U-007-304 .19

5709

REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 5 REFERENCE APPENDICES VOLUME 8 OF 12 APPENDICES N, 0 AND P DRAFT JUNE 1994

06/23/94

DOE-FN EPA
1062
REPORT

REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 5

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

REFERENCE APPENDICES

VOLUME 8 OF 12

APPENDICES N, O, AND P

JUNE 1994

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

DRAFT

Appendix N

Appendix N

Geotechnical Data

TABLE N-0

UNIFIED SOIL CLASSIFICATION SYSTEM (MODIFIED) USED BY FEMP RI/FS INVESTIGATIONS

Soil Type	Symbol	Description
Clean gravel	GW	Well-graded gravel, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravel, gravel-sand mixtures, little or no fines
Gravel with fines	GM	Silty gravel, gravel-sand-silt mixtures
	GC	Clayey gravel, gravel-sand-clay mixtures
Clean sand	SW	Well-graded sand, gravelly sand, little or no fines
	SP	Poorly-graded sand, gravelly sand, little or no fines
Sand with fines	SM	Silty sand, sand-silt mixtures
	SC	Clayey sand, sand-clay mixtures
Low plasticity silt and clay with liquid limit less than 50	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand, or clayey silt with slight plasticity
	CL	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay, silty clay, lean clay
	OL	Organic silt and organic silty clay of low plasticity
Medium to high plasticity silt and clay with liquid limit greater than 50	MH	Inorganic silt, micaceous or diatamaceous fine sandy or silty soil
	CH	Inorganic clay of high plasticity, fat clay
	OH	Organic clay of medium to high plasticity, organic silt
Highly organic soil	PT	Peat, humus, swamp soil with high organic content

TABLE N-1

DETAILS OF GRAIN SIZE DATA

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
EWMF	B-1747	2-5.5	ML						0.0028	0.07	8.5	3.8	4.2
EWMF	B-1747	2-5.5	ML						0.0022	0.05	8.8	4.3	3.3
EWMF	B-1747	2-5.5	ML		7	37	39	17	0.0007	0.03	10.5	5.1	4.3
EWMF	B-1747	5.5-9	CL						0.0119	0.37	6.4	1.4	3.9
EWMF	B-1747	5.5-9	CL						0.0024	0.04	8.7	4.6	4.2
EWMF	B-1747	5.5-9	CL		16	34	39	11	0.003	0.05	8.4	4.3	4.8
EWMF	B-1747	19-21.5	ML						0.0007	0.04	10.5	4.6	4.7
EWMF	B-1747	19-21.5	ML		11	29	39	21	0.001	0.04	10.0	4.6	4.4
EWMF	B-1747u	12-14.5	CL		26	24	32	18	0.0003	0.085	11.7	3.6	6.3
EWMF	B-1748	6-9	CL						0.0013	0.03	9.6	5.1	4.6
EWMF	B-1748	6-9	CL		12	24	44	20	0.0013	0.03	9.6	5.1	3.8
EWMF	B-1748	15.5-18.5	CL						0.00025	0.03	12.0	5.1	5.3
EWMF	B-1748	15.5-18.5	CL		9	27	39	25	0.0006	0.03	10.7	5.1	4.9
EWMF	B-1748u	9-12	CL		34	25	25	16	0.001	0.3	10.0	1.7	5.6
EWMF	B-1742	11-13	CL						0.008	0.03	7.0	5.1	5.0
EWMF	B-1742	11-13	CL		10	28	37	25	0.0009	0.04	10.1	4.6	4.5
EWMF	B-1742u	18-21	CL		9	29	39	23	0.0008	0.035	10.3	4.8	4.7
EWMF	B-1741	6-8	CL		14	27	35	24	0.004	0.04	8.0	4.6	5.6
EWMF	B-1741	8-12	CL		14	29	36	21	0.001	0.04	10.0	4.6	5.2
EWMF	B-1741	12-14	CL		12	30	34	24	0.00035	0.038	11.5	4.7	5.5
EWMF	B-1741	23-28	CL		15	25	35	25	0.0003	0.04	11.7	4.6	5.5

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
EWMF	B-1741	23-28	CL						0.0005	0.06	11.0	4.1	5.9
EWMF	B-1741	23-28	CL						0.0005	0.03	11.0	5.1	4.6
EWMF	B-1741u	20-23	CL		9	28	37	26	0.0004	0.03	11.3	5.1	5.0
EWMF	B-2733	4.5-8	CL						0.0005	0.03	11.0	5.1	5.3
EWMF	B-2733	4.5-8	CL		9	26	38	27	0.0005	0.03	11.0	5.1	4.6
EWMF	B-1732	8-10	CL		0	4	43	53	0.00035	0.0045	11.5	7.8	2.6
EWMF	B-1732	12-14	CL		5	18	37	40	0.0005	0.01	11.0	6.6	4.5
EWMF	B-1732	14-16	CL		0	3	40	57	0.00045	0.005	11.1	7.6	2.4
EWMF	B-1735	0-4	CL						0.00025	0.01	12.0	6.6	2.9
EWMF	B-1735	0-4	CL						0.0007	0.012	10.5	6.4	2.5
EWMF	B-1735	0-4	CL		0	6	58	36	0.00055	0.012	10.8	6.4	2.6
EWMF	B-1735u	8-11	CL-SM/SC		0	36	47	17	0.0005	0.04	11.0	4.6	3.5
EWMF	B-1739	13-15	CL		23	24	32	21	0.0007	0.05	10.5	4.3	5.9
EWMF	B-1739	17-19	CL		7	28	35	30	0.0004	0.02	11.3	5.6	4.9
EWMF	B-1743	9-12	CL						0.00038	0.02	11.4	5.6	4.8
EWMF	B-1743	9-12	CL		2	30	40	28	0.00038	0.03	11.4	5.1	4.4
EWMF	B-1745	9-13	CL						0.0003	0.01	11.7	6.6	3.4
EWMF	B-1745	9-13	CL		3	18	46	33	0.0003	0.01	11.7	6.6	4.6
EWMF	B-1745u	6-9	CL		0	15	55	30	0.0005	0.011	11.0	6.5	3.0
EWMF	B-2731	0-4.5	CL						0.0005	0.007	11.0	7.2	2.4
EWMF	B-2731	0-4.5	CL						0.0005	0.007	11.0	7.2	2.4
EWMF	B-2731	0-4.5	CL		0	2	53	45	0.0005	0.01	11.0	6.6	2.4
EWMF	B-2731	22-29	CL						0.00025	0.03	12.0	5.1	5.9

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
EWMF	B-2731	22-29	CL						0.00025	0.02	12.0	5.6	5.4
EWMF	B-2731	22-29	CL		18	22	32	28	0.0004	0.05	11.3	4.3	6.2
EWMF	B-2731u	8-11	CL		43	22	23	12	0.0035	0.89	8.2	0.2	5.7
EWMF	B-1737	6-9	CL						0.0013	0.032	9.6	5.0	3.1
EWMF	B-1737	6-9	CL		5	32	49	14	0.0035	0.05	8.2	4.3	3.7
EWMF	B-1738	10.5-12	CL						0.0003	0.05	11.7	4.3	6.1
EWMF	B-1738	10.5-12	CL		23	25	32	20	0.0003	0.05	11.7	4.3	6.1
EWMF	B-1738	15-19	CL						0.001	0.02	10.0	5.6	2.6
EWMF	B-1738	15-19	CL		8	24	47	21	0.0005	0.035	11.0	4.8	5.8
EWMF	B-1738	26-27.5	SM/SC						0.0007	0.044	10.5	4.5	5.0
EWMF	B-1738	26-27.5	SM/SC		8	30	41	21	0.0007	0.0035	10.5	8.2	4.5
EWMF	B-1749	4-8	CL						0.00025	0.028	12.0	5.2	5.6
EWMF	B-1749	4-8	CL						0.00011	0.018	13.2	5.8	4.4
EWMF	B-1749	4-8	CL		6	23	41	30	0.00025	0.02	12.0	5.6	5.3
EWMF	B-1749	17-19	CL						0.00015	0.035	12.7	4.8	5.1
EWMF	B-1749	17-19	CL						0.00015	0.04	12.7	4.6	4.9
EWMF	B-1749	17-19	CL		7	32	38	23	0.00015	0.038	12.7	4.7	4.2
EWMF	B-1749	22-28	CL						0.00015	0.031	12.7	5.0	5.1
EWMF	B-1749	22-28	CL						0.0004	0.032	11.3	5.0	4.8
EWMF	B-1749	22-28	CL		7	30	39	24	0.0004	0.038	11.3	4.7	5.2
EWMF	B-1750	4-8	CL						0.00015	0.02	12.7	5.6	3.9
EWMF	B-1750	4-8	CL						0.00015	0.018	12.7	5.8	5.3
EWMF	B-1750	4-8	CL		5	25	45	25	0.0007	0.03	10.5	5.1	3.5
EWMF	B-1750	24-28	CL						0.0003	0.045	11.7	4.5	5.7

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
EWMF	B-1750	24-28	CL						0.0003	0.048	11.7	4.4	5.3
EWMF	B-1750	24-28	CL		10	33	35	22	0.0003	0.04	11.7	4.6	4.9
EWMF	B-1751	4-8	CL						0.0004	0.032	11.3	5.0	4.6
EWMF	B-1751	4-8	CL						0.0007	0.038	10.5	4.7	4.7
EWMF	B-1751	4-8	CL						0.0004	0.0035	11.3	8.2	5.5
EWMF	B-1751	4-8	CL		10	28	38	24	0.0007	0.03	10.5	5.1	4.6
EWMF	B-1751u	8-11	CL		25	37	26	12	0.0035	0.29	8.2	1.8	5.0
EWMF	B-1752	6-17	CL						0.0001	0.005	13.3	7.6	4.3
EWMF	B-1752	6-17	CL						0.0006	0.045	10.7	4.5	6.1
EWMF	B-1752	6-17	CL						0.00011	0.025	13.2	5.3	5.9
EWMF	B-1752	6-17	CL						0.00011	0.015	13.2	6.1	4.8
EWMF	B-1752	6-17	CL		9	16	36	39	0.0001	0.0025	13.3	8.6	3.1
EWMF	B-1752	25.3-27.5	CL						0.0004	0.019	11.3	5.7	4.6
EWMF	B-1752	25.3-27.5	CL						0.0002	0.015	12.3	6.1	5.6
EWMF	B-1752	25.3-27.5	CL		8	17	41	34	0.0003	0.01	11.7	6.6	4.7
EWMF	B-1753	4-8	CL						0.0003	0.0009	11.7	10.1	5.5
EWMF	B-1753	4-8	CL						0.00015	0.0035	12.7	8.2	3.3
EWMF	B-1753	4-8	CL		5	9	35	51	0.00025	0.0045	12.0	7.8	3.4
EWMF	B-2754	4-8	CL		0	2	39	59	0.0002	0.0035	12.3	8.2	2.5
EWMF	B-2754	11-14	CL		0	1	44	55	0.0001	0.004	13.3	8.0	2.8
EWMF	B-2754	22-28	CL		3	27	42	28	0.0003	0.021	11.7	5.6	4.7
EWMF	B-2728	10-14	CL		4	27	37	32	0.00017	0.025	12.5	5.3	5.0
EWMF	B-2728	25-29	CL		10	28	36	26	0.0004	0.035	11.3	4.8	5.1
EWMF	B-2728u	22.5-25.5	CL		14	27	32	27	0.0004	0.035	11.3	4.8	5.3

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
EWMF	B-1679	0-4.5	ML-CL?		0	14	46	40	0.0001	0.01	13.3	6.6	4.6
EWMF	B-1679	20.5-23.5	CL?		14	30	35	21	0.0004	0.045	11.3	4.5	5.4
EWMF	B-1734	20.5-26	CL		9	34	37	20	0.0007	0.045	10.5	4.5	4.7
EWMF	B-1729	23-28	CL		10	29	39	22	0.0006	0.04	10.7	4.6	5.0
EWMF	B-1729u	18-21	CL		7	78	6	9	0.0055	0.45	7.5	1.2	3.5
EWMF	B-1070	2-7.5			4	37	46	13	0.002	0.04	9.0	4.6	3.7
OU4SLANT	B-1616	ELEV 556		CL	14	44	31	11	0.0015	0.15	9.4	2.7	4.6
OU4SLANT	B-1616	ELEV 553		CL	6	24	52	18	0.00035	0.02	11.5	5.6	4.7
OU4SLANT	B-1619	ELEV 569		CL	0	2	75	23	0.0004	0.012	11.3	6.4	2.9
OU4SLANT	B-1619	ELEV 565		CL-ML	0	9	77	14	0.001	0.02	10.0	5.6	2.4
OU4SLANT	B-1619	ELEV 562		CL-ML	8	50	34	8	0.003	0.19	8.4	2.4	4.0
OU4SLANT	B-1618	ELEV 572		CL	0	5	61	34	0.0001	0.009	13.3	6.8	3.3
OU4SLANT	B-1618	ELEV 571		CL	0	4	76	20	0.0005	0.015	11.0	6.1	2.7
OU4SLANT	B-1618	ELEV 569		CL	0	2	76	22	0.0007	0.095	10.5	3.4	2.6
OU4SLANT	B-1618	ELEV 568		CL	0	0	74	26	0.00045	0.007	11.1	7.2	2.6
OU4SLANT	B-1618	ELEV 566		CL	0	2	76	22	0.00045	0.011	11.1	6.5	2.6
PIT3&5	B5-1-6	15-17		CL	25	20	35	20					
PIT3&5	B5-1-7	17-19			6	32	40	22					
PIT3&5	B5-3-2,4&5	2.5-9		CL	8	39	33	20					
PIT3&5	B5-3-6	8-9		CL	2	35	40	23					
PIT3&5	B5-3-9, 10, 11& 12	12-18		CL	2	20	50	27					

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
PIT3&5	B5-3-14, 15& 16	19-20.5		CL	7	31	40	22					
PIT3&5	B5-3-17, 18, 19& 20	23.5-29.5		CL-ML	15	40	32	13					
PIT3&5	B5-3-21, 22,23& 24	29.9-35.5		CL-ML	3	34	43	20					
PIT3&5	B5-4-1A	1-3.5		CL	6	30	39	25					
PIT3&5	B5-4-2B	4-6			6	28	40	26					
PIT3&5	B5-4-7	17.5-19.5			5	24	46	25					
PIT3&5	B5-6-1, 2& 3	1-5.5		CL	2	24	47	27					
PIT3&5	B5-6-4, 5& 6	5.5-10		CL	5	20	45	30					
PIT3&5	B5-6-14, 15& 16	21-25		CL	10	25	42	23					
PIT3&5	B5-6-21, 22& 23	31-37		CL	2	26	47	25					
PIT3&5	B5-7-1	2-4		CL	10	23	40	27					
PIT3&5	B5-7-5	13-15		CL	5	15	55	25					
PIT3&5	B5-7-6	15-17			22	23	36	19					
PIT3&5	B5-9-10A	19-19.5			0	30	44	26					
PIT3&5	B5-9-10B	20-21		CL	3	40	39	18					
PIT3&5	B5-9-14& 15	27-31		CL-ML	11	44	32	13					
PIT3&5	B5-10-4C	9-10		CL	0	2	51	47					
PIT3&5	B5-10-6	14-16		CL	6	25	43	26					
PIT3&5	B5-12-1B	8-10			10	28	41	21					

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
PIT3&5	B5-12-5& 6	33-37		CL-ML	4	25	43	28					
PIT3&5	B5-13-4	9-11.5			0	23	62	15					
PIT3&5	B5-13-8	20-22.5		CL-ML	5	30	45	20					
PIT3&5	B5-15-1	8-9		CL	9	24	42	25					
PIT3&5	B5-15-4A	14-16		CL	0	26	54	20					
PIT3&5	B5-15-7A	20-22		CL	0	17	53	30					
PIT3&5	B5-15-8A	22-24		CL	4	22	48	26					
PIT3&5	B5-15-9C	24-26		CL-SM	9	59	25	7					
PIT3&5	B5-15-10	-2			5	62	27	6					
PIT3&5	B5-15-11	-2			15	36	36	13					
PIT3&5	B5-15-12A	30-32		CL	12	24	58	22					
PIT3&5	B5-A-1	1-3			13	24	41	22					
PIT3&5	B5-A-3	8-10		CL	9	31	40	20					
PIT3&5	B5-A-4C	11-13		CL	6	30	40	24					
PIT3&5	B5-A-7	29-31		CL	9	25	41	25					
PIT3&5	B5-A-C1	19			7	24	41	28					
PIT3&5	B5-A-C2	21			5	24	41	30					
PIT3&5	B5-A-C3	27			2	24	44	30					
PIT3&5	B5-A-C4	30			6	20	44	30					
PIT3&5	B3-1-1	2-4			1	40	54	15					
PIT3&5	B3-1-2& 3	5-9			4	25	41	30					
PIT3&5	B3-1-5	11-13			0	81	15	4					
PIT3&5	B3-3-3& 4	5-10.5			9	29	41	21					
PIT3&5	B3-3-4D	8-10.5			8	23	45	24					

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
PIT3&5	B3-3-5B	11-13		CL	19	26	35	20					
PIT3&5	B3-3-6& 7	14-18			7	37	31	25					
PIT3&5	B3-3-C1	9			4	28	42	26					
PIT3&5	B3-4-2& 6	2-6			10	32	43	15					
PIT3&5	B3-4-4	8-10			15	23	39	23					
PIT3&5	B3-6-3	6-8			28	24	32	16					
PIT3&5	B3-6-6& 7	16-20			20	25	34	21					
PIT3&5	B3-6-C1	10			26	23	31	20					
PIT3&5	B3-6-C3	24-26			5	26	44	25					
PIT3&5	BC-1-1	1-3.5			2	44	42	12					
PIT3&5	BC-1-C1	5			46	42	10	6					
PIT3&5	BC-3-1& 2	2-6			15	26	39	20					
PIT3&5	BC-3-6& 7	14-18		CL	6	24	43	27					
PIT3&5	BC-3-9	20-22			10	28	42	20					
PIT3&5	BC-3-10	22-24			41	45	10	4					
SWRB	PWT-2	15.0-16.5	SW/SM	SM	0	95	5	0	0.085	0.43	3.6	1.2	1.4
SWRB	PWT-3	13.5-14.0	SM	SW	37	61	2	0	0.16	2	2.6	-1.0	3.3
SWRB	PWT-4	13.7-14.0	SM	SW	37	61	2	0	0.35	3.2	1.5	-1.7	1.9
SWRB	PWT-5	10.8-11.5	SW	SW	23	75	2	0	0.15	0.525	2.7	0.9	2.4
FOUNDAT	UD-1	1.5-2.3	GC	GC	54	21	20	5	0.006	5.5	7.4	-2.5	4.4
FOUNDAT	UD-1	2.3-3.0	CL	CL	14	21	45	20	0.0012	0.022	9.7	5.5	5.0
FOUNDAT	UD-1	3.5-6.0	CL	CL	0	1	79	20	0.0007	0.01	10.5	6.6	2.4

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
FOUNDAT	UD-1	5.5-7.0	ML	ML	0	5	85	10	0.003	0.02	8.4	5.6	2.2
FOUNDAT	UD-1	7.5-9.0	CL	CL	3	12	60	25	0.0005	0.008	11.0	7.0	3.5
FOUNDAT	UD-1	9.5-11.0	CL	CL	8	22	50	20	0.00015	0.018	12.7	5.8	5.0
FOUNDAT	UD-1	11.5-13.0	CL	CL	8	22	46	24	0.0005	0.018	11.0	5.8	4.9
FOUNDAT	UD-1	13.6-15.0	CL	CL	8	22	46	24	0.0005	0.018	11.0	5.8	4.9
FOUNDAT	UD-1	15.5-17.0	CL	CL	12	25	43	20	0.0005	0.025	11.0	5.3	5.3
FOUNDAT	UD-1	17.5-18.5	CL	CL	8	22	47	23	0.0003	0.019	11.7	5.7	5.2
FOUNDAT	UD-1	18.5-20.0	CL	CL	8	22	47	23	0.0003	0.019	11.7	5.7	5.2
FOUNDAT	UD-1	20.5-22.0	CL	CL	10	27	43	20	0.0008	0.03	10.3	5.1	5.0
FOUNDAT	UD-2	1.5-3.5	CH/CL	CH	0	4	59	37	0.0001	0.008	13.3	7.0	3.5
FOUNDAT	UD-2	3.5-5.5	CL	CL	3	25	50	22	0.0001	0.018	13.3	5.8	4.9
FOUNDAT	UD-2	5.5-7.5	CL	CL	0	50	35	15	0.0012	0.075	9.7	3.7	4.2
FOUNDAT	UD-2	11.5-13.5	SC	SC	20	46	24	10	0.002	0.55	9.0	0.9	4.2
FOUNDAT	UD-2	15.5-17.5	CL	CL	9	35	46	10	0.0002	0.04	12.3	4.6	5.5
FOUNDAT	UD-2	17.5-19.5	CL	CL	10	37	39	14	0.001	0.06	10.0	4.1	4.7
FOUNDAT	UD-2	19.5-21.5	CL	CL	10	29	43	18	0.0008	0.028	10.3	5.2	4.8
FOUNDAT	UD-2	21.5-23.5	CL	CL	4	33	44	19	0.0005	0.035	11.0	4.8	5.0
FOUNDAT	UD-2	23.5-25.5	CL	CL	8	27	50	15	0.0018	0.04	9.1	4.6	4.1
FOUNDAT	UD-2	25.5-27.5	CL	CL	18	34	36	12	0.0001	0.9	13.3	0.2	5.2
FOUNDAT	UD-2	27.5-29.5	CL	CL	10	35	38	17	0.0007	0.05	10.5	4.3	4.9
FOUNDAT	UD-2	29.5-31.5	CL	CL	6	32	47	15	0.0005	0.03	11.0	5.1	4.8
FOUNDAT	UD-2	31.5-32.5	CL	CL	2	26	49	23	0.0001	0.012	13.3	6.4	5.3
FOUNDAT	UD-2	32.5-34.5	CL	CL	7	29	48	16	0.0002	0.028	12.3	5.2	4.9
FOUNDAT	UD-3	1.5-3.5	CH	CH	0	10	45	45	0.0003	0.004	11.7	8.0	3.2

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
FOUNDAT	UD-3	3.5-5.5	CL	CL	0	0	54	46	0.0006	0.0025	10.7	8.6	2.0
FOUNDAT	UD-3	5.5-7.5	CL	CL	0	10	50	40	0.0001	0.005	13.3	7.6	3.5
FOUNDAT	UD-3	7.5-9.5	ML	ML	0	5	73	22	0.0004	0.012	11.3	6.4	2.6
FOUNDAT	UD-3	9.5-11.5	ML	ML	0	11	82	7	0.003	0.03	8.4	5.1	1.7
FOUNDAT	UD-3	11.5-12.0	ML	ML	0	10	85	5	0.007	0.029	7.2	5.1	1.6
FOUNDAT	UD-3	13.0-13.5	SW	SW	0	95	5	0	0.09	0.2	3.5	2.3	1.3
FOUNDAT	UD-3	13.5-15.5	CL	CL	0	24	60	16	0.0004	0.015	11.3	6.1	3.1
FOUNDAT	UD-3	15.5-17.5	CL	CL	4	19	51	26	0.00012	0.009	13.0	6.8	4.3
FOUNDAT	UD-3	17.5-19.5	CL	CL	5	24	47	24	0.0001	0.015	13.3	6.1	5.4
FOUNDAT	2	3.0-4.0	CL	CL	8	29	48	15	0.001	0.03	10.0	5.1	4.6
FOUNDAT	2	10.0-12.0	CL	CL	10	35	45	10	0.0025	0.06	8.6	4.1	4.2
FOUNDAT	2	27.0-33.0	CL	CL	18	28	44	10	0.0015	0.05	9.4	4.3	4.9
FOUNDAT	2	42.0-47.0	ML	ML	0	60	40	0	0.01	0.1	6.6	3.3	1.5
FOUNDAT	3	2.0-4.0	CL	CL	3	22	55	20	0.0007	0.015	10.5	6.1	3.9
FOUNDAT	3	12.0-17.0	CL	CL	8	25	47	20	0.0007	0.017	10.5	5.9	4.6
FOUNDAT	3	37.0-41.0	ML	ML	0	0	85	15	0.0004	0.01	11.3	6.6	2.5
FOUNDAT	3	41.0-46.0	SM	SM	0	75	25	0	0.02	0.25	5.6	2.0	2.4
FOUNDAT	7	4.0-6.0	CL	CL	0	25	53	22	0.0005	0.016	11.0	6.0	3.9
FOUNDAT	7	18.0-20.0	CL	SW	33	62	5	0	0.3	2	1.7	-1.0	3.3
FOUNDAT	7	20.0-25.0	CL	CL	10	33	43	14	0.0007	0.035	10.5	4.8	4.8
FOUNDAT	12	5.0	CL	CL	8	24	48	20	0.0006	0.018	10.7	5.8	4.7
FOUNDAT	12	14.0	CL	CL	0	4	61	35	0.0002	0.005	12.3	7.6	2.8
FOUNDAT	12	19.0	CL	CL	4	21	53	22	0.0012	0.015	9.7	6.1	3.6
FOUNDAT	12	34.0	SM	SM	0	85	15	0	0.02	0.35	5.6	1.5	2.8

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
FOUNDAT	13	3.0	CH	CH	0	0	75	25	0.0004	0.007	11.3	7.2	2.6
FOUNDAT	13	7.0	CL	CL	0	25	60	15	0.0009	0.035	10.1	4.8	2.7
FOUNDAT	13	11.0	CL	CL	0	5	77	18	0.0004	0.01	11.3	6.6	2.6
FOUNDAT	13	13.5	ML	ML	0	10	80	10	0.002	0.013	9.0	6.3	2.1
FOUNDAT	13	20.0	CL	CL	5	33	47	15	0.001	0.035	10.0	4.8	4.3
FOUNDAT	13	30.0	SM	SM	0	80	19	1	0.015	0.3	6.1	1.7	2.4
FOUNDAT	13	40.0	SM	SM	30	57	13	0	0.04	1.3	4.6	-0.4	3.2
FOUNDAT	16	1.0	CL	CL	0	20	47	33	0.00025	0.08	12.0	3.6	3.6
FOUNDAT	16	7.5	CL	CL	7	25	53	15	0.0015	0.018	9.4	5.8	4.2
FOUNDAT	16	21.0	CL	CL	14	24	45	17	0.001	0.025	10.0	5.3	5.0
FOUNDAT	16	25.0	SM	SM	0	80	20	0	0.03	0.22	5.1	2.2	2.0
FOUNDAT	16	30.0	SM	SM	0	75	25	0	0.01	0.3	6.6	1.7	3.2
FOUNDAT	17	5.0	CL	CL	0	5	55	40	0.0001	0.004	13.3	8.0	3.8
FOUNDAT	17	9.5-10.0	SM	SM	0	65	30	5	0.015	0.1	6.1	3.3	1.4
FOUNDAT	17	15.0	CL	CL	0	5	80	15	0.0009	0.03	10.1	5.1	2.6
FOUNDAT	17	19.0	CL	CL	8	25	47	20	0.0004	0.02	11.3	5.6	4.9
FOUNDAT	17	29.0	SM	SM	0	80	20	0	0.017	0.4	5.9	1.3	2.6
FOUNDAT	17	35.0	SM	SM	3	59	35	3	0.006	0.18	7.4	2.5	3.0
FOUNDAT	18	5.0	CL	CL	0	2	58	40	0.0001	0.005	13.3	7.6	3.2
FOUNDAT	18	9.0	CL	CL	0	10	67	23	0.0001	0.012	13.3	6.4	3.8
FOUNDAT	18	20.0	CL	CL	4	26	52	18	0.0005	0.02	11.0	5.6	4.6
FOUNDAT	18	35.0	SM	SM	0	75	25	0	0.003	0.25	8.4	2.0	4.5
FOUNDAT	18	38.0	SW	SW	40	52	8	0	0.15	2	2.7	-1.0	3.1
FOUNDAT	18	45.0	SM	SM	25	49	26	0	0.0001	0.9	13.3	0.2	6.0

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
FOUNDAT	19	3.0	CL	CL	0	5	57	38	0.0001	0.006	13.3	7.4	4.0
FOUNDAT	19	15.0	CL	CL	7	23	45	25	0.0003	0.018	11.7	5.8	4.8
FOUNDAT	19	23.0	ML	ML	0	6	86	8	0.007	0.018	7.2	5.8	0.8
FOUNDAT	19	30.5-34.2	SM	SM	5	85	10	0	0.013	0.25	6.3	2.0	1.9
FOUNDAT	19	39.0	SM	SM	2	80	18	0	0.08	0.6	3.6	0.7	2.7
FOUNDAT	20	2.0	CL	CL	0	5	59	36	0.0001	0.006	13.3	7.4	4.0
FOUNDAT	20	8.0	ML	ML	0	27	51	22	0.0001	0.015	13.3	6.1	3.5
FOUNDAT	20	15.0	CL	CL	3	25	52	20	0.0001	0.018	13.3	5.8	5.5
FOUNDAT	20	22.0	ML	ML	0	10	79	11	0.001	0.015	10.0	6.1	2.6
FOUNDAT	20	25.0	ML	ML	8	47	41	4	0.01	0.18	6.6	2.5	3.4
FOUNDAT	22	3.0	CL	CL	0	5	55	40	0.00025	0.004	12.0	8.0	2.9
FOUNDAT	22	5.0	CL	CL	0	25	63	12	0.002	0.035	9.0	4.8	3.0
FOUNDAT	22	9.0	SC	SC	20	46	24	10	0.0015	0.4	9.4	1.3	5.0
FOUNDAT	22	14.0	CL	CL	10	18	50	22	0.0005	0.02	11.0	5.6	4.4
FOUNDAT	22	24.0	SM	SM	1	83	16	0	0.04	0.3	4.6	1.7	2.2
SANI L-F	1	39.5-41		SW-SM	13	77	10	W/SILT	0.08	0.45	3.6	1.2	3.2
SANI L-F	1	49.5-51		SW-SM	11	79	10	W/SILT	0.08	0.4	3.6	1.3	2.7
SANI L-F	1	59.5-61		SP-SM	30	63	7	W/SILT	0.15	0.65	2.7	0.6	2.8
SANI L-F	2	3-5		CL	0	10	40	50	0.0001	0.005	13.3	7.6	3.6
SANI L-F	2	10-12		CL	11	23	33	33	0.0001	0.018	13.3	5.8	6.2
SANI L-F	2	19.5-21		CL	7	29	32	32	0.0001	0.022	13.3	5.5	5.5
SANI L-F	2	40-41		SM	3	84	13	W/SILT	0.03	0.6	5.1	0.7	2.5
SANI L-F	2	68.6-70		SP-SM	5	90	5	W/SILT	0.17	0.5	2.6	1.0	1.8

TABLE N-1 (Continued)

Study[a]	Boring	Depth (ft)	Soil-CL Field	Soil-CL Lab	%Gravel	%Sand	%Silt	%Clay	D10% (mm)	D50% (mm)	D10 (phi)	D50 (phi)	Disp. (phi)
SANI L-F	3	9.5-10		ML	0	37	56	7	0.009	0.06	6.8	4.1	2.0
SANI L-F	4	44.5-46		SP-SM	39	52	9	W/SILT	0.13	2.9	2.9	-1.5	3.2
COAL STOR	B-1	3-5		CL	7	21	51	21	0.0001	0.015	13.3	6.1	5.0
COAL STOR	B-2	2-3		CL	0	8	53	39	0.0001	0.0055	13.3	7.5	3.7
K-65	1	-2		CL-ML	5	18	59	18	0.0008	0.014	10.3	6.2	3.8
K-65	1	-2		SC	14	40	28	18	0.0004	0.2	11.3	2.3	5.3
K-65	2	-2		CL-ML	0	8	69	23	0.00025	0.012	12.0	6.4	3.1
K-65	2	-2		SM	0	57	47	2	0.02	0.85	5.6	0.2	1.3
K-65	2	-2		SM	34	49	10	7	0.01	1.7	6.6	-0.8	3.6
K-65	2	-2		SC-SM	7	46	36	11	0.002	0.1	9.0	3.3	4.0
K-65	2	-2		SC-SM	18	35	35	12	0.0013	0.12	9.6	3.1	5.3

[a]Name of Study:

EWMF	(Draft) Engineering Evaluation for Engineered Waste Management Facility, December 1992.
OU4 SLANT	Operable Unit 4 Slant Borings
PIT3&5	Waste Pits 3 and 5 and Clearwell Dikes Stability Analysis Report, January 1992.
SWRB	Hydrogeologic Investigation of the Proposed Storm Water Collection Basin, July 1985.
FOUNDAT	Report of Foundation Investigation, Feed Materials Production Center, February 1952.
SANI L-F	Proposed Sanitary Landfill Report, March 1985
COAL STOR	Geotechnical Exploration of Coal Storage Facility, September 1988.
K-65	Silo area, Camargo Report, 1985.

5709

TABLE N-2

ATTERBURG LIMITS DATA

Agency[a]	Study[a]	Boring	Depth	Liquid Limit	Plastic Limit	Plasticity Index
ASI/IT	EWMF	B-1747	2-5.5	20.0	14.0	6.0
ASI/IT	EWMF	B-1747	5.5-9	NP	NP	NP
ASI/IT	EWMF	B-1747	19-21.5	25.0	15.0	10.0
ASI/IT	EWMF	B-1747u	12-14.5	24.0	15.0	9.0
ASI/IT	EWMF	B-1748	6-9	24.0	16.0	8.0
ASI/IT	EWMF	B-1748	15.5-18.5	25.0	15.0	10.0
ASI/IT	EWMF	B-1748u	9-12	25.0	15.0	10.0
ASI/IT	EWMF	B-1742	11-13	25.0	16.0	9.0
ASI/IT	EWMF	B-1742u	18-21	23.0	15.0	8.0
ASI/IT	EWMF	B-1741	6-8	25.0	15.0	10.0
ASI/IT	EWMF	B-1741	8-12	24.0	15.0	9.0
ASI/IT	EWMF	B-1741	12-14	25.0	16.0	9.0
ASI/IT	EWMF	B-1741	23-28	25.0	15.0	10.0
ASI/IT	EWMF	B-1741u	20-23	26.0	16.0	10.0
ASI/IT	EWMF	B-2733	4.5-8	30.0	17.0	13.0
ASI/IT	EWMF	B-1732	8-10	44.0	24.0	20.0
ASI/IT	EWMF	B-1732	12-14	38.0	20.0	18.0
ASI/IT	EWMF	B-1732	14-16	44.0	23.0	21.0
ASI/IT	EWMF	B-1735	0-4	47.0	23.0	24.0
ASI/IT	EWMF	B-1735u	8-11	NP	NP	NP
ASI/IT	EWMF	B-1739	13-15	26.0	15.0	11.0
ASI/IT	EWMF	B-1739	17-19	31.0	16.0	15.0
ASI/IT	EWMF	B-1743	9-12	26.0	16.0	10.0
ASI/IT	EWMF	B-1745	9-13	25.0	16.0	9.0
ASI/IT	EWMF	B-1745u	6-9	21.0	15.0	6.0
ASI/IT	EWMF	B-2731	0-4.5	44.0	23.0	21.0
ASI/IT	EWMF	B-2731	22-29	31.0	17.0	14.0
ASI/IT	EWMF	B-2731u	8-11	24.0	17.0	7.0
ASI/IT	EWMF	B-1737	6-9	31.0	17.0	14.0
ASI/IT	EWMF	B-1738	10.5-12	28.0	16.0	12.0
ASI/IT	EWMF	B-1738	15-19	27.0	17.0	10.0
ASI/IT	EWMF	B-1738	26-27.5	35.0	20.0	15.0
ASI/IT	EWMF	B-1749	4-8	34.0	20.0	14.0

TABLE N-2 (Continued)

Agency[a]	Study[a]	Boring	Depth	Liquid Limit	Plastic Limit	Plasticity Index
ASI/IT	EWMF	B-1749	17-19	22.0	15.0	7.0
ASI/IT	EWMF	B-1749	22-28	25.0	16.0	9.0
ASI/IT	EWMF	B-1750	4-8	26.0	17.0	9.0
ASI/IT	EWMF	B-1750	24-28	24.0	15.0	9.0
ASI/IT	EWMF	B-1751	4-8	26.0	16.0	10.0
ASI/IT	EWMF	B-1751u	8-11	20.0	15.0	5.0
ASI/IT	EWMF	B-1752	6-17	35.0	15.0	20.0
ASI/IT	EWMF	B-1752	25.3-27.5	35.0	20.0	15.0
ASI/IT	EWMF	B-1753	4-8	43.0	21.0	22.0
ASI/IT	EWMF	B-2754	4-8	39.0	21.0	18.0
ASI/IT	EWMF	B-2754	11-14	32.0	20.0	12.0
ASI/IT	EWMF	B-2754	22-28	26.0	16.0	10.0
ASI/IT	EWMF	B-2728	10-14	30.0	16.0	14.0
ASI/IT	EWMF	B-2728	25-29	26.0	16.0	10.0
ASI/IT	EWMF	B-2728u	22.5-25.5	26.0	16.0	10.0
ASI/IT	EWMF	B-1679	0-4.5	40.0	20.0	20.0
ASI/IT	EWMF	B-1679	20.5-23.5	25.0	15.0	10.0
ASI/IT	EWMF	B-1734	20.5-26	23.0	15.0	8.0
ASI/IT	EWMF	B-1729	23-28	27.0	15.0	12.0
ASI/IT	EWMF	B-1729u	18-21	26.0	15.0	11.0
ASI/IT	EWMF	B-1070	2-7.5	NP	NP	NP
ASI/IT	OU4Slant	1616	Elev. 556	29.0	14.0	15.0
ASI/IT	OU4Slant	1616	Elev. 553	23.0	13.0	10.0
ASI/IT	OU4Slant	1619	Elev. 569	27.0	16.0	11.0
ASI/IT	OU4Slant	1619	Elev. 565	22.0	15.0	7.0
ASI/IT	OU4Slant	1619	Elev. 562	17.0	12.0	5.0
ASI/IT	OU4Slant	1618	Elev. 572	42.0	18.0	24.0
ASI/IT	OU4Slant	1618	Elev. 571	27.0	16.0	11.0
ASI/IT	OU4Slant	1618	Elev. 569	24.0	14.0	10.0
ASI/IT	OU4Slant	1618	Elev. 568	26.0	15.0	11.0
ASI/IT	OU4Slant	1618	Elev. 566	25.0	14.0	11.0
Parsons	Pit3&5	B5-1-6	15-17	26.0	16.0	10.0
Parsons	Pit3&5	B5-3-2,4&5	2.5-9	25.0	14.0	11.0

TABLE N-2 (Continued)

5709

Agency[a]	Study[a]	Boring	Depth	Liquid Limit	Plastic Limit	Plasticity Index
Parsons	Pit3&5	B5-3-6	8-9	35.0	15.0	20.0
Parsons	Pit3&5	B5-3-7	9-10.5	28.0	15.0	13.0
Parsons	Pit3&5	B5-3-9,10,11&12	12-18	30.0	15.0	15.0
Parsons	Pit3&5	B5-3-14,15&16	19-20.5	25.0	14.0	11.0
Parsons	Pit3&5	B5-3-17,18,19&20	23.5-29.5	21.0	14.0	7.0
Parsons	Pit3&5	B5-3-21,22,23&24	29.9-35.5	19.0	13.0	6.0
Parsons	Pit3&5	B5-4-1A	1-3.5	10.0		10.0
Parsons	Pit3&5	B5-4-2B	4-6	28.0	ND	ND
Parsons	Pit3&5	B5-4-4	9-11	23.0	17.0	6.0
Parsons	Pit3&5	B5-4-8	19.5-21.5	26.0	17.0	9.0
Parsons	Pit3&5	B5-6-1,2&3	1-5.5	33.0	18.0	15.0
Parsons	Pit3&5	B5-6-4,5&6	5.5-10	38.0	19.0	19.0
Parsons	Pit3&5	B5-6-10&11	14.5-17.5	29.0	16.0	13.0
Parsons	Pit3&5	B5-6-13A	19-20.5	35.0	18.0	17.0
Parsons	Pit3&5	B5-6-14,15&16	21-25	26.0	17.0	9.0
Parsons	Pit3&5	B5-6-19&20	28-31	26.0	15.0	11.0
Parsons	Pit3&5	B5-6-21,22&23	31-37	27.0	17.0	10.0
Parsons	Pit3&5	B5-7-1	2-4	30.0	18.0	12.0
Parsons	Pit3&5	B5-7-5	13-15	27.0	17.0	10.0
Parsons	Pit3&5	B5-9-2&3	3-7	36.0	19.0	17.0
Parsons	Pit3&5	B5-9-7	13-15	15.0		15.0
Parsons	Pit3&5	B5-9-10B	20-21	23.0	16.0	7.0
Parsons	Pit3&5	B5-9-14&15	27-31	19.0	14.0	5.0
Parsons	Pit3&5	B5-9-16B	31-33	27.0	17.0	10.0
Parsons	Pit3&5	B5-10-2	4-6	35.0	18.0	17.0
Parsons	Pit3&5	B5-10-4C	9-10	16.0		16.0
Parsons	Pit3&5	B5-10-6	14-16	28.0	17.0	11.0
Parsons	Pit3&5	B5-12-3A	20-22	48.0	23.0	25.0
Parsons	Pit3&5	B5-12-4A	26-27	24.0	15.0	9.0
Parsons	Pit3&5	B5-12-4B	27-28	26.0	16.0	10.0
Parsons	Pit3&5	B5-12-5&6	33-37	23.0	16.0	7.0
Parsons	Pit3&5	B5-13-4	9-11.5	25.0	17.0	8.0
Parsons	Pit3&5	B5-13-8	20-22.5	22.0	15.0	7.0
Parsons	Pit3&5	B5-15-1	8-9	28.0	15.0	13.0
Parsons	Pit3&5	B5-15-4A	14-16	30.0	20.0	10.0

TABLE N-2 (Continued)

Agency[a]	Study[a]	Boring	Depth	Liquid Limit	Plastic Limit	Plasticity Index
Parsons	Pit3&5	B5-15-6B	18-20	34.0	19.0	15.0
Parsons	Pit3&5	B5-15-7C	20-22	35.0	20.0	15.0
Parsons	Pit3&5	B5-15-8A	22-24	36.0	20.0	16.0
Parsons	Pit3&5	B5-15-9B	24-26	33.0	20.0	13.0
Parsons	Pit3&5	B5-15-9C	24-26	34.0	20.0	14.0
Parsons	Pit3&5	B5-15-12A	30-32	25.0	16.0	9.0
Parsons	Pit3&5	B5-15-12B	30-32	25.0	16.0	9.0
Parsons	Pit3&5	B5-A-3	8-10	26.0	16.0	10.0
Parsons	Pit3&5	B5-A-4C	11-13	27.0	16.0	11.0
Parsons	Pit3&5	B5-A-7	29-31	29.0	18.0	11.0
Parsons	Pit3&5	B3-1-4	9-11	29.0	17.0	12.0
Parsons	Pit3&5	B3-3-1	1-3	33.0	19.0	14.0
Parsons	Pit3&5	B3-3-5B	11-13	26.0	16.0	10.0
Parsons	Pit3&5	B3-4-5	10-12	27.0	16.0	11.0
Parsons	Pit3&5	B3-6-2	4-6	30.0	17.0	13.0
Parsons	Pit3&5	B3-6-5	12-14	29.0	18.0	11.0
Parsons	Pit3&5	B3-6-9A	22-22	28.0	17.0	11.0
Parsons	Pit3&5	B3-6-11	24-26	30.0	17.0	13.0
Parsons	Pit3&5	BC-1-1	1-3.5	28.0	17.0	11.0
Parsons	Pit3&5	BC-1-4	8-10	25.0	16.0	9.0
Parsons	Pit3&5	BC-3-3A	6-8	28.0	17.0	11.0
Parsons	Pit3&5	BC-3-3&4	6-10	25.0	15.0	10.0
Parsons	Pit3&5	BC-3-6&7	14-18	30.0	17.0	13.0
Parsons	Pit3&5	BC-3-8	18-20	25.0	17.0	8.0
S&ME	MASTERSB	3(257)	2.5-4	48.0	24.0	24.0
S&ME	MASTERSB	3OFFSET	7-9	23.0	17.0	6.0
S&ME	MASTERSB	C2(296)	8.5-10	34.0	19.0	15.0
S&ME	MASTERSB	C3(297)	18.5-20	23.0	14.0	9.0
S&ME	MASTERSB	C7(301)	8.5-10	29.0	17.0	12.0
S&ME	MASTERSB	C8(302)	11-12.5	28.0	17.0	11.0
S&ME	K-65	1	15-17	22.0	15.6	6.4
S&ME	K-65	1	-2	21.8	14.6	7.2
S&ME	K-65	2	-2	23.2	17.8	5.4

TABLE N-2 (Continued)

Agency[a]	Study[a]	Boring	Depth	Liquid Limit	Plastic Limit	Plasticity Index
S&ME	K-65	2	-2	NP	NP	NP
S&ME	K-65	2	-2	14.9	12.5	2.4
S&ME	K-65	2	-2	16.2	12.7	3.5
S&ME	K-65	2	-2	19.6	13.0	6.6
S&ME	COAL STOR	B-1	-2	27.0	17.0	10.0
S&ME	COAL STOR	B-2	-1	41.0	19.0	22.0
COE	FOUNDAT	UD-1	1.5-2.3	27.0	17.8	9.2
COE	FOUNDAT	UD-1	2.3-3.0	38.6	21.4	17.2
COE	FOUNDAT	UD-1	3.5-6.0	22.1	17.1	5.0
COE	FOUNDAT	UD-1	5.5-7.0	NP	NP	NP
COE	FOUNDAT	UD-1	7.5-9.0	28.7	18.5	10.2
COE	FOUNDAT	UD-1	9.5-11.0	24.7	16.0	8.7
COE	FOUNDAT	UD-1	11.5-13.0	23.0	15.1	7.9
COE	FOUNDAT	UD-1	13.6-15.0	24.2	15.7	8.5
COE	FOUNDAT	UD-1	15.5-17.0	24.4	16.1	8.3
COE	FOUNDAT	UD-1	17.5-18.5	24.5	15.7	8.8
COE	FOUNDAT	UD-1	18.5-20.0	23.3	15.8	7.5
COE	FOUNDAT	UD-1	20.5-22.0	22.3	15.1	7.2
COE	FOUNDAT	UD-2	1.5-3.5	55.4	27.4	28.0
COE	FOUNDAT	UD-2	3.5-5.5	24.2	16.5	7.7
COE	FOUNDAT	UD-2	5.5-7.5	20.5	14.1	6.4
COE	FOUNDAT	UD-2	11.5-13.5	18.7	12.9	5.8
COE	FOUNDAT	UD-2	15.5-17.5	23.5	15.2	8.3
COE	FOUNDAT	UD-2	17.5-19.5	18.7	13.5	5.2
COE	FOUNDAT	UD-2	19.5-21.5	21.3	14.6	6.7
COE	FOUNDAT	UD-2	21.5-23.5	19.8	14.3	5.5
COE	FOUNDAT	UD-2	23.5-25.5	17.7	13.8	3.9
COE	FOUNDAT	UD-2	25.5-27.5	15.3	12.7	2.6
COE	FOUNDAT	UD-2	27.5-29.5	14.8	13.2	1.6
COE	FOUNDAT	UD-2	29.5-31.5	19.9	13.7	6.2
COE	FOUNDAT	UD-2	31.5-32.5	23.8	15.7	8.1

TABLE N-2 (Continued)

Agency[a]	Study[a]	Boring	Depth	Liquid Limit	Plastic Limit	Plasticity Index
COE	FOUNDAT	UD-2	32.5-34.5	22.2	15.5	6.7
COE	FOUNDAT	UD-3	1.5-3.5	50.4	26.7	23.7
COE	FOUNDAT	UD-3	3.5-5.5	42.7	24.3	18.4
COE	FOUNDAT	UD-3	5.5-7.5	38.2	22.3	15.9
COE	FOUNDAT	UD-3	7.5-9.5	NP	NP	NP
COE	FOUNDAT	UD-3	11.5-13.5	NP	NP	NP
COE	FOUNDAT	UD-3	13.5-15.5	18.7	14.6	4.1
COE	FOUNDAT	UD-3	15.5-17.5	24.9	16.2	8.7
COE	FOUNDAT	UD-3	17.5-19.5	23.9	16.0	7.9
COE	FOUNDAT	2	3.0-4.0	23.9	16.2	7.7
COE	FOUNDAT	2	10.0-12.0	18.4	13.4	5.0
COE	FOUNDAT	2	27.0-33.0	20.0	14.1	5.9
COE	FOUNDAT	2	42.0-47.0	NP	NP	NP
COE	FOUNDAT	3	2.0-4.0	28.7	18.4	10.3
COE	FOUNDAT	3	12.0-17.0	24.7	15.9	8.8
COE	FOUNDAT	3	37.0-41.0	NP	NP	NP
COE	FOUNDAT	3	41.0-46.0	NP	NP	NP
COE	FOUNDAT	7	4.0-6.0	23.4	16.1	7.3
COE	FOUNDAT	7	18.0-20.0	NP	NP	NP
COE	FOUNDAT	7	20.0-25.0	20.2	14.7	5.5
COE	FOUNDAT	12	5.0	26.9	17.6	9.3
COE	FOUNDAT	12	14.0	27.9	17.5	10.4
COE	FOUNDAT	12	19.0	24.4	16.2	8.2
COE	FOUNDAT	12	34.0	NP	NP	NP
COE	FOUNDAT	13	3.0	55.5	25.7	29.8
COE	FOUNDAT	13	7.0	19.0	15.0	4.0
COE	FOUNDAT	13	11.0	22.6	16.9	5.7
COE	FOUNDAT	13	13.5	18.2	16.7	1.5
COE	FOUNDAT	13	20.0	20.9	14.3	6.6
COE	FOUNDAT	13	30.0	NP	NP	NP
COE	FOUNDAT	13	40.0	NP	NP	NP
COE	FOUNDAT	16	1.0	44.2	23.3	20.9
COE	FOUNDAT	16	7.5	29.2	17.7	11.5
COE	FOUNDAT	16	21.0	20.7	14.9	5.8
COE	FOUNDAT	16	25.0	NP	NP	NP

TABLE N-2 (Continued)

Agency[a]	Study[a]	Boring	Depth	Liquid Limit	Plastic Limit	Plasticity Index
COE	FOUNDAT	16	30.0	NP	NP	NP
COE	FOUNDAT	17	5.0	36.1	22.3	13.8
COE	FOUNDAT	17	9.5-10.0	NP	NP	NP
COE	FOUNDAT	17	15.0	20.3	17.5	2.8
COE	FOUNDAT	17	19.0	23.0	14.8	8.2
COE	FOUNDAT	17	29.0	NP	NP	NP
COE	FOUNDAT	17	35.0	NP	NP	NP
COE	FOUNDAT	18	5.0	41.8	21.5	20.3
COE	FOUNDAT	18	9.0	26.0	17.2	8.8
COE	FOUNDAT	18	20.0	21.0	14.7	6.3
COE	FOUNDAT	18	35.0	NP	NP	NP
COE	FOUNDAT	18	38.0	NP	NP	NP
COE	FOUNDAT	18	45.0	NP	NP	NP
COE	FOUNDAT	19	3.0	43.7	21.1	22.6
COE	FOUNDAT	19	15.0	23.7	14.8	8.9
COE	FOUNDAT	19	23.0	NP	NP	NP
COE	FOUNDAT	19	30.5-34.2	NP	NP	NP
COE	FOUNDAT	19	39.0	NP	NP	NP
COE	FOUNDAT	20	2.0	47.9	24.4	23.5
COE	FOUNDAT	20	8.0	20.5	14.8	5.7
COE	FOUNDAT	20	15.0	22.3	14.9	7.4
COE	FOUNDAT	20	22.0	NP	NP	NP
COE	FOUNDAT	20	25.0	NP	NP	NP
COE	FOUNDAT	22	3.0	43.2	23.7	19.5
COE	FOUNDAT	22	5.0	20.7	18.6	2.1
COE	FOUNDAT	22	9.0	21.3	14.2	7.1
COE	FOUNDAT	22	14.0	24.0	15.6	8.4
COE	FOUNDAT	22	24.0	NP	NP	NP
HCN	TANK FARM	1	10-11.5	20	14.1	5.9
HCN	TANK FARM	4	12-14	20	15.9	4.1
HCN	TANK FARM	7	7.5-8.5	21.7	15	6.7

TABLE N-2 (Continued)

Agency[a]	Study[a]	Boring	Depth	Liquid Limit	Plastic Limit	Plasticity Index
HCN	TANK FARM	11	9.5-11.5	26.6	18	8.6
HCN	SANI L-F	2	3-5	42.5	21.5	21.0
HCN	SANI L-F	2	10-12	27.5	17.7	9.8
HCN	SANI L-F	2	19.5-21	24.5	16	8.5

[a]Investigating Agency and Name of Study:

ASI/IT	Advanced Sciences, Inc., and IT Corporation
EWMF	(Draft) Engineering Evaluation For Engineered Waste Management Facility, December 1992; OU4 SLANT - Operable Unit 4 Slant Borings
COE	U.S. Army Corps of Engineers
FOUNDAT	Report of Foundation Investigation, Feed Materials Production Center, February 1952
HCN	H. C. Nutting Company
SANI L-F	Proposed Sanitary Landfill Report, March 1985; TANK FARM - Report of Geotechnical Investigation, 1984
Parsons	Parsons Engineering, Inc.
PIT3&5	Waste Pits 3 and 5 and Clearwell Dikes Stability Analysis Report, January 1992
S&ME	Soil and Material Engineers, Inc.
MASTRSB	Master Soil Test Boring Plan, January 1988
K-65	Silo area, Camargo Report, 1985
COAL STOR	Geotechnical Exploration of Coal Storage Facility, September 1988

TABLE N-3

SIEVE DATA

Well No. & Depth	Field Log Description		Sieve Analysis Percentages			USGS Class.	Client Sample Number
	Material Type	Material Color	ML&CL	Sand	Gravel		
11120 (Plant 2/3)							
1.0-1.5	Clay	Gray	74	19	7	Clay	30914-11120-01
2.0-2.5	Clay	Gray	88	12	0	Clay	30914-11120-03
6.0-6.5	Clay	Gray-Mottled	92	8	0	Clay	30914-11120-10
8.0-8.5	Silt/Sand	Brown	77	23	0	Clay/Silt	30915-11120-02
10.5-11.0	Sand	Brown	20	57	23	Sand	30915-11120-05
12.0-12.5	Sand	Brown	16	75	9	Sand	30915-11120-06
14.0-14.5	Sand	Brown	14	72	14	Sand	30915-11120-09
18.0-18.5	Sand	Brown	6	94	0	Sand	30915-11120-16
19.5-20.0	Sand/Gravel	Brown	8	91	1	Sand	30915-11120-19
20.0-20.5	Gravel/Silt	Brown	23	70	7	Sand	30915-11120-20
20.5-21.0	Silt	Brown	62	30	8	Clay/Silt	30915-11120-21
21.0-21.5	Clay	Gray	68	30	2	Clay	30915-11120-22
23.0-23.5	Clay	Gray	51	33	16	Clay	30915-11120-25
11211 (PLANT 2/3)							
1.5-2.0	Clay	Gray	75	24	1	Clay	30915-11211-01
5.0-5.5	Clay	Gray-Mottled	86	13	1	Clay	30915-11211-07
8.5-9.0	Clay	Gray-Mottled	81	19	0	Clay	30915-11211-11
9.0-9.5	Clay/Sand	Brown	75	25	0	Clay	30915-11211-12
10.0-10.5	Clay	Brown	52	47	1	Clay	30915-11211-14
10.5-11.0	Sand	Brown	10	89	1	Sand	30915-11211-15
12.0-12.5	Clay	Gray	52	43	5	Clay	30915-11211-18
14.0-14.5	Sand	Brown	24	43	33	Gravel	30915-11211-22
15.0-15.5	Gravel	Brown	10	83	7	Sand	30915-11211-24
16.0-16.5	Sand	Brown	10	89	1	Sand	30915-11211-26
20.0-20.5	Sand	Brown	4	93	3	Sand	30915-11211-34
20.5-21.0	Clay	Brown	54	42	4	Clay	30915-11211-35
21.0-21.5	Silt	Gray	35	43	22	Sand	30915-11211-36
22.5-23.0	Sand	Brown	13	87	0	Sand	30915-11211-37
23.0-23.5	Sand/Clay	Brown/Gray	61	33	6	Clay	30915-11211-38
11131							
0.0-0.5	Silt	Brown	95	5	0	Clay/Silt	30915-11131-01
1.5-2.0	Silt	Brown	91	9	0	Clay/Silt	30915-11131-02
3.0-3.5	Silt	Brown	71	24	5	Clay/Silt	30915-11131-03
6.0-6.5	Silt	Brown	68	23	9	Clay/Silt	30915-11131-07
7.5-8.0	Silt	Brown	64	26	10	Clay/Silt	30915-11131-10
10.5-11.0	Clay	Brown	67	28	5	Clay	30916-11131-01

TABLE N-3 (Continued)

Well No. & Depth	Field Log Description		Sieve Analysis Percentages			USGS Class.	Client Sample Number
	Material Type	Material Color	ML&CL	Sand	Gravel		
11.0-11.5	Clay	Gray	65	29	6	Clay	30916-11131-02
12.0-12.5	Clay	Gray	65	31	4	Clay	30916-11131-03
10.5-13.0	Clay	Brown/Gray	65	26	9	Clay	30916-11131-13
13.5-14.0	CL/ML/Sand	Gray	53	40	7	Clay	30916-11131-06
15.0-15.5	Sand	Gray	20	72	8	Sand	30916-11131-08
16.5-17.0	Clay	Gray	64	29	7	Clay	30916-11131-09
18.0-18.5	Clay	Gray	66	30	4	Clay	30916-11131-11
18.0-20.5	Clay	Gray	60	30	10	Clay	30917-11131-04
20.5-23.0	Clay	Gray	46	33	21	Clay	30917-11131-06
24.0-24.5	Silt	Gray	64	27	9	Clay/Silt	30920-11131-01
27.0-27.5	Silt	Gray	57	33	10	Clay/Silt	30920-11131-05
31.5-32.0	Silt	Gray	68	29	3	Clay/Silt	30920-11131-06
32.5-33.0	Silt	Brown	55	26	19	Clay/Silt	30920-11131-08
33.0-33.5	Clay/Sand	Gray/Brown	42	24	34	Gravel	30921-11131-01
33.5-34.0	Sand	Brown	14	83	3	Sand	30921-11131-02
36.0-36.5	Sand	Brown	6	44	50	Gravel	30921-11131-07
11133							
0.0-0.5	Silt	Brown	73	21	6	Clay/Silt	30916-11133-01
4.5-5.0	Silt	Brown	71	25	4	Clay/Silt	30916-11133-08
7.5-8.0	Clay	Brown	58	27	15	Clay	30916-11133-12
9.0-9.5	Clay	Brown	50	30	20	Clay	30916-11133-15
10.0-10.5	Clay	Gray	68	29	3	Clay	30916-11133-17
11.0-11.5	Silt	Brown	72	26	2	Clay/Silt	30916-11133-19
12.0-12.5	Clay	Gray	59	33	8	Clay	30916-11133-21
14.0-14.5	Clay	Gray	64	30	6	Clay	30916-11133-25
21.0-21.5	Clay	Gray	75	24	1	Clay	30917-11133-07
27.0-27.5	Clay	Gray	78	20	2	Clay	30917-11133-18
31.5-34.5	Clay	Gray	68	26	6	Clay	30917-11133-27
31.5-32.0	Clay	Gray	64	26	10	Clay	30918-11133-01
35.0-35.5	Clay	Gray	73	15	12	Clay	30918-11133-05
34.5-37.5	Clay	Gray	52	25	23	Clay	30918-11133-08
37.5-38.0	Clay	Gray	43	36	21	Clay	30923-11133-01
39.0-39.5	Silt	Gray	82	18	0	Clay/Silt	30923-11133-04
40.5-41.0	Sand	Gray	73	24	3	Silt	30923-11133-06
42.0-42.5	Sand	Gray	55	45	0	Silt	30923-11133-08
43.5-44.0	Sand	Gray	6	94	0	Sand	30923-11133-10

TABLE N-3 (Continued)

Well No. & Depth	Field Log Description		Sieve Analysis Percentages			USGS Class.	Client Sample Number
	Material Type	Material Color	ML&CL	Sand	Gravel		
11121							
1.5-2.0	Clay	Gray	66	27	7	Clay	30921-11121-01
4.5-5.0	Clay	Gray	67	26	7	Clay	30921-11121-05
6.0-6.5	Clay	Brown	88	12	0	Clay	30921-11121-08
8.5-9.0	Sand	Brown	39	61	0	Sand	30921-11121-11
10.5-11.0	Sand	Brown	40	60	0	Sand	30921-11121-12
14.5-15.0	Sand	Brown	46	45	9	Sand	30921-11121-19
15.0-15.5	Sand	Brown	22	61	17	Sand	30921-11121-20
16.5-17.0	Sand	Brown	21	79	0	Sand	30921-11121-23
20.0-20.5	Sand	Brown	7	87	6	Sand	30921-11121-30
24.0-24.5	Clay	Gray	55	31	14	Clay	30921-11121-37
11208							
1.0-1.5	Sand	Brown	27	54	19	Sand	30909-11208-01
1.5-2.0	Sand	Brown	23	77	0	Sand	30909-11208-02
2.5-3.0	Clay	Brown	55	27	18	Clay	30909-11208-03
3.5-4.0	Sand	Brown	11	58	31	Gravel	30909-11208-05
5.5-6.0	Sand	Brown	11	79	10	Sand	30909-11208-08
10.0-10.5	Sand	Brown	7	73	20	Sand	30909-11208-17
10.5-11.0	Clay	Gray	44	37	19	Clay	30909-11208-18
11.0-11.5	Sand	Brown	12	70	18	Sand	30909-11208-19
11.5-12.0	Sand	Brown	13	67	20	Sand	30909-11208-20
13.5-14.0	Clay	Gray	69	25	6	Clay	30909-11208-24
11129							
0.0-0.5	Clay	Brown	91	9	0	Clay	30910A11129-01
0.5-1.0	Clay	Brown-Mottled	94	6	0	Clay	30910A11129-02
1.5-2.0	Clay	Brown-Mottled	90	10	0	Clay	30910A11129-03
2.0-2.5	Clay	Brown-Mottled	79	21	0	Clay	30910A11129-04
3.0-3.5	Clay	Brown-Mottled	95	5	0	Clay	30910A11129-05
4.5-5.0	Clay	Brown-Mottled	70	30	0	Clay	30910A11129-08
5.0-5.5	Clay	Brown	74	26	0	Clay	30910A11129-09
5.5-6.0	Clay	Brown	54	46	0	Clay	30910A11129-10
6.0-6.5	Clay	Brown	67	33	0	Clay	30910A11129-11
6.5-7.0	Clay/Silt	Brown	44	43	13	Clay/Silt	30910A11129-12
7.0-7.5	Clay	Gray	76	19	5	Clay	30910A11129-13
8.5-9.0	Clay/Sand	Brown-Mottled	39	61	0	Sand	30910A11129-16
9.0-9.5	Clay	Brown-Mottled	73	26	1	Clay	30910A11129-17
9.5-10.0	Sand	Brown	24	74	2	Sand	30910A11129-18
10.0-10.5	Sand/Clay	Brown-Mottled	43	40	17	Clay	30910A11129-19

TABLE N-3 (Continued)

Well No. & Depth	Field Log Description		Sieve Analysis Percentages			USGS Class.	Client Sample Number
	Material Type	Material Color	ML&CL	Sand	Gravel		
10.5-13.0	Clay	Gray	52	27	21	Clay	30910-11129-20
13.0-15.5	Clay	Gray	55	31	14	Clay	30910-11129-21
15.0-15.5	Silt	Brown	65	30	5	Clay/Silt	30915-11129-01
16.5-17.0	Silt	Brown	44	32	24	Clay/Silt	30915-11129-03
17.0-17.5	Sand	Brown	12	81	7	Sand	30915-11129-04
18.0-18.5	Clay	Gray	61	29	10	Clay	30915-11129-05
18.5-19.0	Sand	Brown	8	86	6	Sand	30915-11129-06
19.5-20.0	Sand	Brown	17	79	4	Sand	30915-11129-07
11115							
1.0-1.5	Clay	Brown	27	33	40	Gravel	30915-11115-01
2.0-2.5	Sand	Brown	20	71	9	Sand	30915-11115-03
4.0-4.5	Sand	Brown	17	48	35	Gravel	30915-11115-06
5.5-6.0	Sand	Brown	8	50	42	Gravel	30915-11115-07
7.0-7.5	Sand	Brown	6	87	7	Sand	30915-11115-09
8.0-8.5	Gravel	Brown	10	44	46	Gravel	30915-11115-11
8.5-9.0	Sand	Brown	5	60	35	Gravel	30915-11115-12
11.5-12.0	Sand	Brown	7	57	36	Gravel	30915-11115-16
13.0-13.5	Sand	Brown	6	82	12	Sand	30915-11115-19
17.0-17.5	Clay	Gray	65	29	6	Clay	30915-11115-27
11209							
1.0-1.5	Clay	Brown	44	39	17	Clay	30917-11209-01
1.5-2.0	Sand	Brown	18	60	22	Sand	30917-11209-02
2.5-3.0	Sand	Brown	15	68	17	Sand	30917-11209-04
4.0-4.5	Sand	Brown	14	77	9	Sand	30917-11209-06
5.0-5.5	Sand	Brown	10	71	19	Sand	30917-11209-08
7.0-7.5	Sand	Brown	8	76	16	Sand	30917-11209-11
10.0-10.5	Sand	Brown	11	68	21	Sand	30917-11209-16
13.0-13.5	Sand	Brown	4	84	12	Sand	30917-11209-22
16.0-16.5	Sand	Brown	5	85	10	Sand	30917-11209-26
20.5-21.0	Clay	Gray	63	32	5	Clay	30918-11209-01
11112							
1.0-1.5	Clay	Brown	33	46	21	Clay	30920-11112-01
4.0-4.5	Sand	Brown	10	60	30	Gravel	30920-11112-02
7.0-7.5	Sand	Brown	5	93	2	Sand	30920-11112-04
8.5-9.0	Sand	Brown	5	66	29	Sand	30920-11112-07
14.0-14.5	Clay	Gray	67	27	6	Clay	30920-11112-18
14.5-17.0	Clay	Gray	59	34	7	Clay	30921-11112-01
17.0-19.5	Clay	Gray	62	29	9	Clay	30921-11112-02

000028

TABLE N-3 (Continued)

Well No. & Depth	Field Log Description		Sieve Analysis Percentages			USGS Class.	Client Sample Number
	Material Type	Material Color	ML&CL	Sand	Gravel		
11128							
14.5-15.0	Clay	Gray	51	36	13	Clay	30916-11128-02
11132							
24.5-25.0	Clay	Gray	73	22	5	Clay	30923-11132-01
11122							
0.0-0.5	Clay	Brown	89	11	0	Clay	30913A11122-01
0.5-1.0	Clay	Brown	96	4	0	Clay	30913A11122-02
3.5-4.0	Sand	Brown	56	42	2	Clay/Silt	30913A11122-06
4.5-5.0	Clay	Brown	87	13	0	Clay	30913A11122-07
5.0-5.5	Sand	Brown	56	43	1	Clay/Silt	30913A11122-08
5.5-6.0	Silt	Brown	71	28	1	Clay/Silt	30913A11122-09
6.5-7.0	Clay	Brown	71	29	0	Clay	30913A11122-11
7.5-8.0	Clay	Brown	69	30	1	Clay	30913A11122-13
10.0-10.5	Clay	Brown	62	36	2	Clay	30913A11122-18
13.5-14.0	Silt	Gray	82	18	0	Clay/Silt	30913A11122-23
14.0-14.5	Sand	Gray	34	65	1	Sand	30913A11122-24
15.0-15.5	Sand	Gray	7	93	0	Sand	30913A11122-25
15.5-16.0	Sand	Gray	6	94	0	Sand	30913A11122-26
16.5-17.0	Sand	Gray	13	79	8	Sand	30913A11122-28
17.0-17.5	Sand	Gray	62	38	0	Clay/Silt	30913A11122-29
18.0-18.5	Sand	Gray	56	42	2	Clay/Silt	30913A11122-30
19.5-20.0	Sand	Gray	4	96	0	Sand	30913A11122-31
20.5-21.0	Sand	Gray	37	60	3	Sand	30913A11122-33
22.5-23.0	Sand	Gray	7	93	0	Sand	30913A11122-37
11125							
0.0-0.5	Clay	Brown	90	10	0	Clay	30914A11125-01
0.5-1.0	Clay	Brown	96	3	1	Clay	30914A11125-02
1.5-2.0	Clay	Brown	95	4	1	Clay	30914A11125-03
Sand begins at 5'							
6.0-6.5	Sand	Brown	38	60	2	Sand	30914A11125-06
10.0-10.5	Clay	Brown	64	32	4	Clay	30914A11125-14
10.5-11.0	Sand	Brown	23	76	1	Sand	30914A11125-15
11.5-12.0	Clay	Brown	63	31	6	Clay	30914A11125-17
12.0-12.5	Clay	Gray	62	31	7	Clay	30914A11125-18
21.0-21.5	Clay	Gray	61	34	5	Clay	30914A11125-29

TABLE N-3 (Continued)

Well No. & Depth	Field Log Description		Sieve Analysis Percentages			USGS Class.	Client Sample Number
	Material Type	Material Color	ML&CL	Sand	Gravel		
11124							
0.0-0.5	Clay	Brown	85	10	5	Clay	30908A11124-01
0.5-1.0	Clay	Brown	96	4	0	Clay	30908A11124-02
3.0-3.5	Clay	Brown	65	30	5	Clay	30908A11124-05
4.5-5.0	Clay	Brown	93	7	0	Clay	30908A11124-06
7.5-8.0	Clay/Sand	Brown	53	39	8	Clay	30908A11124-09
8.0-8.5	Clay	Brown	37	44	19	Sand	30908A11124-10
8.5-9.0	Sand/Clay	Brown	48	38	14	Clay	30908A11124-11
9.0-9.5	Sand	Brown	23	67	10	Sand	30908A11124-12
9.5-10.0	Clay	Brown	60	30	10	Clay	30908A11124-13
10.5-11.0	Clay	Brown/Gray	60	34	6	Clay	30908A11124-15
12.5-13.0	Clay	Gray	49	42	9	Clay	30908A11124-19
13.0-13.5	Clay	Gray	42	50	8	Sand	30908A11124-20
13.5-14.0	Clay	Gray	46	46	8	Clay	30909A11124-01
15.0-15.5	Clay	Gray	51	47	2	Clay	30909A11124-03
16.5-17.0	Clay	Gray	50	46	4	Clay	30909A11124-06
21.0-21.5	Clay	Gray	65	31	4	Clay	30909A11124-13
21.5-22.0	Clay	Gray	73	19	8	Clay	30909A11124-14
11213							
0.0-0.5	Clay	Brown	91	9	0	Clay	30910A11213-01
1.5-2.0	Clay	Brown	72	24	4	Clay	30910A11213-02
4.5-5.0	Sand	Brown	38	59	3	Sand	30910A11213-05
9.0-9.5	Sand	Brown	15	85	0	Sand	30910A11213-11
11.5-12.0	Sand	Brown	19	79	2	Sand	30910A11213-16
16.0-16.5	Clay	Brown	59	31	10	Clay	30911A11213-03
17.0-17.5	Clay	Gray	65	32	3	Clay	30911A11213-05
19.5-20.0	Clay	Gray	54	38	8	Clay	30911A11213-09
22.5-23.0	Clay	Gray	45	40	15	Clay	30911A11213-13
11116							
1.0-1.5	Silt	Brown	31	35	34	Gravel	30911-11116-01
4.0-4.5	Clay	Brown	50	38	12	Clay	30911-11116-05
5.0-5.5	Sand	Brown	33	51	16	Sand	30911-11116-07
5.5-6.0	Sand	Brown	30	57	13	Sand	30911-11116-08
7.0-7.5	Sand	Brown	15	71	14	Sand	30911-11116-11
8.5-9.0	Sand	Brown	29	56	15	Sand	30911-11116-12
10.0-10.5	Sand	Brown	7	89	4	Sand	30911-11116-15
10.5-11.0	Sand	Brown	10	83	7	Sand	30911-11116-16
11.5-12.0	Sand	Brown	14	66	20	Sand	30911-11116-18

5709

TABLE N-3 (Continued)

Well No. & Depth	Field Log Description		Sieve Analysis Percentages			USGS Class.	Client Sample Number
	Material Type	Material Color	ML&CL	Sand	Gravel		
13.0-13.5	Sand	Brown	10	83	7	Sand	30911-11116-20
13.5-14.0	Sand/Clay	Brown/Gray	44	38	18	Clay	30911-11116-21
11114							
1.0-1.5	Clay	Brown	22	32	46	Gravel	30913-11114-01
2.5-3.0	Clay	Brown	28	44	28	Sand	30913-11114-03
3.0-3.5	Sand	Brown	13	78	9	Sand	30913-11114-04
3.5-4.0	Sand	Brown	21	68	11	Sand	30913-11114-05
5.5-6.0	Sand	Brown	8	91	1	Sand	30913-11114-08
8.5-9.0	Sand	Brown	7	88	5	Sand	30913-11114-13
14.5-15.0	Sand	Brown	7	78	15	Sand	30913-11114-23
16.5-17.0	Sand/Clay	Brown/Gray	15	56	29	Sand	30913-11114-27
17.0-17.5	Clay	Gray	68	29	3	Clay	30913-11114-28
11127							
21.5-22.5	Clay	Gray	50	33	17	Clay	30920U11127-02
20.5-22.5	Clay	Gray	74	19	7	Clay	30921U11127-02
11134							
16.5-19.0	Clay	Gray	62	29	9	Clay	30916B11134-02
19.0-21.5	Clay	Gray	61	34	5	Clay	30915B11134-02

000031

TABLE N-4

PHYSICAL AND CHEMICAL PROPERTIES OF BUTLER COUNTY SOILS ON THE FEMP

Soil Name and Map Symbol	Depth (Inches)	Permeability (Inches/Hr)	Available Water Capacity (Inches/Inches)	Soil Reaction pH	Shrink-Swell Potential
DaA, DaB	0-13	0.6-2.0	0.22-0.24	5.6-7.3	Low
Dana	13-40	0.6-2.0	0.18-0.20	5.1-6.0	Moderate
	40-44	0.6-2.0	0.15-0.19	6.1-7.3	Moderate
	44-60	0.2-0.6	0.05-0.19	6.6-8.4	Low
EcE2, EcF2	0-5	0.06-0.6	0.12-0.18	5.1-8.4	Moderate
Eden	5-27	0.06-0.2	0.10-0.15	5.1-8.4	Moderate
	27-40	-	-	-	-
FdA, FdB	0-8	0.6-2.0	0.22-0.24	5.1-6.5	Low
Fincastle	8-28	0.2-0.6	0.18-0.20	5.1-5.5	Moderate
	28-42	0.06-0.6	0.15-0.19	5.1-6.0	Moderate
	42-56	<0.06	0.04-0.08	7.4-8.4	Moderate
	56	-	-	-	-
Gn	0-8	0.6-2.0	0.20-0.24	6.1-7.8	Low
Genesee	8-34	0.6-2.0	0.17-0.22	6.1-8.4	Low
	34-60	0.6-20	0.19-0.21	7.4-8.4	Low

TABLE N-4 (Continued)

Soil Name and Map Symbol	Depth (Inches)	Permeability (Inches/Hr)	Available Water Capacity (Inches/Inches)	Soil Reaction pH	Shrink-Swell Potential
HoA	0-9	0.6-2.0	0.18-0.23	5.6-6.5	Low
Henshaw	9-50	0.2-0.6	0.15-0.19	5.1-7.3	Low
	50-60	0.2-0.6	0.17-0.22	6.6-8.4	Low
MsC2, MsD2	0-6	0.6-2.0	0.17-0.20	5.6-7.3	Low
Miamian	6-22	0.2-0.6	0.12-0.18	4.5-7.8	Moderate
	22-60	0.2-0.6	0.06-0.10	7.4-8.4	Low
RwB2	0-10	0.6-2.0	0.21-0.24	5.6-7.3	Low
Russell	10-22	0.6-2.0	0.18-0.20	4.5-6.0	Moderate
	22-36	0.6-2.0	0.15-0.19	5.6-7.3	Moderate
	36-60	0.2-0.6	0.05-0.19	7.4-8.4	Low
Ra	0-12	0.6-2.0	0.21-0.23	6.1-7.3	Moderate
Ragsdale	12-50	0.06-0.2	0.18-0.20	6.1-7.3	Moderate
	50-72	0.06-0.2	0.20-0.22	6.6-8.4	Low
RdA, RdB	0-15	0.6-2.0	0.22-0.24	5.6-7.3	Low
Raub	15-37	0.06-0.2	0.18-0.20	5.1-6.5	Moderate
	37-43	0.06-0.2	0.15-0.19	6.1-7.3	Moderate
	43-60	0.06-0.6	0.05-0.19	7.4-8.4	Low
UnA, UnB	0-10	0.6-2.0	0.19-0.33	5.1-7.3	Low

TABLE N-4 (Continued)

Soil Name and Map Symbol	Depth (Inches)	Permeability (Inches/Hr)	Available Water Capacity (Inches/Inches)	Soil Reaction pH	Shrink-Swell Potential
Uniontown	10-49	0.6-2.0	0.18-0.22	5.1-7.8	Low
	49-66	0.2-2.0	0.18-0.22	6.6-8.4	Low
XfA, XfB, Xf2	0-10	0.6-2.0	0.22-0.24	6.6-7.3	Low
Xenia	10-31	0.2-0.6	0.18-0.20	5.1-6.0	Moderate
	31-72	0.2-2.0	0.05-0.19	7.9-8.4	Low
XfA, XfB, XfB2	0-8	0.6-2.0	0.22-0.24	6.6-7.3	Low
Xenia	8-26	0.2-0.6	0.18-0.20	5.1-6.0	Moderate
	26-42	0.2-0.6	0.15-0.19	5.1-7.3	Moderate
	42-59	0.2-0.6	0.04-0.08	7.9-8.4	Moderate
	59	-	-	-	-

Source: U.S. Department of Agriculture, Soil Conservation Service, Ohio Department of Natural Resources, Division of Lands and Soil, and Ohio Agricultural Research and Development Center, 1980, "Soil Survey of Butler County, Ohio," USDA, ODNR, and Ohio Agricultural Research and Development Center, n.p.

