Appendix A

Borehole Logs

BOREHOLE LOG NAT01-0548

PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER 0548
NORTH COORD. (FT) 588998.73
EAST COORD. (FT) 1106297.08
HOLE DEPTH (FT) 23.00
DATE DRILLED 06/09/1986 to 06/11/1986

SURFACE ELEV. (FT NGVD) 5291.03
BIT SIZE(S) (IN)
DRILLING METHOD AUGER/ROTARY
SAMPLING METHOD
WATER LEVEL (FT BTOC) 8.05 on 06/17/1986
LOGGED BY Dupuy, J.
REMARKS

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE ID.	EXTENT	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
5	5290					0-10 ft. CLAY EY SILT (ML), alluvial material, no cobbles. Damp @ 4.0 ft.
	5285					
10	5280					10-13 ft. SANDY GRAVEL (GW-SW), with some cobbles and clay, becomes mostly gravel at depth.
						13-19 ft. GRAVEL (GW), some sand with cobbles, river alluvium.
15	5275					
20	5270					19-23 ft. BRUSHY BASIN MEMBER OF MORRISON FORMATION: SILTSTONE; bedrock with some mudstone, reddish-brown in color.
						Total Depth 23.0 ft.

MONITORING WELL COMPLETION LOG NAT01-DM1

PROJECT	UMTRA GROUND WATER	**NORTH COORD. (FT)**	585973.91	**DATE DRILLED**	07/06/1999
LOCATION	, CO	**EAST COORD. (FT)**	1108381.41	**SURFACE ELEV. (FT NGVD)**	5307.58
SITE	NATURITA	**HOLE DEPTH (FT)**	8.00	**TOP OF CASING (FT)**	5310.81
WELL NUMBER	DM1	**WELL DEPTH (FT)**	8.00	**MEAS. PT. ELEV. (FT)**	5310.81
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	**INTERVAL (FT)**		
SURFACE CASING:				
BLANK CASING:	2 in. PVC Sch 40	-3.23	to	2.67
WELL SCREEN:	2 in. Slotted PVC	2.67	to	7.67
SUMP/END CAP:	2 in. PVC	7.67	to	8.0
SURFACE SEAL:	Cement	0.0	to	0.5
GROUT:				
SEAL:	Bentonite Pellets	0.5	to	2.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	2.0	to	8.0

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS

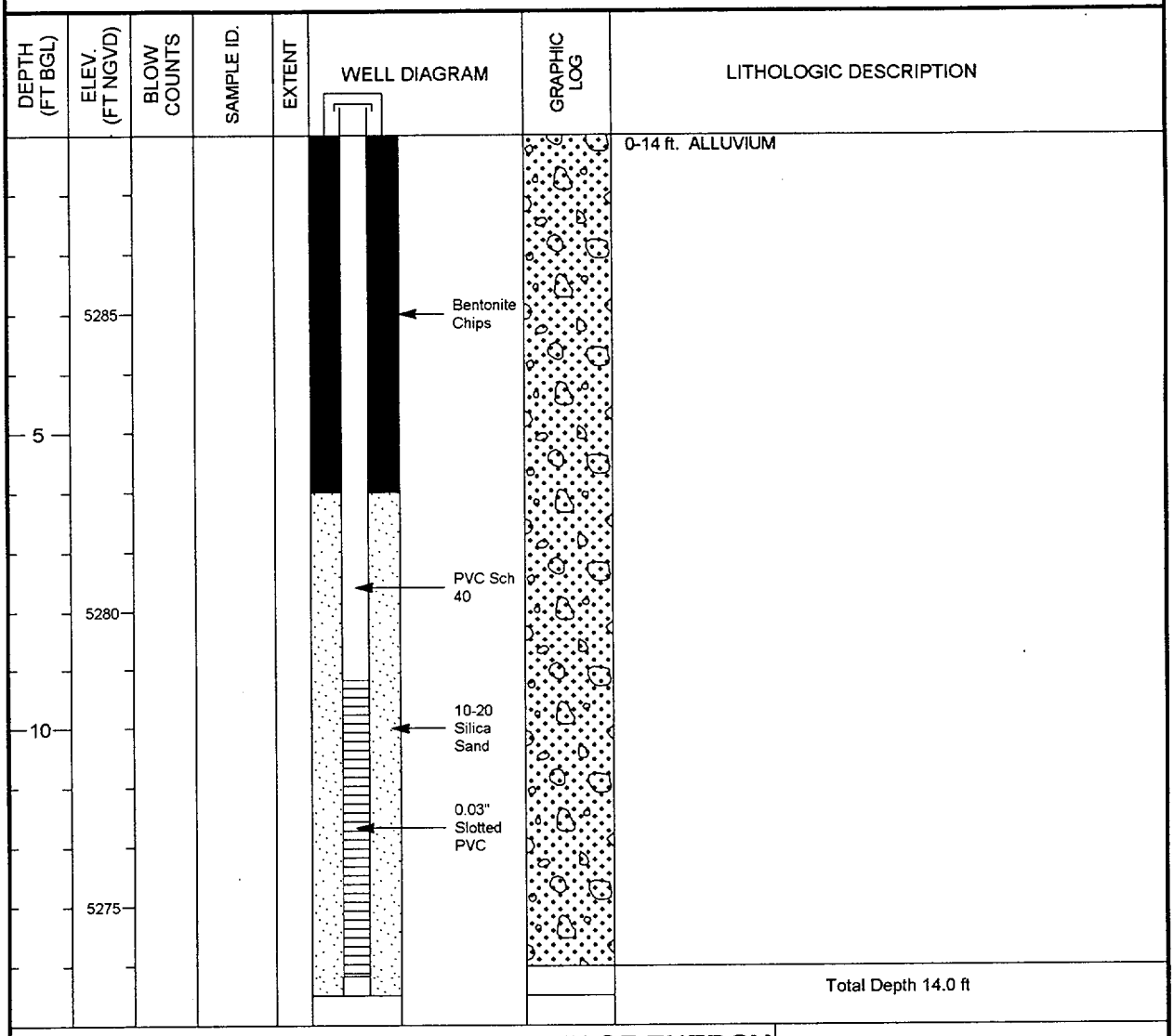
DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE ID.	EXTENT	WELL DIAGRAM	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
					Cement; Bentonite Pellets; PVC Sch 40; 10-20 Silica Sand; 0.020" Slotted PVC		0-8 ft. SANDY GRAVEL (GW-SW), river gravel with sand.
5	5305						
10	5300						Total Depth 8.0 ft.

MONITORING WELL COMPLETION LOG NAT01-MAU01

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589391.84	DATE DRILLED	10/18/1998
LOCATION	, CO	EAST COORD. (FT)	1106198.83	SURFACE ELEV. (FT NGVD)	5287.99
SITE	NATURITA	HOLE DEPTH (FT)	14.50	TOP OF CASING (FT)	5289.68
WELL NUMBER	MAU01	WELL DEPTH (FT)	14.50	MEAS. PT. ELEV. (FT)	5289.68
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-1.69	to	9.17	
WELL SCREEN:	2 in. Slotted PVC	9.17	to	14.17	
SUMP/END CAP:	2 in. PVC Sch 40	14.17	to	14.5	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.0	to	6.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	6.0	to	14.5	

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS

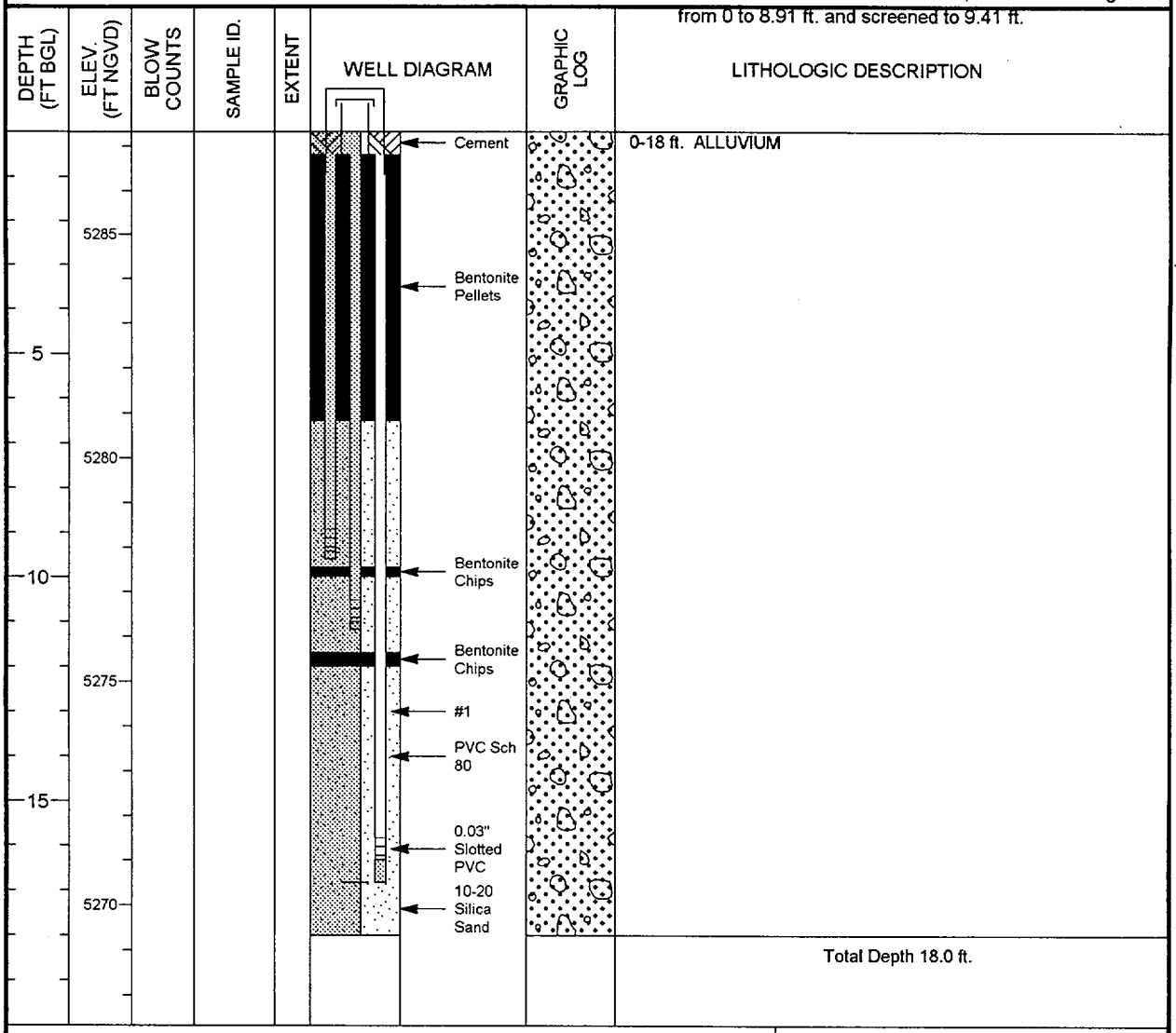


MONITORING WELL COMPLETION LOG NAT01-MAU02-1

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589379.50	DATE DRILLED	10/18/1998
LOCATION	, CO	EAST COORD. (FT)	1106368.48	SURFACE ELEV. (FT NGVD)	5287.33
SITE	NATURITA	HOLE DEPTH (FT)	18.00	TOP OF CASING (FT)	5289.42
WELL NUMBER	MAU02-1	WELL DEPTH (FT)	16.83	MEAS. PT. ELEV. (FT)	5289.42
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.09	to	15.82
WELL SCREEN:	0.5 in. Slotted PVC	15.82	to	16.32
SUMP/END CAP:	0.5 in. PVC Sch 80	16.32	to	16.83
SURFACE SEAL:	Cement	0.0	to	0.5
GROUT:				
SEAL:	Bentonite Chips	11.67	to	12.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	12.0	to	18.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: MAU02-1 casing and screen depths provided; MAU02-2 casing is from 0 to 10.5 ft. and screened to 11.0 ft.; MAU02-3 casing is from 0 to 8.91 ft. and screened to 9.41 ft.



MONITORING WELL COMPLETION LOG NAT01-MAU02-2

PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER MAU02-2

NORTH COORD. (FT) 589379.50
EAST COORD. (FT) 1106368.48
HOLE DEPTH (FT) 18.00
WELL DEPTH (FT) 11.17

DATE DRILLED 10/18/1998
SURFACE ELEV. (FT NGVD) 5287.33
TOP OF CASING (FT) 5289.40
MEAS. PT. ELEV. (FT) 5289.40
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.07	to	10.5
WELL SCREEN:	0.5 in. Slotted PVC	10.5	to	11.0
SUMP/END CAP:	0.5 in. PVC Sch 80	11.0	to	11.17
SURFACE SEAL:	Cement	0.0	to	0.5
GROUT:				
SEAL:	Bentonite Chips	9.75	to	10.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	10.0	to	18.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: MAU02-2 casing and screen depths provided; MAU02-1 casing is from 0 to 15.82 ft. and screened to 16.32 ft.; MAU02-3 casing is from 0 to 8.91 ft. and screened to 9.41 ft.

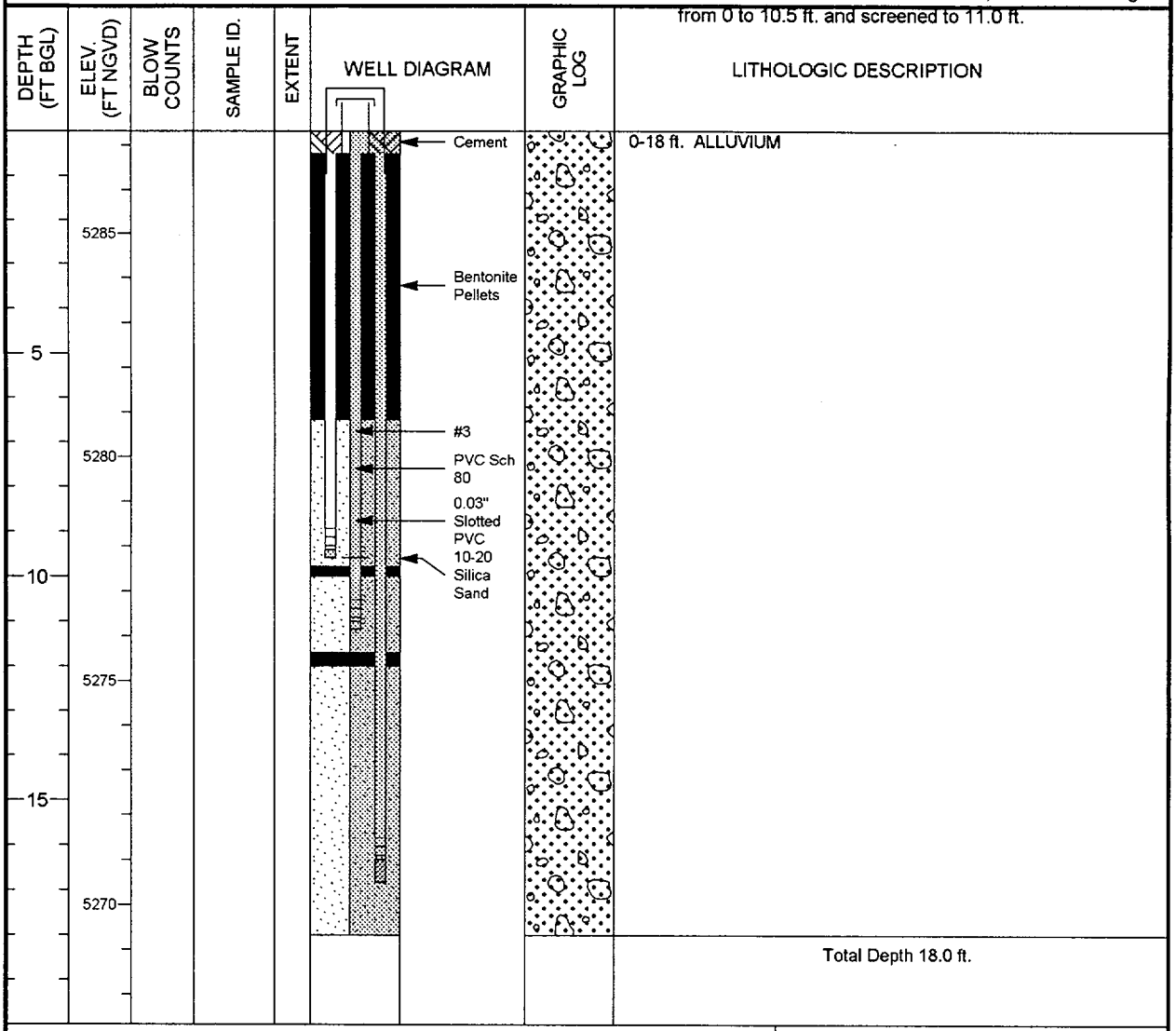
DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE ID.	EXTENT	WELL DIAGRAM	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
0	5285				Cement		0-18 ft. ALLUVIUM
5					Bentonite Pellets		
	5280				#2 PVC Sch 80		
10					10-20 Silica Sand; Bentonite Chips; 0.03" Slotted PVC		
	5275						
15							
	5270						
							Total Depth 18.0 ft.

MONITORING WELL COMPLETION LOG NAT01-MAU02-3

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589379.50	DATE DRILLED	10/18/1998
LOCATION	, CO	EAST COORD. (FT)	1106368.48	SURFACE ELEV. (FT NGVD)	5287.33
SITE	NATURITA	HOLE DEPTH (FT)	18.00	TOP OF CASING (FT)	5289.40
WELL NUMBER	MAU02-3	WELL DEPTH (FT)	9.58	MEAS. PT. ELEV. (FT)	5289.40
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.07	to	8.91
WELL SCREEN:	0.5 in. Slotted PVC	8.91	to	9.41
SUMP/END CAP:	0.5 in. PVC Sch 80	9.41	to	9.58
SURFACE SEAL:	Cement	0.0	to	0.5
GROUT:				
SEAL:	Bentonite Pellets	0.5	to	6.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	6.5	to	18.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: MAU02-3 casing and screen depths provided; MAU02-1 casing is from 0 to 15.82 ft. and screened to 16.32 ft.; MAU02-2 casing is from 0 to 10.5 ft. and screened to 11.0 ft.

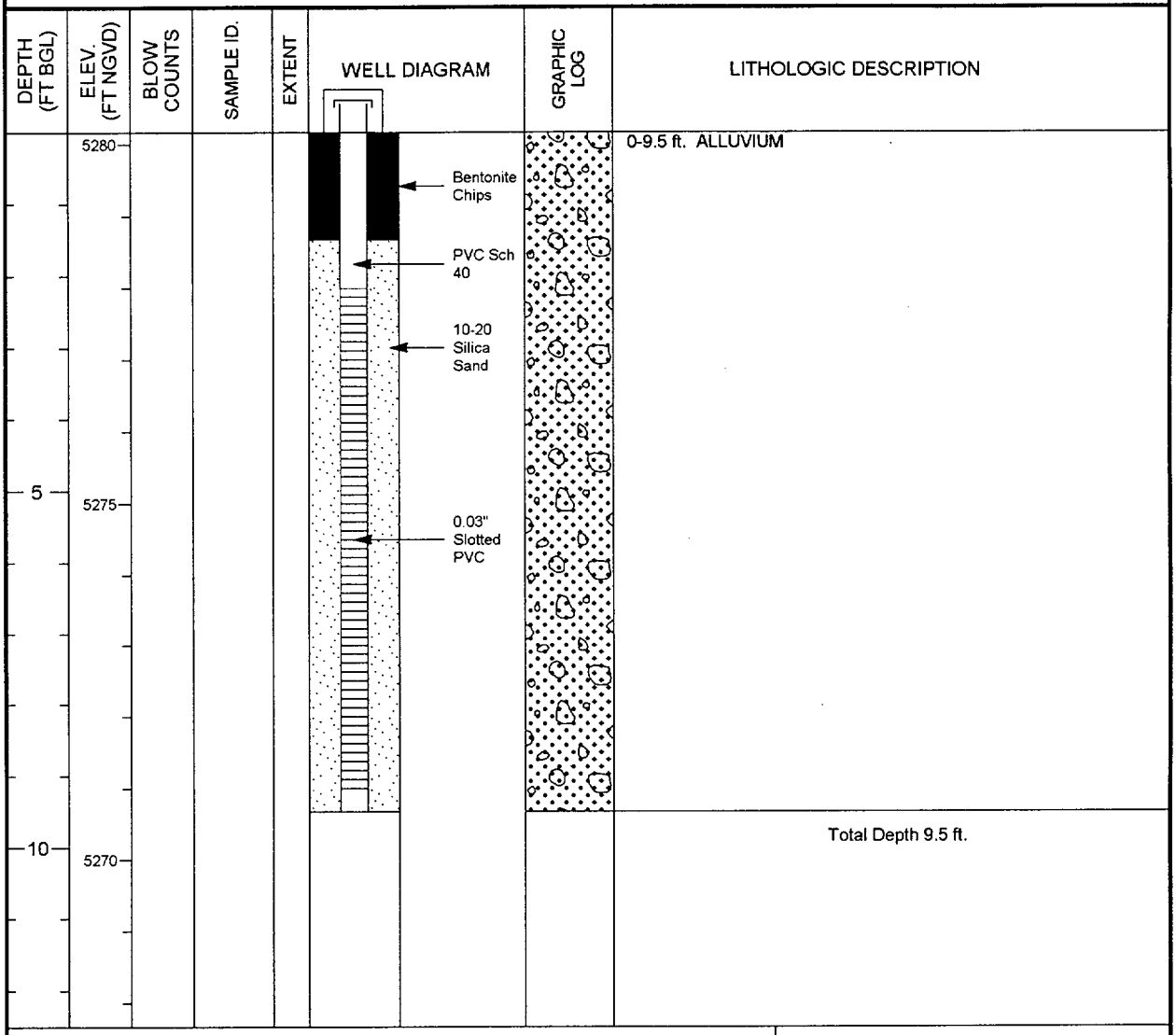


MONITORING WELL COMPLETION LOG NAT01-MAU03

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589917.28	DATE DRILLED	10/19/1998
LOCATION	, CO	EAST COORD. (FT)	1106720.41	SURFACE ELEV. (FT NGVD)	5280.17
SITE	NATURITA	HOLE DEPTH (FT)	9.50	TOP OF CASING (FT)	5282.52
WELL NUMBER	MAU03	WELL DEPTH (FT)	9.50	MEAS. PT. ELEV. (FT)	5282.52
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	10.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.35	to	2.17	
WELL SCREEN:	2 in. Slotted PVC	2.17	to	9.17	
SUMP/END CAP:	2 in. PVC Sch 40	9.17	to	9.5	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.5	to	1.5	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	1.5	to	9.5	

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS

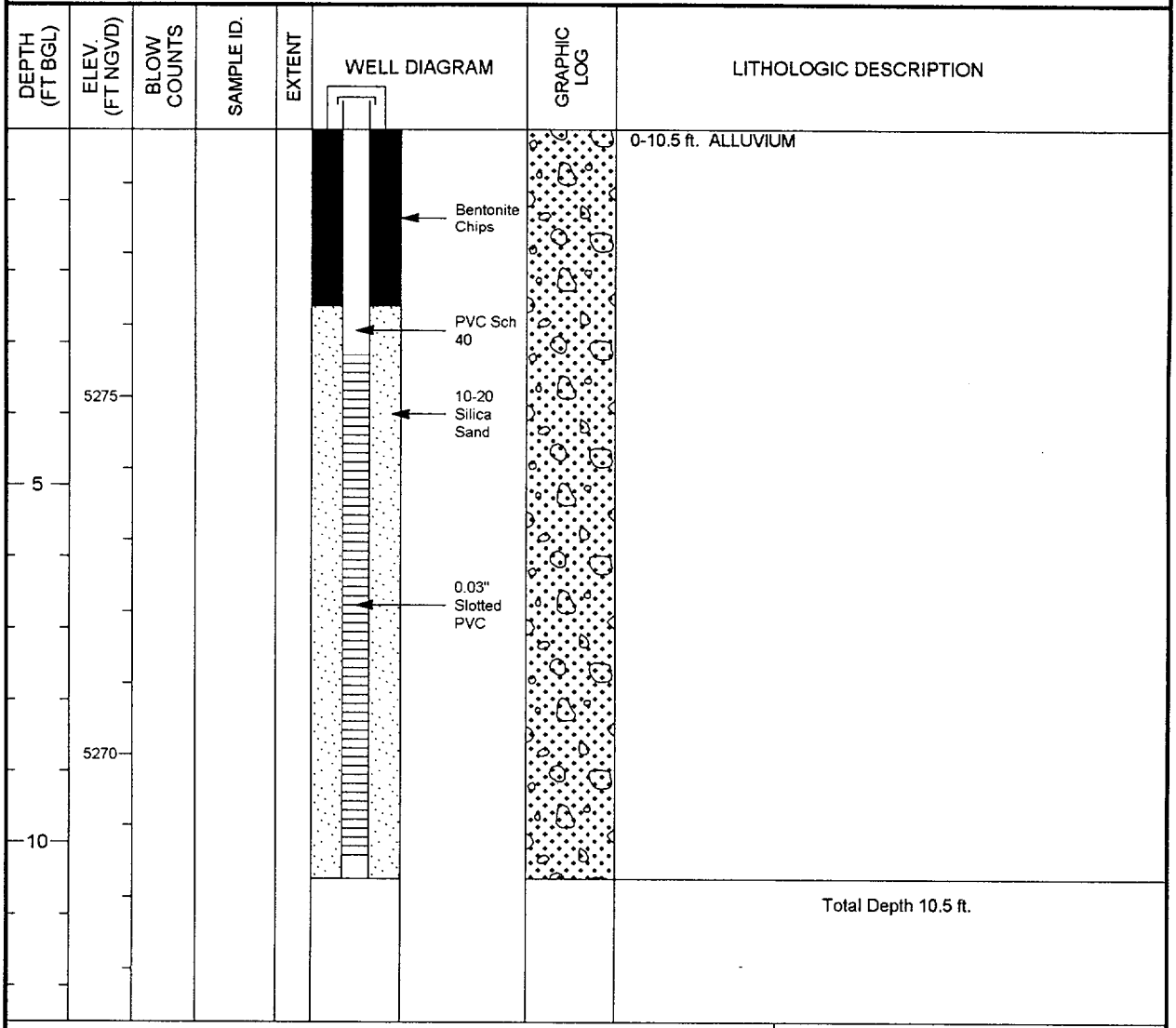


MONITORING WELL COMPLETION LOG NAT01-MAU04

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	590098.35	DATE DRILLED	10/19/1998
LOCATION	, CO	EAST COORD. (FT)	1106618.36	SURFACE ELEV. (FT NGVD)	5278.76
SITE	NATURITA	HOLE DEPTH (FT)	10.50	TOP OF CASING (FT)	5280.56
WELL NUMBER	MAU04	WELL DEPTH (FT)	10.50	MEAS. PT. ELEV. (FT)	5280.56
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

	WELL INSTALLATION	INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-1.8	to	3.17	
WELL SCREEN:	2 in. Slotted PVC	3.17	to	10.17	
SUMP/END CAP:	2 in. PVC Sch 40	10.17	to	10.5	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.0	to	2.5	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	2.5	to	10.5	

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS

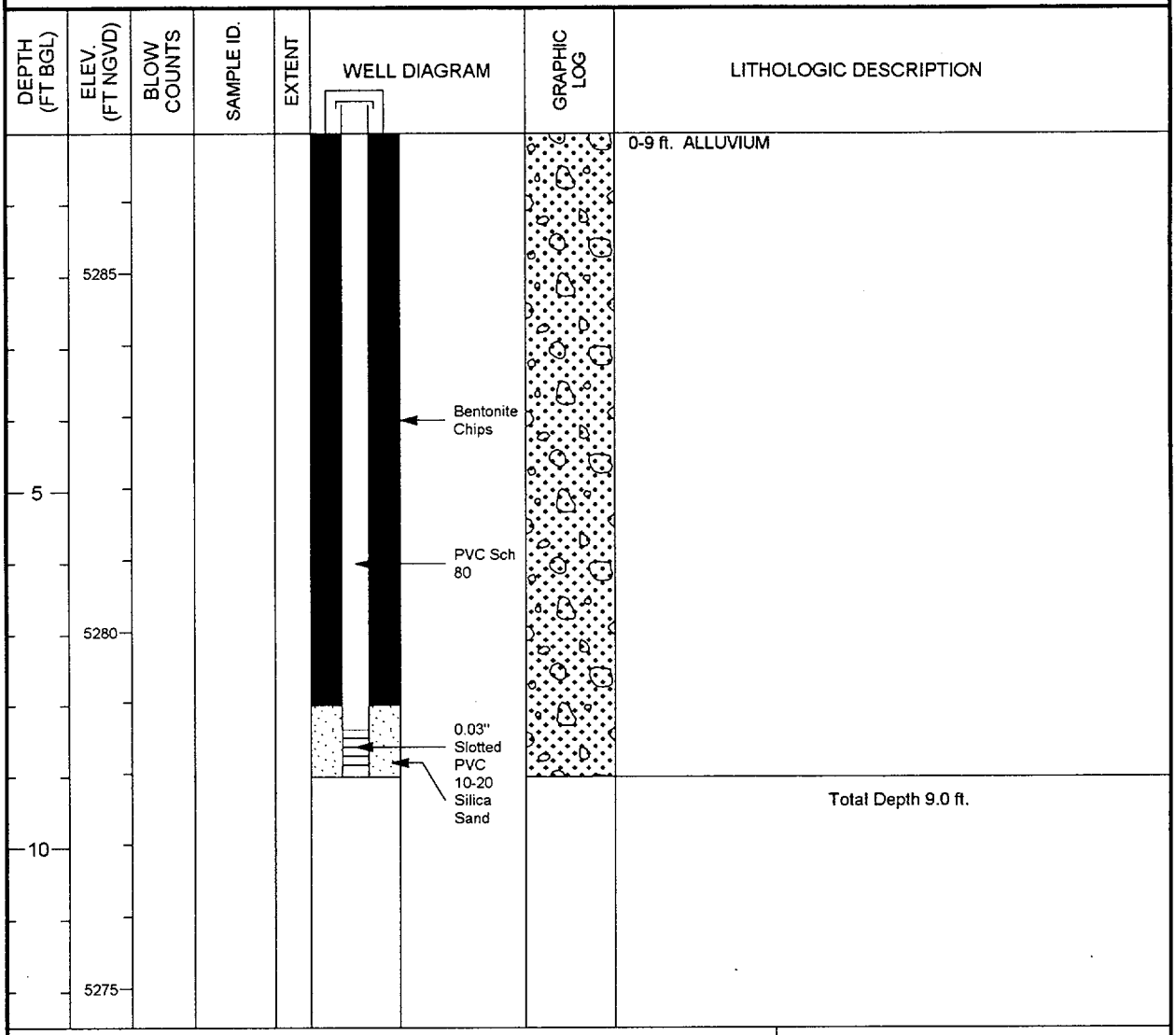


MONITORING WELL COMPLETION LOG NAT01-MAU05

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589407.28	DATE DRILLED	10/18/1998
LOCATION	, CO	EAST COORD. (FT)	1106334.48	SURFACE ELEV. (FT NGVD)	5286.95
SITE	NATURITA	HOLE DEPTH (FT)	9.00	TOP OF CASING (FT)	5289.20
WELL NUMBER	MAU05	WELL DEPTH (FT)	9.00	MEAS. PT. ELEV. (FT)	5289.20
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

	WELL INSTALLATION	INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.25	to	8.17	
WELL SCREEN:	2 in. Slotted PVC	8.17	to	8.67	
SUMP/END CAP:	2 in. PVC Sch 40	8.67	to	9.0	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.0	to	8.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	8.0	to	9.0	

DRILLING METHOD	AUGER
SAMPLING METHOD	
DATE DEVELOPED	
WATER LEVEL (FT BGS)	
LOGGED BY	Holmes
REMARKS	

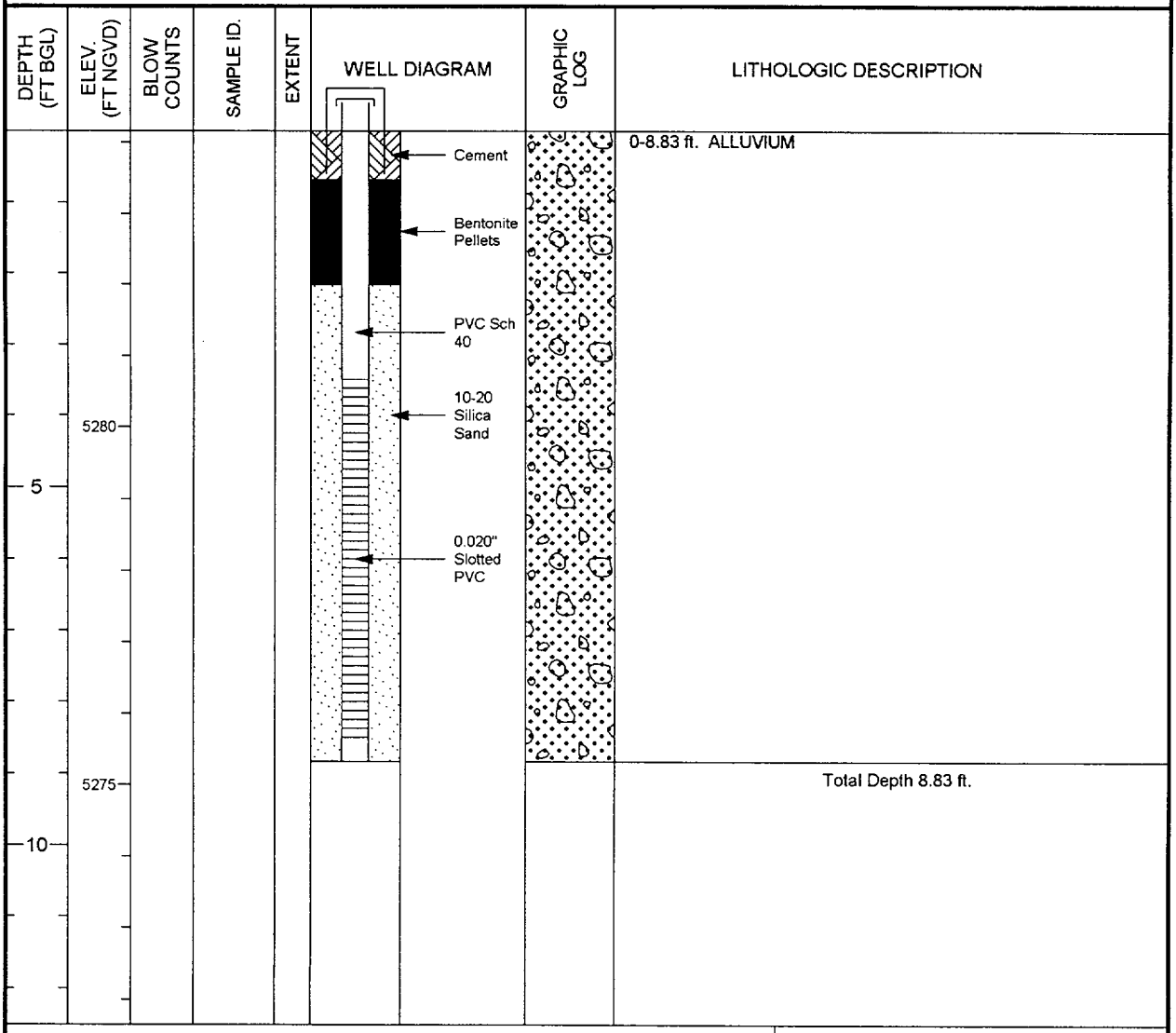


MONITORING WELL COMPLETION LOG NAT01-MAU06

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589667.72	DATE DRILLED	07/01/1999
LOCATION	, CO	EAST COORD. (FT)	1106557.81	SURFACE ELEV. (FT NGVD)	5284.16
SITE	NATURITA	HOLE DEPTH (FT)	8.83	TOP OF CASING (FT)	5286.60
WELL NUMBER	MAU06	WELL DEPTH (FT)	8.83	MEAS. PT. ELEV. (FT)	5286.60
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.44	to	3.5	
WELL SCREEN:	2 in. Slotted PVC	3.5	to	8.5	
SUMP/END CAP:	2 in. PVC Sch 40	8.5	to	8.83	
SURFACE SEAL:	Cement	0.0	to	0.67	
GROUT:					
SEAL:	Bentonite Pellets	0.67	to	2.16	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	2.16	to	8.83	

DRILLING METHOD	HAMMER CASING ADVANCE
SAMPLING METHOD	
DATE DEVELOPED	
WATER LEVEL (FT BGS)	
LOGGED BY	Holmes/Rowland
REMARKS	

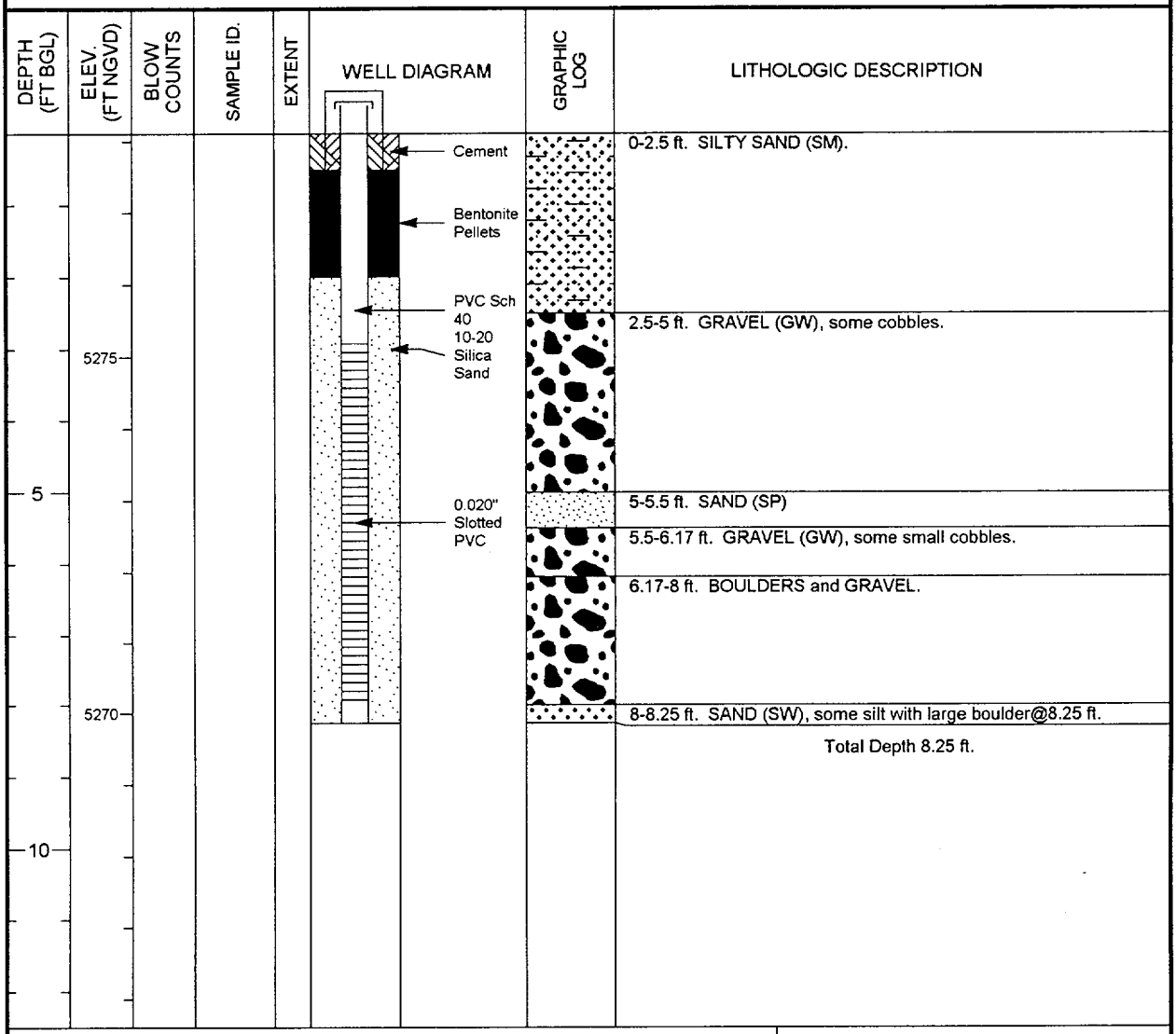


MONITORING WELL COMPLETION LOG NAT01-MAU07

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	590223.12	DATE DRILLED	07/01/1999
LOCATION	, CO	EAST COORD. (FT)	1106502.56	SURFACE ELEV. (FT NGVD)	5278.11
SITE	NATURITA	HOLE DEPTH (FT)	8.25	TOP OF CASING (FT)	5280.88
WELL NUMBER	MAU07	WELL DEPTH (FT)	8.25	MEAS. PT. ELEV. (FT)	5280.88
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	2 in. PVC Sch 40	-2.77	to	2.92
WELL SCREEN:	2 in. Slotted PVC	2.92	to	7.92
SUMP/END CAP:	2 in. PVC Sch 40	7.92	to	8.25
SURFACE SEAL:	Cement	0.0	to	0.5
GROUT:				
SEAL:	Bentonite Pellets	0.5	to	2.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	2.0	to	8.25

DRILLING METHOD	HAMMER CASING ADVANCE
SAMPLING METHOD	
DATE DEVELOPED	
WATER LEVEL (FT BGS)	
LOGGED BY	Holmes/Rowland
REMARKS	

