

Appendix A

Pilot Hole Boring Logs

LOG OF BORING PH1-1

SHEET 1 OF 5

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 11/29/06 Ended 12/1/06Elevation 1122.076199Location Big Stone City, SDLogged By Barr, EJCTotal Depth 215.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
			0/30/70	5YR/2.5/1	Wet	OL/OH		Topsoil	
								Black organic-rich sandy silt w/ fg-mg sand	
								Red granite boulder	
								Crystals ~2mm in diameter	
5			10/15/75	10YR/4/6	Moist			Dark yellowish brown lean clay w/ gravel and some sand	5
								Charcoal	
								Oxidation along fractures	
								Mottled w/ red	
10									10
15			5/5/90	10YR/4/6	Moist				15
20						CL			20
25			5/5/90	10YR/4/6	Moist				25
30									30
35			5/0/95	2.5Y/4/1	Moist				35
40						CH		Dark gray diamicton clay w/ gravel	40
								Angular to subrounded; up to 2 cm in diameter	
45									45

(continued)



Barr Engineering Co

Telephone:

Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 11/29/06 Ended 12/1/06
 Logged By Barr, EJC

LOG OF BORING PH1-1

SHEET 2 OF 5

Elevation 1122.076199
 Total Depth 215.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	0/10/90	2.5Y/4/1	Moist	CH		Dark gray diamicton clay w/ gravel Angular to subrounded; up to 2 cm in diameter(continued)	55
						ML		Dark diamicton silt 10% sand	
						SP		Dark gray diamicton sand	
						SM		FG w/ 10% silt	
60						ML		Dark gray diamicton silt	60
						CH		Dark gray diamicton clay w/ 5% gravel	
65		--	0/5/95	2.5Y/4/1	Moist	CH			65
						ML		Dark gray diamicton silt	
70						SP		Grayish brown sand, mg	70
						SM		Dark gray diamicton silt	
						ML		Dark gray fat clay; diamicton 5% gravel	
75		--	5/40/55	10YR/3/1	Moist	CH			75
						CL		V dark gray sandy lean clay w/ 5% gravel Angular to subrounded	
80						CL			80
						SM		V dark gray silty sand w/ 20% gravel and cobbles Up to 3" in diameter	
85		--	5/15/80	10YR/3/1	Moist	CL		V dark gray lean clay w/ sand 5% gravel to 1" in diameter	85
						ML		Dark reddish brown sandy silt	
90						SP		Dark reddish brown sand, cg	90
						ML		Dark reddish brown sandy silt	
95		--	2/33/65	5YR/3/3	Moist	CL		Dark reddish brown sandy lean clay	95
						CL		V dark gray sandy lean clay	

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH1-1

SHEET 3 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 11/29/06 Ended 12/1/06

Elevation 1122.076199

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 215.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105						CL		V dark gray sandy lean clay(continued)	105
						CL		Reddish brown lean clay w/ some sand, fg-mg	
						CH		Mottled w/ red	
						CL		V dark grayish brown fat clay	
110		---	0/90/10	BLEY1/4/56Y	Wet	SP SM		V dark grayish brown silty clay Dark greenish gray sand w/ silt fg-mg	110
115						CL		Bluish black lean clay	115
						SP		Dark greenish gray sand w/ silt	
						SM		fg-mg	
						CL		Bluish black lean clay	
						SP		Dark greenish gray sand w/ clay and 5% gravel	
120						SC		Dark greenish gray silty sand, fg	120
						SM		Bluish black fat clay	
125		---	0/60/40	BLEY1/4/10Y	Wet	CH		Dark greenish gray silty sand, fg	125
						SM		Bluish black fat clay w/ fg gravel; diamicton	
130									130
135		---	5/0/95	BLEY1/3/10Y	Moist	CH			135
140									140
145		---	5/0/95	BLEY1/3/10Y	Wet				145

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 11/29/06 Ended 12/1/06
 Logged By Barr, EJC

LOG OF BORING PH1-1
 SHEET 4 OF 5

Elevation 1122.076199
 Total Depth 215.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/95/5	5Y/5/1	Wet	CH		Bluish black fat clay w/ fg gravel; diamicton(continued)	155
						SP		Dark greenish gray sand, fg-cg Water-bearing	
						ML		Dark greenish gray sandy silt	
						CL		fg-mg	
160						ML		Bluish black lean clay w/ fg gravel Dark greenish gray sandy silt, fg	160
165		--	0/100/0	5Y/5/1	Wet	SP		Clean gray sand, fg-mg	165
170						ML		Dark greenish gray sandy silt, fg sand	170
175		--	0/95/5	5Y/5/1	Wet	ML		Dark greenish gray sandy silt w/ clay, fg	175
						SP		Clean gray sand, fg-mg	
						ML		Dark greenish gray silt	
180						CH		Bluish black fat clay, shaley	180
185		--	0/0/100	5Y/5/1	Wet	CH			185
190						CH			190
195		--	0/0/100	5Y/5/1	Wet	CH			195

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH1-1

SHEET 5 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 11/29/06 Ended 12/1/06

Elevation 1122.076199

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 215.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
205		--	0/0/100	LEAY 1/3/10Y	Wet	CH	///	Bluish black fat clay, shaley(continued)	205
210									210
215									215
220									220
225									225
230									230
235									235
240									240
245									245



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PW1-2

SHEET 1 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/3/06 Ended 12/5/06

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 196.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/40/60	2.5Y/3/2	Wet	OL		V dark grayish brown organic-rich sandy clay; topsoil	
						ML		V dark brown to olive gray silt with sand	
5		--	15/15/70	10YR/4/4	Wet	SM		V dark olive gray sand w/ silt, mg-cg	5
						CH		Dark yellowish brown sandy fat clay w/ gravel; fg	
						CH		Mottled w/ reddish oxidation; charcoal	
								Yellowish red fat clay	
								Dark red oxidation	
10		--	5/25/70	5YR/4/6	Moist	CL		Yellowish red sandy lean clay; fg-mg	10
								Charcoal	
15		--	5/25/70	5YR/4/6	Moist	CL			15
						CL		Brown sandy lean clay; fg-mg	
20						CL		Dark reddish brown sandy lean clay; fg-cg	20
25		--	10/25/65	5YR/3/3	Moist				25
30						CH		Black fat clay w/ fg gravel; diamicton	30
35		--	2/0/98	5Y/2.5/2	Moist				35
40		--	5/15/80	10YR/3/2	Moist	CL		V dark grayish brown lean clay w/ sand; fg-mg	40
						CH		Dark reddish brown fat clay w/ fg-mg sand	
45						CH		V dark grayish brown fat clay	45
						ML		Dark gray silt	
						SM		Very dark gray silty sand, fg	

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 89' to 178'

Additional data may have been collected in the field which is not included on this log.

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 12/3/06 Ended 12/5/06
 Logged By Barr, EJC

LOG OF Boring PW1-2

SHEET 2 OF 4

Elevation 1079.39636
 Total Depth 196.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	5/5/90	2.5Y/3/1	Moist	SM		Very dark gray silty sand, fg(continued)	55
						ML		Dark gray silt	
						CL		V dark gray lean clay	
60								V dark gray fat clay	60
65									65
70		---	5/5/90	2.5Y/3/1	Moist	CH			70
75									75
80		--	30/20/50	2.5Y/2.5/1	Moist	CL		Black fat gravely clay w/ sand, fg-mg	80
								Dark grayish brown sand w/silt; fg-cg	
85						SP SM			85
						CH		V dark gray fat clay w/ lenses of SP-SM	
90						ML		V dark gray silt	90
								Dark grayish brown sand; mg-cg	
95		---	0/0/100	10YR/4/2	Moist	SP			95
						ML		Dark grayish brown silt	
						SP		Dark grayish brown sand mg-cg at top, grading to fg at bottom	
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 89' to 178'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PW1-2

SHEET 3 OF 4

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 12/3/06 Ended 12/5/06
 Logged By Barr, EJC

Elevation 1079.39636
 Total Depth 196.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		--	0/98/2	5Y/4/1	Wet	SP		Dark grayish brown sand mg-cg at top, grading to fg at bottom(<i>continued</i>)	105
110						SP		Dark gray sand; mg	110
115		--	0/98/2	5Y/4/1	Wet			Dark gray sand; mg-cg	115
120						SP			120
125									125
130						SP		Gray sand, fg-mg	130
135		--	0/100/0	2.5Y/4/1	Wet	GP		Dark gray gravel (fg-cg) w/ sand (mg-cg)	135
						SP		Gray sand; mg-cg	
								Clean gray sand; mg	
140						SP			140
145									145
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 89' to 178'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PW1-2

SHEET 4 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/3/06 Ended 12/5/06

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 196.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	15/85/0	2.5Y/4/1	Wet	SP		Clean gray sand; mg(<i>continued</i>)	155
						SP		V dark gray sand (mg-cg) w/ gravel (fg-cg)	
						SP		Gray sand (cg) w/ gravel (fg)	
								Grayish brown sand; mg	
160									160
165						SP			165
170									170
175		---	0/100/0	5Y/4/1	Wet	SP		Grayish brown sand; cg	175
						SP		Dark gray sand; mg-cg	
180						CH		Black sandy fat clay; fg-cg	180
						SC		V dark gray clayey sand w/ gravel and cobbles 3" in diameter	
185						SC		Greenish gray clayey sand mg-cg at top, grading to fg-mg at bottom w/ increasing cementation	185
190		--	0/80/20	5Y/1/6/10Y	Moist			Greenish gray sandstone; fg	190
195						SC			195



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 89' to 178'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH1-3

SHEET 1 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/5/06 Ended 12/6/06

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 198.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/0/100	10YR/2/2	Wet	OL	OL	V dark brown organic-rich clay; topsoil	
						CL	CL	Dark yellowish brown lean clay	
								Yellowish brown fat clay w/ gravel Mottled w/ gray; reddish oxidation	
5		--	10/2/88	10YR/4/4	Moist				5
10									10
15		--	5/10/85	10YR/4/4	Moist				15
20						CH			20
25		--	5/10/85	10YR/4/4	Moist				25
30									30
35		--	5/15/80	2.5Y/3/2	Moist	SP SM CH		Dark yellowish brown sand w/ silt; mg V dark grayish brown fat clay w/ sand Brown fat clay w/ sand	35
40						CH			40
45		--	5/10/85	5YR/3/2	Moist	CH		Dark reddish brown fat clay w/ sand; fg	45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH1-3

SHEET 2 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/5/06 Ended 12/6/06

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 198.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	2/10/88	5YR/3/1	Moist	CH		Dark reddish brown fat clay w/ sand; fg(continued)	55
60						CL		Black lean clay; diamicton	60
65									65
70		--	0/0/100	5Y/2.5/1	Moist	CH		Black fat clay	70
75									75
80						SP		Dark gray sand; mg-cg	80
85		--	10/5/85	5YR/3/1	Moist	CL		V dark gray lean clay; diamicton	85
90						SP		V dark gray sand; mg-cg	90
95		--	5/0/95	5Y/2.5/1	Moist	CH		Black fat clay; diamicton	95
						SP		Dark gray sand; mg-cg	
(continued)									

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH1-3

SHEET 3 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/5/06 Ended 12/6/06

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 198.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
						SP		Dark gray sand; mg-cg(<i>continued</i>)	
105									105
110		--	5/2/93	5Y/2.5/2	Moist			Fat black clay w/ 5% gravel; diamicton	110
115		--	2/5/93	5Y/2.5/1	Moist				115
120						CH			120
125									125
130									130
135		--	2/0/98	5Y/2.5/1	Moist	ML		Black silt	135
140						CH		Fat black clay	140
145						CL		Black lean clay w/ up to 5% gravel; diamicton	145
					Dry			Grano-diorite boulder	
			5/5/90	5Y/3/1	Moist	CH		V dark gray fat clay w/ 10% sand and gravel	
						CH		V dark gray fat clay	
								(<i>continued</i>)	



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH1-3

SHEET 4 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

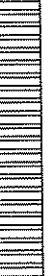
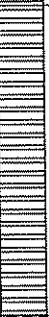
Drilling Started 12/5/06 Ended 12/6/06

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 198.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/0/100	5Y/2.5/1	Dry	CH		Black fat clay, shaley	155
160						CH		Black claystone w/ 5% silt	160
165		--	0/0/100	5Y/2.5/1	Moist				165
170						CH		Fat black clay; shaley	170
175									175
180		--	0/0/100	5Y/2.5/1	Moist	CH		Fat black clay	180
185									185
190		--	0/0/100	5Y/2.5/1	Dry	CH		Light greenish gray soapstone	190
195									195

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PW1-4

SHEET 1 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 11/27/06 Ended 11/29/06

Elevation 1102.36224

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 200.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
			0/10/90	2.5Y/2/1	Dry	OL/OH		Black organic-rich topsoil	
5			5/10/85	2.5Y/7/3	Dry	CL		Pale yellow mottled clay w/ up to 10% fg-cg gravel Gravel is various lithologies, chert-carbonate; med-high toughness; rounded to angular	5
						ML		Clay w/ some silt; mottled w/ gray and red; dark yellowish brown Low toughness	
10						CL		Clay w/ silt; light olive brown. Gravel is various lithologies, fg-cg, angular to subrounded.	10
15			4/2/94	2.5Y/4/3	Moist				15
20						CL		Light olive brown clay w/ silt Sand is fg-mg Oxidation along cracks in clay, can be up to 1 mm thick Gravel is fg-cg, angular to subrounded	20
25			2/15/83	2.5Y/4/3	Moist	CL		Olive brown med-fat clay w/ up to 15% fg sand	25
30						CH		Light olive brown clay w 5% fg-mg gravel	30
35			2/10/88	2.5Y/3/1	Moist			Homogeneous very dark gray diamicton Medium plasticity Medium toughness Clay w/ up to 15% fg sand	35
40						CL			40
45			2/5/93	2.5Y/3/1	Moist				45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 121' to 185'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PW1-4

