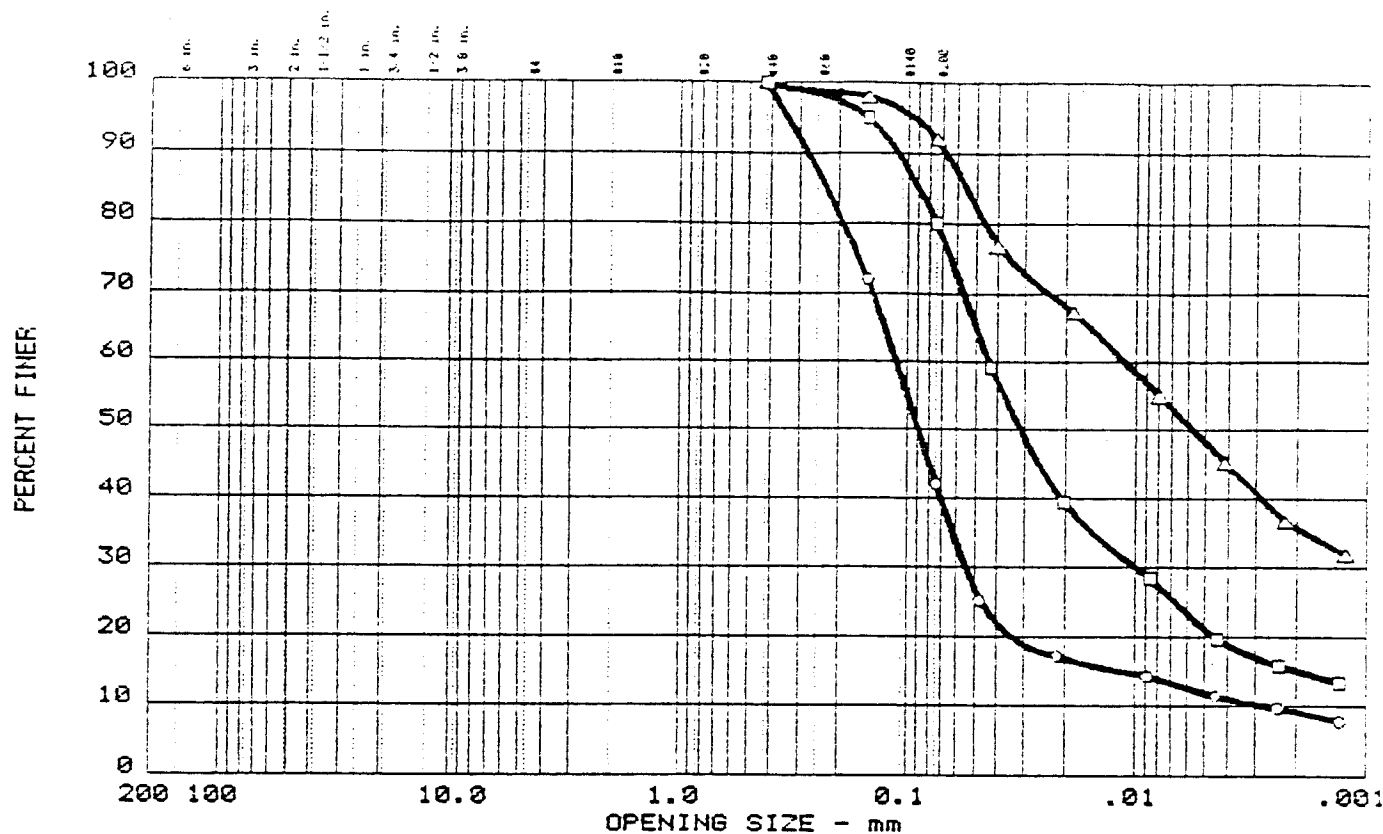
SWD 87/6808 LS: 1

SWD 87/6809 LS: 0

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - SOUTHWESTERN

Plate No. 14

GRAIN SIZE DISTRIBUTION TEST REPORT

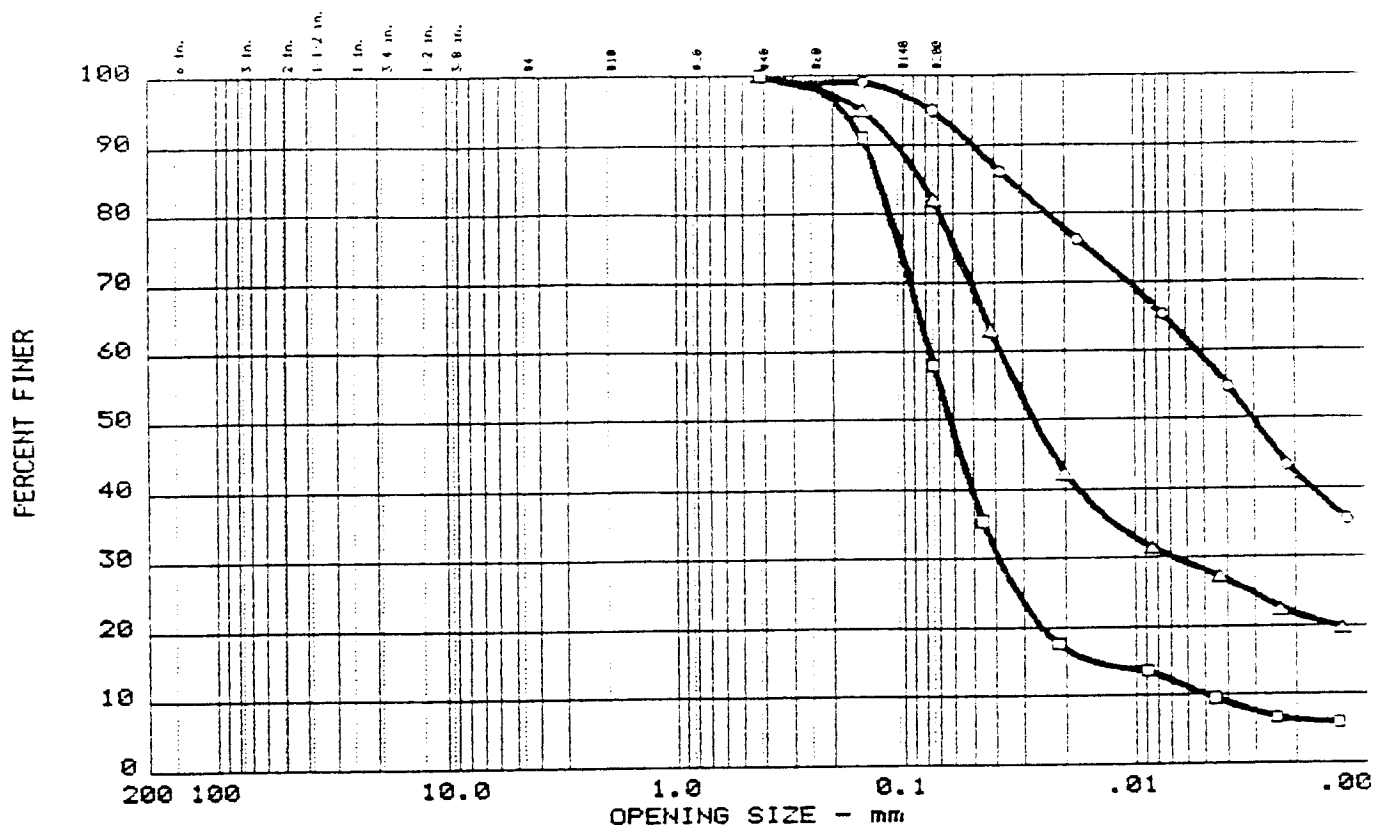


	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	58.0	30.2	11.8
Δ	0.0	0.0	8.0	43.9	48.1
□	0.0	0.0	20.0	59.0	21.0

	USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○	SM		NP		0.11	0.055	0.0026	10.12	42.2
Δ	CL		31	16					
□	CL		25	9					

MATERIAL DESCRIPTION	TYPE OF TEST
○ SILTY SAND Δ LEAN CLAY □ LEAN CLAY WITH SAND	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543 Project: LONGHORN AAP ○ Location: MW-5, J-L, 29.8'-31.5', SWD 87/6811 Δ Location: MW-5, J-M, 31.5'-34.5', SWD 87/6812 □ Location: MW-5, J-N, 34.5'-36.4', SWD 87/6813 Date: MARCH, 1988	Remarks: SWD 87/6811 LS: 0
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 15

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	5.0	36.2	58.8
△	0.0	0.0	18.0	53.9	28.1
□	0.0	0.0	42.0	47.9	10.1

	USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○	CH		55	36					
△	CL-ML		26	6					
□	ML		NP		0.08	0.039	0.0049	4.03	15.7

MATERIAL DESCRIPTION	TYPE OF TEST
○ FAT CLAY	ASTM D 422-63(72)
△ SILTY CLAY WITH SAND	Hydrometer analysis
□ SANDY SILT	Mechanical analysis
Project No.: SWD NO. 14543	Remarks:
Project: LONGHORN AAP	
○ Location: MW-6, J-K, 27.0'-32.0', SWD 87/6825	
△ Location: MW-6, J-M, 37.0'-42.2', SWD 87/6827	
□ Location: MW-6, J-N, 42.2'-45.8', SWD 87/6828	
Date: MARCH, 1988	
GRAIN SIZE DISTRIBUTION TEST REPORT	
CORPS OF ENGINEERS - SOUTHWESTERN	SWD 87/6828 LS: 2
	Plate No. 17

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWDED-6L REPORT NO. 14543-12 LONGHORN AAP - GROUND-WATER MONITORING WELLS

[illegible]

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SHOED-6L REPORT NO. 14543-12 LONGHORN AAP - GROUND-WATER MONITORING WELLS

BORING NO.	SND NO. FLD NO. DEPTH. FT	GR	SA	FI	LL	PL	PT	LS	WC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
NW	9 88/5732 J-H	11.0 - 12.5										
NW	9 88/5733 J-I	12.5 - 13.1	0	21	79	50	16	34	24.6			- CLAY-SHALE. LIGHT GRAY WITH YELLOW. MOIST.
NW	9 88/5734 J-J	13.1 - 16.0	0	72	28			2	30.4			SM - SILTY SAND, YELLOWISH - BROWN. MOIST.
NW	9 88/5735 J-K	16.0 - 19.0	0	3	97	59	16	43	25.5			- CLAY-SHALE. LIGHT GRAY WITH YELLOWISH - BROWN. MOIST.
NW	9 88/5736 J-L	19.0 - 24.0	0	20	80	34	13	21	19.1			- CLAY-SHALE. LIGHT GRAY WITH YELLOWISH - BROWN. MOIST.
NW	9 88/5737 J-M	24.0 - 26.0										
NW	9 88/5738 J-N	26.0 - 27.0	0	5	95	50	16	34	19.8			- CLAY-SHALE. LIGHT GRAY AND YELLOWISH - BROWN. MOIST.
NW	10 88/5898 J-A	0.0 - 1.0										
NW	10 88/5899 J-B	1.0 - 3.0										
NW	10 88/5900 J-C	3.0 - 5.1										
NW	10 88/5901 J-D	5.1 - 7.2	0	26	74	25	13	12	22.6			CL - LEAN CLAY WITH SAND. LIGHT GRAY WITH REDDISH - YELLOW. MOIST.
NW	10 88/5902 J-E	7.2 - 9.2	0	53	47			0	23.4			SM - SILTY SAND, YELLOWISH - GRAY. MOIST.
NW	10 88/5903 J-F	9.2 - 11.2										
NW	10 88/5904 J-G	11.2 - 13.0	0	57	43			0	26.3			SM - SILTY SAND, YELLOWISH - GRAY. MOIST.
NW	10 88/5905 J-H	13.0 - 18.0	0	45	55			2	22.2			ML - SANDY SILT, YELLOWISH - GRAY. MOIST.
NW	10 88/5906 J-I	18.0 - 19.5										
NW	10 88/5907 J-J	19.5 - 23.5	0	88	12			0	31.4			SP-SM - POORLY GRADED SAND WITH SILT, REDDISH - YELLOW GRAY. MOIST.

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SHOED-6L REPORT NO. 14543-12 LONGHORN AAP - GROUND-WATER MONITORING WELLS

BORING NO.	SND NO.	FLD NO.	DEPTH, FT	BR	SA	FI	LL	PL	PI	LS	WC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
MW	10	88/5908 J-K	23.5 - 28.5	0	65	35				0	24.8			SM - SILTY SAND, YELLOWISH DARK GRAY, MOIST.
MW	10	88/5909 J-L	28.5 - 32.0	0	62	38				0	28.6			SM - SILTY SAND, DARK GRAY, MOIST.
MW	10	88/5910 J-M	32.0 - 34.5	0	55	45				1	25.7			SM - SILTY SAND, REDDISH - YELLOW DARK GRAY, MOIST.
MW	11	88/5911 J-A	0.0 - 0.4											
MW	11	88/5912 J-B	0.4 - 1.9											
MW	11	88/5913 J-C	1.9 - 3.9											
MW	11	88/5914 J-D	3.9 - 5.0	0	37	63	33	15	18		15.2			CL - SANDY LEAN CLAY, REDDISH - YELLOW GRAY, MOIST.
MW	11	88/5915 J-E	5.0 - 6.0											
MW	11	88/5916 J-F	6.0 - 8.0	0	69	31				1	20.7			SM - SILTY SAND, YELLOWISH - GRAY, MOIST.
MW	11	88/5917 J-G	8.0 - 10.0	0	71	29				0	29.1			SM - SILTY SAND, YELLOWISH - GRAY, MOIST.
MW	11	88/5918 J-H	10.0 - 11.6											
MW	12	88/6047 J-A	0.0 - 0.7											
MW	12	88/6048 J-B	0.7 - 2.7											
MW	12	88/6049 J-C	2.7 - 4.0											
MW	12	88/6050 J-D	4.0 - 6.0	0	24	76	23	13	10		24.7			CL - LEAN CLAY WITH SAND, BROWNISH - GRAY WITH REDDISH - YELLOW, MOIST.
MW	12	88/6051 J-E	6.0 - 7.0											
MW	12	88/6052 J-F	7.0 - 8.0											

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TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SNOED-6L REPORT NO. 14543-12 LONGHORN AMP - GROUND-WATER MONITORING WELLS

BORING NO.	SND NO.	FLO NO.	DEPTH, FT	GR	SA	FI	LL	PL	PI	LS	MC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
NW	12	88/6053	J-B	9.0 - 10.0										
NW	12	88/6054	J-H	10.0 - 12.0										
NW	12	88/6055	J-I	12.0 - 17.0										
NW	12	88/6056	J-J	17.0 - 22.0	0	69	31	0	0	0	22.6			SN - SILTY SAND, YELLOWISH - LIGHT GRAY, MOIST.
NW	12	88/6057	J-K	22.0 - 27.0	0	63	37	0	0	0	25.0			SN - SILTY SAND, YELLOWISH DARK GRAY, MOIST.
NW	12	88/6058	J-L	27.0 - 28.8	0	57	43	1	1	1	27.9			SN - SILTY SAND, DARK GRAY WITH YELLOWISH - RED, MOIST.
NW	13	88/6627	J-A	0.0 - 0.7										
NW	13	88/6628	J-B	0.7 - 2.7										
NW	13	88/6629	J-C	2.7 - 3.5										
NW	13	88/6630	J-D	3.5 - 5.5										
NW	13	88/6631	J-E	5.5 - 6.5										
NW	13	88/6632	J-F	6.5 - 8.5										
NW	13	88/6633	J-G	8.5 - 13.5										
NW	13	88/6634	J-H	13.5 - 17.0										
NW	13	88/6635	J-I	17.0 - 22.0	0	80	20	0	0	0	26.0			SN - SILTY SAND, LIGHT GRAYISH - YELLOW, MOIST.
NW	13	88/6636	J-J	22.0 - 26.0										
NW	13	88/6637	J-K	26.0 - 28.0	0	58	42	2	2	2	25.9			SN - SILTY SAND, GRAY, MOIST.

TABLE I

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWDED-6L REPORT NO. 14543-12 LONGHORN AAP - GROUND-WATER MONITORING WELLS

BORING NO.	SND NO.	FLD NO.	DEPTH, FT	BR	SA	FI	LL	PL	PT	LB	MC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
MW	13	88/6638 J-L	28.0 - 29.0	0	39	61	23	10	7		23.9			CL-ML - SANDY SILTY CLAY, YELLOWISH - BROWNISH GRAY, MOIST.
MW	14	88/6239 J-A	0.0 - 1.9											
MW	14	88/6240 J-B	1.9 - 3.9											
MW	14	88/6241 J-C	3.9 - 5.0											
MW	14	88/6242 J-D	5.0 - 7.0											
MW	14	88/6243 J-E	7.0 - 9.0											
MW	14	88/6244 J-F	9.0 - 11.0											
MW	14	88/6245 J-G	11.0 - 16.0	0	66	34				0	22.3			SH - SILTY SAND, REDDISH - YELLOW, MOIST.
MW	14	88/6246 J-H	16.0 - 20.0											
MW	14	88/6247 J-I	20.0 - 22.5	0	5	95				1	22.1			ML - SILT, GRAYISH - REDDISH YELLOW, MOIST.
MW	14	88/6248 J-J	22.5 - 23.8											
MW	14	88/6249 J-K	23.8 - 26.0	0	66	34				1	20.9			SH - SILTY SAND, GRAYISH - REDDISH YELLOW, MOIST.
MW	14	88/6250 J-L	26.0 - 27.8	0	40	60	26	10	8		22.2			CL - SANDY LEAN CLAY, YELLOWISH - GRAY, MOIST.
MW	14	88/6251 J-M	27.8 - 32.8											
MW	14	88/6252 J-N	32.8 - 37.8											
MW	14	88/6253 J-O	37.8 - 42.8	0	79	21				1	28.3			SH - SILTY SAND, YELLOWISH - GRAY, MOIST.
MW	14	88/6254 J-P	42.8 - 47.8	0	91	9				0	26.1			SP-SM - POORLY GRADED SAND WITH SILT, YELLOWISH - GRAY, MOIST.

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SHED-6L REPORT NO. 14543-12 LONGHORN AMP - GROUND-WATER MONITORING WELLS

DESCRIPTION OF MATERIAL

MAJOR TESTS

MC, %

PI LB

LL

FI

SA

BR

DEPTH, FT

SND NO., FLD NO.

BORING NO.

14 88/6235 J-B 47.8 - 51.0

15 88/6433 J-A 0.0 - 0.7

15 88/6434 J-B 0.7 - 2.0

15 88/6435 J-C 2.0 - 4.0

15 88/6436 J-D 4.0 - 5.8

15 88/6437 J-E 5.8 - 10.8

15 88/6438 J-F 10.8 - 12.0

15 88/6439 J-G 12.0 - 17.0

15 88/6440 J-H 17.0 - 20.0

15 88/6441 J-I 20.0 - 23.0

15 88/6442 J-J 23.0 - 25.5

15 88/6443 J-K 25.5 - 30.5

15 88/6444 J-L 30.5 - 31.5

15 88/6445 J-M 31.5 - 34.5

15 88/6446 J-N 34.5 - 40.0

15 88/6447 J-O 40.0 - 46.5 0 34 46 30 16 14 25.5

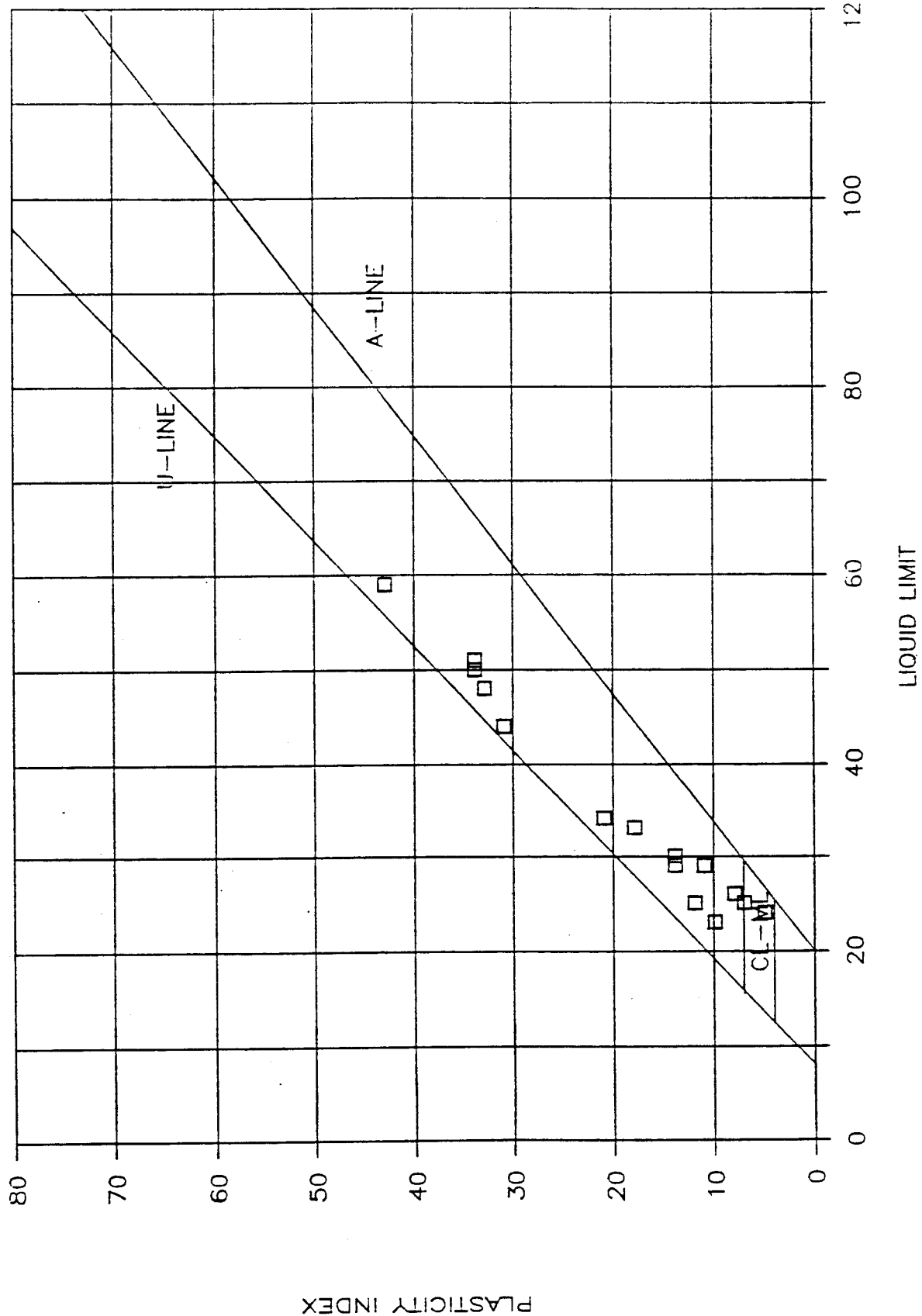
15 88/6448 J-P 46.5 - 47.0 0 38 42 0 28.4

SC - CLAYEY SAND, YELLOWISH - GRAY AND GRAY, MOIST.

SK - SILTY SAND, GRAY, MOIST.