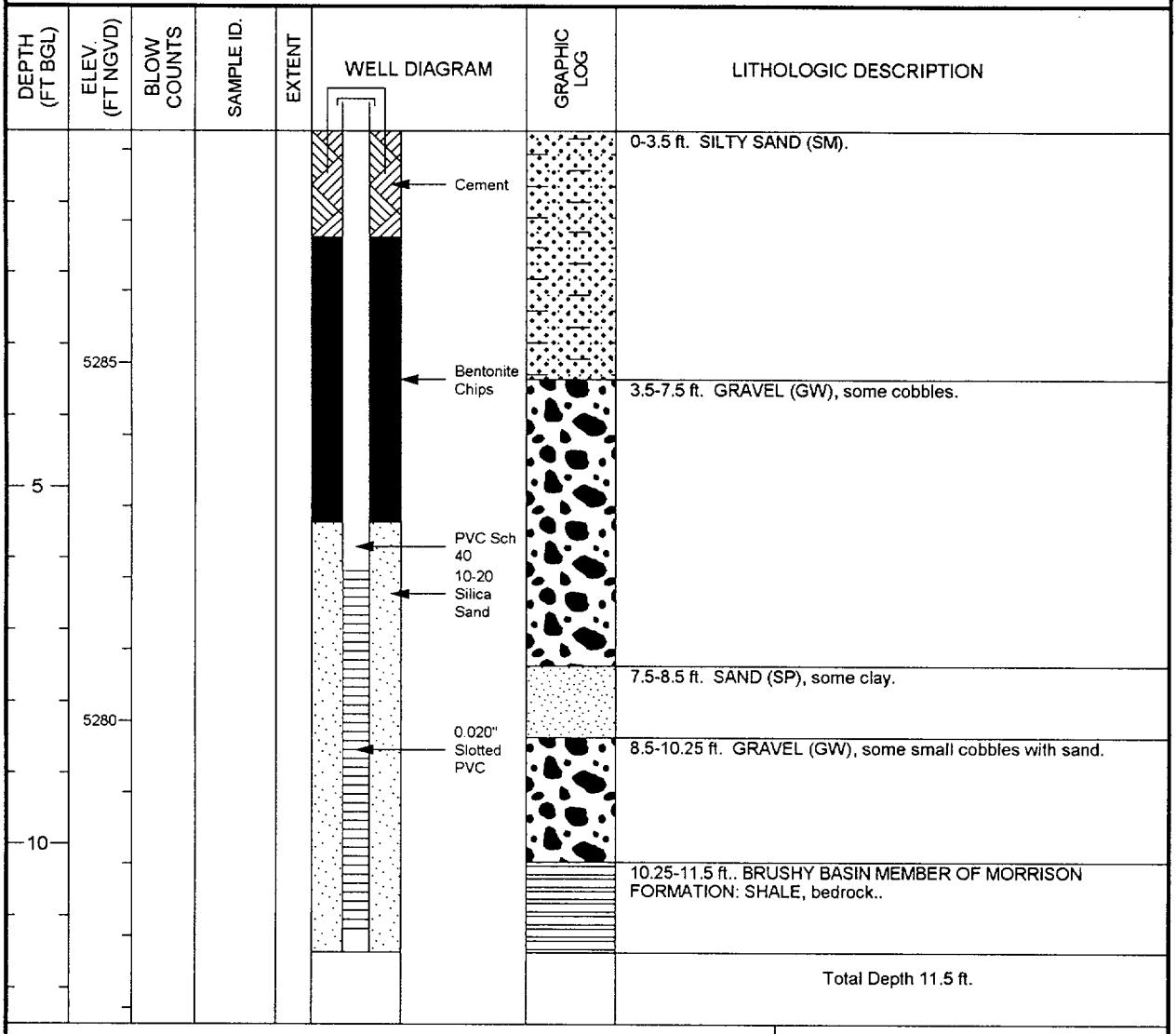


MONITORING WELL COMPLETION LOG NAT01-MAU08

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589388.55	DATE DRILLED	07/01/1999
LOCATION	, CO	EAST COORD. (FT)	1106088.62	SURFACE ELEV. (FT NGVD)	5288.27
SITE	NATURITA	HOLE DEPTH (FT)	11.50	TOP OF CASING (FT)	5291.19
WELL NUMBER	MAU08	WELL DEPTH (FT)	11.50	MEAS. PT. ELEV. (FT)	5291.19
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.92	to	6.17	
WELL SCREEN:	2 in. Slotted PVC	6.17	to	11.17	
SUMP/END CAP:	2 in. PVC Sch 40	11.17	to	11.5	
SURFACE SEAL:	Cement	0.0	to	1.5	
GROUT:					
SEAL:	Bentonite Chips	1.5	to	5.5	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	5.5	to	11.5	

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS



MONITORING WELL COMPLETION LOG NAT01-NAT01-1

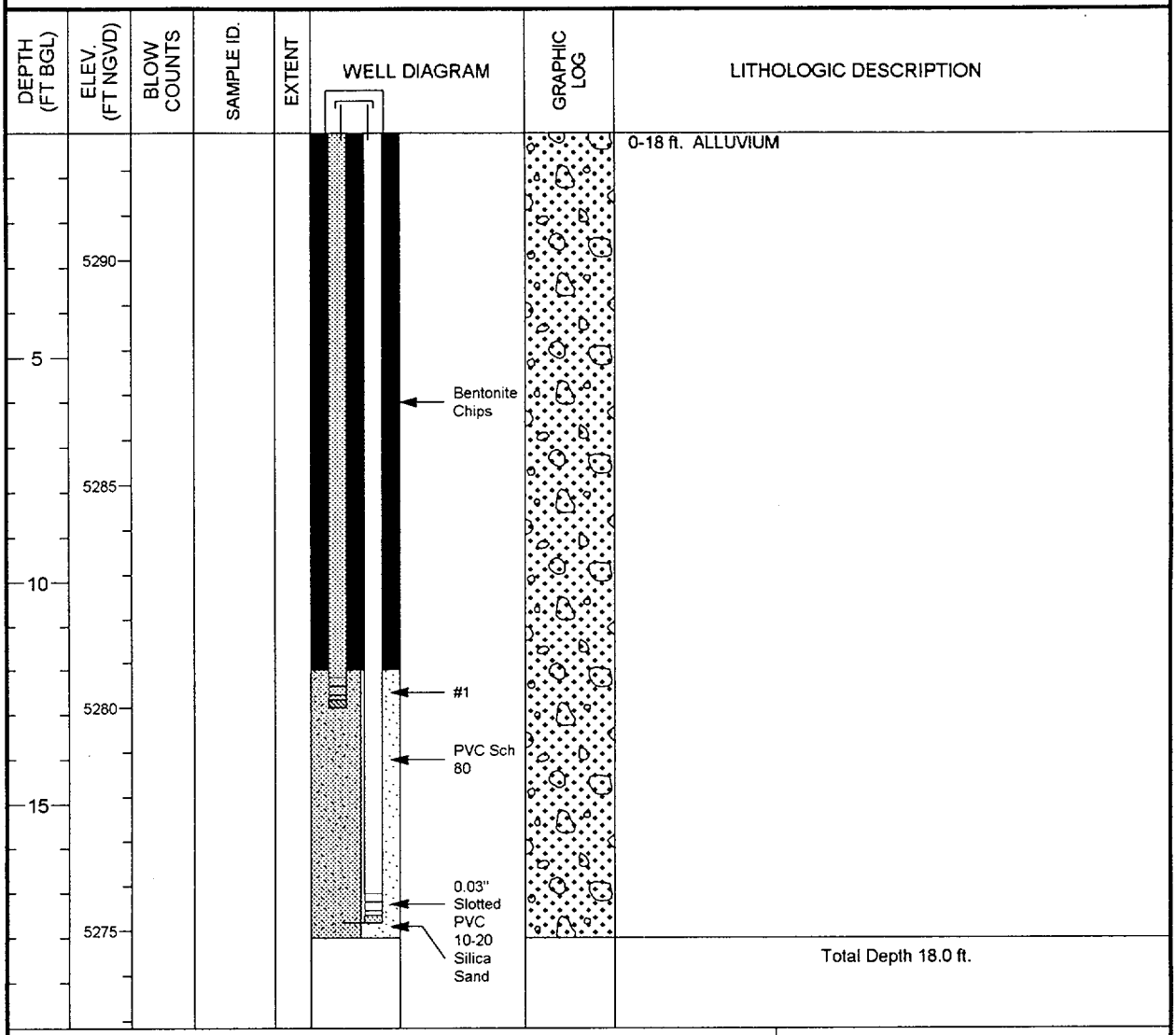
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT01-1

NORTH COORD. (FT) 588672.47
EAST COORD. (FT) 1106284.10
HOLE DEPTH (FT) 18.00
WELL DEPTH (FT) 17.67

DATE DRILLED 10/15/1998
SURFACE ELEV. (FT NGVD) 5292.84
TOP OF CASING (FT) 5295.46
MEAS. PT. ELEV. (FT) 5295.46
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 14.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.62	to	17.0
WELL SCREEN:	0.5 in. Slotted PVC	17.0	to	17.5
SUMP/END CAP:	0.5 in. PVC Sch 80	17.5	to	17.67
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	12.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	12.0	to	18.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 2 casings: NAT01-1 casing and screen depths provided; NAT01-2 casing is from 0 to 12.16 and screened to 12.66 ft.

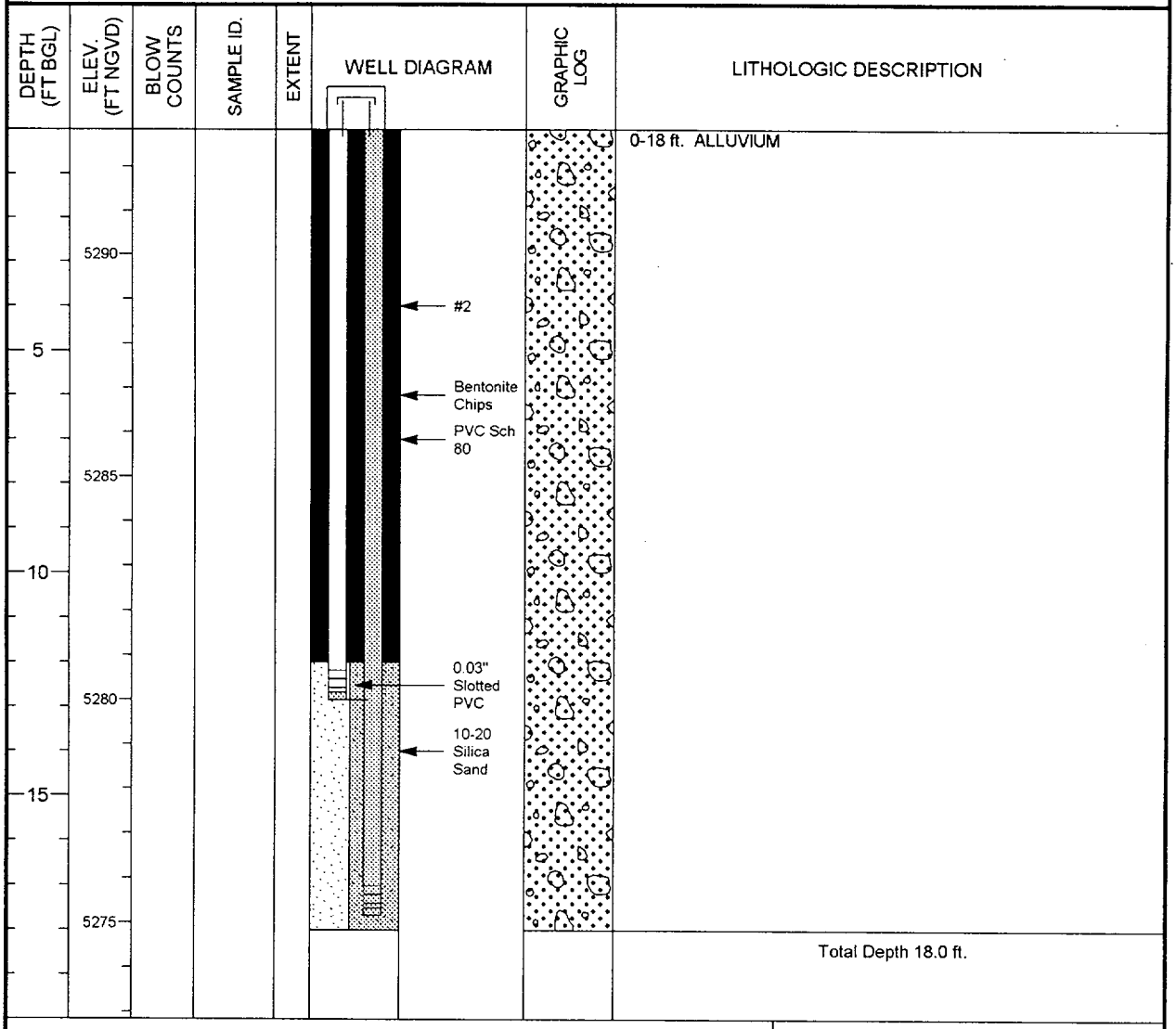


MONITORING WELL COMPLETION LOG NAT01-NAT01-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588672.47	DATE DRILLED	10/15/1998
LOCATION	, CO	EAST COORD. (FT)	1106284.10	SURFACE ELEV. (FT NGVD)	5292.84
SITE	NATURITA	HOLE DEPTH (FT)	18.00	TOP OF CASING (FT)	5295.29
WELL NUMBER	NAT01-2	WELL DEPTH (FT)	12.66	MEAS. PT. ELEV. (FT)	5295.29
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	14.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.45	to	12.16
WELL SCREEN:	0.5 in. Slotted PVC	12.16	to	12.66
SUMP/END CAP:	0.5 in. PVC Sch 80	12.66	to	12.83
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	12.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	12.0	to	18.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 2 casings: NAT01-2 casing and screen depths provided; NAT01-1 casing is from 0 to 17 and screened to 17.5 ft.

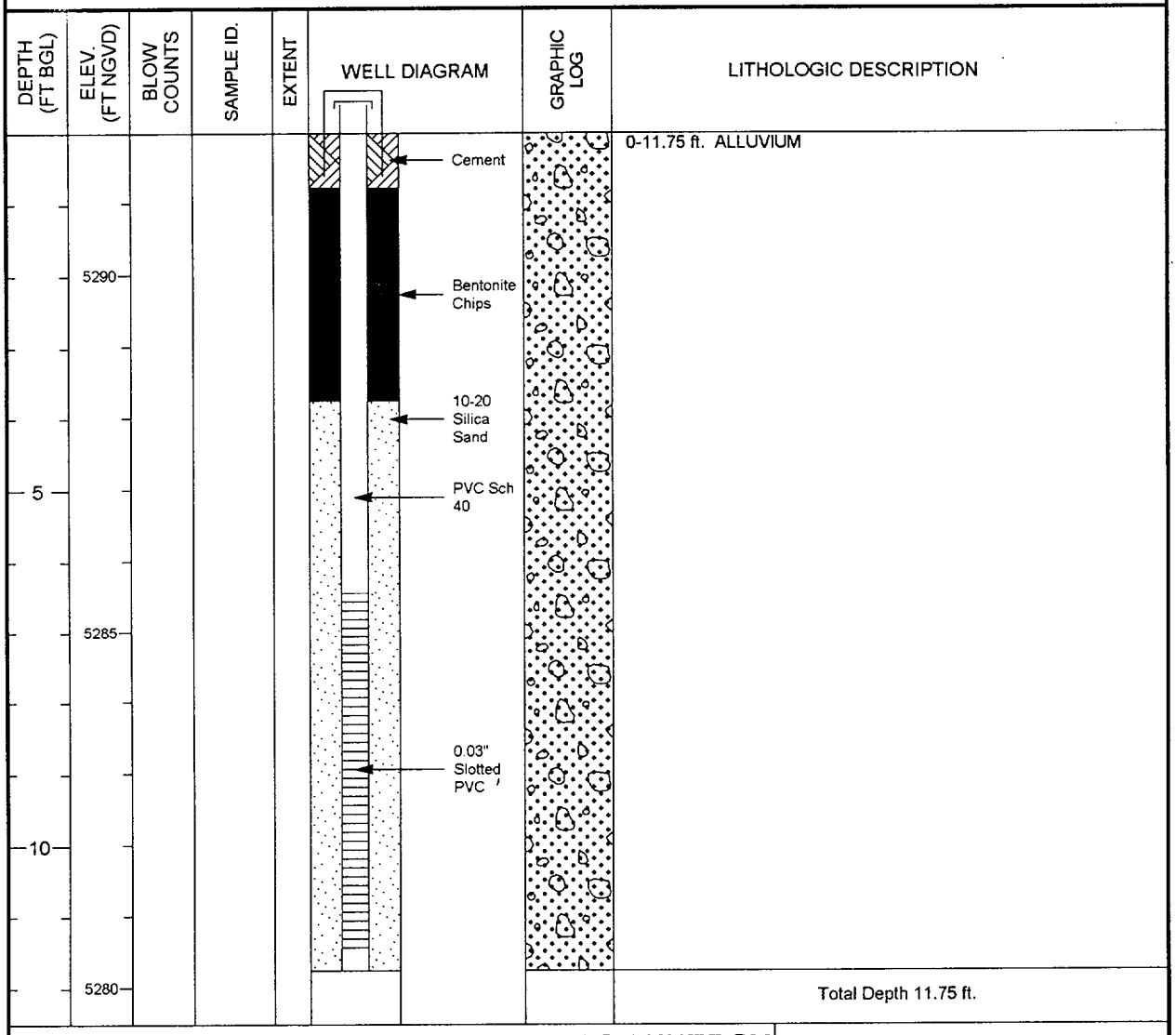


MONITORING WELL COMPLETION LOG NAT01-NAT02

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588084.64	DATE DRILLED	10/16/1998
LOCATION	, CO	EAST COORD. (FT)	1106827.76	SURFACE ELEV. (FT NGVD)	5291.98
SITE	NATURITA	HOLE DEPTH (FT)	11.75	TOP OF CASING (FT)	5294.09
WELL NUMBER	NAT02	WELL DEPTH (FT)	11.75	MEAS. PT. ELEV. (FT)	5294.09
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

	WELL INSTALLATION	INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.11	to	6.42	
WELL SCREEN:	2 in. Slotted PVC	6.42	to	11.42	
SUMP/END CAP:	2 in. PVC Sch 40	11.42	to	11.75	
SURFACE SEAL:	Cement	0.0	to	0.75	
GROUT:					
SEAL:	Bentonite Chips	0.75	to	3.75	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	3.75	to	11.75	

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS

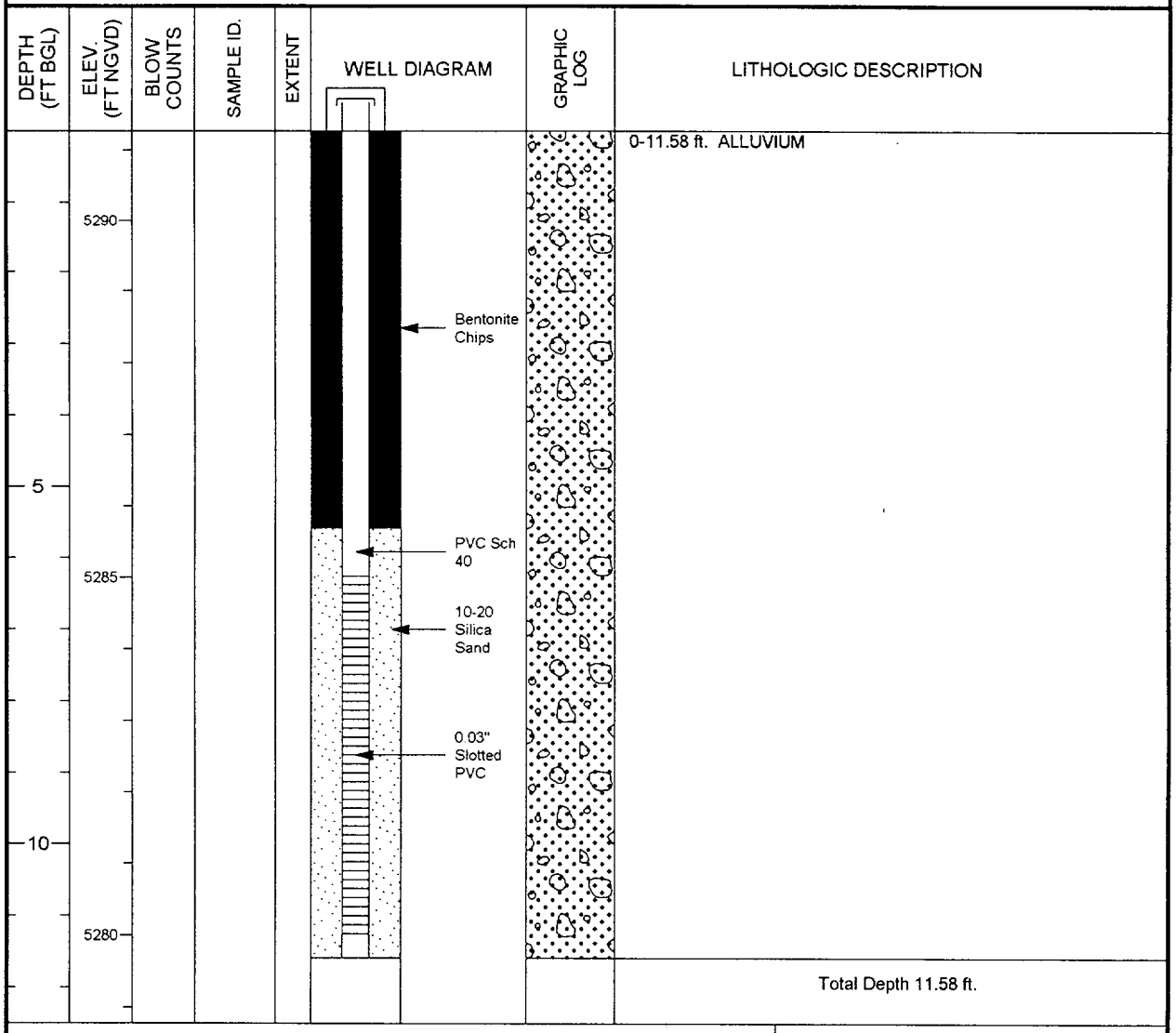


MONITORING WELL COMPLETION LOG NAT01-NAT03

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588292.94	DATE DRILLED	10/17/1998
LOCATION	, CO	EAST COORD. (FT)	1106419.18	SURFACE ELEV. (FT NGVD)	5291.27
SITE	NATURITA	HOLE DEPTH (FT)	11.58	TOP OF CASING (FT)	5293.05
WELL NUMBER	NAT03	WELL DEPTH (FT)	11.58	MEAS. PT. ELEV. (FT)	5293.05
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-1.78	to	6.25	
WELL SCREEN:	2 in. Slotted PVC	6.25	to	11.25	
SUMP/END CAP:	2 in. PVC Sch 40	11.25	to	11.58	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.0	to	5.58	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	5.58	to	11.58	

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS



MONITORING WELL COMPLETION LOG NAT01-NAT04-1

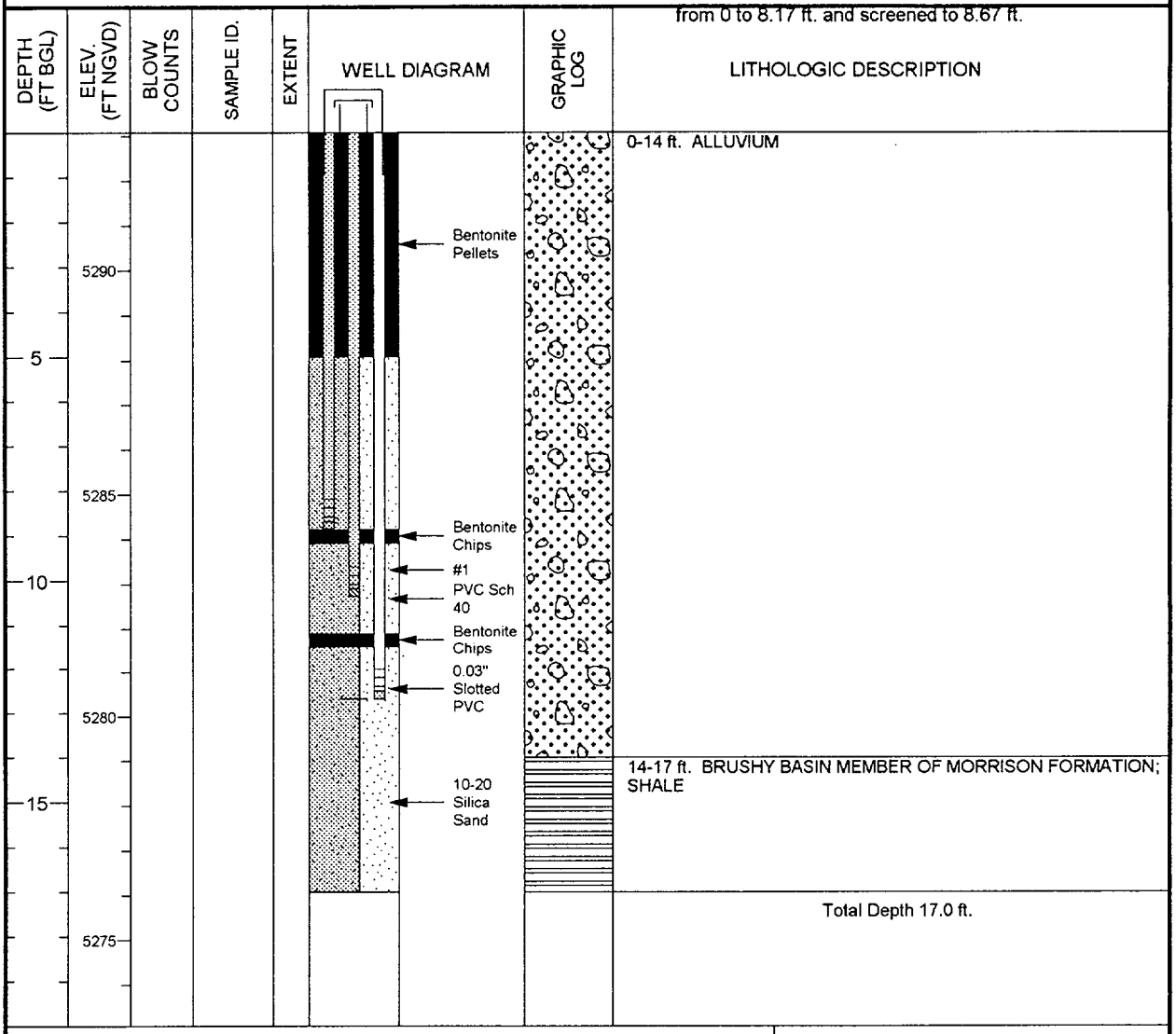
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT04-1

NORTH COORD. (FT) 587979.79
EAST COORD. (FT) 1106710.73
HOLE DEPTH (FT) 17.00
WELL DEPTH (FT) 12.67

DATE DRILLED 10/17/1998
SURFACE ELEV. (FT NGVD) 5293.08
TOP OF CASING (FT) 5295.24
MEAS. PT. ELEV. (FT) 5295.24
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 9.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 40	-2.16	to	12.0
WELL SCREEN:	0.5 in. Slotted PVC	12.0	to	12.5
SUMP/END CAP:	0.5 in. PVC Sch 40	12.5	to	12.67
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Pellets	11.16	to	11.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	11.5	to	17.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT04-1 casing and screen depths provided; NAT04-2 casing is from 0 to 9.67 ft. and screened to 10.17 ft.; NAT04-3 casing is from 0 to 8.17 ft. and screened to 8.67 ft.

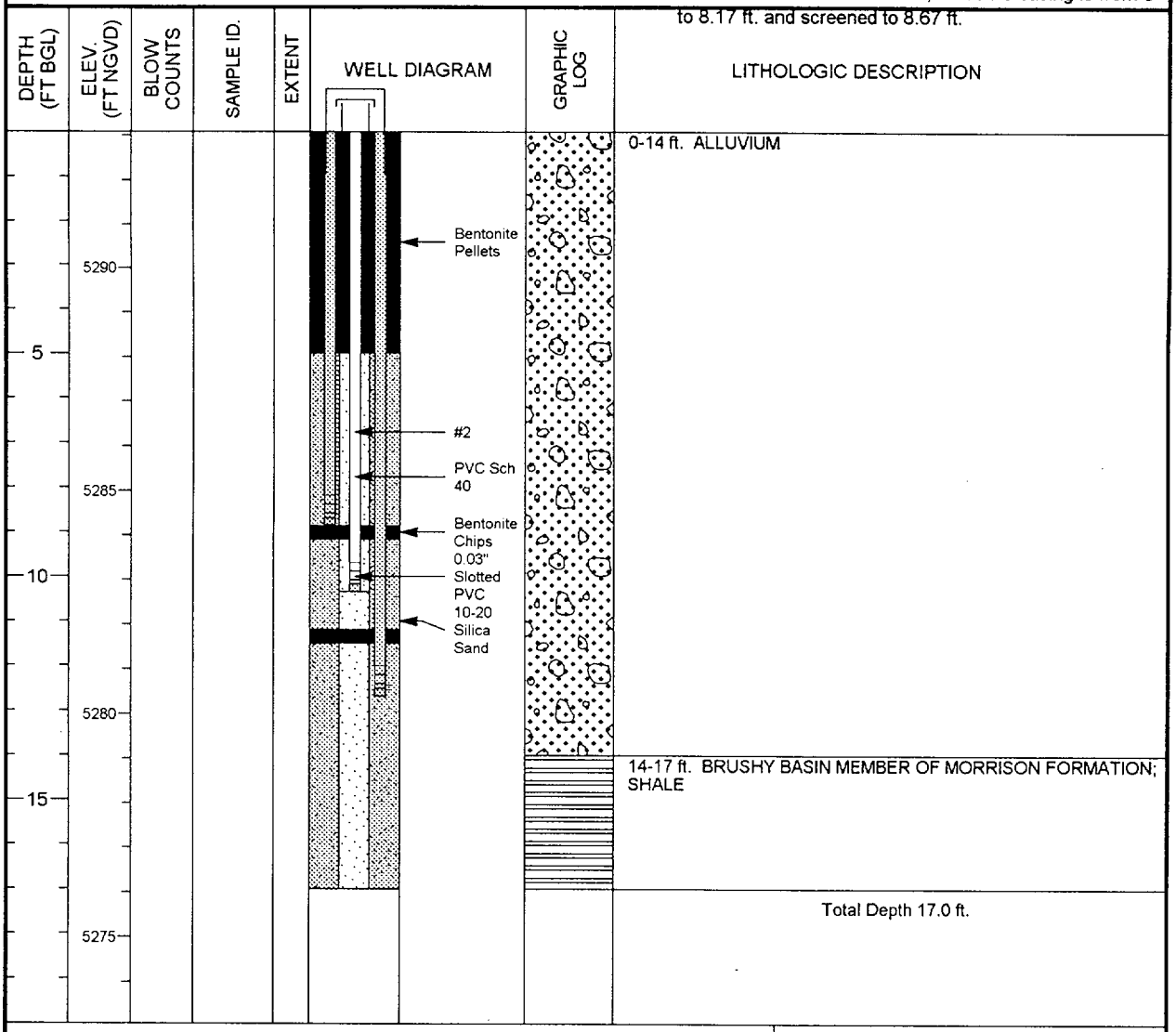


MONITORING WELL COMPLETION LOG NAT01-NAT04-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587979.79	DATE DRILLED	10/17/1998
LOCATION	, CO	EAST COORD. (FT)	1106710.73	SURFACE ELEV. (FT NGVD)	5293.08
SITE	NATURITA	HOLE DEPTH (FT)	17.00	TOP OF CASING (FT)	5295.28
WELL NUMBER	NAT04-2	WELL DEPTH (FT)	10.34	MEAS. PT. ELEV. (FT)	5295.28
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 40	-2.2	to	9.67
WELL SCREEN:	0.5 in. Slotted PVC	9.67	to	10.17
SUMP/END CAP:	0.5 in. PVC Sch 40	10.17	to	10.34
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	9.16	to	8.83
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	8.83	to	17.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT04-2 casing and screen depths provided; NAT04-1 casing is from 0 to 12 ft. and screened to 12.5 ft.; NAT04-3 casing is from 0 to 8.17 ft. and screened to 8.67 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT04-3

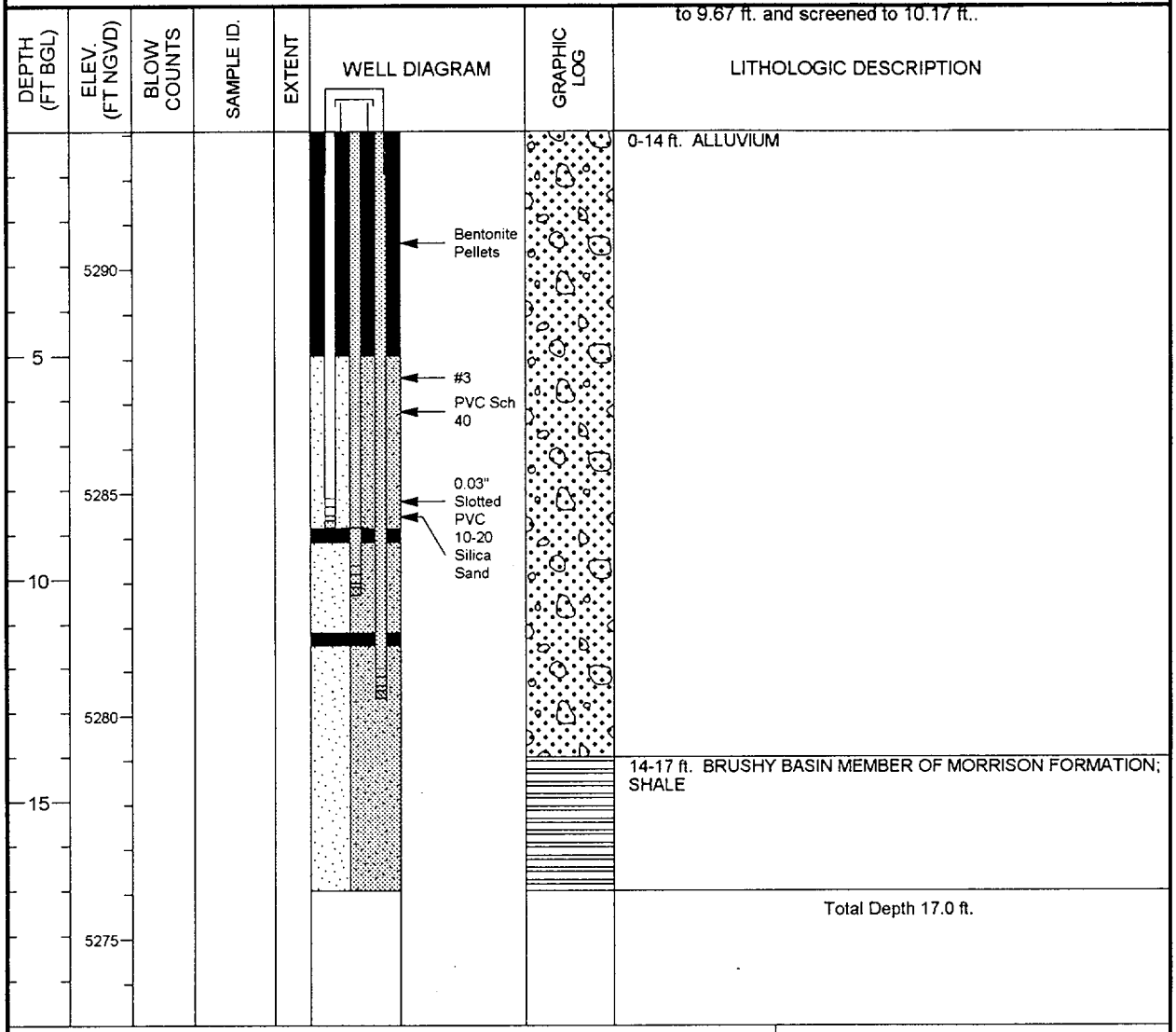
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT04-3

NORTH COORD. (FT) 587979.79
EAST COORD. (FT) 1106710.73
HOLE DEPTH (FT) 17.00
WELL DEPTH (FT) 8.84

DATE DRILLED 10/17/1998
SURFACE ELEV. (FT NGVD) 5293.08
TOP OF CASING (FT) 5295.28
MEAS. PT. ELEV. (FT) 5295.28
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 40	-2.2	to	8.17
WELL SCREEN:	0.5 in. Slotted PVC	8.17	to	8.67
SUMP/END CAP:	0.5 in. PVC Sch 40	8.67	to	8.84
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	17.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT04-3 casing and screen depths provided; NAT04-1 casing is from 0 to 12 ft. and screened to 12.5 ft; NAT04-2 casing is from 0 to 9.67 ft. and screened to 10.17 ft..



MONITORING WELL COMPLETION LOG NAT01-NAT05

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588299.51	DATE DRILLED	10/17/1998
LOCATION	, CO	EAST COORD. (FT)	1106235.48	SURFACE ELEV. (FT NGVD)	5292.33
SITE	NATURITA	HOLE DEPTH (FT)	14.00	TOP OF CASING (FT)	5294.42
WELL NUMBER	NAT05	WELL DEPTH (FT)	14.00	MEAS. PT. ELEV. (FT)	5294.42
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

	WELL INSTALLATION	INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.09	to	8.67	
WELL SCREEN:	2 in. Slotted PVC	8.67	to	13.67	
SUMP/END CAP:	2 in. PVC Sch 40	13.67	to	14.0	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.0	to	5.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	5.0	to	14.0	

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE ID.	EXTENT	WELL DIAGRAM	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
							0-14 ft. ALLUVIUM
	5290				Bentonite Chips		
5							
	5285				PVC Sch 40		
					10-20 Silica Sand		
10							
					0.03" Slotted PVC		
	5280						
							Total Depth 14.2 ft.

MONITORING WELL COMPLETION LOG NAT01-NAT06-1

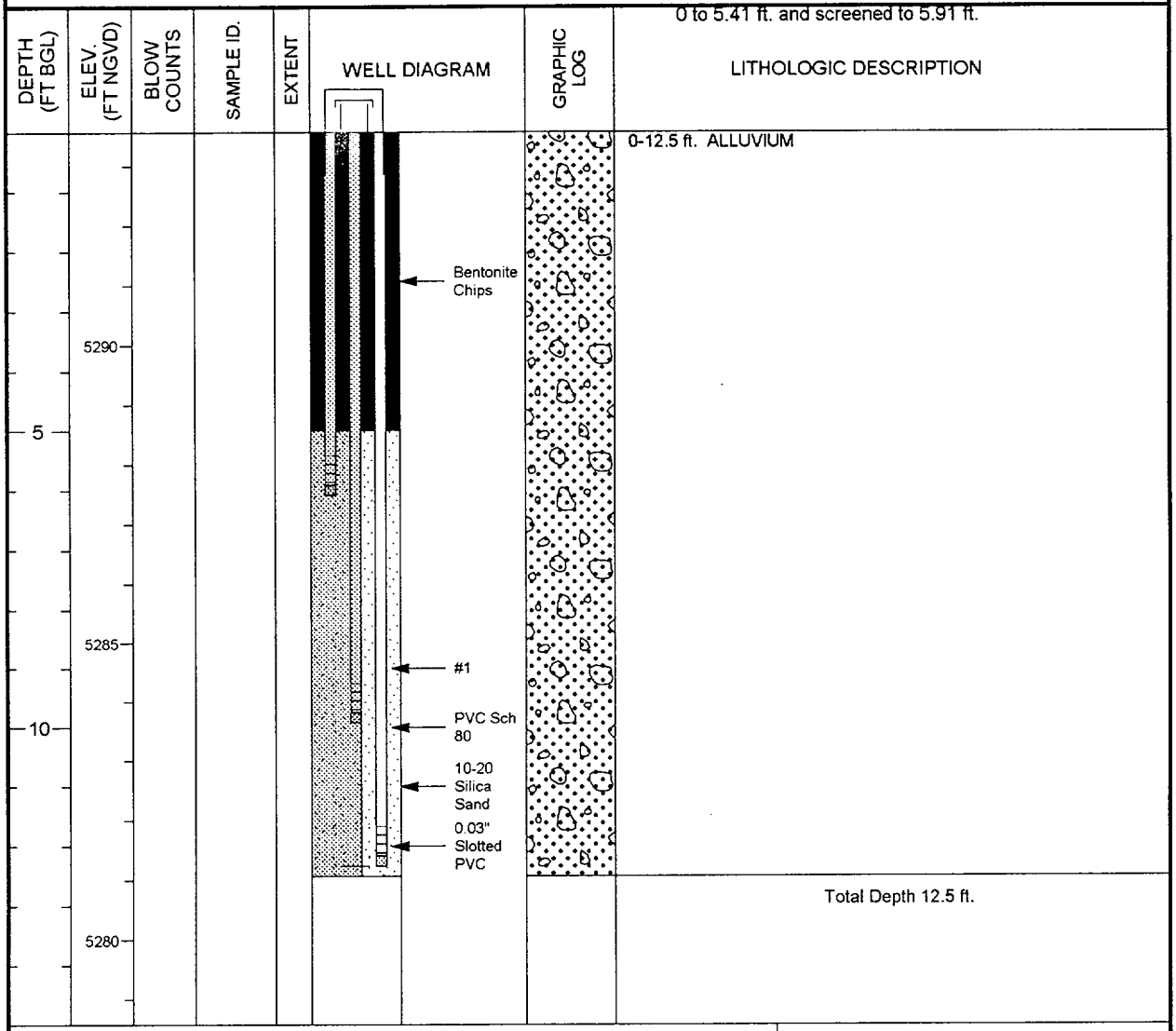
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT06-1

NORTH COORD. (FT) 587901.18
EAST COORD. (FT) 1106621.36
HOLE DEPTH (FT) 12.50
WELL DEPTH (FT) 12.33

DATE DRILLED 10/19/1998
SURFACE ELEV. (FT NGVD) 5293.57
TOP OF CASING (FT) 5296.41
MEAS. PT. ELEV. (FT) 5296.41
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.84	to	11.66
WELL SCREEN:	0.5 in. Slotted PVC	11.66	to	12.16
SUMP/END CAP:	0.5 in. PVC Sch 80	12.16	to	12.33
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	12.5

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT06-1 casing and screen depths provided; NAT06-2 casing is from 0 to 9.25 ft. and screened to 9.75 ft.; NAT06-3 casing is from 0 to 5.41 ft. and screened to 5.91 ft.



