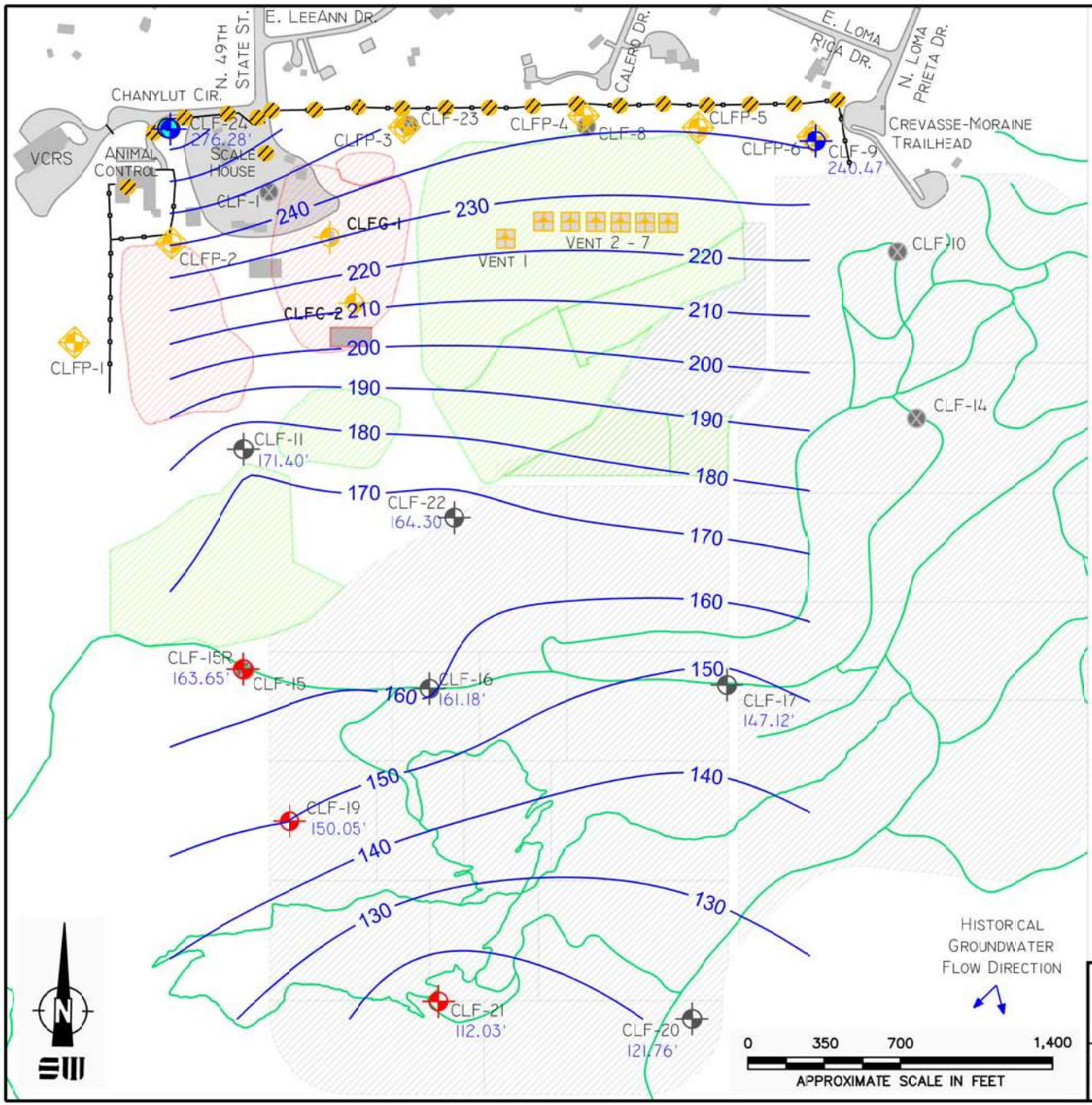


LEGEND

- ASSESSMENT MONITORING WELL
- BACKGROUND WELL
- DETECTION MONITORING WELL
- DRINKING WATER WELL
- DECOMMISSIONED MONITORING WELL
- AMBIENT AIR GAS MONITORING LOCATION (READINGS ALSO TAKEN AT EACH MONITORING WELL
- GAS WELL
- GAS PROBE
- GAS VENT
- APPROXIMATE CLOSED LANDFILL CELL LOCATION
- ACTIVE LANDFILL CELL
- PROPOSED LANDFILL CELL
- BUILDING
- ROAD SURFACE
- FENCE
- TRAIL
- GROUNDWATER CONTOURS
- 121.76' GROUNDWATER ELEVATION IN FEET MEASURED SEPTEMBER 9, 2019

CENTRAL LANDFILL
SITE PLAN

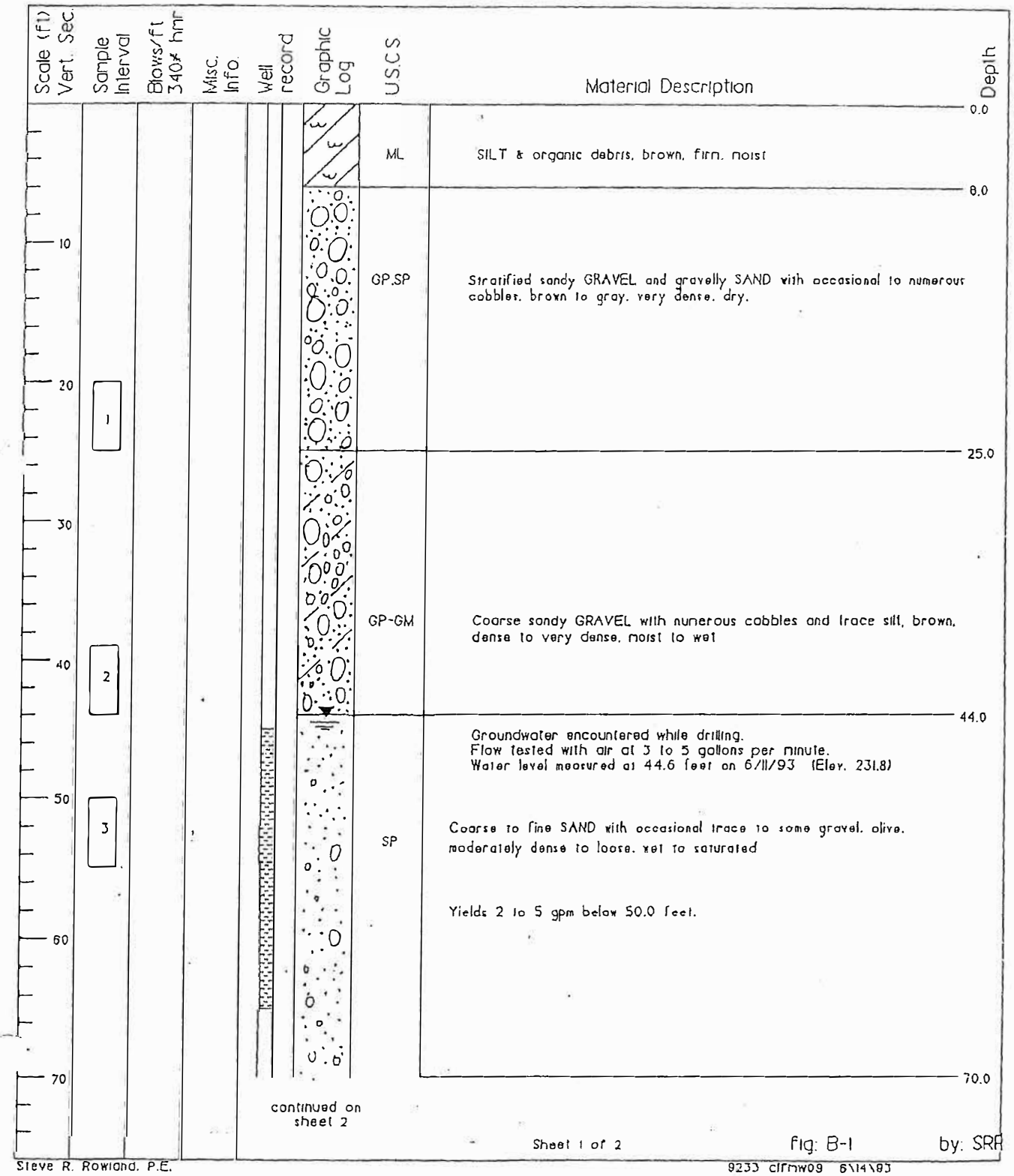
NOVEMBER 2019 | 101709-120.123

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

FIG. 2

GEOLOGIC LOG OF MONITOR WELL NO. 9

PROJECT	Central Landfill	BORING NO.	9	ELEV. GRND	276.4
LOCATION	Palmer Alaska	PAGE	1 of 2	ELEV. COLLAR	279.98
CLIENT	Mat-Su Borough	DATE BEGUN	3-25-93	TOTAL DEPTH	95.0
DRILLED BY	Tester Drilling	DATE END	3-26-93	COORD. NORTH	2774550.4
LOGGED BY	Steve Rowland	EQUIP. TYPE	Drilltech D40K	COORD EAST	1780511.3
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		



Sheet 1 of 2 Fig: B-1 by: SRR

Steve R. Rowland, P.E.

9233 cirmw09 6\14\93

GEOLOGIC LOG OF MONITOR WELL NO. 9

PROJECT	Central Landfill	BORING NO	9	ELEV GRND	276.4
LOCATION	Palmer Alaska	PAGE	2 of 2	ELEV COLLAR	279.98
CLIENT	Mat-Su Borough	DATE BEGUN	3-25-93	TOTAL DEPTH	95.0
DRILLED BY	Tester Drilling	DATE END	3-26-93	COORD. NORTH	2774550.4
LOGGED BY	Steve Rowland	EQUIP TYPE	Drilltech D40K	COORD EAST	1780511.3
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert Sec	Sample Interval	Blows/ft 340# hmr	Misc Info	Well record	Graphic Log	USCS	Material Description	Depth
								70.0
	4					SP	Coarse to fine SAND with occasional trace to some gravel. olive. moderately dense to loose. wet to saturated	
								76.0
80								
	5		LL-27 PI-5	85.0		SC-SM CL-ML	Stratified clayey fine SAND & Silty fine SAND. gray. dense. wet Becomes dryer with depth and clay content increases. Does not produce water. Hydraulic conductivity: 3.37 (10E -7 cm/sec)	
90								
								95.0
							total depth	
00								
110								

fig B-1 by SRR

ieve R Rowland, P.E

9233 clfmw09 6\14\93

GEOLOGIC LOG OF MONITOR WELL NO. 11

PROJECT	Central Landfill	BORING NO.	11	ELEV. GRND.	278.3
LOCATION	Palmer Alaska	PAGE	1 of 2	ELEV. COLLAR	280.11
CLIENT	Mat-Su Borough	DATE BEGUN	2-26-93	TOTAL DEPTH	115.25
DRILLED BY	Tester Drilling	DATE END	2-26-93	COORD NORTH	2773136.9
LOGGED BY	Steve Rowland	EQUIP TYPE	Driltech D40K	COORD EAST	1778162.0
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert. Sec.	Sample Interval	Blows/ft 340# hmr	Misc. Info.	Well record	Graphic Log	U.S.C.S.	Material Description	Depth
								0.0
						ML	SILT & organic debris, brown, soft, moist	1.5
10, 20, 30						GP	Coarse sandy GRAVEL with numerous cobbles and occasional boulders, gray to brown, dense to very dense, dry	34.2
						SP	Gravelly SAND, olive dense, dry, occasional cobbles	37.0
40, 50, 80, 70						GP	Coarse sandy GRAVEL with numerous cobbles, trace silt, brown, dense, dry to slightly moist	70.0

continued on sheet 2

fig: B-3 by SRR

Steve R. Rowland, P.E.

8233 clrnwll 6\14\93

GEOLOGIC LOG OF MONITOR WELL NO. 11

PROJECT	Central Landfill	BORING NO.	11	ELEV. GRND.	278.3
LOCATION	Palmer Alaska	PAGE	2 of 2	ELEV. COLLAR	280.11
CLIENT	Mat-Su Borough	DATE BEGUN	2-26-93	TOTAL DEPTH	115.25
DRILLED BY	Tester Drilling	DATE END	2-26-93	COORD. NORTH	2773136.9
LOGGED BY	Steve Rowland	EQUIP. TYPE	Drilltech D40K	COORD. EAST	1778162.0
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert. Sec.	Sample Interval	Blows/ft 340# hmr	Misc. Info	Well record	Graphic Log	U.S.C.S.	Material Description	Depth
								70.0
						GP		75.0
80						GP-GM	Sandy GRAVEL with trace silt, numerous cobbles and boulders, brown dense, dry to slightly moist	90.0
90						GM	Sandy GRAVEL with some silt, numerous cobbles, gray, dense, dry	100.0
100						SP	Fine to medium SAND, olive, dense, dry	103.0
						GP.SP	Sandy GRAVEL & gravelly SAND, gray, very dense, dry	112.0
110						GP-GM	Groundwater encountered while drilling. Not able to develop significant yield using air. Water level measured at 115.25 feet on 6/11/93 (ELEV. 163.05) Sandy GRAVEL with trace silt, numerous cobbles and boulders, brown, dense, dry to saturated below 115 feet.	124.0
120				128.5		CL	Gravelly lean CLAY, gray, very hard, moderately plastic, moist to wet Groundwater yield ceased below 124.0 feet	128.0
130							total depth	

NOTE: For additional information, refer to Geologic Log of Test Boring No. 2

MW No. 11 was drilled within 10 feet of TB No. 2

MATERIAL DESCRIPTION Approx. Elevation:	Depth, Ft.	Symbol	Samples	Ground Water	Depth, Ft.	Penetration Resistance (140 lb. weight, 30" drop) ▲ Blows per foot 0 25 50 75 100
Gray, *Poorly Graded Gravel with Sand (GP)*; dry					5	
	10.0				10	
Gray to brown, *Poorly Graded Gravel with Sand (GP)*; dry						
	15.0				15	
Brown, *Poorly Graded Sand with Gravel (SP)*; dry					20	
	25.0				25	
Gray, *Poorly Graded Gravel (GP); dry*					30	
					35	
					40	
	45.0				45	
Brown, *Poorly Graded Sand with Gravel (SP)*; dry						
CONTINUED NEXT PAGE						0

■ PID Reading (ppm)

LEGEND

* Sample not recovered
3" O.D. Split Spoon Sample
Ground Water Level At Time Of Drilling
Static Water Level
Solid Casing, Sand Pack
Solid Casing and Annular Seal
Slotted Section, Filter Sand
Solid Casing, Cuttings Backfill

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Matanuska-Susitna Borough
Palmer, Alaska

LOG OF BORING MW-15R

July 2017 32-1-17685-207

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2
Sheet 1 of 3

MATERIAL DESCRIPTION Approx. Elevation:	Depth, Ft.	Symbol	Samples	Ground Water	Depth, Ft.	Penetration Resistance (140 lb. weight, 30" drop) ▲ Blows per foot 0 25 50 75 100
Brown, *Poorly Graded Sand (SP)*; moist	54.0				55	
Gray to brown, *Poorly Graded Gravel with Sand (GP)*; dry	58.0				60	
Brown, *Poorly Graded Sand (SP)*; dry	65.0				65	
Gray to brown, *Poorly Graded Gravel with Sand (GP)*; dry	68.0				70	
Brown, *Poorly Graded Sand (SP)*; dry to moist	72.0				75	
					80	
					85	
					90	
					95	
CONTINUED NEXT PAGE						0 ■ PID Reading (ppm)