TABLE N-5

ENGINEERING PROPERTIES AND CLASSIFICATIONS OF BUTLER COUNTY SOILS ON THE FEMP

Soil Name and Map Symbol	Depth (Inches)	USDA Texture	Unified Classification Symbol	Percentage Passing Sieve Number 4	10	40	200	Liquid Limit (Pct)	Plasticity Index
DaA, DaB	0-13	Silty loam	CL	100	100	95-100	85-95	30-35	8-12
Dana	13-40	Silty clay loam	CL	100	100	95-100	85-98	38-50	20-32
	40-44	Clay loam	CL	90-100	90-95	80-90	65-75	37-50	17-30
	44-60	Loam	CL, ML, CL-ML	85-95	80-90	75-85	50-65	17-30	2-14
EcE2, EcF2	0-5	Silty clay loam	ML, CL	85-100	80-100	75-100	70-100	35-65	12-35
Eden	5-27	Flaggy silty clay, flaggy clay, silty clay	MH, CH	75-100	70-100	65-100	60-100	-	-
	27-40	Weathered bedrock	MH, CH, CL	-	-	-	-	45-75	20-45
FdA, FdB	0-8	Silt loam	CL, ML	100	95-100	90-100	75-93	27-36	4-12
Fincastle	8-28	Silty clay loam	CL, CH	100	100	95-100	85-95	38-54	20-32
	28-42	Silty clay loam, clay loam	CH, CL	95-100	90-98	85-95	75-85	45-58	30-38
	42-56	Flaggy clay loam	CL	85-95	75-90	70-85	55-75	30-50	15-35
	56	Weathered bedrock	-	-	-	-	-	-	-
Gn	0-8	Loam	ML, CL	100	100	90-100	75-85	26-40	3-15
Genesee	8-34	Silty loam, loam	ML, CL	100	100	90-100	75-85	26-40	3-15
	34-60	Stratified sandy loam to silt loam	ML, CL	90-100	85-100	60-80	50-70	26-40	3-15
HoA	0-9	Silt loam	ML, CL, CL, ML	95-100	95-100	90-100	80-100	25-35	3-10
Henshaw	9-50	Silty clay loam, silt loam	CL, ML	95-100	95-100	95-100	85-100	30-40	8-18
	50-60	Silt loam, silty clay loam	ML, CL, CL-ML	95-100	90-100	85-100	75-100	25-40	5-15
MsC2, MsD2;	0-6	Silt loam	ML	95-100	95-100	90-100	70-95	26-40	4-12
Miamian	6-22	Silty clay loam, clay loam, clay	CL	85-100	80-100	75-95	70-85	32-50	15-30
	22-60	Loam, silt loam	CL, ML, CL-ML	75-95	75-90	65-85	50-75	20-35	3-13
RwB2	0-10	Silt loam	CL, CL-ML	100	95-100	80-100	50-90	20-35	5-15
Russell	10-22	Silty clay loam, silt loam	CL	100	100	95-100	85-95	35-50	20-35
	22-36	Clay loam, loam	CL	90-100	90-95	80-90	65-75	35-50	17-31
	36-60	Loam, clay loam	CL, ML CL-ML	85-95	80-90	75-85	50-65	<30	2-14
Ra	0-12	Silty clay loam	CL	100	100	90-100	80-100	35-50	15-30
Ragsdale	12-50	Silty clay loam	CL	100	100	90-100	80-95	35-50	15-30
	50-72	Silt loam	CL, CL-ML	100	100	90-100	70-90	25-35	5-15

TABLE N-5 (Continued)

Soil Name and Map Symbol	Depth (Inches)	USDA Texture	Unified Classification Symbol	Percentage Passing Sieve Number 4	10	40	200	Liquid Limit (Pct)	Plasticity Index
RdA, RdB	0-15	Silt loam	CL, CL-ML	100	100	90-100	75-95	25-35	5-15
Raub	15-37	Silty clay loam	CL, CH	100	100	95-100	80-95	35-55	20-35
	37-43	Clay loam, silty clay loam	CL	95-100	90-100	85-95	60-85	35-50	15-25
	43-60	Loam, clay loam	CL, ML SC, SM	85-95	80-90	70-85	40-65	15-30	NP-15
UnA, UnB	0-10	Silt loam	ML, CL-ML	100	95-100	90-100	80-100	25-35	2-10
Uniontown	10-49	Silt loam, silty clay loam	CL, ML	100	95-100	90-100	85-100	30-45	7-20
	49-66	Silt loam, silty clay loam	ML, CL	90-100	90-100	85-100	75-100	30-45	7-20
XeA, XeB, XeB2	0-10	Silt loam	CL, CL-ML	100	100	90-100	70-100	25-35	5-15
Xenia	10-31	Silty clay loam	CL	100	100	90-100	80-95	35-50	15-30
	31-72	Loam, clay loam	CL, ML SC, SM	85-95	80-90	75-90	40-65	25-30	NP-15
XfA, Xf2B, XfB2	0-8	Silt loam	CL, CL-ML	100	100	90-100	70-100	25-35	5-15
Xenia	8-26	Silty clay loam	CL	100	100	90-100	80-95	35-50	15-30
	26-42	Clay loam, silty clay loam	CL	92-100	90-95	75-95	65-75	35-50	15-30
	42-59	Stoney clay loam	CL	85-95	75-90	70-85	55-75	30-50	15-35
	59	Weathered bedrock	-	-	-	-	-	-	-

The symbol < means less than; > means more than. Absence of any entry indicates that data were not estimated.

Source: U.S. Dept. of Argiculture, Soil Conservation Service, Ohio Dept. of Natural Resources, Division of Lands and Soil, and Ohio Agricultural Research and Development Center, 1980, "Soil Survey of Butler County, Ohio," USDA, ODNR, and Ohio Argicultural Research and Development Center, n.p.

000026

TABLE N-6

PHYSICAL AND CHEMICAL PROPERTIES OF HAMILTON COUNTY SOILS ON THE FEMP

Soil Name and Map Symbol	Depth (Inches)	Moist Bulk Density (g/cm^3)	Permeability (Inches/Hr)	Available Water Capacity Inches/Inches	Shrink-Swell Potential
EpA, EpB2, EpC2	0-7	1.30-1.50	0.6-2.0	0.18-0.22	Low
Eldean	7-36	1.40-1.60	0.2-2.0	0.08-0.14	Moderate
	36-60		>6.0	0.01-0.04	Low
FdA	0-8	1.40-1.55	0.6-2.0	0.22-0.24	Low
Fincastle	8-33	1.45-1.65	0.2-0.6	0.18-0.20	Moderate
	33-42	1.45-1.65	0.2-0.6	0.15-0.19	Moderate
	42-70	1.55-1.90	0.06-0.2	0.05-0.19	Low
FeA	0-8	1.40-1.55	0.6-2.0	0.22-0.24	Low
Fincastle	8-33	1.45-1.65	0.2-0.6	0.18-0.20	Moderate
	33-42	1.45-1.65	0.2-0.6	0.15-0.19	Moderate
	42-70	1.55-1.90	0.06-0.2	0.05-0.19	Low
Gn	0-9	1.30-1.50	0.6-2.0	0.20-0.24	Low
Genesee	9-35	1.30-1.50	0.6-2.0	0.17-0.22	Low
	35-60	1.30-1.50	0.6-2.0	0.19-0.21	Low

000037

TABLE N-6 (Continued)

Soil Name and Map Symbol	Depth (Inches)	Moist Bulk Density (g/cm^3)	Permeability (Inches/Hr)	Available Water Capacity Inches/Inches	Shrink-Swell Potential
EpA, EpB2, EpC2	0-7	1.30-1.50	0.6-2.0	0.18-0.22	Low
HeF	0-2	1.20-1.40	0.6-2.0	0.18-0.24	Low
Hennepin	1-12	1.30-1.60	0.2-2.0	0.14-0.22	Low
	12-60	1.45-1.70	0.06-0.6	0.07-0.11	Low
HoA	0-8	1.20-1.40	0.6-2.0	0.18-0.23	Low
Henshaw	8-44	1.20-1.40	0.2-0.6	0.15-0.19	Low
	44-66	1.20-1.40	0.2-0.6	0.17-0.22	Low
MaB, MaC2, MaD2, MaE2	0-10	1.35-1.50	0.2-0.6	0.18-0.23	Moderate
Markland	10-33	1.55-1.70	0.06-0.2	0.11-0.13	High
	33-60	1.55-1.70	0.06-0.2	0.09-0.11	High
McA, McB	0-9	1.30-1.45	0.6-2.0	0.20-0.24	Low
Martinsville	9-34	1.40-1.60	0.6-2.0	0.17-0.20	Moderate
	34-44	1.40-1.60	0.6-2.0	0.12-0.14	Low
	44-60	1.50-1.70	0.6-2.0	0.19-0.21	Low

TABLE N-6 (Continued)

Soil Name and Map Symbol	Depth (Inches)	Moist Bulk Density (g/cm^3)	Permeability (Inches/Hr)	Available Water Capacity Inches/Inches	Shrink-Swell Potential
EpA, EpB2, EpC2	0-7	1.30-1.50	0.6-2.0	0.18-0.22	Low
MoD2, MoE2	0-6	1.30-1.50	0.6-2.0	0.17-0.20	Low
Miamian	6-24	1.45-1.70	0.2-0.6	0.12-0.18	Moderate
	24-60	1.60-1.82	0.2-0.6	0.06-0.10	Low
RwB2	0-7	1.30-1.45	0.6-2.0	0.21-0.24	Low
Russell	7-22	1.40-1.60	0.6-2.0	0.18-0.20	Moderate
	22-43	1.40-1.60	0.6-2.0	0.15-0.19	Moderate
	43-72	1.60-1.80	0.6-2.0	0.05-0.19	Low
XfA, XfB2	0-9	1.40-1.55	0.6-2.0	0.22-0.24	Low
Xenia	9-26	1.45-1.65	0.2-0.6	0.18-0.20	Moderate
	26-46	1.45-1.65	0.2-0.6	0.15-0.19	Moderate
	46-72	1.55-1.90	0.2-2.0	0.05-0.19	Low

Source: U.S. Department of Agriculture, Soil Conservation Service, Ohio Department of Natural Resources, Division of Lands and Soil, and Ohio Agricultural Research and Development Center, 1982, "Soil Survey of Hamilton County, Ohio," USDA, ODNR, and Ohio Agricultural Research and Development Center, n.p.

TABLE N-7

ENGINEERING INDEX PROPERTIES OF HAMILTON COUNTY SOILS ON THE FEMP

Soil Name and Map Symbol	Depth (Inches)	USDA Texture	Unified Classification Symbol	Percentage Passing Sieve Number				Liquid Limit (Pct)	Plasticity Index
				4	10	40	200		
EpA, EpB2, EpC2	0-7	Loam	ML, CL-ML, CL	85-100	80-100	70-100	55-90	20-40	4-14
Eldean	7-36	Clay, clay loam, gravelly clay loam	CL, ML	75-100	60-100	55-95	50-80	38-50	12-23
	36-60	Stratified sand to gravel	GM, SM, GP-GM, SP-SM	30-70	20-50	5-40	0-35	-	NP
FdA	0-8	Silt Loam	CL, ML	100	95-100	90-100	75-93	27-36	4-12
Fincastle	8-33	Silty clay loam, silt loam	CL, CH	100	100	95-100	85-95	38-54	20-32
	33-42	Clay loam, loam, silty clay loam	CH, CL	95-100	90-98	85-95	75-85	45-58	30-38
	42-70	Loam, clay loam	CL, ML CL-ML	88-96	82-90	70-86	50-66	20-35	3-12
FeA	0-8	Silt loam	CL, ML	100	95-100	90-100	75-93	27-36	4-12
Fincastle	8-33	Silty clay loam, silt loam	CL, CH	100	100	95-100	85-95	38-54	20-32
	33-42	Clay loam, loam, silty clay loam	CH, CL	95-100	90-98	85-95	75-85	45-58	30-38
	42-70	Loam, clay loam	CL, ML, CL-ML	88-96	82-90	70-86	50-66	20-35	3-12

TABLE N-7 (Continued)

Soil Name and Map Symbol	Depth (Inches)	USDA Texture	Unified Classification Symbol	Percentage Passing Sieve Number 4	10	40	200	Liquid Limit (Pct)	Plasticity Index
Gn	0-9	Loam	ML, CL	100	100	90-100	75-90	26-40	3-15
Genesee	9-35	Silt loam, loam	ML, CL	100	100	90-100	75-90	26-40	3-15
	35-60	Stratified sandy loam to silt loam	ML, CL, CL-ML	90-100	85-100	60-90	50-90	20-35	3-15
HeF	0-2	Silt loam	CL, CL-ML	90-100	85-100	70-100	60-95	25-40	5-20
Hennepin	2-12	Loam, sandy loam, silt loam	SC, SM-SC CL, CL-ML	85-100	80-100	65-100	35-95	20-50	5-25
	12-60	Loam, sandy loam, clay loam	SC, SM-SC	85-100	80-100	65-100	35-95	20-50	5-25
HoA	0-8	Silt loam	ML, CL, CL-ML	95-100	95-100	90-100	80-100	20-35	3-10
Henshaw	8-44	Silty clay loam, silt loam	CL, ML	95-100	95-100	95-100	85-100	30-40	8-18
	44-66	Silt loam, silty clay loam	ML, CL, CL-ML	95-100	90-100	85-100	75-100	25-40	5-15
MaB, MaC2, MaD2, MaE2	0-10	Silty clay loam	CL, CH	100	100	95-100	85-95	35-55	20-35
Markland	10-33	Silty clay, clay, silty clay loam	CL, CH	100	100	95-100	90-95	45-60	25-35
	33-60	Stratified clay to silt loam	CL, CH	100	100	90-100	75-95	35-60	20-35

TABLE N-7 (Continued)

Soil Name and Map Symbol	Depth (Inches)	USDA Texture	Unified Classification Symbol	Percentage Passing Sieve Number				Liquid Limit (Pct)	Plasticity Index
				4	10	40	200		
McA, McB	0-9	Silt loam	CL, CL-ML	100	90-100	80-100	60-90	22-33	4-12
Martinsville	9-34	Clay loam, silty clay loam, sandy clay loam	CL, SC	100	90-100	65-90	40-90	20-35	8-20
	34-44	Sandy loam, sandy clay loam, loam	SM, MLA-4	100	90-100	60-80	30-60	30-40	2-8
	44-60	Stratified sand to loam	CL, SC, CL-ML SM-SC	95-100	85-100	80-95	40-60	<25	4-9
MoD2, MoE2	0-6	Silt loam	ML	95-100	95-100	90-100	70-95	26-40	4-12
Miamian	6-24	Silty clay loam, clay loam, clay	CL	95-100	80-100	75-95	70-85	32-50	15-30
	24-60	Loam, clay loam	CL, ML, CL-ML	75-95	75-90	65-85	50-75	20-35	3-13
RwB2	0-7	Silt loam	CL, CL-ML	100	95-100	80-100	50-90	20-35	5-15
Russell	7-22	Silty clay loam, silt loam	CL	100	100	95-100	85-95	35-50	20-35
	22-43	Clay loam, loam	CL, ML, CL-ML	90-100	90-95	80-90	65-75	35-50	17-31
	43-72	Loam, clay loam	CL, ML, CL-ML	85-95	80-90	75-85	50-65	<30	2-14
XfA, XfB2	0-9	Silt loam	CL, CL-ML	100	100	90-100	70-100	25-35	5-15
Xenia	9-26	Silty clay loam	CL	100	100	90-100	80-95	35-50	15-30
	26-46	Clay loam	CL	92-100	90-95	75-95	65-75	35-50	15-30
	46-72	Loam	CL, ML, SC, SM	85-95	80-90	75-90	40-65	15-30	NP-15

Source: U.S. Department of Agriculture, Soil Conservation Service, Ohio Department of Natural Resources, Division of Lands and Soil, and Ohio Agricultural Research and Development Center, 1982, "Soil Survey of Hamilton County, Ohio", USDA, ODNR, and Ohio Agricultural Research and Development Center, n.p.

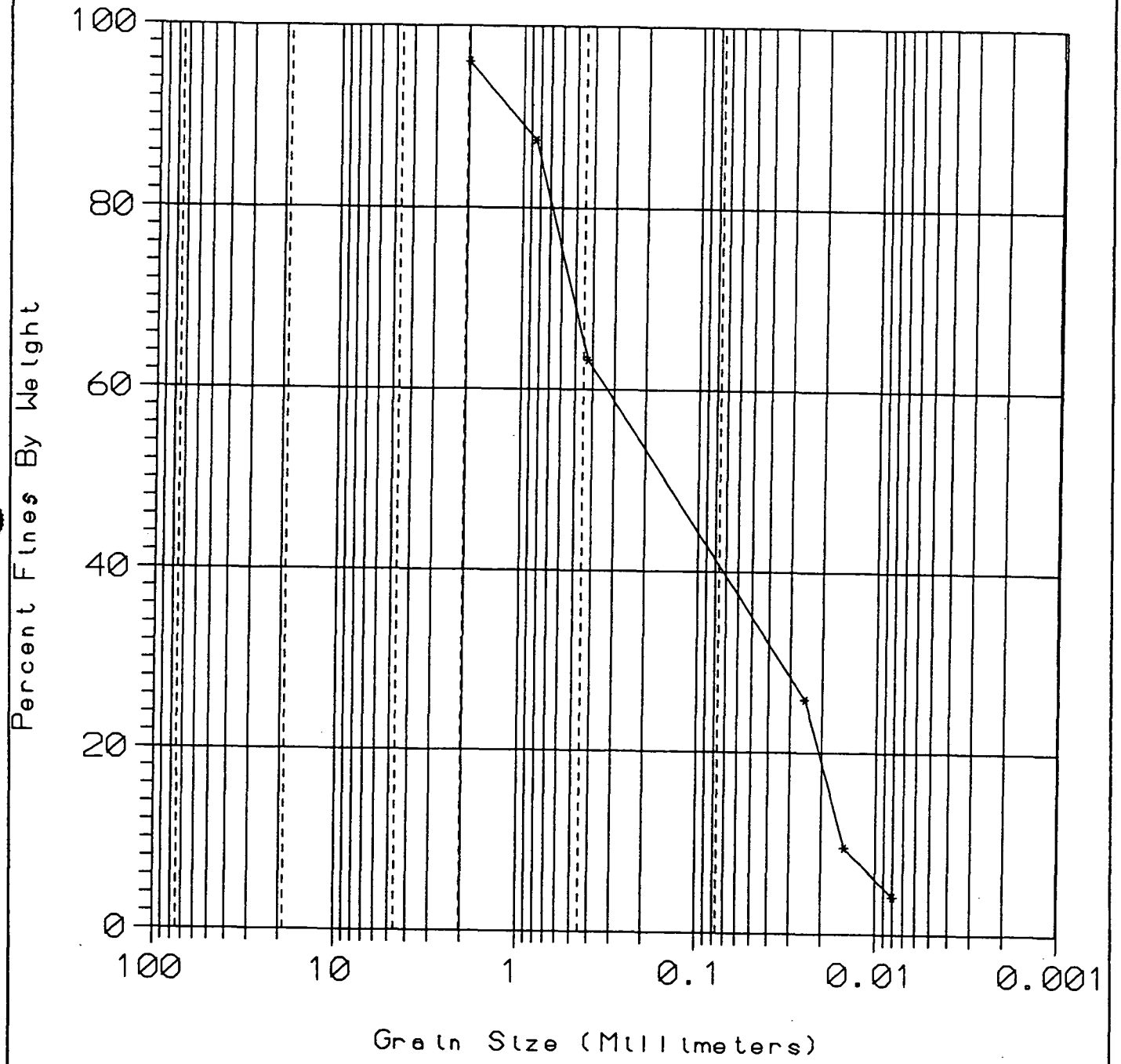


FIGURE N-1. TYPICAL GRAIN SIZE ANALYSIS PLOT

Appendix O

Monitoring Well Installation Data

TABLE O-1

TYPE 1 WELL CONSTRUCTION DATA

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1004	M	481,421.39	1,377,897.48	581.09	581.62	579.00		02/21/88	31.0	19.0	29.0
1008	M	480,660.43	1,378,925.89	579.05	579.53		577.60	03/30/88	31.0	19.0	29.0
1009	M	479,546.01	1,378,000.80	558.20	558.53		556.26	09/11/87	11.3	3.0	8.0
1010	M	481,452.64	1,379,690.67	584.12	584.60	582.60		04/05/88	27.0	13.0	24.0
1011	M	482,247.85	1,377,960.96	583.80	583.98		582.66	12/02/87	36.5	23.4	33.4
1012	M	483,703.23	1,380,912.78	635.25	636.52		634.50		80.0	45.0	61.0
1013	M	481,660.03	1,382,028.71	589.48	590.83		588.90		55.0		
1014	M	476,797.85	1,379,581.49	535.87	536.47		534.50	10/18/87	22.5	3.5	85.0
1015	M	476,138.00	1,380,213.06	579.49	579.30	577.90					
1016	M	477,617.13	1,379,149.06	541.85	542.40		540.70	10/16/87	22.5	10.1	20.1
1018	M	479,450.19	1,378,661.75	572.79	573.45		571.50	10/19/87	33.5	6.0	16.0
1019	M	481,657.56	1,379,094.87	584.87	584.85		582.90	01/01/84	10.0	6.0	10.0
1020	M	479,160.31	1,379,581.26	574.67	574.76		573.30	01/01/84	10.0	6.0	10.0
1021	M	481,566.50	1,378,897.33	585.42	585.52		584.00	01/01/84	12.0	6.5	11.5
1022	M	481,706.62	1,378,686.73	588.55	588.70		586.70		10.0	6.0	10.0
1024	M	482,481.13	1,378,892.98	582.54	582.82	580.20		10/18/87	27.0	17.5	24.5
1025	M	482,021.82	1,378,309.51	582.99	583.51		581.30	01/08/88	23.0	11.0	21.0
1027	M	481,980.79	1,379,319.50	585.02	585.57	583.00		12/22/87	31.5	18.4	28.4
1028	M	481,821.60	1,378,158.13	588.41	589.01		586.60	01/14/88	31.0	19.0	29.0
1029	M	480,826.11	1,378,398.38	578.70	579.06	577.30	577.38	10/28/87	36.0	18.4	28.4
1030	M	481,232.33	1,378,976.48	577.99	578.52	575.90		03/19/88	30.0	18.0	28.0

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1031	M	481,167.08	1,378,136.61	577.75	578.37		576.30	04/07/88	30.0	16.0	26.0
1032	M	480,515.31	1,378,296.87	570.75	571.25	569.30		10/31/87	24.0	7.5	9.5
1033	M	480,412.89	1,378,675.20	578.97	579.49	577.00		04/10/88	21.0	9.0	19.0
1034	M	480,240.85	1,378,410.34	571.29	571.74	569.20		04/07/88	20.0	8.0	18.0
1035	M	482,200.60	1,379,710.46	586.19	586.65		584.80	03/21/88	27.0	13.0	24.0
1037	M	482,151.80	1,379,796.71	590.82	591.22	588.60		02/23/88	41.5	28.0	39.0
1038	M	482,055.43	1,379,622.49	584.09	584.61		582.40	01/13/88	28.5	16.0	26.0
1039	M	480,729.12	1,379,659.11	579.27	579.81	577.40		04/09/88	27.0	13.0	24.0
1040	M	485,833.34	1,376,759.84	581.01		579.90		05/10/74	60.0	48.8	54.0
1041	M	480,550.15	1,379,798.68	583.13	583.62	581.30		04/11/88	22.5	10.0	20.0
1042	M	480,388.77	1,379,543.28	576.46	577.17		575.40	04/21/88	21.0	9.0	19.0
1045	M	477,134.70	1,379,751.55	547.59	548.15		546.20	10/09/87	18.0	2.5	7.9
1046	M	478,054.76	1,379,428.51	579.13	579.45	576.50		02/09/88	28.5	9.5	19.5
1047	M	478,258.45	1,379,062.49	571.07	571.49	568.70	569.10	10/17/87	20.0	7.0	17.0
1048	M	477,477.45	1,379,877.21	573.17	573.64		571.80	10/14/87	19.5	5.5	15.5
1052	M	482,506.58	1,380,147.61	586.92	587.43	584.80	585.40	11/10/87	30.0	16.5	26.5
1053	M	479,920.97	1,380,342.06	581.05	581.24	578.70		10/02/86	18.1	7.0	18.1
1054	M	480,050.26	1,381,524.14	582.78	583.01	579.80		10/01/86	18.7	7.6	18.7
1055	M	481,476.15	1,380,703.31	589.93	590.05		586.50	10/02/86	19.0	7.9	19.0
1058	M	487,510.79	1,377,375.53			582.40					
1059	M	487,827.16	1,376,077.06				605.10				
1060	M	475,865.60	1,380,010.66	581.86	581.86		581.86				

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1064	M	480,718.78	1,382,193.03	589.92	590.49	588.00		12/07/88	31.0	18.0	28.0
1065	M	477,860.01	1,380,415.98	572.96	573.26		571.40	10/06/87	14.0	3.0	13.6
1072	M	481,025.94	1,378,476.39	577.72	578.18	575.90		03/15/88	31.0	19.0	29.0
1073	M	481,417.66	1,378,202.78	585.02	585.55	583.20		04/20/88	29.0	15.0	26.0
1074	M	481,187.08	1,378,638.85	580.21	580.68	578.10		04/13/88	24.0	10.0	21.0
1075	M	481,637.42	1,378,535.90	583.13	583.65	581.50		04/22/88	28.0	20.0	25.0
1076	M	481,425.85	1,378,748.89	584.50	585.03	582.50	583.00	03/09/88	50.0	18.0	29.0
1077	M	481,407.65	1,378,815.68	584.86	585.37	583.20	583.63	03/18/88	33.0	18.0	29.0
1078	M	481,888.89	1,378,704.35	583.49	584.09		581.90	12/09/87	34.6	22.0	32.0
1079	M	482,273.70	1,378,165.47	583.98	584.48		582.60	10/21/87	39.0	23.6	28.6
1080	M	482,229.86	1,378,630.51	583.60	584.07	581.70		04/28/88	51.5	18.3	28.3
1081	M	482,041.23	1,379,003.75	592.15	592.71	590.70		12/03/87	33.0	20.4	30.4
1082	M	482,011.44	1,379,087.20	585.59	586.14	583.90		12/05/87	24.0	10.4	20.4
1083	M	481,804.99	1,379,240.05	585.04	585.60		583.40	01/09/88	22.5	9.0	19.0
1084	M	481,925.26	1,378,934.37	584.96	585.33		583.20	11/21/87	33.0	20.4	30.4
1085	M	481,970.37	1,381,739.56	592.44	592.97	590.50		03/19/88	18.0	5.0	15.0
1086	M	481,984.52	1,381,716.38	592.34	592.92	590.40		03/20/88	18.0	5.0	15.0
1087	M	481,963.01	1,381,686.38	592.08	592.56	590.10	590.50	03/21/88	18.0	5.0	15.0
1088	M	481,977.23	1,381,668.87	592.09	592.63	590.10		03/22/88	18.0	5.0	15.0
1089	M	481,966.04	1,381,716.47	592.18	592.76	590.30		03/24/88	18.0	5.0	15.0
1090	M	481,995.45	1,381,684.46	592.04	592.61	590.10		03/29/88	18.0	5.0	15.0
1110	P	480,426.28	1,381,889.78	582.14	582.51		580.30	11/19/88	13.5	8.2	13.2

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1111	P	480,196.16	1,381,878.06	581.54	581.69		579.70	12/03/88	12.0	6.2	11.2
1112	P	479,991.52	1,381,663.15	580.93	581.25		578.25	11/18/88	19.5	14.2	19.2
1113	P	479,992.70	1,381,403.26	580.91	581.08		579.10	12/02/88	19.5	8.2	13.2
1117	P	480,703.47	1,381,662.46	580.91	581.27		578.90	11/20/88	15.5	10.2	15.2
1124	M	483,033.12	1,382,783.19	618.78	618.90		618.90				
1130	P	480,718.93	1,380,753.33	580.94	581.04	578.90		05/02/89	10.0	5.0	9.8
1131	P	480,724.38	1,381,019.82	581.25	581.51		579.82	05/15/89	7.5	2.5	7.5
1133	M	480,689.65	1,381,883.56	581.84	582.00		580.32	04/01/89	10.5	5.0	9.8
1134	P	480,745.16	1,379,849.31	580.60	580.79	579.80		05/04/89	16.5	10.0	15.8
1135	P	480,557.30	1,380,909.27	579.77	580.15		580.15	08/14/89	10.5	5.3	10.1
1136	P	480,479.10	1,380,906.25	579.96	580.25		580.25	08/11/89	13.5	8.3	13.1
1137	P	480,498.14	1,381,038.54	581.00	581.34		579.37	04/06/89	13.0	8.2	12.9
1145	P	480,450.66	1,381,683.44	582.18	582.33		580.15	08/16/89	20.0	10.8	19.8
1148	P	480,424.65	1,381,655.96	581.02	581.46		580.24	08/08/89	20.0	13.8	18.6
1149	P	480,374.92	1,381,683.22	581.24	581.39		580.23	07/17/89	15.4	10.0	14.6
1150	P	480,419.86	1,380,749.86	581.10	581.33	579.00		04/27/89	15.0	9.5	14.5
1151	P	480,443.07	1,381,171.66	581.68	581.96	579.90		10/24/89	10.5	5.5	10.1
1152	P	480,411.02	1,382,105.62	579.55	579.69		577.69	04/05/89	20.0	5.0	1.0
1153	P	480,301.97	1,381,241.64	580.12	580.43		580.43	08/09/89	12.0	5.8	10.6
1154	P	480,206.13	1,380,744.14	581.79	581.92		579.37	04/26/89	13.0	6.9	11.7
1155	P	480,222.78	1,380,933.07	579.47	579.68		579.68	04/29/89	12.0	6.8	11.6
1156	P	480,196.36	1,381,031.00	580.35	580.63		578.07	04/12/89	7.5	4.0	7.5

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1157	P	480,163.38	1,381,153.01	581.34	581.55	579.60		10/25/89	13.5	8.1	13.1
1158	P	480,210.55	1,381,229.23	579.91	580.18		580.18	08/10/89	10.5	5.3	10.1
1160	P	480,183.25	1,382,104.51	583.91	584.12		582.12	04/04/89	9.5	6.0	9.5
1161	P	480,118.86	1,381,704.87	580.71	581.43		580.20	06/17/89	13.5	6.6	11.6
1165	P	480,019.34	1,381,614.03	579.04	579.53		578.83	04/04/89	5.0	3.0	4.8
1167	P	480,022.72	1,380,741.19	581.06	581.26		579.29	05/03/89	12.0	5.0	9.8
1171	P	479,941.71	1,382,070.58	582.49	582.60		580.60	04/03/89	9.0	3.0	7.8
1172	P	479,911.95	1,381,513.34	579.58	579.95		579.95	04/02/89	10.0	4.6	9.6
1173	P	479,751.25	1,381,394.46	579.22	579.40		579.40	04/01/89	20.0	9.4	4.7
1174	P	479,756.89	1,381,636.89	579.03	579.39		579.39	04/03/89	10.0	4.5	9.3
1176	P	480,705.79	1,379,852.67	581.15	581.51	579.70		05/08/89	12.0	7.0	12.0
1177	P	480,728.72	1,380,078.62	581.23	581.38		579.35	08/24/89	25.0	9.6	24.6
1178	P	480,719.82	1,380,195.61	581.84	582.02		579.80	10/07/89	13.5	8.5	13.5
1179	P	480,729.83	1,380,238.50	580.69	580.91		578.81	10/08/89	18.0	11.0	18.0
1180	P	480,728.25	1,380,268.21	581.40	581.54		579.34	01/05/90	9.0	3.5	8.5
1181	P	480,741.91	1,380,299.96	578.85	579.06		579.06	06/03/89	9.0	4.0	9.0
1182	P	480,705.07	1,380,322.72	581.00	581.22	579.50		10/23/89	13.5	8.0	13.0
1183	P	480,704.01	1,380,355.30	580.84	581.09	579.50		10/23/89	16.5	10.5	15.5
1185	P	480,688.28	1,380,471.80	581.40	581.63	579.50		10/25/89	20.0	14.0	19.0
1186	P	480,701.93	1,380,533.38	581.34	581.48	579.50		07/01/89	18.0	10.0	15.0
1187	P	480,725.13	1,380,586.00	581.36	581.54		579.64	06/02/89	15.0	10.0	15.0
1188	P	480,641.50	1,380,180.94	579.92	580.14		580.14	02/03/90	20.0	9.9	19.6

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1189	P	480,640.16	1,380,213.18	579.80	580.12		580.12	01/30/90	18.0	7.9	17.6
1190	P	480,637.91	1,380,246.45	579.81	580.08		580.08	01/23/90	18.0	9.0	16.5
1193	P	480,634.42	1,380,378.43	580.00	580.26		580.26	12/03/89	16.5	11.4	16.1
1194	P	480,639.27	1,380,420.79	579.96	580.28		580.28	11/19/89	15.0	10.3	15.0
1195	P	480,636.53	1,380,456.82	579.97	580.27		580.27	11/16/89	16.5	11.0	15.7
1196	P	480,627.89	1,380,507.31	580.02	580.23		580.23	11/08/89	15.0	9.6	14.6
1197	P	480,626.41	1,380,538.45	579.77	580.19		580.19	11/06/89	15.0	10.3	15.0
1198	P	480,601.67	1,380,704.13	581.10	581.34		579.46	06/02/89	15.0	10.0	15.0
1199	P	480,598.61	1,380,213.23	581.31	581.56		580.01	05/25/89	18.0	8.0	18.0
1200	P	480,577.09	1,380,315.27	581.64	581.93		579.97	05/16/89	16.5	6.5	16.5
1201	P	480,574.08	1,380,390.62	581.51	581.86		580.09	05/24/89	13.5	8.0	13.5
1202	P	480,581.85	1,380,459.62	581.79	582.02		580.17	05/22/89	16.5	6.5	16.0
1203	P	480,568.95	1,380,486.92	581.91	582.21		580.27	05/24/89	16.5	6.5	16.5
1204	P	480,594.55	1,380,557.47	579.57	579.84		579.84	01/04/90	19.0	13.5	18.5
1205	P	480,566.05	1,380,557.71	579.57	580.07		580.07	06/03/89	15.0	9.8	14.6
1206	P	480,546.57	1,380,525.92	581.49	581.76		579.45	06/04/89	16.5	9.8	14.6
1207	P	480,567.12	1,380,054.83	580.55	581.05		579.46	05/15/89	9.0	4.0	9.0
1208	P	480,550.53	1,380,198.75	581.34	581.80		579.97	05/31/89	20.0	8.0	18.0
1209	P	480,549.50	1,380,231.87	581.43	581.73		579.82	06/01/89	16.5	6.5	16.5
1210	P	480,485.42	1,379,844.46	581.80	582.21		579.41	05/03/89	10.5	5.5	10.5
1211	P	480,489.22	1,380,040.12	580.89	581.31		579.88	05/16/89	10.5	5.5	10.5
1212	P	480,483.60	1,380,175.49	579.42	579.78		579.78	11/02/89	16.5	6.5	16.0

050000

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1213	P	480,519.86	1,380,217.86	579.39	579.60		579.60	06/04/89	10.5	4.4	9.2
1214	P	480,469.95	1,380,286.69	579.65	579.97		579.97	12/15/89	15.0	8.9	14.1
1215	P	480,505.99	1,380,534.02	581.72	582.17	580.20		10/22/89	16.5	10.1	15.1
1216	P	480,465.42	1,380,461.50	579.56	579.80		579.80	10/21/89	18.0	11.1	16.1
1217	P	480,504.69	1,380,625.12	578.72	578.89		578.83	11/18/89	15.0	9.8	14.8
1218	M	480,411.88	1,379,952.56	580.58	581.38	579.80		05/02/89	10.5	5.5	10.5
1219	P	480,402.02	1,380,090.95	581.37	581.52		579.81	05/14/89	12.0	6.5	11.5
1220	P	480,397.05	1,380,209.37	581.59	581.91		580.11	05/25/89	20.0	4.8	19.6
1221	P	480,445.44	1,380,264.76	579.68	579.99		579.99	12/13/89	15.0	8.8	14.0
1223	P	480,400.12	1,380,287.03	579.88	580.09		580.09	11/02/89	20.0	9.0	19.0
1224	P	480,359.18	1,380,267.48	581.87	582.24		580.50	05/24/89	20.0	9.6	19.6
1225	P	480,407.39	1,380,542.26	579.35	579.58		579.58	11/18/89	16.5	11.1	16.1
1226	P	480,415.64	1,380,700.31	580.37	580.78		579.34	06/01/89	16.5	9.8	14.6
1227	P	480,317.47	1,380,474.60	579.57	579.77		579.77	05/14/89	12.0	6.8	11.6
1228	P	480,301.15	1,380,298.90	579.52	579.79		579.79	05/25/89	15.0	9.8	14.6
1229	P	480,262.59	1,379,834.54	580.16	580.85		578.37	05/01/89	12.0	7.0	12.0
1230	P	480,281.12	1,380,055.01	580.48	580.75		578.89	05/12/89	20.0	8.0	18.0
1231	P	480,236.98	1,380,209.43	581.83	582.15		580.09	10/18/89	20.0	8.0	20.0
1232	P	480,283.91	1,380,232.42	581.60	581.86		579.81	10/11/89	25.0	4.6	19.6
1233	P	480,245.01	1,380,269.37	579.49	579.85		579.85	06/01/89	20.0	6.8	19.8
1234	P	480,207.90	1,380,230.49	582.20	582.39		580.54	07/27/89	10.5	7.5	10.5
1235	P	480,225.25	1,380,394.38	579.56	579.75		579.75	04/22/91	17.5	10.5	15.5

5709
000051

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1236	P	480,307.05	1,380,517.69	581.82	581.95		580.04	05/14/89	13.5	6.4	13.1
1237	P	480,279.81	1,380,686.21	580.66	580.75		578.88	05/12/89	15.0	9.8	14.6
1239	P	480,033.76	1,379,829.46	580.63	581.23		578.60	04/30/89	12.0	7.0	12.0
1240	P	480,039.84	1,380,055.08	580.61	580.95		579.53	05/11/89	13.5	8.1	13.4
1241	P	480,029.99	1,380,277.94	580.71	580.92		579.13	05/11/89	15.5	10.3	15.1
1242	P	480,030.60	1,380,507.21	580.51	580.90		579.06	05/10/89	15.0	9.8	14.6
1243	P	480,039.47	1,380,558.22	580.10	580.23		578.45	05/10/89	13.5	7.8	12.6
1244	P	480,060.18	1,380,618.73	581.80	581.89		580.21	05/08/89	15.0	9.7	14.6
1245	P	479,951.92	1,380,057.83	580.66	580.90	578.80		10/10/89	16.5	11.5	16.5
1246	P	479,886.27	1,379,873.45	580.45	580.80		578.90	06/06/89	15.0	5.0	15.0
1247	P	479,914.24	1,379,929.82	578.64	578.85		578.85	12/04/90	20.0	10.0	20.0
1249	P	479,846.31	1,379,859.65	580.16	580.58		578.77	06/14/89	7.5	2.5	7.5
1250	P	479,809.04	1,379,858.62	577.94	578.46		578.46	01/08/90	20.6	10.6	20.0
1251	P	479,870.60	1,379,933.54	578.68	578.88		578.68	01/06/91	20.0	10.0	19.6
1253	P	479,809.06	1,379,885.99	578.43	578.74		578.70	11/17/89	20.0	14.6	19.6
1255	P	479,801.60	1,380,248.75	576.66	576.86		574.69	10/09/89	13.5	8.0	13.0
1258	P	479,746.35	1,379,938.82	578.22	578.43		578.43	09/10/90	20.2	10.2	20.2
1259	P	479,741.40	1,379,978.37	580.18	580.30		578.60	09/08/90	20.0	10.0	20.0
1260	P	479,755.59	1,379,915.71	580.40	580.70		578.83	06/15/89	9.0	4.0	9.0
1261	P	479,784.63	1,380,025.49	578.49	578.66		578.69	11/17/90	20.0	10.0	20.0
1262	P	479,862.46	1,380,221.69	576.46	576.83		574.93	06/04/89	12.0	7.0	12.0
1263	P	479,800.99	1,380,200.65	578.84	579.11	576.90		08/31/89	13.5	8.1	13.1

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1265	P	479,728.83	1,379,915.21	577.48	577.61		577.61	06/15/89	9.0	4.0	9.0
1266	P	479,713.63	1,380,213.49	579.91	580.20		577.83	06/13/89	20.0	10.0	20.0
1267	P	479,607.63	1,379,898.88	578.09	578.40		576.52	06/14/89	16.5	8.0	16.5
1268	P	479,623.49	1,380,008.32	578.49	579.15		577.08	08/30/89	15.0	9.6	14.6
1269	P	479,572.50	1,380,249.77	578.79	579.11		576.91	06/07/89	12.0	7.0	12.0
1270	P	479,572.21	1,380,466.33	578.66	579.12		577.09	06/07/89	9.0	4.0	9.0
1271	P	479,978.04	1,380,205.43	580.64	581.04		579.20	06/14/89	9.0	4.0	9.0
1272	P	482,071.07	1,380,988.72	590.01	590.36		590.36	06/17/89	13.5	8.3	13.1
1273	P	482,071.10	1,381,241.49	590.11	590.33		590.33	06/18/89	13.5	8.3	13.1
1274	P	482,063.80	1,381,462.30	592.94	593.02		591.11	06/19/89	16.5	11.3	16.1
1276	P	482,052.32	1,381,885.01	592.11	592.31		590.51	06/28/89	20.0	17.0	20.0
1277	P	481,958.66	1,381,477.88	592.40	592.59		590.68	07/13/90	9.0	4.0	9.0
1278	P	481,854.87	1,380,973.36	590.42	590.85		588.82	06/17/89	10.5	5.5	10.5
1279	P	481,851.10	1,381,358.44	591.59	591.77		589.87	07/17/89	15.0	9.3	14.2
1280	P	481,878.01	1,381,663.00	589.02	589.20		587.08	06/27/89	18.0	13.0	18.0
1281	P	481,844.00	1,381,864.34	585.64	586.05		584.19	06/28/89	12.0	7.0	12.0
1283	P	481,703.70	1,381,087.91	591.28	591.48		589.89	07/18/89	10.5	5.5	10.3
1287	P	481,634.92	1,380,992.27	589.80	589.97		588.15	07/18/89	15.0	5.0	14.8
1291	P	481,655.51	1,381,859.90	589.98	590.47		588.47	06/28/89	7.5	2.5	7.5
1293	P	481,407.00	1,380,962.16	588.23	588.71		586.99	07/25/89	12.0	7.0	12.0
1299	P	481,185.14	1,381,203.59	586.74	587.05		585.13	07/16/89	18.0	12.8	17.6
1301	P	481,161.40	1,381,649.39	587.33	587.43		585.58	07/14/89	12.0	6.8	11.6

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1304	P	481,099.70	1,380,871.00	583.91	584.29		584.28	01/17/90	9.0	4.0	9.0
1317	P	480,947.54	1,381,246.91	580.77	580.94		580.90	11/16/89	20.0	14.6	19.6
1318	P	480,941.25	1,381,434.52	582.48	582.70		582.66	11/09/89	16.5	6.1	16.1
1324	P	480,828.51	1,381,681.83	580.22	580.50		580.50	11/04/89	13.5	5.0	13.5
1332	P	482,077.01	1,380,737.53	592.10	592.18		590.57	07/30/89	20.0	14.8	19.6
1336	P	481,829.27	1,380,728.87	590.91	591.04		589.13	08/02/89	20.8	7.7	20.7
1337	P	481,637.29	1,380,009.42	587.65	587.76		586.07	08/10/89	10.5	5.1	10.1
1338	P	481,628.75	1,380,284.38	587.05	587.16		585.56	08/08/89	10.5	5.0	10.0
1339	P	481,614.27	1,380,504.33	584.86	585.09		585.09	10/05/89	12.0	5.0	12.0
1340	P	481,618.58	1,380,734.93	589.71	589.81		587.95	08/08/89	20.0	9.6	19.6
1341	P	481,373.11	1,379,977.11	587.52	587.92	585.80		10/04/89	20.0	14.6	19.6
1342	P	481,365.07	1,380,265.73	584.79	585.13		585.13	10/07/89	18.0	12.6	17.6
1343	P	481,347.63	1,380,490.25	584.61	584.84		584.84	10/06/89	10.5	5.1	10.1
1344	P	481,363.02	1,380,728.33	586.81	586.92	584.60		08/12/89	20.0	17.0	20.0
1345	P	481,240.48	1,380,144.50	585.12	585.58		585.58	08/29/89	15.0	9.6	14.6
1346	P	481,245.67	1,380,178.90	584.59	585.00		585.00	01/07/90	20.0	14.9	19.6
1347	P	481,151.60	1,379,994.63	587.11	587.25		585.47	08/09/89	20.0	9.8	19.8
1348	P	481,129.55	1,380,247.52	584.58	585.08		585.08	08/30/89	20.0	15.0	19.7
1350	P	481,120.98	1,380,725.65	586.41	586.55	584.50		08/13/89	9.0	6.0	9.0
1351	P	480,940.44	1,379,899.75	586.13	586.24		584.50	08/11/89	20.0	13.0	20.0
1352	P	480,889.77	1,380,004.40	584.93	585.07	583.20		08/24/89	16.5	9.6	14.6
1353	P	480,927.26	1,380,251.72	584.87	585.18		585.18	10/05/89	18.0	15.0	18.0

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1354	P	480,893.54	1,380,491.66	581.71	582.03		582.03	08/28/89	20.0	15.0	20.0
1356	P	480,828.63	1,380,037.72	583.07	583.28		581.55	08/25/89	20.0	10.0	19.8
1357	P	480,808.23	1,380,037.70	582.75	582.99	580.40		08/27/89	16.5	11.5	16.5
1358	P	480,792.75	1,380,114.61	580.62	580.83		578.97	08/26/89	13.0	8.0	12.8
1359	P	480,803.98	1,380,140.07	582.02	582.16		580.63	08/25/89	15.0	9.6	14.6
1360	P	480,783.43	1,380,506.36	579.22	579.41		579.41	08/27/89	16.5	8.0	16.5
1361	P	481,163.68	1,380,165.82	584.20	584.46		584.42	10/31/89	15.0	10.0	15.0
1362	P	481,303.91	1,380,840.48	587.68	587.88	585.50		10/11/89	10.5	8.0	10.0
1363	P	481,611.99	1,381,150.58	591.74	591.89	589.50		08/17/89	20.0	9.6	19.6
1403	P	479,781.60	1,380,561.35	579.94	580.35		578.84	08/12/89	15.0	9.8	14.8
1411	P	479,800.96	1,379,914.91	580.47	580.62	578.30		06/20/89	12.0	6.8	11.6
1412	P	480,702.37	1,380,398.11	581.01	581.19		579.70	06/30/89	12.0	7.0	12.0
1418	P	480,684.10	1,381,882.72	581.98	582.11		580.44	08/14/89	10.5	8.0	10.5
1420	P	480,645.76	1,380,293.54	579.83	580.12		580.12	01/20/90	20.0	9.9	19.6
1423	P	480,932.91	1,381,617.26	582.95	584.34		583.09	02/18/90	12.6	6.6	12.6
1433	M	477,991.53	1,379,116.16	569.69	569.92	566.70		08/04/92	12.5	6.0	11.0
1441	P	480,091.99	1,383,021.42	595.64	596.67	594.10		12/02/89	18.0	7.5	17.5
1442	P	480,085.14	1,383,110.69	598.28	598.77		596.71	11/20/89	9.0	4.0	9.0
1443	P	480,123.12	1,383,232.48	599.87	600.55		598.80	11/19/89	18.0	8.0	18.0
1444	P	480,070.16	1,383,192.35	601.74	602.15		600.33	11/20/89	15.0	10.0	15.0
1447	P	479,991.53	1,383,019.18	598.70	598.91	595.60		12/03/89	8.0	2.5	7.5
1448	P	479,986.38	1,383,111.86	598.59	598.93	596.60		12/02/89	15.0	4.5	14.5

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1490	P	478,865.49	1,380,509.12	577.82	578.37	575.70		07/02/85	11.5	6.5	11.5
1491	P	478,628.86	1,380,200.56	577.52		577.50		07/02/85	19.0	13.0	18.0
1508	P	482,565.57	1,380,840.06	593.20	593.35	590.90		02/02/90	13.5	8.0	13.0
1509	P	482,519.65	1,380,840.66	592.74	593.04	590.80		02/03/90	20.0	4.5	19.5
1510	P	482,519.62	1,380,877.90	593.13	593.26	591.00		02/04/90	9.0	3.5	8.5
1511	P	482,563.57	1,380,881.74	592.55	592.81	591.00		02/05/90	13.5	3.0	13.0
1512	P	482,541.56	1,380,926.10	592.88	593.08	590.70		02/06/90	14.0	3.5	13.5
1513	P	482,549.47	1,380,951.40	593.05	593.18	590.80		02/07/90	20.0	5.0	20.0
1514	P	482,540.76	1,380,973.96	593.10	593.19	590.80		02/07/90	13.5	3.5	13.5
1515	P	482,532.10	1,380,949.31	593.06	593.20	590.70		02/07/90	13.5	3.0	13.0
1516	P	477,071.10	1,379,636.54			540.00		05/19/90	20.0	2.0	2.5
1517	P	477,022.52	1,379,642.08			538.10		05/21/90	20.0	10.0	20.0
1518	P	476,976.12	1,379,619.39			537.10		05/22/90	20.0	10.0	20.0
1523	P	479,406.88	1,379,945.37	576.90	577.08		574.67	06/27/90	20.0	10.0	20.0
1564	P	478,352.09	1,380,097.21	578.98	579.11	576.60		07/02/85	17.0	12.0	17.0
1606	P	480,374.87	1,381,630.23	580.05	580.33		580.33	02/19/91	20.0	9.5	19.5
1607	P	480,303.77	1,381,636.76	580.05	580.24		580.24	02/03/91	20.0	9.5	19.5
1608	P	480,249.42	1,381,636.25	580.10	580.32		580.32	02/26/91	20.0	9.5	19.5
1610	P	480,280.20	1,381,673.17	580.13	580.40		580.29	01/20/91	20.0	8.0	18.0
1611	P	480,423.16	1,381,733.29	579.30	579.56		579.56	12/13/90	20.0	10.0	15.0
1612	P	480,380.06	1,381,731.07	578.90	579.34		579.34	12/19/90	20.0	12.6	17.6
1613	P	480,283.16	1,381,713.79	580.39	580.59		580.51	01/31/91	20.0	9.5	19.5

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1643	M	481,890.76	1,378,724.03	583.66	584.48		582.68	10/20/90	25.5	13.0	23.0
1644	M	481,616.21	1,378,641.29	583.39	583.94		581.78	08/28/90	26.0	13.0	23.0
1645	M	481,583.25	1,379,060.26	583.94	584.63	582.20		09/12/90	25.5	13.0	23.0
1646	M	481,743.08	1,379,094.86	585.34	585.85	583.50		09/09/90	25.5	13.0	23.0
1674	P	479,899.84	1,379,930.97	578.84	578.99		578.99	12/19/90	20.0	10.0	19.6
1675	P	481,182.80	1,381,060.63	589.26	589.43		587.76	03/08/91	20.0	9.8	19.8
1676	P	481,187.51	1,380,979.41	589.04	589.27		587.34	03/11/91	20.0	9.8	19.8
1679	M	483,924.53	1,378,264.61	587.96	588.50	585.80		01/27/92	35.0	22.0	32.0
1684	P	478,267.45	1,380,321.71	577.48	578.06	575.40		07/03/85	19.0	13.0	18.0
1685	P	478,498.46	1,380,433.06	577.03	577.05	574.40		07/03/85	17.5	7.0	17.0
1711	M	478,126.52	1,378,968.88	578.58	578.97	576.50	576.81	05/30/91	15.5	13.0	15.0
1719	M	482,215.57	1,379,699.18	592.28	592.74	590.10		08/10/91	19.5	12.8	15.8
1728	M	483,308.25	1,377,966.74	596.58	597.25	594.60		02/06/92	27.0	15.0	25.0
1733	M	477,080.44	1,383,156.49	607.15	607.45	604.70		01/08/92	30.0	26.0	29.0
1754	M	484,138.24	1,383,467.45	609.70	610.38		608.14	04/27/92	30.0	18.0	28.0
1765	M	481,377.70	1,378,289.96	582.48	583.05		580.77	07/25/91	22.5	18.0	22.0
1766	M	481,349.56	1,378,240.51	583.48	583.94		581.21	07/16/91	20.5	16.0	20.0
1767	M	481,289.27	1,378,278.74	582.49	583.02		580.70	07/02/91	21.0	16.0	20.0
1768	M	481,392.56	1,378,532.54	581.10	581.27		578.71	08/23/91	17.5	13.0	17.0
1769	M	481,474.32	1,378,468.56	582.61	582.98		580.62	08/21/91	22.0	17.5	21.5
1770	M	481,680.61	1,378,159.99	589.17	589.65		587.67	08/12/91	39.0	34.5	38.5
1771	M	481,638.22	1,378,298.05	591.71	592.15		589.62	08/14/91	41.0	36.5	40.5

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1772	M	481,771.63	1,378,500.36	586.03	586.51		583.43	08/08/91	36.5	31.0	36.0
1773	M	481,696.36	1,378,864.51	591.56	591.96	588.80		09/06/91	30.5	25.5	29.5
1774	M	481,765.34	1,378,912.61	593.03	593.72	590.50		08/27/91	31.0	26.5	30.5
1775	M	481,688.37	1,378,835.02	590.52	590.99	588.40		09/10/91	30.0	25.5	29.5
1776	M	481,718.86	1,378,630.15	587.44	587.65	584.80	584.97	07/31/91	32.5	28.0	32.0
1777	M	481,777.74	1,378,656.58	588.46	588.85		586.10	07/28/91	26.0	20.5	25.5
1778	P	480,305.19	1,381,672.31	579.96	581.53		580.31	02/14/91	20.0	9.5	19.5
1779	P	480,592.55	1,380,159.30	582.50	582.22	580.50		08/15/91	20.1	9.6	19.6
1780	P	480,594.23	1,380,211.84	581.07	581.57		579.57	09/05/91	18.8	8.0	18.0
1781	P	480,540.34	1,380,174.63	580.14	581.47	579.30		09/10/91	20.0	9.0	19.0
1782	P	480,539.34	1,380,217.30	580.78	581.80	579.60		09/08/91	19.7	8.9	18.9
1783	P	480,690.77	1,380,507.82	581.72	582.18	579.90		08/10/91	16.5	10.5	15.5
1784	P	480,678.39	1,380,546.32	581.52	582.50	580.70		08/14/91	16.0	5.5	15.5
1785	P	480,270.45	1,380,260.86	581.08	581.62		579.75	08/25/91	18.7	8.2	18.2
1786	P	480,828.53	1,381,681.73	580.07	580.55		580.55	08/07/91	15.0	4.5	14.5
1836	M	481,090.87	1,378,734.69	581.71	581.89		579.56	07/07/92	16.5	6.5	14.4
1837	M	480,839.19	1,378,727.10	578.95	579.52		576.95	07/01/92	8.5	5.5	7.5
1838	P	481,173.00	1,378,540.70	578.56	578.91		576.63	07/13/92	20.0	10.0	20.0
1839	P	480,433.90	1,379,149.98	578.01	578.31		576.16	06/25/92	20.0	11.5	20.0
1840	P	479,964.90	1,380,658.84	581.01	581.32	579.10		08/09/92	15.0	10.0	15.0
1842	P	479,927.25	1,381,972.92	580.28	580.69		578.78	12/14/92	17.5	10.0	12.0
1843	P	479,905.60	1,382,522.39	593.04	593.46		591.37	06/11/92	20.0	16.5	18.5

000058

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1844	P	479,900.92	1,382,800.94	594.81	595.32		593.12	06/03/92	18.0	15.0	17.0
1866	P	479,487.97	1,381,642.45	578.63	579.15	576.80		12/18/92	11.0	3.5	5.5
1868	P	479,516.95	1,380,691.01	577.34	578.12	575.70		12/19/92	17.0	13.0	15.0
1869	M	479,696.13	1,380,941.76	578.64	579.15		576.87	01/06/93	11.0	8.5	10.5
1887	P	482,410.68	1,380,855.73	591.16	591.52	589.40		12/17/92	13.5	10.0	12.0
1890	P	482,531.73	1,380,778.07	591.80	592.18	589.70		12/18/92	10.5	6.0	9.0
1891	P	480,361.12	1,378,334.70	573.14	573.39	571.40		03/12/93	9.0	5.5	7.5
1892	P	480,445.99	1,378,339.25	575.39	575.72	573.50		03/27/93	21.0	16.0	19.0
1893	P	480,560.90	1,378,345.18	576.53	577.15	575.50		03/17/93	12.0	6.3	9.3
1901	P	478,460.14	1,380,140.22	577.19	577.22		576.50		31.3		
1902	P	478,741.63	1,380,267.57	577.39	577.42		576.55		32.2		
1903	P	478,855.33	1,380,522.66	576.08	576.11		575.41	09/01/84	31.4	20.0	30.0
1904	P	478,776.03	1,381,284.95	579.53	579.59	578.00			29.6		
1905	P	478,587.09	1,381,255.00	577.52	577.56	575.80			32.0		
1906	P	478,520.29	1,380,439.58	575.07	575.10		574.62	09/01/84	31.3	20.0	30.0
1907	P	478,294.66	1,380,286.61	575.70	575.73		575.29	09/01/84	30.9	20.0	30.0
1908	P	478,753.04	1,380,674.94	569.60	569.63		568.85	09/01/84	31.0	20.0	30.0
1913	M	481,650.08	1,382,027.97	589.47	590.59		588.60			36.5	
1915	M	476,141.40	1,380,211.30	579.06	579.48	577.90					
1934	M	480,394.07	1,379,744.81	579.57	580.12		578.31	05/04/93	21.0	9.5	19.5
1937	M	480,645.51	1,379,534.49	578.99	579.27		577.31	05/01/93	20.5	8.5	18.5
1940	M	480,457.72	1,379,525.12	578.95	579.11	576.50		05/27/93	19.5	9.2	18.9

000059

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
1941	M	477,932.76	1,379,691.99	581.19	581.37	578.80		04/26/93	13.5	5.5	12.5
1942	M	477,662.53	1,379,627.53	577.77	578.42	576.50		04/16/93	16.0	5.1	14.9
1947	M	482,108.00	1,379,906.05	591.88	592.48	590.20		04/28/93	20.5	10.5	20.2
1950	M	482,202.10	1,379,549.67	584.34	584.84		582.89	05/06/93	20.0	9.0	19.0
1952	M	482,057.73	1,379,766.45	590.02	590.51		588.51	05/01/93	20.0	8.0	18.0
1954	M	477,864.72	1,379,400.07	577.08	577.64		575.45	05/15/93	20.0	9.0	19.0
11032	M	478,072.47	1,379,787.13	579.06	579.56		577.57	06/25/93	15.3	5.3	10.3
11064	M	478,443.35	1,379,495.01	578.55	579.07	577.00		06/11/93	15.6	11.1	15.1
11067	M	480,193.68	1,382,782.71	592.19	592.78		590.71	06/10/93	20.0	17.0	19.0
11068	M	480,148.51	1,378,746.78	568.97	569.48	566.60		07/01/93	16.5	11.0	16.0
11069	M	479,652.53	1,379,447.35	574.23	574.84	572.20		07/02/93	15.0	7.5	12.5
11070	M	479,980.13	1,379,476.95	576.84	577.03	574.10		07/02/93	18.0	12.5	17.5
11071	M	481,543.62	1,379,799.50	589.37	589.69		587.77	06/22/93	25.0	19.7	24.7
11072	M	481,310.61	1,379,767.85	586.91	586.91	585.10		06/22/93	25.0	19.5	24.5
11073	M	481,062.69	1,379,791.53	584.18	584.76		582.80	06/17/93	20.0	9.6	19.6
11074	M	481,199.10	1,380,777.36	585.54	585.71	582.90		06/29/93	20.0	14.8	19.8
11075	M	479,755.35	1,381,651.54	580.56	580.89		579.49	06/23/93	15.0	9.8	14.8
11076	M	481,418.91	1,377,909.05	582.11	582.49		580.56	07/07/93	21.5	10.0	12.0
11077	M	481,247.74	1,378,975.42	578.40	578.84		577.20	06/16/93	21.5	16.5	21.5
11078	M	482,143.60	1,379,841.59	591.75		590.20		06/29/93	21.0	13.0	18.0
11079	M	481,038.41	1,378,471.71	577.09	577.57	575.20		06/29/93	23.5	13.0	23.0
11080	M	478,751.52	1,380,695.76	570.47	570.95	568.60		07/09/93	12.0	9.2	11.2

090060

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
11081	M	478,656.75	1,380,666.02	569.94	570.39	568.00		07/08/93	13.5	9.2	11.2
11085	M	477,869.01	1,379,926.48	579.52	579.79	577.60		05/28/93	16.5	6.0	16.0
11112	P	481,616.94	1,380,504.36	584.86	585.23		585.23	09/21/93	19.5	4.0	14.0
11114	P	481,616.27	1,380,494.39	584.93	585.13		585.13	09/14/93	17.5	4.0	16.5
11115	P	481,613.19	1,380,494.17	584.90	585.18		585.18	09/16/93	20.5	19.5	20.5
11116	P	481,617.01	1,380,484.39	584.79	585.09		585.09	09/12/93	16.0	6.0	13.5
11118	P	480,280.88	1,380,257.99	579.46	579.72		579.72	09/20/93	8.0	6.0	7.5
11119	P	480,280.63	1,380,260.87	579.04	579.70		579.70	09/20/93	25.0	23.5	24.5
11120	P	480,280.69	1,380,263.52	579.51	579.72		579.72	09/17/93	26.0	10.5	21.0
11121	P	480,300.11	1,380,259.95	579.42	579.64		579.64	09/21/93	24.5	9.5	24.0
11122	P	481,505.10	1,379,218.98	580.88	581.41		580.14	09/14/93	28.5	15.0	25.0
11124	P	481,500.90	1,379,206.56	581.31	581.99		580.55	09/10/93	24.0	8.5	9.5
11125	P	481,515.01	1,379,219.94	581.16	581.81		580.46	09/15/93	24.0	5.5	11.5
11204	P	480,364.10	1,378,187.15	555.96	556.44		554.12	06/17/93	6.3	5.0	6.0
11205	P	480,446.00	1,378,236.93	558.82	559.33		557.25	06/24/93	6.3	5.0	6.0
11206	P	480,496.46	1,378,268.07	561.29	561.88		559.82	06/22/93	6.3	5.0	6.0
11207	M	480,325.09	1,378,273.79	571.63	571.76	569.30		06/28/93	12.0	8.0	11.0
11208	P	481,618.21	1,380,454.71	584.86	585.15		585.15	09/11/93	14.5	4.5	13.5
11209	P	481,627.11	1,380,504.68	584.95	585.27		587.27	09/18/93	21.5	6.5	20.5
11211	P	480,272.13	1,380,272.02	578.72	579.19		579.14	09/16/93	24.0	10.5	23.0
11213	P	481,484.44	1,379,216.23	580.69	581.35		580.03	09/16/93	17.0	5.0	16.0
11214	M	481,495.52	1,379,217.52	581.76	582.27		580.33	08/23/93	34.5	14.0	24.0

TABLE O-1 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
11216	M	481,756.64	1,379,409.16	584.42	584.74		582.93	08/24/93	35.0	18.5	28.5
11229	M	482,516.93	1,380,834.44	591.97	592.54		590.54	08/31/93	18.5	12.3	17.3
11230	M	481,837.12	1,381,868.48	590.91	591.34		595.24	08/26/93	12.0	9.5	11.5
11233	M							09/24/93	20.5	15.0	20.0

290062

TABLE O-2

TYPE 2 WELL CONSTRUCTION DATA

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2002	M	474,718.98	1,380,615.04	586.79	587.31		585.39	04/14/89	83.0	63.0	78.0
2004	M	481,185.10	1,377,945.09	558.52	559.05		556.80	08/15/59	43.0		
2006	M	480,353.44	1,380,563.69	581.48	581.80	579.60		05/03/89	75.0	53.0	68.0
2007	M	480,605.50	1,380,638.55	581.03	581.45		579.48	03/21/89	75.0	55.0	70.0
2008	M	480,661.42	1,378,918.03	578.87	579.37		577.40	03/28/88	72.8	55.8	70.8
2009	M	479,540.71	1,378,007.77	557.68	558.05		557.00	09/08/87	54.5	28.0	43.5
2010	M	481,460.53	1,379,691.07	584.09	584.62	582.20		03/30/88	77.0	58.0	73.0
2011	M	482,271.62	1,377,959.33	584.47	584.99	582.80			130.0		
2013	M	481,651.94	1,382,006.94	589.77	590.45		588.80	08/01/84	80.0	74.0	78.0
2014	M	476,802.99	1,379,584.94	534.92	535.94		533.90	08/01/84	22.0	14.0	18.0
2015	M	476,148.92	1,380,201.29	579.46	579.85	577.70	578.00	08/01/84	84.0	80.0	84.0
2016	M	477,615.38	1,379,157.77	541.30	542.39		540.60	08/01/84	36.0	31.0	34.5
2017	M	476,259.20	1,379,157.09	535.86	536.29	534.30	534.50	08/01/84	37.0	21.0	27.0
2018	M	479,447.70	1,378,671.57	572.19	573.60		571.50	08/01/84	59.0	52.0	59.0
2019	M	481,674.46	1,379,093.84	584.81	585.37		583.20	08/01/84	80.0	69.0	74.0
2020	M	479,168.75	1,379,519.37	575.17	575.62		573.60	08/01/84	66.0	60.0	65.0
2021	M	481,567.90	1,378,913.40	584.86	585.92		584.30	02/13/85	76.0	70.0	75.0
2022	M	481,695.17	1,378,680.21	587.57	587.94		586.20	02/14/93	92.0	81.0	86.0
2024	M	482,487.51	1,378,880.72	582.22	582.48	580.40		10/29/87	70.1	53.5	68.5
2026	M	487,121.81	1,391,612.98	567.27		566.10		11/20/71	75.0	73.0	73.0
2027	M	481,969.29	1,379,317.37	585.55	585.90	582.70	583.60	12/18/87	76.5	58.4	73.4

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2028	M	481,811.42	1,378,152.28	588.55	589.21		587.26	05/19/90	79.0	60.0	75.3
2032	M	480,503.68	1,378,298.59	570.80	571.20	568.80		02/17/90	65.0	40.0	55.0
2033	M	480,411.10	1,378,687.33	578.72	579.23	577.00		06/14/90	70.0	50.0	65.5
2034	M	480,240.05	1,378,419.45	571.44	571.90	569.70		04/05/88	65.0	45.0	60.0
2036	M	474,575.07	1,373,903.36	609.99		611.70		04/24/68	107.0	101.0	103.0
2037	M	482,140.97	1,379,801.07	590.54	591.08	588.50	589.02	02/20/88	84.0	65.0	80.0
2042	M	480,394.27	1,379,542.73	577.20	577.58		573.30	04/19/88	68.0	50.0	66.0
2043	M	481,760.81	1,377,051.97	579.73	580.06		578.60	12/18/87	69.3	51.8	66.8
2044	M	477,783.56	1,378,156.80	573.44	573.92	571.90		03/16/88	65.8	48.2	63.2
2045	M	477,129.91	1,379,760.54	547.34	547.89	545.40		12/07/88	45.0	23.0	38.0
2046	M	478,058.45	1,379,418.68	577.81	578.23	575.90		12/13/88	73.0	53.4	68.4
2047	M	478,263.85	1,379,054.18	570.03	570.51		568.95	01/03/89	64.0	45.3	60.3
2048	M	477,480.23	1,379,866.55	573.56	574.02	571.50		11/30/88	68.0	50.0	65.0
2049	M	477,020.51	1,380,072.04	542.71	543.13		541.20	10/14/87	41.5	18.0	33.0
2050	M	482,407.69	1,376,516.93	580.22		579.20		09/06/84	90.0	69.5	73.6
2051	M	481,597.05	1,383,279.97	609.38	609.96		607.40	11/17/87	105.0	85.0	100.0
2052	M	482,507.16	1,380,139.73	586.46	587.01	584.50	585.10	07/23/88	81.5	60.0	75.0
2053	M	479,935.12	1,380,352.25	579.80	580.36	578.10		02/10/89	71.5	53.3	68.3
2054	M	480,030.82	1,381,523.36	582.45	582.77	579.50		11/17/88	81.5	62.0	77.0
2055	M	481,488.08	1,380,703.99	588.22	588.74	587.40		03/19/89	81.5	63.0	78.0
2056	M	490,669.52	1,374,692.87	595.99			598.90	09/28/83	77.0	72.0	77.0
2057	M	479,621.12	1,372,807.54	611.93		610.40		06/04/64	125.0	120.0	125.0

000064

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2060	M	475,865.60	1,380,010.60	577.01	581.86		581.86	02/12/54	84.0		
2061	M	474,775.50	1,379,665.90	542.85			546.70				
2064	M	480,720.10	1,382,183.97	589.39	589.81	587.80		01/15/88	85.0	65.0	80.0
2065	M	477,866.51	1,380,434.37	573.36	573.81	571.50		10/03/87	66.5	46.5	61.5
2066	M	483,938.95	1,376,703.45	579.88	580.38	578.20	578.20	08/31/87	63.0	45.0	60.0
2067	M	479,761.00	1,382,997.00	595.58	595.64	593.20		03/14/86	103.5		
2068	M	478,683.00	1,381,391.00	579.93	580.05	578.10		03/16/86	88.5		
2069	M	476,416.30	1,380,705.58	576.02	576.15	574.20		04/10/86	86.5		
2070	M	476,752.00	1,382,029.00	594.22	594.35	592.10		03/24/86	103.0	92.8	102.2
2071	M	481,528.00	1,384,984.00	539.05		536.60		04/09/86	46.0		
2084	M	481,922.56	1,378,940.30	585.10	585.49		585.30	11/19/87	77.0	58.4	73.4
2091	M	477,826.61	1,384,448.64	536.49	536.94	534.40	534.90	06/01/88	35.0	10.0	25.0
2092	M	476,613.61	1,384,177.17	575.22	575.75		573.90	06/01/88	70.0	50.5	65.5
2093	M	475,317.29	1,381,403.28	588.03	588.40		586.40	06/15/88	81.0	62.8	77.8
2094	M	470,832.49	1,380,701.68	520.96	521.43	519.50		06/20/88	30.0	10.5	25.5
2095	M	475,052.04	1,379,568.71	535.55	536.10	533.80		07/14/88	28.0	10.0	25.0
2096	M	476,531.14	1,377,204.11	580.37	580.97	579.50		08/18/88	74.0	55.0	70.0
2097	M	480,283.63	1,386,936.00	537.02	537.89		537.89	08/19/88	40.0	17.6	32.6
2098	M	483,385.79	1,386,326.37	549.28	549.83	547.40		09/10/88	46.0	27.0	42.0
2104	M	477,575.00	1,377,655.00	577.80		576.60		11/05/68	90.0	84.0	88.0
2105	M	491,122.03	1,372,678.80	599.38	599.38	598.80		07/11/74	80.0	76.0	80.0
2106	M	476,096.82	1,379,580.27	540.80	541.07	538.90		01/31/89	35.0	15.2	30.2

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2107	M	478,567.08	1,378,527.61	570.52	571.12	568.70		03/10/89	65.0	42.0	57.0
2108	M	480,056.37	1,377,920.72	551.92	552.35	550.20		02/23/89	44.0	23.0	38.0
2109	M	480,492.35	1,381,798.38	580.52	580.79	578.70		12/17/88	81.5	60.0	75.0
2118	M	480,013.14	1,381,795.87	580.94	581.39	579.00		12/06/88	82.0	58.0	73.0
2119	M	479,309.36	1,384,594.27	539.30	539.74		537.45	01/19/93	160.0	13.0	28.0
2120	M	480,186.92	1,382,123.05	584.56	584.71	582.50		02/28/90	76.0	58.4	73.4
2121	M	486,946.78	1,389,231.79	564.43		563.70			72.0		
2122	M	485,610.43	1,388,577.65	552.26		552.10			61.3		
2123	M	476,285.02	1,374,988.55				599.80	10/28/60	103.0	101.0	103.0
2125	M	474,354.95	1,379,479.44	529.19	529.93	527.20		10/28/60	25.0	5.0	20.0
2126	M	473,049.47	1,378,966.19	525.66	526.13	523.90		01/10/90	25.0	6.0	21.0
2127	M	470,038.58	1,380,153.30	518.48	528.69	516.40		03/11/89	20.0	8.3	18.3
2128	M	473,552.11	1,379,795.75	530.93	531.27	529.10		11/05/89	28.0	12.0	22.0
2129	M	472,632.99	1,379,884.49	529.77	530.03	527.90		11/09/89	25.0	12.0	22.0
2166	M	476,523.77	1,381,106.59	581.92	582.44	580.10		10/19/92	135.0	74.0	84.0
2171	M	479,937.91	1,382,076.33	582.75	583.20	581.10		01/23/92	80.0	60.0	75.0
2383	M	480,500.26	1,377,374.38	565.17	565.62	563.30		04/18/90	57.0	38.0	53.0
2384	M	479,054.45	1,377,550.69	573.48	573.73	571.60		03/01/90	65.0	35.5	50.5
2385	M	477,886.51	1,379,923.25	579.35	579.86	577.60		04/25/90	75.0	53.0	68.0
2386	M	477,633.90	1,380,783.98	577.63	577.92	575.20		05/02/90	71.5	51.0	66.0
2387	M	477,119.12	1,380,441.15	571.72	572.19	569.60		04/19/90	65.0	46.0	61.0
2388	M	480,483.16	1,381,424.85	580.87	581.33	578.90		06/28/90	71.5	52.1	67.1