SHEET 2 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 11/27/06 Ended 11/29/06

Elevation 1102.36224

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 200.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	2/5/93	2.5Y/3/1	Moist	CL		Homogeneous very dark gray diamicton Medium plasticity Medium toughness Clay w/ up to 15% fg sand(continued)	55
60									60
65		--	2/5/93	2.5Y/3/1	Moist	CL			65
70						SP		Sand fg - cg w/ 5% gravel up to 1 1/2" in diameter Light olive brown	70
75		---	2/5/93	2.5Y/3/1	Moist	CL		V dark gray diamicton Medium plasticity High toughness	75
80						SC		Fine clayey sand w/ 5% gravel and cobbles to 2" in diameter Dark reddish brown	80
85		--	5/80/15	5YR/4/2	Moist	ML		Silt w/ fg-cg sand Mottled red and gray Very tough	85
90									90
95		--	0/0/100	10YR/3/1	Moist	CH		V dark gray fat clay Lenses containing up to 15% fg-cg sand	95
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 121' to 185'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PW1-4

SHEET 3 OF 4

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 11/27/06 Ended 11/29/06
 Logged By Barr, EJC

Elevation 1102.36224
 Total Depth 200.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		-	0/5/95	10YR/3/1	Moist			V dark gray fat clay Lenses containing up to 15% fg-cg sand(continued)	105
110						CH			110
115		--	0/5/95	10YR/3/1	Moist				115
120									120
125		---	2/98/0	10YR/4/1	Wet	SP		Clean gray sand, fg-cg w/ some gravel some cementation	125
130						SP		Gray sand, mg, grading into cg V little gravel	130
135		--	5/95/0	10YR/4/1	Wet	SP		Gray sand, grading to 30% gravel at 140'	135
140						SP		Gray sand, mg, and gravel, grading to 0% gravel by 145'	140
145		--	0/100/0	10YR/4/1	Wet	SP		Dark gray sand, mg-fg	145
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 121' to 185'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PW1-4

SHEET 4 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 11/27/06 Ended 11/29/06

Elevation 1102.36224

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 200.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/100/0	10YR/4/1	Sat.	SP		Dark gray sand, mg-fg(continued)	155
160									
165						SP		Gray sand, mg-cg, v. clean, grades to fg b/t 163' and 166', then grades back to mg-cg by 175'	165
170									
175		--	0/100/0	10YR/4/1	Sat.			Gray sand, mg-cg, v. clean Changes to clay w/in 6" at 185'	175
180						SP			180
185								Greenish black shaley clay V tough Med-high plasticity	185
190						CH			190
195		--	0/0/100	10Y1/3/2.5Y	Wet				195



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 121' to 185'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH1-5

SHEET 1 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/1/06 Ended 12/3/06

Elevation 1112.20476

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 208.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	5/2/93	10YR/3/3	Moist	OL		Dark brown organic-rich clay; topsoil	
5		--	10/10/80	2.5Y/5/4	Dry	CH		Light olive brown fat clay w/ sand and gravel Mottled w/ gray; charcoal	5
10								Dark yellowish brown fat clay Reddish oxidation	10
15		--	1/2/97	10YR/4/4	Moist	CH			15
20									20
25		--	2/2/96	10YR/4/4	Moist				25
30						CH		Dark yellowish brown fat clay w/ gravel Reddish oxidation	30
35		--	5/2/93	5Y/3/2	Moist	CL		Dark olive gray lean clay Reddish oxidation	35
40						CH		Yellowish brown fat clay Reddish oxidation	40
						CL		Olive brown lean clay Reddish oxidation; charcoal	
45		--	20/70/10	7.5Y/4/3	Wet	SP SM		Brown sand w/ silt; mg-cg Reddish oxidation; charcoal	45
						SP SM		Brown sand w/ silt and gravel; mg-cg	
						CL		V dark gray lean clay w/ sand and gravel; diamicton (continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH1-5

SHEET 2 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/1/06 Ended 12/3/06

Elevation 1112.20476

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 208.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		---	10/10/80	10YR/3/1	Moist	CL		V dark gray lean clay w/ sand and gravel; diamicton(continued)	55
60						SP SM		Dark grayish brown sand w/ silt and 30% gravel	60
						ML		Dark grayish brown silt w/ sand; fg-mg	
						SP		Light olive gray sand; fg-mg	
65		---	5/5/90	10YR/3/1	Moist	CL		Clay and silt lenses V dark gray lean clay w/ gravel; diamicton Sand lenses	65
70						CL		V dark gray lean clay; diamicton Red granite boulder b/t 66.5' and 67'	70
75		---	5/2/93	10YR/3/1	Moist	CL			75
80						GP		Grayish brown gravel w/ sand	80
						CL		V dark gray lean clay; diamicton	
85		---	40/50/10	2.5Y/5/2	Wet	SP		Grayish brown sand w/ gravel Water-bearing	85
90						CL		V dark gray lean clay; diamicton	90
95		---	2/5/93	5YR/3/2	Moist	CL		Dark reddish brown lean clay	95
						CL		V dark gray sandy fat clay	
						CL		(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH1-5

SHEET 3 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/1/06 Ended 12/3/06

Elevation 1112.20476

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 208.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		--	5/10/85	10YR/3/1	Wet				105
110									110
115		--	5/5/90	10YR/3/1	Moist			V dark gray fat clay; diamicton	115
120									120
125						CH			125
130									130
135		--	2/15/83	10YR/3/1	Moist	CL		V dark gray fat clay w/ 15% sand	135
140						SP SM		Dark gray sand w/ silt; mg-cg Water-bearing	140
145						CH		V dark gray fat clay Cobbles to 3" in diameter	145
		---	0/50/50	10YR/3/1	Wet	SM		V dark gray sandy silt; fg	
						SM		V dark gray silty sand; fg	

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 12/1/06 Ended 12/3/06
 Logged By Barr, EJC

LOG OF Boring PH1-5

SHEET 4 OF 5

Elevation 1112.20476

Total Depth 208.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/60/40	5Y/3/1	Wet			V dark gray silty sand; fg(continued)	155
160									160
165						SM			165
170									170
175		--	0/60/40	5Y/3/1	Wet				175
180						ML		V dark gray silt w/ sand; fg-cg	180
185		--	5/20/75	5Y/3/1	Moist	CH		V dark gray fat clay	185
190								V dark gray sandy fat clay Increasing shale with depth	190
195		--	0/0/100	5Y/3/1	Moist	CH			195
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH1-5

SHEET 5 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 12/1/06 Ended 12/3/06

Elevation 1112.20476

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 208.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
205						CH		V dark gray sandy fat clay Increasing shale with depth(continued)	205
210									210
215									215
220									220
225									225
230									230
235									235
240									240
245									245

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-1

SHEET 1 OF 6

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/6/07 Ended 2/7/07Elevation 1102.36224Location Big Stone City, SDLogged By Barr, EJCTotal Depth 260.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/2/98	10YR3/2	Frozen	OL		V dark grayish brown organic-rich topsoil w/ <5% sand, fg	
		--	0/35/65	2.5Y5/4	Moist	CL		Light olive bm sandy lean clay, fg-cg; reddish oxidation; charcoal	
5		--	0/20/80	2.5Y5/4	Moist	SW		Light yellowish bm sand, fg; fg-cg w/ 10% gravel	5
10		--	0/10/90	10YR1/4	Moist	CL		Light olive brown lean clay w/ sand, fg-mg; reddish oxidation; charcoal	10
		--	0/80/20	10YR4/3	Moist	SP		Yellowish bm sand, fg	
		--	5/1/94	10YR3/1	Moist	CL		Yellowish bm lean clay w/ 10% sand, fg; reddish oxidation	
15		--	5/1/94	10YR3/1	Moist	CL		Dark yellowish bm lean clay w/ 10% sand, cg; reddish oxidation; sand lens, mg. @ 14"; charcoal	15
		--				SP		Dark yellowish bm sandy lean clay	
		--				CL		Dark yellowish bm sandy lean clay, mg-cg; charcoal; reddish oxidation	
20		--				CL			20
		--				SP		Dark yellowish bm sand, cg, w/ fg gravel; <5% fines; charcoal;	
25		--				SP		Alternating lenses of fg-cg sand and fg gravel	25
		--				SP			
30		--				SC		Dark yellowish bm gravel and sand cemented in low-med plasticity fines	30
		--						V dark gray clay w/ 5% angular gravel; diamicton	
35		--							35
		--				CH			
40		--				CH			40
		--							
45		--							45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 85' to 253'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-1

SHEET 2 OF 6

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/6/07 Ended 2/7/07

Elevation 1102.36224

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 260.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	5/1/94	10YR3/1	Moist			V dark gray clay w/ 5% angular gravel; diamicton(continued)	55
60						CH			60
65		--	5/1/94	10YR3/1	Moist				65
70									70
75		--	0/100/0	GLE14/N	Moist	SP		Dark gray sand, fg-mg	75
						ML		Dark gray silt w/ 10% sand, cg	
						CL		V dark gray lean clay w/ 5% angular gravel; diamicton	
80						ML		Dark gray silt w/ 10% fg-mg sand	80
						CH		V dark gray fat clay w/ sand and gravel; diamicton	
85		--	5/90/5	2.5Y3/1	Wet	SP		V dark gray sand; cg	85
90						GC		V dark gray gravel to 2" in diameter w/ fg-cg sand and 20% fines	90
95		--	5/20/75	2.5Y3/1	Moist	CH		V dark gray fat clay w/ 20% sand, mg; diamicton	95
								(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 85' to 253'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-1

SHEET 3 OF 6

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/6/07 Ended 2/7/07

Elevation 1102.36224

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 260.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		--	0/98/2	2.5Y4/4	Wet	CH		V dark gray fat clay w/ 20% sand, mg; diamicton(continued)	105
						SP		Olive brown sand, cg	
								Olive brown sand, mg-cg	
110						SP			110
115		--	0/95/5	2/5Y4/1	Wet				115
						SP		Dark gray sand, mg-cg	
120									120
						SP		Dark gray sand, fg	
125						SP		Dark gray sand, mg-cg	125
130						ML		V dark gray silt w/ 5% sand, fg	130
						SP		V dark gray sand, mg-cg	
						SP		V dark gray sand, grading from cg to fg at bottom	
135		--	0/100/0	2.5Y4/1	Wet				135
								V dark gray sand, fg to cg	
140						SP			140
145									145

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 85' to 253'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-1

SHEET 4 OF 6

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/6/07 Ended 2/7/07

Elevation 1102.36224

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 260.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/98/2	2.5Y4/2	Wet	SP		V dark gray sand, fg to cg(continued)	155
160								Olive gray sand, mg-cg	160
165						SP			165
170									170
175		---	0/95/5	5Y3/1	Wet	SP		V dark gray sand, cg	175
180						ML		V dark gray sandy silt, fg	180
185						SP		V dark gray sand, v. fg	185
190								Dark gray sand, mg-cg	190
195		--	0/98/2	5Y4/1	Wet	SP		Dark gray sand, cg	195
						CH		V dark gray fat clay w/ 5% v. fg sand	
						SP		V dark gray sand, fg	
						SP		Dark gray sand, mg	

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 85' to 253'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-1

SHEET 5 OF 6

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/6/07 Ended 2/7/07Elevation 1102.36224Location Big Stone City, SDLogged By Barr, EJCTotal Depth 260.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
205						SP		Dark gray sand, mg(continued)	205
210						SP		Dark gray sand, fg-mg	210
215		--	25/75/0	5Y4/2	Sat.	SP		Dark gray sand, cg	215
220						SP		Olive gray sand, cg, w/ 25% fg gravel	220
225						SP			225
230						SP		Olive gray sand, cg w/ 10% fg gravel	230
235		--	60/40/0	5Y4/2	Sat.	SP		Gray sand, fg	235
240						SP		Olive gray sand, mg-cg w/ 35% gravel to 2" in diameter	235
245						GP		Olive gray gravel w/ cobbles to 4" in diameter and sand, cg	240
									245
								(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 85' to 253'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-1

SHEET 6 OF 6

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/6/07 Ended 2/7/07

Elevation 1102.36224

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 260.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
255		1			Dry	GP		Olive gray gravel w/ cobbles to 4" in diameter and sand, <i>cg(continued)</i>	255
260						GP		Heterogeneous cobbles to 1 1/2" in diameter in a sand/silt matrix; conglomerate? Granite bedrock	260
265									265
270									270
275									275
280									280
285									285
290									290
295									295



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 85' to 253'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-2

SHEET 1 OF 4

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/8/07 Ended 2/8/07Elevation 1067.283548Location Big Stone City, SDLogged By Barr, EJCTotal Depth 185.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
0		--	0/5/95	10YR3/2	Frozen	OL		V dark grayish brown organic-rich topsoil 5% fg sand	0
5		--	5/30/65	10YR5/6	Moist	CL		Light olive brown lean clay w/ sand 10% fg-mg sand Reddish oxidation; charcoal	5
10		--	10/20/70	10YR4/6	Moist	CL		Yellowish brown sandy lean clay 30% mg sand; 5% cg gravel to 2" in diameter Reddish oxidation; charcoal	10
15		--	10/90/0	10YR3/6	Wet	SP		Dark yellowish brown sand, cg 10% fg gravel	15
20						CL		Brown sandy lean clay 20% mg-cg sand; 10% gravel to 1" in diameter Charcoal	20
25		--	5/20/75	7.5YR3/3	Moist	CL		Dark brown sandy lean clay 20% sand; 5% fg gravel Charcoal	25
30						CL			30
35		--	5/10/85	5YR3/1	Moist	CH		Diamicton: v dark gray fat clay 10% fg-cg sand; 5% fg angular gravel	35
40						CH			40
45		--	2/5/93	5YR3/1	Moist	CH		Diamicton: v dark gray fat clay 5% fg sand; 2% fg gravel	45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-2