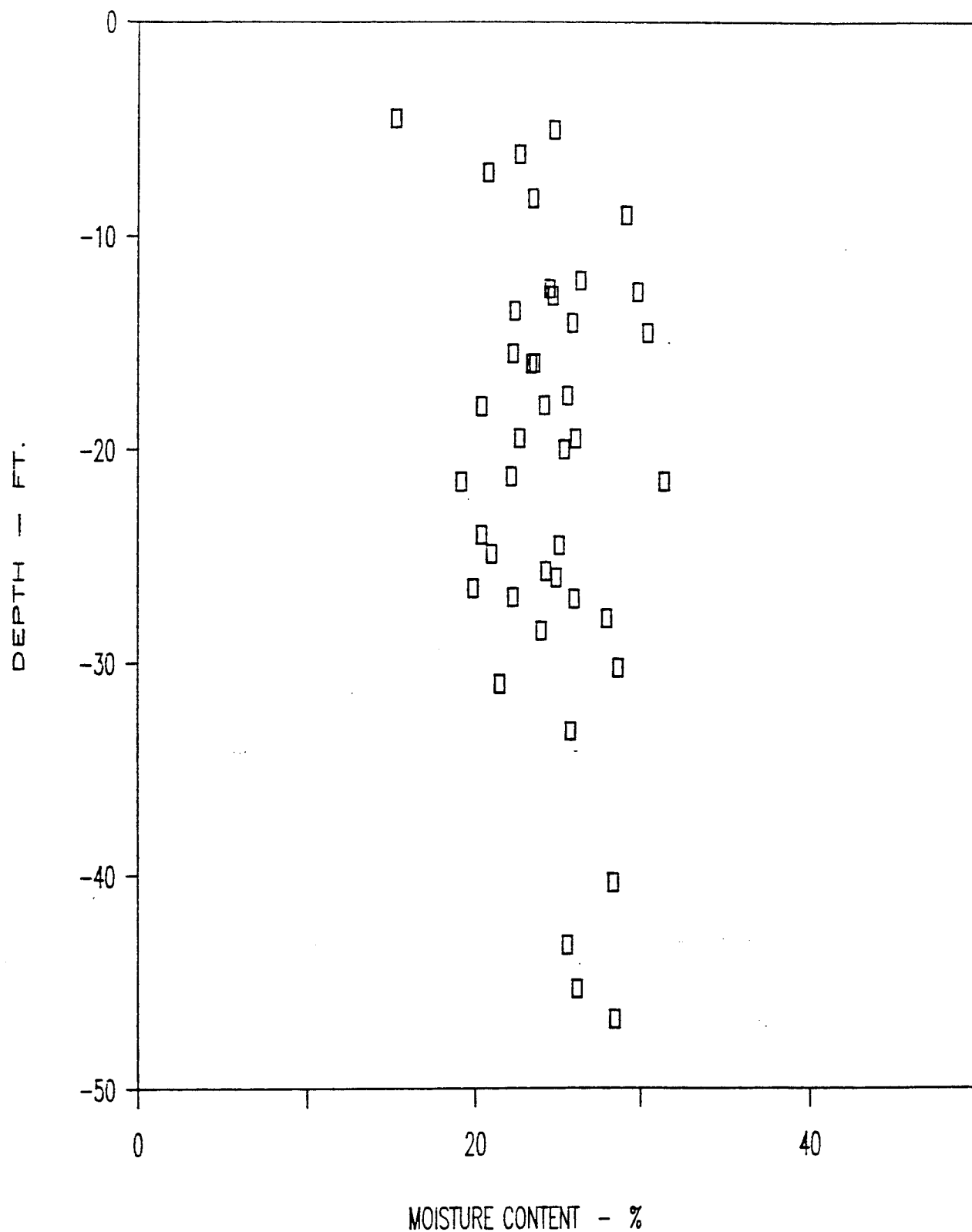
PLASTICITY CHART

LONGHORN AAP - MONITORING WELLS



MOISTURE CONTENT VS DEPTH

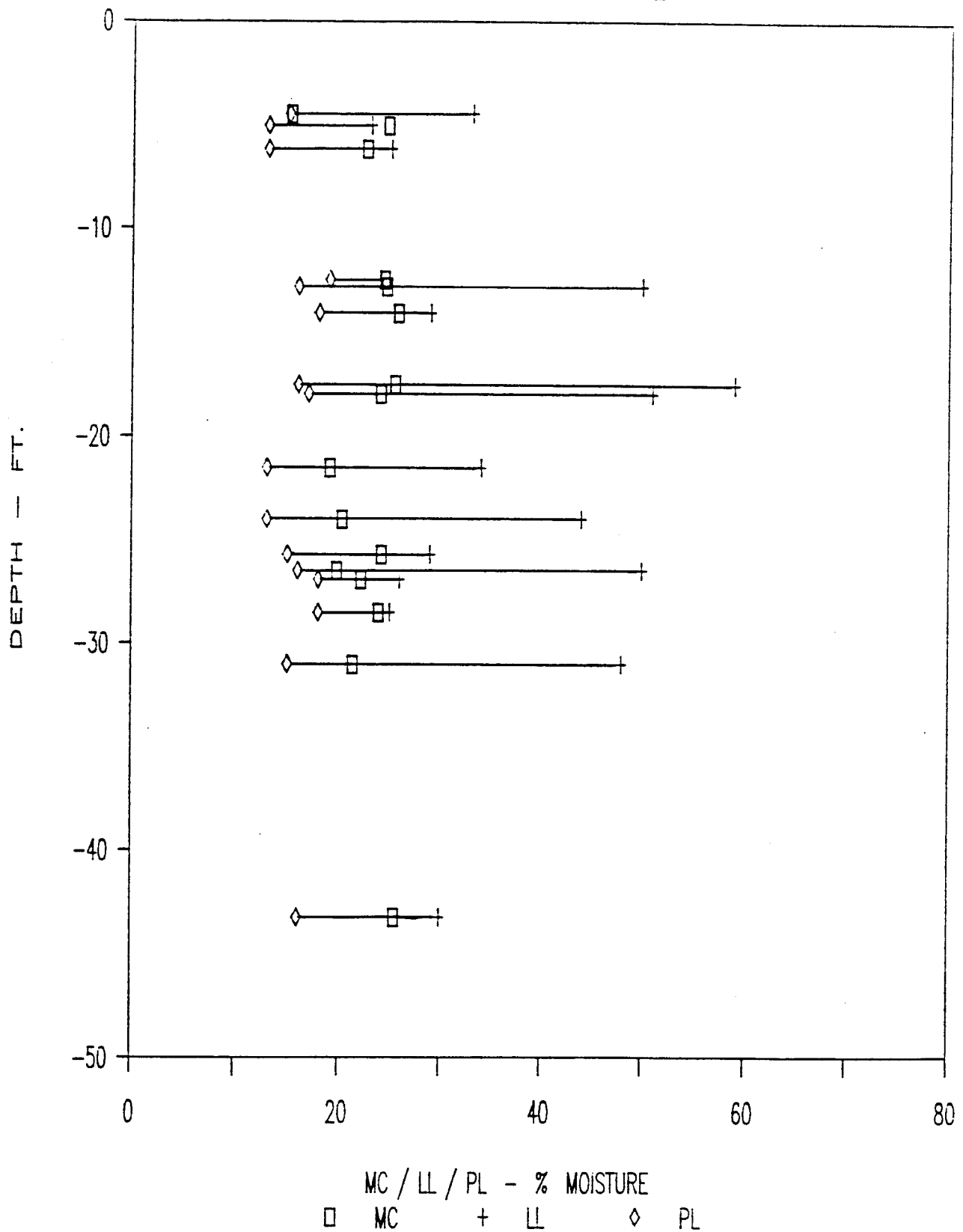
LONGHORN AAP - MONITORING WELLS



MC / LL / PL VS DEPTH

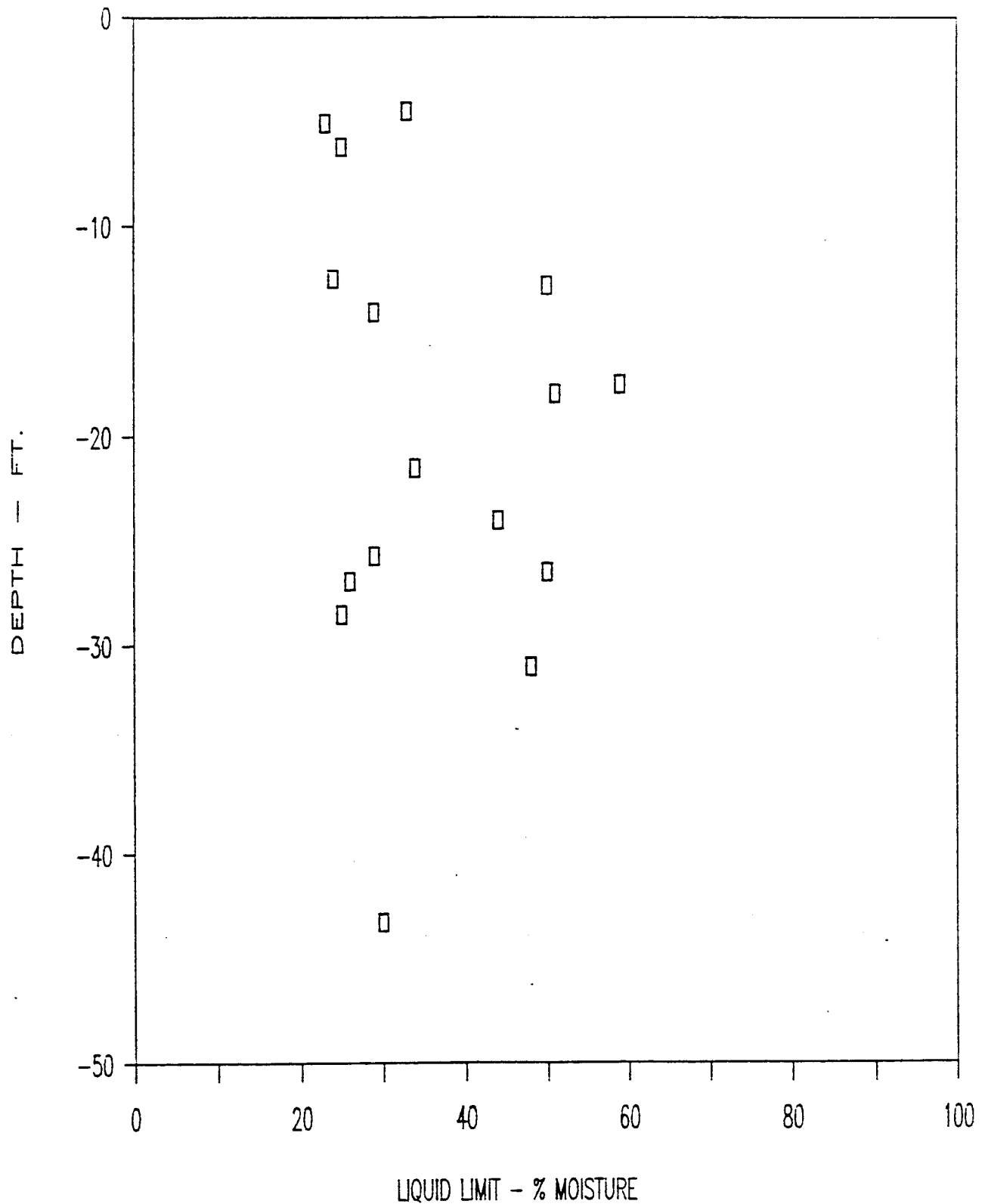
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LONGHORN AAP - MONITORING WELLS



LIQUID LIMIT VS DEPTH

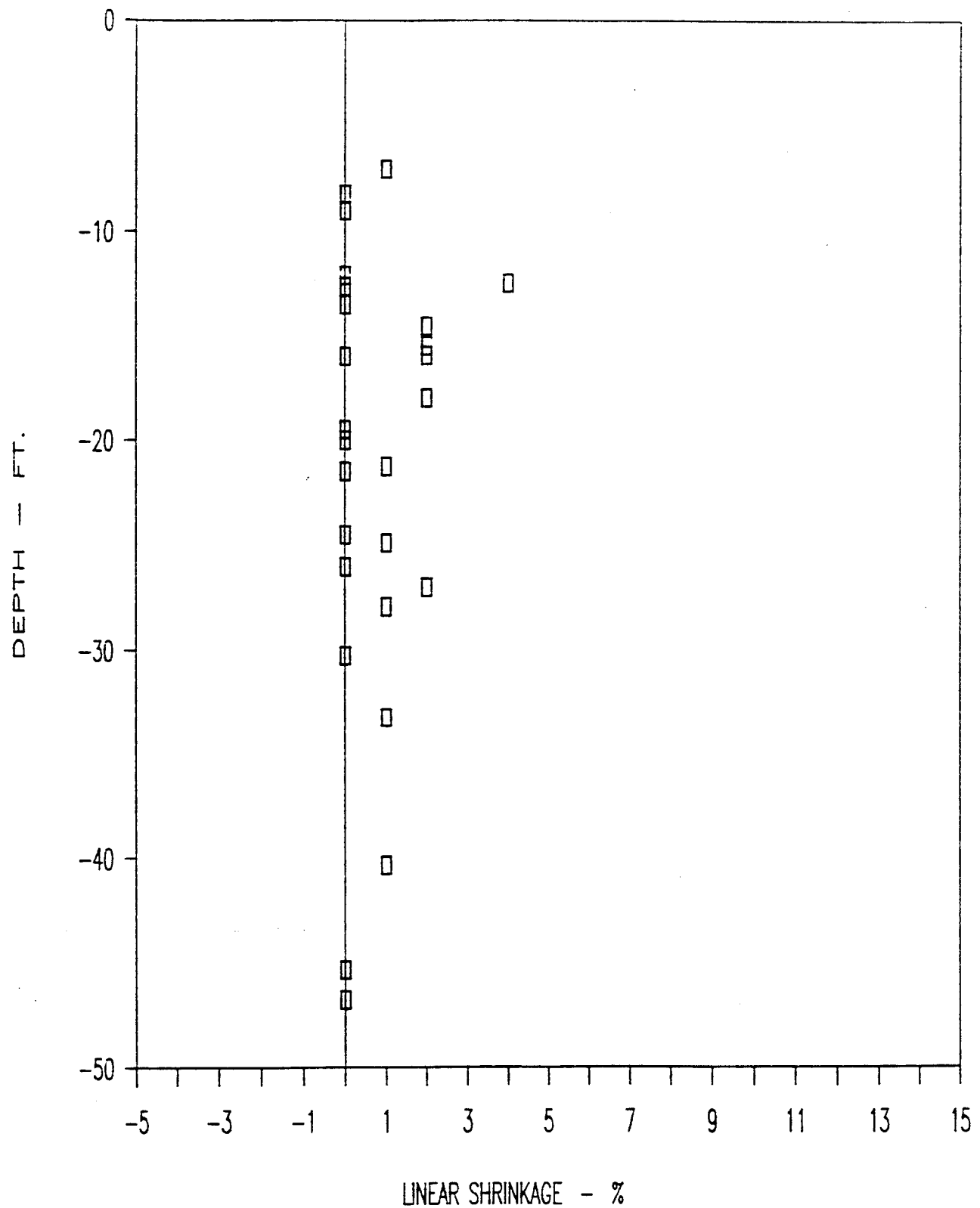
LONGHORN AAP - MONITORING WELLS



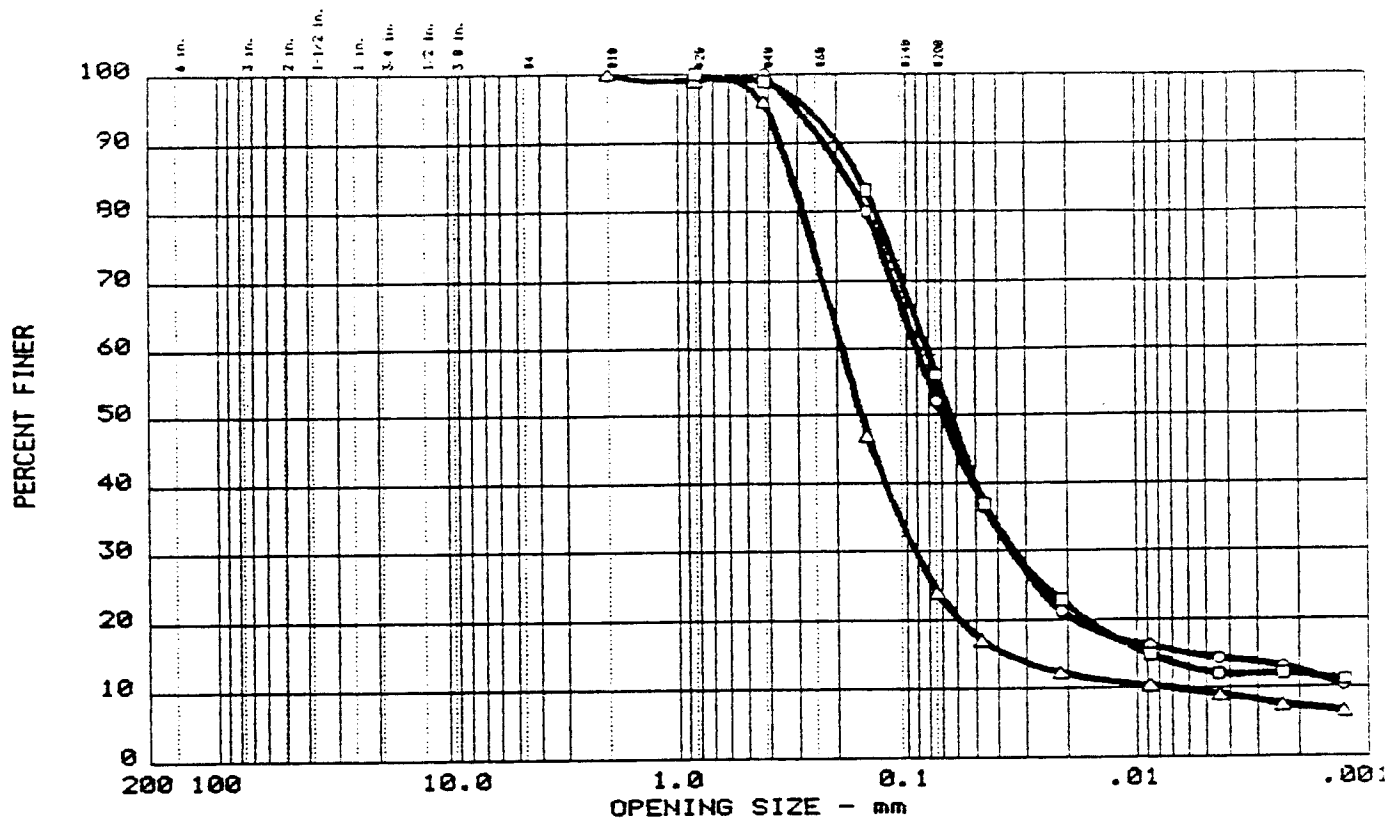
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LINEAR SHRINKAGE VS DEPTH

LONGHORN AAP - MONITORING WELLS



GRAIN SIZE DISTRIBUTION TEST REPORT

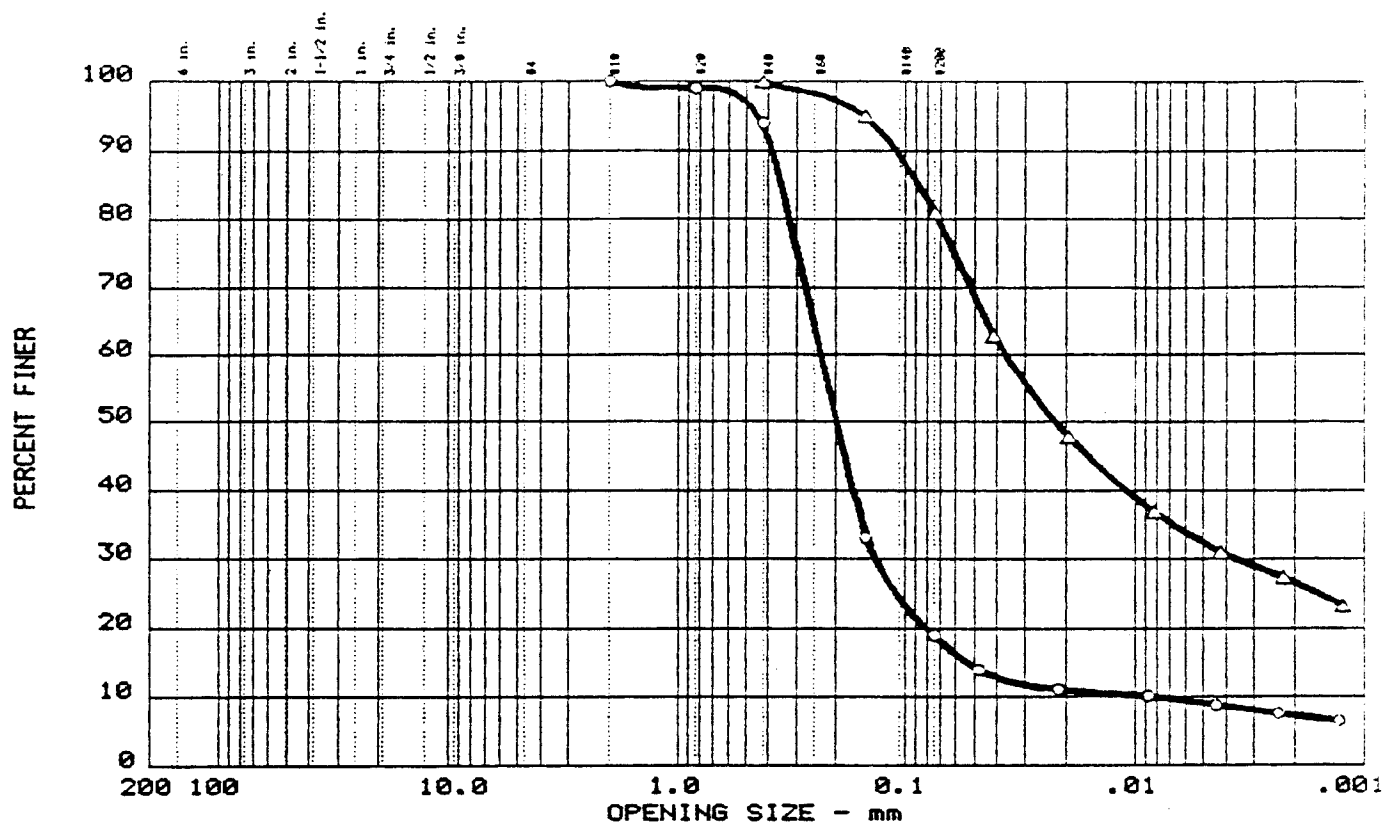


	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	48.0	37.4	14.6
Δ	0.0	0.0	76.0	14.6	9.4
□	0.0	0.0	44.0	43.7	12.3

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ CL-ML		24	5					
Δ SM		NP		0.19	0.092	0.0065	6.81	29.3
□ SM		NP						

MATERIAL DESCRIPTION	TYPE OF TEST
○ SANDY SILTY CLAY Δ SILTY SAND □ SANDY SILT	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-7, J-G, 10.0'-15.0', SWD 88/5134 Δ Location: MW-7, J-H, 15.0'-17.0', SWD 88/5135 □ Location: MW-7, J-I, 17.0'-19.0', SWD 88/5136 Date: DECEMBER, 1988	Remarks: SWD NO. 88/5134 LS: 4 SWD NO. 88/5135 LS: 0 SWD NO. 88/5135 LS: 2
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 6

GRAIN SIZE DISTRIBUTION TEST REPORT

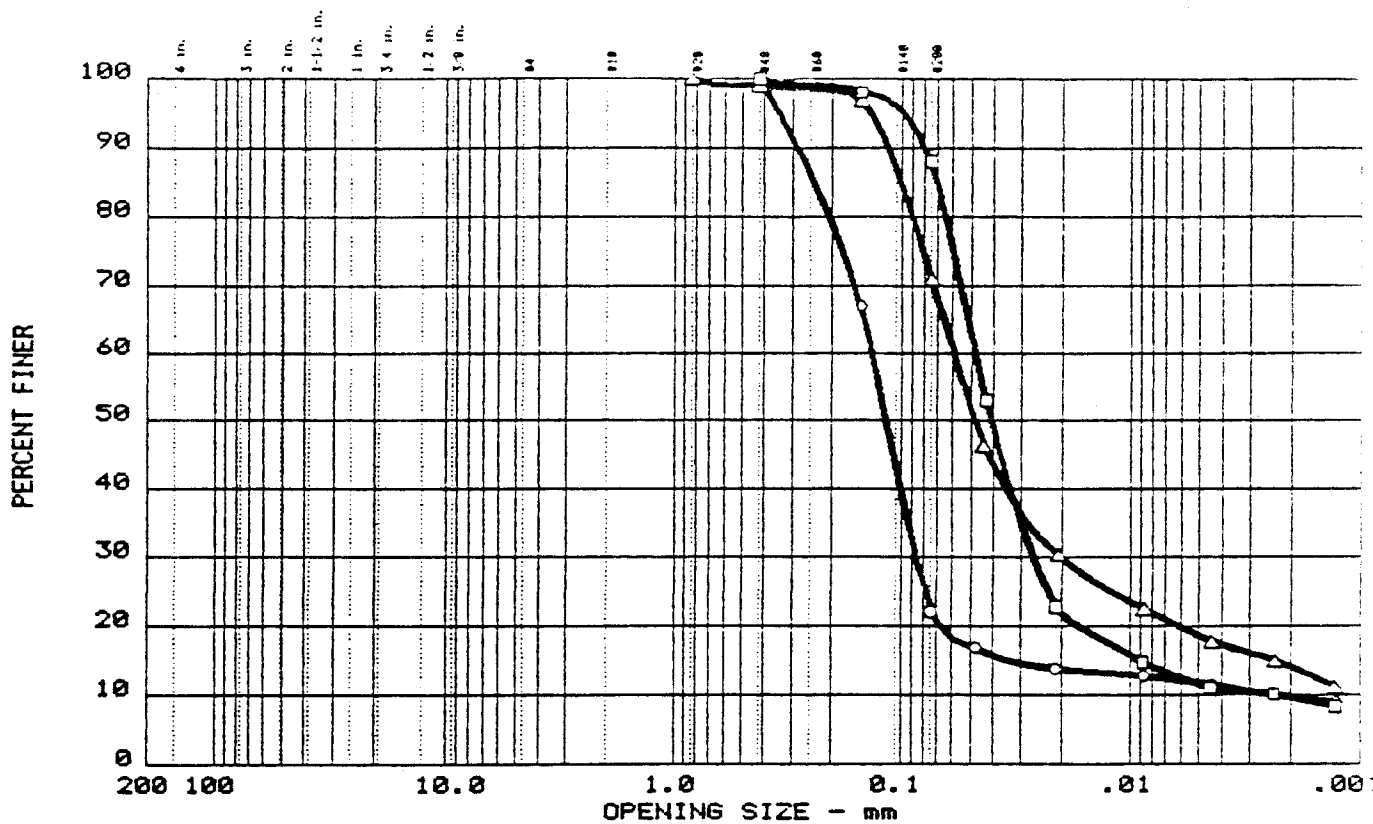


	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	81.0	9.9	9.1
△	0.0	0.0	19.0	48.7	32.3