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2389	M	480,143.91	1,381,322.27	581.76	581.93	579.20		07/13/90	71.5	52.0	67.0
2390	M	476,548.05	1,379,876.56	569.48	570.19	567.60		06/01/90	66.5	42.4	57.4
2391	M	472,144.98	1,381,487.82	526.99	527.44		525.51	03/05/90	30.0	8.4	23.4
2392	M	471,422.36	1,381,580.52	520.23	520.82	518.30		11/07/90	31.5	8.0	23.0
2393	M	472,627.57	1,379,379.79	530.21	530.63		528.20	07/24/90	29.0	10.4	25.4
2394	M	473,323.20	1,381,294.31	536.49	536.87		534.79	05/21/90	46.5	25.0	40.0
2395	M	471,685.09	1,382,128.31	530.50	530.89	528.00		12/12/91	34.0	14.5	29.5
2396	M	474,169.75	1,379,213.52	527.93	528.71		526.70	07/26/90	25.0	4.0	19.0
2397	M	478,270.65	1,380,995.05	576.53	576.75	574.50		07/29/90	70.0	47.0	62.0
2398	M	476,590.05	1,381,346.22	580.33	580.89		578.81	11/15/91	75.0	55.0	70.0
2399	M	477,314.57	1,381,548.79	583.81	583.88	581.00		12/10/91	77.0	59.3	74.3
2400	M	477,899.48	1,381,815.81	582.58	583.13	580.70		12/20/91	80.0	60.0	75.0
2401	M	478,127.83	1,379,105.21	571.26	571.86	569.40		03/05/92	65.0	44.0	59.0
2402	M	478,193.48	1,378,776.56	567.85	568.56	567.10	566.47	12/22/91	62.0	45.0	60.0
2417	M	480,303.49	1,382,933.86	595.45	595.80	593.00	593.62	03/09/92	90.0	70.0	85.0
2420	M	480,457.16	1,382,619.75	592.95	593.48	591.10		01/09/92	90.0	70.0	85.0
2421	M	481,651.85	1,382,074.36	588.46	588.94	586.90		11/13/91	85.0	65.0	80.0
2423	M	482,556.52	1,381,770.68	599.54	599.80	597.30		03/02/92	94.0	77.0	92.0
2424	M	482,347.01	1,383,280.98	615.94	616.65	614.40		01/06/93	107.0	90.0	105.0
2426	M	480,820.82	1,383,202.73	600.27	600.74		598.69	02/04/93	91.0	74.0	89.0
2429	M	480,082.60	1,383,293.04	601.80	602.15		600.15	07/24/93	92.0	74.0	89.0
2430	M	479,753.77	1,382,997.32	595.11	595.68		593.53	10/30/92	86.0	69.0	84.0

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2431	M	478,856.80	1,383,075.02	594.20	594.67		592.23	12/17/92	85.0	68.0	83.0
2432	M	478,002.22	1,383,082.27	605.14	605.59		603.45	01/27/93	97.0	78.0	93.0
2434	M	476,412.18	1,380,716.08	576.51	576.91	574.30		09/21/92	70.0	51.5	66.5
2435	M	481,749.02	1,379,077.26	584.99	585.29	583.59	583.59	10/27/92	72.0	55.0	70.0
2436	M	482,554.44	1,381,230.88	595.35	595.82		593.57	05/25/93	82.0	65.0	80.0
2439	M	481,094.54	1,382,199.38	591.56	592.55		590.57	03/16/93	85.0	65.0	80.0
2446	M	479,369.81	1,382,193.35	584.27	584.72		582.51	03/17/93	77.0	57.0	72.0
2452	M	482,336.30	1,379,190.91	585.50	585.58	582.80		03/10/93	77.0	57.0	72.0
2454	M	481,201.04	1,379,310.18	577.54	578.01		576.16	08/08/93	125.5	53.0	68.0
2539	P	472,218.60	1,379,851.72	532.19		527.50		06/18/89	21.7	11.7	21.7
2540	P	472,395.82	1,379,539.99	531.34		530.00		06/20/89	22.0	12.0	22.0
2541	P	472,957.52	1,379,731.52	528.83		527.40		06/20/89	19.0	9.0	19.0
2542	P	472,715.45	1,381,172.04	528.94		526.00		06/20/89	21.5	11.5	21.5
2543	P	473,172.07	1,381,204.47	531.82		529.00		06/21/89	22.0	12.0	22.0
2544	P	474,536.36	1,379,975.55	539.79	539.96	537.30		06/21/89	26.0	14.5	24.5
2545	P	474,173.90	1,379,479.75	529.09		526.50		06/21/89	17.5	7.5	17.5
2546	P	473,448.60	1,379,530.74	530.84		528.00		06/22/89	21.5	11.5	21.5
2547	P	472,744.96	1,380,375.06	528.02		525.00		06/22/89	21.0	8.0	18.0
2548	P	473,251.34	1,380,335.20	529.94		527.50		06/22/89	19.0	9.0	19.0
2549	M	473,649.48	1,380,226.50	529.65		527.10		06/23/89	16.5	6.5	16.5
2550	M	475,756.24	1,379,348.13	536.58	536.94		535.04	11/29/90	30.0	8.0	23.0
2551	M	475,347.36	1,379,005.94	532.41	533.06	530.60		10/31/90	30.0	8.0	23.0

0068

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2552	M	473,909.82	1,379,195.32	527.56	528.12	525.70		10/31/91	25.0	5.0	20.0
2553	M	473,343.11	1,378,885.60	525.89	527.04	524.10		10/30/91	20.0	3.0	18.0
2554	M	472,202.72	1,378,943.98	524.97	525.42		523.52	11/19/90	31.5	7.0	22.0
2555	M	472,580.39	1,378,111.80	539.42	540.02	537.40		12/02/90	36.5	15.0	30.0
2556	M	471,263.84	1,379,642.75	521.02	521.45	519.20		11/13/90	30.0	8.0	23.0
2557	M	470,857.04	1,379,674.16	520.90	521.59	518.90		10/22/91	30.0	8.0	23.0
2558	M	469,183.69	1,379,930.77	515.86	516.33	514.00		01/15/91	20.5	8.0	18.0
2559	M	469,960.98	1,380,593.38	518.06	518.72	516.20	516.66	01/19/91	31.5	8.0	23.0
2560	M	468,758.40	1,379,713.84	522.47	523.04		520.92	11/16/90	20.0	7.0	17.0
2561	M	468,294.90	1,380,102.15	518.87	519.55	517.30		01/07/91	36.5	13.0	28.0
2624	M	474,576.41	1,379,551.48	533.58	534.12		531.60	03/19/90	17.0	7.0	17.0
2625	M	473,704.84	1,379,696.54	531.29		528.20		03/20/90	14.5	4.5	14.5
2626	M	473,159.97	1,379,871.41	530.04		528.00		03/01/90	16.0	6.0	16.0
2627	M	473,036.85	1,379,903.35	530.53		528.30		03/01/90	18.0	8.0	18.0
2628	M	472,744.04	1,379,916.82	529.60		527.50		03/02/90	18.0	8.0	18.0
2629	M	472,334.63	1,379,845.58	529.45		529.80		03/13/90	22.0	11.9	21.9
2630	M	472,381.20	1,379,958.84	529.71		530.10		03/13/90	22.0	11.8	21.8
2631	M	472,399.95	1,380,018.86	533.06		530.20		03/12/90	22.0	12.0	22.0
2632	M	472,179.43	1,380,127.31	531.89		528.89		03/12/90	20.0	10.0	20.0
2633	M	472,023.15	1,380,157.79	532.12		529.68		03/20/90	22.2	12.2	22.2
2634	M	472,112.90	1,380,085.78	531.73		528.99		03/09/90	22.0	12.0	22.0
2635	M	472,124.98	1,379,852.09	532.59		530.60		03/05/90	22.5	11.9	21.9

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2636	M	473,377.08	1,379,955.07	531.75		528.30		03/07/90	15.5	5.4	15.4
2637	M	471,626.68	1,379,643.05	522.20		518.90		02/26/90	15.0	4.9	14.9
2638	M	471,397.40	1,380,128.50	521.65		518.80		02/21/90	15.2	4.9	14.9
2639	M	471,376.58	1,380,504.88	521.90		518.60		03/14/90	15.2	5.0	15.0
2640	M	471,464.83	1,381,204.95	520.41		517.00		03/14/90	14.5	4.5	14.5
2643	M	481,904.04	1,378,738.65	583.81	584.27		582.42	10/07/90	82.0	63.0	78.0
2648	M	481,508.29	1,379,062.57	583.43	584.03	582.50		09/25/90	80.0	58.0	73.0
2649	M	481,167.42	1,378,125.73	577.77	578.25		576.43	10/19/90	70.0	48.0	63.0
2679	M	483,923.14	1,378,278.45	587.87	588.64	585.90		01/22/92	80.0	60.5	75.5
2690	M	473,146.59	1,379,731.48	530.53		527.90		03/19/90	19.0	9.0	19.0
2691	M	472,878.06	1,379,877.69	531.29		528.30		02/27/90	18.0	7.6	17.6
2692	M	473,186.81	1,379,789.04	528.35		528.60		12/14/90	19.6	9.6	19.6
2693	M	470,584.84	1,381,317.43	525.15		523.20		06/14/90	22.4	12.2	22.2
2694	M	470,320.21	1,380,469.99	524.28		521.20		06/13/90	22.1	12.1	22.1
2695	M	470,274.54	1,380,283.27	518.44		516.50		12/12/90	19.0	8.0	18.0
2696	M	469,440.21	1,380,048.21	516.49		514.40		12/05/90	20.0	7.3	17.3
2697	M	469,467.35	1,380,543.49	518.64		516.80		12/05/90	22.0	9.6	19.8
2698	M	469,059.56	1,380,755.12	524.17		522.20		12/06/90	26.0	13.6	24.0
2699	M	468,718.66	1,379,885.31	515.61		513.50		12/06/90	19.5	9.5	19.5
2700	M	471,943.46	1,379,819.97	533.13		531.20		12/07/90	24.0	13.8	24.0
2701	M	472,014.88	1,380,625.95	528.20		526.20		12/07/90	22.0	10.1	20.4
2702	M	473,070.77	1,380,049.40	527.98		526.10		12/11/90	17.4	7.4	17.4

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2704	M	472,217.51	1,379,922.58	532.89		530.70		12/12/90	22.0	11.0	21.2
2705	M	468,990.88	1,381,222.66	525.89		523.90		01/08/91	27.0	17.0	27.0
2706	M	468,003.98	1,380,554.05	518.15		516.10		01/07/91	23.5	13.4	23.5
2707	M	467,913.96	1,380,882.39	518.95		517.10		01/08/91	24.0	13.9	24.0
2728	M	483,301.63	1,377,960.59	597.08	597.65	594.70		01/30/92	92.0	70.0	85.0
2733	M	477,070.67	1,383,161.03	607.77	607.86	604.90		01/06/92	94.0	77.0	92.0
2754	M	484,149.05	1,383,465.72	609.75	610.33		608.33	04/22/92	120.0	85.0	100.0
2787	M	472,012.22	1,381,040.57	528.40		526.32		04/17/91	20.0	10.0	20.0
2788	M	472,501.77	1,380,482.53	528.36		526.32		04/22/91	18.0	7.0	17.0
2789	M	472,178.49	1,380,465.07	527.64		524.71		04/22/91	20.0	9.0	19.0
2810	M	472,440.81	1,379,840.02	529.14		529.40		04/24/91	24.0	14.0	24.0
2821	M	481,337.23	1,378,625.21	581.57	581.91		580.19	07/02/92	80.0	60.0	75.0
2822	M	481,233.45	1,378,484.44	578.62	579.17	577.00	577.43	05/27/92	70.0	53.0	68.0
2880	M	475,033.86	1,380,068.56	583.83	584.11		582.35	04/12/93	73.0	56.0	71.0
2881	M	475,017.76	1,380,563.78	583.99	584.33		582.66	07/13/93	73.0	56.0	71.0
2897	M	474,980.72	1,380,901.70	589.39	589.71		587.67	03/30/93	81.0	62.0	77.0
2898	M	474,369.10	1,381,298.76	591.30	591.78		590.14	04/29/93	85.0	66.0	81.0
2899	M	474,138.40	1,380,694.74	591.59	591.96		590.28	05/06/93	85.0	65.0	80.0
2900	M	473,920.10	1,379,922.63	531.47	531.93		529.82	06/03/93	25.0	6.0	21.0
2935	M	480,499.49	1,379,855.38	581.13	581.62		579.69	05/08/93	70.0	53.0	68.0
2936	M	480,677.56	1,379,862.08	581.32	581.97	579.60		05/14/93	72.0	53.0	68.0
2939	M	480,671.47	1,379,531.05	578.34	578.67	576.60		05/27/93	69.0	52.0	67.0

570009

5709

TABLE O-2 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
2943	M	477,474.62	1,379,635.87	575.64	575.94	573.50		04/20/93	70.0	49.0	64.0
2944	M	477,514.06	1,379,493.03	576.05	576.38	574.10		06/23/93	67.0	50.0	65.0
2945	M	477,972.18	1,379,119.93	568.71	569.24	566.70		04/07/93	60.0	38.5	53.5
2947	M	482,120.02	1,379,906.75	591.78	592.11	589.80		04/16/93	85.0	63.0	78.0
2949	M	482,338.10	1,379,718.25	585.80	586.26	583.80		04/07/93	79.0	60.0	75.0
2951	M	482,158.80	1,379,554.77	583.75	584.19		582.13	04/26/93	75.0	55.0	70.0
2953	M	482,020.08	1,379,744.25	588.55	588.77	586.60		06/06/93	80.0	60.0	75.0
2954	M	477,804.29	1,379,406.47	577.82	578.41	576.00		06/07/93	65.0	47.0	62.0
2955	M	478,103.82	1,378,953.07	579.13	579.55	577.20		05/05/93	70.0	50.0	65.0
21033	M	477,278.10	1,380,181.18	575.60	576.15		573.58	05/17/93	65.0	47.0	62.0
21063	M	475,839.24	1,381,581.99	582.78	583.13	581.00		07/22/93	148.0	85.0	100.0
21064	M	478,443.48	1,379,482.59	578.88	579.21		577.41	05/20/93			
21065	M	478,483.28	1,380,037.41	578.64	579.02	576.50		07/08/93	131.5	49.0	64.0
21189	M	476,797.85	1,379,581.49	579.49	579.63	577.90		10/18/87	22.5	3.5	8.5
21190	M	477,617.13	1,379,149.12	541.85	542.40		540.70	10/16/87	22.5	10.2	20.2
21191	P	477,071.10	1,379,636.54	540.95	541.20		539.31	05/19/90	20.0	9.5	19.5
21192	P	477,022.52	1,379,642.08	540.06	540.33		538.56	05/21/90	20.0	10.0	20.0
21193	P	476,976.12	1,379,619.39	538.77	539.08		537.26	05/22/90	20.0	10.0	20.0

000072

TABLE O-3

TYPE 3 WELL CONSTRUCTION DATA

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
3001	M	481,311.58	1,378,727.34	585.67	586.01		585.50	08/06/59	79.0		
3003	M	481,630.71	1,377,878.49	560.81	561.35		560.80				
3004	M	481,427.82	1,377,896.26	581.03	581.50	579.10		02/17/88	135.0	93.0	103.0
3005	M	481,081.70	1,378,080.27	557.04	557.56		557.00	08/18/59	95.0	75.0	95.0
3008	M	480,662.16	1,379,220.41	576.76	577.76		575.90	04/15/65	120.0	112.7	117.7
3009	M	479,551.92	1,378,023.78	557.21	558.48		556.81	04/23/65	103.0	98.0	103.0
3010	M	481,572.21	1,379,809.87	587.84	587.94		586.90			130.0	
3011	M	482,246.10	1,377,954.23	584.15	584.33		582.60	11/21/87	150.0	103.0	113.0
3013	M	481,659.74	1,382,006.22	589.71	590.52		588.80	02/04/85	120.0	108.0	116.0
3014	M	476,805.31	1,379,579.24	534.25	535.97		533.90	08/10/84	65.0	43.0	48.0
3015	M	476,136.76	1,380,201.38	579.33	579.63	577.70		03/29/88	136.5	115.0	125.0
3016	M	477,613.84	1,379,163.66	541.98	542.25		540.60	01/17/85	75.0	61.0	66.0
3017	M	476,265.77	1,379,163.52	536.18	536.48	534.20	534.40	01/24/85	80.0	65.0	70.0
3018	M	479,449.10	1,378,689.56	574.09	574.59		572.30	01/23/85	120.0	102.0	108.0
3019	M	481,675.11	1,379,097.62	584.96	585.21		583.10	02/06/85	130.0	118.0	123.0
3020	M	479,167.41	1,379,535.37	574.78	574.88		573.20	01/28/85	121.0	111.0	116.0
3024	M	482,477.17	1,378,902.73	581.83	582.09	579.90		10/03/87	155.0	97.5	107.5
3027	M	481,975.07	1,379,308.29	585.61	586.15	583.20			141.5	114.0	124.0
3032	M	480,492.78	1,378,296.62	571.33	571.80	569.10		09/27/90	123.1	108.0	118.0
3034	M	480,240.23	1,378,431.39	571.73	572.17	569.90		03/29/88	140.0	100.0	110.0
3037	M	482,141.43	1,379,791.96	590.27	590.75	588.50		02/08/88	138.5	124.0	134.0

TABLE O-3 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
3043	M	481,770.91	1,377,050.35	580.18	580.40		578.50	12/10/87	120.0	107.6	117.6
3044	M	477,773.57	1,378,162.79	574.01	574.37	571.80		03/08/88	126.5	113.0	123.0
3045	M	477,139.87	1,379,742.30	547.86	548.42		546.23	05/17/90	106.5	83.0	93.0
3046	M	478,051.23	1,379,438.66	578.60	579.09		576.96	06/04/90	136.5	115.0	125.0
3049	M	477,021.22	1,380,061.42	542.50	543.12	540.70		11/08/88	101.5	78.0	88.0
3051	M	481,588.05	1,383,278.57	607.97	608.71		607.20	11/10/87	151.5	133.9	143.9
3053	M	479,931.93	1,380,343.55	580.93	581.33		578.51	05/25/87	120.6	110.6	120.6
3054	M	480,040.30	1,381,524.47	582.11	582.54	579.90		05/21/87	120.9	110.9	120.9
3055	M	481,464.81	1,380,702.55	589.01	589.37		586.70	05/14/87	120.8	110.8	120.8
3062	M	474,015.60	1,379,612.30	528.52		527.30		06/07/71	82.0	61.0	81.0
3063	M	486,755.52	1,388,672.54	564.15		563.50		11/24/77	80.0	77.0	80.0
3064	M	480,730.53	1,382,184.22	590.34	590.48	588.20		01/10/88	141.5	127.5	137.5
3065	M	477,856.08	1,380,406.96	573.41	573.93	571.70		11/09/88	127.3	110.0	120.0
3066	M	483,951.29	1,376,706.24	579.85	580.36	578.20	578.20	09/22/87	152.0	125.0	135.0
3067	M	479,760.13	1,382,988.18	595.15	595.47		593.40	12/07/87	141.5	120.0	130.0
3068	M	478,672.21	1,381,392.56	579.63	579.95	577.90		01/26/88	141.5	120.0	130.0
3069	M	476,422.17	1,380,713.62	576.19	576.57		574.60	04/12/88	136.5	115.0	125.0
3070	M	476,762.23	1,382,026.06	593.94	594.23	591.40		02/23/88	151.5	130.0	140.0
3084	M	481,920.37	1,378,947.28	584.99	585.47		585.30	11/14/87	124.0	103.4	113.4
3091	M	477,835.27	1,384,454.06	535.39	536.01	533.60	534.20	05/21/88	95.0	80.5	90.5
3092	M	476,611.63	1,384,185.47	574.87	575.39		573.60	05/19/88	133.0	113.0	123.0
3093	M	475,318.41	1,381,389.92	587.64	588.44		586.30	06/07/88	155.0	133.0	143.0

000094

TABLE O-3 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
3094	M	470,838.53	1,380,714.26	521.31	521.88	519.70		06/15/88	81.5	60.5	70.5
3095	M	475,049.38	1,379,557.06	535.39	535.92	533.90		07/12/88	87.0	70.0	80.0
3096	M	476,541.50	1,377,206.26	580.69	581.36	579.10		08/08/88	140.0	128.0	118.0
3097	M	480,290.96	1,386,943.18	537.29	537.95		537.95	08/09/88	102.0	80.5	90.5
3098	M	483,386.93	1,386,314.65	548.70	549.09	546.80		09/02/88	111.5	88.0	100.0
3099	M	486,048.49	1,391,568.76	547.67			553.70	02/18/86	61.0	58.0	61.0
3100	M	487,457.20	1,393,797.00	562.13		561.30		11/20/52	49.0	46.0	49.0
3106	M	476,094.40	1,379,589.66	540.83	541.36	539.10		01/18/89	105.0	77.1	87.1
3107	M	478,558.59	1,378,532.93	570.27	570.82	568.50		02/25/89	120.0	105.0	115.0
3108	M	480,060.05	1,377,927.11	552.12	552.44	550.10		02/08/89	96.5	83.3	93.3
3120	M	480,167.23	1,382,095.20	583.83	584.17	581.90		02/02/90	135.5	120.3	130.3
3125	M	474,344.53	1,379,479.82	529.46	530.09	527.30		11/20/89	86.5	63.0	73.0
3126	M	473,038.66	1,378,961.19	525.63	525.99	523.80		01/06/90	86.5	63.0	73.4
3127	M	470,050.35	1,380,153.65	517.60	518.31	516.20		03/13/89	70.0	55.5	65.5
3128	M	473,541.84	1,379,798.33	530.76	530.99	529.00		11/02/89	85.0	63.0	73.0
3129	M	472,635.88	1,379,875.42		530.51	527.80		03/05/90	101.0	70.8	80.8
3385	M	477,883.04	1,379,932.66	579.29	579.78	577.40		07/01/90	126.7	115.0	125.0
3387	M	477,117.30	1,380,451.65	571.98	572.50	570.00		06/13/90	131.5	108.4	118.4
3390	M	476,540.71	1,379,881.55	569.97	570.59		568.51	07/31/90	126.5	103.4	113.4
3391	M	472,155.60	1,381,487.69	527.00	527.47		525.26	05/15/90	86.5	63.0	73.0
3396	M	474,161.21	1,379,208.13	528.37	528.69		526.77	07/19/90	91.5	68.0	78.0
3397	M	478,276.43	1,381,003.53	576.63	577.29		575.26	09/24/91	135.5	110.0	120.0

TABLE O-3 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
3398	M	476,585.58	1,381,334.81	581.61	581.84	579.40		10/07/92	150.0	120.0	130.0
3402	M	478,196.71	1,378,786.49	567.90	568.23		566.38	03/24/92	116.5	104.0	114.0
3417	M	480,285.10	1,382,932.46	595.16	595.73		593.77	12/04/92	147.0	135.0	145.0
3421	M	481,662.64	1,382,074.74	588.82	589.33	586.80		12/10/91	150.0	130.0	140.0
3423	M	482,555.67	1,381,755.76	599.11	599.80	597.10		02/19/92	150.0	128.0	138.0
3424	M	482,362.74	1,383,262.64	616.37	616.75	614.00		12/21/92	172.0	160.0	170.0
3425	M	481,598.06	1,383,269.05	609.36	609.66	607.50		12/14/92	165.0	152.0	162.0
3426	M	480,830.90	1,383,202.18	600.07	600.34	598.20		01/20/93	157.0	145.0	155.0
3429	M	480,072.93	1,383,292.88	602.45	602.75		600.35	06/10/93	164.0	152.0	162.0
3431	M	478,866.58	1,383,075.73	593.82	594.31	591.60		11/24/92	155.0	139.5	149.5
3432	M	478,014.99	1,383,084.30	605.60	606.05		603.76	01/11/93	162.0	150.0	160.0
3435	M	481,739.65	1,379,081.85	585.45	585.45		583.40	10/07/92	131.0	118.0	128.0
3452	M	482,334.32	1,379,180.93	584.71	585.15	582.60		02/16/93	117.0	103.5	113.5
3550	M	475,766.47	1,379,346.62	536.17	536.96	534.40		10/17/91	100.0	70.0	80.0
3551	M	475,336.88	1,379,005.93	531.86	532.36		530.57	10/07/91	105.0	75.0	85.0
3552	M	473,902.78	1,379,186.92	526.93	527.27		525.84	04/08/92	90.0	70.0	80.0
3624	M	474,565.87	1,379,554.39	533.13	533.71		531.52	03/21/90	80.8	70.8	80.8
3634	M	472,112.47	1,380,095.74		530.96	528.30		03/24/90	80.1	70.1	80.1
3636	M	473,380.42	1,379,962.27		531.08	528.30		03/10/90	78.3	68.3	78.3
3638	M	471,398.09	1,380,120.84		521.31	518.90		02/26/90	82.5	72.2	82.2
3639	M	471,379.79	1,380,512.71		521.00	518.20		03/14/90	81.4	71.4	81.4
3678	M	483,050.11	1,380,911.50	598.03	598.53	595.80		02/19/92	132.0	93.0	103.0

TABLE O-3 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
3679	M	483,926.78	1,378,250.50	587.63	588.24	585.50		02/05/92	129.5	106.0	116.0
3688	M	472,521.38	1,379,932.27		529.78	529.30		02/20/59	96.0	78.0	94.3
3689	M	474,361.16	1,379,607.18		530.28	529.90			83.0	61.0	81.0
3733	M	477,067.25	1,383,145.35	606.32	606.71	604.50		10/28/92	162.0	150.0	160.0
3809	M	472,635.89	1,379,875.42			530.51		03/05/90	80.8	70.8	80.8
3812	M	472,605.64	1,380,846.26			526.00		04/14/70	60.0	58.0	60.0
3813	M	472,227.50	1,380,929.26			526.00		03/27/75	80.0	65.0	80.0
3814	M	471,979.55	1,380,369.31			529.00					
3815	M	471,886.11	1,380,342.98			525.10		07/20/73	145.0	103.0	109.0
3816	M	472,401.45	1,381,272.61			525.80					
3821	M	481,345.97	1,378,630.88	581.76	582.33		580.31	06/22/92	120.0	100.0	110.0
3880	M	475,035.45	1,380,078.75	583.81	584.22	581.80		05/11/93	145.0	125.0	135.0
3881	M	475,018.92	1,380,551.62	584.04	584.56	581.60		06/21/93	139.0	127.0	137.0
3897	M	474,971.14	1,380,900.68	589.55	590.05		587.87	04/07/93	150.0	130.0	140.0
3898	M	474,380.50	1,381,298.08	591.40	591.71	589.70		06/18/93	155.0	135.0	145.0
3899	M	474,118.71	1,380,685.82	591.98	592.36		590.44	07/28/93	155.0	136.0	146.0
3900	M	473,904.35	1,379,956.32	531.29	532.15		530.13	08/11/93	95.5	75.0	85.0
3910	M	474,528.78	1,380,640.15	594.14	594.21		591.41	04/17/93	110.0	105.0	110.0
3911	M	474,492.41	1,380,595.85	592.49	592.63		589.60	05/01/93	110.0	105.0	110.0
3912	M	474,489.35	1,380,603.00	592.13	592.59		589.64	05/01/84	120.0	115.0	120.0
3916	M	474,486.38	1,380,609.18	592.58	592.61		589.62	05/02/93	130.0	125.0	130.0
3917	M	474,487.49	1,380,598.31	592.51	592.53		589.61	04/30/93	140.0	135.0	140.0

TABLE O-3 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
3918	M	474,490.81	1,380,607.17	592.24	592.62		589.64	05/01/84	150.0	145.0	150.0
3921	M	474,467.78	1,380,613.71	592.57	592.77		589.62	04/19/93	110.0	105.0	110.0
3922	M	474,325.64	1,380,666.16	592.16	592.43		589.47	04/19/93	110.0	105.0	110.0
3923	M	474,557.77	1,380,575.91	592.54	592.75		589.86	04/18/93	110.0	105.0	110.0
31217	M	481,606.89	1,383,217.10	607.44	607.69		606.07	08/25/93	170.0	152.0	162.0

000078

TABLE O-4

TYPE 4 WELL CONSTRUCTION DATA

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
4001	M	481,297.33	1,378,768.32	585.50	586.50		584.80	04/12/65	180.0	175.0	180.0
4008	M	480,661.25	1,379,215.51	576.83	577.85		575.90	04/22/65	180.0	175.0	180.0
4010	M	481,455.45	1,379,699.16	583.97	584.53	582.20		02/08/89	210.6	190.4	200.8
4011	M	482,257.09	1,377,955.38	584.87	585.09	582.90		09/13/90	193.0	170.0	180.0
4013	M	481,659.30	1,382,016.82	590.22	590.43	588.30		01/06/89	222.5	200.0	210.0
4014	M	476,786.78	1,379,582.56	535.43	535.88	533.40		11/09/88	150.0	129.5	139.5
4015	M	475,864.90	1,380,046.70	579.58		578.90		08/09/84	217.0	175.0	185.0
4016	M	477,618.74	1,379,138.31	541.70	542.25	539.70		01/05/89	163.2	143.0	153.3
4023	M	484,245.91	1,393,068.98					04/08/69	157.0	139.0	154.0
4064	M	480,730.23	1,382,193.62	589.93	590.52	588.30		11/22/88	218.3	198.0	208.0
4067	M	479,772.61	1,382,994.40	595.09	595.68	593.30		01/20/89	220.7	200.0	210.0
4091	M	477,843.69	1,384,459.58	535.31	535.54	533.40	533.90	05/18/88	140.0	118.0	128.0
4096	M	476,552.30	1,377,207.31	581.25	581.61	579.20		07/22/88	198.5	178.0	188.0
4097	M	480,297.99	1,386,949.96	536.98	537.92		537.92	08/06/88	149.0	130.5	140.5
4101	M	480,719.01	1,379,873.23				578.08	10/06/51	210.0		
4102	M	480,319.66	1,379,862.32				578.59	09/13/51	210.0		
4103	M	479,929.00	1,379,851.00				578.77	10/31/51	210.0		
4108	M	480,064.72	1,377,936.18	552.08	552.56		550.48	07/13/90	117.0	104.0	114.0
4125	M	474,367.01	1,379,481.77	529.14	529.71	527.50		06/28/90	129.5	98.0	108.0
4398	M	476,579.29	1,381,342.97	581.52	581.80	579.10		11/03/92	191.0	175.0	185.0
4424	M	482,354.82	1,383,272.92	615.97	616.23	614.00		10/15/92	250.0	230.0	240.0

TABLE O-4 (Continued)

Well		1927 Planar Coordinates		Elevations in Feet					Depths from Ground in Feet		
Number	Type	North	East	Top of Well	Top of Protective Casing	Ground Surface	Concrete Pad	Date Installed	Boring Bottom	Top of Screen	Bottom of Screen
4425	M	481,588.14	1,383,268.07	608.94	609.27	607.10		11/18/92	240.0	220.0	230.0
4426	M	480,836.24	1,383,193.80	599.82	600.30		597.72	12/09/92	227.3	206.0	216.0
4432	M	478,025.28	1,383,089.83	605.70	606.14		604.39	12/03/92	213.0	193.0	203.0
4436	M	482,555.31	1,381,220.90	595.01	595.34		593.48	03/09/93	205.0	185.0	195.0
4439	M	481,084.27	1,382,199.78	592.42	592.82		590.64	03/01/93	221.0	201.0	211.0
4446	M	479,380.53	1,382,196.48	583.81	584.30		582.37	03/02/92	210.0	188.7	198.7
4451	M	479,381.35	1,380,017.16	577.42	577.91	576.20		02/23/93	206.5	185.0	195.0
4920	M	474,482.67	1,380,600.51	592.15	592.51		589.60	04/16/93	166.0	161.0	166.0
41066	M	482,026.17	1,381,289.27	591.79	592.57		590.60	07/13/93	220.0	200.0	210.0
41217	M	481,575.83	1,383,219.24	606.43	606.96	605.37		09/01/93	237.0	217.0	227.0

Appendix P

Visual Classification of Soil

P.1.0 VISUAL CLASSIFICATION OF SOIL

Appendix P contains the Visual Classification of Soil, Well Installation, and Well Diagram forms that were completed as each boring, piezometer, and monitoring well was advanced by cable tool or hollow-stem auger drilling methods.

The Visual Classification of Soil form contains the boring number; the engineer or geologist who supervised the boring; the drilling method; the dates the boring was started and completed; the sample depth, interval, and number; blows per sample interval; sample recovery; a description of the sample material; the USCS soil symbol; the measured consistency of the sample; and a remarks section.

The Well Diagram and Installation sheets contain the boring and well number; the engineer or geologist who supervised the installation; the person who checked the records; the date the installation was completed; the drilling method and fluid used; the drilling bit type; the temporary casing type; the casing diameter; the well diameter; screen size and length; and the well casing material type, diameter, and length. The forms also show the well protection system, including the depth intervals for the bentonite pellets, Volclay grout, sand, and the well screen.

The Visual Classification of Soil, Well Diagram, and the Well Installation forms are found together for wells and borings in this appendix. In some cases only the Visual Classification of Soil or equivalent form was completed. The forms are organized in sequential order by location designation or the last three or four digits of the boring or well number. This places well clusters (i.e., 2 to 4 wells in close proximity) behind one another. This becomes important were trying to reconstruct the geologic soil column.

The tabs for this appendix begin with -100 and continue to -1200. This means that there are records for wells and borings from 1001 to beyond 11201. Section 2.1.3.2 describes the well number identification system in greater detail.

Subsurface soil analytical data are presented in Appendix H. Groundwater data collected during drilling (i.e., Hydropunch II samples) are presented in Appendix I. Monitoring well installation data

tables are found in Appendix O. Geologic cross sections developed from the Visual Classification of Soil records are located in Appendix Q.

5709 5-2

PLEASE USE PENCIL
OR TYPEWRITER
DO NOT USE INK

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

№ 291494

County Hamilton Township Crosby Section of Township 5 A

Owner Edw Burwinkel Address Ross, O

Location of property

CONSTRUCTION DETAILS

Casing diameter 10" Length of casing 105'

Type of screen Coon brass #90 bottom 5' #40 top 10 ft Length of screen 15

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate G.P.M. Duration of test hrs.

Drawdown ft. Date 8/20/64

Static level depth to water 17' 2" ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	5
Coarse gravel	5	59
Fine gravel & sand	59	70
Med gravel & sand	70	83
Med sand	83	85
Coarse sand	85	97
Sand & fine gravel	97	99
Coarse sand some gravel	99	112
Coarse gravel	112	119
Coarse sand some gravel	119	120

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

See reverse side for instructions

Drilling Firm Wm Crane Date 8/20/64

Address Strandin, O Signed [illegible]

000083

WELL-LOG AND DRILLING REPORT

7-7

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK

№ 358263

County Hamilton Township Crosby Section of Township 7

Owner Mobil Chemical Corporation Address Paddys Run Rd., Fernald, Ohio

Location of property On Paddys Run Rd. north of New Haven Rd.

CONSTRUCTION DETAILS

Casing diameter 12" Length of casing 62 Ft.
Type of screen Cook WW Length of screen 20 Ft.
Type of pump Peerless Turbine
Capacity of pump 225 GPM at 240 TDH.
Depth of pump setting 75 Ft.
Date of completion Jan. 7, 1970

BAILING OR PUMPING TEST

Pumping Rate 395 G.P.M. Duration of test 6 hr.
Drawdown 7 ft. Date Jan. 7, 1970
Static level-depth to water 10 f
Quality (clear, cloudy, taste, odor) Clear

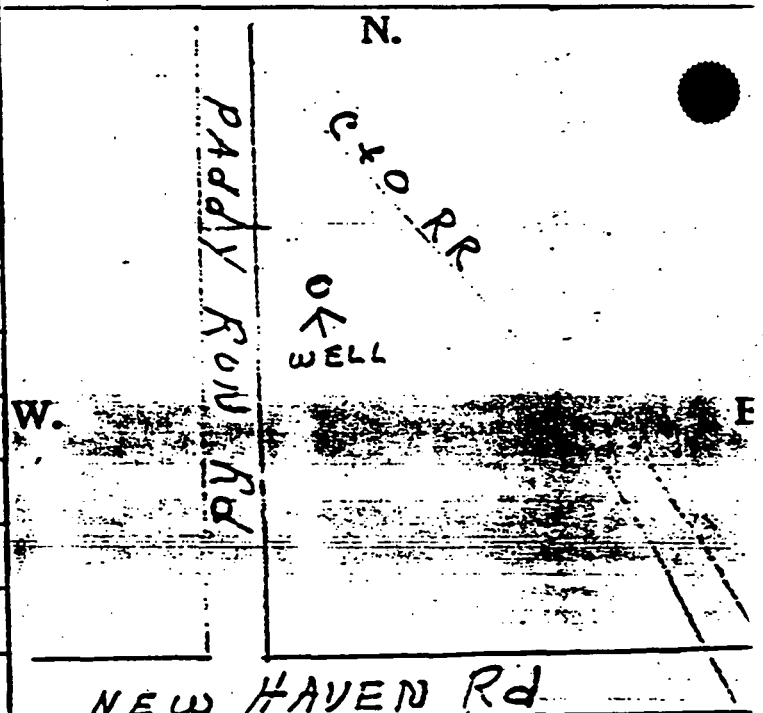
Pump installed by Jos. B. Koehne

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
o soil	0 Feet	7 Ft.
Dry yellow muddy sand	7	18
Yellow sand & gravel	18	47
Grey fine-sand	47	52
Grey sand & gravel	52	83
000084		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Jos. B. Koehne Date Jan. 8, 1970

Address 7028 Moorfield Dr. Cinti. 45230 Signed Jos B Koehne

138

*If additional space is needed to complete well log, use next consecutive numbered form

(20)

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

WELL LOG AND DRILLING REPORT

5709

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

12-2
212

No. 225131

County Hamilton Township Crosby Section of Township 12

Owner Everett Buskirk Address [redacted]

Location of property

CONSTRUCTION DETAILS

Casing diameter 5" Length of casing 106

Type of screen Cook ~~brass~~ #30 Length of screen 2'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date May 23, 59

Developed capacity

Static level—depth to water 74'6" ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
top soil	0	10
Clay	10	60
Fine sand	60	73
Clay	73	83
Sand & gravel	83	108

RECEIVED

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane

Address Shandon, O.

Date May 23, 59

Signed Wm Crane

000085

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

12-4

No. 227441

County Hamilton Township Crosby Section of Township 12

Owner Eugene & Harold Burkhart Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 5" Length of casing 106

Type of screen [redacted] Length of screen 2 ft

Type of pump no pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 70 ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
top soil	0 Feet	4 Ft.
Sand	4 ft	20
clay	20	60
clay and Sand	60	90
fine Sand	90	100
Gravel	100	106

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm [redacted] Date Sept 26 1960

Address 900 Mill st Hamilton Signed Ernest Wilson

J00086

32

WELL LOG AND DRILLING REPORT

ORIGINAL

5709

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK.

№ 366572

127

County Hamilton Township Crosby Section of Township 12

Owner Robert Brankamp Address [redacted]

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 99

Type of screen Cook brass #30 Length of screen 2

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate 20 G.P.M. Duration of test 2 hrs.

Drawdown 3 ft. Date

Static level-depth to water 68 ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Sandy yellow clay	0	8
Blue clay-some gravel	8	44
Yellow clay	44	46
Hard yellow clay & gravel	46	52
Dirty gravel (dry)	52	54
Red clay	54	60
Yellow clay & gravel	60	80
Sand & gravel	80	101

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

See reverse side for instructions

Drilling Firm Wm Crane Date 11/5/68

Address Shandon, O Signed Wm Crane

34

*If additional space is needed to complete well log, use next consecutive numbered form.

(19)

13-1

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

№ 157871

County Hamilton Township Crosby Section of Township or Lot Number 13

Owner Marshall Clark Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 5" Length of casing 105

Type of screen — Length of screen —

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date 8/2/55

Developed capacity

Static level—depth to water 88' ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Clay	0	84'
Gravel	84'	105'
Below 105' clay		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N

[redacted]

See reverse side for instructions

Drilling Firm Wm Crane

Address Brandon O.

Date 8/2/55

Signed Wm Crane

91

13-1

000088

(5709

ORIGINAL

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

13-2

No. 260757

unty Hamilton Township Crosby Section of Township 13

Owner Paul J Wiwi Address [redacted]

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing (21) 28

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date 4/26/61

Developed capacity

Static level—depth to water 19 ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Yellow clay	0	14
Blue clay	14	17
Shale	17	54

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 4/26/61

Address Shandon, O Signed Wm Crane

000089 87

WELL LOG AND DRILLING REPORT

16-1

ORIGINAL

PLEASE USE PENCIL
OR TYPEWRITER
DO NOT USE INK

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

No. 291499

County Hamilton Township Crosby Section of Township 16

Owner Frank Tucker Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 63

Type of screen Length of screen —

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate G.P.M. Duration of test hrs.

Drawdown ft. Date 12/10/64

Static level-depth to water 42 ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	2
Red clay	2	4
Coarse gravel	4	26
Blue clay	26	61'6"
Shale	61'6"	70
— Water at 63'		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

000090

Drilling Firm Wm Crane Date 12/10/64

Address Shandon, O Signed Wm Crane

137

WELL LOG AND DRILLING REPORT 5709

16-2

ORIGINAL

PLEASE USE PENCIL
OR TYPEWRITER
DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

№ 291473

County Hamilton Township Crosby Section of Township 16

Owner Matilda Kelsch Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 28

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion .....

BAILING OR PUMPING TEST

Pumping Rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date 10/2/63

Static level-depth to water 24' ft.

Quality (clear, cloudy, taste, odor) OK

3gpm bailer test

Pump installed by .....

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	1
Coarse gravel	1	16
Blue clay	16	26
Shale	26	50
Water at 30' & 44'		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

See reverse side for instructions

Drilling Firm Wm Crane

Address Shandon, O

Date 10/2/63

Signed Wm Crane

000091

136

17-2

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

№ 145698

County Hamilton Township Crosby Section of Township or Lot Number 16

Owner Loren Hann Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS	PUMPING TEST
Casing diameter 5" Length of casing 28'	Pumping rate ____ G.P.M. Duration of test ____ hrs.
Type of screen Cook brass WW #30 Length of screen 4'	Drawdown ____ ft. Date ____
Type of pump ____	Developed capacity ____
Capacity of pump ____	Static level—depth to water 21'7 ft
Depth of pump setting ____	Pump installed by ____

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
top soil & sand	0	18'
Gravel	18'	32'5"
Clay below		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 5/5/55

Address Shandon O Signed [illegible]

000092

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

8709 No. 107451

x 138,0000
y +70,200S

County Hamilton Township Cresby Section of Township or Lot Number 18

Owner MC Pottenger Address [redacted]

Location of property

CONSTRUCTION DETAILS

Casing diameter 5" Length of casing 37'
Type of screen Miami brass #30 Length of screen 3'
Type of pump
Capacity of pump
Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test h
Drawdown ft. Date
Developed capacity
Static level—depth to water 8'0" 2/5/53
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	11'
Coarse gravel	11'	40'

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways. St. Intersections. County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 2/5/53
Address Shandon O Signed Wm Crane

000093

WELL LOG AND DRILLING REPORT

ORIGINAL

BLK
EMR-14
№ 291459

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

County Hamilton Township Crosby Section of Township 8

Owner [illegible] Address [redacted]

Location of property

CONSTRUCTION DETAILS

Casing diameter ____ Length of casing 2

Type of screen [illegible] Length of screen 2

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate ____ G.P.M. Duration of test ____ hrs.

Drawdown ____ ft. Date 4/13/63

Static level-depth to water 51 ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Yellow clay	0	8
Coarse gravel	8	28
Med gravel	28	60
Med gravel & sand	60	67
Coarse sand	67	78
Med gravel & coarse sand	78	85

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

000094

Drilling Firm Wm Crane Date 4/13/63

Address Shandon, O Signed [illegible]

27

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Geological Survey
Fountain Square
Columbus, Ohio 43224 Phone (614) 466-5344

BU 93
470798
5709

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP OR LOT NUMBER 32

OWNER Wm Pierce ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6 Length of casing 121

Type of screen Cook & Ross #30 Length of screen 3

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 30 gpm Duration of test 4

Drawdown 3 ft Date 1/25/75

Static level (depth to water) 94

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Yellow clay	0 ft	15 ft
Blue clay	15	71
Dirty sand	71	95
Sand & gravel	95	124

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM Wm Crane DATE 3/28/75

ADDRESS Shandon, O SIGNED [signature]

000095

*If additional space is needed to complete well log, use next consecutive numbered form.

WELL LOG AND DRILLING REPORT

ORIGINAL

NO CARBON PAPER NECESSARY— F-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

434544

BU 9

County Butler Township Ross Section of Township 34

Owner Wee Pak Corp Address Ross, O

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 67

Type of screen Cook brass 430 Length of screen 3'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 30 G.P.M. Duration of test 8 hrs

Drawdown 3 ft. Date 11/1/73

Static level-depth to water 29 ft.

Quality (clear, cloudy, taste, odor) Clear

Pump installed by

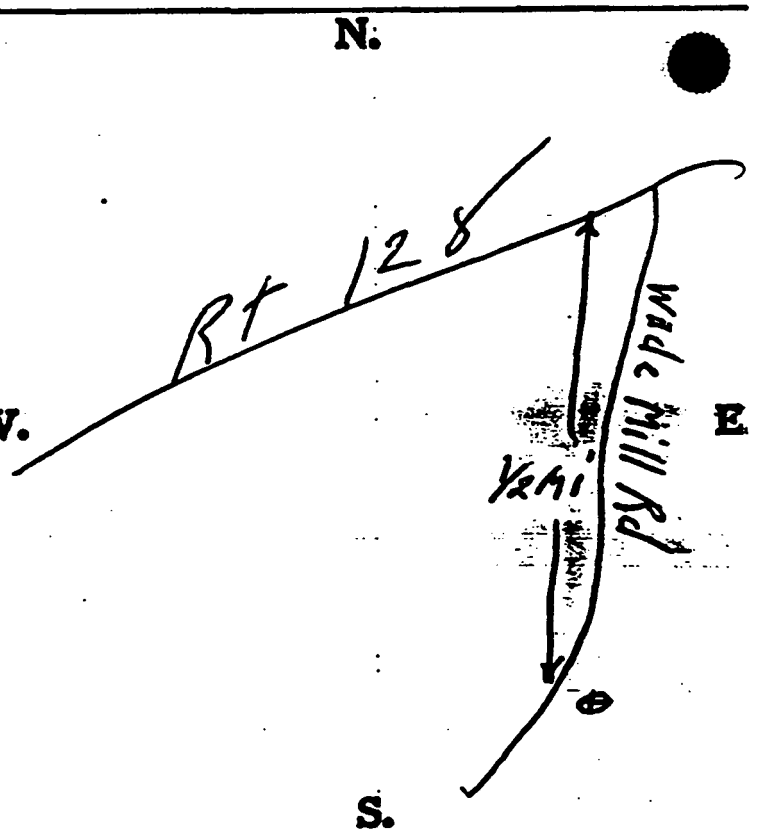
WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From 0 Feet	To Ft.
Top soil	0	4
Sand & gravel	4	48
Coarse sand	48	70

000096

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm W M Crane Date 12/28/73

Address Box 33 Shandon O. Signed W M Crane

*If additional space is needed to complete well log, use next consecutive numbered form

WEL LOG AND DRILLING RE RT

ORIGINAL

NO CARBON PAPER NECESSARY— -TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

E-0-R-16
434526
5709

County Hamilton Township Crosby Section of Township 8

Owner Harry KleKamp Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

ısing diameter 8 Length of casing 100

ype of screen COOK brass Length of screen 10

ype of pump # 35

ıpacity of pump

epth of pump setting

ate of completion

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 250 G.P.M. Duration of test 4 hrs

Drawdown ? Air ft. Date 5/24/73

Static level-depth to water 56' ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
p soil	0 Feet	4 Ft.
Dirty gravel	4	40
oarse gravel w		
ellow clay streaks	40	55
oarse sandstone gravel	55	60
Sand	60	90
Sand & gravel med	90	110

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N

[redacted]

Drilling Firm Wm Crane Date 7/20/73

Address Box 33 Shandon O Signed [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

H-104, 7
No. 327213
EMR-33

County Hamilton Township Crosby Section of Township 7

Owner Frank Lieresch Address Cincinnati, O

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 75

Type of screen Cook Mass #18 Length of screen 5

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate G.P.M. Duration of test hrs.

Drawdown ft. Date 8/18/65

Static level-depth to water 51 ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Yellow clay	0 Feet	61 Ft.
Sand & gravel	61	80

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane

Address Strandon, O

Date 8/18/65

Signed Wm Crane

*If additional space is needed to complete well log, use next consecutive numbered form.

6029

FMPC-OAB. 161

Office No. 527
Log form No.
Quad. Hamilton

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

Hamilton Twp. Crosby Sec.

wner George A. Fuller Co.
ddress Atomic Energy Commission, Venice, O.
ell location near line of new office Bldg.

Construction Details	Pumping Test
sing: Diam. length	Rate: ✓
reen:	Hrs:
ype of pump:	D. D.
apacity:	S.L. ✓
epth of setting:	Date 7-17-51

wner's Well No. Test Well No. 2
riller Layne Ohio
ocated by Date

STRATA	Depth From	Depth To
Elevation		
Fill	0	5
Yellow clay	5	18
Gray sandy clay	18	50
brown sand & gravel	50	65
Brown sand	65	70
Sand & gravel	70	85
Dirty sand & gravel	85	90
Coarse gravel	90	105
sand & gravel	105	115
Brown sand	115	130
Sand & gravel	130	138
Gray Clay	138	140
* 1,380,600		
L. 481,900		

* Approximate Location

old Test Well

590
140+
~~000038~~
450
161

WELL LOG AND DRILLING REPORT

ORIGINAL

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

FMPC-5

No. 258890

County Hamliton Township Crosby Section of Township North

Owner National lead Co. of Ohio Address Box 31958 Cinti, Ohio Zone 39

Location of property S. R. 128 Fernald Ohio

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 75'

Type of screen Red Brass Length of screen 30'

Type of pump Vertical Turbine

Capacity of pump 200 G.P.m.

Depth of pump setting 69' 4"

Date of completion 10/3/63

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water ..... ft.

Pump installed by Hyden Bro's Drilling Co

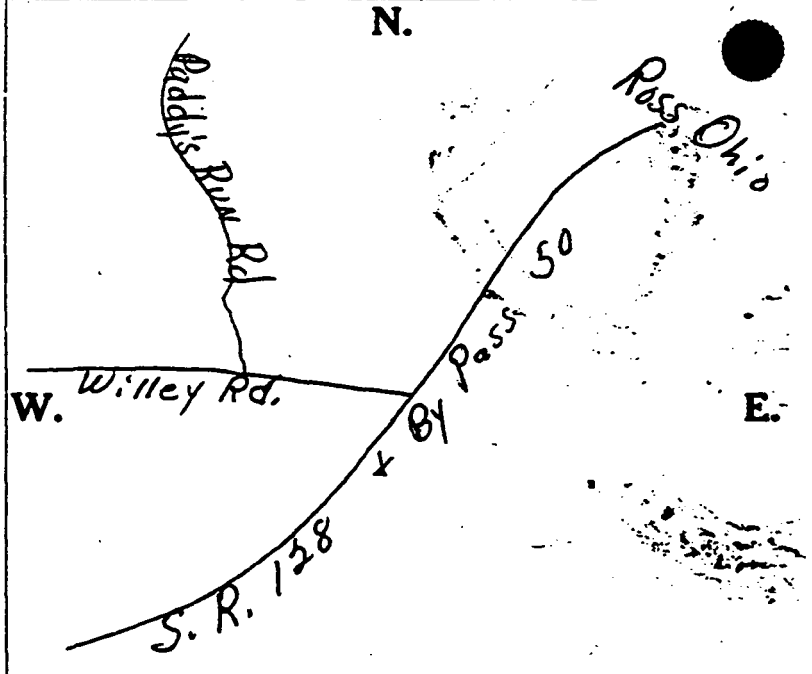
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay + Sand	0 Feet	40 Ft.
S + Gravel	40	95 ft.

000100

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



S.

See reverse side for instructions

Drilling Firm Hyden Bro's Drilling Co Date 10/3/63

Address 6105 Wooster Rd Signed Ralph W. Hyden

26

WELL LOG AND DRILLING REPORT 5709

ORIGINAL

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

FMPC-12 N62

No. 258891

County Hamilton Township Crosby Section of Township North

Owner National Lead Co. of Ohio Address Box 31958 Cinti. Ohio Zone 39

Location of property S.R. 128 Fernald Ohio

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 96'

Type of screen Red Brass Length of screen 20'

Type of pump Vertical Turbine

Capacity of pump 200 G.P.M.

Depth of pump setting 99' 4"

Date of completion 10/10/63

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water ..... ft.

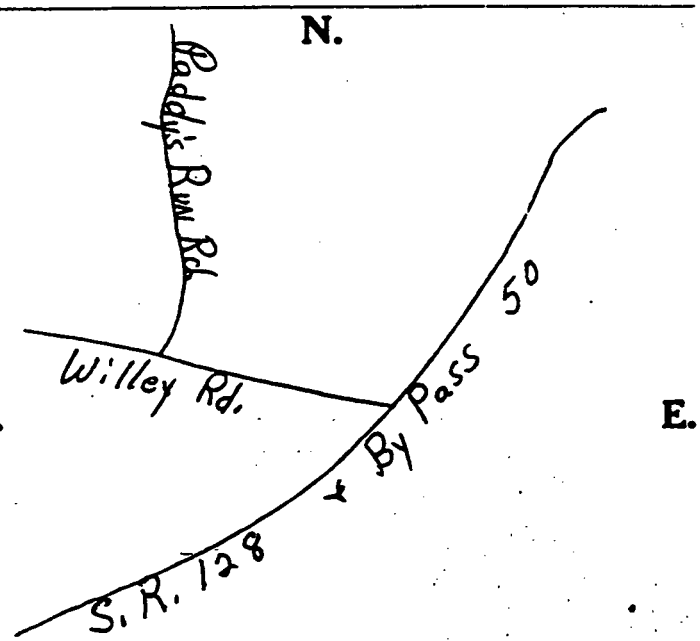
Pump installed by Hyden Bro's Drilling Co.

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Top Soil	0 Feet	8 Ft.
Sand	8'	60'
Sand + Gravel	60'	116

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



000101

See reverse side for instructions

Drilling Firm Hyden Bro's Drilling Co Date 10/10/63

Address 6105 Wooster Rd. Signed Ralph W. Hyden Jr.

WELL LOG AND DRILLING REPORT

ORIGINAL ✓

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

№ 327205
H-113

County Hamilton Township Crosby Section of Township 1 (6)

Owner Walter H Corson Address [redacted]

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 87
Type of screen COOK brass #16 Length of screen 3
Type of pump
Capacity of pump
Depth of pump setting
Date of completion

BAILING OR PUMPING TEST

Pumping Rate G.P.M. Duration of test hrs.
Drawdown ft. Date 6/5/65
Static level-depth to water 59 ft.
Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
1 11 pit	0 Feet	2 Ft.
Yellow clay	2	12
Blue clay	12	41
Yellow clay	41	60
Dirty sand	60	68
Sand	68	90

000102

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 6/5/65
Address Shandon, O Signed [signature] 128

*If additional space is needed to complete well log, use next consecutive numbered form.

WEL LOG AND DRILLING REPORT

H-128

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY - SELF-TRANSCRIBING

596060

5709

COUNTY: HAMILTON TOWNSHIP: CROSBY SECTION OF TOWNSHIP: 7

OWNER: JACOB FUCHS ADDRESS: [redacted]

LOCATION OF PROPERTY: [redacted]

CONSTRUCTION DETAILS

sing diameter: 6" Length of casing: 73

pe of screen: COOK DRIVE #25 Length of screen: 3'

pe of pump: REDA SUB

pacity of pump: 11 GPM

pth of pump setting: 75

te of completion: 4/8/81

BAILING OR PUMPING TEST
(specify one by circling)

Test rate: 18 gpm Duration of test: 4 hrs

Drawdown: 2'6" ft Date: 4/8/81

Static level (depth to water): 55'5" ft

Quality (clear, cloudy, taste, odor):

Pump installed by: CRANE

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
TOP SOIL	0 ft	2 ft
LOW CLAY & GRAVEL	2	12
GRAY TILL	12	33
FINE SAND SOME GRAVEL (DIRTY)	33	40
FINE SAND .012-.015	40	75
MED SAND & GRAVEL	75	81

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

_ING FIRM: WM CRANE DATE: 12/28/81

ADDRESS: BOX 33 SHARON, O 45063 SIGNED: [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

ORIGINAL COPY - ODNR, DIVISION OF WATER, FOUNTAIN SQ., COLS., OHIO 43224

33

WELL LOG AND DRILLING REPORT

H-124 ORIGINA

470774

NO CARBON PAPER NECESSARY - SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Geological Survey
Fountain Square
Columbus, Ohio 43224 Phone (614) 466-5344

COUNTY Hamilton TOWNSHIP Crosby SECTION OF TOWNSHIP OR LOT NUMBER 18

OWNER Rumpke, Inc ADDRESS 10795 Hughes Rd

LOCATION OF PROPERTY Cincinnati

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 56

Type of screen Cook brass #30 Length of screen 4

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 50 gpm Duration of test 4 hr

Drawdown 5 ft Date 6/25/74

Static level (depth to water) 12'6"

Quality (clear, cloudy, taste, odor) Clear

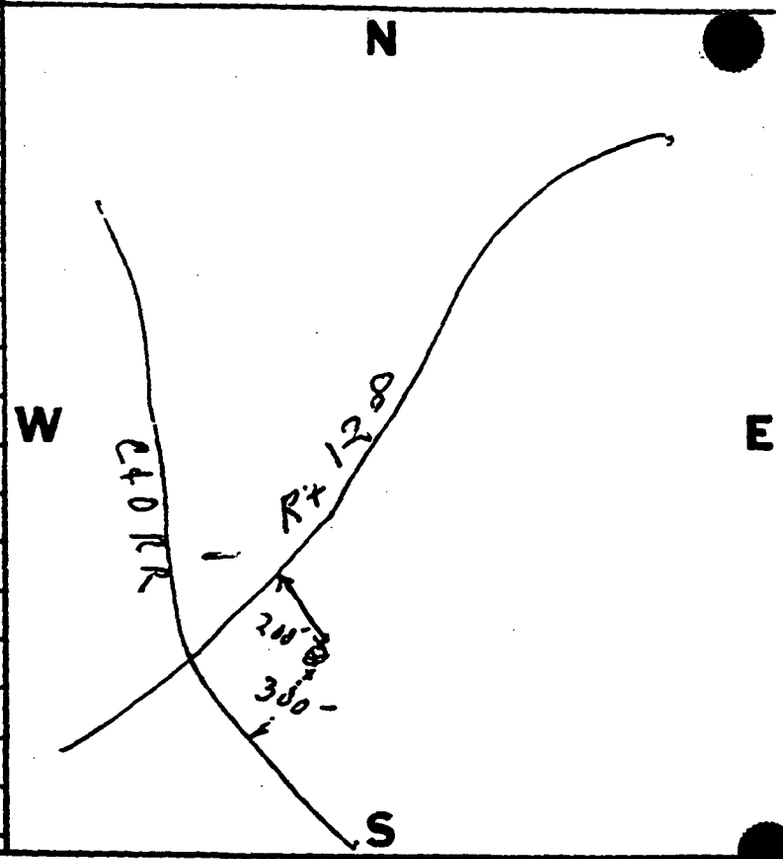
Pump installed by W Crane

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Silt & gravel	0 ft	15 ft
Sand & gravel	15	60

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



ING FIRM Wm Crane DATE 7/11/74

ADDRESS Box 33 Shandon, O SIGNED [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

000104

WEL LOG AND DRILLING REPORT 5709

ORIGINAL

NO CARBON PAPER NECESSARY— LF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 402900
H-127

County Hamilton Township Crosby Section of Township 5

Owner F & C Sand & Gravel Co Address Miamitown, O

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 57'

Type of screen Cook brass #30 Length of screen 2'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 35 G.P.M. Duration of test 4 hrs.

Drawdown 2 ft. Date 8/13/71

Static level-depth to water 22' ft.

Quality (clear, cloudy, taste, odor)

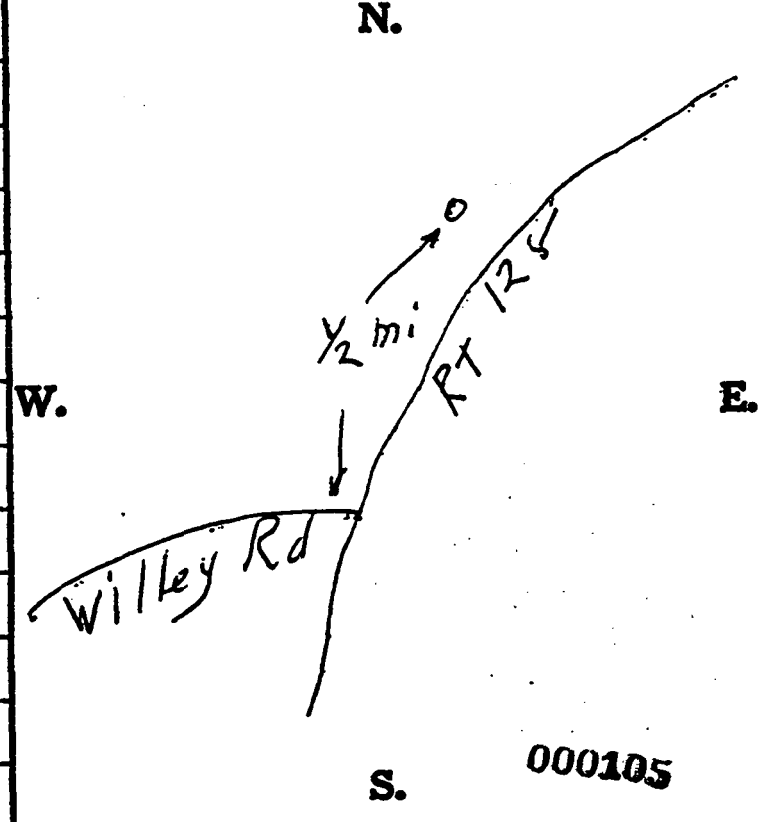
Pump installed by Crane

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Pit	0	6
Sand & Gravel	6	65

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



000105

Drilling Firm Wm Crane Date 8/28/71

Address Box 33 Shandon, O Signed

*If additional space is needed to complete well log, use next consecutive numbered form.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

H-129 H129

№ 172574

County Hamilton Township Crosby Section of Township or Lot Number 17

Owner MC Pottenger Address [redacted]

Location of property

CONSTRUCTION DETAILS	PUMPING TEST
Casing diameter 6" Length of casing 45	Pumping rate G.P.M. Duration of test hrs.
Type of screen Freemans #30 Length of screen 7'	Drawdown ft. Date 5/4/55
Type of pump	Developed capacity
Capacity of pump	Static level—depth to water 27 6 ft.
Depth of pump setting —	Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	12
Gravel	12	30
Med gravel	30	50
Clay	50	?

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 5/4/55

Address Shandon O Signed Wm Crane Opr

000106

5709

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

No. 115635

69

R-69-12098?

County Butler 9 Township Ross 12 Section of Township or Lot Number Sec 32

Owner Emerson E Ellott Address [redacted]

CONSTRUCTION DETAILS

Casing diameter 4" Length of casing 58 ft

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 12 ft below ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	30 Ft.
Clay and mud	0	30
Sand & gravel	30	58

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Clemons & McConnell Date 2-7-54

Address Box 184 Hamilton Ohio Signed Clarke McConnell

69 LOCATED

WELL LOG AND DRILLING REPORT

ORIGINAL

WK

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
NOT USE INK.

№ 327231

County Hamilton Township Crosby Section of Township 8

Owner Wm Knollman Address [redacted]

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 87

Type of screen Cock brass #30 Length of screen 3

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate 25 G.P.M. Duration of test hrs.

Drawdown 16" ft. Date 8/3/66

Static level-depth to water 63' ft.

Quality (clear, cloudy, taste, odor) clear

Pump installed by W Crane

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	2
Yellow clay	2	6
Blue clay	6	38
Sand & gravel	38	90

000108

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 12/5/66

Address Shandon, O Signed Wm Crane

*If additional space is needed to complete well log, use next consecutive numbered form.

WELL LOG AND DRILLING REPORT 5709

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 242554

County Butler Township [redacted] Section of Township Sec 34

Owner WALTER KRAMER Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 6 ID. Length of casing 60

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate 180 G.P.M. Duration of test 2 hrs.

Drawdown 10 ft. Date 4-13-60

Developed capacity 80

Static level—depth to water 30 ft.

Pump installed by J B Hoover

WELL LOG

Formations. Sandstone, shale, limestone, gravel and clay	From	To
Top Soil	0 Feet	1 Ft.
Sand + Gravel	1	60

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm J.B. Hoover & Son Date 4-13-60

Address 4253 Sapna Rd. Hamilton Ohio Signed J B Hoover

LOCATED

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio—
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

State 4
512179

(4)

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP 38

OWNER Lawrence McDaniel ADDRESS [redacted]

LOCATION OF PROPERTY

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 52

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 4 gpm Duration of test 4

Drawdown All the way Date 6/28/78

Static level (depth to water): 43

Quality (clear, cloudy, taste, odor) clear

Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
	0 ft	ft
Brown clay gravel	0	12
Blue clay	12	52
Shale	52	78
Water at 58		
Elev = 600ft		
000110		

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM Wm Crane DATE 10/29/78

ADDRESS Box 33 Shandon, O SIGNED [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Geological Survey
Fountain Square
Columbus, Ohio 43224 Phone (614) 466-5344

5709

470763

State 5

5

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP OR LOT NUMBER 31

OWNER Robert HartKemeyer ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 52

Type of screen _____ Length of screen _____

Type of pump _____

Capacity of pump _____

Depth of pump setting _____

Date of completion _____

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 5 gpm Duration of test 4 hrs

Drawdown 22 ft Date 4/25/74

Static level (depth to water) 18" ft

Quality (clear, cloudy, taste, odor) clear

Pump installed by _____

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Brown clay & gravel	0 ft	11 ft
Blue clay	11	43'6"
Hard blue clay	43'6"	52'
Shale	52'	85'
Elev = 610 ft		

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM Wm Crane DATE 7/10/74

ADDRESS Box 33 Shandon, O SIGNED [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

5

NO CARBON PAPER NECESSARY - SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

512161

State 11

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP 33

OWNER Tom Stehlin ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 82

Type of screen Cook brass #30 Length of screen 3

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 25 gpm Duration of test 2 hrs

Drawdown 2'6" ft Date 8/17/77

Static level (depth to water) 53'8" ft

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Brown clay & rock	0 ft	14 ft
clay & gravel	14	36
brown clay & gravel	36	50
Dirty gravel	50	58
Fine sand & gravel	58	75
Sand & gravel	75	85

SKETCH SHOWING LOCATION*

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM Wm Crane DATE 11/24/77

ADDRESS Box 33 Shandon O SIGNED [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

~~000112~~

11

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Geological Survey
Fountain Square
Columbus, Ohio 43224 Phone (614) 466-5344

5709 State 12
487011

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP OR LOT NUMBER 33

OWNER James Petrey ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 67'

Type of screen Cook brass #30 Length of screen 3'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 20 gpm Duration of test 4 hrs

Drawdown 3 ft Date 8/8/75

Static level (depth to water) 34 ft

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Brown clay+gravel	0 ft	6 ft
clay gravel	6	70

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM Wm Crane DATE 10/21/75

ADDRESS Sharpsburg, Ohio SIGNED Wm Crane

*If additional space is needed to complete well log, use next consecutive numbered form.

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

State 19

PLEASE USE PENCIL OR TYPEWRITER—DO NOT USE INK

No. 247752

County Butler Township Ross Section of Township 34

Owner John C Guard Address Ross, O

Location of property Ross O

CONSTRUCTION DETAILS	BAILING OR PUMPING TEST
Casing diameter 5" Length of casing 56'	Pumping rate ..... G.P.M. Duration of test ..... hr.
Type of screen Cook #36 Length of screen 2'	Drawdown ..... ft. Date Dec 12, 59
Type of pump	Developed capacity .....
Capacity of pump	Static level—depth to water 34 f
Depth of pump setting	Pump installed by .....
Date of completion	

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	..... Ft.
Top soil	0	6
Sand & gravel	6	58

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

000114

Drilling Firm Wm Crane Date Dec 12, 59

Address Shandon, O Signed Wm Crane

LOCATE

WEL' LOG AND DRILLING REP RT

ORIGINAL

State 25

No. 421152

5709

NO CARBON PAPER NECESSARY— F-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

County Hamilton Township Crosby Section of Township 8

Owner Harry Klekamp Address Cincinnati, O

Location of property

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 100

Type of screen Cook brass #35 Length of screen 10

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 300 G.P.M. Duration of test 6 hrs.

Drawdown 4 ft. Date 9/28/71

Static level-depth to water 42 ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Rock & clay	0	7
Sand & gravel	7	60
Sand 40-50 slot	60	88
Sand & gravel	88	110

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 10/20/71

Address BOX 33 Shandon, O Signed Wm Crane

*If additional space is needed to complete well log, use next consecutive numbered form.

State 26 26

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 260764

County Butler Township Ross Section of Township 28

Owner Chas Bowman Address Ross, O

Location of property

CONSTRUCTION DETAILS

Casing diameter 5" Length of casing 87

Type of screen Lock Bass #18 Length of screen 5'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hr.

Drawdown ft. Date 7/5/61

Developed capacity

Static level—depth to water 68 f

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	1
Yellow clay	1	19
Sandy clay	19	60
Med gravel with fine sand	60	92

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

000116

Drilling Firm Wm. Crane Date 7/5/61

Address Shandon, O Signed Wm Crane

26
LOCAT

[redacted]

State 41 5709 41

OHIO WATER RESOURCES BOARD

Well Record No. 444

31 3

. Hamilton Twn Colerain Sec. 30

[redacted]

Size 5" x 47'

Map Hamilton

wner George Gisler Address New Baltimore,

iller Hyder Bros. Date 10-30-48

ell Head Elev. or M. P.

ev. of Ground at Well

5

mping Test: Approx. 1 G.P.M.

no D.D.

atic Level Date

ormal Pumpage

uali Use

of supply

wner's Well No. or Other Designation

ource of Data Driller

ollected by mt Date 1949

32543 STRATA	DEPTH From	DEPTH To
Topsoil clay	0	9
Blue mud		48
0 Shale		100
5		
x 1,390,900		
y 475,000		

* Chief Aquifer

000117

41 550 45 505

WELL LOG AND DRILLING REPORT

State 42 ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

№ 95441

x 1,390,800
1 478,400S

County Hamilton Township Colerain Section of Township or Lot Number 30

Owner Geo Gausman Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 4" Length of casing 31'

Type of screen Miami brass #30 Length of screen 3'

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 26'0 11/12/52 ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	6'
Sand & gravel	6'	34'
Below 34' shale		
Southwestern Water Co well here		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

000118

Drilling Firm Wm Crane Date 11/12/52

Address Springfield O. Signed Wm Crane

4V

WELL LOG AND DRILLING REPORT

5709

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

State 81

№ 172599

County Hamilton Township Crosby Section of Township or Lot Number 4

Owner Edw. Wade Estate Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 5" Length of casing

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date 11/4/56

Developed capacity

Static level—depth to water 30 ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	2'
Gravel	2'	60'
Sand	60	70
Gravel	70	82'

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm W. Crane Date 11/4/56 81

Address Shandon O Signed [illegible]

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

State 134

No. 216002

County Hamilton Township Colerain Section of Township See No

Owner Miss Whitney Camp Address [redacted]

CONSTRUCTION DETAILS	BAILING OR PUMPING TEST
Casing diameter 4" Length of casing 28'7"	Pumping rate ..... G.P.M. Duration of test ..... hrs.
Type of screen none Length of screen none	Drawdown ..... ft. Date .....
Type of pump	Developed capacity .....
Capacity of pump	Static level—depth to water 29 ft ft.
Depth of pump setting	Pump installed by .....
Date of completion	

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	28 Ft.
Top soil and clay	0	
Lime & Shale	28'7"	45

000120

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Lynch & McConnell Date July 24 - 1959

Address 7165 Old New London Rd. Signed Peter McConnell

Okeana Ohio

134

5709

WEL LOG AND DRILLING REPORT

State 137

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

LEASE USE PENCIL OR TYPEWRITER DO NOT USE INK.

Nº 279281

County Hamilton Township Crosby Section of Township

Owner Fort Scott Camps Address

Location of property New Baltimore, Ohio

CONSTRUCTION DETAILS

Casing diameter 12" Length of casing 30'

Type of screen Cook Everdur Length of screen

Type of pump Sumo Submersible 5E91

Capacity of pump 200 GPM

Depth of pump setting 25'

Date of completion 6-12-64

BAILING OR PUMPING TEST

Pumping Rate 200 G.P.M. Duration of test hrs.

Drawdown 0 ft. Date

Static level-depth to water ft.

Quality (clear, cloudy, taste, odor)

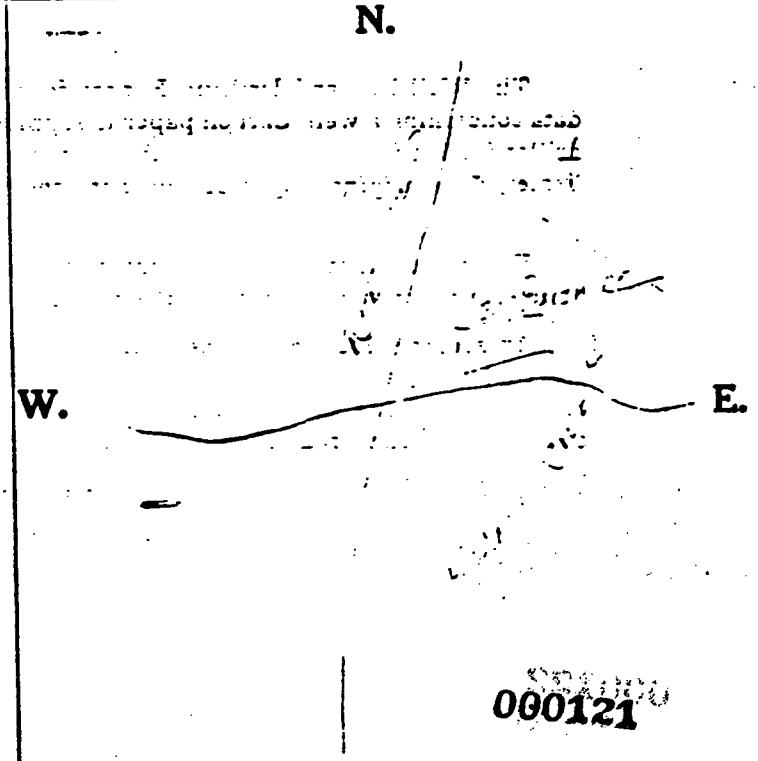
Pump installed by Diehl Pump & Supply Co,

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Loam	0 Feet	3 Ft.
Sand & gravel	3'	28'

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



000121

See reverse side for instructions

Drilling Firm Diehl Pump & Supply Co. Date November 2, 1964

Address 3985 Race Road Signed Edw. Smith

Cincinnati 11, Ohio

13

WELL LOG AND DRILLERS

NO CARBON PAPER
- NECESSARY -
SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

619478
State 150

COUNTY Hamilton TOWNSHIP Whitewater (Crosby) SECTION OF TOWNSHIP 13

OWNER Ron Suber, ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6 1/4 Length of casing 86

Type of screen Slot Length of screen 7'

Type of pump —

Capacity of pump —

Depth of pump setting —

Date of completion —

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 20 gpm Duration of test 1 hrs

Drawdown 75' ft Date 8-25-83

Static level (depth to water) 70' ft

Quality (clear, cloudy, taste, odor) Clear

Pump installed by —

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
top soil	0 ft	2 ft
sandy clay	2	6
sandy clay	6	12
broken	12	16
hardpan clay	16	65
sand & gravel w/ water	65	80
rock	80	100

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM TREADWAY WELL DRILLING
~~P.O. BOX 264~~
ADDRESS SEVEN MILE, OHIO 45062
~~(513) 728-8629~~

DATE Sept 7, 1983

SIGNED W.C. Treadway / M[redacted]

*If additional space is needed to complete well log, use next consecutive numbered form.

