Valmont Station
Ash Disposal Facility
Monitoring Well Installation Report

Prepared by
Xcel Energy
12/23/02

Valmont Station ADF
Well Installation Report

Introduction

Three ground water monitoring wells were installed at the Valmont Station ADF. The ADF is located on the north shore of Legett Reservoir in Section 26, T1N, R70W, 6th Meridian, Boulder County. This report summarizes the installation of the wells and subsequent aquifer tests.

Field Activities

Well Installation

Wells were installed in accordance with the July 2002 drilling plan. Proposed well depths were, 10ft below the first water or 20feet below the regional water table, which ever came first. Well locations and ground elevations were marked prior to mobilization.

Due to drilling difficulties with the HSA, a second mobilization with an air rotary rig was required. Wells MW-1 and MW-3 were installed with HSA. Well MW-2 was installed using air rotary techniques. Boring logs and Well Installation diagrams are included in Appendixes A & B respectively.

On 8/5/02 Site Services mobilized a CME 75 drill rig equipped with 4.25" HSA. Soil samples were collected at five foot intervals using a standard split spoon. Blow counts were recorded to document density. A geologist was on site to classify material drilled and document well construction.

- The borehole for MW-2 was terminated after 35ft due to difficulties in drilling. The presence of a hard Pierre Shale resulted in a drilling rate of less than 2.5ft/hour. With an estimated 65ft to go, it was determined that a different drilling technique should be used for MW-2. The dry borehole was back filled with bentonite chips and hydrated.
- The borehole for MW-1 and MW-3 was advanced using HSA techniques without difficulties. The borehole for both of these wells exhibited dry conditions until they approached proposed termination depths.

On 11/12/02 Spectrum Drilling mobilized an air rotary rig, equipped with 4.5" outer casing, to install MW-2. A geologist was on site to classify material drilled and document well construction. The MW-2 borehole was off set form the initial location, started by Site Services, by three foot.

- The borehole was logged based upon cuttings. Grain size, color, moisture content and the rate of drilling advancement was noted. Periodically the tricone bit was pulled to check for moisture. No moist soils were noted during the drilling. The borehole was terminated at a depth of 18feet below the estimated regional water table. With no evidence of water, a

dry well was constructed. Fifteen hours after completion, approximately two feet of water existed in the well.

Table 1 below summarizes well construction.

Well ID	North	East	Top of Riser Pipe Elev	Screen Elev	GW Elev 11/18/02	Hydrologic Location
W-1	1252477	3082274	5234.35	5205.85 - 5195.85	5226.05	Down gradient
W-2	1253205	3083085	5289.56	5194.56 - 5184.56	5235.73	Up gradient
W-3	1252774	3083742	5233.47	5194.22 - 5184.22	5225.61	Down gradient

Well Development

On 11/11/02 and 11/13/02 wells MW-1 and MW-3 were developed using a surge block and over pumping the well. Although both wells could be evacuated to near dryness after development, a marked improvement in turbidity was noted for MW-3. Insufficient water existed in MW-2 for well development on 11/13/02.

Aquifer Tests

Slug tests were preformed on wells MW-1 & MW-3 from 11/11/02 through 11/13/02. A Telog data recorder equipped with a 5psi pressure transducer was used to record well recovery. The Bouwer and Rice solution for unconfined aquifers was applied using the software Aqtesolv. A hydraulic conductivity of 5.6×10^{-8} ft/min and 1.5×10^{-5} ft/min was determined for wells MW-1 and MW-3. These conductivities are consistent with: 1) geologic material grain size 2) literature values for the Pierre Shale and 3) observations in the field regarding the speed at which these wells recharged after sampling. Test results and Aqtesolve output are included in Appendix C.

Discussion

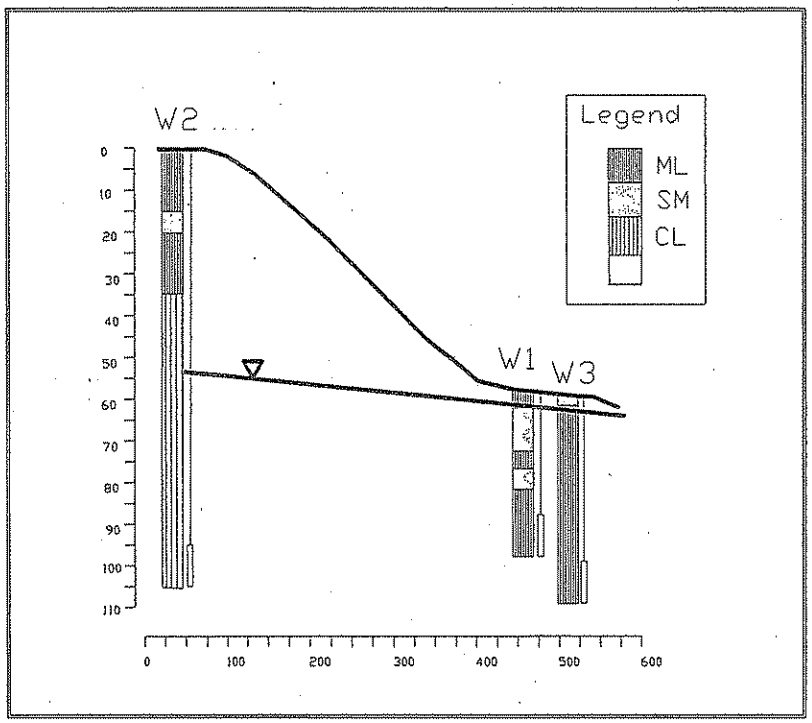
Overburden at the site consists of silts, sands, gravel and cobble. It is yellow orange to tan in color. Permeability's are estimated to range from 1×10^{-3} to 1×10^{-2} cm/sec (Dames & Moore 1985). The material is loose; N values were less than 10.

Consolidated materials, beneath the ADF, consist of siltstone, claystone and Pierre Shale. Split spoon samples and rotary cuttings reveal significant clay content. The material is tan, brown or yellow orange near the surface and transitions into gray or olive gray with depth. Split spoons have identified laminations of silty sand and fine sands. No voids were identified, however layers of loosely cemented materials were evident based upon drilling rate and loss of air circulation.

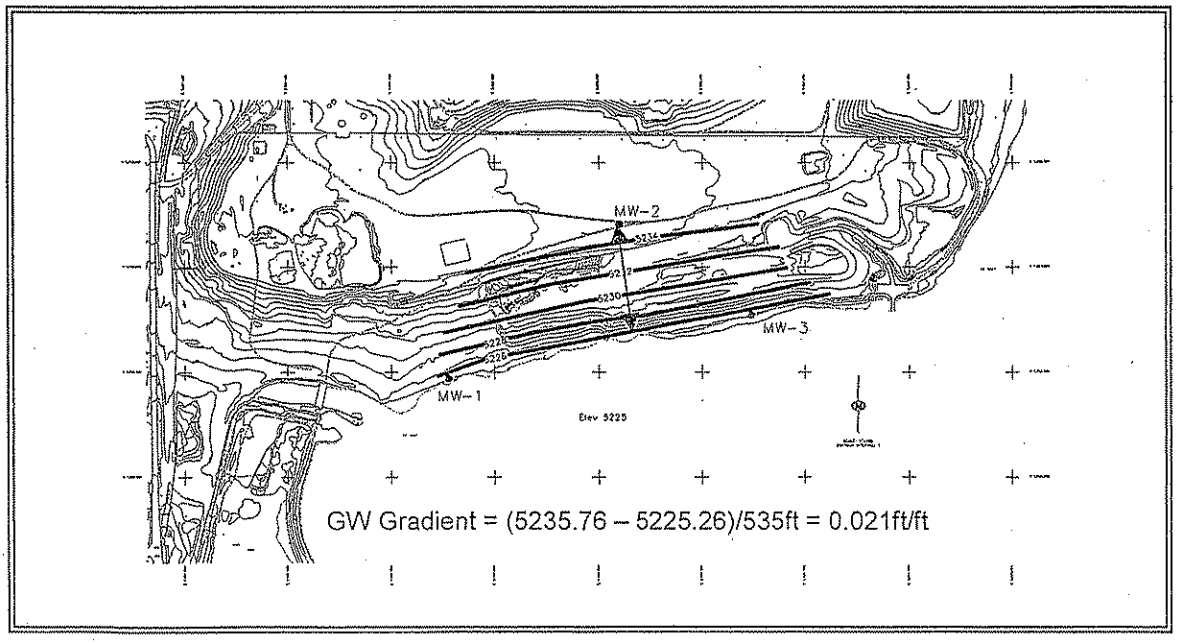
The Pierre shale is highly weathered in the upper 1to 5 feet. Beneath the weathered surface, it is hard / very dense. N values exceeded 50 blows for less

than 6" of penetration with a standard split spoon. Figure 1 presents a geologic cross section showing relative well locations and stratigraphy.

Figure 1 Geologic Cross Section



The ADF monitoring wells place the first water table within the Pierre Shale. Figure 2 illustrates the ground water elevations beneath the site. A gradient of 0.021 was calculated using 11/19/2002 elevation measurements. Using an average shale permeability, determined by on-site slug tests, ($4x10^{-7}$ cm/sec) and a porosity of 30%, a ground water travel velocity of 0.03 ft per year was calculated.



Conclusion

- Three monitoring wells were installed at the Valmont Station ADF; one up gradient, two down gradient.
- Ground water beneath the ADF is situated in the Pierre Shale and flows SE at a rate of 0.03 ft/year.
- The permeability of the first water table material is estimated to be $4x10^{-7}$ cm/sec.
- A ground water gradient of 0.021 ft/ft was measured for the first water table.

Appendix A
Boring Logs

ec americas, LLC

Test Boring Report - Boring No.: B1

Client: XCEL Energy
Job Name: Valmont GW Investigation
Job Description: EMS Installation
Job Location: Valmont Ash Disposal Site
Contractor: Site Services, Inc.
Drill Rig (Mfr./Model): CME/75

Logged By: Jim Chamness
Date Start: 05 August 2002
Date Finished: 06 August 2002
Boring Coord:
Elevation (ground surface):
Driller: Joshua Eckhoff

Groundwater		Depth in Feet To:			Auger or Casing Type			Sampler Type		
Date	Hours After Completion	Water	Bottom of Augers	Bottom of Borehole	Type	SSA	HSA	C	S	Other:
08/05/02	0.1	15.0	39.0	39.2	Size ID		4.25"		2.0"	
08/05/02	0.2	10.0	39.0	39.2	Hammer Wt.				140#	
08/06/02	16.0	5.9	0.0	39.2	Hammer Fall				30"	Automatic

Blows / Ft.	Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
51+	Very Dense

Blows / Ft.	Consistency
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
31+	Hard

Sampler Type ID
C - California Barrel
S - Split Spoon
T - Tube
U - Undisturbed Piston
G - Grab Sample
X - Other

Component %
Mostly 50 - 100%
Some 30 - 49%
Little 15 - 29%
Few 5 - 10%
Trace <5%

Groundwater Abbreviations
WD - While drilling
NE - Not encountered
UR - Not read

Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
0.0	5 6 4 8	100	S1	0-2.0		ML	SANDY SILT: Stiff, slightly moist, dark gray-brown, mostly SILT, some fine sand, trace roots; lower 4 inches calcareous
	8 27 50	95	S2	4.0-5.5		SM	SILTY SAND: Very dense, slightly moist, olive-gray, mostly very fine SAND; little to some silt, moderately cemented, calcareous
-5.0							
	35 50	75	S3	9.0-10.0		SM	SILTY SAND: Very dense, slightly moist, mottled yellow to orange-brown and olive-gray, mostly very fine SAND; few to
-10.0							

Notes: Bottom of exploration at 39.2 ft. below ground. GW at 5.5 ft.b.g. 22 hours after completion, 08/06/2002. Installed monitoring well MW1 in boring B1 on 08/06/2002 with with screen at 28.5 to 38.5 ft. below ground surface.

ec americas,LLC							Test Boring Report - Boring No.: B1
Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
							little silt, weakly cemented, slightly calcareous (breaks into thin horizontal layers)
-15.0	50	50	S4	14.0-14.5		ML	SILT: Hard, slightly moist, tan to olive-brown, mostly SILT, trace to few sand, severely weathered bedrock, PIERRE SHALE.
-20.0	50 (4")	50	S5	19.0-19.3		SM	SILTY SAND: Very dense, slightly moist, olive-gray, mostly very fine SAND, some silt. Severely weathered bedrock, PIERRE SHALE.
-25.0	50 (3")	90	S6	24.0-24.25		ML	SILT: Hard, moist to wet (see following note), olive-brown, mostly SILT with hard shale fragments, moderately to severely weathered bedrock, PIERRE SHALE. Note: driller attributes "wet" condition at top of sample to condensation from difficult drilling
-30.0	50 (3")	60	S7	29.0-29.25		ML	SILT: Hard, very slightly moist, blue-gray, mostly SILT

Notes: Bottom of exploration at 39.2 ft. below ground. GW at 5.5 ft.b.g. 22 hours after completion, 08/06/2002. Installed monitoring well MW1 in boring B1 on 08/06/2002 with with screen at 28.5 to 38.5 ft. below ground surface.

ec americas,LLC	Test Boring Report - Boring No.: B1

Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
-35.0	50 (3")	50	S8	34.0-34.25		ML	SILT: Hard, very slightly moist, blue-gray, mostly SILT
-40.0	50 (3")	50	S9	39.0-39.20		---	SILTSTONE: Moderately hard, blue-gray, fine-grained siltstone; one-half inch thick fragment recovered; remainder of "sample" pulverized to silty clay by drilling, PIERRE SHALE.
-45.0							

Notes: Bottom of exploration at 39.2 ft. below ground. GW at 5.5 ft.b.g. 22 hours after completion, 08/06/2002. Installed monitoring well MW1 in boring B1 on 08/06/2002 with with screen at 28.5 to 38.5 ft. below ground surface.

ec americas, LLC

Test Boring Report - Boring No.: B2

Client: XCEL Energy
Job Name: Valmont GW Investigation
Job Description: EMS Installation
Job Location: Valmont Ash Disposal Site
Contractor: Site Services, Inc.
Drill Rig (Mfr./Model): CME/75

Logged By: Jim Chamness
Date Start: 05 August 2002
Date Finished: 05 August 2002
Boring Coord:
Elevation (ground surface):
Driller: Joshua Eckhoff

Groundwater		Depth in Feet To:			Auger or Casing Type			Sampler Type		
Date	Hours After Completion	Water	Bottom of Augers	Bottom of Borehole	Type	SSA	HSA	C	S	Other:
08/05/02	0.5	NE	34.5	34.5	Size ID		4.25"		2.0"	
					Hammer Wt.				140#	
					Hammer Fall				30"	Automatic

Blows / Ft.	Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
51+	Very Dense

Blows / Ft.	Consistency
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
31+	Hard

Sampler Type ID
C - California Barrel
S - Split Spoon
T - Tube
U - Undisturbed Piston
G - Grab Sample
X - Other

Component %
Mostly 50 - 100%
Some 30 - 49%
Little 15 - 29%
Few 5 - 10%
Trace <5%

Groundwater Abbreviations
WD - While drilling
NE - Not encountered
UR - Not read

Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
0.0							
	18 20 16 23	75	S1	4.0-6.0		ML	SILT with sand: Hard, slightly moist, mottled olive to orange-brown and olive-gray, mostly SILT, little very fine sand; with very thin horizontal very fine sand laminations and irregular white, calcareous seams and lenses Severely weathered bedrock, PIERRE SHALE.
-5.0							
	8 37	70	S2	9.0-10.5		ML	SILT with sand: Hard, slightly moist, mottled olive to orange-brown and olive-gray, mostly SILT, little very fine
-10.0							

Notes: Botttom of exploration at 34.5 ft. below grade, due to difficult drilling (>10 min.s / ft. at 29-34 ft.b.g.)
Borehole abandoned by filling hole with 17 50#-bags of CETCO bentonite chips (medium) while pumping water down hole.

ec americas,LLC	Test Boring Report - Boring No.: B2

Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
-10.0	50						sand; with very thin horizontal very fine sand laminations and some surfaces stained with FeO2 and MnO2.
-15.0	25 50	100	S3	14.0-15.0		SM	SILTY SAND: Very dense, slightly moist, mottled light yellow-brown and light gray, mostly very fine SAND, little silt, thinly laminated.
-20.0	11 50	100	S4	19.0-20.0		ML	SANDY SILT: Hard, moist, mottled light yellow to olive-brown and light gray, mostly SILT, little to some very fine sand, thinly laminated, severely weathered bedrock, PIERRE SHALE.
-25.0	18 50	75	S5	24.0-25.0		ML	SANDY SILT: Hard, slightly moist, mottled yellow -, orange -, and olive-brown to light olive-gray, mostly SILT, some very fine sand, thinly laminated
-30.0	50	25	S6	29.0-29.5		ML	SANDY SILT: Hard, slightly moist, mottled yellow -, orange -, and olive-brown to light olive-gray, mostly SILT, some very fine sand, thinly laminated: slightly to severely weathered olive-gray, fine-grained bedrock, PIERRE SHALE

Notes: Botttom of exploration at 34.5 ft. below grade, due to difficult drilling (>10 min.s / ft. at 29-34 ft.b.g.)
Borehole abandoned by filling hole with 17 50#-bags of CETCO bentonite chips (medium) while pumping water down hole.

ec americas,LLC	Test Boring Report - Boring No.: B2

Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
-35.0	50	20	S7	34.0-34.5		ML	SILT: Hard, slightly moist, olive-gray, mostly SILT, little very fine sand; thinly laminated
-40.0							

Notes: Botttom of exploration at 34.5 ft. below grade, due to difficult drilling (>10 min.s / ft. at 29-34 ft.b.g.)
Borehole abandoned by filling hole with 17 50#-bags of CETCO bentonite chips (medium) while pumping water down hole.

XCEL ENERGY

414 NICOLLET MALL
MPLS MN (612) 330-6082

BORING LOG

Boring No: MW-2

Site: Valmont ADF
Project No.:
Sheet Of

Drilling Method:	4 1/2 OD A
Company:	Spectrum
Foreman:	Steve
Rig Model:	CME
Geol/Engr:	C. Donkers
Ground Surface Elevation:	
Physical Setting: Top of Butte	
Date/Time Started:	
Date/Time Completed: 11/12/02	
Coordinates:	

Water Level Info

Date	Time	Depth
11/12/02	12:30	30
	3:12	75
	5:30	105

SOIL LOG	DEPTH (FEET)	SAMPLING INFORMATION NO.	T	A	R	B	N	USCS	SOIL DESCRIPTION	COMMENTS
									0-5 overburden	
									See EC Americas boring log for B-2 for upper 35ft of this boring.	
									B-2 is offset 3 ft horizontally from MW-3	
	5							ML	5-10 silt stone, tan, dry	
								ML		
	10								same	
	15							SM	same	
								ML		
	20								same possible void or loosely cemented from 20-21, lost circulation	
	25							ML	Same, clay stone, tan, dry, bit was pulled - dry possible void or loosely cemented from 25-26, lost circulation	
								ML		
	30								same, clay stone, tan, dry	
	35							ML	same (end of B-2 split spoon record)	
								ML		
	40								same	
	45							ML	same	
								CL		
	50								Same	

BORING LOG

Xcel Energy

414 Nicollet Mall
MPLS MN (612) 330-6082

Boring No: MW-2

Site: Valmont ADF
Project No.:
Sheet Of

Drilling Method: 4 1/2 Air Rotary
Company: Spectrum
Foreman: Steve
Rig Model: CME
Geol/Engr: Chuck Donkers

Ground Surface Elevation:
Physical Setting:
Date/Time Started: 11/12/02
Date/Time Completed: 11/12/02
Coordinates:

Water Level Info

Date	Time	Depth

SOIL LOG	DEPTH (FEET)	SAMPLING INFORMATION NO.	T	A	R	B	N	USCS	SOIL DESCRIPTION	COMENTS
	55							CL	Same	
								CL		
	60								Laminations, tan & grey, clay stone, dry	Approx Resivoir elevation
	65							CL	olive grey, dry, Pierre Shale	
								ML		
	70								olive grey, dry, Pierre Shale	
	75							ML	olive grey, dry, Pierre Shale, (Taped -No Water)	
								ML	laminations of tan	
	80								olive grey, dry, Pierre Shale	
									hard	
	85							CL	olive grey, dry, hard, Pierre Shale	
								CL	soft layer	Estimated Regional water table
	90								olive grey, soft, dry, Pierre Shale	
	95							CL	olive grey, hard, dry, Pierre Shale	
								CL		
	100								same	
								CL	olive grey, dry, Pierre Shale - bit was dry when pulled and no water on tape	End of Boring @ 105' BGS

WESTON

ec americas, LLC

Test Boring Report - Boring No.: B3

Client: XCEL Energy
Job Name: Valmont GW Investigation
Job Description: EMS Installation
Job Location: Valmont Ash Disposal Site
Contractor: Site Services, Inc.
Drill Rig (Mfr./Model): CME/75

Logged By: Jim Chamness
Date Start: 06 August 2002
Date Finished: 06 August 2002
Boring Coord:
Elevation (ground surface):
Driller: Joshua Eckhoff

Groundwater		Depth in Feet To:			Auger or Casing Type			Sampler Type		
Date	Hours After Completion	Water	Bottom of Augers	Bottom of Borehole	Type	SSA	HSA	C	S	Other:
08/06/02	0.25	NE	44	34.8	Size ID		4.25"		2.0"	
08/06/02	0.25	44.3	34	44.5	Hammer Wt.				140#	
					Hammer Fall				30"	Automatic

Blows / Ft.	Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
51+	Very Dense

Blows / Ft.	Consistency
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
31+	Hard

Sampler Type ID
C - California Barrel
S - Split Spoon
T - Tube
U - Undisturbed Piston
G - Grab Sample
X - Other

Component %
Mostly 50 - 100%
Some 30 - 49%
Little 15 - 29%
Few 5 - 10%
Trace <5%

Groundwater Abbreviations
WD - While drilling
NE - Not encountered
UR - Not read

Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
0.0	4 5 4 6	100	S1	0.0-2.0		SM	0 - 0.2 Sod SILTY SAND: Loose, dark gray-brown to olive-brown, mostly SAND, some silt; with roots: Colluvium
						ML	SANDY SILT: Colluvium
	2 4 7 11	90	S2	4.0-6.0			SILT: Stiff, moist, mottled yellow- orange- and olive-brown, mostly SILT, occasional roots
-5.0							
	7 14	88	S3	9.0-11.0		ML	SILT: Hard, slightly moist, yellow to olive-brown, mostly SILT, with numerous MnO2 and FeO2 stained planar and
-10.0							

Notes: Bottom of exploration at 49.5 ft. below ground surface.
Advanced augers to 50.1 ft. below ground surface.
Installed monitoring well MW3 with screen
from 39.25 to 49.25 ft. below ground surface.

Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
-10.0	21 26						irregular surfaces; completely weathered bedrock, PIERRE SHALE
-15.0	6 17 27 40	100	S4	14.0-16.0		ML	SILT: Hard, very slightly moist, mottled yellow-brown, olive and light gray, mostly SILT; numerous discontinuous MnO2 and FeO2 planar and irregular surfaces
-20.0	14 22 26 36	100	S5	19.0-21.0		ML	SILT: Hard, very slightly moist, mottled yel.-brown, olive & lt. gray, mostly SILT; num. discontin. MnO2 & FeO2 planar & irregular surfaces, w/ occas. CaCO2-filled fractures
-25.0	6 17 27 40	100	S6	24.0-26.0		ML	SILT: Hard, v. sltly. moist, mott. yel-brown, olive & light gray, mostly SILT; num. discontinuous MnO2 and FeO2 planar and irregular surfaces, with occasional CaCO2-filled fractures
-30.0	20 50	100	S7	29.0-30.0		ML	SANDY SILT: Hard, dry to very slightly moist, mottled yellow-brown, olive and gray, mostly SILT, some very fine sand; numerous discontinuous MnO2 and FeO2 planar and irregular surfaces, drilling difficulty increasing below 30 ft.b.g. : Moderately to severely weathered bedrock, PIERRE SHALE.