LEGEND

- * Sample not recovered
- 3" O.D. Split Spoon Sample
- Ground Water Level At Time Of Drilling
- Static Water Level
- Solid Casing, Sand Pack
- Solid Casing and Annular Seal
- Slotted Section, Filter Sand
- Solid Casing, Cuttings Backfill

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Matanuska-Susitna Borough
Palmer, Alaska

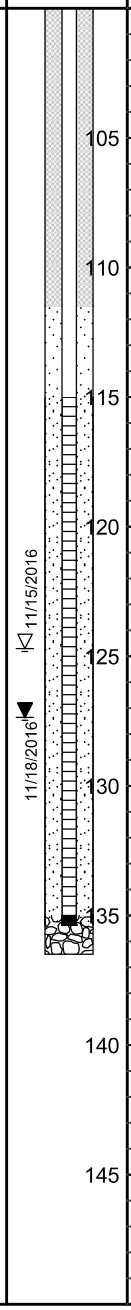
LOG OF BORING MW-15R

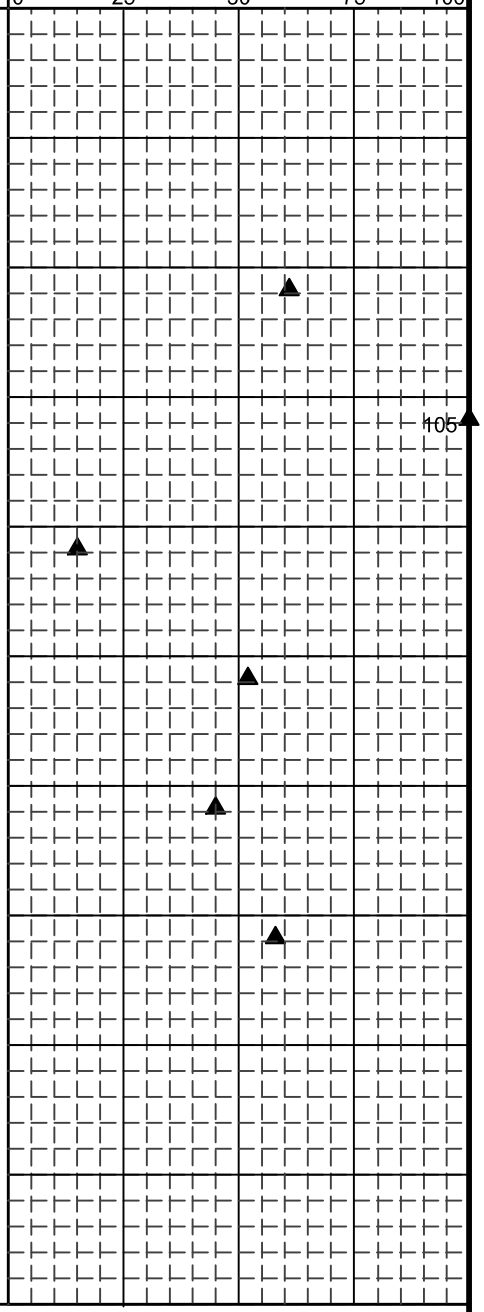
July 2017 32-1-17685-207

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2
Sheet 2 of 3

MATERIAL DESCRIPTION Approx. Elevation:	Depth, Ft.	Samples
Brown, *Poorly Graded Gravel with Sand (GP)*; dry	100.0	
Very dense, brown, *Poorly Graded Gravel with Silt and Sand (GP-GM)*; moist	110.0	S1, S2
Medium dense, brown, *Poorly Graded Gravel with Sand (SP)*; dry	120.0	S3
Medium dense, brown, *Poorly Graded Sand (SP)*; moist to wet	125.0	S4
Dense, brown to gray, *Poorly Graded Gravel with Sand (GP)*; wet	130.0	S5
Very dense, gray, *Poorly Graded Gravel with Sand (GP)*; wet	135.0	S6
Bottom of Boring Boring Completed 11/15/2016	136.5	





■ PID Reading (ppm)

LEGEND

- * Sample not recovered
- 3" O.D. Split Spoon Sample
- Ground Water Level At Time Of Drilling
- Static Water Level
- Solid Casing, Sand Pack
- Solid Casing and Annular Seal
- Slotted Section, Filter Sand
- Solid Casing, Cuttings Backfill

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Matanuska-Susitna Borough
Palmer, Alaska

LOG OF BORING MW-15R

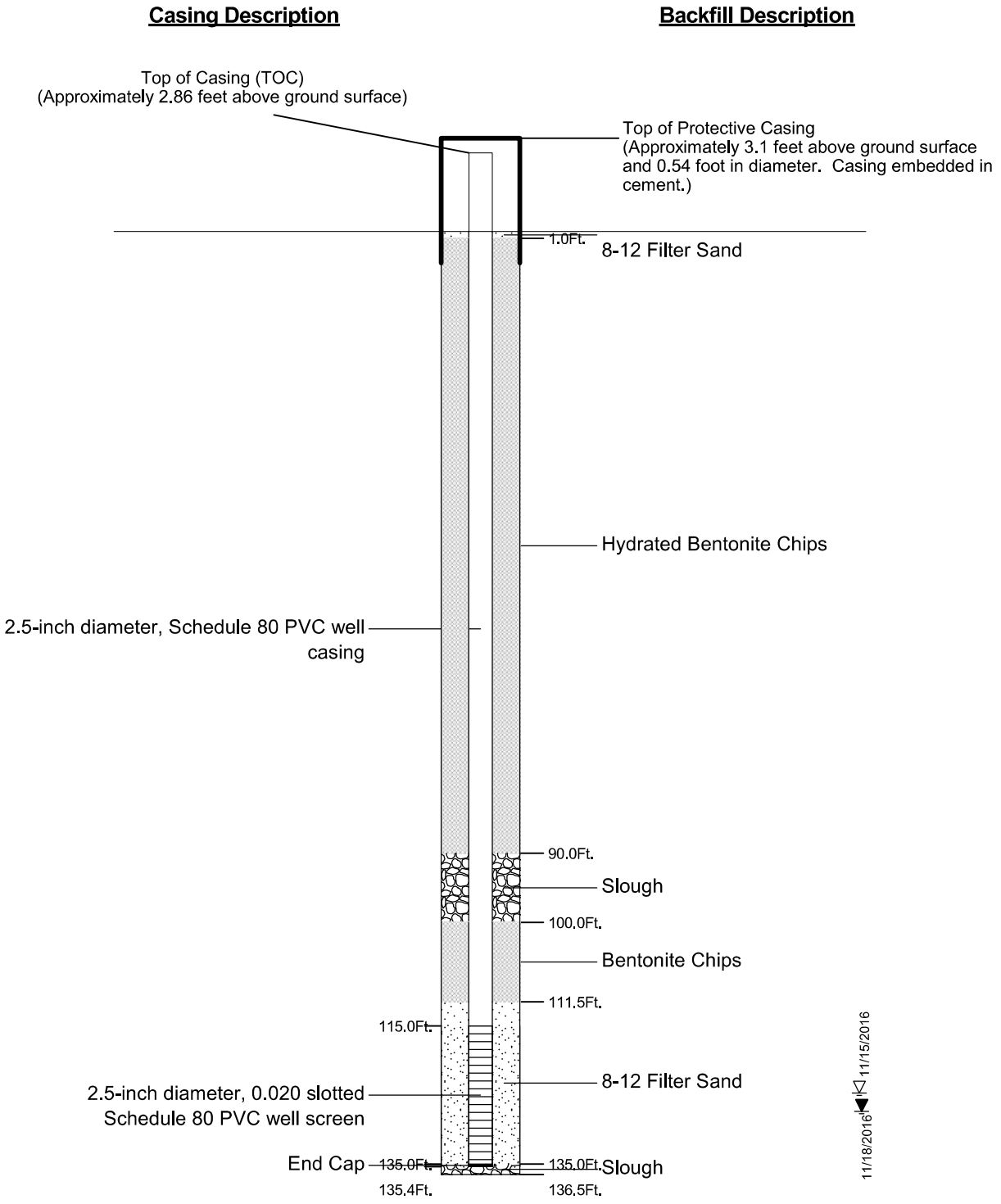
July 2017 32-1-17685-207

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2
Sheet 3 of 3

REV 3 - Approved for Submittal

ENVIRONMENTAL LOG BORING MW 15R.GPJ S&W_GEO1.GDT 6/26/17



LEGEND

Groundwater Level ATD

Static Groundwater Level

NOTE: All joints use threaded connections.

Central Landfill
Matanuska-Susitna Borough
Palmer, Alaska

MONITORING WELL MW-15R
CONSTRUCTION DETAIL

July 2017 | 32-1-17685-207

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 3

GEOLOGIC LOG OF MONITOR WELL NO. 16

PROJECT	Central Landfill	BORING NO.	16	ELEV. GRND.	279.9
LOCATION	Palmer Alaska	PAGE	1 of 4	ELEV. COLLAR	282.88
CLIENT	Mat-Su Borough	DATE BEGUN	3-13-93	TOTAL DEPTH	278.0
DRILLED BY	Tester Drilling	DATE END	3-19-93	COORD. NORTH	2772035.8
LOGGED BY	Steve Rowland	EQUIP TYPE	Driltech D40K	COORD. EAST	1779015.9
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert. Sec.	Sample Interval	Blows/ft 340# hmr	Misc. Info.	Well record	Graphic Log	U.S.C.S.	Material Description	Depth
						ML	SILT, brown-tan, firm, dry	0.0 – 2.5
10, 20, 30, 40, 50, 60, 70						GP,SP	Stratified coarse sandy GRAVEL with numerous cobbles and gravelly SAND brown to gray, very dense, dry	2.5 – 70.0

continued on sheet 2

fig: B-8 by: SRR

Steve R Rowland, P E

GEOLOGIC LOG OF MONITOR WELL NO. 16

PROJECT	Central Landfill	BORING NO.	16	ELEV. GRND.	279.9
LOCATION	Palmer Alaska	PAGE	2 of 4	ELEV. COLLAR	282.88
CLIENT	Mat-Su Borough	DATE BEGUN	3-13-93	TOTAL DEPTH	278.0
DRILLED BY	Tester Drilling	DATE END	3-19-93	COORD. NORTH	2772035.8
LOGGED BY	Steve Rowland	EQUIP. TYPE	Driltech D40K	COORD EAST	1779015.9
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert Sec.	Sample Interval	Blows/ft 340# hmr	Misc. Info.	Well record	Graphic Log	U.S.C.S.	Material Description	Depth
								70.0
						GP,SP	Stratified coarse sandy GRAVEL with numerous cobbles and gravelly SAND brown to gray, very dense, dry	
80								80.0
90						GP-GM	Sandy GRAVEL with numerous cobbles & trace silt, brown, dense, dry	
100								
110								
								112.0
120	1					SP	Fine to medium SAND, olive, moderately dense, dry to slightly moist becoming moist below 123 feet. Static water level record at 122.0 feet on 3/19/93 thru 3/22/93 for lower confined aquifer prior to being sealed off with grout.	
								128.0
130	2					SP	Groundwater encountered while drilling. Yields greater than 20 gpm. Water level measured at 128.5 feet on 6/11/93 (ELEV. 151.40) Water level measured at 130.0 feet on 3/25/93 Gravelly SAND, olive, dense, saturated	
								138.0
140	3					GP	Sandy GRAVEL with numerous cobbles, brown, dense, saturated	140

continued on sheet 3

Fig: B-8 by: SRR

GEOLOGIC LOG OF MONITOR WELL NO. 16

PROJECT	Central Landfill	BORING NO	16	ELEV. GRND.	279.9
LOCATION	Palmer Alaska	PAGE	3 of 4	ELEV. COLLAR	282.88
CLIENT	Mat-Su Borough	DATE BEGUN	3-13-93	TOTAL DEPTH	278.0
DRILLED BY	Tester Drilling	DATE END	3-19-93	COORD. NORTH	2772035.8
LOGGED BY	Steve Rowland	EQUIP. TYPE	Driltech D40K	COORD. EAST	1779015.9
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert. Sec.	Sample Interval	Blows/ft 340# hmr	Misc. Info	Well record	Graphic Log	U.S.C.S.	Material Description	Depth
								140.0
150, 160						GP.SP	Stratified coarse sandy GRAVEL with numerous cobbles and gravelly SAND brown to gray, very dense, dry	162.0
170, 180				170.0		SP SP-SM	Fine to medium SAND with occasional trace silt & gravel, brown, dense, saturated	182.0
190	4					SP-SM GP-GM	Stratified gravelly SAND & sandy GRAVEL with trace silt, brown, dense, saturated	195.0
200, 210	5					SC.GC	Clayey GRAVEL & clayey SAND, gray, very dense, wet to dry below 205 feet.	210

continued on sheet 4

Fig. B-8 by: SRR

Steve R. Rowland, P.E.

9233 clfnw16 6\17\93

GEOLOGIC LOG OF MONITOR WELL NO. 16

PROJECT	Central Landfill	BORING NO	16	ELEV GRND.	279.9
LOCATION	Palmer Alaska	PAGE	4 of 4	ELEV COLLAR	282.88
CLIENT	Mat-Su Borough	DATE BEGUN	3-13-93	TOTAL DEPTH	278.0
DRILLED BY	Tester Drilling	DATE END	3-19-93	COORD NORTH	2772035.8
LOGGED BY	Steve Rowland	EQUIP TYPE	Driltech D40K	COORD EAST	1779015.9
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert Sec	Sample Interval	Blows/ft 340# hmr	Misc Info	Well record	Graphic Log	U.S.C.S	Material Description	Depth
								210
220						SC,GC	Clayey GRAVEL & clayey SAND, gray, very dense, wet to dry below 203 feet.	223.0
230	6		NP			ML	Silty GRAVEL with some sand, gray, very dense, dry to moist Hydraulic conductivity: 1.45 (10E -4 cm/sec)	240.0
240, 250, 260	7					SP SP-SM	Fine to coarse SAND with occasional trace silt, olive, dense, saturated Extreme sand heave while drilling. Yields in excess of 30 gpm mixed sand and water during test flow with air.	
270						SP	Gravelly SAND, olive, dense, saturated Yields greater than 50 gpm.	278.0
280							total depth	

Fig B-8 by SRR

Steve R. Rowland, P.E.

9233 clfmw16 6\17\93

GEOLOGIC LOG OF MONITOR WELL NO. 17

PROJECT	Central Landfill	BORING NO.	17	ELEV. GRND.	224.0
LOCATION	Palmer Alaska	PAGE	1 of 2	ELEV. COLLAR	226.56
CLIENT	Mat-Su Borough	DATE BEGUN	3-8-93	TOTAL DEPTH	136.0
DRILLED BY	Tester Drilling	DATE END	3-10-93	COORD. NORTH	2772056.1
LOGGED BY	Steve Rowland	EQUIP. TYPE	Driltech D40K	COORD. EAST	1780382.5
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert. Sec	Sample Interval	Blows/ft 340# hmr	Misc. Info.	Well record	Graphic Log	U.S.C.S.	Material Description	Depth
						ML	SILT, brown-tan, firm, dry	0.0 – 2.5
10, 20	1					GP,SP	Stratified coarse sandy GRAVEL with numerous cobbles and gravelly SAND brown to gray, very dense, dry	2.5 – 30.0
30, 40, 50, 60, 70	2					GP GP-GM	Coarse sandy GRAVEL with numerous cobbles & occasional trace silt, gray to tan, very dense, dry to saturated below 87 feet	30.0 – 70.0

continued on sheet 2

Fig: B-9 by: SRR

Steve R. Rowland, P.E.