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MONITORING WELL COMPLETION LOG NAT01-NAT06-2

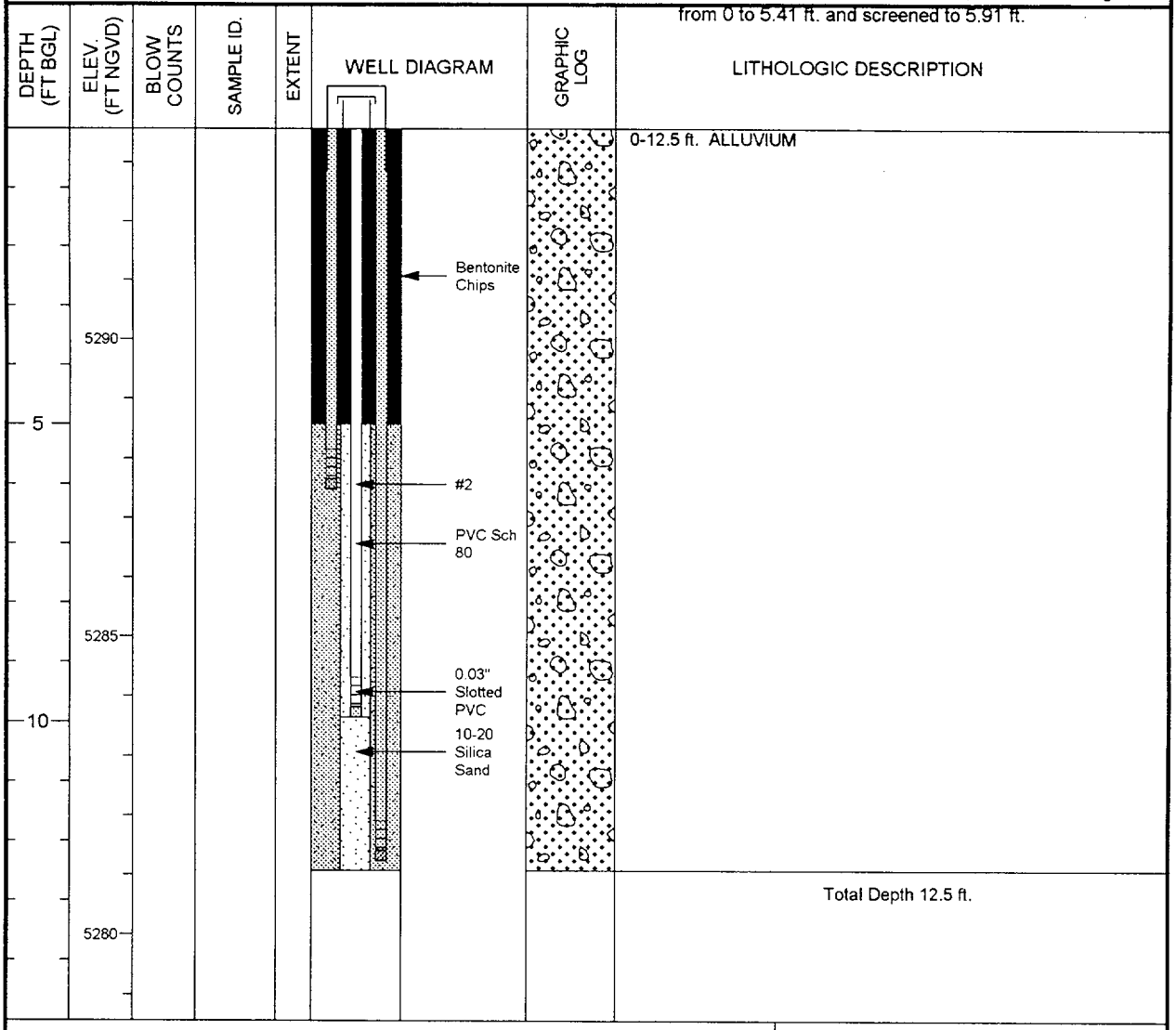
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT06-2

NORTH COORD. (FT) 587901.18
EAST COORD. (FT) 1106621.36
HOLE DEPTH (FT) 12.50
WELL DEPTH (FT) 9.92

DATE DRILLED 10/19/1998
SURFACE ELEV. (FT NGVD) 5293.57
TOP OF CASING (FT) 5296.41
MEAS. PT. ELEV. (FT) 5296.41
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.84	to	9.25
WELL SCREEN:	0.5 in. Slotted PVC	9.25	to	9.75
SUMP/END CAP:	0.5 in. PVC Sch 80	9.75	to	9.92
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	12.5

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT06-2 casing and screen depths provided; NAT06-1 casing is from 0 to 11.66 ft. and screened to 12.16 ft.; NAT06-3 casing is from 0 to 5.41 ft. and screened to 5.91 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT06-3

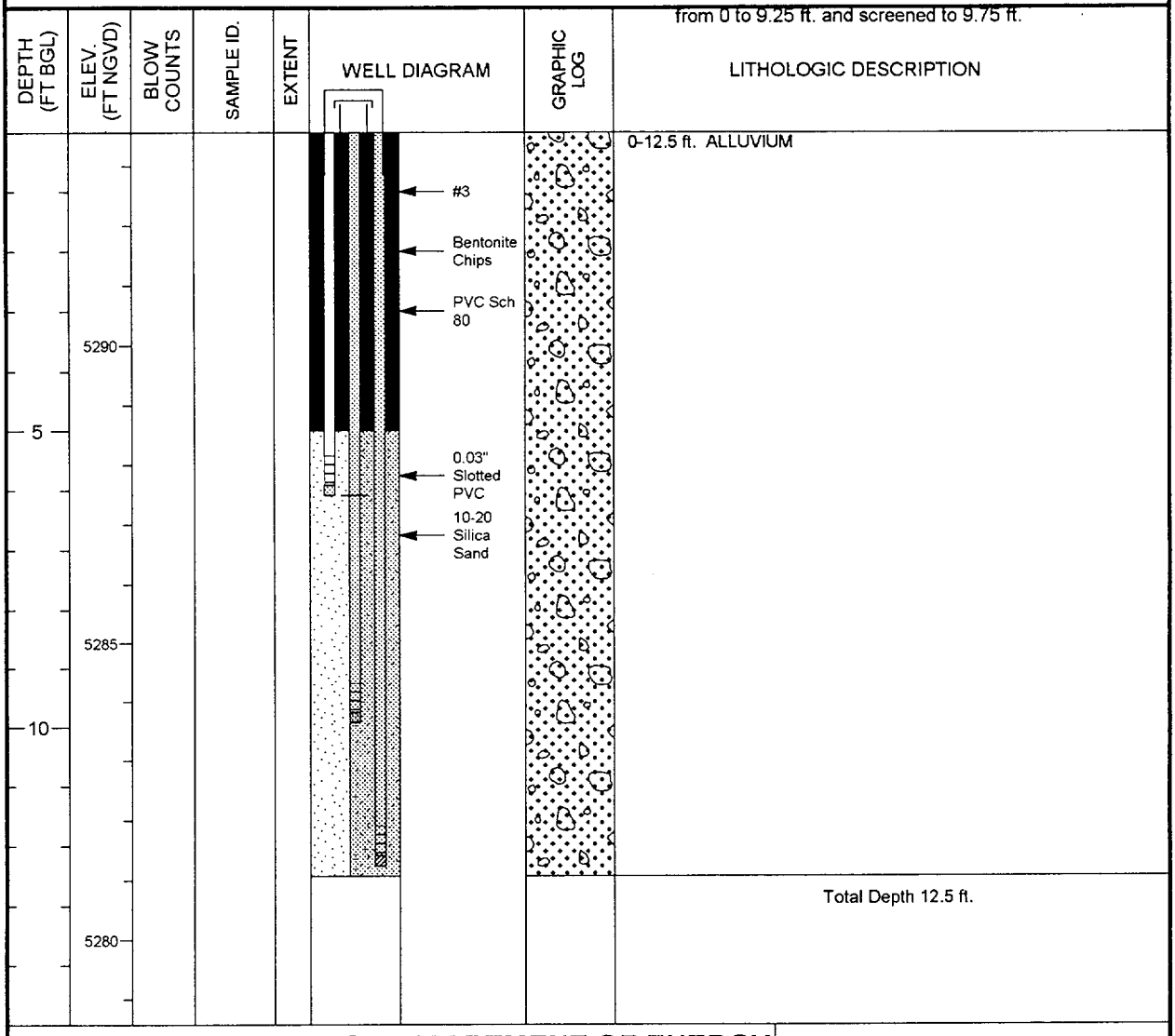
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT06-3

NORTH COORD. (FT) 587901.18
EAST COORD. (FT) 1106621.36
HOLE DEPTH (FT) 12.50
WELL DEPTH (FT) 6.08

DATE DRILLED 10/19/1998
SURFACE ELEV. (FT NGVD) 5293.57
TOP OF CASING (FT) 5296.41
MEAS. PT. ELEV. (FT) 5296.41
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.84	to	5.41
WELL SCREEN:	0.5 in. Slotted PVC	5.41	to	5.91
SUMP/END CAP:	0.5 in. PVC Sch 80	5.91	to	6.08
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	12.5

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT06-3 casing and screen depths provided; NAT06-1 casing is from 0 to 11.66 ft. and screened to 12.16 ft.; NAT06-2 casing is from 0 to 9.25 ft. and screened to 9.75 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT07-1

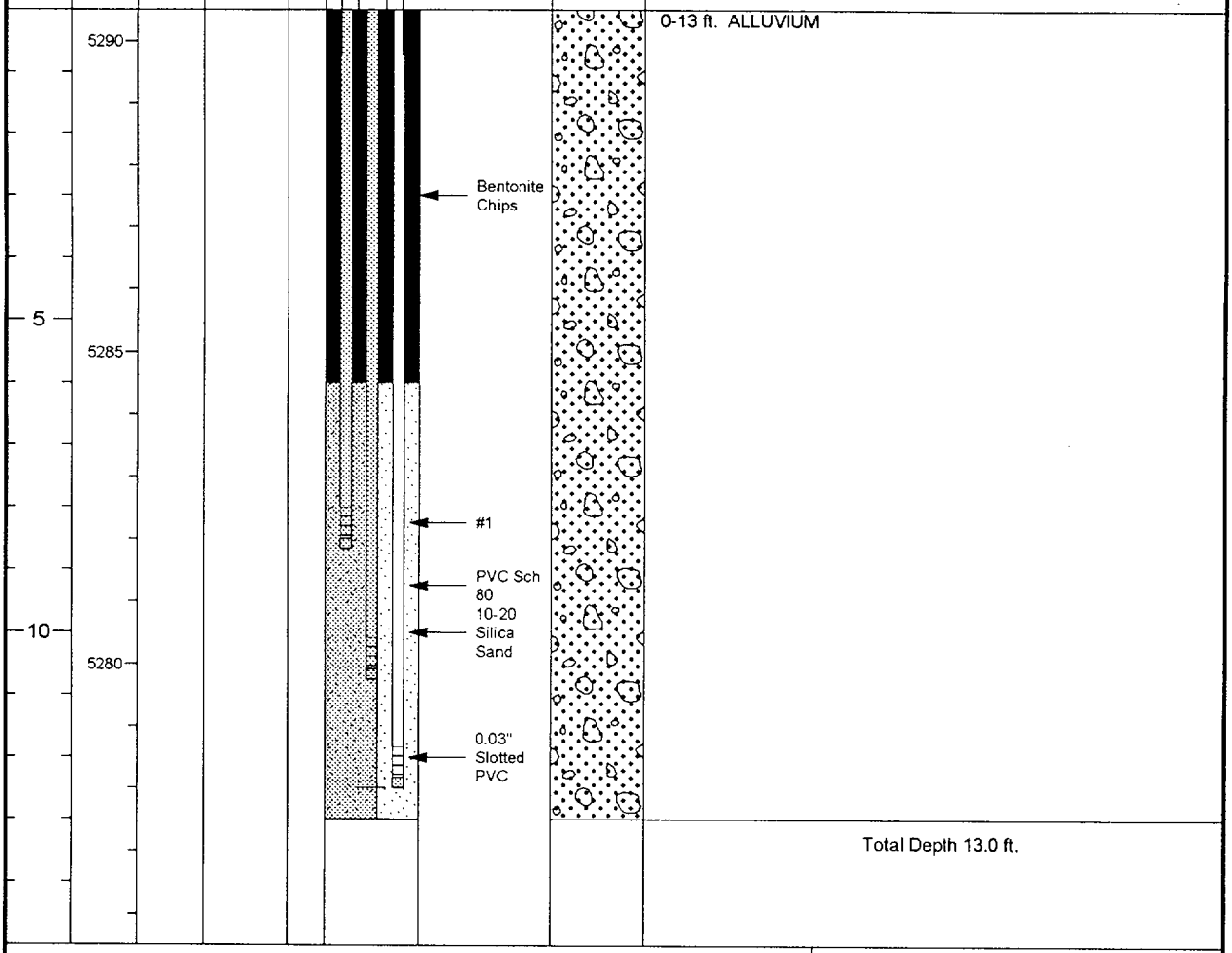
PROJECT UMTRA GROUND WATER
LOCATION CO
SITE NATURITA
WELL NUMBER NAT07-1

NORTH COORD. (FT) 588381.47
EAST COORD. (FT) 1106551.24
HOLE DEPTH (FT) 13.00
WELL DEPTH (FT) 12.50

DATE DRILLED 10/19/1998
SURFACE ELEV. (FT NGVD) 5290.51
TOP OF CASING (FT) 5292.64
MEAS. PT. ELEV. (FT) 5292.64
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.13	to	11.83
WELL SCREEN:	0.5 in. Slotted PVC	11.83	to	12.33
SUMP/END CAP:	0.5 in. PVC Sch 80	12.33	to	12.5
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	6.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	6.0	to	13.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT07-1 casing and screen depths provided; NAT07-2 casing is from 0 to 10.08 ft. and screened to 10.58 ft.; NAT07-3 casing is from 0 to 8.00 ft. and screened to 8.50 ft.



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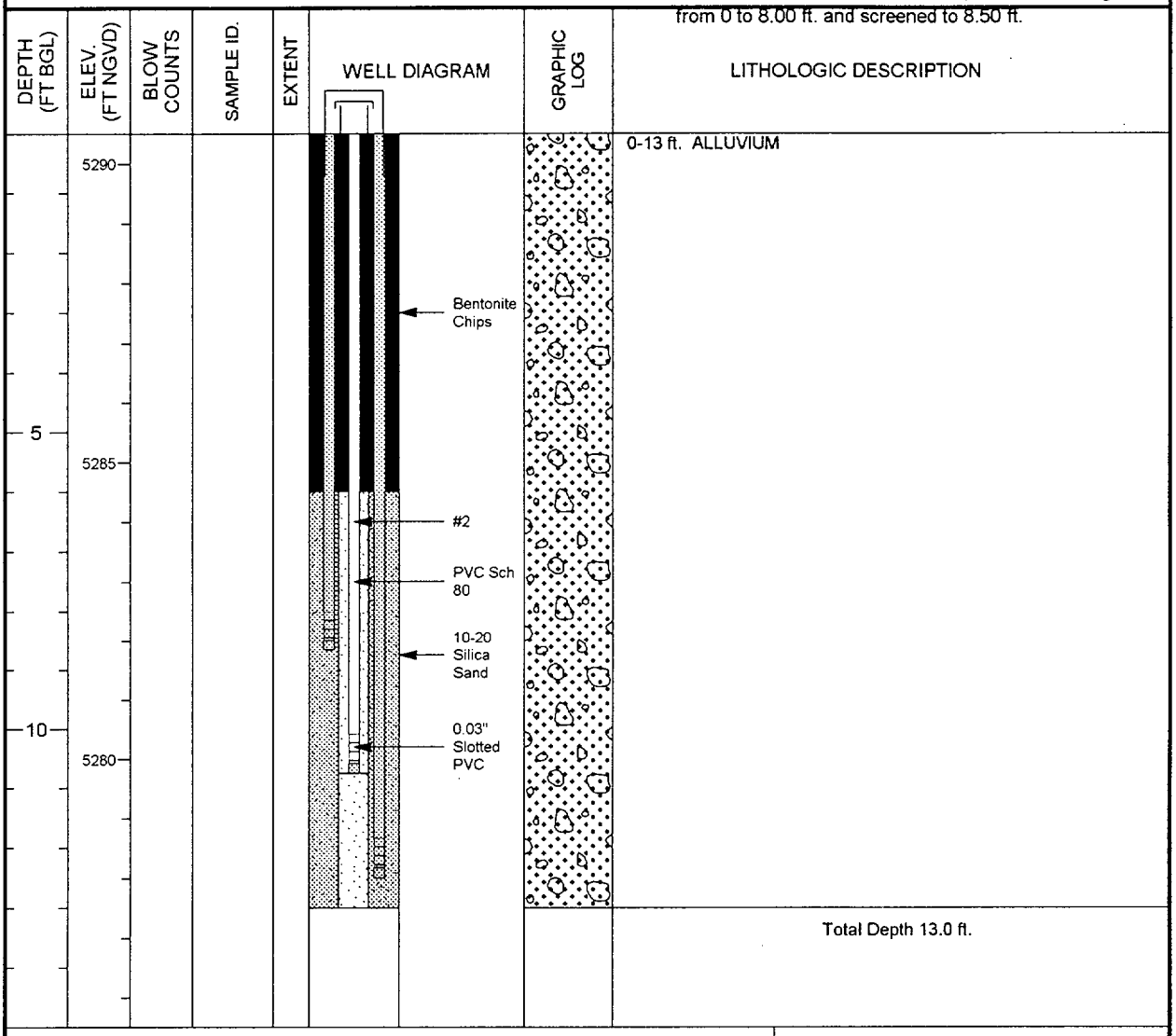
MONITORING WELL COMPLETION LOG NAT01-NAT07-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588381.47	DATE DRILLED	10/19/1998
LOCATION	, CO	EAST COORD. (FT)	1106551.24	SURFACE ELEV. (FT NGVD)	5290.51
SITE	NATURITA	HOLE DEPTH (FT)	13.00	TOP OF CASING (FT)	5292.53
WELL NUMBER	NAT07-2	WELL DEPTH (FT)	10.75	MEAS. PT. ELEV. (FT)	5292.53
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.02	to	10.08
WELL SCREEN:	0.5 in. Slotted PVC	10.08	to	10.58
SUMP/END CAP:	0.5 in. PVC Sch 80	10.58	to	10.75
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	6.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	6.0	to	13.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT07-2 casing and screen depths provided; NAT07-1 casing is from 0 to 11.83 ft. and screened to 12.33 ft.; NAT07-3 casing is from 0 to 8.00 ft. and screened to 8.50 ft.

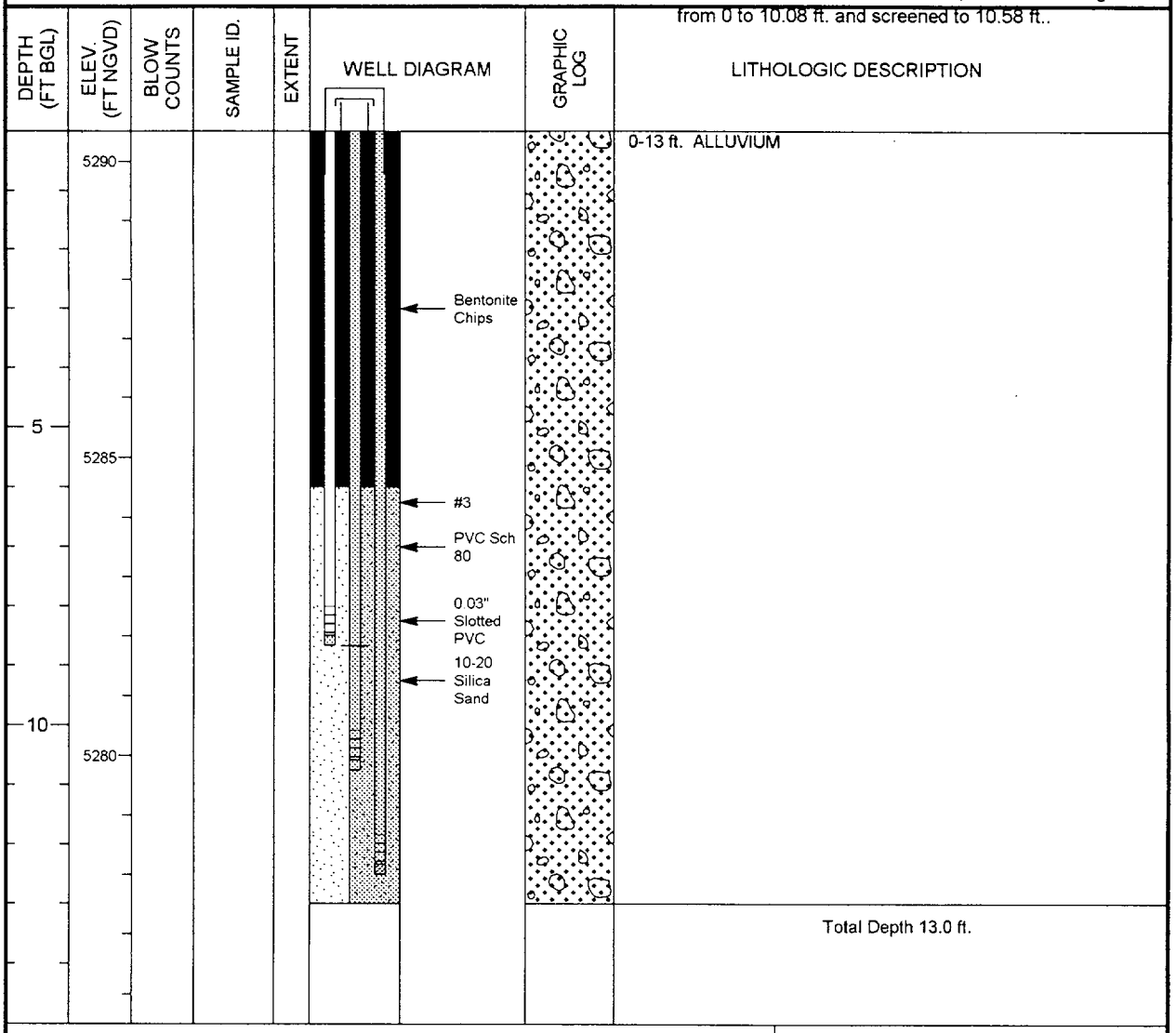


MONITORING WELL COMPLETION LOG NAT01-NAT07-3

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588381.47	DATE DRILLED	10/19/1998
LOCATION	, CO	EAST COORD. (FT)	1106551.24	SURFACE ELEV. (FT NGVD)	5290.51
SITE	NATURITA	HOLE DEPTH (FT)	13.00	TOP OF CASING (FT)	5292.34
WELL NUMBER	NAT07-3	WELL DEPTH (FT)	8.67	MEAS. PT. ELEV. (FT)	5292.34
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-1.83	to	8.0
WELL SCREEN:	0.5 in. Slotted PVC	8.0	to	8.5
SUMP/END CAP:	0.5 in. PVC Sch 80	8.5	to	8.67
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	6.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	6.0	to	13.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 3 casings: NAT07-3 casing and screen depths provided; NAT07-1 casing is from 0 to 11.83 ft. and screened to 12.33 ft; NAT07-2 casing is from 0 to 10.08 ft. and screened to 10.58 ft..



MONITORING WELL COMPLETION LOG NAT01-NAT08

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588288.72	DATE DRILLED	10/20/1998
LOCATION	, CO	EAST COORD. (FT)	1106422.26	SURFACE ELEV. (FT NGVD)	5291.13
SITE	NATURITA	HOLE DEPTH (FT)	12.00	TOP OF CASING (FT)	5292.73
WELL NUMBER	NAT08	WELL DEPTH (FT)	11.67	MEAS. PT. ELEV. (FT)	5292.73
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	12.0

	WELL INSTALLATION	INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	4 in. PVC Sch 40	-1.6	to	6.3	
WELL SCREEN:	4 in. Slotted PVC	6.3	to	11.3	
SUMP/END CAP:	4 in. PVC Sch 40	11.3	to	11.67	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.0	to	3.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	3.0	to	12.0	

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS

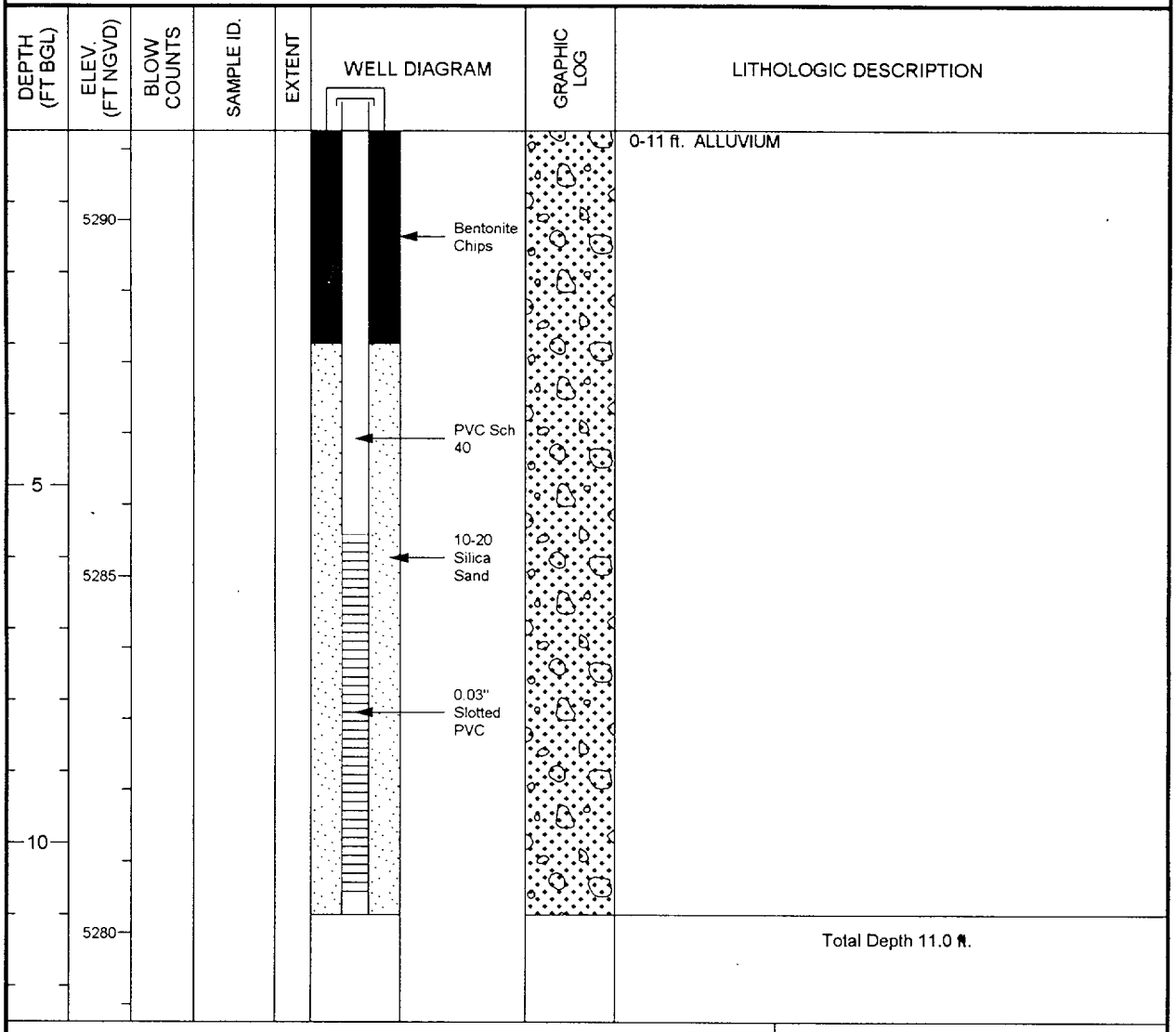
DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE ID.	EXTENT	WELL DIAGRAM	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
	5290				Bentonite Chips		0-12 ft. ALLUVIUM
5	5285				PVC Sch 40; 10-20 Silica Sand; 0.03" Slotted PVC		
10	5280						
							Total Depth 12.0 ft.

MONITORING WELL COMPLETION LOG NAT01-NAT09

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588296.86	DATE DRILLED	10/20/1998
LOCATION	, CO	EAST COORD. (FT)	1106415.59	SURFACE ELEV. (FT NGVD)	5291.26
SITE	NATURITA	HOLE DEPTH (FT)	11.00	TOP OF CASING (FT)	5293.11
WELL NUMBER	NAT09	WELL DEPTH (FT)	11.00	MEAS. PT. ELEV. (FT)	5293.11
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-1.85	to	5.67	
WELL SCREEN:	2 in. Slotted PVC	5.67	to	10.67	
SUMP/END CAP:	2 in. PVC Sch 40	10.67	to	11.0	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.0	to	3.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	3.0	to	11.0	

DRILLING METHOD	AUGER
SAMPLING METHOD	
DATE DEVELOPED	
WATER LEVEL (FT BGS)	
LOGGED BY	Holmes
REMARKS	



MONITORING WELL COMPLETION LOG NAT01-NAT10

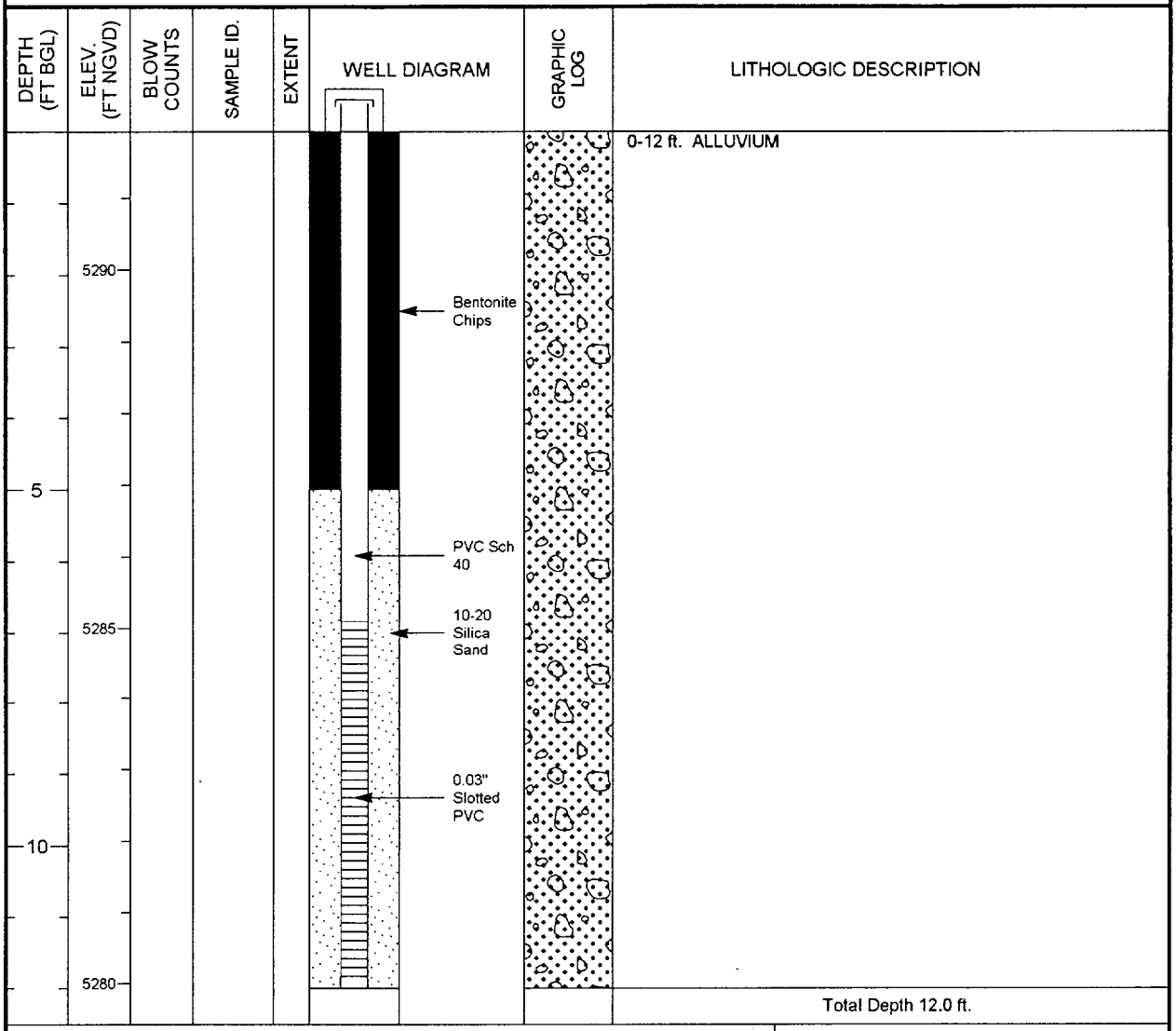
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT10

NORTH COORD. (FT) 588109.13
EAST COORD. (FT) 1106419.25
HOLE DEPTH (FT) 12.00
WELL DEPTH (FT) 12.00

DATE DRILLED 10/20/1998
SURFACE ELEV. (FT NGVD) 5291.93
TOP OF CASING (FT) 5294.21
MEAS. PT. ELEV. (FT) 5294.21
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	2 in. PVC Sch 40	-2.28	to	6.83
WELL SCREEN:	2 in. Slotted PVC	6.83	to	11.83
SUMP/END CAP:	2 in. PVC Sch 40	11.83	to	12.0
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	12.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS

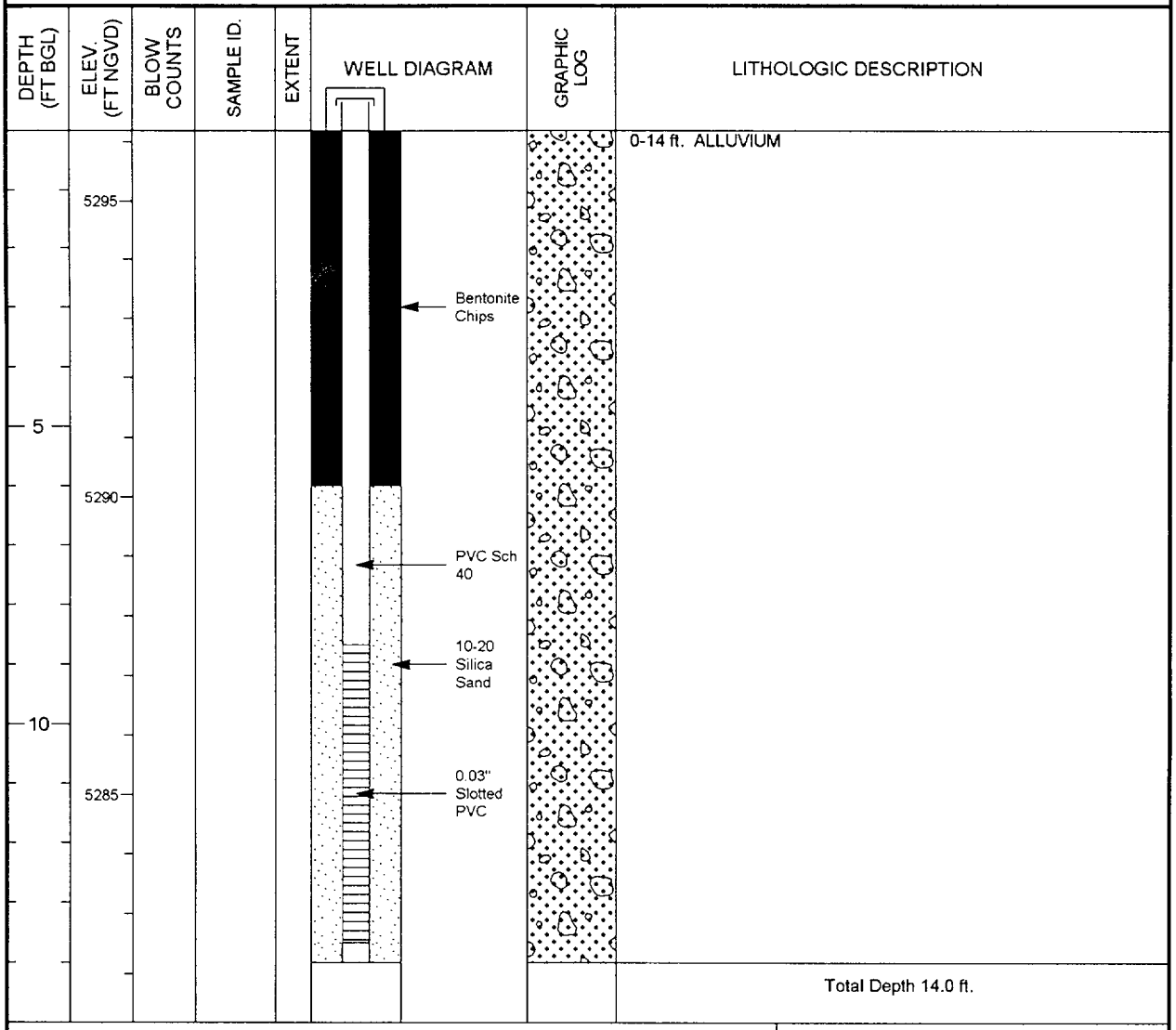


MONITORING WELL COMPLETION LOG NAT01-NAT11

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587557.46	DATE DRILLED	10/21/1998
LOCATION	, CO	EAST COORD. (FT)	1106948.06	SURFACE ELEV. (FT NGVD)	5296.19
SITE	NATURITA	HOLE DEPTH (FT)	14.00	TOP OF CASING (FT)	5298.49
WELL NUMBER	NAT11	WELL DEPTH (FT)	14.00	MEAS. PT. ELEV. (FT)	5298.49
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	10.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	2 in. PVC Sch 40	-2.3	to	8.67
WELL SCREEN:	2 in. Slotted PVC	8.67	to	13.67
SUMP/END CAP:	2 in. PVC Sch 40	13.67	to	14.0
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	0.0	to	6.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	6.0	to	14.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS

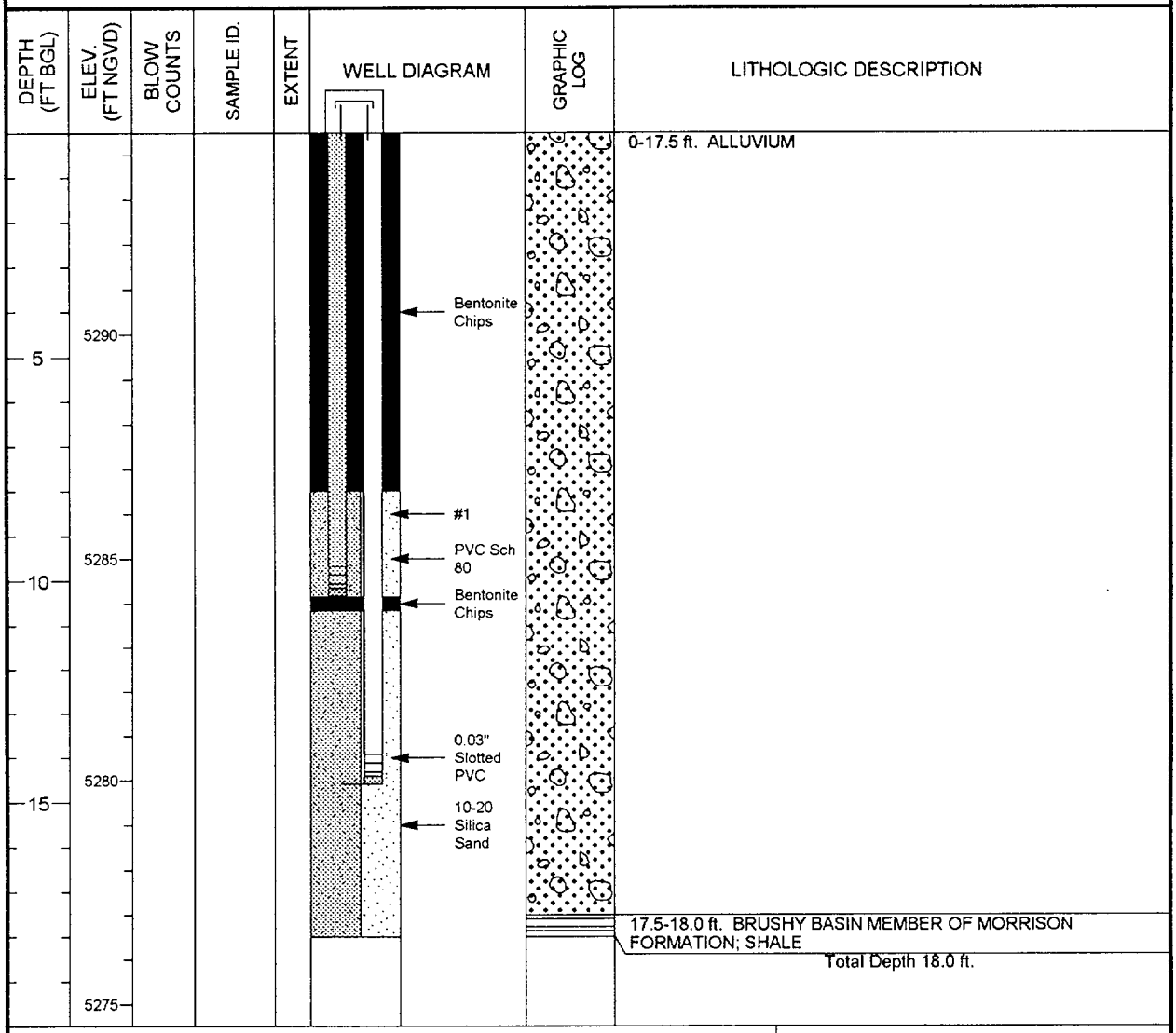


MONITORING WELL COMPLETION LOG NAT01-NAT12-1

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588608.43	DATE DRILLED	10/21/1998
LOCATION	, CO	EAST COORD. (FT)	1106183.99	SURFACE ELEV. (FT NGVD)	5294.50
SITE	NATURITA	HOLE DEPTH (FT)	18.00	TOP OF CASING (FT)	5296.35
WELL NUMBER	NAT12-1	WELL DEPTH (FT)	14.58	MEAS. PT. ELEV. (FT)	5296.35
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-1.85	to	13.91
WELL SCREEN:	0.5 in. Slotted PVC	13.91	to	14.41
SUMP/END CAP:	0.5 in. PVC Sch 80	14.41	to	14.58
SURFACE SEAL:				
GROUT:				
SEAL:	Bentonite Chips	10.66	to	11.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	11.0	to	18.0

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 2 casings: NAT12-1 casing and screen depths provided; NAT12-2 casing is from 0 to 9.66 ft. and screened to 10.16 ft.