Notes: Bottom of exploration at 49.5 ft. below ground surface.
Advanced augers to 50.1 ft. below ground surface.
Installed monitoring well MW3 with screen
from 39.25 to 49.25 ft. below ground surface.

ec americas,LLC	Test Boring Report - Boring No.: B3

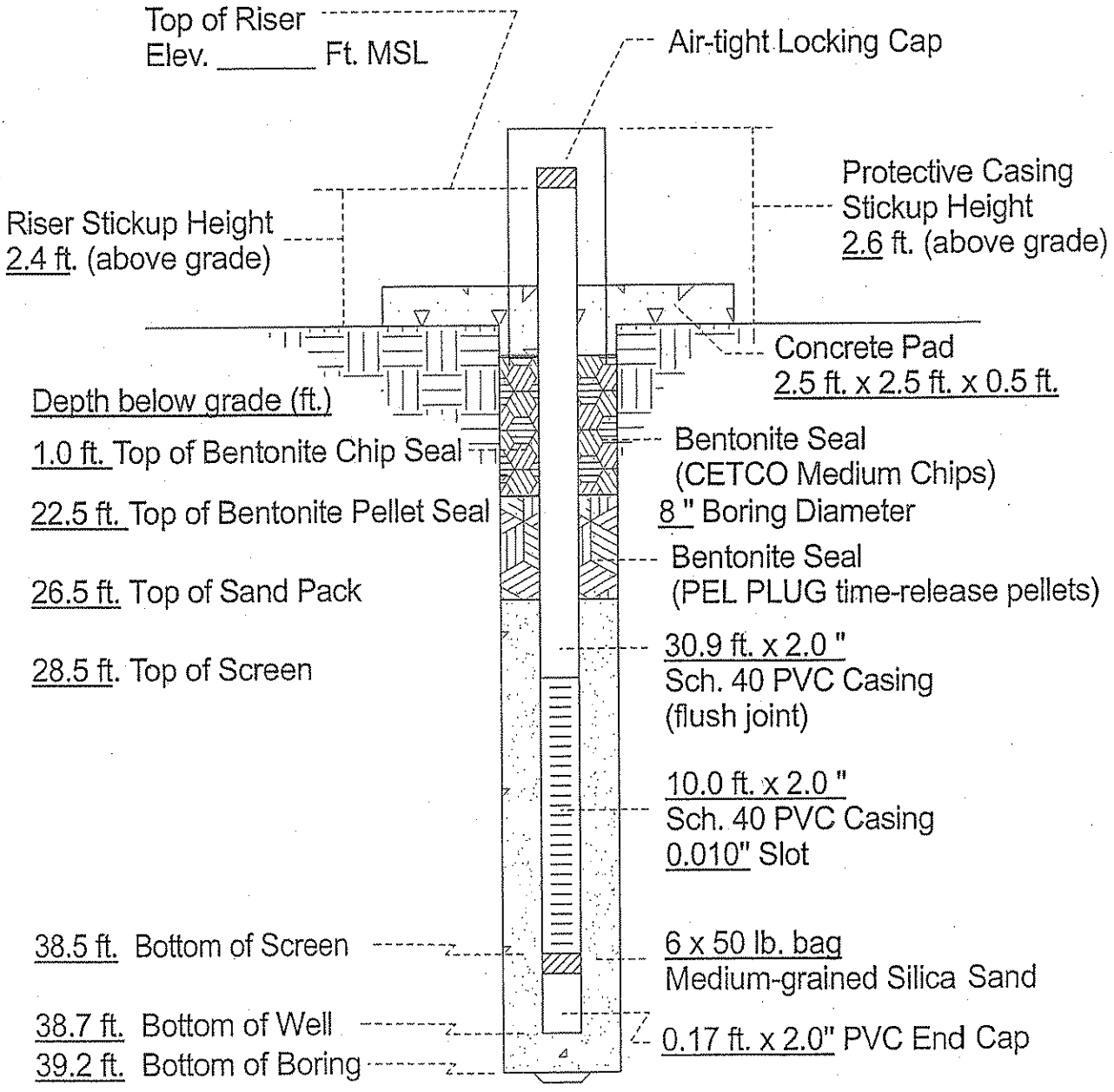
Depth (feet)	Sampler (bp6")	Percent Rcvry	Sample No.	Sample Depth Range	Lith.	USCS	Lithologic Description / Notes
-35.0	35 50 (4")	100	S8	34.0-34.8		ML	SILT and SANDY SILT: Hard, dry to very slightly moist, mottled yellow-brown, olive and gray, mostly SILT, some very fine sand; numerous discontinuous MnO2 and FeO2 planar and irregular surfaces, in thin horizontal laminations
-40.0	50 (5")	30	S9	39.0-39.4		ML	SILT: Hard, dry, mottled yellow to orange-brown, olive and dark gray, mostly SILT; moderately weathered bedrock, PIERRE SHALE
-45.0	50	90	S10	44.0-44.5		ML	SILT: Hard, moist, mottled yellow to orange-brown, olive and dark gray, mostly SILT, calcareous; moderately weathered bedrock, PIERRE SHALE; drilling advance easier at 42 ft.b.g.
-50.0	50	30	S11	49.0-49.5		ML	SILT: Hard, wet, olive to dark gray, mostly SILT, calcareous; moderately to severely weathered bedrock, PIERRE SHALE

Notes: Bottom of exploration at 49.5 ft. below ground surface.
Advanced augers to 50.1 ft. below ground surface.
Installed monitoring well MW3 with screen
from 39.25 to 49.25 ft. below ground surface.

Appendix B
Well Construction Diagrams

ec americas Monitoring Well Construction Details

Client:	XCEL Energy	Well No.:	MW1
Job Name:	Valmont GW Investigation	Date Installed:	06 August 2002
Drilling Co.:	Site Services, Inc.	Drilling Method:	HSA
Drilling Location:	Valmont Ash Disposal Site Boulder, CO	Field Geologist:	Jim Chamness



Not to Scale

Monitoring Well Construction Detail

Job Name: Valmont ADF

Well No: MW-2

Drilling Co: Spectrum

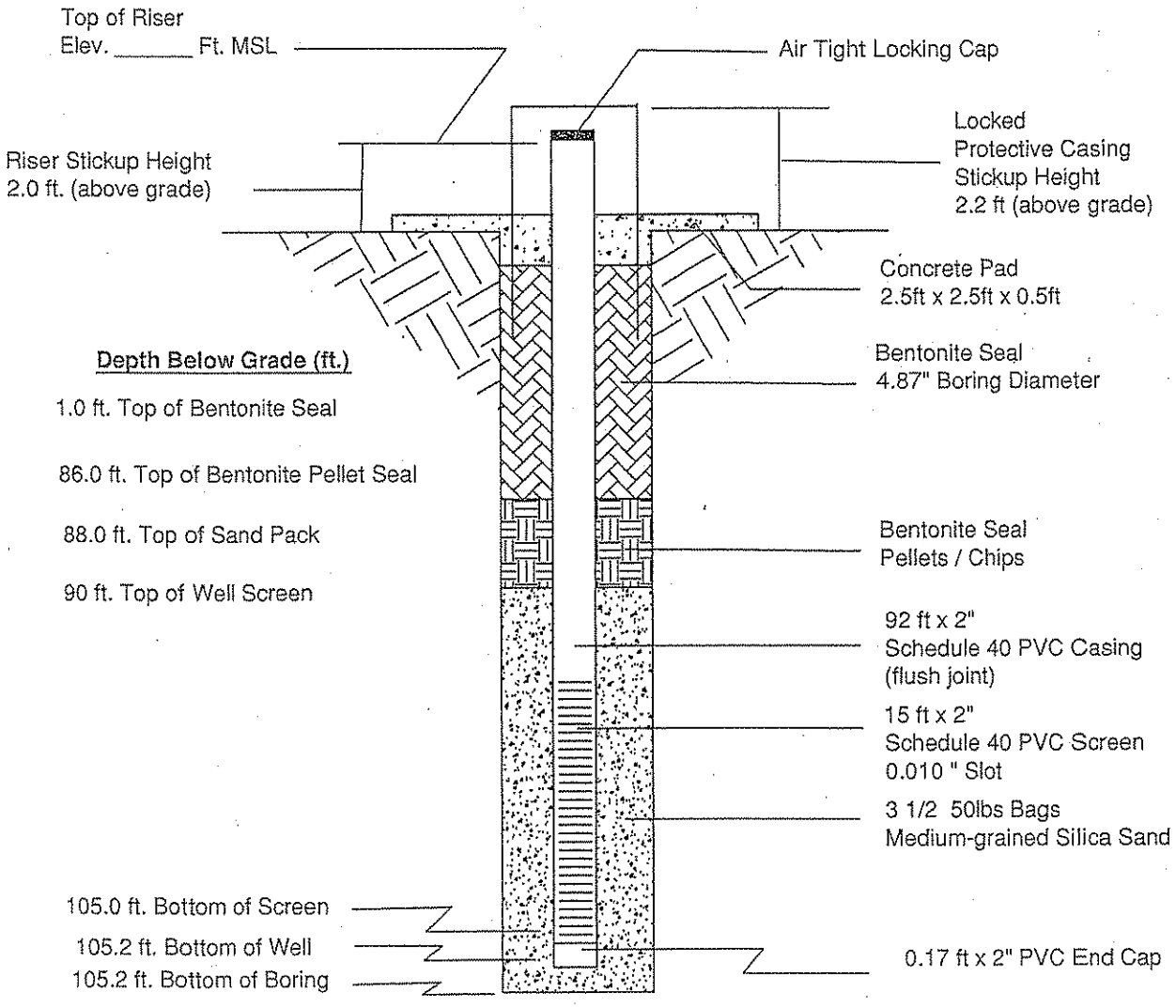
Date Installed: 11/12/02

Latitude: _____

Drilling Method: Air Rotary

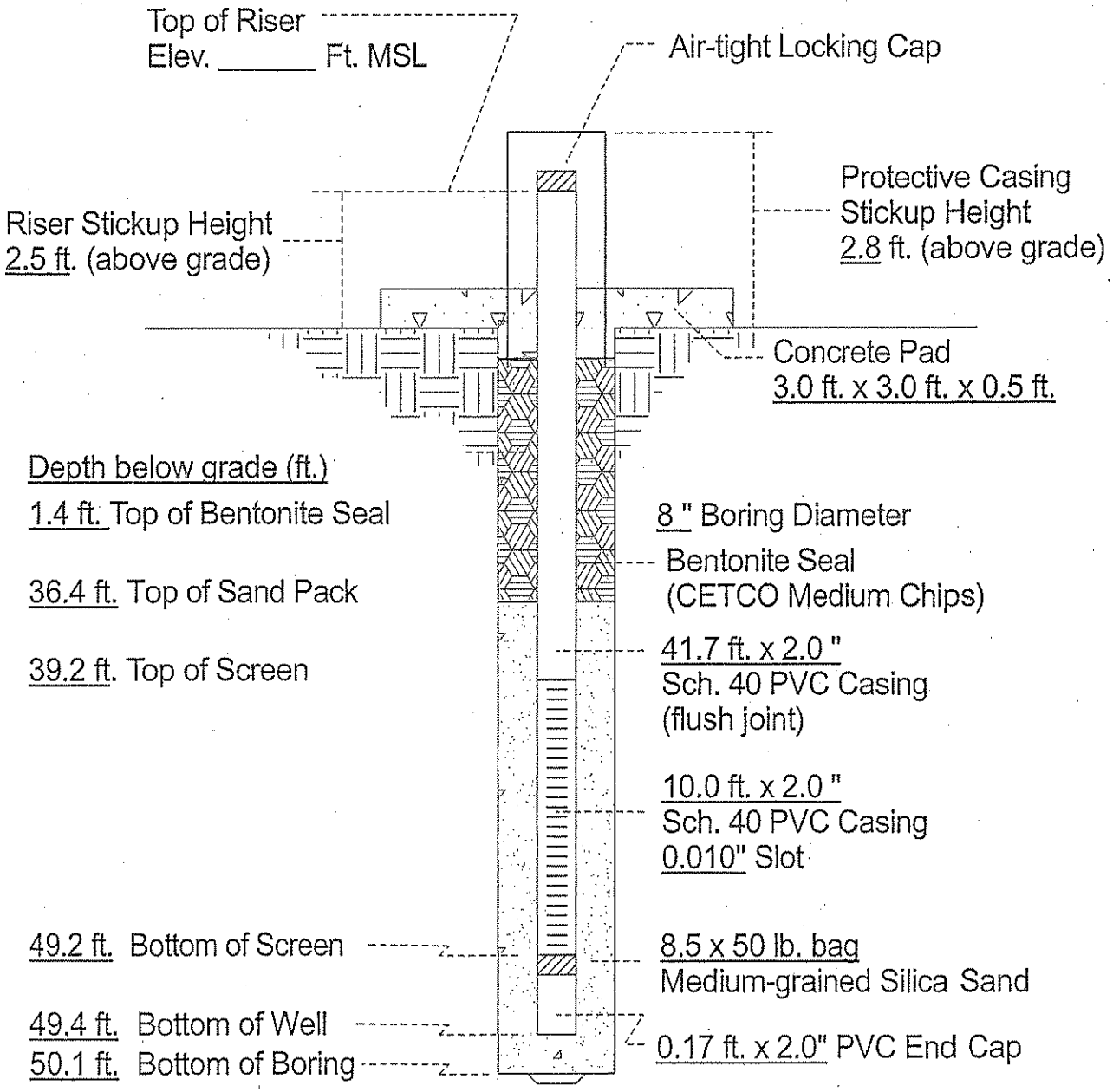
Longitude: _____

Field Geologist: Chuck Donkers



ec americas Monitoring Well Construction Details

Client:	XCEL Energy	Well No.:	MW3
Job Name:	Valmont GW Investigation	Date Installed:	06 August 2002
Drilling Co.:	Site Services, Inc.	Drilling Method:	HSA
Drilling Location:	Valmont Ash Disposal Site Boulder, CO	Field Geologist:	Jim Chamness



Not to Scale

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 257834 - - -
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

XCEL ENERGY
1800 N 63RD ST
BOULDER, CO 80302-

(303) 440-2535

APPROVED WELL LOCATION
BOULDER COUNTY
NW 1/4 NW 1/4 Section 26
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
1050 Ft. from North Section Line
100 Ft. from West Section Line

UTM COORDINATES
Northing: Easting:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-41045, and known as MW-1.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with well permit number(s) and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit. P.T. 6-25-2004

APPROVED
LMD

Hal D. Simpson
State Engineer

By

Receipt No. 0524872A DATE ISSUED 06-25-2004 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 257835 - - -
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

XCEL ENERGY
1800 N 63RD ST
BOULDER, CO 80302-

(303) 440-2535

APPROVED WELL LOCATION
BOULDER COUNTY
NW 1/4 NW 1/4 Section 26
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
320 Ft. from North Section Line
1100 Ft. from West Section Line

UTM COORDINATES
Northing: Easting:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-41045, and known as MW-2.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with well permit number(s) and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit. RC 6-25-2004

APPROVED
LMD

Hal D. Simpson
State Engineer

By

Receipt No. 0524872B DATE ISSUED 06-25-2004 EXPIRATION DATE N/A

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 257836 - - -
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

XCEL ENERGY
1800 N 63RD ST
BOULDER, CO 80302-

(303) 440-2535

APPROVED WELL LOCATION
BOULDER COUNTY
NW 1/4 NW 1/4 Section 26
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
650 Ft. from North Section Line
1300 Ft. from West Section Line

UTM COORDINATES
Northing: Easting:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-41045, and known as MW-3.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with well permit number(s) and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

P.T. 6-25-2004

APPROVED
PAT

Hal D. Simpson
State Engineer

By

Receipt No. 0524872C DATE ISSUED 06-25-2004 EXPIRATION DATE N/A

Form
No. GWS-7
03/02

EXEMPT PERMIT INFORMATION SHEET

STATE OF COLORADO
OFFICE OF THE STATE ENGINEER
821 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581 Fax (303) 866-3589

INFORMATION FOR WELL PERMITS APPROVED PURSUANT TO CRS 37-92-602
(HOUSEHOLD, DOMESTIC, LIVESTOCK AND EXEMPT COMMERCIAL USES)

Carefully read the conditions of approval on your well permit. The conditions and the information on this information sheet must be complied with in order for the permit to remain valid.

THE PERMIT EXPIRATION DATE IS TWO YEARS FROM THE DATE ISSUED. The well must be constructed and evidence of it's construction must be received by this office in the form of a Well Construction and Test report from the well construction contractor confirming that the well was constructed prior to expiration of the well permit. The well permit number is located in the upper right hand corner of the permit, and the expiration date is located in the lower right hand corner. The expiration date of the permit may be **extended one year at a time** at the discretion of the State Engineer for good cause shown. **If an extension of time is necessary to construct the well, a written request for the extension of time must be received by this office prior to the expiration date of the well permit. In the request, you must provide the well permit number, your name and mailing address and the reasons why the well has not been constructed and when it will be constructed. No fee is required for this type of permit extension.**

Water well construction and pump installation contractors are specifically licensed in Colorado to perform these specialized tasks. It is illegal for contractors who do not hold these licenses to construct wells and/or install pumping equipment in or on wells. The well must be constructed and the pump installed by contractors with current license(s) issued by the State of Colorado unless exempted as described on the reverse side. Please ask to see their license(s). Backhoe Operators and Licensed Plumbers may or may not hold the respective Well Construction and/or Pump Installation licenses. Please be aware of this when you contract to construct the well and install pumping equipment. The well construction report including a test of the well yield must be submitted to the office of the State Engineer within sixty (60) days of completion of the work or within seven days after expiration of the permit, whichever is earlier. The pump installation report including a pumping system test must be submitted within sixty (60) days of completion of the work. The contractor(s) must provide you with a copy of the work report(s) filed with the State Engineer. The Well Construction and Test Report, Form Number GWS-31 and the Pump Installation and Test Report, Form Number GWS-32 are available from the Division of Water Resources offices. Additional information regarding well construction, pump installation, required testing and well plugging and sealing regulations are found on the reverse side of this sheet.

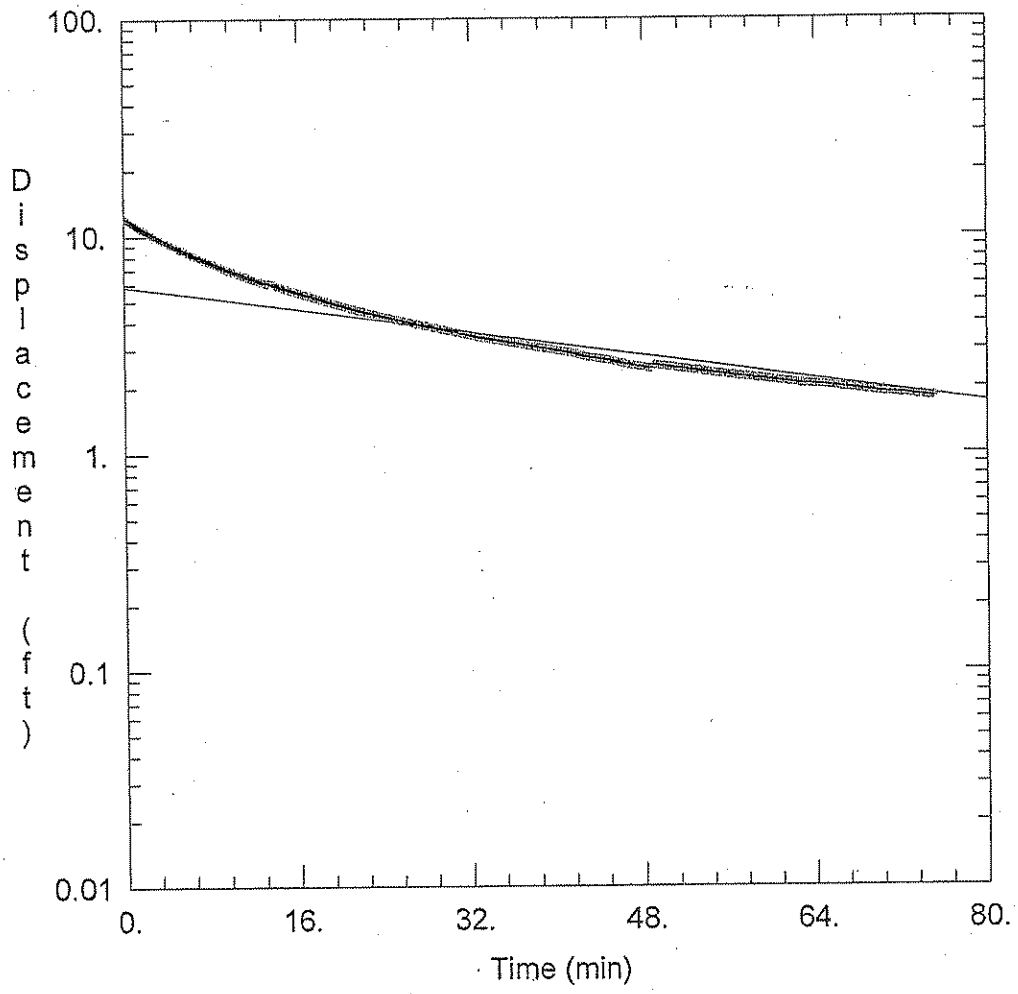
You have been provided with at least two copies of the well permit. Keep a copy for your records. There is also a copy for the pump installation contractor. Copies have been sent to the driller if you indicated a driller license number on the application, or two additional copies have been enclosed. You may make additional copies for the well construction contractor if you select one different from the one indicated in your application.

The original permit is on file in the Denver office Records Section. Copies may be obtained for a fee of 50 cents per page. Statutes require that any change of mailing address or ownership be reported to the State Engineer. Form number GWS-11 is used both by new owners to report ownership changes and current owners to report address changes.

If you have questions, contact the Denver Office, or the Division Office in the area where your well is located.

Division 1 810 9th St. 2nd Floor Greeley, CO 80631 (970) 352-8712 Fax (970) 391-1816	Division 2 310 E. Abriendo Ave Ste B Pueblo, CO 81004 (719) 542-3368 Fax (719) 544-0800	Division 3 422 4th St Alamosa, CO 81101 (719) 589-6683 Fax (719) 589-6685	Division 4 1871 East Main St. Montrose, CO 81402 (970) 249-6622 Fax (970) 249-8728
Division 5 Direct mail to Box 396 Glenwood Spgs CO 81602 50633 U.S. Hwy 6 & 24 Glenwood Spgs., CO 81601 (970) 945-5665 Fax (970) 945-8741 Call first	Division 6 Direct mail to Box 773450 505 Anglers Dr. Suite 101 Steamboat Spgs, CO 80477 (970) 879-0272 Fax (970) 879-1070	Division 7 701 Camino Del Rio Ste. 205 Durango, CO 81301 (970) 247-1845 Fax (970) 866-5417	Denver Office 1313 Sherman St. Rm. 818 Denver, CO 80203 (303) 866-3581 Fax (303) 866-3589

Appendix C
Slug Test Results



WELL TEST ANALYSIS

Data Set: \...\mw3valmont.aqt
Date: 12/23/02
Time: 09:26:07

AQUIFER DATA

Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (mw-3val)

Initial Displacement: 12.14 ft
Wellbore Radius: 0.33 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.083 ft
Well Skin Radius: 0.33 ft
Total Well Penetration Depth: 41.39 ft

SOLUTION

Aquifer Model: Unconfined
K = 1.508E-05 ft/min
Solution Method: Bouwer-Rice
y0 = 5.887 ft

Data Set: \\FNPESGO01\Home\dnkc02\DATA\data-keep\WORD\Project_Files\Valmont\mw3valmont.aqt
Date: 12/23/02
Time: 09:25:44

AQUIFER DATA

Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Initial Displacement: 12.14 ft
Casing Radius: 0.083 ft
Wellbore Radius: 0.33 ft
Well Skin Radius: 0.33 ft
Screen Length: 10. ft
Total Well Penetration Depth: 41.39 ft
Gravel Pack Porosity: 0.3

No. of observations: 903

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.	37.67	3.1
0.08	12.07	37.75	3.1
0.17	12.02	37.83	3.08
0.25	11.95	37.92	3.08
0.33	11.86	38.	3.07
0.42	11.78	38.08	3.07
0.5	11.7	38.17	3.06
0.58	11.63	38.25	3.06
0.67	11.57	38.33	3.05
0.75	11.49	38.42	3.05
0.83	11.42	38.5	3.05
0.92	11.36	38.58	3.04
1.	11.29	38.67	3.04
1.08	11.22	38.75	3.03
1.17	11.16	38.83	3.03
1.25	11.11	38.92	3.03
1.33	11.04	39.	3.02
1.42	10.96	39.08	3.01
1.5	10.9	39.17	3.01
1.58	10.86	39.25	3.01
1.67	10.79	39.33	3.01
1.75	10.72	39.42	2.99
1.83	10.67	39.5	2.99
1.92	10.61	39.58	2.98
2.	10.55	39.67	2.98
2.08	10.5	39.75	2.98
2.17	10.43	39.83	2.97
2.25	10.39	39.92	2.96
2.33	10.33	40.	2.96
2.42	10.26	40.08	2.96
2.5	10.21	40.17	2.95
2.58	10.17	40.25	2.94
2.67	10.12	40.33	2.94
2.75	10.05	40.42	2.94
2.83	10.01	40.5	2.93
2.92	9.96	40.58	2.93
3.	9.91	40.67	2.92
3.08	9.85	40.75	2.92
3.17	9.81	40.83	2.92
3.25	9.76	40.92	2.9
3.33	9.71	41.	2.9