SHEET 2 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/8/07 Ended 2/8/07

Elevation 1067.283548

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 185.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	7/3/90	5YR3/1	Moist	CH		Diamicton: v dark gray fat clay 5% fg sand; 2% fg gravel(continued)	55
60						CH		Diamicton: v dark gray fat clay 3% sand; 7% gravel to 1" in diameter	60
65		--	2/2/96	5YR2.5/1	Moist			Diamicton: black fat clay 2% fg gravel; 2% sand	65
70									70
75		--	2/2/96	5YR2.5/1	Moist				75
80						CH			80
85		--	5/2/93	5YR2.5/1	Moist				85
90									90
95						SP		V dark gray sand; fg	95
						CH		Diamicton: black fat clay 2% sand; 5% gravel	
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-2

SHEET 3 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/8/07 Ended 2/8/07

Elevation 1067.283548

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 185.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		-	0/0/100	SLY12.5/N	Moist	CH		Diamicton: black fat clay 2% sand; 5% gravel(continued)	105
110						CH		Black fat clay; tough	110
115		--	0/0/100	SLY12.5/N	Moist			Black shaley fat clay; tough	115
120									120
125									125
130						CH			130
135		--	0/0/100	SLY12.5/N	Moist				135
140									140
145		--	0/0/100	SLY12.5/N	Moist				145
(continued)									

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-2

SHEET 4 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/8/07 Ended 2/8/07

Elevation 1067.283548

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 185.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/0/100	SLAY12.5/N	Moist			Black shaley fat clay; tough(continued)	155
160						CH			160
165		--	0/0/100	SLAY12.5/N	Moist				165
170									170
175		--	0/0/100	SLAY12.5/N	Dry			Black weathered shale	175
180									180
185						CH			185
190									190
195									195

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-4a

SHEET 1 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/9/07 Ended 2/10/07

Elevation 1085.95804

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 175.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/20/80	7.5YR3/2	Frozen	OL		Brown organic-rich topsoil	
5		--	20/5/75	10YR6/6	Dry	CL		Grayish brown gravelly lean clay w/ sand 20% sand; 15% gravel Reddish oxidation Charcoal	5
						CL		Brownish yellow lean clay w/ gravel 20% gravel; 5% sand	
								Granite boulder	
10		--	10/15/75	7.5YR4/4	Moist	CL		Brownish yellow lean clay w/ gravel 20% gravel; 5% sand Charcoa; reddish oxidation	10
15		--	10/3/87	7.5YR4/4	Moist	CL		Brown lean clay w/ gravel 10% gravel; 15% sand	15
20						CL			20
25		--	10/90/0	7.5YR4/6	Wet	SP		Strong brown sand; mg-cg 10% gravel	25
						CL		Brown lean clay	
						SP		Strong brown sand; mg-cg Brown lean clay	
30						CL			30
35		--	3/2/95	7.5YR4/6	Moist				35
40						CH		Diamicton: v dark gray fat clay	40
45		--	5/0/95	7.5YR3/1	Moist				45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-4a

SHEET 2 OF 4

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/9/07 Ended 2/10/07Elevation 1085.95804Location Big Stone City, SDLogged By Barr, EJCTotal Depth 175.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	0/0/100	2.5Y3/1	Moist	CH		Diamicton: v dark gray fat clay(continued)	55
						SW		V dark gray sand; fg-cg	
						CH		Diamicton: v dark gray fat clay	
60						CH		V dark gray fat clay fg-mg sand lenses from 64' to 65', up to 3" thick	60
65		--	0/80/20	2.5Y3/1	Wet	SM		V dark gray silty sand; fg-cg	65
70								Diamicton: v dark gray fat clay	70
75		--	5/0/95	2.5Y3/1	Moist				75
80									80
85		--	5/0/95	2.5Y3/1	Moist	CH			85
90									90
95									95

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-4a

SHEET 3 OF 4

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/9/07 Ended 2/10/07Elevation 1085.95804Location Big Stone City, SDLogged By Barr, EJCTotal Depth 175.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		--	5/0/95	2.5Y3/1	Moist			Diamicton: v dark gray fat clay(continued)	105
110									110
115		--	5/0/95	2.5Y3/1	Moist				115
120						CH			120
125									125
130									130
135		--	0/0/100	5Y2.5/1	Moist			Black fat clay; somewhat shaley	135
140						CH			140
145		--	0/0/100	5Y2.5/1	Moist				145
								(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-4a

SHEET 4 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/9/07 Ended 2/10/07

Elevation 1085.95804

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 175.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/0/100	5Y2.5/1	Moist	CH		Black fat clay; somewhat shaley(continued)	155
160									160
165		--	0/0/100	5Y2.5/1	Moist	CH		Weathered black shale	165
170									170
175									175
180									180
185									185
190									190
195									195



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-4b

SHEET 1 OF 3

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/10/07 Ended 2/11/07Elevation 1053.316764Location Big Stone City, SDLogged By Barr, EJCTotal Depth 140.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/30/70	10YR3/3	Frozen	OL		Dark brown organic-rich topsoil 30% fg sand	
5		--	20/60/20	10YR4/6	Moist	SM		Dark yellowish brown silty sand 60% fg sand	5
						SM		Dark yellowish brown silty sand 60% mg sand	
10						SC		Dark yellowish brown clayey sand; mg-cg	10
15		--	15/5/80	5YR4/4	Moist	CH		Fat clay w/ gravel 15% gravel; 5% sand	15
20						SM		Olive to olive gray silty sand; fg-mg Reddish oxidation	20
25		--	0/0/100	5Y3/1	Moist	SP SM		Dark gray sand w/ silty; mg-cg Silt and clay lenses to 4" thick from 23' to 25'	25
30						CH		V dark gray fat clay	30
35		--	0/0/100	5Y3/1	Moist	SP		V dark gray sand, mg 5% fines	35
40						CH		V dark gray fat clay	40
45		--	10/0/90	5Y3/1	Moist	CH		Diamicton: v dark gray fat clay w/ 10% fg gravel	45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07

LOG OF BORING PH2-4b

SHEET 2 OF 3

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/10/07 Ended 2/11/07Elevation 1053.316764Location Big Stone City, SDLogged By Barr, EJCTotal Depth 140.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	10/0/90	5Y3/1	Moist	CH		Diamicton: v dark gray fat clay w/ 10% fg gravel(continued)	55
60									60
65		--	50/40/10	2.5Y3/1	Wet	GW		V dark gray gravel w/ sand, cg	65
70						CH		Diamicton: v dark gray fat clay w/ cobbles to 3" in diameter 10% gravel & cobbles	70
75		--	10/0/90	2.5Y2.5/1	Moist	CH		Diamicton: v dark gray fat clay w/ 10% gravel to 1" in diameter	75
80						SP		V dark gray sand, mg-cg	80
85		--	10/0/90	2.5Y2.5/1	Moist	CH		Diamicton: v dark gray fat clay w/ 5% gravel	85
90		--	5/0/95	2.5Y2.5/1	Moist	CH		Diamicton: v dark gray fat clay w/ 10% gravel	90
95						CH		Diamicton: v dark gray fat clay w/ 5% gravel	95
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-4b

SHEET 3 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/10/07 Ended 2/11/07

Elevation 1053.316764

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 140.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		--	0/0/100	2.5Y2.5/1	Moist	CH		Diamicton: v dark gray fat clay w/ 5% gravel(continued)	105
110						CH		V dark gray fat clay, somewhat shaley	110
115		--	0/0/100	2.5Y2.5/1	Moist			V dark gray fat clay; shaley	115
120						CH			120
125		--	0/0/100	2.5Y2.5/1	Moist				125
130						CH		Shale, pulverized by bit Smells like motor oil	130
135		--	0/0/100	2.5Y2.5/1	Moist	CH		V dark gray fat clay; shaley	135
140						CH		V dark gray shale	140
145									145



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07

LOG OF BORING PH2-5

SHEET 1 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/11/07 Ended 2/12/07

Elevation 1063.842474

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 130.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
5		--	20/0/80	10YR2/1	Moist	OL		Black organic-rich topsoil 20% fg gravel	
5		--	0/40/60	10YR3/2	Wet	CL		Dark grayish brown lean clay 5% gravel	5
10						ML		Mottled yellowish brown V dark brown sandy silt	
10						GC		Dark yellowish brown clayey gravel 10% sand	10
15		--	0/100/0	10YR4/4	Wet	SP		Dark yellowish brown clean sand; cg	15
20						SP		Dark gray sand, cg	20
25						SP SM		Dark gray sand, fg-mg 10% silty fines	
25						CH		Diamicton: v dark gray fat clay	25
30									
35		--	5/0/95	10YR3/1	Moist			Dark gray sand w/ silty, mg-cg	35
40						SP SM			40
45								Dark gray sand w/ silt, fg	45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 35.5' to 99'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-5

SHEET 2 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/11/07 Ended 2/12/07

Elevation 1063.842474

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 130.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	0/80/20	10YR4/1	Moist	SP SM		Dark gray sand w/ silt, fg(continued)	
						SM		Dark gray silty sand, fg	55
						SM		Dark gray silty sand, fg-mg	
60						ML SM CL ML		Dark gray silt and clay w/ 20% sand	
								Dark gray sand w/ silt, fg-mg	
								Alternating lenses of dark gray silt and clay	60
								Dark gray sand w/ silt, fg	
65		--	0/95/5	10YR4/1	Wet	SP SM			
								Dark gray sand, fg-mg	65
70									
75						SP			
80									
85		--	10/85/5	10YR3/1	Wet	CH		V dark gray fat clay	
						SP		V dark gray sand, cg 10% fg gravel	85
90						SP		V dark gray sand, mg	
						SP		V dark gray sand, mg-mg	90
95						SP		V dark gray sand, mg-cg	
						CH		V dark gray fat clay, somewhat shaley (continued)	95



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 35.5' to 99'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-5

SHEET 3 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/11/07 Ended 2/12/07

Elevation 1063.842474

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 130.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		--	0/0/100	10YR3/1	Moist			V dark gray fat clay, somewhat shaley(continued)	105
110						CH			110
115		--	0/0/100	10YR3/1	Moist				115
120									120
125		--	0/0/100	10YR3/1	Moist	CH		V dark gray shaley clay	125
130								Granite bedrock	130
135									135
140									140
145									145

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARLOG.GDT 3/21/07



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 35.5' to 99'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-6

SHEET 1 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/12/07 Ended 2/12/07

Elevation 1106.329856

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 155.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/0/100	5.YR2.5/2	Frozen			V dark brown organic-rich medium plasticity clayey topsoil	
5		--	25/75/0	10YR5/4	Moist	CL		Dark brown lean clay 5% fg gravel; 5% fg sand Yellowish brown sand w/ gravel to 2" in diameter	5
10						SP			10
15		--	20/80/0	10YR5/4	Wet	SP		Yellowish brown sand, cg 20% fg gravel	15
						SP		Yellowish brown sand, mg	
20						SP		Yellowish brown sand, fg	20
								Gray sand, fg-mg	
25									25
30									30
35		--	0/100/0	10YR5/1	Wet	SP			35
40									40
45									45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 25' to 151'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-6

SHEET 2 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/12/07 Ended 2/12/07

Elevation 1106.329856

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 155.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	0/100/0	10YR5/1	Wet	SP		Gray sand, fg-mg(continued)	55
60						SP		Gray sand, mg	60
65						SP		Gray sand, fg-mg	65
70						SP			70
75		--	0/100/0	10YR5/1	Wet			Gray sand, mg-cg	75
80									80
85						SP			85
90									90
95		--	0/100/0	10YR5/1	Wet				95
								(continued)	

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 25' to 151'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-6

SHEET 3 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/12/07 Ended 2/12/07

Elevation 1106.329856

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 155.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105								Gray sand, mg-cg(continued)	105
110									110
115		--	0/100/0	10YR5/1	Wet	SP			115
120									120
125									125
130									130
135		--	5/95/0	10YR5/1	Wet	SP		Gray sand, mg	135
140									140
145									145
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 25' to 151'

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring PH2-6

SHEET 4 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/12/07 Ended 2/12/07

Elevation 1106.329856

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 155.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155						SP		Gray sand, mg(continued)	
						CH		Fat black clay, v shaley	
						CH		Shale bedrock	155
160									160
165									165
170									170
175									175
180									180
185									185
190									190
195									195



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 25' to 151'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-7

SHEET 1 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/13/07 Ended 2/14/07

Elevation 1128.60896

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 155.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/S&A FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/0/100	10YR2/2	Frozen	OL		V dark brown organic-rich topsoil	
5		--	10/0/90	2.5Y5/4	Moist	CL		Light olive brown lean clay 2% cg sand	5
10		--				CL		Light olive brown lean clay 10% fg gravel Reddish oxidation; gray mottling	10
15		--	2/10/88	10YR5/4	Moist	CL		Yellowish brown lean clay 10% cg sand Reddish oxidation; gray mottling	15
20						GC		Yellowish brown clayey gravel	20
						GC		Yellowish brown clayey gravel	
25		--	30/60/10	10YR5/4	Wet	GC		Yellowish brown clayey gravel and sand Charcoal; reddish oxidation	25
						SP SC		Yellowish brown sand w/ clay and gravel	
30						CL		Diamicton: dark gray lean clay w/ 10% fg gravel	30
35		--	40/60/0	10YR4/4	Wet	SP		Dark yellowish brown sand w/ 40% fg-cg gravel	35
40						SP		Dark gray sand, mg-cg 20% fg gravel	40
45		--	5/0/95	2.5Y3/1	Moist	CL		Diamicton: v dark gray lean clay 5% fg gravel	45
						CL		Diamicton: v dark gray lean clay 5% gravel	