ORIGINAL COPY - ODNR, DIVISION OF WATER, FOUNTAIN SQ., COLS., OHIO 43224

000122

15

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

State 163
EMR-22 163

ORIGINAL

No. 225124

5709

County Hamilton Township Crosby Section of Township 6

Owner Don Gieringer Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 66

Type of screen Freeman #30 Length of screen 4'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 28 ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	10
Clay	10	28
Sand & gravel	28	70

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date April 4, 59

Address Shandon, O. Signed Wm Crane

163

000124

THE LAYNE OHIO COMPANY

COLUMBUS, OHIO

8-in.

LOG OF TEST WELL No. 1 15

mw S. [illegible] no

3001

For National Lead Co. of Ohio City Fernald State Ohio

Location On bank between plant and dump

Date Started 3-3-59 Date Finished 8-6-59

FORMATIONS

DEPTH TO TOP OF STRATUM	DEPTH TO BOTTOM OF STRATUM	THICKNESS OF STRATUM	STATIC WATER LEVEL	1-HOUR BAILING TEST		HOW FAR DID FORMATION HEAVE	FORMATION FOUND	REMARKS
				AVERAGE G. P. M.	DRAWDOWN FEET			
0'	16'	16'					Yellow clay	
16	36	20					Blue clay	
36	40	4					Clay and gravel	
40	55	15					Sandy clay	
55	60	5	59'				Brown sand	
60	79	19					Sand and gravel	

#3001

DRILLER N[illegible]. Morris

SKETCH OF LOCATION ON BACK OF THIS LOG SHEET

WELL LOG AND DRILLING REPORT

#4001 5709

PLEASE USE PENCIL OR TYPEWRITER DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

№ 291500

County Butler Township Ross Section of Township 31

Owner National Lead of Ohio Address Box 39158 Cincinnati, O

Location of ~~property~~ Well # 1-D

CONSTRUCTION DETAILS	BAILING OR PUMPING TEST
Casing diameter 4" Length of casing 176'6"	Pumping Rate 70 G.P.M. Duration of test 4 h:
Type of screen Cook brass 1" 14 Length of screen 5'	Drawdown – ft. Date 4/12/65
Type of pump	Static level-depth to water 64'
Capacity of pump	Quality (clear, cloudy, taste, odor)
Depth of pump setting	
Date of completion	Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Yellow clay	0	12
Gravel & yellow clay	12	14
Blue clay-some gravel	14	40
Sandy yellow clay	40	45
Sand some gravel	45	131'6"
Blue clay	131'6"	145'
~~[illegible]~~		
Sand & gravel	145'	152'
Med & coarse sand	152'	170'
Fine sand	170'	180'

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

Check with Nat'l Lead for well location

W. AEC Fernald Plant E

S.

See reverse side for instructions

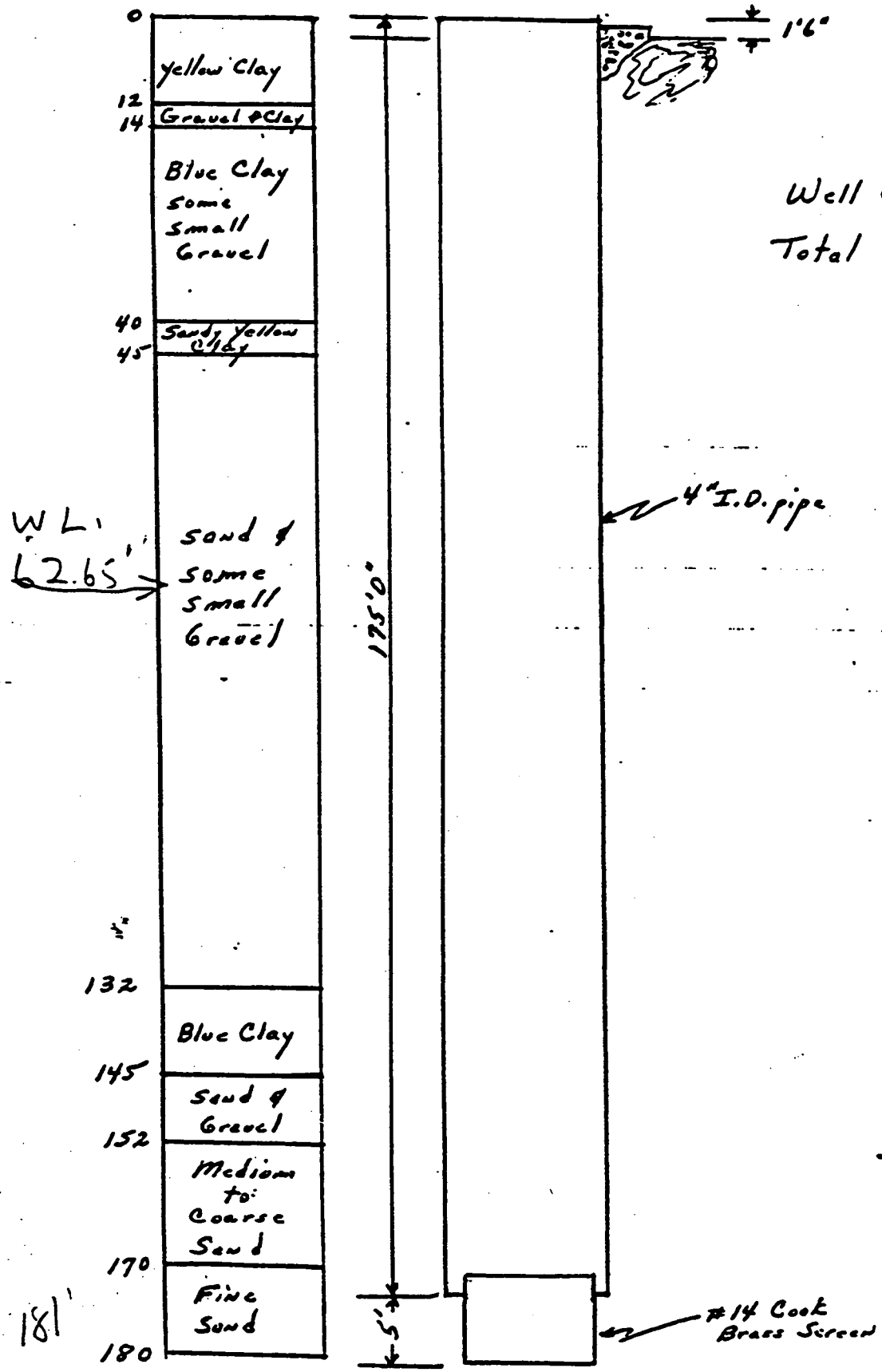
Drilling Firm Wm Crane Date 4/12/65

Address Shandon, O Signed [illegible]

000125

#4001

No. 1D Test Well
Driller - Wm Crane Co.
4/12/65



Well Capacity - 60G
Total depth - 180'0

FERNALD RI/FS

5709

Date	5-5-5			
Initial	4/7			
	Field Check	1st Rev In	2nd Rev In	Final Rev Completion

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: 7MPC RI/FS (SOUTH FIELD)	
BORING NUMBER: 2002	COORDINATES:	DATE: 04-2-89 / 04-4-89
ELEVATION:	GWL: Depth 70.0 FT Date/Time 4-11-89 @ 1500	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 68.2 FT Date/Time 4-12-89 @ 0700	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL (CYCLONE) 6.9 FT 4-13-89 @ 0800		PAGE 1 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	32295 0938 04-2	1 2 6	8	STIFF, DARK YELLOWISH BROWN, (10YR 4/6), ORGANIC SILTY CLAY, LOW TO MED. PLASTICITY, WET	OL	1.5	Hnu = Bkg. α = Bkg. βγ = 60 CPM
2 3	32296 0943 04-2	3 8 10	8	STIFF, DARK YELLOWISH BROWN, (10YR 4/6) ORGANIC SILTY CLAY, LOW TO MED. PLASTICITY, WET.	OL	1.5	Hnu = Bkg. α = Bkg. βγ = 60 CPM
4	32297 0945 04-2	9 14 16	9	HARD, GRAY, (10YR 5/1), SANDY CLAY, MOIST, LOW PLASTICITY.	CL	4.5	Hnu = Bkg. α = Bkg. βγ = 60 CPM
5 6	32298 0950 04-2	14 21 25	7	VERY STIFF, YELLOWISH BROWN, (10YR 5/4), GRAVELLY CLAY, MED. PLASTICITY, MOIST.	CL	4.0	Hnu = Bkg. α = Bkg. βγ = 60-80 CPM
7	32299 1010 04-2	15 25 30	10	VERY STIFF, YELLOWISH BROWN-GRAY, (10YR 4/4), CLAY, SOME COARSE SAND, LOW TO MED. PLASTICITY, MOIST.	CL	4.0	Hnu = Bkg. α = Bkg. βγ = 60-80 CPM
8 9	32300 1015 04-4	9 17 10	12	HARD, DARK YELLOWISH BROWN-GRAY, (10YR 4/6) GRAVELLY, SILTY CLAY, MOIST. MED. PLASTICITY.	CL	>4.0	Hnu = Bkg. α = Bkg. βγ = 60-80 CPM
10	32301 1030 04-4	15 22 32	13	HARD, DARK GRAYISH BROWN, (10YR 4/2) SANDY CLAY, TRACE OF FINE GRAVEL, MOIST. MED. PLASTICITY.	CL	>4.0	Hnu = Bkg. α = Bkg. βγ = 80-CPM
11 12	32302 1046 04-4	10 14 14	14	VERY STIFF, DARK GRAYISH BROWN, (2.5Y 4/2), CLAY, TRACE OF COARSE SAND, MOIST. MED. PLASTICITY.	CL	3.75	Hnu = Bkg. α = Bkg. βγ = 60 CPM
13	32303 1115 04-4	6 10 14	8	VERY STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND, MED PLASTICITY, MOIST.	CL	2.50	Hnu = Bkg. α = Bkg. βγ = 60 CPM
14	32304 1127 04-4	5 12 17	10	VERY STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND, MED. PLASTICITY, MOIST.	CL	2.50	Hnu = Bkg. α = Bkg. βγ = 60 CPM

NOTES: PENN DRILL CO.
DRILLER: JOE DARLE
HELPER: BILL FELTY

MATERIALS USED
SAND: 20 BAGS 10/20 80 lb
BENTONITE: 5 BUCKETS
VOLCLAY GROUT: 12 BAGS
WATER: 650 GALS. TOTAL

SAMPLING PERFORMED IN ACCORDANCE WITH ASTM STANDARDS, COLOR DESCRIBED BY MUNSELL COLOR CHART.

INSTRUMENT BACKGROUND
Hnu = 0.4 PPM
α = 0 CPM
βγ = 60-80 CPM
EXO TOX LELO = 0 PPM/0 %

4/13/89 CB

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2002	COORDINATES:	DATE: 04-4-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TEALINGER	Depth Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL (CYCLONE)		PAGE 2 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	32305 1136 04-4	5 10 11	10	VERY STIFF, DARK GREENISH GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND, MED. PLASTICITY, MOIST	CL	3.50	Hmu = BKG. α = BKG. βγ = 60 CPM
17–18	32306 1345 04-4	5 12 14	8	VERY STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND AND FINE GRAVEL, MED. PLASTICITY, MOIST.	CL	3.75	Hmu = BKG. α = BKG. βγ = 60 CPM
19	32307 1405 04-4	5 5 7	6	STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND AND ORGANIC DEBRIS-WOOD, ETC., MED. PLASTICITY, MOIST TO WET.	CL	2.00	Hmu = BKG α = BKG βγ = 40-60 CPM
20–21	32308 1425 04-4	5 7 7	7	VERY STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF FINE GRAVEL, MED. PLASTICITY, WET.	CL	2.50	Hmu = BKG α = BKG βγ = 40-60 CPM
22	32309 1600 04-4	3 5 8	5	VERY STIFF, DARK GRAY, (2.5Y 4/0), SANDY CLAY, TRACE OF FINE GRAVEL, MED. PLASTICITY, MOIST	CL	2.50	Hmu = BKG α = BKG. βγ = 40-60 CPM
23–24	32310 1615 04-4	5 7 10	8	VERY STIFF, DARK GRAY, (10YR 4/1), SILTY CLAY, TRACE OF FINE GRAVEL, MED. PLASTICITY, MOIST.	CL	2.75	Hmu = BKG. α = BKG. βγ = 40-60 CPM
25	32311 1630 04-4	5 9 10	8	VERY STIFF, DARK GRAY, (10YR 4/1), CLAY, TRACE OF GRAVEL .50 IN, AND SOME SILT THROUGHOUT, MED. PLASTICITY, MOIST.	CL	2.75	Hmu = BKG. α = BKG. βγ = 60 CPM
26–27	32312 1645 04-4	5 8 11	7	VERY STIFF, DARK GRAY-BROWN, (10YR 4/1), SILTY CLAY, TRACE OF FINE GRAVEL, MED. TO LOW PLASTICITY, MOIST.	CL	3.50	Hmu = BKG. α = BKG. βγ = 40-60 CPM
28	32313 1700 04-4	7 8 20	9	MEDIUM DENSE, YELLOWISH BROWN-GRAY, (10YR 5/6), VERY SILTY CLAY, SILT TRACE, OF FINE GRAVEL, MOIST.	ML ET.	E.T. N/A	Hmu = BKG. α = BKG. βγ = 40-60 CPM
TILL EXTENT @28.5 FT. 29	32314 1715 04-4	22 21 14	10	DENSE, YELLOWISH BROWN, (10YR 5/6), POORLY GRADED SAND, MOIST.	SP	N/A ET	Hmu = BKG. α = BKG. βγ = 40-60 CPM

NOTES:

DRILLER: JOE BITRILE
HELPER: BILL FELTY

INSTRU. BKG.
Hmu = 0.2-0.4 ppm
α = 0 CPM
βγ = 40-60 CPM

000128

4/15/89

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2002	COORDINATES:	DATE: 4-5-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TRULLINGER	Depth Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31 32 33 34 35				PREVIOUS SAMPLE TAKEN AT 28.5 FT - 30.0 FT. THUS SAMPLING STARTED AT 35.0 FT AND EVERY 5.0 FT INTERVAL THEREAFTER.			
36	92315 1515 04-05	42 50 50/4in	10	VERY DENSE, DARK YELLOWISH BROWN, (10YR 4/4), WELL GRADED SAND TRACE OF FINE GRAVEL, DRY.	SW	N/A	Hau = BKG. α = BKG βγ = 30-40 CPM
37 38 39 40							
41	32316 1700 04-05	47 50 5in	6	VERY DENSE, DARK YELLOWISH BROWN, (10YR 4/4), POORLY GRADED SAND, TRACE OF FINE GRAVEL, DRY.	SP	N/A	Hau = BKG. α = BKG. βγ = 40 CPM
42 43 44							

NOTES:

DRILLER: JOE BARILE
HELPER: BILL FATY

INSTRU. BKG.
Hau = 0.4 ppm
α = 0 CPM
βγ = 40 CPM

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2002	COORDINATES:		DATE: 4-6-89 / 4-11-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TRILLINGER	Depth	Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL			PAGE 4 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISH)	REMARKS
32317 46	32317 1010 ~~1045~~ ET. 04-06	50+ / 4in	4	VERY DENSE, YELLOWISH BROWN, (10YR 4/4), WELL GRADED SAND, MOIST.	SW	N/A	Hnu = BKG. α = BKG. βγ = 40-50 cpm
47							
48							
49							
50							
51	32318 1035 ~~1045~~ 04-06	42 50 / 5in	7	VERY DENSE YELLOWISH BROWN (10YR 4/4), WELL GRADED SAND, MOIST.	SW	N/A	Hnu = BKG. α = BKG. βγ = 40 cpm
52							
53							
54							
55							
56	32319 1045 04-11	42 50 / 3in	6	VERY DENSE DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED SAND, MOIST.	SP	N/A	Hnu = BKG α = BKG βγ = 40 cpm
57							
58							
59							

NOTES:

DRILLER: JOE BARICE
HELPER: BILL FOLTY

INSTRU. BKG.
Hnu = 0.4 ppm
α = 0 CPM
βγ = 40-50 CPM

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2002	COORDINATES:	DATE: 4-11-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TOLLINGER	Depth Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	32320 1130 04-11	50 50+/4in	7	VERY DENSE, DARK YELLOWISH BROWN, (10YR 4/4) WELL GRADED GRAVELLY SAND, MOIST.	SW	N/A	Hnu = BKG. α = BKG. βγ = 50-60 CPM
62							
63							
64							
65							
66	32321 1400 04-11	50 50+/3in	6	VERY DENSE, GRAYISH BROWN, (10YR 4/2) SANDY, FINE, WELL GRADED GRAVEL, MOIST TO WET.	GW	N/A	Hnu = BKG. α = BKG. βγ = 60 CPM
67							
68							
69							
70	32322 1450 04-11	5 8 30	9	DENSE, BROWN, (10YR 4/3) POORLY GRADED SAND, WET	SP	N/A	Hnu = BKG. α = BKG. βγ = 60 CPM
71							
72							
73							
74							

AVERAGE WATER LEVEL @69.3 FT.

NOTES:

DRILLER: JOE BARKLE
HELPER: BILL FELTY

INSTRU. BKG.
Hnu = 0.4 ppm
α = 0 CPM
βγ = 60 CPM

000131

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2002	COORDINATES:		DATE: 4-11-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth	Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL			PAGE 6 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	32323 1515 0411	13 12 25	12	DENSE, BROWN, (10YR 4/3) WELL GRADED, GRAVELLY SAND, WET.	SW	N/A	Hnu = BKG. α - BKG. βγ = 60 CPM
77							
78							
79							
80							
81	32324 1556 04-11	10 14 18	10	DENSE, BROWN, (10YR 4/3) SANDY, WELL GRADED GRAVEL, WET.	GW	N/A	Hnu = BKG. α - BKG. βγ = 60 CPM
82				SAMPLING ENDED AT 81.5 FT. DRILLING ENDED AT 83.0 FT		-	
83							
84							
85							

NOTES:

DRILLER: JOE BARKLE
HELPER: BILL FELTY

INSTRU. BKG.

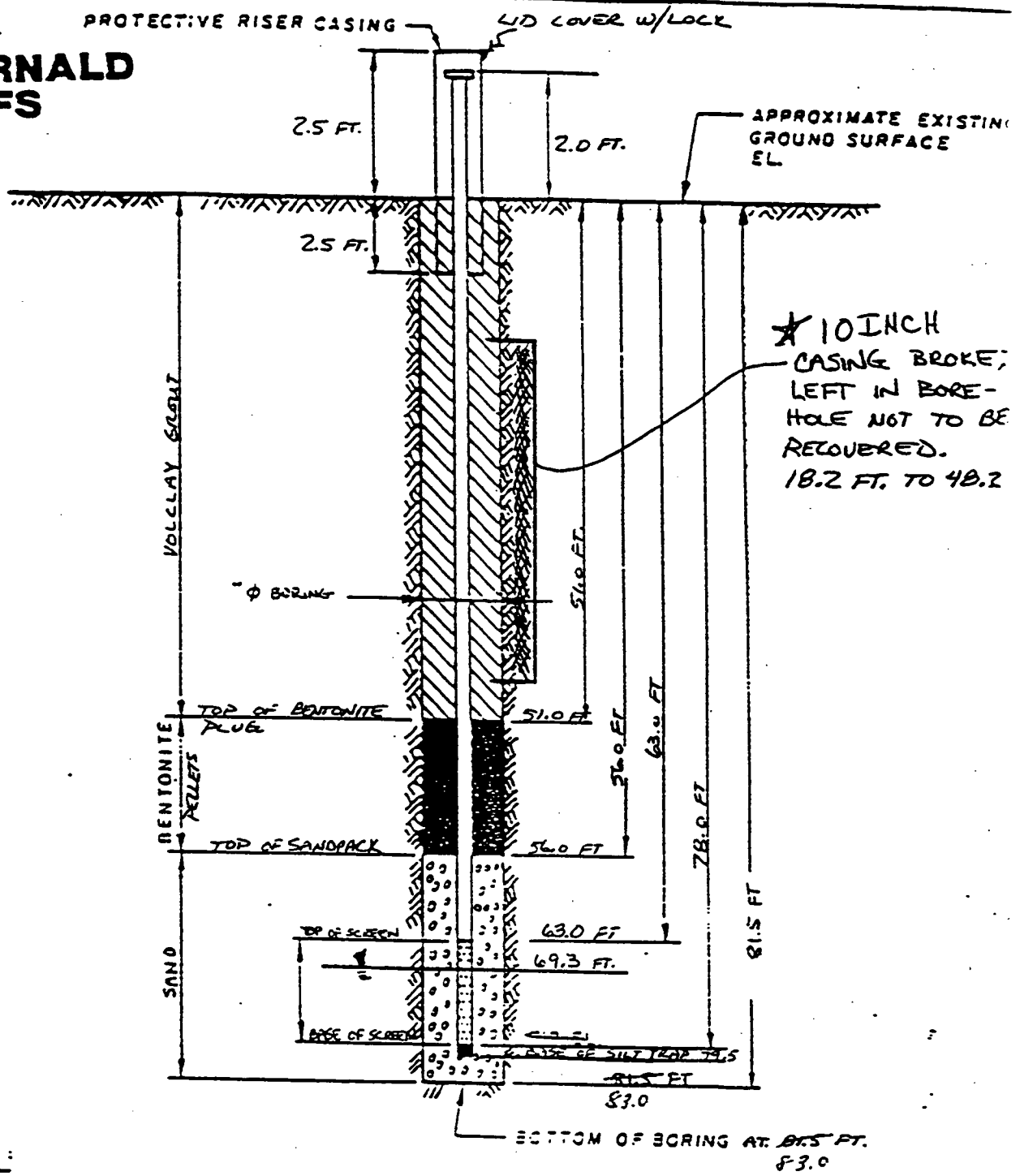
Hnu = 0.4 ppm
α = 0 CPM
βγ = 60-70 CPM

MW-2002

5109

7/8

FERNALD RI/FS



DRAWN BY: E.T. | CHECKED BY: LAH | APPROVED BY: | DRAWING NUMBER: MW-2002 | 5-5-89

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED W/WELDED SILT TRAP
4. ELEVATION OF WATER LEVEL 68.2, 70.0 69.9 FT.
5. WATER LEVEL READING ON 4-11, 4-12, 4-13-89

MATERIALS USED:

20 BAGS 10/20 SAND (80 lb.) ea.
12 BAGS VOLCLAY GROUT (50 lb.) ea.
5 BUCKETS BENTONITE PELLETS (5 gal.) ea.
WATER: 450 GALS DRILLING
200 GROUTING
(650 GALS. TOTAL)

PIPE SECTIONS:
6 - 10 FT.
1 - 5 FT.
1 - 15 FT. PERF. SCREEN
1 - 1.5 FT. SILT TRAP (WELDED)

INSTALLATION DETAILS
MONITORING WELL #2002

PREPARED FOR FMPC RI/F

000133

4/15/89 [illegible]

8/8

FERNALD RI/FS

MW-2002

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. E. TRAUNGER DATE 4-12-89
PROJECT NO. 602 3.2.1 CHECKED BY W A Hertel DATE 5-5-89
BORING NO. 2002
PIEZOMETER NO. 2002 DATE OF INSTALLATION 4-14-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT. TO 83.0 FT
FLUID _____ FROM _____ TO _____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN ID FROM 0.0 FT. TO 83.0 FT
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010 IN
TOTAL PERFORATED AREA 15.0 FT.

RISER PIPE MATERIAL (316) STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN
LENGTH OF PIPE SECTIONS 10.0 FT., 5.0 FT.
JOINING METHOD THREADED, FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10.75 IN

OTHER PROTECTION RISER PROTECTIVE PIPE HINGED LID COVER WITH LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 51.0 FT.	TOP	BOTTOM
BENTONITE PELLETS	TOP 51.0 FT.	BOTTOM 56.0 FT.	TOP	BOTTOM
SAND 10/20	TOP 56.0 FT.	BOTTOM 81.5 FT.	TOP	BOTTOM
~~GRAVEL~~ NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 63.0 FT.	BOTTOM 78.0 FT.	TOP	BOTTOM
PIEZOMETER TIP	79.5 FT.			
BOTTOM OF BOREHOLE	83.0 ~~81.5~~ FT.			
GWL AFTER INSTALLATION	69.9 FT.			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS 1.5 FOOT OF SETTLEMENT OF SUSPENDED MATERIAL.

WELL LOG AND DRILLING REPORT

5709 ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

Form C-3 3003

No. 258889

County Hamilton Township Crosby Section of Township North

Owner National Lead Co. of Ohio Address Box 39158 Cinti. Ohio Zone 39

Location of property S.R. 128 Fernald Ohio

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 85'

Type of screen Red Brass Length of screen 30'

Type of pump Vertical turbine

Capacity of pump 200 G.P.M.

Depth of pump setting 79'4"

Date of completion 9/27/63

BAILING OR PUMPING TEST

Pumping rate 380 G.P.M. Duration of test 24 hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water ft.

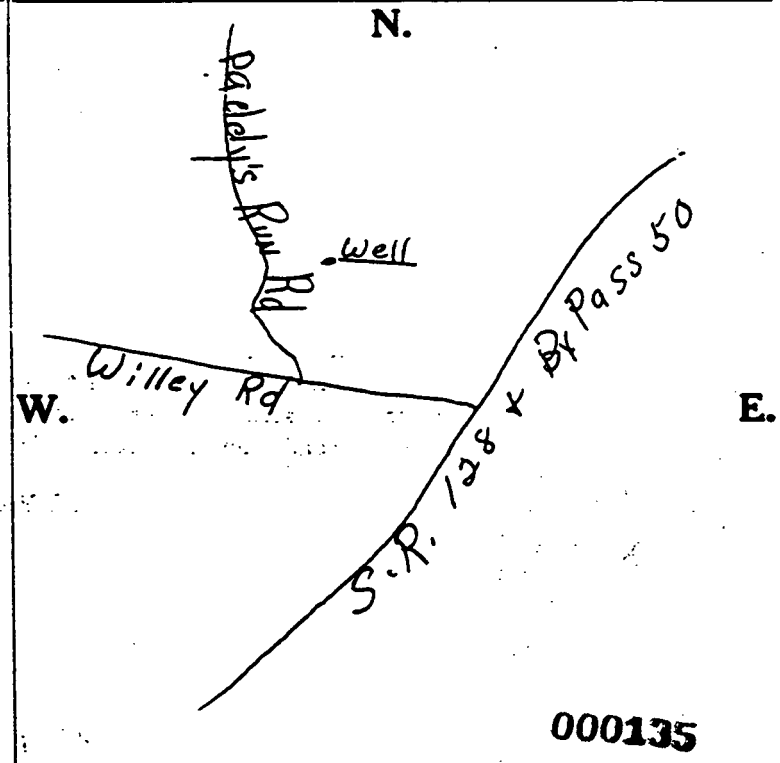
Pump installed by Hyden Bro's Drilling Co

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay + Sand	0 Feet	40 Ft.
Sand + Gravel	40'	105'

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



000135

See reverse side for instructions

Drilling Firm Hyden Bro's Drilling Co Date 9/27/63

Address 6605 Wooster Rd. Signed Ralph W. Hyden

130

FERNALD RI/FS

DLG 2/3/89

	Initial	Date
1st Key In		
2nd Key In		
3rd Key In		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 802	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: ~~104~~ 1004	COORDINATES: See p1	DATE: 2-20-88
ELEVATION: See p1	GWL: Depth See Date/Time	DATE STARTED: 02/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth See Date/Time	DATE COMPLETED: 02/21/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16				See Well Boring			
17				No. ~~304~~ 3004 RMG 2/6/89			
18				FOR			
19				Soil Lithology			
20							
21							
22							
23							
24							
25							02/21/88
26	S1 85	N/A	12"	SHELBY Tube	N/A	N/A	Pushed Tube 2.0 Ft Recovery 1.0 Ft 1000
27							
28				REVIEWED BY QA [signature] DATE 7-22-91			
29							
30							
31							

NOTES:

Bottom of Hole 31 Ft

FERNALD RI/FS

DLG 2/7/89

	Initial	Date
1st Key In		
2nd Key In		5/4
Verify		5/25/88

5709

VISUAL CLASSIFICATION OF SOILS

WPK 4/23/88 RIG #1

PROJECT NUMBER: 6023.2		PROJECT NAME: FMPC RI/FS T3.2			
BORING NUMBER: ~~104~~ DO 1-5-89 1004		COORDINATES: NC 78142.39 EC 1377397.78		DATE: 2-20-88	
ELEVATION: 579.0 GL		GWL: Depth NA	Date/Time NA	DATE STARTED: 02/20/88	
ENGINEER/GEOLOGIST: M. Goldberg		Depth NA	Date/Time NA	DATE COMPLETED: 02/21/88	
DRILLING METHODS: Cable Tool				PAGE 1 OF 2	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See Well Boring No. 304 For soil Lithology			
2							
3							
4							
5							
6							
7							02/20/88
8	08 1E4	N/A	12"	Shelby Tube	N/A	N/A	Pushed 2.3 FT Recovery 1.0 FT 1445
9							
10							
11							
12				REVIEWED BY QA MB DATE 7-22-91			
13							
14							
15							

NOTES: I) Drilling contractor: Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter

II Background Measurements:

A) Hna = 0 B) α = 0 C) γB = 140cpm

N/A = not applicable

III) Water used = 75 gallons

000137

IV Samples via Mancell Color chart

402-11-86

FERNALD RI/FS

DLG 2/3/89

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Goldberg DATE 02/21/88
PROJECT NO. 602.3.2 CHECKED BY R.M. Bollert DATE 2/6/89
BORING NO. ~~109~~ 88 1-5-88 1004
PIEZOMETER NO. N/A DATE OF INSTALLATION 02/21/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 30 TO 310 Ft	SIZE 10" FROM 0 TO 31 Ft
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO

PIEZOMETER DESCRIPTION

TYPE Monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4" inches
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 FT
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD Thread and couple
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 Ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE Ø.D. 10" inches	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0		581	
GROUND SURFACE	0.0		579.0	
BOTTOM OF PROTECTIVE PIPE	2.5 Ft		576.5	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 10 Ft	TOP 0	BOTTOM 569
BENTONITE	TOP 10 Ft	BOTTOM 15 Ft	TOP 569	BOTTOM 564
~~[illegible]~~	TOP NA	BOTTOM NA	TOP NA.	BOTTOM ~~548~~
GRAVEL	TOP 15 Ft	BOTTOM 31 Ft	TOP 564	BOTTOM 548
PERFORATED SECTION	TOP 19 ft	BOTTOM 29 ft	TOP 568	BOTTOM 550
PIEZOMETER TIP	31 ft		548	
BOTTOM OF BOREHOLE	31 ft		548	
GWL AFTER INSTALLATION	N/A		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS

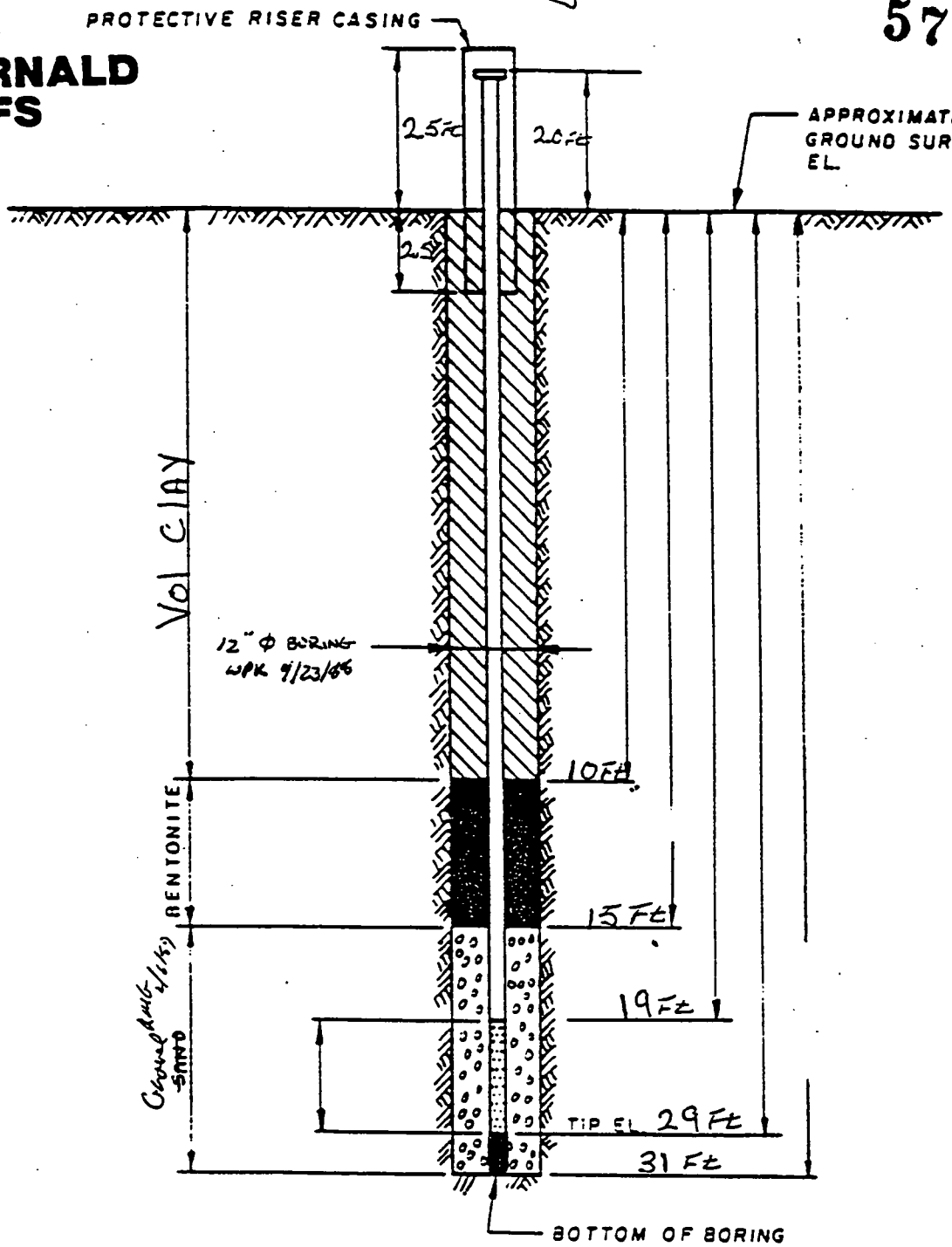
REVIEWED BY QA DATE 7-22-91

000138

Monitoring Well ~~104~~ 1004 BB 1-5-89 DG 2/3/89

5709

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED ~~FLUSH~~-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 104

PREPARED FOR FMPC

REVIEWED BY QA AB DATE 7-22-91

000139

#20(

THE LAYNE OHIO COMPANY

COLUMBUS, OHIO

8-in.

LOG OF/TEST WELL No. 4

For National Lead Co. of Ohio City Fernald State Ohio

Location 300 ft. downstream from well No. 3

Date Started 8-13-59 Date Finished 8-17-59

FORMATIONS

DEPTH TO TOP OF STRATUM	DEPTH TO BOTTOM OF STRATUM	THICK-NESS OF STRATUM	STATIC WATER LEVEL	1-HOUR BAILING TEST		HOW FAR DID FORMATION HEAVE	FORMATION FOUND	REMARKS
				AVERAGE G. P. M.	DRAWDOWN FEET			
0'	6'	6'					Blue clay	
6	16	10					Yellow clay	
16	40	24	30'10"				Brown sand	
40	43	3					Sand and gravel	

DRILLER N[illegible] R. Morris

([illegible] ON BACK OF THIS LOG SHEET)

-2004

5709

FERNALD RI/FS

REVIEWED BY QA DATE AUG 15 1991

	Initial	Date
1st Key In		NK
2nd Key In		5/5
Hand Copy Verification		2/16

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.7	
BORING NUMBER: 304 88 FS-39 3004	COORDINATES: N 484427.87 E 1371886.22	DATE: 1-20-88
ELEVATION: 579.1	GWL: Depth / Date/Time	DATE STARTED: 01/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED 02/18/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07 9 10	1 3 4	10"	Very STIFF yellowish Brown clay (10YR 5/4) Dry	ML	3.0	Hnu = 0 α = 0 δB = 140 cpm 1005
2 3	07 9 11	2 2 5	8"	STIFF very dark grayish Brown (10YR 3/2) Dry 3.0 ft	CL	2.0	Hnu = 0 α = 0 δB = 120 1010
4	07 9 12	3 5 7	10"	Very STIFF yellowish Brown clay (10YR 5/4) Dry. Trace gravel 4.5 ft	CL	2.5	Hnu = 0 α = 0 δB = 100 1015
5 6	07 9 13	4 8 9	10"	Very STIFF Dark Brown clay (10YR 4/3) Dry Trace of gravel	CL	3.0	Hnu = 0 α = 0 δB = 120 1022
7	07 9 14	15 19 21	18"	Hard Dark Brown clay (10YR 4/3) Dry. Trace of gravel 7.5 ft		4.0	Hnu = 0 α = 0 δB = 140 1026
8 9	07 9 15	28 29 33	14"	Hard Dark grayish Brown clay (10YR 3/2) Dry. Trace of gravel	CL	4.0	Hnu = 0 α = 0 δB = 140 1032
10	07 9 16	6 14 17	16"	Hard Dark grayish Brown clay (10YR 3/2) Dry. Trace of gravel 10.5			Hnu = 0 α = 0 δB = 140 cpm 0909
11 12	07 9 17	15 16 23	18"	Hard Dark Brown clay (10YR 4/3) Trace of gravel. Dry 12.0 ft	CL	4.0	Hnu = 0 α = 0 δB = 140 cpm 0923
13	07 9 18	8 11 10	12"	Hard Dark grayish Brown clay (10YR 3/2) Trace of gravel Dry.		4.0	Hnu = 0 α = 0 δB = 100 0952
14 15	07 9 19	10 13 16	8"	Hard Dark grayish Brown clay (10YR 3/2) Trace gravel. Dry		4.0	Hnu = 0 α = 0 δB = 100 0957

NOTES:
I) Drilling contractor: Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter

II) Background Measurements
A) Hnu = 0 B) α = 0 C) δB = 140 cpm

III Water used - 150 + 80 + 3000

IV Samples via Munsell colors ASTM

V ASTM Followed for SPT

000141

FERNALD RI/FS

REVIEWED BY QA K.S. DATE AUG 15 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 304 1-5-88 BD 3004	COORDINATES: See A	DATE: 1-21-88	
ELEVATION: See A	GWL: Depth Date/Time	DATE STARTED: 01/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 2-18-88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 10	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	0 7 9 20	8 10 11	10"	Hard yellowish Brown clay (10YR 5/6) Trace gravel. Dry	CL	4.0	Hnu = 0 α = 0 δB = 120 1045
17 18	0 7 9 21	5 9 13	10"	Hard yellowish Brown clay (10YR 5/6) Trace gravel. Dry	CL	4.0	Hnu = 0 α = 0 δB = 120 1440
19	0 7 9 22	4 7 11	14"	Very STIFF yellowish Brown clay (10YR 5/6) Trace gravel. Dry 19.5	CL	3.5	Hnu = 0 α = 0 δB = 100 1505
20 21	0 7 9 23	8 14 17	14"	Very STIFF Dark Brown clay (10YR 4/3) Trace gravel - DRY 21.5	CL	3.5	Hnu = 0 α = 0 δB = 100 1542
22	0 7 9 24	13 11 18	10"	Very STIFF yellowish Brown clay (10YR 5/6) Dry. 22.5	CL	2.5	Hnu = 0 α = 0 δB = 140 cpm 1630
23 24	0 7 9 25	9 11 17	14"	Very STIFF Dark grey clay (5Y 4/1) Dry. 24.5	CL	2.5	Hnu = 0 α = 0 δB = 180 cpm Lense of Yellow Brown clay. 1645
25	0 7 9 26	8 12 17	14"	Very STIFF Dark Brown clay (10YR 4/3) w/ lenses of Dark grey clay (5Y 4/1) Trace gravel. Dry 25.5	CL	3.5	Hnu = 0 α = 0 δB = 100 0850
26 27	0 7 9 27	8 12 16	16"	Very STIFF Dark Brown clay (10YR 4/3) Trace gravel Dry 27	CL	2.5	Hnu = 0 α = 0 δB = 120 0920
28	0 7 9 28	18 25 25	8"	Very STIFF Dark Brown clay (10YR 4/3) w/ Trace of sand. ~~Dry~~ Moist 28.5	CL	3.0	Hnu = 0 α = 0 δB = 100 0940
29 30	0 7 9 29	11 23	8"	Very STIFF Dark grey clay (2.5Y 4/0) Trace gravel Dry	CL	3.5	Hnu = 0 α = 0 δB = 100 1045

NOTES:

5709

FERNALD RI/FS

REVIEWED BY QA K.G. DATE AUG 15 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T 3.2	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 304	COORDINATES:	DATE: 1-22-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 01/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 2-18-88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 10	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	07 9 3 0	21 24 50-3	8"	31 Ft Very Stiff olive yellow clay (2.5Y 6/6) Trace gravel Dry 31.5	CL	3.0	Hnu = 0 ∝ = 0 γB = 120 1345
32 33	07 9 3 1	24 34 38	16"	Very Dense olive yellow sand (2.5Y 5/6) Dry	SW	1.0	Hnu = 0 ∝ = 0 γB = 100 1428
34 35	07 9 3 2	22 24 18 33	24"	Very Dense olive yellow sand (2.5Y 5/6) Dry	SP	1.0	Hnu = 0 ∝ = 0 γB = 100 1450
36 37 38 39							
40 41	07 9 3 3	16 16 24	18"	Dense yellowish Brown sand (10YR 5/6) Trace gravel. Dry	SP	1.0	Hnu = 0 ∝ = 0 γB = 100 1015
42 43 44 45							

NOTES:

000143

FERNALD RI/FS

REVIEWED BY QA KAG DATE 7/13/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 5.1		
BORING NUMBER: 304	COORDINATES: Seep1	DATE: 1-24-88	
ELEVATION: Seep1	GWL: Depth Date/Time	DATE STARTED: 01/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 2-18-88	
DRILLING METHODS: Cable Tool		PAGE 4 OF 10	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	07 9 3 4	20 26 28	18"	Very Dense yellowish Brown sand (10YR 5/6) DRY	SP	1.0	Hnu = 0 α = 0 γB = 140 1340
47							
48							
49							
50							
51	07 9 3 5	5 11 23	16"	Dense yellowish Brown sand (10YR 5/4) DRY		<1	Hnu = 0 α = 0 γB = 100 1440
52							
53							
54							
55							
56	07 9 3 6	9 13 23	18"	Dense yellowish Brown sand 10YR 5/4) MOIST	SM	<1	Hnu = 0 α = 0 γB = 100 1600
57							
58							
59							
60							

NOTES:

FERNALD RI/FS

REVIEWED BY GA KLG DATE AUG 23 1989 DLG

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 304 BB 1-5-89 3004	COORDINATES: Seep1	DATE: 1-26-88	
ELEVATION: Seep1	GWL: Depth Date/Time	DATE STARTED: 01/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 2-18-88	
DRILLING METHODS: Cable Tool		PAGE 5 OF 10	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY IN (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	07 9 3 7	11 13 23	18"	Dense Yellowish Brown sand (10YR5/4) Moist	SM	<1	Hna = 0 α = 0 ΣB = 100 1653
62							
63							
64				≈ WaTeR ≈			
65	07 9 3 8	9 21 23	16"	Dense Dark yellowish Brown (10yr 4/6) Trace gravel. Wet	SW	<1	Hna = 0 α = 0 ΣB = 100 1030
66							
67							
68							
69							
70	07 9 3 9	7 16 21	18"	Dense Dark Yellowish Brown (10YR 4/6) Trace gravel. Wet	SW	<1	Hna = 0 α = 0 ΣB = 100 1105
71							
72							
73							
74							
75							

NOTES:

000145

402-11-86

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 15 1991

DLG 2/3/89

	Initial	Date
1st Key In		
2nd Key In		98
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 304 1-5-88 3004	COORDINATES: Seal	DATE: 1-28-88	
ELEVATION: Seal	GWL: Depth 71.7 Date/Time 01/27/88 1720	DATE STARTED: 01/20/88	
ENGINEER/GEOLOGIST: M Goldberg	Depth 67.2 Date/Time 01/28/88 0840	DATE COMPLETED: 2-18-88	
DRILLING METHODS: Cable Tool		PAGE 6 OF 10	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	079 40	22 24 32	18"	Very dense DARK Yellowish Brown (10YR 4/4) very coarse. Wet. Gravel.	sand SW	<1	Hnu=0 α=0 βB=100cpm 1605
77							
78							
79							
80	079 41	5 3 5	18"	Loose DARK Yellowish Brown sand (10YR 4/6) poorly sorted. Trace gravel wet	SW	<1	Hnu=0 α=0 βB=80 1655
81							
82							
83							
84							
85	079 42	19 29 50	18"	Very Dense DARK yellowish Brown Sand (10YR 4/6) poorly sorted. Wet	SW	<1	Hnu=0 α=0 βB=140cpm 0910
86							
87							
88							
89							
90							

NOTES:

000246

FERNALD RI/FS

REVIEWED BY QA [redacted] AUG 15 1988 DATE

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: 304 BB 1-5-88 3004	COORDINATES: see	DATE: 2-5-88
ELEVATION: see	GWL: Depth 58.1 Date/Time 02/03/88 0835	DATE STARTED: 01/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 2-18-88
DRILLING METHODS: Cable Tool		PAGE 7 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90				900			
91	0 7 9 4 3	22 19 24	16"	Dense grayish Brown gravel (10YR 5/2) w/sand wet	GW	<1	Hnu = 0 α = 0 γB = 100 1440
92							
93							
94				≈ 94 Ft			
95							
96	0 7 9 4 4	19 24 37	12"	Very Dense Dark grey sand (10YR 4/1) very Fine	SM	<1	Hnu = 0 α = 0 γB = 100 Blowsand 1515
97							
98							
99							
100	0 8 17 5	40 49 50/3	NR	Blow sand Very Dense Dark grey sand (10YR 4/1)			Hnu = no Recovery α = after 2 attempt γB = 1450
101							
102							
103							
104							
105							

NOTES: NR = no Recovery

000147

FERNALD RI/FS

REVIEWED BY QA KLG DATE AUG 2/3/89 DLG

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 304 BB 1-5-88 3004	COORDINATES: Surpl	DATE: 2-8-88	
ELEVATION: Surpl	GWL: Depth	Date/Time	DATE STARTED: 01/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth	Date/Time	DATE COMPLETED: 2-18-88
DRILLING METHODS: Cable Tool			PAGE 8 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106	08176	50/3 50/3 50/3	6"	Very Dense Dark Brown sand (10 YR 4/3) wet			Hna = 0 α = C BB = 80 Bloos sand 1505
107	08177		2#	Shelby Tube Blue clay contact ??? 107.5			No. 08177 1300
108							
109							
110							
111	08178	22 50/1	4"	Very dense, dark gray, well graded sand, gravelly (5-y 4/1) wet	SW		Hna = 0 α = 0 BB = 160 1015
112							
113							
114							
115							
116	08179	32 50/3	9"	Very dense, very dark grayish brown poorly graded sand, wet (Clay 3/2)	SP		Hna = 0 α = 0 BB = 120 1425
117							
118							
119							
120							

NOTES: BB

FERNALD RI/FS

REVIEWED BY QA KB DATE AUG 15 1991

5709 DIC 2/3/19

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verified		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 304 (BB 1-5-88 3004)	COORDINATES: See #1	DATE: 2-16-88	
ELEVATION: See #1	GWL: Depth / Date/Time	DATE STARTED: 01/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth / Date/Time	DATE COMPLETED: 2-18-88	
DRILLING METHODS: Cable Tool		PAGE 9 OF 10	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120				120.5			
121	C8 1 8 0	50/3	6"	Very Dense ~~Dark~~ very dark gray gravely sand (10YR 3/1) no Fines poorly sorted. wet	GW	<1	Hna=0 α=0 GB=100 1320
122							
123							
124							
125							
126	C8 1 8 1	50/5	6"	Very Dense Very dark gray gravely sand (10YR 3/1) no Fines poorly sorted wet	GW	<1	Hna=0 α=0 GB=100 1555
127							
128							
129							
130							
131	C8 1 8 2	6 8 12	8"	Medium dense Very dark grey gravel (10YR 3/1) no Fines. wet large Fragments.	GW	<1	Hna=0 α=0 GB=100 0935
132							
133							
134							
135							

NOTES:

000149

FERNALD RI/FS

REVIEWED BY QA KG AUG 15 1991 DLG 2/3/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: ~~304~~ OB 1-5-88 3004	COORDINATES: see pl	DATE: 2-18-88	
ELEVATION: see pl	GWL: Depth 58.7 Date/Time 02/18/88	DATE STARTED: 01/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 02/18/88	
DRILLING METHODS: Cable Tool		PAGE 10 OF 10	

DEPTH (FT) 135	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	08 1 83	22 16 12		Dense Dark grey gravel (10YR3/1) Trace clay. wet poorly sorted			Hnu = 0 α = 0 OB = 100 1110
				Bottom of Borehole 135 ft			

NOTES:

000150

FERNALD RI/FS

REVIEWED BY QA K.G. DATE AUG. 15 1989 DLG 1/13/89 5709

	Initial	Date
1st Key In	NK	
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Goldberg DATE 02/18/88
PROJECT NO. 602 CHECKED BY R M Galbraith DATE 2/6/89
BORING NO. ~~304~~ BB 1-5-88 3004
PIEZOMETER NO. N/A DATE OF INSTALLATION 02/17-18/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 3ft TO 135ft	SIZE 10" FROM 0 TO 135ft
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE Monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4" inches
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10ft
AVERAGE SIZE OF PERFORATIONS .010 inches	JOINING METHOD Thread ~~and couple~~ Flush RM.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5ft	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE O.D. 10" inches	

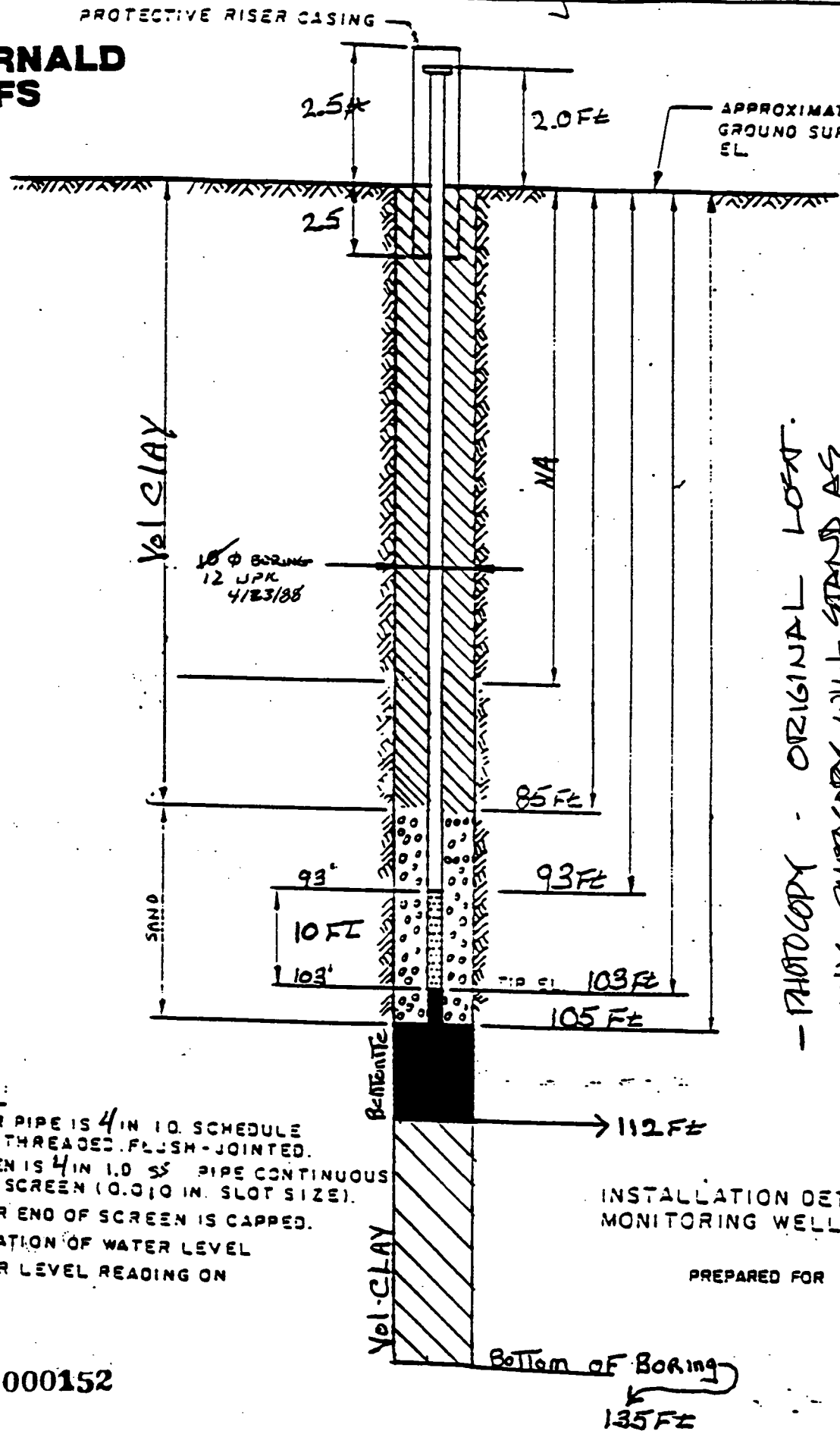
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION (ft)	
TOP OF RISER PIPE	2.0ft		581.1	
GROUND SURFACE	0.0		579.1	
BOTTOM OF PROTECTIVE PIPE	2.5ft		576.6	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 85ft	TOP 579.1	BOTTOM 494.1
BENTONITE	TOP NA	BOTTOM NA	TOP –	BOTTOM –
SAND	TOP 85ft	BOTTOM 105ft	TOP 494.1	BOTTOM 474.1
~~GRAVEL~~	TOP NA	BOTTOM NA	TOP –	BOTTOM –
PERFORATED SECTION	TOP 93ft	BOTTOM 103	TOP 486.1	BOTTOM 476.1
PIEZOMETER TIP	~~NA~~ 105ft		475.1	
BOTTOM OF BOREHOLE	135ft		444.1	
GWL AFTER INSTALLATION	58.7ft @ 1315-02/18/88		TOC	Variable

IS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒ 000151
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Borehole was overdrilled to 135ft in search for Blue clay and then grouted to 112Ft, a Bentonite plug was then set from 112Ft → 105Ft, just above the Blue clay? encountered @ 108 ft.

Monitoring Well 304 BB 1-5-89 3004

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

REVIEWED BY QA

DATE

- PHOTOCOPY - ORIGINAL LOST. THIS PHOTOCOPY WILL STAND AS THE ORIGINAL. 1-21-90

000152

#3005

THE LAYNE OHIO COMPANY

COLUMBUS, OHIO

LOG OF 8-in. TEST WELL No. 5 3005

For National Lead Co. of Ohio City Fernald State Ohio

Location 200 ft. downstream from well No. 4

Date Started 8-18-59 Date Finished 8-18-59

FORMATIONS

DEPTH TO TOP OF STRATUM	DEPTH TO BOTTOM OF STRATUM	THICKNESS OF STRATUM	STATIC WATER LEVEL	1-HOUR BAILING TEST AVERAGE G. P. M.	1-HOUR BAILING TEST DRAWDOWN FEET	HOW FAR DID FORMATION HEAVE	FORMATION FOUND	REMARKS
0'	3'	3'					Top soil	
3	16	13					Yellow clay	
16	40'6"	24'6"	30'3"				Brown sand	

000153

3005

5709

DRILLER Neil R. Morris

FERNALD RI/FS

Date	5-18-89			
Initials	JAH			
	Field Check	1st Ver'n	2nd Ver'n	Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 ~~3.1~~ 3.7 WAM 1.8-4.5	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2006	COORDINATES:	DATE: 04-26-89
ELEVATION: 579.6 Ground Level	GWL: Depth Date/Time	DATE STARTED: 04-26-89
ENGINEER/GEOLOGIST: C. Grabe	Depth Date/Time	DATE COMPLETED: 05-01-89
DRILLING METHODS: Cable Tool		PAGE 1 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10805 0930 04-26	8 11 7	12	Medium Dense, mottled brown (10YR4/3) to yellowish brown (10YR5/4) clayey gravel, some sand, gravel (.25 - 1.0 in), dry	GC	N/A	HNU = 0 ppm α = 0 cpm βγ = 140-180 cpm
2 3	10806 0934 04-26	4 5 5	14	Very stiff, yellowish brown (10YR5/4), silty clay, trace gravel (.25 - .75 in), trace sand, moist	CL	2.0 to 3.0	HNU = 0 ppm α = 0 cpm βγ = 100-140 cpm
4	10807 0940 04-26	4 8 11	16	Stiff to very stiff, yellowish brown (10YR5/4), silty clay, trace sand, trace gravel (.25 - .75 in), moist	CL	1.5 to 3.0	HNU = 0 ppm α = 0 cpm βγ = 160-180 cpm
				Contact 4.0 FT			
				very stiff, very dark gray (5Y 3/1), silty clay, trace sand, moist		3.5	
5 6	10808 0945 04-26	8 12 12	04/26/89 ~~12~~ 16	Very stiff to stiff, olive gray (5Y 4/2), silty clay, trace sand moist	CL	3.0 to 1.5	HNU = 0 ppm α = 0 cpm βγ = 100-140 cpm
7	10809 1245 04-26	1 4 6	04/26/89 12 ~~14~~	Very stiff to stiff, olive gray (5Y 4/2), silty clay, trace sand, moist	CL	1.5 to 3.0	HNU = 0 ppm α = 0 cpm βγ = 80-100 cpm
				Contact 7.0 FT			
				very stiff very dark gray (5Y 3/1), silty clay, trace sand, moist			
8 9	10810 1255 04-26	3 5 7	04/26/89 14 ~~18~~	Stiff, very dark gray (5Y 3/1), silty clay, trace sand, moist	CL	1.5	HNU = 0 ppm α = 0 cpm βγ = 90-120 cpm
				Stiff, olive gray (5Y 4/2), silty clay, trace sand, moist			
10	10811 1300 04-26	3 10 8	18	Stiff, olive gray (5Y 4/2), silty clay, trace sand, moist	CL	1.0 to .5	HNU = 0 ppm α = 0 cpm βγ = 80-100 cpm
				Contact 10.0 FT			
				medium stiff (10YR 5/8) yellowish brown, sandy clay trace silt, moist			
11 12	10812 1320 04-26	2 3 3	18	Medium stiff (10YR 5/8) yellowish brown, sandy clay, trace silt, moist	CL	1.5	HNU = 0 ppm α = 0 cpm βγ = cpm
13	10813 1329 04-26	3 6 10	18	medium stiff (10YR 5/8) yellowish brown, sandy clay, trace silt, moist	CL	1.5	HNU = 0 ppm α = cpm βγ = 90-120 cpm
				13.3 FT			
				medium Dense, dark yellowish brown (10YR 4/6) poorly graded sand, some silt, wet	SW	N/A	
14 15	10814 1443 04-26	3 5 8	12	Medium stiff, dark yellowish brown (10YR 4/6) silty clay, some sand, very moist	CL	.5	HNU = 0 ppm α = 0 cpm βγ = 60-80 cpm

NOTES:

Contractor - Pem Drill
Rig - 42 cyclone
Driller - Craig Coulter
Assistant - Chris Coulter

Samples collected as per ASTM standard penetrationtest
colors identified using Munsell color chart

Background Levels: HNU = 0 ppm
α = 0 cpm
βγ = 140-180 cpm
LELO₂ = 0 PPM LEL
20.8% O₂

Water used (added to Borehole) during drilling & Completion activities - 720 GALLONS

000154

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3rd 3.7 WAW 3.18	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2006	COORDINATES:	DATE: 4-26-89
ELEVATION: 579.66	GWL: Depth Date/Time	DATE STARTED: 4-26-89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 05-01-89
DRILLING METHODS: Cable Tool		PAGE 2 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	10815 1447 04-26	3 2 7	14	Soft, dark yellowish brown (10YR 4/6) silty clay, some sand, very moist	CL	.5	HNU = 0ppm
				contact 16.0 FT			α = 0cpm
				Stiff, dark gray (5Y 4/1), silty clay, trace gravel (.25-.75in), trace sand, moist		1.5	βγ = 80-110 cpm
17	10816 1500 04-26	2 3 5	10	Stiff, dark gray (5Y 4/1), silty clay, trace gravel (.25-.75in), trace sand, moist	CL	1.0	HNU = 0 ppm α = 0 cpm βγ = 70-90 cpm
18							
19	10817 1507 04-26	3 6 8	9	Stiff, dark gray (5Y 4/1), silty clay, trace gravel (.25-.75in) trace sand, moist	CL	1.0	HNU = 0ppm α = 0cpm βγ = 80-110 cpm
20	10818 1545 04-26	5 12 21	14	Stiff, dark gray (5Y 4/1) silty clay, trace gravel (.25-.5in), trace sand, moist	CL	1.75	HNU = 0 ppm α = 0 cpm βγ = 90-110 cpm
21							
22	10819 0913 04-27	4 6 13	15	Stiff, dark gray (5Y 4/1) silty clay, trace gravel (.25-.75in) trace sand, moist	CL	2.0	HNU = 0ppm α = 0 cpm βγ = 70-100 cpm
23	10820 0916 04-27	12 28 30	7	Stiff, dark gray (5Y 4/1), silty clay, trace gravel (.25-.75in), trace sand, moist	CL	2.0	HNU = 0 ppm α = 0 cpm βγ = 50-100 cpm
24							
25	10821 0935 04-27	9 13 14	7	Stiff, dark gray, (5Y 4/1), silty clay, trace gravel (.25-.75in) trace sand moist	CL	2.0	HNU = 0 ppm α = 0 cpm βγ = 80-110 cpm
26	10822 1010 04-27	5 9 11	N/R	Sample attempted twice with catcher - no recovery	N/A ~~CL~~ 4/26/89	N/A	HNU = α = βγ = N/A
27							
28	10823 1035 04-27	5 9 11	4	Stiff, dark gray, (5Y 4/1) silty clay, trace gravel (.25-.75in) trace sand, moist	CL	1.0	HNU = 0ppm α = 0cpm βγ = 80-120 cpm
29	10824 1056 04-27	4 8 12	16	Stiff, dark gray (5Y 4/1) silty clay, trace gravel (.25-.75in) moist 29.0 FT	CL	1.75	HNU = 0 ppm α = 0 cpm βγ = 70-100 cpm
				Stiff, dark gray (5Y 4/1), silty clay, some sand, trace gravel (.25-.75in) moist Base of Till 29.6 FT			
30				medium dense, Yellowish brown (10YR 4/4) poorly graded sand trace fine gravel (.25in), dry	SP	N/A	

NOTES:

000155

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2 3.7 WAN 5-18	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 2006	COORDINATES:		DATE: 04-30-89
ELEVATION: 579.66	GWL: Depth	Date/Time	DATE STARTED: 04-26-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth	Date/Time	DATE COMPLETED: 05-01-89
DRILLING METHODS: CABLE TOOL			PAGE 3 OF ~~6~~ 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31							
32							
33							
34							
35	10825			NO RECOVERY OF SAMPLE SAMPLE #10825 VOID			
36							
37							
38							
39							
40	10826	12		DENSE, YELLOW-BROWN (10YR 4/3) POORLY GRADED FINE SAND, TRACE GRAVEL (.25 - .50 IN) DRY	SP	N/A	
41	1440	17	14				$H_{\alpha\beta}$ = 0 PPM α = 0 CPM $B\gamma$ = 80-160 CPM
	04-30	20					
42							
43							
44							

WA 5-18

NOTES:

000156

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3/C 3.7 WAP 5.1.8	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2006	COORDINATES:	DATE: 04-30-89 / 05-01-8
ELEVATION: 579.6 GL	GWL: Depth Date/Time	DATE STARTED: 04-26-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-01-8
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 68

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10827 1550 04-30	47 50/4 in. —	10	VERY DENSE, YELLOW-BROWN (10YR4/3) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25 - .75 in) DRY	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 80-120 CPM
47							
48							
49							
50	10828 1630 04-30	14 21 24	10	DENSE, YELLOW-BROWN (10YR4/4) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25 - 1.0 in) DRY	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 80-120 CPM
51							
52							
53							
54							
55	10829 0905 05-01	50 50/1 in. —	4	VERY DENSE, YELLOW-BROWN (10YR4/2) WELL GRADED GRAVEL-SAND MIXTURE, GRAVEL RANGING FROM (.25 - 1.5 in) WET	GW	N/A	HNU = 0 PPM α = 0 CPM BG = 80-120 CPM
56							
57							
58							
59							

NOTES:

000157

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7 WAH 5-12-89	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2006	COORDINATES:	DATE: 05-01-89
ELEVATION: 579.6 GL	GWL: Depth 57.8 Date/Time 1100 05-01-89	DATE STARTED: 04-26-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth 57.4 Date/Time 1320 05-01-89	DATE COMPLETED: 05-01-89
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 68

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10830 0950 05-01	6 8 8	12	MEDIUM DENSE, GREY-BROWN (10YR4/1) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.50 in) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 80-120 CPM
62							
63							
64							
65	10831 1045 05-01	12 24 20	12	DENSE, GREY-BROWN (10YR 4/1) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.50 in) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 80-120 CPM
66							
67							
68							
69							
70	10832 1130 05-01	2 1 5	12	DENSE, GREY-BROWN (10YR 4/1) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25-.50 in) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 80-120 CPM
71							
72							
73							
74				BOTTOM OF BORING 75.0 ft			

NOTES:

000158

Date	5-18-89			
Initial	WAH			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

pg 6 of 7

5709

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUZALSKI DATE 05-03-89

PROJECT NO. 602 2.2 3.7 WAH 5-18-89 CHECKED BY W.A. Hertel DATE 5-18-89

BORING NO. 2006

PIEZOMETER NO. 2006 DATE OF INSTALLATION 05-03-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL

DRILLING FLUID (S) USED:

FLUID WATER FROM 0.0 FT. TO 75.0 FT.

FLUID — FROM — TO —

TYPE OF BIT HAMMER

CASING SIZE (S) USED:

SIZE 10.0 IN (ID) FROM 0.0 FT. TO 75.0 FT.

SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL

DIAMETER OF PERFORATED SECTION 4.0 IN ID

PERFORATION TYPE:

SLOTS ☒ HOLES ☐ SCREEN ☐

AVERAGE SIZE OF PERFORATIONS .010 IN.

TOTAL PERFORATED AREA 15.0 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL

RISER PIPE DIAMETERS:

O.D. 4 3/8 IN I.D. 4.0 IN.

LENGTH OF PIPE SECTIONS 5.0 FT./10.0 FT./16.7 FT.

JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.

PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION HINGED LOCKING COVER W/ PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 43.0	TOP	BOTTOM
BENTONITE	TOP 43.0	BOTTOM 48.0	TOP	BOTTOM
SAND (10-20)	TOP 48.0	BOTTOM 71.0	TOP	BOTTOM
GRAVEL (N/A)	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 53.0	BOTTOM 68.0	TOP	BOTTOM
PIEZOMETER TIP	69.7 FT.			
BOTTOM OF BOREHOLE	75.0 FT.			
GWL AFTER INSTALLATION				

000159

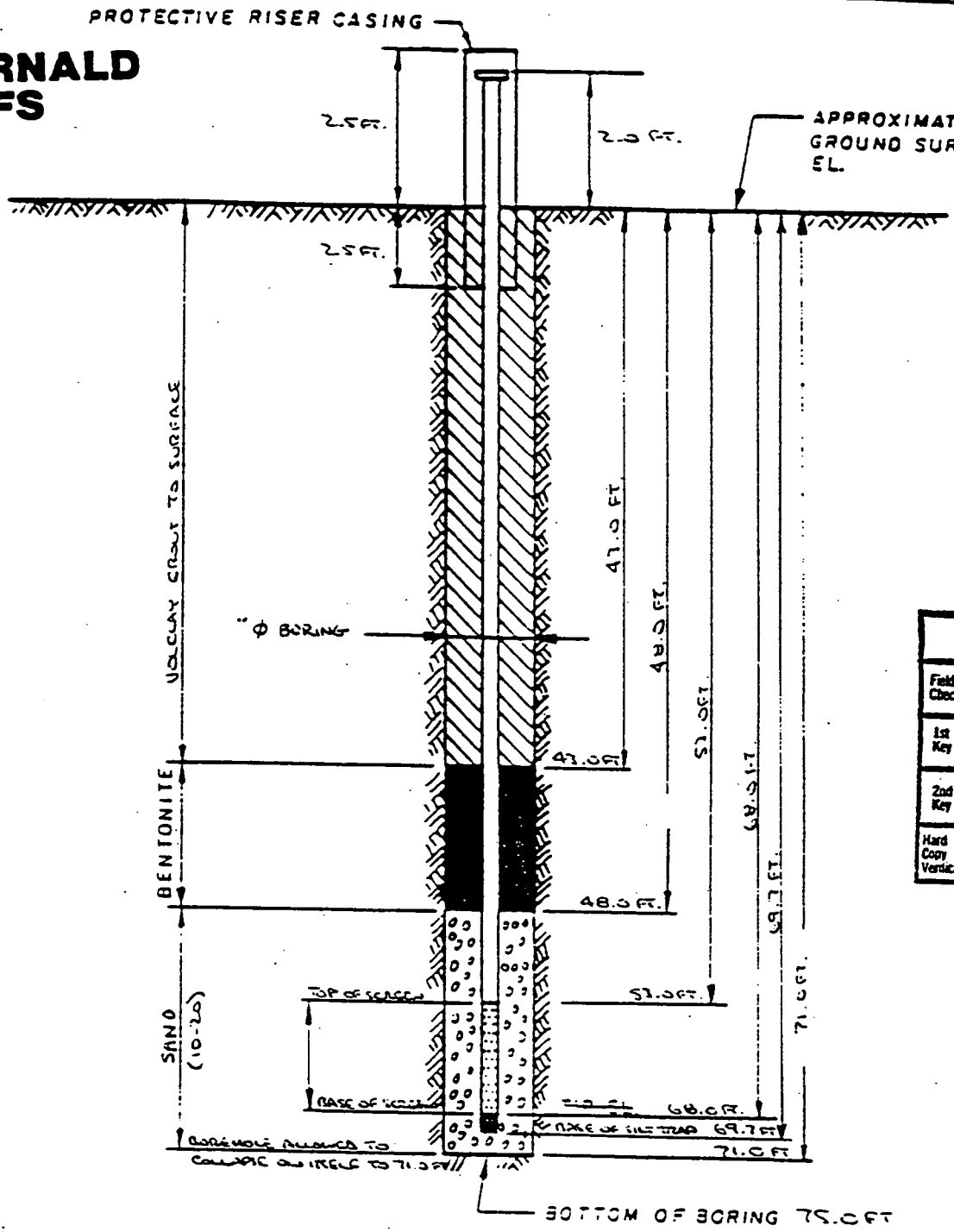
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒

WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE INTERVAL FROM 75.0 FT TO 71.0 FT WAS ALLOWED TO COLLAPSE ON ITSELF. 1 BUCKET OF BENTONITE PELLETS WAS POURED AROUND THE PROTECTIVE HOLE COVER TO SERVE AS PACKING AND SEALING MATERIAL @ THE SURFACE

BORING 2006

FERNALD RI/FS



	Initial	Date
Field Check	WAW	5-15-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWN BY	CHECKED BY / APPROVED BY	DRAWING NUMBER
MLC	WAW / S-15-89	

NOTES:

1. RISER PIPE IS 4.0 IN ID SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 57.8 FT ON 05-01-89 @ 1100
5. WATER LEVEL READING ON 57.4 FT ON 05-01-89 @ 1320

MATERIALS USED DURING WELL INSTALLATION:

10-20 SAND: 17-~~105~~ 80 SACKS

BENTONITE PELLETS: 7 BUCKETS (5 GAL)

VOLCLAY GROUT: 11-50 LB SACKS.

WATER USED DURING DRILLING ACTIVITIES: 500 GAL

WATER USED DURING WELL INSTALLATION: 220 GAL

TOTAL WATER USED: 720 GAL

INSTALLATION DETAILS
MONITORING WELL #2006

PREPARED FOR

STAINLESS STEEL: RISER PIPE, WELL SCREEN & SILT TRAP.

1 - 5.0 FT SS RISER PIPE

5 - 10.0 FT SS RISER PIPE

1 - 16.7 SS WELLSCREEN/SILT TRAP

5709

FERNALD RI/FS

	Initial	Date
Field Check	E.T.	3/22/89
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI FS		
BORING NUMBER: 2007	COORDINATES:	DATE: 3-1-89	
ELEVATION:	GWL: Depth 60.7 Date/Time 3-13/1100	DATE STARTED: 3-1-89	
ENGINEER/GEOLOGIST: L. Adams	Depth 60.5 Date/Time 3-14/0835	DATE COMPLETED: 03-13-89	
DRILLING METHODS: Cable Tool		PAGE 1	OF 5

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10770 1340 3-1-89	12 11 8	6 in.	~~Very si~~ loose Medium dense, silty gravel (gravel mostly from surface cover.) Yellowish brown 10yr 5/3. Damp.	GP	N/A	Hnu = Bkg α = 0 cpm βγ = 800 cpm
2 3	10771 1345 3-1-89	5 8 13	12 1	Stiff, greenish gray silty Clay (5yr 5/2) trace gravel, damp / Dense, brown well graded sand, trace gravel. damp (10yr 4/4)	CL / SW	2.0	Hnu = 0 ppm α = 0 cpm βγ = 80-100 cpm
4	10772 1350 3-1-89	13 14 15	11 5	very stiff, ~~brown~~ LA dark greenish gray clay (5yr 4/2) Damp / med. dense, well sorted sand. Brown (10yr-) 4/3)	CL / SW	3.0	Hnu = 0 ppm α = 0 cpm βγ = 80-100 cpm
5 6	10773 1525 3-1-89	5 12 18	13	Hard, dark gray (5yr 4/1) clay, trace gravel, (gravel .20 in.) damp. Sample has a slight acidic odor. Some silt present.	CL	~~2.25~~ LA 4.25	Hnu = 0-4 ppm α = 0 cpm βγ = 80-100 cpm
7	10774 1530 3-1-89	20 21 20	16	Very stiff, very dark gray (5yr 3/1) silty clay with organics (wood pieces) present. Gravel (.5 in.) present. Wet.	OL	~~2.75~~ LA 2.25	Hnu = 0-4 ppm α = 0 cpm βα = 80 cpm
8 9	10775 1605 3-1-89	1 3 10	13 ~~16~~ LA 3	Very stiff, Brownish yellow silty clay (10yr 4/5) gradually becoming greenish gray (5yr 5/2). Damp / Greenish gray (5yr 5/2) Sandy silty clay with organics (wood) present. Very soft, wet.	CL / OH	2.75	Hnu = .2 ppm α = 0 cpm βγ = 80 cpm
10	10776 1610 3-1-89	2 20 18	18	Hard, yellow brown clay (10yr 4/5) with gravel present (trace). Gravel to .5 in. Damp	CL	4.5+	Hnu = 2.5 ppm α = 0 cpm βα = 80 cpm
11	10777 1655 3-1-89	8 15 19	13	Very stiff, greenish gray (5yr 5/2) clay with organics present (wood) Damp	OL	3.75	Hnu = 0 ppm α = 0 cpm βγ = 80 cpm
12 13	10778 1325 03-11	2 6 8	8	VERY STIFF, GREENISH-GRAY (5Y 4/1) CLAY, TRACE GRAVEL (.25 IN) DAMP	CL	3.75	Hnu = 0 PPM WMCO (METER) 44237 α = 0 CPM βγ = 80 CPM
14	10779 1440 03-11	4 9 13	6	VERY STIFF, GREENISH GREY (5Y 4/1) CLAY, SOME GRAVEL (.25-.50 IN) DAMP	CL	4.0	Hnu = 0 PPM α = 0 CPM βγ = 80-100 CPM

NOTES: Contractor: Penn Drill
Rig: Cyclone Model #42
Driller: Craig Coulter
Assistant: Chris Coulter

Samples collected as per ASTM Standard Penetration Test. Colors identified using Munsell Color Chart.