8233 clfnw17 6\18\93

GEOLOGIC LOG OF MONITOR WELL NO. 17

PROJECT	Central Landfill	BORING NO.	17	ELEV. GRND.	224.0
LOCATION	Palmer Alaska	PAGE	2 of 2	ELEV. COLLAR	226.56
CLIENT	Mat-Su Borough	DATE BEGUN	3-8-93	TOTAL DEPTH	136.0
DRILLED BY	Tester Drilling	DATE END	3-10-93	COORD. NORTH	2772056.1
LOGGED BY	Steve Rowland	EQUIP. TYPE	Drilltech D40K	COORD. EAST	1780382.5
DRILLER	Tim Tester	DRILL METHOD	Reverse Circ.		

Scale (ft) Vert. Sec.	Sample Interval	Blows/ft 340# hrr	Misc. Info.	Well record	Graphic Log	U.S.C.S.	Material Description	Depth
								70.0
80						GP GP-GM	Coarse sandy GRAVEL with numerous cobbles & occasional trace silt. gray to tan. very dense, dry to saturated below 87 feet	
90							Groundwater encountered while drilling. Yields greater than 10 gpm at 100 feet below ground surface. Water level measured at 87.7 feet on 6/11/93 (ELEV. 136.62)	
100								103.0
110	3					SP	Medium to coarse SAND. olive. dense. saturated	
120								
130						GP	Coarse sandy GRAVEL with numerous cobbles. gray. dense. saturated	130.0
						GC	Clayey GRAVEL. gray. very dense. saturated to moist No groundwater production below 133.0 feet.	133.0
				136			total depth	136.0
140								

Fig. B-9 by: SDD

MATERIAL DESCRIPTION	Depth, Ft.	Symbol	Samples	Ground Water	Depth, Ft.	Penetration Resistance (340 lb. weight, 30" drop) ▲ Blows per foot (0 25 50 75 100)
Medium to light brown, slightly silty, sandy GRAVEL; damp; GW-GM			S1	10/23/2000	5, 10, 15, 20, 25, 30, 35, 40, 45	
Light brown, slightly gravelly, silty SAND; damp	52.0		S2	10/19/2000	50, 55, 60, 65	
Hard, gray SILT; moist	70.0		S3		70	
Bottom of Boring Boring Completed 10/19/2000	72.0				75	0 100 200 300 400

LEGEND

- * Sample Not Recovered
- 2" O.D. Split Spoon Sample
- 3" O.D. Split Spoon Sample
- Surface Seal
- Solid Casing and Annular Sealant
- Well Screen and Filter Sand
- Cuttings Backfill
- Ground Water Level At Time of Drilling
- Static Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

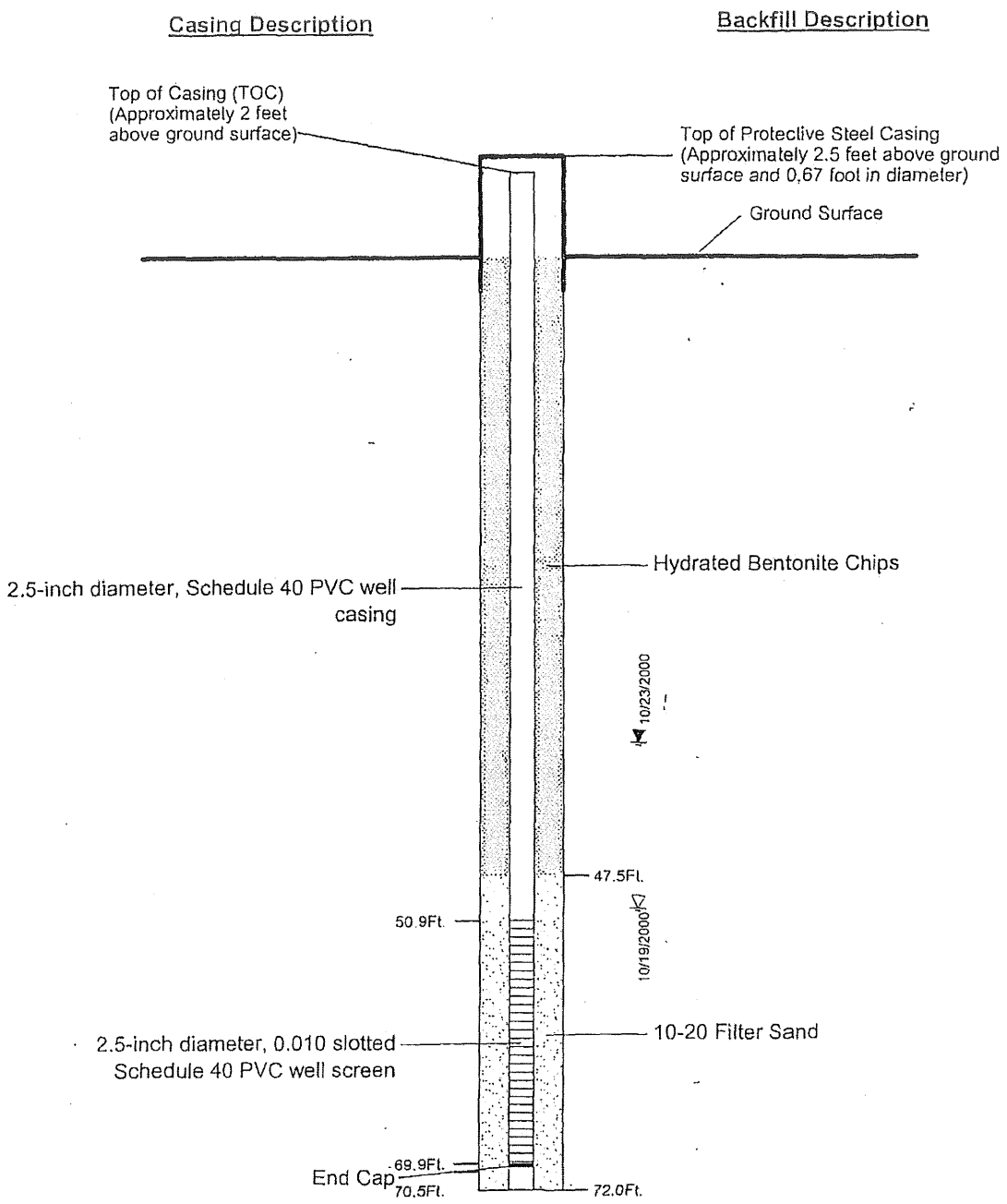
LOG OF BORING NO. B19

November 2000 Y-6185-11

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 3

MASTER LOG Y6185-1.GPJ SHAN WIL.GDT 12/1/00



LEGEND

▽ Ground Water Level At Time of Drilling

▼ Static Ground Water Level

NOTE: All joints used threaded connections

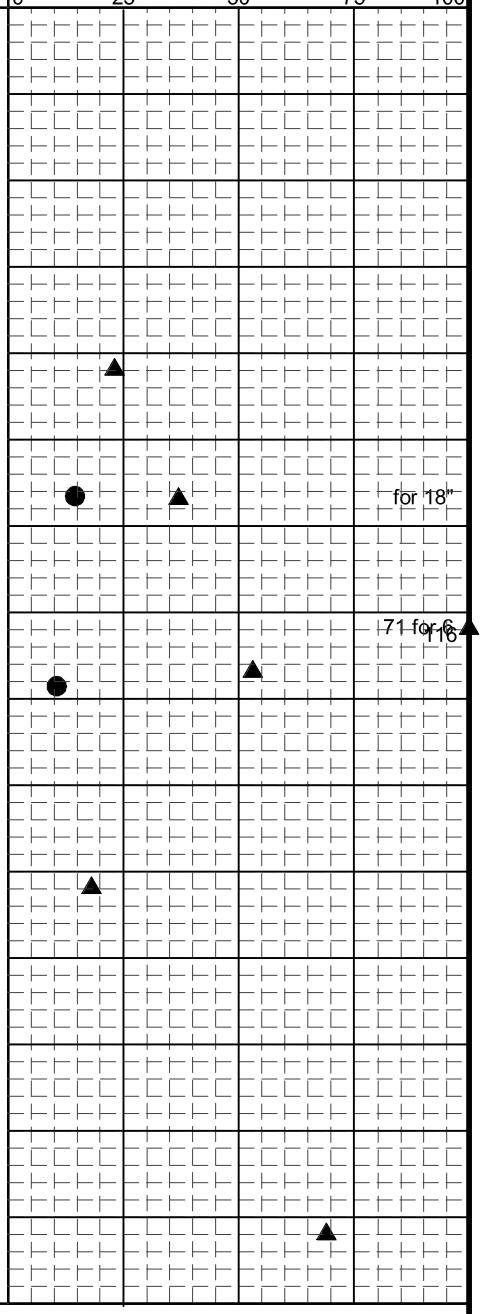
Central Landfill Palmer, Alaska	
MONITORING WELL MW-19 CONSTRUCTION DETAIL	
November 2000	Y-6185-11
SHANNON & WILSON, INC. Geotechnical and Environmental Consultants	Fig. 4

MATERIAL DESCRIPTION Elevation: GPS 230 Ft.	Depth, Ft.	Samples
Brown, gravelly, silty SAND; frozen	2.5	
Medium dense, lt. brown, silty, sandy coarse GRAVEL, with cobbles, trace clay; moist	25.0	S1, SS1, S2, SS2*
Dense to very dense, lt. brown silty, sandy subrounded GRAVEL, trace cobbles; moist	39.5	
Medium dense, brown, slightly gravelly, silty fine SAND, trace cobbles; moist	43.0	
Medium dense, lt. brown, slightly silty fine SAND; moist, occasional gravelly lenses	65.0	S3
Medium dense to very dense, mixed brown, subrounded gravelly SAND; moist		S4

CONTINUED NEXT PAGE

Ground Water

Depth, Ft.: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70



LEGEND

* Sample not recovered

3" O.D. Split Spoon Sample

Static Water Level

Solid Casing, Sand Pack

Solid Casing and Annular Seal

Slotted Section, Filter Sand

Solid Casing, Cuttings Backfill

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

LOG OF BORING 20

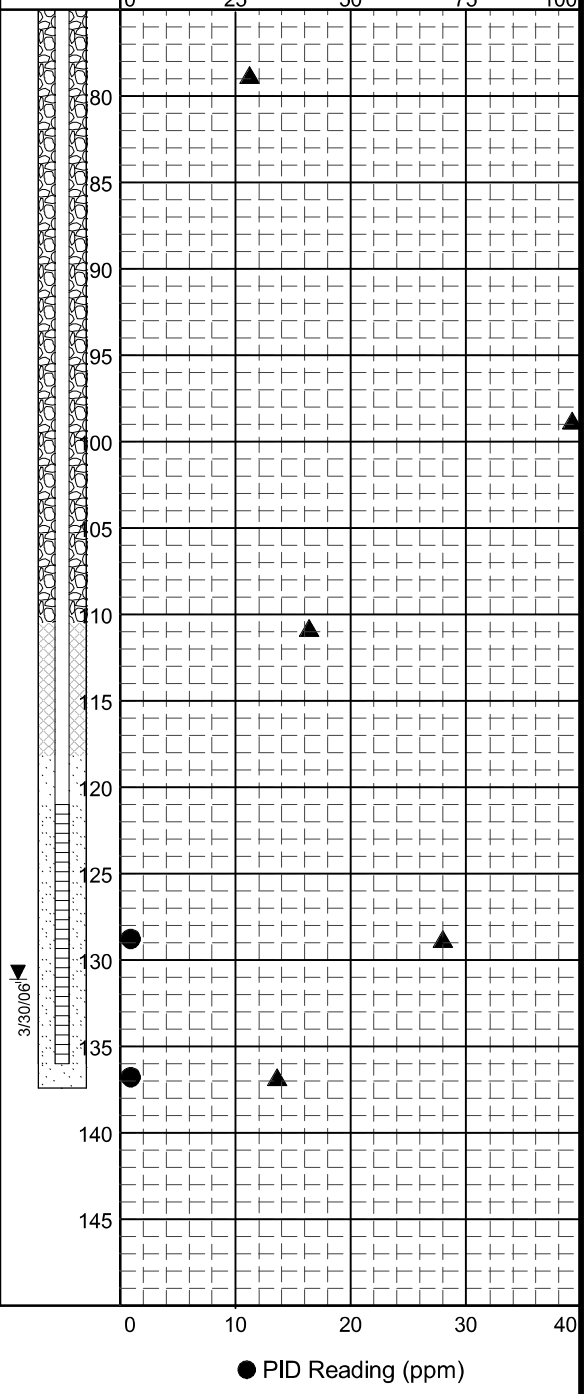
May 2006 | 32-1-16721-021

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 1
Sheet 1 of 2

ENVIRONMENTAL LOG 16721NEWWELLS.GPJ S&W_GEO1.GDT 4/16/15

MATERIAL DESCRIPTION Elevation: GPS 230 Ft.	Depth, Ft.	Samples
Lt. brown, slightly silty fine SAND; moist	79.1	S5
Brown gravelly SAND to sandy subrounded GRAVEL; moist; gravel content trending higher with depth	80.0	
Very dense, gray to lt. brown, coarse sandy subrounded GRAVEL, with cobbles; moist	96.0	S6
Dense to very dense, mixed brown, subrounded gravelly coarse SAND, trace cobbles; moist	108.0	S7
Dense, mixed brown, subrounded gravelly coarse SAND, trace silt and cobbles; wet	131.0	S8
		S9
Bottom of Boring Boring Completed 3/30/06	137.5	



LEGEND

* Sample not recovered

3" O.D. Split Spoon Sample

Static Water Level

Solid Casing, Sand Pack

Solid Casing and Annular Seal

Slotted Section, Filter Sand

Solid Casing, Cuttings Backfill

NOTES

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3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

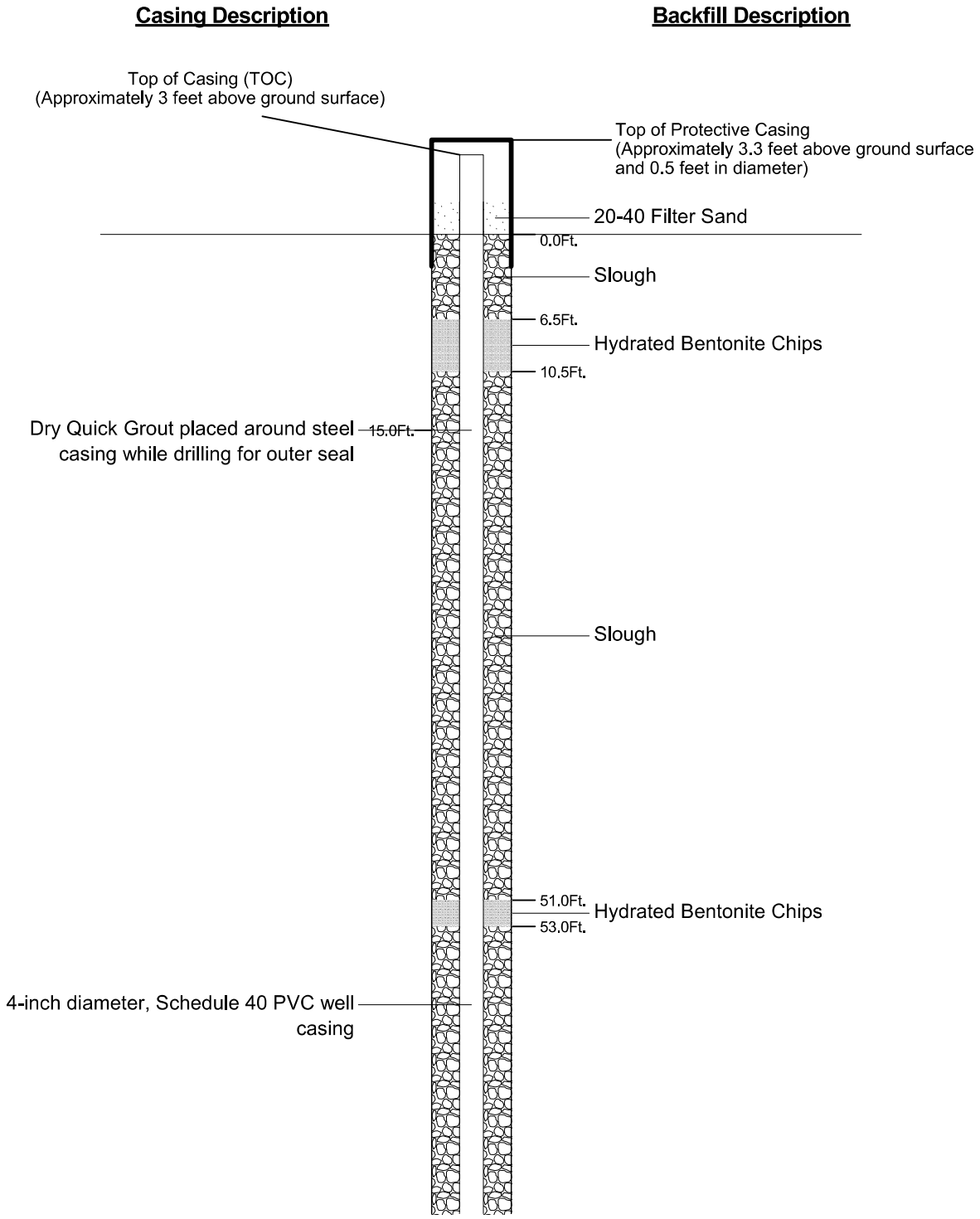
LOG OF BORING 20

May 2006 | 32-1-16721-021

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 1
Sheet 2 of 2

ENVIRONMENTAL LOG 16721NEWWELLS.GPJ S&W_GEO1.GDT 4/16/15



LEGEND

▽ Groundwater Level ATD

▼ Static Groundwater Level

NOTE: All joints use threaded connections.