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
3.42	9.65	41.08	2.89
3.5	9.61	41.17	2.89
3.58	9.55	41.25	2.88
3.67	9.51	41.33	2.88
3.75	9.46	41.42	2.87
3.83	9.41	41.5	2.87
3.92	9.37	41.58	2.86
4.	9.33	41.67	2.86
4.08	9.28	41.75	2.85
4.17	9.24	41.83	2.84
4.25	9.2	41.92	2.84
4.33	9.15	42.	2.83
4.42	9.1	42.08	2.81
4.5	9.06	42.17	2.81
4.58	9.02	42.25	2.8
4.67	8.98	42.33	2.8
4.75	8.93	42.42	2.78
4.83	8.89	42.5	2.78
4.92	8.84	42.58	2.78
5.	8.81	42.67	2.77
5.08	8.77	42.75	2.76
5.17	8.72	42.83	2.76
5.25	8.7	42.92	2.76
5.33	8.65	43.	2.75
5.42	8.61	43.08	2.75
5.5	8.56	43.17	2.75
5.58	8.53	43.25	2.74
5.67	8.5	43.33	2.74
5.75	8.45	43.42	2.74
5.83	8.42	43.5	2.72
5.92	8.37	43.58	2.72
6.	8.35	43.67	2.72
6.08	8.3	43.75	2.72
6.17	8.26	43.83	2.71
6.25	8.23	43.92	2.71
6.33	8.19	44.	2.71
6.42	8.16	44.08	2.71
6.5	8.12	44.17	2.7
6.58	8.09	44.25	2.69
6.67	8.06	44.33	2.69
6.75	8.02	44.42	2.69
6.83	7.99	44.5	2.68
6.92	7.96	44.58	2.68
7.	7.91	44.67	2.68
7.08	7.89	44.75	2.67
7.17	7.85	44.83	2.67
7.25	7.82	44.92	2.66
7.33	7.79	45.	2.66
7.42	7.75	45.08	2.66
7.5	7.72	45.17	2.65
7.58	7.69	45.25	2.65
7.67	7.66	45.33	2.63
7.75	7.63	45.42	2.62
7.83	7.6	45.5	2.62
7.92	7.56	45.58	2.61
8.	7.54	45.67	2.6
8.08	7.51	45.75	2.6
8.17	7.48	45.83	2.59
8.25	7.45	45.92	2.59
8.33	7.42	46.	2.58
8.42	7.39	46.08	2.58
8.5	7.36	46.17	2.58
8.58	7.33	46.25	2.57

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
8.67	7.29	46.33	2.56
8.75	7.27	46.42	2.56
8.83	7.24	46.5	2.56
8.92	7.21	46.58	2.54
9.	7.18	46.67	2.54
9.08	7.15	46.75	2.53
9.17	7.12	46.83	2.53
9.25	7.1	46.92	2.52
9.33	7.08	47.	2.51
9.42	7.06	47.08	2.51
9.5	7.02	47.17	2.51
9.58	7.	47.25	2.51
9.67	6.97	47.33	2.5
9.75	6.94	47.42	2.5
9.83	6.93	47.5	2.5
9.92	6.91	47.58	2.49
10.	6.88	47.67	2.49
10.08	6.85	47.75	2.49
10.17	6.83	47.83	2.48
10.25	6.8	47.92	2.48
10.33	6.77	48.	2.47
10.42	6.74	48.08	2.47
10.5	6.73	48.17	2.47
10.58	6.7	48.25	2.45
10.67	6.67	48.33	2.45
10.75	6.65	48.42	2.45
10.83	6.63	48.5	2.44
10.92	6.61	48.58	2.44
11.	6.58	48.67	2.44
11.08	6.56	48.75	2.44
11.17	6.54	48.83	2.51
11.25	6.52	48.92	2.54
11.33	6.49	49.	2.53
11.42	6.46	49.08	2.53
11.5	6.45	49.17	2.53
11.58	6.43	49.25	2.52
11.67	6.4	49.33	2.52
11.75	6.38	49.42	2.51
11.83	6.36	49.5	2.51
11.92	6.34	49.58	2.51
12.	6.31	49.67	2.51
12.08	6.29	49.75	2.5
12.17	6.28	49.83	2.5
12.25	6.26	49.92	2.5
12.33	6.23	50.	2.5
12.42	6.2	50.08	2.49
12.5	6.18	50.17	2.49
12.58	6.18	50.25	2.49
12.67	6.14	50.33	2.48
12.75	6.12	50.42	2.48
12.83	6.1	50.5	2.47
12.92	6.09	50.58	2.47
13.	6.07	50.67	2.47
13.08	6.05	50.75	2.47
13.17	6.04	50.83	2.45
13.25	6.09	50.92	2.45
13.33	6.09	51.	2.45
13.42	6.08	51.08	2.45
13.5	6.04	51.17	2.45
13.58	6.02	51.25	2.44
13.67	6.	51.33	2.44
13.75	5.99	51.42	2.43
13.83	5.95	51.5	2.43

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
13.92	5.93	51.58	2.43
14.	5.91	51.67	2.42
14.08	5.9	51.75	2.42
14.17	5.86	51.83	2.42
14.25	5.84	51.92	2.42
14.33	5.83	52.	2.42
14.42	5.81	52.08	2.41
14.5	5.8	52.17	2.41
14.58	5.77	52.25	2.41
14.67	5.75	52.33	2.4
14.75	5.74	52.42	2.39
14.83	5.72	52.5	2.39
14.92	5.71	52.58	2.39
15.	5.69	52.67	2.39
15.08	5.67	52.75	2.4
15.17	5.65	52.83	2.39
15.25	5.64	52.92	2.38
15.33	5.62	53.	2.38
15.42	5.6	53.08	2.39
15.5	5.58	53.17	2.38
15.58	5.57	53.25	2.38
15.67	5.56	53.33	2.36
15.75	5.54	53.42	2.35
15.83	5.53	53.5	2.35
15.92	5.5	53.58	2.34
16.	5.48	53.67	2.35
16.08	5.47	53.75	2.34
16.17	5.46	53.83	2.34
16.25	5.44	53.92	2.35
16.33	5.42	54.	2.35
16.42	5.41	54.08	2.35
16.5	5.39	54.17	2.34
16.58	5.38	54.25	2.33
16.67	5.38	54.33	2.33
16.75	5.36	54.42	2.32
16.83	5.35	54.5	2.33
16.92	5.32	54.58	2.33
17.	5.31	54.67	2.31
17.08	5.29	54.75	2.31
17.17	5.28	54.83	2.31
17.25	5.27	54.92	2.32
17.33	5.24	55.	2.31
17.42	5.23	55.08	2.3
17.5	5.22	55.17	2.31
17.58	5.21	55.25	2.3
17.67	5.19	55.33	2.3
17.75	5.18	55.42	2.3
17.83	5.15	55.5	2.29
17.92	5.14	55.58	2.29
18.	5.12	55.67	2.3
18.08	5.11	55.75	2.27
18.17	5.1	55.83	2.29
18.25	5.09	55.92	2.27
18.33	5.08	56.	2.27
18.42	5.05	56.08	2.27
18.5	5.04	56.17	2.26
18.58	5.03	56.25	2.26
18.67	5.01	56.33	2.26
18.75	5.01	56.42	2.26
18.83	4.99	56.5	2.25
18.92	4.96	56.58	2.25
19.	4.95	56.67	2.26
19.08	4.94	56.75	2.24

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
19.17	4.93	56.83	2.24
19.25	4.91	56.92	2.24
19.33	4.9	57.	2.24
19.42	4.88	57.08	2.24
19.5	4.87	57.17	2.24
19.58	4.85	57.25	2.23
19.67	4.85	57.33	2.22
19.75	4.83	57.42	2.22
19.83	4.82	57.5	2.22
19.92	4.81	57.58	2.24
20.	4.78	57.67	2.22
20.08	4.77	57.75	2.22
20.17	4.76	57.83	2.22
20.25	4.75	57.92	2.21
20.33	4.74	58.	2.21
20.42	4.73	58.08	2.22
20.5	4.72	58.17	2.22
20.58	4.69	58.25	2.21
20.67	4.68	58.33	2.21
20.75	4.67	58.42	2.2
20.83	4.65	58.5	2.2
20.92	4.65	58.58	2.18
21.	4.63	58.67	2.18
21.08	4.61	58.75	2.2
21.17	4.6	58.83	2.2
21.25	4.59	58.92	2.2
21.33	4.58	59.	2.2
21.42	4.56	59.08	2.2
21.5	4.56	59.17	2.18
21.58	4.54	59.25	2.18
21.67	4.52	59.33	2.18
21.75	4.52	59.42	2.18
21.83	4.51	59.5	2.18
21.92	4.49	59.58	2.17
22.	4.49	59.67	2.17
22.08	4.49	59.75	2.17
22.17	4.48	59.83	2.17
22.25	4.47	59.92	2.17
22.33	4.46	60.	2.16
22.42	4.43	60.08	2.17
22.5	4.42	60.17	2.15
22.58	4.43	60.25	2.16
22.67	4.42	60.33	2.14
22.75	4.4	60.42	2.14
22.83	4.39	60.5	2.14
22.92	4.38	60.58	2.13
23.	4.37	60.67	2.14
23.08	4.38	60.75	2.13
23.17	4.37	60.83	2.13
23.25	4.36	60.92	2.13
23.33	4.34	61.	2.13
23.42	4.31	61.08	2.12
23.5	4.31	61.17	2.12
23.58	4.29	61.25	2.12
23.67	4.29	61.33	2.12
23.75	4.29	61.42	2.11
23.83	4.28	61.5	2.11
23.92	4.25	61.58	2.11
24.	4.24	61.67	2.11
24.08	4.24	61.75	2.11
24.17	4.24	61.83	2.11
24.25	4.22	61.92	2.11
24.33	4.22	62.	2.09

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
24.42	4.2	62.08	2.09
24.5	4.19	62.17	2.09
24.58	4.2	62.25	2.09
24.67	4.19	62.33	2.08
24.75	4.16	62.42	2.08
24.83	4.15	62.5	2.08
24.92	4.14	62.58	2.06
25.	4.13	62.67	2.08
25.08	4.13	62.75	2.06
25.17	4.13	62.83	2.08
25.25	4.12	62.92	2.06
25.33	4.11	63.	2.06
25.42	4.09	63.08	2.06
25.5	4.09	63.17	2.08
25.58	4.07	63.25	2.08
25.67	4.06	63.33	2.06
25.75	4.07	63.42	2.06
25.83	4.06	63.5	2.06
25.92	4.05	63.58	2.06
26.	4.04	63.67	2.06
26.08	4.03	63.75	2.06
26.17	4.02	63.83	2.06
26.25	4.01	63.92	2.06
26.33	4.	64.	2.06
26.42	4.01	64.08	2.06
26.5	4.	64.17	2.06
26.58	4.	64.25	2.05
26.67	3.98	64.33	2.05
26.75	3.96	64.42	2.05
26.83	3.95	64.5	2.04
26.92	3.94	64.58	2.05
27.	3.93	64.67	2.04
27.08	3.94	64.75	2.04
27.17	3.93	64.83	2.04
27.25	3.92	64.92	2.04
27.33	3.92	65.	2.04
27.42	3.89	65.08	2.04
27.5	3.88	65.17	2.03
27.58	3.88	65.25	2.03
27.67	3.86	65.33	2.03
27.75	3.87	65.42	2.02
27.83	3.86	65.5	2.02
27.92	3.86	65.58	2.03
28.	3.85	65.67	2.02
28.08	3.83	65.75	2.02
28.17	3.82	65.83	2.02
28.25	3.83	65.92	2.02
28.33	3.82	66.	2.02
28.42	3.79	66.08	2.
28.5	3.79	66.17	2.
28.58	3.78	66.25	2.
28.67	3.77	66.33	2.
28.75	3.77	66.42	1.99
28.83	3.77	66.5	1.99
28.92	3.76	66.58	1.99
29.	3.76	66.67	1.99
29.08	3.74	66.75	1.99
29.17	3.73	66.83	1.99
29.25	3.73	66.92	1.99
29.33	3.71	67.	1.99
29.42	3.71	67.08	1.99
29.5	3.7	67.17	1.98
29.58	3.7	67.25	1.98

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
29.67	3.69	67.33	1.97
29.75	3.67	67.42	1.97
29.83	3.67	67.5	1.97
29.92	3.66	67.58	1.97
30.	3.65	67.67	1.96
30.08	3.66	67.75	1.97
30.17	3.65	67.83	1.96
30.25	3.64	67.92	1.95
30.33	3.64	68.	1.95
30.42	3.61	68.08	1.95
30.5	3.6	68.17	1.95
30.58	3.59	68.25	1.95
30.67	3.59	68.33	1.95
30.75	3.59	68.42	1.94
30.83	3.59	68.5	1.94
30.92	3.58	68.58	1.94
31.	3.57	68.67	1.94
31.08	3.56	68.75	1.93
31.17	3.55	68.83	1.93
31.25	3.55	68.92	1.93
31.33	3.53	69.	1.93
31.42	3.53	69.08	1.93
31.5	3.53	69.17	1.93
31.58	3.52	69.25	1.93
31.67	3.52	69.33	1.91
31.75	3.5	69.42	1.91
31.83	3.49	69.5	1.91
31.92	3.49	69.58	1.91
32.	3.48	69.67	1.9
32.08	3.48	69.75	1.9
32.17	3.48	69.83	1.9
32.25	3.47	69.92	1.9
32.33	3.46	70.	1.9
32.42	3.43	70.08	1.9
32.5	3.43	70.17	1.9
32.58	3.42	70.25	1.89
32.67	3.41	70.33	1.89
32.75	3.43	70.42	1.88
32.83	3.42	70.5	1.88
32.92	3.41	70.58	1.88
33.	3.41	70.67	1.88
33.08	3.39	70.75	1.88
33.17	3.39	70.83	1.88
33.25	3.38	70.92	1.88
33.33	3.38	71.	1.88
33.42	3.37	71.08	1.88
33.5	3.37	71.17	1.88
33.58	3.37	71.25	1.87
33.67	3.37	71.33	1.87
33.75	3.34	71.42	1.87
33.83	3.34	71.5	1.87
33.92	3.34	71.58	1.87
34.	3.33	71.67	1.87
34.08	3.32	71.75	1.87
34.17	3.32	71.83	1.86
34.25	3.32	71.92	1.86
34.33	3.31	72.	1.86
34.42	3.3	72.08	1.86
34.5	3.3	72.17	1.86
34.58	3.29	72.25	1.86
34.67	3.29	72.33	1.87
34.75	3.29	72.42	1.87
34.83	3.28	72.5	1.87

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
34.92	3.28	72.58	1.85
35.	3.26	72.67	1.85
35.08	3.26	72.75	1.85
35.17	3.25	72.83	1.85
35.25	3.25	72.92	1.84
35.33	3.25	73.	1.84
35.42	3.24	73.08	1.84
35.5	3.24	73.17	1.84
35.58	3.23	73.25	1.84
35.67	3.23	73.33	1.84
35.75	3.22	73.42	1.84
35.83	3.22	73.5	1.82
35.92	3.21	73.58	1.82
36.	3.21	73.67	1.82
36.08	3.2	73.75	1.82
36.17	3.2	73.83	1.82
36.25	3.19	73.92	1.84
36.33	3.19	74.	1.84
36.42	3.19	74.08	1.82
36.5	3.17	74.17	1.82
36.58	3.17	74.25	1.82
36.67	3.16	74.33	1.82
36.75	3.15	74.42	1.82
36.83	3.14	74.5	1.8
36.92	3.14	74.58	1.8
37.	3.14	74.67	1.8
37.08	3.14	74.75	1.8
37.17	3.13	74.83	1.8
37.25	3.13	74.92	1.8
37.33	3.12	75.	1.8
37.42	3.12	75.08	1.79
37.5	3.12	75.17	1.81
37.58	3.11		

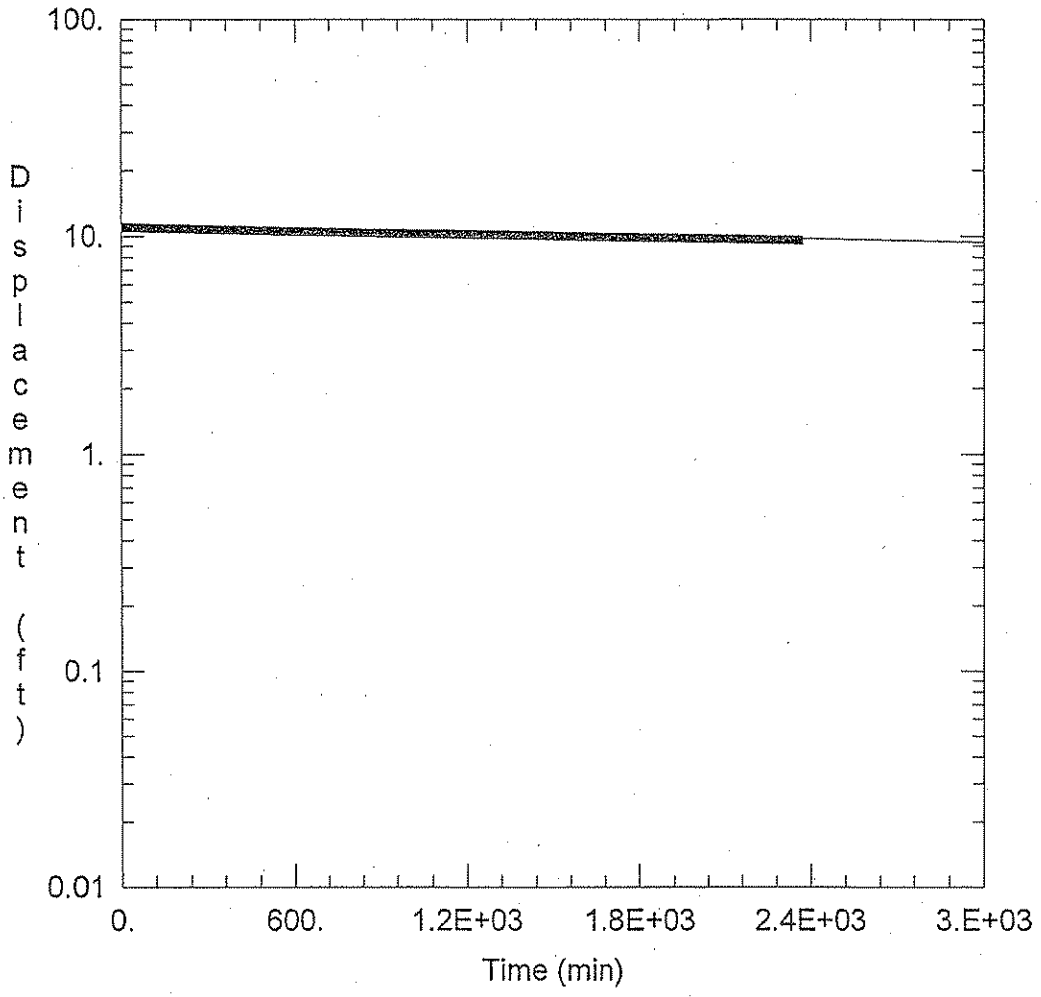
SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.508E-05	ft/min
y0	5.887	ft



WELL TEST ANALYSIS

Data Set: \...\mw1valmont.aqt
Date: 12/23/02 Time: 09:28:02

AQUIFER DATA

Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (mw-1val)

Initial Displacement: 11.03 ft
Wellbore Radius: 0.33 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.083 ft
Well Skin Radius: 0.33 ft
Total Well Penetration Depth: 30.2 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 5.615E-08 ft/min
y0 = 11.29 ft

Data Set: \\FNPESGO01\Home\dnkc02\DATA\data-keep\WORD\Project_Files\Valmont\mw1valmont.aqt
Date: 12/23/02
Time: 09:26:54

AQUIFER DATA

Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Initial Displacement: 11.03 ft
Casing Radius: 0.083 ft
Wellbore Radius: 0.33 ft
Well Skin Radius: 0.33 ft
Screen Length: 10. ft
Total Well Penetration Depth: 30.2 ft
Gravel Pack Porosity: 0.3

No. of observations: 2361

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.	1181.	10.22
1.	11.03	1182.	10.22
2.	10.99	1183.	10.22
3.	11.	1184.	10.22
4.	11.01	1185.	10.22
5.	11.01	1186.	10.22
6.	11.	1187.	10.23
7.	11.	1188.	10.23
8.	11.	1189.	10.22
9.	11.01	1190.	10.22
10.	11.01	1191.	10.22
11.	11.	1192.	10.22
12.	11.	1193.	10.22
13.	11.01	1194.	10.22
14.	11.	1195.	10.23
15.	11.	1196.	10.23
16.	11.	1197.	10.23
17.	11.	1198.	10.23
18.	11.01	1199.	10.23
19.	11.01	1200.	10.23
20.	11.	1201.	10.23
21.	11.01	1202.	10.23
22.	11.	1203.	10.22
23.	11.	1204.	10.22
24.	11.	1205.	10.22
25.	11.	1206.	10.22
26.	11.	1207.	10.22
27.	11.	1208.	10.22
28.	11.	1209.	10.22
29.	10.99	1210.	10.22
30.	10.99	1211.	10.22
31.	10.99	1212.	10.23
32.	10.99	1213.	10.22
33.	10.99	1214.	10.2
34.	10.99	1215.	10.2
35.	10.99	1216.	10.2
36.	10.98	1217.	10.19
37.	10.98	1218.	10.19
38.	10.99	1219.	10.2
39.	10.98	1220.	10.22
40.	10.98	1221.	10.22

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
41.	10.98	1222.	10.2
42.	10.98	1223.	10.19
43.	10.98	1224.	10.19
44.	10.98	1225.	10.2
45.	10.97	1226.	10.2
46.	10.97	1227.	10.2
47.	10.97	1228.	10.19
48.	10.97	1229.	10.2
49.	10.97	1230.	10.2
50.	10.97	1231.	10.2
51.	10.97	1232.	10.2
52.	10.97	1233.	10.19
53.	10.97	1234.	10.17
54.	10.97	1235.	10.17
55.	10.97	1236.	10.18
56.	10.97	1237.	10.18
57.	10.97	1238.	10.18
58.	10.96	1239.	10.16
59.	10.96	1240.	10.16
60.	10.96	1241.	10.17
61.	10.96	1242.	10.18
62.	10.96	1243.	10.18
63.	10.96	1244.	10.19
64.	10.96	1245.	10.19
65.	10.96	1246.	10.19
66.	10.96	1247.	10.2
67.	10.95	1248.	10.19
68.	10.95	1249.	10.19
69.	10.95	1250.	10.2
70.	10.95	1251.	10.2
71.	10.95	1252.	10.19
72.	10.95	1253.	10.19
73.	10.95	1254.	10.18
74.	10.95	1255.	10.18
75.	10.95	1256.	10.17
76.	10.95	1257.	10.17
77.	10.94	1258.	10.17
78.	10.94	1259.	10.17
79.	10.94	1260.	10.18
80.	10.94	1261.	10.18
81.	10.94	1262.	10.16
82.	10.94	1263.	10.16
83.	10.94	1264.	10.16
84.	10.94	1265.	10.17
85.	10.94	1266.	10.17
86.	10.94	1267.	10.17
87.	10.94	1268.	10.19
88.	10.94	1269.	10.18
89.	10.94	1270.	10.18
90.	10.92	1271.	10.16
91.	10.92	1272.	10.15
92.	10.92	1273.	10.14
93.	10.92	1274.	10.14
94.	10.92	1275.	10.16
95.	10.92	1276.	10.17
96.	10.92	1277.	10.17
97.	10.92	1278.	10.16
98.	10.91	1279.	10.15
99.	10.92	1280.	10.15
100.	10.91	1281.	10.16
101.	10.92	1282.	10.16
102.	10.92	1283.	10.15
103.	10.91	1284.	10.15

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
104.	10.91	1285.	10.16
105.	10.91	1286.	10.17
106.	10.91	1287.	10.17
107.	10.91	1288.	10.17
108.	10.91	1289.	10.16
109.	10.9	1290.	10.16
110.	10.9	1291.	10.15
111.	10.9	1292.	10.15
112.	10.9	1293.	10.15
113.	10.9	1294.	10.15
114.	10.9	1295.	10.15
115.	10.9	1296.	10.16
116.	10.9	1297.	10.16
117.	10.9	1298.	10.15
118.	10.9	1299.	10.15
119.	10.9	1300.	10.15
120.	10.9	1301.	10.14
121.	10.9	1302.	10.14
122.	10.9	1303.	10.15
123.	10.9	1304.	10.15
124.	10.89	1305.	10.15
125.	10.9	1306.	10.15
126.	10.9	1307.	10.15
127.	10.9	1308.	10.15
128.	10.9	1309.	10.15
129.	10.9	1310.	10.15
130.	10.89	1311.	10.15
131.	10.89	1312.	10.14
132.	10.89	1313.	10.14
133.	10.89	1314.	10.14
134.	10.89	1315.	10.14
135.	10.89	1316.	10.14
136.	10.89	1317.	10.15
137.	10.89	1318.	10.15
138.	10.89	1319.	10.15
139.	10.89	1320.	10.15
140.	10.89	1321.	10.15
141.	10.88	1322.	10.15
142.	10.89	1323.	10.14
143.	10.89	1324.	10.15
144.	10.88	1325.	10.15
145.	10.88	1326.	10.14
146.	10.87	1327.	10.14
147.	10.87	1328.	10.15
148.	10.87	1329.	10.15
149.	10.87	1330.	10.14
150.	10.88	1331.	10.14
151.	10.88	1332.	10.14
152.	10.88	1333.	10.13
153.	10.88	1334.	10.13
154.	10.87	1335.	10.13
155.	10.87	1336.	10.13
156.	10.87	1337.	10.11
157.	10.87	1338.	10.13
158.	10.87	1339.	10.13
159.	10.87	1340.	10.13
160.	10.86	1341.	10.13
161.	10.86	1342.	10.13
162.	10.86	1343.	10.13
163.	10.86	1344.	10.14
164.	10.86	1345.	10.14
165.	10.86	1346.	10.14
166.	10.86	1347.	10.14