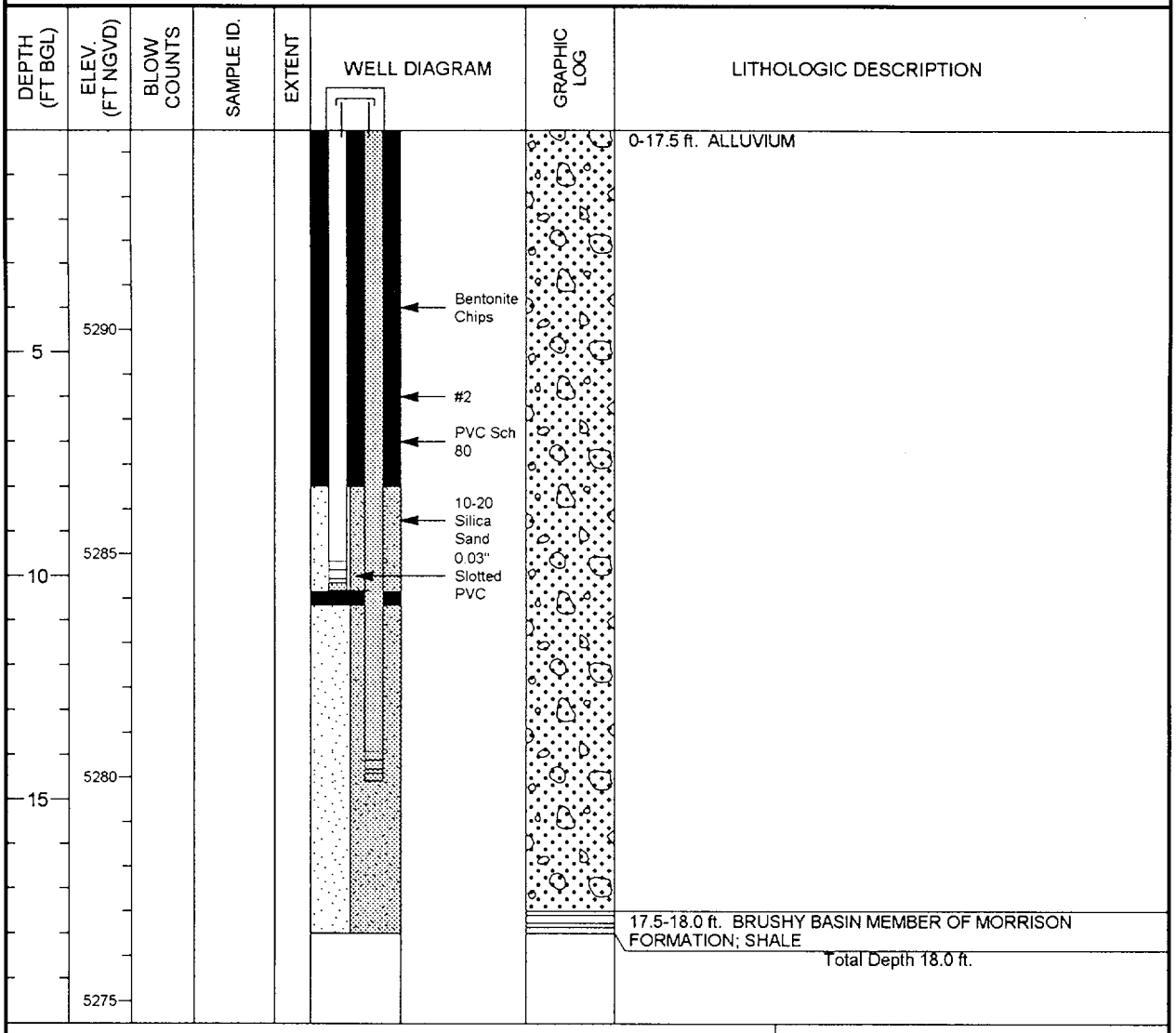


MONITORING WELL COMPLETION LOG NAT01-NAT12-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588608.43	DATE DRILLED	10/21/1998
LOCATION	, CO	EAST COORD. (FT)	1106183.99	SURFACE ELEV. (FT NGVD)	5294.50
SITE	NATURITA	HOLE DEPTH (FT)	18.00	TOP OF CASING (FT)	5296.35
WELL NUMBER	NAT12-2	WELL DEPTH (FT)	10.33	MEAS. PT. ELEV. (FT)	5296.35
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	9.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	0.5 in. PVC Sch 80	-1.85	to	9.66	
WELL SCREEN:	0.5 in. Slotted PVC	9.66	to	10.16	
SUMP/END CAP:	0.5 in. PVC Sch 80	10.16	to	10.33	
SURFACE SEAL:					
GROUT:					
SEAL:	Bentonite Chips	0.0	to	8.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	8.0	to	18.0	

DRILLING METHOD AUGER
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes
REMARKS Cluster of 2 casings: NAT12-2 casing and screen depths provided; NAT12-1 casing is from 0 to 13.91 ft. and screened to 14.41 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT13-1

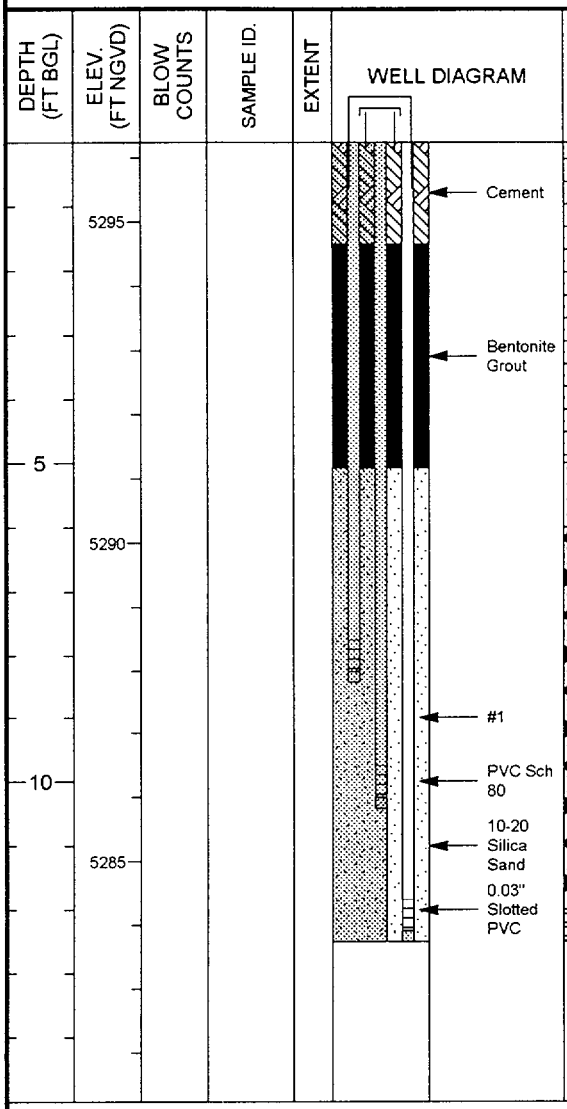
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT13-1

NORTH COORD. (FT) 587562.60
EAST COORD. (FT) 1106943.70
HOLE DEPTH (FT) 12.50
WELL DEPTH (FT) 12.50

DATE DRILLED 06/30/1999
SURFACE ELEV. (FT NGVD) 5296.24
TOP OF CASING (FT) 5298.99
MEAS. PT. ELEV. (FT) 5298.99
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.75	to	11.83
WELL SCREEN:	0.5 in. Slotted PVC	11.83	to	12.33
SUMP/END CAP:	0.5 in. PVC Sch 80	12.33	to	12.5
SURFACE SEAL:	Cement	0.0	to	1.58
GROUT:	Bentonite Grout	1.58	to	5.08
SEAL:				
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.08	to	12.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT13-1 casing and screen depths provided; NAT13-2 casing is from 0 to 9.75 and screened to 10.25 ft.; NAT13-3 casing is from 0 to 7.75 and screened to 8.25 ft.



LITHOLOGIC DESCRIPTION

0-5 ft. SILT (ML), some gravel and cobbles.

5-6 ft. SAND (SW), moist.

6-12 ft. SANDY GRAVEL (GW-SW), sand with gravel cobbles and boulders.

12-12.5 ft. BRUSHY BASIN MEMBER OF MORRISON FORMATION: SHALE; very hard drilling.

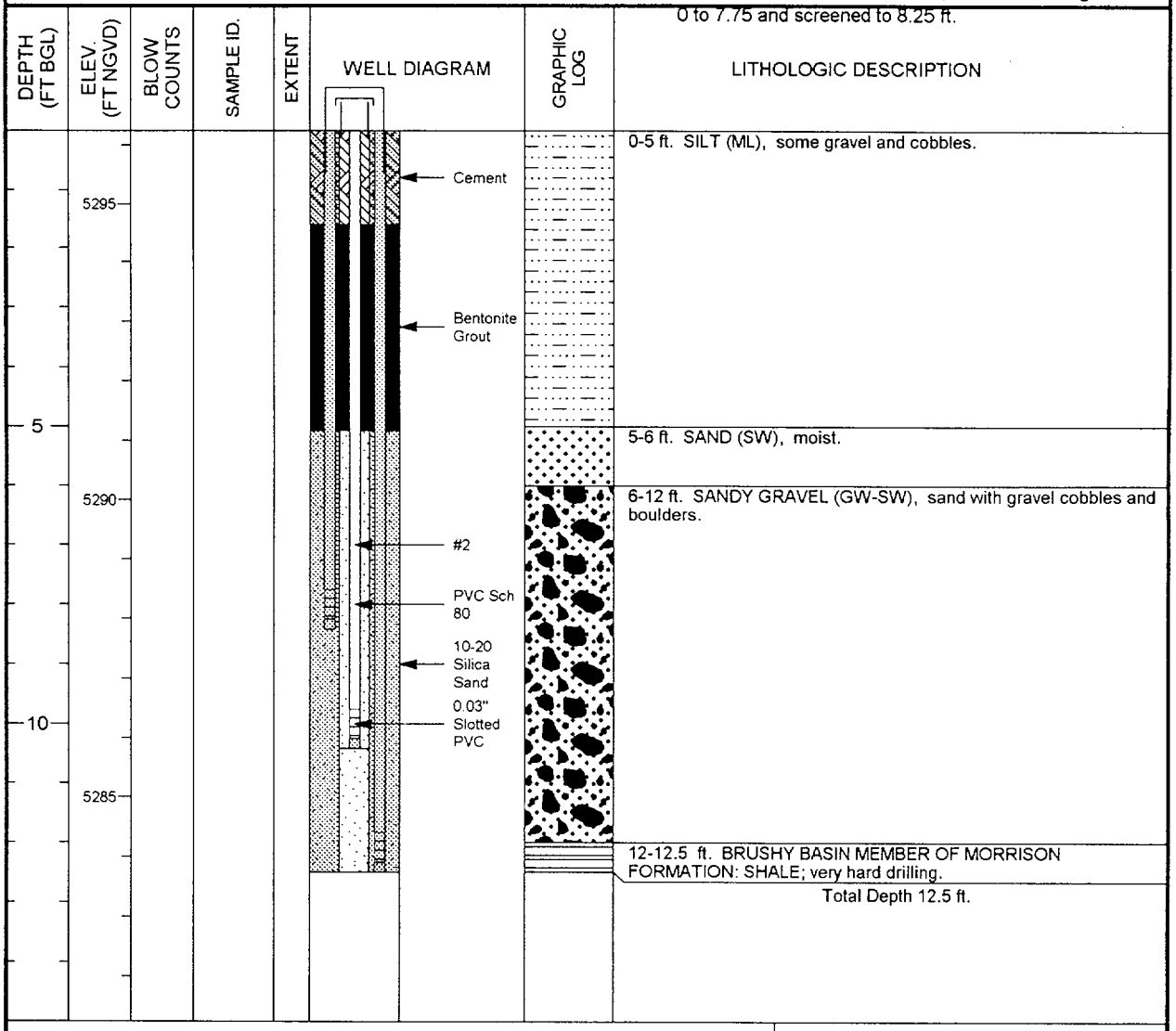
Total Depth 12.5 ft.

MONITORING WELL COMPLETION LOG NAT01-NAT13-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587562.60	DATE DRILLED	06/30/1999
LOCATION	, CO	EAST COORD. (FT)	1106943.70	SURFACE ELEV. (FT NGVD)	5296.24
SITE	NATURITA	HOLE DEPTH (FT)	12.50	TOP OF CASING (FT)	5298.93
WELL NUMBER	NAT13-2	WELL DEPTH (FT)	10.42	MEAS. PT. ELEV. (FT)	5298.93
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.69	to	9.75
WELL SCREEN:	0.5 in. Slotted PVC	9.75	to	10.25
SUMP/END CAP:	0.5 in. PVC Sch 80	10.25	to	10.42
SURFACE SEAL:	Cement	0.0	to	1.58
GROUT:	Bentonite Grout	1.58	to	5.08
SEAL:				
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.08	to	12.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT13-2 casing and screen depths provided; NAT13-1 casing is from 0 to 11.83 and screened to 12.33 ft.; NAT13-3 casing is from 0 to 7.75 and screened to 8.25 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT13-3

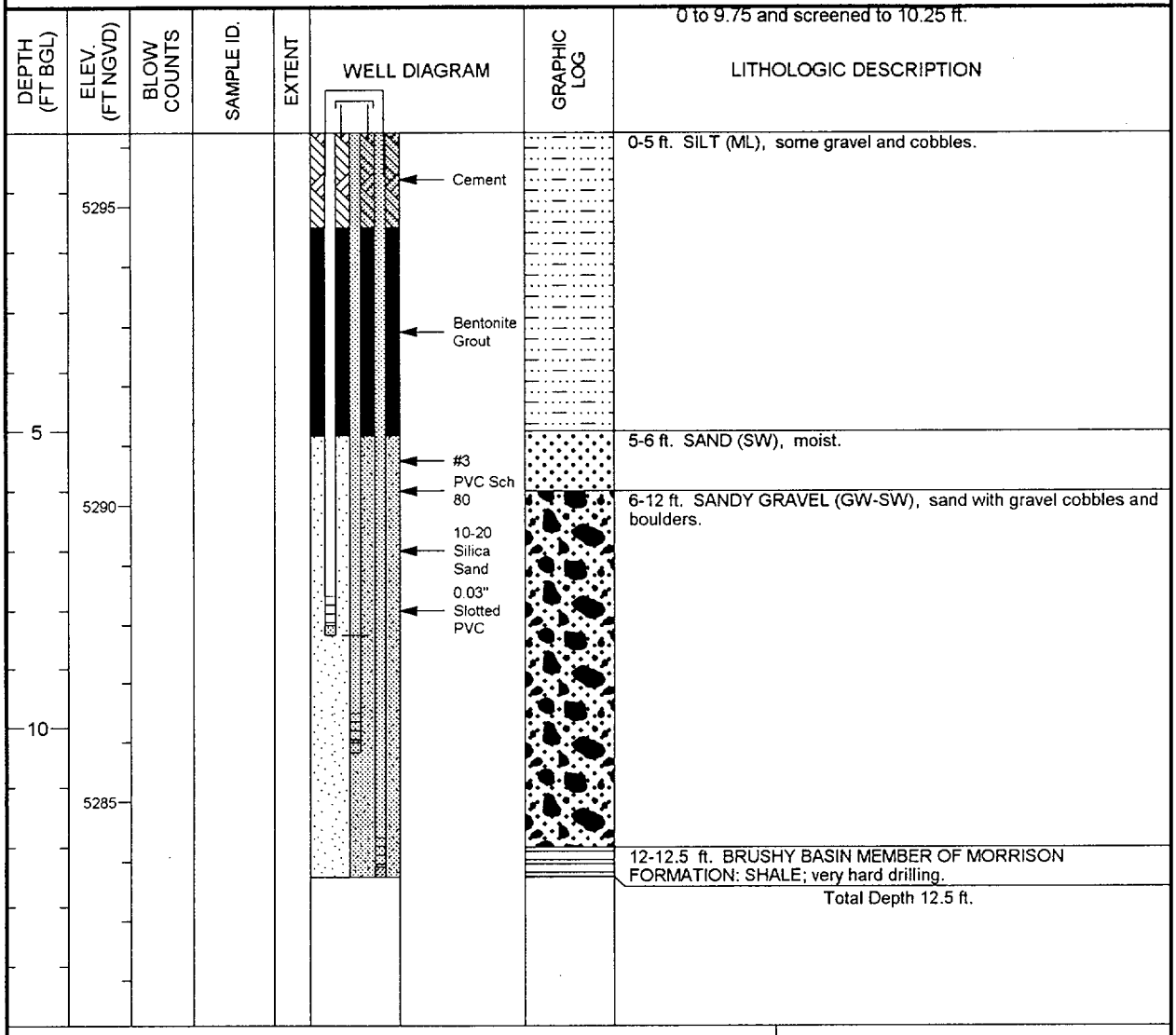
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT13-3

NORTH COORD. (FT) 587562.60
EAST COORD. (FT) 1106943.70
HOLE DEPTH (FT) 12.50
WELL DEPTH (FT) 8.42

DATE DRILLED 06/30/1999
SURFACE ELEV. (FT NGVD) 5296.24
TOP OF CASING (FT) 5298.99
MEAS. PT. ELEV. (FT) 5298.99
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.75	to	7.75
WELL SCREEN:	0.5 in. Slotted PVC	7.75	to	8.25
SUMP/END CAP:	0.5 in. PVC Sch 80	8.25	to	8.42
SURFACE SEAL:	Cement	0.0	to	1.58
GROUT:	Bentonite Grout	1.58	to	5.08
SEAL:				
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.08	to	12.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT13-3 casing and screen depths provided; NAT13-1 casing is from 0 to 11.83 and screened to 12.33 ft.; NAT13-2 casing is from 0 to 9.75 and screened to 10.25 ft.

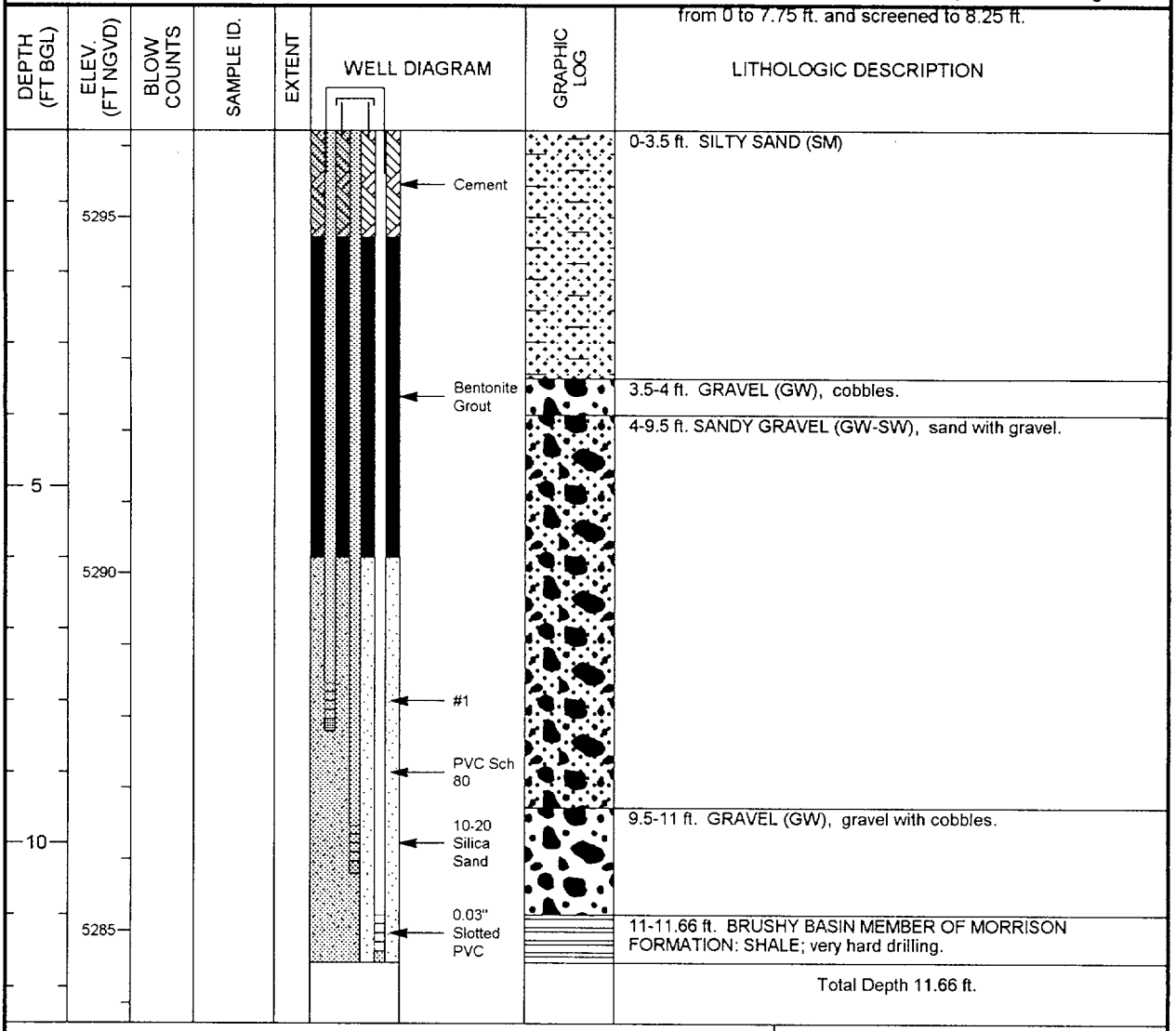


MONITORING WELL COMPLETION LOG NAT01-NAT14-1

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587568.48	DATE DRILLED	06/30/1999
LOCATION	, CO	EAST COORD. (FT)	1106939.85	SURFACE ELEV. (FT NGVD)	5296.22
SITE	NATURITA	HOLE DEPTH (FT)	11.66	TOP OF CASING (FT)	5299.32
WELL NUMBER	NAT14-1	WELL DEPTH (FT)	11.66	MEAS. PT. ELEV. (FT)	5299.32
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	0.5 in. PVC Sch 80	-3.1	to	11.0	
WELL SCREEN:	0.5 in. Slotted PVC	11.0	to	11.5	
SUMP/END CAP:	0.5 in. PVC Sch 80	11.5	to	11.66	
SURFACE SEAL:	Cement	0.0	to	1.5	
GROUT:	Bentonite Grout	1.5	to	6.0	
SEAL:					
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	6.0	to	11.66	

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT14-1 casing and screen depths provided; NAT14-2 casing is from 0 to 9.75 ft. and screened to 10.25 ft.; NAT14-3 casing is from 0 to 7.75 ft. and screened to 8.25 ft.

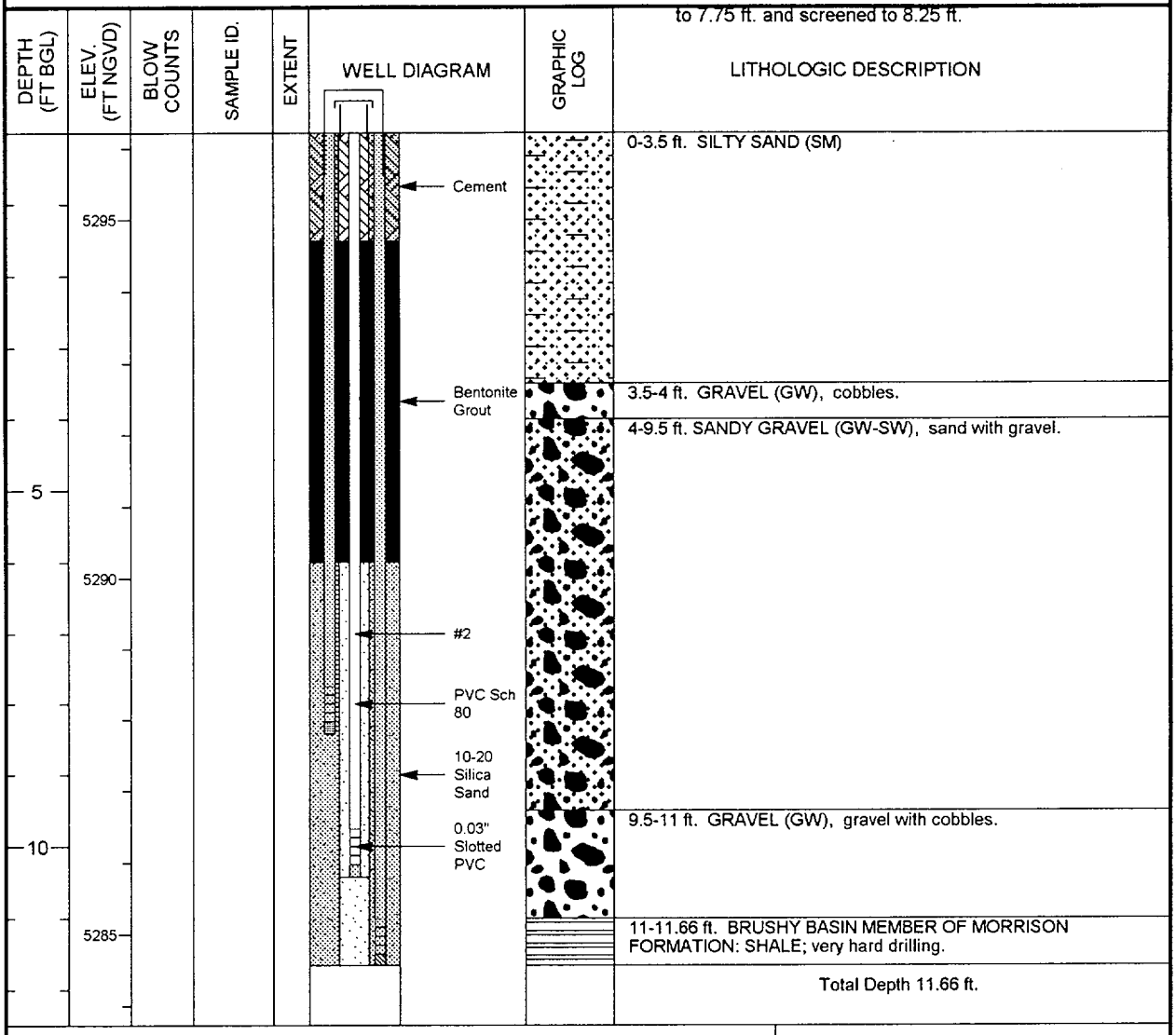


MONITORING WELL COMPLETION LOG NAT01-NAT14-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587568.48	DATE DRILLED	06/30/1999
LOCATION	, CO	EAST COORD. (FT)	1106939.85	SURFACE ELEV. (FT NGVD)	5296.22
SITE	NATURITA	HOLE DEPTH (FT)	11.66	TOP OF CASING (FT)	5299.31
WELL NUMBER	NAT14-2	WELL DEPTH (FT)	10.42	MEAS. PT. ELEV. (FT)	5299.31
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-3.09	to	9.75
WELL SCREEN:	0.5 in. Slotted PVC	9.75	to	10.25
SUMP/END CAP:	0.5 in. PVC Sch 80	10.25	to	10.42
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:	Bentonite Grout	1.5	to	6.0
SEAL:				
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	6.0	to	11.66

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT14-2 casing and screen depths provided; NAT14-1 casing is from 0 to 11 ft. and screened to 11.5 ft.; NAT14-3 casing is from 0 to 7.75 ft. and screened to 8.25 ft.

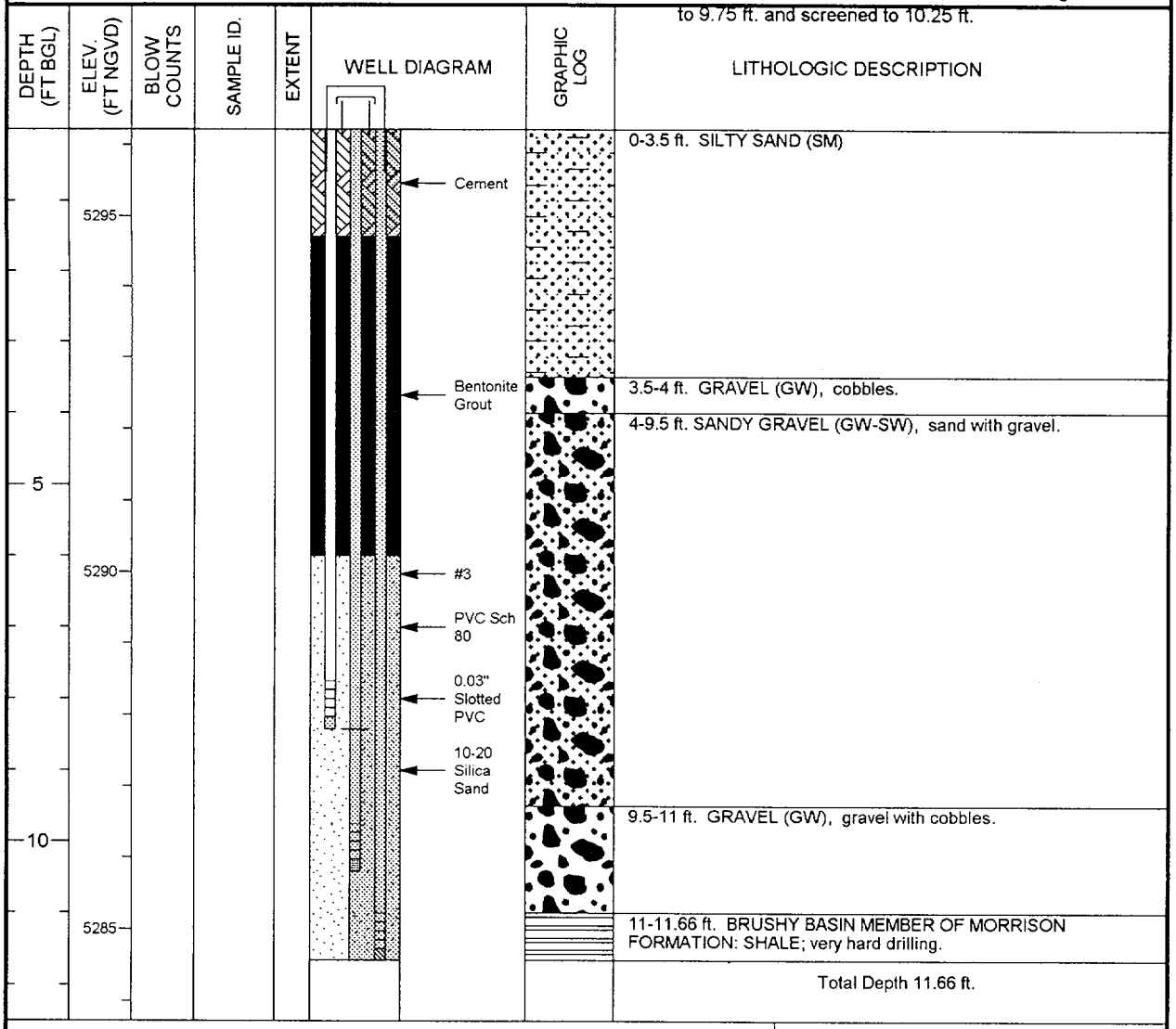


MONITORING WELL COMPLETION LOG NAT01-NAT14-3

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587568.48	DATE DRILLED	06/30/1999
LOCATION	, CO	EAST COORD. (FT)	1106939.85	SURFACE ELEV. (FT NGVD)	5296.22
SITE	NATURITA	HOLE DEPTH (FT)	11.66	TOP OF CASING (FT)	5299.31
WELL NUMBER	NAT14-3	WELL DEPTH (FT)	8.42	MEAS. PT. ELEV. (FT)	5299.31
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-3.09	to	7.75
WELL SCREEN:	0.5 in. Slotted PVC	7.75	to	8.25
SUMP/END CAP:	0.5 in. PVC Sch 80	8.25	to	8.42
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:	Bentonite Grout	1.5	to	6.0
SEAL:				
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	6.0	to	11.66

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT14-3 casing and screen depths provided; NAT14-1 casing is from 0 to 11 ft. and screened to 11.5 ft; NAT14-2 casing is from 0 to 9.75 ft. and screened to 10.25 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT15-1

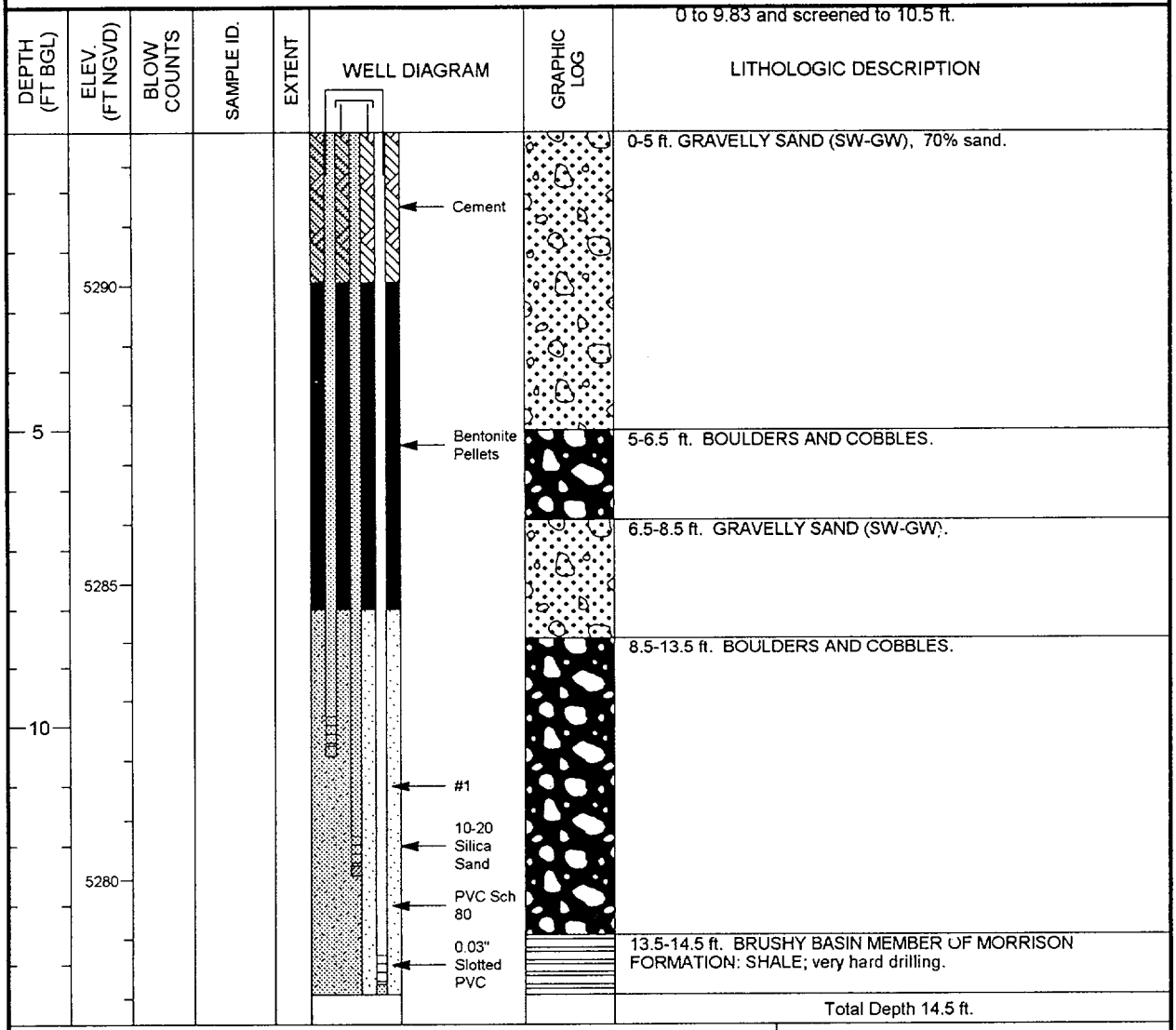
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT15-1

NORTH COORD. (FT) 588305.94
EAST COORD. (FT) 1106235.04
HOLE DEPTH (FT) 14.50
WELL DEPTH (FT) 14.50

DATE DRILLED 07/01/1999
SURFACE ELEV. (FT NGVD) 5292.57
TOP OF CASING (FT) 5294.93
MEAS. PT. ELEV. (FT) 5294.93
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.36	to	13.83
WELL SCREEN:	0.5 in. Slotted PVC	13.83	to	14.33
SUMP/END CAP:	0.5 in. PVC Sch 80	14.33	to	14.5
SURFACE SEAL:	Cement	0.0	to	2.5
GROUT:				
SEAL:	Bentonite Pellets	2.5	to	8.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	8.0	to	14.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT15-1 casing and screen depths provided; NAT15-2 casing is from 0 to 11.83 ft and screened to 12.5 ft.; and NAT15-3 casing is 0 to 9.83 and screened to 10.5 ft.

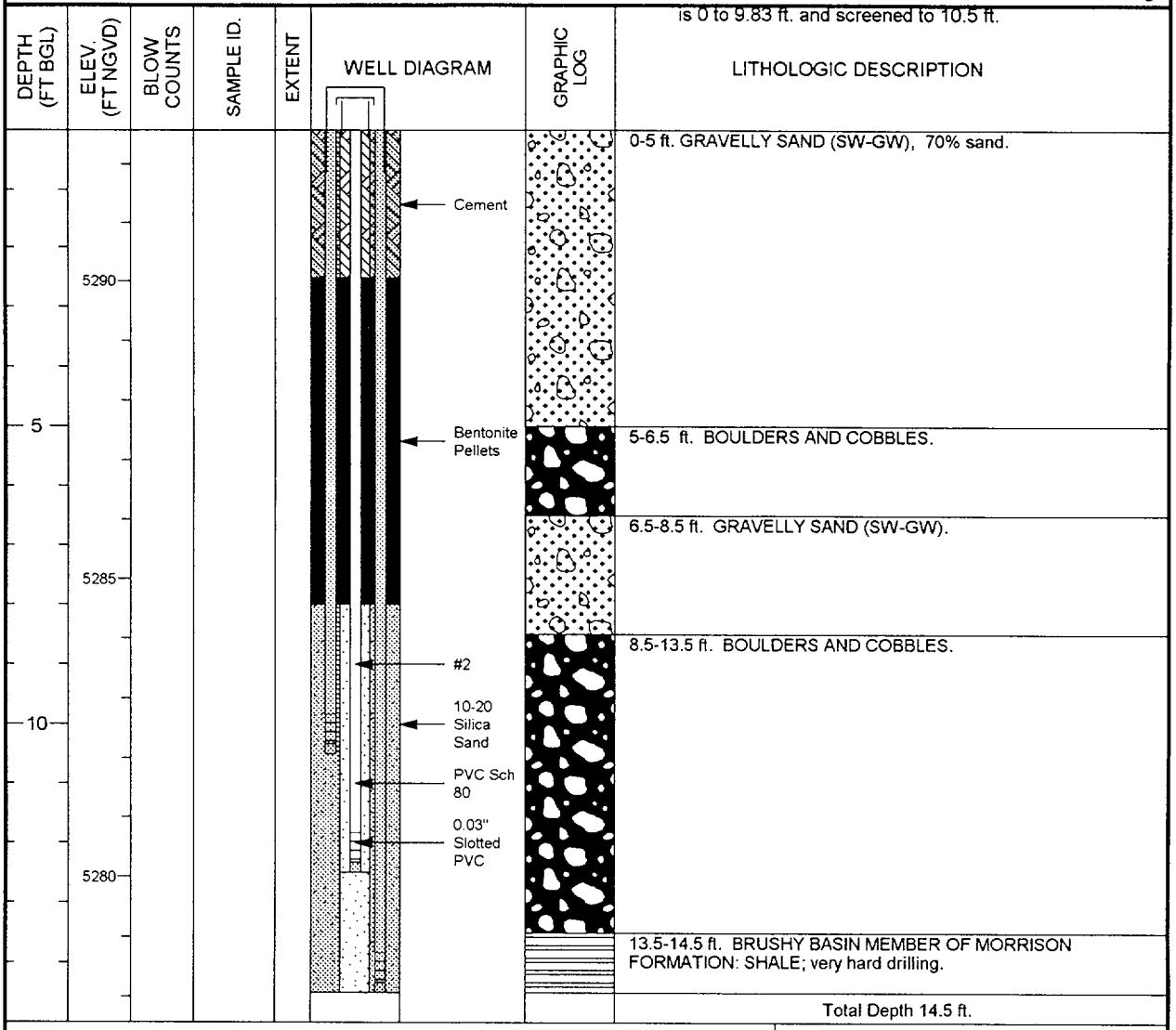


MONITORING WELL COMPLETION LOG NAT01-NAT15-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588305.94	DATE DRILLED	07/01/1999
LOCATION	, CO	EAST COORD. (FT)	1106235.04	SURFACE ELEV. (FT NGVD)	5292.57
SITE	NATURITA	HOLE DEPTH (FT)	14.50	TOP OF CASING (FT)	5294.96
WELL NUMBER	NAT15-2	WELL DEPTH (FT)	12.50	MEAS. PT. ELEV. (FT)	5294.96
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.39	to	11.83
WELL SCREEN:	0.5 in. Slotted PVC	11.83	to	12.33
SUMP/END CAP:	0.5 in. PVC Sch 80	12.33	to	12.5
SURFACE SEAL:	Cement	0.0	to	2.5
GROUT:				
SEAL:	Bentonite Pellets	2.5	to	8.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	8.0	to	14.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT15-2 casing and screen depths provided; NAT15-1 casing is from 0 to 13.83 ft. and screened to 14.33 ft.; and NAT15-3 casing is 0 to 9.83 ft. and screened to 10.5 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT15-3

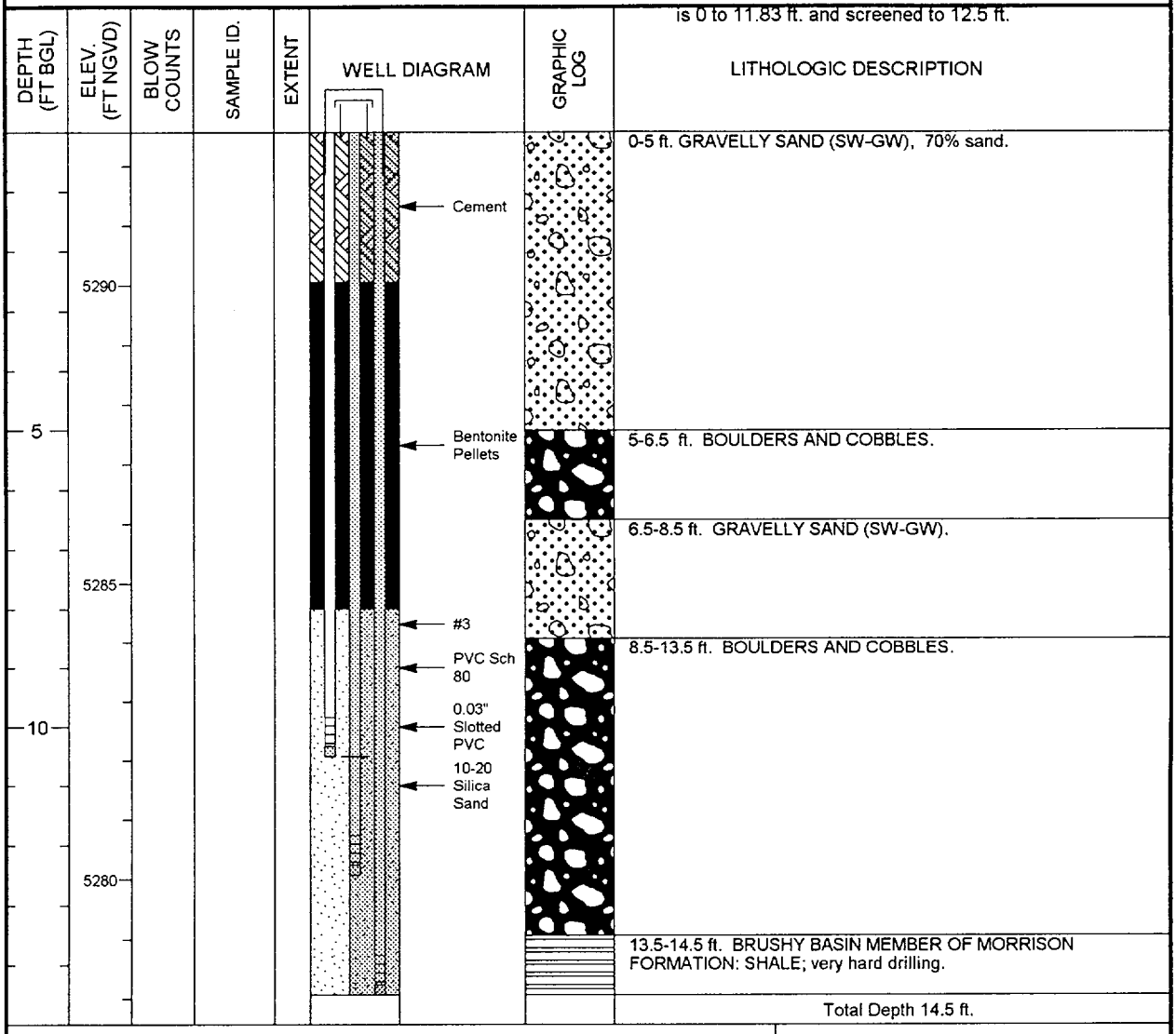
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT15-3

NORTH COORD. (FT) 588305.94
EAST COORD. (FT) 1106235.04
HOLE DEPTH (FT) 14.50
WELL DEPTH (FT) 10.50

DATE DRILLED 07/01/1999
SURFACE ELEV. (FT NGVD) 5292.57
TOP OF CASING (FT) 5294.95
MEAS. PT. ELEV. (FT) 5294.95
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.38	to	9.83
WELL SCREEN:	0.5 in. Slotted PVC	9.83	to	10.33
SUMP/END CAP:	0.5 in. PVC Sch 80	10.33	to	10.5
SURFACE SEAL:	Cement	0.0	to	2.5
GROUT:				
SEAL:	Bentonite Pellets	2.5	to	8.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	8.0	to	14.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT15-3 casing and screen depths provided; NAT15-1 casing is from 0 to 13.83 ft. and screened to 14.33 ft.; and NAT15-2 casing is 0 to 11.83 ft. and screened to 12.5 ft.