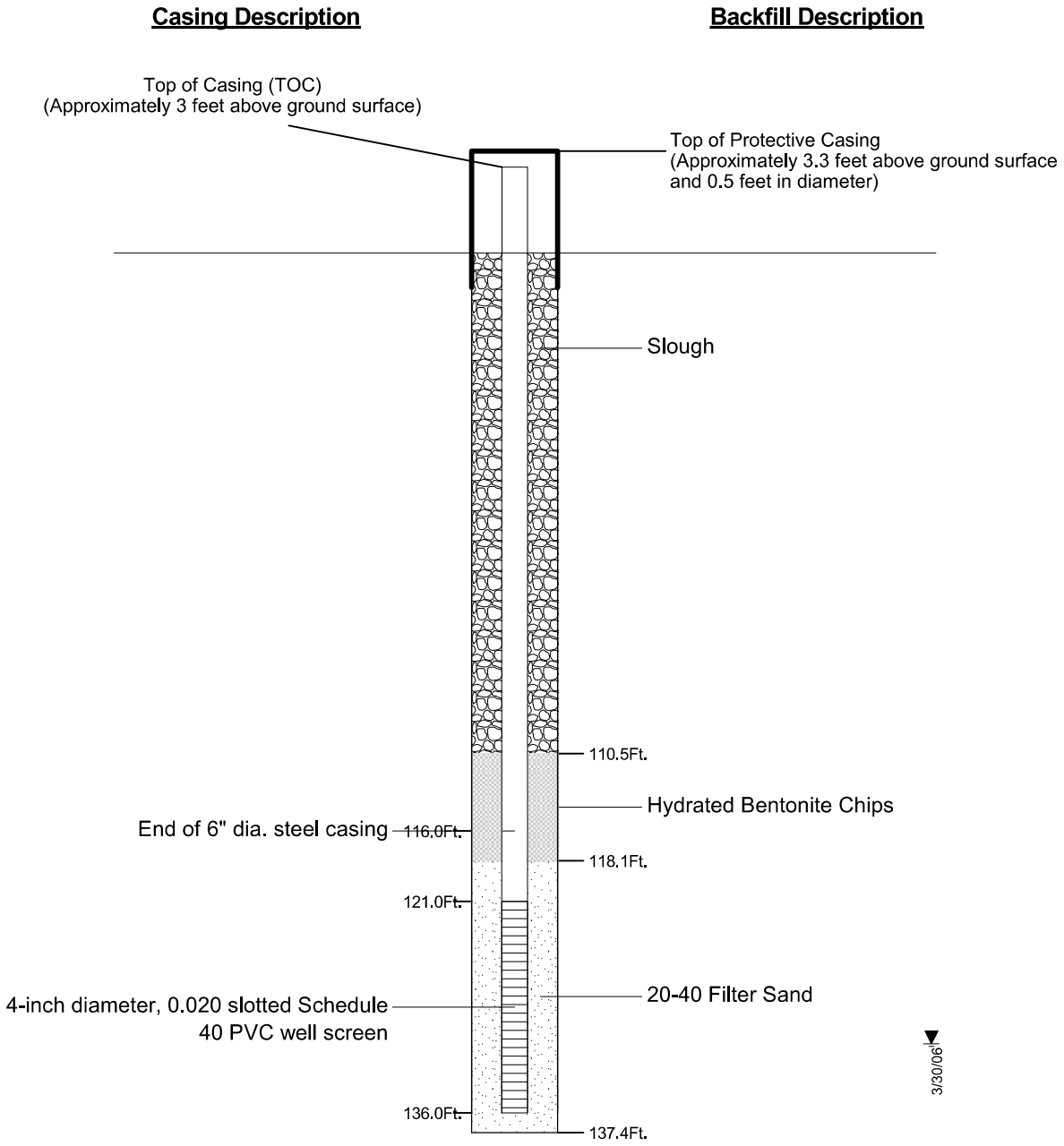
Central Landfill
Palmer, Alaska

MONITORING WELL 20
CONSTRUCTION DETAIL

May 2006 32-1-16721-021

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 2
Sheet 1 of 2



LEGEND

▽ Groundwater Level ATD

▼ Static Groundwater Level

NOTE: All joints use threaded connections.

Central Landfill
Palmer, Alaska

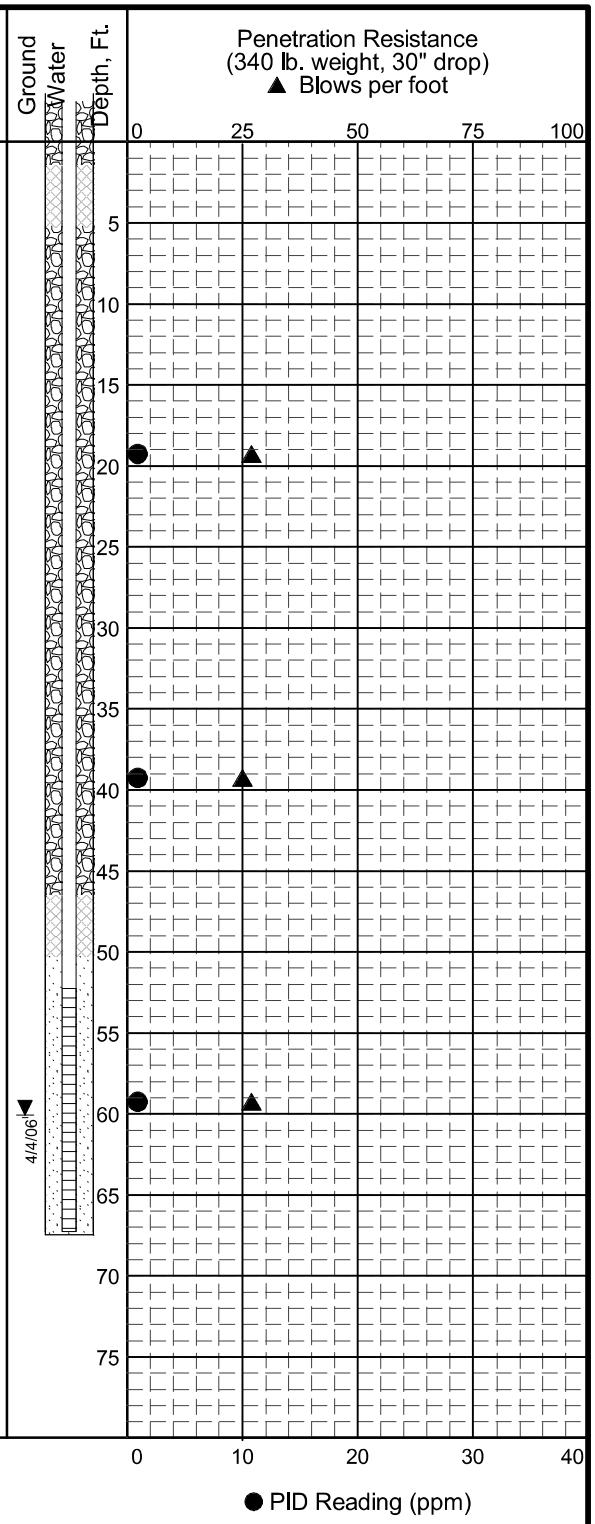
MONITORING WELL 20
CONSTRUCTION DETAIL

May 2006 32-1-16721-021

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 2
Sheet 2 of 2

MATERIAL DESCRIPTION Elevation: GPS 197 Ft.	Depth, Ft.	Samples
Medium dense, mixed brown, coarse sandy subrounded GRAVEL to gravelly SAND, with cobbles; moist		S1
	36.5	
Very dense, cobbly, sandy GRAVEL; moist	38.5	S2
Medium dense, mixed brown and green, subrounded gravelly coarse SAND; moist	39.6	
Mixed brown and green, slightly gravelly to gravelly coarse SAND, with lenses of lt. brown, medium to fine SAND, trace silt; moist		
	54.0	
Medium dense, mixed brown and green, subrounded gravelly coarse SAND; moist		
	59.5	S3
Medium dense, mixed brown and green, subrounded gravelly coarse SAND; wet		
	70.0	
Brown, medium to fine SAND; wet; heaving		
	73.0	
Bottom of Boring Boring Completed 4/4/06		



LEGEND

* Sample not recovered

3" O.D. Split Spoon Sample

Static Water Level

Solid Casing, Sand Pack

Solid Casing and Annular Seal

Slotted Section, Filter Sand

Solid Casing, Cuttings Backfill

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
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4. USC letter symbol based on visual classification.

Central Landfill

Palmer, Alaska

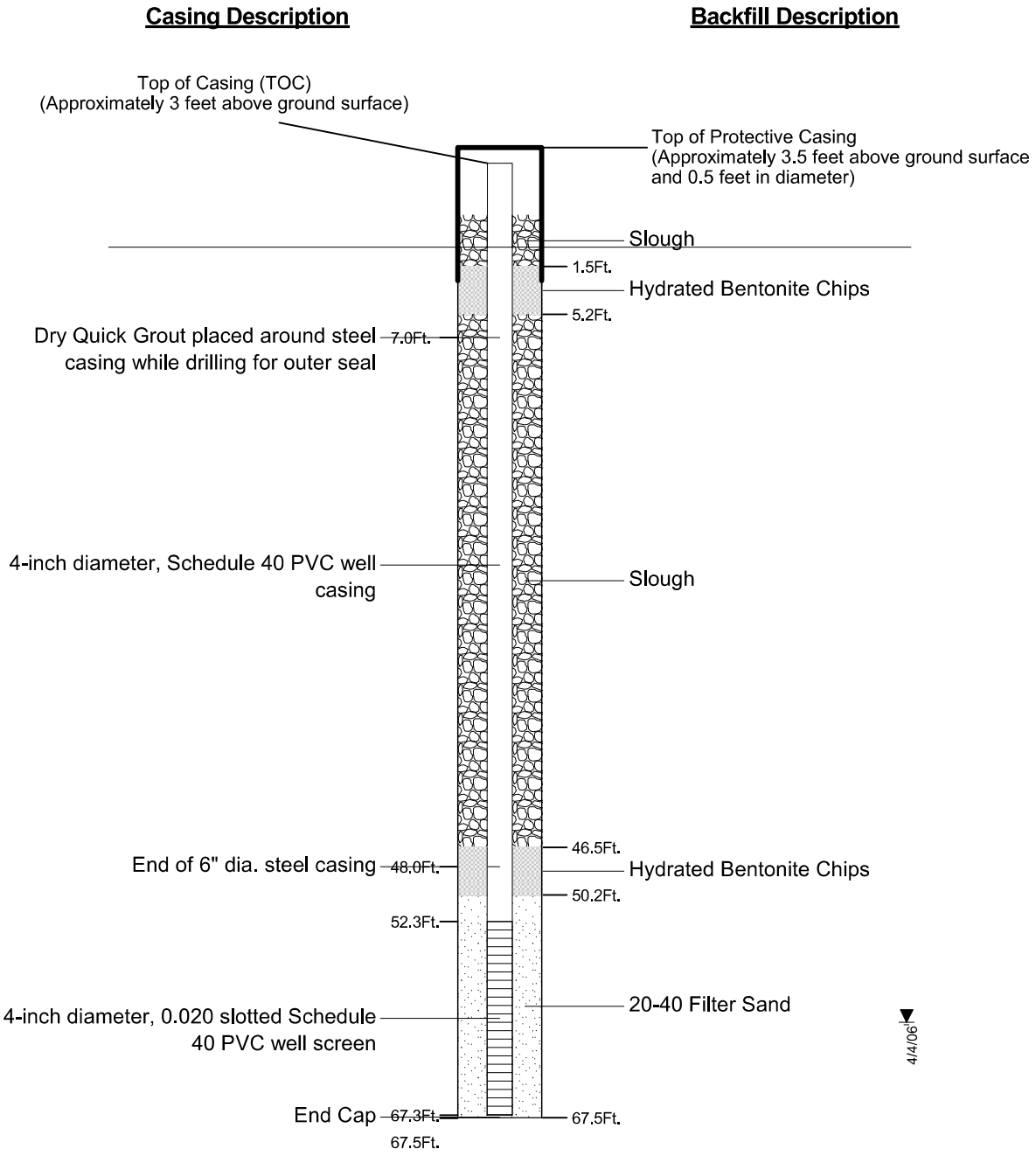
LOG OF BORING 21

May 2006 32-1-16721-021

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 2

ENVIRONMENTAL LOG 16721NEWWELLS.GPJ S&W_GEO1.GDT 4/16/15



LEGEND

▽ Groundwater Level ATD

▼ Static Groundwater Level

NOTE: All joints use threaded connections.