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-7

SHEET 2 OF 4

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/13/07 Ended 2/14/07Elevation 1128.60896Location Big Stone City, SDLogged By Barr, EJCTotal Depth 155.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		1	5/0/95	2.5Y3/1	Moist	CL		Diamicton: v dark gray lean clay 5% gravel(continued)	55
60									60
65		--	5/5/90	5YR4/2	Moist	CL		Dark reddish gray lean clay 5% fg gravel; 5% fg sand	65
70									70
75		--	0/0/100	10YR3/1	Moist	ML		V dark gray silt	75
80						SP		V dark gray sand, mg 10% gravel; 10% silt, grading to cg gravel at 83'	80
85		--	0/0/100	10YR3/1	Moist	CL		Diamicton: v dark gray lean clay	85
90									90
95		--	5/0/95	2.5Y2.5/1	Moist	CL		Black lean clay Smells like motor oil	95
								(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-7

SHEET 3 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 2/13/07 Ended 2/14/07

Elevation 1128.60896

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 155.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105		--	5/80/15	10YR3/1	Wet	CL		Black lean clay Smells like motor oil (continued)	105
						SM		V dark gray sand, cg	
						CL		5% gravel, 15% silt V dark gray lean clay	
110						SP		V dark gray sand, fg-mg	110
								Black fat clay	
115		--	0/0/100	2.5Y2.5/1	Moist				115
120									120
125		--	0/0/100	2.5Y2.5/1	Moist				125
130						CH			130
135		--	0/0/100	2.5Y2.5/1	Moist				135
140									140
145		--	0/0/100	2.5Y2.5/1	Moist				145

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH2-7

SHEET 4 OF 4

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 2/13/07 Ended 2/14/07Elevation 1128.60896Location Big Stone City, SDLogged By Barr, EJCTotal Depth 155.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155						CH		Black fat clay(continued)	155
160									160
165									165
170									170
175									175
180									180
185									185
190									190
195									195



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-1

SHEET 1 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/6/07 Ended 3/6/07

Elevation 1064.112378

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 115.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/0/100	2.5Y3/1	Frozen	OL		V dark gray organic-rich topsoil	
5		--	0/0/100	2.5Y5/3	Moist	CH		Light olive brown faty clay Reddish oxidation; charcoal	5
10						SP		Light olive brown sand, cg	
15		--	70/30/0	10YR4/1	Wet	GP		Black sandy gravel w/ cobbles to 2" in diameter 70% fg gravel; 30% cg sand	10
20						GP		Dark gray gravel w/ sand 70% gravel; 30% sand	15
25						ML		Dark gray silt	20
30						ML			25
35		--	10/85/5	10YR5/1	Wet	SP		Gray sand, fg-mg	30
40						SP		Gray sand, mg-cg Decreasing grain size w/ depth 10% gravel; 5% fines	35
45						CH		Diamicton: v dark gray fat clay w/ 10% sand, cg	40
						CH			45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 60' to 98'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-1

SHEET 2 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/6/07 Ended 3/6/07

Elevation 1064.112378

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 115.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	0/10/90	10YR3/1	Moist	CH		Diamicton: v dark gray fat clay w/ 10% sand, cg(continued)	55
60						SP		V dark gray sand, mg-cg	60
65		--	0/100/0	10YR4/1	Wet	SP		Dark gray sand, mg	65
						GP		Dark gray gravel and cobbles from 1/4" to 2" in diameter	
						SP		Granite, limestone, shale	
						SP		Dark gray sand, mg	
								Faint petroleum odor	
70						SP		Dark gray sand, cg	70
								20% gravel	
								Faint petroleum odor	
								Dark gray sand, mg-cg	
								Faint petroleum odor	
75						SP		Dark gray sand, fg-mg	75
								Faint petroleum odor	
80						SP		Dark gray sand, mg	80
								20% gravel	
								Faint petroleum odor	
85		--	20/80/0	10YR4/1	Wet	SP		Dark gray sand, mg-cg	85
								20% gravel	
						SM		Dark gray sand, fg	
								30% fines	
90						SP		Dark gray sand, mg, and cg gravel	90
95		--	0/90/10	10YR4/1	Wet	SP		Dark gray sand, mg	95
								10% fines	
						CH		Shaley black clay	

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 60' to 98'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-1

SHEET 3 OF 3

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 3/6/07 Ended 3/6/07Elevation 1064.112378Location Big Stone City, SDLogged By Barr, EJCTotal Depth 115.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105			0/0/100	10YR2/1	Moist			Shaley black clay(continued)	105
110						CH			110
115									115
120									120
125									125
130									130
135									135
140									140
145									145



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 60' to 98'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-2

SHEET 1 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/7/07 Ended 3/8/07

Elevation 1046.58796

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 173.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
0		—	0/5/95	10YR3/2	Frozen	OL		V dark grayish brown organic-rich topsoil w/ 5% sand, fg	0
5		—	0/5/95	2.5Y3/4	Moist	CL		Light olive brown lean clay; mottled w/ gray	5
10						SM		Light olive brown silty sand, fg	10
15		—	10/85/5	10YR4/4	Wet	SP		Dark yellowish brown mg sand, grading to cg w/ fg gravel	15
20						SP		Dark gray sand, cg, w/ 10% fg gravel	20
25						CH		Diamicton: dark gray fat clay w/ 10% fg gravel Gravel lenses to 3" thick	25
30						CH		Diamicton: dark gray fat clay w/ 10% fg gravel	30
35		—	40/60/0	10YR4/1	Wet	SP		Dark gray gravel to 3" in diameter; grading to very cg sand	35
40						CH		Diamicton: dark gray fat clay w/ 10% fg gravel	40
45						CH		Diamicton: dark gray fat clay w/ 10% fg gravel	45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 140' to 169.5'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-2

SHEET 2 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/7/07 Ended 3/8/07

Elevation 1046.58796

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 173.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	10/0/90	10YR3/1	Moist	CH		Diamicton: dark gray fat clay w/ 10% fg gravel(continued)	55
60								Diamicton: V dark gray fat clay w/ 10% fg-mg angular gravel Gravel lenses up to 6" thick	60
65									65
70									70
75		--	10/0/90	10YR3/1	Moist	CH			75
80									80
85									85
90									90
95		--	0/0/100	10YR3/1	Moist	CH		V dark gray fat clay; shaley	95
								(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 140' to 169.5'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-2

SHEET 3 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/7/07 Ended 3/8/07

Elevation 1046.58796

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 173.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105								V dark gray fat clay; shaley(continued)	105
110						CH			110
115		--	0/0/100	10YR2/1	Dry			Black weathered shale; faint petroleum odor	115
120									120
125									125
130						CH			130
135		--	0/0/100	10YR2/1	Moist				135
140								Greenish gray sandy soapstone V soft and friable	140
145									145
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 140' to 169.5'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-2

SHEET 4 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/7/07 Ended 3/8/07

Elevation 1046.58796

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 173.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155								Greenish gray sandy soapstone V soft and friable(continued)	155
160		1	0/60/40	BLEY16/10Y	Moist				160
165		2	0/60/40	BLEY16/10Y	Moist			Granite boulder, well rounded Greenish gray soapy sandstone Somewhat friable	165
170								Granite bedrock	170
175									175
180									180
185									185
190									190
195									195



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 140' to 169.5'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-3

SHEET 1 OF 4

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 3/8/07 Ended 3/9/07
 Logged By Barr, EJC

Elevation 1049.8688
 Total Depth 182.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/0/100	10YR2/2	Frozen			V dark brown organic-rich topsoil	
5		--	0/0/100	2.5Y4/4	Moist	OL		Olive brown lean clay Mottled w/ gray	5
10						CL		Dark grayish brown mg sand, grading to cg w/ 5% gravel to 2" in diameter at 12'	10
15		--	10/90/0	10YR4/6	Wet	SP		Dark yellowish brown cg sand w/ 10% fg gravel	15
20						SP		Diamicton: v dark gray fat clay w/ 10% sand, cg	20
25									25
30									30
35		--	0/10/90	10YR3/1	Moist	CH			35
40									40
45									45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-3

SHEET 2 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/8/07 Ended 3/9/07

Elevation 1049.8688

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 182.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	0/5/95	10YR3/1	Moist	CH		Diamicton: v dark gray fat clay w/ 10% sand, cg(continued)	55
60						CH		Diamicton: v dark gray fat clay w/ 5% sand, cg Lenses of sand & gravel throughout	60
65									65
70		--	0/0/100	10YR3/1	Moist			V dark gray fat clay	70
75						CH			75
80									80
85		--	0/0/100	10YR3/1	Moist			V dark gray fat clay; slightly shaley	85
90						CH			90
95		--	0/0/100	10YR3/1	Moist				95

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-3

SHEET 3 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/8/07 Ended 3/9/07

Elevation 1049.8688

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 182.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105								V dark gray fat clay; slightly shaley(continued)	105
110						CH			110
115		--	0/0/100%	LE12.5/M	Dry			Black weathered shale	115
120									120
125									125
130						CH			130
135		--	0/0/100%	LE12.5/M	Dry				135
140									140
145		--	0/5/95%	LE17/10GY	Dry			Light bluish gray soapstone 5-25% sand V soft and friable	145
								(continued)	

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-3

SHEET 4 OF 4

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 3/8/07 Ended 3/9/07Elevation 1049.8688Location Big Stone City, SDLogged By Barr, EJCTotal Depth 182.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/10/90	LE17/10GY	Dry			Light bluish gray soapstone 5-25% sand V soft and friable(continued)	155
160		--	0/10/90	LE17/10GY	Dry				160
165								Green metamorphosed sandstone/soapstone, like soft quartzite	165
170								Red granite bedrock	170
175									175
180									180
185									185
190									190
195									195



Barr Engineering Co

Telephone:
Fax:

Remarks

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-4

SHEET 1 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/9/07 Ended 3/10/07

Elevation 1122.04728

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 210.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
			0/5/95	10YR2/2	Frozen	OL	OL	V dark brown organic-rich topsoil w/ 5% cg sand	
5						CL	CL	Yellowish brown lean clay Reddish oxidation; charcoal	5
10						CL	CL	Yellowish brown lean clay 5% gravel Reddish oxidation; charcoal	10
15			0/100/0	10YR7/4	Dry			V pale brown sand Well graded from v fg to cg	15
20						SW	SW		20
25									25
30									30
35			0/100/0	10YR6/6	Moist	CL	CL	Olive brown sandy lean clay 10% mg sand	35
						SP	SP	Yellowish brown sand, cg	
40						SP	SP	Yellowish brown sand, mg	40
						SP	SP	Yellowish brown sand, cg	
45						MI	MI	Yellowish brown silty sand, fg	45
						SP	SP	Yellowish brown sand, cg, w/ gravel to 2" in diameter	
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 35' to 50'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-4

SHEET 2 OF 5

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 3/9/07 Ended 3/10/07
 Logged By Barr, EJC

Elevation 1122.04728
 Total Depth 210.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	70/30/0	10YR4/1	Wet	SM		V dark gray silty sand w/ 20% gravel	55
						ML		Sandy silt w/ gravel	
						GP		Dark gray cg gravel w/ 30% mg-cg sand	
60								V dark gray medium plasticity clay w/ 10% gravel to 1 1/2" in diameter and 10% mg sand Gravel and sand lenses up to 6" thick @ 64', 66', 67', 74'	60
65									65
70						CL			70
75		---	10/10/80	10YR3/1	Moist				75
80									80
85						SM		V dark gray silty sand	85
90						GP		Cobbles to 4" in diameter in a v dark gray silt/clay matrix Diamicton: v dark gray fat clay w/ 20% fg-mg gravel	90
95		--	10/0/90	10YR3/1	Moist	CH			95
						CH		Diamicton: v dark gray fat clay w/ 10% fg-mg gravel	

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 35' to 50'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-4

SHEET 3 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/9/07 Ended 3/10/07

Elevation 1122.04728

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 210.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105								Diamicton: v dark gray fat clay w/ 10% fg-mg gravel(continued)	105
110									110
115		--	10/0/90	10YR3/1	Moist	CH			115
120									120
125									125
130									130
135		--	0/0/100	10YR3/1	Moist	CH		V dark gray fat clay	135
140									140
145									145
(continued)									



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 35' to 50'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-4

SHEET 4 OF 5

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 3/9/07 Ended 3/10/07
 Logged By Barr, EJC

Elevation 1122.04728
 Total Depth 210.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		--	0/0/100	10YR3/1	Moist	CH		V dark gray fat clay(continued)	155
160								V dark gray fat clay w/ seams of silty sand < 5mm thick	160
165									165
170									170
175		---	0/0/100	10YR3/1	Moist	CH			175
180									180
185		--	0/0/100	10YR3/1	Moist				185
190									190
195		---	0/0/100	10Y 12.5/10Y	Moist	CH		Greenish black shale	195
								(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 35' to 50'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-4

SHEET 5 OF 5

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 3/9/07 Ended 3/10/07
 Logged By Barr, EJC

Elevation 1122.04728
 Total Depth 210.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
205						CH		Greenish black shale(continued)	205
210									210
215									215
220									220
225									225
230									230
235									235
240									240
245									245



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 35' to 50'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-5