Background Levels: Hnu = 0-2 ppm
α = 0-1 cpm
βγ = 80-100 cpm
LEL O_2 = 0%

WATER ADDED TO BOREHOLE DURING DRILLING ACTIVITIES: 700 GAL.
TOTAL WATER ADDED DURING DRILLING & COMPLETION ACTIVITIES: 920 GAL.

000161

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2007	COORDINATES:	DATE: 03-11-89 / 03-12-
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-01-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-17-89
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10780 1500 03-11	2 4 7	4	VERY STIFF, GREENISH-GREY (5Y 4/1) CLAY, SOME GRAVEL (.25 - .75 IN), TRACE SAND, DAMP	CL	4.0	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
17 18	10781 1520 03-11	2 6 7	4	MEDIUM STIFF, GREENISH-GREY (5Y 4/1) CLAY, SOME GRAVEL (.25 - .75 IN), TRACE SAND, WET	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
19	10782 1540 03-11	3 5 7	14	STIFF, GREENISH-GREY (5Y 4/1) CLAY, TRACE GRAVEL (.25 IN) TRACE SAND WET	CL	1.5	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
20 21	10783 1555 03-11	2 4 5	12	MEDIUM STIFF, GREENISH-GREY (5Y 4/1) CLAY, TRACE GRAVEL (.25 IN) WET	CL	.75	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
22	10784 1615 03-11	25 35 50/5	12	VERY STIFF, GREENISH-GREY (5Y 4/1) CLAY, SOME GRAVEL (.25 - .50 IN) TRACE SAND, DAMP	CL	4.0+	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
23 24	10785 1645 03-11	19 50 61	14	HARD, GREENISH-GREY (5Y 4/1) CLAY SOME GRAVEL (.25 - .50 IN), TRACE SAND, DAMP	CL	4.0+	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
25	10786 0840 03-12	16 35 50/3	12	VERY STIFF, GREENISH-GREY (5Y 4/1) CLAY, SOME GRAVEL (.25 - .50 IN) TRACE SAND,	CL	3.5	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
26 27	10787 0900 03-12	10 18 32	12	STIFF, GREENISH-GREY (5Y 4/1) CLAY TRACE GRAVEL (.25 IN), TRACE OF SAND, DAMP	CL	3.5	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
28	10788 0925 03-12	14 16 16	10	STIFF, GREENISH-GREY (5Y 4/1) CLAY TRACE GRAVEL (.25 IN), TRACE SAND, (SAME AS ABOVE) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
29	10789 0935 03-12	3 3 7	12	"BASE OF TILL" LOOSE, YELLOW-BROWN (10YR 5/6) POORLY GRADED SAND, TRACE GRAVEL (.25 - .50 IN) DRY 29.8	CL SP	2.0 N/A	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2007	COORDINATES:	DATE: 03-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-01-89
ENGINEER/GEOLOGIST: M SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-13-89
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31							
32							
33							
34							
35	10790	2		VERY DENSE, YELLOW-BROWN (10YR 5/6) POORLY GRADED FINE SAND, TRACE GRAVEL (.25 IN) DRY	SP	N/A	HNU = 0 PPM
36	1020 03-12	40 50/3	10				α = 0 CPM βγ = 40-60 CPM
37							
38							
39							
40	10791	30		VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25-1.0 IN) DRY	SW	N/A	HNU = 0 PPM
41	1045 03-12	50 50	12				α = 0 CPM βγ = 40-60 CPM
42							
43							
44							

NOTES:

000163

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2007	COORDINATES:	DATE: 03-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-01-89
ENGINEER/GEOLOGIST: M. SLUZARSKI	Depth Date/Time	DATE COMPLETED: 03-13-89
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10792 1405 03-12	19 50/3	7	VERY DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, TRACE GRAVEL (.50-.75 in) DRY	SP	N/A	HNU = 0 PPM α = 0 CPM βγ = 80 CPM
47							
48							
49							
50							
51	10793 1430 03-12	25 50 50/3	14	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVEL-SAND MIXTURE, WET	GW	N/A	HNU = 0 PPM α = 0 CPM βγ = 80 CPM
52							
53							
54							
55	10794 1550 03-12	16 50 50/1	10	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0 CPM βγ = 80 CPM
56							
57							
58							
59							

NOTES:

000164

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2007	COORDINATES:	DATE: 03-12-89/03-13-
ELEVATION:	GWL: Depth 60.9 Date/Time 03-13-89, 1100	DATE STARTED: 03-01-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth 60.5 Date/Time 03-14-89, 0835	DATE COMPLETED: 03-13-89
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 5

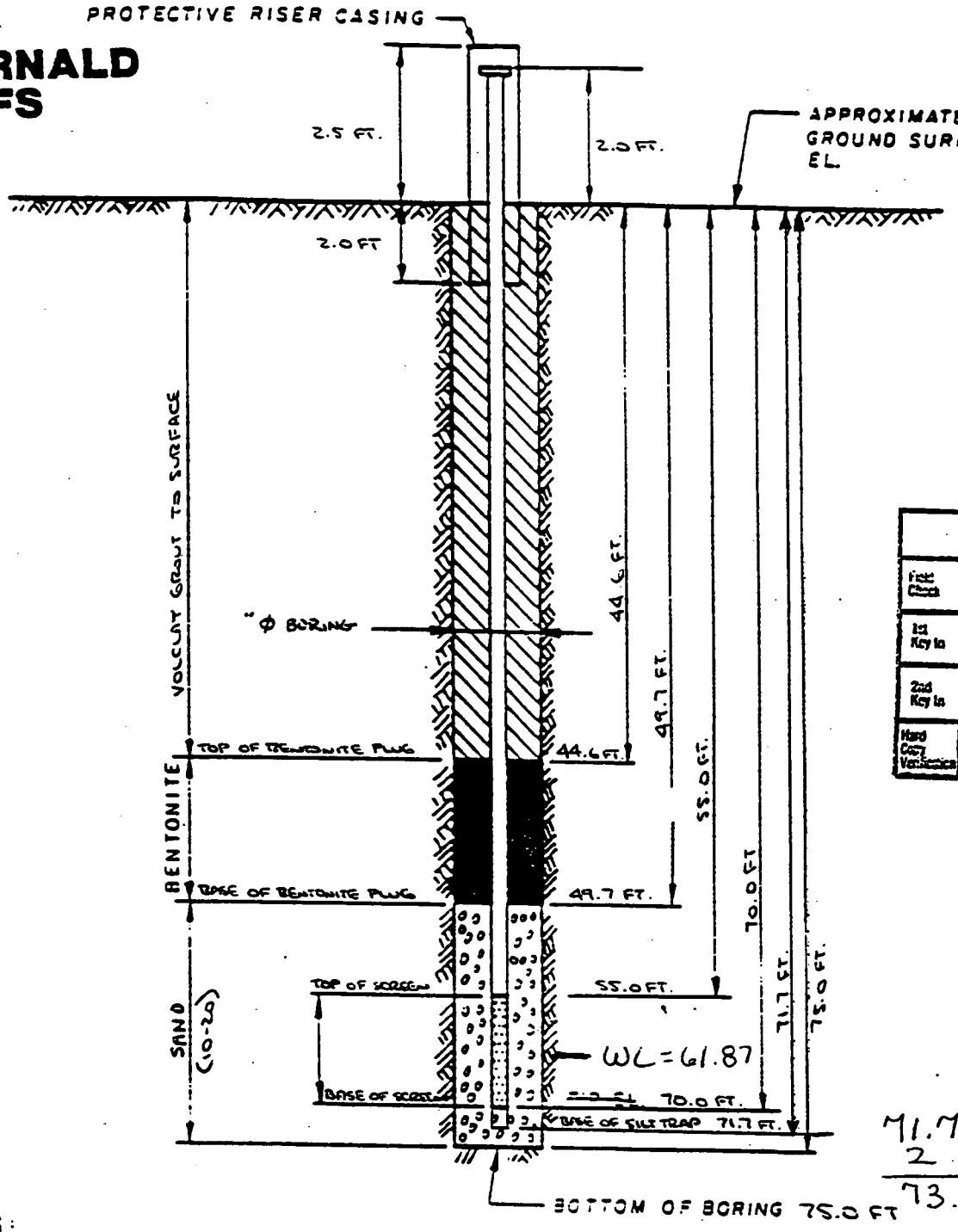
DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10795 1640 03-12	23 50/1	9	VERY DENSE, GREY (10YR 5/1) POORLY SORTED SAND, TRACE GRAVEL (.25 IN) WET	SP	N/A	HNU = 0 PPM α = 0 CPM BG = 80 CPM
62							
63							
64							
65	10796 0935 03-13	19 32 35	12	VERY DENSE, GREY (10YR 5/1) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25 - .75 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 60 CPM
66							
67							
68							
69							
70	10797 1035 03-13	19 31 32	14	VERY DENSE, GREY (10YR 5/1) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25 - 1.0 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM BG = 60 CPM
71							
72							
73							
74				"BOTTOM OF BORING" 75.0			

NOTES:

000165

BORING 2007

FERNALD RI/FS



71.7
2
73.7

	Initial	Date
First Check	WJH	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWING NUMBER

CHECKED BY / APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 60.9 FT, 1100 60.5 FT, 0835
5. WATER LEVEL READING ON 03-13-89 03-14-89

MATERIALS USED DURING WELL INSTALLATION:

~~13~~ 16 - (80 LB. SKS) 10-20 SAND

11 - (50 LB SKS) VOLCLAY GROUT

7 - (5 GAL BUCKETS) BENTONITE PELLETS

WATER USED DURING DRILLING ACTIVITIES: 700 GALS.

TOTAL WATER USED DURING DRILLING AND WELL INSTALLATION ACTIVITIES: 920 GALS.

INSTALLATION DETAILS
MONITORING WELL #2007

PREPARED FOR
FERNALD RI/FS

4.0 IN I.D. SS RISER PIPE:
1 - 2.0 FT. SECTION
1 - 5.0 FT SECTION
5 - 10.0 FT SECTIONS
1 - 15.0 FT SCREEN WITH 1.7 FT WELDED SILT TRAP

000166

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602 3.2
BORING NO. 2007
PIEZOMETER NO. 2007

FIELD ENG./GEO. M. SLUSARSKI DATE 03-21-89
CHECKED BY E. TROLLINGER DATE 03-22-89
DATE OF INSTALLATION 03-21-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT. TO 75.0 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10.0 IN ID FROM 0.0 FT. TO 75.0 FT.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN ID.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.01 IN
TOTAL PERFORATED AREA 15.0 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4.0 IN
LENGTH OF PIPE SECTIONS 2.0 FT, 5.0 FT, 10.0 FT
JOINING METHOD SCREW TYPE, FLUSH-JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION HINGED LOCKING COVER WITH PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 44.6	TOP	BOTTOM
BENTONITE	TOP 44.6	BOTTOM 49.7	TOP	BOTTOM
SAND (10-20)	TOP 49.7	BOTTOM 73.0	TOP	BOTTOM
~~GRAVEL~~ N/A	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 55.0	BOTTOM 70.0	TOP	BOTTOM
PIEZOMETER TIP	71.7			
BOTTOM OF BOREHOLE	75.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE INTERVAL FROM 75.0 FT TO 73.0 FT WAS ALLOWED TO FILL WITH "BLOW SAND". ONE (1) BUCKET OF BENTONITE PELLETS WAS POURED AROUND PROTECTIVE HOLE COVER AT SURFACE TO SERVE AS PACKING AND SEALING MATERIAL

000169

QC/DH/2.3.89

	Initial	Date
1st Key In		
2nd Key In		8/10
Hard Copy Verification		

4

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: 88 1-5-89 ~~108~~ 1008	COORDINATES:	DATE: 3-29-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/29/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-29-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See Soil			
2				Boring 2008			
3				For Lithology			
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

NOTES:

Drilling Contractor: Pennsylvania Drilling Co.

I) Driller: Tim Harris
Helper: Craig Coulter

II) Background measurements:
A) Hnu = 0 B) ∝ = 0 C) γR = 260cpm

III Water used =

IV Color via Munsell Color chart

000168

402-11-86

QC/DH/2.3.89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

4/23/88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: BB 1-5-88 ~~208~~ 1008	COORDINATES:	DATE: 3-29-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/29/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 03/29/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16				See Soil			
17				Boring 208			
18				for Lithology			
19							
20							
21							
22							
23							
24							
25							
26							
29							
28							
29							
30							
NOTES: 31							

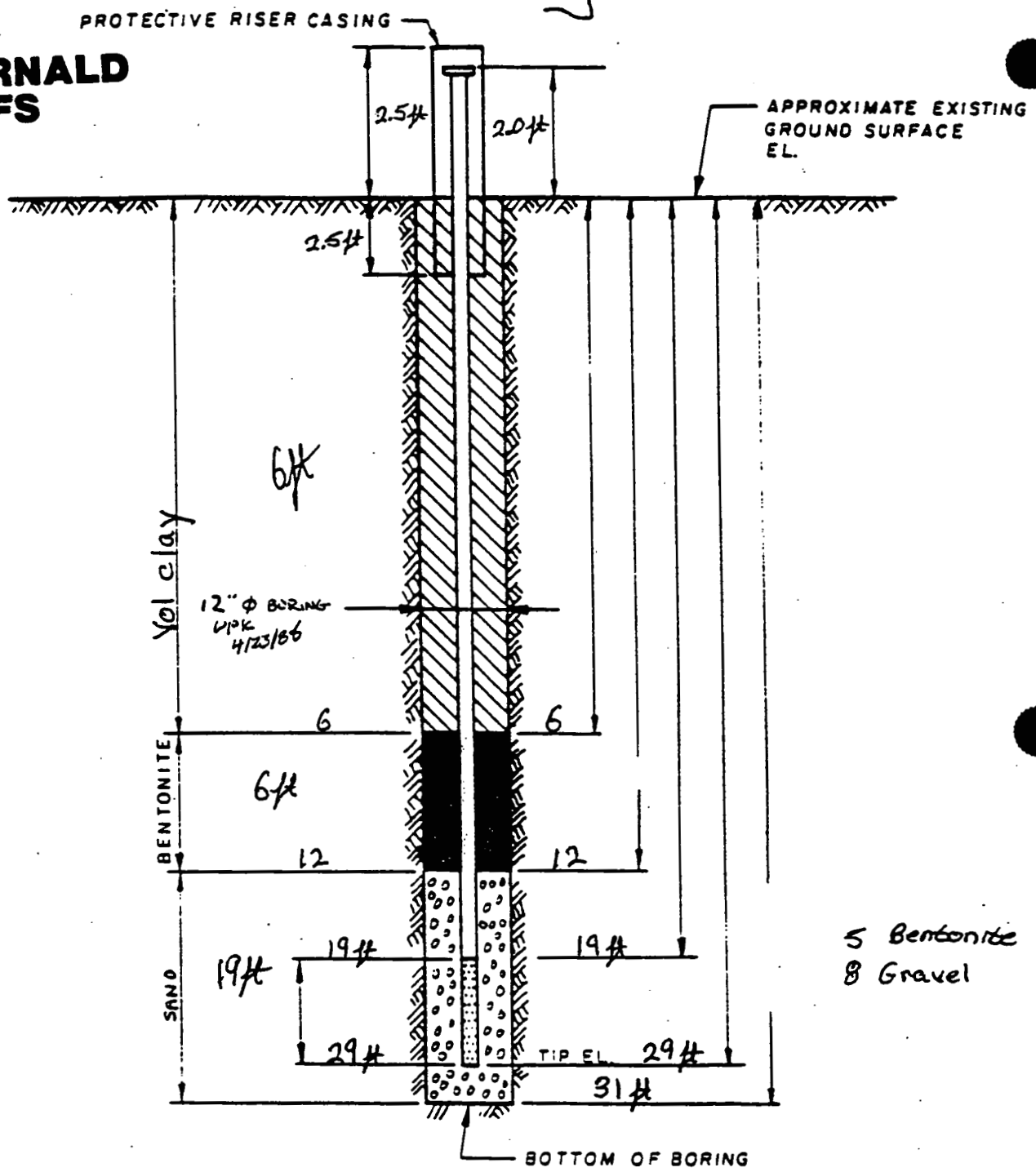
Bottom of Boring 31 ft

000169

QC/DH/2-3-89

Monitoring Well #~~108~~ BG 1-#70C

FERNALD RI/FS



5 Bentonite
8 Gravel

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
FMPC RI/FS

000170

QC/D4/2.3.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M. Goldberg DATE 03/30/88
PROJECT NO. 602 T 3.2 CHECKED BY RM Colbourne DATE 2/6/89
BORING NO. BB1-5 ~~108~~ 1008
PIEZOMETER NO. N/A DATE OF INSTALLATION 03/30/88

BOREHOLE DRILLING

DRILLING METHOD ~~Water~~ Auger Tool	TYPE OF BIT Flat Head
DRILLING FLUID(S) USED:	CASING SIZE (S) USED:
FLUID ~~H2O~~ FROM 3 TO 31 ft	SIZE 10" FROM 0 TO 31 ft
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE Monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4"
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD THread ~~and couple~~ Flush
TOTAL PERFORATED AREA 10 ft	RMC 2/6/89

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE ~~O~~ I.D. 10"	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 6	TOP	BOTTOM
BENTONITE	TOP 6	BOTTOM 12	TOP	BOTTOM
~~SAND~~	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP 12 ft	BOTTOM 31 ft	TOP	BOTTOM
PERFORATED SECTION	TOP 19 ft	BOTTOM 29 ft	TOP	BOTTOM
PIEZOMETER TIP	31 ft			
BOTTOM OF BOREHOLE	31 ft			
GWL AFTER INSTALLATION	N/A			

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

000171

REMARKS

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA DATE 8/6/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI FS T 3.2	
BORING NUMBER: 208 2008	COORDINATES: 480661.42 N 1378918.036	DATE: 3-20-88
ELEVATION: 577.37	GWL: Depth NA Date/Time NA	DATE STARTED: 03/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth NA Date/Time NA	DATE COMPLETED: 3-27-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	0 8 2 41	2 2 4	12"	STIFF yellowish Brown silty clay (10YR 5/6) dry	CL	1.5	Hnu = 3 α = 0 δB = 260 1516
2 3	0 8 2 42	6 7 11	9"	Very STIFF Dark Yellowish Brown silty clay (10YR 4/6) dry. 3.0ft	CL		Hnu = 1.5 α = 0 δB = 270 1520
4	0 8 2 43	5 8 9	6"	Med. STIFF yellowish Brown clayey silt (10YR 5/4) Dry 4.5ft	ML	0.5	Hnu = 2.0 α = 0 δB = 250 1524
5 6	0 8 2 44	3 4 4	11"	STIFF dark yellowish Brown sandy clay (10YR 5/4) moist 6.0ft	CL	1.25	Hnu = 1.25 α = 0 δB = 240 1540
7	0 8 8 05	N/A	18"	SHelBY Tube 7.5ft	N/A	N/A	1645
8 9	0 8 8 06	4 8 8	10"	Loose Yellowish Brown sand (10YR 5/8) WET Trace Silt	SP	<1	Hnu = 0 α = 0 δB = 200 03/21/88 1430
10	0 8 8 07	6 9 10	14"	Loose Yellowish Brown sand (10YR 5/8 WET. Trace silt 10.5	SP	<1	Hnu = 0 α = 0 δB = 200 1435
11 12	0 8 8 08	7 9 10	14"	STIFF Dark grey clay (5Y4/1) w/ sand. ~~wet~~ and silt 12ft	CL	1.5	Hnu = 0 α = 0 δB = 200 1440
13	0 8 8 09	10 10 9	14"	STIFF Dark grey silt (5Y4/1) w/sand trace clay. wet 13.5ft	ML	1.5	Hnu = 0 α = 0 δB = 200 1445
14 15	0 8 8 10	2 3 4	16"	Medium STIFF Dark gray clay (5Y4/1) Trace silt moist	CL	<1	Hnu 0 α = 0 δB = 200 1500

NOTES:

1) Pennsylvania Drilling co.
Driller: Tim Harris
Helper: Craig Coalter

2) Background measurements
a) HNU = 0 ppm b) α = 0 cpm c) δB = 200 cpm

III Water used = 600 gal

IV Colors via Muncell color chart.

SC0172

402-11-86

QC/DW/2.3.89

FERNALD RI/FS

REVIEWED BY QA K.G DATE 8/6/91

5709

	Initial	Date
1st Key In		
2nd Key In		8/8
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: 208 DB FS-89 2008	COORDINATES: See pl	DATE: 3-21-88
ELEVATION: See pl	GWL: Depth - Date/Time -	DATE STARTED: 03/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth - Date/Time -	DATE COMPLETED: 3-22-88
DRILLING METHODS: Cable Tool		PAGE 2 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08B 11	5 7 6	18"	Medium STIFF Dark gray silty clay (5Y4/1) Trace sand and silt WET	ML	1.5	Hnu = 0 α = 0 δB = 200 1510
17	08B 12	6 7 10	18"	Medium STIFF Dark gray silty clay (5Y4/1) Trace sand & gravel WET	ML	1.5	Hnu = 0 α = 0 δB = 210 1535
18	08B 13	N/A	12"	S Helby Tube	N/A	N/A	1650
19	08B 14	13 13 15	12"	STIFF Dark gray silty clay (5Y4/1) trace gravel. moist 20.5	CL	2.0	Hnu = 0 α = 0 δB = 210 3/22/88 0855
21	08B 15	7 7 9	10"	STIFF Dark gray clay (5Y4/1) trace gravel. DRY	CL	2.0	Hnu = 0 α = 0 δB = 210 0900
22							
23	08B 16	5 6 9	12"	Very STIFF Dark gray clay (5Y4/1) trace gravel. moist	CL	2.5	Hnu = 0 α = 0 δB = 210 0925
24	08B 17	4 6 10	12"	Very STIFF Dark gray clay (5Y4/1) trace gravel moist	CL	2.0	Hnu = 0 α = 0 δB = 180 0940
25							
26	08B 18	4 5 7	8"	Very STIFF Dark gray clay (5Y4/1) trace gravel. DRY	CL	2.0	Hnu = 0 α = 0 δB 180 0950
27	08B 19	2 4 3	12"	STIFF Dark gray clay (5Y4/1) trace gravel. DRY	CL	1.0	δB = 180 Hnu = 0 α = 0 1030
28							
29	08B 20	5 7 50/4	14"	STIFF Dark gray clay (5Y4/1) trace gravel. DRY.	CL	1.0	Hnu = 0 α = 0 δB = 190 1335
30		33					

NOTES:

13

FERNALD RI/FS

REVIEWED BY QA K.6 DATE 8/26/91

QA/DH/2.3.89

	Initial	Date
1st Key In		
2nd Key In		8/8
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3-2		
BORING NUMBER: 208	COORDINATES: See p1	DATE: 3-22-88	
ELEVATION: See p1	GWL: Depth – Date/Time –	DATE STARTED: 03/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth – Date/Time –	DATE COMPLETED: 3-22-88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 5	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	1	50 50	18"	Very Hard olive gray clay (5Y4/2) Trace Gravel. DRY.	CL	>4.0	Hnu=0 α=0 δB=190 1400
32	2	14 34 50	18"	Very Hard Dark gray clay (5Y4/1) Trace gravel DRY	CL	>4.0	Hnu=0 α=0 δB=190 1415
33	3	14 24 35	18	Very Hard Dark gray clay (5Y4/1) trace gravel 33.5ft	CL	>4.0	Hnu=0 α=0 δB=180 Thin lense of Yellowish Brown clay at contact. (10YR5/6) 1445
34				Dense Yellowish Brown sand (10YR5/6) DRY	SW	<1	
35							
36							
37							
38							
39							
40	4	14 47 50	18"	Very Dense Yellowish Brown sand (10YR5/6) DRY.	SW	<1	Hnu=0 α=0 δB=190 1545
41							
42							
43							
44							
45							

NOTES:

000174

402-11-88

FERNALD RI/FS

REVIEWED BY QA K.G DATE 8/16/91 QC/DH/2.3.8 8/9/91

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: 88-5-1 2008 2008	COORDINATES: See P1	DATE:
ELEVATION: See P1	GWL: Depth – Date/Time –	DATE STARTED: 03/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth – Date/Time –	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 4 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							03/23/88
46	8 8 2 5	40 50 ~~58~~ 53	16"	Very dense yellowish Brown sand (10YR 5/6) Trace gravel. DRY	SW	<1	Hnu=0 α=0 γB=190 0835
47							
48							
49				49 Ft			
50	8 8 2 6	15 20 25	18"	Dense Yellowish Brown sand (10YR 5/6) DRY	SP	<1	Hnu=0 α=0 γB=120 0900
51							
52							
53							
54				54 ft			
55	8 8 2 7	7 14 22	18"	Dense Dark gray sand (2.5Y 4/1) moist.	SP	<1	Hnu=0 α=0 γB=120 0925
56							
57							
58							
59							
60							

NOTES:

000175

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 8/6/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: BB 1-5-89 208 2008	COORDINATES: See P1	DATE:
ELEVATION: See P1	GWL: Depth 57.53 Date/Time 03/28/88 1630	DATE STARTED: 03/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth — Date/Time —	DATE COMPLETED: 03/28/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	0 8 8 2 8	5 7 11	14"	Medium Dense yellowish Brown sand (10YR5/6). WET.	SW	<1	Hnu=0 α=0 δB=120 1030
62							
63							
64							
65							
66	0 8 8 2 9	12 10 16	18"	Medium Dense yellowish Brown sand (10YR5/6) WET Trace gravel	SW	<1	Hnu=0 α=0 δB=120 1310
67							
68							
69							
70							
71	0 8 8 3 0	11 12 21	18"	Medium Dense yellowish Brown sand (10YR5/6) w/Gravel. Wet	SW	<1	Hnu=0 α=0 δB=110 14 1555
72							
73							
74				Bottom of Boring 73'ft			
75							

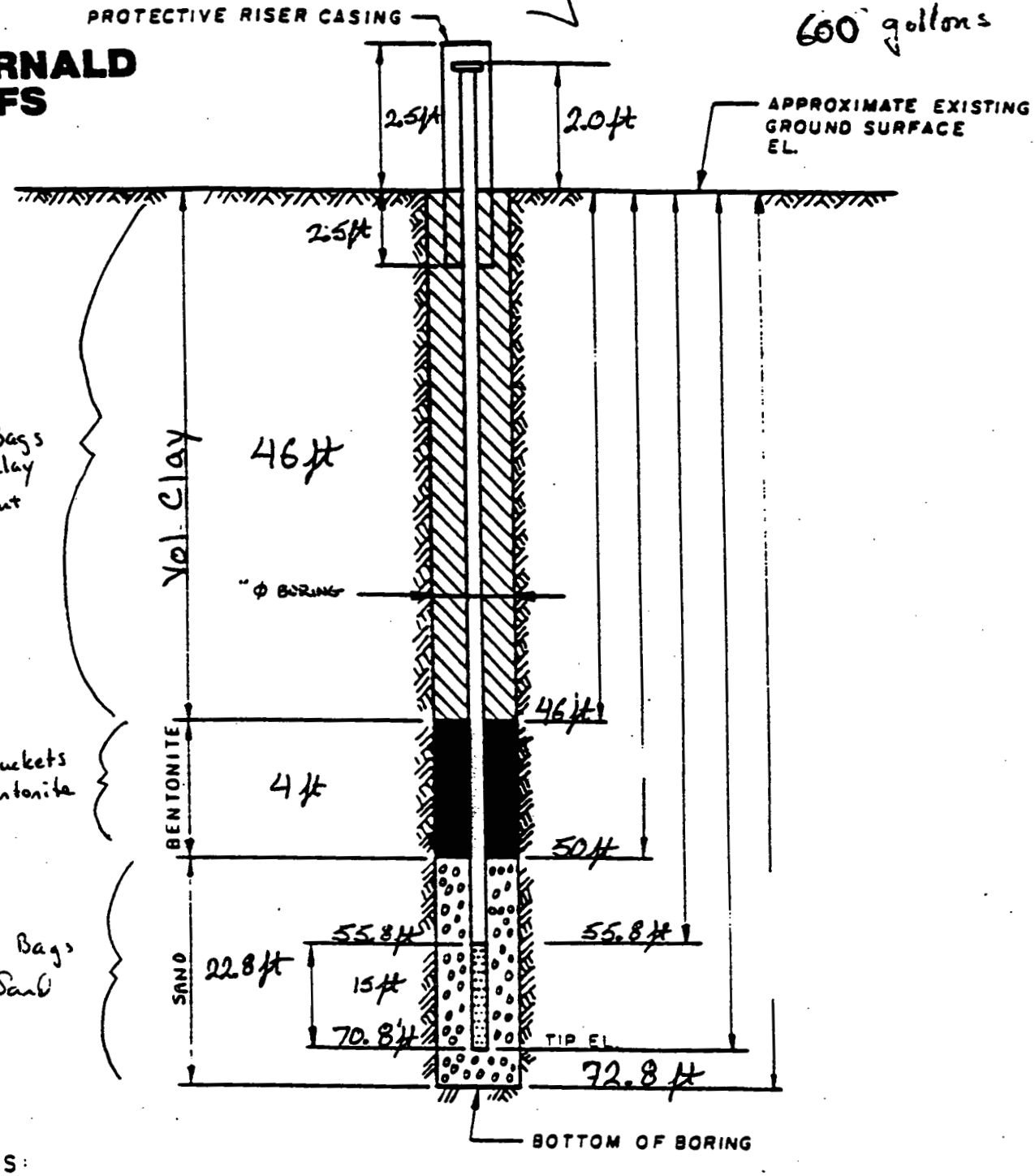
NOTES:

000176

Monitoring Well 208 5709

600 gallons

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

FMPC RI/FS

000177

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M. Goldberg DATE 03/28/8
PROJECT NO. 6023T3.2 CHECKED BY _____ DATE _____
BORING NO. 208
PIEZOMETER NO. N/A DATE OF INSTALLATION 03/28/88

BOREHOLE DRILLING

DRILLING METHOD Water	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID _____ FROM 0 TO 73ft	SIZE 10" FROM 0 TO 73ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION _____	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4"
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10ft
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD Thread and couple
TOTAL PERFORATED AREA 10ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5ft	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE O.D. 10"	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0 ft	BOTTOM 46 ft	TOP	BOTTOM
BENTONITE	TOP 46ft	BOTTOM 50ft	TOP	BOTTOM
~~SAND~~	TOP	BOTTOM	TOP	BOTTOM
GRAVEL	TOP 50	BOTTOM 72.8ft	TOP	BOTTOM
PERFORATED SECTION	TOP 55.8ft	BOTTOM 70.8	TOP	BOTTOM
PIEZOMETER TIP	72.8ft			
BOTTOM OF BOREHOLE	72.8ft			
GWL AFTER INSTALLATION	57.53ft ~~[illegible]~~			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

~~000178~~

WELL LOG AND DRILLING REPORT

#3008 5709 CUSTOMER'S COPY

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

№ 327201

3008

County Butler Township Ross Section of Township 31

Owner National Lead Co of Ohio Address Box 39158 Cincinnati, O

Location of ~~property~~ Well # 8 S 3008

CONSTRUCTION DETAILS

Casing diameter 4" Length of casing 112'8"

Type of screen Cook brass #14 Length of screen 5"

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate 50 G.P.M. Duration of test 4 hrs.

Drawdown — ft. Date 4/15/65

Static level-depth to water 52' ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
top soil	0	2
Blue muck	2	8
Blue clay	8	37
Sand & some clay	37	38
Sand	38	60
Blue clay	60	61
Sand & some gravel	61	85
Fine gray sand	85	116
Blue clay	116	120
Pulled back to	116'	

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

Check with Natl Lead for well location

W. AEC Fernald Pla. E.

S.

000179

See reverse side for instructions

Drilling Firm Wm Crane Date 4/15/65

Address Shandon, O Signed Wm Crane

*If additional space is needed to complete well log, use next consecutive numbered form

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK

№ 327202

#4008

County Butler Township Ross Section of Township 3

Owner National Lead Co of Ohio Address Box 039158 Cincinnati, O

Location of ~~property~~ Well #8-D Deep

CONSTRUCTION DETAILS

Casing diameter _____ Length of casing _____

Type of screen Cook brass #14 Length of screen 5'

Type of pump _____

Capacity of pump _____

Depth of pump setting _____

Date of completion _____

BAILING OR PUMPING TEST

Pumping Rate 20 G.P.M. Duration of test 4 hr hrs

Drawdown — ft. Date 4/22/65

Static level-depth to water 52' ft

Quality (clear, cloudy, taste, odor) _____

Pump installed by _____

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From 0 Feet	To Ft.
Top Soil	0	2
Blue muck	2	8
Blue clay	8	36'6"
Sand & some blue clay	36'6"	38'
Sand	38'	60'
Streak blue clay (6"to 8")	60'	61'
Sand & some fine gravel	61	116'
Blue clay	116'	122'
Sand & gravel	122'	150'
Med & fine sand	150'	165'
Fine sand	165'	180'

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

Check with Mallinckrodt well location

W. AEC Fernald Plant E.

S.

See reference side for instructions

G90180

Drilling Firm Wm Crane Date 4/22/65

Address Shandon, O Signed Wm Crane

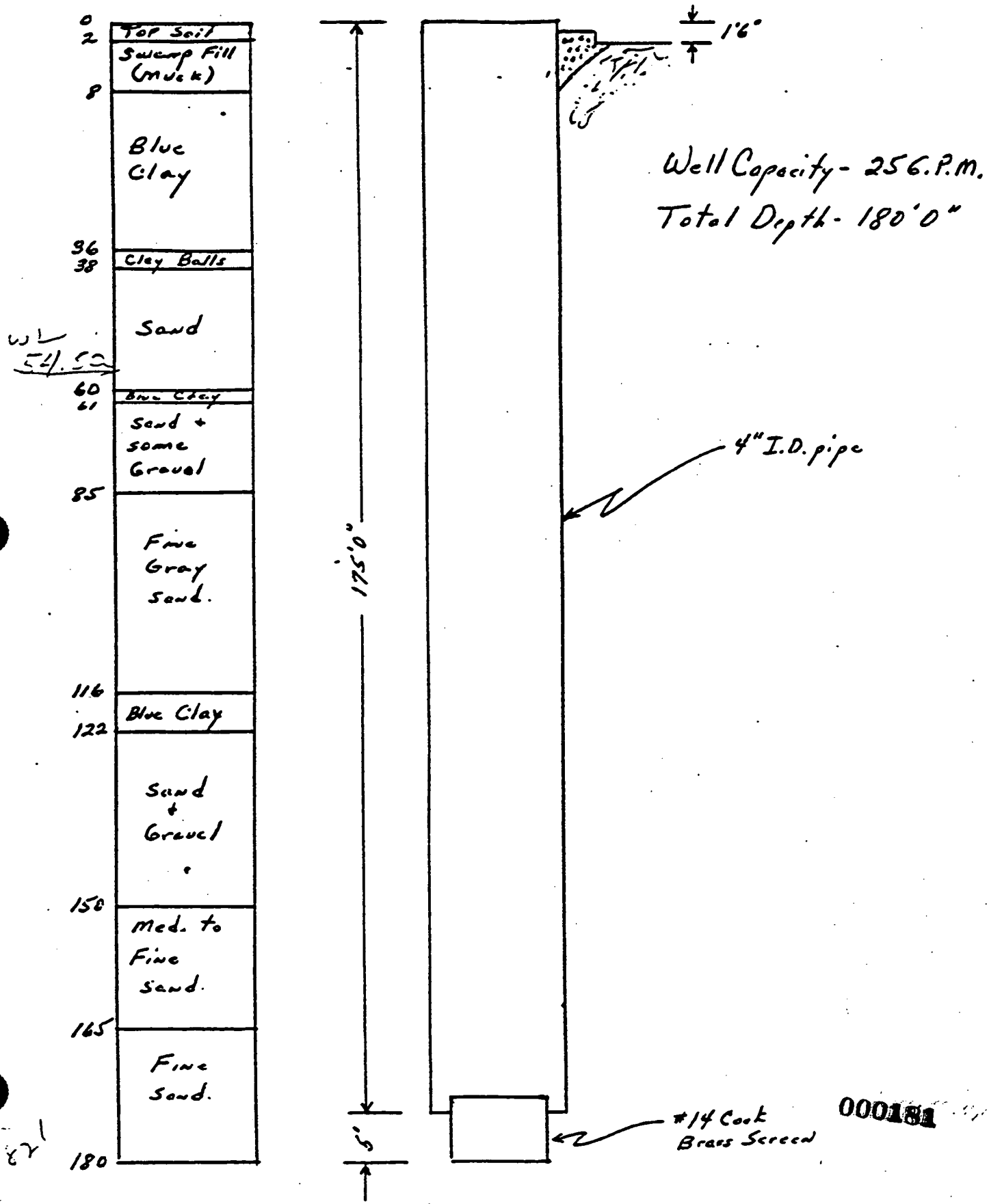
*If additional space is needed to complete well log, use next consecutive numbered form.

4008

4008

5709

No. 8D Test Well
Driller - Wm Crane Co.
4/22/65



000181

RINALD
RI/FS

	Initial	Date
1st Key In		
2nd Key In		8/12
Hard Copy Completion		

PA
SA
2/5

VISUAL CLASSIFICATION OF SOILS

4/23/88
KTG # 1

PROJECT NUMBER: 60232	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~209~~ 1009	COORDINATES:	DATE: 9-9-87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 9-9-87 @ 1500
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED 9-10-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.5, 1, 2', 3, 4', 5', 6', 7', 8', 9', 10				SEE SAMPLE DESCRIPTIONS From Borehole # ~~209~~ 2009 RMG 2/6/89			Started Drilling at 3:00 p.m (1500) 9-9-87
							End 9-9-87
							Begin 9-10-87
10.5'							
11.3'	ST 07088	NA		→ Shelby Tube		*	NOTE: Hydrocarbon-gas smell observed at 10.6'
				Bottom of Boring 10.5' Sampled to 11.3 RMG 2/6/89			Hnu = 0-4 for 30 Seconds LEL = 1%

NOTES: 1) NA = not Applicable

2) Background Readings $\alpha\beta$ = 80-150
α = 0
Hnu = 0

3) Used 35 gallons of Water To Drill Hole.

4) Drilling Contractor Pennsylvania Drilling
· Dave Newman
· Bob Johnson

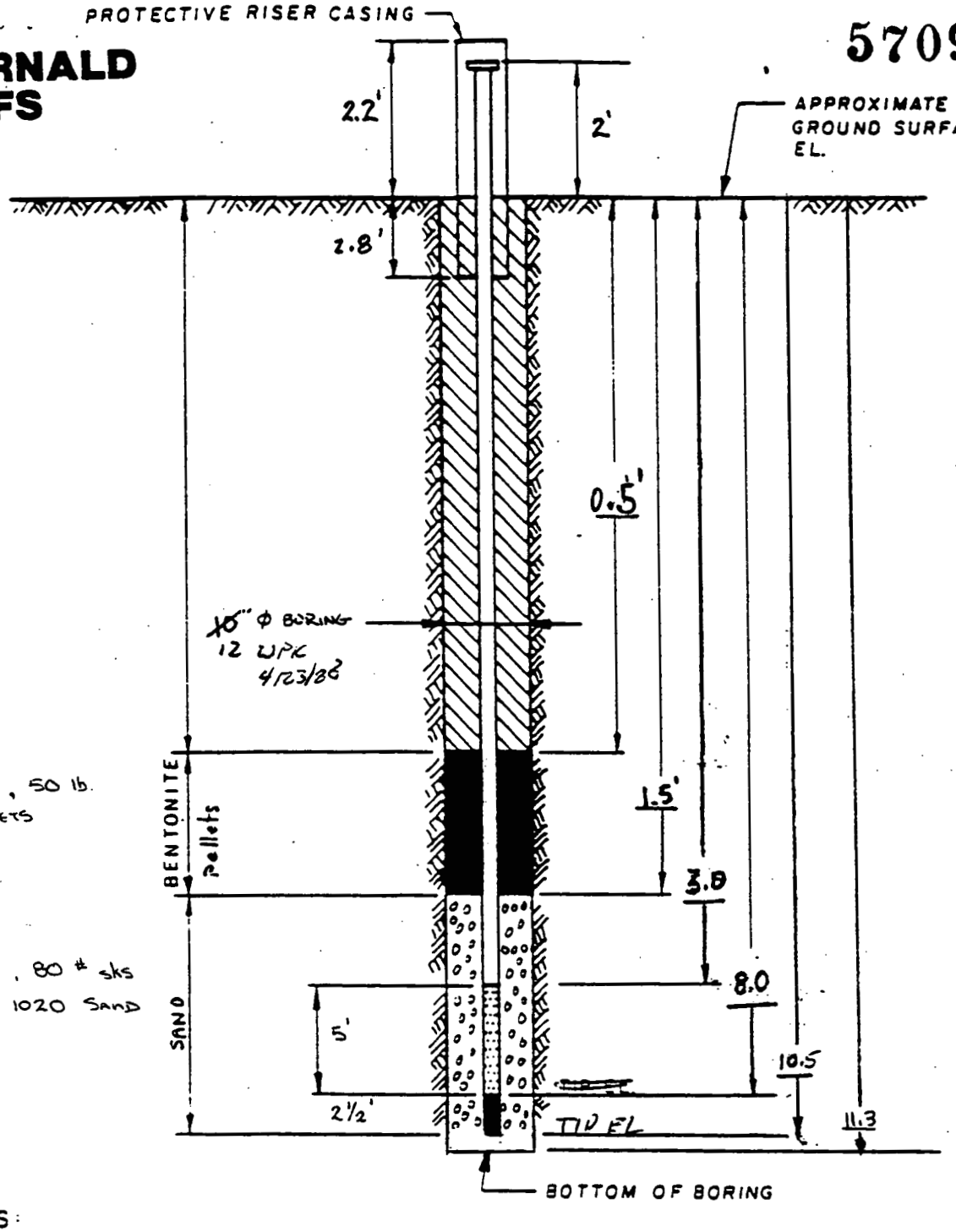
000182

402-11-86

WELL # ~~109~~ 1009
BB 1-5-

FERNALD RI/FS

5709



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

2½, 50 lb. buckets

4½, 80 # sks of 1020 Sand

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

This form did not represent the installed monitoring well, therefore, the form has been modified with white out.
Also some corrections were made with white out by B. Dunning. WPK 4/24/86

INSTALLATION DETAILS
MONITORING WELL 109

PREPARED FOR

FMPC - RI/FS

000183

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 9-11-87
PROJECT NO. 602 CHECKED BY D. Halgrem DATE 12-12-87
BORING NO. ~~109~~ 1009 BB 1-5-88
~~PIEZOMETER NO.~~ ~~109~~ 1009 DATE OF INSTALLATION 9-11-87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED: Potable H_2O
FLUID WATER FROM 0 TO 10
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED: (TEMPORARY)
SIZE 10" FROM Surface TO 10.5'
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

Screen Information

TYPE 4" Ø Stainless Steel (316)
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 5' Screen

Riser Information

RISER PIPE MATERIAL SS (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 5'
JOINING METHOD Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE Ø.D. 10"

OTHER PROTECTION Locking CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	+ 2'			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	-2.8			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM NA	TOP	BOTTOM
BENTONITE	TOP -.5'	BOTTOM -1.5'	TOP	BOTTOM
SAND	TOP 1.5'	BOTTOM 11.3	TOP	BOTTOM
NO GRAVEL USED	TOP ~~NA~~	BOTTOM ~~NA~~	TOP	BOTTOM
PERFORATED SECTION	TOP 3.0'	BOTTOM 8.0'	TOP	BOTTOM
PIEZOMETER TIP	10.5' (SILT TRAP)			
BOTTOM OF BOREHOLE	11.3'			
GWL AFTER INSTALLATION	NONE			

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒ NA
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS NA means not applicable

(White out corrections were made by B. Dunning at the time this well was completed)

000184

5709

FERNALD RI/FS

REVIEWED BY QA KG DATE 8/6/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Reviewed		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: MW-209 2009	COORDINATES: 479540.71N 1318487.77E	DATE: 8-25-87	
ELEVATION: 556.15 BB-1-2-89	GWL: Depth - Date/Time -	DATE STARTED: 8-25-87	
ENGINEER/GEOLOGIST: DP Holzman	Depth - Date/Time -	DATE COMPLETED: 9-2-87	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0	S 07070	7 16 26	6	DENSE, DARK BROWN FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, TRACE SILT, MOIST.	SP	-	15:20 γ - 0/min α - Background HNU = 0 ppm
2.0	S 07071	13 9 13	6	MEDIUM DENSE, DARK BROWN FINE SAND TRACE SILT SOME GRAVEL, DRY.	SP	-	Drove A Second Spoon to Collect Additional Sample 16:07 γ - 0/min α - Background HNU - 0 ppm
4.0	S 07072	14 23 26	8	DENSE, DARK BROWN FINE TO COARSE SILTY SAND SOME SILTY CLAY, TRACE FINE TO COARSE GRAVEL, DRY. 4.5	SP	-	16:23 γ = 0/min α = Background HNU = 0 ppm
5.0 6.0	S 07073	25 36 41	18	HARD, Light gray SILTY CLAY TRACE FINE SAND AND FINE TO COARSE GRAVEL, DRY.	CL	-	16:40 2-sample jars filled. γ = 0/min α = Background HNU = 0 END OF DAY 8-25-87
7.0	S 07074	20 29 38	16	HARD, Light yellowish brown, SILTY CLAY, TRACE FINE TO MEDIUM SAND AND FINE GRAVEL, MOIST.	CL	-	8-26-87 14:20 γ = 0/min (2-sample jars) α = Background HNU = 0
8.0 9.0	S 07075	33 33/5"	13	HARD, DARK BROWN SILTY CLAY TRACE FINE TO COARSE SAND AND FINE GRAVEL, MOIST.	CL	-	14:35 γ = 0/min 2-sample jars α = Background HNU = 0 ppm
10.0	S 07076	7 11 21	16	HARD DARK BROWN SILTY CLAY, TRACE FINE TO COARSE SAND AND FINE GRAVEL, MOIST. 10.8	CL	-	15:45 γ = 0 α = Background HNU = 0 ppm
11 12	S 07077	26 23 21	12	DENSE, BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL, MOIST. 11.5 11.7 VERY STIFF LIGHT BROWN SILTY CLAY, MOIST	SP CL	- -	16:00 γ = 0/min α = Background HNU = 0 ppm
13	S 07078	9 11 17	17	DENSE, BROWN FINE TO MEDIUM SAND, MOIST. MEDIUM DENSE, BROWN FINE SAND, TRACE SILT, MOIST.	SP	-	16:25 γ = 0/min α = Background HNU = 0 ppm
14 15	S 07079	23 29 29	16	VERY DENSE BROWN FINE SAND, TRACE SILT, MOIST.	SP	-	16:50 γ = 0/min α = Background HNU = 0 ppm

NOTES:

1. CONTRACTED DRILLER:
   - PENNSYLVANIA DRILLING
   - Driller DAVID NEWMAN
   - Helper BOB JOHNSON
2. RIG TYPE: NEW 71 SPEED STAR
3. SAMPLING
   SOIL SAMPLES collected using 2 INCH split spoon samplers driven by a 140 pound hammer dropped 30 inches; 2 wraps on CATHEAD
4. APPROXIMATE number of gallons of water added during drilling operations: 5+5+5+5+5+5+5 (8-25-87; 8-26-87)
5. 8-25-87 Background γ = 0/min

000185

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 8/6/88

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: MW-2009	COORDINATES: see pl	DATE: 8-26, 27 1987
ELEVATION: see pl	GWL: Depth – Date/Time –	DATE STARTED: 8-25-87
ENGINEER/GEOLOGIST: DP HOLZMAN	Depth – Date/Time –	DATE COMPLETED: 9-2-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16							Petroleum like odor detected at about 16-17 feet measurement with HNU. Detected nothing
17							
18							
19	S1 070880	21 23 26	18	DENSE DARK BROWN FINE TO COARSE SAND, TRACE SILT, MOIST	SP	-	17:25 γ = 0/min α = Background HNU = 0 ppm
20							START 8-26
21							11:00 - at top of boring HNU = 0 LEL exp = 0
22							
23							
24	S 070881	11 20 31	15	DENSE, DARK BROWN fine to medium sand, some SILT, moist	SW	-	13:53 γ = α = BACKGROUND HNU = 0 ppm
25							
26							14:00 Breathing zone at hol HNU = 0 α = Background γ 0 LEL = 0
27							
28							
29	S 070882	10. 21 31	18	DENSE DARK BROWN fine to medium SILTY SAND, MOIST.	SP	-	14:25 γ = 0/min α = Background HNU = 0
30							

NOTES:

SEE PAGE 1 OF 4

8-28-87
- water added 8-28-87 — 70+5
- α background = 80-120/min
- γ background = 0/min

000186

402-11-86

5709

FERNALD RI/FS

REVIEWED BY QA LLG DATE 8/6/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: MW-2009	COORDINATES: See p1	DATE: 8-28,31-87
ELEVATION: Sept	GWL: Depth — Date/Time —	DATE STARTED: 8-25-87
ENGINEER/GEOLOGIST: D. Holzman B. Breisinger	Depth — Date/Time —	DATE COMPLETED: 9-2-87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							STOP 8-28-87 START 8-31-87
31							
32							
33							
34	S 07083	14 15 19	18	DENSE DARK BROWN FINE TO COARSE SAND TRACE GRAVELS TRACE SILT, MOIST	SP	—	14:30 γ: 0/min α = 80/min HNU = 0 ppm
35							
36							Neutronics GAS meter ALARM sounded several times: @ CO - 11 ppm probably false alarms
37							
38							
39	S 07084	17 20 29	18	DENSE DARK BROWN FINE TO COARSE SAND TRACE GRAVELS TRACE SILT. MOIST	SP	—	γ 0/min 15100 α BACKGROUND VALUES HNU = 0 ppm 8-31-87
40				39.9 VERY STIFF LIGHT BROWN SILTY CLAY MOIST.			9-1-87
41							Checked meter 07:45 γ = 0/min α = 80-100/min (BACKGROUND) HNU 0 ppm Exp - 2%
42							
43							
44	S 07085	17 26 40	18	DENSE DARK YELLOW BROWN FINE TO COARSE SAND, SOME GRAVEL TRACE SILT, MOIST	SP	—	10:10 γ = 0/min α = BACKGROUND HNU = 0 ppm
45							

NOTES:

See page 1 of 4

H_2O depth @ end of day = 31.51 (8-31-87)

• WATER ADDED TO BORING (5 gal / MARK) 8-31-87 — ~~THERM~~ ||

α BACKGROUND approximately 80-100/min 8-31-87

000187

REVIEWED BY KC. DATE 8/6/91

40.2
6 6
33.6

	Initial	Date
1st Key In		
2nd Key In		8/8
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: MW-209 2009	COORDINATES:	DATE: 9-1, 2, 87
ELEVATION: see pl BB 1-5-88	GWL: Depth 33.6 Date/Time 9/3/87 16:20	DATE STARTED: 8-25-87
ENGINEER/GEOLOGIST: D P Holzmann	Depth Date/Time (4:20 pm)	DATE COMPLETED: 9-2-87
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46							10:15 Drillers begin setting up to add 5th 10 foot section of casing
47							Sample S-07086 is the first sample which was below wet indicating a possible water table
48							48.0 Casing driven to 48 ft.
49	S 07086	13 23 22	18	DENSE, PALE BROWN FINE to COARSE SAND, TRACE FINE gravel, wet.	SW	—	15:10 γ = 0/min α = Background Hydro = 0 STOP 9-1-87 49.5 ft START 9-2-87
50							
51							
52							9-2-87 0800 WATER LEVEL 45.15 10.50 33.65 Below ground surface
53							
54	S 07087	16 36 50/5"	18	VERY DENSE, PALE BROWN FINE to COARSE SAND, SOME fine gravel wet 54.5	SW	—	10:50 γ = 0 α = Background Hydro = 0
55				Bottom of split spoon sample 54.5 feet			11:10 water level 35.7' below ground
56							53.0 Bottom of 12"ø Boring
57							54.5 Bottom of split spoon
58							WATER LEVELS 9-2-87
59							Bailed to 51.5' below ground surface at 12:50 13:15-39.5' 14:45-36.0'
60							

NOTES:

WATER ADDED 9-1 (5 gal/mark)
~~IIII IIII IIII IIII IIII IIII~~
~~IIII~~ IIII

α Background for 9-1-87 = 60-100/min
α Background for 9-2-87 = 60-110/min

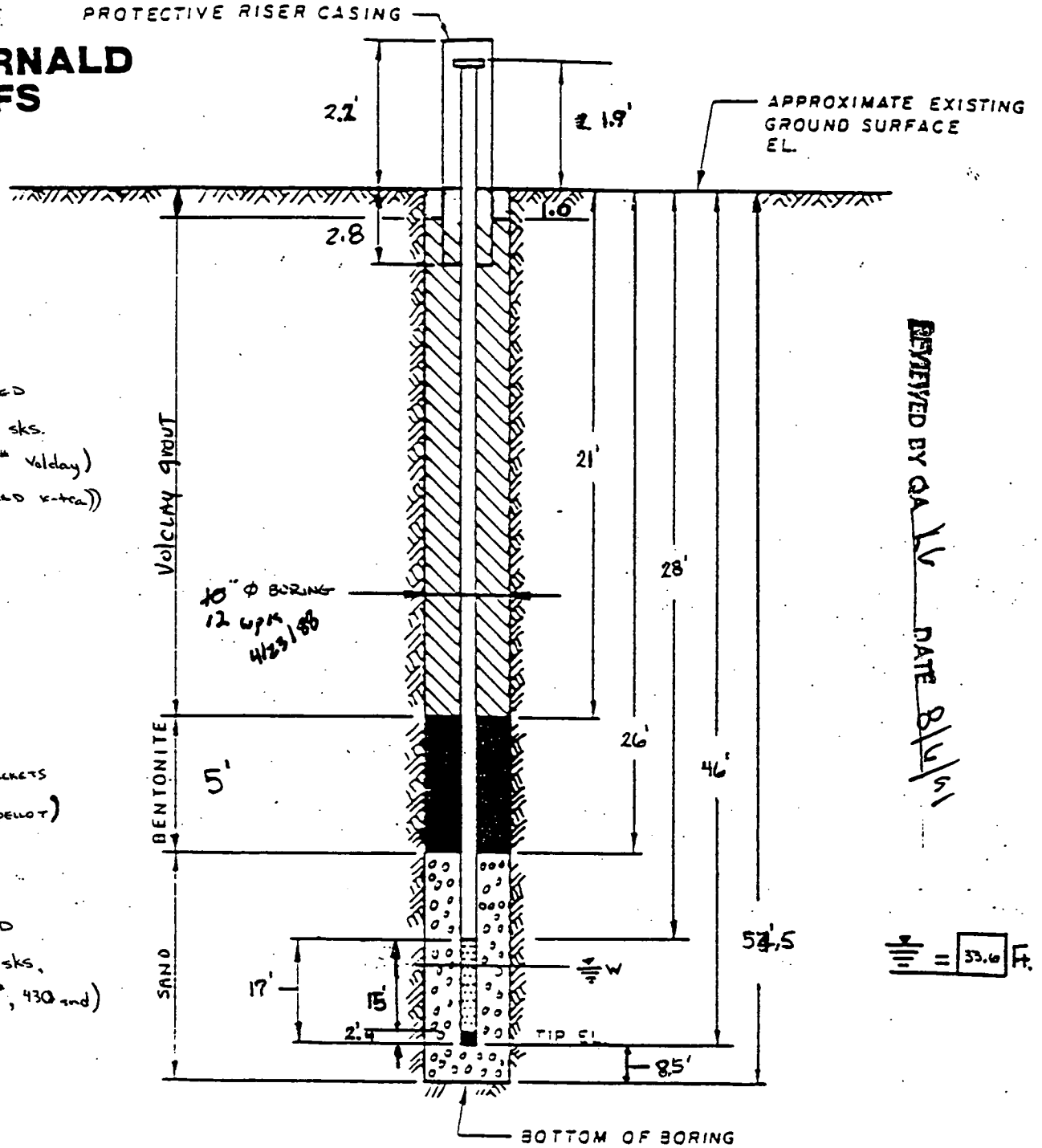
000188

402-11-86

5709

WELL : ~~209~~ 2009

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

Used 4 sks. (50# Volclay) (hand mixed)

Used 5 buckets (50# pellet)

Used 26 sks. (80#, 430 sand)

RECEIVED BY QA LV DATE 8/6/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 209

PREPARED FOR
FMPC RI/FS

000189

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RAC SAB 2/3

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 9/8/87
PROJECT NO. 602 CHECKED BY D. Hofman DATE 12/22/87
BORING NO. MW # ~~209~~ 2009 BS, 5-59
PIEZOMETER NO. ~~209~~ 2009 DATE OF INSTALLATION 9/8/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED: Potable Water
FLUID WATER FROM 0 TO 10.5
FLUID NA FROM NA TO NA

TYPE OF BIT Cable Tool hammer type
CASING SIZE (S) USED:
SIZE 12" FROM Surface TO 53'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

(Screen Information)

TYPE 4" Ø Stainless Steel (316)
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15' (mm) Screen

(Riser Information)

RISER PIPE MATERIAL Stainless Steel (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 5 AND 10'
JOINING METHOD Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE Ø.D. 10"

OTHER PROTECTION LOCKING CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	1.9 FT.		558.65	
GROUND SURFACE	0.0		556.15	
BOTTOM OF PROTECTIVE PIPE	2.8'		555.52	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP -1'	BOTTOM -21'	TOP 555.15	BOTTOM 537.05
BENTONITE	TOP -21'	BOTTOM -26'	TOP 537.05	BOTTOM 532.05
SAND	TOP -26'	BOTTOM -54.5	TOP 532.05	BOTTOM 503.55
NO GRAVEL USED	TOP None	BOTTOM None	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP -28'	BOTTOM -43.5'	TOP 530.05	BOTTOM 514.55
PIEZOMETER TIP	46.0 (SILT TRAP)		512.05	
BOTTOM OF BOREHOLE	54.5'		503.55	
GWL AFTER INSTALLATION	- 33.6' (TOC) WPE 4/14/88		rumble	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑ } NA

REMARKS

000190

WELL LOG AND DRILLING REPORT

#3009

CUSTOMER'S

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

5709

№ 32720

County Butler Township Ross Section of Township 31

Owner National Lead Co of Ohio Address Box 39155 Cincinnati, Ohio

Location of ~~property~~ Well # (9) 3009 Test well

CONSTRUCTION DETAILS

Casing diameter 4" Length of casing 99'6"

Type of screen Cook brass #20 Length of screen 5'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate 90 G.P.M. Duration of test 7 h

Drawdown — ft. Date 4/23/65

Static level-depth to water 28'

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
top soil	0	1'
Yellow clay	1'	15'
Sandy yellow clay	15'	20'6"
Sand	20'6"	55'
Sand & some gravel	55'	70'
Sand	70'	93'
Sand & gravel	93'	103'
Blue clay	103'	—

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

Check with Natl Lead for well location

W. A.E.C. Fernald Plant E

S.000191

See reverse side for instructions

Drilling Firm Wm Crane Date 4/23/65

Address Hamilton O. Signed [illegible]

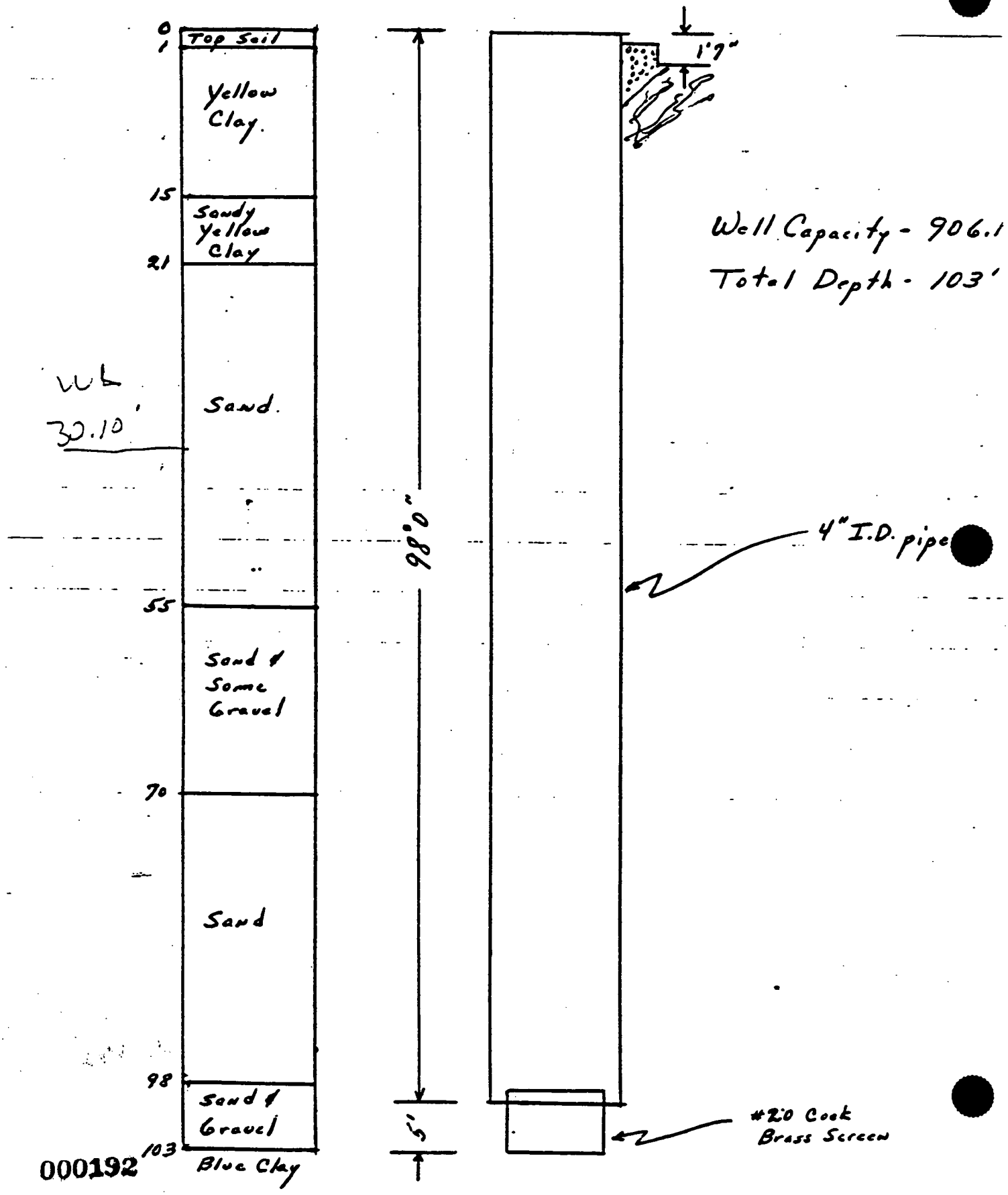
*If additional space is needed to complete well log, use next consecutive numbered form

#3009

No. 95 Test Well

Driller - Wm Crone Co.

4/23/65



000192

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RKA 2/3/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~110~~ BB 15-89 1010	COORDINATES:	DATE: 04-07-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-05-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 04-07-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				see boring log ~~210~~ 2010 for lithologic description RMG 2/6/89			
2							
3							
4							
5							
6							
7							
8							
9							
10	0829			PUSHED SHELBY TUBE FROM 10.0 FT. TO 12.0 FT. RECOVERED 1.5 FT.			HNU=0
11	1035		1.5 FT.				α = —
12	04-05						BZ = 8CPM
13							
14							000193

NOTES: CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE
WATER ADDED TO BOREHOLE: 300 GALLONS

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU: 0 LEL: 0PPM LEL
α = — O2: 21.9% O2
BZ: 100CPM

* FOR SAMPLE DESCRIPTION SEE VISUAL CLASSIFICATION OF SOILS FOR BORING # 210

402-11-88

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

KKA 2/3/5

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: HO 1010 BB 4-5-88	COORDINATES:	DATE: 04-07-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-05-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 04-07-88
DRILLING METHODS: Cable tool		PAGE 2 OF 2

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16							
17							
18							
19							
20							
21							
22							
23	0843						
24	1530		1.0 FT				HNU = 0 α = - BG: 80 CPM
25	04-05						
26							
27				BOTTOM OF BORING @ 27.0 FT.			
28							
29							

NOTES:

000194

402-11-86

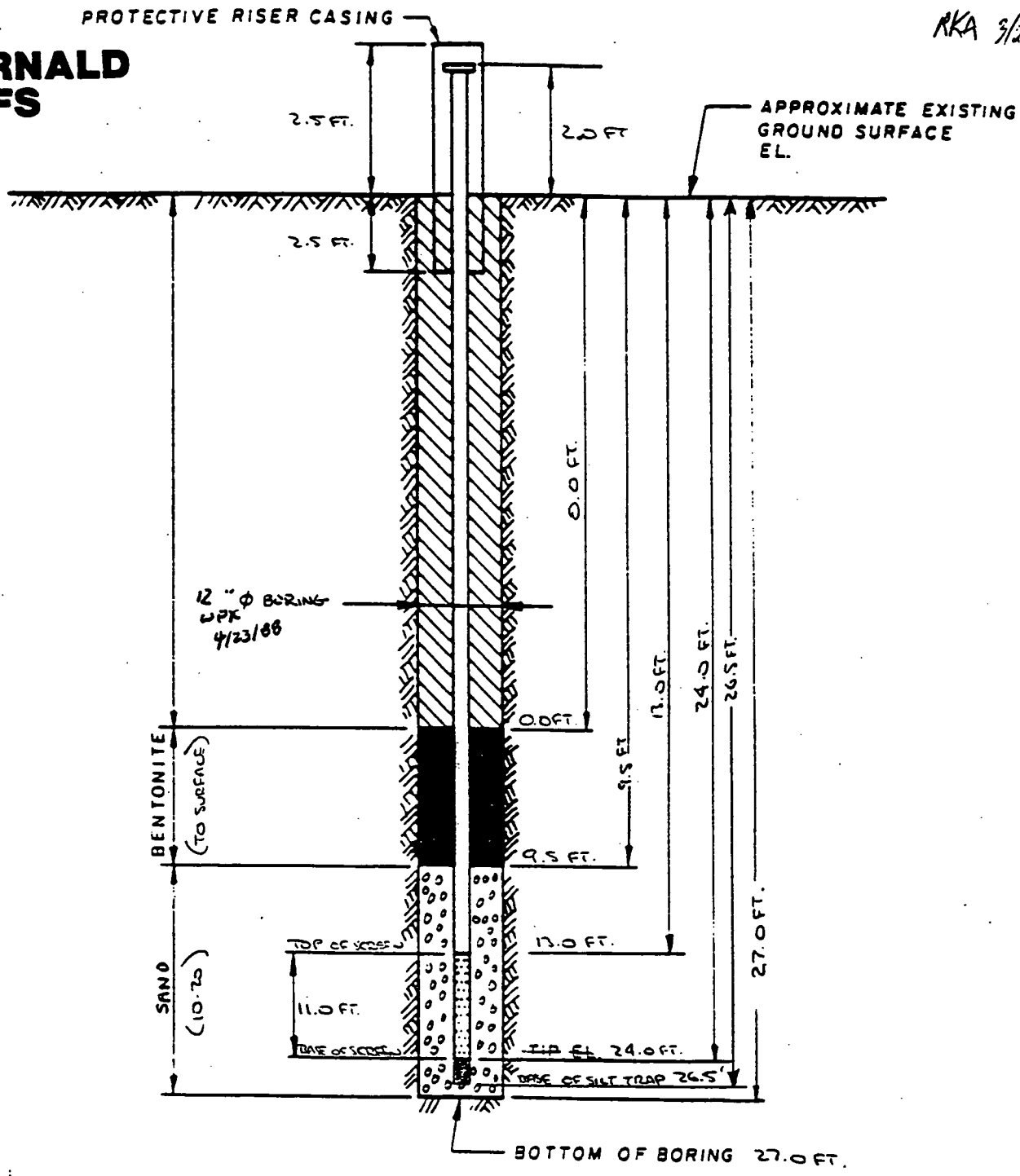
5709

BB 1-5-5

BORING # ~~110~~ 1010

RKA 3/2/89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY HCS

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

04-05-98 - 04-07-98

PREPARED FOR

BORING # ~~110~~ 1010 RMG 2/6/89

MATERIALS USED: 10-20 SAND (100LB. SACKS) · 9 SACKS

BENTONITE: 7 BUCKETS.

000195

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 04-05-88
PROJECT NO. 602 3.2 CHECKED BY R M Zollweile DATE 2/6/89
BORING NO. ~~110~~ 1010 BB 1-5-88
PIEZOMETER NO. ~~110~~ 1010 DATE OF INSTALLATION 04-05-88 – 04-07-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO
FLUID FROM TO

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT TO
SIZE FROM TO

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 11.0 FT.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN.
LENGTH OF PIPE SECTIONS
JOINING METHOD SCREW TYPE FLUSH
JOINT ~~FLUSH~~

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE ~~Ø~~ I.D. 10 3/4 IN

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM NA	TOP	BOTTOM
BENTONITE	TOP 0.0 FT	BOTTOM 9.5 FT.	TOP	BOTTOM
SAND (10-20)	TOP 9.5 FT.	BOTTOM 27.0 FT.	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 13.0 WPIL 4/24/88	BOTTOM 24.0 WPIL 4/24/88	TOP	BOTTOM
PIEZOMETER TIP	26.5			
BOTTOM OF BOREHOLE	27.0			
GWL AFTER INSTALLATION				

IS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS 000196

FERNALD RI/FS

5709

	Initials	Date
1st Key In		
2nd Key In		8/9
Hard Copy Verification		4/23

PA
RKA 2/
WPK
RTG # 2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~210~~ 2010 OB 1-5-88	COORDINATES: N 481460.53 E 1379691.07	DATE: 03-30-88
ELEVATION: 582.2	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 1 OF 6

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08393 0850 03-23	1 5 6	8	SOFT, BROWN (10YR 4/1) CLAY, SOME FINE GRAVEL, ROOTLETS, DAMP	CL	.5	HNU = 0 α = — BZ = 100 CPM
2 3	08394 0852 03-23	5 6 8	12	STIFF, BROWN (10YR 4/2) CLAY, SOME SILT AND FINE GRAVEL, DRY	CL	1.5	HNU = 0 α = — BZ = 100 CPM
4	08395 0856 03-23	6 8 9	12	STIFF, BROWN (10YR 4/4) CLAY, SOME SILT AND FINE GRAVEL, DRY 4.5	CL	1.5	HNU = 0 α = — BZ = 100 CPM
5 6	08396 0859 03-23	9 9 9	14	MEDIUM STIFF, GREY-OLIVE (5Y 4/1) CLAY SOME SILT, DRY	CL	1.0	HNU = 0 α = — BZ = 100 CPM
7	08397 0901 03-23	7 9 10	18	MEDIUM STIFF, GREY-OLIVE (5Y 3/1) CLAY SOME SILT, DRY 7.0	CL	1.0	HNU = 0 α = — BZ = 100 CPM
8 9	08398 0905 03-23	7 13 14	18	MEDIUM STIFF, GREY-OLIVE (5Y 5/2) CLAY SOME SILT, DRY	CL	1.0	HNU = 0 α = — BZ = 80 CPM
10	08399 1032 03-23	2 2 4	14	MEDIUM STIFF, GREY-OLIVE (5Y 5/2) CLAY SOME SILT, DRY	CL	1.0	HNU = 0 α = — BZ = 80 CPM
11 12	08400 1038 03-23	4 4 4	14	SOFT, GREY-OLIVE (5Y 5/2) CLAY, SOME SILT, DAMP 12.5	CL	.25	HNU = 0 α = — BZ = 80 CPM
13	08401 1050 03-23	4 5 6	12	STIFF, BROWN-GREY (2.5Y 5/4) CLAY, SOME SILT, DAMP 14.0	CL	1.5	HNU = 0 α = — BZ = 80 CPM
14	08402 1056 03-23	8. 7 8	18	VERY STIFF, GREY (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.5	HNU = 0 α = — BZ = 80 CPM

NOTES:
CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS: IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0, α = —, BZ = 100
LELO2: 0 PPM LEL, 21.9% O2

WATER ADDED TO BOREHOLE: 750 GAL.

000197

402-11-86

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

LPJ
RKA 2/2/6

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~210~~ 2010 BB 1-5-89	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08403 1113 03-23	10 9 10	14	MEDIUM DENSE GREY (5Y 5/1) CLAYEY FINE SAND, SOME SILT, DAMP	ML		HNU = 0 α = — BG = 80 CPM
17 18	08404 1310 03-23	12 16 12	14	MEDIUM DENSE GREY (5Y 5/1) CLAYEY FINE SAND, SOME SILT, ~~DAMP~~ WET	ML		HNU = 0 α = — BG = 80 CPM
19	08405 1316 03-23	6 6 6	12	MEDIUM DENSE GREY (5Y 5/1) CLAYEY FINE SAND, SOME SILT, WET 19.5	ML		HNU = 0 α = — BG = 80 CPM
20 21	08406 1330 03-23	11 10 9	12	MEDIUM DENSE GREY (5Y 5/1) CLAYEY GRAVEL, SOME SAND WET 20.0	GC		HNU = 0 α = — BG = 80 CPM
				MEDIUM DENSE GREY (5Y 5/1) SILTY FINE SAND, WET	SM		
22	08407 1339 03-23	8 8 10	12	MEDIUM DENSE GREY (5Y 5/1) SILTY FINE SAND, TRACE FINE GRAVEL, WET	SM		HNU = 0 α = — BG = 80 CPM
23 24	08408 1456 03-23	13 10 15	8	HARD GREY (5Y 4/1) CLAY TRACE FINE GRAVEL, DRY	CL	>4.0	HNU = 0 α = — BG = 80 CPM
25	08409 1510 03-23	7 7 10	10	VERY STIFF GREY (5Y 4/1) CLAY TRACE SILT, DRY	CL	2.5	HNU = 0 α = — BG = 80 CPM
26 27	08410 1520 03-23	3 5 7	14	STIFF GREY (5Y 4/1) CLAY TRACE SILT, DRY	CL	2.0	HNU = 0 α = — BG = 80 CPM
28	08411 1558 03-23	2 5 7	8	STIFF GREY (5Y 4/1) CLAY SOME FINE GRAVEL DAMP	CL	2.0	HNU = 0 α = — BG = 80 CPM
29	08412 1605 03-23	2 4 9	14	STIFF GREY (5Y 4/1) CLAY SOME FINE GRAVEL, DAMP	CL	2.0	HNU = 0 α = — BG = 80 CPM

NOTES:

000198

402-11-86

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAK RKA 2/3/15

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~210~~ 2010 GB 1-5-9	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 3 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08413 1617 03-23	3 7 12	12	STIFF GREY (5Y 4/1) CLAY, SOME SAND AND FINE GRAVEL DAMP 32.0	CL	2.0	HNU = 0 α = — BG = 80 CPM
32 33	08414 1627 03-23	10 20 50	14	VERY DENSE GREY (5Y 4/1) CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE TRACE COARSE GRAVEL, DAMP 33.5	GC		HNU = 0 α = — BG = 80 CPM
34	08415 1637 03-23	PENETRATION 4" >50	4	VERY DENSE GREY (5Y 5/1) SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE TRACE SAND, DRY	GM		HNU = 0 α = — BG = 80 CPM
35 36	08416 1704 03-23	PENETRATION 7" 50 >50	7	VERY DENSE GREY (5Y 5/1) SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE TRACE SAND, DAMP 36.0	GM		HNU = 0 α = — BG = 80 CPM
37	08417 1030 03-28	16 43 50	14	VERY DENSE GREY (5Y 5/1) CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE TRACE COARSE GRAVEL DAMP	GC		HNU = 0 α = — BG = 80 CPM
38 39	08418 1048 03-28	15 29 33	2	VERY DENSE GREY (5Y 5/1) CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE TRACE COARSE GRAVEL DAMP 39.0	GC		HNU = 0 α = — BG = 80 CPM
40	08419 1115 03-28	9 20 28	14	VERY STIFF GREY (5Y 4/1) CLAY WITH SOME FINE TO MEDIUM GRAVEL DAMP 41.0	CL	2.0	HNU = 0 α = — BG = 80 CPM
41 42	08420 1330 03-28	9 32 36	18	HARD, BROWN (10YR 4/3) CLAY, SOME FINE GRAVEL & SAND DRY 41.5	CL	4.0	HNU = 0 α = — BG = 80 CPM * BASE OF TILL @ 41.5 FT.
43 44				VERY DENSE YELLOW-BROWN (10YR 5/4) SAND, TRACE FINE GRAVEL, DRY.			

