

FWDA GROUND WATER MONITORING PROGRAM

APPENDIX E

OCTOBER 2009 SAMPLING EVENT

NEW MONITORING WELL LOGS AND WELL COMPLETION DIAGRAMS

WELL LOGS

GEOLOGIC BORING/WELL LOG

Project #: <u>DHBR</u>		Project Name: <u>Ft. Wingate Parcel 121</u>		Boring/Well #: <u>5-1 FMW30</u>	
Geologist: <u>Markume</u>			Driller/Company: <u>USGS</u>		
Drilling Equip.: <u>ED</u>		Date Start: <u>11/08/09</u>		Date Completed: <u>11/09/09</u>	
Surface Elev.:	Top of Casing Elev.:	Total Depth:	Well Depth:		
Method of Drilling		Casing/Riser Type - <u>See Installation Report</u>		Screen Period of Well:	
<input checked="" type="checkbox"/> Hollow Stem	<input type="checkbox"/> Direct Rotary	<input checked="" type="checkbox"/> Steel	<input type="checkbox"/> Threaded	Material: <u>PVC</u>	
<input checked="" type="checkbox"/> Air Rotary	<input type="checkbox"/> Bucket Auger	<input type="checkbox"/> Galv	<input type="checkbox"/> Welded	Diameter: <u>3"</u> Length: <u>10 ft.</u>	
<input type="checkbox"/> MUD Rotary	<input checked="" type="checkbox"/> Flight Auger	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> Solvent	Set between: <u>35</u> ft and <u>45</u> ft	
Hole Diameter: <u>wire flight - 4 3/8"</u>		<input type="checkbox"/> SS	<input type="checkbox"/> Welded	Slit size: <u>0.025</u>	
Filter Pack		Annulus Seal		Grout	
Size: <u>sand</u>		<input checked="" type="checkbox"/> Bentonite Pellets <input checked="" type="checkbox"/> Chips		Used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Volume: <u> </u>	
Method of Install: <u>slow pour tremie</u>		<input type="checkbox"/> <u> </u>		<input type="checkbox"/> Neat Cement <input type="checkbox"/> Bentonite	
Composition: <u>sand</u>		Volume Used? <u>9 gal</u>		<input type="checkbox"/> <u> </u>	
Volume Used: <u>110 lbs.</u>		Method of Install: <u>slow pour tremie</u>		Method of Install: <u> </u>	
Depth to top of f.p.: <u>30.5 ft.</u>		Depth: from <u>30.5</u> ft. to <u> </u> ft.		Depth: from <u> </u> ft. to <u> </u> ft.	
Well Head Completion		Development		Static Water Level: <u>(305)</u>	
<input type="checkbox"/> Flushmount <input checked="" type="checkbox"/> Stand up		Method: <u>air</u>		Initial: <u>46.4</u> ft	
Cap Type: <u> </u>		Gallons Evacuated: <u>4 well volumes</u>		Development: <u> </u> ft.	
Lock #: <u> </u>		Date: <u>11/08 - 11/09</u>		24 hr.: <u>36.0</u> ft.	
Volume Used: <u> </u>		Oor: <u>no</u>		<u> </u>	

DRILLING		SAMPLE - <u>core collected</u>				GEOLOGIC LOG				
Depth	FID Reading (ppm)	Sample Type	Sample ID	Blow Count				USCS Class	Contact Depth (ft)	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"			
0-22.5								22.5	alluvium	
22.5-24.5								20	upper ss - surface caving 8" set to 25 ft.	
24.5-31.5								6.4	interbedded red & white ss	
31.5-41.5								10	37.7 fault - clayey ss layer 37.7-38.4	
								3.5	38.4 remaining is interbedded red & white ss	
41.5-46.5								6	45 ss - core detracted to contact with blue clay. Clay residue in base of barrel	
46.5-51.5									Recover from top of blue clayey ss & prevents interbed plus 10 ft. internal clayey sandstone grading with depth into sandy mudstone.	

GEOLOGIC BORING/WELL LOG

Project #: DWBRC	Project Name: FWDA/P22	Boring/Well #: 1-1/TMW 31 S/D
Geologist: A.M. Matherne	Driller/Company: USGS	
Drilling Equip.: GD/CME	Date Start: 11/13/09	Date Completed: 11/18/09
Surface Elev.: 6738 ft	Top of Casing Elev.:	Total Depth: 112 Well Depth: 60/107 ft

DRILLING				SAMPLE				GEOLOGIC LOG			
Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery <i>ml/fl</i>	USCS Class	Contact Depth	Descriptions and Comments
				0-8"	6-12"	12-18"	18-24"				
60-66								<i>cl-fl</i>	66	CME auger - claystone contact	
68-72								<i>gl</i>	71	GD-wire flight cone claystone/SS contact	
72-82								<i>ml-fl</i>		Possible fracture near base, clay layer nr. bottom	
82-87								<i>ml-fl</i>		SS fines to bottom, bas branching nr. bottom	
87-92								<i>gl-fl</i>		SS, 5-10 ft w/ 4 narrow clay dykes	
92-97								<i>gl-fl</i>		coarser SS <i>calc. conc. ind. at base</i>	
97-102								<i>cl-fl</i>	99	Change to gray v.c. conglomeratic clayey SS	
102-104								<i>ml-sch</i>	104	contact SS/claystone	
104-112								<i>fl</i>		sandy clayey siltstone	

GEOLOGIC BORING/WELL LOG

Project #: <u>TMW 32</u>		Project Name: <u>FNDA Parcel 21</u>		Boring/Well #: <u>TMW 32(1-3)</u>	
Geologist: <u>AM MAMMONE</u>			Driller/Company: <u>USGS</u>		
Drilling Equip.: <u>Flight Auger</u>			Date Start: <u>11/19/09</u>	Date Completed: <u>12/01/09</u>	
Surface Elev.: <u>670.73 ft</u>		Top of Casing Elev.: <u>670.30 ft</u>	Total Depth: <u>139 ft</u>	Well Depth: <u>137.5 ft</u>	
Method of Drilling		Casing/Riser Type		Screen Portion of Well	
<input type="checkbox"/> Hollow Stem <input type="checkbox"/> Direct Rotary <input checked="" type="checkbox"/> Air Rotary <input type="checkbox"/> Bucket Auger <input type="checkbox"/> MUD Rotary <input checked="" type="checkbox"/> Flight Auger Hole Diameter: <u>5"</u>		<input type="checkbox"/> Steel <input type="checkbox"/> Threaded Height <u>(above)</u> <input type="checkbox"/> Galv <input type="checkbox"/> Welded below surface <input checked="" type="checkbox"/> PVC <input type="checkbox"/> Solvent <u>1.47 ft</u> <input type="checkbox"/> SS <input type="checkbox"/> Welded Diameter Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> No <u>2 1/2</u>		Material <u>Sawcut</u> Diameter <u>2 1/2"</u> Length <u>20 ft</u> Set between <u>117</u> ft and <u>137</u> ft Slot size <u>0, 0/10</u>	
Filter Pack		Annulus Seal		Grout	
Size _____ Method of Install <u>tremy + slow pour</u> Composition <u>sand</u> Volume Used <u>(5)</u> Depth to top of f.p. <u>106 ft BGS</u>		<input checked="" type="checkbox"/> Bentonite Pellets _____ Chips _____ <input type="checkbox"/> _____ Volume Used? <u>(35)</u> Method of Install <u>tremy / slow pour</u> Depth: from <u>106</u> ft. to <u>137.5</u> ft. BGS		Used? <input type="checkbox"/> Yes <input type="checkbox"/> No Volume _____ <input type="checkbox"/> Neat Cement <input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> _____ Method of Install <u>slow pour</u> Depth: from <u>10</u> ft. to <u>96</u> ft.	
Well Head Completion		Development		Static Water Level	
<input type="checkbox"/> Flushmount <input checked="" type="checkbox"/> Stand Up Cap Type _____ Lock # <u>N/A</u> Volume Used <u>cement (4)</u>		Method <u>2600M trash pump</u> Gallons Evacuated <u>240 gallons</u> Date <u>12/5/09, 12/6/09, 12/12/09</u> Odor _____		Initial <u>51.6</u> ft Development <u>51.6</u> ft 24 hr. <u>37.8</u> ft	

DRILLING		SAMPLE					GEOLOGIC LOG				
ft Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (%)	USCS Class	Contact-Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
64-73								7.6		63'	Top of sst.
73-78								4.7		67.5'	SS to claystone
78-87								8.5			claystone
87-93								6.0			"
93-103								10.			"
103-113										106.5'	claystone to sst
112-11										110.	harder sst / Banded begin making water
113-123								10.3		112-115'	clay partings in sst.
											core - brown + blue mottled. top 5' blue banded sst.