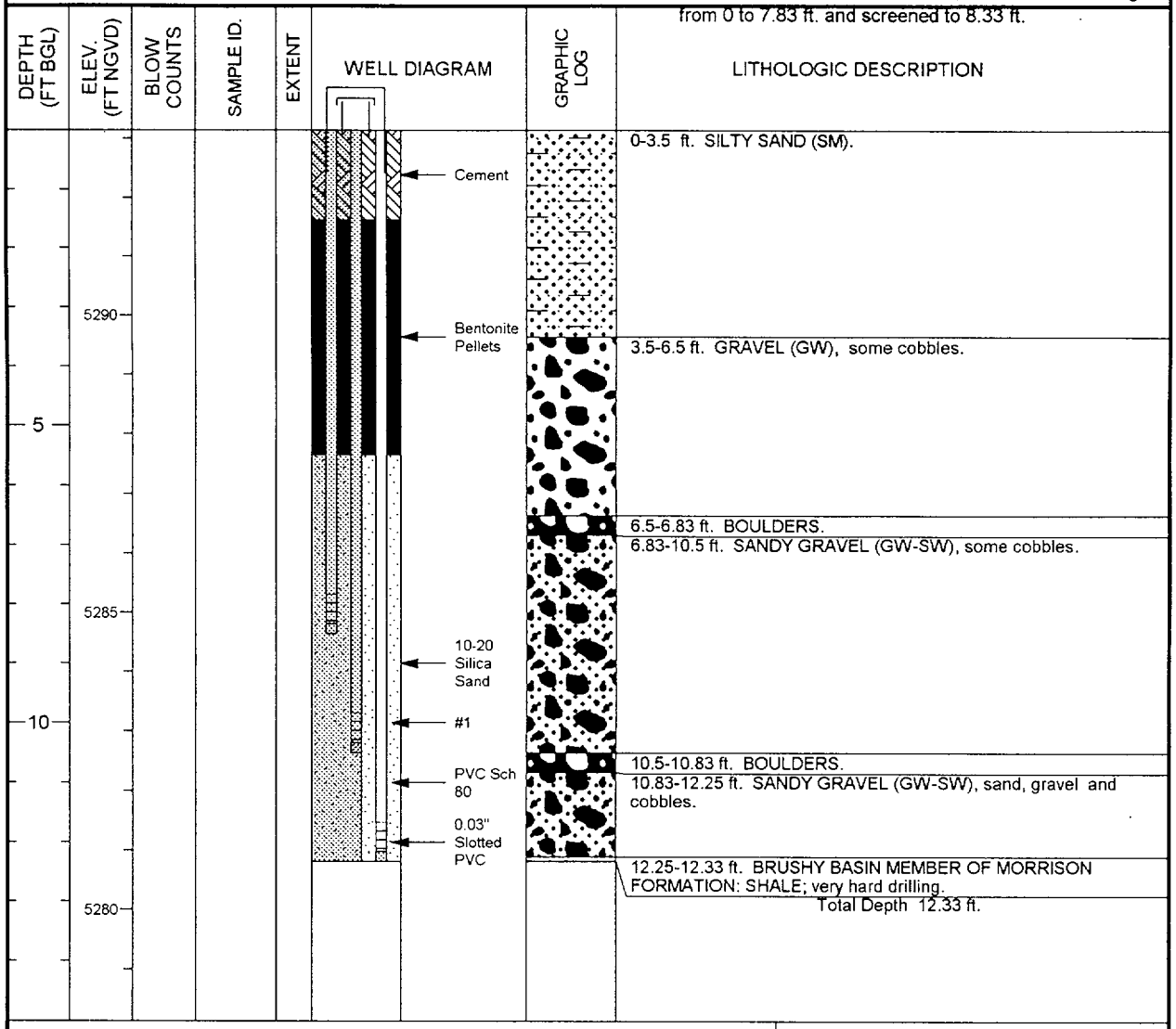


MONITORING WELL COMPLETION LOG NAT01-NAT16-1

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587987.01	DATE DRILLED	07/02/1999
LOCATION	, CO	EAST COORD. (FT)	1106706.27	SURFACE ELEV. (FT NGVD)	5293.14
SITE	NATURITA	HOLE DEPTH (FT)	12.33	TOP OF CASING (FT)	5295.82
WELL NUMBER	NAT16-1	WELL DEPTH (FT)	12.33	MEAS. PT. ELEV. (FT)	5295.82
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.68	to	11.66
WELL SCREEN:	0.5 in. Slotted PVC	11.66	to	12.16
SUMP/END CAP:	0.5 in. PVC Sch 80	12.16	to	12.33
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	5.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.5	to	12.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT16-1 casing and screen depths provided; NAT16-2 casing is from 0 to 9.83 ft. and screened to 10.33 ft.; and NAT16-3 casing is from 0 to 7.83 ft. and screened to 8.33 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT16-2

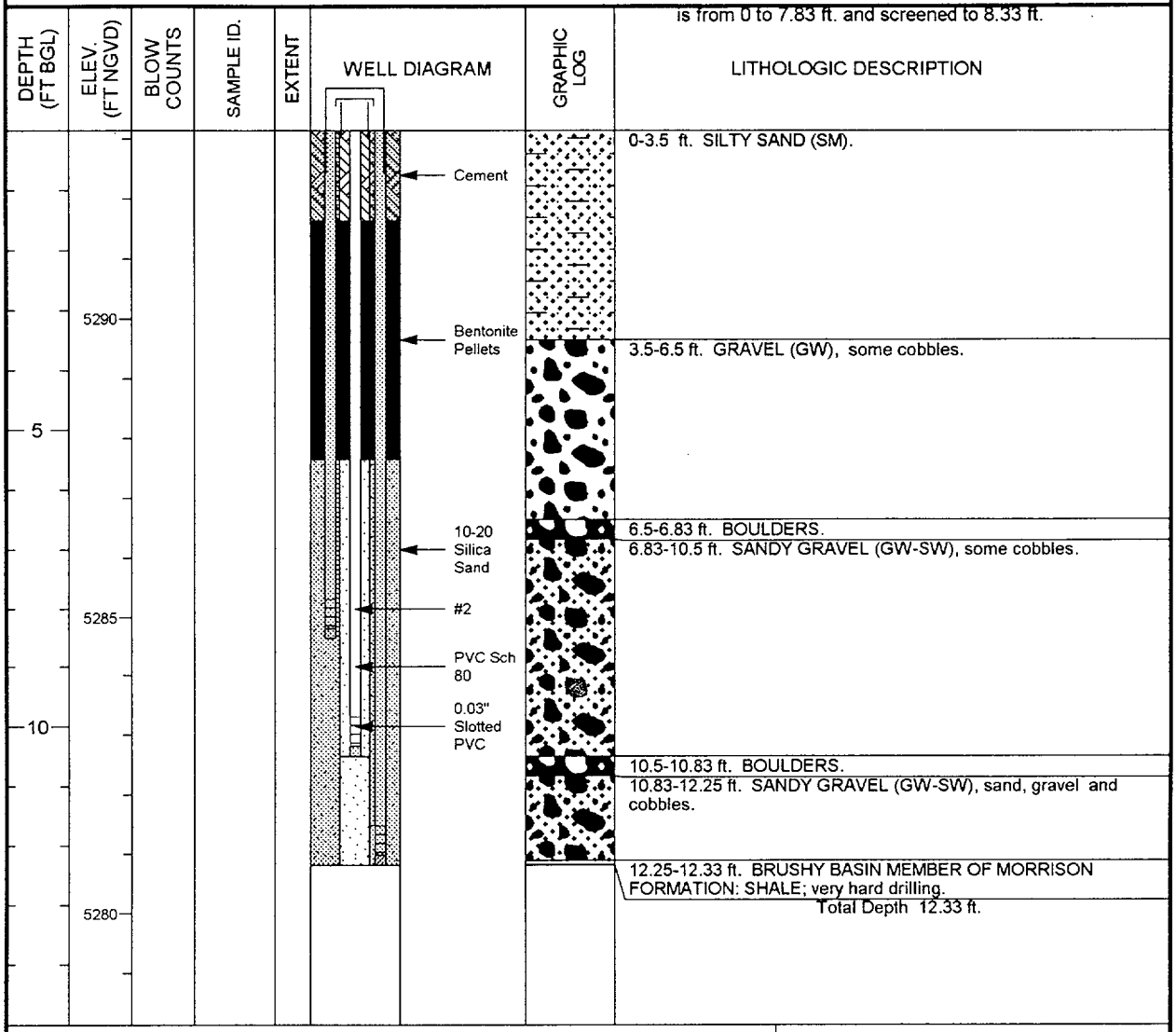
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT16-2

NORTH COORD. (FT) 587987.01
EAST COORD. (FT) 1106706.27
HOLE DEPTH (FT) 12.33
WELL DEPTH (FT) 10.50

DATE DRILLED 07/02/1999
SURFACE ELEV. (FT NGVD) 5293.14
TOP OF CASING (FT) 5295.75
MEAS. PT. ELEV. (FT) 5295.75
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.61	to	9.83
WELL SCREEN:	0.5 in. Slotted PVC	9.83	to	10.33
SUMP/END CAP:	0.5 in. PVC Sch 80	10.33	to	10.5
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	5.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.5	to	12.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT16-2 casing and screen depths provided; NAT16-1 casing is from 0 to 11.66 ft. and screened to 12.16 ft.; and NAT16-3 casing is from 0 to 7.83 ft. and screened to 8.33 ft.

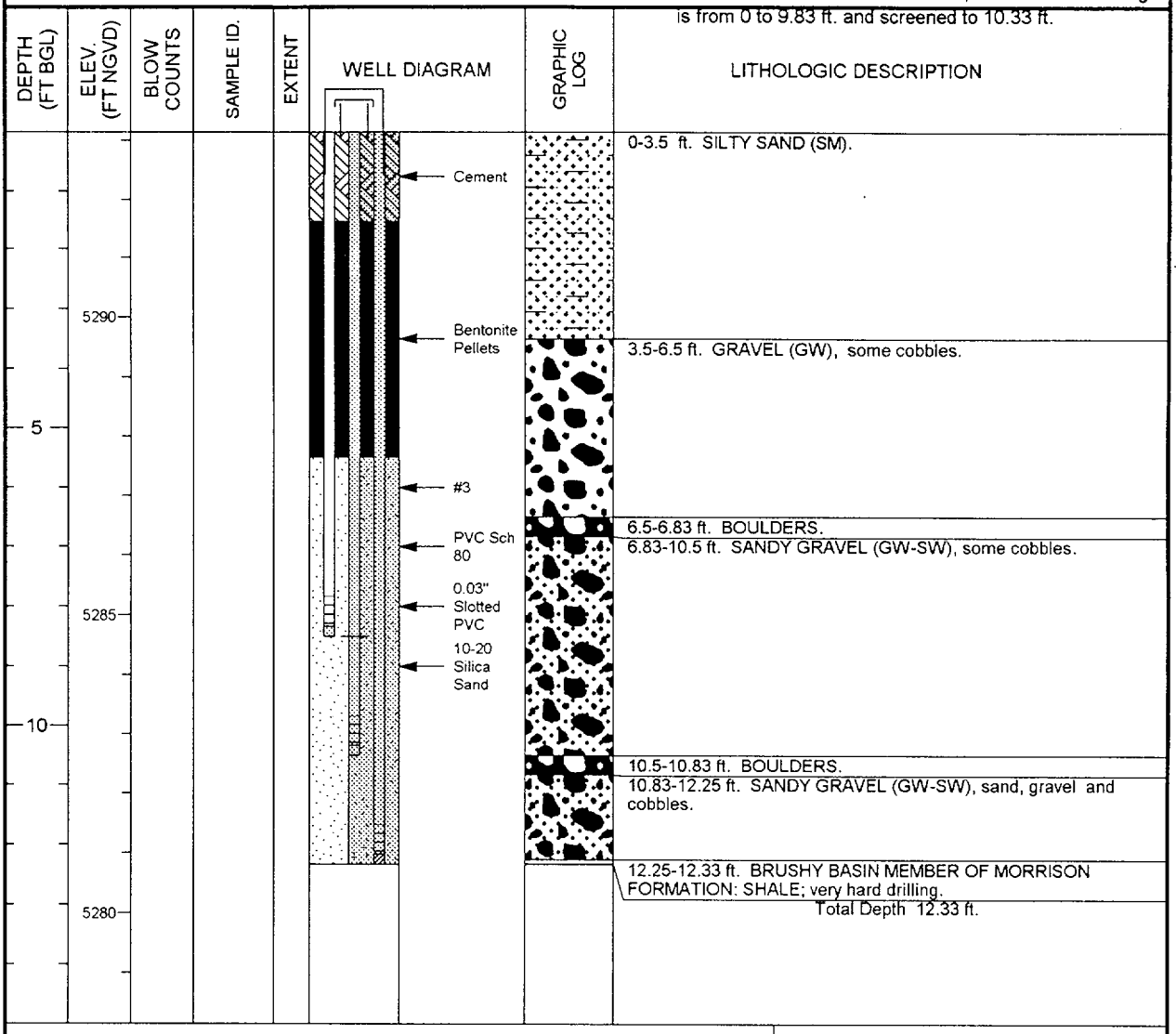


MONITORING WELL COMPLETION LOG NAT01-NAT16-3

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587987.01	DATE DRILLED	07/02/1999
LOCATION	, CO	EAST COORD. (FT)	1106706.27	SURFACE ELEV. (FT NGVD)	5293.14
SITE	NATURITA	HOLE DEPTH (FT)	12.33	TOP OF CASING (FT)	5295.75
WELL NUMBER	NAT16-3	WELL DEPTH (FT)	8.50	MEAS. PT. ELEV. (FT)	5295.75
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.61	to	7.83
WELL SCREEN:	0.5 in. Slotted PVC	7.83	to	8.33
SUMP/END CAP:	0.5 in. PVC Sch 80	8.33	to	8.5
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	5.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.5	to	12.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings. NAT16-3 casing and screen depths provided; NAT16-1 casing is from 0 to 11.66 ft. and screened to 12.33 ft.; and NAT16-2 casing is from 0 to 9.83 ft. and screened to 10.33 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT17-1

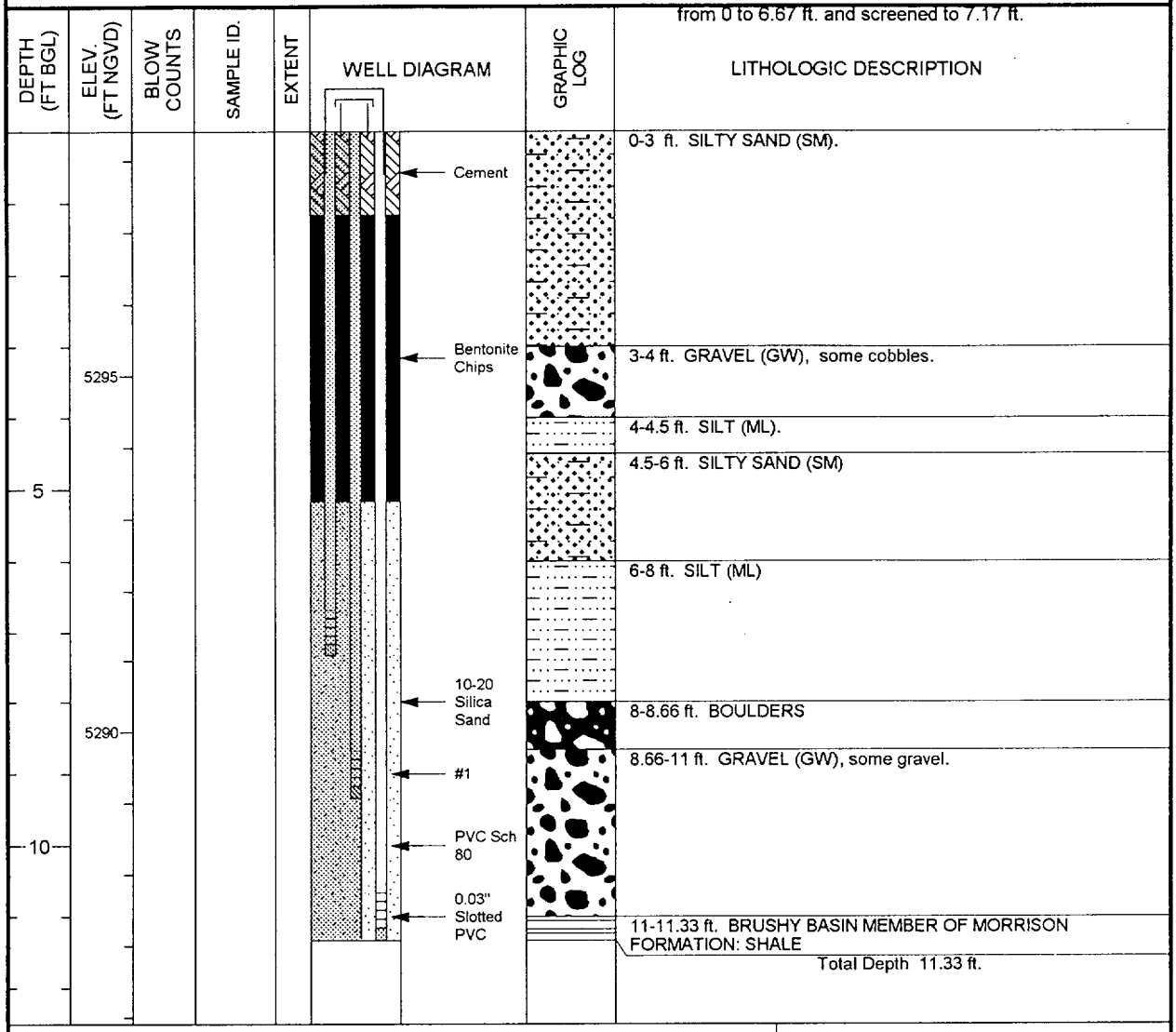
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT17-1

NORTH COORD. (FT) 587235.58
EAST COORD. (FT) 1107135.98
HOLE DEPTH (FT) 11.33
WELL DEPTH (FT) 11.33

DATE DRILLED 07/02/1999
SURFACE ELEV. (FT NGVD) 5298.41
TOP OF CASING (FT) 5300.74
MEAS. PT. ELEV. (FT) 5300.74
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.33	to	10.66
WELL SCREEN:	0.5 in. Slotted PVC	10.66	to	11.16
SUMP/END CAP:	0.5 in. PVC Sch 80	11.16	to	11.33
SURFACE SEAL:	Cement	0.0	to	1.16
GROUT:				
SEAL:	Bentonite Chips	1.16	to	5.16
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.16	to	11.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT17-1 casing and screen depths provided; NAT17-2 casing is from 0 to 8.67 ft. and screened to 9.17 ft.; and NAT17-3 casing is from 0 to 6.67 ft. and screened to 7.17 ft.

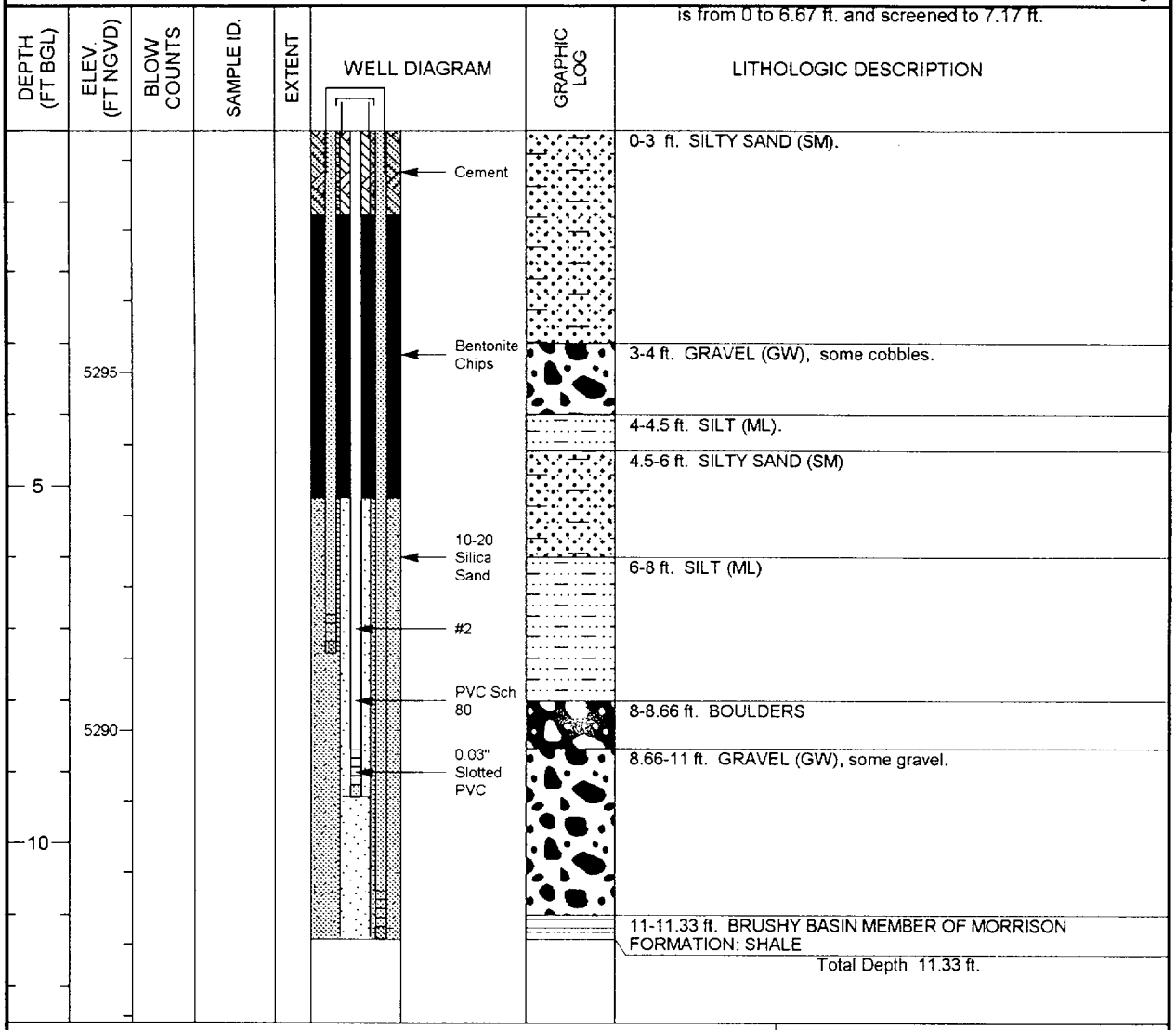


MONITORING WELL COMPLETION LOG NAT01-NAT17-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587235.58	DATE DRILLED	07/02/1999
LOCATION	, CO	EAST COORD. (FT)	1107135.98	SURFACE ELEV. (FT NGVD)	5298.41
SITE	NATURITA	HOLE DEPTH (FT)	11.33	TOP OF CASING (FT)	5300.74
WELL NUMBER	NAT17-2	WELL DEPTH (FT)	9.17	MEAS. PT. ELEV. (FT)	5300.74
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.33	to	8.67
WELL SCREEN:	0.5 in. Slotted PVC	8.67	to	9.17
SUMP/END CAP:	0.5 in. PVC Sch 80	9.17	to	9.34
SURFACE SEAL:	Cement	0.0	to	1.16
GROUT:				
SEAL:	Bentonite Chips	1.16	to	5.16
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.16	to	11.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT17-2 casing and screen depths provided; NAT17-1 casing is from 0 to 10.66 ft. and screened to 11.16 ft.; and NAT17-3 casing is from 0 to 6.67 ft. and screened to 7.17 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT17-3

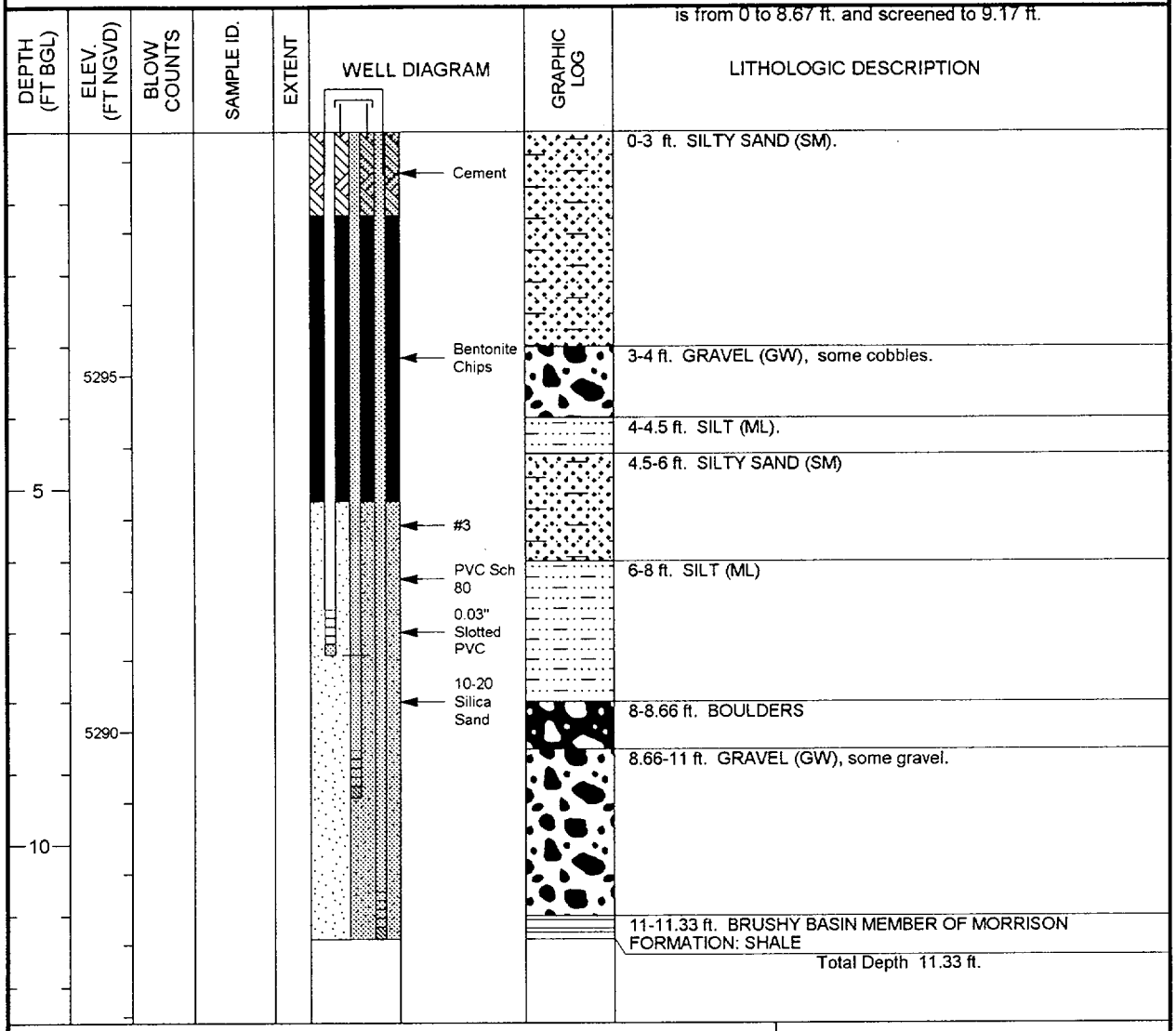
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT17-3

NORTH COORD. (FT) 587235.58
EAST COORD. (FT) 1107135.98
HOLE DEPTH (FT) 11.33
WELL DEPTH (FT) 7.17

DATE DRILLED 07/02/1999
SURFACE ELEV. (FT NGVD) 5298.41
TOP OF CASING (FT) 5300.74
MEAS. PT. ELEV. (FT) 5300.74
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.33	to	6.67
WELL SCREEN:	0.5 in. Slotted PVC	6.67	to	7.17
SUMP/END CAP:	0.5 in. PVC Sch 80	7.17	to	7.34
SURFACE SEAL:	Cement	0.0	to	1.16
GROUT:				
SEAL:	Bentonite Chips	1.16	to	5.16
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.16	to	11.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT17-3 casing and screen depths provided; NAT17-1 casing is from 0 to 10.66 ft. and screened to 11.16 ft.; and NAT17-2 casing is from 0 to 8.67 ft. and screened to 9.17 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT18-1

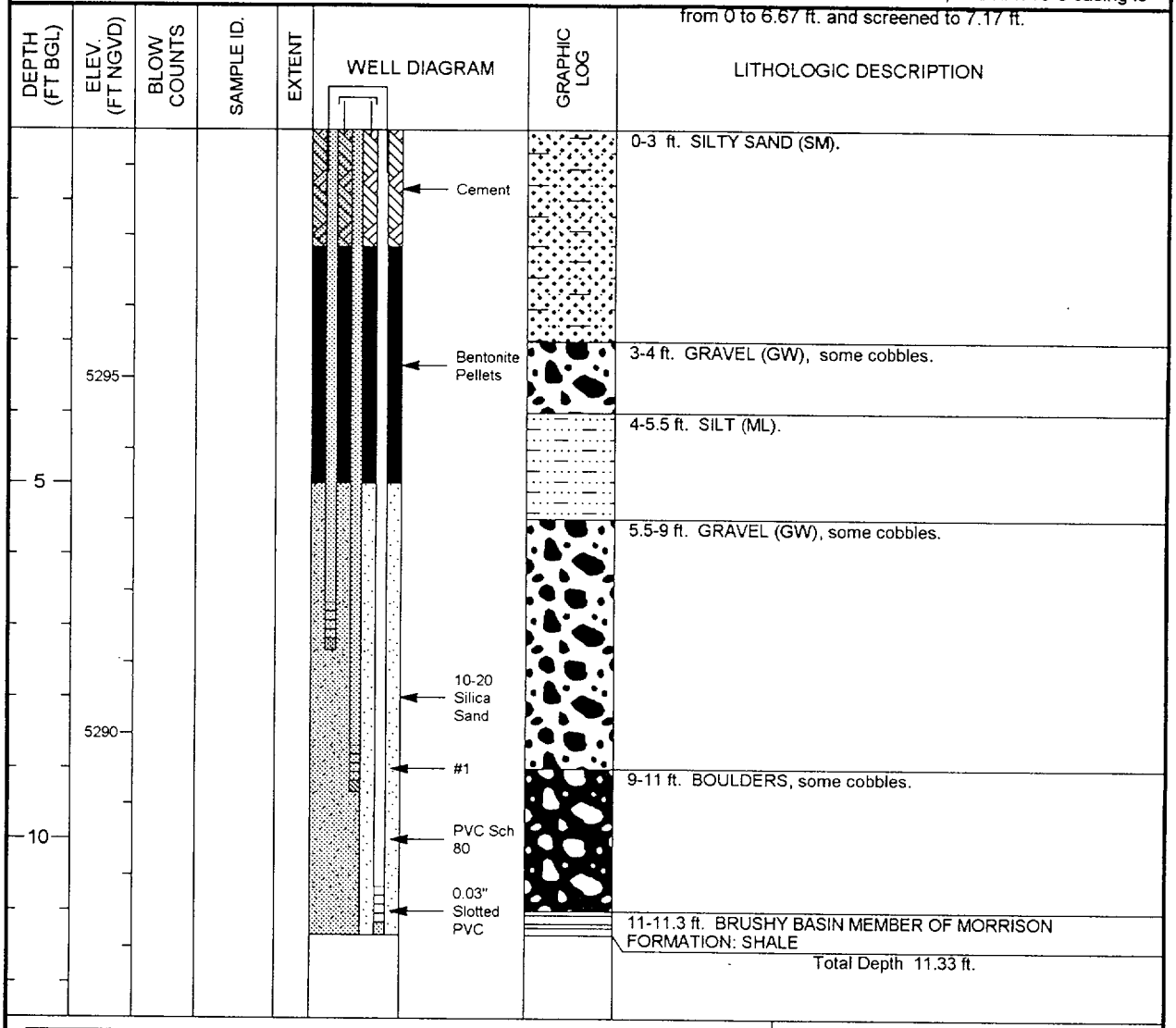
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT18-1

NORTH COORD. (FT) 587229.97
EAST COORD. (FT) 1107140.96
HOLE DEPTH (FT) 11.33
WELL DEPTH (FT) 11.33

DATE DRILLED 07/02/1999
SURFACE ELEV. (FT NGVD) 5298.51
TOP OF CASING (FT) 5301.19
MEAS. PT. ELEV. (FT) 5301.19
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.68	to	10.66
WELL SCREEN:	0.5 in. Slotted PVC	10.66	to	11.16
SUMP/END CAP:	0.5 in. PVC Sch 80	11.16	to	11.33
SURFACE SEAL:	Cement	0.0	to	1.67
GROUT:				
SEAL:	Bentonite Pellets	1.67	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	11.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT18-1 casing and screen depths provided; NAT18-2 casing is from 0 to 8.67 ft. and screened to 9.17 ft.; and NAT18-3 casing is from 0 to 6.67 ft. and screened to 7.17 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT18-2

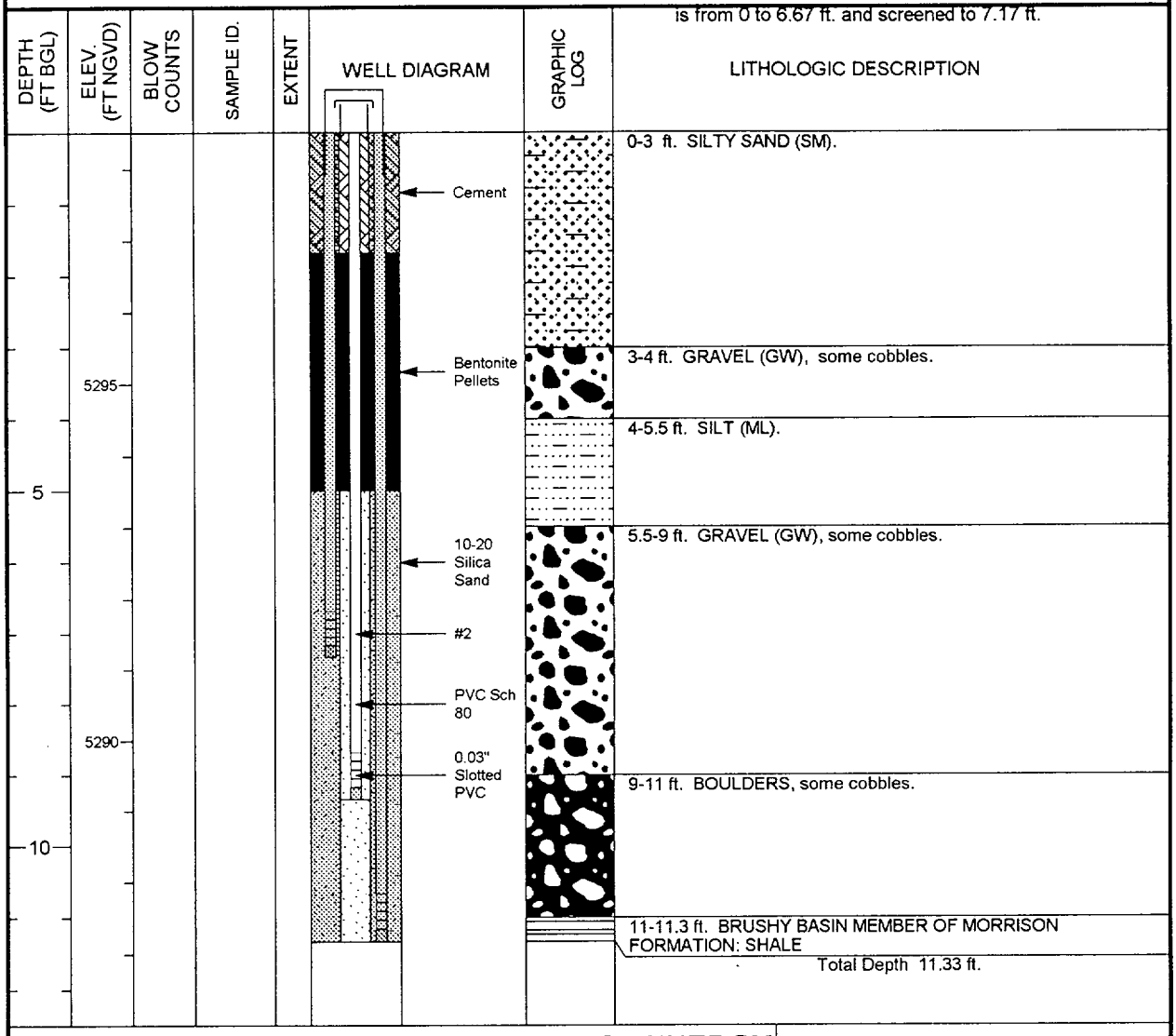
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT18-2

NORTH COORD. (FT) 587229.97
EAST COORD. (FT) 1107140.96
HOLE DEPTH (FT) 11.33
WELL DEPTH (FT) 9.34

DATE DRILLED 07/02/1999
SURFACE ELEV. (FT NGVD) 5298.51
TOP OF CASING (FT) 5301.19
MEAS. PT. ELEV. (FT) 5301.19
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.68	to	8.67
WELL SCREEN:	0.5 in. Slotted PVC	8.67	to	9.17
SUMP/END CAP:	0.5 in. PVC Sch 80	9.17	to	9.34
SURFACE SEAL:	Cement	0.0	to	1.67
GROUT:				
SEAL:	Bentonite Pellets	1.67	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	11.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT18-2 casing and screen depths provided; NAT18-1 casing is from 0 to 10.66 ft. and screened to 11.16 ft.; and NAT18-3 casing is from 0 to 6.67 ft. and screened to 7.17 ft.

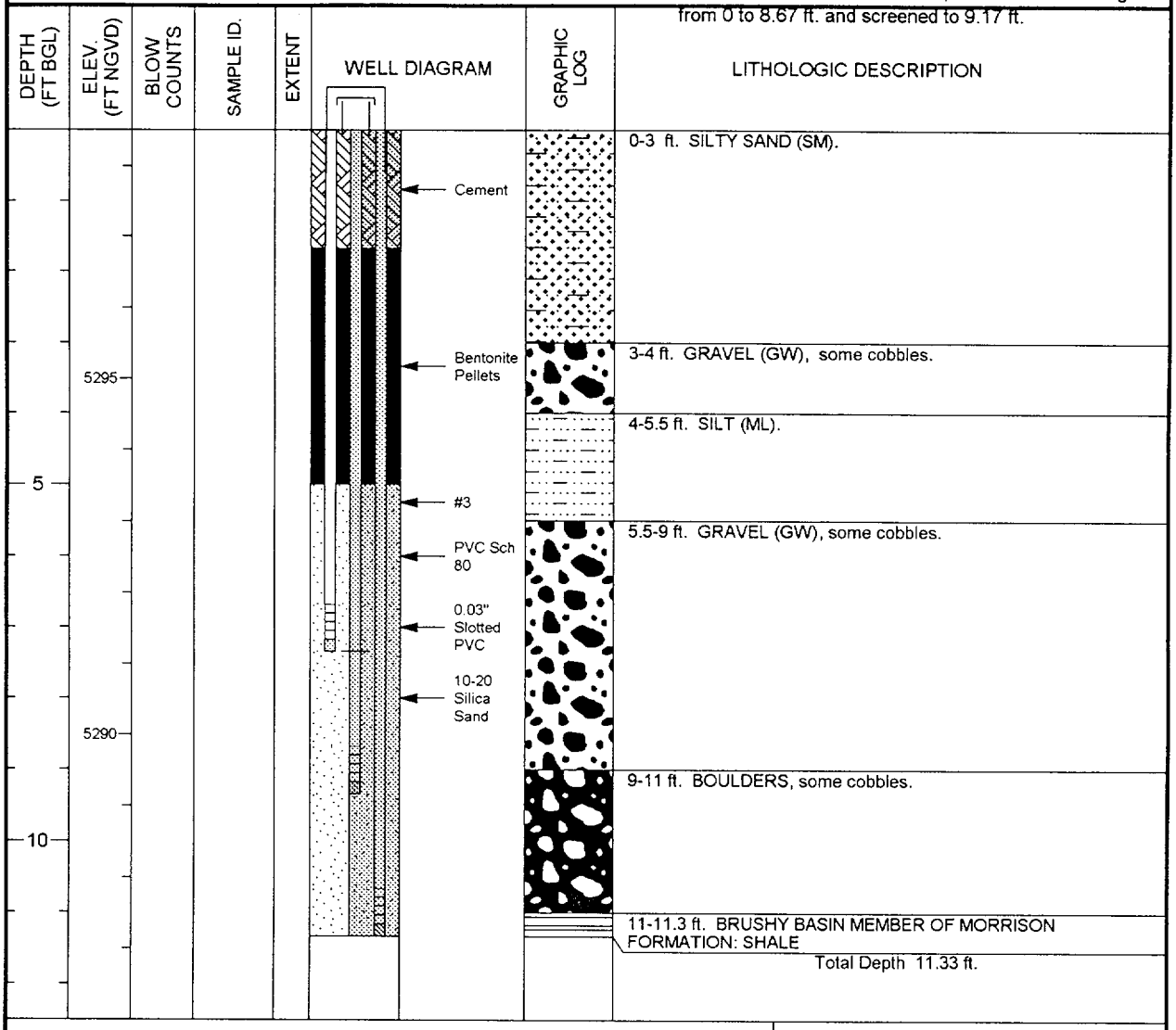


MONITORING WELL COMPLETION LOG NAT01-NAT18-3

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587229.97	DATE DRILLED	07/02/1999
LOCATION	, CO	EAST COORD. (FT)	1107140.96	SURFACE ELEV. (FT NGVD)	5298.51
SITE	NATURITA	HOLE DEPTH (FT)	11.33	TOP OF CASING (FT)	5301.19
WELL NUMBER	NAT18-3	WELL DEPTH (FT)	7.34	MEAS. PT. ELEV. (FT)	5301.19
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.68	to	6.67
WELL SCREEN:	0.5 in. Slotted PVC	6.67	to	7.17
SUMP/END CAP:	0.5 in. PVC Sch 80	7.17	to	7.34
SURFACE SEAL:	Cement	0.0	to	1.67
GROUT:				
SEAL:	Bentonite Pellets	1.67	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	11.33

DRILLING METHOD	HAMMER CASING ADVANCE
SAMPLING METHOD	
DATE DEVELOPED	
WATER LEVEL (FT BGS)	
LOGGED BY	Holmes/Rowland
REMARKS	Cluster of 3 casings: NAT18-3 casing and screen depths provided; NAT18-1 casing is from 0 to 9.33 ft. and screened to 9.83 ft.; and NAT18-2 casing is from 0 to 8.67 ft. and screened to 9.17 ft.