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ SM		NP		0.23	0.134	0.0075	10.23	30.9
△		31						

MATERIAL DESCRIPTION	TYPE OF TEST
○ SILTY SAND △ CLAY-SHALE	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-7, J-J, 19.0'-21.0', SWD 88/5137 △ Location: MW-7, J-K, 21.0'-27.0', SWD 88/5138 Date: DECEMBER, 1988	Remarks: SWD NO. 88/5137 LS: 0
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 7

GRAIN SIZE DISTRIBUTION TEST REPORT

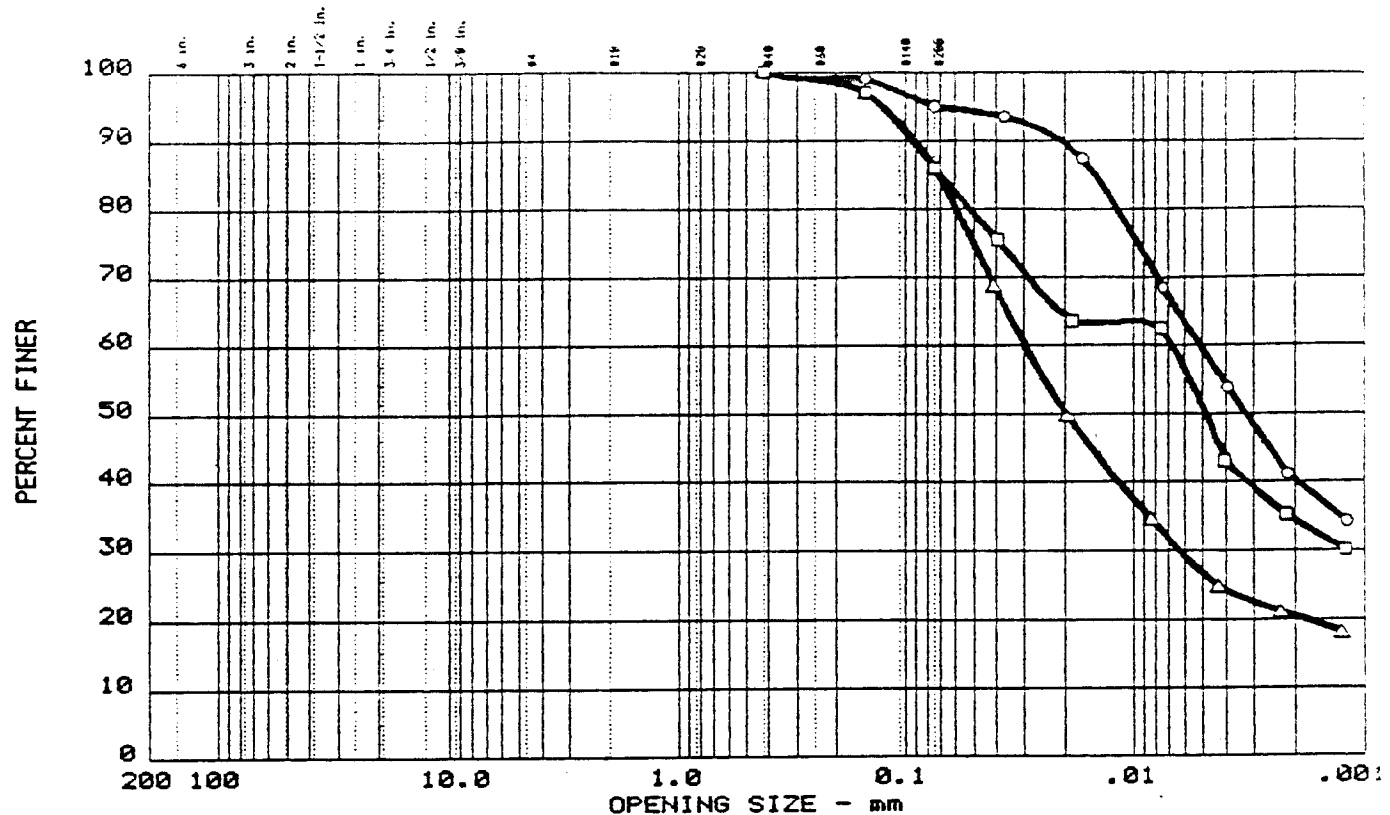


	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
O	0.0	0.0	78.0	10.2	11.8
Δ	0.0	0.0	29.0	52.4	18.6
□	0.0	0.0	12.0	76.4	11.6

	USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
O	SM		NP		0.13	0.096	0.0022	25.41	62.4
Δ	CL		29	11					
□	ML		NP		0.05	0.027	0.0021	7.04	22.5

MATERIAL DESCRIPTION	TYPE OF TEST
O SILTY SAND Δ LEAN CLAY WITH SAND □ SILT	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS O Location: MW-8, J-G, 11.5'-13.8', SWD 88/5717 Δ Location: MW-8, J-H, 13.8'-14.4', SWD 88/5718 □ Location: MW-8, J-I, 14.4'-17.5', SWD 88/5719 Date: DECEMBER, 1988	Remarks: SWD NO. 88/5717 LS: 0 SWD NO. 88/5719 LS: 2
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 8

GRAIN SIZE DISTRIBUTION TEST REPORT

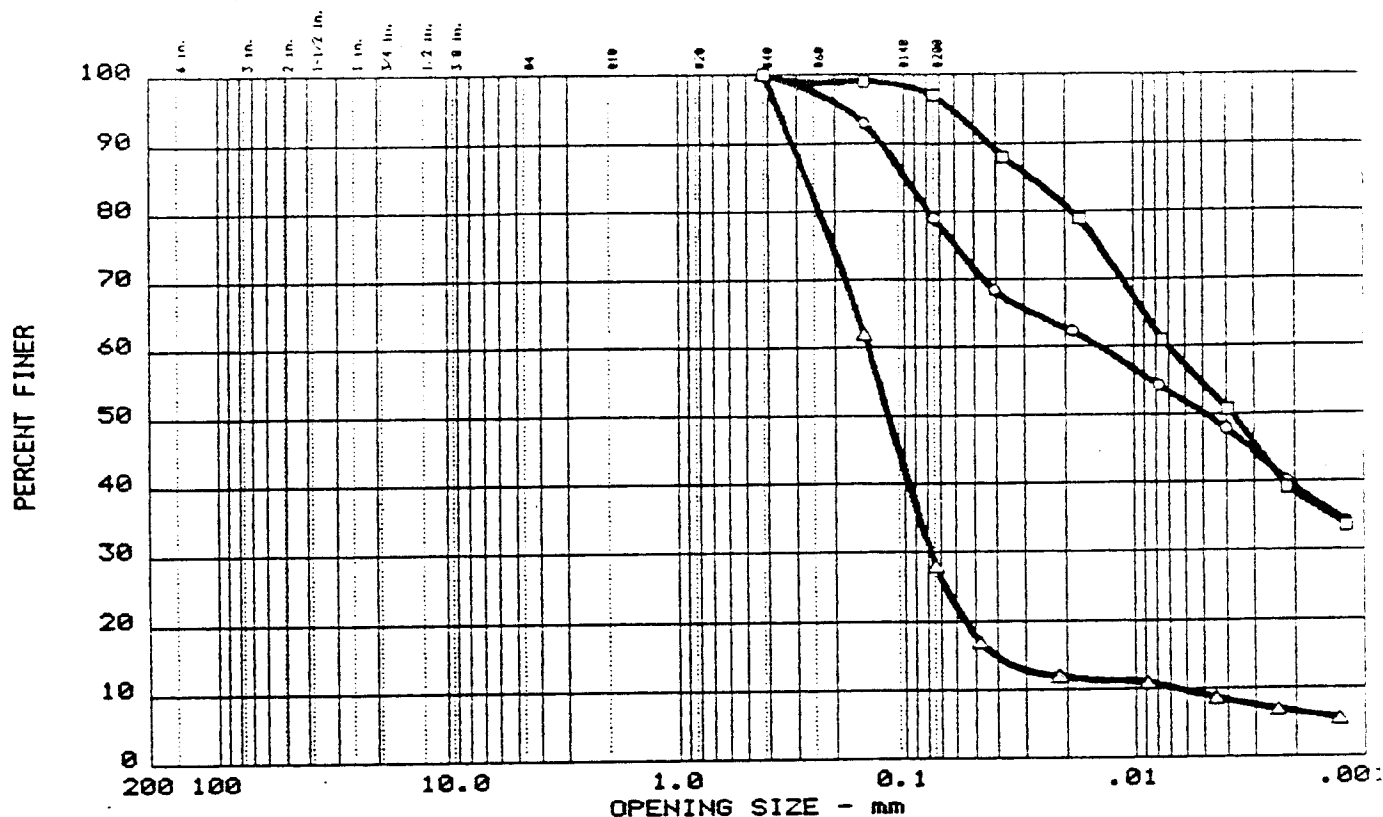


	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	5.0	35.6	59.4
△	0.0	0.0	14.0	59.3	26.7
□	0.0	0.0	14.0	35.2	50.8

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○		51	34					
△	CL	29	14					
□		48	33					

MATERIAL DESCRIPTION	TYPE OF TEST
○ CLAY-SHALE △ LEAN CLAY □ CLAY-SHALE	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-8, J-J, 17.5'-18.4', SWD 88/5720 △ Location: MW-8, J-L, 23.4'-28.0', SWD 88/5722 □ Location: MW-8, J-N, 30.0'-32.0', SWD 88/5724 Date: DECEMBER, 1988	Remarks:
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 9

GRAIN SIZE DISTRIBUTION TEST REPORT



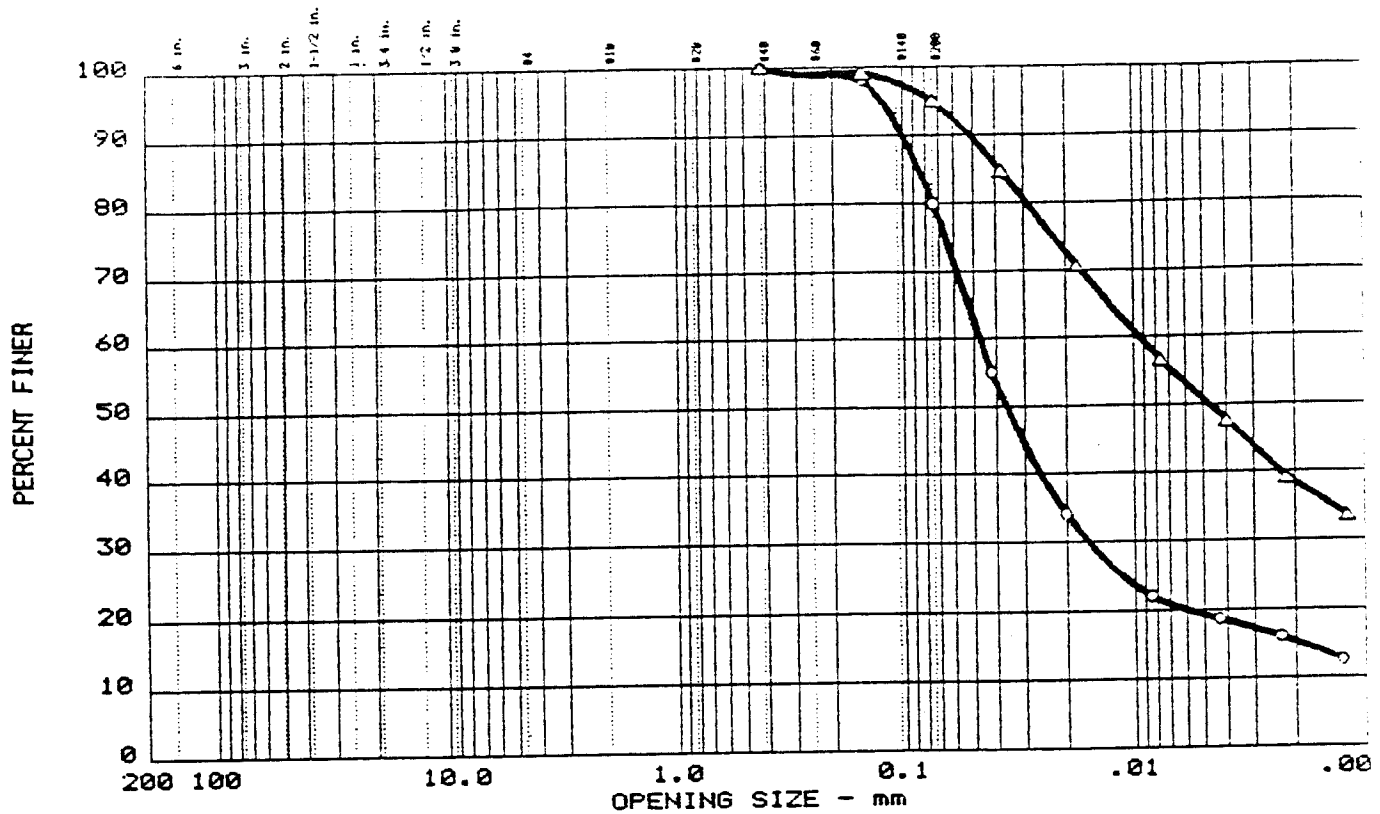
%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○ 0.0	0.0	21.0	28.9	50.1
△ 0.0	0.0	72.0	18.9	9.1
□ 0.0	0.0	3.0	42.5	54.5

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○		50	34					
△ SM		NP		0.14	0.074	0.0064	5.95	22.2
□		59	43					

MATERIAL DESCRIPTION	TYPE OF TEST
○ CLAY-SHALE △ SILTY SAND □ CLAY-SHALE	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-9, J-I, 12.5'-13.1', SWD 88/5733 △ Location: MW-9, J-J, 13.1'-16.0', SWD 88/5734 □ Location: MW-9, J-K, 16.0'-19.0', SWD 88/5735 Date: DECEMBER, 1988	Remarks: SWD NO. 88/5734 LS: 2
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 10

GRAIN SIZE DISTRIBUTION TEST REPORT

002999



%+3"	% GRAVEL	% SAND	% SILT	% CLAY
O 0.0	0.0	20.0	60.8	19.2
Δ 0.0	0.0	5.0	44.3	50.7

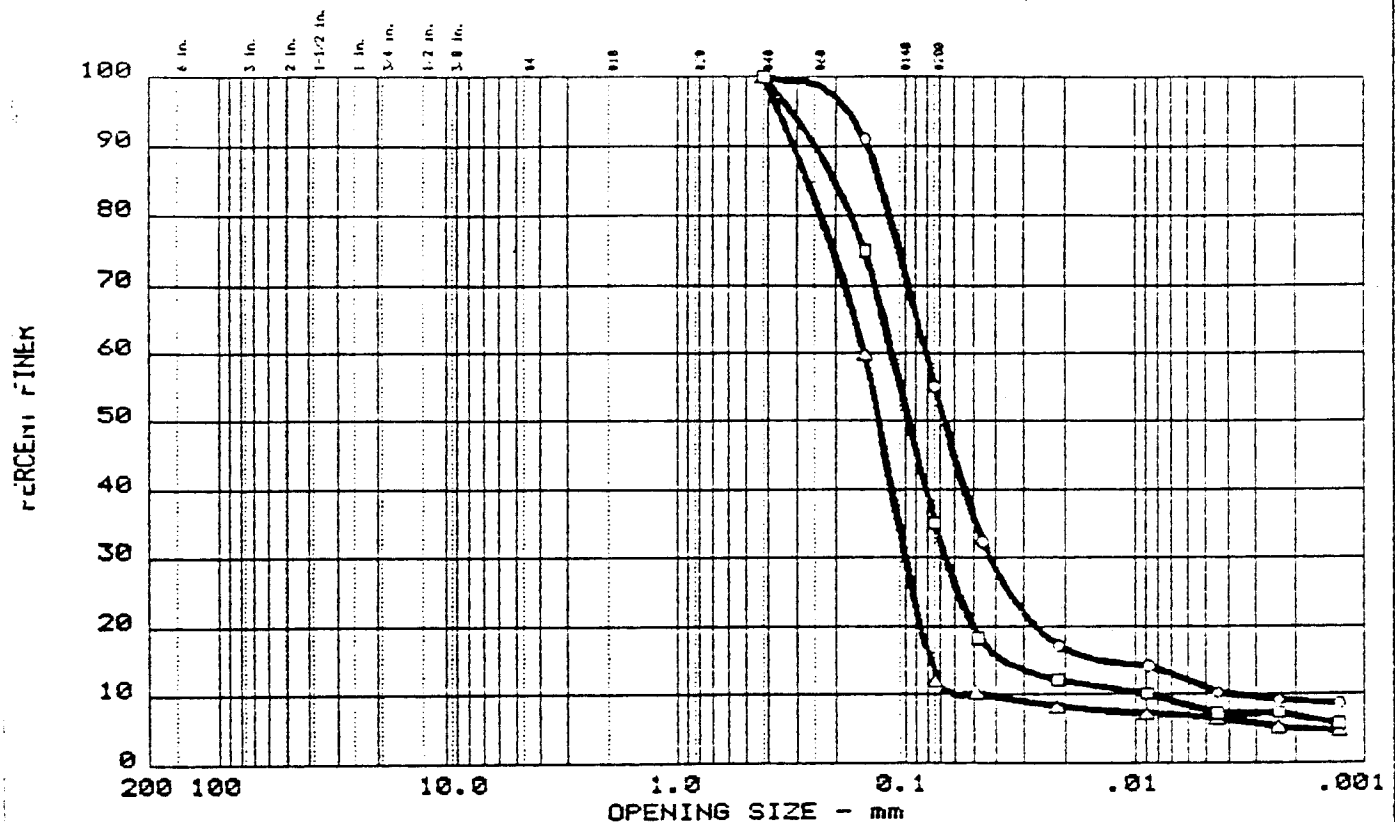
USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
O		34	21					
Δ		50	34					

MATERIAL DESCRIPTION	TYPE OF TEST
O CLAY-SHALE Δ CLAY-SHALE	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS O Location: MW-9, J-L, 19.0'-24.0', SWD 88/5736 Δ Location: MW-9, J-N, 26.0'-27.0', SWD 88/5738 Date: DECEMBER, 1988 Remarks:	
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	

Plate No. 11

003001

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	45.0	44.0	11.0
Δ	0.0	0.0	88.0	5.3	6.7
□	0.0	0.0	65.0	27.3	7.7

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
ML		NP		0.08	0.042	0.0034	6.61	24.0
SP-SM		NP		0.15	0.100	0.0562	1.19	2.7
SM		NP		0.11	0.066	0.0083	4.62	13.6

MATERIAL DESCRIPTION

- SANDY SILT
 Δ POORLY GRADED SAND WITH SILT
 □ SILTY SAND

TYPE OF TEST

ASTM D 422-63(72)
 Hydrometer analysis
 Mechanical analysis

Project No.: SWD NO. 14543-12

Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS

○ Location: MW-10, J-H, 13.0'-18.0', SWD 88/5905

Δ Location: MW-10, J-J, 19.5'-23.5', SWD 88/5907

□ Location: MW-10, J-K, 23.5'-28.5', SWD 88/5908

Date: DECEMBER, 1988

Remarks:

SWD NO. 88/5905 LS: 2

SWD NO. 88/5907 LS: 0

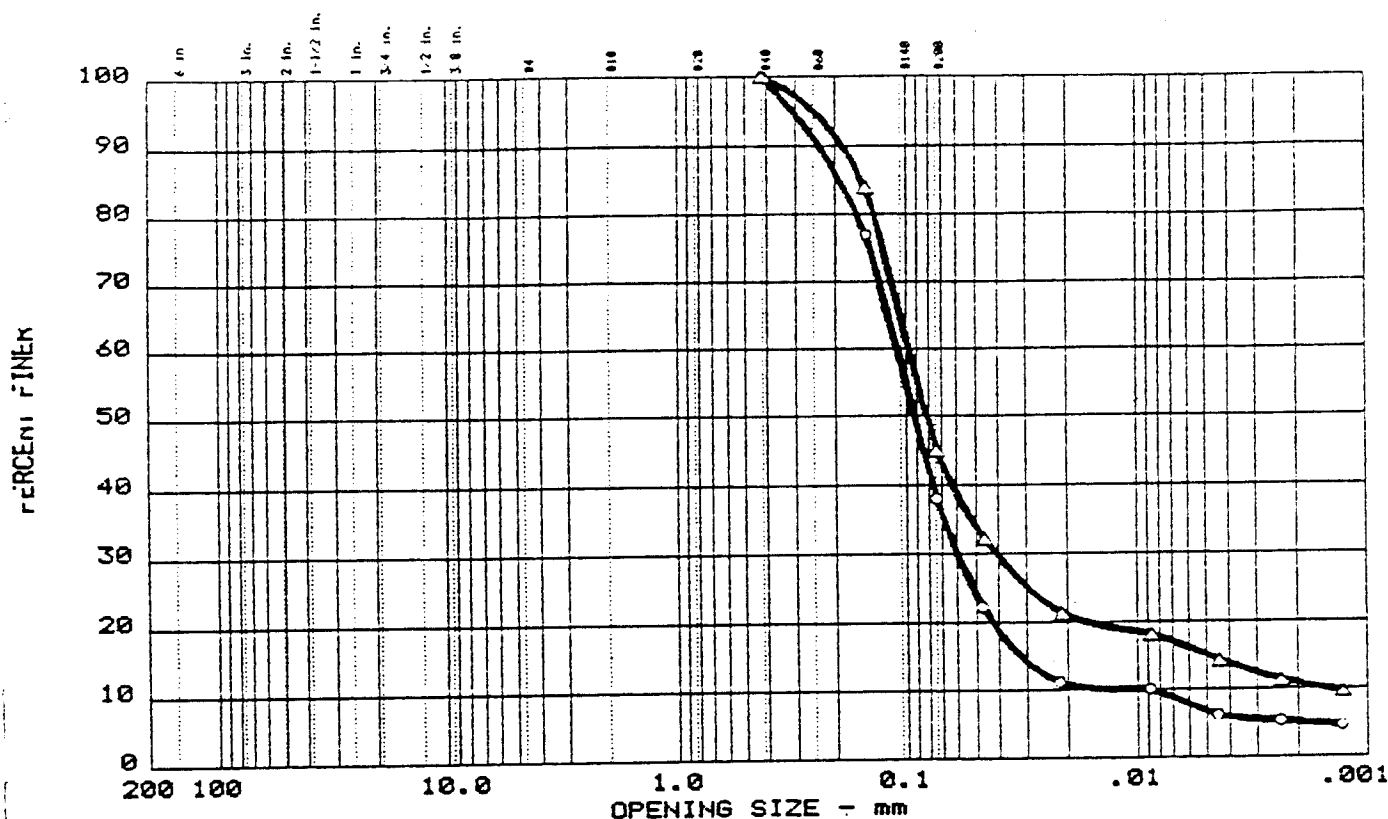
SWD NO. 88/5908 LS: 0

GRAIN SIZE DISTRIBUTION TEST REPORT
 CORPS OF ENGINEERS - SOUTHWESTERN

Plate No. 13

003002

GRAIN SIZE DISTRIBUTION TEST REPORT



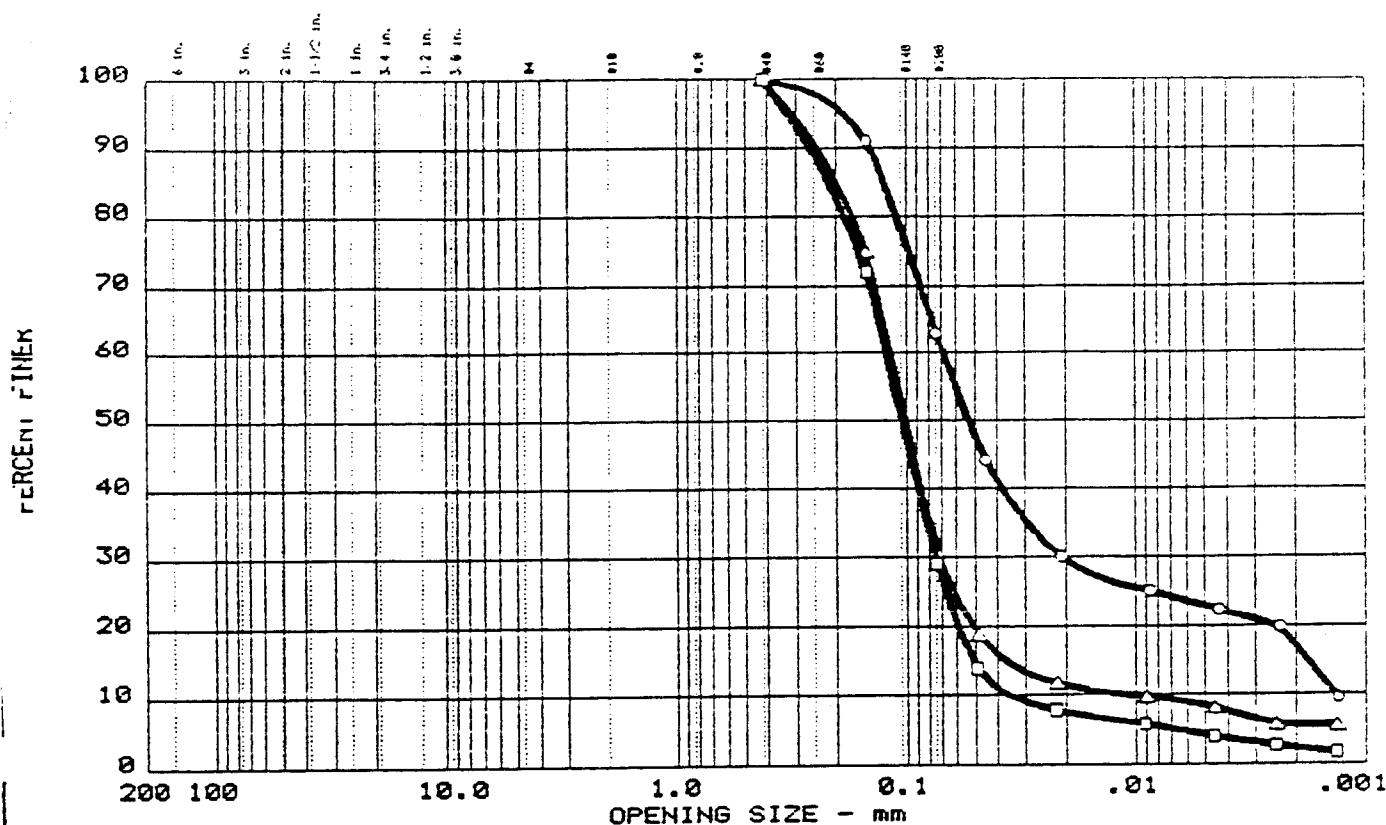
%+3"	% GRAVEL	% SAND	% SILT	% CLAY
O 0.0	0.0	62.0	31.2	6.8
Δ 0.0	0.0	55.0	29.9	15.1

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
SM		NP		0.11	0.060	0.0085	3.09	12.9
SM		NP		0.10	0.041	0.0014	11.89	68.4

MATERIAL DESCRIPTION	TYPE OF TEST
O SILTY SAND Δ SILTY SAND	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS O Location: MW-10, J-L, 28.5'-32.0', SWD 88/5909 Δ Location: MW-10, J-M, 32.0'-34.5', SWD 88/5910 Date: DECEMBER, 1988	Remarks: SWD NO. 88/5909 LS: 0 SWD NO. 88/5910 LS: 1
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 14

GRAIN SIZE DISTRIBUTION TEST REPORT

003003

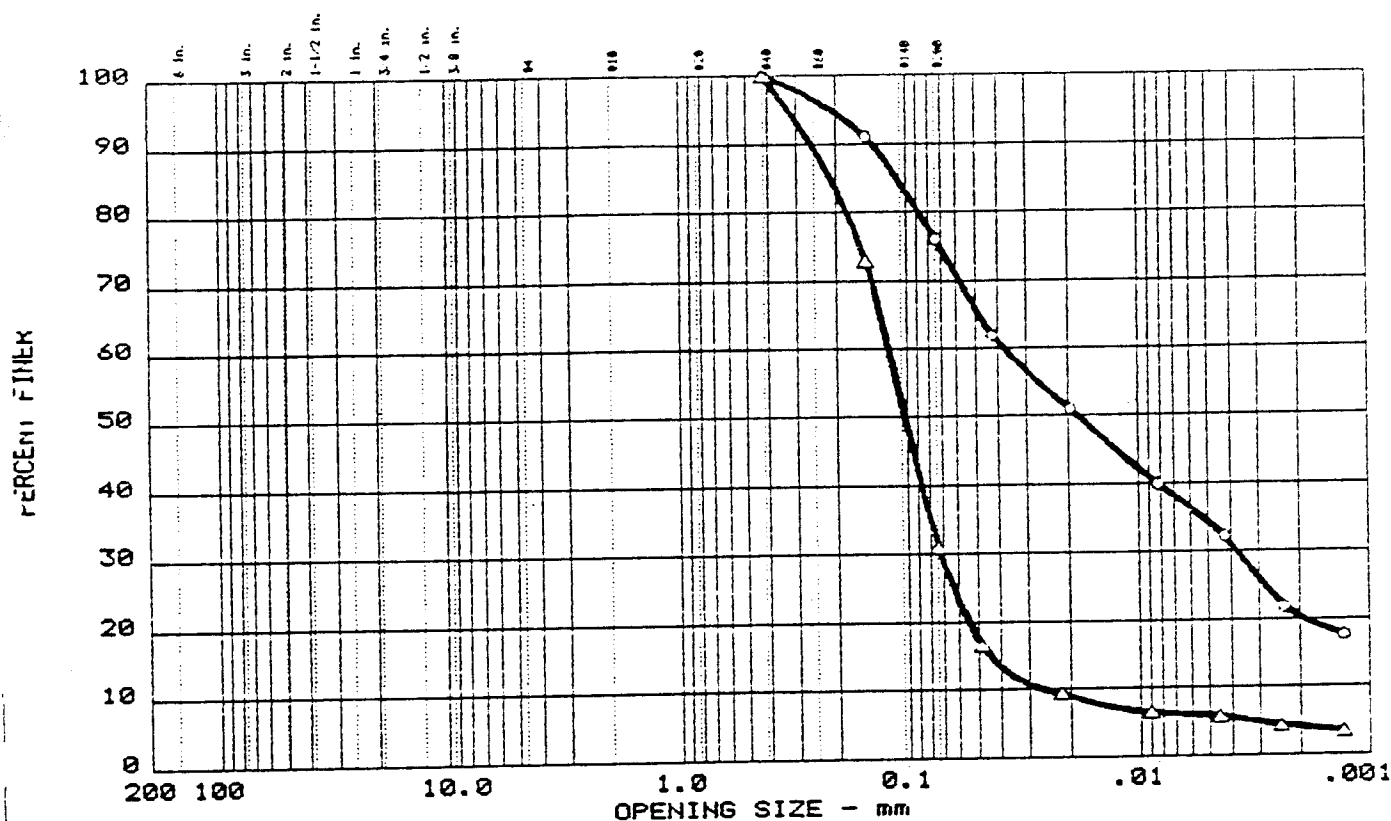


%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○ 0.0	0.0	37.0	40.2	22.8
△ 0.0	0.0	69.0	22.6	8.4
□ 0.0	0.0	71.0	24.8	4.2

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
CL		33	18					
SM		NP		0.12	0.072	0.0102	4.34	11.5
□ SM		NP		0.12	0.074	0.0354	1.27	3.4

MATERIAL DESCRIPTION	TYPE OF TEST
○ SANDY LEAN CLAY △ SILTY SAND □ SILTY SAND	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-11, J-D, 3.9'-5.0', SWD 88/5914 △ Location: MW-11, J-F, 6.0'-8.0', SWD 88/5916 □ Location: MW-11, J-G, 8.0'-10.0', SWD 88/5917 Date: DECEMBER, 1988	Remarks: SWD NO. 88/5916 LS: 1 SWD NO. 88/5917 LS: 0
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 15

GRAIN SIZE DISTRIBUTION TEST REPORT

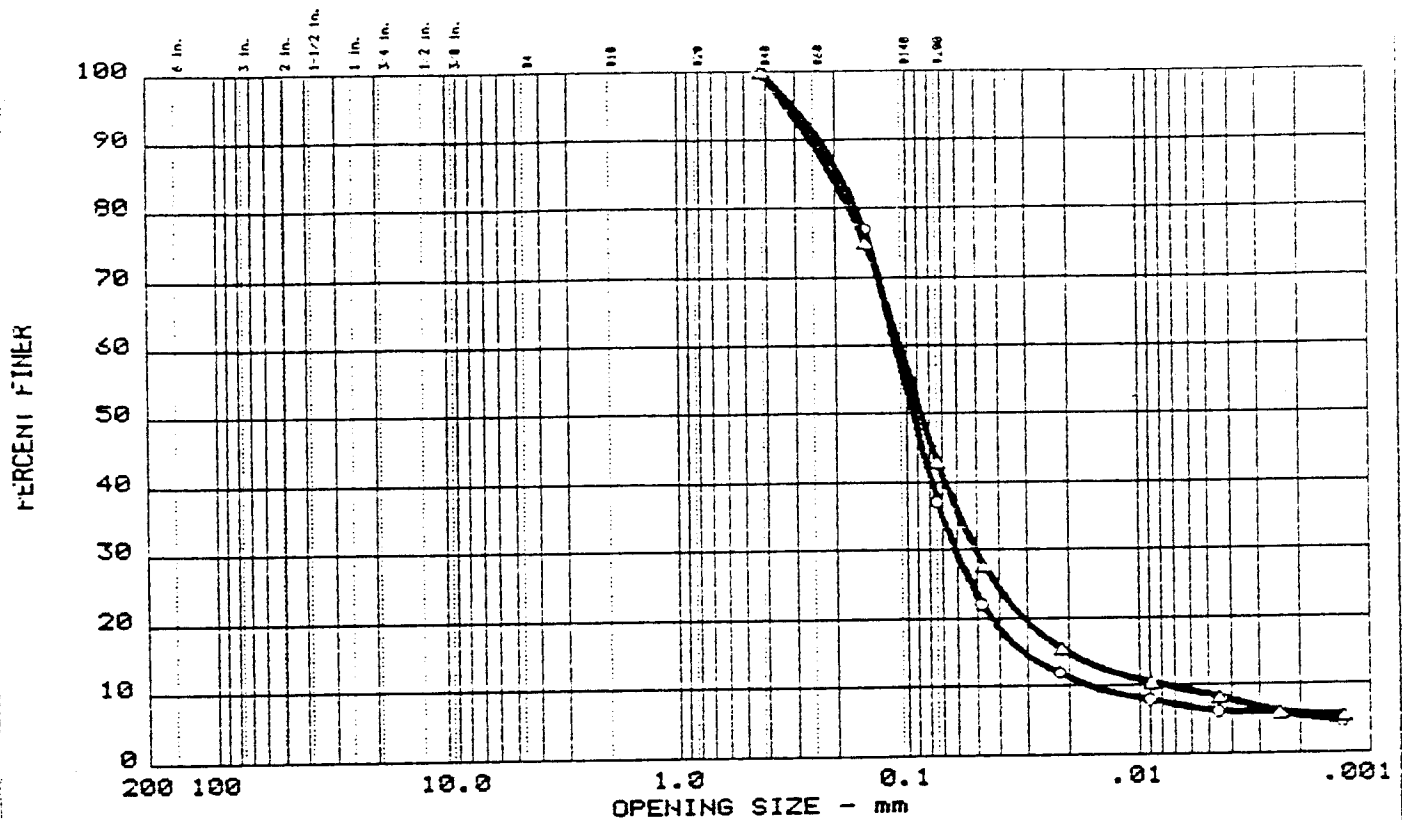


%+3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	24.0	41.7	34.3
0.0	0.0	69.0	25.1	5.9

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
CL		23	10					
SM		NP		0.12	0.072	0.0256	1.70	4.7

MATERIAL DESCRIPTION		TYPE OF TEST
○ LEAN CLAY WITH SAND △ SILTY SAND		ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-12, J-D, 4.0'-6.0', SWD 88/6050 △ Location: MW-12, J-J, 17.0'-22.0', SWD 88/6056 Date: DECEMBER, 1988		Remarks: SWD NO. 88/6055 LS: 0
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN		Plate No. 16

GRAIN SIZE DISTRIBUTION TEST REPORT



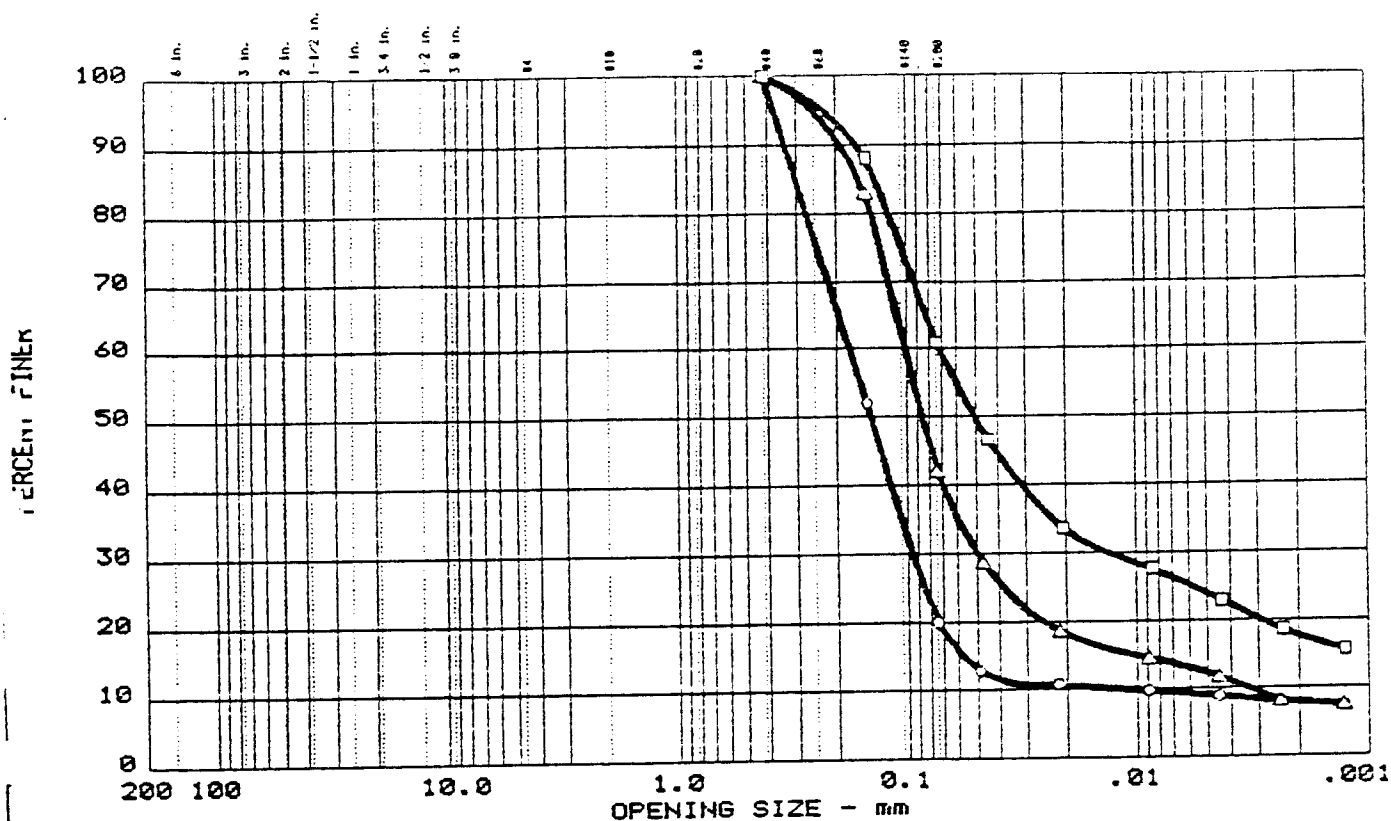
%+3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	63.0	30.7	6.3
0.0	0.0	57.0	34.4	8.6

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
SM		NP		0.11	0.062	0.0161	2.16	6.9
SM		NP		0.11	0.051	0.0077	3.12	14.0

MATERIAL DESCRIPTION	TYPE OF TEST
○ SILTY SAND △ SILTY SAND	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-12, J-K, 22.0'-27.0', SWD 88/6057 △ Location: MW-12, J-L, 27.0'-28.8', SWD 88/6058 Date: DECEMBER, 1988	Remarks: SWD NO. 88/6057 LS: 0 SWD NO. 88/6058 LS: 1
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 17

003006

GRAIN SIZE DISTRIBUTION TEST REPORT

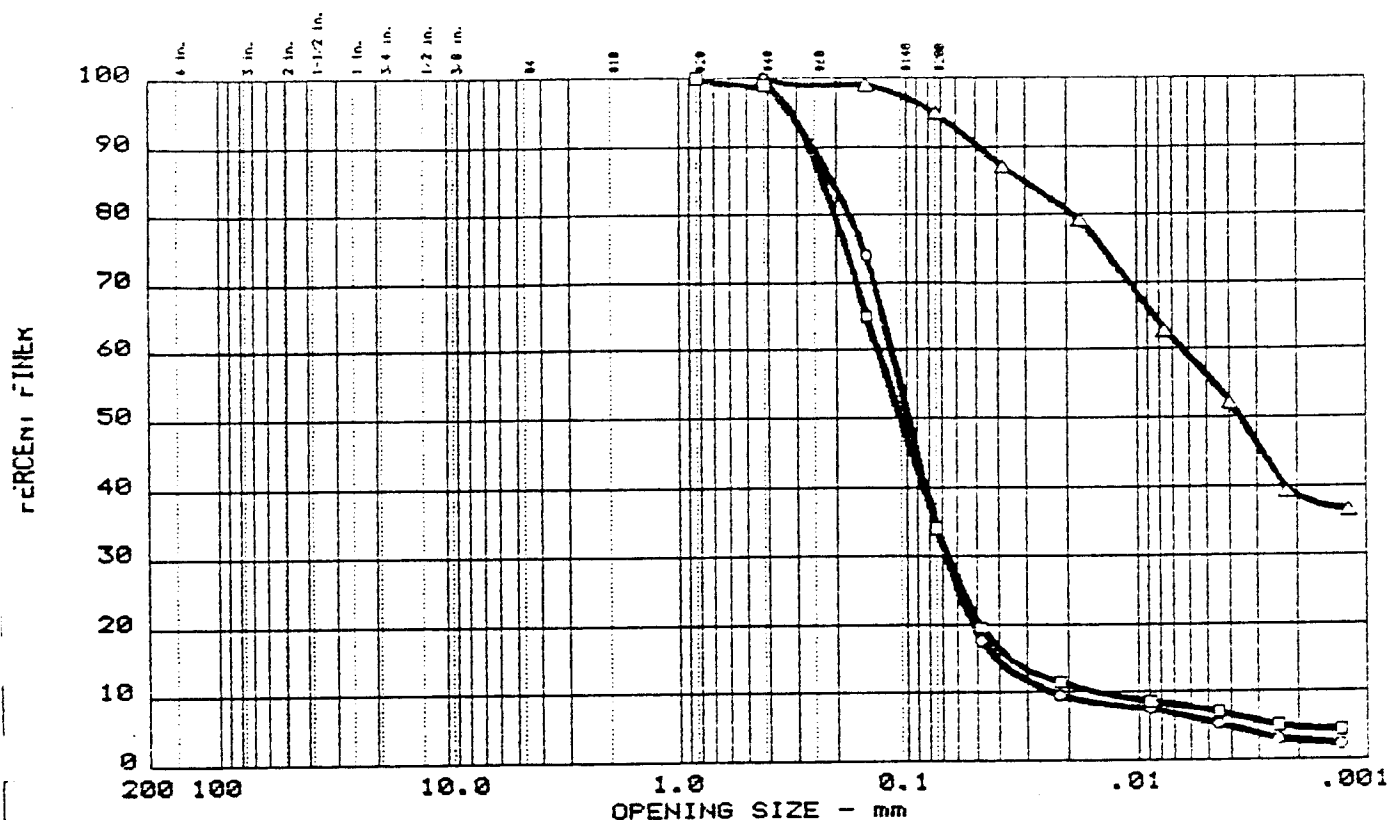


	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	80.0	10.9	9.1
△	0.0	0.0	58.0	29.7	12.3
□	0.0	0.0	39.0	37.1	23.9

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
○ SM		NP		0.18	0.095	0.0107	4.79	16.6
△ SM		NP		0.10	0.047	0.0033	6.53	30.6
□ CL-ML		25	7					

MATERIAL DESCRIPTION	TYPE OF TEST
○ SILTY SAND △ SILTY SAND □ SANDY SILTY CLAY	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS Location: MW-13, J-I, 17.0'-22.0', SWD 88/6635 Location: MW-13, J-K, 26.0'-28.0', SWD 88/6637 Location: MW-13, J-L, 28.0'-29.0', SWD 88/6638 Date: DECEMBER, 1988	Remarks: SWD NO. 88/6635 LS: 0 SWD NO. 88/6637 LS: 2
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 18