GEOLOGIC BORING/WELL LOG

Project #: DHBRC Project Name: FWDA Parcel Boring/Well #: TMW 32 1-3
 Geologist: _____ Driller/Company: _____
 Drilling Equip.: _____ Date Start: 11/19/09 Date Completed: _____
 Surface Elev.: _____ Top of Casing Elev.: _____ Total Depth: _____ Well Depth: _____

DRILLING		SAMPLE				GEOLOGIC LOG					
(ft) Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (ft)	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
34-38								48			unconsolidated, clayey silty sand with pebbles and gravel yellowish-reddish brown slightly moist, lost 4" @ bottom
38-42								55			very tight silty clay w/ CaCO ₃ inclusions, dark brown, slightly moist Break @ 40' 13" slough, lost 6" @ bottom
42-46								48			very tight silty clay, dark red-brown, slightly moist, lost 3" @ bottom Squeezing? @ 42-45; tagged bottom of hole @ 44.9' 3" slough
44-47								48			clay, friable, dk red-brown with green clay inclusions, slightly moist, no loss. Suspected refusal @ 47' But going to try again.
45-49								49			friable, silty clay, dark red, slightly moist
49-53											Tried but stopped @ 45', cored to 49', but got little recovery 16" STOPPING @ 48.4'
45-50											Cuttings show more moisture 59' possible caliche layer was tighter, broke thru, then softer but getting tighter - Sheared bit Start coring
55-60											
60-64											

Flight trigger

GEOLOGIC BORING/WELL LOG

Project #: DH3RC		Project Name: FWDA Parcel 11		Boring/Wel #: P112 MW <i>(old gas station)</i>	
Geologist: DALE RANKIN			Driller/Company:		
Drilling Equip.: Crawford Denver		Date Start: 11/19/09		Date Completed: 11/20/09	
Surface Elev.: _____		Top of Casing Elev.: _____		Total Depth: _____	
Method of Drilling		Casing/Riser Type		Screen Portion of Well	
<input type="checkbox"/> Hollow Stem <input type="checkbox"/> Direct Rotary <input checked="" type="checkbox"/> Air Rotary <input type="checkbox"/> Bucket Auger <input type="checkbox"/> MUD Rotary <input type="checkbox"/> Flight Auger Hole Diameter: 5"		<input type="checkbox"/> Steel <input type="checkbox"/> Threaded Height above/below surface: _____ <input type="checkbox"/> Galv <input type="checkbox"/> Welded <input type="checkbox"/> PVC <input type="checkbox"/> Solvent <input type="checkbox"/> SS <input type="checkbox"/> Welded Diameter: _____ Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> No		Material: _____ Diameter: _____ Length: _____ Set between: _____ ft and _____ ft. Slot size: _____	
Filter Pack		Annulus Seal		Grout	
Size: _____		<input type="checkbox"/> Bentonite Pellets Chips: _____ <input type="checkbox"/> _____		Used: <input type="checkbox"/> Yes <input type="checkbox"/> No Volume: _____	
Method of Install: _____		Volume Used? _____		<input type="checkbox"/> Near Cement <input type="checkbox"/> Bentonite <input type="checkbox"/> _____	
Composition: _____		Method of Install: _____		Method of Install: _____	
Volume Used: _____		Depth from: _____ ft. to _____ ft.		Depth from: _____ ft. to _____ ft.	
Depth to top of f.p.: _____					
Well Head Completion		Development		Static Water Level	
<input type="checkbox"/> Flushmount <input type="checkbox"/> Stand Up Cap Type: _____ Lock #: _____ Volume Used: _____		Method: _____ Gallons Evacuated: _____ Date: _____ Date: _____		Initial: _____ ft. Development: _____ ft. 24 hr.: _____ ft.	

DRILLING		SAMPLE				GEOLOGIC LOG					
Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (in)	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
0-4								36			clay, dk red-br, moist lost 12" from bottom
4-8								32			clay, dk red-br, moist, lost 16" from bottom
8-12								32		12'	clay, dk red-br, moist, lost 16" from bottom
12-16								29			clayey, sand @ bottom, yellowish-reddish moist, lost 17" from bottom <i>brown</i>
16-20	1.9							29			clayey, sandy silt @ bottom, yell-red-br moist, lost 19" from bottom
20-25								33		25'	clayey, sandy silt @ bottom, yell-red-br, moist, lost 29" from bottom
25-30								29			Silty, clay @ bottom, dk brown moist, lost 31" from bottom
30-34								39			Silty, sandy clay @ bottom <i>reddish</i> dk brown moist lost 14" from bottom

GEOLOGIC BORING/WELL LOG

Project #: **DHBRC** Project Name: **FNDA Parcel 11** Boring/Well #: **P112 MW**
 Geologist: **DALE RANKIN** Driller/Company: **USGS**
 Drilling Equip.: **Gardner Denver** Date Start: **11/19/09** Date Completed:
 Surface Elev.: Top of Casings Elev.: Total Depth: Well Depth: **65**

DRILLING		SAMPLE				GEOLOGIC LOG					
Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (in)	USCS Class	Contact-Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
34-35								29			Silty sandy clay @ Bottom dark brown, wet @ Bottom clay @ Bottom. dk br, wet @ bottom Silty clay @ Bottom, dk brown very moist, wet inside tube. - Had 10" more recovery than it should, maybe scraping side as Barrell goes down hole?
38-42								50		30.7	
47-46								58			
46-50								?			Silty clay/minor lignite dk brown, wet - difficulty extracting core cannot measure recovery, sample bagged. - GOING TO STOP/PIN PROCEDURE -
50-54								58			Silty clay @ Bottom dk brown TOP: unconsolidated dk br. moist clay. BOTTOM: very tight dry red friable clay.
59-62.5								58			57' missing 50-50.75 moist contact b/w moist/dry clays. very tight dry red-brown clay DRY
62.5-65								30			very tight dry red brown clay DRY Refusal @ 65'

GEOLOGIC BORING/WELL LOG

Project #: <u>DHBR</u>		Project Name: <u>FNDA</u>		Boring/Well #: <u>TMW 3A</u>	
Geologist: <u>Dale Rankin</u>		Driller/Company: <u>USGS</u>			
Drilling Equip.:			Date Start: <u>12/02/09</u>	Date Completed:	
Surface Elev.: <u>6684.573A</u>		Top of Casing Elev.: <u>6687.874</u>		Total Depth: <u>59.92ft</u>	Well Depth: <u>57.25ft</u>
Method of Drilling		Casing/Riser Type		Screen Portion of Well	
<input type="checkbox"/> Hollow Stem <input type="checkbox"/> Direct Rotary <input checked="" type="checkbox"/> Air Rotary <input type="checkbox"/> Bucket Auger <input type="checkbox"/> MUD Rotary <input type="checkbox"/> Flight Auger Hole Diameter: _____		<input type="checkbox"/> Steel <input type="checkbox"/> Threaded Height above below surface <input type="checkbox"/> Galv <input type="checkbox"/> Welded <u>2.67ft</u> <input checked="" type="checkbox"/> PVC <input type="checkbox"/> Solvent <input type="checkbox"/> SS <input type="checkbox"/> Welded Diameter Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> No <u>2 1/2"</u>		Material <u>Sawcut</u> Diameter <u>2 1/2</u> Length <u>20ft</u> Set between <u>37</u> ft and <u>57</u> ft Slot size <u>0,010</u>	
Filter Pack		Annulus Seal		Grout	
Size _____ Method of Install <u>slow pour</u> Composition <u>silica sand #20</u> Volume Used <u>(22) 50lb bags</u> Depth to top of f.p. <u>31ft.</u>		<input checked="" type="checkbox"/> Bentonite Pellets <u>1/4"</u> Chips <input type="checkbox"/> _____ Volume Used? <u>(4) 5gal buckets</u> Method of Install <u>slow pour</u> Depth: from <u>27</u> ft. to <u>31</u> ft.		Used? <input type="checkbox"/> Yes <input type="checkbox"/> No Volume _____ <input type="checkbox"/> Neat Cement <input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> <u>(14)(50lb) bags chips (3/8")</u> Method of Install <u>slow pour</u> Depth: from <u>10</u> ft. to <u>27</u> ft.	
Well Head Completion		Development		Static Water Level	
<input type="checkbox"/> Flushmount <input checked="" type="checkbox"/> Stand Up Cap Type _____ Lock # <u>N/A</u> Volume Used <u>cement (4) 94lb bags</u>		Method <u>260PM trash pump</u> Gallons Evacuated <u>107</u> Date <u>12/12, 12/13, 2/6/10</u> Odor _____		Initial <u>39.6</u> ft. Development <u>39.6</u> ft. 24 hr. <u>39.6</u> ft.	

DRILLING		SAMPLE				GEOLOGIC LOG					
ft. Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (ft)	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
0-5								50			Silty clay, dk. brown, dry
5-10								49			TOP: Silty clay, dk. brown
10-15								47			BOTTOM: sandy clay, lt. brown, dry
15-20								40			TOP: Sandy clay, lt. brown, slightly
20-24								46			BOTTOM: clay, dk. brown, moist
24-28								40			TOP: clay, dk. brown,
28-32								46			BOTTOM: clayey sand w/ lignite, lt. br. dry
32-36								36			CLAYEY SAND, LT. BROWN, moist
36-40								36			TOP: clayey sand, dk. brown, slightly
40-44								58			BOTTOM: silty clay, dk. brown, moist
44-48								58			Silty clay, dk. red-br, slightly moist
48-52								48			Sandy clay, very tight, dk reddish-br, slightly moist
											Very tight expansive clay, dk. br, slightly moist
											Silty clay @ bottom, dk. br, slightly moist
											Silty clay, dk. brown, wet
											Silty clay, dk. reddish-br, wet

GEOLOGIC BORING/WELL LOG

Project #: <u>DHBC</u>	Project Name: <u>FWDA</u>	Boring/Well #: <u>TMW 34</u>
Geologist: <u>Dale Rankin</u>		Driller/Company: <u>USGS</u>
Drilling Equip.:		Date Start: <u>12/2/09</u> Date Completed: <u>12/04/09</u>
Surface Elev.: <u>6684.5734</u>	Top of Casing Elev.: <u>6687.3734</u>	Total Depth: <u>59.92ft</u> Well Depth: <u>57.25ft</u>