Central Landfill
Palmer, Alaska

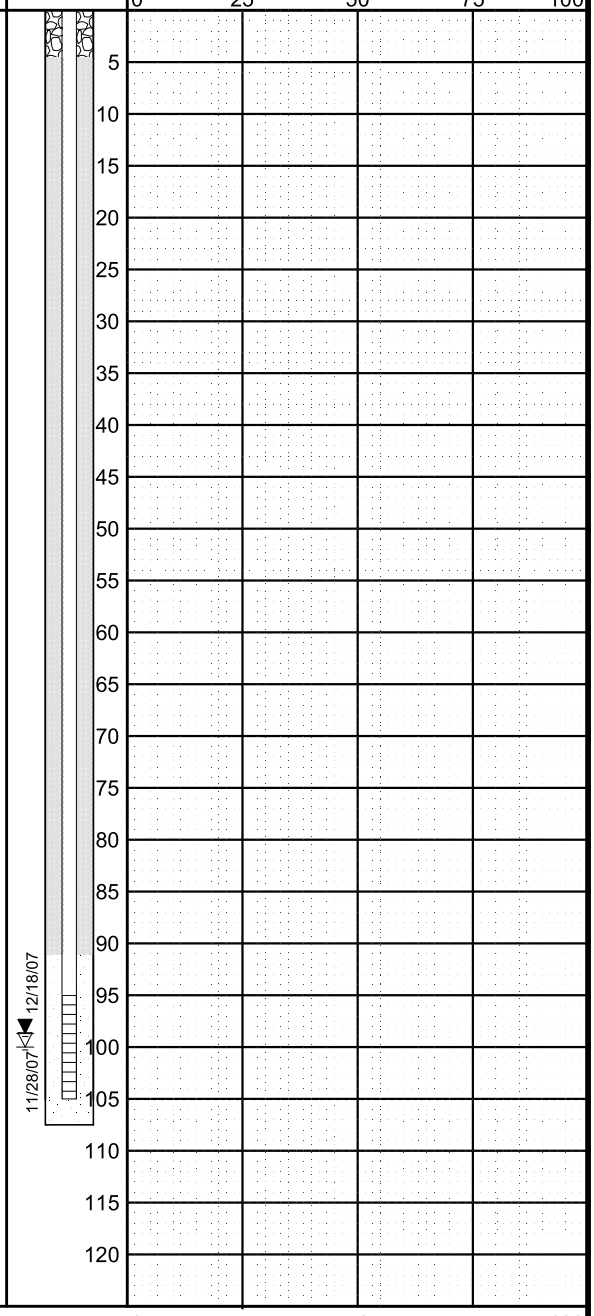
MONITORING WELL 21
CONSTRUCTION DETAIL

May 2006 32-1-16721-021

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 3

MATERIAL DESCRIPTION	Depth, Ft.	Symbol	Samples
Gray COBBLES; moist to dry			
Boulder at 62 feet			S1
Gray, slightly sandy GRAVEL; moist	80.0		S2, S3
Gray, slightly silty, sandy GRAVEL; moist to wet	98.0		S4
Gray SILT; moist to wet	105.0		
Bottom of Boring Boring Completed 11/28/07	107.5		



LEGEND

- * Sample Not Recovered
- Grab Sample
- Surface Seal
- Solid Casing and Annular Seal
- Well Casing and Filter Sand
- Cuttings Backfill
- Ground Water Level At Time Of Drilling
- Static Water Level
- ● Reading (ppm)
- Plastic Limit ├─●─┤ Liquid Limit
- Natural Water Content

NOTES

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4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

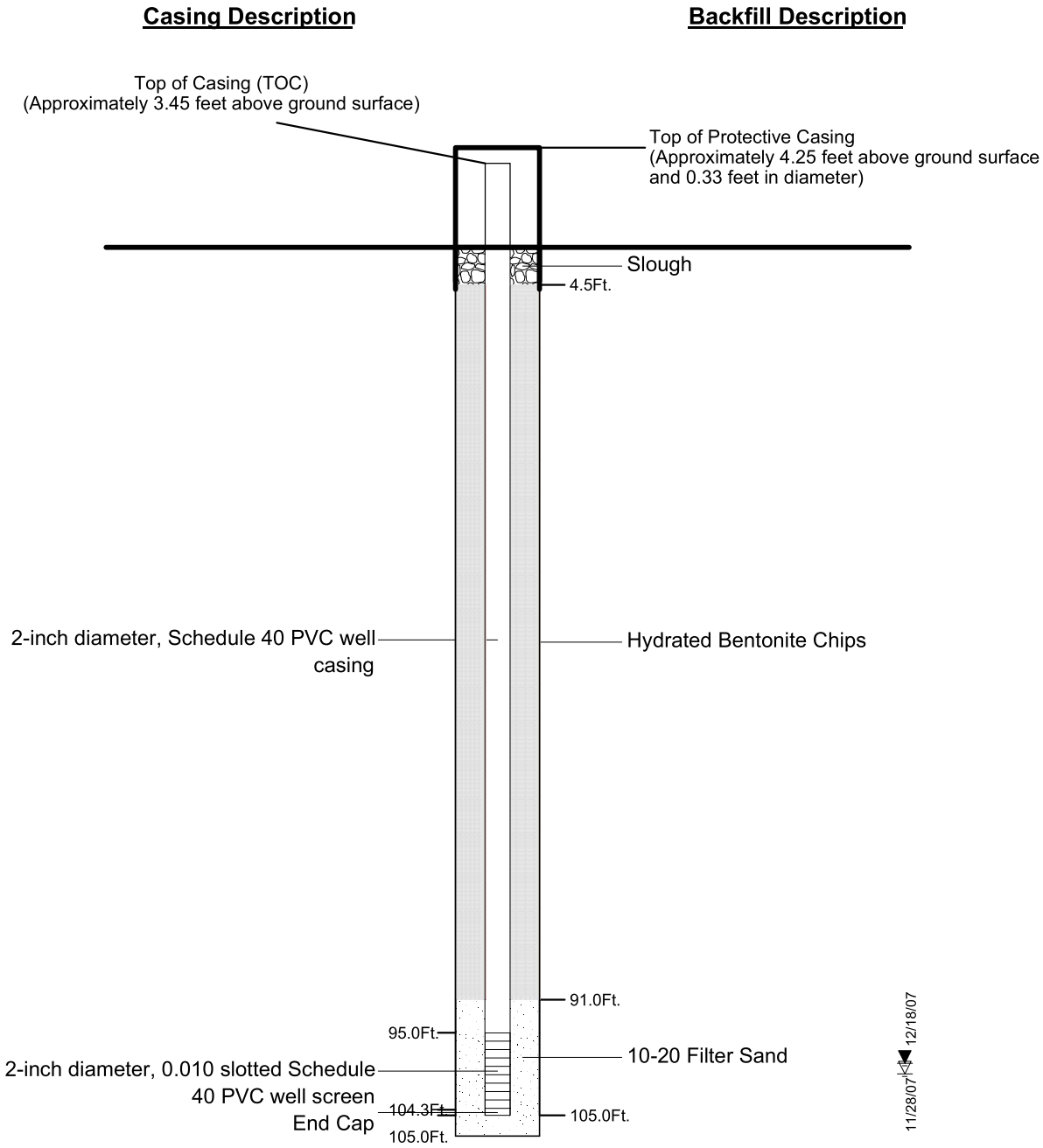
LOG OF BORING MW-22

January 2008 | 32-1-17153-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. A-1

ENVIRONMENTAL LOG 17153-1 MW22.GPJ S&W GEO1.GDT 1/4/08



LEGEND

▽ Ground Water Level ATD

▼ Static Ground Water Level

NOTE: All joints use threaded connections.

Central Landfill
Palmer, Alaska

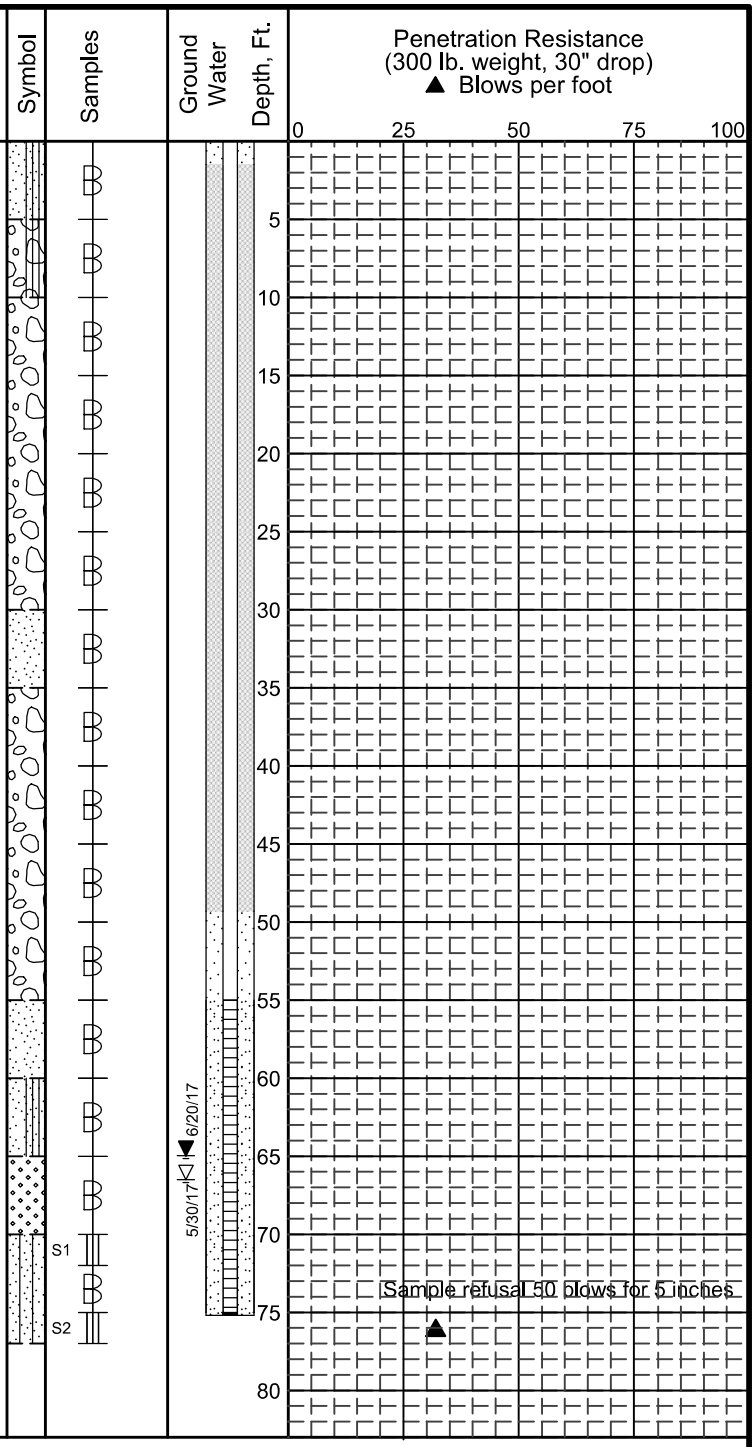
MONITORING WELL MW-22
CONSTRUCTION DETAIL

January 2008 32-1-17153-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. A-2

MATERIAL DESCRIPTION Approx. Elevation:	Depth, Ft.
Brown, *Poorly Graded Sand with Silt (SP-SM)*, moist	
Brown, *Poorly Graded Gravel with Silt and Sand (GP-GM)*, moist	5.0
Brown, *Poorly Graded Gravel with Sand (GP)*, moist	10.0
Brown, *Poorly Graded Sand with Gravel (SP)* , moist	30.0
Brown, *Poorly Graded Gravel with Sand (GP)*, moist	35.0
Brown, *Poorly Graded Sand with Gravel (SP)* , moist	55.0
Brown, *Poorly Graded Sand with Silt and Gravel (SP-SM)* , moist to wet	60.0
Brown, *Well-Graded Sand (SW)* , wet	65.0
Dense to very dense, gray to brown, *Silty Sand (SM)*, wet	70.0
Bottom of Boring Boring Completed 5/30/17	77.0



LEGEND

- * Sample not recovered
- 3" O.D. Split Spoon Sample
- Grab Sample
- Ground Water Level At Time Of Drilling
- Static Water Level
- Solid Casing, Sand Pack
- Solid Casing and Annular Seal
- Slotted Section, Filter Sand
- Solid Casing, Cuttings Backfill

NOTES

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4. USC letter symbol based on visual classification.

Central Landfill
Matanuska-Susitna Borough
Palmer, Alaska

LOG OF BORING CLF-23

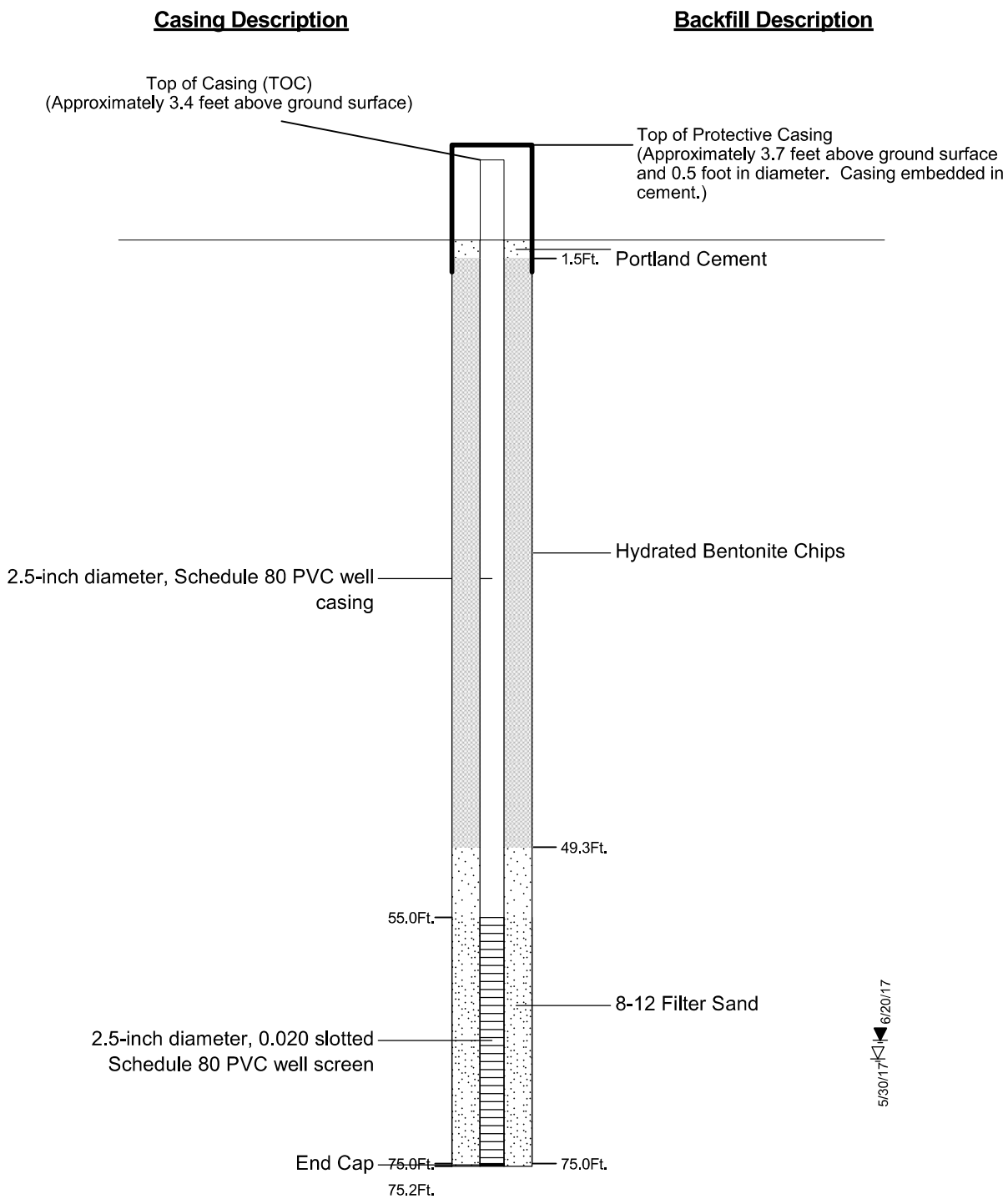
March 2018 32-1-17685-304

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2

ENVIRONMENTAL LOG CLF-23.GPJ S&W_GEO1.GDT 6/26/17

REV 2



LEGEND

▽ Groundwater Level ATD

▼ Static Groundwater Level

NOTE: All joints use threaded connections.