NOTES:

000199

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 210 2010 BB 1-5-89	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 4 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08421 1423 03-28	40 95 —	10	VERY DENSE YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND DRY	SW		HNU = 0 * COULD ONLY DRIVE SPOON 1.0 FT. α = — BG = 80 CPM
47							
48							
49							
50	08422 1555 03-28	75 50 —	8	VERY DENSE YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND DAMP	SW		HNU = 0 * COULD ONLY DRIVE SPOON 1.0 FT. α = — BG = 80 CPM
51							
52							
53							
54							
55	08423 1707 03-28	90 — —	10	VERY DENSE YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND DAMP	SW		HNU = 0 * COULD ONLY DRIVE SPOON .5 FT α = — BG = 80 CPM
56							
57							
58							
59							

NOTES:

000200

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~210~~ 2010 BB 1-5-89	COORDINATES:	DATE: 03-30-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-89
DRILLING METHODS: Cable tool		PAGE 5 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	08424 3851 03-29	26 49 48	12	VERY DENSE YELLOW-BROWN (10YR 5/4) WELL GRADED, GRAVELLY SAND DAMP 61.0	SW		HNU = 0 x = — BS = 80 CPM
62				VERY DENSE GREY (10YR 4/1) SAND TRACE FINE GRAVEL DAMP	SP		
63							* ESTIMATED WATER TABLE 03-29-88: 63.0 FT
64							
65							
66	08425 3938 03-29	13 23 31	10	VERY DENSE GREY (10YR 4/1) SAND TRACE FINE GRAVEL, WET 66.0	SP		HNU = 0 x = — BS = 80 CPM
67				STIFF GREY (5Y 4/1) SILTY CLAY, WET	CL		
68							
69							
70							
71	08426 1102 03-29	58 60 >50	14	VERY DENSE, GREY (10YR 4/1) POORLY GRADED GRAVELLY SAND WET	SP		HNU = 0 x = — BS = 80 CPM
72							
73							
74							

NOTES:

WATER TABLE ON 03-29-88 ESTIMATED @ 63.0 FT.

000201

402-11-88

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RKA 2/3/5

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~210~~ 2010 BB 1-5-89	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 6 OF 6

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	8427 1358 03-29	9 65 35	10	VERY DENSE GRAY (10YR 4/1) WELL GRADED GRAVELLY SAND WET	SW		HNU: 0 X: – BZ: 80 CPM
77				BOTTOM OF BORING 77 FT WPK 4/24/88			
78							
79							
80							

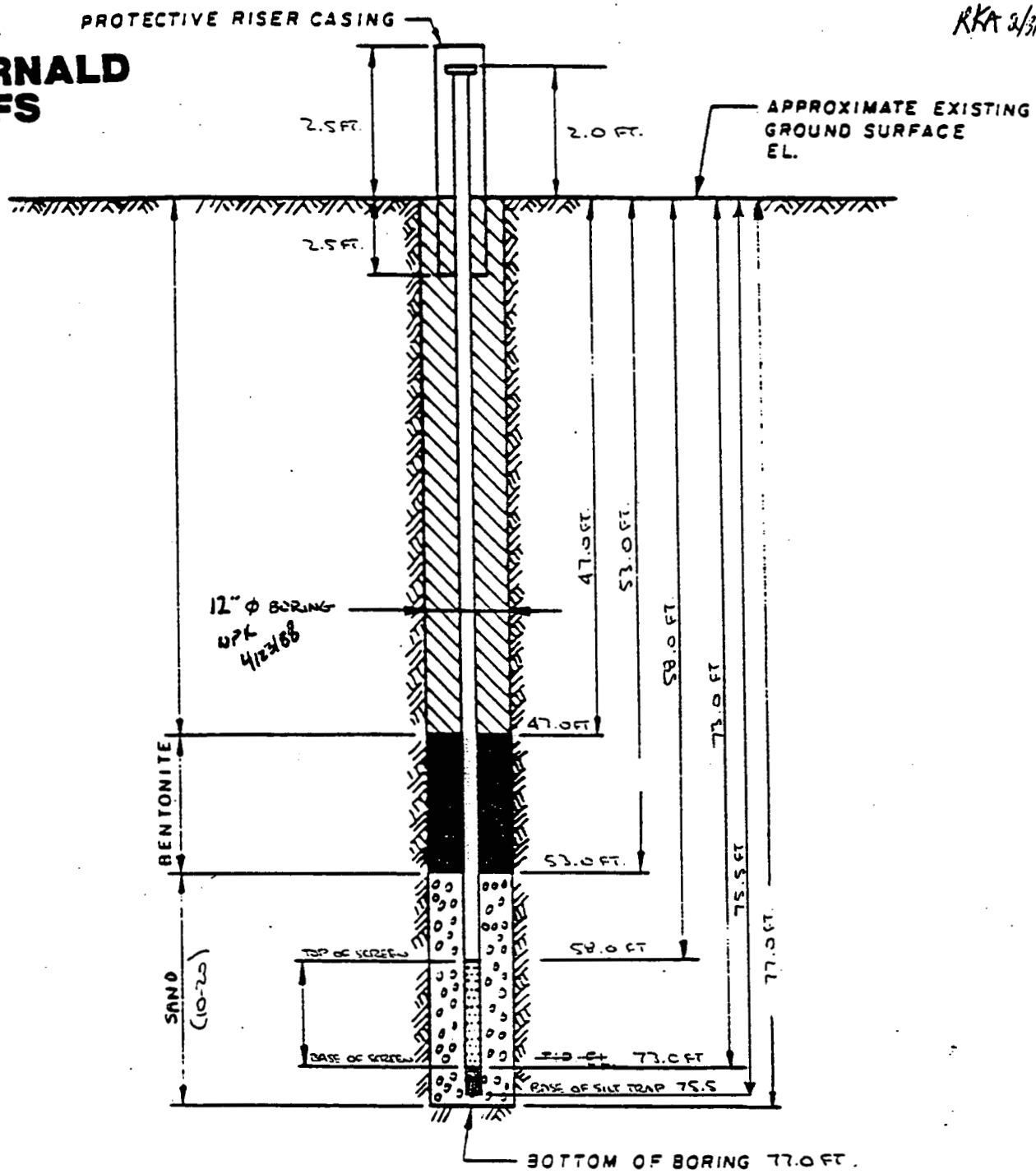
NOTES:

000202

5709

BB.
BORING # ~~210~~ 201
RKA 2/3/97

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY / APPROVED BY

DRAWN BY: MLS

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL
03-30-98
PREPARED FOR

BORING # ~~210~~ 2010 RMW 2/6/99

000203

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 03-30-88
PROJECT NO. 602 32 CHECKED BY [illegible] DATE 2/6/89
BORING NO. ~~210~~ 2010 BB 1-5-89
PIEZOMETER NO. ~~210~~ WPK 4/24/88 2010 DATE OF INSTALLATION 03-30-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 77.0 FT	SIZE 10" ID FROM 0.0 FT TO 27.0 FT
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN I.D. 4 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS _____
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD SCREW TYPE FLUSH
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15.0 FT.	JOINT THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE ~~O~~.D. 10 3/4 IN.	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.5~~ 2.0			
GROUND SURFACE	0.0		582.2	
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 47.0 FT.	TOP	BOTTOM
BENTONITE	TOP 47.0 FT.	BOTTOM 53.0 FT	TOP	BOTTOM
SAND (10-20)	TOP 53.0 FT.	BOTTOM 77.0 FT	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 58.0 ft WPK 4/24/88	BOTTOM 73.0 ft WPK 4/23/88	TOP	BOTTOM
PIEZOMETER TIP	75.5 FT.			
BOTTOM OF BOREHOLE	77.0 FT			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000204

5709

Reynolds Supply, Inc.

COMPLETE MUNICIPAL & INDUSTRIAL WATER SYSTEMS

FORMATION LOG OF WELL

3010

Starting Date _____ Finished _____ Well Number _____ Well #

586.9

Owner NLO Location Whitewater, Ohio

TOTAL DEPTH	THICKNESS EACH STRATUM	FORMATION
0	8	Yellow Clay
8	18	Blue clay
18	19	Muddy gravel
19	48	Blue clay
48	52	Blue gravel
52	63	Yellow coarse sand & gravel
63	70	Gray sand and clay balls
70	85	Gray sand and gravel
85	110	Gray sand and fine gravel
110	125	Gray sand and gravel
125	130	Gray sand and gravel

Static Water Level 60' Draw Down

Driller Steve Reynolds

000205

FERNALD RI/FS

	Initial	Date
Field Check	WAL	3-6-89
1st Key In		
2nd Key In		
Final Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 4010	COORDINATES: N491,460.53/E4,379,691.07	DATE: 1/19/89
ELEVATION: 582.2 G.S.	GWL: Depth Date/Time	DATE STARTED: 1/18/89
ENGINEER/GEOLOGIST: L. Adams	Depth Date/Time	DATE COMPLETED: 2/25/89
DRILLING METHODS: Cable Tool		PAGE 1 OF 16/17

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				For information on samples for interval 0-80 ft from ground surface, please refer to Visual Class. of Soils on Boring + Well No. 210 dated 3-30-88. Samples for this boring begin at 80.0-81.5'.			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

NOTES: Contractor: Penn Drill
Rig: 4
Driller: Craig Coulter
Assistant: Chris Coulter

Samples Collected as per ASTM Standard Penetration Test
Colors identified using Munsell Color Chart
Background Levels: H_m = 0 ppm
α = 0-1 cpm
β = 80 cpm

LEL O_2 = 0 ppm lel
21.9% O_2

Water added to Borehole 1,820 gallons

Total pages = 17 including diagram and installation sheet

000206

402-

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RIFS	
BORING NUMBER: 4010	COORDINATES:	DATE: 11-19-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: L. Adams	Depth Date/Time	DATE COMPLETED: 2/25/89
DRILLING METHODS: Cable Tool		PAGE 2 OF 16

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
16				For classification of samples in interval 0-80 ft, refer to descriptions on boring + well no. 210.			
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

NOTES:

000207

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RIFS		
BORING NUMBER: 4010	COORDINATES:		DATE: 1-19-89
ELEVATION: 582.2 G.S.	GWL: Depth	Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: Cable Tool			PAGE 3 OF 16

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
31				For description of samples over interval 0-80 ft. See descriptions for boring & well 210.			
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

NOTES:

000208

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald		
BORING NUMBER: 4010	COORDINATES:		DATE: 1-20-89
ELEVATION: 582.2 G.S.	GWL: Depth	Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: Cable Tool			PAGE 4 OF ~~16~~ 17

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46				For description of samples over interval 0-80 Ft. See descriptions for boring & well 210.			
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							

NOTES:

000209

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI FS		
BORING NUMBER: 4010	COORDINATES:		DATE: 1-19-89
ELEVATION: 582.2	GWL: Depth	Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: Cable Tool			PAGE 5 OF 16

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61				For descriptions of samples over interval 0-80 ft. See descriptions for boring & well 210.			
62							
63							
64							
65							
66							
67							
68							
69							
70							
71							
72							
73							
74							

NOTES:

000210

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 603 3.2	PROJECT NAME: Fernald		
BORING NUMBER: 4010	COORDINATES:		DATE: 1/20/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1/18/89
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 2/25/89
DRILLING METHODS: Cable Tool			PAGE 6 OF 16

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76							
77							
78							
79	WAH 2-23-89 08968						
80	~~11070~~ 1005 1-20-89	23 38 24	7	Very dense, gray brown (10yr 4/3) well graded gravelly sand. Wet. Gravel size to 1 in.	SW	N/A	Hnu = 0 ppm α = — β = 80cpm (bkg.)
81							
82							
83							
84	WAH 2-23-89 08969						
85	~~11071~~ 1400 1-20-89	14 15 23		Dense, gray brown (10 yr 4/1) med-well sorted gravelly sand. Damp. Gravel size to 3/4 in.	SW	N/A	Hnu = 0ppm α = — β = 100 ppm
86							
87							
88							
89							

NOTES: Drillers: Craig Coulter, Chris Coulter

Instrument Backgrounds:
Hnu = 0ppm
α = 0 cpm
β = 80 cpm

000211

402-1

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald		
BORING NUMBER: 4010	COORDINATES:	DATE: 1/20/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 1/18/89	
ENGINEER/GEOLOGIST: L. Adams	Depth Date/Time	DATE COMPLETED: 2/25/89	
DRILLING METHODS: Cable Tool		PAGE 7 OF 16	

DEPTH (ft) WAH 2-23-89	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS WA 2/27/89
91	~~11072~~ 1505 1-20-89	15 25 20	4	~~Med~~ LA Dense, gray brown gravelly sand, well graded. Gravel to 1 in. Wet. (10 yr 4/1)	SW	N/A	Hnu = 0 ppm α = 0 cpm β = 80 cpm
92							
93							
94	WAH 2-23-89 08971						
95	~~11073~~ 1310 1-23	10 10 20	18	Med. dense, gray brown poorly graded sand, trace gravel. (gravel to .4 in.) (10 yr 4/1) Damp.	SP	N/A	Hnu = 0 ppm α = 0-1 cpm β = 60 cpm
97							
98							
99	WAH 2-23-89 08972						
100	~~11074~~ 1400 1-23	14 15 26	10	Dense, gray brown poorly graded to medium graded sand. Some gravel (10 yr 4/1) Damp	SP	N/A	Hnu = 0 ppm α = 0 cpm β = 80 cpm
101							
102							
103							
104							

NOTES: Drillers:
Craig Coulter
Chris Coulter

Instrument Backgrounds:
Hnu = 2 ppm
α = 0 cpm
β = 80 cpm

000212

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RIFS		
BORING NUMBER: 4010	COORDINATES:		DATE: 1-23-89
ELEVATION: 582.2 G.S.	GWL: Depth	Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: Cable Tool			PAGE 8 OF 16

DEPTH 1 ft. WAH 2-23-89	SAMPLE TYPE & NO. 08973	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS ~~ago 2nt~~ 1/1 2/27/8
106	~~1075~~ 1600 1-23	5 8 9	4	Med. Dense gray brown poorly graded gravelly sand. (Gravel to 1 in) (10yr 4/1) Wet	SP	N/A	Hnu = Bkg. α = Bkg. β = Bkg.
107							
108				* Sampling rod sunk when weight was first put on.			
109	WAH 2-23-89 08974						
110	~~1076~~ 0900 1-24	8 8 26	18	Dense, gray brown poorly graded sand. Trace gravel. (10yr 4/1) Damp.	SP	N/A	Hnu = Bkg α = Bkg β = Bkg
111							
112							
113							
114	WAH 2-23-89 08975						
115	~~1077~~ 1038 1-24	~~8~~ 7 ~~12~~ 6 ~~16~~ 13	6	Med. Dense, gray brown poorly graded sand. Some gravel (gravel .5 in) (10 yr 4/1) wet.	SP	N/A	Hnu = Bkg α = Bkg β = Bkg
116							
117				* This sample was taken on 2nd attempt.			
118							
119							

NOTES: Driller: Craig Coulter
Assist: Chris Coulter

Equipment Backgrounds: (1-23-8
Hnu = 2 ppm
α = 0 cpm
β = 80 cpm

000213

402-

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER:	602 3.2	PROJECT NAME:	Fernald RIFS		
BORING NUMBER:	4010	COORDINATES:		DATE:	1-24-89
ELEVATION:	582.2 G.S.	GWL: Depth	Date/Time	DATE STARTED:	1-18-89
ENGINEER/GEOLOGIST:	L. Adams	Depth	Date/Time	DATE COMPLETED:	2-25-89
DRILLING METHODS:	Cable Tool			PAGE	9 OF 16

DEPTH (FT.) WAH 2-23-89	SAMPLE TYPE & NO. 08976	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS LA 2/27/89
121	~~11078~~ ~~1415~~ 1-24	*	12	Loose, poorly graded brown gray sand with some gravel. Wet. (10 yr 4/1) (Gravel to .5 in.)	SP	N/A	Hnu = Bkg α = Bkg β = Bkg
122							
123				* When sample rod was put in hole, it sunk as soon as weight was placed on it. The rod was pounded about 3 times and sunk 2 ft.			
124	WAH 2-23-89 08977						
125	~~11079~~ 1605 1-24	6 22 26	10	Dense, brown gray (10 yr 4/2) well graded gravelly sand. (Gravel to .25 in.)	SW	N/A	Hnu = Bkg α = Bkg β = Bkg
126							
127							
128							
129	WAH 2-23-89 08978						
130	~~11080~~ 0935 1-26	8 12 16	8	Med. Dense gray brown (10 yr 4/2) well graded gravelly sand (gravel to .25 in.)	SP	2.5	Hnu = Bkg α = Bkg β = Bkg
131				~~Very stiff blue clay~~			
132	~~1113~~ ~~1030~~ 2-1-89 10611	NA	6	VERY STIFF, DARK GRAY (7.5 YR 3/0) CLAY, ~~SAND~~	CL	2.5	SEE NOTE
133							Blue clay layer contact.
134							

NOTES: Blow sand has been causing quite a few problems in stabilizing borehole depth. It has also been possible to make progress from 110-120.0 ft in borehole using only sand pump (not using drill bit.)

SAMPLE 10611 IS A SHELBY TUBE

000214

402-

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4010	COORDINATES:	DATE: 2-1-89, 2-2
ELEVATION: 582.2 FT	GWL: Depth Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: TESORIERO	Depth Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL		PAGE 90 OF 161

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	10595 1600 2-1-89	NA	24	VERY STIFF, DARK GRAY (7.5YR 3/0) CLAY, DAMP	CL	2.5	HNU = 0 ppm SEE NOTE α = 0 cpm βγ = 80-100 cpm
137		2-1-89					
138							
139							
140	10596 0900 2-2-89	5 10 12	14	VERY STIFF, OLIVE GRAY (5Y 4/2) CLAY, WET	CL	2.3	HNU = 0 ppm α = 0 cpm βγ = 80-100 cpm
141							
142							
143							
144							
145	10597 1040 2-2-89	3 5 10	12	STIFF, OLIVE ~~GREEN~~ GRAY (5Y 4/2) CLAY, TRACE SAND AND GRAVEL WET	CL	2.0	HNU = 1 ppm α = 0 cpm βγ = 60-50 cpm
146							
147							
148							
149							

NOTES: SAMPLE 10595 IS A SHELBY TUBE.

000215

402-11-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4010	COORDINATES:		DATE: 2-2-89, 24
ELEVATION: 582.2 FT	GWL: Depth	Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: TESORIERO	Depth	Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL			PAGE 10 OF 16

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	10598 1120 2-2-89	47 25 38	5	VERY DENSE, BROWN ~~GRAVELLY SAND~~ (10YR 5/2) GRAVELLY SAND, WET WELL GRADED	SW	NA	HNU = 0 ppm α = 0 cpm βγ = 60-80 cpm
152							
153							
154							
155	10599 1520 2-2-89	40 45 50	8	VERY DENSE, BROWN (10YR 5/2) WELL GRADED FINE SAND WITH SOME GRAVEL, WET	SW	NA	HNU = 0 ppm α = 0 cpm βγ = 80-100 cpm
156							
157							
158							
159							
160	10600 1400 2-4-89	10 15 15	6	MEDIUM DENSE, BROWN (10YR 5/2) WELL GRADED, SILTY MEDIUM TO COARSE SAND WITH SOME GRAVEL WET	SM	NA	HNU = 0 ppm α = 0 cpm βγ = 80-100 cpm
161							
162							
163							
164							

NOTES:

000216

402-11-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS 5709

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4010	COORDINATES:	DATE: 2-4-89, 2-6-
ELEVATION: 582.2 FT	GWL: Depth Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: TESORIERO	Depth Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL		PAGE 12 OF 16

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
166	10601 1530 2-4-89	18 24 13	9	DENSE, BROWN (10YR 5/2), WELL GRADED MEDIUM SAND, TRACE GRAVEL, WET (0.25-0.50 IN)	SW	NA	HNu = 1 ppm α = 0 cpm βγ = 60-100 cpm
167							
168							
169							
170	10602 1610 2-4-89	6 13 14	9	MEDIUM DENSE, BROWN (10YR 5/2) WELL GRADED MEDIUM SAND, TRACE GRAVEL (0.25IN-0.50IN), WET	SW	NA	HNu = 1 ppm α = 0 cpm βγ = 60-100 cpm
171							
172							
173							
174							
175	10603 1050 2-6-89	13 36 62	8	VERY DENSE, GRAY BROWN (10YR 5/2) WELL GRADED MEDIUM SAND, TRACE GRAVEL (0.25-0.50 IN), WET	SW	N/A	HNu = 0 ppm α = 0 cpm βγ = 60-80 cpm
176							
177							
178							
179							

NOTES:

000217

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4010	COORDINATES:		DATE: 2-6-89
ELEVATION: 582.2	GWL: Depth	Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: TESORIERO	Depth	Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL			PAGE 13 OF 167

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
181	10604 1340 2-6-89	8 10 14	4	MEDIUM DENSE, GRAY BROWN (10YR 5/2) WELL GRADED MEDIUM SAND, TRACE GRAVEL, WET	SW	NA	HNU = 0 ppm α = 0 cpm βγ = 60-80 cpm
182							
183							
184							
185	10605 1510 2-6-89	16 30 25	17	VERY DENSE, DARK GRAYISH BROWN (10YR 4/2) FINE TO MEDIUM SAND, WELL GRADED, TRACE GRAVEL, WET	SW	N/A	HNU = 0 ppm α = 0 cpm βγ = 40-80 cpm
186							
187							
188							
189							
190	10606 1600 2-6-89	20 50 50/2	7	VERY DENSE, DARK GRAYISH BROWN (10YR 4/2) POORLY GRADED MEDIUM SAND, WET	SP	N/A	HNU = 0 ppm α = 0 cpm βγ = 60-80 cpm
191							
192							
193							
194							

NOTES:

000218

402-11

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4010	COORDINATES:	DATE: 2-7-89	
ELEVATION: 582.2	GWL: Depth Date/Time	DATE STARTED: 1-18-89	
ENGINEER/GEOLOGIST: TESCHIERO	Depth Date/Time	DATE COMPLETED: 2-25-89	
DRILLING METHODS: CABLE TOOL		PAGE ~~13~~ 14 OF ~~16~~	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (UA 2/27/89)
196	10607 1000 2-7-89	40 43 50/2	14	VERY DENSE, DARK GRAYISH BROWN (10YR 4/2) POORLY GRADED MEDIUM SAND, WET	SP	N/A	HNU = 0 ppm α = 0 cpm βγ = 60-80 cpm
197							
198							
199							
200	10608 1050 2-7-89	5 8 12	7	MEDIUM DENSE, DARK GRAYISH BROWN (10YR 4/2) POORLY GRADED SAND, WET	SP	N/A	HNU = 0 ppm α = 0 cpm βγ = 80-120 cpm
201							
202							
203							
204							
205	10609 1350 2-7-89	25 50 100/4*	10	VERY DENSE, DARK GRAYISH BROWN (10YR 4/2) WELL GRADED SAND, TRACE GRAVEL (0.25-0.75 IN), WET	SW	UAH 2-28-89 N/A	HNU = 0 ppm α = 0 cpm βγ = 60-110 cpm
206							
207							
208							
209							

NOTES:
* MORE THAN 50 BLOWS WERE ALLOWED ~~DUE~~ ago 2-7-89 TO TRY TO RECOVER BEDROCK, IF PRESENT

000219

402-11

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4010	COORDINATES:	DATE: 2-7-89
ELEVATION: 582.2 FT	GWL: Depth Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: TESORIERO	Depth Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL		PAGE ~~14~~ 15 OF ~~16~~ 18

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
211	10610 1530 2-7-89	40 50/1	7	VERY DENSE DARK GRAYISH BROWN (10YR 4/2) WELL GRADED FINE TO MEDIUM SAND, WET	SW	NA	Hnu = 0 ppm
				VERY DENSE, DARK GRAY (5Y 4/1) WEATHERED SHALE (210.5 FT)	N/A	NA	α = 0 cpm βγ = 80-120 cpm
				BOTTOM OF BORING = 210.6 FT			
212							
213							
214							
215							
216							
217							
218							
219							
220							
221							
222							
223							
224							

NOTES:

000220

4G2-1

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
PROJECT NO. 602 3.2
BORING NO. 4010
PIEZOMETER NO. 4010

FIELD ENG./GEO. L. Adams DATE 2/27/89
CHECKED BY W.F. Hertel DATE 3-6-89
DATE OF INSTALLATION 2/8/89 - 2/25/89

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 ft. TO 210.6 ft.
FLUID — FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10 in. ID FROM 0.0 ft TO 210.0 ft.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 4 in. I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 10.0 ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4 in.
LENGTH OF PIPE SECTIONS 10 ft., 2 ft.
JOINING METHOD screw, type, flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION locking cap with padlock WAH 3-6-89

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION (Ft.)	
TOP OF RISER PIPE	2.0		584.2	
GROUND SURFACE	0.0		582.2	
BOTTOM OF PROTECTIVE PIPE	2.5		579.7 ft.	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 180.0	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND (10x20) WAH 3-6-89	TOP 180.0	BOTTOM 202.8	TOP	BOTTOM
~~GRAVEL~~ (4x30)	TOP 202.8	BOTTOM 205 ft	TOP	BOTTOM
PERFORATED SECTION	TOP 190.4	BOTTOM 200.8	TOP	BOTTOM
PIEZOMETER TIP	202.8 ft.			
BOTTOM OF BOREHOLE	210.6 ft.			
GWL AFTER INSTALLATION				

000221

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Hole was allowed to collapse in on itself to 205.0 ft., where the gravel pack was started.
Drilling procedures began on 1-18-89, Stainless steel riser placed in well on 2-8-89, Hole cover emplaced on 2-25-89 (WAH 3-6-89)

4C9-

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 10 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. Brad Dunning DATE 12/9/87
PROJECT NO. 602 Task 3.2
CHECKED BY R Calbaugh DATE 2/6/64
BORING NO. 3H 3011 BD 1-5-89
PIEZOMETER NO. 3H 3011
DATE OF INSTALLATION 11/21/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0' TO 115.5'
FLUID NA FROM NA TO NA

TYPE OF BIT hammer-type
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 115.5'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel
DIAMETER OF PERFORATED SECTION 4" Ø
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01 Inches
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 Ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10' & 25'
JOINING METHOD Flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft.
PROTECTIVE PIPE Ø.D. 10" (nom)

OTHER PROTECTION Lockable lid with lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0'		584.33	
GROUND SURFACE	0.0		582.33	
BOTTOM OF PROTECTIVE PIPE	2.8'		579.53	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP Surface	BOTTOM 90'	TOP 582.33	BOTTOM 492.33
BENTONITE	TOP 90'	BOTTOM 99'	TOP 492.33	BOTTOM 483.33
SAND	TOP 99'	BOTTOM 115.5'	TOP 483.33	BOTTOM 466.83
GRAVEL	TOP NA	BOTTOM NA	TOP —	BOTTOM —
PERFORATED SECTION	TOP 103'	BOTTOM 113'	TOP 479.33	BOTTOM 469.33
PIEZOMETER TIP	115.5'		466.83	
BOTTOM OF BOREHOLE	150.0'		432.33	
GWL AFTER INSTALLATION	= 67.5' (TOC) - WPK 4/24/88		Jamble	

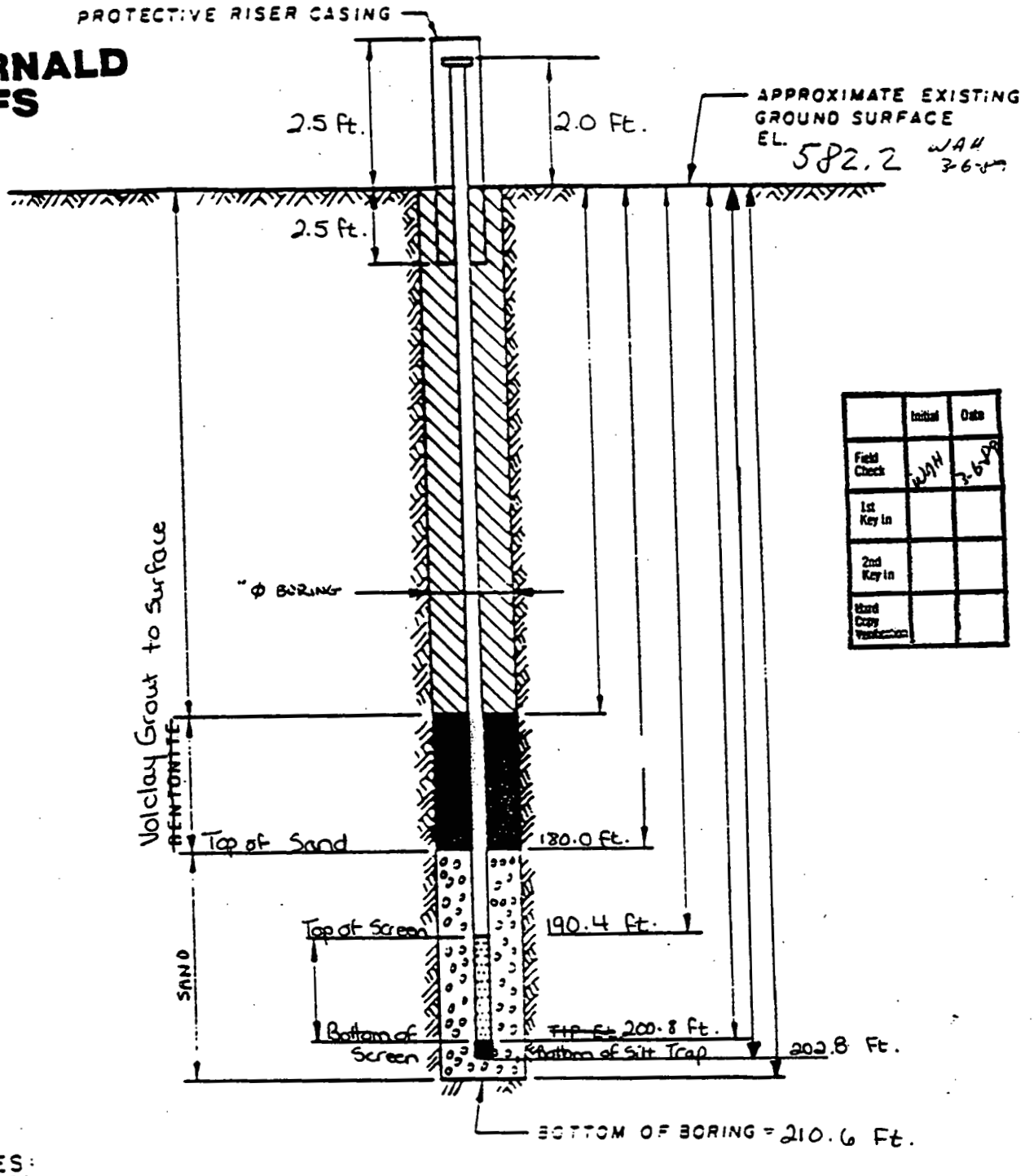
AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

000222

REMARKS White out correction was made by Brad Dunning at the time this form was completed. WPK 4/24/88

Well 4010 5709

FERNALD RI/FS



	Initial	Date
Field Check	WJH	3-6-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWING NUMBER	3-6-89	WAH-KI	CHECKED BY	APPROVED BY	WAH 2/27/89	DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN 1.0 SS PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. 3-30-~~89~~ 88 WAH (from 2010 log)
4. ELEVATION OF WATER LEVEL 63.0 Ft. from 2010.
5. WATER LEVEL READING ON

Materials used:
19 Bags 10-20 sand
51 Bags volclay grout.
3 Bags 4-30 Sand

Total Water added to hole: 1820 gal.

INSTALLATION DETAILS
MONITORING WELL 4010

PREPARED FOR
Boring # 4010 2/27/89

Water Used:
During Drilling: Approx. 800 gal
During Grouting: 1020 gal

000223

QC/DH/2.3.89

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

WPK 4/23/86
RIG # 1

PROJECT NUMBER: 60232	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB 1-5 ~~BH~~ 1011	COORDINATES:	DATE: 12/1/87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12/1/87 @ 0830
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/2/87
DRILLING METHODS:		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See all Sample-Soil descriptions obtained in boring #~~BH~~ 1011 BH 2/6/89			Background Levels Noted Below in Notes
3	ST 07612		2'	Pushed Shelby Tube	CL		Sealed with wax 3-5' 0900
5							
7							
10							
12							
15							
17							
20							
22							
25	ST 07613	'	1.9'	Pushed Shelby Tube	CL		23.5' - 25.4' 1535
27							End of Day 12/1/87
30'							

NOTES: 1.) Drilling Contractor: Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter
Rig Make: "New" Speed King

2.) Water Added To hole For Drilling
12/1/87: 50 gallons
12/2/87: 8 gallons

000224

402-11-86

QC/DH/2-3-89

5709

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 6B ~~1-5~~ ~~1-11~~ 1011	COORDINATES:	DATE: 12/2/87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12/1/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/2/87
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (Ft.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31							
35							
37				Bottom of Boring 36.5 Ft.			Completed Drilling at 1000, 12/2/87
40							

NOTES: Background Levels

1.) Hnu = 0

2.) α = 0

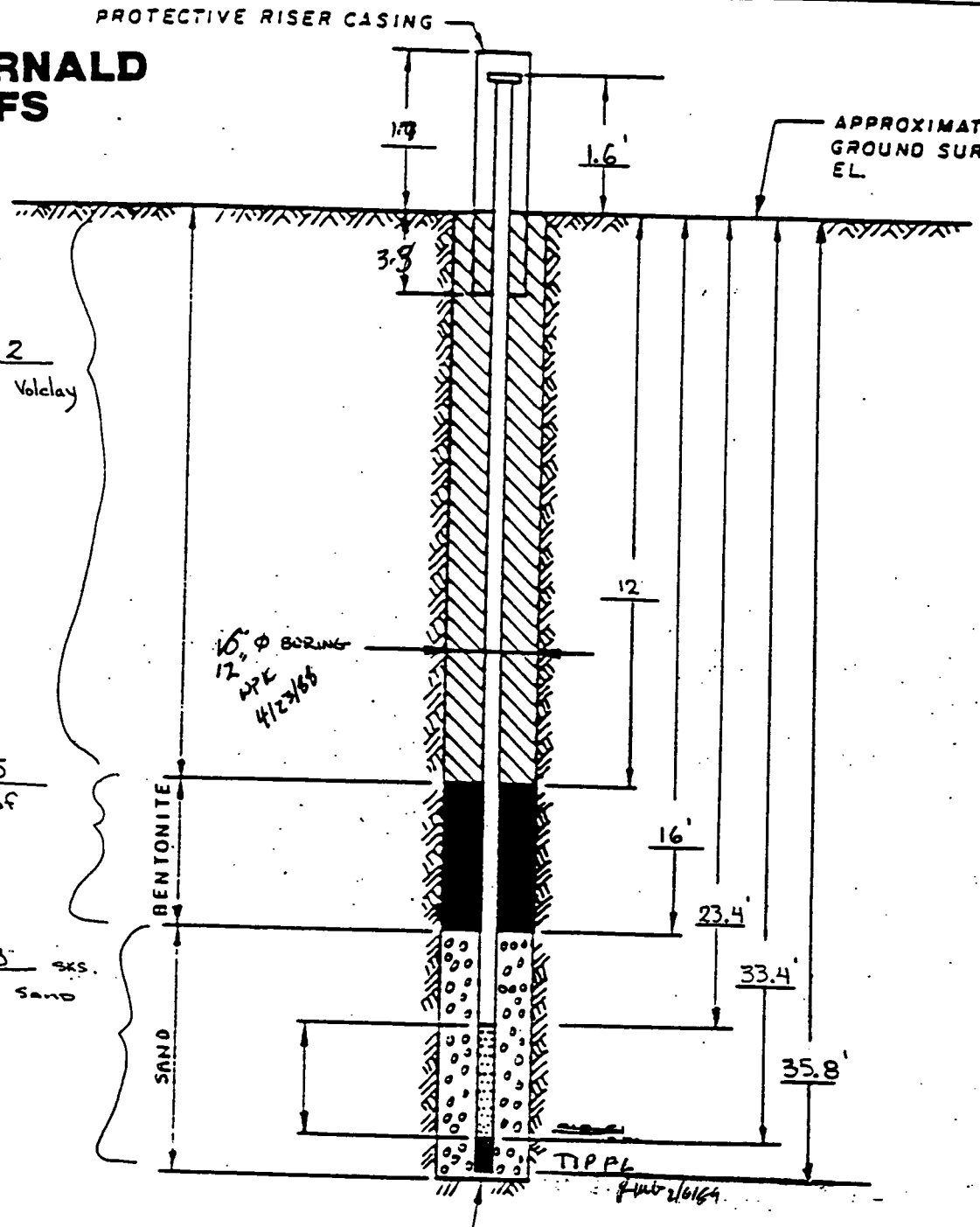
3.) $\gamma\beta$ = 40-50 c.p.m.

000225

QC/DH/2.3.89

BOREHOLE # ~~111~~ 1011

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

000226

QC/DH/2-3-89 5709

	Initial	Date
1st Key In		
2nd Key In		Oct 17 89
Hard Copy Verification		

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. Brad Dunning DATE 12/9/87
PROJECT NO. 602 Task 3.2 CHECKED BY R Galbreath DATE 2/6/89
BORING NO. ~~111~~ 1011
PIEZOMETER NO. ~~111~~ ~~BB 1-5 88~~ 1011 DATE OF INSTALLATION x 12/2/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 36.5'
FLUID NA FROM NA TO NA

TYPE OF BIT hammer type
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 36.5'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .01" inches
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10' Ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10 Ft.
JOINING METHOD Flush-joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft.
PROTECTIVE PIPE ~~Ø~~ I.D. 10 Inches (mm)

OTHER PROTECTION STEEL PROTECTIVE CASING WITH locking lid AND lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (~~FT~~)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	1.6 Ft.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.3 Ft.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP Surface	BOTTOM 12'	TOP	BOTTOM
BENTONITE	TOP 12'	BOTTOM 16'	TOP	BOTTOM
SAND	TOP 16'	BOTTOM 36.5	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 23.4	BOTTOM 33.4'	TOP	BOTTOM
PIEZOMETER TIP	35.8'			
BOTTOM OF BOREHOLE	36.5			
GWL AFTER INSTALLATION				

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000227

QA/DH/2-3-89

	Initial	Date
1st Key In		
2nd Key In		8/89
Hard Copy		

PAC

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

VISUAL CLASSIFICATION OF SOILS

WPK 4/23/88
RIG # 1

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS Subsurface Sampling		
BORING NUMBER: 3+1 3011 BB 1-5-88	COORDINATES: N 982246.10 E 1377869.25	DATE: 11-12-87	
ELEVATION: 582.33	GWL: Depth	Date/Time	DATE STARTED: 11-12-87 @ 0730
ENGINEER/GEOLOGIST: B. Dunning	Depth	Date/Time	DATE COMPLETED: 11-18-87
DRILLING METHODS: Cable Tool - Advance Casing			PAGE 1 OF 10

DEPTH (Feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 Inch)	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	S 07564	15 22 30	10"	Very stiff, brownish-yellow silt with some coarse grain sand terminated with a light gray rock (10 YR, 6/6) DRY	ML		Hnu = 0 α = 0 βB = 40-50 c.p.m. Sample collected at → 0730
2 3	S 07565	4 15 14	10"	Very stiff to hard, dark yellowish-brown silty clay (10 YR, 4/4) DRY	CL	2.5 to 4.5+	Hnu = 0 α = 0 βB = 50 c.p.m. 0735
4	S 07566	15 15 30	15"	Hard, dark gray clay with a trace of fine to coarse gravel grading downwards into a silty clay at 5.7' DRY.	CL	4.5+	Hnu = 0 α = 0 βB = 40-60 0740
5 6	S 07567	24 28 22	18"	5.7' Very stiff, yellowish-brown silty clay with some fine to coarse gravel (10 YR, 5/8) DRY 6.5'	CL	4.5+ / 3.0	Hnu = 0 α = 0 βB = 50 0845
7	S 07568	17 15 17	15"	6.5' Very stiff, olive gray to dark gray laminated clay (5Y, 4/4) DRY 7.5	CL	3.0 / 3.5	Hnu = 0 α = 0 βB = 40-60 0850
8 9	S 07569	12 13 16	14"	Stiff, olive clay with a trace of gravel (5Y, 4/4). DRY	CL	2.0	Hnu = 0 α = 0 βB = 40-60 1120
10	S 07570	2 7 10	12"	Very stiff light olive-brown to very dark gray mottled clay with a trace of gravel (2.5 Y, 5/6 - 2.5 Y, N3) DRY	CL	3.5	Hnu = 0 α = 0 βB = 50 1315
11 12	S 07571	11 13 13	10"	Dark olive gray clay, stiff (5Y, 3/2) with a trace to some gravel DRY	CL	2.5	Hnu = 0 α = 0 βB = 40-60 1320
13	S 07572	6 14 16	10"	Stiff, black clay (2.5 Y, 2.5/1) with a trace of gravel DRY	CL	2.5	Hnu = 0 α = 0 βB = 50 1330
14 15	S 07573	6. 10 10	12"	Very stiff, dark gray clay with a trace of fine gravel DRY	CL	3.0	Hnu = 0 α = 0 βB = 40-60 1415

NOTES:

1.) Drilling Contractor: Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter
Rig: New 71 Speed Master

2) Soil Sampling as per ASTM standard penetration test.

3.) Color description with Munsell

4) Water Added ≈40 gal.

4.) Field Measurements Background Levels for 11/12/87
Hnu = 0 ppm
α = 0 c.p.m.
βB = 40-60 c.p.m.

000228

402-11-88

2011

5709

Reynolds Supply, Inc.

COMPLETE MUNICIPAL & INDUSTRIAL WATER SYSTEMS

FORMATION LOG OF WELL

Starting Date _____ Finished _____ Well Number Well #11

Owner NLO Location Whitewater, Ohio

TOTAL DEPTH	THICKNESS EACH STRATUM	FORMATION
0	14	Yellow clay
14	28	Blue clay & gravel
28	40	Gray clay
40	45	Blue clay
45	51	Yellow sand
51	64	Yellow sand
64	89	Gray sand & gravel
89	92	Dark gray sand & clay balls
92	96	Gray sand and gravel
96	100	Gray sand and gravel
100	115	Gray sand and boulders
115	125	Gray sand and boulders
125	130	gray sand and small boulders

000229

Static Water Level 63' Draw Down _____

Driller Steve Reynolds

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS Subsurface Soil Sampling	
BORING NUMBER: 3H 3011 BB 1-5-89	COORDINATES: Seep1	DATE: 11/12 & 11/13/87
ELEVATION: Seep1	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 2 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15				Stiff			
16	S 0 7 5 7 4	6 7 9	9"	Light olive-brown clay (2.5 Y, 5/6) with a trace of gravel DRY	CL	1.0	Hnu = 0 α = 0 βB = 40-80 cpm 1430
17	–	8 11 14	0"	Lost Sample	CL		No Sample Obtained 1440
18	S 0 7 5 7 6	4 4 7	9"	Very stiff, light olive-brown clay as above. DRY 18.8'	CL	2.0	Used catcher in split spoon Hnu = 0 α = 0 βB = 40-80 cpm. 1615
19				Loose, unconsolidated gray (5Y, 5/1) fine gravel DRY	GW	–	
20	S 0 7 5 7 7	4 3 5	4"	21.0	GW	–	Hnu = 0 α = 0 βB = 60 cpm. 1655
21							
22	S 0 7 5 7 8	5 7 10	9"	Very stiff, dark olive gray clay (5Y, 3/2) with a trace of black organic debris. DRY	CL	3.0	End of Day 11/12/87 Start of Day 11/13/87 @ 21' Hnu = 0 βB = 40-80 cpm α = 0 0800
23	S 0 7 5 7 4	12 15 19	18"	24.0	CL	1.0 to 3.0	Hnu = 0 α = 0 βB = 60 cpm. 0805
24							
25	S 0 7 5 8 0	6 12 12	9"	Medium stiff, very dark grayish-brown (2.5 Y, 3/2) silty clay DRY 25.2'	CL	1.0	Hnu = 0 α = 0 βB = 40-60 0820
				25.5 Medium dense, very dark gray (2.5 Y, N/3) sand DRY	SM	–	
26	S 0 7 5 8 1	7 7 12	5"	Medium dense, black to very dark gray (2.5 Y, N2) fine to coarse gravel DRY 27.0	GP		Slight odor observed coming out of hole Hnu = 0 α = 0 βB = 40-80 cpm. 0917
27							
28	S 0 7 5 8 3	8 11 16	9"	Very stiff, olive gray (5Y, 4/4) silty clay with some gravel, DRY. 28.5	CL	3.5	Lost First sample. Hnu = 1 ppm with 11.7 probe 0 with 10.2 probe βB = 40-60 α = 0 1300
29	S 0 7 5 8 4	50/5"	5"	Very dense, olive gray (5 Y, 5/3) silty sand, DRY.	SM	–	Hnu = 0 α = 0 βB = 40-60 cpm 1340
30							

NOTES: 1) Background levels for 11/13/87
Hnu = 0
α = 0
βB = 40-80 cpm.

2.) Water added to borehole. 11-14-87
~~IIII~~ ~~IIII~~ 1 (11 x 5 = 55 gallons.)

000230

402-11-86

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991 5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS Subsurface Sampling	
BORING NUMBER: 3H 3011 86 1-5-89	COORDINATES: See 1	DATE: 11/13 & 11/14/87
ELEVATION: See p1	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 3 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	S 07 5 8 5	26 50/3"	10"	30.5 Medium dense, dark gray gravel (2.5 Y, N/3) DRY 30.5	GW		Hnu = 0 α = 0 βγ = 40-80 c.p.m. 1403
32	S 07 5 8 6	24 36 50	18"	Very dense, dark grayish-brown (2.5 Y, 4/2) clayey sand DRY 32'	SC		Hnu = 0 α = 0 βγ = 40-60 c.p.m. 1425
33				33' Very stiff, very dark gray (2.5 Y, N 3) clay with some fine to coarse gravel. DRY. 33	CL	2.5	
34	S 07 6 8 7	49 50/1"	9"	Very dense, gray (2.5 Y, N5) silty sand with some gravel DRY 34.7'	SM	–	Hnu = 0 α = 0 βγ = 40-60 c.p.m. 1520
35	S 07 5 8 8	40 50/1"	10"	34.7'	GW		Hnu = 0 α = 0 βγ = 40-60 c.p.m. 1545
36				Very stiff, very dark gray (5 Y, 4/1) silty clay with a trace of gravel. DRY 36.5'	CL	3.5	
37	S 07 5 8 9	14 24 29	18"	36.5' Very stiff, yellowish-brown clay (10 YR, 5/6) DRY 37'			Hnu = 0 α = 0 βγ = 40-70 c.p.m. 1605
38	S 07 5 9 0	8 14 23	15"	Very dense, yellowish-brown (10 YR, 5/8) silty sand DRY 38.5	SC		Hnu = 0 α = 0 βγ = 40-60 c.p.m. 1625
39				Dense, very pale brown (10 YR, 7/4) sand DRY	SW		End of Day 11/13/87 Start of Day 11/14/87
40							
41				Upper Sand & Gravel Aquifer at 37'			BEGIN Collecting 5 Foot Samples
42							
43							
44							
45							

NOTES: 1.) Background Measurements 11/14/87

Hnu = 0

α = 0-1 c.p.m.

βγ = 40-60 c.p.m.

000231

402-11-88

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 BB 1-5-89	COORDINATES: See pl	DATE: 11/14/87
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 4 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (mm)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	S 07591	22 27 31	18"	Very dense, yellowish-brown (10 YR, 5/8) sand - Dry	SW		Hnu = 0 α = 0 βB = 40-60 c.p.m. 0820
47							
48							
49							
50	S 07592	12 23 27	18"	Dense, yellowish-brown sand as above, but becoming coarser grained			Hnu = 0 α = 0 βB = 40-60 c.p.m. 0930
51							
52							
53							
54							
55	S 07593	32 50/1"	15"	Very dense, dark yellowish-brown (10YR, 4/6) medium to coarse grain damp sand	SW		Hnu = 0 α = 0 βB = 40-60 c.p.m. 1155
56							
57							
58							
59							
60							

NOTES: 1.) Background measurements for 11/14/87
Hnu = 0
α = 0-1 c.p.m.
βB = 40-60 c.p.m.

2.) Water added 11/14/87 = 158 gallons

000232

402-11-86

QC/PH/2.3.89

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		7/9
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 BB 1-5-89	COORDINATES: See 1	DATE: 11/14 & 11/15/87
ELEVATION: See 1	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 5 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	S 07594	14 32 42	18"	61' Very dense, gray (10 YR, 5/1) Sand - (Appears to be Wet) 61'	SW		Hnu = 0 α = 0 βB = 20-40 c.p.m. 1445
62							Had to drive 10" casing to 70 feet in order to stop blow sand coming in at 60 Ft.
63							
64							
65	S 07595	25 33 42	18"	65.5' Very dense, dark grayish-brown (10 YR, 4/2) sand, wet 65.5' Very dense gray sand (10 YR, 5/1) with fine gravel Appears Wet	SW		Hnu = 0 α = 0 βB = 40-60 c.p.m. 1600
66							
67							Filled hole with water in attempt to hold blow sand down.
68							
69							
70	S 07596	13 18 21	10"	Medium dense, dark grayish-brown (10 YR, 4/2) Sand WET			Hnu = 0 α = 0 βB = 40-60 c.p.m. 1630
71							
72							Drilled 10" hole down to 75 Ft. but hole caved back to 71 Ft. End of day 11/14/87 Start Day 11/15/87 @ 71'
73							
74							
75							

NOTES: See page for background measurements and water used for 11/14/87

000233

402-11-86

FERNALD RI/FS

REVIEWED BY QA 86 DATE AUG 16 1991

QC/DW/2-3-89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011	COORDINATES: See p1	DATE: 11/15/87
ELEVATION: See p1	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool - Advance Casing		PAGE 6 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	S 07596 7	17 22 27	18"	Dense, gray (10 YR, 5/1) sand with some fine to coarse gravel ie. 1" x 3/4" WET			Hnu = 0 α = 0 βB = 40-60 cpm. 0915
77							
78							
79							
80				80.0 — — — — — — — — — — 80.5			
81	S 07598 8	10 17 32	18"	Dense, slightly salt and pepper, very dark gray fine gravel with a trace of coarse rock fragments (7.5 YR, N3) WET	GW		Hnu = 0 α = 0 βB = 40 c.p.m. 1010
82							Blow sand & gravel coming into hole. HAD to drive casing down to 90 Ft.
83							
84							
85	S 07599 9	22 50 50/3"	15"	Very dense, very dark gray coarse gravel (2.5 Y, N3). WET.			Hnu = 0 α = 0 βB = 40-60 c.p.m. 1415
86							
87							
88							
89							
90							

NOTES: Background Measurements for 11/15/87
Hnu = 0
α = 0-1 c.p.m.
βB = 40-80 c.p.m.

2.) Water added to hole 11/15/87 100 gallons

C00234

402-11-86

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA KL DATE AUG 16 1991

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 BB, 1-5-88	COORDINATES: See p. 1	DATE: 11/15 & 11/16/87
ELEVATION: See p.	GWL: Depth 63.1' Date/Time 11/16 @ 0800	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool		PAGE 7 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90							
91	S 0760 0	2 3 3	18"	Loose, dark gray coarse sand (2.5 Y, N 4) with some fine gravel 91' WET 91'	SW		Hnu = 0 α = 0-1 γB = 40 c.p.m. 1600
92				Loose, very dark grayish-brown silty sand (2.5 Y, 3/2) WET	SM		
93							
94							
95	S 0760 1	5 12 22	18"	Dense, dark olive gray silty clayey sand with some fine to coarse gravel (5 Y, 3/2) WET	SC		Hnu = 0 α = 0 γB = 40-50 c.p.m. 1645
96							
97							End of Day 11/15/87 Start of Day 11/16/87 @ 96.5'.
98							
99				~99.0			
100	S 0760 2	7 12 25	9"	Dense, dark grayish-brown clayey coarse gravel (2.5 Y, 4/2) WET	GC		Hnu = 0 α = 0 γB = 40-60 c.p.m. 0815
101							
102							
103							
104							
105							

NOTES: 1.) Background Level Measurements for 11/16/87

Hnu = 0
α = 0
γB = 20-60 c.p.m.

000235

402-11-86

QC/DH/2.3.89

FERNALD RI/FS

REVIEWED BY QA 116 DATE AUG 1 0 1991

	Initial	Date
1st Key In		
2nd Key In	DH	8/9
Hard Copy Verification		

PA

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3H 3011 BB 1-5-88	COORDINATES: See pl	DATE: 11/16 & 11/17/87
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool		PAGE 8 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106	S 0760 3	4 7 11	12"	Medium dense, very dark gray to light grayish-brown fine to coarse gravel (2.5 Y, N3 to 2.5Y, 6/2) wet	GP		Hnu = 0 α = 0 βγ = 50 c.p.m. 0925
107							
108							
109							
110				Dense, dark grayish-brown sand (2.5 Y, 4/2) wet 111' 111'	SM		End of Day 11/16/87 Start Day 11/17
111	S 0760 4	26 16 18	15"				Hnu = 0 α = 0 βγ = 40-60 c.p.m. 0810
112				Dense, grayish-brown (2.5 Y, 5/2) clayey gravel wet	GC		Had to drive casing 10" to 124 Ft. in order to get lower. Blow sand coming in to 111.5 level.
113							
114							
115							
116	S 0760 5	9 28 50	15"	Very dense, grayish-brown silty & sandy gravel (2.5 Y, 5/2) wet	GM		Hnu = 0 α = 0 βγ = 50 c.p.m. 1150
117							Could not get below 115' without blow sand coming into hole. Added 100 gallons of water trying to hold sand down. Had to Drive casing to 130 Ft.
118							
119							
120							

NOTES: 1.) Background Level Measurements for 11/17/87

Hnu = 0

α = 0

βγ = 40 - 60 c.p.m.

2.) Water Added 11/17/87

100 gallons

000236

402-11-86

QC/DH/2.3.89 5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 1 6 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3~~11~~ 3011 BB 1-5-88	COORDINATES: See pl	DATE: 11/17 & 11/18/87
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 11/12/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87
DRILLING METHODS: Cable Tool		PAGE 9 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120							
121	S 07606	18 28 50	16"	Very dense, dark grayish-brown sand (2.5 Y, 4/2) with some gravel WET	SW		Hnu = 0 α = 0 βB = 60 c.p.m. 1700
122							
123							
124							
125							
126	S 07607	17 21 26	14"	Sand as above with some coarse gravel. ie ½" x 1½" rock fragments WET	SW		Hnu = 0 α = 0 βB = 40-60 c.p.m. End of Day 11/17/87 1738
127							Start of Day 11/18/87
128							
129							
130	S 07608	2 18 28	18"	Dense, multicolored gravel. ie. white, brown, gray, dark brown etc. WET 131'	GP		Hnu = 0 α = 0 βB = 60-80 c.p.m. 0850
131				Dense, olive gray (5Y, 5/2) clayey gravel WET	GC		
132							Had to drive 10" casing down to 135' in order to block off blow sand.
133							
134							Had to drive 10" casing down to 140' in order to attempt 135-136.5' sample.
135							

NOTES: 1.) See background Measurement for 11/17 on page 8

2.) Background Measurements 11/18/87
Hnu = 0
α = 0
βB = 60-80 c.p.m.

000237

402-11-86

QC/DH/2-8-89

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		8/9
Hard Copy Verification		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602, Task 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 311 3011 BD 1-5-88	COORDINATES: Surf	DATE: 11/18/87	
ELEVATION: Surf	GWL: Depth Date/Time	DATE STARTED: 11/12/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/18/87	
DRILLING METHODS: Cable Tool		PAGE 10 OF 10	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135							
136	–	50/2"	0	REFUSAL - No Sample			Attempted sample twice at 1450 & again at 1500. Refused both times
137							
138					SW		
139							
140	S 07 6 09	18 32 36	15"	Very dense, grayish-brown sand (2.5 Y, 5/2) wet 140.5' 140.5		–	Hnu = 0 α = 0 γβ = 40 c.p.m. 1555
141				Very dense, salt and pepper dark gray (2.5 Y, N 3) to grayish-brown fine to coarse gravel wet	GP		
142							
143							
144							
145	S 07 6 10	8 27 50	18"	Very dense, salt and peppered, dark gray, black, white etc. loose unconsolidated fine to coarse gravel wet			Hnu = 0 α = 0 γβ = 40 c.p.m. 1630
146							
147							
148							
149				Bottom of Boring at 150.0 ft			Attempted Sample 150-151.5 but sample fell out of split spoon.
150							

NOTES: 1.) Background Measurements 11/18/87
Hnu = 0
α = 0
γβ = 40 - 80 c.p.m.

2.) Water Added 11/18/87
150 gallons

000238

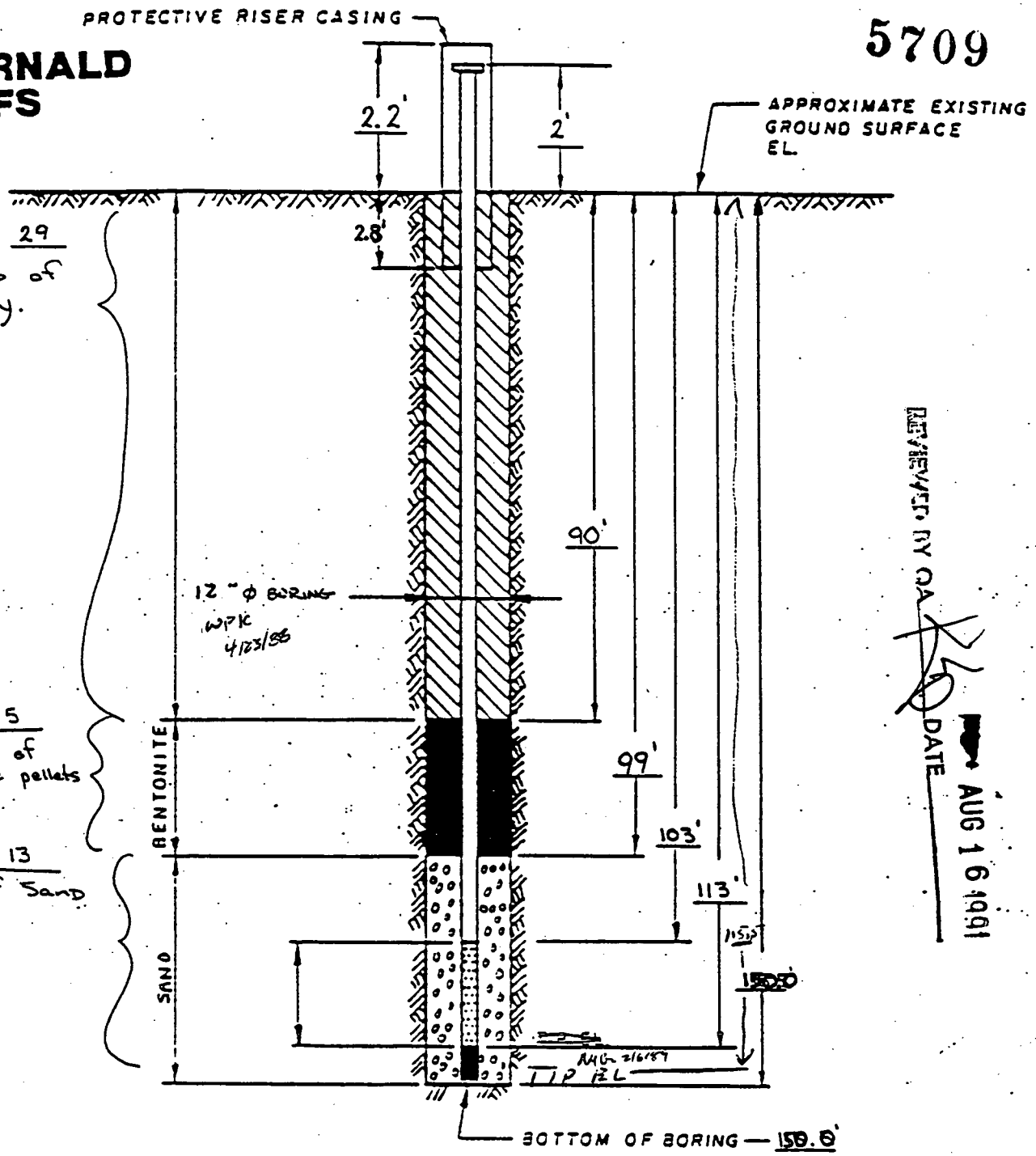
402-11-86

QQ/DH/2.3.89

BOREHOLE # 3H 30

5709

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

REVIEWED BY QA

DATE AUG 16 1991

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

The 10.n temporary casing was pulled ~~to~~ ~~12~~ from 150 to 120 feet allowing formation sand to fill the borehole from 150 to 115.5. The formation sand rose inside the temporary casing from 120 to 115.5 feet. WPK 4/24/88

FERNALD
RI/FS

	Date			
	Initial	E.T.		
		Field Check	1st Key In	2nd Key In

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI\FS		
BORING NUMBER: 4011	COORDINATES		DATE: 8-21-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 8-21-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth	Date/Time	DATE COMPLETED: 9-13-90
DRILLING METHODS: CABLE TOOL			PAGE 1 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	NA WELL CONSTRUCTION	REMARKS
0				SEE VISUAL CLASSIFICATION LOGS FOR MW 3011 0.0 - 150.0 FT				
10								
20								
30								
40								
50								
60								
70								
80								
90								
100								
110								
120								
130								
140								
150								

NOTES.

Drilling Contractor: PENNSYLVANIA DRILLING

Drilling Equipment: CYCLONE 43

Driller: CRAIG COULTER

ASST: CHRIS COULTER

BACKGROUND:

HNU = 0 ppm

α = 0 cpm

γB = 20 - 100 cpm

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4011	COORDINATES	DATE	8-26-90
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED:	8-21-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth / Date/Time	DATE COMPLETED:	9-13-90
DRILLING METHODS: CABLE TOOL		PAGE	2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	NA WELL CONSTRUCTION	REMARKS
150	32893 8-26 1140	50 50/5in —	10	VERY DENSE (10YR, 4/1) DARK GRAY SILTY WELL GRADED SAND, WET.	SM	NA		HNU = 0 α = 0 γB = 80 cpm
151								
152								
153								
154								
155	32894 8-27 1030	12 13 11	18	MEDIUM DENSE (2.5Y, N4/0) DARK GRAY WELL GRADED SAND. TRACE SILT. TRACE MEDIUM TO COARSE GRAVEL. WET.	SW	NA		HNU = 0 α = 0 γB = 80 cpm
156								
157								
158								
159								
160	32895 8-27 1125	17 24 41	18	VERY DENSE (2.5Y, N4/0) DARK GRAY GRAVELLY WELL GRADED SAND. TRACE SILT. WET.	SW	NA		HNU = 0 α = 0 γB = 60 cpm
161								
162								
163								
164								
165								

YOU CAN DISREGARD ENTERING THE "N" FOR THESE E.T. 9-20-90

NOTES.

Drilling Contractor PENNSYLVANIA DRILLING

Drilling Equipment CYCLONE 43

Driller: ~~GRAIG COULTER~~ ALLEN REBOLD MG 8-26-90

ASST: CHRIS COULTER

BACKGROUND:
HNU = 0 ppm
α = 0 cpm
γB = 30-100 cpm

000241

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI\FS		
BORING NUMBER: 4011	COORDINATES		DATE: 8-27-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 8-21-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth	Date/Time	DATE COMPLETED: 9-13-90
DRILLING METHODS: CABLE TOOL			PAGE 3 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION NA	REMARKS
165	32896 8-27 1552	12 19 18	18	DENSE (10YR, 4/1) DARK GRAY SILTY FINE TO MEDIUM GRAINED SAND. WET.	SM	NA		HNU = 0 α = 0 γB = 90cpm
166								
167								
168								
169								
170	32897 8-27 1644	17 22 38	18	VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. TRACE FINE GRAVEL. TRACE SILT. WET.	SW	NA		HNU = 0 α = 0 γB = 80cpm
171								
172								
173								
174								
175	32898 8-28 1517	14 50/6in —	12	VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. TRACE SILT. TRACE FINE GRAVEL. WET.	SW	NA		HNU = 0 α = 0 γB = 80cpm
176								
177								
178								
179								
180								

NOTES.

Drilling Contractor: PENNSYLVANIA DRILLING

Drilling Equipment: CYCLONE 43

Driller: ~~CRAIG COULTER~~ ALLEN REBOLD AG 8-27-90

ASST.: CHRIS COULTER

BACKGROUND:
HNU = 0 ppm
α = 0 cpm
γB = 30 - 100 cpm

000242

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI\FS		
BORING NUMBER: 4011	COORDINATES		DATE: 8-28-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 8-21-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth	Date/Time	DATE COMPLETED: 9-13-90
DRILLING METHODS: CABLE TOOL			PAGE 4 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	NA WELL CONSTRUCTION	REMARKS
180	32899	19		VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. TRACE SILT. TRACE FINE GRAVEL. WET.	SW	NA		HNU = 0
	8-28	36	18					α = 0
181	1612	52						γB = 90 cpm
182								
183								
184								
185	33075	16		VERY DENSE (2.5Y, N4/0) DARK GRAY WELL GRADED SAND. SOME SILT. WET.	SW	NA		HNU = 0
	9-05	24	18					α = 0
186	1450	32	K					γB = 90 cpm
187								
188								
189								
190	33076	19		VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. SOME COARSE GRAVEL AND COBBLES. TRACE SILT. WET.	SW	NA		HNU = 0
	9-05	22	18					α = 0
191	1550	50						γB = 100 cpm
192								
193	33077	100/2in.		VERY DENSE (10YR, 4/1) DARK GRAY SHALE BEDROCK. TRACE SILT. DRY.	NA	NA		HNU = 0
	9-06	–	1					α = 0
194	1615	–						γB = 60 cpm
195				BOTTOM OF BOREHOLE - 193.0 FT BEDROCK				

NOTES. TOTAL U sample #5 WMCO-32892, IT - none sent

Drilling Contractor PENNSYLVANIA DRILLING

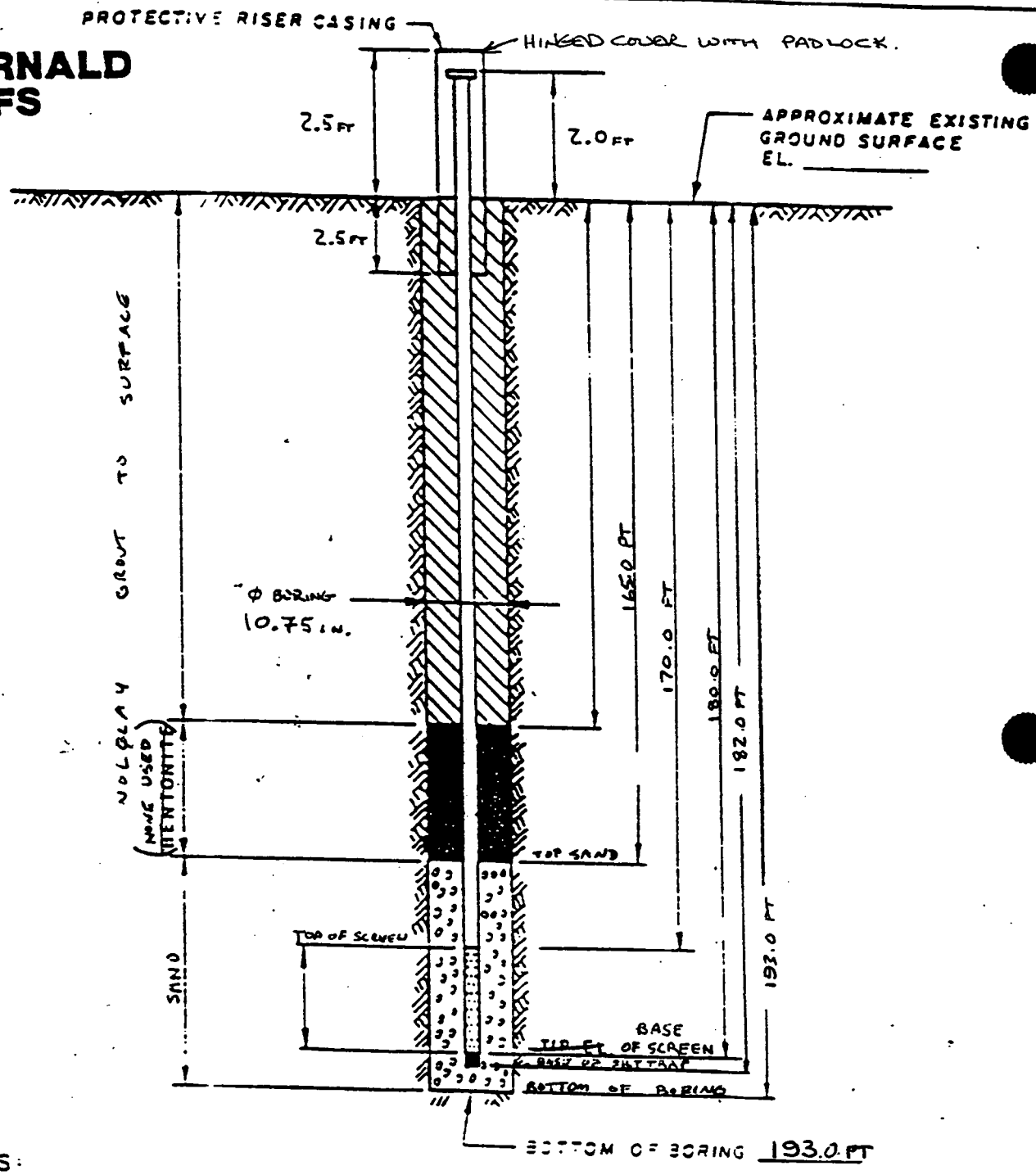
Drilling Equipment CYCLONE 43

Driller: ALLEN REBOLD \ CRAIG COULTER

Asst. CHRIS COULTER

BACKGROUND:
HNU = 0 ppm
α = 0 cpm
γB = 40-100 cpm

FERNALD RI/FS



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
MG 9-12-90			

NOTES:

1. RISER PIPE IS 4.0 IN I.D SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. (WITH WELDED SILTTRAP)
4. ELEVATION OF WATER LEVEL 69.80 @ T.O.C.
5. WATER LEVEL READING ON 9-13-90

MATERIALS USED DURING WELL INSTALLATION:

11 80 LB. BAGS OF 10/20 SAND
38 50 LB. BAGS OF VOLCLAY GROUT
3 5 GAL. BUCKETS OF BENTONITE PELLETS
2000 GALLONS OF WATER USED DURING GROUTING AND DRILLING PROCEDURES
SS PIPE SECTIONS: 1-10 FT. SCREEN WITH 2.0 FT. WELDED SILT TRAP. 17-10 FT. SECTIONS, 1-2.0 FT SECTION STAINLESS STEEL RISER.

INSTALLATION DETAILS
MONITORING WELL #4011

PREPARED FOR
FERNALD RI/FS

000244

5709

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 602 3.2.1
BORING NO. 4011
PIEZOMETER NO. 4011

FIELD ENG./GEO. M. GARMAN DATE 9-7-90
CHECKED BY E. TROLLINGER DATE 9-20-90
DATE OF INSTALLATION 9-13-90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOLS
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 FT TO 193.0 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE ~~10~~ 8.0 IN ID FROM 0 FT TO 193.0 FT
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN I.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT
JOINING METHOD THREADED - FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 10.75 IN.

OTHER PROTECTION HINGED, LOCKING LID COVER WITH PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	+ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	- 2.5			
BOREHOLE FILL MATERIALS:				
POCLAY GROUT / ~~SLURRY~~	TOP 0.0	BOTTOM 165.0	TOP	BOTTOM
BENTONITE NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND 10/20	TOP 165.0	BOTTOM 193.0	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 170.0	BOTTOM 180.0	TOP	BOTTOM
PIEZOMETER TIP	182.0			
BOTTOM OF BOREHOLE	193.0			
GWL AFTER INSTALLATION	69.8 FT FROM T.O.C. ~~E.T. NOT MEASURED~~			

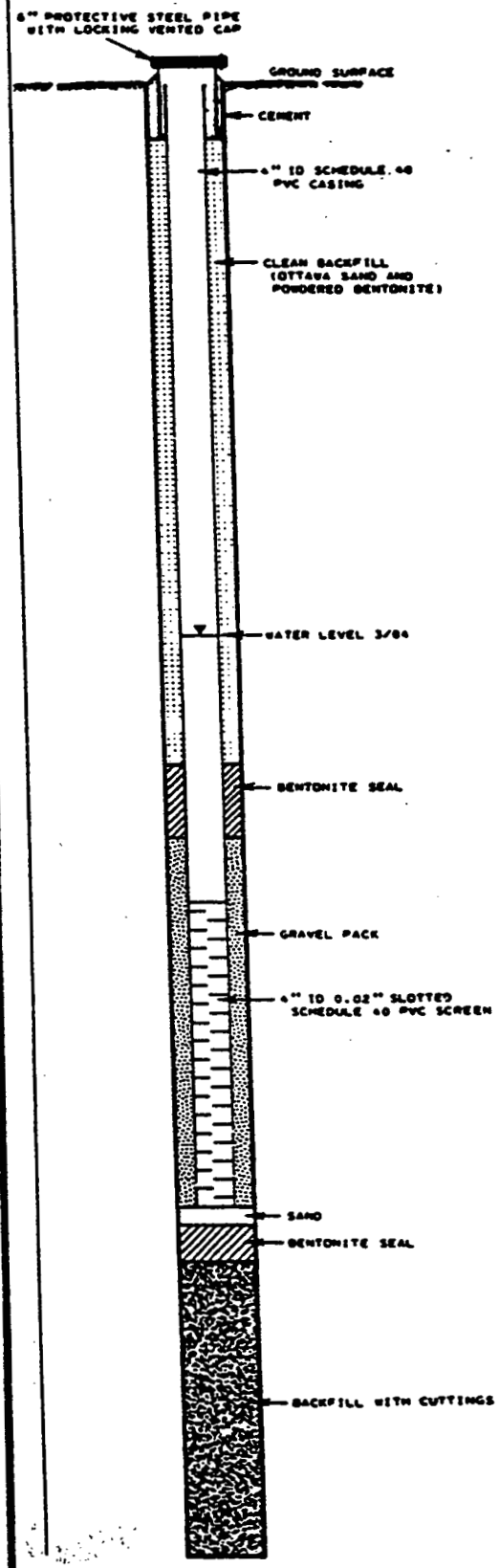
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS 3 BUCKETS BENTONITE ADDED IN AND AROUND PROTECTIVE WELL COVER.