SHEET 1 OF 5

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/12/07 Ended 3/13/07

Elevation 1102.36224

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 225.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
0		--	0/5/95	10YR3/3	Frozen	CL	11/2	Dark brown organic-rich topsoil 5% fg-mg sand	0
5		--	0/10/90	2.5Y4/4	Dry	ML		Light yellow brown clayey silt	5
10						ML		Olive brown silt w/ 10% fg sand Calcified fragments	10
15		--	5/20/75	10YR5/4	Moist	CL		Yellowish brown sandy lean clay 20% mg sand Reddish oxidation	15
20						SM		Yellowish brown silty sand, fg	20
25		--	0/90/10	10YR6/6	Moist	SP SM		Brownish yellow sand, fg w/ 10% silt	25
30						SP SM			30
35		--	0/95/5	10YR5/6	Moist	SP		Yellowish brown sand, fg w/ 5% silt	35
40						SP			40
45						SP		Yellowish brown sand, mg-cg (continued)	45



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 55' to 202'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-5

SHEET 2 OF 5

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 3/12/07 Ended 3/13/07Elevation 1102.36224Location Big Stone City, SDLogged By Barr, EJCTotal Depth 225.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		-	0/100/0	10YR5/6	Wet	SP		Yellowish brown sand, mg-cg(continued)	55
						SP		Yellowish brown sand, mg	
						SP		Gray mg-cg sand	
						GP		Gray gravel, fg-cg, w/ 40% mg-cg sand	
						SP		Gray sand, mg w/ 30% fg gravel	
60								Gray sand, mg-cg	60
65						SP			65
70									70
75		--	50/50/0	10YR5/1	Wet	GP		Gray gravel w/ 40% cg sand	75
						GP		Gray cg sand and fg-cg gravel	
						SP		Gray mg-cg gravel	
80								Gray cg sand & fg gravel	80
85						SP			85
90									90
95		---	5/80/0	10YR5/1	Sat.	SM		Gray silty sand, fg	95
						GP		Gray gravel, fg-cg	
						SM		Gray silty sand, mg	
								(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 55' to 202'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-5

SHEET 3 OF 5

Client Otter Tail Power Company
 Project Name Big Stone II
 Number 41/25-003 GWTR 200
 Location Big Stone City, SD

Drill Contractor Boart Longyear
 Drill Method Rotasonic
 Drilling Started 3/12/07 Ended 3/13/07
 Logged By Barr, EJC

Elevation 1102.36224
 Total Depth 225.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105						SP		Gray sand, cg	105
110									110
115		--	60/40/0	10YR5/1	Sat.	GP		Gray gravel, cg, w/ 40% cg sand	115
120									120
125						SP		Gray sand, cg Faint petroleum odor	125
130									130
135		--	70/30/0	10YR5/1	Sat.	GP		Gray gravel, fg-cg, and sand, mg-cg	135
140						SP		Gray gravel, cg, w/ 30% sand Faint petroleum odor	140
145						SP		Gray sand, mg Faint petroleum odor	145
						SP		Gray sand, cg Faint petroleum odor	
						GP		Gray sand, mg Faint petroleum odor	

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 55' to 202'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-5

SHEET 4 OF 5

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 3/12/07 Ended 3/13/07Elevation 1102.36224Location Big Stone City, SDLogged By Barr, EJCTotal Depth 225.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155		-	90/10/0	10YR5/1	Sat.	GP		Gray gravel & sand, mg-cg Faint petroleum odor(continued)	155
						GP		Gray gravel, fg	
						SP		Gray sand, cg, w/ 30% fg gravel	
160						SP		Gray sand, cg	160
165		--	70/30/0	10YR5/1	Sat.	GP		Gray gravel, cg, to 3" in diameter	165
						GP		Gray gravel, fg-cg, w/ 30% cg sand	
170						SP		Sand, cg, w/ 20% cg gravel	170
						GP		Gravel, cg, w/ 30% sand	
						SP		Sand, cg, w/ 10% fg gravel	
175						SP		Sand, mg, w/ 5% fg gravel	175
						SP		Sand, mg, and mg gravel	
180						SP		Sand, mg-cg, w/ 5% fg gravel	180
185		--	90/10/0	10YR5/1	Sat.	GP		Gravel, fg	185
						ML		Cemented fg gravel (40%) w/ 10% sand Sand, cg, to fg gravel	
190						SP			190
195						SP		Sand, mg-cg	195

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 55' to 202'

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 4 (LOGS CREATED PRE 5/24/04) 4125003.GPJ BARRLOG.GDT 3/21/07

LOG OF BORING PH3-5

SHEET 5 OF 5

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 3/12/07 Ended 3/13/07Elevation 1102.36224Location Big Stone City, SDLogged By Barr, EJCTotal Depth 225.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
205		--	0/10/90	GRAY 17/10 Y	Dry	SP		Sand, mg-cg(continued)	205
210						CL		Shaley cemented siltstone w/ alternating black, gray, and white layers to 5 mm thick Faint petroleum odor	210
215								Soapy gray sandstone	215
220									220
225									225
230									230
235									235
240									240
245									245



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 55' to 202'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-8

SHEET 1 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/11/07 Ended 3/11/07

Elevation 1072.83468

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 153.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
5		--	0/10/90	10YR2/2	Frozen	OL		V dark brown organic-rich topsoil 10% sand	
						CL		Dark yellowish brown lean clay 10% mg sand	
						SP		Yellowish brown sand, mg-cg 10% fg gravel	5
10		--	10/90/0	10YR5/4	Dry			Yellowish brown gravelly sand, mg-cg 10% gravel	
								Gravel and cobbles from 2.5' to 3', 10.5' to 11', and 17' to 18'	
15		--	15/85/0	10YR5/4	Dry				10
						SP			
20		--	20/80/0	10YR5/4	Dry				15
25		---	20/80/0	10YR5/4	Moist				20
30		--	70/30/0	10YR5/4	Sat.			Yellowish brown fg-cg gravel	25
						GP			
35		---	60/30/10	2.5Y4/3	Sat.			Olive brown gravel & sand 10% fines	35
						GP			
40						CH		V dark gray fat clay w/ sand & gravel 4% fg gravel; 10% cg sand	40
45		---	0/5/95	5Y4/1	Wet			V dark gray silt w/ 10% sand, cg	45
						ML			

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 25' to 35'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-8

SHEET 2 OF 4

Client Otter Tail Power CompanyDrill Contractor Boart LongyearProject Name Big Stone IIDrill Method RotasonicNumber 41/25-003 GWTR 200Drilling Started 3/11/07 Ended 3/11/07Elevation 1072.83468Location Big Stone City, SDLogged By Barr, EJCTotal Depth 153.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		-	0/10/90	5Y3/1	Moist	ML		V dark gray silt w/ 10% sand, cg(continued)	55
60									60
65									65
70									70
75		--	0/10/90	5Y3/1	Moist	CH		Diamicton: v dark gray fat clay w/ 10% sand, cg	75
80									80
85									85
90									90
95		--	0/30/70	5Y3/1	Moist	ML		V dark gray sandy silt, fg	95
						SP		V dark gray silty sand, mg	
								(continued)	



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 25' to 35'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-8

SHEET 3 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/11/07 Ended 3/11/07

Elevation 1072.83468

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 153.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105								V dark gray sandy silt, fg	105
110						ML			110
115		--	0/0/100	5Y3/1	Moist			V dark gray fat clay w/ silt	115
120									120
125						CH			125
130									130
135		--	0/0/100	5Y3/1	Moist			V dark gray fat clay	135
140									140
145						CH			145

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 25' to 35'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-8

SHEET 4 OF 4

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/11/07 Ended 3/11/07

Elevation 1072.83468

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 153.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
155						CH		V dark gray fat clay(continued)	155
160									160
165									165
170									170
175									175
180									180
185									185
190									190
195									195



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 25' to 35'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-9

SHEET 1 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/11/07 Ended 3/11/07

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 95.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		--	0/10/90	10YR2/2	Frozen	OH		V dark brown organic-rich topsoil 10% mg sand	
5		--	30/70/0	10YR4/4	Dry	CL		Yellowish brown sandy lean clay 10% mg sand	5
10								Dark yellowish brown clean sand, cg 30% gravel to 3 1/2" inches in diameter	10
15		--	30/70/0	10YR4/4	Dry	SP			15
20								Diamicton: Dark gray clayey silt w/ 35% mg-cg sand	20
25		--	2/35/63	2.5Y4/1	Moist	ML			25
30									30
35		--	5/55/40	2.5Y4/1	Moist	SM		Diamicton: dark gray sand w/ clayey silt	35
40									40
45									45

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 53' to 82'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-9

SHEET 2 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/11/07 Ended 3/11/07

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 95.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
55		--	50/50/0	2.5Y4/1	Sat.	SM		Diamicton: dark gray sand w/ clayey silt(<i>continued</i>)	55
60						SP		Dark gray sand & gravel to 3" in diameter	60
65		--	40/55/5	2.5Y4/1	Sat.	SP		Dark gray sand & gravel to 3" in diameter 5% fines	65
70						SP SM		Olive gray sand w/ 10% silt	70
75		--	40/60/0	5Y4/1	Sat.	SP		Dark gray sand, cg 30% gravel to 1 1/2" in diameter	75
80						SP		Dark gray sand, cg 40% gravel	80
85						CL		Dark gray sandy lean clay w/ silt 40% mg sand 10% gravel	85
90						CH		Dark gray fat clay w/ sand and gravel 10% fg sand; 10% gravel	90
95									95

(continued)



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 53' to 82'

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING PH3-9

SHEET 3 OF 3

Client Otter Tail Power Company

Drill Contractor Boart Longyear

Project Name Big Stone II

Drill Method Rotasonic

Number 41/25-003 GWTR 200

Drilling Started 3/11/07 Ended 3/11/07

Elevation 1079.39636

Location Big Stone City, SD

Logged By Barr, EJC

Total Depth 95.0

DEPTH FEET	SAMPLE RECOVERY NUMBER	BLOWS/6 in.	%GR/SA/ FINES	Color	MOISTURE	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
105									105
110									110
115									115
120									120
125									125
130									130
135									135
140									140
145									145



Barr Engineering Co

Telephone:
Fax:

Remarks Sampled from 53' to 82'

Additional data may have been collected in the field which is not included on this log.

Appendix B

Pumping Well and Observation Well Construction Logs



BOART LONGYEAR

Well Construction Report

Job Name Otter Trail
Job Number 34101442
Location Big Stone City, SD

Well Name MW 1-2
Driller M. Hansen
Date Installed 01/17/07

Type of Well:

- ☒ Water Table Observation
☐ Piezometer
☐ Other _____

A. Height of Well Casing above ground
2.0 ft.

B. Diameter of Well Casing
2.0 in.

C. Surface Seal Bottom
0.0 ft.

D. Well Casing: Flush Threaded PVC
☒ Schedule 40
☐ Schedule 80
☐ Other _____

E. Bentonite Seal Top 164.0 ft.

F. Fine Sand Top NA ft.

G. Filter Pack Top 166.0 ft.

H. Screen Joint Top 168.0 ft.

I. Well Bottom 178.0 ft.

J. Filter Pack Bottom 180.0 ft.

K. Borehole Bottom 180.0 ft.

1. Locking Cap? ☒ Yes ☐ No

2. Protective Cover: a. Inside diam. 4.0 in.
b. Length 7.0 ft.
c. Material ☒ Steel
☐ Other _____
d. Bumper Post _____
_____ 3" _____ 4"

3. Surface Seal: ☐ Bentonite
☒ Concrete
☐ Other _____

4. Material between Casing and Protap: ☐ Bentonite
☐ Other _____

5. Annular Space Seal: ☐ Granular Bentonite
☐ Bentonite Slurry
☒ Cement-Bentonite Grout
☐ Other _____

How Installed: ☐ Gravity
☒ Tremie Pumped

6. Bentonite Seal: ☒ Granules
☐ Pellets

7. Type of Fine Sand: NA

8. Type of Filter Pack: Red Flint 35/45

9. Screen Material: PVC
Type: ☒ Factory Cut
☐ Continuous Slot
Slot Size: 0.010 in.
Length: 10.0 ft.

10. Backfill Material: (Below filter pack)
☐ None
☒ Other Red Flint #40

Boart Longyear
101 Alderson Street
Schofield WI 54476
Phone (715) 359-7090
Fax (715) 355-5715



BOART LONGYEAR

Well Construction Report

Job Name Otter Trail
Job Number 34101442
Location Big Stone City, SD

Well Name MW 1-4
Driller M. Hansen
Date Installed 01/19/07

Type of Well:

☒ Water Table Observation
☐ Piezometer
☐ Other _____

A. Height of Well Casing above ground
2.0 ft.

B. Diameter of Well Casing
2.0 in.

C. Surface Seal Bottom
0.0 ft.

D. Well Casing: Flush Threaded PVC
☒ Schedule 40
☐ Schedule 80
☐ Other _____

E. Bentonite Seal Top 171.0 ft.

F. Fine Sand Top NA ft.

G. Filter Pack Top 173.0 ft.

H. Screen Joint Top 175.0 ft.

I. Well Bottom 185.0 ft.

J. Filter Pack Bottom 186.0 ft.

K. Borehole Bottom 186.0 ft.

1. Locking Cap? ☒ Yes ☐ No

2. Protective Cover: a. Inside diam. 4.0 in.
b. Length 7.0 ft.
c. Material ☒ Steel
☐ Other _____
d. Bumper Post 3" 4"

3. Surface Seal: ☐ Bentonite
☒ Concrete
☐ Other _____

4. Material between Casing and Protop: ☐ Bentonite
☐ Other _____

5. Annular Space Seal: ☐ Granular Bentonite
☐ Bentonite Slurry
☒ Cement-Bentonite Grout
☐ Other _____

How Installed: ☐ Gravity
☒ Tremie Pumped

6. Bentonite Seal: ☐ Granules
☐ Pellets

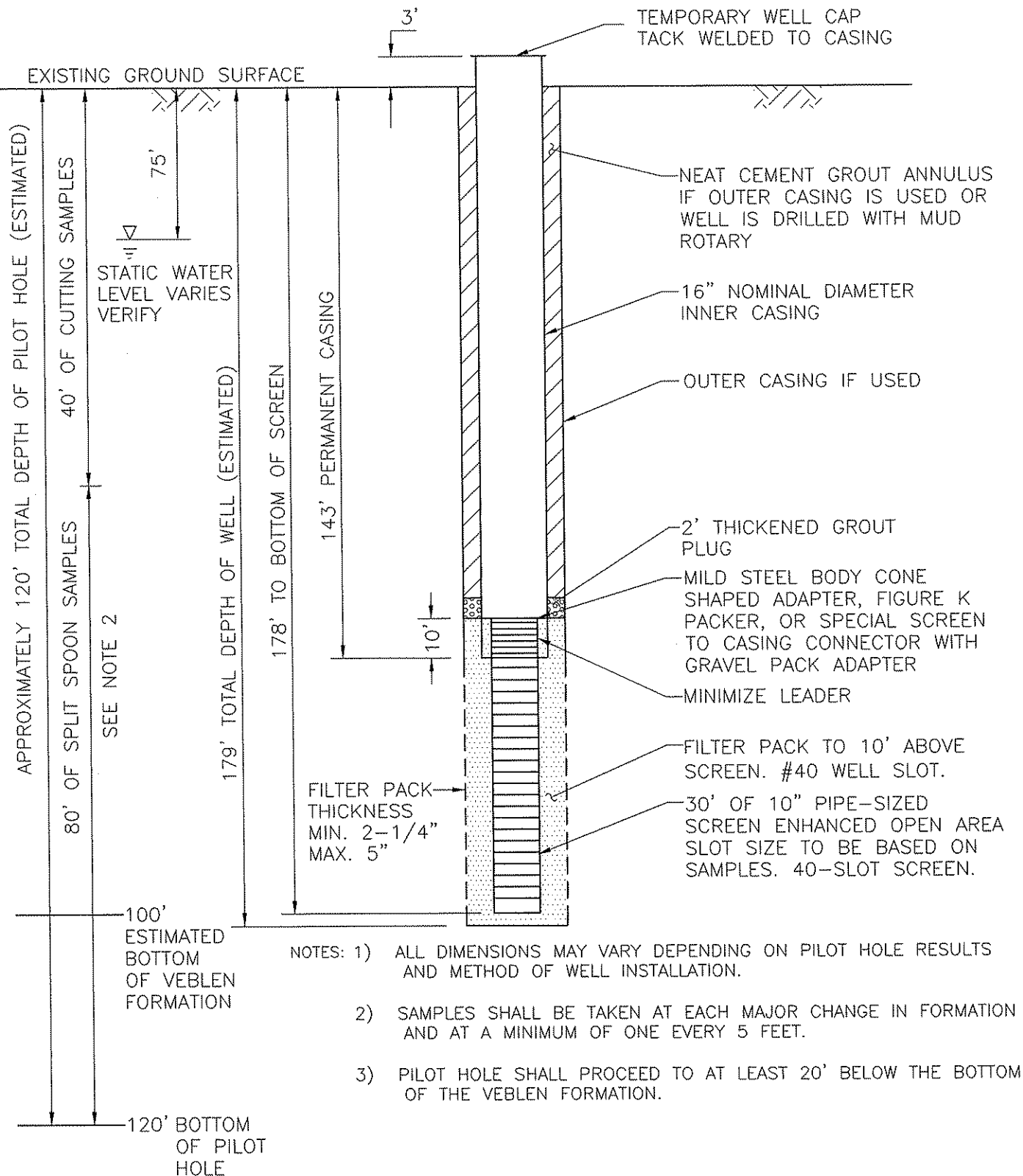
7. Type of Fine Sand: NA

8. Type of Filter Pack: Red Flint 35/45

9. Screen Material: PVC
Type: ☒ Factory Cut
☐ Continuous Slot
Slot Size: 0.010 in.
Length: 10.0 ft.

10. Backfill Material: (Below filter pack)
☐ None
☒ Other Red Flint 35/45

Boart Longyear
101 Alderson Street
Schofield WI 54476
Phone (715) 359-7090
Fax (715) 355-5715



Project Office:
BARR ENGINEERING CO.
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
55435-4803
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

NOT TO SCALE
PW1-2
PRODUCTION WELL LOGS

P.W. 2

SOUTH DAKOTA WATER WELL COMPLETION REPORT

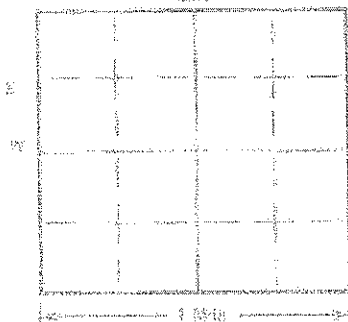
07-82

Location 5 SW 15 Twp 121 N R 47 W
County GrantWell Owner Otter Tail Power Company

Business Name

Address

Please mark well for all use in 1:2



Well Completion Date

WELL LOG:

DEPTH

	FORMATION	DEPTH	
		FROM	TO
clay	Reddish Brown	0	26
clay	Gray	26	90
Sand	Gray	90	180

LOCATION:

Distance from nearest potential pollution source (septic tank, abandoned well)

Footage to N/A of road

PROPOSED USE:

- ☐ Domestic Stock ☐ Municipal ☐ Business ☐ Test Holes
☐ Irrigation ☒ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud RotaryCASING DATA: ☒ Steel ☐ Plastic ☐ Other

If other specify

PIPELINE DIAMETER FROM TO HOLE DIAMETER
49.56 12 +2 -143 16 3/4
 LBS FT FT FT FT
 H. FT H. FT FT FT FT

GROUTING DATA

Grout Type Neat 100 Grout Weight 0 -105
Cement

Describe grouting procedure Pressure Grouted from
105 To Ground level

SCREEN ☐ Fabricated pipe ☒ ManufacturedDiameter 10" Length 35 FEETMaterial 304 stainless steelSlot Size 40 Set from 143 Feet to 178 FeetPipe manufacturer 12" x 10" CS Concentric

Weld Reducer to connect pipe to SC

WAS A PROBLEM IN SEAL DESIGN? ☐ YES ☒ NO

If so, what problem?

Describe casing and screen

DISINFECTION ☐ Yes and disinfected upon completion?

YES, How

Disinfectant used to treat water
 quality samples

X was
 going to be test
 pumped

STATIC WATER LEVEL 75' Feet

If flowing, closed in pressure

GPM flow through

Controlled by ☐ Valve ☐ Reducers ☐ Other

Water level pressure

Can well be completely shut in?

WELL TEST DATA

☒ Pumped☐ Bored☐ Other

Pumping level below land surface

93.6 In After 83 hrs pumped 550 GPM

In After hrs pumped GPM

If pump installed, pump rate GPM

REMARKS

well cleaned up very nice
 no sand.

This well was drilled under license # 424

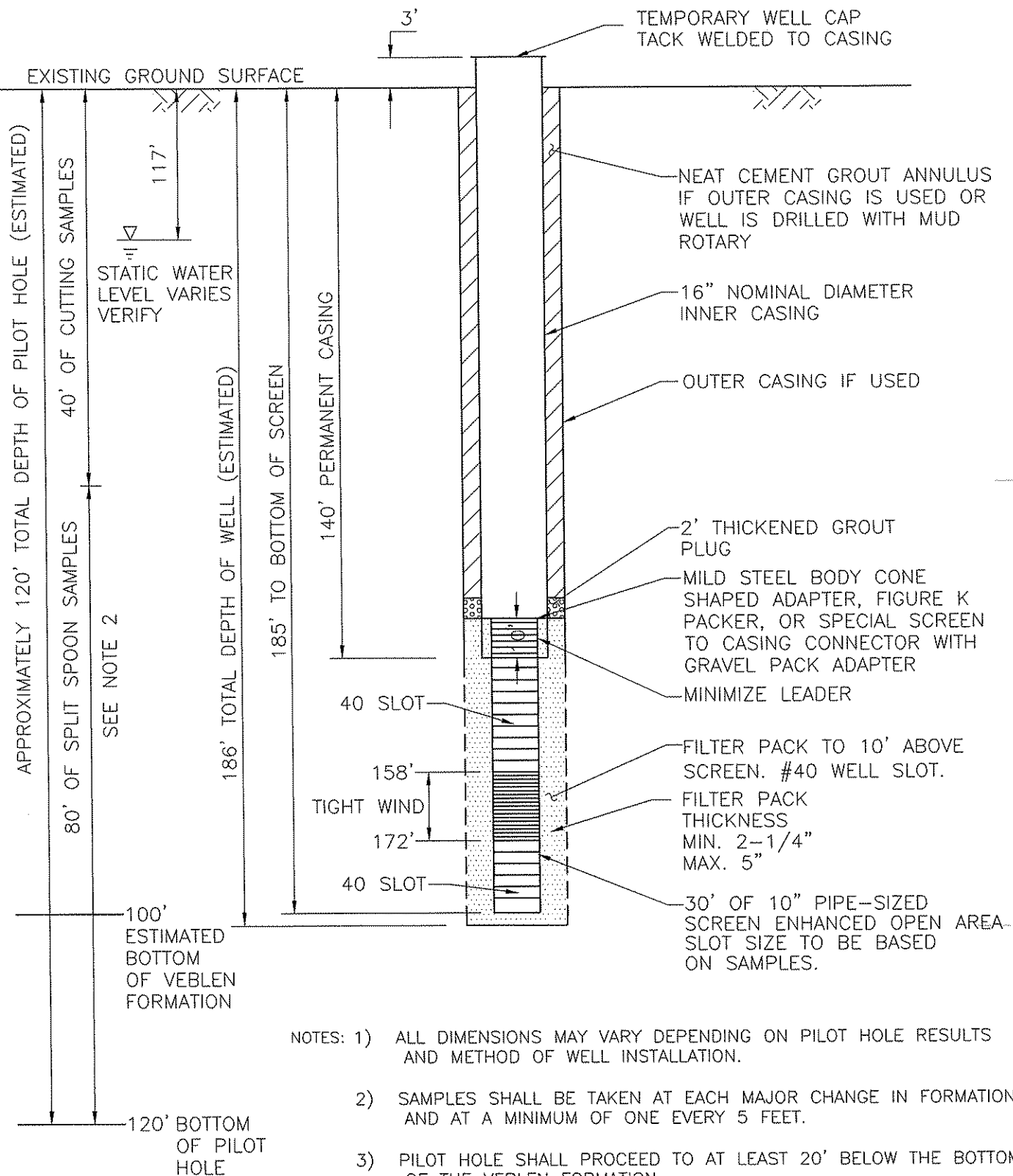
And this report is true and accurate

Drilling by

Signature of Land Representative

Signature of Well Owner or Landable Property Holder

Date



Project Office:
 BARR ENGINEERING CO.
 4700 WEST 77TH STREET
 MINNEAPOLIS, MN.
 55435-4803
 Ph: 1-800-632-2277
 Fax: (952) 832-2601
 www.barr.com

NOT TO SCALE
 PW1-4
 PRODUCTION WELL LOGS

P.W. 4

SOUTH DAKOTA WATER WELL COMPLETION REPORT

07-92

Location NE NE 7 Top 121 N. 46 W

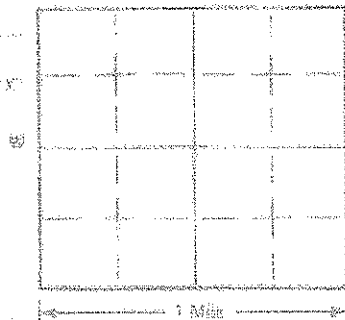
County Grant

Well Owner: Otter Tail Power Company

Business Name:

Address:

Please mark well location with an "X"



Well Completion Date:

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
clay	0	35
clay	35	67
Sand	67	75
clay	75	79
clay	79	93
clay	93	121
Sand	121	185

LOCATION:

Distance from nearest potential pollution source (septic tank, abandoned well,

ford, etc.) N/A ft. from Identify source:

PROPOSED USE:

- ☐ Domestic/Stock ☐ Municipal ☐ Business ☐ Test Holes
☐ Irrigation ☒ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA: ☒ Steel ☐ Plastic ☐ Other

If other, describe:

DEPTH	DIAMETER	FROM	TO	HOLE DIAMETER
49.56	12 in	+2	-140	18 3/4 in
18/17	in	ft	ft	in
18/17	in	ft	ft	in

GROUTING DATA

Grout Type: Neat Cement
 lbs. of Sacks: 120
 Grout Weight: 0 lb/gal
 From: 0 To: 126 ft

Description grouting procedure: Pressure grouted from 105 to ground level.

SCREEN: ☐ Fabricated pipe ☒ Manufactured

Diameter: 10" Length: 45 feet
 Material: 304 Stainless steel
 Slot Size: 40 Screen: 140 Feet to 185 feet
 Screen description: Tight wrapped screen from 158 to 172

WAS A PACKER OR SEAL USED? ☐ YES ☒ NO

If so, what material?

Describe packer and location?

DISINFECTION: Was well disinfected upon completion?

☒ YES, How?

Laboratory sent to test water

quality and/or

NO, Why Not?