Central Landfill
Matanuska-Susitna Borough
Palmer, Alaska

MONITORING WELL CLF-23
CONSTRUCTION DETAIL

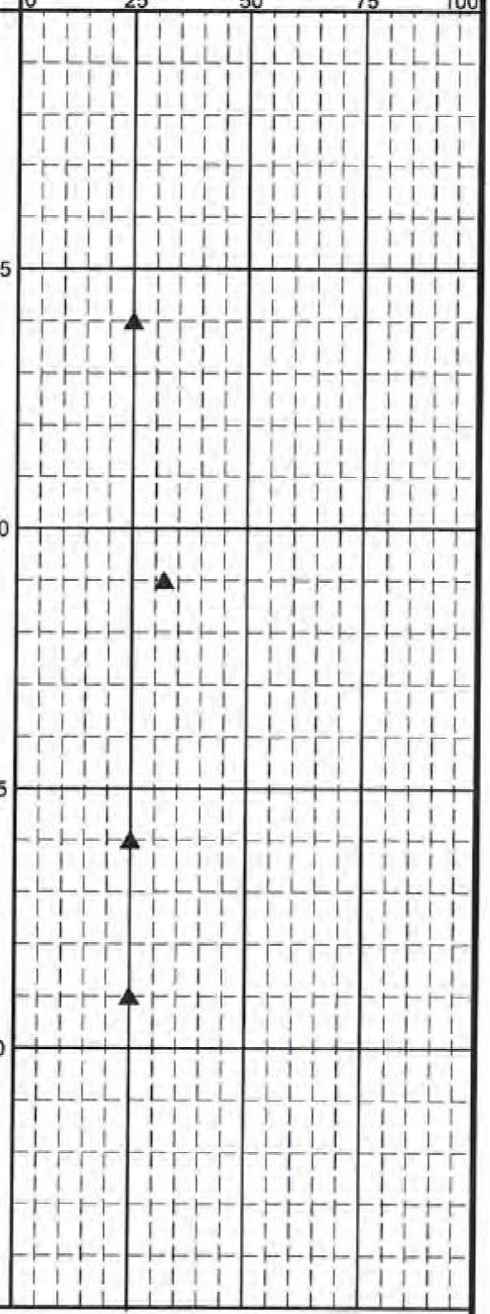
March 2018

32-1-17685-304

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 3

MATERIAL DESCRIPTION Elevation: 285 Ft.	Depth, Ft.	Symbol	Samples	Ground Water Depth, Ft.	Penetration Resistance (340 lb. weight, 30" drop) ▲ Blows per foot
Medium dense, brown, *Sand with Silt and Gravel (SP)*; frozen to moist					
Cobble layer 3 inches thick at approximately 11.7 feet below ground surface			S1, S2, S3, S4	Groundwater Not Encountered During Drilling on 12/16/13	
Bottom of Boring Boring Completed 12/16/13	20.0				



LEGEND

* Sample not recovered

3" O.D. Split Spoon Sample

Frozen

Solid Casing, Sand Pack

Solid Casing and Annular Seal

Slotted Section, Filter Sand

Solid Casing, Cuttings Backfill

NOTES

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4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

LOG OF BORING GP-1

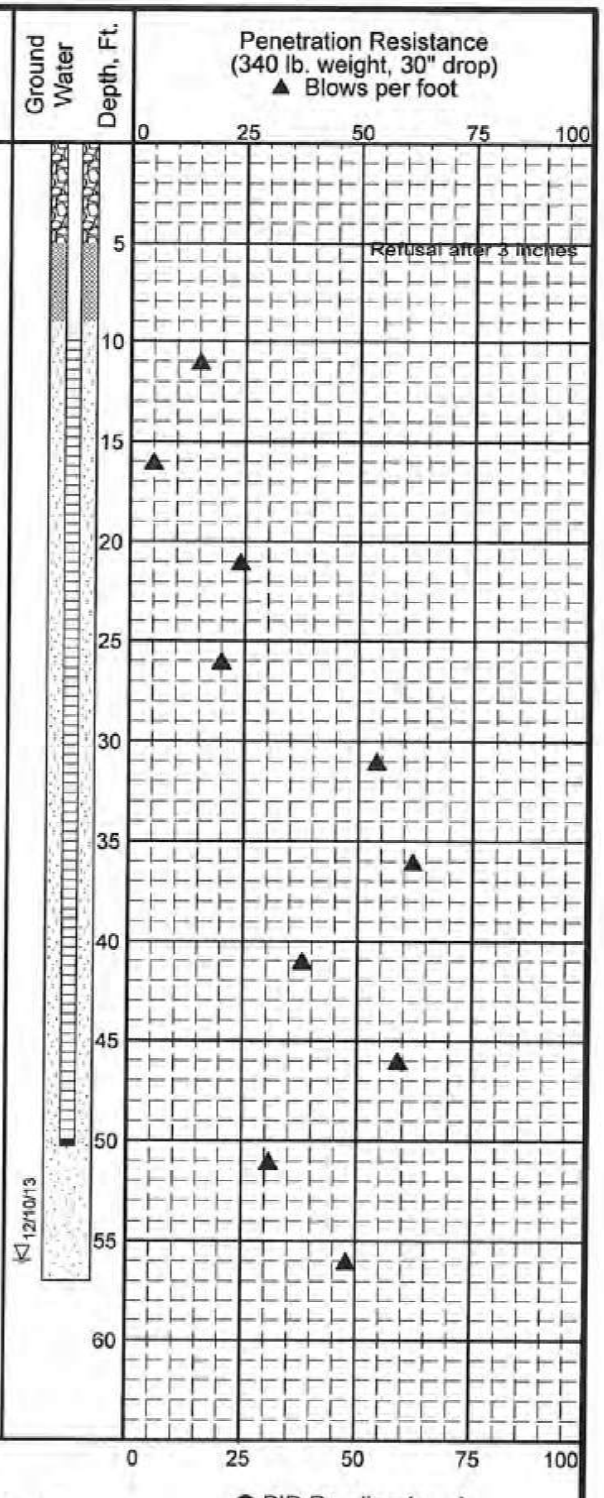
February 2014 | 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2-1

ENVIRONMENTAL LOG BORING LOGS.GPJ S&W GEO1.GDT 2/18/14

MATERIAL DESCRIPTION Elevation: 291 Ft.	Depth, Ft.	Samples
Medium dense, dark brown to brown, *Sand with Silt and Gravel (SP-SM)*; frozen to moist; trace organics		S1, S2, S3
Medium dense to very dense, brown to light brown, *Sand with Gravel (SP)*; moist; trace cobbles	20.5	S4, S5, S6, S7
Very dense to dense, brown, *Sand with Silt (SP-SM)*; moist to wet; few cobbles	40.0	S8, S9, S10, S11
Bottom of Boring Boring Completed 12/9/13	57.0	



LEGEND

* Sample not recovered

3" O.D. Split Spoon Sample

Frozen

Ground Water Level At Time Of Drilling

Solid Casing, Sand Pack

Solid Casing and Annular Seal

Slotted Section, Filter Sand

Solid Casing, Cuttings Backfill

NOTES

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2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
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4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

LOG OF BORING GP-2

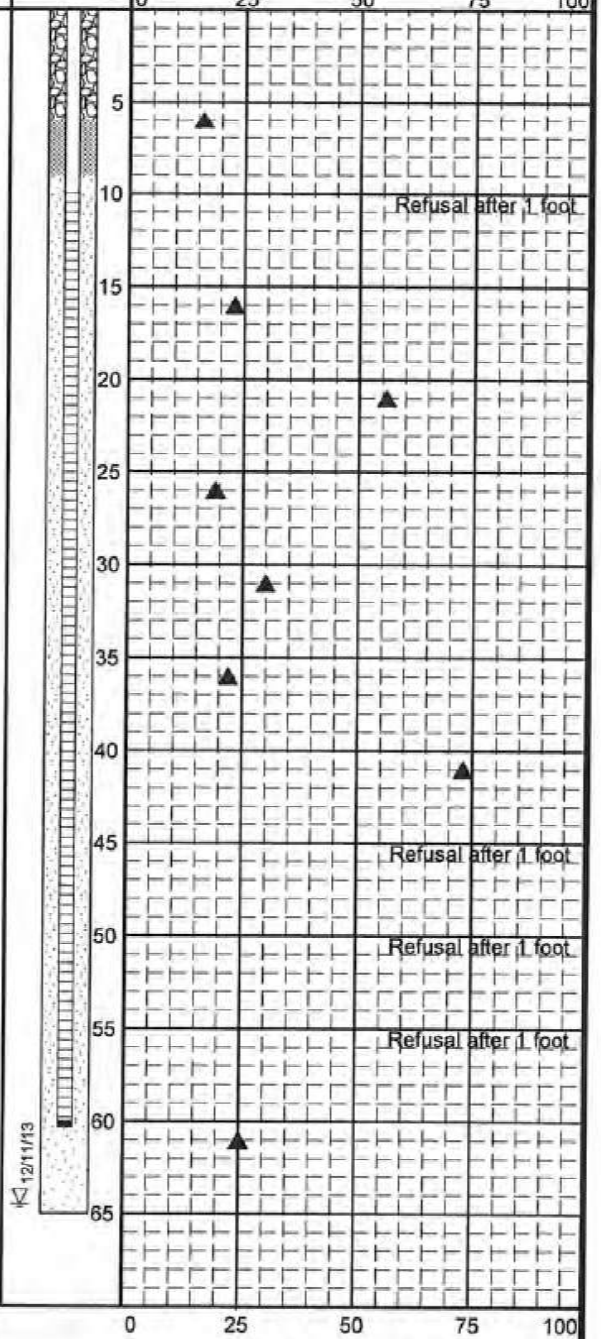
February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2-2

ENVIRONMENTAL LOG BORING LOGS.GPJ S&W GEO1.GDT 2/18/14

MATERIAL DESCRIPTION Elevation: 306 Ft.	Depth, Ft.	Samples
Medium dense, brown, *Silt with Sand (SP-SM)*; frozen to moist, trace organics		
Medium dense, brown, *Sand with Gravel (SP)*; moist; trace cobbles	6.0	S1, S2, S3
Very dense, brown, *Sand with Silt and Gravel (SP-SM)*; moist; few cobbles	20.0	S4
Medium dense to very dense, brown, *Sand with Gravel (SP)*; moist; few cobbles	25.0	S5, S6, S7, S8, S9, S10, S11
Medium dense, brown, *Sand with Silt (SP-SM)*; moist to wet	60.0	S12
Bottom of Boring Boring Completed 12/11/13	65.0	



LEGEND

* Sample not recovered

3" O.D. Split Spoon Sample

Frozen

Ground Water Level At Time Of Drilling

Solid Casing, Sand Pack

Solid Casing and Annular Seal

Slotted Section, Filter Sand

Solid Casing, Cuttings Backfill

NOTES

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2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

LOG OF BORING GP-3

February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2-3

ENVIRONMENTAL LOG BORING LOGS.GPJ S&W GEO1.GDT 2/18/14

MATERIAL DESCRIPTION Elevation: 268 Ft.	Depth, Ft.	Symbol	Samples	Ground Water	Depth, Ft.
Loose, dark brown to brown, *Sand with Silt (SP-SM)*; frozen to moist; trace gravel and organics			S1		5
Medium dense, brown, *Sand with Gravel (SP)*; moist	10.0		S2		10
			S3		15
			S4		20
Cobble layer at 22 feet below ground surface					
Brown, *Sand with Gravel (SP)*; moist; trace cobbles	25.0		S5	12/12/13	25
					30
Cobble layer	31.0		S6		
Brown, *Silt with Sand (ML)*; moist to wet; trace gravel	31.3 32.0				
					35
Bottom of Boring Boring Completed 12/12/13					

Penetration Resistance
(340 lb. weight, 30" drop)
▲ Blows per foot

0 25 50 75 100

● PID Reading (ppm)

LEGEND

- * Sample not recovered
- 3" O.D. Split Spoon Sample
- Frozen
- Ground Water Level At Time Of Drilling
- Solid Casing, Sand Pack
- Solid Casing and Annular Seal
- Slotted Section, Filter Sand
- Solid Casing, Cuttings Backfill

NOTES

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2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

LOG OF BORING GP-4

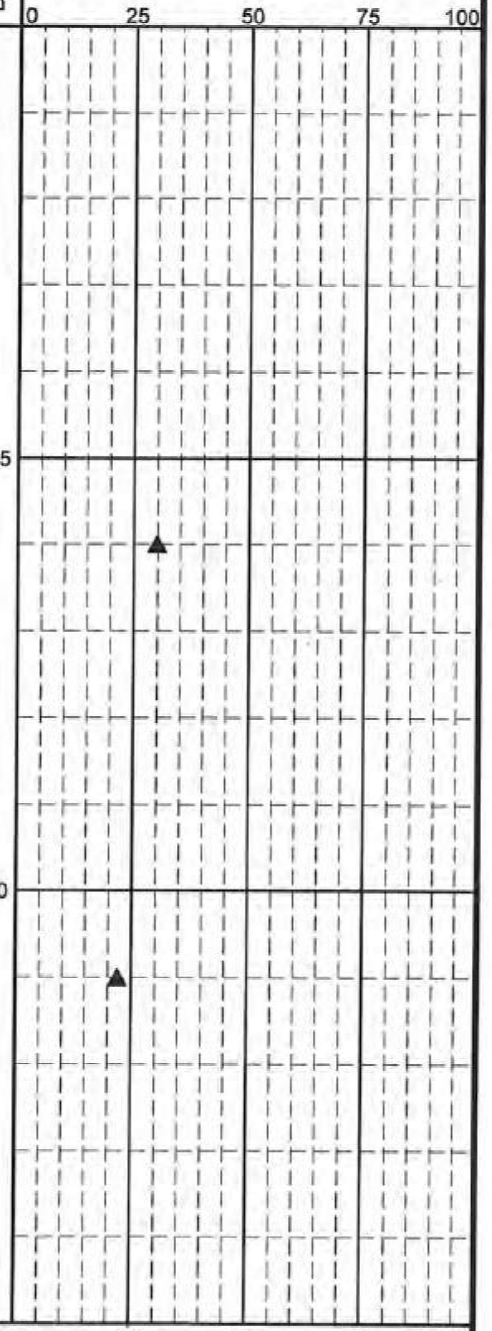
February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2-4

ENVIRONMENTAL LOG BORING LOGS.GPJ S&W GEO1.GDT 2/18/14

MATERIAL DESCRIPTION Elevation: 255 Ft.	Depth, Ft.	Symbol	Samples	Ground Water Depth, Ft.	Penetration Resistance (340 lb. weight, 30" drop) ▲ Blows per foot
Medium dense, brown, *Silt with Sand (ML)*; frozen to moist; trace organics			S1	5	
Medium dense, brown, *Sand with Gravel (SP)*; moist to wet	7.0		S2	12/13/13 10	
Bottom of Boring Boring Completed 12/13/13	12.0				



● PID Reading (ppm)

LEGEND

- * Sample not recovered
- 3" O.D. Split Spoon Sample
- ■ Frozen
- Ground Water Level At Time Of Drilling
- Solid Casing, Sand Pack
- Solid Casing and Annular Seal
- Slotted Section, Filter Sand
- Solid Casing, Cuttings Backfill

NOTES

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4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