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
167.	10.86	1348.	10.13
168.	10.86	1349.	10.13
169.	10.86	1350.	10.11
170.	10.86	1351.	10.11
171.	10.86	1352.	10.11
172.	10.86	1353.	10.11
173.	10.86	1354.	10.11
174.	10.86	1355.	10.13
175.	10.85	1356.	10.11
176.	10.86	1357.	10.1
177.	10.85	1358.	10.11
178.	10.85	1359.	10.11
179.	10.85	1360.	10.11
180.	10.85	1361.	10.1
181.	10.85	1362.	10.13
182.	10.85	1363.	10.13
183.	10.85	1364.	10.13
184.	10.85	1365.	10.13
185.	10.85	1366.	10.13
186.	10.85	1367.	10.13
187.	10.83	1368.	10.13
188.	10.83	1369.	10.11
189.	10.83	1370.	10.11
190.	10.83	1371.	10.11
191.	10.83	1372.	10.11
192.	10.83	1373.	10.11
193.	10.83	1374.	10.11
194.	10.83	1375.	10.11
195.	10.83	1376.	10.11
196.	10.83	1377.	10.11
197.	10.83	1378.	10.11
198.	10.83	1379.	10.11
199.	10.83	1380.	10.11
200.	10.83	1381.	10.1
201.	10.83	1382.	10.1
202.	10.83	1383.	10.1
203.	10.83	1384.	10.1
204.	10.82	1385.	10.1
205.	10.82	1386.	10.1
206.	10.82	1387.	10.1
207.	10.82	1388.	10.1
208.	10.82	1389.	10.1
209.	10.82	1390.	10.1
210.	10.82	1391.	10.1
211.	10.82	1392.	10.1
212.	10.82	1393.	10.1
213.	10.82	1394.	10.1
214.	10.81	1395.	10.1
215.	10.81	1396.	10.1
216.	10.81	1397.	10.1
217.	10.81	1398.	10.1
218.	10.82	1399.	10.1
219.	10.81	1400.	10.1
220.	10.82	1401.	10.09
221.	10.82	1402.	10.1
222.	10.82	1403.	10.09
223.	10.81	1404.	10.1
224.	10.81	1405.	10.09
225.	10.81	1406.	10.09
226.	10.81	1407.	10.09
227.	10.81	1408.	10.09
228.	10.81	1409.	10.09
229.	10.81	1410.	10.09

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
230.	10.81	1411.	10.09
231.	10.81	1412.	10.08
232.	10.81	1413.	10.08
233.	10.81	1414.	10.08
234.	10.81	1415.	10.08
235.	10.81	1416.	10.09
236.	10.8	1417.	10.08
237.	10.8	1418.	10.09
238.	10.81	1419.	10.08
239.	10.81	1420.	10.08
240.	10.8	1421.	10.08
241.	10.81	1422.	10.08
242.	10.8	1423.	10.08
243.	10.79	1424.	10.08
244.	10.79	1425.	10.08
245.	10.79	1426.	10.08
246.	10.8	1427.	10.08
247.	10.8	1428.	10.08
248.	10.8	1429.	10.08
249.	10.8	1430.	10.07
250.	10.79	1431.	10.07
251.	10.79	1432.	10.08
252.	10.78	1433.	10.08
253.	10.78	1434.	10.07
254.	10.79	1435.	10.07
255.	10.79	1436.	10.07
256.	10.79	1437.	10.07
257.	10.79	1438.	10.07
258.	10.79	1439.	10.07
259.	10.79	1440.	10.07
260.	10.79	1441.	10.07
261.	10.78	1442.	10.07
262.	10.78	1443.	10.07
263.	10.78	1444.	10.07
264.	10.78	1445.	10.07
265.	10.78	1446.	10.06
266.	10.78	1447.	10.07
267.	10.78	1448.	10.07
268.	10.78	1449.	10.07
269.	10.78	1450.	10.06
270.	10.78	1451.	10.06
271.	10.77	1452.	10.06
272.	10.78	1453.	10.06
273.	10.77	1454.	10.06
274.	10.78	1455.	10.06
275.	10.77	1456.	10.06
276.	10.77	1457.	10.06
277.	10.77	1458.	10.06
278.	10.77	1459.	10.06
279.	10.77	1460.	10.06
280.	10.77	1461.	10.06
281.	10.77	1462.	10.06
282.	10.77	1463.	10.06
283.	10.77	1464.	10.06
284.	10.77	1465.	10.06
285.	10.77	1466.	10.06
286.	10.77	1467.	10.06
287.	10.76	1468.	10.05
288.	10.76	1469.	10.06
289.	10.76	1470.	10.06
290.	10.76	1471.	10.06
291.	10.76	1472.	10.05
292.	10.76	1473.	10.05

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
293.	10.76	1474.	10.05
294.	10.76	1475.	10.05
295.	10.74	1476.	10.05
296.	10.76	1477.	10.05
297.	10.74	1478.	10.05
298.	10.74	1479.	10.05
299.	10.76	1480.	10.04
300.	10.74	1481.	10.04
301.	10.74	1482.	10.04
302.	10.74	1483.	10.04
303.	10.74	1484.	10.04
304.	10.74	1485.	10.04
305.	10.74	1486.	10.02
306.	10.74	1487.	10.02
307.	10.76	1488.	10.02
308.	10.74	1489.	10.04
309.	10.74	1490.	10.02
310.	10.74	1491.	10.04
311.	10.74	1492.	10.04
312.	10.74	1493.	10.02
313.	10.74	1494.	10.04
314.	10.74	1495.	10.02
315.	10.74	1496.	10.02
316.	10.74	1497.	10.02
317.	10.74	1498.	10.02
318.	10.74	1499.	10.02
319.	10.73	1500.	10.02
320.	10.74	1501.	10.02
321.	10.74	1502.	10.02
322.	10.73	1503.	10.02
323.	10.73	1504.	10.02
324.	10.73	1505.	10.02
325.	10.73	1506.	10.02
326.	10.73	1507.	10.01
327.	10.73	1508.	10.02
328.	10.73	1509.	10.02
329.	10.73	1510.	10.01
330.	10.73	1511.	10.01
331.	10.73	1512.	10.01
332.	10.73	1513.	10.01
333.	10.73	1514.	10.01
334.	10.73	1515.	10.02
335.	10.72	1516.	10.02
336.	10.72	1517.	10.01
337.	10.72	1518.	10.02
338.	10.72	1519.	10.01
339.	10.71	1520.	10.01
340.	10.71	1521.	10.01
341.	10.71	1522.	10.01
342.	10.72	1523.	10.
343.	10.72	1524.	10.
344.	10.72	1525.	10.
345.	10.72	1526.	10.
346.	10.71	1527.	10.
347.	10.71	1528.	10.
348.	10.71	1529.	10.
349.	10.71	1530.	10.
350.	10.72	1531.	10.
351.	10.71	1532.	10.
352.	10.71	1533.	10.
353.	10.71	1534.	10.
354.	10.71	1535.	10.
355.	10.71	1536.	10.

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
356.	10.71	1537.	10.
357.	10.71	1538.	10.
358.	10.7	1539.	9.99
359.	10.7	1540.	9.99
360.	10.7	1541.	9.99
361.	10.7	1542.	9.99
362.	10.7	1543.	9.99
363.	10.7	1544.	9.99
364.	10.7	1545.	10.
365.	10.7	1546.	10.
366.	10.7	1547.	10.
367.	10.7	1548.	9.99
368.	10.7	1549.	9.99
369.	10.7	1550.	9.99
370.	10.7	1551.	9.99
371.	10.7	1552.	9.99
372.	10.69	1553.	9.99
373.	10.7	1554.	9.99
374.	10.7	1555.	9.99
375.	10.69	1556.	9.99
376.	10.69	1557.	9.99
377.	10.7	1558.	9.99
378.	10.69	1559.	9.98
379.	10.69	1560.	9.98
380.	10.69	1561.	9.98
381.	10.69	1562.	9.98
382.	10.69	1563.	9.98
383.	10.68	1564.	9.98
384.	10.68	1565.	9.98
385.	10.68	1566.	9.98
386.	10.69	1567.	9.98
387.	10.68	1568.	9.98
388.	10.68	1569.	9.98
389.	10.68	1570.	9.98
390.	10.68	1571.	9.98
391.	10.68	1572.	9.98
392.	10.68	1573.	9.97
393.	10.68	1574.	9.97
394.	10.68	1575.	9.97
395.	10.68	1576.	9.97
396.	10.68	1577.	9.97
397.	10.68	1578.	9.97
398.	10.68	1579.	9.97
399.	10.67	1580.	9.97
400.	10.67	1581.	9.97
401.	10.67	1582.	9.97
402.	10.67	1583.	9.97
403.	10.67	1584.	9.98
404.	10.67	1585.	9.98
405.	10.68	1586.	9.97
406.	10.68	1587.	9.97
407.	10.68	1588.	9.98
408.	10.68	1589.	9.97
409.	10.67	1590.	9.97
410.	10.68	1591.	9.97
411.	10.68	1592.	9.97
412.	10.68	1593.	9.97
413.	10.67	1594.	9.98
414.	10.67	1595.	9.97
415.	10.67	1596.	9.96
416.	10.67	1597.	9.97
417.	10.67	1598.	9.96
418.	10.67	1599.	9.96

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
419.	10.67	1600.	9.96
420.	10.67	1601.	9.96
421.	10.67	1602.	9.97
422.	10.67	1603.	9.97
423.	10.65	1604.	9.96
424.	10.67	1605.	9.97
425.	10.67	1606.	9.96
426.	10.65	1607.	9.96
427.	10.65	1608.	9.96
428.	10.64	1609.	9.96
429.	10.64	1610.	9.97
430.	10.65	1611.	9.96
431.	10.65	1612.	9.96
432.	10.65	1613.	9.96
433.	10.65	1614.	9.96
434.	10.64	1615.	9.96
435.	10.64	1616.	9.96
436.	10.64	1617.	9.96
437.	10.64	1618.	9.96
438.	10.65	1619.	9.96
439.	10.65	1620.	9.96
440.	10.65	1621.	9.95
441.	10.65	1622.	9.95
442.	10.64	1623.	9.95
443.	10.64	1624.	9.95
444.	10.64	1625.	9.95
445.	10.63	1626.	9.95
446.	10.64	1627.	9.95
447.	10.64	1628.	9.95
448.	10.64	1629.	9.95
449.	10.64	1630.	9.95
450.	10.63	1631.	9.95
451.	10.63	1632.	9.95
452.	10.63	1633.	9.95
453.	10.63	1634.	9.95
454.	10.63	1635.	9.95
455.	10.63	1636.	9.95
456.	10.63	1637.	9.93
457.	10.63	1638.	9.95
458.	10.63	1639.	9.95
459.	10.63	1640.	9.95
460.	10.63	1641.	9.93
461.	10.63	1642.	9.93
462.	10.63	1643.	9.93
463.	10.63	1644.	9.93
464.	10.63	1645.	9.93
465.	10.63	1646.	9.93
466.	10.63	1647.	9.93
467.	10.63	1648.	9.93
468.	10.63	1649.	9.92
469.	10.62	1650.	9.92
470.	10.63	1651.	9.92
471.	10.62	1652.	9.93
472.	10.62	1653.	9.93
473.	10.62	1654.	9.93
474.	10.62	1655.	9.92
475.	10.62	1656.	9.92
476.	10.62	1657.	9.92
477.	10.62	1658.	9.92
478.	10.62	1659.	9.92
479.	10.62	1660.	9.92
480.	10.62	1661.	9.92
481.	10.61	1662.	9.92

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
482.	10.62	1663.	9.92
483.	10.61	1664.	9.92
484.	10.61	1665.	9.92
485.	10.61	1666.	9.92
486.	10.61	1667.	9.92
487.	10.61	1668.	9.92
488.	10.61	1669.	9.92
489.	10.61	1670.	9.93
490.	10.61	1671.	9.92
491.	10.61	1672.	9.92
492.	10.61	1673.	9.92
493.	10.61	1674.	9.92
494.	10.6	1675.	9.92
495.	10.6	1676.	9.92
496.	10.61	1677.	9.92
497.	10.6	1678.	9.92
498.	10.6	1679.	9.92
499.	10.6	1680.	9.92
500.	10.6	1681.	9.92
501.	10.61	1682.	9.92
502.	10.6	1683.	9.92
503.	10.6	1684.	9.92
504.	10.6	1685.	9.92
505.	10.6	1686.	9.92
506.	10.6	1687.	9.91
507.	10.6	1688.	9.92
508.	10.6	1689.	9.92
509.	10.6	1690.	9.91
510.	10.6	1691.	9.91
511.	10.6	1692.	9.91
512.	10.6	1693.	9.9
513.	10.6	1694.	9.91
514.	10.6	1695.	9.91
515.	10.59	1696.	9.91
516.	10.6	1697.	9.91
517.	10.6	1698.	9.9
518.	10.59	1699.	9.9
519.	10.59	1700.	9.9
520.	10.6	1701.	9.9
521.	10.6	1702.	9.91
522.	10.59	1703.	9.91
523.	10.59	1704.	9.91
524.	10.6	1705.	9.91
525.	10.59	1706.	9.9
526.	10.58	1707.	9.9
527.	10.59	1708.	9.9
528.	10.59	1709.	9.9
529.	10.59	1710.	9.91
530.	10.58	1711.	9.9
531.	10.59	1712.	9.9
532.	10.59	1713.	9.9
533.	10.59	1714.	9.9
534.	10.58	1715.	9.89
535.	10.58	1716.	9.9
536.	10.58	1717.	9.89
537.	10.58	1718.	9.9
538.	10.58	1719.	9.9
539.	10.58	1720.	9.9
540.	10.56	1721.	9.9
541.	10.56	1722.	9.9
542.	10.56	1723.	9.9
543.	10.56	1724.	9.9
544.	10.56	1725.	9.9

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
545.	10.56	1726.	9.9
546.	10.56	1727.	9.9
547.	10.56	1728.	9.9
548.	10.56	1729.	9.9
549.	10.56	1730.	9.9
550.	10.56	1731.	9.89
551.	10.56	1732.	9.89
552.	10.56	1733.	9.9
553.	10.56	1734.	9.89
554.	10.56	1735.	9.89
555.	10.56	1736.	9.89
556.	10.56	1737.	9.89
557.	10.56	1738.	9.89
558.	10.56	1739.	9.89
559.	10.56	1740.	9.89
560.	10.55	1741.	9.89
561.	10.55	1742.	9.89
562.	10.55	1743.	9.89
563.	10.55	1744.	9.89
564.	10.55	1745.	9.89
565.	10.55	1746.	9.89
566.	10.55	1747.	9.88
567.	10.55	1748.	9.89
568.	10.55	1749.	9.89
569.	10.55	1750.	9.88
570.	10.55	1751.	9.88
571.	10.55	1752.	9.88
572.	10.55	1753.	9.88
573.	10.55	1754.	9.88
574.	10.55	1755.	9.88
575.	10.54	1756.	9.88
576.	10.54	1757.	9.88
577.	10.54	1758.	9.88
578.	10.54	1759.	9.88
579.	10.54	1760.	9.88
580.	10.54	1761.	9.88
581.	10.54	1762.	9.88
582.	10.54	1763.	9.88
583.	10.54	1764.	9.88
584.	10.54	1765.	9.88
585.	10.54	1766.	9.88
586.	10.54	1767.	9.88
587.	10.54	1768.	9.88
588.	10.54	1769.	9.88
589.	10.54	1770.	9.88
590.	10.54	1771.	9.88
591.	10.54	1772.	9.87
592.	10.54	1773.	9.88
593.	10.54	1774.	9.88
594.	10.54	1775.	9.87
595.	10.53	1776.	9.87
596.	10.54	1777.	9.87
597.	10.54	1778.	9.87
598.	10.54	1779.	9.87
599.	10.54	1780.	9.87
600.	10.53	1781.	9.87
601.	10.53	1782.	9.87
602.	10.53	1783.	9.87
603.	10.53	1784.	9.86
604.	10.53	1785.	9.86
605.	10.53	1786.	9.87
606.	10.53	1787.	9.86
607.	10.53	1788.	9.86

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
608.	10.53	1789.	9.86
609.	10.53	1790.	9.86
610.	10.53	1791.	9.86
611.	10.53	1792.	9.86
612.	10.52	1793.	9.86
613.	10.53	1794.	9.86
614.	10.53	1795.	9.86
615.	10.52	1796.	9.86
616.	10.52	1797.	9.86
617.	10.52	1798.	9.86
618.	10.52	1799.	9.84
619.	10.52	1800.	9.86
620.	10.52	1801.	9.84
621.	10.52	1802.	9.84
622.	10.52	1803.	9.86
623.	10.52	1804.	9.84
624.	10.52	1805.	9.84
625.	10.52	1806.	9.84
626.	10.51	1807.	9.86
627.	10.52	1808.	9.84
628.	10.52	1809.	9.84
629.	10.52	1810.	9.84
630.	10.52	1811.	9.84
631.	10.51	1812.	9.84
632.	10.51	1813.	9.84
633.	10.51	1814.	9.84
634.	10.51	1815.	9.84
635.	10.51	1816.	9.84
636.	10.51	1817.	9.84
637.	10.51	1818.	9.84
638.	10.51	1819.	9.84
639.	10.51	1820.	9.84
640.	10.51	1821.	9.84
641.	10.51	1822.	9.84
642.	10.5	1823.	9.84
643.	10.51	1824.	9.84
644.	10.51	1825.	9.84
645.	10.51	1826.	9.83
646.	10.5	1827.	9.83
647.	10.51	1828.	9.83
648.	10.51	1829.	9.84
649.	10.5	1830.	9.83
650.	10.5	1831.	9.83
651.	10.5	1832.	9.83
652.	10.5	1833.	9.83
653.	10.5	1834.	9.83
654.	10.5	1835.	9.83
655.	10.5	1836.	9.83
656.	10.5	1837.	9.83
657.	10.5	1838.	9.83
658.	10.5	1839.	9.83
659.	10.5	1840.	9.83
660.	10.5	1841.	9.83
661.	10.5	1842.	9.83
662.	10.5	1843.	9.83
663.	10.5	1844.	9.83
664.	10.5	1845.	9.83
665.	10.5	1846.	9.83
666.	10.49	1847.	9.83
667.	10.5	1848.	9.82
668.	10.49	1849.	9.82
669.	10.49	1850.	9.82
670.	10.49	1851.	9.82

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
671.	10.5	1852.	9.82
672.	10.5	1853.	9.82
673.	10.49	1854.	9.82
674.	10.49	1855.	9.82
675.	10.49	1856.	9.82
676.	10.49	1857.	9.82
677.	10.49	1858.	9.82
678.	10.49	1859.	9.82
679.	10.49	1860.	9.82
680.	10.47	1861.	9.82
681.	10.49	1862.	9.82
682.	10.49	1863.	9.82
683.	10.47	1864.	9.82
684.	10.47	1865.	9.82
685.	10.47	1866.	9.82
686.	10.49	1867.	9.83
687.	10.47	1868.	9.82
688.	10.47	1869.	9.82
689.	10.47	1870.	9.82
690.	10.47	1871.	9.82
691.	10.47	1872.	9.82
692.	10.47	1873.	9.82
693.	10.47	1874.	9.82
694.	10.47	1875.	9.82
695.	10.47	1876.	9.82
696.	10.46	1877.	9.82
697.	10.47	1878.	9.82
698.	10.47	1879.	9.81
699.	10.47	1880.	9.82
700.	10.46	1881.	9.82
701.	10.46	1882.	9.82
702.	10.47	1883.	9.82
703.	10.47	1884.	9.81
704.	10.46	1885.	9.81
705.	10.46	1886.	9.81
706.	10.47	1887.	9.81
707.	10.47	1888.	9.81
708.	10.46	1889.	9.81
709.	10.46	1890.	9.81
710.	10.46	1891.	9.81
711.	10.46	1892.	9.81
712.	10.46	1893.	9.81
713.	10.46	1894.	9.81
714.	10.46	1895.	9.81
715.	10.46	1896.	9.81
716.	10.46	1897.	9.81
717.	10.46	1898.	9.81
718.	10.46	1899.	9.8
719.	10.46	1900.	9.81
720.	10.45	1901.	9.81
721.	10.45	1902.	9.81
722.	10.46	1903.	9.8
723.	10.46	1904.	9.81
724.	10.45	1905.	9.8
725.	10.45	1906.	9.8
726.	10.46	1907.	9.8
727.	10.46	1908.	9.81
728.	10.45	1909.	9.8
729.	10.45	1910.	9.8
730.	10.46	1911.	9.8
731.	10.45	1912.	9.8
732.	10.45	1913.	9.8
733.	10.45	1914.	9.8

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
734.	10.45	1915.	9.8
735.	10.45	1916.	9.8
736.	10.45	1917.	9.79
737.	10.44	1918.	9.8
738.	10.45	1919.	9.79
739.	10.45	1920.	9.8
740.	10.44	1921.	9.79
741.	10.44	1922.	9.8
742.	10.45	1923.	9.79
743.	10.45	1924.	9.79
744.	10.44	1925.	9.79
745.	10.44	1926.	9.79
746.	10.45	1927.	9.79
747.	10.45	1928.	9.79
748.	10.44	1929.	9.79
749.	10.44	1930.	9.79
750.	10.44	1931.	9.79
751.	10.44	1932.	9.79
752.	10.44	1933.	9.79
753.	10.44	1934.	9.79
754.	10.44	1935.	9.79
755.	10.44	1936.	9.79
756.	10.43	1937.	9.79
757.	10.43	1938.	9.79
758.	10.44	1939.	9.79
759.	10.44	1940.	9.79
760.	10.43	1941.	9.79
761.	10.43	1942.	9.79
762.	10.44	1943.	9.79
763.	10.43	1944.	9.79
764.	10.43	1945.	9.79
765.	10.43	1946.	9.79
766.	10.43	1947.	9.79
767.	10.43	1948.	9.78
768.	10.43	1949.	9.78
769.	10.42	1950.	9.78
770.	10.42	1951.	9.78
771.	10.42	1952.	9.78
772.	10.42	1953.	9.78
773.	10.43	1954.	9.78
774.	10.42	1955.	9.78
775.	10.42	1956.	9.78
776.	10.42	1957.	9.78
777.	10.42	1958.	9.78
778.	10.42	1959.	9.78
779.	10.41	1960.	9.78
780.	10.41	1961.	9.78
781.	10.42	1962.	9.77
782.	10.41	1963.	9.77
783.	10.41	1964.	9.77
784.	10.41	1965.	9.78
785.	10.41	1966.	9.77
786.	10.41	1967.	9.77
787.	10.41	1968.	9.77
788.	10.41	1969.	9.77
789.	10.41	1970.	9.77
790.	10.41	1971.	9.77
791.	10.41	1972.	9.77
792.	10.41	1973.	9.77
793.	10.41	1974.	9.77
794.	10.41	1975.	9.77
795.	10.41	1976.	9.77
796.	10.41	1977.	9.77

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
797.	10.41	1978.	9.75
798.	10.4	1979.	9.75
799.	10.41	1980.	9.75
800.	10.41	1981.	9.75
801.	10.4	1982.	9.77
802.	10.41	1983.	9.77
803.	10.4	1984.	9.77
804.	10.4	1985.	9.77
805.	10.4	1986.	9.75
806.	10.4	1987.	9.75
807.	10.4	1988.	9.75
808.	10.4	1989.	9.75
809.	10.4	1990.	9.77
810.	10.4	1991.	9.77
811.	10.4	1992.	9.77
812.	10.4	1993.	9.77
813.	10.4	1994.	9.75
814.	10.4	1995.	9.75
815.	10.4	1996.	9.75
816.	10.4	1997.	9.75
817.	10.4	1998.	9.77
818.	10.38	1999.	9.77
819.	10.4	2000.	9.77
820.	10.4	2001.	9.77
821.	10.38	2002.	9.75
822.	10.38	2003.	9.75
823.	10.38	2004.	9.75
824.	10.38	2005.	9.74
825.	10.38	2006.	9.75
826.	10.38	2007.	9.75
827.	10.38	2008.	9.75
828.	10.38	2009.	9.75
829.	10.38	2010.	9.74
830.	10.38	2011.	9.74
831.	10.38	2012.	9.74
832.	10.38	2013.	9.74
833.	10.38	2014.	9.75
834.	10.38	2015.	9.75
835.	10.38	2016.	9.75
836.	10.38	2017.	9.75
837.	10.38	2018.	9.74
838.	10.37	2019.	9.74
839.	10.37	2020.	9.74
840.	10.37	2021.	9.74
841.	10.37	2022.	9.75
842.	10.37	2023.	9.75
843.	10.37	2024.	9.75
844.	10.37	2025.	9.75
845.	10.37	2026.	9.73
846.	10.37	2027.	9.73
847.	10.37	2028.	9.73
848.	10.37	2029.	9.73
849.	10.37	2030.	9.74
850.	10.37	2031.	9.74
851.	10.37	2032.	9.74
852.	10.37	2033.	9.74
853.	10.37	2034.	9.73
854.	10.37	2035.	9.73
855.	10.37	2036.	9.73
856.	10.37	2037.	9.73
857.	10.37	2038.	9.74
858.	10.37	2039.	9.74
859.	10.37	2040.	9.74