DRILLING		SAMPLE				GEOLOGIC LOG					
ft. Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (in)	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
52-56								54			Silty clay, Dk reddish-br, wet
56-60								46			" " "
60-64								56			" " "
64-68								56			Clayey silty sand, Dk-reddish Br, wet
68-72								57			Coarse grained unconsolidated sand, w/gravel, Brown, wet
72-76								WTD			Clayey coarse br. unconsolidated silty pebbly sand w/very minor red clay and lignite, Br-red
76-80											76-79 = wet, 79-80 = dry. silty sand with very tight red claystone lignite Br-red w/green clay nodules
										79	Contact @ 79' BEDROCK
											<alluvial well>

GEOLOGIC BORING/WELL LOG

Project #: <u>DHBRC</u>		Project Name: <u>FWDA</u>		Boring/Well #: <u>TMW 35</u>	
Geologist: <u>DALE RANKIN</u>			Driller/Company: <u>USGS</u>		
Drilling Equip.:			Date Start: <u>12/05/09</u>		Date Completed: <u>12/08/09</u>
Surface Elev.: <u>6684.199ft</u>		Top of Casing Elev.: <u>6686.539ft</u>		Total Depth: <u>57.34ft</u>	Well Depth: <u>55ft</u>
Method of Drilling		Casing/Riser Type		Screen Portion of Well	
<input type="checkbox"/> Hollow Stem <input type="checkbox"/> Direct Rotary <input checked="" type="checkbox"/> Air Rotary <input type="checkbox"/> Bucket Auger <input type="checkbox"/> MUD Rotary <input type="checkbox"/> Flight Auger Hole Diameter: _____		<input checked="" type="checkbox"/> Steel <input type="checkbox"/> Threaded Height above/below surface: <u>2.34ft</u> <input type="checkbox"/> Galv <input type="checkbox"/> Welded <input checked="" type="checkbox"/> PVC <input type="checkbox"/> Solvent <input type="checkbox"/> SS <input type="checkbox"/> Welded Diameter: <u>2 1/2"</u> Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> No		Material: <u>SAND CUT</u> Diameter: <u>2 1/2</u> Length: <u>20ft.</u> Set between: <u>35</u> ft and <u>55</u> ft Slot size: <u>0.010</u>	
Filter Pack		Annulus Seal		Grout	
Size: _____ Method of Install: <u>slow pour</u> Composition: <u>10/20 silica sand</u> Volume Used: <u>(24) 50lb bags.</u> Depth to top of f.p.: <u>25ft</u>		<input checked="" type="checkbox"/> Bentonite Pellets <u>1/4"</u> Chips <input type="checkbox"/> _____ Volume Used: <u>(4) 5gal buckets</u> Method of Install: <u>slow pour</u> Depth: from <u>25</u> ft to <u>28</u> ft.		Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Volume: <u>(16) 50lb bags</u> <input type="checkbox"/> Neat Cement <input checked="" type="checkbox"/> Bentonite chips <input type="checkbox"/> <u>(16) 50lb bags (3/8")</u> Method of Install: _____ Depth: from <u>10</u> ft. to <u>25</u> ft.	
Well Head Completion		Development		Static Water Level	
<input type="checkbox"/> Flushmount <input checked="" type="checkbox"/> Stand Up Cap Type: _____ Lock #: <u>N/A</u> Volume Used: <u>cement.</u>		Method: <u>26" trash Pump.</u> Gallons Evacuated: _____ Date: <u>12/6, 12/8, 12/13</u> Odor: _____		Initial: <u>41.02</u> ft Development: <u>41.02</u> ft. 24 hr.: <u>41.02</u> ft.	

DRILLING		SAMPLE				GEOLOGIC LOG					
ft. Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (ft)	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
0-5								58			tight silty clay, Rd-Br, Dry
5-10	0.7							32			very tight clay, Dk Br, Dry
10-15	0.4							58			" " " Rd-Br, moist/Dry
15-20	0.3							43			Red Bottom.
20-25	0.4							35			silty clay rd-Br, moist
25-30	0.6							41			" " "
30-35	0.6							36			bottom: silty sand, Rd-Br, Dry
35-40	0.5							58			bottom: coarse gr. silty sand, Rd-Br, Dry
40-45	0.5							58			bottom: coarse gr. clayey silty sand, Rd-Br, very moist
45-50	1.4							58			silty clay, red-Br, very moist → wet
50-55	0.7							58			T: clayey wet silt Red Br, top is wet. B: silty clay, clayey silt rd-br, wet

55' - TD

GEOLOGIC BORING/WELL LOG

Project #: <u>DMBRC</u>	Project Name: <u>FWDRA Parcel 22</u> (SOMER 1-2) <u>TMW 36</u>	Boring/Well #:
Geologist: <u>Pale Rankin</u>	Driller/Company: <u>USGS</u>	
Drilling Equip.:	Date Start: <u>11/08/09</u>	Date Completed:
Surface Elev.: <u>6699.3ft</u>	Top of Casing Elev.: <u>6700.9ft</u>	Total Depth: <u>158.68ft</u> Well Depth: <u>157ft</u>

DRILLING		SAMPLE				GEOLOGIC LOG					
Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (ft)	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
29-32								48			Silty clay T & B: RB 6/4 7" slough
33-37								50			DRY - T: LTB 6/4 B: P 7/4 2" slough
37-41								49			DRY - T: P 7/4 B: P 7/4 7" slough
41-45								46			DRY T: P 7/4 B: LTB 4/4 11" slough
45-49								48			Silty clay - DRY T & B: LTB 6/4 4" slough
49-53								50			T: silty clay 15 B 6/4 11" slough B: pebbly silty clay with gravel
53-57.5								29			friable SS dk RB 3/3 55' Water @ 55' Friable SS @ Bottom G 9/1 57.5' BEDROCK @ 57.5 WATER
Auger											
54-59											TIGHT @ 61'
59-64											LOST 64-65 FROM CORE
64-72											65-71.5 rd BR consolidated
65-71.5											Silty claystone
71.5-72											71.5-72 rd BR consolidated
71.5-72											Silty claystone w/ conspicuous nodules of clay (blue-grey)
72-82											72-75 LOST
75-82											75-82 - conglomeratic claystone with intervals of brown clay near top. - DH reports 75-82 is sandy claystone -
85-82											Sandy claystone @ top
82-92											rest is claystone, fractured
92-102											top ---, bottom ---
122-132											tripping down to 122'
142-152											130' - CONTACT WITH SST. - transitional - CONTACT SS/CLAYSTONE. - sand less consolidated SST.

@ bottom is blue-gr claystone

GEOLOGIC BORING/WELL LOG

Project #: <u>DHBRC</u>		Project Name: <u>FWD A Parcel</u> (Source 12) <u>TMW 36</u>	
Geologist: <u>Dak Rankin</u>		Driller/Company:	
Drilling Equip.:		Date Start: <u>11/08/09</u>	Date Completed:
Surface Elev.: <u>6699.275ft</u>		Top of Casing Elev.: <u>6700.95ft</u>	Total Depth: <u>158.68ft</u> Well Depth: <u>157ft</u>
Method of Drilling <input type="checkbox"/> Hollow Stem <input type="checkbox"/> Direct Rotary <input checked="" type="checkbox"/> Air Rotary <input type="checkbox"/> Bucket Auger <input type="checkbox"/> MUD Rotary <input checked="" type="checkbox"/> Flight Auger Hole Diameter: <u>10.75" → 5"</u>		Casing/Riser Type <input type="checkbox"/> Steel <input type="checkbox"/> Threaded Height above/below surface: <u>168ft</u> <input type="checkbox"/> Galv <input type="checkbox"/> Welded <input checked="" type="checkbox"/> PVC <input type="checkbox"/> Solvent <input type="checkbox"/> SS <input type="checkbox"/> Welded Diameter: <u>2 1/4"</u> Drive Shoes? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Filter Pack Size: _____ Method of Install: <u>slow pour</u> Composition: <u>10/20 Silica Sand</u> Volume Used: <u>(3.75) 50lb bags</u> Depth to top of f.p.: <u>130ft</u>		Annular Seal <input checked="" type="checkbox"/> Bentonite Pellets <u>1/4</u> Chips _____ <input type="checkbox"/> _____ Volume Used? <u>(4) 5 gal buckets</u> Method of Install: <u>slow pour</u> Depth: from <u>64</u> ft. to <u>130</u> ft.	
Well Head Completion <input type="checkbox"/> Flushmount <input type="checkbox"/> Stand Up Cap Type: _____ Lock #: _____ Volume Used: <u>cement (4) 94lb bags</u>		Development Method: <u>260PM trash pump</u> Gallons Evacuated: <u>88 gallons</u> Date: <u>12/12/09</u> <u>3/26/10</u> Odor: _____	
		Static Water Level Initial: <u>38.79</u> ft. Development: <u>38.79</u> ft. 24 hr.: <u>38.79</u> ft.	