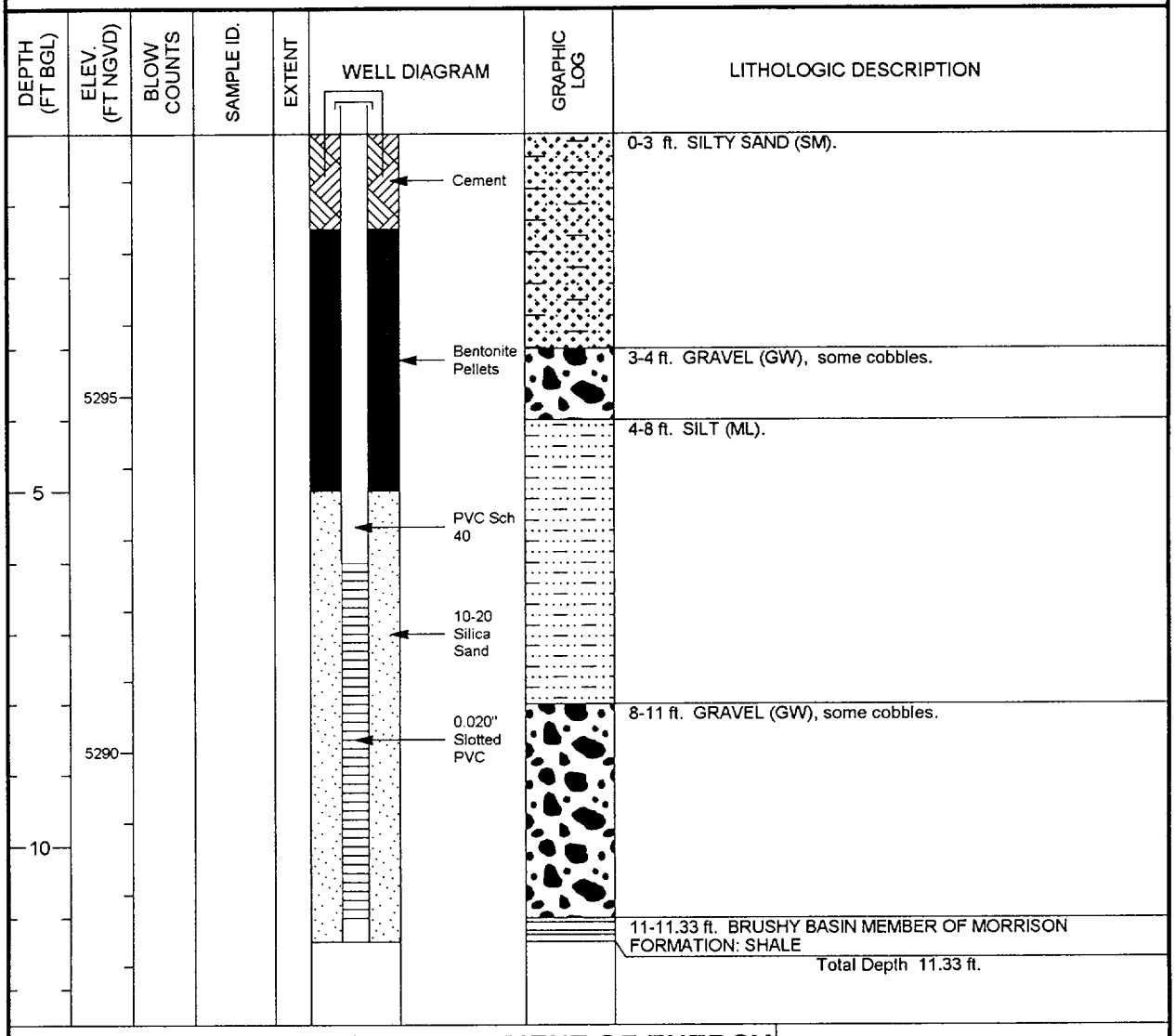


MONITORING WELL COMPLETION LOG NAT01-NAT19

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587224.44	DATE DRILLED	07/02/1999
LOCATION	, CO	EAST COORD. (FT)	1107145.63	SURFACE ELEV. (FT NGVD)	5298.67
SITE	NATURITA	HOLE DEPTH (FT)	11.33	TOP OF CASING (FT)	5301.36
WELL NUMBER	NAT19	WELL DEPTH (FT)	11.33	MEAS. PT. ELEV. (FT)	5301.36
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.69	to	6.0	
WELL SCREEN:	2 in. Slotted PVC	6.0	to	11.0	
SUMP/END CAP:	2 in. PVC Sch 40	11.0	to	11.33	
SURFACE SEAL:	Cement	0.0	to	1.33	
GROUT:					
SEAL:	Bentonite Pellets	1.33	to	5.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	5.0	to	11.33	

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS

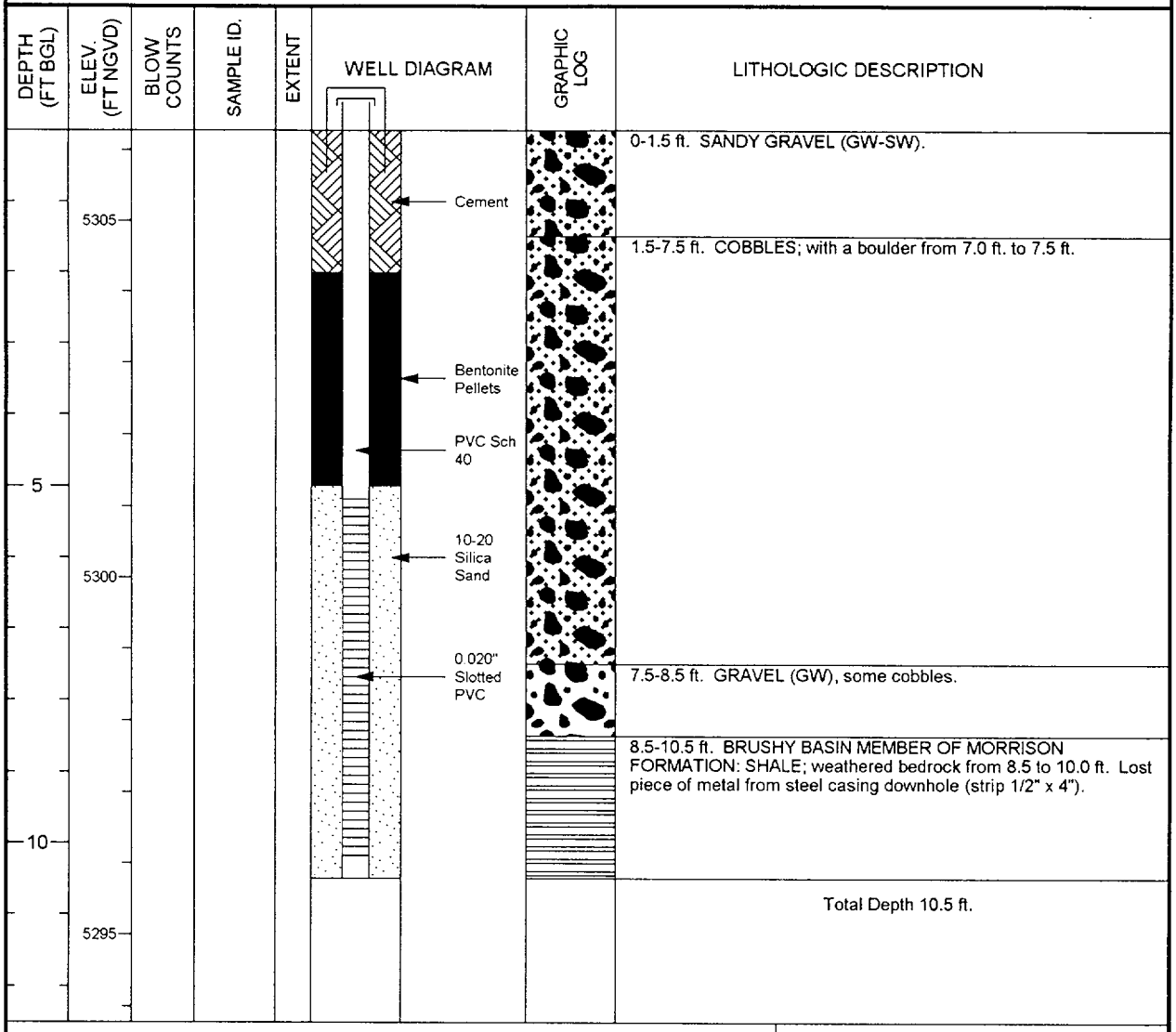


MONITORING WELL COMPLETION LOG NAT01-NAT20

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	586308.35	DATE DRILLED	07/03/1999
LOCATION	, CO	EAST COORD. (FT)	1107776.56	SURFACE ELEV. (FT NGVD)	5306.28
SITE	NATURITA	HOLE DEPTH (FT)	10.50	TOP OF CASING (FT)	5309.29
WELL NUMBER	NAT20	WELL DEPTH (FT)	10.50	MEAS. PT. ELEV. (FT)	5309.29
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	2 in. PVC Sch 40	-3.01	to	5.17
WELL SCREEN:	2 in. Slotted PVC	5.17	to	10.17
SUMP/END CAP:	2 in. PVC Sch 40	10.17	to	10.5
SURFACE SEAL:	Cement	0.0	to	2.0
GROUT:				
SEAL:	Bentonite Pellets	2.0	to	5.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	5.0	to	10.5

DRILLING METHOD	HAMMER CASING ADVANCE
SAMPLING METHOD	
DATE DEVELOPED	
WATER LEVEL (FT BGS)	
LOGGED BY	Holmes/Rowland
REMARKS	



MONITORING WELL COMPLETION LOG NAT01-NAT21-1

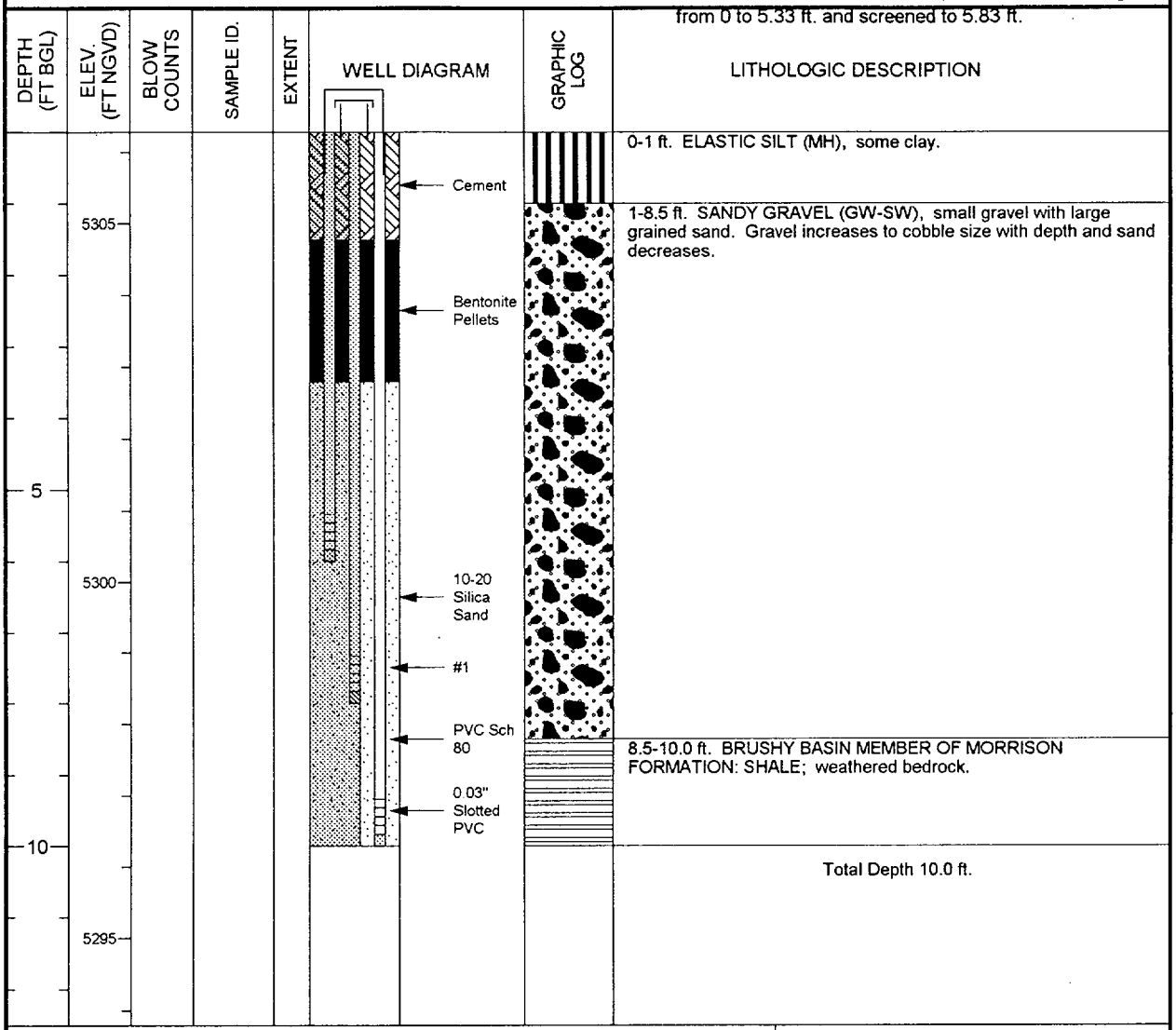
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT21-1

NORTH COORD. (FT) 586313.05
EAST COORD. (FT) 1107772.43
HOLE DEPTH (FT) 10.00
WELL DEPTH (FT) 10.00

DATE DRILLED 07/03/1999
SURFACE ELEV. (FT NGVD) 5306.29
TOP OF CASING (FT) 5309.07
MEAS. PT. ELEV. (FT) 5309.07
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.78	to	9.33
WELL SCREEN:	0.5 in. Slotted PVC	9.33	to	9.83
SUMP/END CAP:	0.5 in. PVC Sch 80	9.83	to	10.0
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.5	to	10.0

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT21-1 casing and screen depths provided; NAT21-2 casing is from 0 to 7.33 ft. and screened to 7.83 ft.; and NAT21-3 casing is from 0 to 5.33 ft. and screened to 5.83 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT21-2

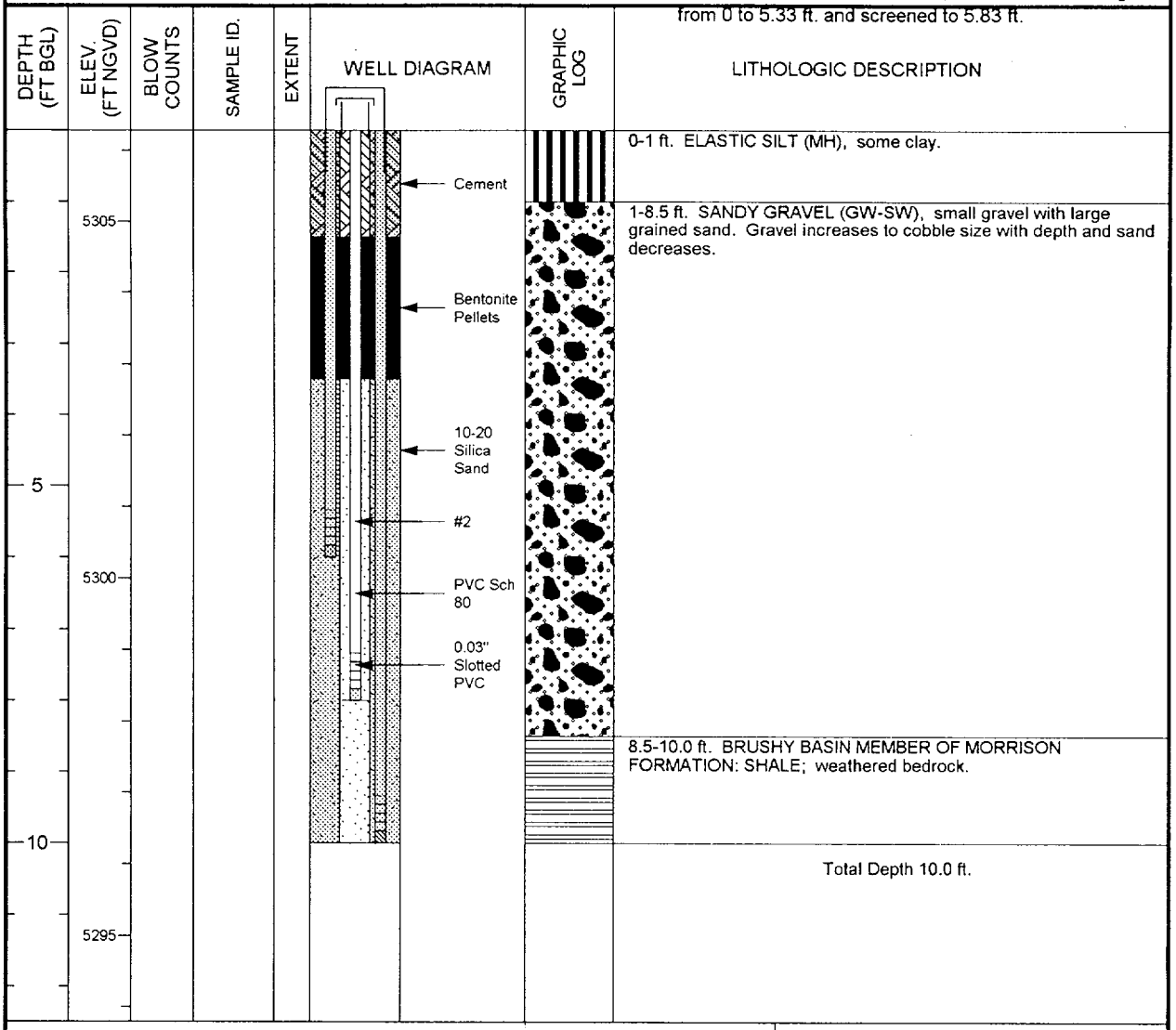
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT21-2

NORTH COORD. (FT) 586313.05
EAST COORD. (FT) 1107772.43
HOLE DEPTH (FT) 10.00
WELL DEPTH (FT) 8.00

DATE DRILLED 07/03/1999
SURFACE ELEV. (FT NGVD) 5306.29
TOP OF CASING (FT) 5309.07
MEAS. PT. ELEV. (FT) 5309.07
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.78	to	7.33
WELL SCREEN:	0.5 in. Slotted PVC	7.33	to	7.83
SUMP/END CAP:	0.5 in. PVC Sch 80	7.83	to	8.0
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.5	to	10.0

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT21-2 casing and screen depths provided; NAT21-1 casing is from 0 to 9.33 ft. and screened to 9.83 ft.; and NAT21-3 casing is from 0 to 5.33 ft. and screened to 5.83 ft.

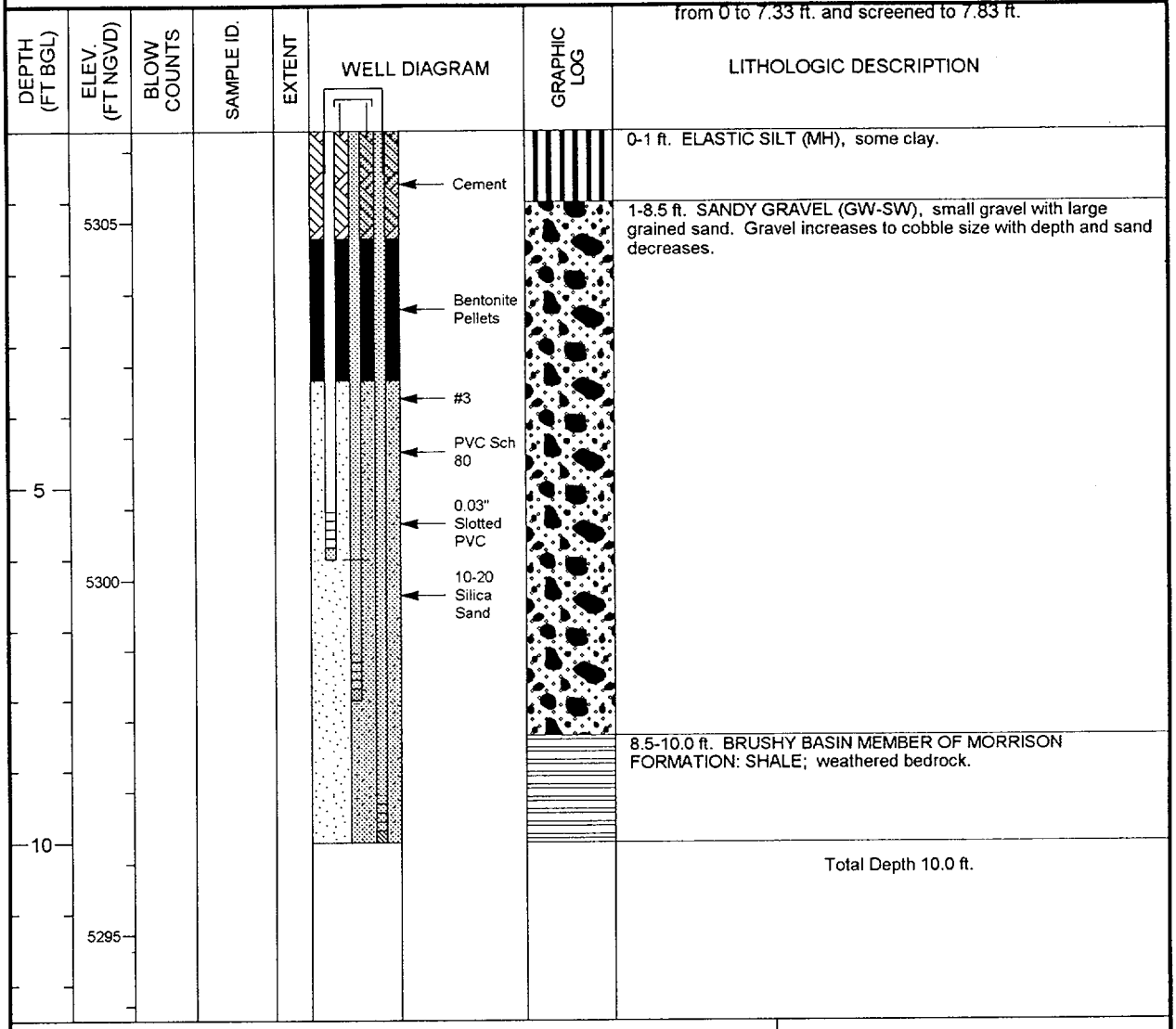


MONITORING WELL COMPLETION LOG NAT01-NAT21-3

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	586313.05	DATE DRILLED	07/03/1999
LOCATION	, CO	EAST COORD. (FT)	1107772.43	SURFACE ELEV. (FT NGVD)	5306.29
SITE	NATURITA	HOLE DEPTH (FT)	10.00	TOP OF CASING (FT)	5309.07
WELL NUMBER	NAT21-3	WELL DEPTH (FT)	6.00	MEAS. PT. ELEV. (FT)	5309.07
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.78	to	5.33
WELL SCREEN:	0.5 in. Slotted PVC	5.33	to	5.83
SUMP/END CAP:	0.5 in. PVC Sch 80	5.83	to	6.0
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.5	to	10.0

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT21-3 casing and screen depths provided; NAT21-1 casing is from 0 to 9.33 ft. and screened to 9.83 ft.; and NAT21-2 casing is from 0 to 7.33 ft. and screened to 7.83 ft.

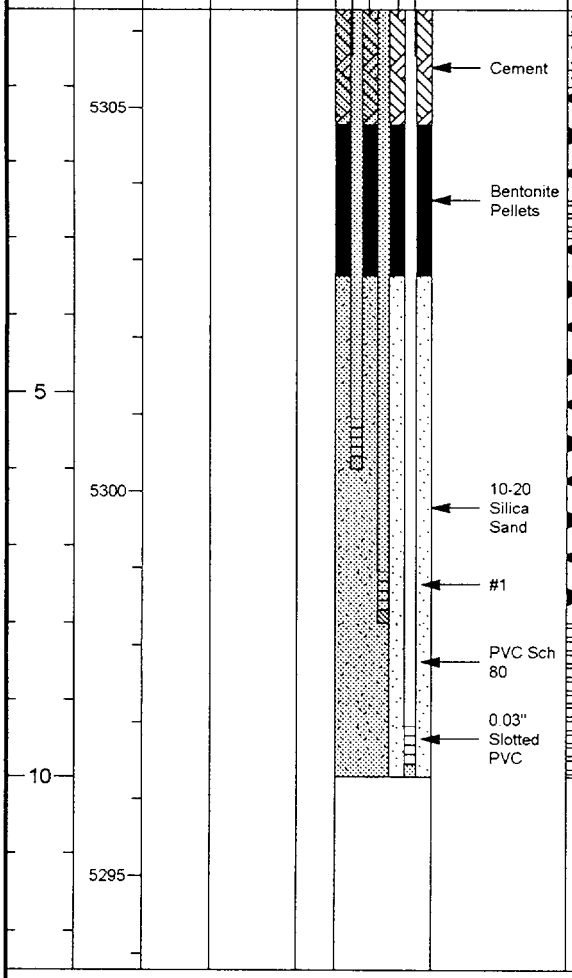


MONITORING WELL COMPLETION LOG NAT01-NAT22-1

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	586318.78	DATE DRILLED	07/04/1999
LOCATION	, CO	EAST COORD. (FT)	1107768.24	SURFACE ELEV. (FT NGVD)	5306.29
SITE	NATURITA	HOLE DEPTH (FT)	10.00	TOP OF CASING (FT)	5309.05
WELL NUMBER	NAT22-1	WELL DEPTH (FT)	10.00	MEAS. PT. ELEV. (FT)	5309.05
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.76	to	9.33
WELL SCREEN:	0.5 in. Slotted PVC	9.33	to	9.83
SUMP/END CAP:	0.5 in. PVC Sch 80	9.83	to	10.0
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.5	to	10.0

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT22-1 casing and screen depths provided; NAT22-2 casing is from 0 to 7.33 ft. and screened to 7.83 ft.; and NAT22.3 casing is from 0 to 5.33 ft. and screened to 5.83 ft.



LITHOLOGIC DESCRIPTION

0-1 ft. SILTY SAND (SM). Light tan in color.

1-2.5 ft. GRAVEL (GW), samll gravel and small cobbles. Light tan in color.

2.5-3 ft. SHALE, some small size gravel. Light tan in color.

3-8 ft. GRAVEL (GW), gravel increases in size with depth. Color changes to dark brown.

8-10 ft. BRUSHY BASIN MEMBER OF MORRISON FORMATION: SHALE; weathered bedrock with large cobbles the first few inches. Dark gray in color.

Total Depth 10.0 ft.

MONITORING WELL COMPLETION LOG NAT01-NAT22-2

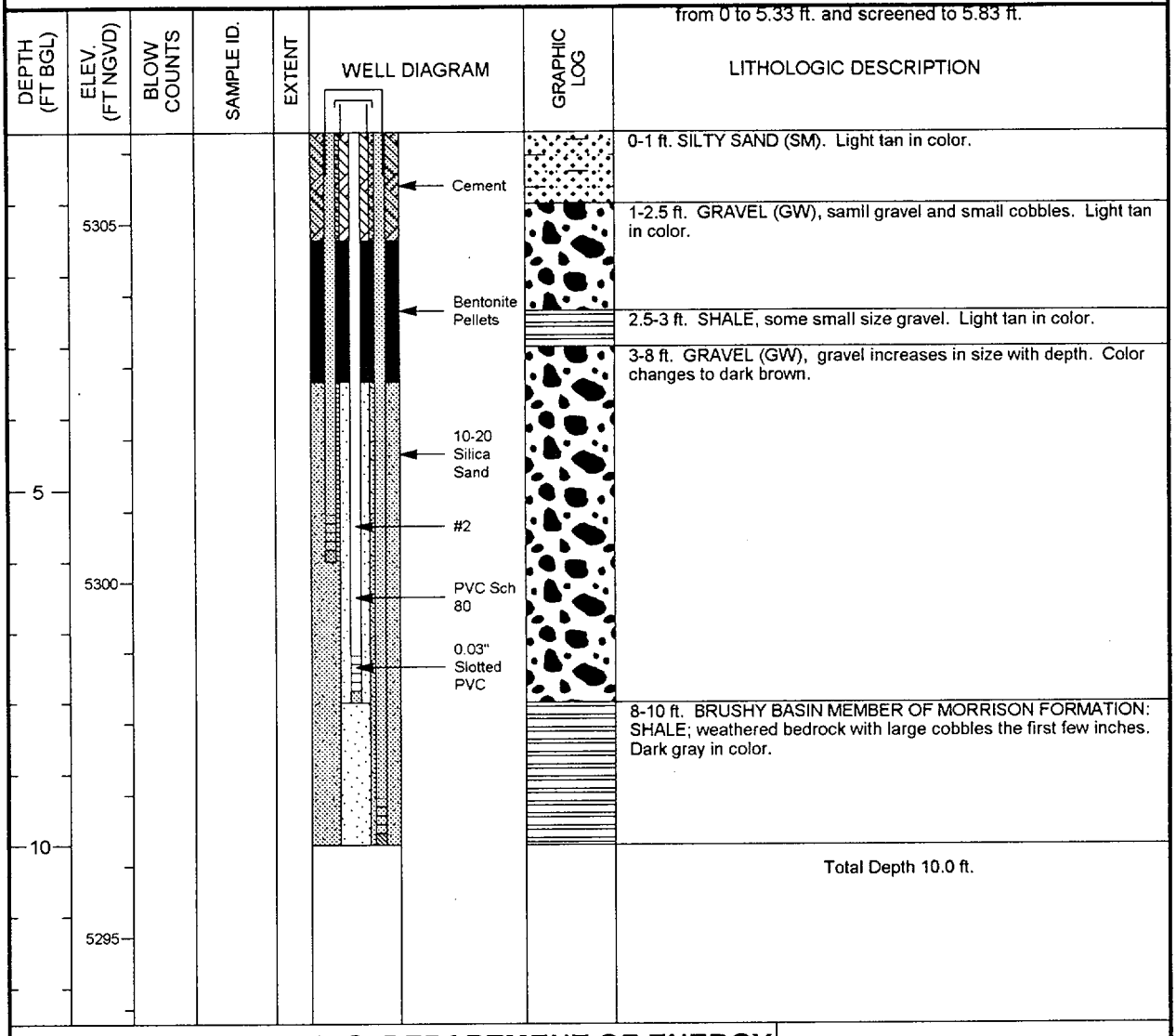
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT22-2

NORTH COORD. (FT) 586318.78
EAST COORD. (FT) 1107768.24
HOLE DEPTH (FT) 10.00
WELL DEPTH (FT) 8.00

DATE DRILLED 07/04/1999
SURFACE ELEV. (FT NGVD) 5306.29
TOP OF CASING (FT) 5309.05
MEAS. PT. ELEV. (FT) 5309.05
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.76	to	7.33
WELL SCREEN:	0.5 in. Slotted PVC	7.33	to	7.83
SUMP/END CAP:	0.5 in. PVC Sch 80	7.83	to	8.0
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.5	to	10.0

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT22-2 casing and screen depths provided; NAT22-1 casing is from 0 to 9.33 ft. and screened to 9.83 ft.; and NAT22.3 casing is from 0 to 5.33 ft. and screened to 5.83 ft.

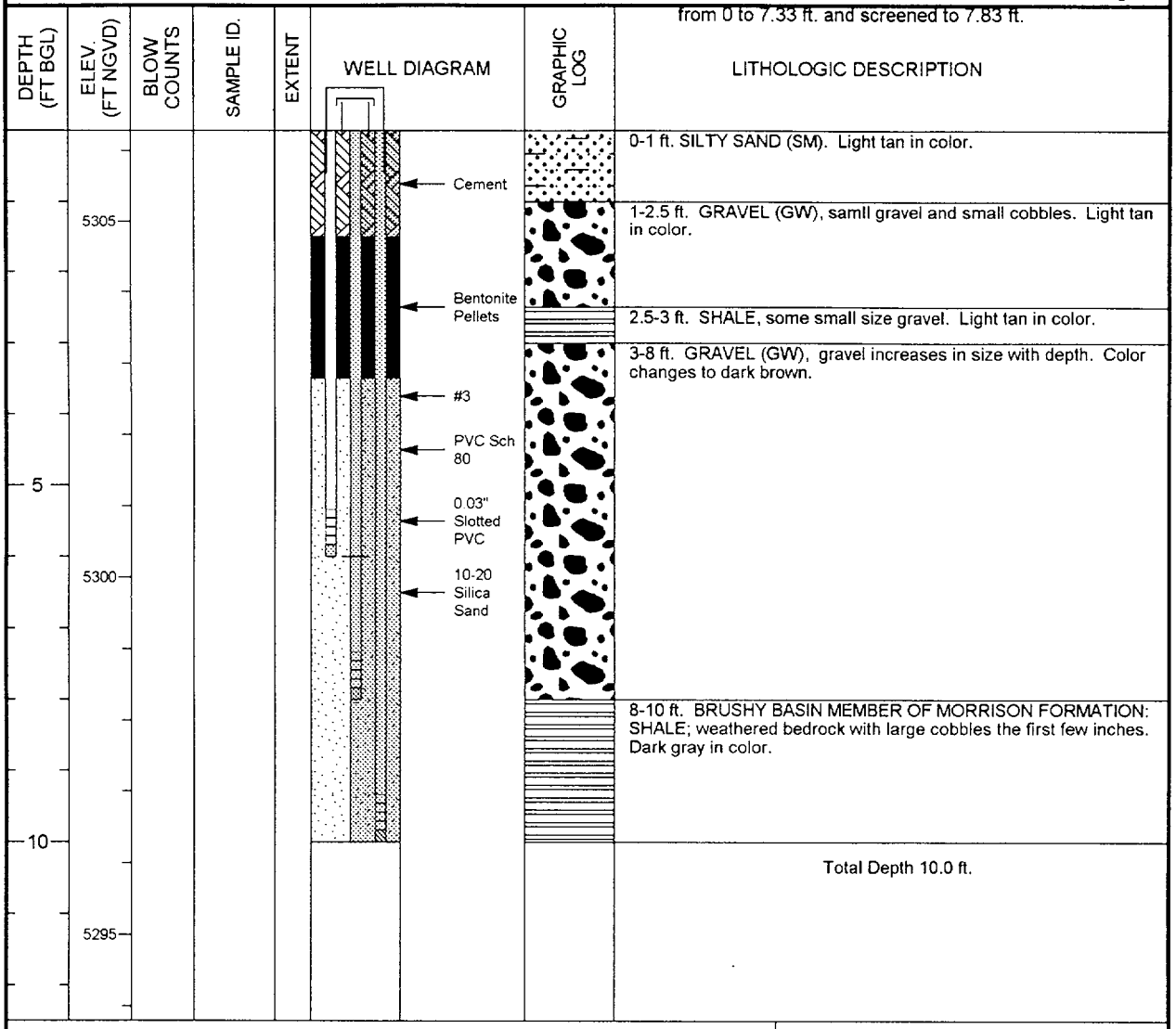


MONITORING WELL COMPLETION LOG NAT01-NAT22-3

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	586318.78	DATE DRILLED	07/04/1999
LOCATION	, CO	EAST COORD. (FT)	1107768.24	SURFACE ELEV. (FT NGVD)	5306.29
SITE	NATURITA	HOLE DEPTH (FT)	10.00	TOP OF CASING (FT)	5309.05
WELL NUMBER	NAT22-3	WELL DEPTH (FT)	6.00	MEAS. PT. ELEV. (FT)	5309.05
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.76	to	5.33
WELL SCREEN:	0.5 in. Slotted PVC	5.33	to	5.83
SUMP/END CAP:	0.5 in. PVC Sch 80	5.83	to	6.0
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.5
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.5	to	10.0

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT22-2 casing and screen depths provided; NAT22-1 casing is from 0 to 9.33 ft. and screened to 9.83 ft.; and NAT22-2 casing is from 0 to 7.33 ft. and screened to 7.83 ft.

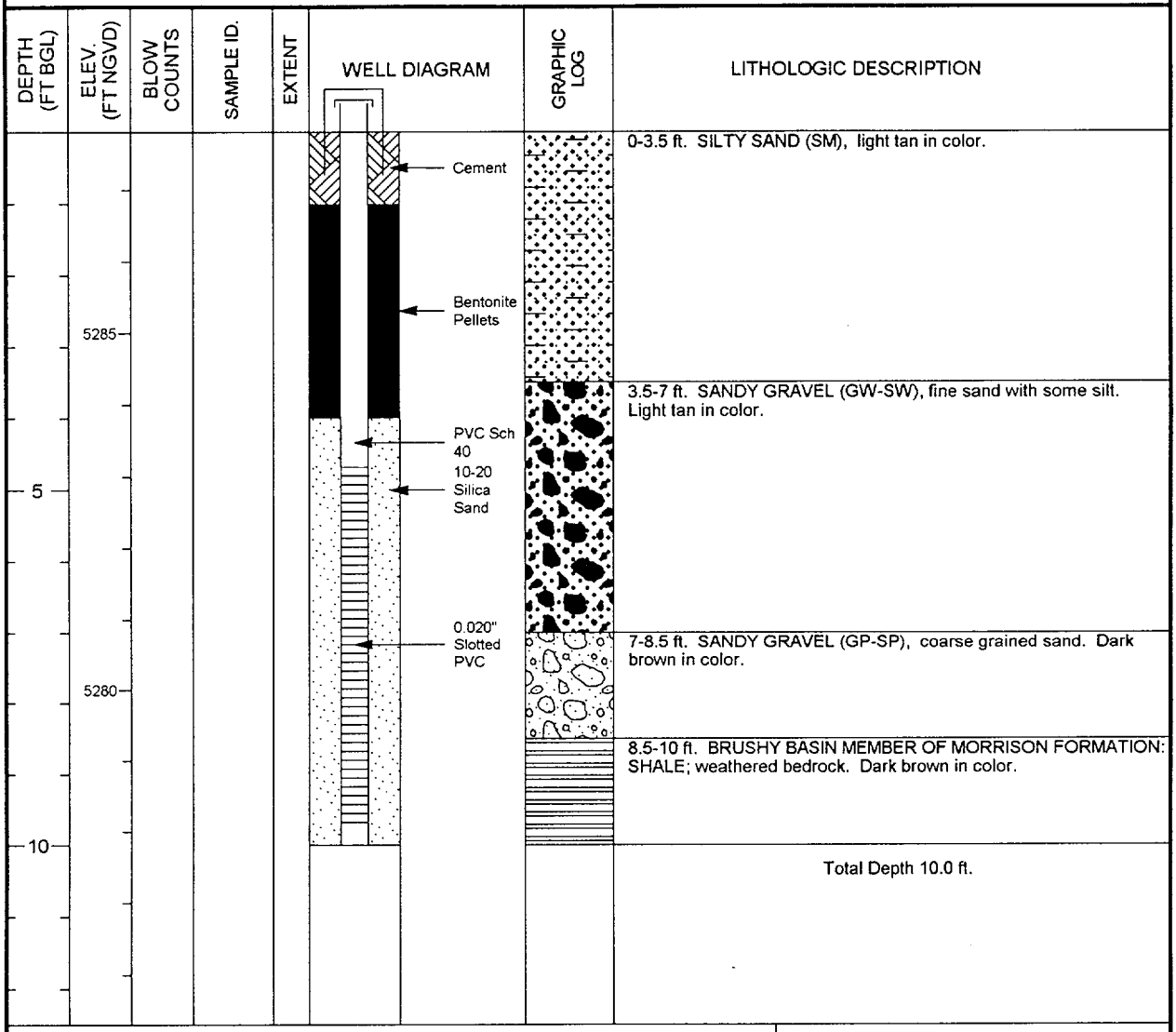


MONITORING WELL COMPLETION LOG NAT01-NAT23

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589215.25	DATE DRILLED	07/05/1999
LOCATION	, CO	EAST COORD. (FT)	1106290.35	SURFACE ELEV. (FT NGVD)	5287.81
SITE	NATURITA	HOLE DEPTH (FT)	10.00	TOP OF CASING (FT)	5290.19
WELL NUMBER	NAT23	WELL DEPTH (FT)	10.00	MEAS. PT. ELEV. (FT)	5290.19
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.38	to	4.67	
WELL SCREEN:	2 in. Slotted PVC	4.67	to	9.67	
SUMP/END CAP:	2 in. PVC Sch 40	9.67	to	10.0	
SURFACE SEAL:	Cement	0.0	to	1.0	
GROUT:					
SEAL:	Bentonite Pellets	1.0	to	4.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	4.0	to	10.0	

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS



mactec-ers

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION OFFICE, COLORADO

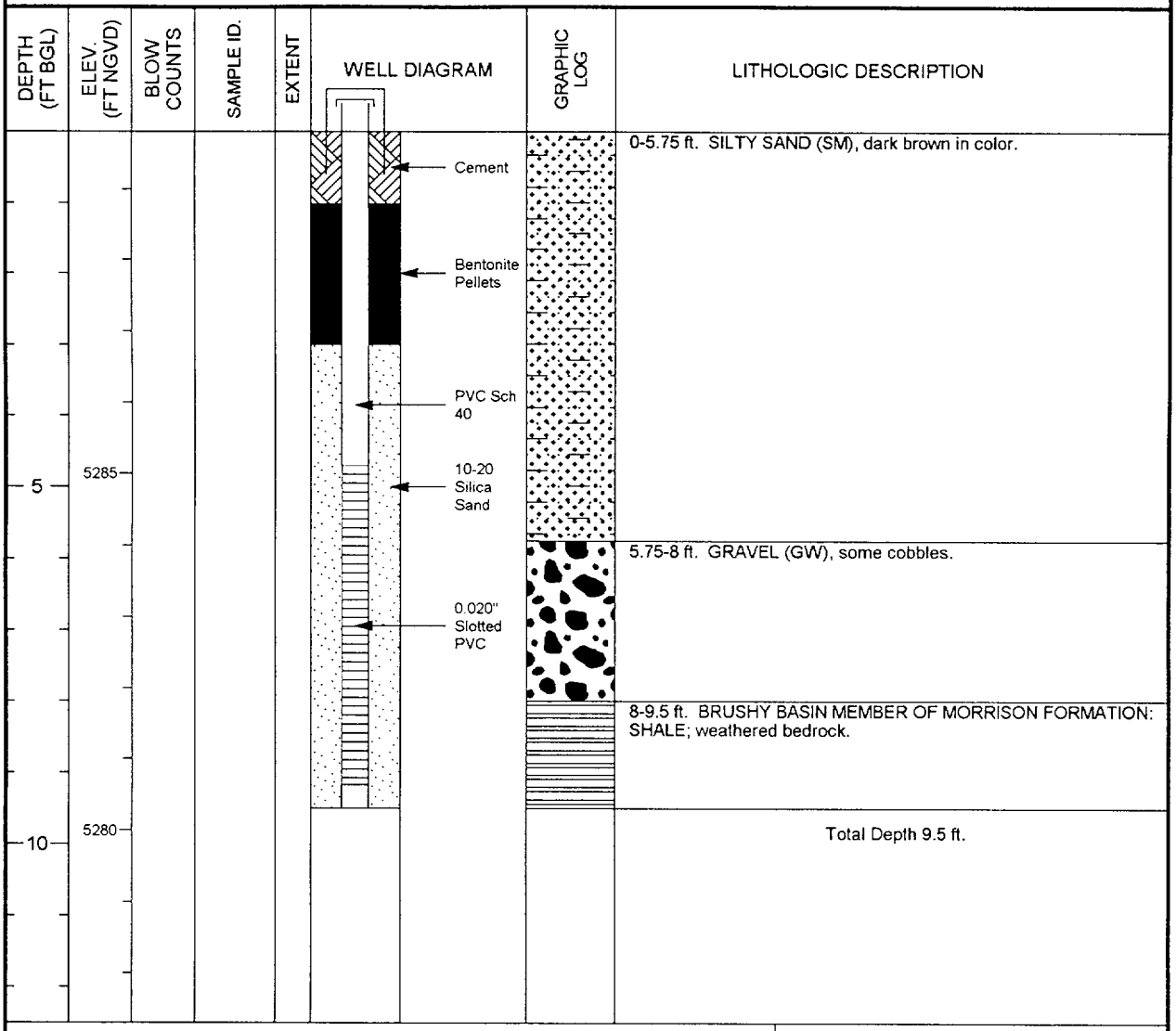
 08/02/2001

MONITORING WELL COMPLETION LOG NAT01-NAT24

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589167.42	DATE DRILLED	07/05/1999
LOCATION	, CO	EAST COORD. (FT)	1106178.07	SURFACE ELEV. (FT NGVD)	5289.81
SITE	NATURITA	HOLE DEPTH (FT)	9.50	TOP OF CASING (FT)	5292.34
WELL NUMBER	NAT24	WELL DEPTH (FT)	9.50	MEAS. PT. ELEV. (FT)	5292.34
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.53	to	4.7	
WELL SCREEN:	2 in. Slotted PVC	4.7	to	9.17	
SUMP/END CAP:	2 in. PVC Sch 40	9.17	to	9.5	
SURFACE SEAL:	Cement	0.0	to	1.0	
GROUT:					
SEAL:	Bentonite Pellets	1.0	to	3.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	3.0	to	9.5	