GRAIN SIZE DISTRIBUTION TEST REPORT

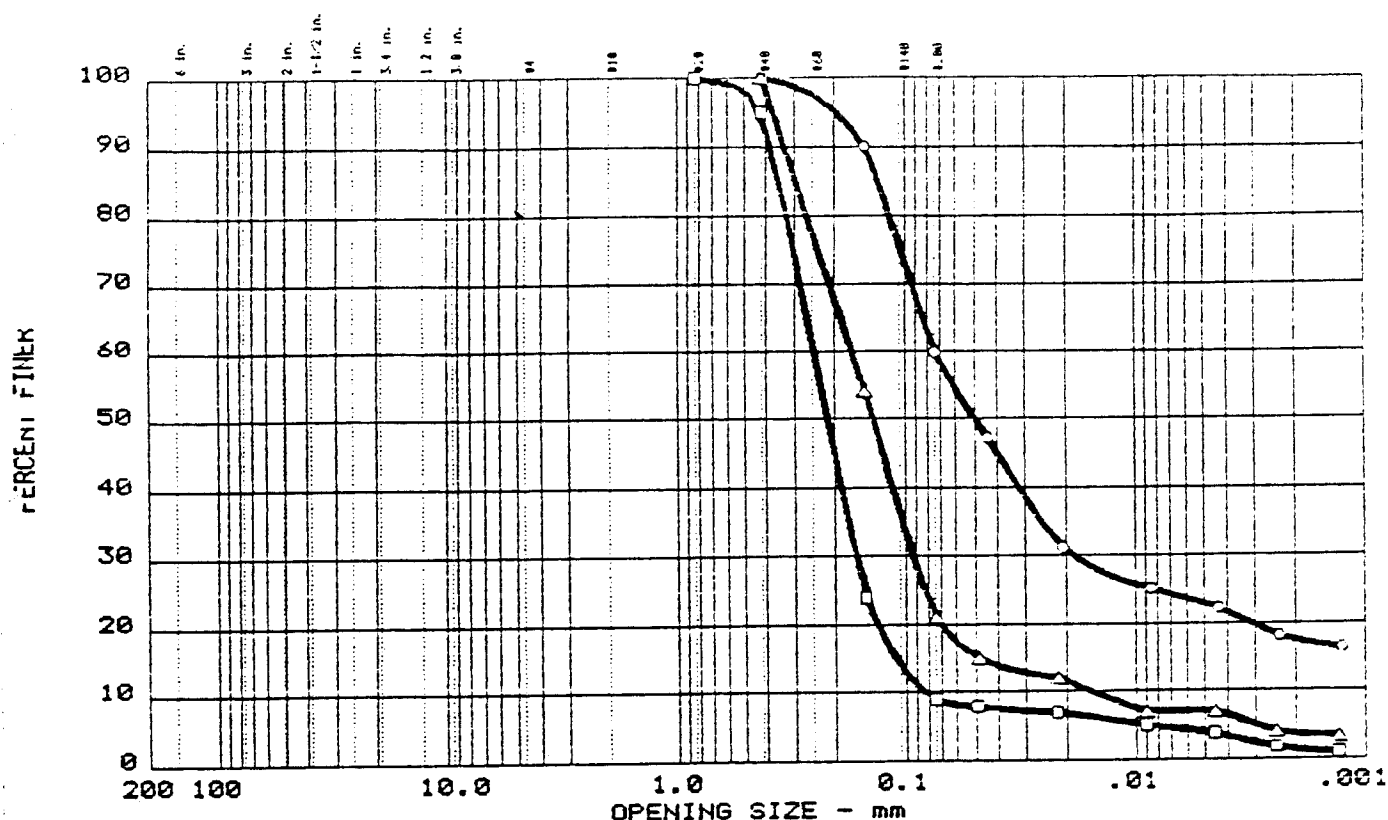


%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○ 0.0	0.0	66.0	28.4	5.6
Δ 0.0	0.0	5.0	38.8	56.2
◻ 0.0	0.0	66.0	26.7	7.3

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₅₀	D ₁₀	C _c	C _u
SM		NP		0.12	0.063	0.0219	1.80	5.3
ML		NP						
SM		NP		0.13	0.066	0.0149	2.23	8.9

MATERIAL DESCRIPTION	TYPE OF TEST
○ SILTY SAND Δ SILT ◻ SILTY SAND	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-14, J-G, 11.0'-16.0', SWD 88/6245 Δ Location: MW-14, J-I, 20.0'-22.5', SWD 88/6247 ◻ Location: MW-14, J-K, 23.8'-26.0', SWD 88/6249 Date: DECEMBER, 1988	Remarks: SWD NO. 88/6245 LS: 0 SWD NO. 88/6247 LS: 1 SWD NO. 88/6249 LS: 1
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN	Plate No. 19

GRAIN SIZE DISTRIBUTION TEST REPORT

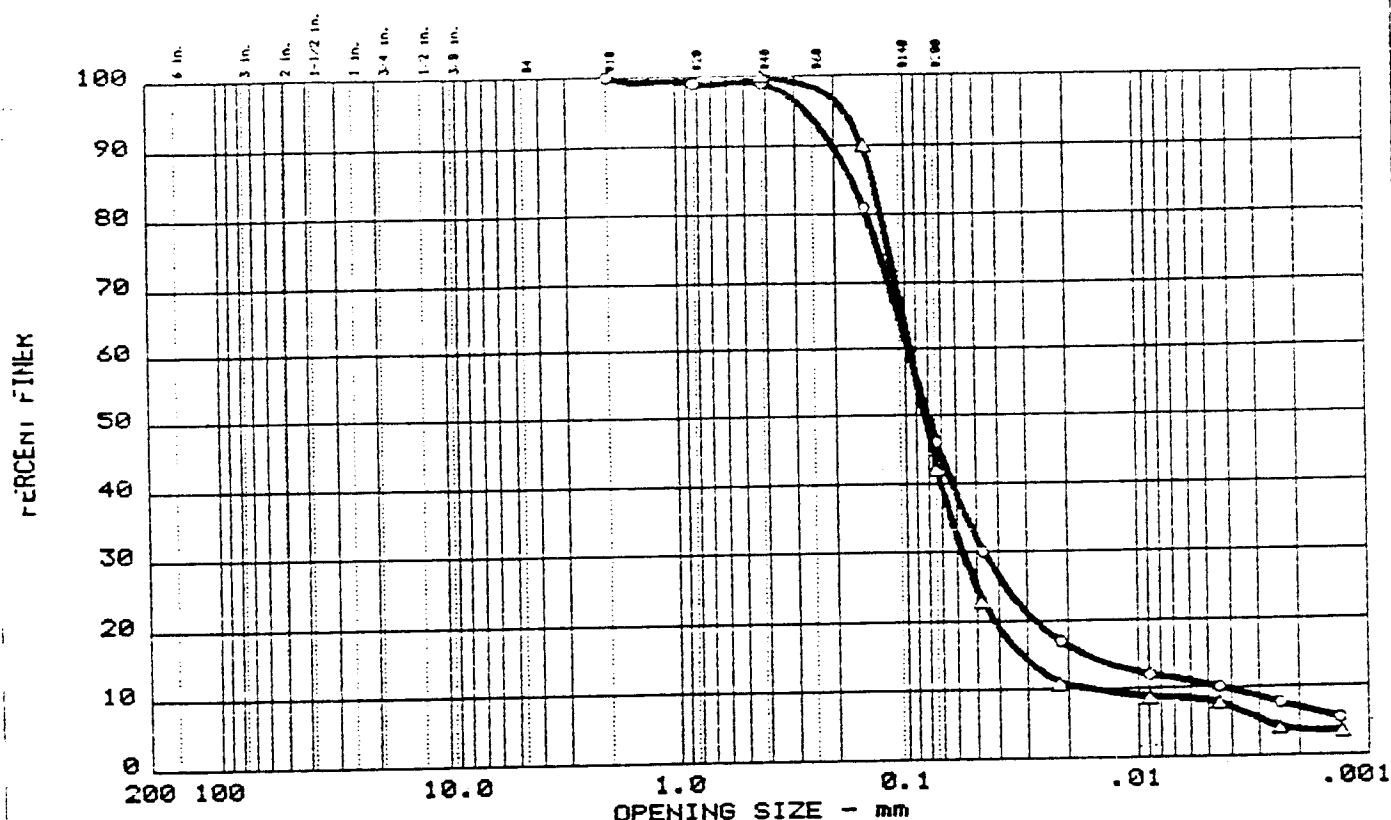


%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○ 0.0	0.0	40.0	37.1	22.9
△ 0.0	0.0	79.0	13.9	7.1
□ 0.0	0.0	91.0	5.0	4.0

USCS Classification	% COLLOIDS	LL	PI	D ₆₀	D ₃₀	D ₁₀	C _c	C _u
CL		26	8					
SM		NP		0.17	0.093	0.0156	3.25	10.9
SP-SM		NP		0.25	0.163	0.0818	1.32	3.0

MATERIAL DESCRIPTION		TYPE OF TEST	
☐ SANDY LEAN CLAY ☐ SILTY SAND ☐ POORLY GRADED SAND WITH SILT		ASTM D 422-63(72) Hydrometer analysis Mechanical analysis	
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ☐ Location: MW-14, J-L, 26.0'-27.8', SWD 88/6250 ☐ Location: MW-14, J-O, 37.8'-42.8', SWD 88/6253 ☐ Location: MW-14, J-P, 42.8'-47.8', SWD 88/6254 Date: DECEMBER, 1988		Remarks: SWD NO. 88/6253 LS: 1 SWD NO. 88/6254 LS: 0	
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN			

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
O	0.0	0.0	54.0	35.5	10.5
Δ	0.0	0.0	58.0	33.8	8.2

[illegible]

MATERIAL DESCRIPTION		TYPE OF TEST
○ CLAYEY SAND △ SILTY SAND		ASTM D 422-63(72) Hydrometer analysis Mechanical analysis
Project No.: SWD NO. 14543-12 Project: LONGHORN AAP - GROUNDWATER MONITOR WELLS ○ Location: MW-15, J-O, 40.0'-46.5', SWD 88/6447 △ Location: MW-15, J-P, 46.5'-47.0', SWD 88/6448 Date: DECEMBER, 1988		Remarks: SWD NO. 88/6448 LS: 0
GRAIN SIZE DISTRIBUTION TEST REPORT CORPS OF ENGINEERS - SOUTHWESTERN		Plate No. <u>21</u>

003010

APPENDIX BB

SLUG TEST DATA PLOTS AND K CALCULATIONS

003011

SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY	DATE	PROJECT LUMPKIN - SUGAR TINE I	SHEET ____ OF ____
CHKD BY	DATE	FEATURE	
DETAILS			

EQUATIONS AND DATA USED TO DETERMINE K AND $\bar{V}$ VALUES FROM SLUG TEST DATA:Shape Factor Equation¹:

$$F = \frac{2\pi L}{\ln \left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D} \right)^2} \right]}$$

where F = shape factor, cm
 L = length of intake (screen), cm
 D = diameter of intake (screen), cm

If $L/D > 4$, use simplified formula:

$$F = \frac{2\pi L}{\ln \left(\frac{2L}{D} \right)}$$

$L = 5\text{ ft} \times 30.48\text{ cm/ft} = 152.40\text{ cm}$
 $D = 4\text{ in} \times 2.54\text{ cm/in} = 10.16\text{ cm}$

Basic Time Lag Equation²:

$$T = \frac{A}{FK} \Rightarrow K = \frac{A}{FT}$$

where K = hydraulic conductivity, cm/sec
 A = cross-sectional area of standpipe, cm²
 F = shape factor, cm
 T = time lag, sec, where $\ln H_0/H = 0.37$

$$A = \pi R^2 = (3.14)(5.08\text{ cm})^2 = 81.03\text{ cm}^2$$

Average Velocity Equation³:

$$\bar{V} = \frac{K dh/dl}{\Theta}$$

where $\bar{V}$ = average velocity, cm/sec
 K = hydraulic conductivity, cm/sec
 dh/dl = hydraulic gradient
 Θ = effective porosity

$$dh/dl = 0.0048$$

$$\Theta = 0.20^4$$

¹ Hvorslev, M. Juul, "Time Lag and Soil Permeability in Ground-water Observations," Corps of Engineers, U.S. Army, Waterways Experiment Station, Vicksburg, Mississippi, Bulletin No. 36, April 1951, p. 31, case (C).

² ibid, p. 10, equation (3).

³ Lohman, S.W., "Ground-water Hydraulics," U.S. Geological Survey, Geological Survey Professional Paper 708, 1979, p. 10, equation (28).

⁴ McWhorter, D., and Sunada, D.K., "Ground-Water Hydrology and Hydraulics," 1977, p. 31.

003012

SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY <i>FITZGERALD</i>	DATE <i>11/15/83</i>	PROJECT <i>LHMP-SWQA Phase I</i>	SHEET ____ OF ____
CHKD BY	DATE	FEATURE <i>MW-1</i> <i>X 57</i>	
DETAILS <i>Time Lag Test Data</i>			

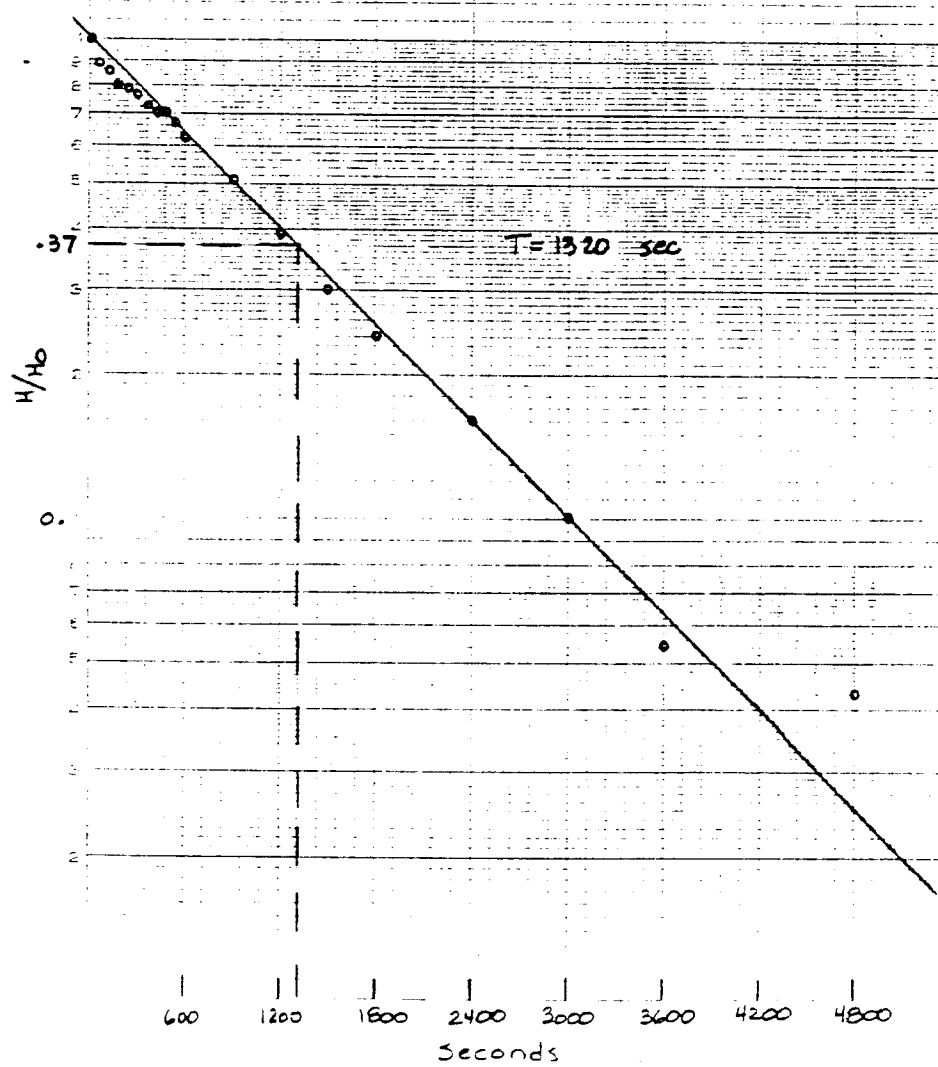
MW-1					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		25.22			
0	0	37.68	12.46	12.46	1.00
1	60	36.33	11.11		0.89
2	120	35.07	10.65		0.85
3	180	35.24	10.02		0.80
4	240	34.92	9.70		0.78
5	300	34.68	9.46		0.76
6	360	34.26	9.04		0.72
7	420	33.94	8.72		0.70
8	480	33.88	8.66		0.70
9	540	33.61	8.39		0.67
10	600	32.89	7.67		0.62
15	900	31.57	6.35		0.51
20	1200	30.12	4.90		0.39
25	1500	28.98	3.76		0.30
30	1800	28.17	2.95		0.24
40	2400	27.21	1.99		0.16
50	3000	26.49	1.27		0.10
60	3600	25.90	0.68		0.054
80	4800	25.76	0.54		0.043
100	6000				
120	7200				
140	8400				
160	9600				
180	10800				

$$\begin{aligned}
 F &= \frac{2\pi L}{\ln(24/D)} \\
 &= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]} \\
 &= \frac{957.07 \text{ cm}}{\ln[2(15)]} \\
 &= \frac{957.07 \text{ cm}}{\ln[30]} \\
 &= \frac{957.07 \text{ cm}}{3.4012} \\
 &= 281.39 \text{ cm}
 \end{aligned}$$

$$\begin{aligned}
 K &= \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(1320 \text{ sec})} \\
 &= \frac{81.03 \text{ cm}}{371,434.8 \text{ sec}} \\
 &= 2.18 \times 10^{-4} \text{ cm/sec}
 \end{aligned}$$

$$\begin{aligned}
 \bar{v} &= \frac{K \Delta h / \Delta e}{\Theta} \\
 &= \frac{(2.18 \times 10^{-4} \text{ cm/sec})(0.0043)}{0.20} \\
 &= 5.232 \times 10^{-6} \text{ cm/sec}
 \end{aligned}$$

003013



BY Fitzgerald	DATE 11/16/83	PROJECT LHAPP - GUDF Phase I	SHEET ____ OF ____
CHKD BY	DATE	FEATURE 11W-2 K&V	
DETAILS Time Lag Test Data			

mw-2					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/ H ₀
-1		23.36			
0	0	40.63	17.27	17.27	1.00
1	60	39.70	16.34		0.95
2	120	39.55	16.19		0.94
3	180	39.25	15.89		0.92
4	240	39.00	15.64		0.90
5	300	38.72	15.36		0.89
6	360	38.67	15.31		0.89
7	420	38.56	15.20		0.88
8	480	38.43	15.07		0.87
9	540	38.30	14.94		0.86
10	600	38.21	14.85		0.86
15	900	37.68	14.32		0.83
20	1200	37.08	13.72		0.79
25	1500	36.57	13.21		0.76
30	1800	35.99	12.63		0.73
40	2400	34.72	11.36		0.66
50	3000	33.54	10.18		0.59
60	3600	32.61	9.25		0.53
80	4800	30.89	7.53		0.44
100	6000	29.45	6.09		0.35
120	7200	28.21	4.85		0.28
140	8400	27.28	3.92		0.23
160	9600	26.53	3.17		0.18
180	10800	25.93	2.57		0.15

$$F = \frac{2\pi L}{\ln\left(\frac{24}{D}\right)}$$

$$= \frac{2(3.14)(152.40\text{cm})}{\ln\left[\frac{2(152.40\text{cm})}{10.16\text{cm}}\right]}$$

$$= 281.39\text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03\text{cm}^2}{(281.39\text{cm})(5520\text{sec})}$$

$$= \frac{81.03\text{cm}}{1,553,272.8\text{sec}}$$

$$= 5.21 \times 10^{-5}\text{ cm/sec}$$

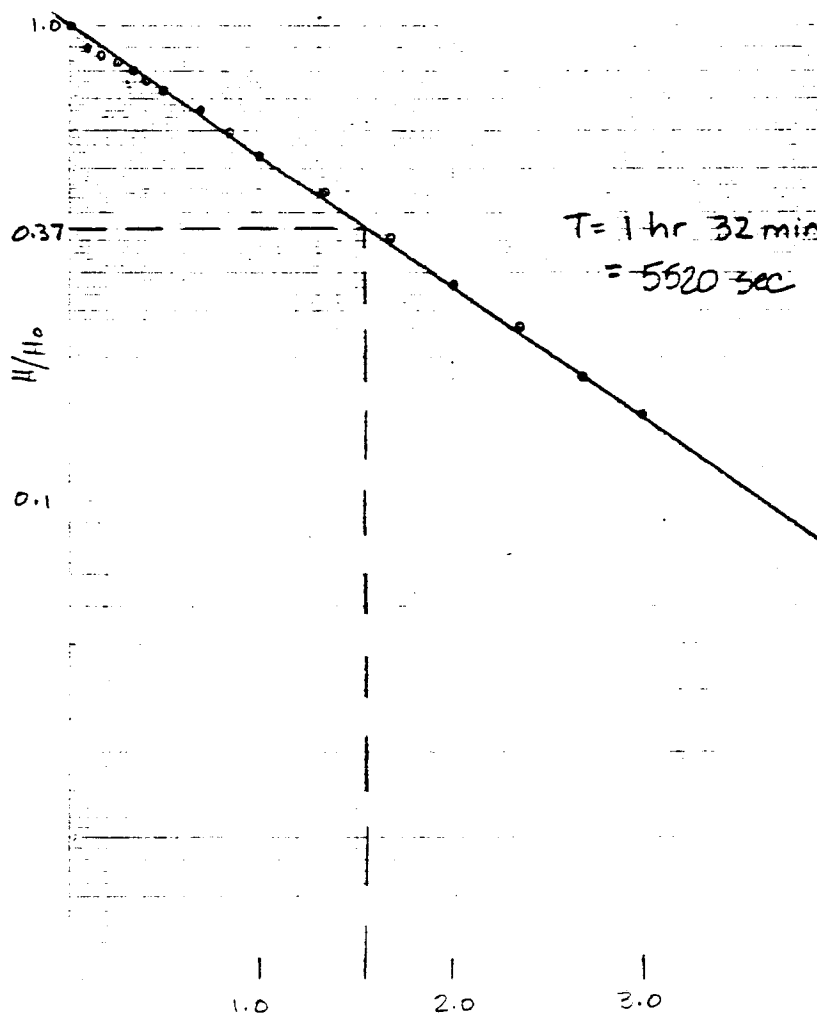
$$\bar{V} = \frac{K dh/dl}{\theta}$$

$$= \frac{(5.21 \times 10^{-5}\text{cm/sec})(0.0048)}{0.20}$$

$$= 2.501 \times 10^{-6}\text{ cm/sec}$$

003015

NO. 17-22. SERRAVALLO
 1000 1000 1000 1000 1000 1000
 1000 1000 1000 1000 1000 1000



SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY <i>FITZGERALD</i>	DATE <i>11/16/88</i>	PROJECT <i>LHAPP - GUSIA P. 1122</i>	SHEET ____ OF ____
CHKD BY	DATE	FEATURE <i>MW-3 K&T</i>	
DETAILS <i>Time Lag Test Data</i>			

MW-3					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1	—	25.74	—	—	—
0	0	46.71	20.97	20.97	1.00
1	60	45.58	19.84		0.95
2	120	44.60	18.86		0.90
3	180	44.16	18.42		0.88
4	240	43.63	17.89		0.85
5	300	43.07	17.33		0.83
6	360	42.78	17.04		0.81
7	420	42.03	16.29		0.78
8	480	41.58	15.84		0.76
9	540	40.98	15.24		0.73
10	600	40.38	14.64		0.70
15	900	37.97	12.23		0.58
20	1200	35.85	10.11		0.48
25	1500	34.20	8.46		0.40
30	1800	32.88	7.14		0.34
40	2400	30.76	5.02		0.24
50	3000	28.94	3.20		0.15
60	3600	27.92	2.18		0.10
80	4800	26.63	0.89		0.042
100	6000	26.09	0.35		0.017
120	7200				
140	8400				
160	9600				
180	10800				

$$F = \frac{2\pi L}{\ln(2L/D)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(1500 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{424,898.9 \text{ sec}}$$