DRILLING		SAMPLE					GEOLOGIC LOG				
ft. Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (in)	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
0-4								33			silty clay T: RB 4/4 B: RY 6/6 DRY
4-8								39			silty clay to clay T: RY 6/6 B: RB 4/3 - slightly moist @ bottom
8-12								53			silty clay T: RB 5/4 B: RB 4/4 TOP 11" slough
12-16								45			slightly moist silty clay RB 4/4 B: LT RB 6/4 3" slough
16-20								45			- dry silty clay - clay T: LT RB 4/4
20-24								54			9" slough DRY: B: DK RB 3/4
24-28								42			silty clay T: DK RB 3/4 - 9" slough B: LT RB 6/4 - DRY
28-29								41			* 2' slough - silty clay T: LT RB 6/4 - DRY B: LT RB 6/4 silty clay T: LT RB 6/4 B: LT RB 6/4 2" slough dry

GEOLOGIC BORING/WELL LOG

Project #: <u>DHBRE</u>		Project Name: <u>FVDA PARCEL (some 1-2)</u>		Boring/Well #: <u>TMW 36</u>							
Geologist: <u>Dale Rankin</u>			Driller/Company: <u>USGS</u>								
Drilling Equip.:			Date Start: <u>11/08/09</u>		Date Completed:						
Surface Elev.: <u>6699.3ft</u>		Top of Casing Elev.: <u>6700.9ft</u>		Total Depth: <u>158.68ft</u> Well Depth: <u>157ft</u>							
DRILLING		SAMPLE				GEOLOGIC LOG					
Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (in)	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
<u>152-157</u>											<u>Claystone</u> <u>152' SS/CS CONTACT</u> <u>(49-152 transitional)</u> <u>SS interval is 130-152'</u> <u>(20' screen interval)</u>

GEOLOGIC BORING/WELL LOG

Project #: DHRRC Project Name: FVDA Parcel 11 Boring/Well #: TMW 37 (S. 4)
 Geologist: A Robertson Driller/Company: USGS (new location)
 Drilling Equip.: GD/CME Date Start: 12/11/09 Date Completed: 12/11/09
 Surface Elev.: 6710.8 ft Top of Casing Elev.: 6713.1 ft Total Depth: 111 ft Well Depth: 108 ft

DRILLING		SAMPLE					GEOLOGIC LOG				
Depth	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery %	USCS Class	Contact Depth	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
20-25							4.7			~6" silt, easy push * Dry - Top 3.5' same as above - More silt, Btm 1-2 silt with black staining	
25-30							5.0			~6" silt, btm 3-4 really hard * Dry - Top 3' silty sand, variable grain size - Fine to coarse, well sorted, Black staining - Btm 2' sandy clay, lots of CaCO ₃ , pebbles in cutting shoe + CaCO ₃ cementation + staining	
30-34							5.0			- Relatively Hard * Dry - Top 1' silt, est red blocky platy clay - some rust staining	
34-38							5.0			- Top 1' silt * Dry - Btm 1' dark red clay lots of CaCO ₃ + 2-3' - Btm 1-2' lots of CaCO ₃	
38-42							5.0			- Top 1' silt - Btm 4' same as above	
42-46							5.0			- Top 1' silt - Btm 4' same as above	
46-49.5							5.0			- Btm 0.5 very strong dark red clay with CaCO ₃ - Resist same as above - top 1' silt	
AUGER											
30-35										some gravel @ 32' may be limestone strong HCl rxn Angular to sub-round. otherwise silty clay to 35'	
55-60										tighter, less silt, more clay in cuttings also color change from Lt. Br → dk red/or. - is actually 54-59 55' CONTACT alluvium/CS?	

GEOLOGIC BORING/WELL LOG

Project #: <u>DHERC</u>		Project Name: <u>FWDA PARCEL 22</u>		Boring/Wel #: <u>TMW 37 (S-4)</u> <i>new position</i>	
Geologist: <u>A. ROBERTSON</u>			Driller/Company: <u>USGS</u>		
Drilling Equip.: <u>ETD/CME</u>			Date Start: <u>12/11/09</u>		Date Completed: <u>12/11/09</u>
Surface Elev.: <u>6710.8 ft.</u>		Top of Casing Elev.: <u>6713.1 ft.</u>		Total Depth: <u>111 ft.</u>	
Well Depth: <u>108 ft.</u>					
Method of Drilling		Casing/Riser: Type		Screen Portion of Well	
<input type="checkbox"/> Hollow Stem <input type="checkbox"/> Direct Rotary <input checked="" type="checkbox"/> Air Rotary <input type="checkbox"/> Bucket Auger <input type="checkbox"/> MUD Rotary <input type="checkbox"/> Flight Auger Hole Diameter: <u>5"</u>		<input type="checkbox"/> Steel <input type="checkbox"/> Threaded <input type="checkbox"/> Galv <input type="checkbox"/> Welded <input checked="" type="checkbox"/> PVC <input type="checkbox"/> Solvent <input type="checkbox"/> SS <input type="checkbox"/> Welded Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> No		Material: <u>sawcut</u> Diameter: <u>2 1/2"</u> Length: <u>20 ft</u> Set between: <u>88</u> ft and <u>108</u> ft Slot size: <u>0,010</u>	
Filter Pack		Annulus Seal		Grout	
Size: _____ Method of Install: <u>slow pour</u> Composition: <u>10/20 silica sand</u> Volume Used: <u>(5.25) 50 lb bags</u> Depth to top of f.p.: <u>111'</u>		<input checked="" type="checkbox"/> Bentonite Pellets <u>1/4"</u> Chips _____ <input type="checkbox"/> _____ Volume Used: <u>(3) 5 gal buckets</u> Method of Install: <u>slow pour</u> Depth: from <u>82</u> ft. to <u>111</u> ft.		Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Volume: <u>(34) 50 lb bags</u> <input type="checkbox"/> Nea: Cement <input checked="" type="checkbox"/> Bentonite chips <input type="checkbox"/> _____ Method of Install: <u>slow pour</u> Depth: from <u>10</u> ft. to <u>61</u> ft.	
Well Head Completion		Development		Static Water Level	
<input type="checkbox"/> Flushmount <input checked="" type="checkbox"/> Stand Up Cap Type: _____ Lock #: <u>N/A</u> Volume Used: <u>cement (4) 94 lb bags</u>		Method: <u>260 PM trash pump</u> Gallons Evacuated: <u>101 gallons</u> Date: <u>12/14/09, 2/4/10, 3/25/10</u>		Initial: <u>50.87</u> ft. Development: <u>5067</u> ft. 24 hr: <u>50.87</u> ft.	

DRILLING		SAMPLE					GEOLOGIC LOG				
Depth (ft)	PID Reading (ppm)	Sample Type	Sample ID	Blow Count				Recovery (ft)	USCS Class	Contact Depth (ft)	Descriptions and Comments
				0-6"	6-12"	12-18"	18-24"				
0-5 ft.								3.5		REDDISH SILTY SAND - Btm 2.5 ft. A-HORIZONTAL TOP 1.5 FT. *DRY -DRY, PIECES CaCO ₃ + COAL -MID-FINE SOME LOOSER, SUB - rounded -WELL SORTED *DRY	
5-10 ft.								5.0		REDDISH SANDY SILT - more clays than previous -Btm 1 FT BLKY PLATEY CLAY, some rootlets (no visible CaCO ₃) - black staining	
10-15 ft.								5.0		Maybe ~1.5' silt -Btm 2' -med coarse grain, well sorted, round - sub rounded top 3' BLKY PLATEY clay w/ interbedded silts	
15-20										PRETTY Easy Pushing *DRY Same as Btm 2' above more black staining Ink bedded grain sizes well-sorted	