STATIC WATER LEVEL

117 feet

If flowing, closed in pressure

GPM flow through inch pipe

Controlled by ☐ Valve ☐ Restrictor ☐ Other

Reduced Flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☐ Potential Describe☐ Tested☐ Other

Pumping test below Land Surface

ft. After hrs. pumped GPM

ft. After hrs. pumped GPM

If pump restores pump rate GPM

REMARKS

This well was drilled under license # 424

And this report is true and accurate

Drilling firm

Signature of License Representative:

Signature of Well Owner or Liable Property Holder:

Date:

Appendix C

Groundwater Analytical Results



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 2 Sample #1
SAP SoldTo Number: 0001008566

Sample Number: NW0701367
Date Sampled: 8:50 am 29-Jan-2007
Date Received: 30-Jan-2007
Date Completed: 12-Feb-2007

Water Analysis Report

Cations/Metals	Filtered	Total
Aluminum (Al)	<0.1	<0.1 mg/L
Arsenic (As)		<0.030 mg/L
Arsenic (As) Filtered		<0.030 mg/L
Barium (Ba)	<0.4	<0.4 mg/L
Boron (B)	0.2	0.2 mg/L
Cadmium (Cd)	<0.04	<0.04 mg/L
Calcium (Ca)	140	140 mg/L
Chromium (Cr)	<0.01	<0.01 mg/L
Copper (Cu)	<0.01	0.02 mg/L
Iron (Fe)	0.01	1.9 mg/L
Lead (Pb)	<0.2	<0.2 mg/L
Lithium (Li)	0.06	0.06 mg/L
Magnesium (Mg)	50	50 mg/L
Manganese (Mn)	0.10	0.10 mg/L
Molybdenum (Mo)	<0.1	<0.1 mg/L
Nickel (Ni)	<0.1	<0.1 mg/L
Phosphorus (P)	<1.1	<1.0 mg/L
Phosphorus (PO4)	<3.2	<3.1 mg/L
Potassium (K)	6.8	6.8 mg/L
Selenium (Se)		<0.010 mg/L
Selenium (Se) Filtered		<0.010 mg/L
Silica (SiO2)	38.0	38.0 mg/L
Silver (Ag)		<0.030 mg/L
Silver (Ag) Filtered		<0.030 mg/L
Sodium (Na)	19.0	19.0 mg/L
Strontium (Sr)	0.59	0.59 mg/L
Vanadium (V)	<0.53	<0.50 mg/L
Zinc (Zn)	0.09	0.12 mg/L
Calcium (CaCO3)	340	340 mg/L
Magnesium (CaCO3)	210	210 mg/L
Sodium (CaCO3)	42.0	42.0 mg/L
Calculated Hardness (CaCO3)	550	550 mg/L

Phosphates	Filtered	Total
Phosphate (PO4) - Total	0.30 mg/L	0.70 mg/L
Phosphate (PO4) - Ortho	0.30 mg/L	0.70 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 2 Sample #1
SAP SoldTo Number: 0001008566

Sample Number: NW0701367
Date Sampled: 8:50 am 29-Jan-2007
Date Received: 30-Jan-2007
Date Completed: 12-Feb-2007

Water Analysis Report

Anions

Bromide (Br)	<0.20 mg/L
Chloride (Cl)	1.9 mg/L
Nitrate (NO3)	<0.20 mg/L
Nitrite (NO2)	<0.20 mg/L
Sulfate (SO4)	190 mg/L
<i>Chloride (CaCO3)</i>	2.7 mg/L
<i>Nitrate (CaCO3)</i>	<0.16 mg/L
<i>Sulfate (CaCO3)</i>	200 mg/L

ALK - Alkalinity

Bicarbonate (CaCO3)	330 mg/L
Methyl Orange (CaCO3)	330 mg/L
Phenolphthalein (CaCO3)	<10 mg/L

Others

pH	7.9 pH Units
Conductivity	930 µS/cm
Organic Carbon (C) - Total	5.0 mg/L
Ammonia (NH3)	1.2 mg/L
<i>Ammonia (CaCO3)</i>	3.4 mg/L
Suspended Solids (Total @ 105C)	< 2.0 mg/L
Sulfide	< 0.01 mg/L
Organic Carbon (C) - Filtered	< 2.0 mg/L
BOD at 5 days (mg/l or ppm)	3
Chemical Oxygen Demand (O2)	<5.0 mg/L
Nitrogen (N) - Kjeldahl	<1.0 mg/L
Oil and Grease	<1.0 mg/L
Soluble Fluoride (F)	0.34 mg/L
Mercury (Hg) - Total	<0.00050 mg/L
Silica (SiO2) - Colloidal	7.0 mg/L
Silica (SiO2)-Molybdate Reactive	31 mg/L
Acetic Acid	<3 mg/L
Butanoic Acid	<3 mg/L
Propionic Acid	<3 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power	Sample Number:	NW0701367
Big Stone City SD USA	Date Sampled:	8:50 am 29-Jan-2007
Sample Marked: Well 2 Sample #1	Date Received:	30-Jan-2007
SAP SoldTo Number: 0001008566	Date Completed:	12-Feb-2007

Water Analysis Report

Authorized by : Cheryl Y. Heard





Nalco Analytical Resources
1601 West Diehl Road, Naperville, Illinois 60563-1198
Phone: (630) 305-2315, Fax: (630) 305-2946, Analytical.Lab.Naperville@Nalco.com



Otter Tail Power	Sample Number:	NW0701483
Big Stone City SD USA	Date Sampled:	10:00 pm 30-Jan-2007
Sample Marked: Well 2 Sample #2	Date Received:	31-Jan-2007
SAP SoldTo Number: 0001008566	Date Completed:	12-Feb-2007

AMENDED REPORT, Replaces report issued: 08-Feb-2007 2:48 pm

Error in sample information during sample login



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 2 Sample #2
SAP SoldTo Number: 0001008566

Sample Number: NW0701483
Date Sampled: 10:00 pm 30-Jan-2007
Date Received: 31-Jan-2007
Date Completed: 12-Feb-2007

Water Analysis Report

Cations/Metals	Filtered	Total
Aluminum (Al)	<0.1	<0.1 mg/L
Arsenic (As)		<0.030 mg/L
Arsenic (As) Filtered		<0.030 mg/L
Barium (Ba)	<0.4	<0.4 mg/L
Boron (B)	0.2	0.2 mg/L
Cadmium (Cd)	<0.04	<0.04 mg/L
Calcium (Ca)	120	130 mg/L
Chromium (Cr)	<0.01	<0.01 mg/L
Copper (Cu)	0.02	0.11 mg/L
Iron (Fe)	0.03	1.8 mg/L
Lead (Pb)	<0.2	<0.2 mg/L
Lithium (Li)	0.04	0.05 mg/L
Magnesium (Mg)	44	47 mg/L
Manganese (Mn)	0.09	0.10 mg/L
Molybdenum (Mo)	<0.1	<0.1 mg/L
Nickel (Ni)	<0.1	<0.1 mg/L
Phosphorus (P)	<1.1	<1.0 mg/L
Phosphorus (PO4)	<3.2	<3.1 mg/L
Potassium (K)	6.2	6.5 mg/L
Selenium (Se)		<0.010 mg/L
Selenium (Se) Filtered		<0.010 mg/L
Silica (SiO2)	34.0	36.0 mg/L
Silver (Ag)		<0.030 mg/L
Silver (Ag) Filtered		<0.030 mg/L
Sodium (Na)	16.0	17.0 mg/L
Strontium (Sr)	0.51	0.55 mg/L
Vanadium (V)	<0.53	<0.50 mg/L
Zinc (Zn)	0.21	0.30 mg/L
Calcium (CaCO3)	310	320 mg/L
Magnesium (CaCO3)	180	190 mg/L
Sodium (CaCO3)	35.0	38.0 mg/L
Calculated Hardness (CaCO3)	490	510 mg/L

Phosphates	Filtered	Total
Phosphate (PO4) - Total	0.30 mg/L	0.30 mg/L
Phosphate (PO4) - Ortho	0.20 mg/L	0.20 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 2 Sample #2
SAP SoldTo Number: 0001008566

Sample Number: NW0701483
Date Sampled: 10:00 pm 30-Jan-2007
Date Received: 31-Jan-2007
Date Completed: 12-Feb-2007

Water Analysis Report

Anions

Bromide (Br)	<0.20 mg/L
Chloride (Cl)	1.1 mg/L
Nitrate (NO3)	<0.20 mg/L
Nitrite (NO2)	<0.20 mg/L
Sulfate (SO4)	190 mg/L
Chloride (CaCO3)	1.5 mg/L
Nitrate (CaCO3)	<0.16 mg/L
Sulfate (CaCO3)	200 mg/L

ALK - Alkalinity

Bicarbonate (CaCO3)	330 mg/L
Methyl Orange (CaCO3)	330 mg/L
Phenolphthalein (CaCO3)	<10 mg/L

Others

pH	8.1 pH Units
Conductivity	910 µS/cm
Organic Carbon (C) - Total	3.4 mg/L
Ammonia (NH3)	1.1 mg/L
Ammonia (CaCO3)	3.3 mg/L
Suspended Solids (Total @ 105C)	< 2.0 mg/L
Organic Carbon (C) - Filtered	< 2.0 mg/L
Sulfide	< 0.01 mg/L
BOD at 5 days (mg/l or ppm)	3
Chemical Oxygen Demand (O2)	8.0 mg/L
Nitrogen (N) - Kjeldahl	1.1 mg/L
Oil and Grease	<1.0 mg/L
Soluble Fluoride (F)	0.33 mg/L
Silica (SiO2) - Colloidal	3.4 mg/L
Silica (SiO2)-Molybdate Reactive	33 mg/L
Mercury (Hg) - Total	<0.00050 mg/L
Acetic Acid	<3 mg/L
Butanoic Acid	<3 mg/L
Propionic Acid	<3 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power
Big Stone City SD USA
Sample Marked: Well 2 Sample #2
SAP SoldTo Number: 0001008566

Sample Number: NW0701483
Date Sampled: 10:00 pm 30-Jan-2007
Date Received: 31-Jan-2007
Date Completed: 12-Feb-2007

Water Analysis Report

Authorized by : Cheryl Y. Heard





Nalco Analytical Resources
1601 West Diehl Road, Naperville, Illinois 60563-1198
Phone: (630) 305-2315, Fax: (630) 305-2946, Analytical.Lab.Naperville@Nalco.com



Otter Tail Power	Sample Number:	NW0701482
Big Stone City SD USA	Date Sampled:	7:00 am 30-Jan-2007
Sample Marked: Well 2 Sample #3	Date Received:	31-Jan-2007
SAP SoldTo Number: 0001008566	Date Completed:	12-Feb-2007

AMENDED REPORT, Replaces report issued: 08-Feb-2007 2:48 pm

Error in sample information during sample login



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 2 Sample #3
SAP SoldTo Number: 0001008566

Sample Number: NW0701482
Date Sampled: 7:00 am 30-Jan-2007
Date Received: 31-Jan-2007
Date Completed: 12-Feb-2007

Water Analysis Report

Cations/Metals	Filtered	Total
Aluminum (Al)	<0.1	<0.1 mg/L
Arsenic (As)		<0.030 mg/L
Arsenic (As) Filtered		<0.030 mg/L
Barium (Ba)	<0.4	<0.4 mg/L
Boron (B)	0.2	0.2 mg/L
Cadmium (Cd)	<0.04	<0.04 mg/L
Calcium (Ca)	130	130 mg/L
Chromium (Cr)	<0.01	<0.01 mg/L
Copper (Cu)	<0.01	0.03 mg/L
Iron (Fe)	<0.01	1.8 mg/L
Lead (Pb)	<0.2	<0.2 mg/L
Lithium (Li)	0.04	0.04 mg/L
Magnesium (Mg)	46	47 mg/L
Manganese (Mn)	0.10	0.10 mg/L
Molybdenum (Mo)	<0.1	<0.1 mg/L
Nickel (Ni)	<0.1	<0.1 mg/L
Phosphorus (P)	<1.1	<1.0 mg/L
Phosphorus (PO4)	<3.2	<3.1 mg/L
Potassium (K)	6.4	6.4 mg/L
Selenium (Se)		<0.010 mg/L
Selenium (Se) Filtered		<0.010 mg/L
Silica (SiO2)	35.0	36.0 mg/L
Silver (Ag)		<0.030 mg/L
Silver (Ag) Filtered		<0.030 mg/L
Sodium (Na)	17.0	17.0 mg/L
Strontium (Sr)	0.53	0.54 mg/L
Vanadium (V)	<0.53	<0.50 mg/L
Zinc (Zn)	0.13	0.18 mg/L
Calcium (CaCO3)	320	320 mg/L
Magnesium (CaCO3)	190	190 mg/L
Sodium (CaCO3)	37.0	38.0 mg/L
Calculated Hardness (CaCO3)	510	510 mg/L

Phosphates	Filtered	Total
Phosphate (PO4) - Total	0.60 mg/L	0.80 mg/L
Phosphate (PO4) - Ortho	0.60 mg/L	0.80 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 2 Sample #3
SAP SoldTo Number: 0001008566

Sample Number: NW0701482
Date Sampled: 7:00 am 30-Jan-2007
Date Received: 31-Jan-2007
Date Completed: 12-Feb-2007

Water Analysis Report

Anions

Bromide (Br)	<0.20 mg/L
Chloride (Cl)	1.4 mg/L
Nitrate (NO3)	<0.20 mg/L
Nitrite (NO2)	<0.20 mg/L
Sulfate (SO4)	190 mg/L
<i>Chloride (CaCO3)</i>	2.0 mg/L
<i>Nitrate (CaCO3)</i>	<0.16 mg/L
<i>Sulfate (CaCO3)</i>	200 mg/L

ALK - Alkalinity

Bicarbonate (CaCO3)	340 mg/L
Methyl Orange (CaCO3)	340 mg/L
Phenolphthalein (CaCO3)	<10 mg/L