LOG OF BORING GP-5

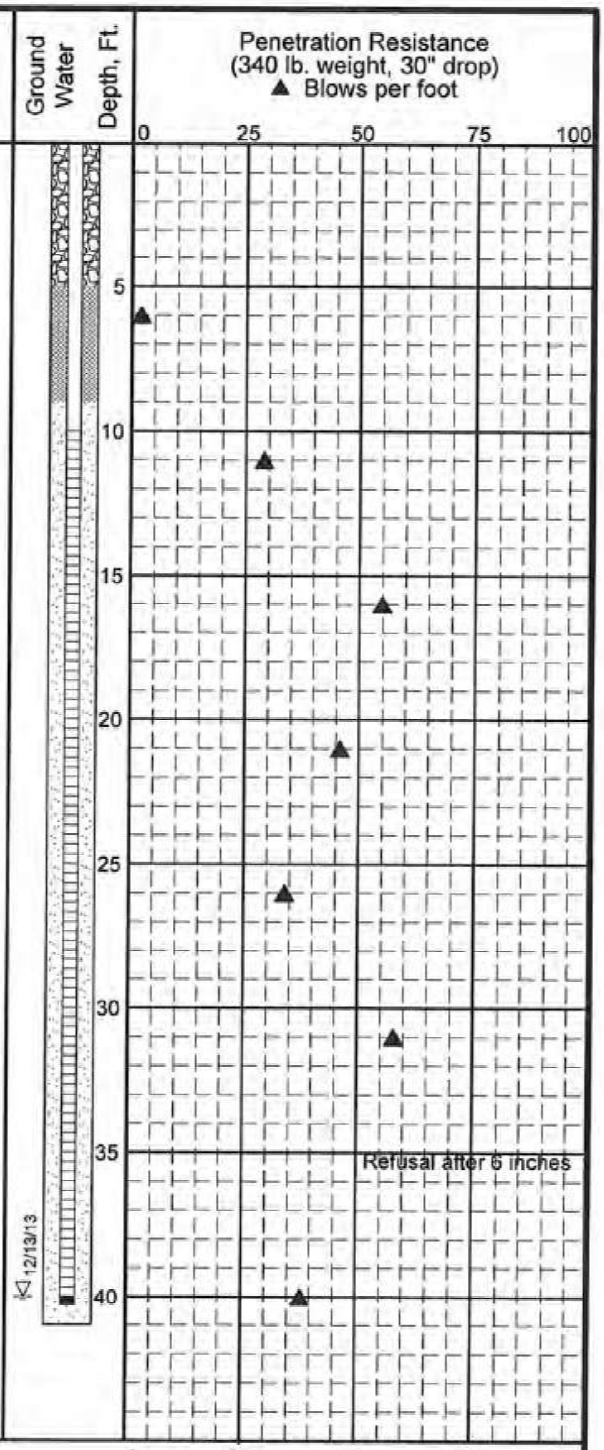
February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2-5

ENVIRONMENTAL LOG BORING LOGS.GPJ S&W GEO1.GDT 2/18/14

MATERIAL DESCRIPTION Elevation: 280 Ft.	Depth, Ft.	Samples
Loose to medium dense, dark brown to brown, *Silt with Sand (ML)*; frozen to moist		S1, S2
Medium dense to very dense, brown, *Sand with Gravel (SP)*; moist; trace cobbles	11.5	S3, S4
Dense to very dense, brown, *Gravel with Sand (GP)*; moist to wet; trace cobbles	25.0	S5, S6, S7
Cobble layer	39.0	
Dense, brown, *Sand with Gravel (SP)*; moist	39.5	S8
Bottom of Boring Boring Completed 12/13/13	41.0	



LEGEND

* Sample not recovered
3" O.D. Split Spoon Sample
Frozen
Ground Water Level At Time Of Drilling
Solid Casing, Sand Pack
Solid Casing and Annular Seal
Slotted Section, Filter Sand
Solid Casing, Cuttings Backfill

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

Central Landfill
Palmer, Alaska

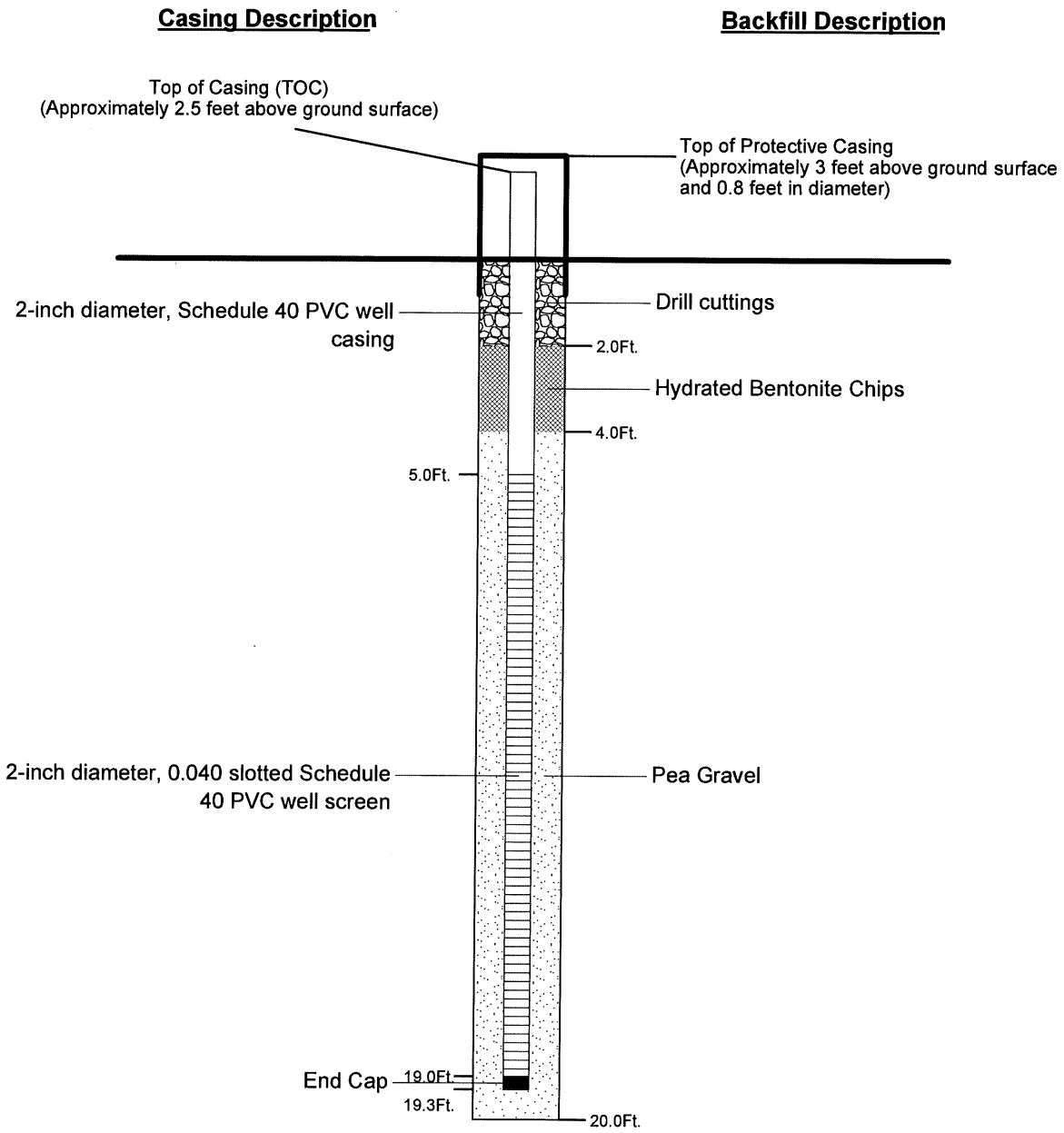
LOG OF BORING GP-6

February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2-6

ENVIRONMENTAL LOG BORING LOGS.GPJ S&W GEO1.GDT 2/18/14



LEGEND

▽ Groundwater Level ATD

NOTE: All joints use threaded connections.

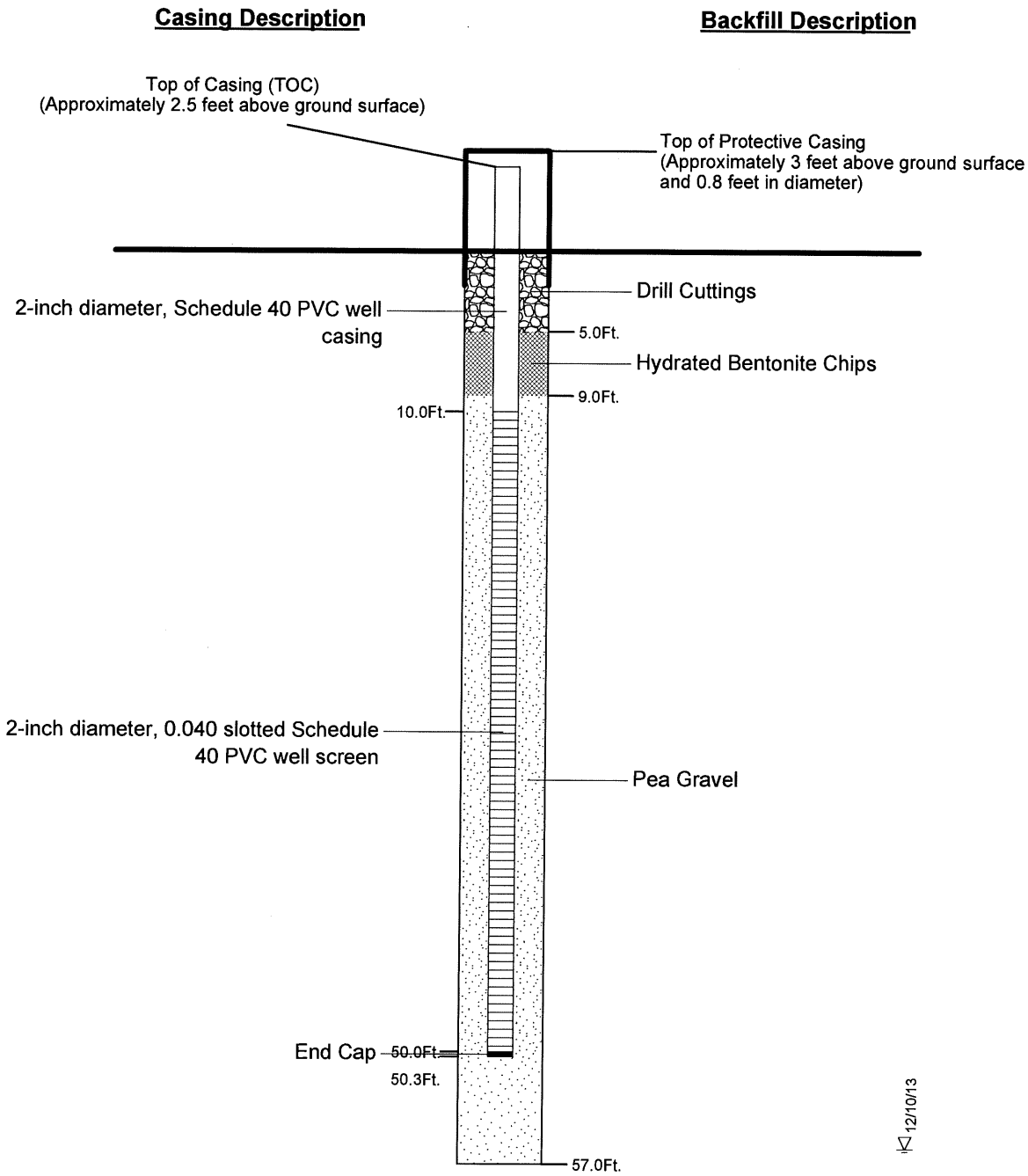
Central Landfill
Palmer, Alaska

MONITORING WELL GP-1 CONSTRUCTION DETAIL

February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 2-7



LEGEND

▽ Groundwater Level ATD

NOTE: All joints use threaded connections.

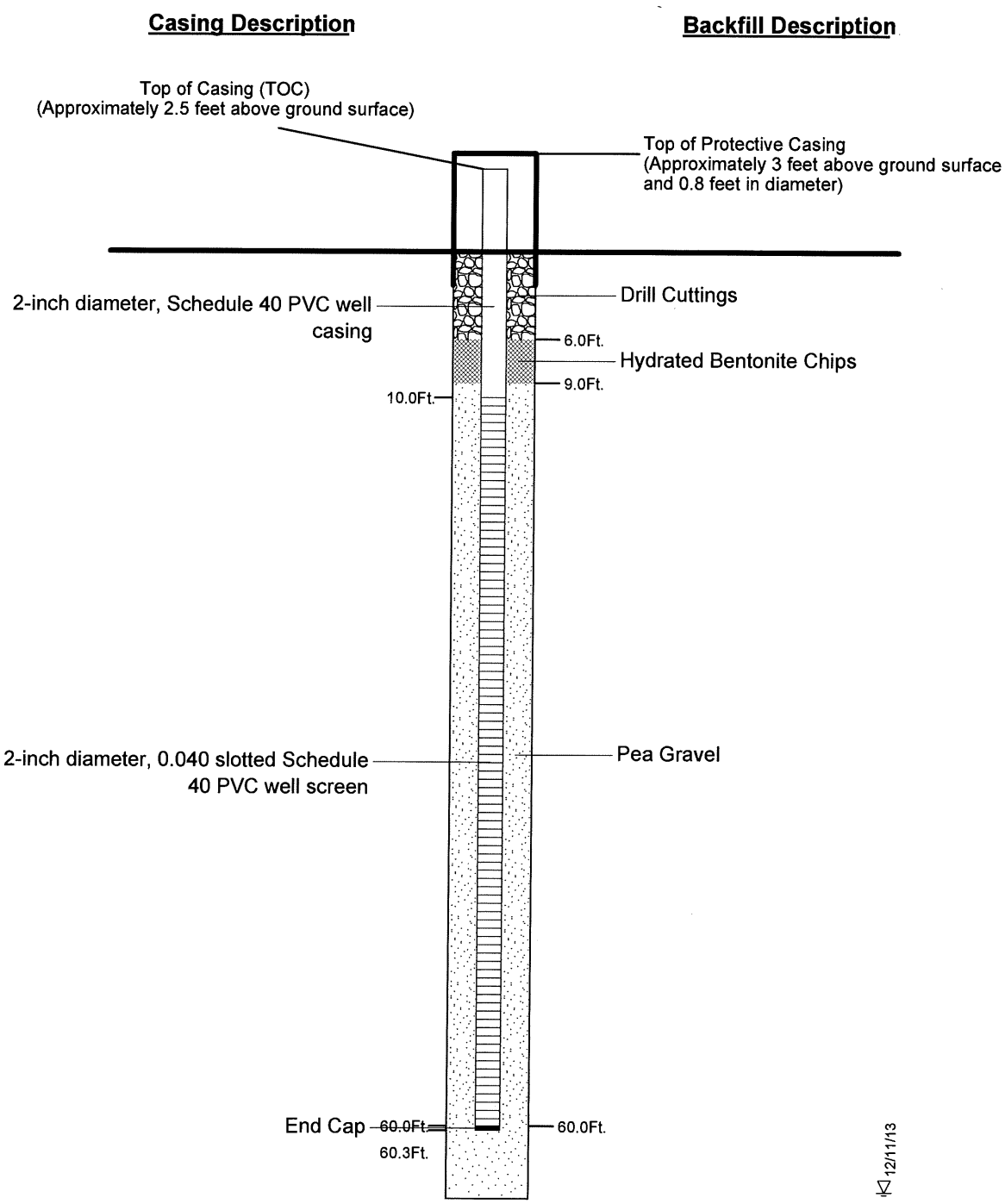
Central Landfill
Palmer, Alaska

MONITORING WELL GP-2 CONSTRUCTION DETAIL

February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 2-8



LEGEND

▽ Groundwater Level ATD

NOTE: All joints use threaded connections.