WELL COMPLETION DIAGRAMS

Installation Report

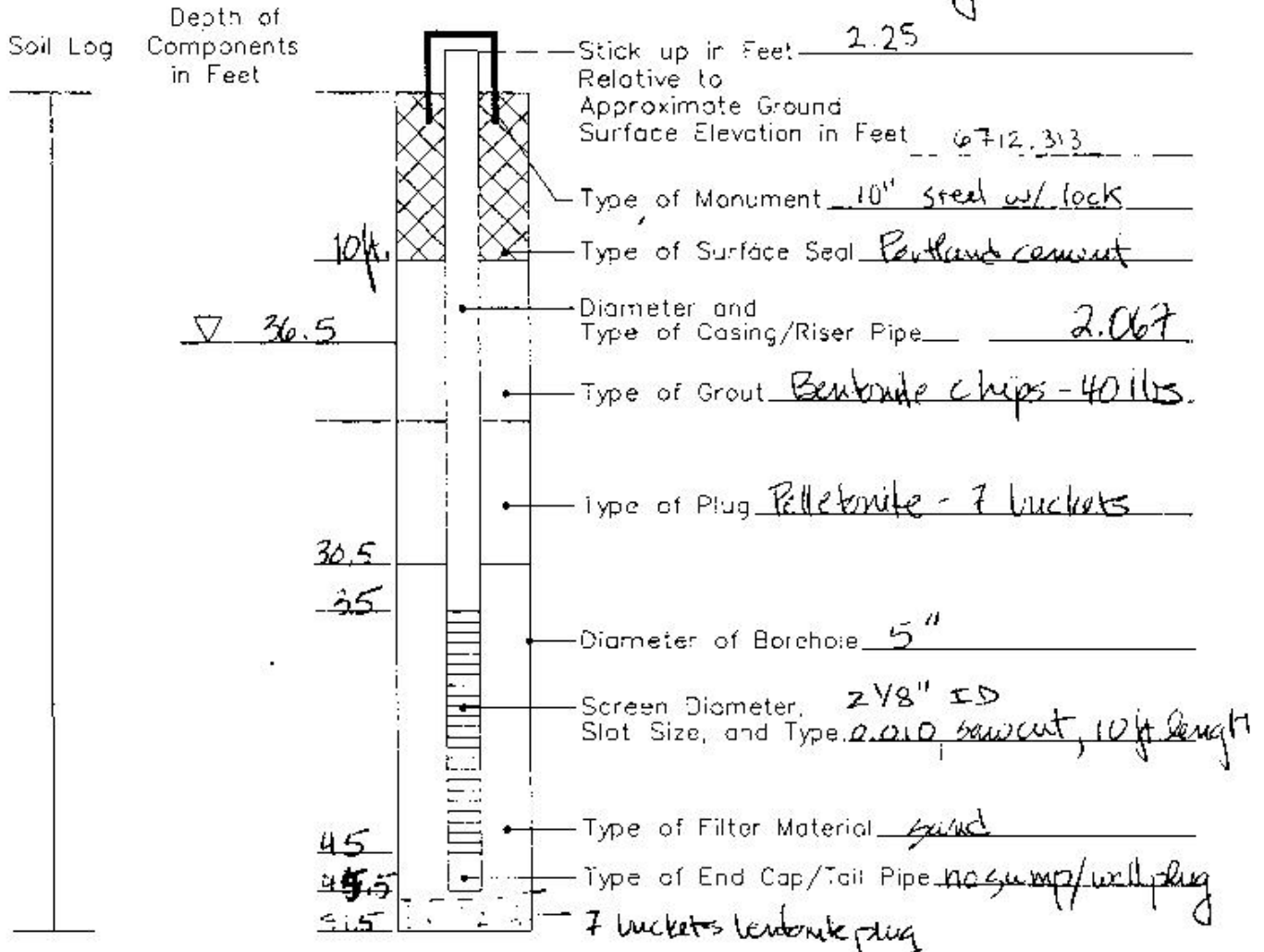
Monitoring Well 5-1/1 MW30

191

Project: ~~BRW~~-DABRC Job No. _____ Date 4/29/09

Location Parcel 21 HC Observer Mathew Driller WSGS/Grant
X 109°35'11.76" W Y 35°30'17.84" N

Type of Well (Observation, Sampling, Vapor Extraction) monitoring



Remarks: TD 51.5 ft Plug with pellebrite to 45 ft. (contact with
sumstone)

Materials Total:

Sand	<u>110 lbs</u>	Monument	<u>10" steel</u>
Cement	<u>3 bags</u>	PVC	<u>10 screen/35 pipe</u>
Bentonite	<u>46 lbs & 7 buckets</u>	Other	_____

Installation Report

Monitoring Well TMW31-D

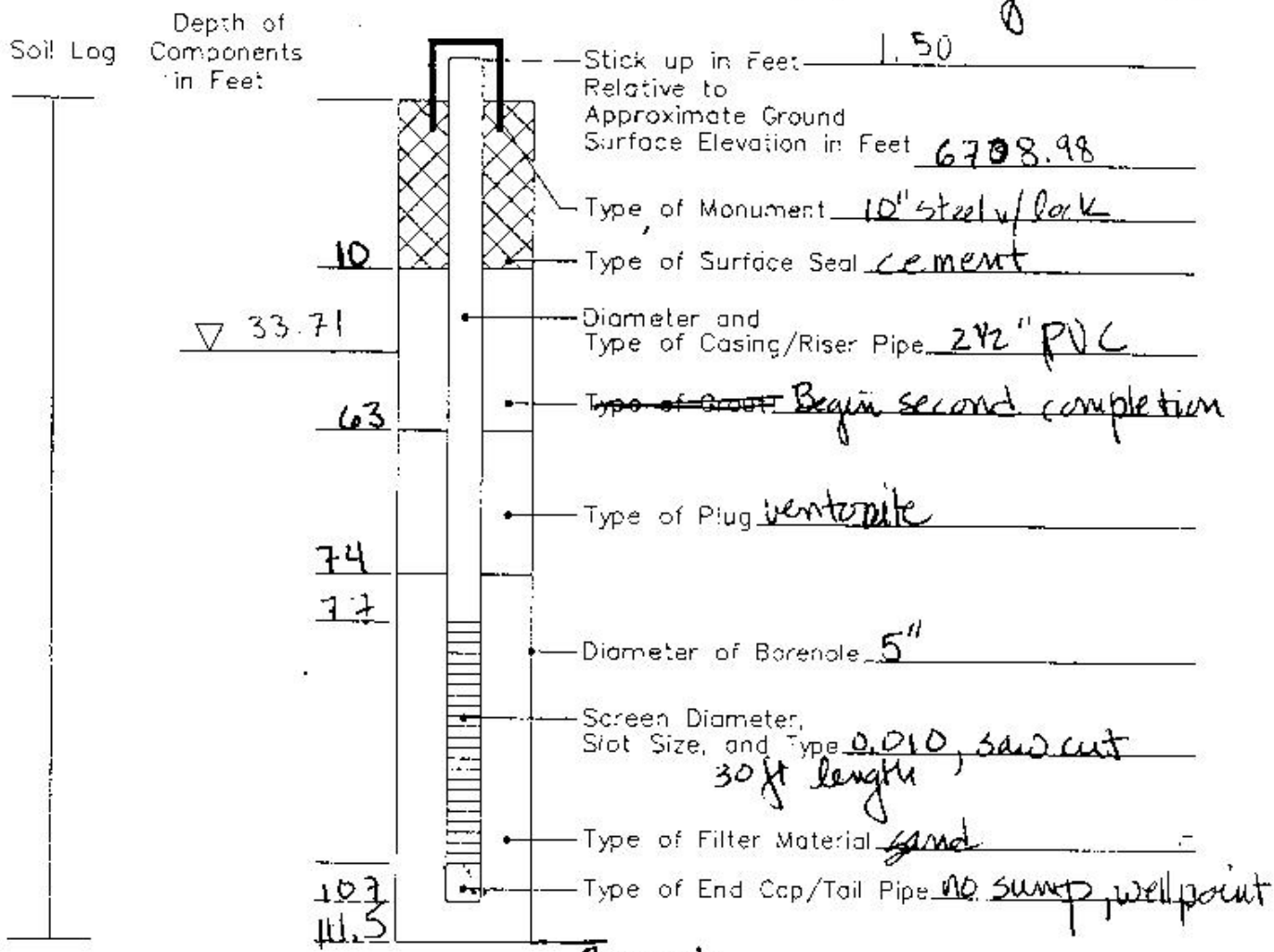
DHBRC

(1-1)

Project FWDA 1-1/P22 Job No. _____ Date 11/18/09

Location _____ HC Observer Matheme Driller WGS

Type of Well: (Observation, Sampling, Vapor Extraction) monitoring



Remarks: Deep well of dual completion

Materials Tally:

Sand	<u>6 bags</u>	Monument	<u>10' steel</u>
Cement	_____	PVC	<u>80/30 screen, 2 1/2" ID</u>
Bentonite	<u>5 bags</u>	Other	_____