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
860.	10.37	2041.	9.74
861.	10.37	2042.	9.73
862.	10.37	2043.	9.73
863.	10.37	2044.	9.73
864.	10.36	2045.	9.73
865.	10.37	2046.	9.73
866.	10.36	2047.	9.73
867.	10.36	2048.	9.73
868.	10.36	2049.	9.73
869.	10.36	2050.	9.73
870.	10.36	2051.	9.73
871.	10.36	2052.	9.72
872.	10.36	2053.	9.72
873.	10.36	2054.	9.73
874.	10.36	2055.	9.72
875.	10.36	2056.	9.72
876.	10.36	2057.	9.72
877.	10.36	2058.	9.72
878.	10.36	2059.	9.72
879.	10.36	2060.	9.72
880.	10.36	2061.	9.72
881.	10.36	2062.	9.72
882.	10.36	2063.	9.72
883.	10.36	2064.	9.72
884.	10.35	2065.	9.72
885.	10.35	2066.	9.72
886.	10.35	2067.	9.72
887.	10.35	2068.	9.72
888.	10.35	2069.	9.72
889.	10.35	2070.	9.72
890.	10.35	2071.	9.72
891.	10.35	2072.	9.72
892.	10.35	2073.	9.72
893.	10.35	2074.	9.72
894.	10.35	2075.	9.72
895.	10.35	2076.	9.72
896.	10.35	2077.	9.72
897.	10.35	2078.	9.72
898.	10.35	2079.	9.71
899.	10.35	2080.	9.72
900.	10.35	2081.	9.72
901.	10.34	2082.	9.72
902.	10.34	2083.	9.72
903.	10.34	2084.	9.72
904.	10.34	2085.	9.71
905.	10.34	2086.	9.71
906.	10.34	2087.	9.72
907.	10.34	2088.	9.72
908.	10.34	2089.	9.71
909.	10.34	2090.	9.71
910.	10.34	2091.	9.71
911.	10.34	2092.	9.71
912.	10.34	2093.	9.71
913.	10.34	2094.	9.71
914.	10.34	2095.	9.71
915.	10.34	2096.	9.71
916.	10.34	2097.	9.71
917.	10.34	2098.	9.71
918.	10.34	2099.	9.71
919.	10.34	2100.	9.71
920.	10.34	2101.	9.71
921.	10.34	2102.	9.71
922.	10.34	2103.	9.71

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
923.	10.33	2104.	9.71
924.	10.33	2105.	9.7
925.	10.33	2106.	9.71
926.	10.33	2107.	9.7
927.	10.33	2108.	9.7
928.	10.33	2109.	9.7
929.	10.33	2110.	9.7
930.	10.33	2111.	9.7
931.	10.33	2112.	9.7
932.	10.33	2113.	9.7
933.	10.33	2114.	9.7
934.	10.33	2115.	9.7
935.	10.33	2116.	9.7
936.	10.33	2117.	9.7
937.	10.33	2118.	9.7
938.	10.33	2119.	9.7
939.	10.33	2120.	9.7
940.	10.33	2121.	9.7
941.	10.32	2122.	9.7
942.	10.33	2123.	9.7
943.	10.32	2124.	9.7
944.	10.32	2125.	9.7
945.	10.32	2126.	9.7
946.	10.32	2127.	9.7
947.	10.32	2128.	9.7
948.	10.32	2129.	9.7
949.	10.32	2130.	9.7
950.	10.32	2131.	9.69
951.	10.32	2132.	9.69
952.	10.32	2133.	9.69
953.	10.32	2134.	9.69
954.	10.32	2135.	9.69
955.	10.32	2136.	9.68
956.	10.32	2137.	9.69
957.	10.32	2138.	9.69
958.	10.32	2139.	9.69
959.	10.31	2140.	9.69
960.	10.31	2141.	9.68
961.	10.31	2142.	9.68
962.	10.31	2143.	9.68
963.	10.31	2144.	9.68
964.	10.31	2145.	9.68
965.	10.31	2146.	9.68
966.	10.31	2147.	9.68
967.	10.31	2148.	9.68
968.	10.31	2149.	9.68
969.	10.31	2150.	9.68
970.	10.31	2151.	9.68
971.	10.31	2152.	9.68
972.	10.31	2153.	9.68
973.	10.32	2154.	9.68
974.	10.31	2155.	9.68
975.	10.31	2156.	9.68
976.	10.32	2157.	9.68
977.	10.31	2158.	9.68
978.	10.32	2159.	9.68
979.	10.31	2160.	9.66
980.	10.31	2161.	9.66
981.	10.31	2162.	9.68
982.	10.29	2163.	9.68
983.	10.29	2164.	9.68
984.	10.29	2165.	9.66
985.	10.29	2166.	9.66

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
986.	10.29	2167.	9.66
987.	10.29	2168.	9.66
988.	10.29	2169.	9.66
989.	10.29	2170.	9.66
990.	10.29	2171.	9.66
991.	10.29	2172.	9.66
992.	10.29	2173.	9.66
993.	10.29	2174.	9.66
994.	10.29	2175.	9.66
995.	10.29	2176.	9.66
996.	10.29	2177.	9.66
997.	10.29	2178.	9.66
998.	10.29	2179.	9.66
999.	10.31	2180.	9.66
1000.	10.31	2181.	9.66
1001.	10.29	2182.	9.66
1002.	10.29	2183.	9.66
1003.	10.29	2184.	9.66
1004.	10.28	2185.	9.66
1005.	10.28	2186.	9.66
1006.	10.29	2187.	9.65
1007.	10.29	2188.	9.66
1008.	10.29	2189.	9.65
1009.	10.29	2190.	9.65
1010.	10.29	2191.	9.65
1011.	10.29	2192.	9.65
1012.	10.29	2193.	9.65
1013.	10.29	2194.	9.65
1014.	10.29	2195.	9.65
1015.	10.29	2196.	9.65
1016.	10.28	2197.	9.65
1017.	10.28	2198.	9.65
1018.	10.28	2199.	9.65
1019.	10.28	2200.	9.65
1020.	10.28	2201.	9.65
1021.	10.28	2202.	9.65
1022.	10.28	2203.	9.65
1023.	10.28	2204.	9.65
1024.	10.28	2205.	9.65
1025.	10.28	2206.	9.65
1026.	10.28	2207.	9.65
1027.	10.28	2208.	9.65
1028.	10.27	2209.	9.64
1029.	10.28	2210.	9.64
1030.	10.28	2211.	9.64
1031.	10.28	2212.	9.64
1032.	10.28	2213.	9.64
1033.	10.28	2214.	9.64
1034.	10.27	2215.	9.64
1035.	10.28	2216.	9.64
1036.	10.28	2217.	9.64
1037.	10.28	2218.	9.64
1038.	10.28	2219.	9.64
1039.	10.28	2220.	9.64
1040.	10.27	2221.	9.64
1041.	10.27	2222.	9.64
1042.	10.27	2223.	9.64
1043.	10.27	2224.	9.64
1044.	10.27	2225.	9.64
1045.	10.27	2226.	9.64
1046.	10.26	2227.	9.64
1047.	10.27	2228.	9.64
1048.	10.27	2229.	9.63

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1049.	10.27	2230.	9.63
1050.	10.27	2231.	9.63
1051.	10.27	2232.	9.63
1052.	10.27	2233.	9.63
1053.	10.27	2234.	9.64
1054.	10.27	2235.	9.63
1055.	10.27	2236.	9.63
1056.	10.26	2237.	9.63
1057.	10.27	2238.	9.63
1058.	10.26	2239.	9.63
1059.	10.26	2240.	9.63
1060.	10.26	2241.	9.63
1061.	10.26	2242.	9.63
1062.	10.27	2243.	9.63
1063.	10.27	2244.	9.63
1064.	10.27	2245.	9.63
1065.	10.27	2246.	9.63
1066.	10.26	2247.	9.63
1067.	10.26	2248.	9.63
1068.	10.26	2249.	9.63
1069.	10.26	2250.	9.63
1070.	10.27	2251.	9.63
1071.	10.27	2252.	9.62
1072.	10.27	2253.	9.62
1073.	10.26	2254.	9.62
1074.	10.26	2255.	9.62
1075.	10.26	2256.	9.62
1076.	10.26	2257.	9.62
1077.	10.26	2258.	9.62
1078.	10.26	2259.	9.62
1079.	10.26	2260.	9.62
1080.	10.26	2261.	9.62
1081.	10.25	2262.	9.62
1082.	10.25	2263.	9.62
1083.	10.26	2264.	9.62
1084.	10.25	2265.	9.63
1085.	10.25	2266.	9.63
1086.	10.26	2267.	9.62
1087.	10.26	2268.	9.63
1088.	10.26	2269.	9.62
1089.	10.26	2270.	9.62
1090.	10.27	2271.	9.62
1091.	10.26	2272.	9.62
1092.	10.26	2273.	9.62
1093.	10.26	2274.	9.62
1094.	10.26	2275.	9.62
1095.	10.26	2276.	9.62
1096.	10.26	2277.	9.62
1097.	10.26	2278.	9.62
1098.	10.25	2279.	9.62
1099.	10.25	2280.	9.62
1100.	10.25	2281.	9.62
1101.	10.24	2282.	9.62
1102.	10.25	2283.	9.62
1103.	10.25	2284.	9.61
1104.	10.25	2285.	9.62
1105.	10.25	2286.	9.62
1106.	10.25	2287.	9.61
1107.	10.25	2288.	9.62
1108.	10.25	2289.	9.61
1109.	10.25	2290.	9.62
1110.	10.25	2291.	9.61
1111.	10.26	2292.	9.62

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1112.	10.25	2293.	9.61
1113.	10.25	2294.	9.61
1114.	10.25	2295.	9.61
1115.	10.25	2296.	9.62
1116.	10.25	2297.	9.61
1117.	10.25	2298.	9.62
1118.	10.25	2299.	9.61
1119.	10.25	2300.	9.61
1120.	10.25	2301.	9.61
1121.	10.24	2302.	9.61
1122.	10.24	2303.	9.61
1123.	10.24	2304.	9.61
1124.	10.24	2305.	9.61
1125.	10.24	2306.	9.61
1126.	10.25	2307.	9.6
1127.	10.25	2308.	9.61
1128.	10.25	2309.	9.61
1129.	10.24	2310.	9.61
1130.	10.25	2311.	9.6
1131.	10.25	2312.	9.6
1132.	10.25	2313.	9.6
1133.	10.24	2314.	9.6
1134.	10.24	2315.	9.6
1135.	10.24	2316.	9.6
1136.	10.24	2317.	9.6
1137.	10.24	2318.	9.6
1138.	10.25	2319.	9.6
1139.	10.25	2320.	9.61
1140.	10.24	2321.	9.6
1141.	10.23	2322.	9.6
1142.	10.24	2323.	9.6
1143.	10.24	2324.	9.6
1144.	10.25	2325.	9.6
1145.	10.25	2326.	9.6
1146.	10.24	2327.	9.6
1147.	10.24	2328.	9.6
1148.	10.24	2329.	9.6
1149.	10.24	2330.	9.6
1150.	10.25	2331.	9.59
1151.	10.24	2332.	9.6
1152.	10.24	2333.	9.59
1153.	10.24	2334.	9.6
1154.	10.24	2335.	9.6
1155.	10.23	2336.	9.6
1156.	10.23	2337.	9.6
1157.	10.23	2338.	9.6
1158.	10.24	2339.	9.6
1159.	10.24	2340.	9.6
1160.	10.24	2341.	9.6
1161.	10.24	2342.	9.59
1162.	10.23	2343.	9.59
1163.	10.23	2344.	9.6
1164.	10.23	2345.	9.6
1165.	10.23	2346.	9.6
1166.	10.24	2347.	9.59
1167.	10.23	2348.	9.6
1168.	10.23	2349.	9.59
1169.	10.24	2350.	9.57
1170.	10.23	2351.	9.57
1171.	10.23	2352.	9.57
1172.	10.23	2353.	9.57
1173.	10.24	2354.	9.59
1174.	10.24	2355.	9.59

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1175.	10.23	2356.	9.59
1176.	10.24	2357.	9.59
1177.	10.24	2358.	9.56
1178.	10.23	2359.	9.56
1179.	10.23	2360.	9.56
1180.	10.22		

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	5.615E-08	ft/min
y0	11.29	ft

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 257298 -_____-____
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

XCEL ENERGY
ESG 4653 TABLE MOUNTAIN DR
GOLDEN, CO 80403-

(720) 497-2109

APPROVED WELL LOCATION
BOULDER COUNTY
NE 1/4 SW 1/4 Section 26
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
2200 Ft. from South Section Line
1500 Ft. from West Section Line

UTM COORDINATES
Northing: Easting:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-42027, and known as MW-1.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with well permit number(s) and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

PT 6-3-2004

APPROVED
PAT

Hal D. Simpson
State Engineer

Patricia A. Tyler
By

Receipt No. 0522644F DATE ISSUED 06-03-2004 EXPIRATION DATE N/A

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES
1313 SHERMAN ST., RM 818, DENVER CO 80203
phone – info: (303) 866-3587 main: (303) 866-3581
Fax: (303) 866-3589 http://www.water.state.co.us

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Form GWS-46 (6/2003)

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COLO.

MONITORING/OBSERVATION Water Well Permit Application

Review instructions on reverse side prior to completing form.
The form must be completed in black ink or typed

1. Well Owner Information

Name of well owner: Xcel Energy

Mailing address: ESG, 4653 Table Mountain Drive

City	State	Zip code
Golden	CO	80403

Telephone #: (720)497-2109 (Quinn Kilty)

2. Type Of Application (check applicable boxes)

☒ Use existing well
☐ Construct new well
☐ Other:
☐ Replacement for existing monitoring well:
Permit no.:

3. Refer To (if applicable)

Monitoring hole acknowledgment	Well name or #
MH- 42027	MW-1

4. Location Of Proposed Well

County: Boulder

NE 1/4 of the SW 1/4

Section	Township	N or S	Range	E or W	Principal Meridian
26	1	☒ ☐	70	☐ ☒	6th

Distance of well from section lines (section lines are typically not property lines)
2200 Ft. from ☐ N ☒ S 1500 Ft. from ☐ E ☒ W

For replacement wells only – distance and direction from old well to new well
feet direction

Well location address (if applicable): 1800 North 63rd Street, Boulder, CO, 80301

Optional: GPS well location information in UTM format
Required settings for GPS units are as follows:

Format must be UTM
Zone must be 13
Units must be Meters
Datum must be NAD27 (CONUS)
Unit must be set to true north
Were points averaged? ☐ YES ☐ NO

Northing _____
Easting _____

5. Property Owner Information

Name of property owner: Xcel Energy

Mailing address: ESG, 4653 Table Mountain Drive

City	State	Zip Code
Golden	CO	80403

Telephone #: (720) 497-2109 (Quinn Kilty)

6. Use Of Well

Use of this well is limited to monitoring water levels and/or water quality sampling

7. Well Data (proposed)

Total depth	Aquifer
13 feet	Unconfined

8. Consultant Information (if applicable)

Name of contact person: Micheal Hattel

Company name: Apex Consulting Services, Inc.

Mailing address: P.O. Box 369

City	State	Zip Code
Louisville	CO	80027-0369

Telephone #: (303) 665-1400

9. Proposed Well Driller License #(optional):NA

10. Signature Of Well Owner, Consultant Or Authorized Agent

The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge.

Sign here (Must be ***original*** signature): Michael Hattel
Date: 3/11/4

Print name & title: Michael Hattel / Engineering Geologist

Office Use Only

USGS map name	DWR map no.	Surface elev.

Lou✓
MH✓

Receipt area only

Invoice # 522644F
4/2/2004 -- 15:18:34
Cashier ID: 01
$2770.00

Check Purchase- #229284

DIV 1 WD 6 BA ____ MD ____

FORM NO. GWS-31 10/94

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER

For Office Use Only

RECEIVED

JUN 05 2003

WATER RESOURCES STATE ENGINEER COLO.

10 Wells

0042027 0522644F

1. **WELL PERMIT NUMBER:** ~~MH-42027~~ 257298

2. **OWNER NAME(S)** Xcel Energy
Mailing Address ESG, 4653 Table Mountain Drive
City, St., Zip Golden, CO 80403
Phone 720-497-2109 (Quinn Kilty)

3. **WELL LOCATION AS DRILLED:** NE 1/4 SW 1/4, Sec. 26 Twp. 1 N Range 70 W
DISTANCES FROM SEC. LINES:
2200 ft. from S Sec. line. and 1500 ft. from W Sec. line. OR
SUBDIVISION LOT BLOCK FILING(UNIT)
STREET ADDRESS AT WELL LOCATION: 1800 North 63rd Street, Boulder, CO 80301

4. GROUND SURFACE ELEVATION: 5140 ft. DRILLING METHOD Hollow Stem Auger
DATE COMPLETED April 11, 2003 TOTAL DEPTH 13 ft. DEPTH COMPLETED 13 ft.

5. **GEOLOGIC LOG**

Depth	Description of Material (Type, Size, Color, Water Location)
0 - 1.0'	Fill
1.0-6.0'	Sand: Fine to Medium Grained, Clayey to Very Clayey, Brown to Dark Gray
6.0-13.0'	Clay: Silty to Sandy, Tan to Brown or Dark Gray to Black
	WATER AT 4.0' ON 4-11-3

6. **HOLE DIAM (in.)**

	From (ft)	To (ft)
8	0	13

7. **PLAIN CASING**

OD (in)	Kind	Wall Size	From (ft.)	To (ft.)
2	PVC	SCH 40	0	3

PERF. CASING: Screen Slot Size: 0.02 inches

2	PVC	SCH 40	3	13

8. **FILTER PACK**
Material: SAND
Size: 10-20
Interval: 2.5'-13'

9. **PACKER PLACEMENT:**
Type: N/A
Depth:

10. **GROUTING RECORD:**

Material	Amount	Density	Interval	Placement
Bentonite Chips	50 lbs.		.5'-2.5'	Poured & Hydrated

REMARKS: MW-1

11. **DISINFECTION:** Type N/A Amt. Used

12. **WELL TEST DATA:** ☐ Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test
TESTING METHOD N/A
Static Level Date/Time measured . Production Rate gpm.
Pumping Level Date/Time measured . Test Length hrs.
Remarks

13. I have read the statements mad herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104(13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]

CONTRACTOR Apex Consulting Services, Inc. Phone (303) 665-1400 Lic. No. N/A
Mailing Address P.O. Box 369, Louisville, CO, 80027-0369

Name/Title (Please Type or print)	Signature	Date
Michael Hattel/Engineering Geologist	Michael Hattel	6/3/3

APEX CONSULTING SERVICES, INC.

APEX

566 West Willow Court
Reply to: P.O. Box 369
Louisville, CO 80027-0369
Phone: 303-665-1400
Fax: 303-665-0620
email: apexcsi@comcast.net

February 11, 2008

Ms. Jennifer McCarter
Xcel Energy
ESG, 4653 Table Mountain Drive
Golden, Colorado 80403

Re: Valmont Station, Ash Disposal Facility, Additional Monitoring Well Installation, APEX Job No.: 1-0013.004.01

Dear Ms. McCarter:

Apex Consulting Services, Inc. (APEX) has completed the additional monitoring well installation at the Xcel Energy, Valmont Station, Ash Disposal Facility (Facility) located at 1800 North 63rd Street, Boulder, Colorado (Figure 1). The work performed in this investigation included drilling and completing five (5) monitoring wells; performing slug test in four (4) of the 5 monitoring wells, analyzing groundwater elevation and slug test data, and preparation of this letter report.

BACKGROUND

In 2002, three (3) groundwater monitoring wells (MW-1, MW-2, and MW-3) were installed at the Facility (Figure 1). The Facility is located to the north of Legett Reservoir (Figure 1). One (1) monitoring well (MW-2) was installed up-gradient and two (2) monitoring wells (MW-1 and MW-3) were installed down-gradient of the Facility. Groundwater beneath the Facility was encountered in the Pierre Shale (siltstone and shale) and was determined to flow at 0.03 feet/year (ft/yr) to the southeast. The hydraulic conductivity (K) of the shale was estimated to be 4×10^{-7} centimeters per second (cm/sec) or 7.9×10^{-7} feet per minute (ft/min) and the groundwater gradient was calculated at 0.021.

WELL INSTALLATION

On July 2, 2007, APEX notified the State Engineer's Office (SEO) of the intent to install monitoring wells at the Facility. Prior to drilling, APEX also contacted and met with the Utility Notification Center of Colorado (UNCC) and Xcel Energy locators in an effort to identify buried utilities at the Facility. Drilling for soil sampling, collection of subsurface stratigraphic data, and installation of groundwater monitoring wells was performed between July 9 and 11, 2007 at the locations shown on Figure 1. The soil borings were advanced with a Simco, air-rotary/percussion hammer drill rig equipped with 4.5-inch diameter outer casing. The soil borings were completed to depths ranging from 22.5 to 65.5 feet below ground surface. Each of the soil borings were completed as monitoring wells (MW-4, MW-5, MW-6, MW-7, and MW-8). The soil boring/monitoring well locations are

shown on Figure 1. Each monitoring well was permitted with the SEO. The permits are included in Attachment A.

Each of the soil borings was logged by a geologist. Soil samples and properties were collected at varying depths from each boring using Standard Penetration Test (SPT) methods by lowering a split-spoon sampler into the open annulus and driving it into the soil with a 140-pound hammer falling 30 inches. The SPT yields an N-value (number of blows per 6-inches) for determining soil properties. Overburden encountered in the soil borings consisted of clay and silty sand. The encountered clay in boring MW-4 was soft to firm (N-values ranging from 3 to 6). Consolidated materials encountered at the Facility consisted of siltstone in borings MW-5, MW-6, MW-7, and MW-8 and shale in boring MW-4. The siltstone and shale were tan to olive grey in color. They were weathered near the surface (N-values of less than 50 blows for 6-inches) and hard to very hard (dense) with depth (N-values of 50 blows for 3 to 6-inches). Soil boring logs are included in Attachment B.

Each monitoring well was constructed of 2-inch diameter, threaded, polyvinyl chloride (PVC) pipe, a 10/20 gravel pack, and hydrated bentonite. Monitoring wells MW-5, MW-6, MW-7 and MW-8 were completed with 15 feet of factory slotted piping and solid piping. Monitoring well MW-4 was completed with 10 feet of factory slotted piping and solid piping. Metal risers (locking covers) were installed (concreted) over each monitoring well. Well construction summary logs are included in Attachment C.

SLUG TESTS AND AQUIFER PROPERTY CALCULATIONS

Monitoring wells MW-4, MW-6, MW-7, and MW-8 were developed by purging the groundwater with a bailer until dry immediately following installation and again in October 2007. An insufficient amount of groundwater was present in monitoring well MW-5 for development. During the week of November 12, 2007, slug tests were performed in monitoring wells MW-4, MW-6, MW-7, and MW-8. An insufficient amount of groundwater was present in monitoring well MW-5 for performing a slug test.

A Level Troll pressure transducer was used to record well recovery data. The Bouer and Rice solution for unconfined aquifers was applied to analyze the data using Aqtesolv software. The Aqtesolv solutions and outputs are included in Attachment D. Calculated K values in monitoring wells MW-4, MW-6, MW-7 and MW-8 are 1.1×10^{-6}, 1.0×10^{-6}, 6.8×10^{-7}, and 5.9×10^{-6} ft/min, respectively. The average K value for the aforementioned monitoring wells is 2.2×10^{-6} ft/min.

Flagstaff Surveying, Inc. was contracted to survey the relative elevation of the top of the casing of each monitoring well. The top of casing of each monitoring well was surveyed relative to the elevation of the brass cap located at monitoring well MW-3. The results of the survey are included in Attachment E.

Groundwater elevations were measured and recorded in each well (Figure 2). Groundwater was present in the monitoring wells at depths ranging from approximately seven (7) to approximately 45 feet below the ground surface (bgs). Relative groundwater elevations are shown on Figure 2. The data indicates shallow groundwater flow follows topography and is basically to the south-southeast at the eastern portion of the facility and to the southwest (towards South Boulder Creek) at the western portion of the Facility. The groundwater gradient across the Facility was calculated (difference in the measured water level {feet} between two monitoring wells divided by the distance {feet} between the monitoring wells). An average gradient of 0.017 was calculated for the eastern portion of the Facility using data from monitoring wells MW-1, MW-2, MW-3 and MW-4. An average gradient of 0.068 was calculated for the western portion of the Facility using data from monitoring wells MW-6, MW-7 and MW-8.

Since the gradient varies between the eastern and western portions of the Facility, the groundwater velocity was determined for each portion. Using the average K (2.2×10^{-6} ft/min), a gradient of 0.017, and a porosity of 30% (same porosity used in 2002), the groundwater flow velocity of 0.07 ft/yr was calculated for the eastern portion of the Facility. Using the average K (2.2×10^{-6} ft/min), a gradient of 0.068, and a porosity of 30%, the groundwater flow velocity of 0.26 ft/yr was calculated for the western portion of the Facility.

DISCUSSION

Consolidated materials encountered during drilling operations at the Facility consisted of siltstone and shale. The siltstone and shale were tan to olive grey in color and are consistent with the materials encountered during the 2002 investigation. Groundwater elevation data suggests that groundwater flow is to the south-southeast at the eastern portion of the Facility and to the southwest at the western portion of the facility. The calculated K (2.2×10^{-6} ft/min), gradient (0.017), and groundwater velocity (0.07 ft/yr) values for the eastern portion of the Facility are consistent with values calculated in 2002. However, the calculated K (2.2×10^{-6} ft/min), gradient (0.068), and groundwater velocity (0.26 ft/yr) for the western portion of the Facility are higher than the values calculated in 2002. It appears that the difference can likely be attributed to topography (steeper terrain) and to laminated and weathered siltstone at the western portion of the Facility. Since the western portion of the Facility is characterized by steeper terrain, the groundwater gradient and velocity are greater.