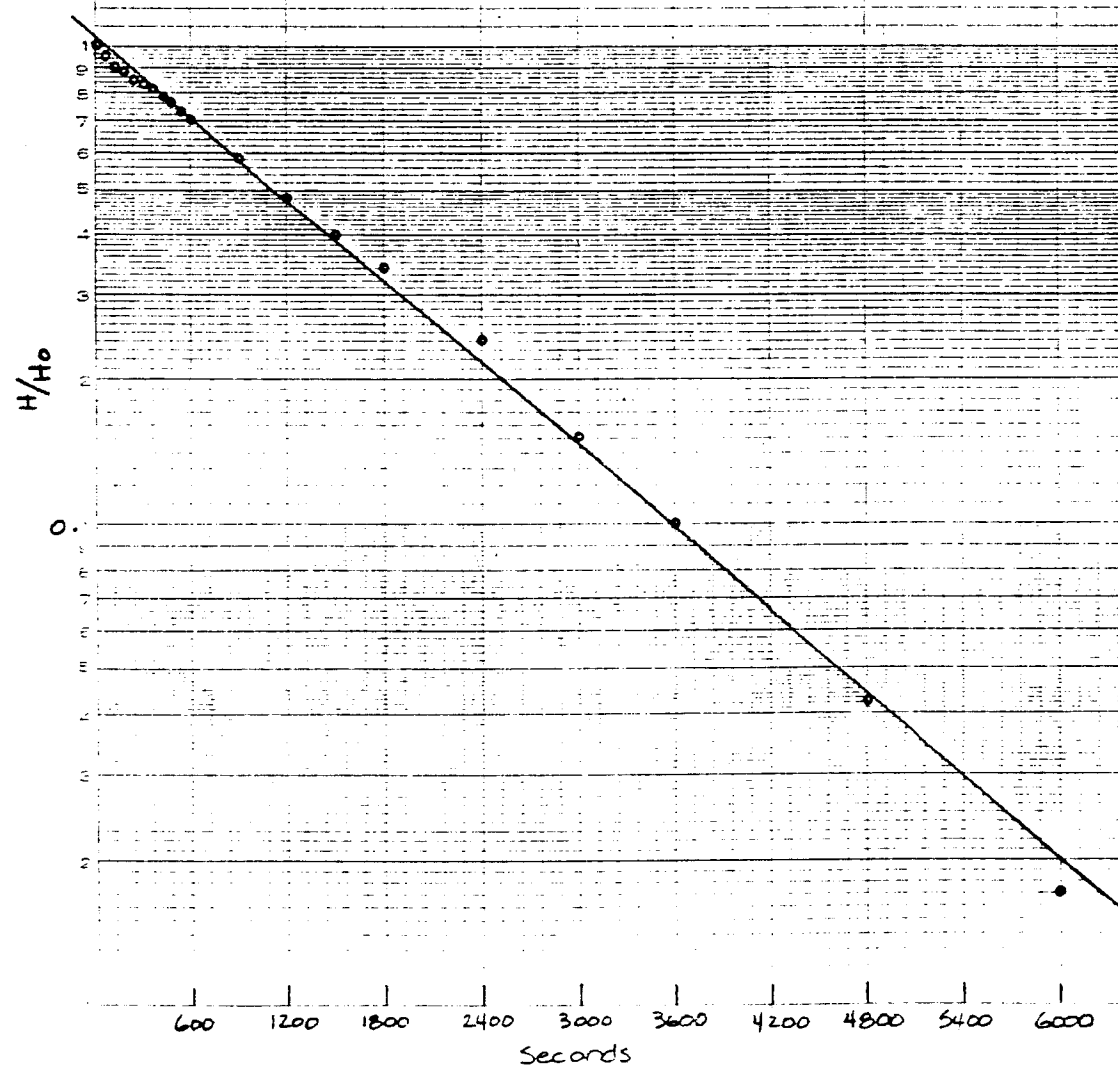
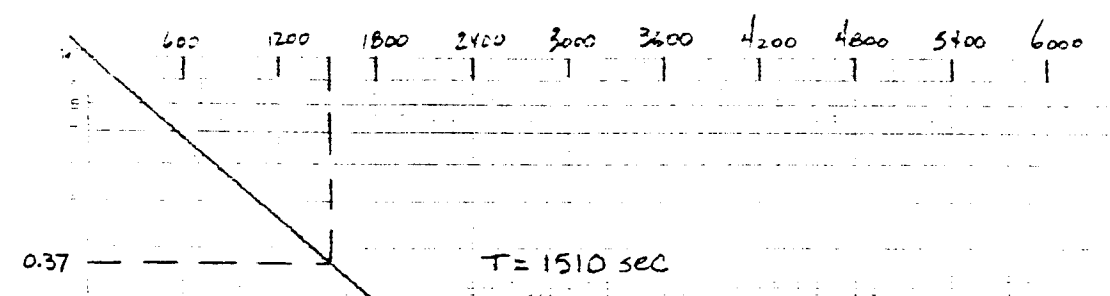
$$= 1.91 \times 10^{-4} \text{ cm/sec}$$

$$\bar{V} = \frac{k}{\Theta} \frac{dh}{dl}$$

$$= \frac{(1.91 \times 10^{-4} \text{ cm/sec})(0.0048)}{0.20}$$

$$= 4.584 \times 10^{-6} \text{ cm/sec}$$

003017



003018

SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY FIREBEAD	DATE 11/16/88	PROJECT LHAPP - GWA FIVE	SHEET ____ OF ____
CHKD BY	DATE	FEATURE MW-4 KSV	
DETAILS Time Log Test Data			

MW-4					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
- 1		25.25			
0	0	42.34	17.09	17.09	1.00
1	60	41.04	15.79		0.92
2	120	40.27	15.02		0.88
3	180	39.40	14.15		0.83
4	240	38.65	13.40		0.78
5	300	37.82	12.57		0.74
6	360	37.07	11.82		0.69
7	420	36.01	10.76		0.63
8	480	35.45	10.20		0.60
9	540	34.72	9.47		0.55
10	600	34.06	8.81		0.52
15	900	32.34	7.09		0.41
20	1200	30.67	5.42		0.32
25	1500	29.34	4.09		0.24
30	1800	28.42	3.17		0.18
40	2400	27.23	1.98		0.12
50	3000	26.02	0.77		0.045
60	3600	25.65	0.40		0.023
80	4800	25.34	0.09		0.005
100	6000				
120	7200				
140	8400				
160	9600				
180	10800				

$$F = \frac{2\pi L}{\ln(24/D)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(960 \text{ sec})}$$

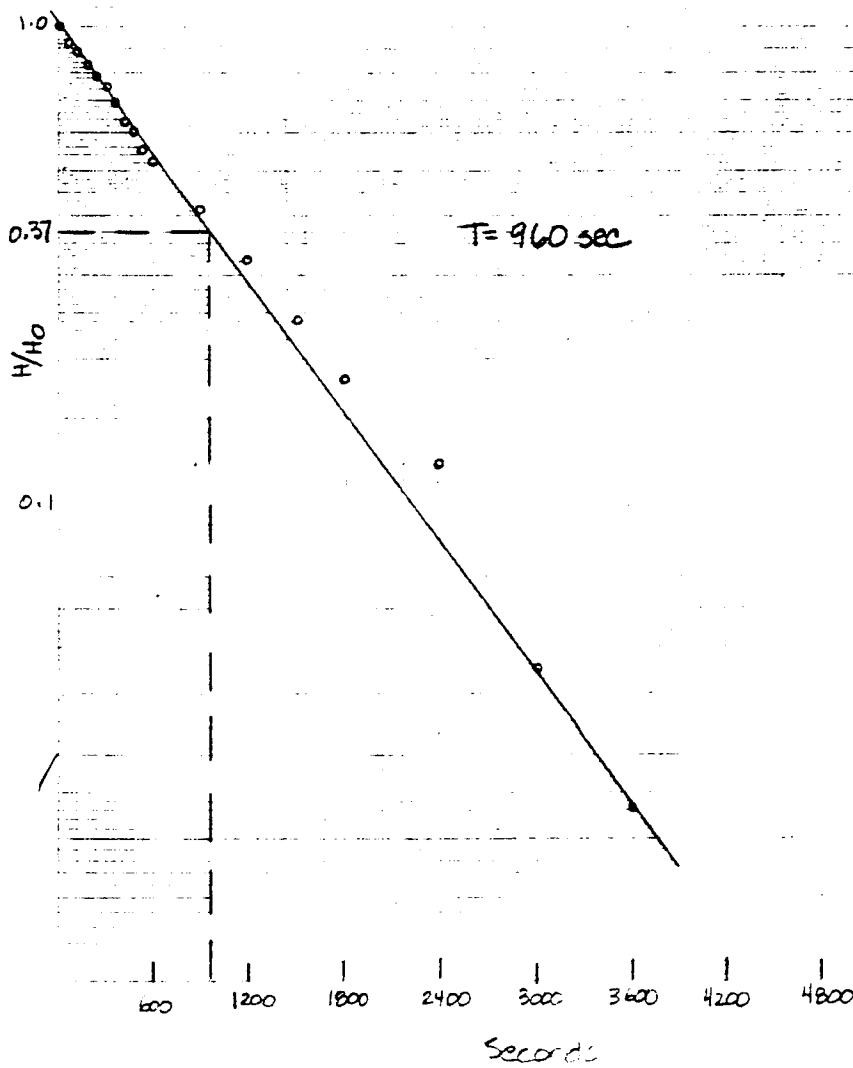
$$= \frac{81.03 \text{ cm}}{270,134.4 \text{ sec}}$$

$$= 3.00 \times 10^{-4} \text{ cm/sec}$$

$$\bar{V} = \frac{K dh/dt}{\theta}$$

$$= \frac{(3.00 \times 10^{-4} \text{ cm/sec})(0.0049)}{0.20}$$

$$= 7.200 \times 10^{-6} \text{ cm/sec}$$



SWF Form 1271-J(a)
19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY <i>FITZGERALD</i>	DATE <i>11/16/88</i>	PROJECT <i>LHAAP- GWDA Phase I</i>	SHEET ____ OF ____
CHKD BY	DATE	FEATURE <i>MW-5 K&V</i>	
DETAILS <i>Time Lag Test Data</i>			

MW-5					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1	—	24.59	—	—	—
0	0	41.95	17.36	17.36	1.00
1	60	41.16	16.57		0.95
2	120	40.34	15.75		0.91
3	180	39.80	15.21		0.88
4	240	39.22	14.63		0.84
5	300	38.67	14.08		0.81
6	360	38.05	13.46		0.78
7	420	37.74	13.15		0.76
8	480	37.26	12.67		0.73
9	540	36.86	12.27		0.71
10	600	36.37	11.78		0.68
15	900	34.64	10.05		0.58
20	1200	32.79	8.20		0.47
25	1500	31.43	6.84		0.39
30	1800	30.31	5.72		0.33
40	2400	28.64	4.05		0.23
50	3000	27.40	2.81		0.16
60	3600	26.65	2.06		0.12
80	4800	25.78	1.19		0.068
100	6000	25.18	0.59		0.034
120	7200	24.50	0.09		0.005
140	8400				
160	9600				
180	10800				

$$F = \frac{2\pi L}{\ln(24D)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(1704 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{479,488.56 \text{ sec}}$$

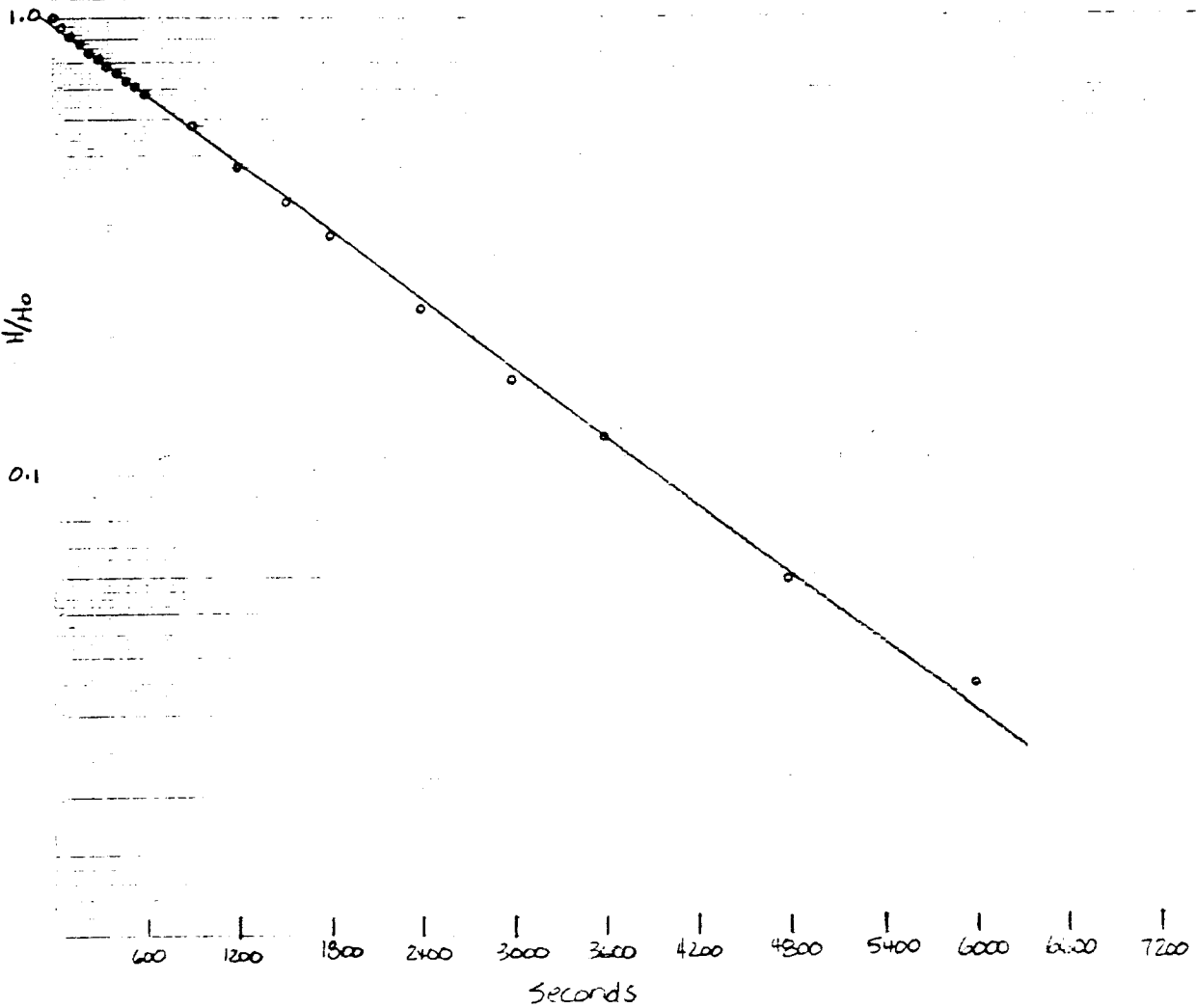
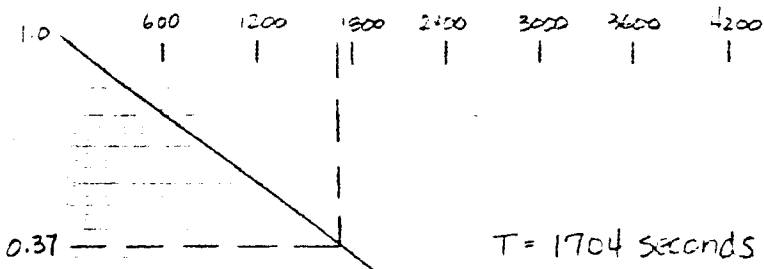
$$= 1.69 \times 10^{-4} \text{ cm/sec}$$

$$\bar{V} = \frac{K dh/dl}{\Theta}$$

$$= \frac{(1.69 \times 10^{-4} \text{ cm/sec})(0.0049)}{0.20}$$

$$= 4.056 \times 10^{-6} \text{ cm/sec}$$

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SWF Form 1271-J(a)
19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY FITZGERALD	DATE 11/16/88	PROJECT LGAAP - GLOCA H-04-01	SHEET _____ OF _____
CHKD BY	DATE	FEATURE mw-6 KSV	
DETAILS Time Log Test Data			

mw-6					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		21.47			
0	0	45.26	23.79	23.79	1.00
1	60	44.81	23.34		0.98
2	120	44.42	22.95		0.96
3	180	44.09	22.62		0.95
4	240	43.75	22.28		0.94
5	300	43.43	21.96		0.92
6	360	43.12	21.65		0.91
7	420	42.86	21.39		0.90
8	480	42.53	21.06		0.88
9	540	42.26	20.79		0.87
10	600	42.08	20.61		0.87
15	900	41.11	19.64		0.82
20	1200	39.97	18.50		0.78
25	1500	38.89	17.42		0.73
30	1800	38.00	16.53		0.69
40	2400	36.24	14.77		0.62
50	3000	34.64	13.17		0.55
60	3600	33.19	11.72		0.49
80	4800	30.82	9.35		0.39
100	6000	28.77	7.30		0.31
120	7200	27.34	5.87		0.25
140	8400	26.22	4.75		0.20
160	9600	25.28	3.81		0.16
180	10800				

$$F = \frac{2\pi L}{\ln(2L/D)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{Ft} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(5280 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{1,485,739.2 \text{ sec}}$$

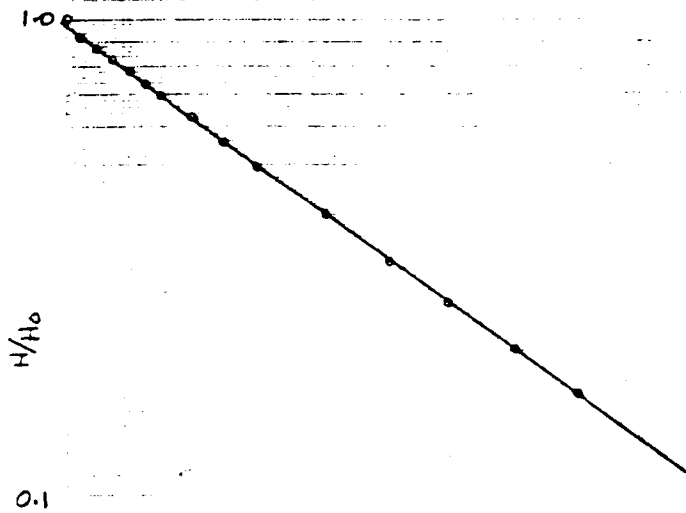
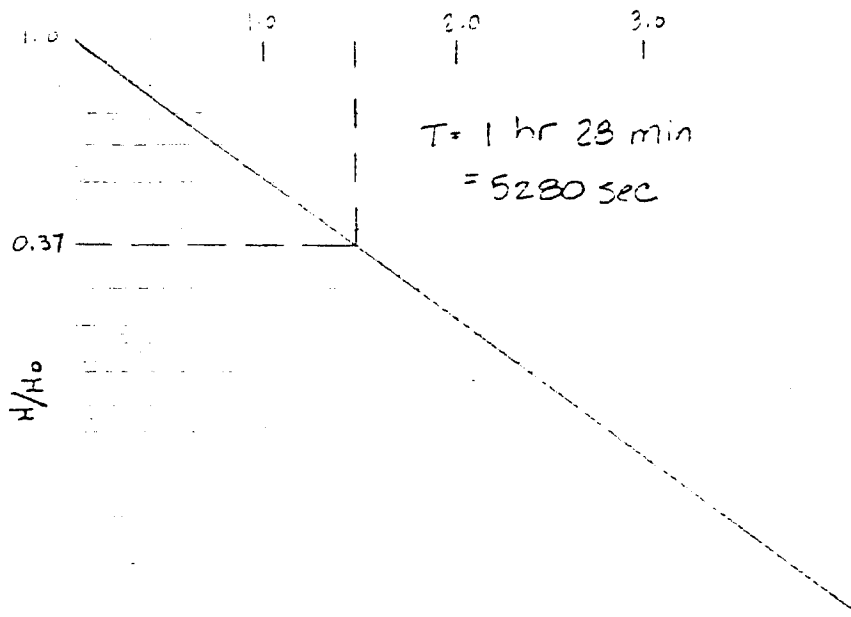
$$= 5.45 \times 10^{-5} \text{ cm/sec}$$

$$\bar{V} = \frac{K \Delta h / \Delta l}{\theta}$$

$$= \frac{(5.45 \times 10^{-5} \text{ cm/sec})(0.0049)}{0.20}$$

$$= 1.308 \times 10^{-6} \text{ cm/sec}$$

003023



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U. S. MIDWAY COMPANY
1000 24th Street, Suite 100
Long Beach, California 90802

Hours

003024

SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY FITZGERALD	DATE 11/16/88	PROJECT LHAAP-GWDA Phase I	SHEET ____ OF ____
CHKD BY	DATE	FEATURE MW-7 KET	
DETAILS Time Lag Test Data			

MW-7					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		15.77			
0	0	26.65	10.88	10.88	1.00
1	60	26.51	10.74		0.99
2	120	26.40	10.63		0.98
3	180	26.28	10.51		0.96
4	240	26.15	10.38		0.95
5	300	26.03	10.26		0.94
6	360	25.90	10.13		0.93
7	420	25.81	10.04		0.92
8	480	25.71	9.94		0.91
9	540	25.62	9.85		0.90
10	600	25.54	9.77		0.90
15	900	25.01	9.24		0.85
20	1200	24.76	8.99		0.83
25	1500	24.45	8.68		0.80
30	1800	24.27	8.50		0.78
40	2400	23.74	7.97		0.73
50	3000	23.31	7.54		0.69
60	3600	22.97	7.20		0.66
80	4800	22.11	6.34		0.58
100	6000	21.52	5.75		0.53
120	7200	21.04	5.27		0.48
140	8400	20.60	4.83		0.44
160	9600	20.19	4.42		0.41
180	10800	19.82	4.05		0.37
240	14400	18.88	3.11		0.28
300	18000	17.97	2.20		0.20
360	21600	17.10	1.33		0.12

$$F = \frac{2\pi L}{\ln(2L/D)}$$

$$= \frac{2(3.14)(152.40\text{cm})}{\ln\left[\frac{2(152.40\text{cm})}{10.16\text{cm}}\right]}$$

$$= 281.39\text{cm}$$

$$K = \frac{A}{FT} = \frac{81.03\text{cm}^2}{(281.39\text{cm})(12000\text{sec})}$$

$$= \frac{81.03\text{cm}}{3,376,680.0\text{sec}}$$

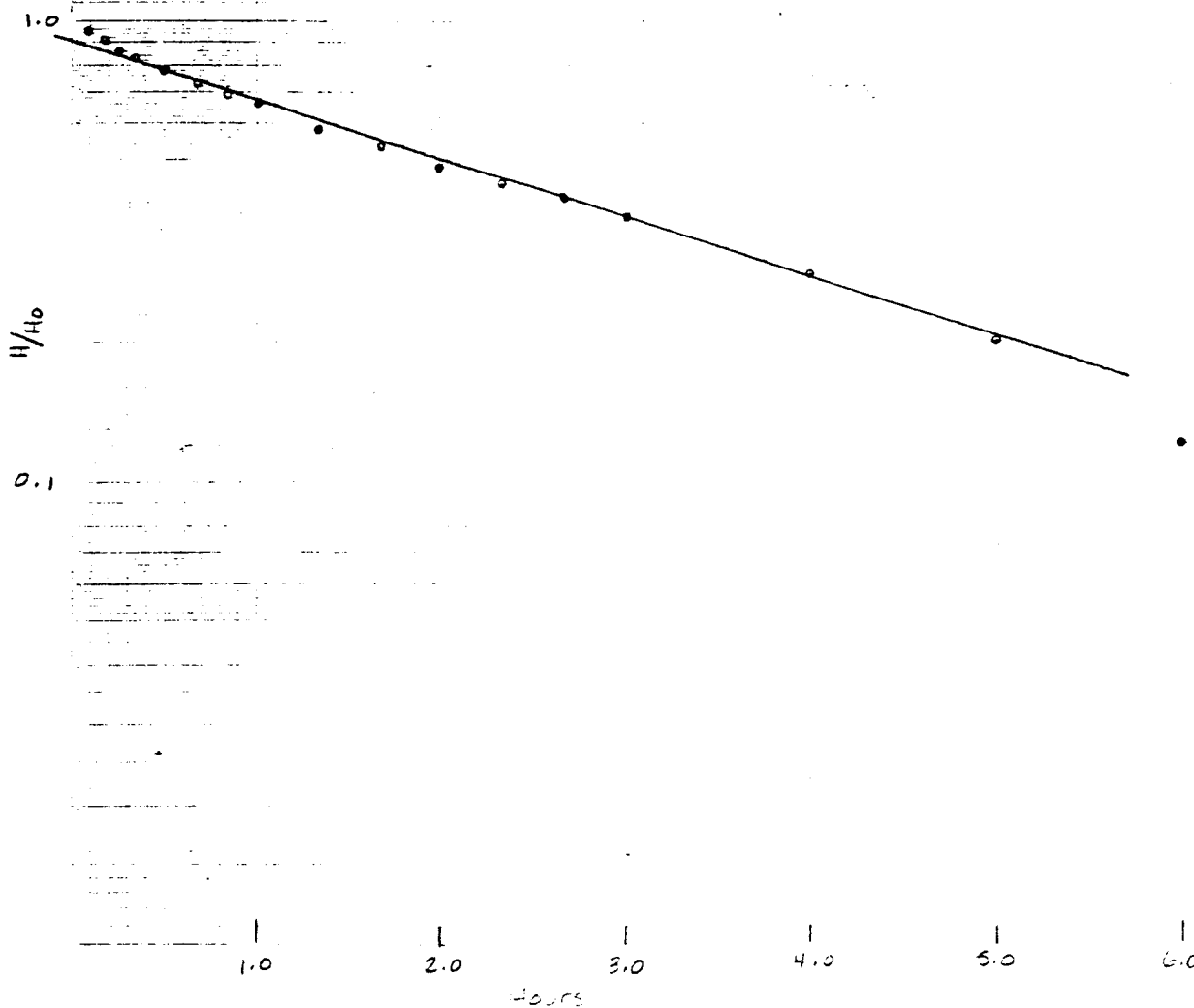
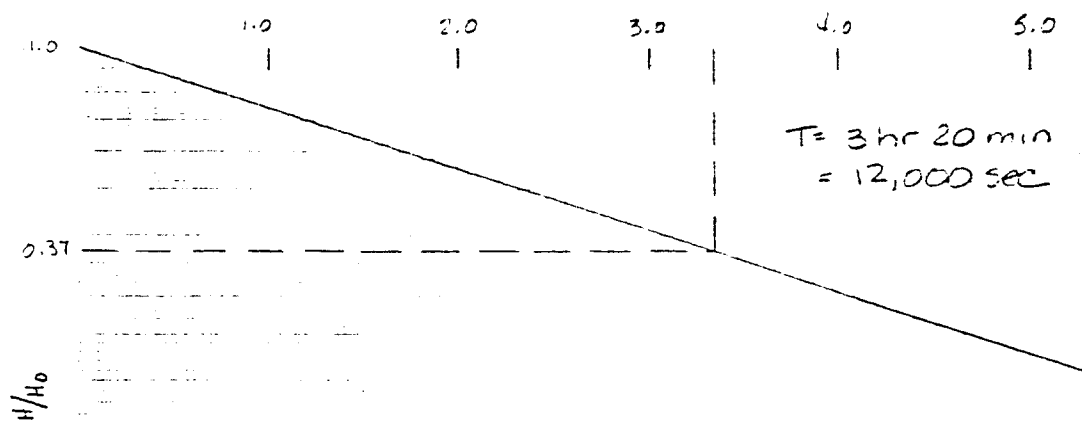
$$= 2.39 \times 10^{-5}\text{cm/sec}$$

$$\bar{v} = \frac{K dh/dl}{\theta}$$

$$= \frac{(2.39 \times 10^{-5}\text{cm/sec})(6.0049)}{0.20}$$

$$= 5.736 \times 10^{-7}\text{cm/sec}$$

003025



SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY F. J. GERALD	DATE 11/16/88	PROJECT LHAAP - GWCA PIRI 2	SHEET ____ OF ____
CHKD BY	DATE	FEATURE MW-B K&V	
DETAILS Time Lag Test Data			