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS

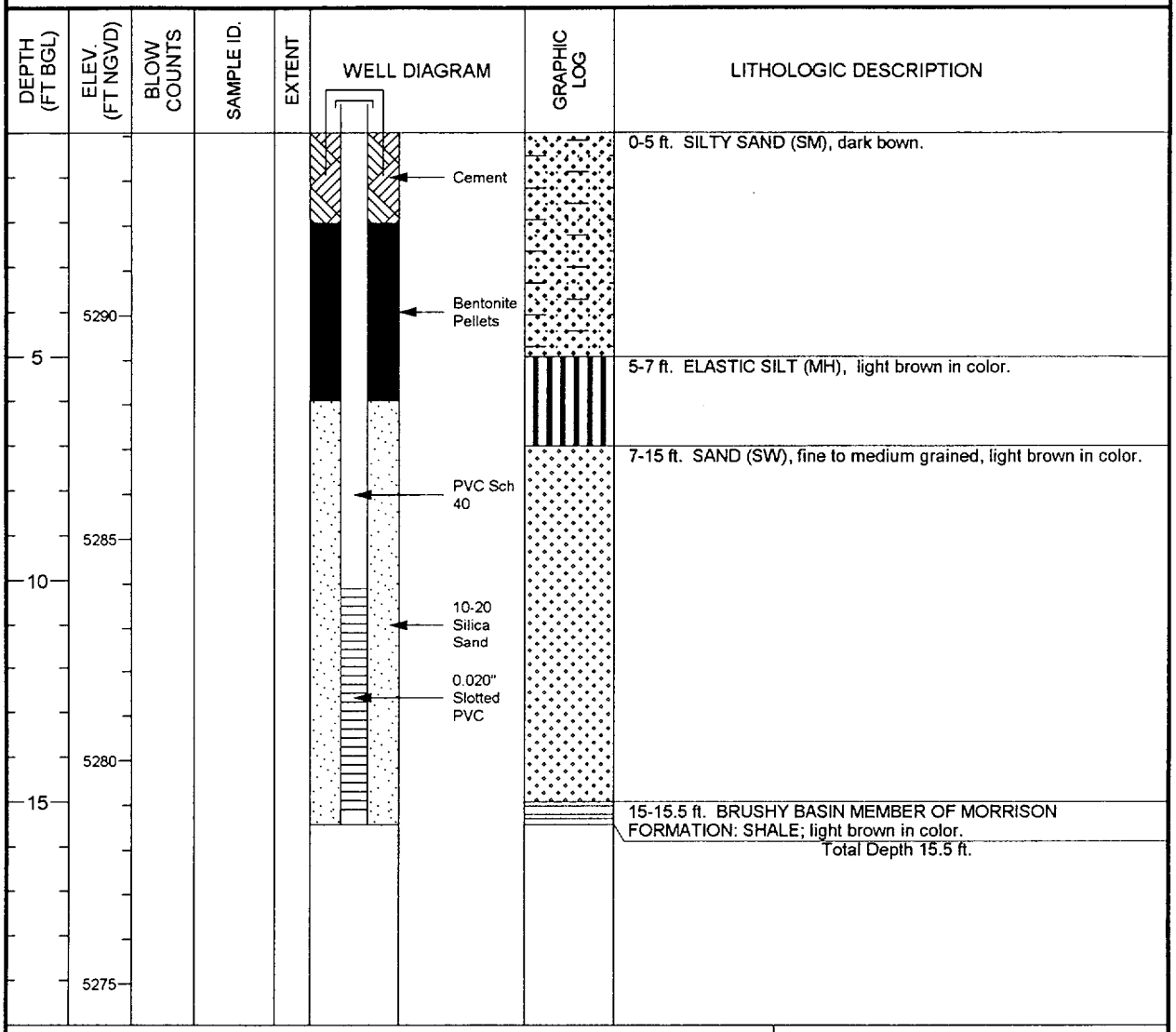


MONITORING WELL COMPLETION LOG NAT01-NAT25

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	589095.59	DATE DRILLED	07/05/1999
LOCATION	, CO	EAST COORD. (FT)	1106042.99	SURFACE ELEV. (FT NGVD)	5294.08
SITE	NATURITA	HOLE DEPTH (FT)	15.50	TOP OF CASING (FT)	5296.55
WELL NUMBER	NAT25	WELL DEPTH (FT)	15.50	MEAS. PT. ELEV. (FT)	5296.55
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.47	to	10.17	
WELL SCREEN:	2 in. Slotted PVC	10.17	to	15.17	
SUMP/END CAP:	2 in. PVC Sch 40	15.17	to	15.5	
SURFACE SEAL:	Cement	0.0	to	2.0	
GROUT:					
SEAL:	Bentonite Pellets	2.0	to	6.0	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	6.0	to	15.5	

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS

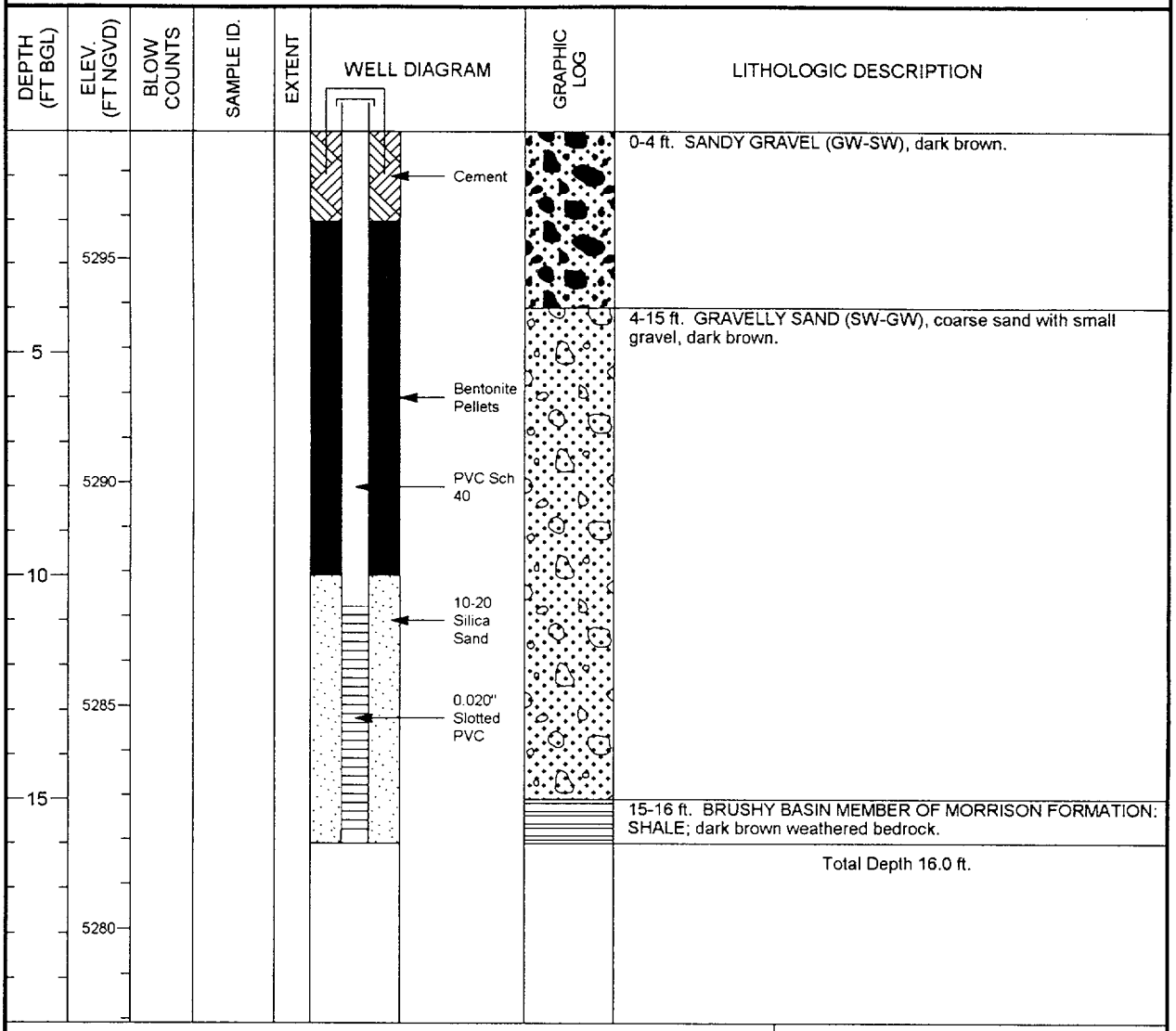


MONITORING WELL COMPLETION LOG NAT01-NAT26

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	588699.25	DATE DRILLED	07/05/1999
LOCATION	, CO	EAST COORD. (FT)	1106014.15	SURFACE ELEV. (FT NGVD)	5297.90
SITE	NATURITA	HOLE DEPTH (FT)	16.00	TOP OF CASING (FT)	5300.21
WELL NUMBER	NAT26	WELL DEPTH (FT)	16.00	MEAS. PT. ELEV. (FT)	5300.21
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	2 in. PVC Sch 40	-2.31	to	10.67
WELL SCREEN:	2 in. Slotted PVC	10.67	to	15.67
SUMP/END CAP:	2 in. PVC Sch 40	15.67	to	16.0
SURFACE SEAL:	Cement	0.0	to	2.0
GROUT:				
SEAL:	Bentonite Pellets	2.0	to	10.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	10.0	to	16.0

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS

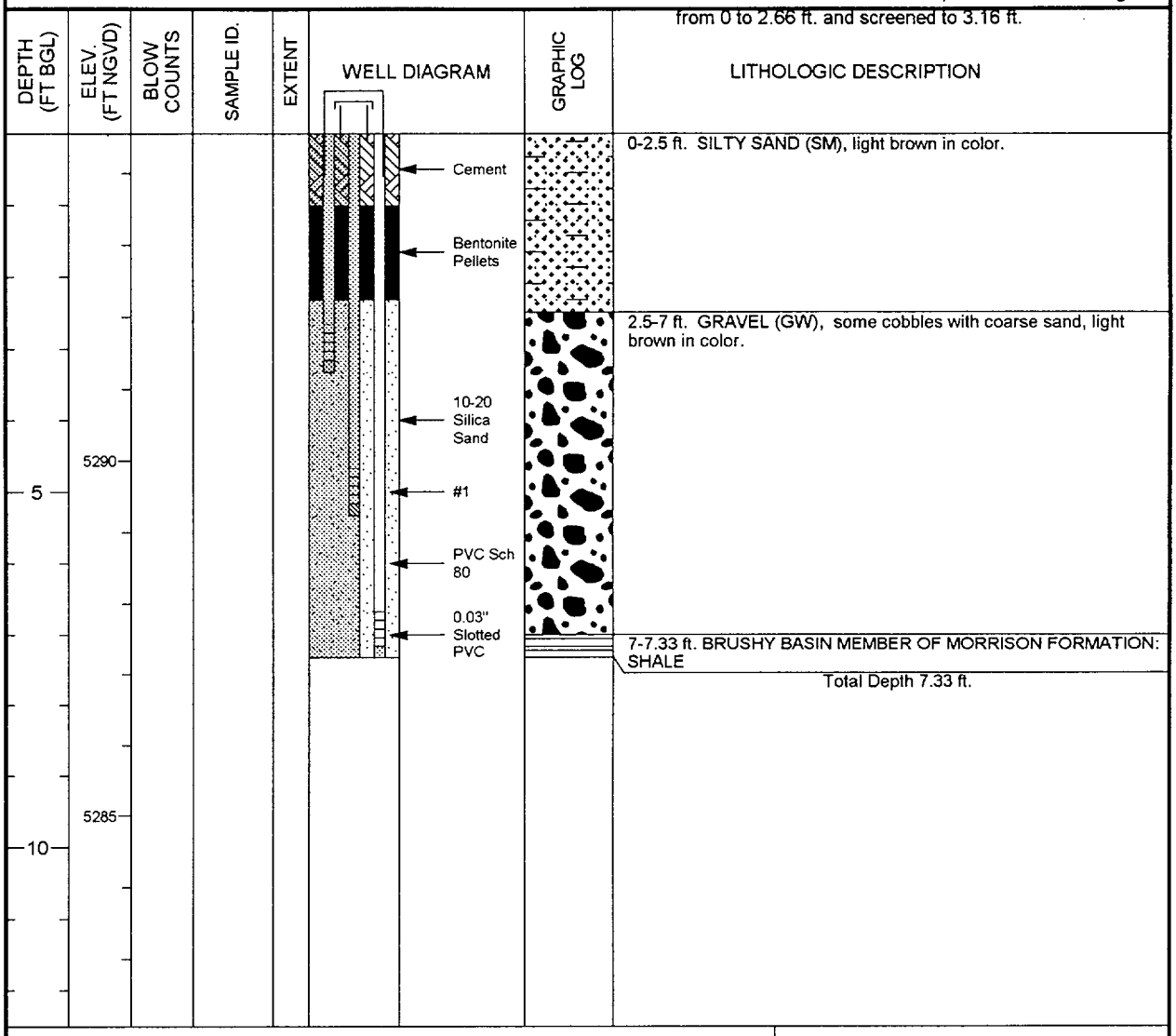


MONITORING WELL COMPLETION LOG NAT01-NAT27-1

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587776.30	DATE DRILLED	07/05/1999
LOCATION	, CO	EAST COORD. (FT)	1107200.51	SURFACE ELEV. (FT NGVD)	5294.56
SITE	NATURITA	HOLE DEPTH (FT)	7.33	TOP OF CASING (FT)	5297.53
WELL NUMBER	NAT27-1	WELL DEPTH (FT)	7.33	MEAS. PT. ELEV. (FT)	5297.53
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.97	to	6.66
WELL SCREEN:	0.5 in. Slotted PVC	6.66	to	7.16
SUMP/END CAP:	0.5 in. PVC Sch 80	7.16	to	7.33
SURFACE SEAL:	Cement	0.0	to	1.0
GROUT:				
SEAL:	Bentonite Pellets	1.0	to	2.33
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	2.33	to	7.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT27-1 casing and screen depths provided; NAT27-2 casing is from 0 to 4.66 ft. and screened to 5.16 ft.; and NAT27-3 casing is from 0 to 2.66 ft. and screened to 3.16 ft.

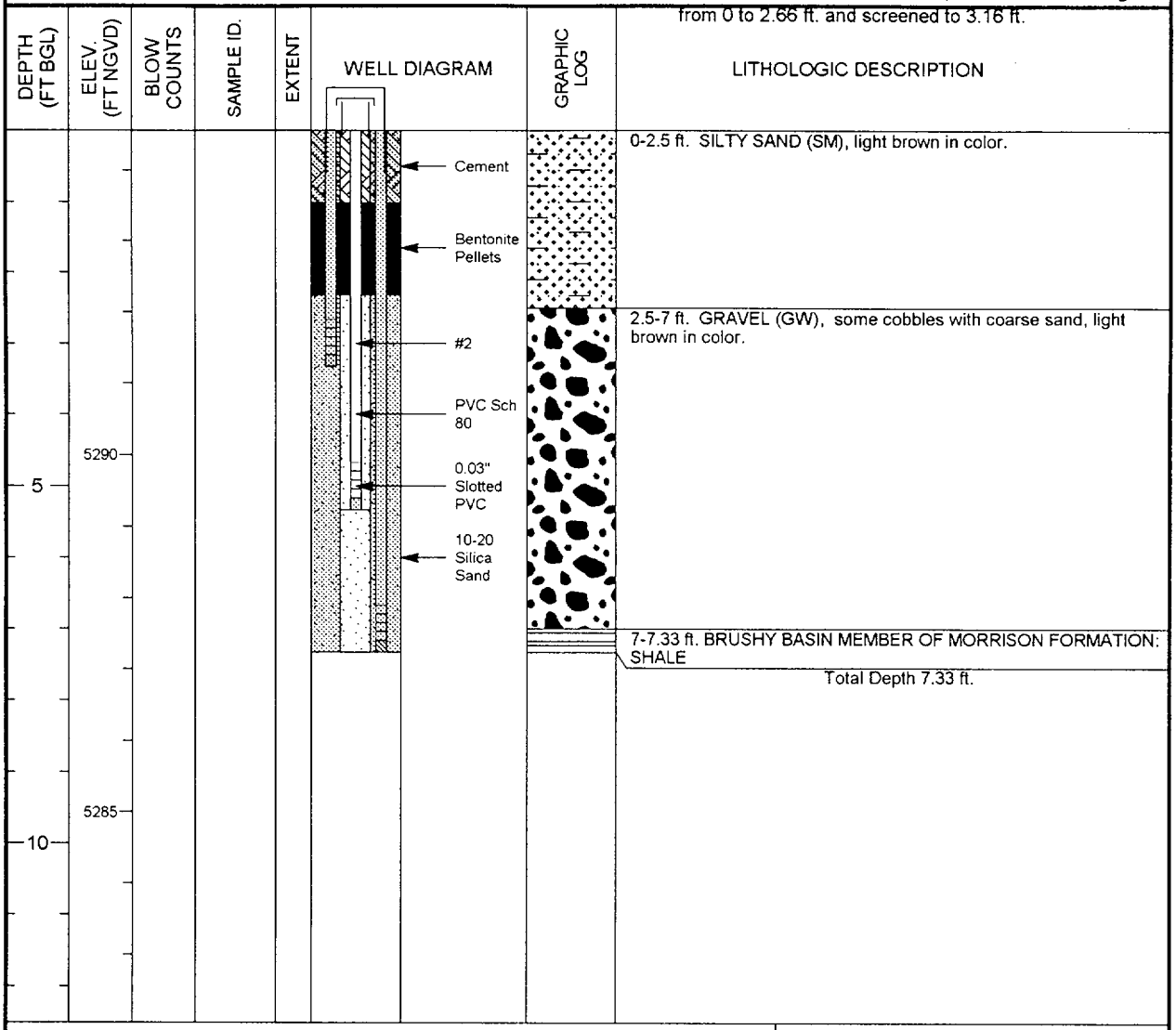


MONITORING WELL COMPLETION LOG NAT01-NAT27-2

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587776.30	DATE DRILLED	07/05/1999
LOCATION	, CO	EAST COORD. (FT)	1107200.51	SURFACE ELEV. (FT NGVD)	5294.56
SITE	NATURITA	HOLE DEPTH (FT)	7.33	TOP OF CASING (FT)	5297.50
WELL NUMBER	NAT27-2	WELL DEPTH (FT)	5.33	MEAS. PT. ELEV. (FT)	5297.50
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.94	to	4.66
WELL SCREEN:	0.5 in. Slotted PVC	4.66	to	5.16
SUMP/END CAP:	0.5 in. PVC Sch 80	5.16	to	5.33
SURFACE SEAL:	Cement	0.0	to	1.0
GROUT:				
SEAL:	Bentonite Pellets	1.0	to	2.33
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	2.33	to	7.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT27-2 casing and screen depths provided; NAT27-1 casing is from 0 to 6.66 ft. and screened to 7.16 ft.; and NAT27-3 casing is from 0 to 2.66 ft. and screened to 3.16 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT27-3

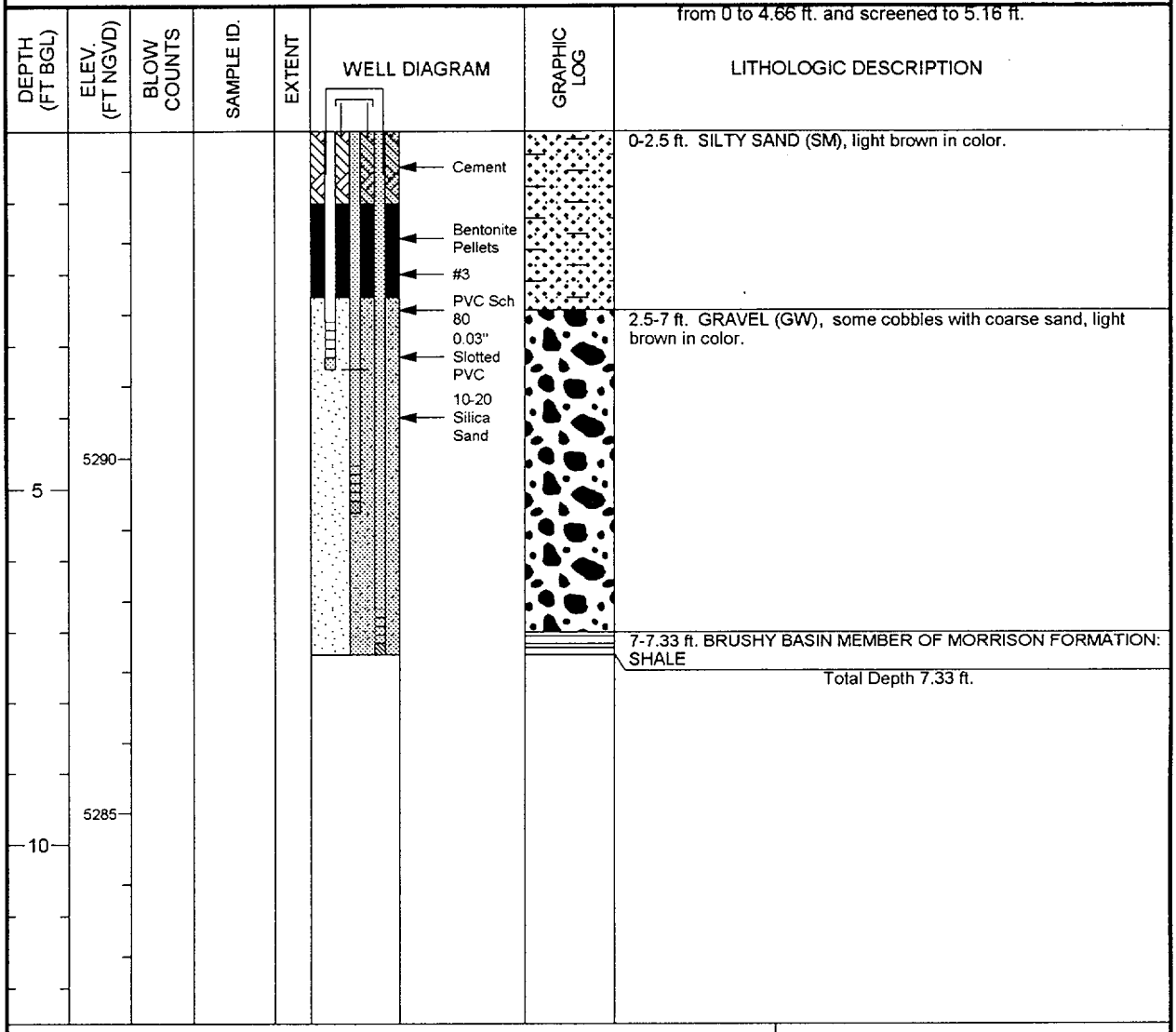
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT27-3

NORTH COORD. (FT) 587776.30
EAST COORD. (FT) 1107200.51
HOLE DEPTH (FT) 7.33
WELL DEPTH (FT) 3.33

DATE DRILLED 07/05/1999
SURFACE ELEV. (FT NGVD) 5294.56
TOP OF CASING (FT) 5297.51
MEAS. PT. ELEV. (FT) 5297.51
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.95	to	2.66
WELL SCREEN:	0.5 in. Slotted PVC	2.66	to	3.16
SUMP/END CAP:	0.5 in. PVC Sch 80	3.16	to	3.33
SURFACE SEAL:	Cement	0.0	to	1.0
GROUT:				
SEAL:	Bentonite Pellets	1.0	to	2.33
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	2.33	to	7.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT27-3 casing and screen depths provided; NAT27-1 casing is from 0 to 6.66 ft. and screened to 7.16 ft.; and NAT27-2 casing is from 0 to 4.66 ft. and screened to 5.16 ft.

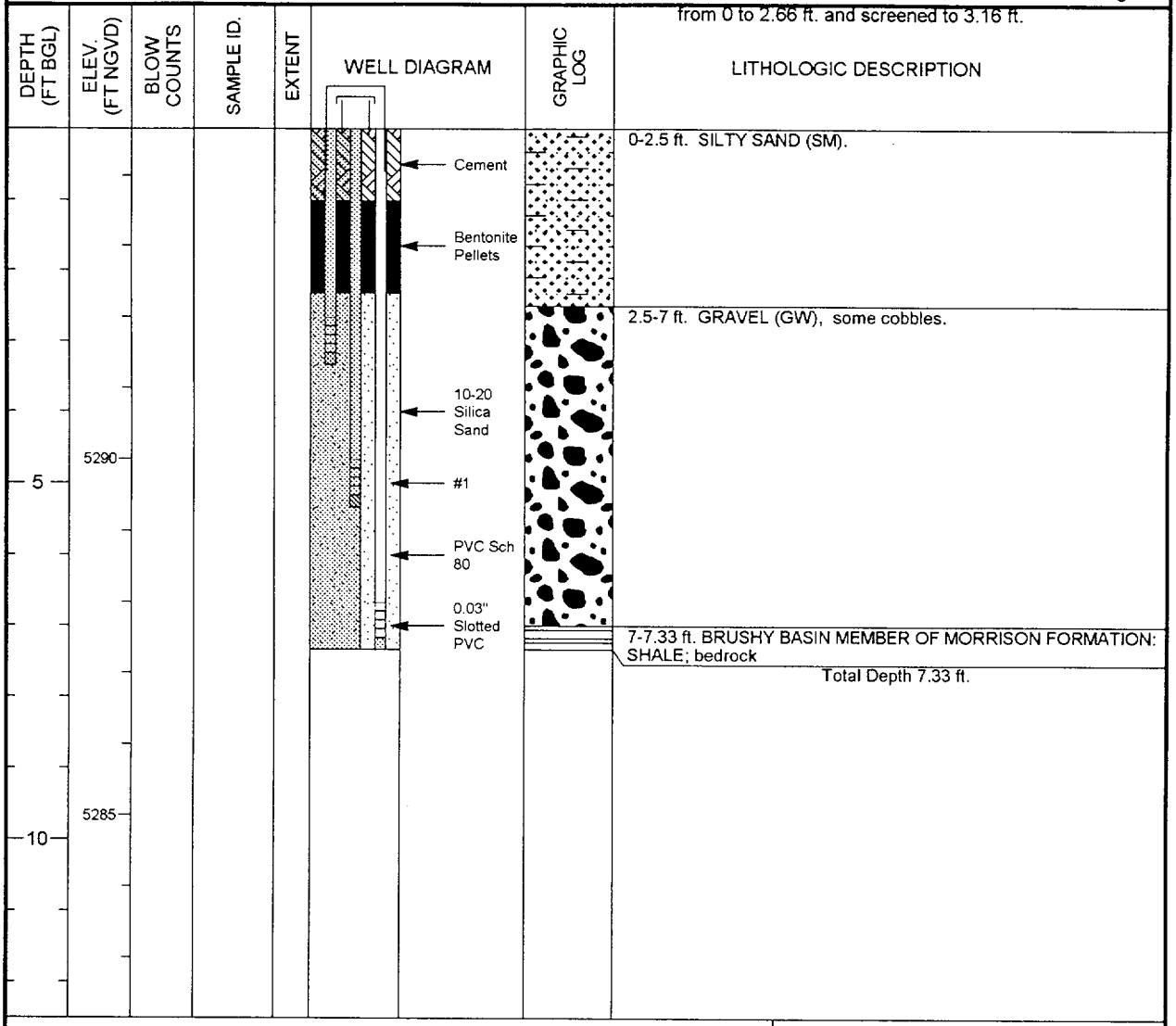


MONITORING WELL COMPLETION LOG NAT01-NAT28-1

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587770.69	DATE DRILLED	07/06/1999
LOCATION	, CO	EAST COORD. (FT)	1107204.15	SURFACE ELEV. (FT NGVD)	5294.66
SITE	NATURITA	HOLE DEPTH (FT)	7.33	TOP OF CASING (FT)	5297.37
WELL NUMBER	NAT28-1	WELL DEPTH (FT)	7.33	MEAS. PT. ELEV. (FT)	5297.37
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.71	to	6.66
WELL SCREEN:	0.5 in. Slotted PVC	6.66	to	7.16
SUMP/END CAP:	0.5 in. PVC Sch 80	7.16	to	7.33
SURFACE SEAL:	Cement	0.0	to	1.0
GROUT:				
SEAL:	Bentonite Pellets	1.0	to	2.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	2.0	to	7.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT28-1 casing and screen depths provided; NAT28-2 casing is from 0 to 4.66 ft. and screened to 5.16 ft.; and NAT28-3 casing is from 0 to 2.66 ft. and screened to 3.16 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT28-2

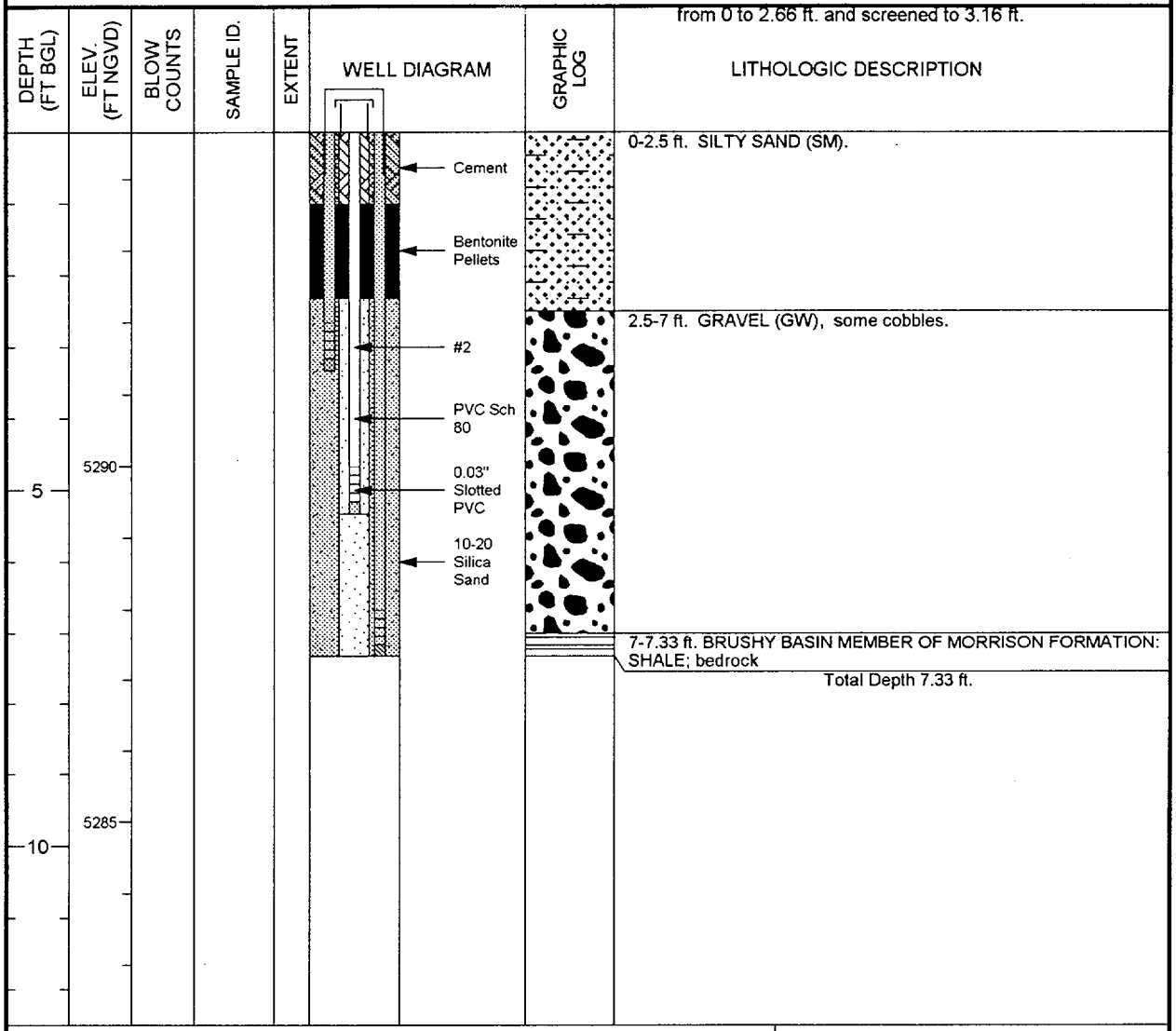
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT28-2

NORTH COORD. (FT) 587770.69
EAST COORD. (FT) 1107204.15
HOLE DEPTH (FT) 7.33
WELL DEPTH (FT) 5.33

DATE DRILLED 07/06/1999
SURFACE ELEV. (FT NGVD) 5294.66
TOP OF CASING (FT) 5297.37
MEAS. PT. ELEV. (FT) 5297.37
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.71	to	4.66
WELL SCREEN:	0.5 in. Slotted PVC	4.66	to	5.16
SUMP/END CAP:	0.5 in. PVC Sch 80	5.16	to	5.33
SURFACE SEAL:	Cement	0.0	to	1.0
GROUT:				
SEAL:	Bentonite Pellets	1.0	to	2.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	2.0	to	7.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT28-2 casing and screen depths provided; NAT28-1 casing is from 0 to 6.66 ft. and screened to 7.16 ft.; and NAT28-3 casing is from 0 to 2.66 ft. and screened to 3.16 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT28-3

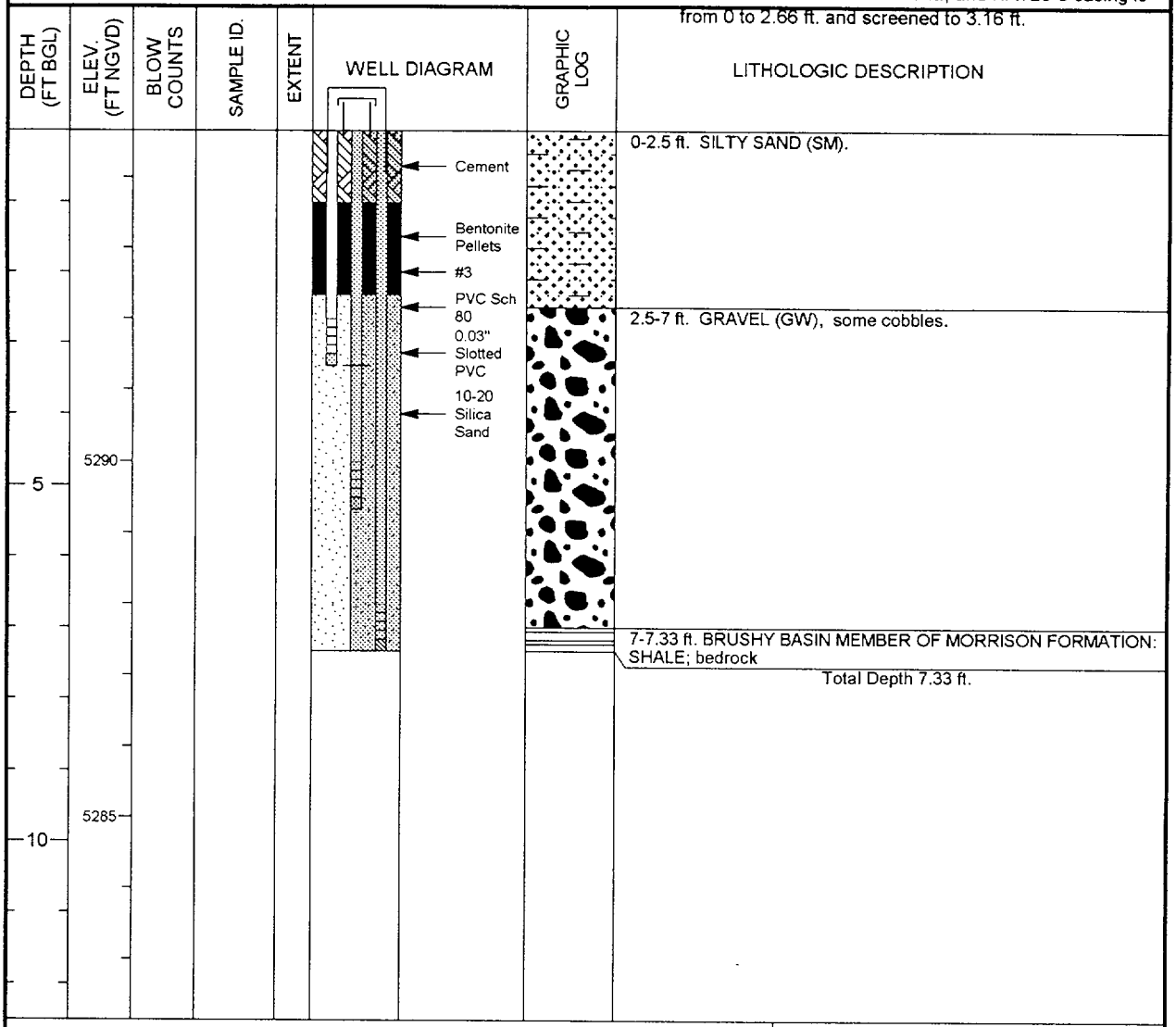
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT28-3

NORTH COORD. (FT) 587770.69
EAST COORD. (FT) 1107204.15
HOLE DEPTH (FT) 7.33
WELL DEPTH (FT) 3.33

DATE DRILLED 07/06/1999
SURFACE ELEV. (FT NGVD) 5294.66
TOP OF CASING (FT) 5297.36
MEAS. PT. ELEV. (FT) 5297.36
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.7	to	2.66
WELL SCREEN:	0.5 in. Slotted PVC	2.66	to	3.16
SUMP/END CAP:	0.5 in. PVC Sch 80	3.16	to	3.33
SURFACE SEAL:	Cement	0.0	to	1.0
GROUT:				
SEAL:	Bentonite Pellets	1.0	to	2.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	2.0	to	7.33

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT28-1 casing and screen depths provided; NAT28-2 casing is from 0 to 4.66 ft. and screened to 5.16 ft.; and NAT28-3 casing is from 0 to 2.66 ft. and screened to 3.16 ft.

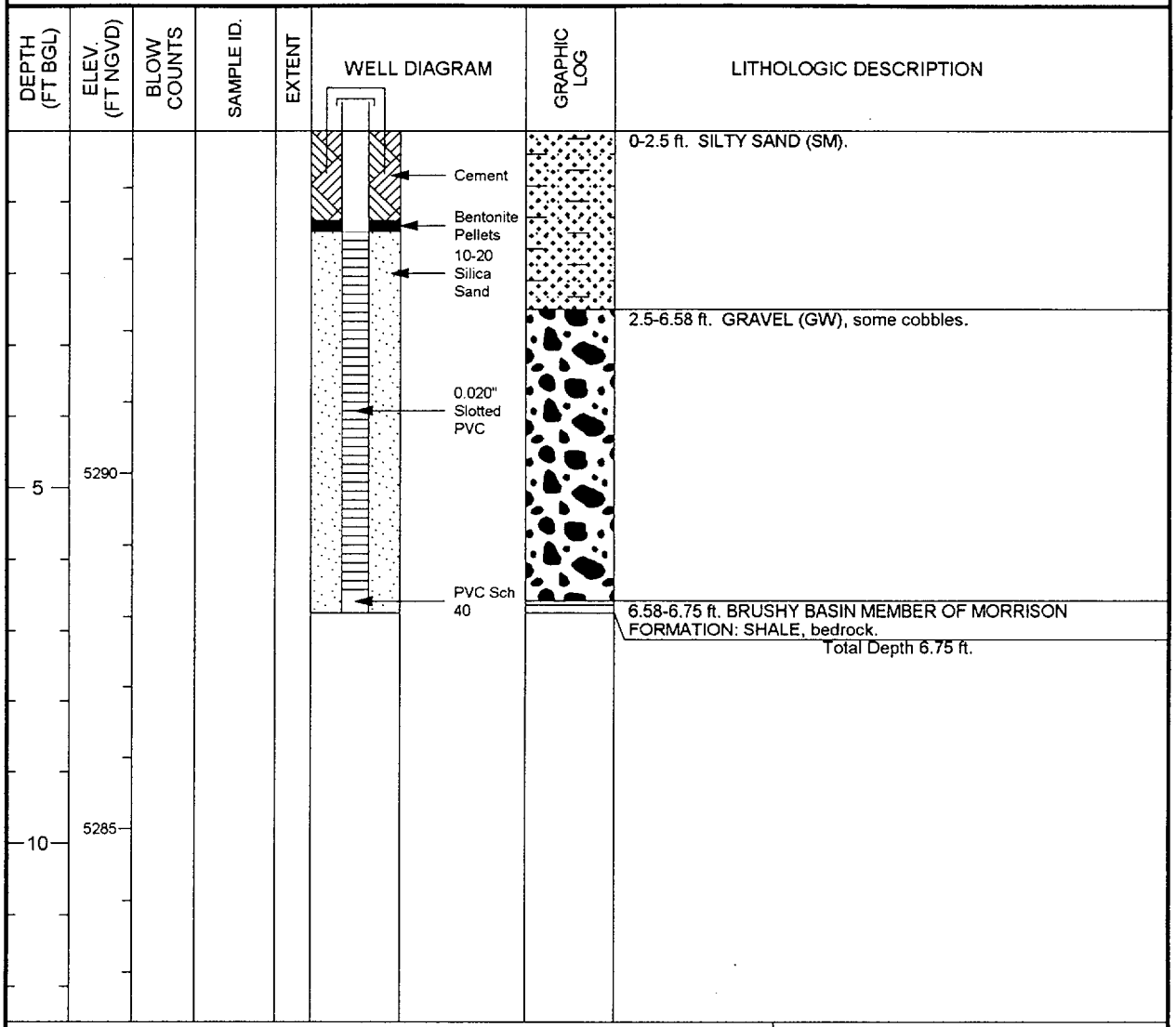


MONITORING WELL COMPLETION LOG NAT01-NAT29

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	587764.89	DATE DRILLED	07/06/1999
LOCATION	, CO	EAST COORD. (FT)	1107208.58	SURFACE ELEV. (FT NGVD)	5294.80
SITE	NATURITA	HOLE DEPTH (FT)	6.75	TOP OF CASING (FT)	5297.65
WELL NUMBER	NAT29	WELL DEPTH (FT)	6.75	MEAS. PT. ELEV. (FT)	5297.65
				SLOT SIZE (IN)	0.020
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	INTERVAL (FT)			
SURFACE CASING:					
BLANK CASING:	2 in. PVC Sch 40	-2.85	to	1.42	
WELL SCREEN:	2 in. Slotted PVC	1.42	to	6.42	
SUMP/END CAP:	2 in. PVC Sch 80	6.42	to	6.75	
SURFACE SEAL:	Cement	0.0	to	1.25	
GROUT:					
SEAL:	Bentonite Pellets	1.25	to	1.42	
UPPER PACK:					
LOWER PACK:	10-20 Silica Sand	1.42	to	6.75	

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS

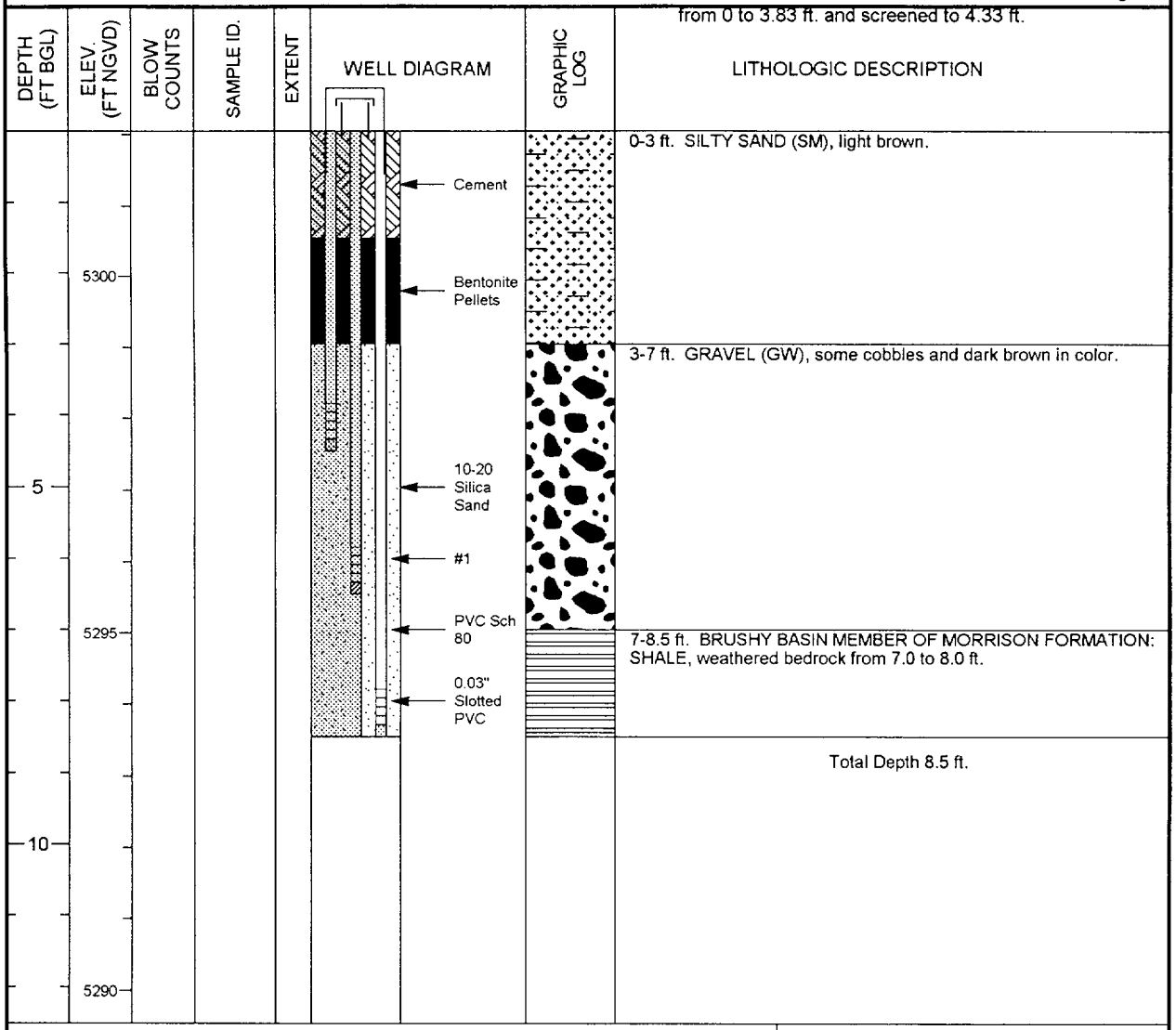


MONITORING WELL COMPLETION LOG NAT01-NAT30-1

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	586838.30	DATE DRILLED	07/06/1999
LOCATION	, CO	EAST COORD. (FT)	1107476.19	SURFACE ELEV. (FT NGVD)	5302.05
SITE	NATURITA	HOLE DEPTH (FT)	8.50	TOP OF CASING (FT)	5304.91
WELL NUMBER	NAT30-1	WELL DEPTH (FT)	8.50	MEAS. PT. ELEV. (FT)	5304.91
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.86	to	7.83
WELL SCREEN:	0.5 in. Slotted PVC	7.83	to	8.33
SUMP/END CAP:	0.5 in. PVC Sch 80	8.33	to	8.5
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.0	to	8.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT30-1 casing and screen depths provided; NAT30-2 casing is from 0 to 5.83 ft. and screened to 6.33 ft.; and NAT30-3 casing is from 0 to 3.83 ft. and screened to 4.33 ft.