LIMITATIONS

This report is intended for the exclusive use of Xcel Energy. The report and the conclusions herein are based on data collected from widely spaced monitoring wells at the Facility. Subsurface conditions may vary from those portrayed herein. Data collected from other areas of the Facility could produce different results than those found in this investigation. We warrant only that the work was performed in accordance with generally accepted engineering practices.

Please call if you have any questions or comments.

Sincerely,

APEX CONSULTING SERVICES, INC.

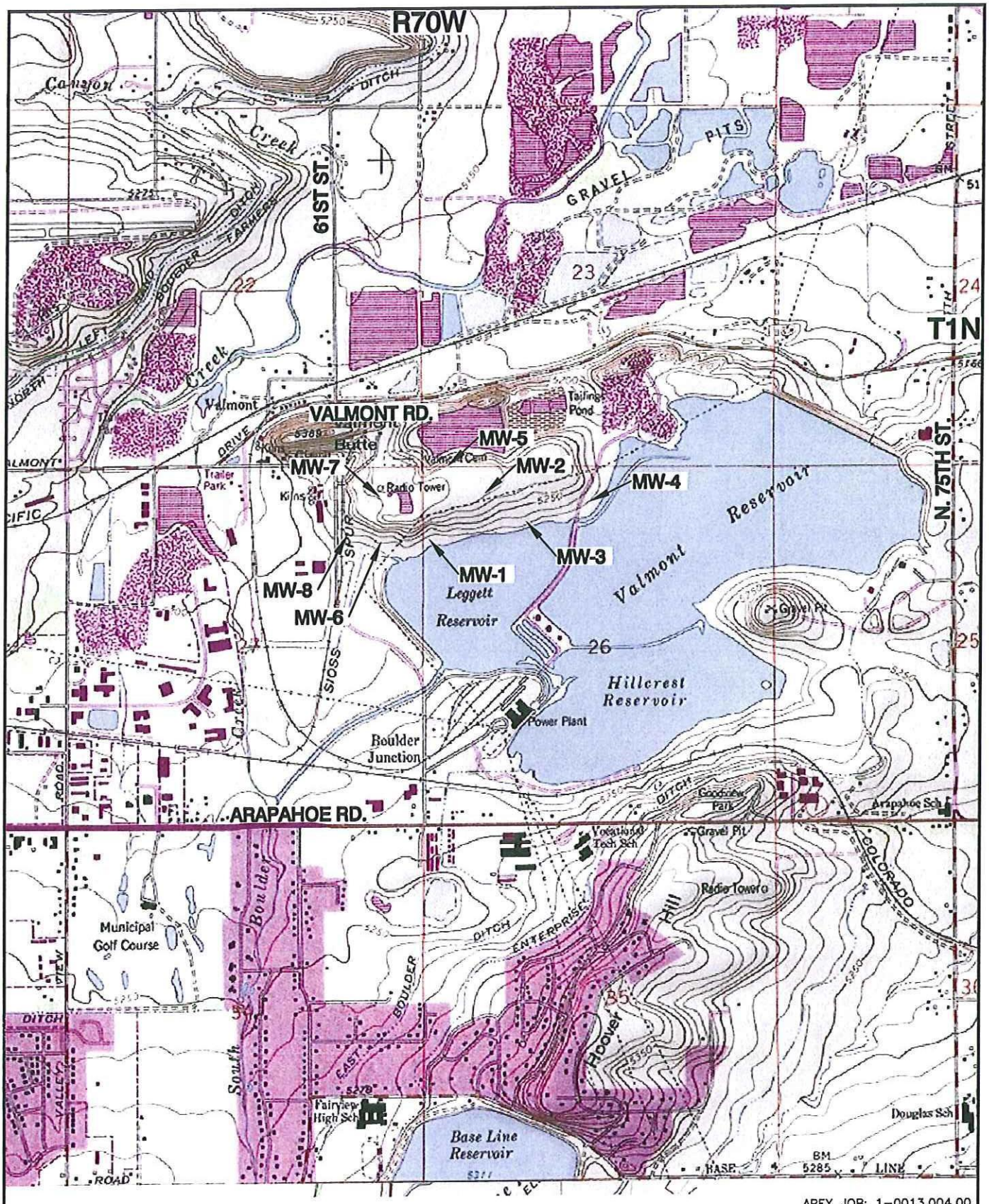
PROFESSIONAL GEOLOGIST
MICHAEL DEAN HATTEL
PG 708
WYOMING

Michael D. Hattel, P.G., P.E.S.
Principal

MDH:mh

Attachments

Valmont.Ash.Well.Rpt.R2.rtf



NORTH

0 1000 2000

SCALE: 1" = 2000'

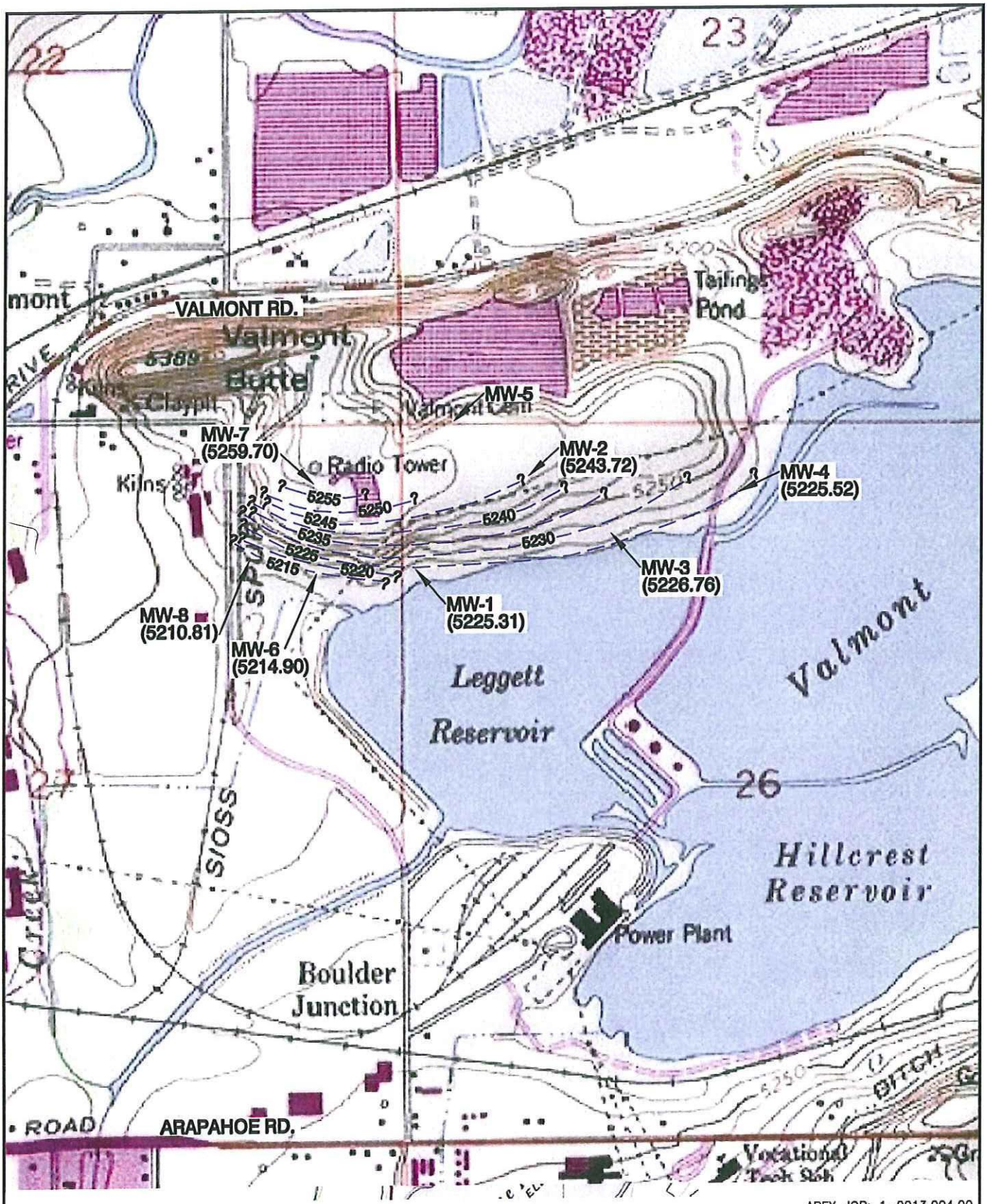
APEX JOB: 1-0013.004.00

XCEL ENERGY
VALMONT GROUNDWATER
MONITORING WELL
LOCATION MAP

APEX

FIGURE:
1

MDS FILE: 01-065\VICNITY-VALMONT-GW.DWG



APEX JOB: 1-0013.004.00

NORTH

0 500 1000

SCALE: 1" = 1000'

XCEL ENERGY
VALMONT GROUNDWATER
ELEVATION MAP

APEX

FIGURE:
2

MDS FILE: 01-065\VICNITY-VALMONT-GW ELEV.DWG

ATTACHMENT A

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 275212 - - -
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

MW-4

PUBLIC SERVICE OF COLO DBA XCEL ENERGY
C/O APEX CONSULTING SERVICES
PO BOX 369
LOUISVILLE, CO 80027-

(303) 665-1400

APPROVED WELL LOCATION
BOULDER COUNTY
NE 1/4 NW 1/4 Section 26
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
547 Ft. from North Section Line
2528 Ft. from West Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: 483137 Northing: 4430840

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-47169, and known as MW-4.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTICE: This permit has been approved subject to the following changes: The distances from section lines were calculated from UTM coordinate values provided with the permit application. You are hereby notified that you have the right to appeal the issuance of this permit, by filing a written request with this office within sixty (60) days of the date of issuance, pursuant to the State Administrative Procedures Act. (See Section 24-4-104 through 106, C.R.S.) 09/11/07

APPROVED
BDH

Dick Wolfe
For State Engineer

Brenda Hasenauer
By

Receipt No. 3620930A DATE ISSUED 09-11-2007 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 275213 - - -
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

MW-5

PUBLIC SERVICE OF COLO DBA XCEL ENERGY
C/O APEX CONSULTING SERVICES
PO BOX 369
LOUISVILLE, CO 80027-

(303) 665-1400

APPROVED WELL LOCATION
BOULDER COUNTY
NW 1/4 NW 1/4 Section 26
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
15 Ft. from North Section Line
300 Ft. from West Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: 482477 Northing: 4431007

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-47168, and known as MW-5.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTICE: This permit has been approved subject to the following changes: The distances from section lines were calculated from UTM coordinate values provided with the permit application. You are hereby notified that you have the right to appeal the issuance of this permit, by filing a written request with this office within sixty (60) days of the date of issuance, pursuant to the State Administrative Procedures Act. (See Section 24-4-104 through 106, C.R.S.) B.D.H. 09/11/07

APPROVED
BDH

Dick Wolfe
For State Engineer

Brenda Hastings
By

Receipt No. 3620930B DATE ISSUED 09-11-2007 EXPIRATION DATE N/A

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 275214 - - -
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

MW-6

PUBLIC SERVICE OF COLO DBA XCEL ENERGY
C/O APEX CONSULTING SERVICES
PO BOX 369
LOUISVILLE, CO 80027-

(303) 665-1400

APPROVED WELL LOCATION
BOULDER COUNTY
NE 1/4 NE 1/4 Section 27
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
1111 Ft. from North Section Line
600 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: 482178 Northing: 4430674

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-47167, and known as MW-6.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTICE: This permit has been approved subject to the following changes: The distances from section lines were calculated from UTM coordinate values provided with the permit application. You are hereby notified that you have the right to appeal the issuance of this permit, by filing a written request with this office within sixty (60) days of the date of issuance, pursuant to the State Administrative Procedures Act. (See Section 24-4-104 through 106, C.R.S.) D.D.H. 09/11/07

APPROVED
BDH

Dick Wolfe
For State Engineer

Brenda Hoskinson
By

Receipt No. 3620930C DATE ISSUED 09-11-2007 EXPIRATION DATE N/A

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 275215 - - -
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

MW-7

PUBLIC SERVICE OF COLO DBA XCEL ENERGY
C/O APEX CONSULTING SERVICES
PO BOX 369
LOUISVILLE, CO 80027-

(303) 665-1400

APPROVED WELL LOCATION
BOULDER COUNTY
NE 1/4 NE 1/4 Section 27
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
432 Ft. from North Section Line
500 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: 482174 Northing: 4430881

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-47167, and known as MW-7.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTICE: This permit has been approved subject to the following changes: The distances from section lines were calculated from UTM coordinate values provided with the permit application. You are hereby notified that you have the right to appeal the issuance of this permit, by filing a written request with this office within sixty (60) days of the date of issuance, pursuant to the State Administrative Procedures Act. (See Section 24-4-104 through 106, C.R.S.) B.D.H. 09/11/07

APPROVED
BDH

Dick Wolfe
For State Engineer

Brenda Hasenyager
By

Receipt No. 3620930D DATE ISSUED 09-11-2007 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 275216 - - -
DIV. 1 WD 6 DES. BASIN MD

APPLICANT

MW-8

PUBLIC SERVICE OF COLO DBA XCEL ENERGY
C/O APEX CONSULTING SERVICES
PO BOX 369
LOUISVILLE, CO 80027-

(303) 665-1400

APPROVED WELL LOCATION
BOULDER COUNTY
NE 1/4 NE 1/4 Section 27
Township 1 N Range 70 W Sixth P.M.

DISTANCES FROM SECTION LINES
1260 Ft. from North Section Line
1155 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: 482015 Northing: 4430629

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-47167, and known as MW-8.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTICE: This permit has been approved subject to the following changes: The distances from section lines were calculated from UTM coordinate values provided with the permit application. You are hereby notified that you have the right to appeal the issuance of this permit, by filing a written request with this office within sixty (60) days of the date of issuance, pursuant to the State Administrative Procedures Act. (See Section 24-4-104 through 106, C.R.S.) J.D.H. 09/11/07

APPROVED
BDH

Dick Wolfe
For State Engineer

Brenda Hasenyager
By

Receipt No. 3620930E DATE ISSUED 09-11-2007 EXPIRATION DATE N/A

ATTACHMENT B

APEX CONSULTING SERVICES, INC.

SOIL BORING LOG

Date 07-11-07

PROJECT Valmont Ash **DESCRIPTION** Monitoring Well Installation **LOGGED BY** Michael Hattel

OWNER Xcel Energy **LOCATION** Valmont Ash Disposal Site **SEC** 26 **TWN** 1N **RNG** 70W **PM** 6th

COUNTY Boulder **CONTRACTOR** Spectrum **RIG** Simco

BORING NO. MW-4 **DRILLING METHOD** Air Rotary **DRILLER** Ken

UTM Zone 13, NAD 83, True North, Meters
Northing 4430840
Easting 0483137
Ground Surface Elev. 5256 (1602 m) (ft.)

Surface Water Elev. NA (ft.)
Groundwater Elev.
First Encounter 21.5 (ft.)
Upon Completion 14.1 (ft.)
After 79 Days 10.99 (ft.)

SOIL DESCRIPTION	DEPTH (ft.)	SPT N (blows)	%RCVY	USCS
Sand, silty, loose, fine grained, grey to brown, roots present.	0	NA	NA	ML
Clay, silty to slightly sandy, soft to moderately stiff, very moist,	-2	4/3/6	75	CL
	-5			
	-10			
Shale, weathered, olive grey,	-15.5			CL
	-20			
Total Depth	-22.5	16/27/50	100	CL
	-25			
	-30			
	-35			
	-40			

APEX CONSULTING SERVICES, INC.

SOIL BORING LOG

Date 07-09-07

PROJECT Valmont Ash **DESCRIPTION** Monitoring Well Installation **LOGGED BY** Michael Hattel

OWNER Xcel Energy **LOCATION** Valmont Ash Disposal Site **SEC** 26 **TWN** 1N **RNG** 70W **PM** 6th

COUNTY Boulder **CONTRACTOR** Spectrum **RIG** Simco

BORING NO. MW-5 **DRILLING METHOD** Air Rotary **DRILLER** Ken

UTM Zone 13, NAD 83, True North, Meters
Northing 4431007
Easting 0482477
Ground Surface Elev. 5299 (1615 m) (ft.)

Surface Water Elev. NA (ft.)
Groundwater Elev.
First Encounter 55 (moist) (ft.)
Upon Completion Dry (ft.)
After 79 Days 62.4 (ft.)

SOIL DESCRIPTION	DEPTH (ft.)	SPTN (blows)	%RCVY	USCS
Sand, silty, loose, fine grained, brown to tan.	0	NA	NA	ML
Siltstone, weathered, tan to olive-grey.	-10	32/50	100	CL
Siltstone, very hard, tan to olive-grey.	-20	50 For 3"	100	CL
Siltstone, very hard, tan to olive-grey, iron laminations present.	-30	50	100	CL
	-40			

SOIL DESCRIPTION	DEPTH (ft.)	SPTN (blows)	%RCVY (tsf)	USCS
	-40			
Siltstone, very hard, tan to olive-grey, iron & grey laminations present, grey cutting at 51'. Slightly moist cuttings at 55'.	-50	50	100	CL
	-60			
Siltstone, grey, very hard, total Depth	-65	50 For 1"	100	CL
	-70			
	-80			

APEX CONSULTING SERVICES, INC.

SOIL BORING LOG

Date 07-11-07

PROJECT Valmont Ash **DESCRIPTION** Monitoring Well Installation **LOGGED BY** Michael Hattel

OWNER Xcel Energy **LOCATION** Valmont Ash Disposal Site **SEC** 27 **TWN** 1N **RNG** 70W **PM** 6th

COUNTY Boulder **CONTRACTOR** Spectrum **RIG** Simco

BORING NO. MW-6 **DRILLING METHOD** Air Rotary **DRILLER** Ken

UTM Zone 13, NAD 83, True North, Meters
Northing 4430674
Easting 0482178
Ground Surface Elev. 5244 (1598 m) (ft.)

Surface Water Elev. NA (ft.)
Groundwater Elev.
First Encounter 23 (ft.)
Upon Completion 19.6 (ft.)
After 79 Days 17.7 (ft.)

SOIL DESCRIPTION	DEPTH (ft.)	SPT N (blows)	% RCVY	USCS
Sand, silty, loose, fine grained, grey to brown, roots present.	0	NA	NA	ML
	-5			
Siltstone, weathered, tan to olive-grey, with iron (red) staining.	-6	23/7	75	CL
	-10			
	-20			
Siltstone, olive-grey, very hard, moist at 23'.	-20	50 = 2"	CL	NA

SOIL DESCRIPTION	DEPTH (ft.)	SPT N (blows)	% RCVY (tsf)	USCS
	-25			
Siltstone, grey, very hard, total depth.	-30	50 = 2"	100	CL
	-35			
	-40			

APEX CONSULTING SERVICES, INC.

SOIL BORING LOG

Date 07-10-07

PROJECT Valmont Ash **DESCRIPTION** Monitoring Well Installation **LOGGED BY** Michael Hattel

OWNER Xcel Energy **LOCATION** Valmont Ash Disposal Site **SEC** 27 **TWN** 1N **RNG** 70W **PM** 6th

COUNTY Boulder **CONTRACTOR** Spectrum **RIG** Simco

BORING NO. MW-7 **DRILLING METHOD** Air Rotary **DRILLER** Ken

UTM Zone 13, NAD 83, True North, Meters
Northing 4430881
Easting 0482174
Ground Surface Elev. 5325 (1623 m) (ft.)

Surface Water Elev. NA (ft.)
Groundwater Elev.
First Encounter 52 (moist) (ft.)
Upon Completion 64.5 (ft.)
After 79 Days 43.2 (ft.)

SOIL DESCRIPTION	DEPTH (ft.)	SPT N (blows)	%RCVY	USCS
Sand, silty, loose, fine grained, grey to brown.	0	NA	NA	ML
	-10			
Siltstone, weathered, tan to olive-grey.	-16	32/50	100	CL
	-20			
Siltstone, olive-grey with grey and iron (red) laminations. Grey cuttings at 48'.	-25	50	100	CL
Siltstone, very hard, tan to olive-grey, red laminations present.	-30	50	100	CL
	-40			

SOIL DESCRIPTION	DEPTH (ft.)	SPT N (blows)	%RCVY (tsf)	USCS
	-40			
	-50			
Siltstone, very hard, grey, moist to very moist.	-52	50 For 2"	100	CL
	-60			
Total depth.	-65.5			
	-70			
	-80			

APEX CONSULTING SERVICES, INC.

SOIL BORING LOG

Date 07-11-07

PROJECT Valmont Ash **DESCRIPTION** Monitoring Well Installation **LOGGED BY** Michael Hattel

OWNER Xcel Energy **LOCATION** Valmont Ash Disposal Site **SEC** 27 **TWN** 1N **RNG** 70W **PM** 6th

COUNTY Boulder **CONTRACTOR** Spectrum **RIG** Simco

BORING NO. MW-8 **DRILLING METHOD** Air Rotary **DRILLER** Ken

UTM Zone 13, NAD 83, True North, Meters
Northing 4430629
Easting 0482015
Ground Surface Elev. 5251 (1500 m) (ft.)

Surface Water Elev. NA (ft.)
Groundwater Elev.
First Encounter 23 (ft.)
Upon Completion 23.8 (ft.)
After 79 Days 17.7 (ft.)

SOIL DESCRIPTION	DEPTH (ft.)	SPT N (blows)	%RCVY	USCS
Sand, silty, loose, fine grained, grey to brown, cobbles in first 1'.	0	NA	NA	ML
	-5			
Siltstone, weathered, tan to slightly olive-grey, hard.	-10	50 = 4"	100	CL
Siltstone, weathered olive-grey, moist/hard at 23'.	-20	NA	NA	CL
Siltstone, grey, very hard, total depth.	-25			
	-30	50 = 2"	0	CL
	-35			
	-40			

ATTACHMENT C

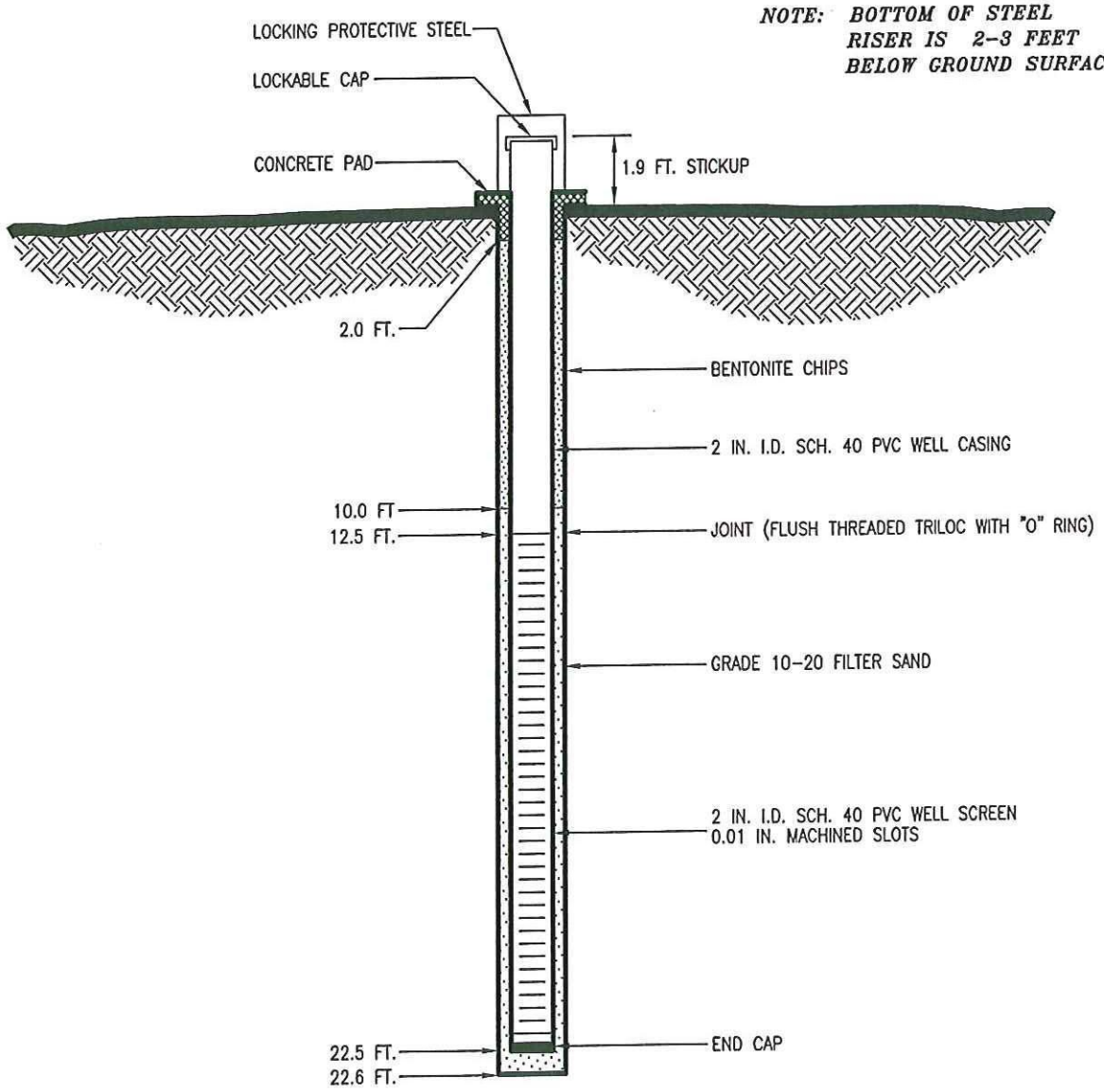
WELL CONSTRUCTION SUMMARY

LOCATION: VALMONT ASH DISPOSAL SITE – MW-4

ELEVATION OF: TOP OF WELL CASING 5257.9 FT., GROUND SURFACE 5256 FT., PROTECTIVE CASING 5258 FT.