Installation Report

Monitoring Well MW 31-5

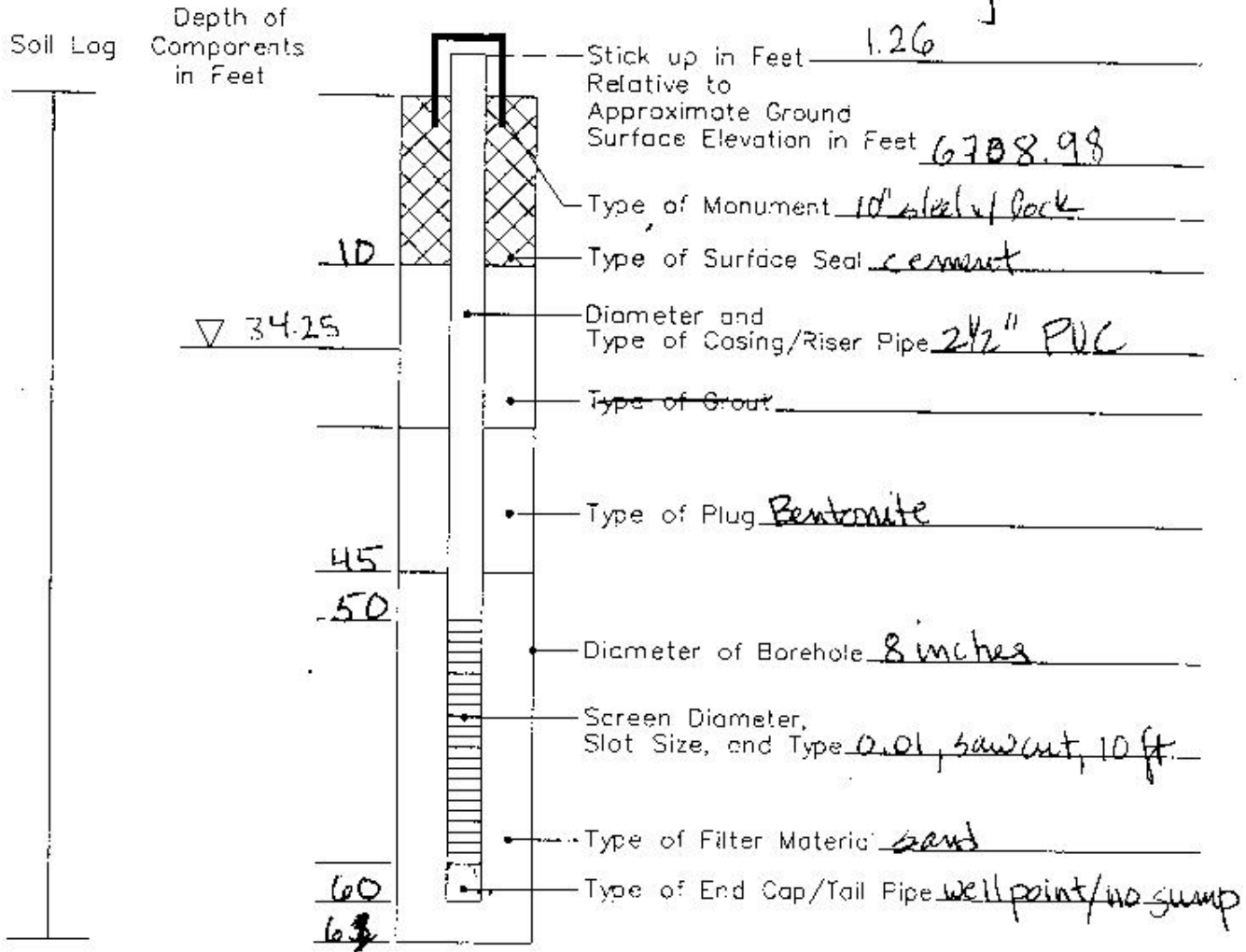
DHBRC

Project FWDA 1-1/P22 Job No _____ Date 1/18/09

Location _____ HC Observer Mastherme Driller USGS

X 108° 35' 11.43" W Y 35° 30' 25.08" N

Type of Well (Observation, Sampling, Vapor Extraction) monitoring



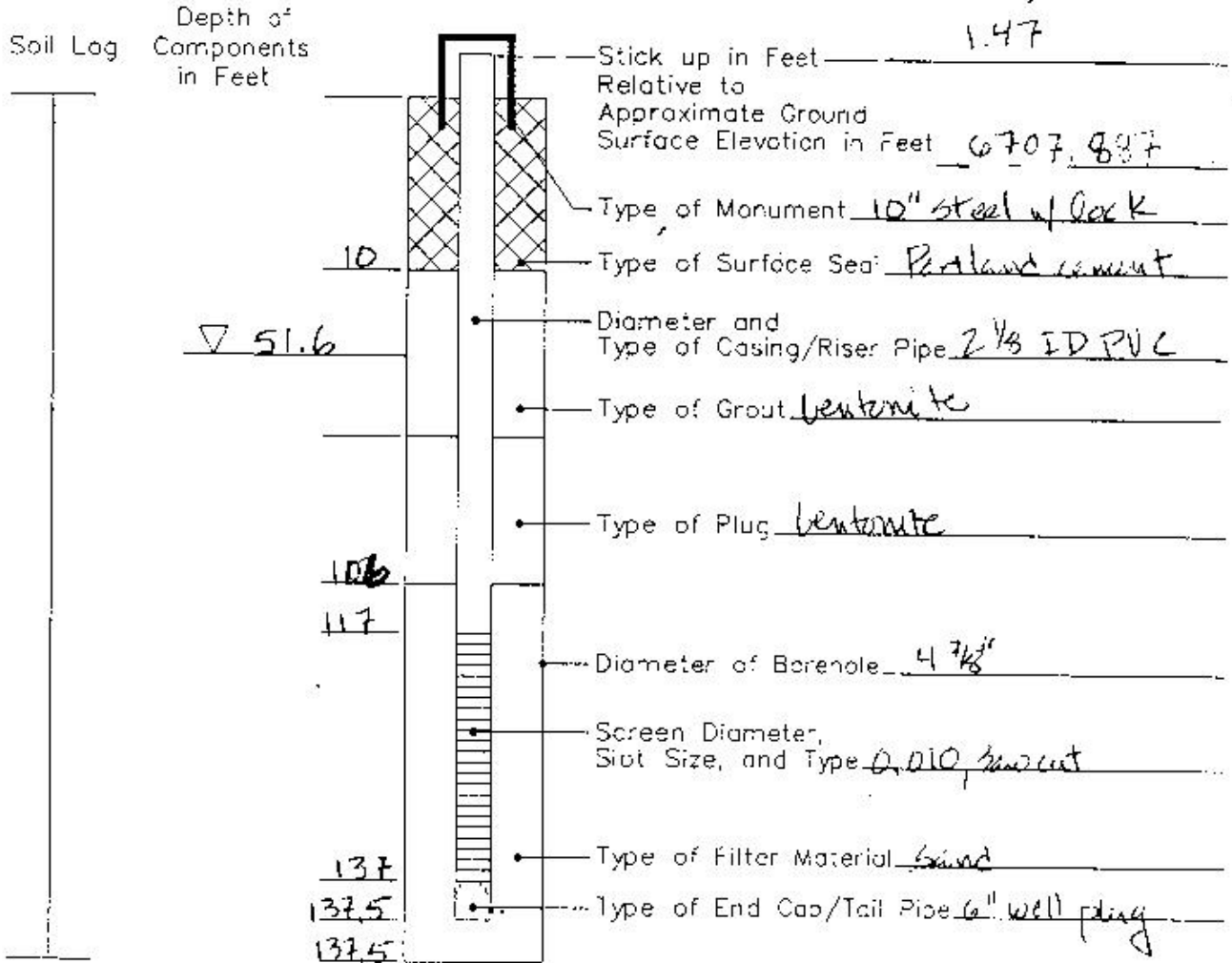
Remarks: Shallow well of dual completion.

- Materials Used:
- | | | | |
|-----------|-------------------|----------|--|
| Sand | <u>16 bags</u> | Monument | <u>10" steel</u> |
| Cement | <u>3 bags</u> | PVC | <u>60 pipe / 10 screen (A) 2 1/2 inch ID</u> |
| Bentonite | <u>2 1/2 bags</u> | Other | _____ |

Installation Report

Monitoring Well 1-3/TMW 32

Project DHBR Job No. _____ Date 12/2/09
 Location EWDA P21 HC Observer M. Harne Driller USGS/Grant
 X 109° 35' 15.97" W Y 35° 30' 28.71" N
 Type of Well (Observation, Sampling, Vapor Extraction) monitoring



Remarks: _____

Materials Tally:

Sand	<u>5</u>	Monument	<u>10" steel</u>
Cement	<u>4</u>	PVC	<u>20ft screen / 120ft pipe, 2 1/8 ID</u>
Bentonite	<u>35</u>	Other	_____

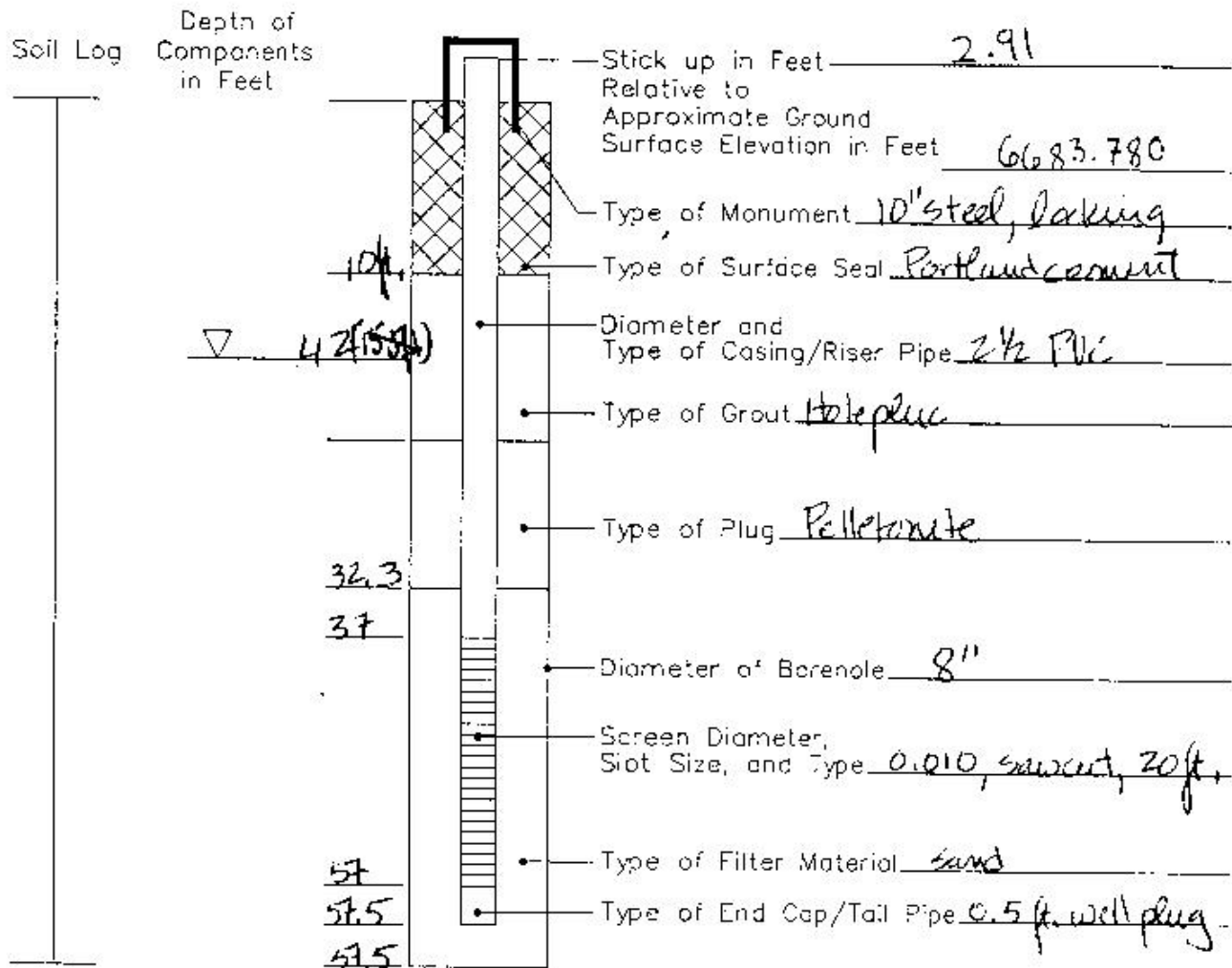
Installation Report

Monitoring Well TMW33

Project DABRC Job No. _____ Date 1/7/09

Location FWDA/PII HC Observer Matherne Driller USGS/Grant
X 108° 35' 19.33" W Y 35° 30' 58.12" N