Others

pH	8.2 pH Units
Conductivity	910 µS/cm
Organic Carbon (C) - Total	3.5 mg/L
Ammonia (NH3)	1.1 mg/L
<i>Ammonia (CaCO3)</i>	3.3 mg/L
Suspended Solids (Total @ 105C)	< 2.0 mg/L
Organic Carbon (C) - Filtered	< 2.0 mg/L
Sulfide	< 0.01 mg/L
BOD at 5 days (mg/l or ppm)	3
Chemical Oxygen Demand (O2)	6.7 mg/L
Nitrogen (N) - Kjeldahl	1.1 mg/L
Oil and Grease	<1.0 mg/L
Soluble Fluoride (F)	0.32 mg/L
Silica (SiO2) - Colloidal	3.5 mg/L
Silica (SiO2)-Molybdate Reactive	33 mg/L
Mercury (Hg) - Total	<0.00050 mg/L
Acetic Acid	<3 mg/L
Butanoic Acid	<3 mg/L
Propionic Acid	<3 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power	Sample Number:	NW0701482
Big Stone City SD USA	Date Sampled:	7:00 am 30-Jan-2007
Sample Marked: Well 2 Sample #3	Date Received:	31-Jan-2007
SAP SoldTo Number: 0001008566	Date Completed:	12-Feb-2007

Water Analysis Report

Authorized by : Cheryl Y. Heard





Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 4 Sample #1
SAP SoldTo Number: 0001008566

Sample Number: NW0703827
Date Sampled: 7:30 am 28-Feb-2007
Date Received: 06-Mar-2007
Date Completed: 20-Mar-2007

Water Analysis Report

Cations/Metals	Filtered	Total
Aluminum (Al)	<0.1	<0.1 mg/L
Arsenic (As)		<0.030 mg/L
Barium (Ba)	<0.4	<0.4 mg/L
Boron (B)	0.2	0.2 mg/L
Cadmium (Cd)	<0.04	<0.04 mg/L
Calcium (Ca)	180	190 mg/L
Chromium (Cr)	<0.01	<0.01 mg/L
Copper (Cu)	0.02	0.07 mg/L
Iron (Fe)	<0.01	2.2 mg/L
Lead (Pb)	<0.2	<0.2 mg/L
Lithium (Li)	0.08	0.09 mg/L
Magnesium (Mg)	72	75 mg/L
Manganese (Mn)	0.19	0.20 mg/L
Molybdenum (Mo)	<0.1	<0.1 mg/L
Nickel (Ni)	<0.1	<0.1 mg/L
Phosphorus (P)	<1.1	<1.0 mg/L
Phosphorus (PO4)	<3.2	<3.1 mg/L
Potassium (K)	9.2	9.6 mg/L
Selenium (Se)		<0.010 mg/L
Silica (SiO2)	31.0	32.0 mg/L
Silver (Ag)		<0.030 mg/L
Sodium (Na)	18.0	19.0 mg/L
Strontium (Sr)	1.1	1.1 mg/L
Vanadium (V)	<0.53	<0.50 mg/L
Zinc (Zn)	0.05	0.07 mg/L
Calcium (CaCO3)	460	480 mg/L
Magnesium (CaCO3)	300	310 mg/L
Sodium (CaCO3)	40.0	42.0 mg/L
Calculated Hardness (CaCO3)	760	790 mg/L

Phosphates	Filtered	Total
Phosphate (PO4) - Total	<0.2 mg/L	<0.2 mg/L
Phosphate (PO4) - Ortho	<0.10 mg/L	<0.10 mg/L

Anions

Bromide (Br)	<2.0 mg/L
Chloride (Cl)	<2.0 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 4 Sample #1
SAP SoldTo Number: 0001008566

Sample Number: NW0703827
Date Sampled: 7:30 am 28-Feb-2007
Date Received: 06-Mar-2007
Date Completed: 20-Mar-2007

Water Analysis Report

Anions

Nitrate (NO3)	<2.0 mg/L
Nitrite (NO2)	<2.0 mg/L
Sulfate (SO4)	400 mg/L
Chloride (CaCO3)	<2.8 mg/L
Nitrate (CaCO3)	<1.6 mg/L
Sulfate (CaCO3)	410 mg/L

ALK - Alkalinity

Bicarbonate (CaCO3)	330 mg/L
Methyl Orange (CaCO3)	330 mg/L
Phenolphthalein (CaCO3)	<10 mg/L

Others

pH	7.3 pH Units
Conductivity	1400 µS/cm
Organic Carbon (C) - Total	4.2 mg/L
Ammonia (NH3)	1.5 mg/L
Ammonia (CaCO3)	4.4 mg/L
Suspended Solids (Total @ 105C)	5.4 mg/L
Soluble Fluoride (F)	0.26 mg/L
Silica (SiO2) - Colloidal	2.4 mg/L
Silica (SiO2)-Molybdate Reactive	30 mg/L
Mercury (Hg) - Total	<0.00050 mg/L
Sulfide	< 0.01 mg/L
Organic Carbon (C) - Filtered	2.7 mg/L
BOD at 5 days (mg/l or ppm)	2
Chemical Oxygen Demand (O2)	<5.0 mg/L
Oil and Grease	<1.0 mg/L
Acetic Acid	<3 mg/L
Butanoic Acid	<3 mg/L
Propionic Acid	<3 mg/L
Nitrogen (N) - Kjeldahl	<5.0 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 4 Sample #2
SAP SoldTo Number: 0001008566

Sample Number: NW0703829
Date Sampled: 7:20 am 02-Mar-2007
Date Received: 06-Mar-2007
Date Completed: 22-Mar-2007

Water Analysis Report

Cations/Metals	Filtered	Total
Aluminum (Al)	<0.1	<0.1 mg/L
Arsenic (As)		<0.032 mg/L
Arsenic (As) Filtered		<0.032 mg/L
Barium (Ba)	<0.4	<0.4 mg/L
Boron (B)	0.2	0.2 mg/L
Cadmium (Cd)	<0.04	<0.04 mg/L
Calcium (Ca)	170	180 mg/L
Chromium (Cr)	<0.01	<0.01 mg/L
Copper (Cu)	<0.01	<0.01 mg/L
Iron (Fe)	<0.01	2.5 mg/L
Lead (Pb)	<0.2	<0.2 mg/L
Lithium (Li)	0.07	0.09 mg/L
Magnesium (Mg)	68	73 mg/L
Manganese (Mn)	0.17	0.19 mg/L
Molybdenum (Mo)	<0.1	<0.1 mg/L
Nickel (Ni)	<0.1	<0.1 mg/L
Phosphorus (P)	<1.1	<1.0 mg/L
Phosphorus (PO4)	<3.2	<3.1 mg/L
Potassium (K)	8.5	9.6 mg/L
Selenium (Se)		<0.011 mg/L
Selenium (Se) Filtered		<0.011 mg/L
Silica (SiO2)	29.0	35.0 mg/L
Silver (Ag)		<0.032 mg/L
Silver (Ag) Filtered		<0.032 mg/L
Sodium (Na)	17.0	20 mg/L
Strontium (Sr)	0.99	1.2 mg/L
Vanadium (V)	<0.53	<0.50 mg/L
Zinc (Zn)	0.03	0.04 mg/L
Calcium (CaCO3)	440	460 mg/L
Magnesium (CaCO3)	280	300 mg/L
Sodium (CaCO3)	37.0	44 mg/L
Calculated Hardness (CaCO3)	720	760 mg/L
Phosphates		
Phosphate (PO4) - Total	<0.2 mg/L	0.20 mg/L
Phosphate (PO4) - Ortho	<0.10 mg/L	<0.10 mg/L

Authorized by : Karen B Harriman



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 4 Sample #2
SAP SoldTo Number: 0001008566

Sample Number: NW0703829
Date Sampled: 7:20 am 02-Mar-2007
Date Received: 06-Mar-2007
Date Completed: 22-Mar-2007

Water Analysis Report

Anions

Bromide (Br)	<2.0 mg/L
Chloride (Cl)	<2.0 mg/L
Nitrate (NO3)	<2.0 mg/L
Nitrite (NO2)	<2.0 mg/L
Sulfate (SO4)	380 mg/L
<i>Chloride (CaCO3)</i>	<2.8 mg/L
<i>Nitrate (CaCO3)</i>	<1.6 mg/L
<i>Sulfate (CaCO3)</i>	400 mg/L

ALK - Alkalinity

Bicarbonate (CaCO3)	380 mg/L
Methyl Orange (CaCO3)	380 mg/L
Phenolphthalein (CaCO3)	<10 mg/L

Others

pH	6.8 pH Units
Conductivity	1400 µS/cm
Organic Carbon (C) - Total	2.5 mg/L
Ammonia (NH3)	1.5 mg/L
<i>Ammonia (CaCO3)</i>	4.5 mg/L
Suspended Solids (Total @ 105C)	4.3 mg/L
Soluble Fluoride (F)	0.26 mg/L
Silica (SiO2) - Colloidal	4.9 mg/L
Silica (SiO2)-Molybdate Reactive	30 mg/L
Mercury (Hg) - Total	<0.00050 mg/L
Sulfide	< 0.01 mg/L
Organic Carbon (C) - Filtered	3.6 mg/L
BOD at 5 days (mg/l or ppm)	1
Chemical Oxygen Demand (O2)	8.3 mg/L
Nitrogen (N) - Kjeldahl	<5.0 mg/L
Oil and Grease	<1.0 mg/L
Acetic Acid	<3 mg/L
Butanoic Acid	<3 mg/L
Propionic Acid	<3 mg/L

Authorized by : Karen B Harriman



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 4 Sample #3
SAP SoldTo Number: 0001008566

Sample Number: NW0703828
Date Sampled: 2:00 pm 02-Mar-2007
Date Received: 06-Mar-2007
Date Completed: 20-Mar-2007

Water Analysis Report

Cations/Metals	Filtered	Total
Aluminum (Al)	<0.1	<0.1 mg/L
Arsenic (As)		<0.030 mg/L
Barium (Ba)	<0.4	<0.4 mg/L
Boron (B)	0.2	0.2 mg/L
Cadmium (Cd)	<0.04	<0.04 mg/L
Calcium (Ca)	180	180 mg/L
Chromium (Cr)	<0.01	<0.01 mg/L
Copper (Cu)	<0.01	<0.01 mg/L
Iron (Fe)	0.06	2.2 mg/L
Lead (Pb)	<0.2	<0.2 mg/L
Lithium (Li)	0.07	0.07 mg/L
Magnesium (Mg)	68	69 mg/L
Manganese (Mn)	0.17	0.18 mg/L
Molybdenum (Mo)	<0.1	<0.1 mg/L
Nickel (Ni)	<0.1	<0.1 mg/L
Phosphorus (P)	<1.1	<1.0 mg/L
Phosphorus (PO4)	<3.2	<3.1 mg/L
Potassium (K)	8.5	8.8 mg/L
Selenium (Se)		<0.010 mg/L
Silica (SiO2)	29.0	30.0 mg/L
Silver (Ag)		<0.030 mg/L
Sodium (Na)	17.0	17.0 mg/L
Strontium (Sr)	1.00	1.0 mg/L
Vanadium (V)	<0.53	<0.50 mg/L
Zinc (Zn)	0.02	0.03 mg/L
Calcium (CaCO3)	440	440 mg/L
Magnesium (CaCO3)	280	280 mg/L
Sodium (CaCO3)	37.0	38.0 mg/L
Calculated Hardness (CaCO3)	720	720 mg/L

Phosphates	Filtered	Total
Phosphate (PO4) - Total	<0.2 mg/L	<0.2 mg/L
Phosphate (PO4) - Ortho	<0.10 mg/L	<0.10 mg/L

Anions	
Bromide (Br)	<2.0 mg/L
Chloride (Cl)	<2.0 mg/L

Authorized by : Cheryl Y. Heard



Otter Tail Power
 Big Stone City SD USA
Sample Marked: Well 4 Sample #3
SAP SoldTo Number: 0001008566

Sample Number: NW0703828
Date Sampled: 2:00 pm 02-Mar-2007
Date Received: 06-Mar-2007
Date Completed: 20-Mar-2007

Water Analysis Report

Anions

Nitrate (NO3)	<2.0 mg/L
Nitrite (NO2)	<2.0 mg/L
Sulfate (SO4)	400 mg/L
Chloride (CaCO3)	<2.8 mg/L
Nitrate (CaCO3)	<1.6 mg/L
Sulfate (CaCO3)	420 mg/L

ALK - Alkalinity

Bicarbonate (CaCO3)	380 mg/L
Methyl Orange (CaCO3)	380 mg/L
Phenolphthalein (CaCO3)	<10 mg/L

Others

pH	7.0 pH Units
Conductivity	1400 µS/cm
Organic Carbon (C) - Total	2.8 mg/L
Ammonia (NH3)	1.5 mg/L
Ammonia (CaCO3)	4.4 mg/L
Suspended Solids (Total @ 105C)	2.7 mg/L
Soluble Fluoride (F)	0.26 mg/L
Silica (SiO2) - Colloidal	0.40 mg/L
Silica (SiO2)-Molybdate Reactive	30 mg/L
Mercury (Hg) - Total	<0.00050 mg/L
Sulfide	< 0.01 mg/L
Organic Carbon (C) - Filtered	3.7 mg/L
BOD at 5 days (mg/l or ppm)	2
Nitrogen (N) - Kjeldahl	<5.0 mg/L
Oil and Grease	<1.0 mg/L
Acetic Acid	<3 mg/L
Butanoic Acid	<3 mg/L
Propionic Acid	<3 mg/L
Chemical Oxygen Demand (O2)	5.7 mg/L

Authorized by : Cheryl Y. Heard