000245

WELL SCHEMATICS

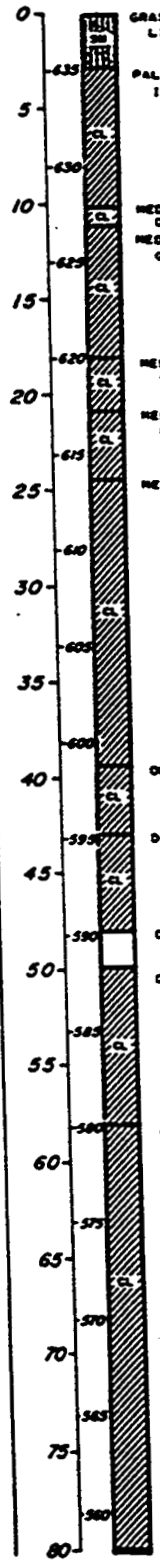
12D 1012



BORING 12

SURFACE ELEVATION 637.0'

DEPTH IN FEET | *ELEVATION IN FEET* | *GRAPHIC LOG* | *DESCRIPTIVE GEOLOGIC NOTES*



GRASS. SILTY SAND WITH UNDERLYING RIP-RAP LIMESTONE COBBLES

PALE OLIVE (10Y6/2) MASSIVE CLAY WITH SOME IRON STAINED FRACTURES

MEDIUM BLUISH-GRAY CLAY (5BG/1) MASSIVE, DENSE, DRY, NO FRACTURES

MEDIUM BLUISH-GRAY CLAY (5BG/1) WITH SOME GRAVEL, IRON OXIDE STAINING

MEDIUM BLUISH-GRAY CLAY (5BG/1) WITH SOME SAND

MEDIUM BLUISH-GRAY CLAY (5BG/1) MORE FRIABLE THAN ABOVE

MEDIUM BLUISH-GRAY CLAY (5BG/1), MASSIVE, VARVED, FRIABLE

OLIVE GRAY (5Y3/2) CLAY WITH SILT

DARK GREENISH-GRAY (5GY4/1) CLAY WITH THIN GRAVEL LENS (~1/4" THICK) OF IRON STAINED QUARTZ. A FEW SHALE FRAGMENTS 1/2" DIAMETER PRESENT

DRILL BIT CHATTERING, CUTTINGS SHOW LIMESTONE FRAGMENTS, POSSIBLE BOULDERS OR BEDROCK

DARK GREENISH-GRAY (5GY4/1) CLAY, VERY DENSE, THINLY BEDDED, DRY, ALMOST A SHALE

NO SAMPLE, SOFT GREENISH-GRAY SHALE

BORING TERMINATED AT A DEPTH OF 80 FEET

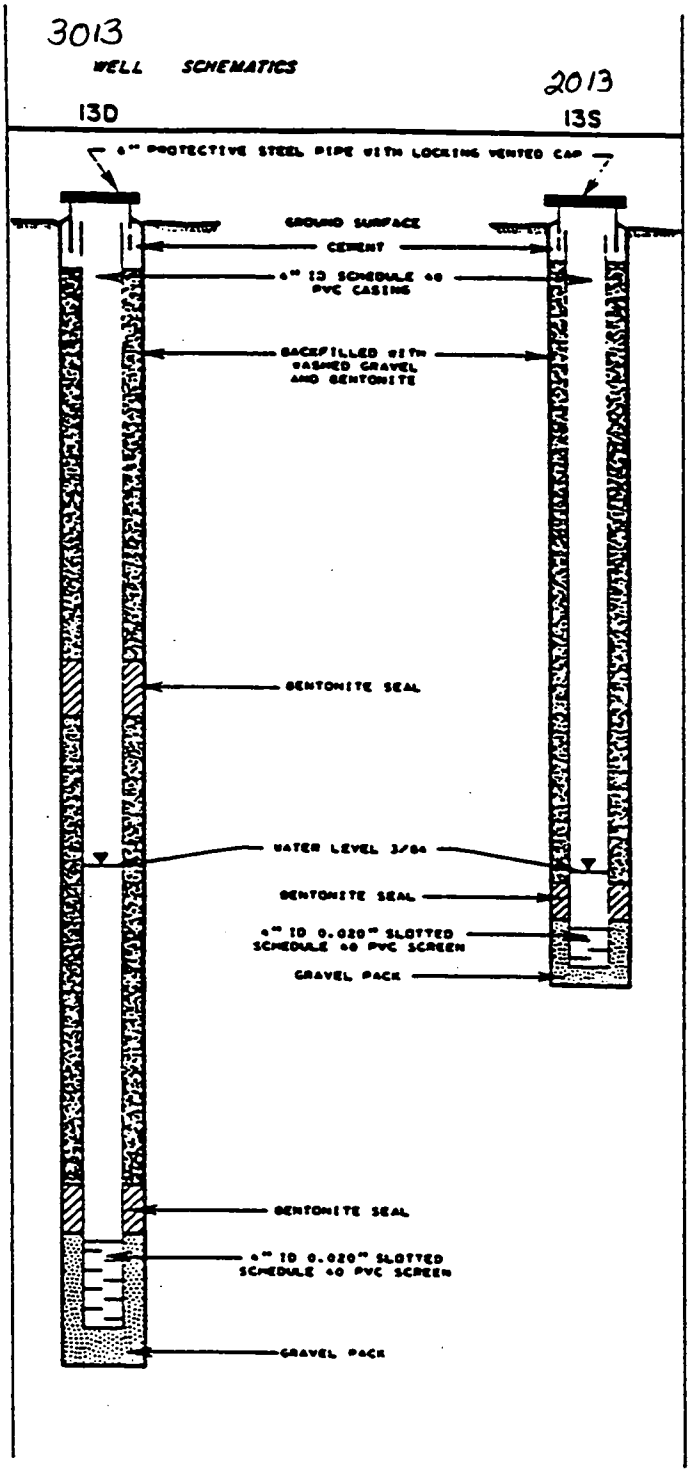
C00246

DAMES & MOORE

3013

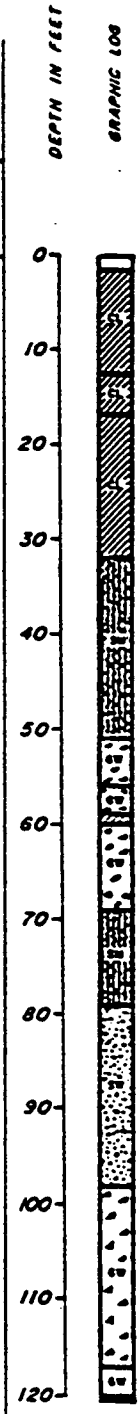
WELL SCHEMATICS

2013



BORING 13

SURFACE ELEVATION 13D 566.52'
13S 566.73'



DESCRIPTIVE GEOLOGIC NOTES

LIMESTONE RIP-RAP

OLIVE GRAY (5Y3/2) CLAY WITH SOME SILT. LESS THAN 1% GRAVEL. SLIGHT YELLOWISH OXIDATION PARTICLES IN UPPER 2", CLAY IS PLASTIC. DENSE

ALMOST PURE CLAY AS ABOVE. LITTLE TO NO SILT OR GRAVEL

OLIVE GRAY (5Y3/2) SILTY CLAY WITH UP TO 5% GRAVEL. LARGE FRAGMENTS OF LIMESTONE AND QUARTZ (UP TO 2" IN DIAMETER)

LIGHT OLIVE GRAY (5Y5/2) MEDIUM TO COARSE GRAINED, MOIST WELL SORTED SILTY SAND. GRAVEL UP TO 2%

COARSE GRAVEL (QUARTZ AND LIMESTONE FRAGMENTS)

BROWN CLAY

COARSE GRAVEL

SILTY SAND WITH SOME GRAVEL

SAND-GRAVEL

GRAVEL

COARSE GRAVEL

BORING TERMINATED AT A DEPTH OF 120.0' ON 2/6/85

000247

DAMES & MOORE

FERNALD RI/FS

	Initial	Date
Field Check	WAH	3-3-89
1st Key In		
2nd Key In		
Hard Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4013	COORDINATES:	DATE: 1-6-89
ELEVATION: ≈ 588.5 FT.	GWL: Depth Date/Time	DATE STARTED: 1-6-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89
DRILLING METHODS: CABLE TOOL SPEED STAR		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (WAH 3-3-89)
1	20499 1000 1-6	3 8 10	4	VERY STIFF, OLIVE YELLOW - BROWN, (2.5 Y 5/4) CLAY, HIGH PLASTICITY, WET TO MOIST.	CL	2.5	Hnu = BKg. α = BKg. βγ = 600 CPM
2 3	20500 1012 1-6	10 13 16	8	HARD, OLIVE YELLOW - GRAY, (5Y 5/4) CLAY, TRACE OF GRAVEL, HIGH PLASTICITY, MOIST.	CL	>4.0	Hnu = BKg. α = BKg. βγ = 450 CPM
4	20501 1020 1-6	14 17 21	8	VERY STIFF, GRAYISH BROWN, (2.5Y 5/2), CLAY, TRACE OF GRAVEL, HIGH PLASTICITY, MOIST.	CL	4.0	Hnu = BKg. α = BKg. βγ = 450 CPM
5 6	20502 1030 1-6	25 29 31	15	HARD, LIGHT OLIVE BROWN, (2.5Y 5/4), GRAVELLY CLAY, HIGH PLASTICITY, MOIST.	CL	>4.0	Hnu = BKg. α = BKg. βγ = 220 CPM
7	20503 1040 1-6	25 35 37	9	HARD, GRAYISH BROWN, (2.5Y 5/2), GRAVELLY CLAY, HIGH PLASTICITY, MOIST.	CL	>4.0	Hnu = BKg. α = BKg. βγ = 220 CPM
8 9	20504 1047 1-6	40 42 40	16	VERY STIFF, GRAY (5Y 4/1) CLAY, TRACE OF GRAVEL, HIGH PLASTICITY, MOIST.	CL	3.5	Hnu = BKg α = BKg βγ = 200 CPM
10	20505 1058 1-6	20 21 20	17	VERY STIFF, DARK GRAY, (5Y 4/1), CLAY, TRACE OF GRAVEL, HIGH PLASTICITY, MOIST.	CL	2.75	Hnu = BKg. α = BKg. βγ = 180 CPM
11 12	20506 1521 1-7	5 9 14	6	MEDIUM STIFF, GRAY, (2.5Y 5/0), CLAY, HIGH PLASTICITY, MOIST	CL	.75	Hnu = BKg α = BKg βγ = 240 CPM
13	20507 1534 1-7	4 5 8	8	STIFF, GRAYISH BROWN TO DARK GRAY, (10YR 4/1) CLAY, SOME COARSE SAND, MEDIUM TO HIGH PLASTICITY, MOIST.	CL	1.5	Hnu = BKg α = BKg βγ = 220 CPM
14	20508 1548 1-7	4 9 14	10	STIFF, GRAY, (10YR 5/1) CLAY, HIGH PLASTICITY, MOIST.	CL	1.5	Hnu = BKg. α = BKg. βγ = 200 CPM

NOTES:
1-6-89 PENN. DRILL CO.
1-7-89 DRILLER: Harry Dykes Jr.
ASSIST.: Jim Lang
MATERIALS
SAND: 22 (80 lb) bags 10/20
VOLCLAY GROUT: 49 bags (50 lb)
BENTONITE: NONE USED
WATER: 1500 GALS. DRILLING

Color WAH 3-3-89
SOIL DESCRIBED BY MUNSELL COLOR CHART AND SAMPLING FOLLOWED ASTM STD. PENE. TEST.
ELEVATION TAKEN FROM DAMES AND MOORE DATA SHEET. (TOP OF RISER PIPE)

(ON SURFACE) INSTRUMENT BACKGROUND
Hnu = 0.4 ppm
α = 0-5 CPM
βγ = 300-500 CPM
EXO TOX = 0-1 ppm LOL

1400 Gallons Grouting Total Water added = 2900 gallons
WAH 3-3-89

000248

402-

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4013	COORDINATES:		DATE: 01-08-89
ELEVATION: 588.5 Ft. Estimate	GWL: Depth	Date/Time	DATE STARTED: 01-06-89
ENGINEER/GEOLOGIST: E. Trollinger W.A. Hertel	Depth	Date/Time	DATE COMPLETED: 2-7-89
DRILLING METHODS: CABLE TOOL			PAGE 2 OF ~~15~~ 17

WAH 3-3-89

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.50 ft)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	20509 1555 1-7	5 8 14	10	Stiff, Gray (10 YR 5/1) Clay, Trace of Gravel, High to Medium plasticity, Moist	CL	2.0	Hnu = BG α = BG βγ = 180 cpm
17 18	20510 1605 1-7	6 9 11	15	Stiff, Gray (10YR 5/1) Clay, Trace of gravel, Medium to High Plasticity Moist	CL	2.0	Hnu = BG α = BG βγ = 180 cpm
19	20511 1615 1-7	5 11 12	10	Stiff, Brownish Gray (10 YR 5/2) Clay Trace of Gravel - 0.5 In. Medium Plasticity, Moist	CL	1.5	Hnu = BG α = BG βγ = 200 cpm
20 21	20512 0900 1-8	18 10 17	4	Medium Dense, Gray (10YR 5/1) Poorly Graded Gravel (0.25 In. Ave)	GP	N/A	Hnu = BG α = BG βγ = 250 cpm Low Recovery Due to gravel Blocking split spoon opening.
22	20513 0918 1-8	7 9 16	10	Very Stiff, Grayish Brown (10YR 5/2) Inorganic Clay, Trace of Gravel, Medium Plasticity, Moist.	CL	2.25	Hnu = BG α = BG βγ = 220 cpm
23 24	20514 0925 1-8	4 8 11	12	Stiff, Gray, (10 YR 5/1) Inorganic Clay, Trace of Gravel, Medium Plasticity, Moist	CL	1.2	Hnu = BG α = BG βγ = 220 cpm
25	20515 0931 1-8	7 7 12	12	Very Stiff, Gray (10 YR 5/1) Inorganic Clay, Trace of Gravel, Medium Plasticity, Moist	CL	2.0	Hnu = BG α = BG βγ = 220 cpm
26 27	20516 0941 1-8	4 7 11	10	Medium Stiff, Grayish Brown (10YR 5/2) Inorganic Clay, Trace of Gravel, Medium Plasticity, Moist.	CL	0.80	Hnu = BG α = BG βγ = 250 cpm
28	20517 1000 1-8	6 10 14	18	Medium Stiff, Grayish Brown (10YR 5/2) Inorganic Clay, Trace of Gravel Medium Plasticity, Moist	CL	0.80	Hnu = BG α = BG βγ = 250 cpm
29	20518 1007 1-8	7 14 18	14	Very Stiff, Grayish Brown (10 YR 5/2) Inorganic Clay, Trace of Gravel Medium Plasticity, Moist.	CL	2.5	Hnu = BG α = BG βγ = 250 cpm

NOTES:

Penn Drill Rig 1
Rig Type: Speedstar
Driller: Harry Dykes
Assistant: Jim Lang
BILL HERTEL SAT. 1-8-89

Instrument Background @ Surface

	01-07-89	01-08-89
Hnu =	0.4 ppm	0.4 ppm
α =	0-5 cpm	0-5 cpm
βγ =	300-500 cpm	300-500 cpm

SPM JAN 0 9 1989

000249

402-11-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4013	COORDINATES:	DATE: 1-9-89	
ELEVATION: ≈ 588.5	GWL: Depth Date/Time	DATE STARTED: 1-6-89	
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89	
DRILLING METHODS: CABLE TOOL '72 SPEEDSTAR		PAGE 3 OF ~~15~~ 11	

VAH 3-3-8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	20519 0947 1-9	11 10 13	8	VERY STIFF, OLIVE GRAY (5Y 5/2). SILTY CLAY, TRACE OF GRAVEL .25 IN - .5 IN, MED. PLASTICITY, MOIST.	CL	2.25	Hnu = BKg. α = BKg. βγ = 220 CPM
32 33	20520 1000 1-9	7 11 20	8	VERY STIFF, OLIVE GRAY (5Y 5/2) SILTY CLAY, MEDIUM PLASTICITY, MOIST.	CL	3.3	Hnu = BKg. α = BKg. βγ = 200 CPM
34	20521 1024 1-9	13 11 15	10	VERY STIFF, OLIVE GRAY TO GRAY, (5Y 5/2) SILTY CLAY, TRACE OF GRAVEL .25 IN - .5 IN, MED. TO HIGH PLASTICITY. MOIST.	CL	2.5	Hnu = BKg. α = BKg. βγ = 180 -200
TILL EXTENT → @ 34.5 FT 35 36	20522 1051 1-9	35 50 50/2 IN	6	VERY DENSE, BROWN (10YR 5/4) POORLY GRADED SAND, VERY LITTLE FINES, DRY.	SP	N/A	Hnu = BKg. α = BKg. βγ = 160 -180 CPM
37 38 39 40				SAMPLING AT 5 FT. INTERVALS HEREAFTER.			
41	20523 1500 1-9	28 40 43	12	VERY DENSE, YELLOWISH BROWN, (10YR 5/4) POORLY GRADED SAND, DRY TO MOIST.	SP	N/A	Hnu = BKg α = BKg βγ = 170 CPM
42 43 44							

NOTES: 1-9-89 / DRILLER: HARRY DYKES. ASSIST.: PETE MITTLIN

INSTRU. BKg. ON 1-9-89
Hnu = 0.6 ppm
α = 0-5 CPM
βγ = 180-220 CPM

000250

402-11

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4013	COORDINATES:	DATE: 1-9-89
ELEVATION: ≈588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89
ENGINEER/GEOLOGIST: E. TRELLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89
DRILLING METHODS: CABLE TOOL '72 SPEEDSTAR		PAGE 4 OF ~~15~~ 11

WAL 3-3-

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	20524 1613 1-9	50+/5"	5	VERY DENSE, BROWN (10YR 4/3). POORLY GRADED SAND, DRY.	SP	N/A	Hnu = BKG α = BKG βγ = ~~BKG~~ CT 160 CPM
47							
48							
49							
50							
51	10665 1633 1-9	21 35 40	12	VERY DENSE, LIGHT BROWN (10YR4/2) POORLY GRADED SAND, DRY.	SP	N/A	Hnu = BKG α = BKG βγ = 160 CPM
52							
53							
54							
55							
56	10666 0935 1-10	50+/4½ IN	4	VERY DENSE, BROWN, (10YR4/3), POORLY GRADED SAND, MOIST.	SP	N/A	Hnu = BKG. α = BKG. βγ = 160 CPM
57							
58							
59							

NOTES:

1-10-89 DRILLER: Harry Dykas Jr
ASSIST. Jim Lang

000251

INSTRU. BKG.
Hnu = 0.4 ppm
α = 0-5 CPM
βγ = 200 CPM

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMDC RI/FS		
BORING NUMBER: 4013	COORDINATES: 745 FT E.T.	DATE: 1-10-89	
ELEVATION: ≈588.5 FT	GWL: Depth ~~1406 FT~~ Date/Time 1-10-89 @ 1600	DATE STARTED: 1-6-89	
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 720 FT Date/Time 1-10-89 @ 1600	DATE COMPLETED: 2-7-89	
DRILLING METHODS: CABLE TOOL / 12" SPEED STAR 71.8 FT 2-7-89 @ 11:00		PAGE 5 OF ~~15~~ 1	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (WAH 3-3-8)
61	10668 1020 1-10	50+/5IN	5	VERY DENSE, BROWN, (10YR 4/2), GRAVELLY SAND, POORLY GRADED, SOME GRAVEL (.25IN-.5IN), MOIST.	SP	N/A	Hnu = BKG α = BKG βγ = 150 CPM
62							
63							
64							
65							
66	10668 1400 1-10	50+/5IN	4	VERY DENSE, LIGHT BROWN-GRAY, (10YR 4/2), POORLY GRADED SAND, MEDIUM TO FINE, MOIST ~~TO WET~~. E.T. 1-10-89	SP	N/A	Hnu = BKG. α = BKG. βγ = 160-180 CPM
67							
68							
69							
70							
71	10669 1445 1-10	44 42 36	8	VERY DENSE, DARK GRAYISH BROWN, (10YR 4/2), POORLY GRADED SAND, MOIST.	SP	N/A	Hnu = BKG. α = BKG. βγ = 120 CPM
72							
73							
74							
				WATER TABLE ELEV. 1-10-89			

2-7-89
2-1-89
1-10-89

NOTES:

1-10-89 PENN DRILL.
DRILLER: Harry Dykes
ASSIST.: Jim Kaung

INSTRU. BKG. 1-10-89
Hnu = 0.4 ppm
α = 0-5 CPM
βγ = 200 CPM

000252

402-1

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4013	COORDINATES:	DATE: 1-10-89 / 1-11/8	
ELEVATION: ≈588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89	
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89	
DRILLING METHODS: CABLE TOOL '72 SPEED STAR		PAGE 6 OF ~~15~~ 1	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (WAH 3-3-89)
76	10670 1556 1-10	21 32 50/4 IN	10	VERY DENSE, DARK BROWN (10YR 3/3), POORLY GRADED SAND, WET.	SP	N/A	H_{net} = BKG α = BKG $\beta\gamma$ = 140 CPM
77							
78							
79							
80							
81	10671 1620 1-10	50+/5 IN	4	VERY DENSE, DARK BROWN, (10YR 4/2) WELL GRADED, GRAVELLY SAND SOME GRAVEL .25-.5 IN, WET.	SW	N/A	H_{net} = BKG α = BKG $\beta\gamma$ = BKG - 160 BPM
82							
83							
84							
85							
86	10672 0930 1-11	46 50+/1 IN	6	VERY DENSE, DARK BROWN, (10YR 4/3), POORLY GRADED SAND, TRACE OF FINE GRAVEL .25 IN, WET.	SP	N/A	H_{net} = BKG α = BKG $\beta\gamma$ = 120 CPM
87							
88							
89							

NOTES:

DRILLER: Harry Dykes.
ASSIST.: Jim Lang

INSTRU. BKG.
H_{net} = 0.4 ppm
α = 0-5 CPM
$\beta\gamma$ = 200 CPM

000253

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4013	COORDINATES:	DATE: 1-11-89 / 1-17-8	
ELEVATION: ≈588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89	
DRILLING METHODS: Cable Tool		PAGE 7 OF ~~11~~ 1	

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10673 1030 1-11	28 27 25	12	VERY DENSE, DARK GRAYISH BROWN, (10YR 4/2), POORLY GRADED SAND, TRACE OF FINE GRAVEL (.25 IN), WET.	SP	N/A	Hmu = BKG α = BKG βγ = 100 CPM
92							
93							
94							
95							
96	10674 1045 1-17	50 50+/4 IN	8	VERY DENSE, DARK BROWN, (10YR 4/3) POORLY GRADED SAND, TRACE OF GRAVEL @ 95.5 FT (.25-1.0 IN) WET.	SP	N/A	Hmu = BKG α = BKG βγ = 90 CPM
97							
98							
99							
100							
101	10675 1340 1-17	2 5 9	7	MEDIUM DENSE, DRK GRAYISH BROWN (10YR 3/2) WELL GRADED SAND, TRACE OF GRAVEL (.25 IN - .5 IN) WET.	SW	N/A	Hmu = BKG α = BKG βγ = 100 CPM
102							
103							
104							

NOTES:

1-11-89 DRILLER: Harry Dykes Jr
ASSIST.: Jim Lang

1-17-89 DRILLER: Harry Dykes Jr. 000254
ASSIST.: Bob Yost

INSTRU. BKG. 1-11-89
Hmu = 0.4 ppm
α = 0-5 cpm
βγ = 180-200 cpm
BKG. SAME 1-17-89

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4013	COORDINATES:	DATE: 1-18-89
ELEVATION: ~588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89
DRILLING METHODS: CABLE TOOL '72 SPEED STAR		PAGE 8 OF 15

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	10676 0856 1-18	22 50+/5IN	7	VERY DENSE, DARK BROWN, (10YR 3/3), POORLY GRADED SAND, TRACE OF COARSE SAND AT 105.5 FT, WET.	SP	N/A	Hnu = BKg. α = BKg. βγ = 180 CPM
107							
108							
109							
110							
111	10677 1010 1-18	40 37 50	12	VERY DENSE, DARK BROWN, (10YR 3/3), POORLY GRADED SAND, TRACE OF GRAVEL, WET.	SP	N/A	Hnu = BKg. α = BKg. βγ = 120 CPM
112							
113							
114							
115							
116	10678 1118 1-18	21 27 50	10	VERY DENSE, DARK BROWN, (10YR 3/3). POORLY GRADED SAND, TRACE OF GRAVEL AT 115.5 FT., WET	SP	N/A	Hnu = BKg α = BKg βγ = 100-120 CPM
117							
118							
119							

NOTES:
1-18-89 DRILLER: Harry Dykas Jr.
ASSIST.: Bob Yonts

INSTRU. BKg. 1-17-89
Hnu = 0.4 ppm
α = 0-5 CPM
βγ = 180-200 CPM
BKg SAME AS ABOVE 1-18-89 E.T.

000255

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4013	COORDINATES:	DATE: 1-18-89	
ELEVATION: ~588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89	
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89	
DRILLING METHODS: CABLE TOOL '72 SPEED STAR		PAGE 9 OF 15	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (WAH 3-3-8)
121	10679 1400 1-18	28 29 22	10	VERY DENSE, DARK BROWN, (10YR 3/3) WELL GRADED GRAVEL, SOME SAND COARSE TO MEDIUM, WET.	GW	N/A	Hnu = BKG. α = BKG. βγ = 120 CPM
122							
123							
124							
125							
126	10680 1515 1-18	50+ 4IN	3	VERY DENSE, DARK GRAYISH BROWN, (10YR 4/2), GRAVELLY SAND, WELL GRADED, WET.	SW	N/A	Hnu = BKG. α = BKG. βγ = 100-110 CPM. LOW [illegible] DUE TO GRAVEL
127							
128							
129							
130							
131	10681 1620 1-18	7 11 11	8	MEDIUM DENSE, DARK BROWN, (10YR 3/3), POORLY GRADED SAND, TRACE OF GRAVEL (.25-.50 IN), WET.	SP	N/A	Hnu = BKG α = BKG βγ = 100 CPM
132							
133							
134							

NOTES:

1-18-89 DRILLER: Harry Dykes
ASSIST.: Bob. Yost

INSTRU. BKG.
1-18-89 Hnu = 0.4 PPM
α = 0.5 CPM
βγ = 180 CPM

000256

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4013	COORDINATES:	DATE: 1-19-89 / 1-23-89	
ELEVATION: ~588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89	
ENGINEER/GEOLOGIST: E. TRALINGER	Depth Date/Time	DATE COMPLETED: 2-7-89	
DRILLING METHODS: CABLE TOOL 12 SPEED STAR		PAGE 10 OF 17	

WAH 3-3-89

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	10682 1415 1-21-89	17 50 50(4 in)	10	Very dense, Dark gray brown (10yr 4/2) Gravelly sand, well graded, wet	SW	N/A	Hrm = Bkg α = Bkg. βγ = 280 cpm
137							
138							
139							
140							
141	10683 1515 1-21	5 22 42	6	Very dense, dark gray brown (10yr 4/1) Poorly sorted sand, trace gravel. wet	SP	N/A	Hrm = Bkg α = Bkg βγ = 180
142							
143							
144							
145							
146	10684 1107 1-23	45 47 50/4in	12	VERY DENSE, GRAYISH BROWN, (10YR 4/2) POORLY GRADED SANDY GRAVEL (.25 IN - .5 IN), WET.	GP	N/A	Hrm = Bkg. α = Bkg βγ = 120-140 cpm
147							
148							
149							

NOTES: Driller: Harry Dykes
Assist. Bob Yost

Lorrie Adams / GEOLOGIST FOR 1-21-89, 2 SAMPLES.

000257

1/21/89

Instru Bkg
H_{Air} = .2 ppm
α = 0 cpm
βγ = 200 cpm - 280 cpm

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4013	COORDINATES:	DATE: 1-23-89
ELEVATION: ~588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89
ENGINEER/GEOLOGIST: E. TRELLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89
DRILLING METHODS: CABLE TOOL		PAGE 11 OF ~~15~~ 17

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (WAH 3-3-89)
151	10685 1345 01-23	50+ / 4in	4	VERY DENSE, GRAYISH BROWN, (10YR 4/2) WELL GRADED SANDY GRAVEL, WET.	GW	N/A	Hmu = BKG. α = BKG. βγ = 90-100 CPM
152							
153							
154							
155							
156	10686 1525 01-23	17 20 19	12	DENSE, GRAYISH BROWN, (10YR 3/2) WELL GRADED GRAVELLY SAND (.25-.50 IN) GRAVEL, WET.	SW	N/A	Hmu = BKG. α = BKG. βγ = 90-100 CPM
157							
158							
159							
160							
161	10687 1600 01-23	5 6 12	8	MEDIUM DENSE, DARK BROWN, (10YR 3/3) POORLY GRADED SAND, TRACE OF GRAVEL (.25-.50 IN), WET.	SP	N/A	Hmu = BKG. α = BKG. βγ = 100 CPM
162							
163							
164							

NOTES: DRILLER: Harry Dykes
ASSIST: Robert Yost

000258

INSTRU. BKG.
Hmu = 0.6 ppm
α = 0 cpm
βγ = 180-200 cpm

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4013	COORDINATES:	DATE: 1/24/89
ELEVATION: ~588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89
DRILLING METHODS: CABLE TOOL 172 SPEED STAR		PAGE 12 OF ~~15~~ 17

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
166	10688 0933 01-24	17 23 23	8	DENSE, DARK BROWN (10YR 3/3) POORLY GRADED SAND, TRACE OF GRAVEL (.25-.50 IN) @ 166.5, WET.	SP	N/A	Hmu = BKg. α = BKg. βγ = 100 CPM
167							
168							
169							
170							
171	10689 1013 01-24	5 7 12	6	MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED SAND, TRACE OF FINE GRAVEL (.25-.50 IN), WET	SP	N/A	Hmu = BKg α = BKg βγ = 90-100 CPM
172							
173							
174							
175							
176	10690 1441 01-24	19 29 27	10	VERY DENSE, DARK BROWN, (10YR 3/3) POORLY GRADED SAND, MEDIUM TO COARSE, WET.	SP	N/A	Hmu = BKg. α = BKg. βγ = 90-100 CPM
177							
178							
179							

NOTES:
1-24-89

DRILLER: Harry Dykes Jr.
ASSIST.: Robert Yost

INSTRU. BKg. 1-24-89
Hmu = 0.6 ppm
α = 0 CPM
βγ = 160 CPM

000259

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4013	COORDINATES:	DATE: 1-24-89 / 1-25-89
ELEVATION: ~ 588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 3-7-89
DRILLING METHODS: CABLE TOOL		PAGE 13 OF 15 17

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
181	10691 1535 01-24	17 19 50	8	VERY DENSE, BROWN (10YR 4/3) POORLY GRADED FINE SAND, WET.	SP	N/A	Hnu = BKG α = BKG. βγ = 100 CPM
182							
183							
184							
185							
186	10692 0943 01-25	12 50+ / 5 IN	8	VERY DENSE, GRAYISH BROWN (10YR 4/2) POORLY GRADED SAND, TRACE OF GRAVEL @ 186.5 (.75-1.0 IN), WET.	SP	N/A	Hnu = BKG. α = BKG. βγ = 100 CPM
187							
188							
189							
190							
191	10693 1014 01-25	4 7 12	8	MEDIUM DENSE, BROWN, (10YR 4/2) POORLY GRADED SAND, TRACE OF FINE GRAVEL (.25 IN), WET	SP	N/A	Hnu = BKG α = BKG. βγ = 100 CPM
192							
193							
194							

NOTES:

DRILLER: Harry Dykes.
ASSIST.: Robert Yost.

INSTRU. BKG.

1-24-89 Hnu = 0.6 ppm
α = 0 cpm
βγ = 160 cpm

1-25-89 Hnu = .4 ppm
α = 0 cpm βγ = 150 CPM

000260

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4013	COORDINATES:	DATE: 1-25-89
ELEVATION: ~588.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 1-7-89
DRILLING METHODS: CABLE TOOL		PAGE 14 OF ~~15~~ 17

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (WAH 3-3-89)
196	10694 1307 01-25	7 8 8	10	MEDIUM DENSE, BROWN (10YR 4/3) POORLY GRADED SAND, WET.	SP	N/A	Hnu = BKG. α = BKG. βγ = 100 CPM
197							
198							
199							
200							
201	10695 1400 01-25	8 17 46	12	VERY DENSE, BROWN, (10YR 4/3), POORLY GRADED SAND, MEDIUM GRAINED, WET.	GP	N/A	Hnu = BKG. α = BKG. βγ = 90 CPM
202							
203							
204							
205							
206	10696 1623 01-25	17 25 32	6	VERY DENSE, BROWN, (10YR 4/3) POORLY GRADED SANDY GRAVEL, (.25-.50IN), WET	GP	N/A	Hnu = BKG α = BKG βγ = 90 CPM
207							
208							
209							

NOTES:

DRILLER: HARRY DYKES JR.
ASSIST.: BOB YOST

INSTRU. BKG. 1-25-89
Hnu = 0.4 ppm
α = 0 CPM
βγ = 160 CPM

000261

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4013	COORDINATES:	DATE: 1-26-89 / 1-31-89
ELEVATION: ~558.5 FT	GWL: Depth Date/Time	DATE STARTED: 1-6-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-7-89
DRILLING METHODS: CABLE TOOL		PAGE 15 OF 17

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
211	10697 1000 01-26	12 23 33	6	VERY DENSE, LIGHT BROWN (10YR 4/4) POORLY GRADED SAND, WET.	SP	N/A	Hnu = BKG α = BKG. βγ = 100 CPM
212							
213							
214							
215							
216	10698 1000 01-31	12 27 50	15	VERY DENSE, BROWN, (10YR 4/3) POORLY GRADED SAND, WET.	SP	N/A	Hnu = BKG α = BKG βγ = 100 CPM
217							
218							
219							
220							
221	10699 1115 01-31	50+ 2 IN	2	VERY DENSE, BROWN, (10YR 4/3), WELL GRADED GRAVEL, SOME SAND, WET.	GW	N/A	Hnu = BKG. α = BKG. βγ = 100 CPM
222				BEDROCK @ 222.5 FT			
223							
224							

NOTES:

DRILLER: Harry Dykes Jr.
ASSIST.: Robert Yost

INSTRU. BKG. 1-26-89 1-31-

Hnu = 0.6 ppm
α = 0 CPM
βγ = 180 CPM

000262

FERNALD RI/FS

Field Check	WAH	3-3-89
1st Keyin		
2nd Keyin		
Hard Copy Verification		

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. E. TROUNGER DATE 2-7-89
PROJECT NO. 102 TASK 3.2.1 CHECKED BY W.A. Hertel DATE 3-3-89
BORING NO. 4013
PIEZOMETER NO. 4013 DATE OF INSTALLATION 1-6-89 TO 2-7-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 222.5 FT.
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN ID FROM 0.0 TO 222.5
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN ~~[X]~~ WAH 3-3-89
AVERAGE SIZE OF PERFORATIONS 0.01 IN.
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4.0 IN.
LENGTH OF PIPE SECTIONS 2 FT, 10 FT, 11.5 screen + silt trap
JOINING METHOD SCREW TYPE THREADED FLUSH JOINTED.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10.75 IN.

OTHER PROTECTION RISER PROTECTIVE PIPE LOCKING LID WITH INSTALLED PADLOCK

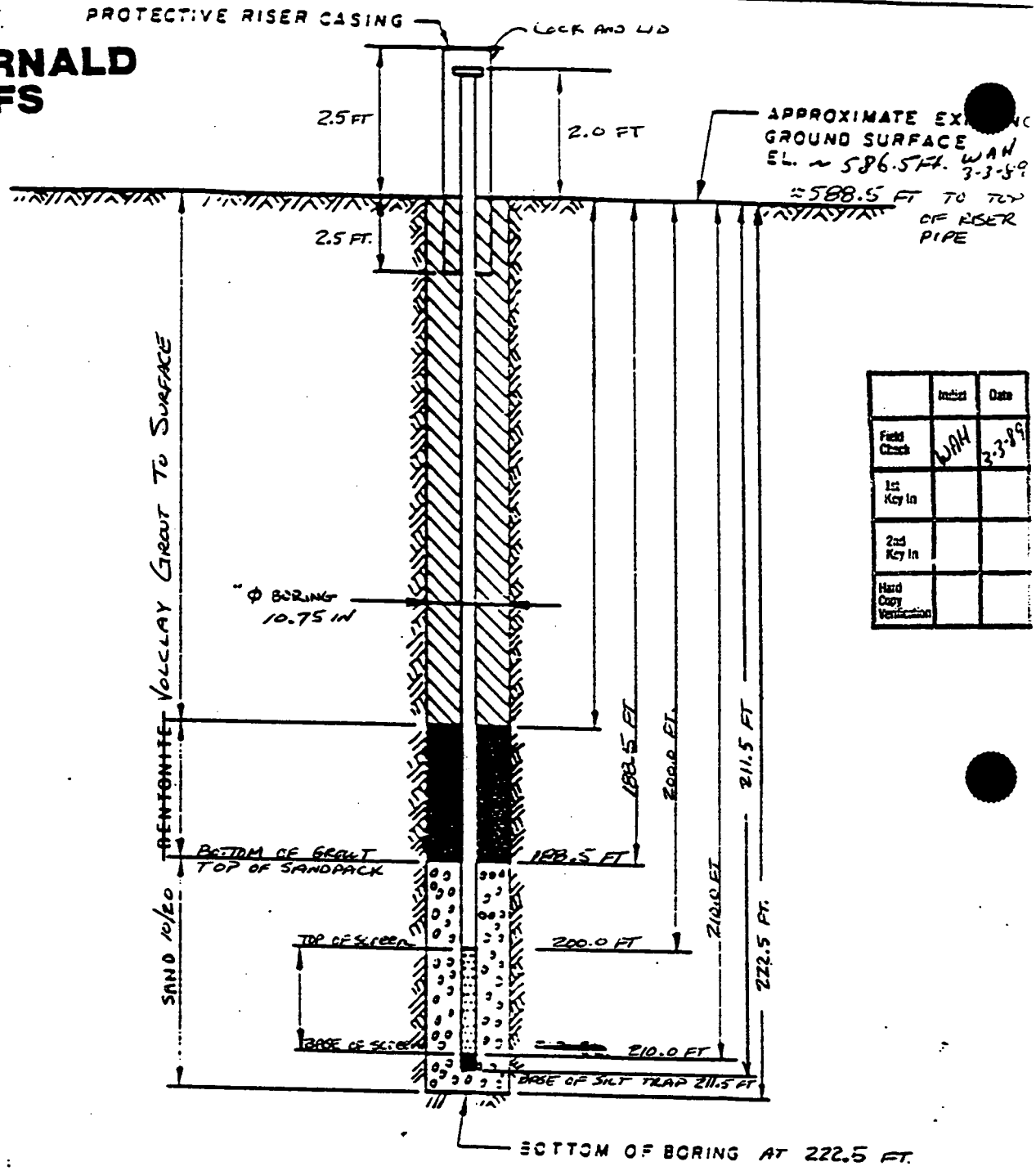
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT / ~~SLURRY~~	TOP 0.0	BOTTOM 188.5	TOP	BOTTOM
~~BENTONITE~~ N/A ON 4000 SERIES	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND 10/20	TOP 188.5	BOTTOM 222.5	TOP	BOTTOM
~~GRAVEL~~ ONLY SAND USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 200.0	BOTTOM 210.0	TOP	BOTTOM
PIEZOMETER TIP	211.5			
BOTTOM OF BOREHOLE	222.5			
GWL AFTER INSTALLATION	71.8			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [✓]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [✓]
REMARKS WELL DEVELOPMENT WILL DEVELOP THE WELL BEFORE INSTALLATION OF PIEZOMETER IS ENTIRELY COMPLETE.

000263

409-

FERNALD RI/FS



	Initial	Date
Field Check	WAH	3-3-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWN BY	2-7-89	CHECKED BY	WAH	3-3-89	DRAWING NUMBER
	E.T.	APPROVED BY	3		

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.-SILT TRAP 1.5 FT (WELDED)
4. ELEVATION OF WATER LEVEL 74.5 FT 1-10-89
5. WATER LEVEL READING ON 72.0 FT 2-1-89
   71.8 FT 2-7-89

MATERIALS USED:

SAND: 22 BAGS (80 lb) 10/20

VOLCLAY GROUT: 47 BAGS (50 lb.)

BENTONITE PELLETS: NONE USED

WATER: 1500 GALLONS DRILLING
1460 GROUTING.

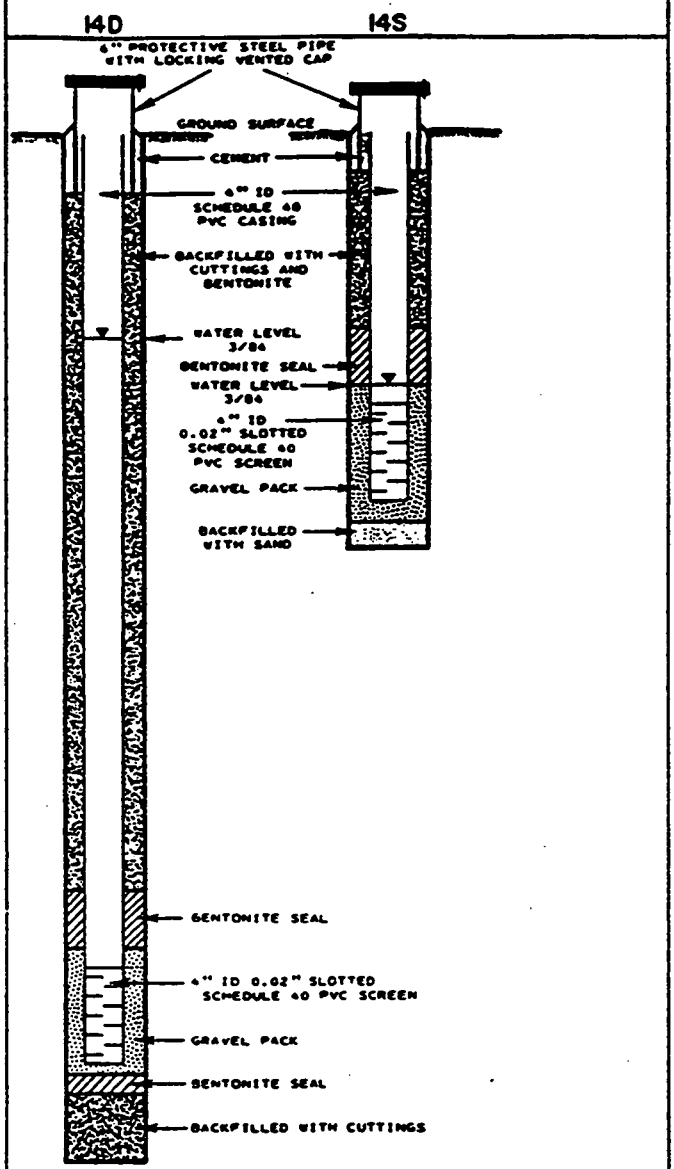
INSTALLATION DETAILS
MONITORING WELL
MW-4013
PREPARED FOR

MONITORING WELL INSTALLATION 1-6-89 TO 2-7-89

Started Drilling and Sampling 1-6-89. Hole Cover emplaced 2-7-89. (WAH 3-3-89)

000264

3014 WELL SCHEMATICS 2014



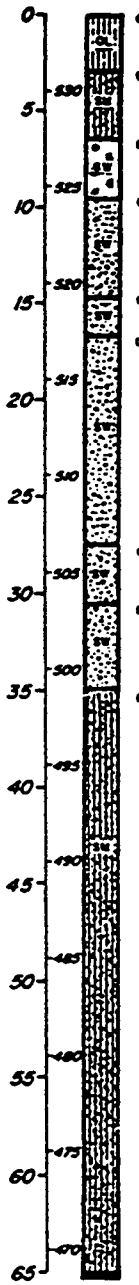
BORING 14

5709

SURFACE ELEVATION 14D 533.71'
14S 533.79'

DEPTH IN FEET
ELEVATION IN FEET
GRAPHIC LOG

DESCRIPTIVE GEOLOGIC NOTES



GRASS OVER SILTY LOAM

OLIVE GRAY (5Y3/2) SILTY SAND WITH UP TO 10% GRAVEL, BLEACHED CLAY PODS PRESENT

OLIVE BROWN (5Y4/4) COARSE GRAVEL IN MEDIUM SAND MATRIX

OLIVE BROWN (5Y4/4) MEDIUM TO COARSE GRAINED SAND, 3-10% GRAVEL

OLIVE BROWN (5Y4/4) FINE TO MEDIUM GRAINED SAND, LESS THAN 1% GRAVEL

OLIVE BROWN (5Y4/4) MEDIUM TO COARSE SAND WITH UP TO 3% GRAVEL

CONTAINS SEVERAL LARGE (1.5" DIAMETER) PEBBLES OF LIMESTONE AND QUARTZ

OLIVE BROWN (5Y4/4) COARSE SAND WITH SOME GRAVEL

OLIVE BROWN (5Y4/4) COARSE SAND WITH SILT, LESS THAN 1% GRAVEL

BORING TERMINATED AT A DEPTH OF 65.0' ON 8/10/84

000265

DAMES & MOORE

FERNALD RI/FS

	Initial	Date
Field Check	[illegible]	12/12/88
1st Key In		
2nd Key In		
Final Check		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4014	COORDINATES:	DATE: 10-27-88
ELEVATION: 534.5 CONC.	GWL: Depth Date/Time	DATE STARTED: 10-26-88
ENGINEER/GEOLOGIST: E. THOLLINGER M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				INTERVAL 0.0 FT TO 22.5 PREVIOUSLY SAMPLED IN BORING #1014. BASE OF TILL @ 5.3 FT.. RIG UP ON LOCATION #4014 ON 10-26-88. COMMENCE DRILLING ACTIVITIES ON 10-27-88. SAMPLING TO COMMENCE @ 25.0 FT IN BORING #4014			
2							
3							
4							
5							
6							
7				SARAH BATTELLE KRIS HEMLEIN			
8							
9							
10							
11							
12							
13							
14				000266			

NOTES: CONTRACTOR: PENN DRILL
RIG: 72 STRATOSTAR
DRILLER: HARRY DYKES JR.
ASSISTANT: JOE BARICE

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST.
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 LEL O_2 = 0 PPM LEL
α = 0.5 CPM = 20.5 % O_2
$\beta\gamma$ = 50-60 CPM

WATER ADDED TO HOLE 140 GAL

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4014	COORDINATES:	DATE: 11-01-88
ELEVATION: 534.5	GWL: Depth Date/Time	DATE STARTED: 10-26-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16							
17							
18							
19							
20							
21							
22							
23							
24							
25	10325	15		DGWSE, DK YELLOW-BROWN (10YR 4/2)			HNU = 0 PPM
26	0952	21	12	WELL ~~SORTED~~ GRADED GRAVELLY SAND, SOME SILT, WET	SW	N/A	α = 0.5 CPM
	11-01	25		SOME GRAVEL (.25 - .50 in)			BKG = 40-60 CPM
27							
28							
29							

NOTES:

000267

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4014	COORDINATES:	DATE: 11-01-88
ELEVATION: 534.5	GWL: Depth Date/Time	DATE STARTED: 10-26-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TO		PAGE 3 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	10386 1108 11-01	10 10 9	10	MEDIUM DENSE DK OLIVE-BROWN (10YR 4/2) WELL GRADED GRAVEL SAND MIXTURE (GRAVEL .25-1.0 IN) WET 31.2	GW	GOOD N/A	HNU = 0 PPM α = 0-5 CPM BG = 40-60 CPM
32				MEDIUM DENSE DK OLIVE-BROWN (10YR 3/2) POORLY GRADED GRAVELLY SAND, WET	SP	SP	
33							
34							
35	10387 1405 11-01	15 17 18	14	DENSE Y-B (10YR 5/3) WELL GRADED GRAVEL SAND MIXTURE (GRAVEL .25 - 1.0 IN) WET.	GW	N/A	HNU = 0 PPM α = 0-5 CPM BG = 40-60 CPM
36							
37							
38							
39							
40	10388 1455 11-01	20 16 17	9	MEDIUM DENSE Y-B (10YR 5/3) WELL GRADED GRAVEL SAND MIXTURE (GRAVEL .25 - 1.0 IN) WET	GW	N/A	HNU = 0 PPM α = 0-5 CPM BG = 40-60 CPM
41							
42							
43							
44							

NOTES:

000268

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4014	COORDINATES:	DATE: 11-01-88
ELEVATION: 574.5	GWL: Depth Date/Time	DATE STARTED: 10-26-88
ENGINEER/GEOLOGIST: M. SLUGARSKI	Depth Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10391 1615 11-01	18 30 28	12	U. DENSE Y-B (10YR 5/3) WELL GRADED GRAVEL SAND MIXTURE (FR COARSE GRAVEL .5-1.0 IN) WET	GW	N/A	HNU = 0 PPM α = 0.5 CPM Bβ = 40-60 CPM
47							
48							
49							
50							
51	10390 0930 1102	15 8 8	10	MEDIUM DENSE, Y-B (10YR 4/2) POORLY GRADED GRANULAR SAND, WET	SW	N/A	HNU = 0 PPM α = 0.5 Bβ = 30 CPM
52							
53							
54							
55	~~10390~~ 10391 1020 11-02	15 19 24	15	DENSE, Y-B (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0.5 Bβ = 30 CPM
57							
58							
59							

NOTES:

000269

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4014	COORDINATES:	DATE: 11-02-88
ELEVATION: 534.5	GWL: Depth Date/Time	DATE STARTED: 10-26-88
ENGINEER/GEOLOGIST: M. SWIMSKI	Depth Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	~~10391~~ 10392 1100 11-02	3 5 7	10	MEDIUM DENSE, Y-B (10 YR 4/2) WELL GRADED SAND (SOME 1/4" GRAVEL), WET.	SW	N/A	Hnu = 0 ppm α = 0-5 cpm Bδ = 30 cpm
62							
63							
64							
65	~~10392~~ 10393 1355 11-02	13 24 25	15	DENSE, Yellow Brown (10 YR 4/4) POORLY GRADED SAND, SOME GRAVEL 3/8"-1/4"). WET.	SP	N/A	Hnu = 0 ppm α = 0-5 cpm Bδ = 20 cpm
66							
67							
68							
69							
70	~~10393~~ 10394 1700 11-02	50/3"	3	VERY DENSE, DARK yellow brown, (10 YR 3/2), WELL GRADED GRAVEL (FINE TO COARSE), WET.	GW	N/A	Hnu = 0 ppm α = 0-5 cpm Bδ = 30 cpm
71							
72							
73							
74							

NOTES:
- WIRE 6" SHEET
- RUNNING CLOTH CLOTH
- ALUMINUM NOTE BOOK
- PENTOMETER
- LEATHER WORK GLOVES
- HANDMAT LINERS

000270

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/RS		
BORING NUMBER: 4014	COORDINATES:		DATE: 11-03-88
ELEVATION: 534.5	GWL: Depth	Date/Time	DATE STARTED: 10-26-88
ENGINEER/GEOLOGIST: M.S., E.T.	Depth	Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TOOL			PAGE 6 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10395 0900 11-03	17 19 15	10	DENSE, yellow BROWN, (10 YR 4/3) WELL GRADED SAND, LITTLE FINES, WET.	SW	N/A	Hw = 0 ppm α = 0-5 cpm βγ = 30 cpm
77							
78							
79							
80	10396 0930 11-03	6 7 14	6	MEDIUM DENSE, yellowish BROWN, (10 YR 4/3) POORLY GRADED SAND, VERY LITTLE FINES, WET.	SP	N/A	Hw = 0 ppm α = 0-5 cpm βγ = 20 cpm
81							
82							
83							
84							
85	10397 1100 11-03	9 15 20	9	DENSE, DARK BROWN (10 YR 3/3) POORLY GRADED SAND, VERY LITTLE FINES, WET.	SP	N/A	Hw = 0 ppm α = 0 cpm βγ = 30 cpm
86							
87							
88							
89							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 40M	COORDINATES:		DATE: 11-03-88
ELEVATION: 534.5	GWL: Depth	Date/Time	DATE STARTED: 10-26-88
ENGINEER/GEOLOGIST: E.T.	Depth	Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TOOL			PAGE 7 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10398 1200 11-03	8 12 13	18	MEDIUM DENSE, yellowish brown, (10 YR 4/3), WELL GRADED SAND, SOME GRAVEL (.25-.50 in.), WET.	SW	N/A	H_{NU} = 0 ppm α = 0-5 cpm β γ = 20 cpm
92							
93							
94							
95	10399 1645 11-03	30 50/5"	10	VERY DENSE, yellowish brown, (10 YR 4/3), WELL GRADED GRAVEL, FINE, WET.	GW	N/A	H_{NU} = 0 ppm α = 0-5 cpm β γ = 20 cpm
96							
97							
98							
99							
100	10400 0915 11-06	50 39 50	10	VERY DENSE, LIGHT BROWNISH GRAY, (10 YR 6/2) WELL GRADED GRAVEL, FINE GRAVEL RANGE, WET.	GW	N/A	H_{NU} = 0 ppm α = 0-5 cpm β γ = 10-20 cpm
101							
102							
103							
104							

NOTES:

000272

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4014	COORDINATES:	DATE: 11-06-88	
ELEVATION: 534.5	GWL: Depth Date/Time	DATE STARTED: 10-26-88	
ENGINEER/GEOLOGIST: E.T.	Depth Date/Time	DATE COMPLETED: 11-8-88	
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 11	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	10401 1152 11-06	50/6"	4	VERY DENSE, LIGHT BROWNISH GRAY (10 YR 6/2), WELL GRADED GRAVEL, COARSE TO FINE RANGE, WET.	GW	N/A	H_{NU} = 0 ppm α = 0-5 cpm $\beta\gamma$ = 20 cpm
107							
108							
109							
110							
111	10402 0845 11-07	16 14 12	6	MEDIUM DENSE, yellowish BROWN, (10 YR 5/3), POORLY ~~SORTED~~ GRADED SAND, TRACE OF FINE GRAVEL, WET.	SP	N/A	H_{NU} = 0 ppm α = 0 cpm $\beta\gamma$ = 10-20 cpm
112							
113							
114							
115							
116	10403 1002 11-07	15 30 30	10	VERY DENSE, BROWN, (10 YR 4/2) POORLY GRADED SAND, PREDOMINANTLY MEDIUM TO FINE GRAINED, WET	SP	N/A	H_{NU} = 0 ppm α = 0-5 cpm $\beta\gamma$ = 20 cpm
117							
118							
119							

NOTES:

000273

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4014	COORDINATES:	DATE: 11-7-88	
ELEVATION: 534.5 ft.	GWL: Depth Date/Time	DATE STARTED: 10-26-88	
ENGINEER/GEOLOGIST: EVERETT T.	Depth Date/Time	DATE COMPLETED: 11-8-88	
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 11	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	10404 1110 11-07	6 7 8	8	MEDIUM DENSE, yellowish BROWN, (10 YR 4/3), POORLY GRADED SAND, WET.	SP	N/A	H_{NU} = 0 ppm α = 0 cpm $\beta\gamma$ = 10-20 cpm
122							
123							
124							
125							
126	10405 1505 11-07	20 50/5"	8	VERY DENSE, yellowish BROWN, (10 YR 4/3), POORLY GRADED SAND, WET.	SP	N/A	H_{NU} = 0 ppm α = 0-5 cpm $\beta\gamma$ = 10-20 cpm
127							
128							
129							
130							
131	10406 1535 11-07	10 16 50/5"	10	VERY DENSE, yellowish BROWN, (10 YR 4/3), POORLY GRADED SAND, SOME GRAVEL (1/4" SIZE), WET.	SP	N/A	H_{NU} = 0 ppm α = 0-5 ppm $\beta\gamma$ = 20 cpm
132							
133							
134							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 401A	COORDINATES:	DATE: 11-8-88
ELEVATION: 534.5	GWL: Depth Date/Time	DATE STARTED: 10-26-88
ENGINEER/GEOLOGIST: E.T.	Depth Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	10407 0850 11-08	11 25 29	8	VERY DENSE, BROWN, (10YR 4/3), WELL GRADED SAND, SOME FINE GRAVEL (.25"), WET.	SW	N/A	H_{NU} = 0 ppm α = 0-5 ppm $\beta\gamma$ = 20 CPM
137							
138							
139							
140							
141	10408 1000 11-08	8 13 13	6	MEDIUM DENSE, BROWN (10YR 3/3) POORLY GRADED SAND, VERY LITTLE GRAVEL (.25"), WET.	SP	N/A	H_{NU} = 0 ppm α = 0-5 CPM $\beta\gamma$ = 20 CPM
142							
143							
144							
145							
146	10409 1406 11-08	23 50/2"	4	VERY DENSE, LIGHT BROWN (10YR 5/3), WELL GRADED GRAVEL, (.25"-.50"), WET.	GW	N/A	H_{NU} = 0 ppm α = 0-5 CPM $\beta\gamma$ = 20 CPM
147							
148							
149							

NOTES:

FERNALD RI/FS

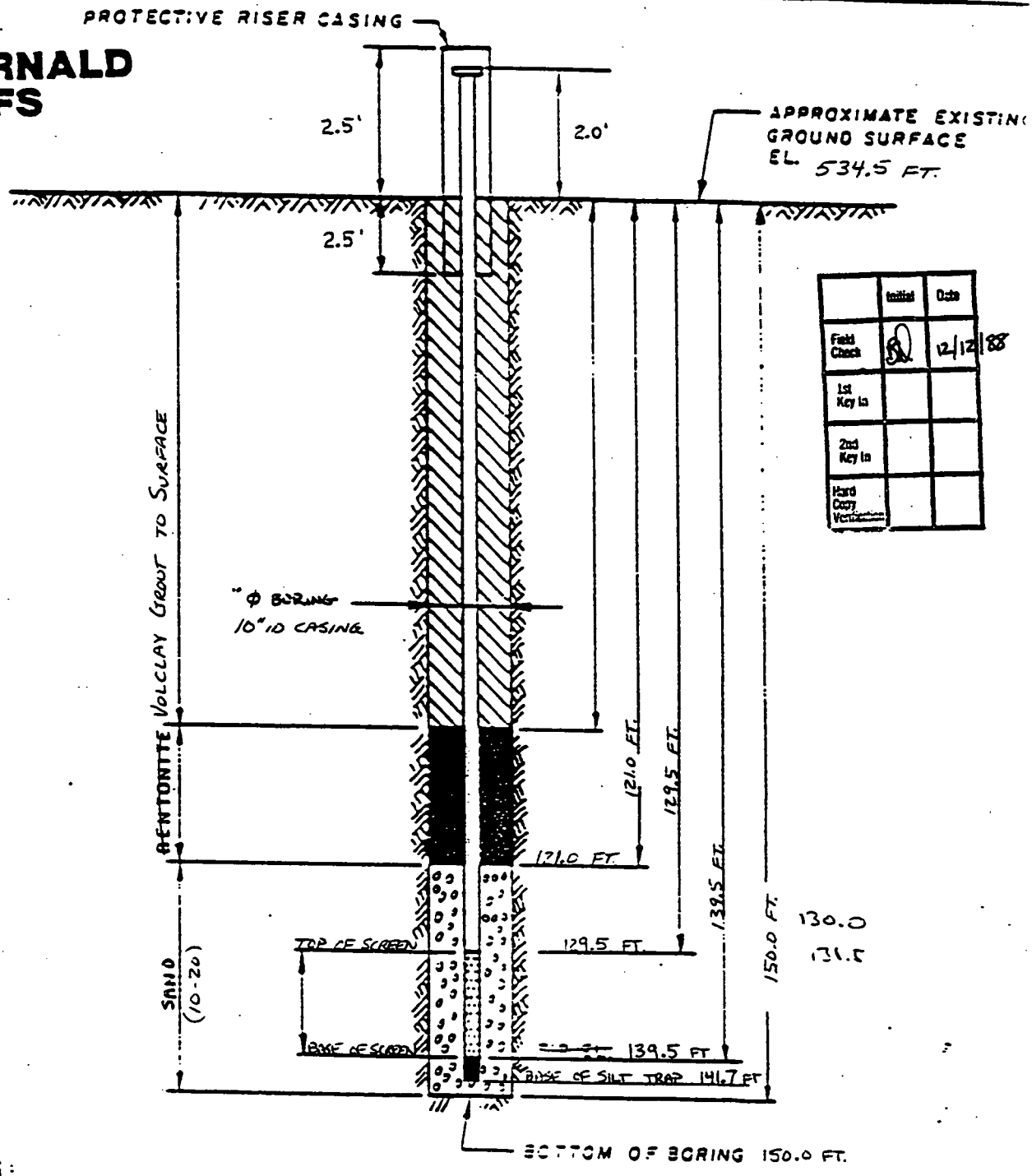
VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 4014	COORDINATES:		DATE: 11/8/88
ELEVATION: 534.5	GWL: Depth	Date/Time	DATE STARTED: 10/26/88
ENGINEER/GEOLOGIST: E.T.	Depth	Date/Time	DATE COMPLETED: 11-8-88
DRILLING METHODS: CABLE TOOL			PAGE 11 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	10410 1625 11-08	50/2"		BEDROCK, GREY LIMESTONE BOTTOM OF BOREHOLE 150.0 FT.			
152				BEDROCK AT 150.0 ft. ~~SAMPLER STOPPED AT 150.2 ft.~~ E.T. 11-8-88			
153							
154							
155							
156				LAST SAMPLE TAKEN FROM INTERVAL 145.0'-146.5'			
157							
158							
159							
160							

NOTES:

FERNALD RI/FS



	Initial	Date
Field Check		12/12/88
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWING NUMBER	CHECKED BY	APPROVED BY	DRAWN BY
			E.T.

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED:

19 BAGS OF 10-20 80lb SACKS SAND
950 GALLONS WATER USED DURING DRILLING
450 GALLONS WATER FOR GROUTING → 1400 GALLONS TOTAL
34 BAGS VOLCLAY GROUT USED (50 lb. SACK).
EXCESS GROUT USED TO FILL HOLE ≈ 15' BELOW SURFACE.

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
BORING # 4014 11-9-88

000277

FERNALD RI/FS

	Field Check	1st Rev'n	2nd Rev'n	Rev'n
Date	12/12/88			
Initial				

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. E. TROLLINGER DATE 11-9-88
PROJECT NO. 602 3.2 CHECKED BY B. Dunning DATE 12/12/88
BORING NO. 4014
PIEZOMETER NO. 4014 DATE OF INSTALLATION 11-9-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 ft. TO 150.0 ft.
FLUID ____ FROM ____ TO ____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT TO 150.0 FT.
SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 10 ft.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4.0"
LENGTH OF PIPE SECTIONS 10 ft, 2 ft, 12 ft.
JOINING METHOD SCREW TYPE, THREADED FLUSH JOINTED.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.
PROTECTIVE PIPE O.D. 10 3/4"

OTHER PROTECTION LOCKING LID

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 Ft. BD. 12/12/88			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 Ft. BD. 12/12/88			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY VOLCLAY	TOP 0.0 FT.	BOTTOM 121.0 FT.	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND (10-20)	TOP 121.0 FT.	BOTTOM 150.0 FT	TOP	BOTTOM
GRAVEL	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 129.5 ET. ~~130.0~~ FT.	BOTTOM 139.5 ET. ~~140.0~~ FT.	TOP	BOTTOM
PIEZOMETER TIP	141.7 FT.			
BOTTOM OF BOREHOLE	150.0 FT			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS 000278

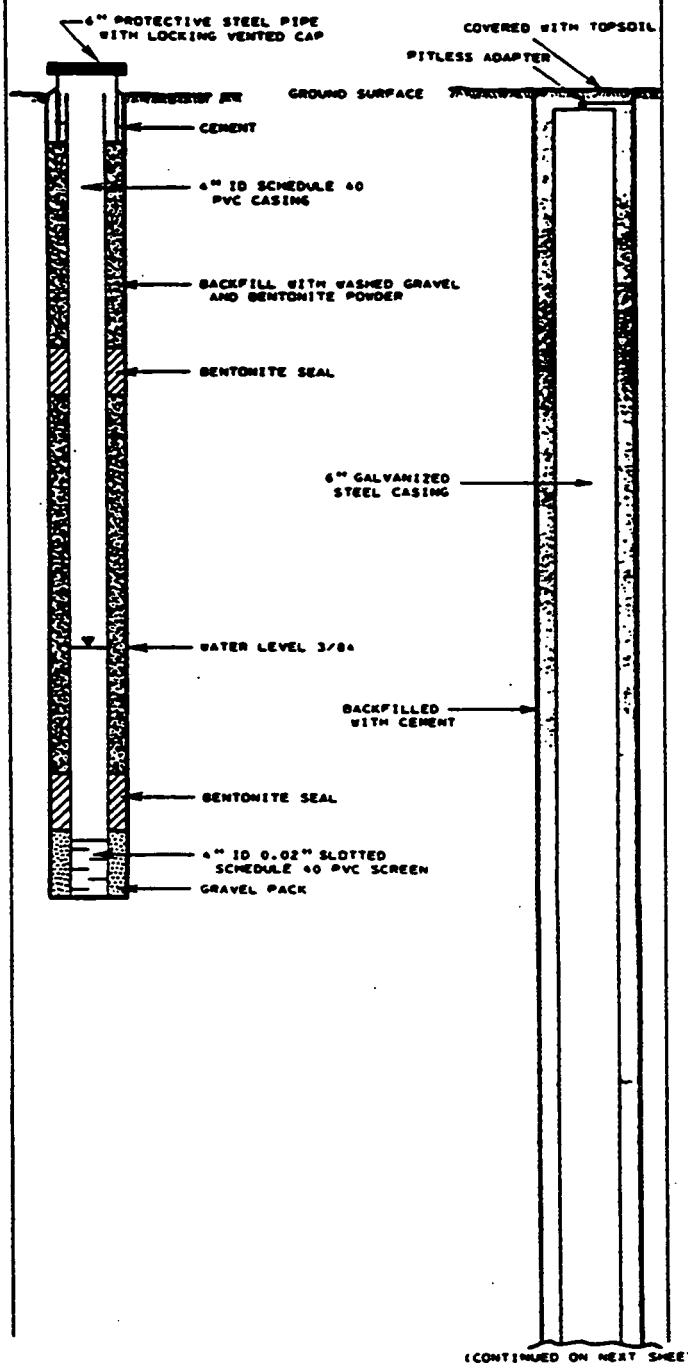
409-11.

BORING 15

SURFACE ELEVATION 15S 579.41'
15D 577.60'

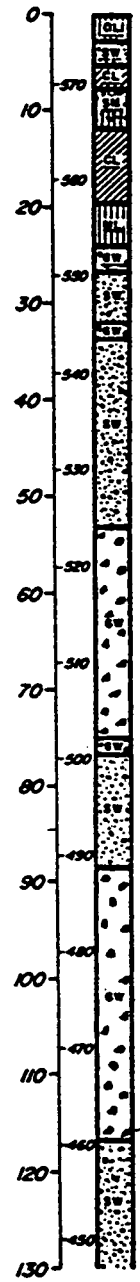
2015 WELL SCHEMATICS 4015

15S 15D



(CONTINUED ON NEXT SHEET)

DEPTH IN FEET | ELEVATION IN FEET | GRAPHIC LOG | DESCRIPTIVE GEOLOGIC NOTES



CLAYEY LOAM TOPSOIL

MEDIUM TO FINE GRAINED SAND

LIGHT OLIVE BROWN (5Y5/6) SILTY CLAY WITH IRON STAINS AND BLEACHED PODS

LIGHT OLIVE BROWN (5Y5/6) SILTY SAND AND SANDY SILT, WELL GRADED

GRAYISH OLIVE (10Y4/2) MASSIVE LENSE OF SILTY CLAY WITH SOME GRAVEL (UP TO 5-7%)

DENSE DRY CLAYEY SILT

MEDIUM TO COARSE GRAVEL

LIGHT OLIVE BROWN (5Y5/6) COARSE SAND WITH SOME GRAVEL (QUARTZ AND LIMESTONE FRAGMENTS)

GRAVEL WITH SOME CLAY

OLIVE BROWN (5Y5/6) MEDIUM TO COARSE SAND WITH SOME GRAVEL

COARSE WELL SORTED GRAVEL, LESS THAN 1% SILT OR CLAY

LIGHT OLIVE BROWN SANDY GRAVEL

LIGHT OLIVE BROWN GRAVELLY SAND

LIGHT OLIVE BROWN GRAVEL WITH SOME SAND

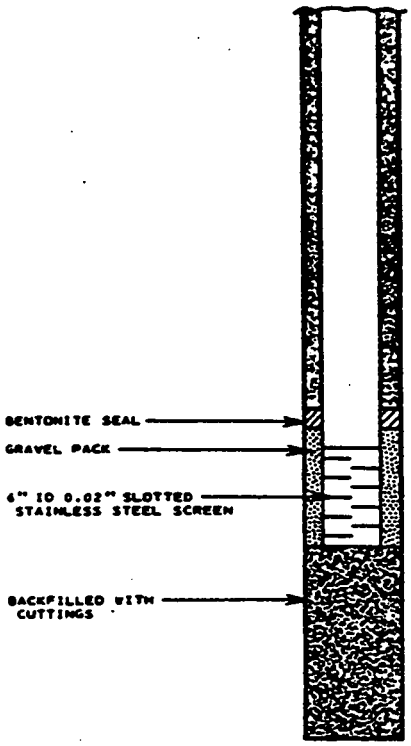
GRAYISH-BROWN GRAVELLY SAND

BORING 15

WELL SCHEMATICS

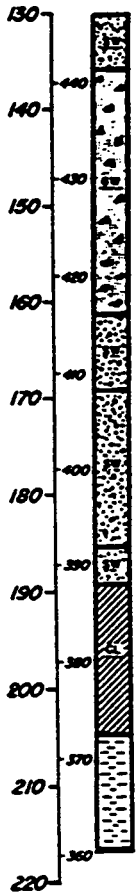
4015 (cont.)