MW-B					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		14.32			
0	0	33.40	19.08	19.08	1.00
1	60	32.68	18.36		0.96
2	120	31.91	17.59		0.92
3	180	31.45	17.13		0.90
4	240	31.11	16.79		0.88
5	300	30.61	16.29		0.85
6	360	30.26	15.94		0.84
7	420	30.06	15.74		0.82
8	480	29.83	15.51		0.81
9	540	29.45	15.13		0.79
10	600	29.21	14.89		0.78
15	900	27.92	13.60		0.71
20	1200	26.84	12.52		0.66
25	1500	26.33	12.01		0.63
30	1800	25.96	11.64		0.61
40	2400	25.03	10.71		0.56
50	3000	24.25	9.93		0.52
60	3600	23.75	9.43		0.49
80	4800	22.50	8.18		0.43
100	6000	21.42	7.10		0.37
120	7200	20.67	6.35		0.33
140	8400	19.99	5.67		0.30
160	9600	19.39	5.07		0.26
180	10800	18.87	4.55		0.24
240	14400	17.64	3.32		0.17
300	18000	16.40	2.08		0.11

$$F = \frac{2\pi L}{\ln(24/5)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(9600 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{2,701,344.0 \text{ sec}}$$

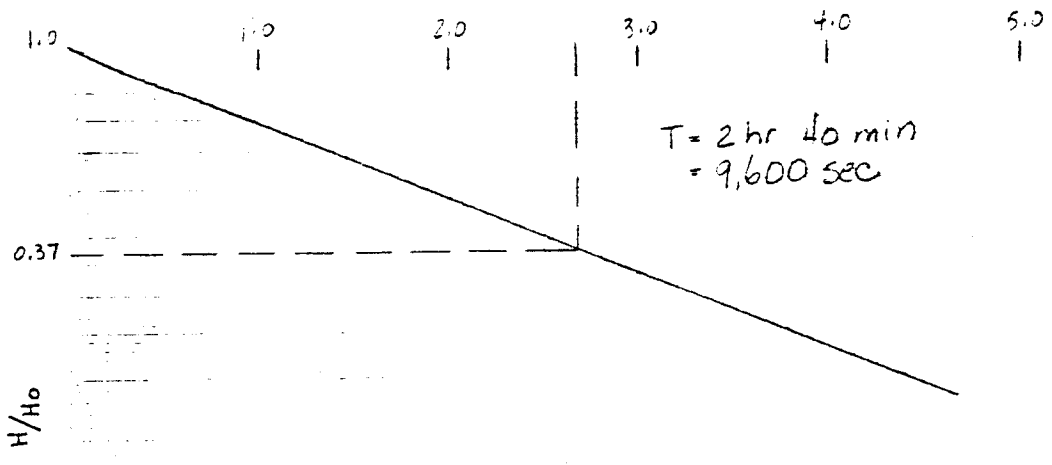
$$= 2.99 \times 10^{-5} \text{ cm/sec}$$

$$\bar{V} = \frac{K dh/dt}{\theta}$$

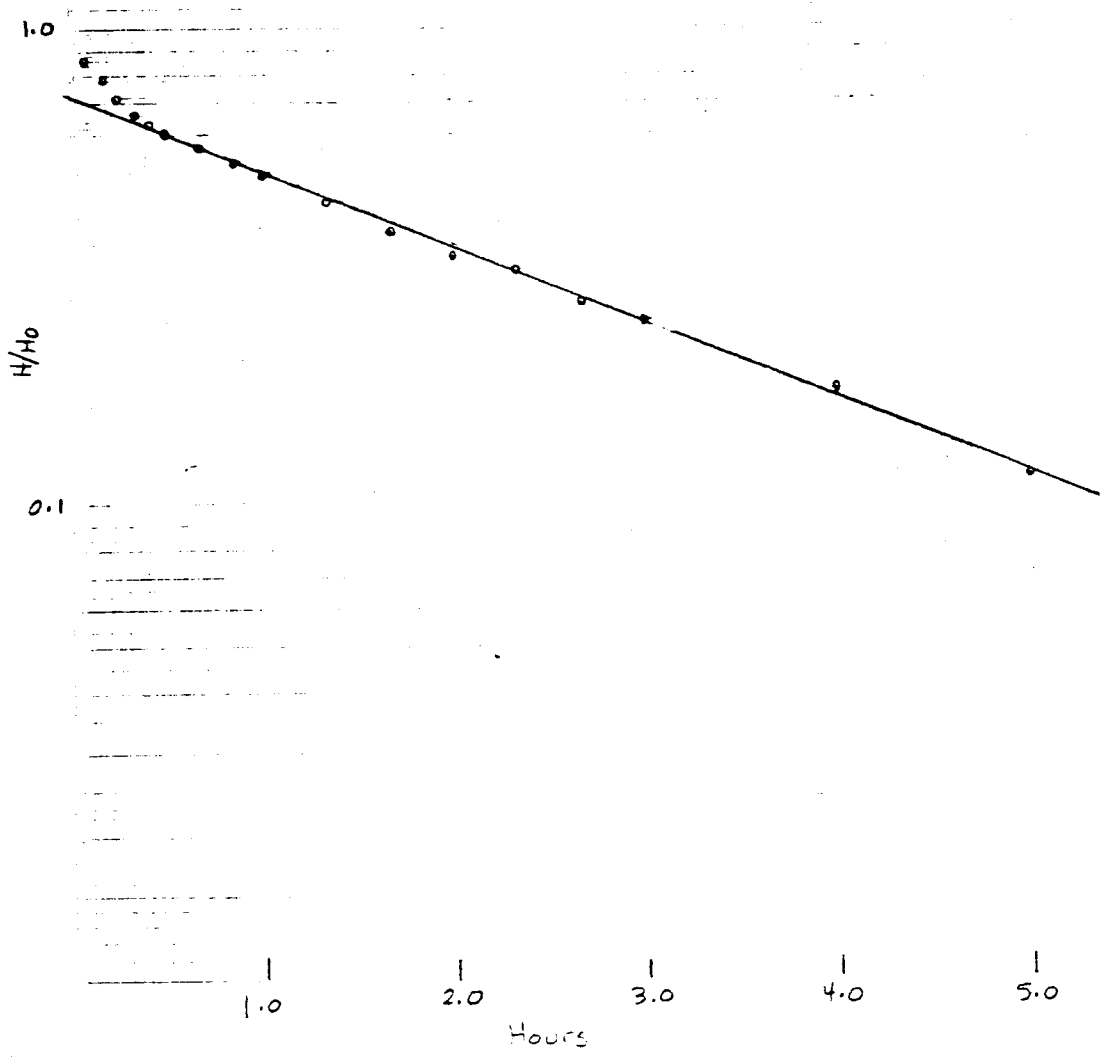
$$= \frac{(2.99 \times 10^{-5} \text{ cm/sec})(0.0048)}{0.20}$$

$$= 7.176 \times 10^{-7} \text{ cm/sec}$$

003027



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PITTSBURGH, U.S.A.



SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY FITZGERALD	DATE 11/6/88	PROJECT LAAP - SODA PUMP	SHEET ____ OF ____
CHKD BY	DATE	FEATURE MW-9 K=V	
DETAILS Time Lag Test Data			

MW-9					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/ H ₀
-1		11.73			
0	0	27.45	15.72	15.72	1.00
1	60	27.22	15.49		0.98
2	120	26.93	15.20		0.97
3	180	26.62	14.89		0.95
4	240	26.33	14.60		0.93
5	300	26.17	14.44		0.92
6	360	25.90	14.17		0.90
7	420	25.49	13.76		0.88
8	480	25.26	13.53		0.86
9	540	25.03	13.30		0.85
10	600	24.90	13.17		0.84
15	900	24.12	12.39		0.79
20	1200	23.77	12.04		0.76
25	1500	23.55	11.82		0.75
30	1800	23.37	11.64		0.74
40	2400	22.61	10.88		0.69
50	3000	22.07	10.34		0.66
60	3600	21.48	9.75		0.62
80	4800	20.37	8.64		0.55
100	6000	19.19	7.46		0.47
120	7200	18.34	6.61		0.42
140	8400	18.03	6.30		0.40
160	9600	17.93	6.20		0.39
180	10800	17.43	5.70		0.36
240	14400	16.35	4.62		0.29
300	18000	15.76	4.03		0.25

$$F = \frac{2\pi L}{\ln(24/d)}$$

$$= \frac{2(3.14)(152.40\text{cm})}{\ln\left[\frac{2(152.40\text{cm})}{10.16\text{cm}}\right]}$$

$$= 281.39\text{cm}$$

$$K = \frac{A}{F} = \frac{81.03\text{m}^2}{(281.39\text{cm})(18,180\text{sec})}$$

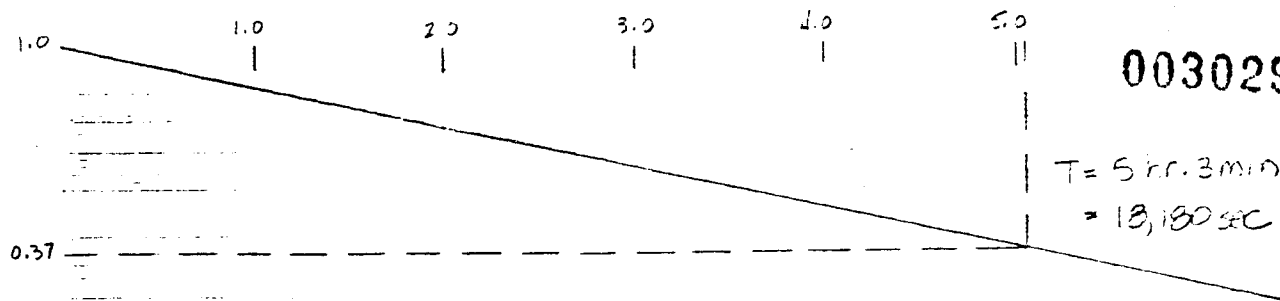
$$= \frac{81.03\text{cm}}{5,115,670.2\text{sec}}$$

$$= 1.58 \times 10^{-5}\text{cm/sec}$$

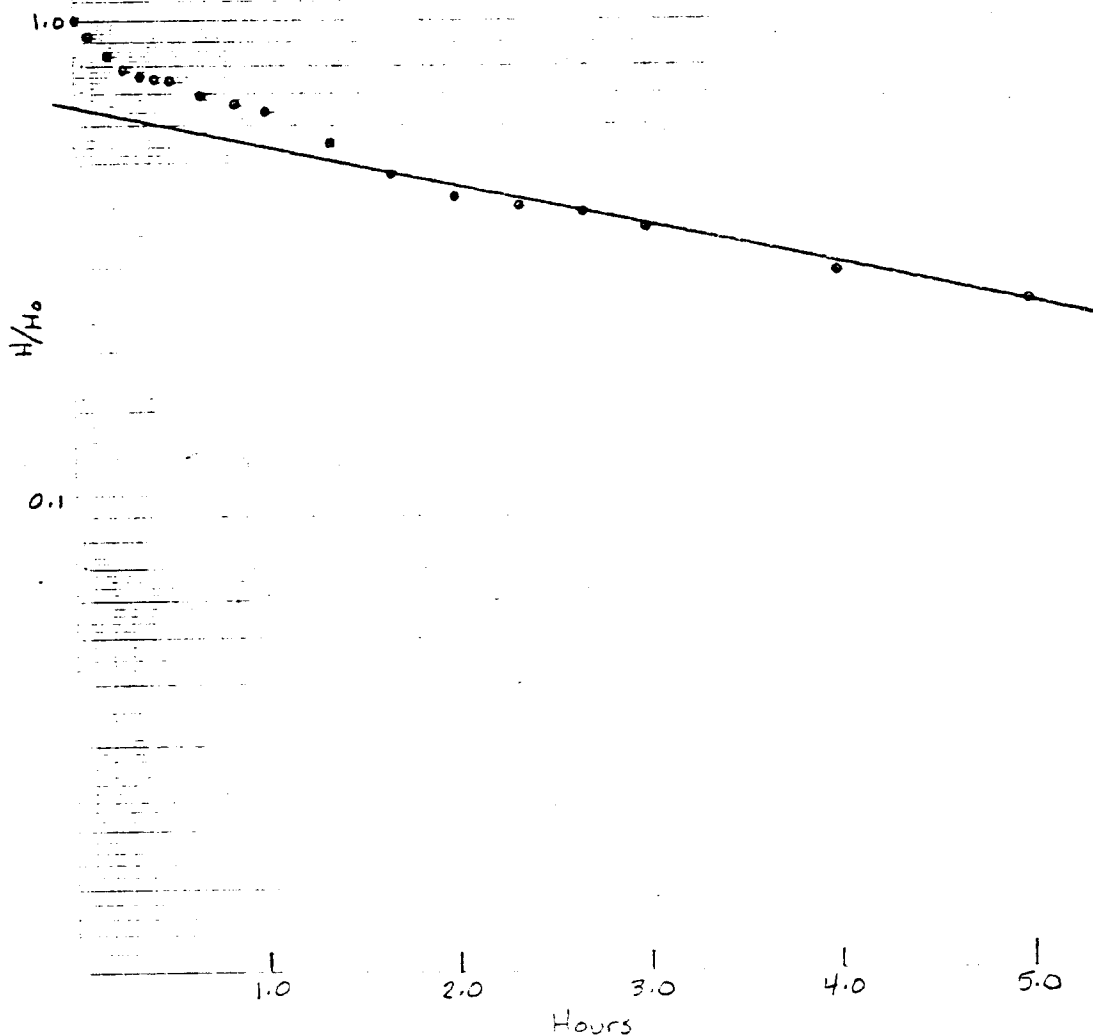
$$\bar{V} = \frac{K dh/dz}{\theta}$$

$$= \frac{(1.53 \times 10^{-5}\text{cm/sec})(0.0055)}{0.20}$$

$$= 3.792 \times 10^{-7}\text{cm/sec}$$

$$T = 5 \text{ hr. } 3 \text{ min} \\ = 18,180 \text{ sec}$$


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[illegible]

SWF Form 1271-J(a)
19 Oct 84

COMPUTATION SHEET

003030

(SWFED SOP)

BY FITZGERALD	DATE 11/16/88	PROJECT LAMP-500A PUMP	SHEET _____ OF _____
CHKD BY	DATE	FEATURE MW-10 K&V	
DETAILS Time Lag Test Data			

MW-10					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		7.85			
0	0	35.64	27.79	27.79	1.00
1	60	35.09	27.24		0.98
2	120	34.58	26.73		0.96
3	180	34.15	26.30		0.95
4	240	33.75	25.90		0.93
5	300	33.35	25.50		0.92
6	360	33.00	25.15		0.90
7	420	32.79	24.94		0.90
8	480	32.45	24.60		0.88
9	540	32.05	24.20		0.87
10	600	31.73	23.88		0.86
15	900	30.32	22.47		0.81
20	1200	29.07	21.22		0.76
25	1500	27.85	20.00		0.72
30	1800	26.64	18.79		0.68
40	2400	24.27	16.42		0.59
50	3000	22.35	14.50		0.52
60	3600	20.78	12.93		0.46
80	4800	17.96	10.11		0.36
100	6000	15.49	7.64		0.27
120	7200	14.25	6.40		0.23
140	8400	12.94	5.09		0.18
160	9600	11.94	4.09		0.15
180	10800	11.10	3.25		0.12
240	14400	9.42	1.57		0.056
300	18000	8.63	0.78		0.028
360	21600	8.10	0.25		0.009

$$F = \frac{2\pi L}{\ln(2L/D)}$$

$$= \frac{2(3.14)(52.40 \text{ cm})}{\ln \left[\frac{2(52.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(5040 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{1,418,205.6 \text{ sec}}$$

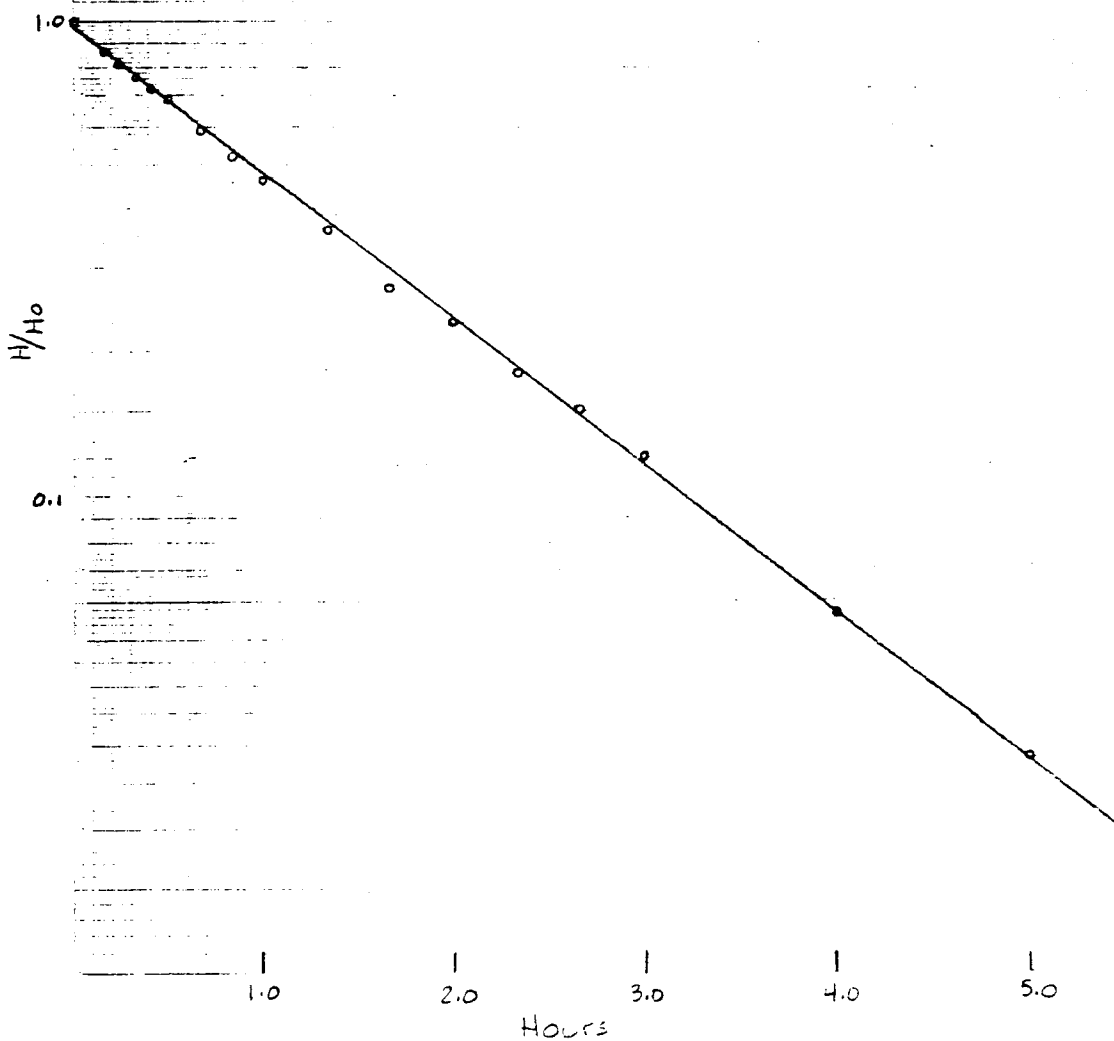
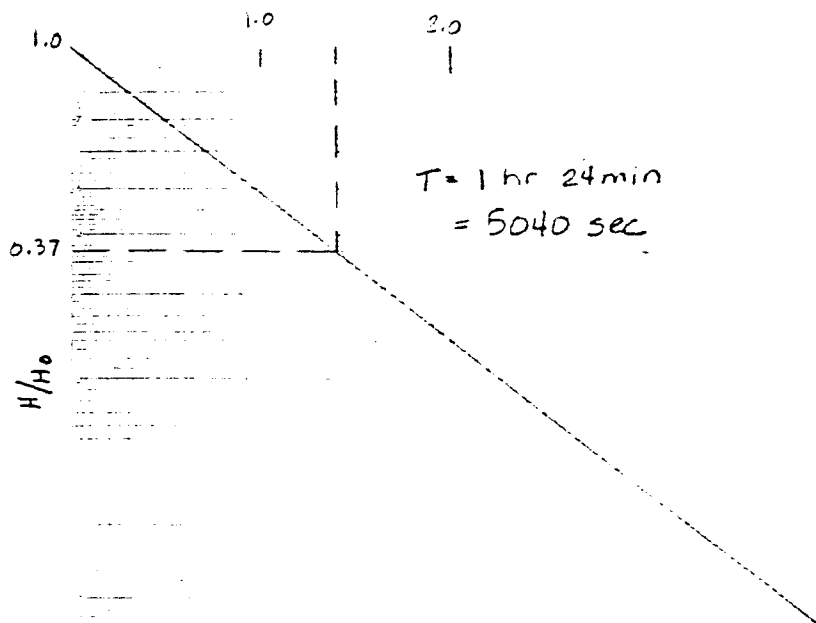
$$= 5.71 \times 10^{-5} \text{ cm/sec}$$

$$\bar{v} = \frac{K dh/dx}{\theta}$$

$$= \frac{(5.71 \times 10^{-5} \text{ cm/sec})(0.0048)}{0.20}$$

$$= 1.370 \times 10^{-6} \text{ cm/sec}$$

003031



003032

SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY S. F. F. F.	DATE 11/10/84	PROJECT LAPAR- D. A. A. I. C. I.	SHEET _____ OF _____
CHKD BY	DATE	FEATURE mw-11 K & V	
DETAILS Time Log Test Data			

mw-11					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		7.33			
0	0	10.91	3.58	3.58	1.00
1	60	9.97	2.64		0.74
2	120	9.57	2.24		0.62
3	180	9.26	1.93		0.54
4	240	8.90	1.57		0.44
5	300	8.66	1.33		0.37
6	360	8.28	0.95		0.26
7	420	8.18	0.85		0.24
8	480	8.01	0.68		0.19
9	540	7.99	0.66		0.18
10	600	7.97	0.64		0.18
15	900	7.88	0.55		0.15
20	1200	7.79	0.46		0.13
25	1500	7.74	0.41		0.11
30	1800	7.70	0.37		0.10
40	2400	7.60	0.27		0.075
50	3000	7.52	0.19		0.053
60	3600	7.45	0.12		0.034
80	4800	7.39	0.06		0.017
100	6000	7.33	0.00		0.00
120	7200				
140	8400				
160	9600				
180	10800				

$$F = \frac{2\pi L}{\ln(24/5)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(1908 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{536,892.12 \text{ sec}}$$