ALL DEPTHS ARE RELATIVE TO GROUND SURFACE EXCEPT AS INDICATED

NOTE: BOTTOM OF STEEL RISER IS 2-3 FEET BELOW GROUND SURFACE



INSTALLED BY: MICHAEL HATTEL

NOT TO SCALE

DATE INSTALLED 07-11-07

DRILLER SPECTRUM

SOIL SAMPLES ☐ YES ☒ NO

GEOPHYSICAL LOG ☐ YES ☒ NO

VOLUME: SLURRY N/A
SAND 200 LBS.
BENTONITE 100 LBS.

DRILLING METHOD AIR-ROTARY

BORING LOG MW-4

COMMENTS

CONSTRUCTION SUMMARY MW-4

PROJECT: 1-0009.004.01

DATE: 12-06-07

REVISIONS

APEX

MDS FILE: 01-065\WELLSUMM-VALMONT1207.DWG

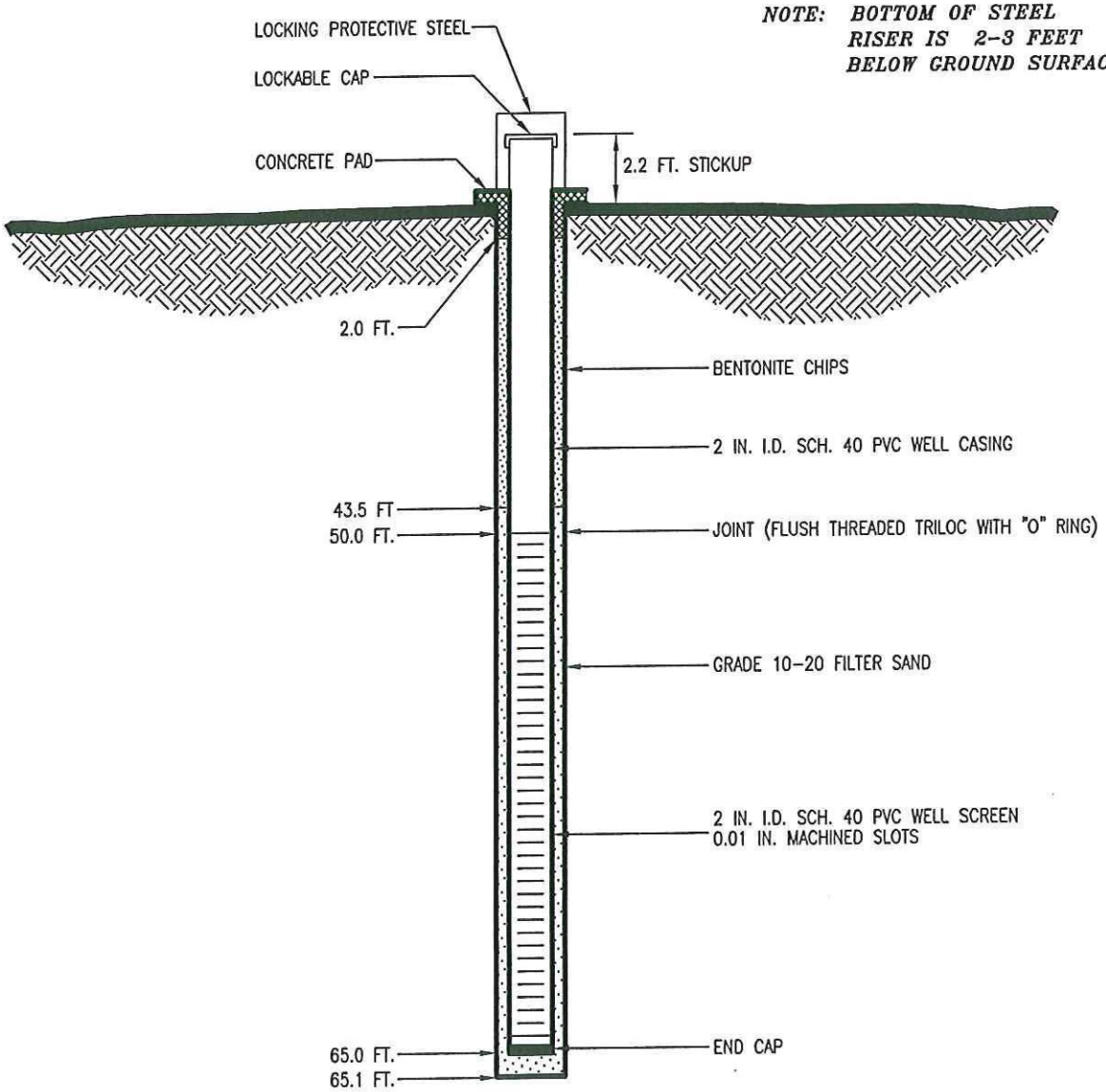
WELL CONSTRUCTION SUMMARY

LOCATION: VALMONT ASH DISPOSAL SITE – MW-5

ELEVATION OF: TOP OF WELL CASING 5301 FT., GROUND SURFACE 5299 FT., PROTECTIVE CASING 5301 FT.

ALL DEPTHS ARE RELATIVE TO GROUND SURFACE EXCEPT AS INDICATED

NOTE: BOTTOM OF STEEL RISER IS 2-3 FEET BELOW GROUND SURFACE



INSTALLED BY: MICHAEL HATTEL

NOT TO SCALE

DATE INSTALLED 07-09-07

DRILLER SPECTRUM

SOIL SAMPLES ☐ YES ☒ NO

GEOPHYSICAL LOG ☐ YES ☒ NO

VOLUME: SLURRY N/A
SAND 125 LBS.
BENTONITE 275 LBS.

DRILLING METHOD AIR-ROTARY

BORING LOG MW-5

COMMENTS

CONSTRUCTION SUMMARY MW-5

PROJECT: 1-0009.004.01

DATE: 12-06-07

REVISIONS

APEX

MDS FILE: 01-065\WELLSUMM-VALMONT1207.DWG

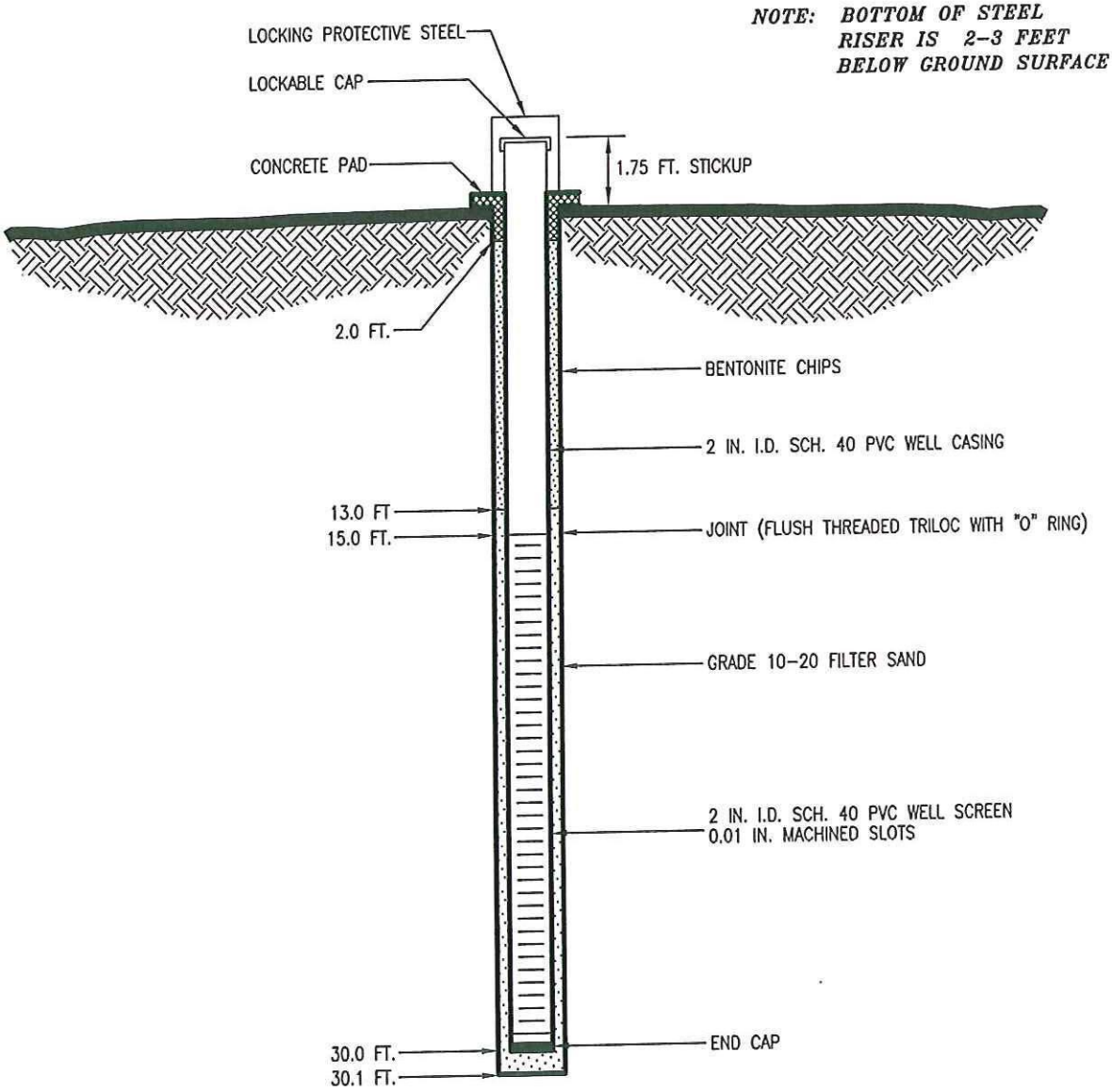
WELL CONSTRUCTION SUMMARY

LOCATION: VALMONT ASH DISPOSAL SITE – MW-6

ELEVATION OF: TOP OF WELL CASING 5245.75 FT., GROUND SURFACE 5244 FT., PROTECTIVE CASING 5245.8 FT.

ALL DEPTHS ARE RELATIVE TO GROUND SURFACE EXCEPT AS INDICATED

NOTE: BOTTOM OF STEEL RISER IS 2-3 FEET BELOW GROUND SURFACE



INSTALLED BY: MICHAEL HATTEL

NOT TO SCALE

DATE INSTALLED 07-11-07

DRILLER SPECTRUM

SOIL SAMPLES ☐ YES ☒ NO

GEOPHYSICAL LOG ☐ YES ☒ NO

VOLUME: SLURRY N/A
SAND 175 LBS.
BENTONITE 100 LBS.

DRILLING METHOD AIR-ROTARY

BORING LOG MW-6

COMMENTS

CONSTRUCTION SUMMARY MW-6

PROJECT: 1-0009.004.01

DATE: 12-06-07

REVISIONS

APEX

MDS FILE: 01-065\WELLSUMM-VALMONT1207.DWG

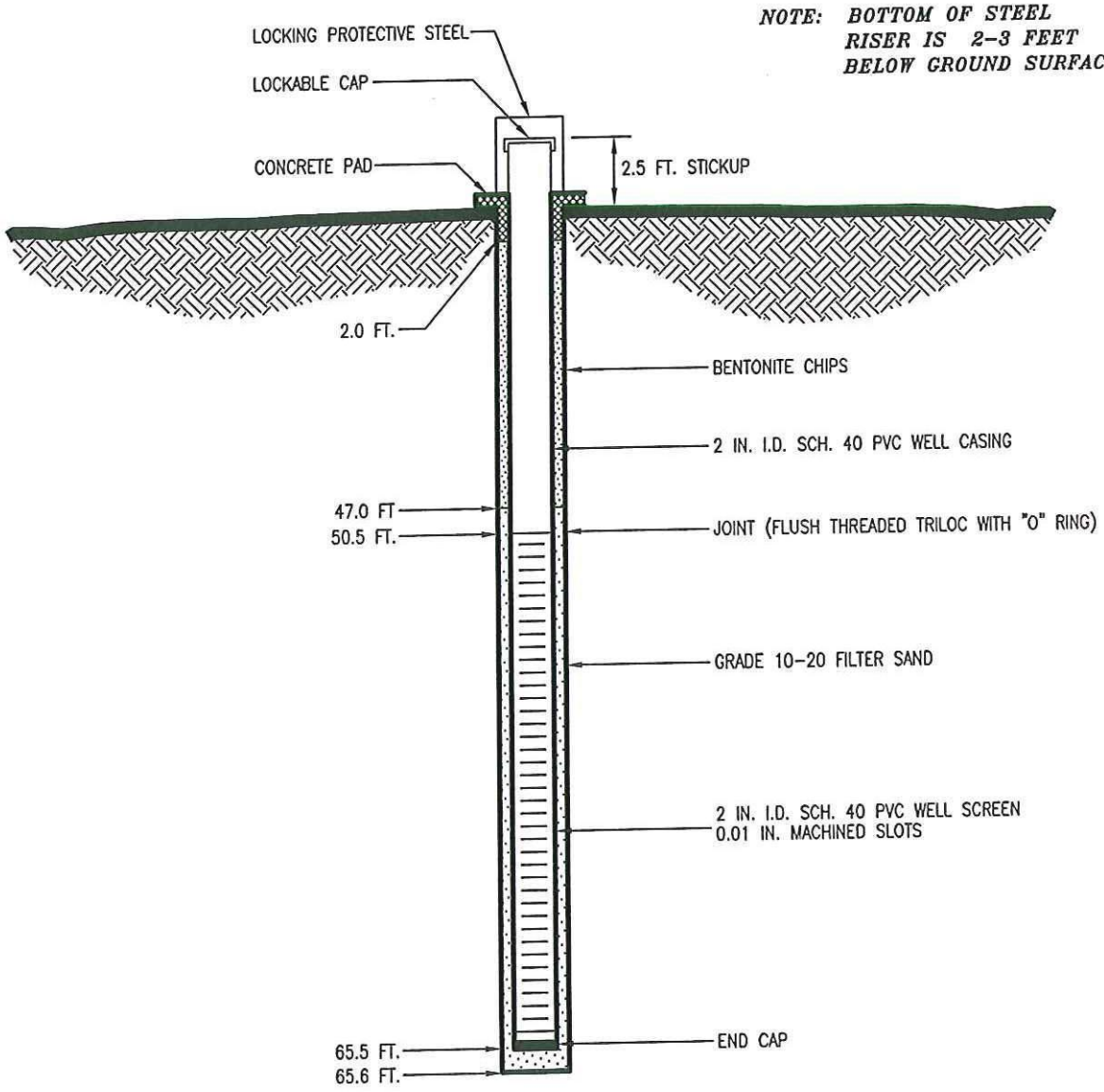
WELL CONSTRUCTION SUMMARY

LOCATION: VALMONT ASH DISPOSAL SITE – MW-7

ELEVATION OF: TOP OF WELL CASING 5327.5 FT., GROUND SURFACE 5325 FT., PROTECTIVE CASING 5327.6 FT.

ALL DEPTHS ARE RELATIVE TO GROUND SURFACE EXCEPT AS INDICATED

NOTE: BOTTOM OF STEEL RISER IS 2-3 FEET BELOW GROUND SURFACE



INSTALLED BY: MICHAEL HATTEL

NOT TO SCALE

DATE INSTALLED 07-10-07

DRILLER SPECTRUM

SOIL SAMPLES ☐ YES ☒ NO

GEOPHYSICAL LOG ☐ YES ☒ NO

VOLUME: SLURRY N/A
SAND 200 LBS.
BENTONITE 225 LBS.

DRILLING METHOD AIR-ROTARY

BORING LOG MW-7

COMMENTS

CONSTRUCTION SUMMARY MW-7

PROJECT: 1-0009.004.01

DATE: 12-06-07

REVISIONS

APEX

MDS FILE: 01-065\WELLSUMM-VALMONT1207.DWG

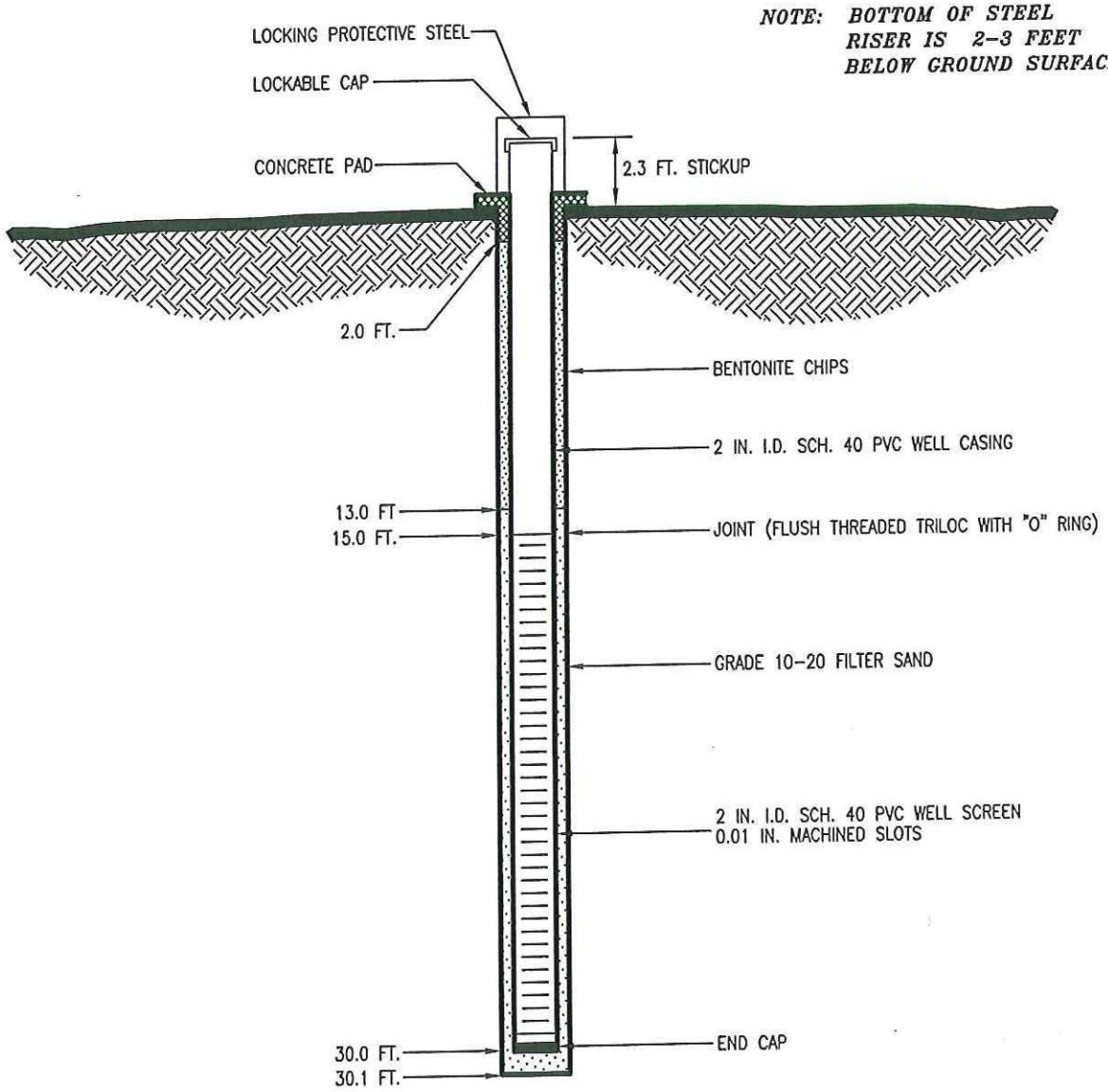
WELL CONSTRUCTION SUMMARY

LOCATION: VALMONT ASH DISPOSAL SITE – MW-8

ELEVATION OF: TOP OF WELL CASING 5253.3 FT., GROUND SURFACE 5351 FT., PROTECTIVE CASING 5253.5 FT.

ALL DEPTHS ARE RELATIVE TO GROUND SURFACE EXCEPT AS INDICATED

NOTE: BOTTOM OF STEEL RISER IS 2-3 FEET BELOW GROUND SURFACE



INSTALLED BY: MICHAEL HATTEL

NOT TO SCALE

DATE INSTALLED 07-11-07

DRILLER SPECTRUM

SOIL SAMPLES ☐ YES ☒ NO

GEOPHYSICAL LOG ☐ YES ☒ NO

VOLUME: SLURRY N/A
SAND 175 LBS.
BENTONITE 100 LBS.

DRILLING METHOD AIR-ROTARY

BORING LOG MW-8

COMMENTS

CONSTRUCTION SUMMARY MW-8

PROJECT: 1-0009.004.01

DATE: 12-06-07

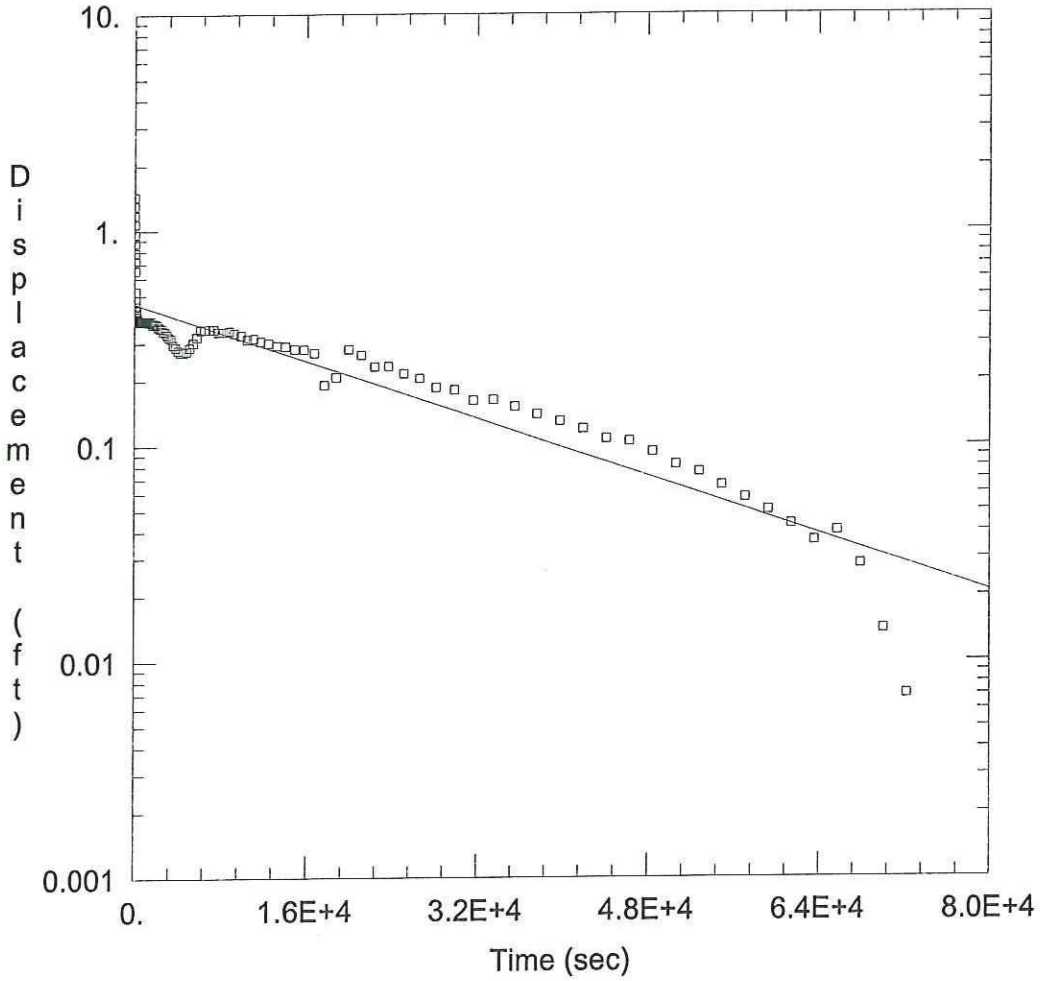
REVISIONS

APEX

MDS FILE: 01-065\WELLSUMM-VALMONT1207.DWG

ATTACHMENT D

MW-4



WELL TEST ANALYSIS

Data Set:
Date: 02/02/08 Time: 18:46:10

PROJECT INFORMATION

Company: Apex Consulting Services, Inc
Client: Xcel Energy
Project: 1-0013.004.02
Location: Ash Disposal
Test Date: 11-15-07

AQUIFER DATA

Saturated Thickness: 12.48 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-4)

Initial Displacement: 1.437 ft
Total Well Penetration Depth: 22.5 ft
Casing Radius: 0.083 ft

Static Water Column Height: 12.48 ft
Screen Length: 10. ft
Well Radius: 0.42 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.083E-6 ft/min y0 = 0.4567 ft

Data Set:
Date: 02/02/08
Time: 18:46:18

MW-4

PROJECT INFORMATION

Company: Apex Consulting Services, Inc
Client: Xcel Energy
Project: 1-0013.004.02
Location: Ash Disposal
Test Date: 11-15-07

AQUIFER DATA

Saturated Thickness: 12.48 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-4

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.437 ft
Static Water Column Height: 12.48 ft
Casing Radius: 0.083 ft
Well Radius: 0.42 ft
Well Skin Radius: 0.42 ft
Screen Length: 10. ft
Total Well Penetration Depth: 22.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.05735 ft
Gravel Pack Porosity: 0.