MONITORING WELL COMPLETION LOG NAT01-NAT30-2

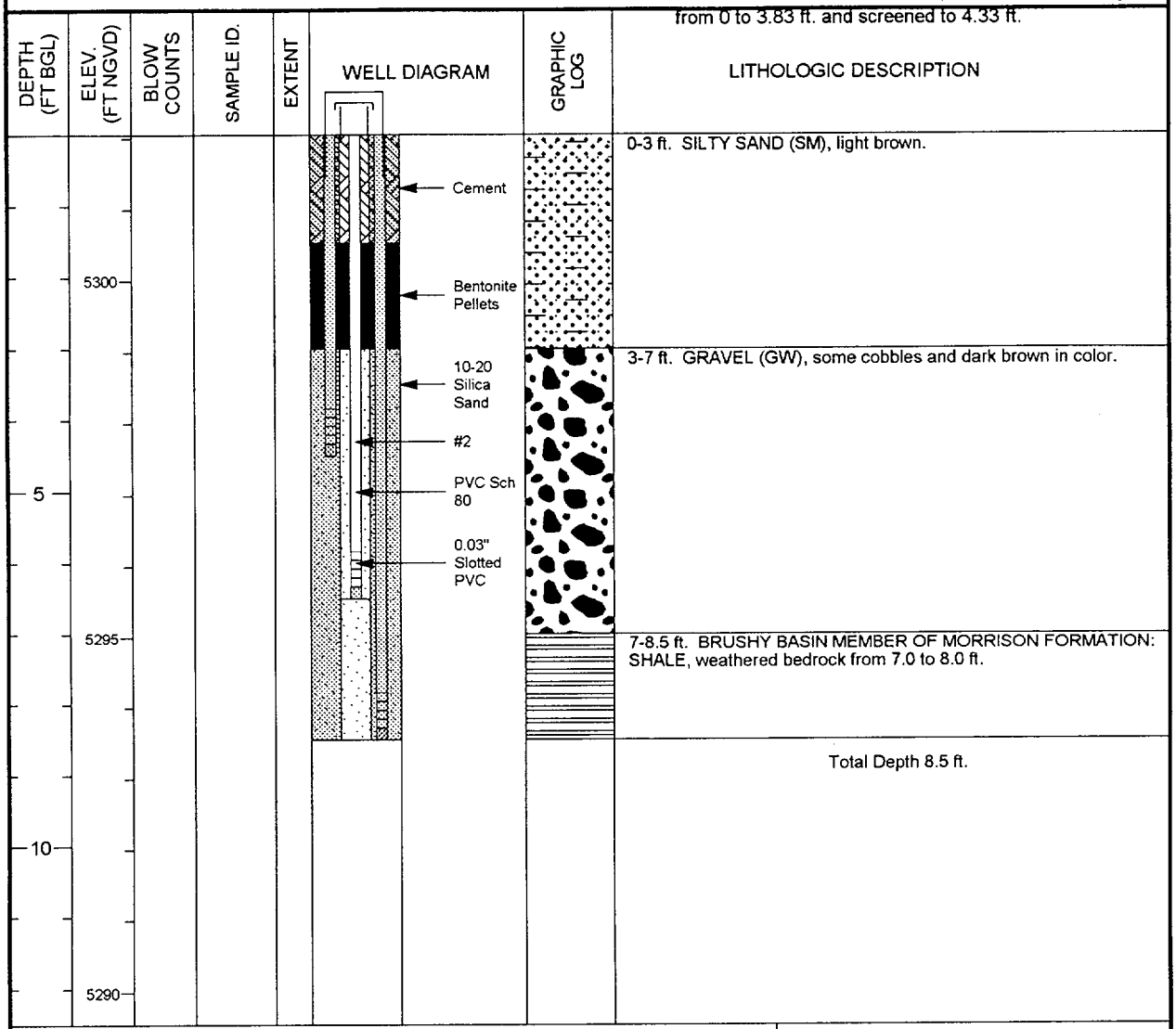
PROJECT UMTRA GROUND WATER
LOCATION , CO
SITE NATURITA
WELL NUMBER NAT30-2

NORTH COORD. (FT) 586838.30
EAST COORD. (FT) 1107476.19
HOLE DEPTH (FT) 8.50
WELL DEPTH (FT) 6.50

DATE DRILLED 07/06/1999
SURFACE ELEV. (FT NGVD) 5302.05
TOP OF CASING (FT) 5304.87
MEAS. PT. ELEV. (FT) 5304.87
SLOT SIZE (IN) 0.030
BIT SIZE(S) (IN) 4.0

WELL INSTALLATION		INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.82	to	5.83
WELL SCREEN:	0.5 in. Slotted PVC	5.83	to	6.33
SUMP/END CAP:	0.5 in. PVC Sch 80	6.33	to	6.5
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.0	to	8.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT30-2 casing and screen depths provided; NAT30-1 casing is from 0 to 7.83 ft. and screened to 8.33 ft.; and NAT30-3 casing is from 0 to 3.83 ft. and screened to 4.33 ft.

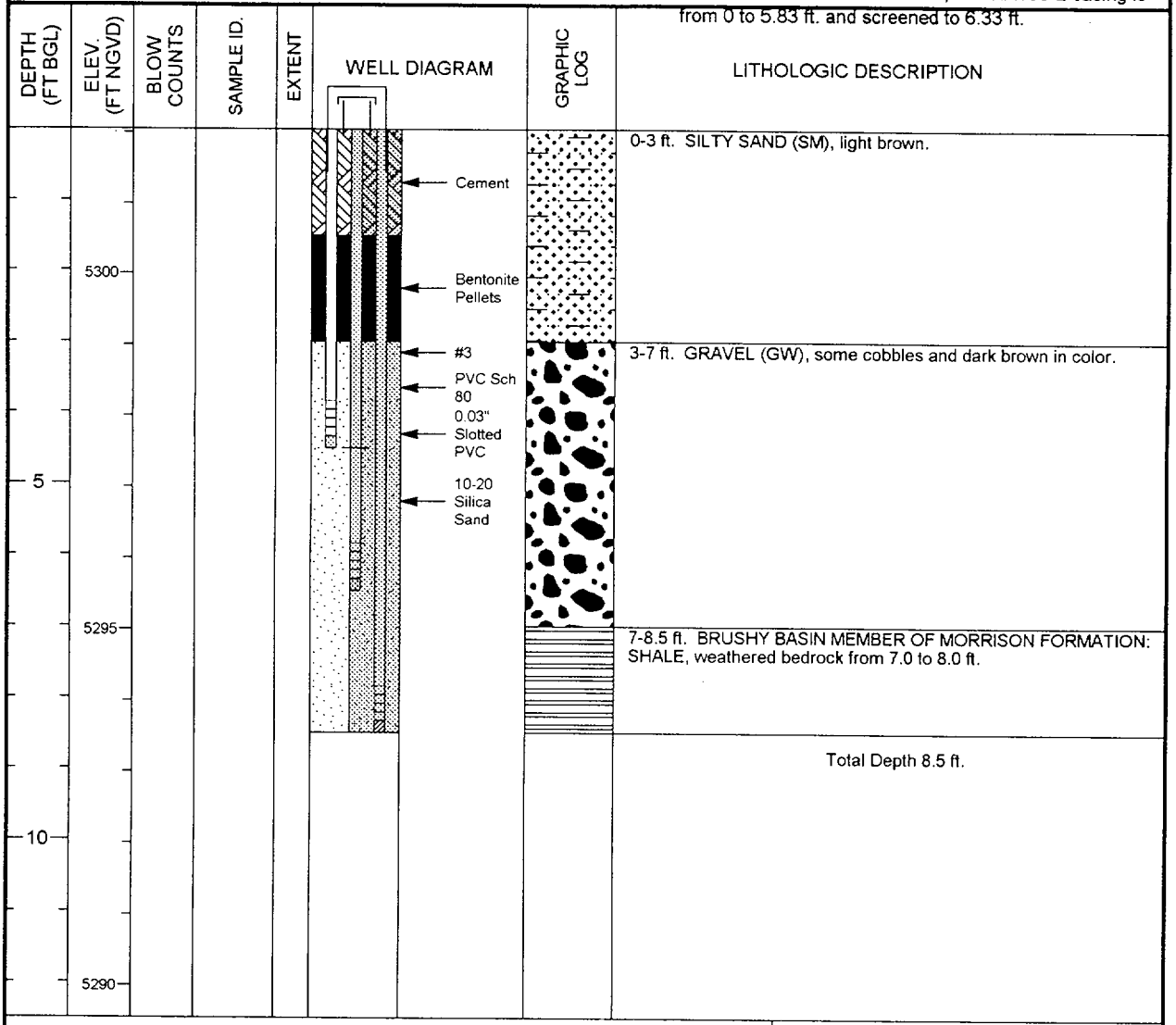


MONITORING WELL COMPLETION LOG NAT01-NAT30-3

PROJECT	UMTRA GROUND WATER	NORTH COORD. (FT)	586838.30	DATE DRILLED	07/06/1999
LOCATION	, CO	EAST COORD. (FT)	1107476.19	SURFACE ELEV. (FT NGVD)	5302.05
SITE	NATURITA	HOLE DEPTH (FT)	8.50	TOP OF CASING (FT)	5304.87
WELL NUMBER	NAT30-3	WELL DEPTH (FT)	4.50	MEAS. PT. ELEV. (FT)	5304.87
				SLOT SIZE (IN)	0.030
				BIT SIZE(S) (IN)	4.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:				
BLANK CASING:	0.5 in. PVC Sch 80	-2.82	to	3.83
WELL SCREEN:	0.5 in. Slotted PVC	3.83	to	4.33
SUMP/END CAP:	0.5 in. PVC Sch 80	4.33	to	4.5
SURFACE SEAL:	Cement	0.0	to	1.5
GROUT:				
SEAL:	Bentonite Pellets	1.5	to	3.0
UPPER PACK:				
LOWER PACK:	10-20 Silica Sand	3.0	to	8.5

DRILLING METHOD HAMMER CASING ADVANCE
SAMPLING METHOD
DATE DEVELOPED
WATER LEVEL (FT BGS)
LOGGED BY Holmes/Rowland
REMARKS Cluster of 3 casings: NAT30-3 casing and screen depths provided; NAT30-1 casing is from 0 to 7.83 ft. and screened to 8.33 ft.; and NAT30-2 casing is from 0 to 5.83 ft. and screened to 6.33 ft.



Appendices B, C and D are provided on CD

Final Site Observational Work Plan for the Naturita, Colorado, UMTRA Project Site Appendices B, C, and D

Appendix E

USGS Distribution Coefficient Analysis

1.0 Introduction

1.1 Distribution Coefficient (K_d) Analysis

The K_d is a bulk parameter that has been used with some success to describe the retardation of contaminant movement in an aquifer system. Laboratory measurements to determine the K_d for selected analytes were performed on alluvial material to support computer-modeling efforts in characterizing subsurface contaminant transport at the Naturita site.

1.1.1 Method of Solution

Laboratory analyses of the K_d were performed according to American Society for Testing and Materials (ASTM) procedure D 4646–87 (ASTM 1987), with slight modifications as detailed below, for two site-related contaminants of potential concern (COPCs): uranium and vanadium. Essentially, the procedure involves placing a sample representative of a location (e.g., soil, sediments, cuttings, core) into a solution of simulated contaminated ground water with which the material is likely to come in contact. The simulated ground water solution was agitated for 96 hours (uranium) or 24 hours (vanadium) and then centrifuged. The supernatant solution was analyzed and compared to the contaminant concentrations of the original solution. The difference between the two is assumed to be adsorbed to the sample. The linear adsorption isotherm distribution coefficient is generally defined as

$$C_{soil} = K_d \times C_{water}, \text{ which can be rearranged to } K_d = C_{soil}/C_{water},$$

or the ratio of the concentration of the contaminant in soil (or other material of interest) to the concentration of the contaminant in water at equilibrium. Therefore, the higher the K_d, the greater the retardation of contaminant movement in ground water.

The procedure requires analysis of only the solutions (and no actual soil samples) used in the experiments. Site samples collected from background areas or uncontaminated site samples are generally used, and all contaminant loss in the final solution is attributed to sample adsorption. However, for this study, uranium-contaminated alluvial samples were also collected, and uranium(VI) adsorption on these samples was determined by desorption in alkaline solutions and by uranium isotopic exchange in artificial ground water solution.

1.1.1.1 Sample Selection

A large sample of background alluvial material was collected by backhoe from the saturated zone of the aquifer at a location upgradient of the site on July 16 and 17, 1998. The sample was considered uncontaminated because concentrations of dissolved uranium at well 0547 (and decommissioned DOE wells nearby) were always very low, near the background uranium concentrations in the San Miguel River. The background sample of alluvium was screened in the field to remove cobbles larger than about 65 mm, and it was estimated visually that about 50 percent of the material scooped by the backhoe did not pass the 65-mm screen.

1.1.1.2 Preparation of the Sample of Background Alluvium

The sample was air dried at room temperature and sieved to separate the <3 mm fraction. Alluvial material totaling 190 kg passed a 3-mm screen and was mixed into a single composite

sample, representing 30 percent (by weight) of the material that had been sieved in the field through a 65-mm screen. The <3 mm sample represented approximately 15 percent of the total material sampled by backhoe in the field.

Synthetic solutions were prepared that simulated ground water at the Naturita site. Based on ground water analyses for several wells sampled in November 1998 and on preliminary batch experiments, a composition of synthetic ground water (AGW–3) was prepared for experiments equilibrated with air as follows (in mg/L): Na = 55.5, K = 2.5, Ca = 189, Mg = 36.8, SO_4 = 459, Cl = 171, C (inorganic) = 6.46, with pH adjusted to 7.9. The concentrations of C (inorganic) and Ca were expected to change somewhat during the batch experiments, because of the presence of calcite in the alluvial material. The AGW–3 solution equilibrated in the batch experiments with alluvial material and air without a significant change in pH (about 7.9) or alkalinity (37.5 mg/L as $CaCO_3$).

For uranium(VI), because of its tendency to form aqueous carbonate complexes, other synthetic solutions were prepared for experiments equilibrated with gas mixtures containing 0.5 percent CO_2/99.5 percent N_2 (AGW–7) and 2.0 percent CO_2/98 percent N_2 (AGW–5). The composition of AGW–7 was Na = 55.5, K = 2.5, Ca = 98.2, Mg = 36.8, SO_4 = 368.5, Cl = 8.2, and C (inorganic) = 30. This solution yielded a final pH of about 7.58 and an alkalinity of 152 mg/L as $CaCO_3$ after equilibration with the alluvial material and the gas mixture containing 0.5 percent CO_2. This alkalinity corresponds to a C (inorganic) concentration of 36.5 mg/L.

The composition of AGW–5 was Na = 55.5, K = 2.5, Ca = 257, Mg = 36.8, SO_4 = 459, Cl = 193, and C (inorganic) = 40. This solution yielded a final pH of about 7.18 and an alkalinity of 202 mg/L as $CaCO_3$, after equilibration with the alluvial material and the gas mixture containing 2.0 percent CO_2. This alkalinity corresponds to a C (inorganic) concentration of 48.4 mg/L. This latter solution was closer to the observed ground water pH and C (inorganic) concentrations observed in the alluvial aquifer than could be obtained by equilibrating experiments in the presence of air. Alkalinity in the alluvial aquifer ranges from 200 to 500 mg/L (as $CaCO_3$).

After equilibration of the synthetic solution with the alluvial material for 12 hours, either uranium or vanadium was then added from acidified nitrate stock solutions to study a range of target concentrations: 0.006 to 1.9 mg/L uranium or 1 to 16 mg/L vanadium.

1.1.1.3 Sample Analysis

The synthetic ground water solutions were analyzed to determine that the target concentrations were achieved by additions from the uranium(VI) and vanadium(V) stock solutions. These results are reported in Table 1.

Table 1. Laboratory Analytical Results for Synthetic Ground Water Solutions

Sample ID	Sample Description	Solution Volume (mL)	Target Concentration (mg/L)		Analyzed Concentration (mg/L)	
			U	V	U	V
AGW3–1	Synthetic ground water	30	0.0255	1.75	0.0267	1.73
AGW3–2	Synthetic ground water	30	0.241	5.25	0.0254	5.35
AGW3–3	Synthetic ground water	30	2.40	8.75	2.62	8.95

Aliquots of the synthetic ground water were first preequilibrated with each sample at a concentration of 25 g/L prior to use in the actual sample analyses, to preequilibrate the synthetic ground water with the sample surface. The preequilibrated synthetic ground water was filtered through a 0.45 micrometer (μm) filter prior to use in the sample analyses. For analysis with the ground water AGW–3, approximately 0.5 or 0.75 g of each sample was measured and placed in 50-milliliter (mL) polycarbonate centrifuge tubes with 20 or 30 mL of the filtered, preequilibrated synthetic ground water, resulting in sample suspension of 25 g/L. For analysis with the ground water AGW–7, approximately 3.75 g of each sample was measured and placed in 50-mL polycarbonate centrifuge tubes with 30 mL of the filtered, preequilibrated synthetic ground water, resulting in a sample suspension of 125 g/L. For analysis with the ground water AGW–5, approximately 7.5 g of each sample was measured and placed in 50 mL polycarbonate centrifuge tubes with 30 mL of the filtered, preequilibrated synthetic ground water, resulting in a sample suspension of 250 g/L.

Samples were rotated end over end at 14 revolutions per minute (rpm) for 24 hours, after which an aliquot of uranium(VI) or vanadium(V) stock solution was added to achieve the target contaminant concentration in the analysis. Samples were then rotated end-over-end at 14 rpm for 24 hours (V analysis) or 96 hours (U analysis). They were then centrifuged at 23,500 rpm for 30 minutes. The 5 mL aliquots of the resulting leachate samples were preserved with 50 μL concentrated HNO_3 in glass scintillation vials for analysis of U(VI) or vanadium. Analytical results are reported in Tables 2 through 4. Blank centrifuge tubes (with no solid sample) were included for each analysis to check for adsorption onto container walls; no adsorption on the container walls was observed. U(VI) was analyzed by kinetic phosphoresence analysis (KPA), and vanadium was analyzed by inductively coupled plasma optical emission spectrometry (ICP-OES).

Table 2. Analytical Results for Sample Leachate Solutions Using the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–3 (equilibrated with the partial pressure of CO_2 in air)

Sample ID	Sample Description	Solution Volume (mL)	Synthetic Solution Type	Sample Mass (g)	Concentration (mg/L)	
					U	V
Ex6S7	Alluvium composite leachate	30	AGW–3	0.75	0.00635	
Ex6S8	Duplicate	30	AGW–3	0.75	0.00584	
Ex6S9	Alluvium composite leachate	30	AGW–3	0.75	0.0167	
Ex6S10	Duplicate	30	AGW–3	0.75	0.0180	
Ex6S11	Alluvium composite leachate	30	AGW–3	0.75	0.0530	
Ex6S12	Duplicate	30	AGW–3	0.75	0.0514	
Ex6S13	Alluvium composite leachate	30	AGW–3	0.75	0.196	
Ex6S14	Duplicate	30	AGW–3	0.75	0.192	
Ex6S15	Alluvium composite leachate	30	AGW–3	0.75	0.412	
Ex6S16	Duplicate	30	AGW–3	0.75	0.420	
Ex6S17	Alluvium composite leachate	30	AGW–3	0.75	2.24	
Ex6S18	Duplicate	30	AGW–3	0.75	2.13	
ExVS5	Alluvium composite leachate	20	AGW–3	0.5		1.16
ExVS6	Duplicate	20	AGW–3	0.5		1.17
ExVS8	Alluvium composite leachate	20	AGW–3	0.5		4.34
ExVS9	Duplicate	20	AGW–3	0.5		4.32
ExVS11	Alluvium composite leachate	20	AGW–3	0.5		7.75
ExVS12	Duplicate	20	AGW–3	0.5		7.83
ExVS14	Alluvium composite leachate	20	AGW–3	0.5		11.8
ExVS15	Duplicate	20	AGW–3	0.5		12.0
ExVS17	Alluvium composite leachate	20	AGW–3	0.5		16.2
ExVS18	Duplicate	20	AGW–3	0.5		16.1

Table 3. Analytical Results for Sample Leachate Solutions Using the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–7 (equilibrated with 0.5 percent CO_2)

Sample ID	Sample Description	Solution Volume (mL)	Synthetic Solution Type	Sample Mass (g)	Concentration (mg/L)
					U
Ex11S107	Alluvium composite leachate	30	AGW–7	3.75	0.0178
Ex11S108	Duplicate	30	AGW–7	3.75	0.0182
Ex11S109	Alluvium composite leachate	30	AGW–7	3.75	0.0305
Ex11S110	Duplicate	30	AGW–7	3.75	0.0304
Ex11S111	Alluvium composite leachate	30	AGW–7	3.75	0.0644
Ex11S112	Duplicate	30	AGW–7	3.75	0.0657
Ex11S113	Alluvium composite leachate	30	AGW–7	3.75	0.188
Ex11S114	Duplicate	30	AGW–7	3.75	0.200
Ex11S115	Alluvium composite leachate	30	AGW–7	3.75	0.589
Ex11S116	Duplicate	30	AGW–7	3.75	0.574
Ex11S117	Alluvium composite leachate	30	AGW–7	3.75	1.95
Ex11S118	Duplicate	30	AGW–7	3.75	1.96

Table 4. Analytical Results for Sample Leachate Solutions Using the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–5 (equilibrated with 2.0 percent CO_2)

Sample ID	Sample Description	Solution Volume (mL)	Synthetic Solution Type	Sample Mass (g)	Concentration (mg/L)
					U
Ex10S7	Alluvium composite leachate	30	AGW–5	7.5	0.0252
Ex10S8	Duplicate	30	AGW–5	7.5	0.0225
Ex10S9	Alluvium composite leachate	30	AGW–5	7.5	0.0308
Ex10S10	Duplicate	30	AGW–5	7.5	0.0307
Ex10S11	Alluvium composite leachate	30	AGW–5	7.5	0.0566
Ex10S12	Duplicate	30	AGW–5	7.5	0.0621
Ex10S13	Alluvium composite leachate	30	AGW–5	7.5	0.180
Ex10S14	Duplicate	30	AGW–5	7.5	0.187
Ex10S15	Alluvium composite leachate	30	AGW–5	7.5	0.529
Ex10S16	Duplicate	30	AGW–5	7.5	0.535
Ex10S17	Alluvium composite leachate	30	AGW–5	7.5	1.87
Ex10S18	Duplicate	30	AGW–5	7.5	1.83

1.1.1.4 K_d Calculation

K_ds are calculated using the analytical data summarized in Table 5 through Table 8 and the following equation:

$$K_d = \frac{(A - B)V}{(M_s)B}$$

where

A = total initial concentration (mg/L) of the COPCs in the synthetic ground water,
B = final concentration of the COPCs in the leachate after 96 hours (uranium) or 24 hours (vanadium) in contact with the sediment sample (mg/L),
V = volume of solution (mL),
M_s = mass of sediment sample (grams), and
K_d = distribution coefficient (milliliters per gram [mL/g]).

Results of the calculations are presented in Table 5 through Table 7. The K_d values are consistent with R_d values in the ASTM procedure; this value only represents a true K_d if equilibrium conditions were attained during the test period.

Table 5. Measured K_d Values for the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–3 (equilibrated with the partial pressure of CO_2 in air)

Sample ID	Sample Description	Initial Concentration (mg/L)		Final Concentration (mg/L)		K_d (mL/g)	
		U	V	U	V	U	V
Ex6S7	Alluvium composite leachate	0.0108		0.00635		28.1	
Ex6S8	Duplicate	0.0107		0.00584		33.9	
Ex6S9	Alluvium composite leachate	0.0279		0.0167		27.1	
Ex6S10	Duplicate	0.0280		0.0180		22.5	
Ex6S11	Alluvium composite leachate	0.0791		0.0530		19.8	
Ex6S12	Duplicate	0.0794		0.0514		21.9	
Ex6S13	Alluvium composite leachate	0.255		0.196		12.2	
Ex6S14	Duplicate	0.256		0.192		13.2	
Ex6S15	Alluvium composite leachate	0.533		0.412		11.7	
Ex6S16	Duplicate	0.534		0.420		10.8	
Ex6S17	Alluvium composite leachate	2.59		2.24		6.1	
Ex6S18	Duplicate	2.59		2.13		8.6	
ExVS5	Alluvium composite leachate		1.73		1.16		20.0
ExVS6	Duplicate		1.73		1.17		19.5
ExVS8	Alluvium composite leachate		5.35		4.34		9.3
ExVS9	Duplicate		5.35		4.32		9.5
ExVS11	Alluvium composite leachate		8.95		7.75		6.2
ExVS12	Duplicate		8.95		7.83		5.7
ExVS14	Alluvium composite leachate		13.3		11.8		5.2
ExVS15	Duplicate		13.3		12.0		4.5
ExVS17	Alluvium composite leachate		17.8		16.2		4.0
ExVS18	Duplicate		17.8		16.1		4.3

Table 6. Measured Uranium K_d Values for the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–7 (equilibrated with 0.5 percent CO_2)

Sample ID	Sample Description	Initial Concentration (mg/L)	Final Concentration (mg/L)	K_d (mL/g)
		U	U	U
Ex11S107	Alluvium composite leachate	0.0304	0.0178	5.8
Ex11S108	Duplicate	0.0304	0.0182	5.4
Ex11S109	Alluvium composite leachate	0.0466	0.0305	4.3
Ex11S110	Duplicate	0.0454	0.0304	4.2
Ex11S111	Alluvium composite leachate	0.0904	0.0644	3.5
Ex11S112	Duplicate	0.0940	0.0657	3.6
Ex11S113	Alluvium composite leachate	0.273	0.188	3.7
Ex11S114	Duplicate	0.274	0.200	3.0
Ex11S115	Alluvium composite leachate	0.756	0.589	2.3
Ex11S116	Duplicate	0.756	0.574	2.6
Ex11S117	Alluvium composite leachate	2.42	1.95	2.0
Ex11S118	Duplicate	2.40	1.96	1.8

Table 7. Measured Uranium K_d Values for the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–5 (equilibrated with 2.0 percent CO_2)

Sample ID	Sample Description	Initial Concentration (mg/L)	Final Concentration (mg/L)	K_d (mL/g)
		U	U	U
Ex10S7	Alluvium composite leachate	0.0430	0.0252	3.0
Ex10S8	Duplicate	0.0429	0.0225	3.8
Ex10S9	Alluvium composite leachate	0.0570	0.0308	3.6
Ex10S10	Duplicate	0.0570	0.0307	3.6
Ex10S11	Alluvium composite leachate	0.0974	0.0566	3.1
Ex10S12	Duplicate	0.0979	0.0621	2.5
Ex10S13	Alluvium composite leachate	0.283	0.180	2.4
Ex10S14	Duplicate	0.282	0.187	2.2
Ex10S15	Alluvium composite leachate	0.772	0.529	2.0
Ex10S16	Duplicate	0.777	0.535	1.9
Ex10S17	Alluvium composite leachate	2.55	1.87	1.5
Ex10S18	Duplicate	2.54	1.83	1.6

Measured K_d values obtained for the alluvial aquifer samples were adjusted on the basis of aquifer grain size analysis. It was found in collecting the uncontaminated alluvial material that only 15 percent of the aquifer material was in the <3 mm fraction and that most of the material was gravel to cobble size. Therefore, the measured K_d values for the alluvial aquifer, which were

performed on the <3 mm fraction, were adjusted by multiplying by 0.15. This assumes that the gravel- and cobble-sized materials are insignificant in terms of contaminant adsorption. The adjusted values are reported in Table 8 through Table 10.

Table 8. Results for K_d Values Adjusted for Grain-Size Distribution for the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–3 (equilibrated with the partial pressure of CO_2 in air)

Sample ID	Sample Description	K_d (mL/g)	
		U	V
Ex6S7	Alluvium composite leachate	4.2	
Ex6S8	Duplicate	5.1	
Ex6S9	Alluvium composite leachate	4.1	
Ex6S10	Duplicate	3.4	
Ex6S11	Alluvium composite leachate	3.0	
Ex6S12	Duplicate	3.3	
Ex6S13	Alluvium composite leachate	1.8	
Ex6S14	Duplicate	2.0	
Ex6S15	Alluvium composite leachate	1.8	
Ex6S16	Duplicate	1.6	
Ex6S17	Alluvium composite leachate	0.92	
Ex6S18	Duplicate	1.3	
ExVS5	Alluvium composite leachate		3.0
ExVS6	Duplicate		2.9
ExVS8	Alluvium composite leachate		1.4
ExVS9	Duplicate		1.4
ExVS11	Alluvium composite leachate		0.93
ExVS12	Duplicate		0.86
ExVS14	Alluvium composite leachate		0.77
ExVS15	Duplicate		0.67
ExVS17	Alluvium composite leachate		0.59
ExVS18	Duplicate		0.64

Table 9. Results for K_d Values Adjusted for Grain-Size Distribution for the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–7 (equilibrated with 0.5 percent CO_2)

Sample ID	Sample Description	K_d (mL/g) U
Ex11S107	Alluvium composite leachate	0.87
Ex11S108	Duplicate	0.81
Ex11S109	Alluvium composite leachate	0.65
Ex11S110	Duplicate	0.63
Ex11S111	Alluvium composite leachate	0.52
Ex11S112	Duplicate	0.54
Ex11S113	Alluvium composite leachate	0.56
Ex11S114	Duplicate	0.45
Ex11S115	Alluvium composite leachate	0.35
Ex11S116	Duplicate	0.39
Ex11S117	Alluvium composite leachate	0.30
Ex11S118	Duplicate	0.27

Table 10. Results for K_d Values Adjusted for Grain-Size Distribution for the Uncontaminated Alluvial Deposit Sample and Synthetic Ground Water AGW–5 (equilibrated with 2.0 percent CO_2)

Sample ID	Sample Description	K_d (mL/g) U
Ex10S7	Alluvium composite leachate	0.45
Ex10S8	Duplicate	0.58
Ex10S9	Alluvium composite leachate	0.54
Ex10S10	Duplicate	0.54
Ex10S11	Alluvium composite leachate	0.46
Ex10S12	Duplicate	0.37
Ex10S13	Alluvium composite leachate	0.36
Ex10S14	Duplicate	0.32
Ex10S15	Alluvium composite leachate	0.29
Ex10S16	Duplicate	0.28
Ex10S17	Alluvium composite leachate	0.23
Ex10S18	Duplicate	0.25

The data show that the K_d values are somewhat dependent on the concentration of the COPC, under otherwise constant chemical conditions (Figure 1 through Figure 3). In addition, the data show that the uranium K_d values are greatly decreased by increasing alkalinity (or partial pressure of carbon dioxide gas), due to the formation of weakly adsorbing, aqueous uranyl-carbonate complexes (Figure 4).

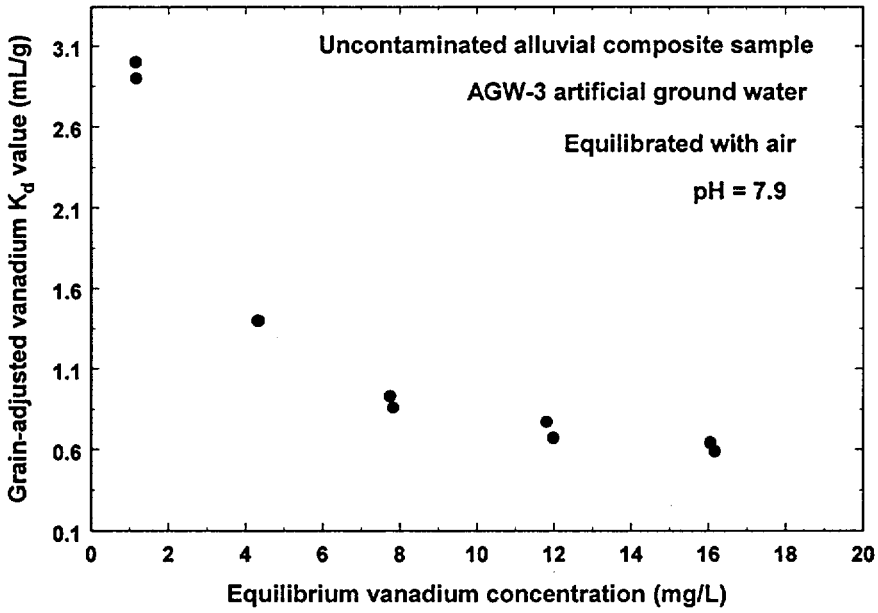


Figure 1. Grain-Adjusted K_d Values for Vanadium as a Function of Vanadium Concentration
Vanadium Concentrations in the Alluvial Aquifer Vary from Below Detection to 7 mg/L

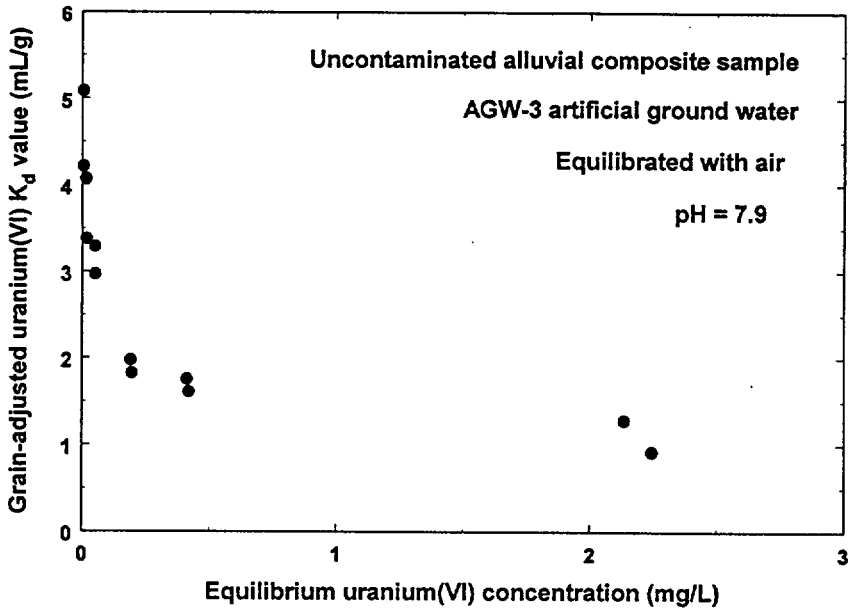


Figure 2. Grain-Adjusted K_d Values for Uranium as a Function of Uranium Concentration Uranium Concentrations in the Alluvial Aquifer Vary from 0.005 to 2.6 mg/L

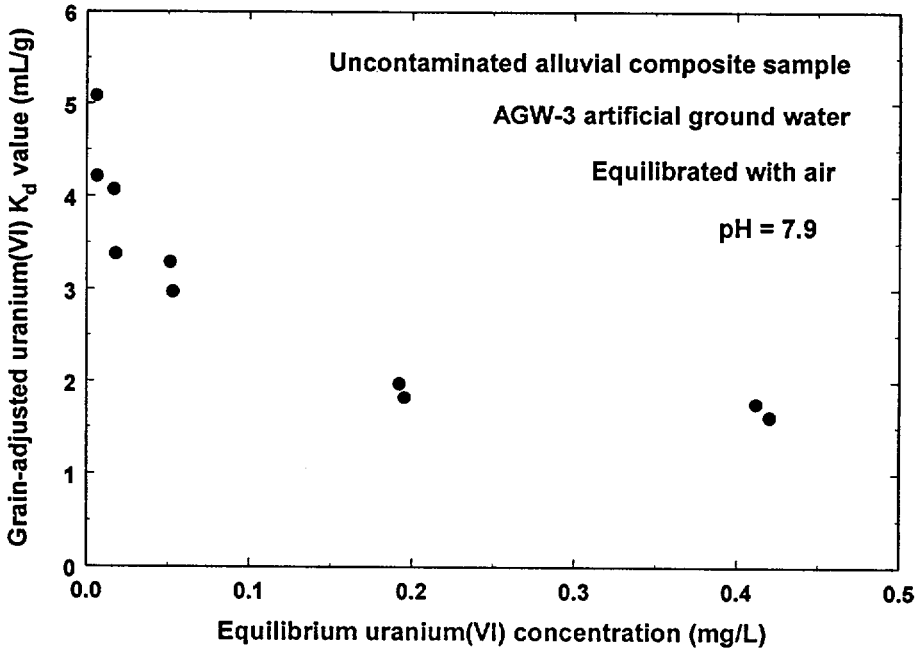


Figure 3. Grain-Adjusted K_d Values for Uranium as a Function of Uranium Concentration at Low Uranium Concentrations
Uranium Concentrations in the Alluvial Aquifer Vary from 0.005 to 2.6 mg/L

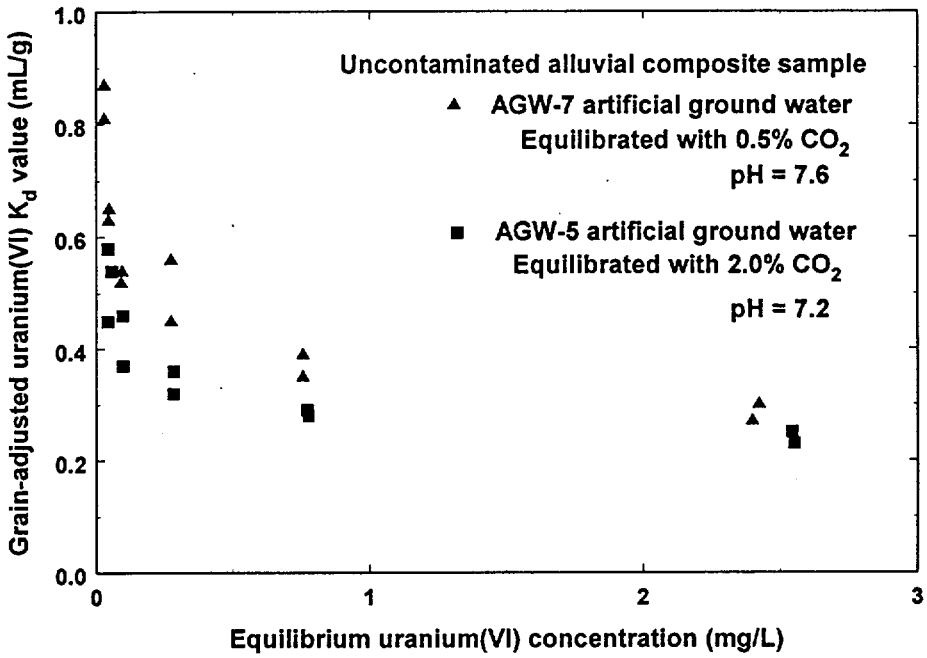


Figure 4. Grain-Adjusted K_d values for Uranium as a Function of Uranium Concentration in Waters Equilibrated with 0.5 or 2 percent CO_2
Each System Reaches a Different Equilibrium pH Value Due to Equilibration with Carbonate Minerals in the Alluvial Sediments. Partial Pressures of CO_2 in the Alluvial Aquifer Range from 1 to 10 percent CO_2

If left undisturbed, the trailing edge of the contaminant plume will probably leave the site with low uranium concentrations and an alkalinity closer to background conditions. This would be near the conditions represented by the sample analysis with 0.5 percent CO_2, although alluvial ground water usually has a lower pH (7.0 to 7.2). Based on the range of K_d values indicated by the sample analysis, it is recommended that K_d values in the range of 1–3 mL/g be used for both uranium and vanadium in the contaminant transport modeling of alluvial ground water.

End of current text