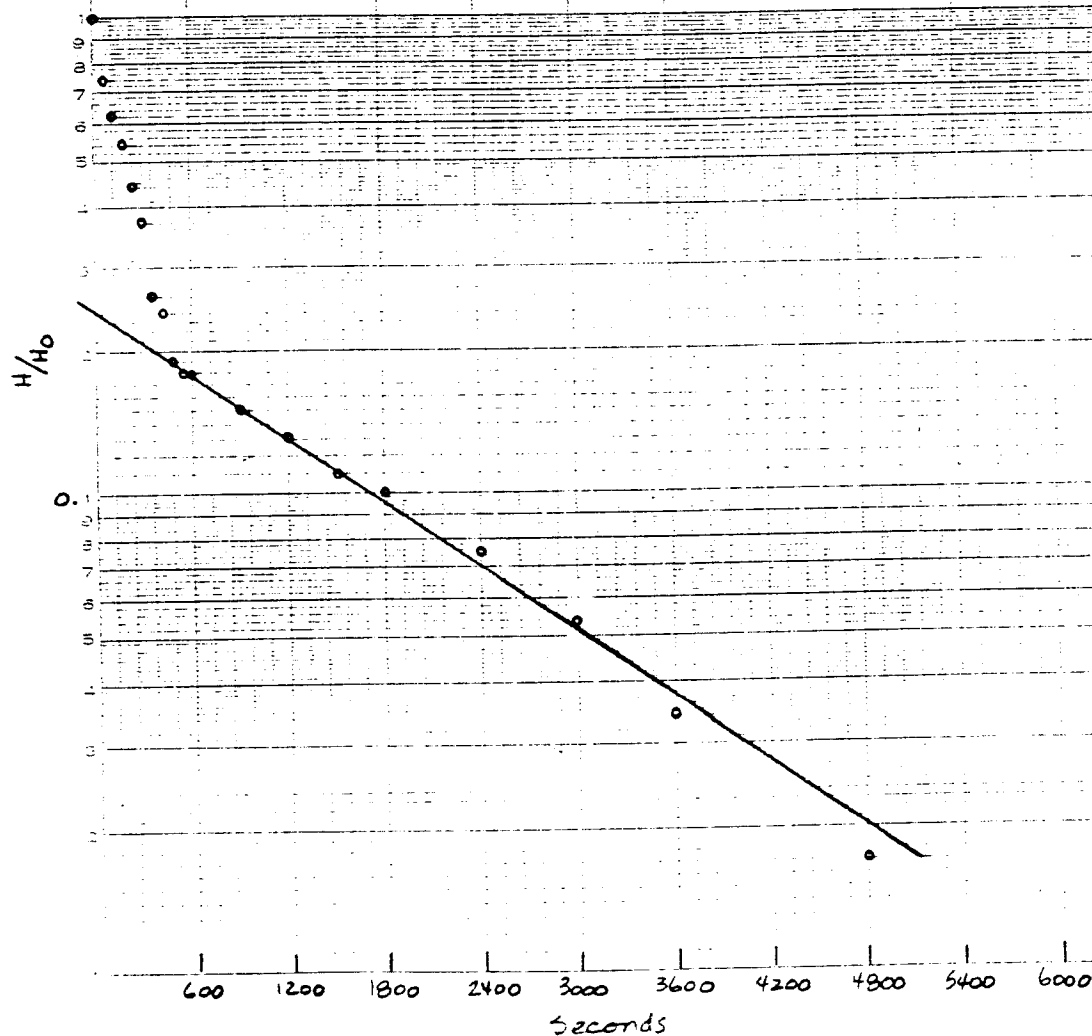
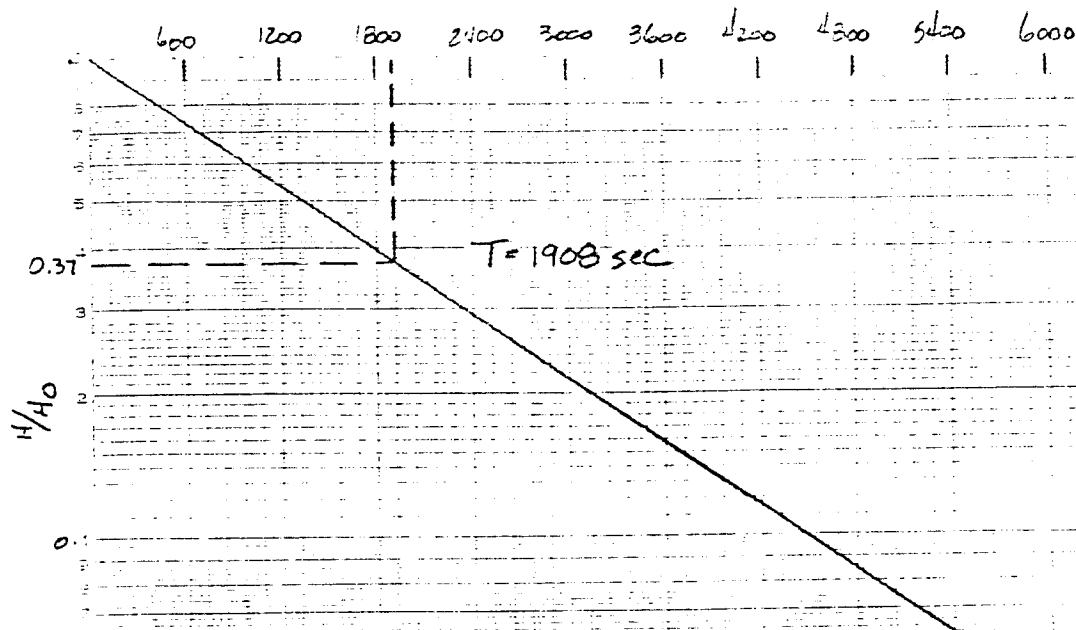
$$= 1.51 \times 10^{-4} \text{ cm/sec}$$

$$\bar{V} = \frac{K}{\Theta} \frac{dh}{d\bar{t}}$$

$$= \frac{(1.51 \times 10^{-4} \text{ cm/sec})}{0.20} (0.504 \text{ sec})$$

$$= 3.62 \times 10^{-5} \text{ cm/sec}$$

003033



SWF Form 1271-J(a)
19 Oct 84

COMPUTATION SHEET

003034
(SWFED SOP)

BY <i>FRANCOIS</i>	DATE <i>11/10/82</i>	PROJECT <i>LEAF - SODA PHASE I</i>	SHEET ____ OF ____
CHKD BY	DATE	FEATURE <i>FW-12 K = V</i>	
DETAILS <i>Time Lag Test Data</i>			

MW-12					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		7.92			
0	0	30.70	22.78	22.78	1.00
1	60	27.65	19.73		0.87
2	120	24.91	16.99		0.74
3	180	22.88	14.96		0.66
4	240	20.98	13.06		0.57
5	300	19.32	11.40		0.50
6	360	18.22	10.30		0.45
7	420	17.33	9.41		0.41
8	480	16.82	8.90		0.39
9	540	16.48	8.56		0.38
10	600	16.25	8.33		0.36
15	900	14.90	6.98		0.31
20	1200	13.65	5.73		0.25
25	1500	12.69	4.77		0.21
30	1800	12.21	4.29		0.19
40	2400	11.86	3.94		0.17
50	3000	11.66	3.74		0.16
60	3600	11.47	3.55		0.16
80	4800	11.38	3.46		0.15
100	6000				
120	7200				
140	8400				
160	9600				
180	10800				

$$F = \frac{2\pi L}{\ln(2L/D)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(11,130 \text{ sec})}$$

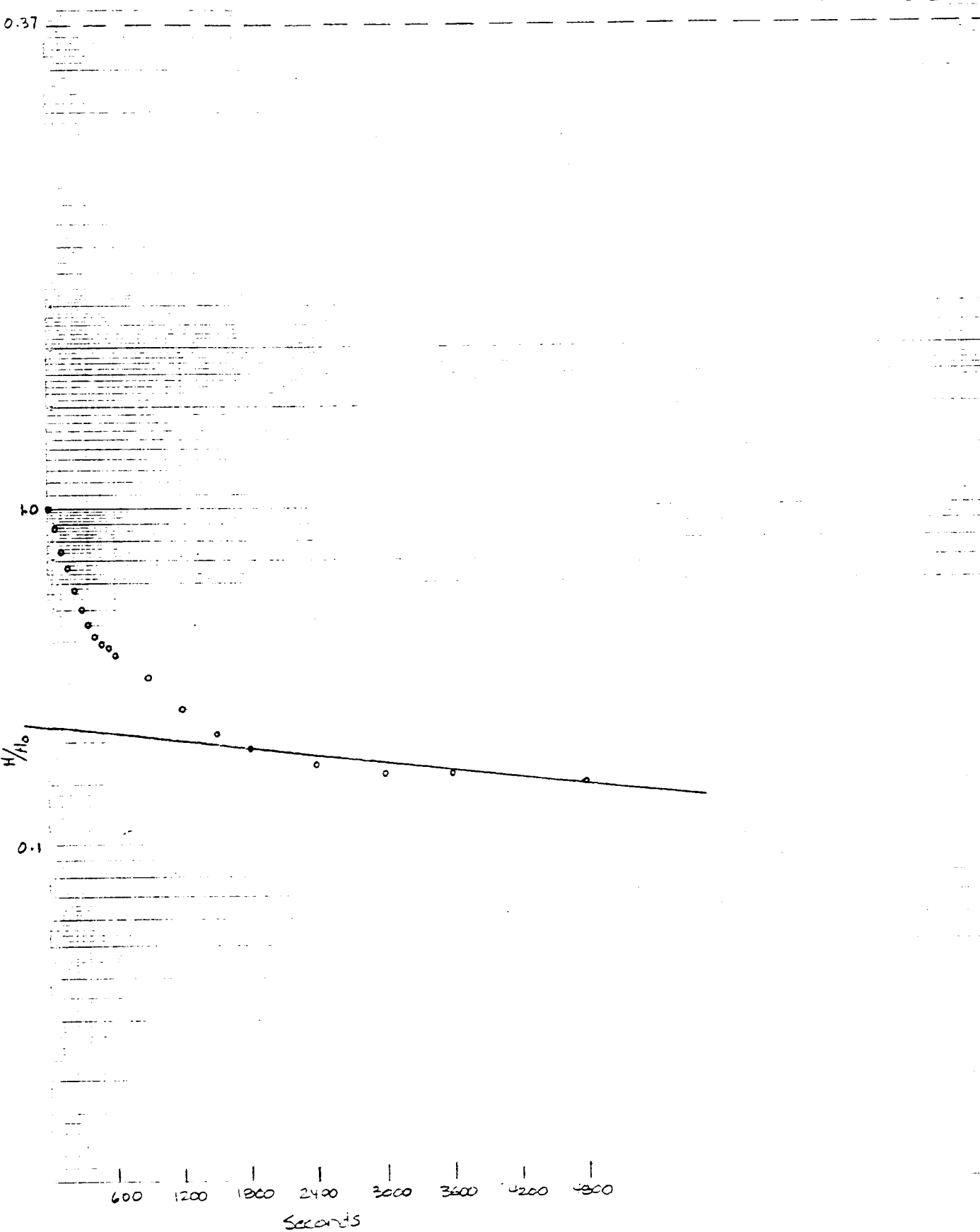
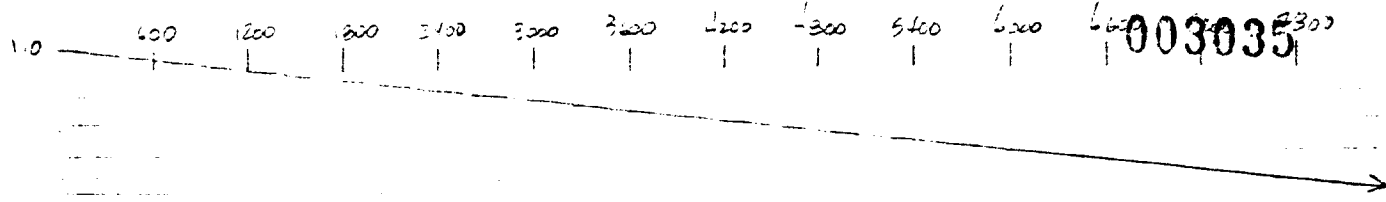
$$= \frac{81.03 \text{ cm}}{3,131,870.7 \text{ sec}}$$

$$= 2.58 \times 10^{-5} \text{ cm/sec}$$

$$\bar{V} = \frac{K dh/dg}{\theta}$$

$$= \frac{(2.58 \times 10^{-5} \text{ cm/sec})(0.0043)}{0.20}$$

$$= 6.192 \times 10^{-7} \text{ cm/sec}$$



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DESIGN OR CONSTRUCTION PURPOSES

003036

SWF Form 1271-J(a)
19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY <u>FITZGERALD</u>	DATE <u>11/9/88</u>	PROJECT <u>WATER TREATMENT PLANT</u>	SHEET <u> </u> OF <u> </u>
CHKD BY	DATE	FEATURE <u>MW-13</u>	<u>K</u>
DETAILS <u>Time Log Test Data</u>			

MW-13					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		6.90			
0	0	44.10	37.20	37.20	1.00
1	60	41.84	34.94		0.94
2	120	39.10	32.20		0.86
3	180	37.07	30.17		0.81
4	240	34.93	28.03		0.75
5	300	32.87	25.97		0.70
6	360	31.05	24.15		0.65
7	420	29.47	22.57		0.61
8	480	27.89	20.99		0.56
9	540	26.28	19.38		0.52
10	600	25.04	18.14		0.49
15	900	19.47	12.57		0.34
20	1200	15.59	8.69		0.23
25	1500	13.01	6.11		0.16
30	1800	11.02	4.12		0.11
40	2400	8.90	2.00		0.054
50	3000	7.95	1.05		0.028
60	3600	7.54	0.64		0.017
80	4800	7.30	0.40		0.011
100	6000	7.12	0.22		0.006
120	7200	6.98	0.08		0.002
140	8400	6.94	0.04		0.001
160	9600				
180	10800				

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln\left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}}\right]}$$

$$= 281.34 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(970 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{244,809.3 \text{ sec}}$$

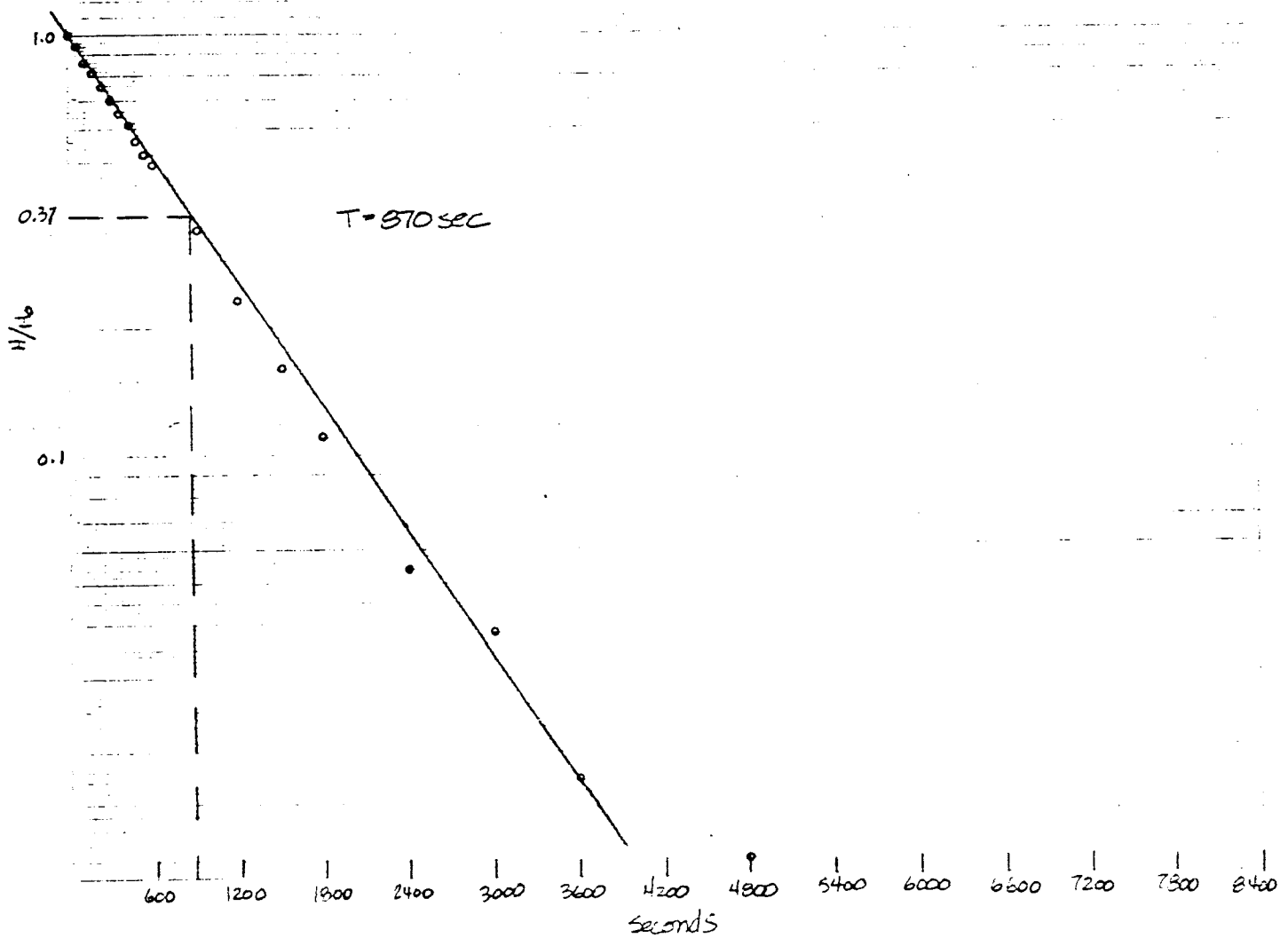
$$= 3.31 \times 10^{-4} \text{ cm/sec}$$

003037

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FOR THE PURPOSE OF THIS TEST
THE FOLLOWING DATA WAS OBTAINED
BY THE METHOD OF THE TEST



003038

SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY FITZGERALD	DATE 11/10/83	PROJECT LHAAP- GWSA FIVE CI	SHEET _____ OF _____
CHKD BY	DATE	FEATURE mw-14 K	
DETAILS Time Lag Test Data			

mw-14					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/ H ₀
-1		12.42			
0	0	17.02	4.60	4.60	1.00
1	60	15.91	3.49		0.76
2	120	14.82	2.40		0.52
3	180	14.12	1.70		0.37
4	240	13.72	1.30		0.28
5	300	13.58	1.16		0.25
6	360	13.37	0.95		0.21
7	420	13.24	0.82		0.18
8	480	13.12	0.70		0.15
9	540	13.04	0.62		0.13
10	600	12.96	0.54		0.12
15	900	12.78	0.36		0.078
20	1200	12.62	0.20		0.043
25	1500	12.54	0.12		0.026
30	1800	12.49	0.07		0.015
40	2400	12.42	0.00		0.00
50	3000				
60	3600				
80	4800				
100	6000				
120	7200				
140	8400				
160	9600				
180	10800				

$$F = \frac{2\pi L}{\ln(2L/D)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln \left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}} \right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(600 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{168,834 \text{ sec}}$$

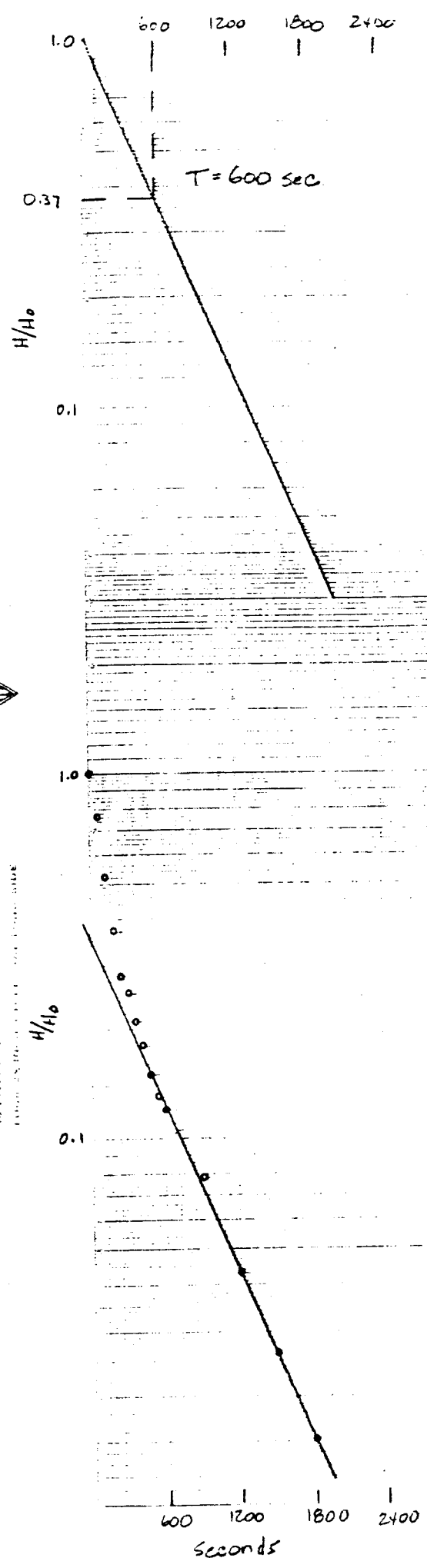
$$= 4.80 \times 10^{-4} \text{ cm/sec}$$

003039

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TO DIVISION OF HIGHWAYS, U.S. DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C. 20540



ATION SHEET

(SWFED SOP)

AAP- GWQA Form =

SHEET ____ OF ____

MW-15 K

/ Ho

.00

.37

.10

.10

.078

.051

.035

.027

.012

.012

2.00

$$F = \frac{2\pi L}{\ln(2L/D)}$$

$$= \frac{2(3.14)(152.40\text{cm})}{\ln\left[\frac{2(152.40\text{cm})}{10.16\text{cm}}\right]}$$

$$= 281.39\text{cm}$$

$$K = \frac{A}{FT} = \frac{81.03\text{cm}^2}{(281.39\text{cm})(120\text{sec})}$$

$$= \frac{81.03\text{cm}}{33,766.8\text{sec}}$$

$$= 2.40 \times 10^{-3}\text{cm/sec}$$

SWF Form 1271-J(a)

19 Oct 84

COMPUTATION SHEET

(SWFED SOP)

BY FITZGERALD	DATE 11/16/88	PROJECT LHAAP- GWSA PHASE I	SHEET ____ OF ____
CHKD BY	DATE	FEATURE MW-15 K	
DETAILS Time Lag Test Data			

MW-15					
TIME (MIN)	TIME (SEC)	DEPTH (FT)	H (FT)	H ₀ (FT)	H/H ₀
-1		26.45			
0	0	29.00	2.55	2.55	1.00
1	60	27.39	0.94		0.37
2	120	26.89	0.44		0.18
3	180	26.71	0.26		0.10
4	240	26.65	0.20		0.078
5	300	26.58	0.13		0.051
6	360	26.54	0.09		0.035
7	420	26.52	0.07		0.027
8	480	26.48	0.03		0.012
9	540	26.48	0.03		0.012
10	600	26.45	0.00		0.00
15	900				
20	1200				
25	1500				
30	1800				
40	2400				
50	3000				
60	3600				
80	4800				
100	6000				
120	7200				
140	8400				
160	9600				
180	10800				

$$F = \frac{2\pi L}{\ln(24/D)}$$

$$= \frac{2(3.14)(152.40 \text{ cm})}{\ln\left[\frac{2(152.40 \text{ cm})}{10.16 \text{ cm}}\right]}$$

$$= 281.39 \text{ cm}$$

$$K = \frac{A}{FT} = \frac{81.03 \text{ cm}^2}{(281.39 \text{ cm})(120 \text{ sec})}$$

$$= \frac{81.03 \text{ cm}}{33,766.8 \text{ sec}}$$

$$= 2.40 \times 10^{-3} \text{ cm/sec}$$