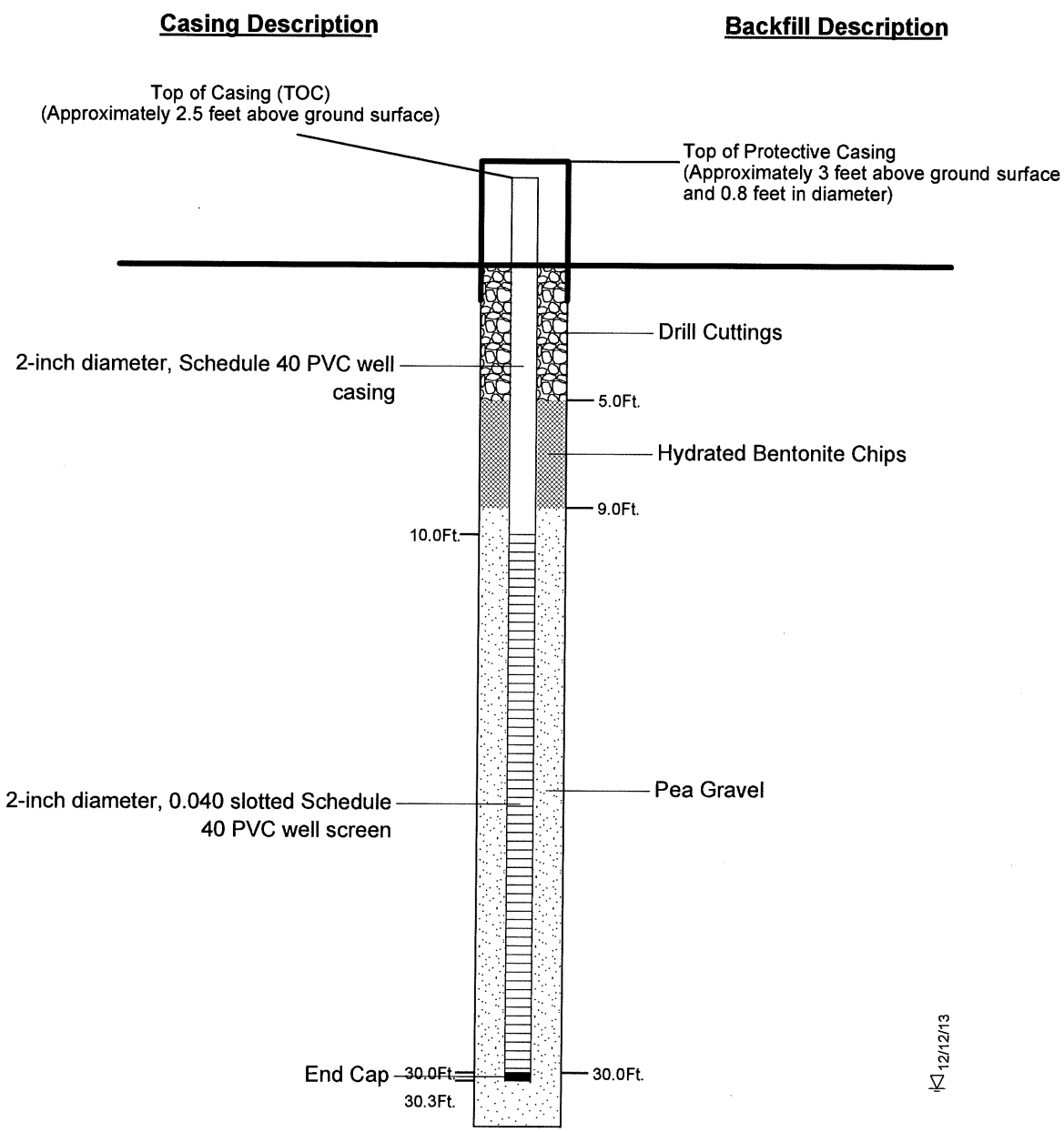
Central Landfill
Palmer, Alaska

MONITORING WELL GP-3 CONSTRUCTION DETAIL

February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 2-9



LEGEND

▽ Groundwater Level ATD

NOTE: All joints use threaded connections.

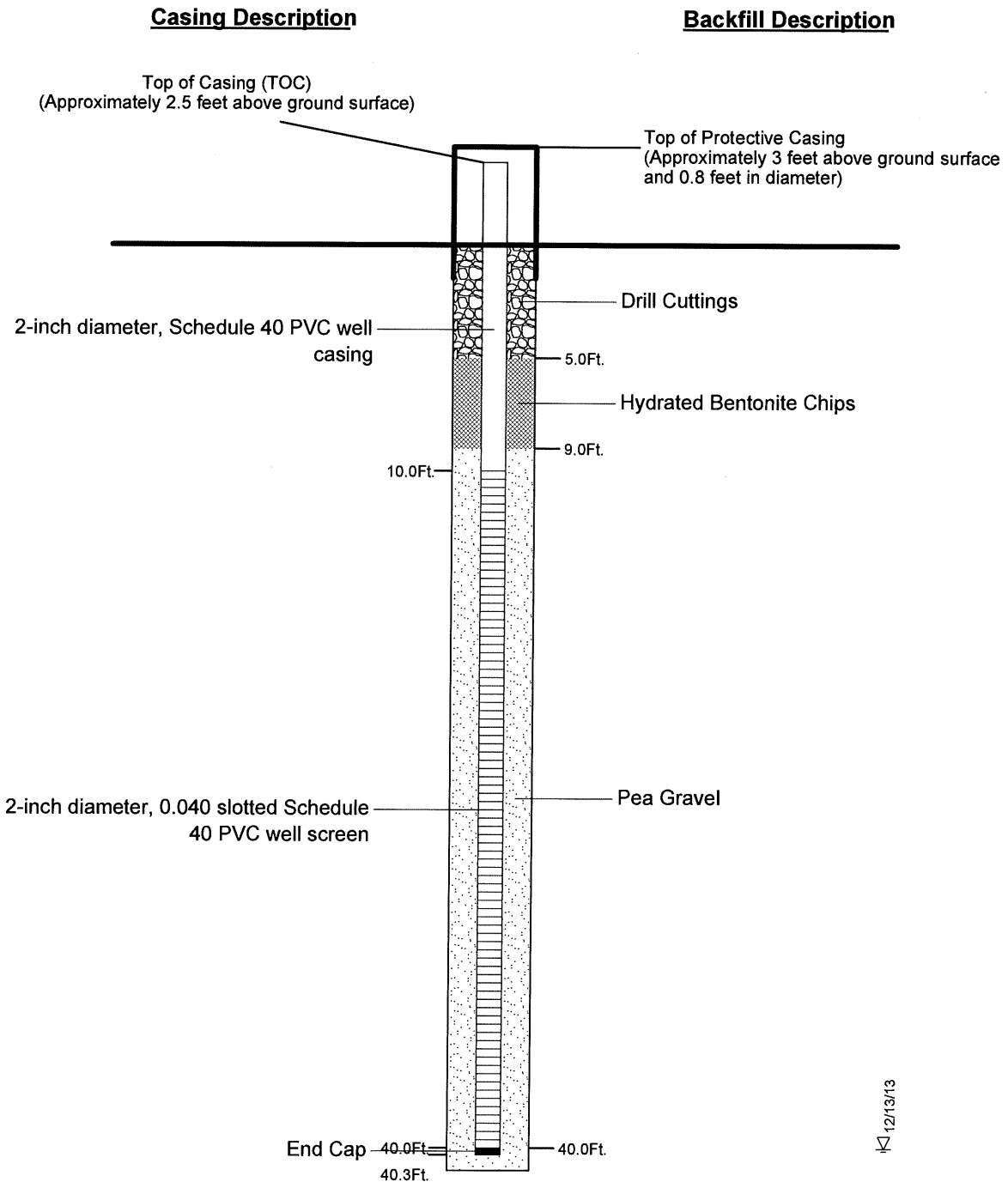
Central Landfill
Palmer, Alaska

MONITORING WELL GP-4 CONSTRUCTION DETAIL

February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 2-10



LEGEND

▽ Groundwater Level ATD

NOTE: All joints use threaded connections.

Central Landfill
Palmer, Alaska

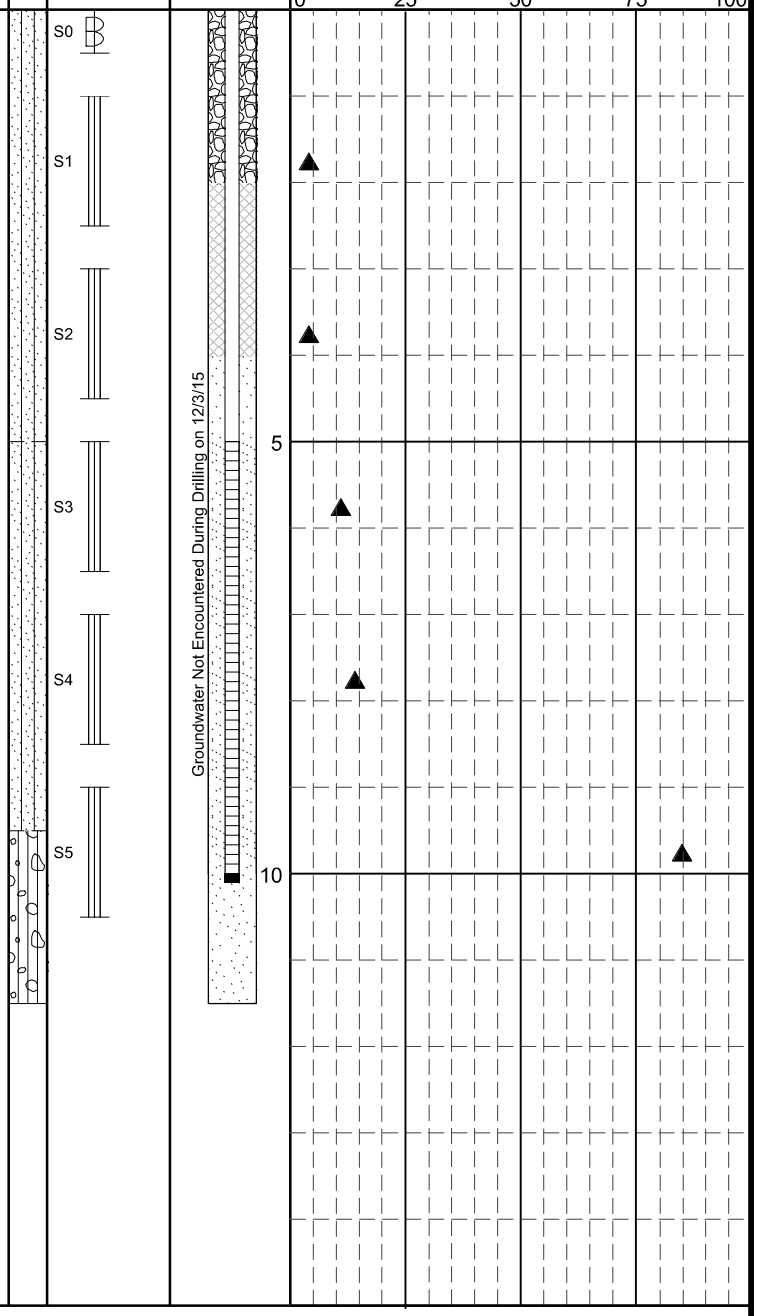
MONITORING WELL GP-6 CONSTRUCTION DETAIL

February 2014 32-1-17594-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 2-12

MATERIAL DESCRIPTION	Depth, Ft.
Loose, brown, *Silt with Sand (ML)*; frozen to moist; trace organics	
Medium dense, brown, *Silt with Sand and Gravel (ML)*; moist	5.0
Very dense, gray and brown, *Silty Gravel (GM)*; moist	9.5
Bottom of Boring Boring Completed 12/3/15	11.5



● PID PID Reading (ppm)

LEGEND

* Sample not recovered

3" O.D. Split Spoon Sample

Solid Casing, Pea Gravel Pack

Solid Casing and Annular Seal

Slotted Section, Pea Gravel Pack

Solid Casing, Cuttings Backfill

NOTES

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4. USC letter symbol based on visual classification.

Central Landfill

Palmer, Alaska

LOG OF BORING GP-5R

January 2016 | 32-1-17769

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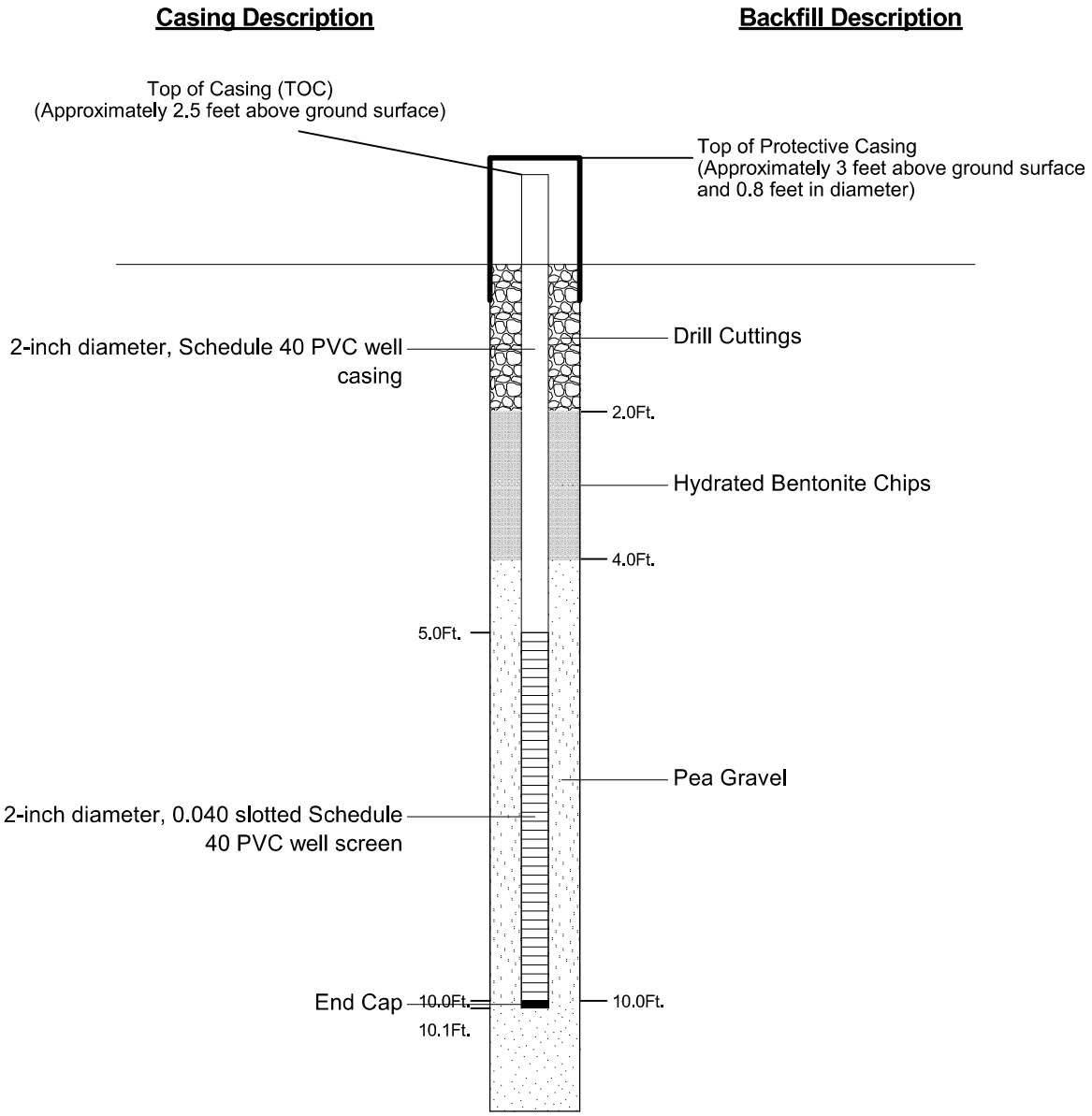
Fig. 2-1

ENVIRONMENTAL LOG BORING LOGS.GPJ S&W_GEO1.GDT 1/5/16



LEGEND

▽ Groundwater Level ATD

NOTE: All joints use threaded connections.

Central Landfill
Palmer, Alaska

MONITORING WELL GP-5R CONSTRUCTION DETAIL

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Fig. 2-2