Type of Well (Observation, Sampling, Vapor Extraction) _____



Remarks: _____

Materials Tally:

Sand <u>25 bags</u>	Monument <u>10" steel</u>
Cement <u>4 bags</u>	PVC <u>20ft screen, 40 ft pipe</u>
Bentonite <u>5 buckets, 16 bags</u>	Other _____

Installation Report

Monitoring Well TMW 34

Project: FWDA

Proj. #

Job # 8636DHBP1

Installation

Date 12/10/09

X 109° 35' 22.83" W Y 35° 30' 57.69" N

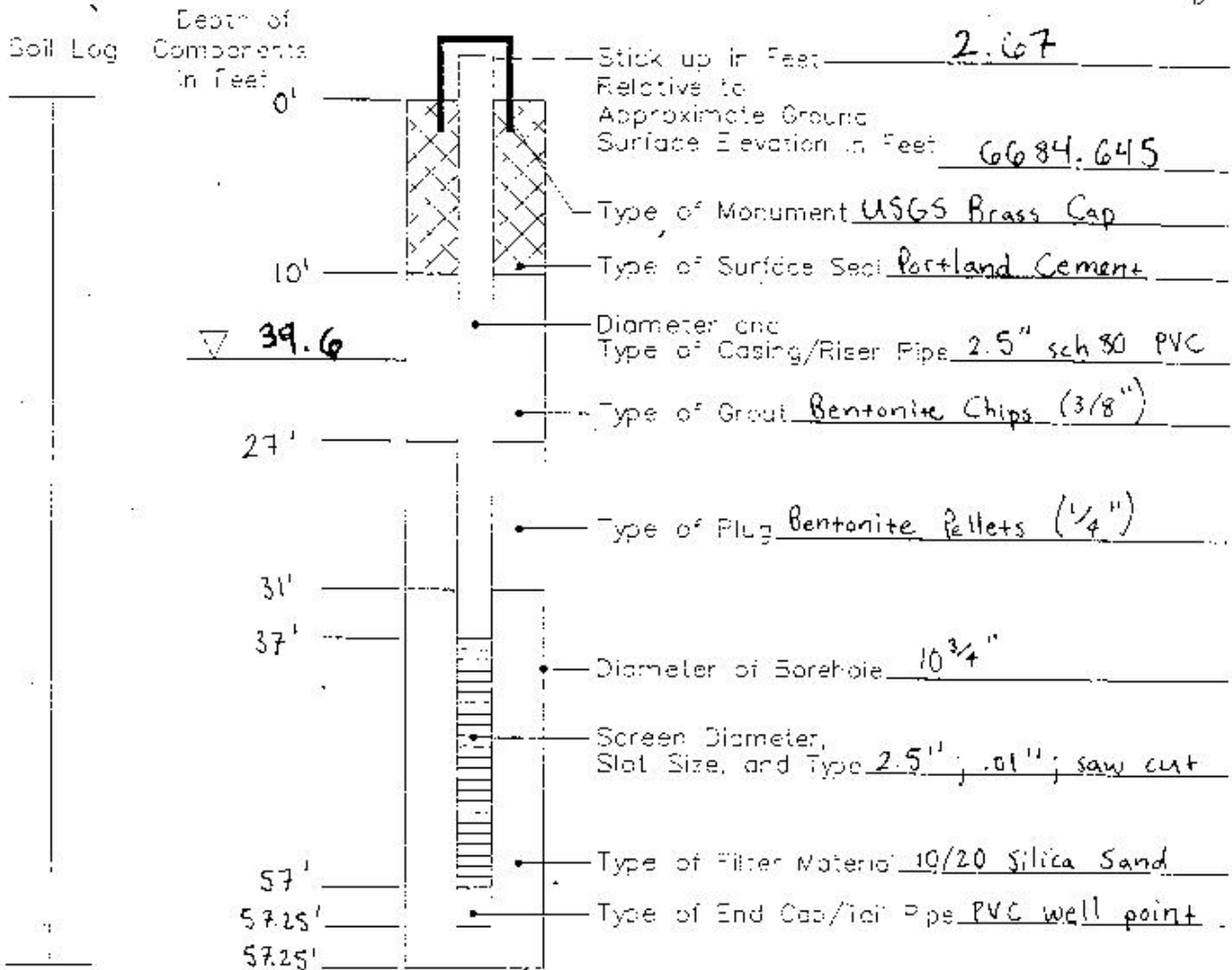
Location Parcel 11

HC Observer

Driller USGS

Ft Wingate Depot Activity, NM

Type of Well (Observation, Sampling, Vapor Extraction) observation and sampling



Remarks: _____

Materials Tally:

Sand 22 - 50 lb. bags

Monument 1

Cement 4 - 94 lb. bags

PVC 2 10' screens, 4 10' risers

Bentonite chips - 14 50 lb bags
pellets - 4 5 gal buckets

Other _____

Installation Report

Monitoring Well TMW 35

Project FWDA

Proj #

Job No. 86360H881

Date 12/5/09

X 108° 35' 17.66" W Y 35° 30' 59.28" N

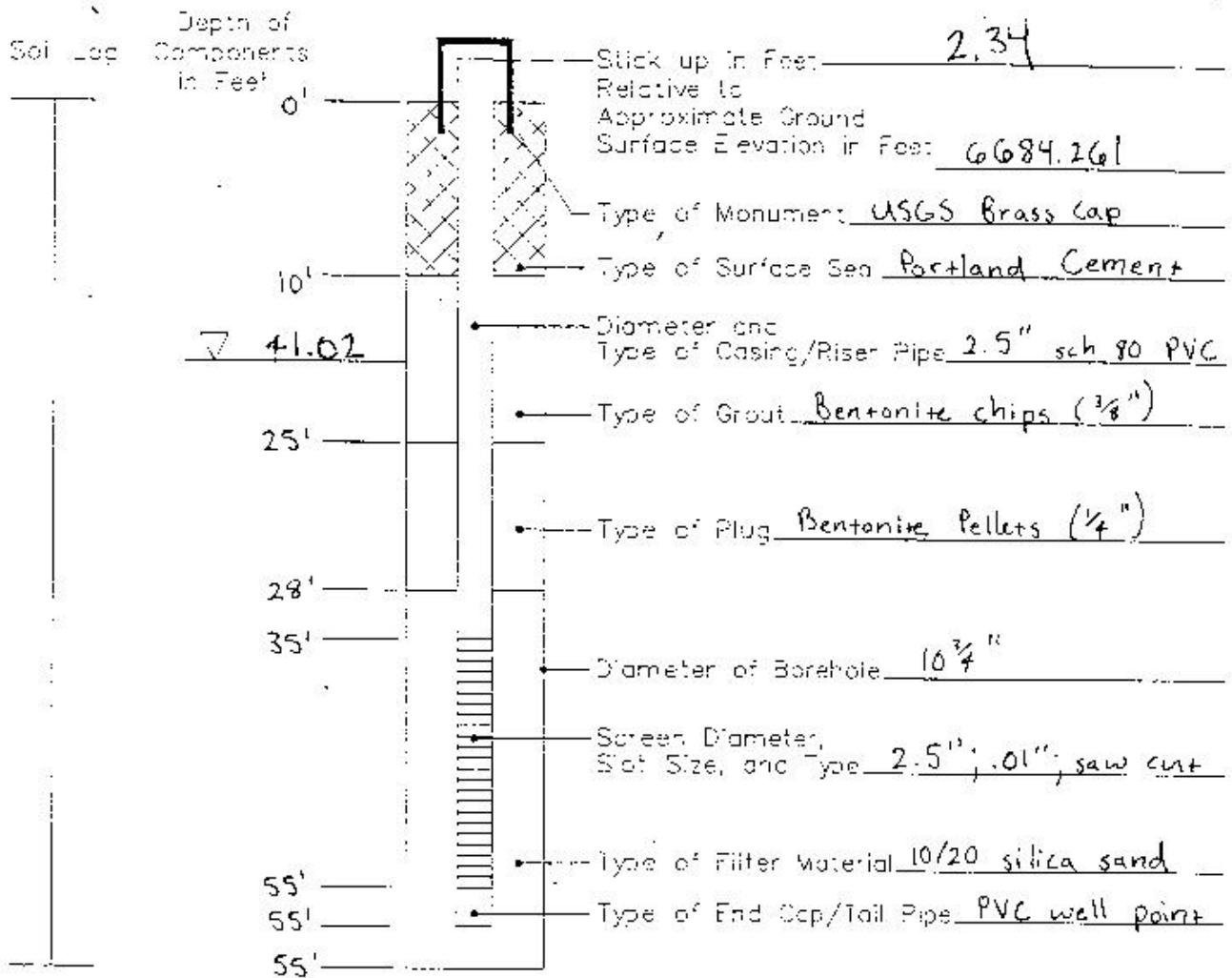
Location Parcel II

HC Observer

Driller USGS

Ft. Wingate Depot Activity, NM

Type of Well (Observation, Sampling, Vapor Extraction) Observation and Sampling



Remarks:

Materials To Use

Sand 24 - 50 lb. bags

Monument 1

Cement

PVC 2 10' screens, 4 10' risers

Bentonite chips - 16 50 lb. bags

Other

pellets - 4 5 gal buckets

Installation Report

Monitoring Well T MW 36

Project FWDA

Project #

Job No. 8636DHBP1

Date 12/5/09

X 108° 35' 10.08" W Y 35° 30' 34.54" N

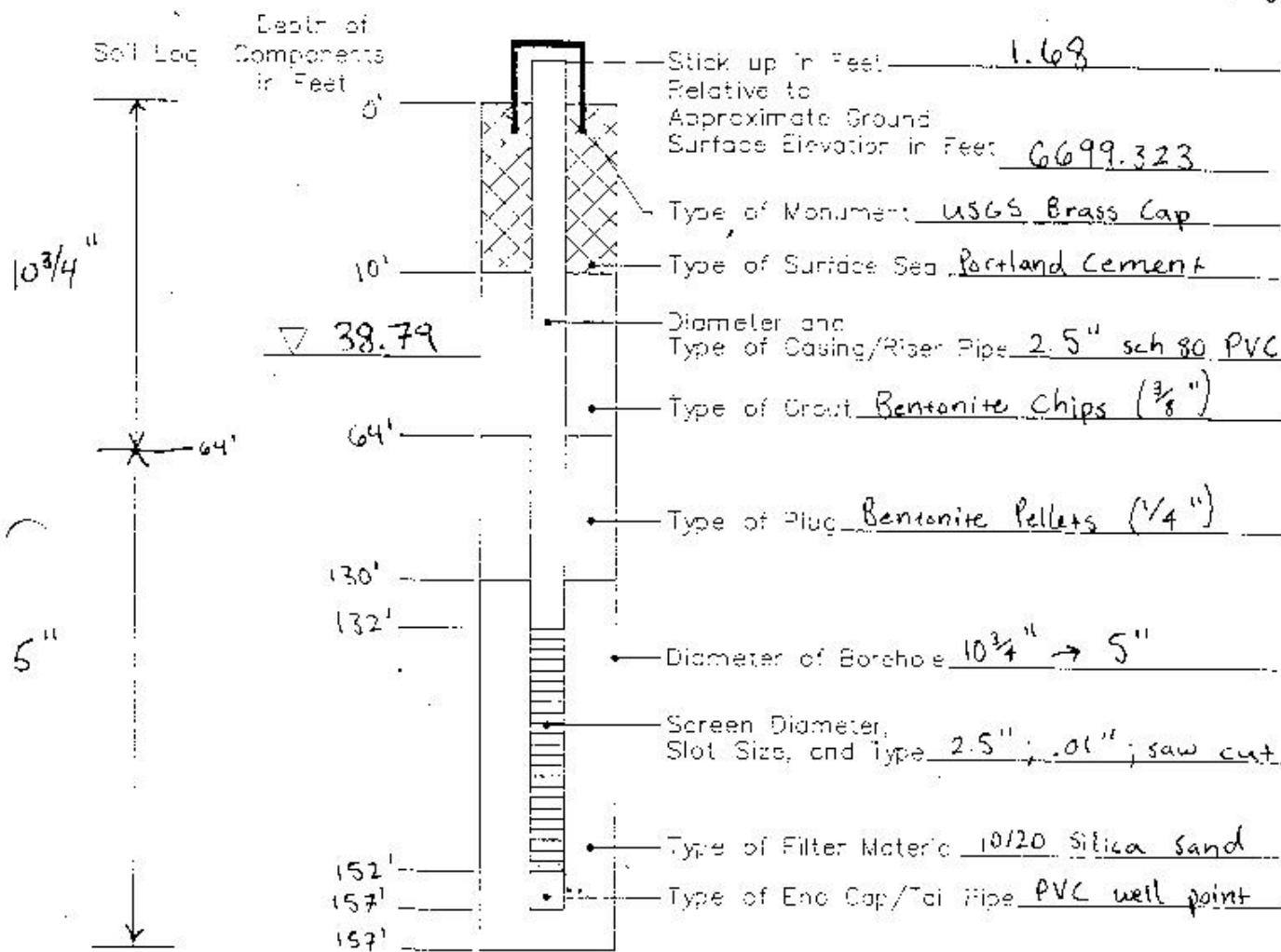
Location Parcel 22

F.O. Observer _____

Driller USGS

Ft. Wingate Depot Activity, NM

Type of Well (Observation, Sampling, Vapor Extraction) Observation and sampling



Remarks: _____

Materials To y:

Sand 3.75 - 50 lb bags

Monument 1

Cement 4 - 94 lb bags

PVC 2 10' screens, 4 10' risers

Bentonite chips - 32 50 lb bags
 pellets - 9 5 gal buckets

Other _____

Installation Report

Monitoring Well TMW 37

Project FWDA

Project

Job No. 86360HBPI

Date 12/12/09

X 108°35'17.88"W Y 35°30'24.63"N

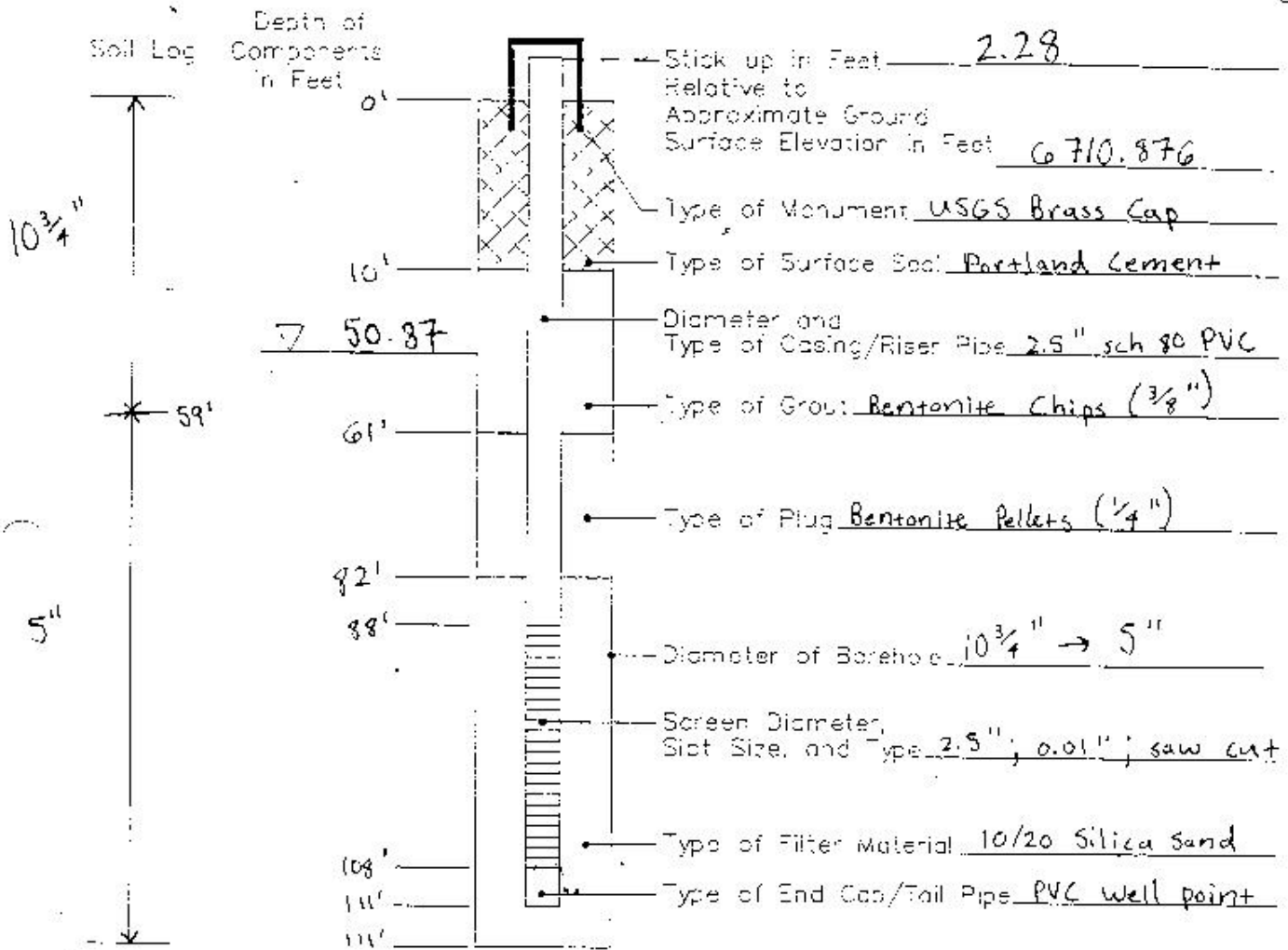
Location Parcel 22

HC Observer _____

Driller USGS

R. Wingate Depot Activity, NM

Type of Well (Observation, Sampling, Vapor Extraction) observation and sampling



Remarks: _____

Materials To go:

Sand 5.25 - 50 lb bags

Monument 1

Cement 4 - 94 lb bags

PVC 2 10' screens, 4 10' risers

Bentonite chips - 34 50 lb bags

Other _____

pellets - 3 5 gal buckets