No. of Observations: 110

Observation Data

Time (sec)	Displacement (ft)
10.8	1.305
22.2	1.18
34.2	1.075
46.8	0.964
60.	0.878
74.4	0.791
89.4	0.722
105.	0.654
121.8	0.524
139.8	0.476
158.4	0.446
178.8	0.428
199.8	0.416
222.	0.4
246.	0.392
271.2	0.389
297.6	0.388
325.8	0.382
355.8	0.381
387.6	0.381
421.2	0.384
457.2	0.381
493.2	0.381
535.2	0.379
577.2	0.382
619.2	0.381
667.2	0.378
721.2	0.381

Time (sec)	Displacement (ft)
769.2	0.383
829.2	0.38
889.2	0.38
949.2	0.382
1015.2	0.379
1087.2	0.377
1165.2	0.378
1243.2	0.376
1327.2	0.381
1417.2	0.377
1513.2	0.38
1609.2	0.373
1717.2	0.367
1831.2	0.373
1951.2	0.369
2077.2	0.365
2209.2	0.357
2353.2	0.353
2503.2	0.35
2659.2	0.342
2827.2	0.338
3007.2	0.329
3193.2	0.321
3397.2	0.316
3607.2	0.295
3829.2	0.287
4069.2	0.278
4321.2	0.272
4585.2	0.272
4867.2	0.275
5167.2	0.286
5485.2	0.301
5821.2	0.321
6181.2	0.346
6541.2	0.348
6961.2	0.348
7381.2	0.348
7801.2	0.339
8281.2	0.339
8821.2	0.342
9301.2	0.334
9901.2	0.326
1.05E+4	0.312
1.11E+4	0.315
1.176E+4	0.306
1.248E+4	0.299
1.326E+4	0.291
1.404E+4	0.289
1.488E+4	0.281
1.578E+4	0.28
1.674E+4	0.269
1.77E+4	0.191
1.878E+4	0.207
1.992E+4	0.28
2.112E+4	0.263
2.238E+4	0.232
2.37E+4	0.233
2.514E+4	0.215
2.664E+4	0.204
2.82E+4	0.185
2.988E+4	0.18
3.168E+4	0.161
3.354E+4	0.162
3.558E+4	0.151
3.768E+4	0.139

Time (sec)	Displacement (ft)
3.984E+4	0.129
4.2E+4	0.119
4.416E+4	0.107
4.632E+4	0.104
4.848E+4	0.093
5.064E+4	0.081
5.28E+4	0.075
5.496E+4	0.065
5.712E+4	0.057
5.928E+4	0.05
6.144E+4	0.043
6.36E+4	0.036
6.576E+4	0.04
6.792E+4	0.028
7.008E+4	0.014
7.224E+4	0.007
7.44E+4	0.

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.849

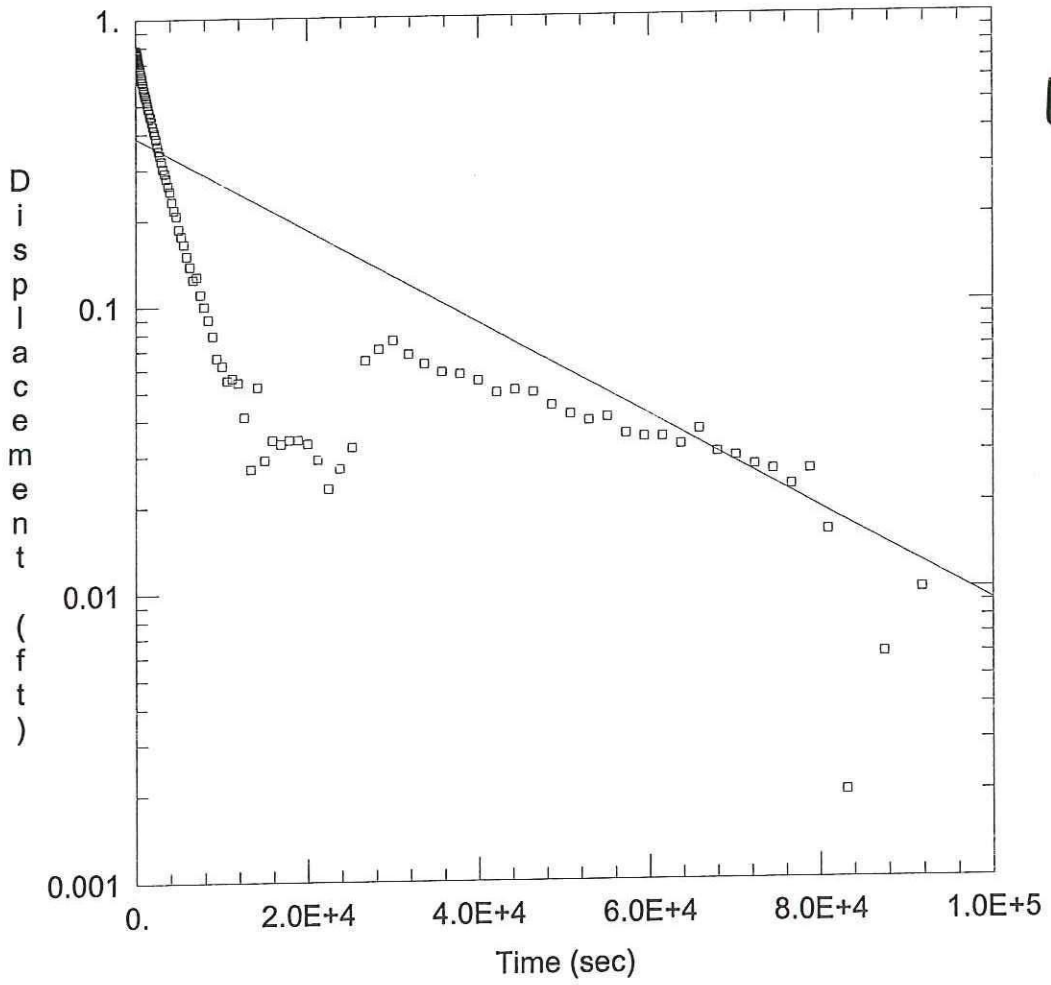
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.083E-6	ft/min
y0	0.4567	ft

K = 5.5E-7 cm/sec
T = K*b = 1.351E-5 ft²/min (0.0002092 sq. cm/sec)

MW-6



WELL TEST ANALYSIS

Data Set: C:\APEX\0013_004\Deep_Wells\AqtwMW6.aqt
Date: 02/02/08 Time: 18:55:37

PROJECT INFORMATION

Company: Apex Consulting Services, Inc
Client: Xcel Energy
Project: 1-0013.004.02
Location: Ash Disposal
Test Date: 11-15-07

AQUIFER DATA

Saturated Thickness: 11.63 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-6)

Initial Displacement: 1.451 ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.083 ft
Static Water Column Height: 11.63 ft
Screen Length: 15. ft
Well Radius: 0.33 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
K = 1.044E-6 ft/min
Solution Method: Bouwer-Rice
y0 = 0.3855 ft

Data Set: C:\APEX\0013_004\Deep_Wells\AqtwMW6.aqt
Date: 02/02/08
Time: 18:55:44

MW-6

PROJECT INFORMATION

Company: Apex Consulting Services, Inc
Client: Xcel Energy
Project: 1-0013.004.02
Location: Ash Disposal
Test Date: 11-15-07

AQUIFER DATA

Saturated Thickness: 11.63 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-6

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.451 ft
Static Water Column Height: 11.63 ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft
Well Skin Radius: 0.33 ft
Screen Length: 15. ft
Total Well Penetration Depth: 30. ft
Corrected Casing Radius (Bouwer-Rice Method): 0.05735 ft
Gravel Pack Porosity: 0.

No. of Observations: 133

Observation Data

Time (sec)	Displacement (ft)
4.196	0.784
8.997	0.778
14.4	0.773
19.38	0.772
25.2	0.766
31.2	0.766
37.2	0.758
43.8	0.754
51.	0.761
58.8	0.755
66.6	0.75
75.	0.742
84.	0.737
93.6	0.731
103.2	0.733
114.	0.729
125.4	0.715
137.4	0.717
150.	0.771
163.2	0.768
177.6	0.759
192.6	0.755
208.2	0.749
225.	0.742
243.	0.739
261.6	0.733
282.	0.726
303.	0.72

Time (sec)	Displacement (ft)
325.2	0.709
349.2	0.706
374.4	0.696
400.8	0.692
429.	0.681
459.	0.675
490.8	0.668
524.4	0.658
560.4	0.647
596.4	0.635
638.4	0.631
680.4	0.624
722.4	0.61
770.4	0.603
824.4	0.595
872.4	0.581
932.4	0.568
992.4	0.559
1052.4	0.548
1118.4	0.539
1190.4	0.532
1268.4	0.516
1346.4	0.504
1430.4	0.491
1520.4	0.476
1616.4	0.461
1712.4	0.456
1820.4	0.441
1934.4	0.423
2054.4	0.41
2180.4	0.401
2312.4	0.384
2456.4	0.363
2606.4	0.349
2762.4	0.337
2930.4	0.321
3110.4	0.302
3296.4	0.292
3500.4	0.279
3710.4	0.264
3932.4	0.252
4172.4	0.232
4424.4	0.217
4688.4	0.207
4970.4	0.186
5270.4	0.176
5588.4	0.165
5924.4	0.15
6284.4	0.138
6644.4	0.124
7064.4	0.127
7484.4	0.11
7904.4	0.1
8384.4	0.09
8924.4	0.079
9404.4	0.066
1.0E+4	0.062
1.06E+4	0.055
1.12E+4	0.056
1.186E+4	0.054
1.258E+4	0.041
1.336E+4	0.027
1.414E+4	0.052
1.498E+4	0.029
1.588E+4	0.034

Time (sec)	Displacement (ft)
1.684E+4	0.033
1.78E+4	0.034
1.888E+4	0.034
2.002E+4	0.033
2.122E+4	0.029
2.248E+4	0.023
2.38E+4	0.027
2.524E+4	0.032
2.674E+4	0.064
2.83E+4	0.07
2.998E+4	0.075
3.178E+4	0.067
3.364E+4	0.062
3.568E+4	0.058
3.778E+4	0.057
3.994E+4	0.054
4.21E+4	0.049
4.426E+4	0.05
4.642E+4	0.049
4.858E+4	0.044
5.074E+4	0.041
5.29E+4	0.039
5.506E+4	0.04
5.722E+4	0.035
5.938E+4	0.034
6.154E+4	0.034
6.37E+4	0.032
6.586E+4	0.036
6.802E+4	0.03
7.018E+4	0.029
7.234E+4	0.027
7.45E+4	0.026
7.666E+4	0.023
7.882E+4	0.026
8.098E+4	0.016
8.314E+4	0.002
8.53E+4	0.
8.746E+4	0.006
8.962E+4	0.
9.178E+4	0.01

SOLUTION

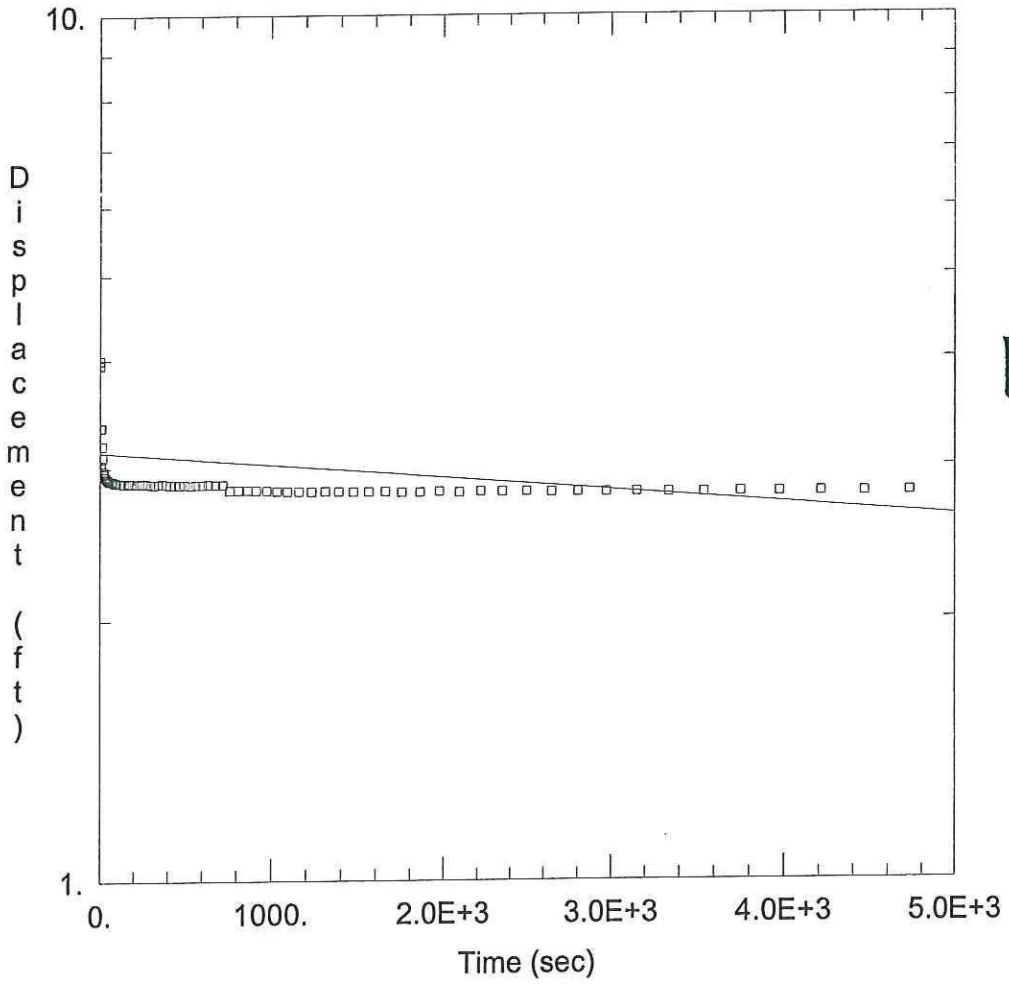
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.35

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.044E-6	ft/min
y0	0.3855	ft

K = 5.304E-7 cm/sec
T = K*b = 1.215E-5 ft²/min (0.0001881 sq. cm/sec)



MW-7

WELL TEST ANALYSIS

Data Set: C:\...\valmont.aqt
Date: 02/11/08
Time: 10:30:41

PROJECT INFORMATION

Company: MW-7
Location: valmont

AQUIFER DATA

Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW 1)

Initial Displacement: 4. ft
Total Well Penetration Depth: 26. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 26. ft
Screen Length: 15. ft
Well Radius: 0.3333 ft

SOLUTION

Aquifer Model: Unconfined
K = 6.779E-7 cm/sec
Solution Method: Bouwer-Rice
y0 = 3.129 ft

Data Set: C:\Documents and Settings\Mike\Local Settings\Temporary Internet Files\Content.IE5\AQNIA5FD\valr
Date: 02/11/08
Time: 10:31:46

PROJECT INFORMATION

Company: MW-7
Location: valmont

AQUIFER DATA

Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW 1

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 4. ft
Static Water Column Height: 26. ft
Casing Radius: 0.0833 ft
Well Radius: 0.3333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 15. ft
Total Well Penetration Depth: 26. ft

No. of Observations: 87

Observation Data

Time (sec)	Displacement (ft)
0.	0.
2.04	3.948
4.14	3.337
6.36	3.011
8.76	3.026
11.28	3.344
13.92	3.186
16.74	3.088
19.74	2.983
22.92	2.969
26.28	2.958
29.88	2.936
33.48	2.931
37.68	2.92
41.88	2.913
46.08	2.916
50.88	2.906
56.28	2.9
61.08	2.902
67.08	2.897
73.08	2.9
79.08	2.893
85.68	2.891
92.88	2.884
100.7	2.887
108.5	2.883
116.9	2.883
125.9	2.883
135.5	2.881
145.1	2.881
155.9	2.875
167.3	2.884
179.3	2.884

Time (sec)	Displacement (ft)
191.9	2.877
205.1	2.878
219.5	2.879
234.5	2.875
250.1	2.884
266.9	2.877
284.9	2.876
303.5	2.87
323.9	2.871
344.9	2.874
367.1	2.878
391.1	2.872
416.3	2.865
442.7	2.871
470.9	2.866
500.9	2.871
532.7	2.864
566.3	2.868
602.3	2.867
638.3	2.87
680.3	2.867
722.3	2.869
764.3	2.825
812.3	2.828
866.3	2.827
914.3	2.825
974.3	2.823
1034.3	2.817
1094.3	2.815
1160.3	2.814
1232.3	2.812
1310.3	2.815
1388.3	2.812
1472.3	2.809
1562.3	2.81
1658.3	2.813
1754.3	2.805
1862.3	2.805
1976.3	2.811
2096.3	2.803
2222.3	2.81
2354.3	2.808
2498.3	2.807
2648.3	2.803
2804.3	2.803
2972.3	2.801
3152.3	2.802
3338.3	2.797
3542.3	2.796
3752.3	2.801
3974.3	2.799
4214.3	2.799
4466.3	2.796
4730.3	2.798

SOLUTION

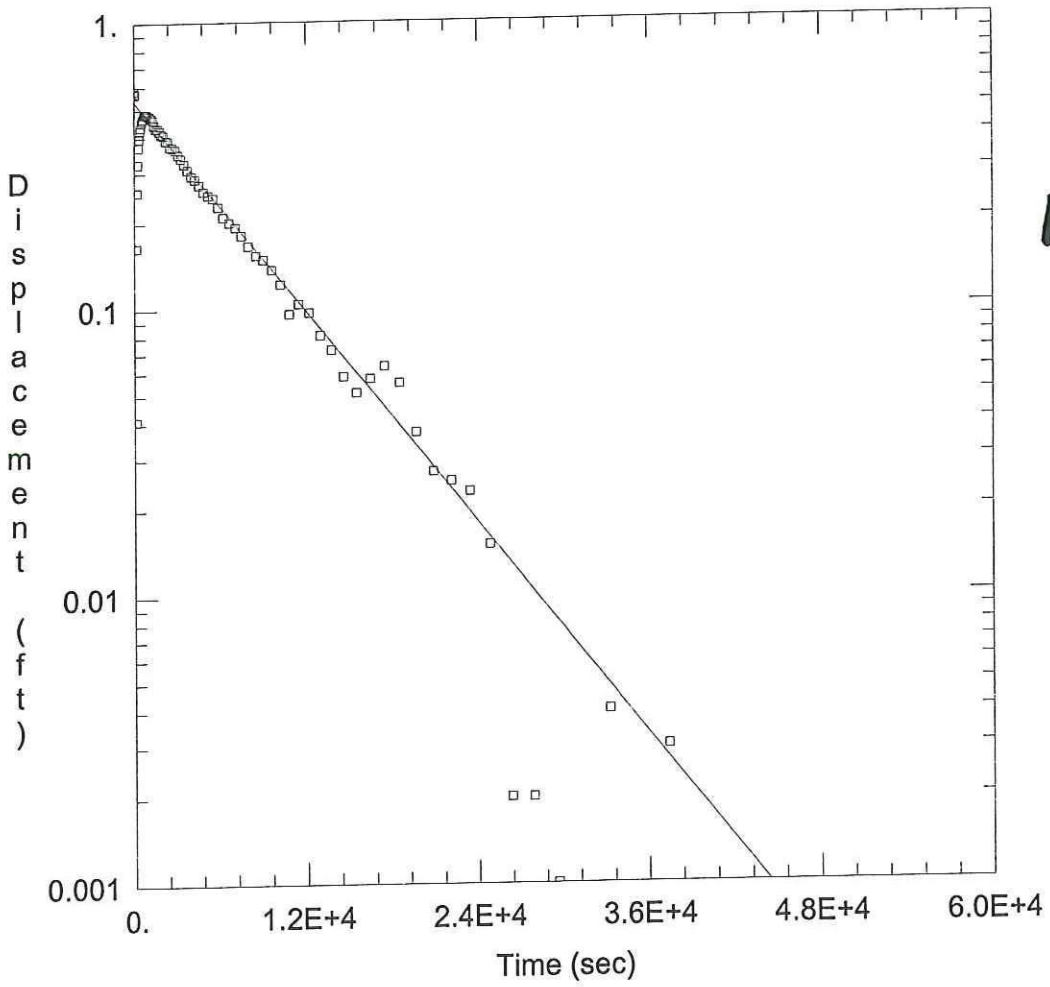
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.762

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	6.779E-7	cm/sec
y0	3.129	ft

$T = K*b = 0.001033$ cm²/sec



MW-8

WELL TEST ANALYSIS

Data Set:
Date: 02/03/08 Time: 11:36:48

PROJECT INFORMATION

Company: Apex Consulting Services, Inc
Client: Xcel Energy
Project: 1-0013.004.02
Location: Ash Disposal
Test Date: 11-13-07

AQUIFER DATA

Saturated Thickness: 7.398 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-8)

Initial Displacement: 0.584 ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.083 ft
Static Water Column Height: 7.398 ft
Screen Length: 15. ft
Well Radius: 0.33 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 5.874E-6 ft/min
y0 = 0.5359 ft

MW-8

Data Set:
Date: 02/03/08
Time: 11:36:55

PROJECT INFORMATION

Company: Apex Consulting Services, Inc
Client: Xcel Energy
Project: 1-0013.004.02
Location: Ash Disposal
Test Date: 11-13-07

AQUIFER DATA

Saturated Thickness: 7.398 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-8

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.584 ft
Static Water Column Height: 7.398 ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft
Well Skin Radius: 0.33 ft
Screen Length: 15. ft
Total Well Penetration Depth: 30. ft
Corrected Casing Radius (Bouwer-Rice Method): 0.05735 ft
Gravel Pack Porosity: 0.

No. of Observations: 84

Observation Data

Time (sec)	Displacement (ft)
28.2	0.574
58.2	0.572
90.	0.567
123.6	-0.107
159.6	0.041
195.6	0.165
237.6	0.258
279.6	0.324
321.6	0.371
369.6	0.398
423.6	0.426
471.6	0.436
531.6	0.452
591.6	0.46
651.6	0.467
717.6	0.484
789.6	0.483
867.6	0.483
945.6	0.481
1029.6	0.477
1119.6	0.474
1215.6	0.468
1311.6	0.462
1419.6	0.444
1533.6	0.432
1653.6	0.43
1779.6	0.423
1911.6	0.412

Time (sec)	Displacement (ft)
2055.6	0.408
2205.6	0.392
2361.6	0.39
2529.6	0.372
2709.6	0.369
2895.6	0.364
3099.6	0.349
3309.6	0.338
3531.6	0.324
3771.6	0.309
4023.6	0.293
4287.6	0.286
4569.6	0.273
4869.6	0.259
5187.6	0.251
5523.6	0.245
5883.6	0.228
6243.6	0.21
6663.6	0.201
7083.6	0.193
7503.6	0.181
7983.6	0.166
8523.6	0.154
9003.6	0.149
9603.6	0.137
1.02E+4	0.122
1.08E+4	0.096
1.146E+4	0.104
1.218E+4	0.097
1.296E+4	0.081
1.374E+4	0.072
1.458E+4	0.058
1.548E+4	0.051
1.644E+4	0.057
1.74E+4	0.063
1.848E+4	0.055
1.962E+4	0.037
2.082E+4	0.027
2.208E+4	0.025
2.34E+4	0.023
2.484E+4	0.015
2.634E+4	0.002
2.79E+4	0.002
2.958E+4	0.001
3.138E+4	-0.005
3.324E+4	0.004
3.528E+4	-0.005
3.738E+4	0.003
3.954E+4	-0.007
4.17E+4	-0.005
4.386E+4	-0.007
4.602E+4	-0.013
4.818E+4	-0.017
5.034E+4	-0.013
5.25E+4	-0.016
5.466E+4	-0.022

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.35

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	5.874E-6	ft/min
y0	0.5359	ft

K = 2.984E-6 cm/sec
T = K*b = 4.345E-5 ft²/min (0.0006728 sq. cm/sec)

ATTACHMENT E

Flagstaff Surveying, Inc.

January 16, 2008

Apex Consulting Services, Inc.
Attn: Michael D. Hattel
566 West Willow Court
P.O. Box 369
Louisville, Colorado 80027

Re: Valmont Groundwater Monitoring Wells

Dear Michael,

The following is an elevation table showing the results of the fieldwork conducted on Tuesday January 15, 2008. Elevations are based upon a closed "three-wire" differential level loop. The brass cap of Well #3 was held as our project benchmark.

Description	Elevation Measured	Elevation provided by client	
Brass Cap			
1	5232.42	5232.4	
2	5287.78	5287.8	
3	5231.40	5231.4	(benchmark used)
Well ID			
W-1	5234.20	5234.35	
W-2	5289.18	5289.56	
W-3	5233.44	5233.47	
W-4	5237.23		
W-5	5292.10		
W-6	5235.16		
W-7	5299.51		
W-8	5234.83		

Please contact me if you have any questions regarding the above information.

Thank You,

Steven J. Sellars PLS
Principal

<16025-1.let>

Table Mesa Shopping Center 637 South Broadway, Suite C Boulder, Colorado 80305
Phone:(303)499-9737 Fax:(303)499-9770