15D (CONTINUED)



DEPTH IN FEET / ELEVATION IN FEET / GRAPHIC LOG

DESCRIPTIVE GEOLOGIC NOTES



GRAYISH-BROWN GRAVELLY SAND

GRAVEL WITH SOME SAND

GRAVELLY SAND

OLIVE GRAY SAND WITH UP TO 10% GRAVEL
SAND, NO GRAVEL

SAND, NO GRAVEL

GRAY CLAY GRADING INTO GREENISH-BLACK ("BLUE CLAY") SILTY CLAY, LARGE COBBLES ON TOP OF CLAY LAYER

SHALE

BORING TERMINATED AT A DEPTH OF 217.0' ON 8/9/84

000280

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~3015~~ 3015	COORDINATES:	DATE: 3/18/88
ELEVATION: ~ 573'	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 6in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	08700	3 7 6	13	Med. St.ff, V. Dark Grayish Brown (10YR 3/2) Silty Clay, trace Sand moist. 1.0 Med. St.ff, Dark Yellowish Brown (10YR 4/4) Clay, some Silt, moist. 1.5	CL	1.6	t = 1455 Hnu = 0ppm α = 2cpm r/β = 50cpm
2.5	08701	2 10 6	12	Med. St.ff, Dark Yellowish Brown (10YR 4/6), Clay, Some Silt, Moist 3.0	CL	1.8	t = 1515 Hnu = 0ppm α = 2cpm r/β = 40cpm
	08702	9 10 13	13	Medium Stiff, Yellowish Brown (10YR 5/6), Clay, Moist. 4.5	CL	1.2	t = 1525 Hnu = 0ppm α = 2cpm r/β = 40cpm
5.0	08703	24 38 30	18	Hard, Yellowish Brown (10YR 5/4), Silty Clay; Moist. 6.0	CL	>4.5	t = 1535 Hnu = 0ppm α = 2ppm r/β = 40cpm End Shift 3/19/88
	08704	15 14 12	15	Hard, Brownish Yellow (10YR 6/6) Silty Clay, Moist. 7.5	CL	>4.5	t = 0845 Hnu = 0ppm α = 2cpm r/β = 40cpm Perched Water Zone
7.5	08705	13 20 19	18	Very St.ff, Yellowish Brown (10YR 5/6) Silty Clay, wet. 9.0	CL	3.0	t = 0905 Hnu = 0ppm α = 2cpm r/β = 50cpm
	08706	4 7 7	14	Med. St.ff, Yellowish Brown (10YR 5/6), Silty Clay, some sand, wet. 10.0 Med. Dense, Dark Yellowish Brown (10YR 4/4), Silty, Fine Sand, some clay, wet. 10.5	CL SM	1.0	t = 0925 Hnu = 0ppm α = 2cpm r/β = 40cpm
10.0	08707	8 12 16	18	Very St.ff, Dark Gray (7.5YR 4/0), Fine Sandy Silt, some clay, trace gravel, moist. 12.0	ML	3.0	t = 0940 Hnu = 0ppm α = 2cpm r/β = 40cpm
12.5	08708	3 7 9	12	Very St.ff, Gray (7.5YR 5/0) Clayey Silt, some Sand, trace gravel, moist 13.5	ML	2.7	t = 1000 Hnu = 0ppm α = 2cpm r/β = 50cpm
15.0	08709	5 15 8	14	Medium Stiff, Grayish Brown (2.5Y 5/2), Sandy Silt, some gravel and clay. Moist 15.0	ML	1.5	t = 1017 Hnu = 0ppm α = 2cpm r/β = 40cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Driller: Joe Barile
Helper: Tim Vandine
Rig: 72 Speedstar

Water Used During Drilling = 1375 gallons
Soil Sampling as per ASTM
Color Descriptions as per Munsell
Field Measurements: Hnu, β/α

000281

402-11-8

ALD
FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/19/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0							
	08710	15 20 25	18	Hard, Dark Gray (5Y 4/1), Clay, some fine to coarse gravel, moist 16.5	CL	>4.5	t = 1028 Hau = 0ppm α = 2cpm γ/β = 60cpm
17.5	08711	15 22 24	18	Hard, Dark Gray (5Y 4/1), Clay, some gravel, moist 18.0	CL	4.0	t = 1050 Hau = 0ppm α = 2cpm γ/β = 50cpm
	08712	11 8 13	5	Hard, Gray (5Y 5/1), Gravelly Clay, moist 19.5	CL	4.0	t = 1456 Hau = 0ppm α = 2cpm γ/β = 60cpm
20.0	08713	5 7 10	13	Very Stiff, Dark Gray (5Y 4/1) Gravelly Clay, some sand. moist 21.0	CL	3.5	t = 1545 Hau = 0ppm α = 2cpm γ/β = 60cpm
	08714	4 8 13	2	Dark Gray (5Y 4/1) Gravelly Clay. moist 22.5	CL		t = 1605 Hau = 0ppm α = 2cpm γ/β = 60cpm Gravel plugged sampler
22.5	08715	6 16 35	17	Hard, Dark Gray (5Y 4/1), Gravelly Clay, moist. 23.5	CL	4.0	t = 1633 Hau = 0ppm α = 2cpm γ/β = 40cpm
				Very Stiff, Brown (7.5 YR 5/6) Clayey Silt, moist. 24.5	ML	3.5	
25.0	08716	20 35 45	13	Dense, Yellow (10 YR 7/6), Gravelly Sand, Poorly Sorted, trace silt, moist. 25.5	SP		t = 1658 Hau = 0ppm α = 2cpm γ/β = 60cpm
27.5							
30.0							

NOTES:

C00282

402-11-86

ALD
FS

5709

VISUAL CLASSIFICATION OF SOILS

JECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
RING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/20/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	08717	32 36 31	16	Very Dense, Brownish Yellow (10YR 6/6), Gravelly Sand, poorly sorted with trace silt, Moist.	SP		t = 0824 Hnu = 0ppm α = 2 cpm γ/β = 50 cpm
32.5							
35.0	08718	30 51/3"	9	Very Dense, Yellowish Brown (10YR 5/6), Sand, poorly sorted with some gravel and trace silt. Moist	SP		t = 1556 Hnu = 0ppm α = 1cpm γ/β = 50cpm
37.5							
40.0	08719	11 20 29	18	Very Dense, Yellowish Brown (10YR 5/6). Sand, poorly sorted, trace fine to coarse gravel and silt. Moist.	SP		t = 1629 Hnu = 0ppm α = 1cpm γ/β = 50cpm
42.5							
45.0							

NOTES:

000283

402-11-86

ALD
FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald R1/FS	
BORING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/21/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45.0							
	08720	50 50/2"	8	Very Dense, Brownish Yellow (10YR 6/6), Gravelly Sand, poorly sorted fine sand to coarse gravel, trace silt, Moist.	SP		t: 0858 Hau: 0ppm α: 1cpm γ/β: 50cpm
47.5							
50.0							
	08721	24 51/5"	9	Very Dense, Very Pale Brown (10YR 7/3), Sand, poorly sorted with some gravel, trace silt, Moist.	SP		t: 1000 Hau: 0ppm α: 1cpm γ/β: 40cpm
52.5							
55.0							
	08722	30 50/5"	9	Very Dense Light Yellowish Brown, Gravelly Sand, poorly sorted, trace silt, Moist	SP		t: 1105 Hau: 0ppm α: 1cpm γ/β: 40cpm
57.5							
60.0							

NOTES:

000284

402-11-86

ALD
FS

5709

VISUAL CLASSIFICATION OF SOILS

JECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
ORING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/21/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60.0	08723	17 29 39	12	Very Dense, Dark Yellowish Brown (10YR 4/4), Sand, poorly sorted with some gravel, trace silt, ~~Moist~~ wet.	SP		t: 1503 Hau: 0ppm α: 1cpm γ/β: 60cpm
62.5							
65.0	08724	14 27 38	18	Very Dense, Yellowish Brown (10YR 5/4), Sand, some gravel, trace silt, wet	SP		t: 1707 Hau: 0ppm α: 2cpm γ/β: 40cpm
67.5							
70.0	08725	5 11 12	13	Medium Dense, Dark Yellowish Brown (10YR 4/4), Sand, some gravel, trace silt, wet.	SP		t: 0845 3/22/88 Hau: 0ppm α: 1cpm γ/β: 40cpm
72.5							
75.0							

NOTES:

000285

402-11-8

ALD
FS

VISUAL CLASSIFICATION OF SOILS

OJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
ORING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/22/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75.0							
76.2							76.2
77.5	08726	5 8 5	8	Medium Dense Dark Yellowish Brown (10YR 4/4) Sand with Some gravel, trace silt, wet.	SP		t: 1056 Hnu: 0ppm α: 0cpm γ/β: 40cpm 77.7
							Sampler Continued to Fall After Hammering (Blow Sand)
80.0	08727	8 11 11	10	Medium Dense, Dark Yellowish Brown (10YR 4/4) Gravelly Sand, trace silt, wet.	SP		t: 1432 Hnu: 0ppm α: 1cpm γ/β: 40cpm
82.5							
85.0	08728	44 50/4"	5	Very Dense, Yellowish Brown (10YR 5/4) Sand with some gravel, trace silt, wet	SP		t: 1614 Hnu: 0ppm α: 1cpm γ/β: 40cpm
87.5							
90.0							

NOTES:

000286

402-11-86

ALD
FS

5709

VISUAL CLASSIFICATION OF SOILS

JECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
DRING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/23/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90.0	08729	48 41 25	12	Very Dense, Dark Yellowish Brown (10YR 4/4) Sand with some gravel, trace silt, wet.	SP		t: 0727 Hau: 0ppm α: 0cpm γ/β: 40cpm
92.5							
95.0		5 6 6	0	No Recovery			t: 1415 Blow sand not in situ After sampling sand continued to rise to 90'
97.5							
100.0	08730	10 12 14	6	Medium Dense, Yellowish Brown (10YR 5/4) Sand with some gravel, trace silt, wet	SP		t: 0750 3/24/88 Hau: 0ppm α: 1cpm γ/β: 40cpm
102.5							
105.0							

NOTES:

000287

402-11-86

ALD
FS

VISUAL CLASSIFICATION OF SOILS

JECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
DRING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/28/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105.0	08731	22 50 50/5"	13	V. Dense, Dark Yellowish Brown (10YR 4/4), Gravelly Sand, trace silt, wet.	SP		t: 0955 Hnu: 0ppm α: 0cpm γ/β: 40cpm
107.5							
110.0	08732	4 6 16	8	Loose, Dark Yellowish Brown (10YR 4/4) Sand with some gravel, trace silt, wet. 111.0	SP		t: 1056 Hnu: 0ppm α: 0cpm γ/β: 40cpm
				Medium Dense, Dark Gray (10YR 4/1) Sand with trace gravel and silt, wet	SP		
112.5							
115.0	08733	34 46 34	14	Very Dense, Dark Gray (10YR 4/1) Sand with some gravel and silt wet.	SP		t: 1318 Hnu: 0ppm α: 0cpm γ/β: 40cpm
117.5							
120.0							

NOTES:

000288

402-11-8

ALD
/FS

5709

VISUAL CLASSIFICATION OF SOILS

OJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/28/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120.0	08734	9 19 14	12	Dense. Dark Gray (10YR 4/1) Fine Sand, some silt, trace gravel. wet	SP		t = 1408 Hm = 0ppm α = 0cpm β/γ = 80 cpm
122.5							
125.0	08735	6 9 12	16	Medium Dense, Dark Gray (10YR 4/1) Sand, fine to medium poorly sorted. trace silt and gravel wet.	SP		t = 1533 Hm = 0 ppm α = 0cpm β/γ = 40cpm
127.5							
130.0	08736	6 12 16	13	Medium Dense, Dark Gray (10YR 4/1) Sand, fine to medium poorly sorted, trace silt and gravel, wet	SP		t = 1658 Hm = 0ppm α = 0cpm β/γ = 40 cpm
132.5							
135.0							

NOTES:

000289

402-11-86

ALD
/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~315~~ 3015	COORDINATES:	DATE: 3/29/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135.0	08737	3 14 25	15	Dense, Dark Gray (10 YR 4/1) Sand trace gravel and silt, wet	SP		t: 0823 Hnu: 0ppm a: broken β/β: 40cpm
137.5				END OF BORING			

NOTES:
12 Bags Coarse Sand
30 Bags Volclay
2 Buckets ~~[illegible]~~
Screened 115 - 125 Ft.

402-11-8

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. DAVIES DATE 3/31/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. ~~315~~ 3015
PIEZOMETER NO. ~~315~~ 3015 DATE OF INSTALLATION 3/29/88 to 3/31/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT Steel
DRILLING FLUID (S) USED: 1375 gallon	CASING SIZE (S) USED:
FLUID H_2O FROM _____ TO _____	SIZE 10" FROM 0 TO 135'
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4.375" I.D. 4"
SLOTS ☒ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 Ft
AVERAGE SIZE OF PERFORATIONS 0.01"	JOINING METHOD Screw wrench tight
TOTAL PERFORATED AREA 10 Ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft.	OTHER PROTECTION _____
PROTECTIVE PIPE O.D. 10.75"	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.2			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.8			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 111.5	BOTTOM .5	TOP	BOTTOM
BENTONITE	TOP 0	BOTTOM .5	TOP	BOTTOM
SAND	TOP 136.5	BOTTOM 111.5	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 115.0	BOTTOM 125.0	TOP	BOTTOM
PIEZOMETER TIP	127.0			
BOTTOM OF BOREHOLE	136.5			
GWL AFTER INSTALLATION	Not measured			

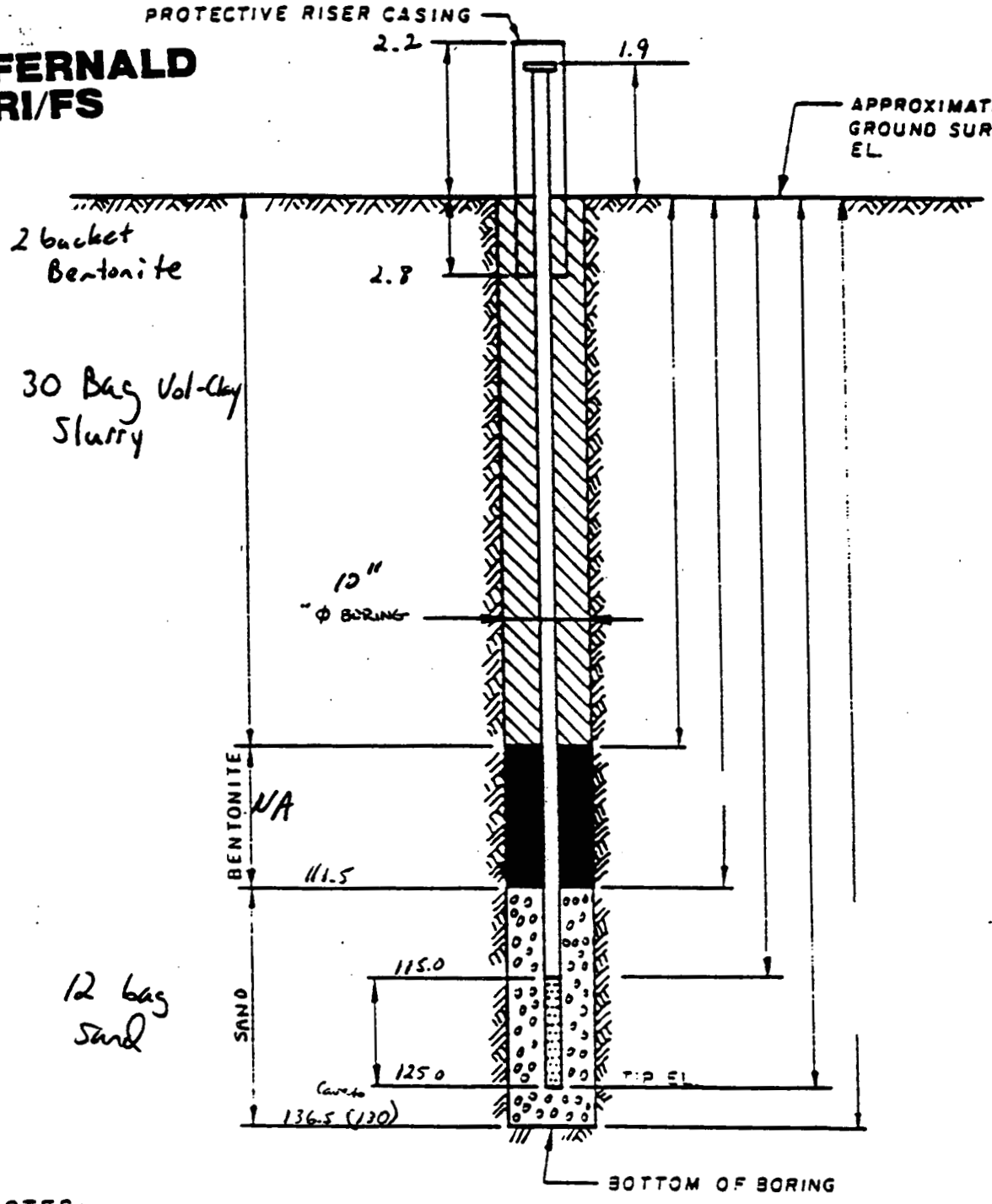
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS _____

000291

409-11-8

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~315~~ 3015

PREPARED FOR

Boring #3015 by B. Davies 3/31/88

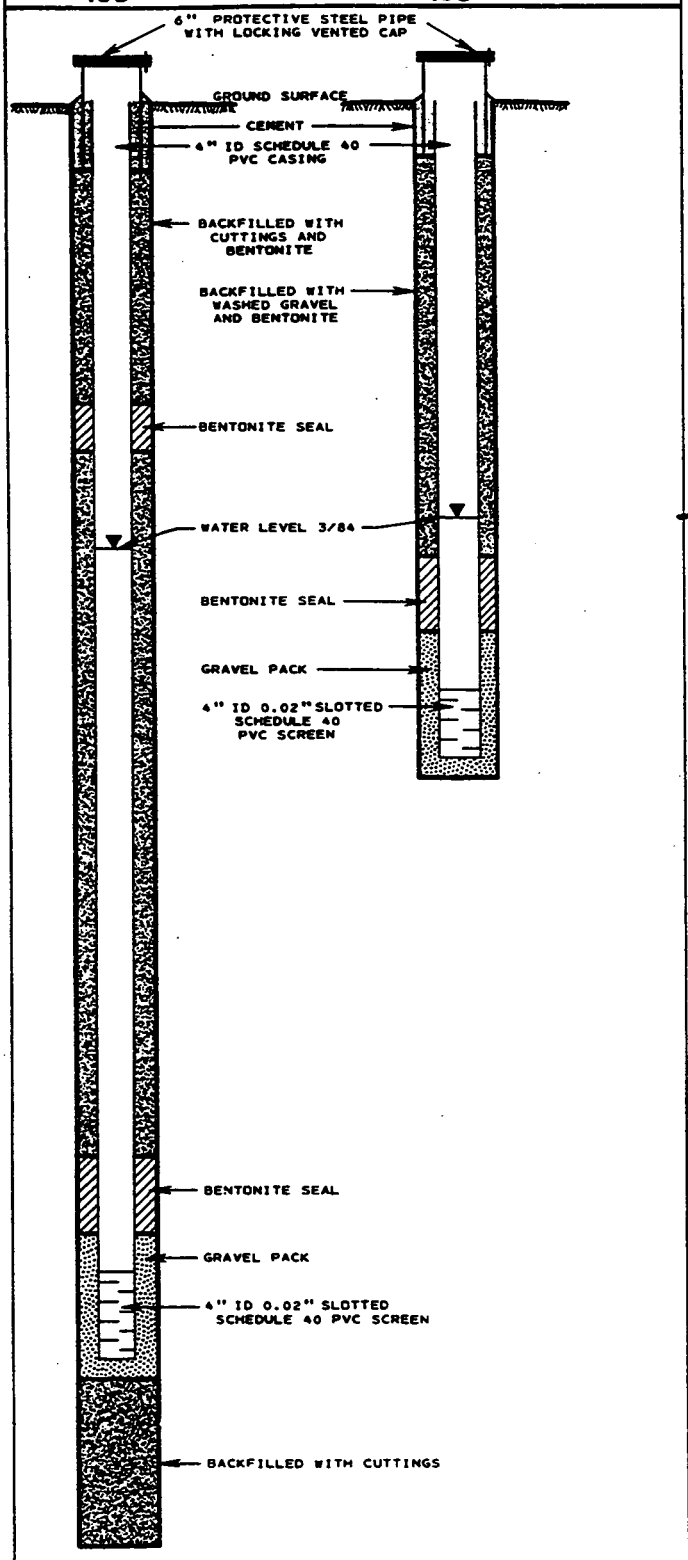
5709

BORING 16

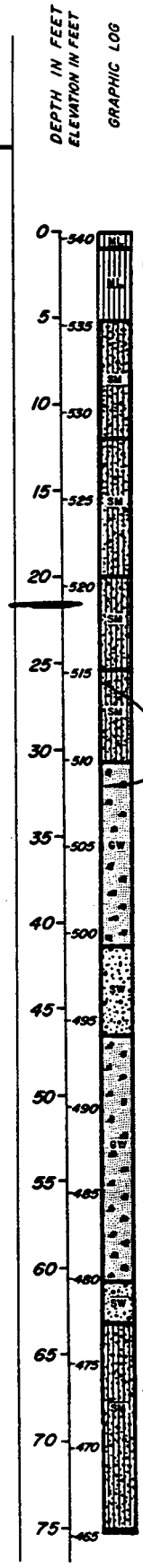
SURFACE ELEVATION 16D 540.47' / 16S 540.50'

WELL SCHEMATICS

16D 3016 | 16S 2016



DESCRIPTIVE GEOLOGIC NOTES



0-9" BLACK SILTY FILL MATERIAL (PROBABLY FLYASH)
DARK YELLOWISH BROWN (10YR5/4) CLAYEY SILT

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO COARSE GRAINED SILTY SAND, CONTAINS LIMESTONE FRAGMENTS UP TO 3" AND PEBBLES OF QUARTZ (SUBROUNDED TO ANGULAR) DECREASING IN QUANTITY WITH DEPTH

LIGHT OLIVE BROWN (5Y5/6) SILTY SAND, NO PEBBLES WELL SORTED, DECREASING IN GRAIN SIZE WITH DEPTH

DUSKY YELLOW (5Y6/4) FINE GRAINED SILTY SAND

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO COARSE GRAINED SANDY GRAVEL WITH PEBBLES OF QUARTZ (UP TO 1/2" DIAMETER) AND LIMESTONE (ROUNDED TO SUBROUNDED)

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO COARSE GRAINED SAND WITH GRAVEL, WELL SORTED

LIGHT OLIVE BROWN (5Y5/6) COARSE GRAINED SANDY GRAVEL WITH SUBANGULAR TO SUBROUNDED PEBBLES OF QUARTZ AND LIMESTONE

OLIVE BROWN (5Y4/4) MEDIUM TO COARSE GRAINED SAND

DARK OLIVE BROWN (5Y4/4) TO LIGHT OLIVE BROWN (5Y5/6) SILTY SAND

BORING TERMINATED AT A DEPTH OF 75.0' ON 1/17/85

000293

DAMES & MOORE

FIGURE A4-6

FERNALD RI/FS

Field Check		
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: LOC 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4016	COORDINATES:	DATE: 01-03-89
ELEVATION: ~ 540.7	GWL: Depth Date/Time	DATE STARTED: 12-16-88
ENGINEER/GEOLOGIST: M. SCHUMER	Depth Date/Time	DATE COMPLETED: 01-10-89
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 CM)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* DETAILED SAMPLE DESCRIPTION FOR INTERVAL 0.0 FT TO 22.5 FT IS AVAILABLE FROM VISUAL CLASSIFICATION OF SOILS LOG FOR BORING #1016. SAMPLE DESCRIPTION FOR BORING #4016 WILL COMMENCE @ 25.0 FT			
25	1036	5		MEDIUM DENSE, GREY-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, TRACE MEDIUM GRAVEL (.25-.5IN) WET	SW	N/A	HNU = 0 PPM X - 0 CPM BG = 40-60 CPM
26	1028	5	12				
	12-17	7					
27							
28							
29							

NOTES: CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: JOE BARICE
ASSISTANTS: TONY HUMPHREY
LARRY BOOTH

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU: 0 PPM LEL: 0 PPM
X: 0.2 CPM
BG: 40-60 CPM 20.6% O_2

1290 GAL (TOTAL FROM 4 WELL COMPLETION)
WATER ADDED TO MAINTAIN DURING DRILLING & COMPLETION ACTIVITIES: 500 GAL. (THROUGH 01-03-89)

000294

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4016	COORDINATES:	DATE: 01-05-89
ELEVATION: ~ 540.7	GWL: Depth Date/Time	DATE STARTED: 12-16 89
ENGINEER/GEOLOGIST: M. SLOBASCI	Depth Date/Time	DATE COMPLETED: 01-10 89
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	10437 1145 12-17	7 7 8	18	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED GRAVELLY SAND, SOME FINE GRAVEL (.25 IN) WET	SW	N/A	HNU = 0 PPM α = 0-2 CPM BG = 40-60 CPM
32							
33							
34							
35							
36	10438 1325 12-17	19 24 25	14	DENSE, YELLOW BROWN (10YR 5/2) WELL GRADED GRAVEL SAND MIXTURE, TRACE COARSE GRAVEL (1.0-1.5 IN) WET	GW	N/A	HNU = 0 PPM α = 0-2 CPM BG = 40-60 CPM
37							
38							
39							
40							
41	10439 1350 12-17	3 4 8	12	LOOSE, GREY-BROWN (10YR 4/2) WELL GRADED GRAVELLY SAND, GRAVEL (.25-.50 IN) WET	SW	N/A	HNU = 0 PPM α = 0-2 CPM BG = 40-60 CPM
42							
43							
44							

NOTES:

000295

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6022 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4011	COORDINATES:	DATE: 01-02-89
ELEVATION: ~ 540.7	GWL: Depth Date/Time	DATE STARTED: 12-16-88
ENGINEER/GEOLOGIST: M. [illegible]	Depth Date/Time	DATE COMPLETED: [illegible]
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10440 1530 12-17	20 25 35	14	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL (< .25 IN) WET	SP	N/A	HNU = 0 PPM α = 0-2 CPM BG = 40-50 CPM
47							
48							
49							
50	10441 0900 12-18	19 17 15	14	DENSE, GREY-BROWN (10YR 4/2) WELL GRADED GRAVELLY SAND, SOME MEDIUM GRAVEL (.25-.50 IN) WET 51.3	SW	N/A	HNU = 0 PPM α = 0-2 CPM BG = 40-60 CPM
51				MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED GRAVEL (.25-1.0 IN), SOME SAND, WET	GW		
52							
53							
54							
55	10442 1025 12-19	8 27 33	12	VERY DENSE, PALE BROWN (10YR 6/3) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM WH α = 0-2 CPM BG = 40-60 CPM
56							
57							
58							
59							

NOTES:

000296

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4016	COORDINATES:	DATE: 01-07-91
ELEVATION: ~340.7	GWL: Depth Date/Time	DATE STARTED: 12-18-90
ENGINEER/GEOLOGIST: M. SLOWARSKI	Depth Date/Time	DATE COMPLETED: 01-10-91
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10443 1100 12-19	5 3 4	15	LOOSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, SOME GRAVEL, WET	SP	N/A	HNU = 0 PPM WH α = 0-1 CPM BG = 40-60 CPM
62							
63							
64							
65	10444 1330 12-19	9 3 8	17	MEDIUM DENSE, BROWN (10YR 5/3) POORLY GRADED SAND, < 5.0% GRAVEL, WET	SP	N/A	HNU = 0 PPM WH α = 0-1 CPM BG = 40-60 CPM
66							
67							
68							
69							
70	10445 1320 12-19	3 3 4	5	LOOSE, GREY-BROWN (10YR 5/2) POORLY GRADED SAND, < 5.0% GRAVEL, WET	SP	N/A	HNU = 0 PPM WH α = 0-1 CPM BG = 40-60 CPM
71							
72							
73							
74							

NOTES:

000297

402-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6062 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4016	COORDINATES:	DATE: 01-05-87
ELEVATION: ~540.7	GWL: Depth Date/Time	DATE STARTED: 12-16 87
ENGINEER/GEOLOGIST: M. SLOBARSKI	Depth Date/Time	DATE COMPLETED: 01-10-87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10446 1510 12-19	14 23 21	15	DENSE, YELLOW-BROWN (10YR 5/6) POORLY GRADED SAND, < 10.0% GRAVEL, WET	SP	N/A	HNU = 0 PPM WH α = 0 CPM BG = 40-60 CPM
77							
78							
79							
80							
81	10447 1530 12-19	3 4 8	10	MEDIUM DENSE, GREY-BROWN (10YR 5/2) POORLY GRADED SAND, < 10% GRAVEL WET	SP	N/A	HNU = 0 PPM WH α = 0 CPM BG = 40-60 CPM
82							
83							
84							
85	10448 1700 12-19	30 33 30	12	VERY DENSE, DARK GREY-BROWN (10YR 4/2), POORLY GRADED SAND, < 5.0% GRAVEL, WET	SP	N/A	HNU = 0 PPM WH α = 0 CPM BG = 40-60 CPM
86							
87							
88							
89	10449 1010 12-20			TOP OF "BLUE CLAY" 89.0 PUSHED SHELBY TUBE FROM 89.0 - 91.0 FT. RECOVERED 1.5 FT			

NOTES:

000298

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4016	COORDINATES:	DATE: 01-05-89
ELEVATION: ~540.7	GWL: Depth Date/Time	DATE STARTED: 12-16-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 01-10-89
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (FT.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10449 1010 12-20			PUSHED SHELBY TUBE FROM 89.0 TO 91.0 FT. RECOVERED 1.5 FT.			
92							
93							
94							
95							
96	10450 1340 12-20	6 14 17	15	STIFF, DARK GREY (10YR 4/1) INORGANIC CLAY, MEDIUM PLASTICITY DAMP	CL	1.25	HNU = 0 PPM W 11 α = 0 CPM BJ = 40-60 CPM
97							
98							
99							
100				BASE OF "BLUE CLAY" 100.0			
101	10451 1500 12-20	29 39 39	14	VERY DENSE, OLIVE GREY (5Y 4/1) WELL GRADED GRAVEL SAND MIXTURE, GRAVEL (.25 - 1.5 IN) WET	GW	N/A	HNU = 0 PPM α = 0 CPM BJ = 40-60 CPM
102							
103							
104							

NOTES:

000299

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 602C	COORDINATES:	DATE: 21-OCT-89
ELEVATION: ~540.7	GWL: Depth Date/Time	DATE STARTED: 12-16-89
ENGINEER/GEOLOGIST: M. SLUSZARSKI	Depth Date/Time	DATE COMPLETED: [illegible]
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	10452 1620 12-20	50+ OVER .4 in	1	VERY DENSE, DARK GREY (10YR 4/1) WELL GRADED GRAVELLY SAND, SOME GRAVEL (.25 - 1.5 in) WET	SW	N/A	HNU = 0 PPM X = 0 CPM BG = 40-60 CPM
107							
108							
109							
110	10453 1700 12-20	20 12 11	6	MEDIUM DENSE, DARK GREY (10YR 4/1) WELL GRADED GRAVEL SAND MIXTURE, GRAVEL (.25-1.5 in) WET	GW	N/A	HNU = 0 PPM X = 0 CPM BG = 40-60 CPM
111							
112							
113							
114							
115	10454 0915 12-21	19 21 24	12	DENSE, OLIVE GREY (5Y 4/1) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 PPM X = 0 CPM BG = 40-60 CPM
116							
117							
118							
119							

NOTES:

000300

402-11

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4016	COORDINATES:	DATE: 01-05-89
ELEVATION: ~540.7	GWL: Depth Date/Time	DATE STARTED: 12-16-88
ENGINEER/GEOLOGIST: M. [illegible]	Depth Date/Time	DATE COMPLETED: 01-10-89
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	10455 0940 12-21	10 14 17	10	MEDIUM DENSE, OLIVE GRAY (5Y 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
122							
123							
124							
125							
126			X	NO RECOVERY AFTER SEVERAL ATTEMPTS. SAMPLE NUMBER 10456 NOT USED OR ASSIGNED			HNU = — α = — Bβ = —
127							
128							
129							
130	10457 1520 12-21	5 10 12	16	MEDIUM DENSE, OLIVE GRAY (5Y 4/2) POORLY GRADED, FINE SAND, WET 131.0	SP	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
131				MEDIUM DENSE, OLIVE-GRAY (5Y 4/2) WELL GRADED SAND, TRACE MEDIUM GRAVEL (.25-.50 IN) WET	SW		
132							
133							
134							

NOTES:

000301

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 662 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4016	COORDINATES:	DATE: 01-05-89
ELEVATION: ~540.7	GWL: Depth Date/Time	DATE STARTED: 12-16-88
ENGINEER/GEOLOGIST: M. SLUCZARSKI	Depth Date/Time	DATE COMPLETED: 01-05-89
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	1045B 1650 12-21	21 44 33	18	VERY DENSE, OLIVE-GRAY (5Y 4/2) POORLY GRADED SAND, WITH FINE GRAVEL (~25 IN) WET	SP	N/A	HNU = 0 PPM α = 0 CPM BS = 40-65 CPM
137							
138							
139							
140							
141	1045A 0910 01-03	4 6 8	12	MEDIUM DENSE, OLIVE GRAY (5Y 4/2) WELL GRADED SAND, TRACE OF COARSE GRAVEL (1.0-2.0 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM BS = 40-65 CPM
142							
143							
144							
145							
146	1046A 1350 01-03	18 35 34	14	VERY DENSE, OLIVE-BROWN (2.5Y 4/4) POORLY GRADED SAND, TRACE FINE GRAVEL (< 25 IN) WET	SP	N/A	HNU = 0 PPM α = 0 CPM BS = 40-65 CPM
147							
148							
149							

NOTES:

000302

402-11-8

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4016	COORDINATES:	DATE: 01-05-91
ELEVATION: ~540 ?	GWL: Depth Date/Time	DATE STARTED: 12-16-88
ENGINEER/GEOLOGIST: M. [illegible]	Depth Date/Time	DATE COMPLETED: 01-10-89
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	10461 1440 01-01	5 10 10	12	MEDIUM DENSE, OLIVE-BROWN (2.5Y 4/4) POORLY GRADED SAND, TRACE FINE GRAVEL (< 25 IN), WET	SP	N/A	HNU = 0 PPM α = 0 CPM BG = 40-60 CPM
152							
153							
154							
155	10462 1650 01-03	6 7 10	14	MEDIUM DENSE, OLIVE-BROWN (2.5Y 4/4) POORLY GRADED SAND, TRACE MEDIUM GRAVEL (.25-.50 IN) WET	SP	N/A	HNU = 0 PPM α = 0 CPM BG = 40-60 CPM
156							
157							
158							
159							
160	10463 1325 01-04	18 27 34	12	VERY DENSE, BROWN (2.5Y 5/2) POORLY GRADED SAND, TRACE MEDIUM GRAVEL (.25-.50 IN) WET 161.2	SP	N/A	HNU = 0 PPM α = 0 CPM BG = 40-60 CPM
161				VERY STIFF, OLIVE-GRAY (5Y 4/1) GRAVELLY CLAY, SOME SAND, WET	CL	2.5	
162							
163				BOTTOM OF BORING 163.2 BEDROCK			
164							

NOTES:

000303

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. [illegible] DATE 01-11-89
PROJECT NO. 662 [illegible] CHECKED BY _____ DATE _____
BORING NO. 4016
PIEZOMETER NO. 4016 DATE OF INSTALLATION 01-07-89 TO 01-10-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 163.0 FT	SIZE 10.0 IN ID FROM 0.0 FT TO 160.0 FT
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4.0 IN ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN I.D. 4.0 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 1.7 FT / 5.0 FT / 10.0 FT
AVERAGE SIZE OF PERFORATIONS .010 IN	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 10.0 FT.	JOINT THREADS

PROTECTION SYSTEM

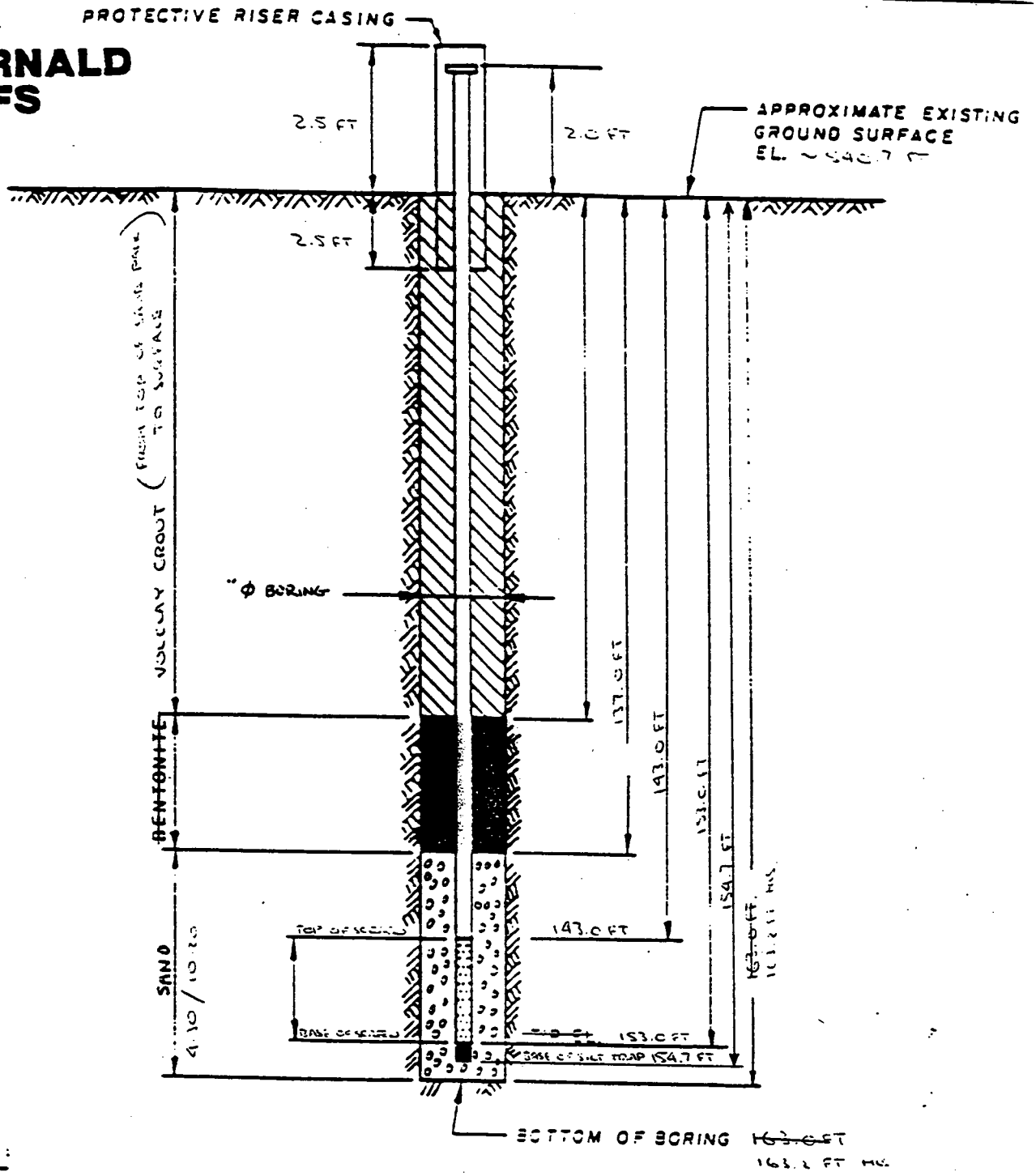
RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 137.0	TOP	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND (10-20)	TOP 137.0	BOTTOM 153.0	TOP	BOTTOM
GRAVEL (4-30)	TOP 153.0	BOTTOM 155.0	TOP	BOTTOM
PERFORATED SECTION	TOP 143.0	BOTTOM 153.0	TOP	BOTTOM
PIEZOMETER TIP	154.7			
BOTTOM OF BOREHOLE	~~163.0~~ 163.2 mb.			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE INTERVAL FROM 163.0 FT TO 155.0 FT WAS ALLOWED TO COLLAPSE ON itself. TWO (2) BUCKETS OF BENTONITE PELLETS WERE POURED AROUND THE PROTECTING CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
MLS	
DRAWN BY	

NOTES:

1. RISER PIPE IS 4.0 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 01-11-89

PREPARED FOR
BORING 4016

MATERIALS USED DURING WELL INSTALLATION:

4-30 GRAVEL: 2 - 50LB BAGS
10-20 SAND: 12 - 80LB BAGS
VOLCLAY GROUT: 38 - 50LB BAGS
BENTONITE PELLETS: 2 BUCKETS

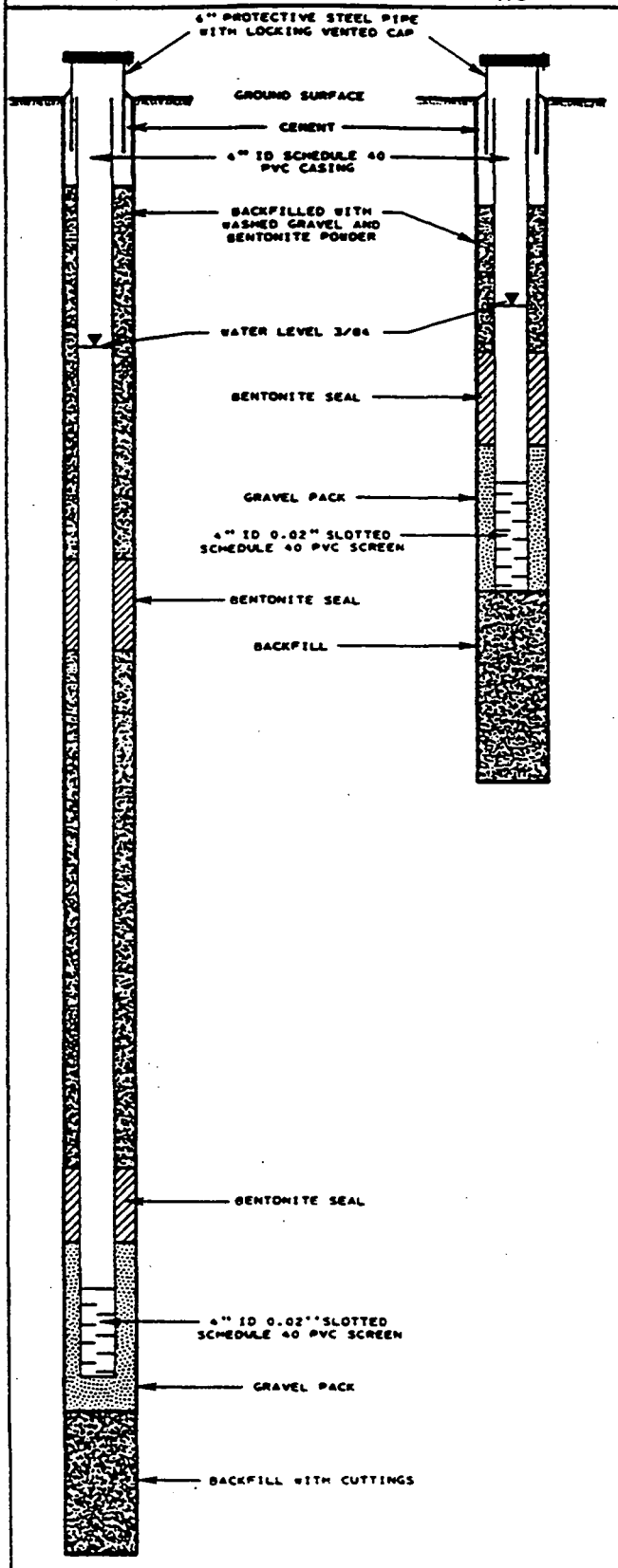
STAINLESS STEEL RISER PIPE: 1 - 2.0 FT SECTION
14 - 10.0 FT SECTIONS
STAINLESS STEEL WELL SCREEN: 1 - 10.0 FT SCREEN
STAINLESS STEEL SILT TRAP: 1 - 1.7 FT SILT TRAP

WATER USED DURING DRILLING AND WELL INSTALLATION 1240 GAL.

WELL SCHEMATICS

3017 17D

2017 17S

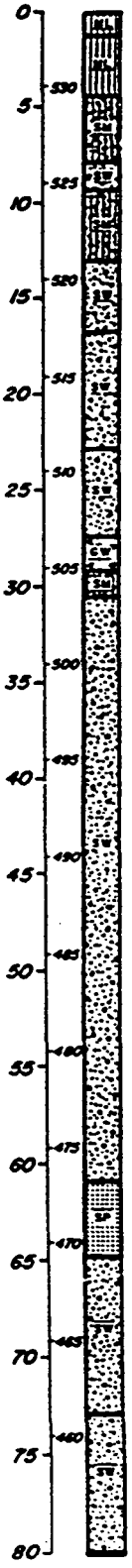


BORING 17

SURFACE ELEVATION 17D 534.28'
17S 534.43'

DEPTH IN FEET
ELEVATION IN FEET
GRAPHIC LOG

DESCRIPTIVE GEOLOGIC NOTES



BROWN CLAYEY SILT

PALE BROWN (5YR5/2) CLAYEY SILT, SOME ROOTS CONTACT IS SHARP AND WELL DEFINED

LIGHT OLIVE BROWN (5Y5/6) SILTY SAND WITH SMALL AMOUNT OF GRAVEL, DRY LOOSE, SOME YELLOW LIMONITE STAINING NEAR CONTACT WITH CLAYEY SILT

LIGHT OLIVE BROWN (5Y5/6) GRAVELLY SAND, CONTACT IS SHARP AND WELL DEFINED

MEDIUM TO FINE GRAINED LIGHT OLIVE BROWN (5Y5/6) SILTY SAND, WELL SORTED

LIGHT OLIVE BROWN (5Y5/6) COARSE GRAVELLY SAND, CONTACT IS GRADATIONAL

LIGHT OLIVE BROWN (5Y5/6) FINE TO MEDIUM WELL SORTED SAND, MODERATE OLIVE BROWN (5Y4/4) COARSE TO MEDIUM WELL SORTED SAND

LIGHT OLIVE GRAY (5Y5/2) TO LIGHT OLIVE BROWN (5Y5/6) GRAVELLY SAND WITH SOME SILT AND PEBBLES UP TO 1" IN DIAMETER, CONTACT IS SHARP AND WELL DEFINED

COARSE GRAVEL, WELL SORTED CONSISTING OF LIMESTONE AND QUARTZ PEBBLES, CONTACT IS GRADATIONAL WITH GRAVEL GOING TO A MEDIUM TO COARSE SAND

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO COARSE GRAINED, WELL SORTED SILTY SAND

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO COARSE SAND WITH UP TO 5% GRAVEL

DARK OLIVE BROWN (5Y4/4) SAND WITH UP TO 1% GRAVEL, COARSER GRAINED AND NOT AS WELL SORTED AS ABOVE

DARK YELLOWISH BROWN (10YR6/6) MEDIUM TO COARSE SAND WITH 5% GRAVEL

DARK YELLOWISH BROWN (10YR6/6) FINE TO MEDIUM GRAINED SAND

BORING TERMINATED AT A DEPTH OF 80.0' ON 1/29/85

000306

DAMES & MOORE

FIGURE A4-7

Black Ink corrections were made by L. Wille to change Recovery in feet to Recovery inches. WPK 4/24/88

5709

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/24/89 DLG 2/13/89

WPK 4/23/90

RIG #3

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B118 B1018	COORDINATES: 419850.19 N 1378661.69 E	DATE: 10-18-87	
ELEVATION:	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-18-87	
ENGINEER/GEOLOGIST: Howell Wille	Depth N/A Date/Time N/A	DATE COMPLETED: OCT 20 1987	
DRILLING METHODS: Cable tool		PAGE 1 OF 3	

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	7309 S1 1110	2 8 10	14	soft brown (10YR 6/4) silty clay - trace sand, some organic plant material moist 0.5	OL	3.5	scoured sample - background
				stiff brown (10YR 5/2) silty clay trace sand - dry 1.5	CL	1.8	
2	7310 S2 1115	3 6 15	08	hard brown (10YR 6/8) clay, trace silt and fine sand - dry 3.0	CL	>4.5	scoured sample - background
	7311 S3 1120	7 15 21	12	hard brown (10YR 5/6) mottled grey clay trace silt and fine sand - dry 4.0	CL	4.5	scoured sample - background
4				loose brown (10YR 4/6) fine sand, some medium sand and silt, trace clay - dry 4.5	SW	NA	
	7312 S4 1130	8 10 10	14	hard brown (10YR 6/8) clay trace silt and fine sand - moist 5.5	CL	3.5	scoured sample - background
6				hard brown (10YR 5/8) clayey silt, some fine sand moist - moist 6.0	CL	2.8	
	7313 ST5 1230	NA	13	hard brown (10YR 6/8) silty sand, some clay. trace gravel and pebbles - dry 7.5	SM	bottom >5	scoured sample - background
8	7314 S6 1500	6 8 10	01	dense brown (10YR 5/8) and gray 10YR 6/2 interlayered sand, some silt, trace clay and fine gravel - dry 9.0	SM	NA	scoured sample - background
10	7315 S7 1530	16 42 36	13	dense brown (10YR 5/8) fine to medium sand, some silt, clay, trace gravel - moist, slightly bonded 10.5	SM	NA	scoured sample - background
	7316 S8 1545	18 28 37	17	dense gray (10YR 5/1) fine sand, some silt and clay - moist 12	SM	0.5	scoured sample - background
12	7317 S9 1700	45 17 15	17	dense gray (10YR 6/6) sand and gravel some silt and clay - dry 12.5	GC	NA	scoured sample - background
				hard gray (10YR 6/1) gray clay - some silt moist 13	CL	1.0	
14	7318 S10 1730	16 44 50	17	dense gray (10YR 6/6) fine sand some silt trace clay - dry 13.5	SM	0.5	scoured sample - background
				hard gray (10YR 5/1) clay - some silt - moist 14	CL	4.0	
				dense gray (10YR 5/1) sand - some silt and clay - dry 14.25	SM	NA	
				hard gray (10YR 5/1) clay some silt - moist 14.5	CL	3.5	
				dense gray (10YR 5/1) sand and gravel - some silt and clay - dry 15.5	GC	NA	

NOTES:
Pennsylvania Drilling Co.
Driller - Dave Newman
Helper: Bob Johnson
water added to hole (5 gallon buckets)

background levels:
- 10-18-87 alpha = 2/min beta-gamma = 80/min
- 10-19-87 alpha = 2/min beta-gamma = 80/min

000307

402-11-86

Black ink corrections were made by L. Wille to change Recovery in feet to Recovery in inches. WPK 4/24/89

FERNALD RI/FS

REVIEWED BY QA V.G. DATE 7/24/91 8/3/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernold RI/FS	
BORING NUMBER: ~~B118~~ B1018 BB 1-5-89	COORDINATES: same as page 1	DATE: 10-18-87
ELEVATION:	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-18-87
ENGINEER/GEOLOGIST: Lowell Wille	Depth N/A Date/Time N/A	DATE COMPLETED: OCT 20 1987
DRILLING METHODS: Cable tool		PAGE 2 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	S11 1230 7319	4 7 12	18	stiff gray 7½YR 6/2 clay some silt, trace fine sand - moist 16.5	CL	3.5	scaned sample-background
18	S12 810 7320	3 5 23	18	stiff gray 10YR 6/1 clay some silt, sand and gravel - dry 18	CL	3.5	scaned sample - background
	S13 820 7321	8 10 23	11	stiff gray 10YR 6/1 clay some silt and sand, trace gravel - dry 19.5	CL	3.2	scaned sample - background
20	S14 930 7322	43 27 32	12	hard gray 10YR 5/1 gravelly clay some silt and clay ~~some~~ trace pebbles - dry 21	CL	75	S-12 tried to push shelby tube. soil to hard, drove spoon ~~later~~ instead scaned sample background
22	S15 940 7323	50+ for ½ ft	6	hard gray 10YR 5/1 clay some gravel trace sand and silt, dry 22.5	CL	>5	scaned sample - background
24	S16 1130 7324	8 14 50	18	hard gray 10YR 6/1 clay, trace gravel and sand, some silt, dry 24.8	CL	75	scaned sample - background
	S17 1300 7325	6 16 36	14	hard gray 10YR 6/1 clay trace gravel and silt, dry 25.5	CL	~~4.5~~ 3.5	scaned sample - background
26	S18 1345 7326	5 13 30	8½	hard gray 10YR 6/1 gravelly clay some sand and silt moist 27.0	CL	3.5	scaned sample - background
28	S19 1350 7327	11 21 36	18	stiff gray 10YR 6/1 clay trace sand gravel and silt. dry 28½	CL	2.5	scaned sample - background
	S20 1430 7328	12 9 12	13	loose brown 10YR 6/6 sand some silt and clay - trace gravel - dry	SM	NA	scaned sample - background

30

NOTES:

background LEVELS: • alpha = 2/min • beta/gamma = 75/min

000308

Black ink changes were made by Lowell Wille to change Recovery in feet to recovery in inches.

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 7/29/91 DLG 2/7/89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60237	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B118~~ B1018 AB 1-5-89	COORDINATES:	DATE: OCT 19, 1987
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: OCT 18, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: OCT 20, 1987
DRILLING METHODS: Cable Tool		PAGE 3 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1½ FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	~~S19~~ 7329 1560	5 16 26	14	~~loose~~ dense brown 10YR 2/6 sand, some silt ~~and~~ clay, trace gravel - dry 31½	SM	NA	scoured sample; background
32	~~S20~~ 7330 1556	33 71	12	~~loose~~ dense brown 10YR 5/6 sand and gravel some silt and clay - trace pebbles - dry 32.5	GC	NA	scoured sample; background
	S23 7331 1600	50+ for ½ ft	6	dense brown 10YR 5/6 ~~sand and gravel~~ some silt and clay - trace pebbles - dry	GM	NA	scoured sample - background
34				bottom of boring 33½ feet			
36							
38							
40							

NOTES:

samples S1 - S9 OCT 18, 1987

samples S9 - S21 OCT 19, 1987

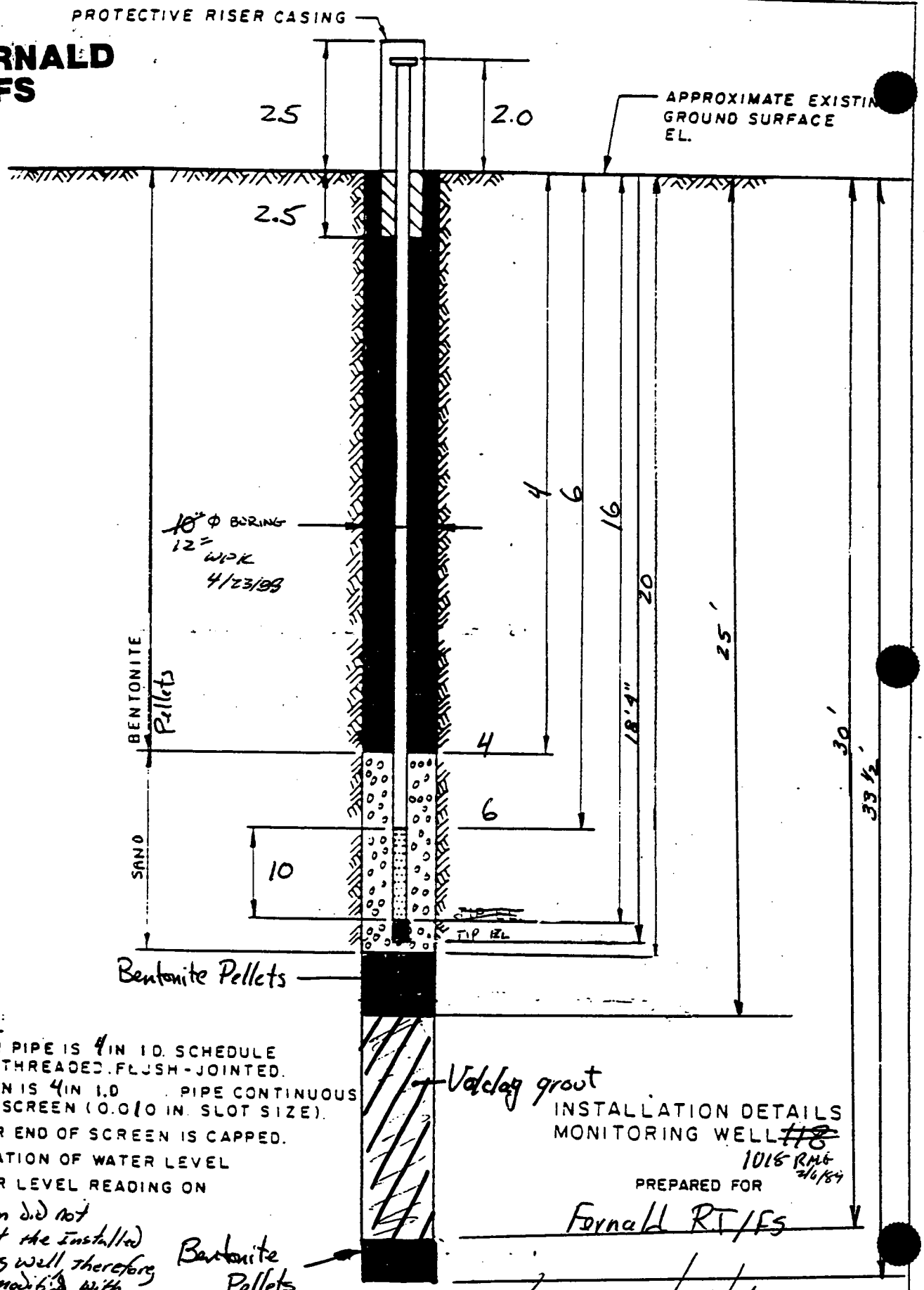
000309

402-11-86

DLG 2/7/89

WELL ~~118~~ 1018 BB 1-5

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

This form did not represent the installed monitoring well, therefore it was modified with white out by Lowell White.
WPK 4/23/88

INSTALLATION DETAILS
MONITORING WELL ~~118~~ 1018 RMG 2/6/89

PREPARED FOR

Fernald RI/FS

REVIEWED BY LG DATE 7/24/91

000310

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 2/4/91 DLG 2/13/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
PROJECT NO. 602.3.2
BORING NO. B118 B1018 BD 1-5-89
PIEZOMETER NO. H8 1018

FIELD ENG./GEO. Lowell Wille DATE Oct 19, 1987
CHECKED BY R Calbraith DATE 2/6/89
DATE OF INSTALLATION Oct 19, 1987

BOREHOLE DRILLING

DRILLING METHOD Cable tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 33'
FLUID NA FROM NA TO NA

TYPE OF BIT HAMMER
CASING SIZE (S) USED: (TEMPORARY)
SIZE 10" FROM 0 TO 33½
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE ~~Extraction~~ Monitoring Well
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 ft.

RISER PIPE MATERIAL Stainless Steel (316)
RISER PIPE DIAMETERS:
O.D. 4⅜" I.D. 4"
LENGTH OF PIPE SECTIONS 10'
JOINING METHOD FLUSH JOINT THREAD

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE I.D. 10"

OTHER PROTECTION Lockable TOP AND lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0		573.45	
GROUND SURFACE	0.0		571.45	
BOTTOM OF PROTECTIVE PIPE	2½		568.95	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM N/A	TOP N/A	BOTTOM N/A
BENTONITE	TOP 0	BOTTOM 4	TOP 571.45	BOTTOM 567.45
SAND	TOP 4	BOTTOM 20	TOP 567.45	BOTTOM 547.45
BENTONITE PELLETS	~~TOP 20~~	~~BOTTOM 25~~	~~TOP 551.45~~	~~BOTTOM 546.45~~
VOLCLAY GROUT	~~TOP 25~~	~~BOTTOM 30~~	~~TOP 546.45~~	~~BOTTOM 541.45~~
BENTONITE PELLETS	~~TOP 30~~	~~BOTTOM 33.5~~	~~TOP 541.45~~	~~BOTTOM 537.95~~
PERFORATED SECTION	TOP 6	BOTTOM 16	TOP	BOTTOM
PIEZOMETER TIP	18.4 (SILT TRAP)		553.05	
BOTTOM OF BOREHOLE	33½		537.95	
GWL AFTER INSTALLATION	DRY		N/A	

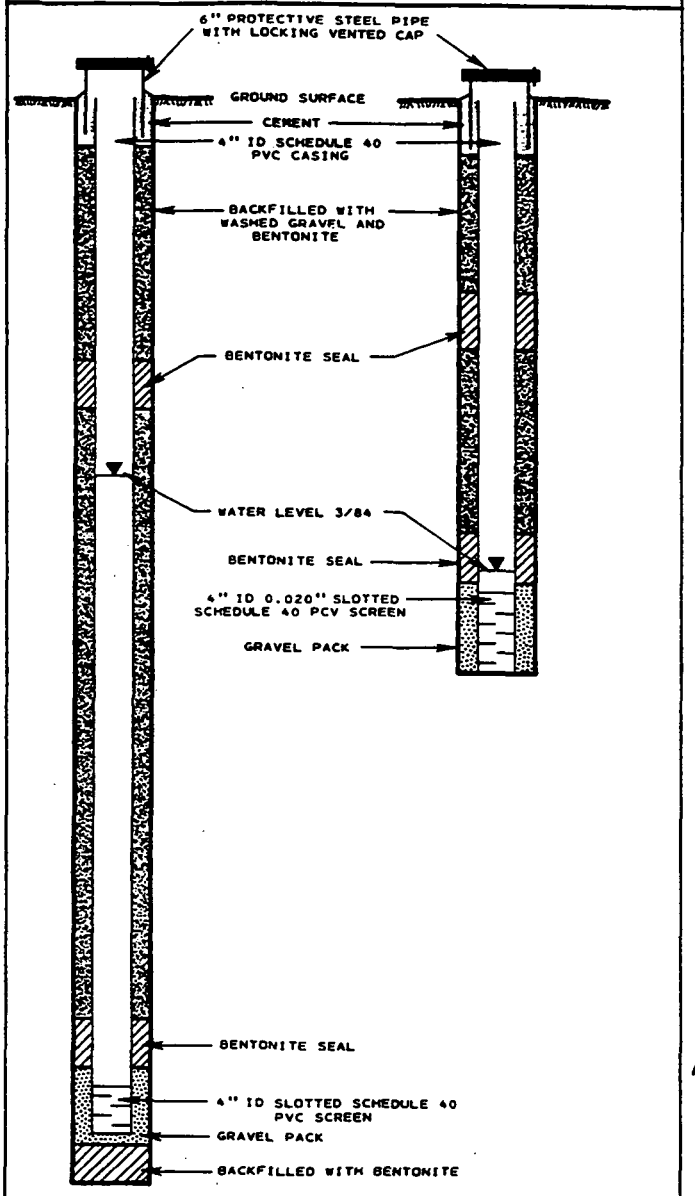
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Dry well Bentonite pellets 32½-30, Volclay grout 30-25, Bentonite pellets 25-20, SAND 20-4, Bentonite pellets 4-0

This form did not represent the installed monitoring well, therefore, it was modified with white out by L. Wille.

WELL SCHEMATICS

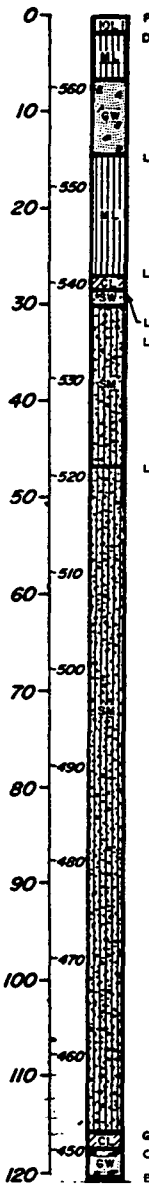
18D 3018 | 18S 2018



BORING 18

SURFACE ELEVATION 18D ~~521.30~~ 572.3' 18S 521.31'

DEPTH IN FEET | ELEVATION IN FEET | GRAPHIC LOG



DESCRIPTIVE GEOLOGIC NOTES

FROZEN SOIL TO 1.3' MEDIUM TO COARSE SANDY LOAM

DUSKY YELLOW (5Y6/4) CLAYEY SILT, CONTAINS THIN BANDS OF LIGHT OLIVE BROWN CLAYEY SILT

LIGHT OLIVE GRAY (5Y5/2) CLAYEY SILT, CONTAINS LESS THAN 1% ANGULAR TO SUBANGULAR QUARTZ AND LIMESTONE FRAGMENTS. SILTY SAND ENCOUNTERED AT BOTTOM

LIGHT OLIVE GRAY (5Y5/2) SILTY CLAY WITH UP TO 10% GRAVEL CONSISTING OF QUARTZ AND LIMESTONE FRAGMENTS (0.5" IN DIAMETER)

LIGHT OLIVE BROWN (5Y5/6) SAND, WELL SORTED

LIGHT OLIVE GRAY (5Y5/2) SILTY SAND WITH SOME GRAVEL (1-4%)

LIGHT OLIVE BROWN (5Y5/6) SILTY SAND, FINER GRAINED THAN ABOVE, NO NOTICEABLE GRAVEL

GREENISH-BLACK ("BLUE CLAY") SILTY CLAY (5G2/1)

COARSE GRAVEL 1/4-1/2" IN DIAMETER

BORING TERMINATED AT A DEPTH OF 120.0' ON 1/23/85

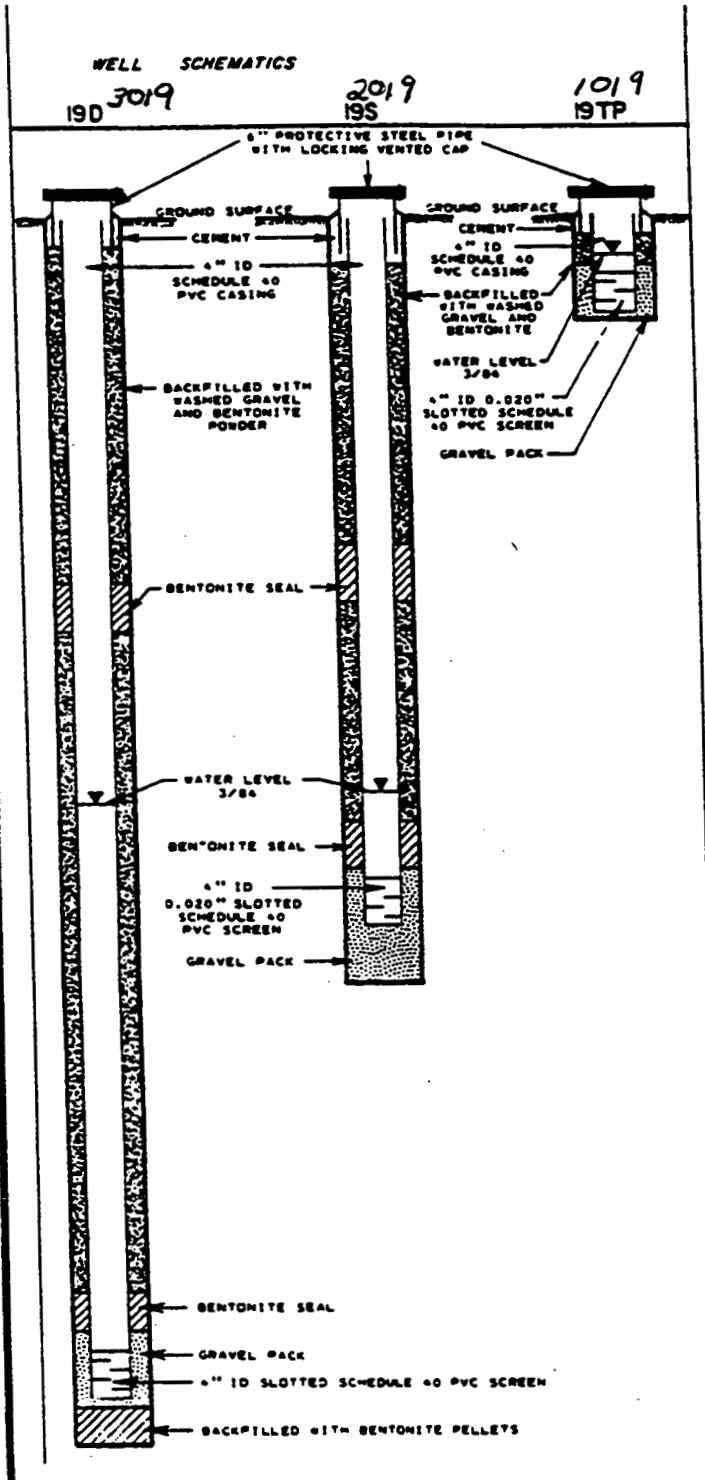
000312

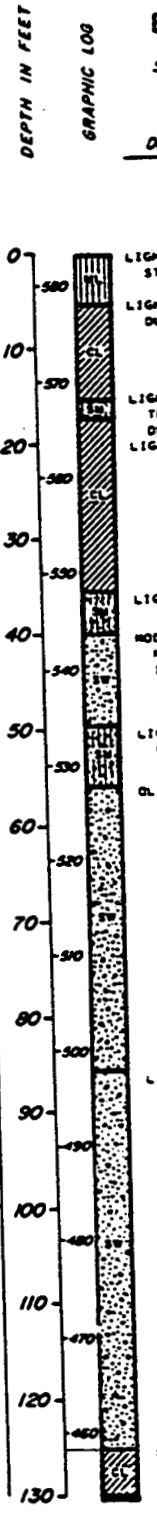
DAMES & MOORE

FIGURE A6-9

BORING 19

SURFACE ELEVATION 19D 583.20'
19S 583.26'
19TP 582.98'





DESCRIPTIVE GEOLOGIC NOTES

LIGHT OLIVE BROWN (5Y5/6) CLAYEY SILT, CONTAINS STREAKS OF DUSKY YELLOW SILT, SOME GRAVEL

LIGHT OLIVE GRAY (5Y5/2) SILTY CLAY, CONTAINS DUSKY YELLOW SILT, NO GRAVEL

LIGHT OLIVE BROWN (5Y5/6) SANDY SILT WITH UP TO 5% GRAVEL, CONTACT IS SHARP AND WELL DEFINED

LIGHT OLIVE GRAY (5Y5/2) SILTY CLAY WITH 2% GRAVEL

LIGHT OLIVE BROWN (5Y5/6) SILTY SAND WITH 3% GRAVEL

MODERATE OLIVE BROWN (5Y4/4) GRAVELLY SAND MEDIUM TO COARSE GRAINED, SOME GRAVEL, CONTACT IS GRADATIONAL

LIGHT OLIVE BROWN (5Y5/6) FINE TO MEDIUM GRAINED WELL SORTED SILTY SAND

OLIVE GRAY (5Y3/2) MEDIUM TO COARSE GRAINED WELL SORTED SAND

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO COARSE GRAINED WELL SORTED SAND

GREENISH-BLACK ("BLUE CLAY") (5G2/1) SILTY CLAY

BORING TERMINATED AT A DEPTH OF 130.0' ON 2/6/85

DAMES & MOORE

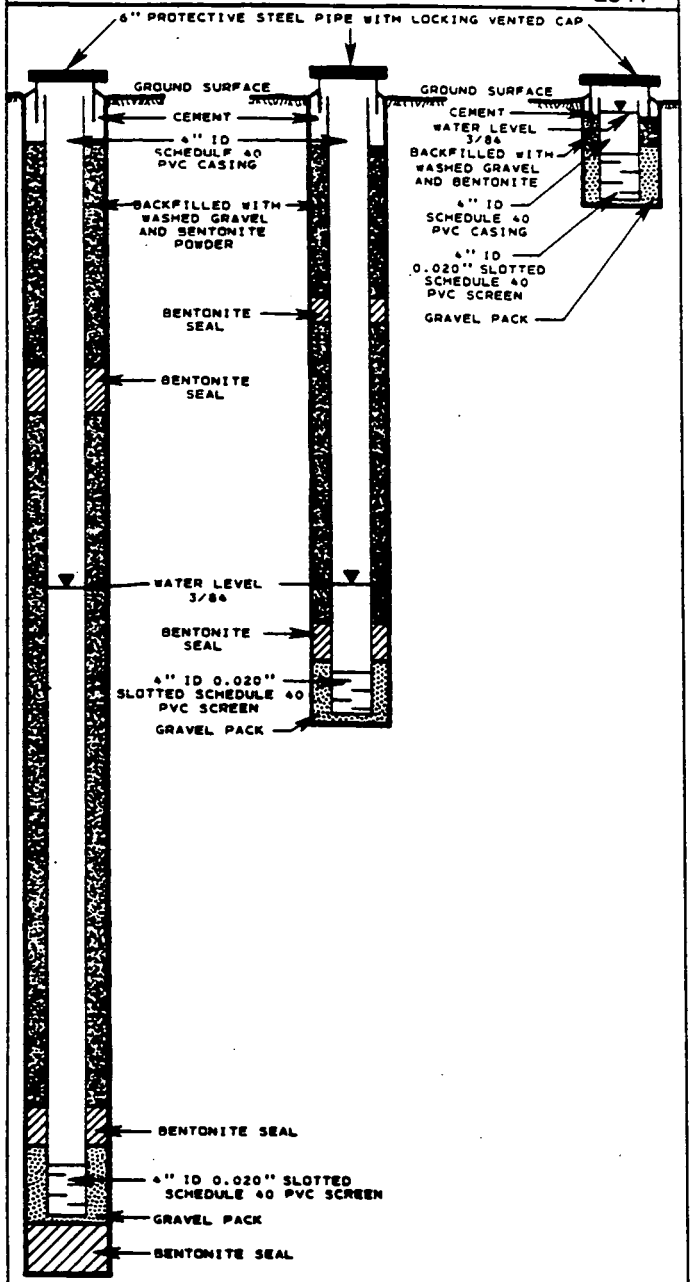
B120-220-320

3020 ~~220~~ CB

WELL SCHEMATICS

2020 ~~220~~ CB

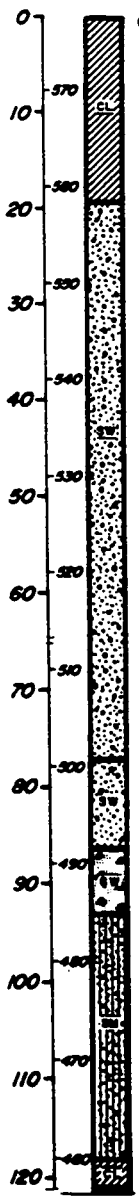
1020 ~~120~~ CB 3/23/84



BORING 20

SURFACE ELEVATION 20D 573.31'
20S 573.42'
20TP 573.21'

DEPTH IN FEET / ELEVATION IN FEET / GRAPHIC LOG



DESCRIPTIVE GEOLOGIC NOTES

LIGHT OLIVE BROWN (5Y5/6) SILTY CLAY, DRY, DENSE, STIFF

LIGHT OLIVE BROWN (5Y5/6) SAND WITH UP TO 10% GRAVEL

LIGHT OLIVE GRAY (5Y5/2) COARSE SAND WITH GRAVEL

GRAY SANDY GRAVEL

GRAYISH OLIVE (10Y4/2) MEDIUM TO COARSE WELL SORTED SILTY SAND

GREENISH-BLACK ("BLUE CLAY") (BG2/1) SILTY CLAY

BORING TERMINATED AT A DEPTH OF 121.0' ON 1/28/85

000314

DAMES & MOORE

WM. CRANE, WELL DRILLING CONTRACTOR, SHANDON, OHIO

Well for — Miami Conservency District (Bu-13) 4023

No. : ..... Location: Lark St, Ross, Ohio

: 6"

: Observation

5709

Sand & gravel	0	5'
Dirty Sand & gravel	5'	15'
Yellow clay	15'	21'
Sand & gravel	21'	45'
Sand few gravels	45'	90'
Sand & med gravel	90'	105'
Sand & gravel	105'	120'
Sand	120'	135'
Sand & rocks	135'	140'
Yellow sandy rocks & sand	140'	154'
Brown clay	154'	155'
Shale	155'	157'

[redacted] slot red brass strainer set 139'-154'

Static level 27'10" (12/12/'68) level taken from end of casing approx 4 ft above ground level.

Driller, H. Williams

000315

FERNALD
RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Verification		

RKA 2/4/87

VISUAL CLASSIFICATION OF SOILS

WPK 11/23/88

RIG # 1

PROJECT NUMBER: 6023.2	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: ~~BB 1-3-5 124~~ 1024	COORDINATES:	DATE: 10-4-87
ELEVATION:	GWL: Depth 9.3' Date/Time 10-17/1100 WPK	DATE STARTED: 10-4-87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 10/16/87
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				Detailed Continuous Samples were collected on borehole # ~~324~~ 3024 JDW 2/6/89. Please refer to that Soil Log for details			
1'							
2'							
3'							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15'				Unsuccessful Shelby Tube Attempt.			Attempted to obtain a Shelby Tube from 14'-15.5'. Only recovered 5".

NOTES: Used a total of 35 gallons of water to drill hole.

000316

402-11-86

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
3rd Verification		

5709 RKA 2/4

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: BB 1-5-89 ~~124~~ 1024	COORDINATES:	DATE: 10/16/87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-4-87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 10/16/87
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				See Well Log # ~~3224~~ 3024 for Soil descriptions BHL 2/6/89			
16	ST 07247		= 8"		CL		Shelby Tube: Csg began pulling up after 8" collected
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27				Bottom of Boring = 27'			1st well - Drilling Completed but had to be redrilled to to bentonite pellets setting up & lifting Stainless Steel Csg with 10" Temp. Csg.
28							
29							
30							

NOTES:

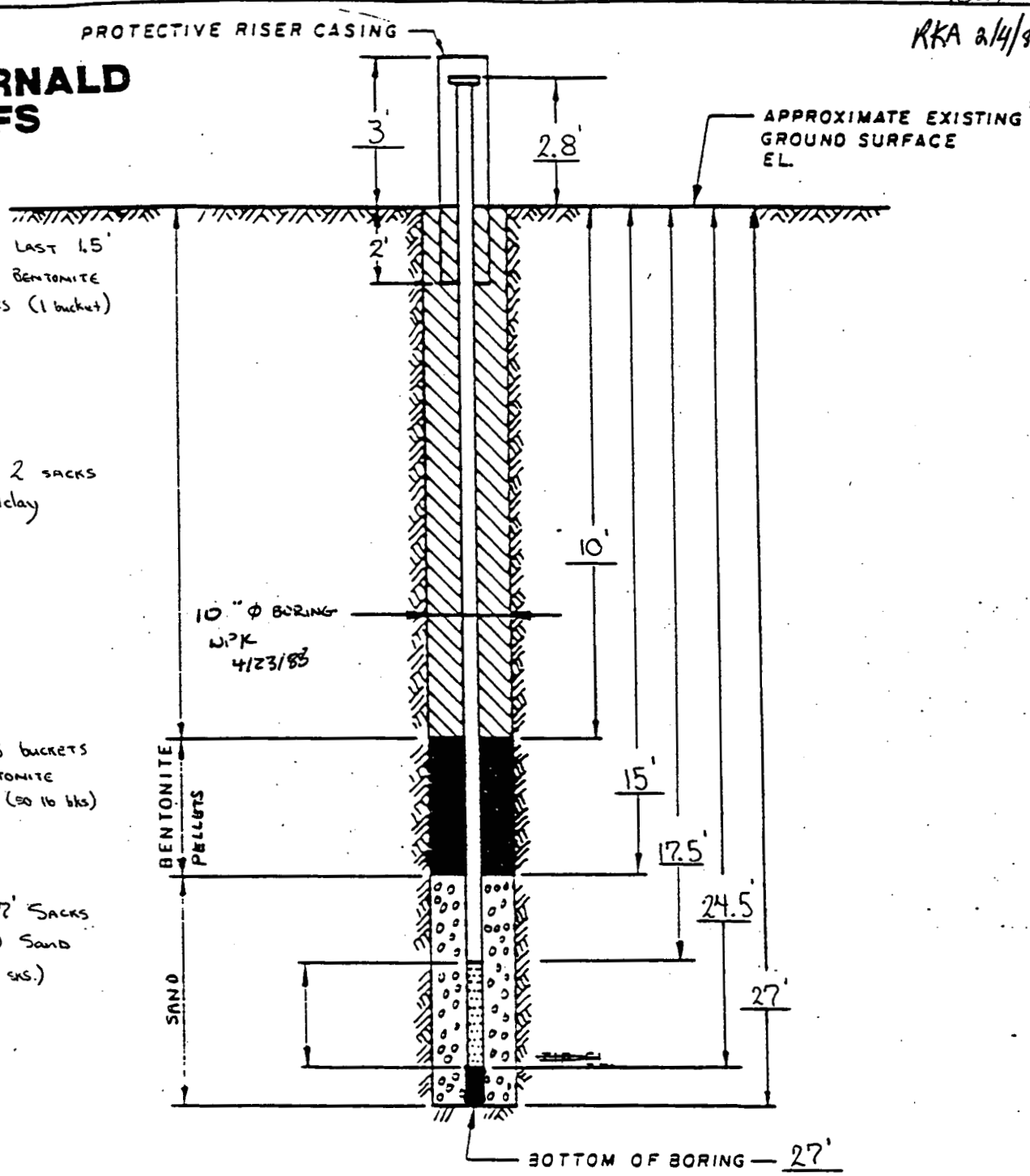
000317

402-11-86

WELL # ~~124~~ 1024 BB...

RKA 2/4/89

FERNALD RI/FS



Toped last 1.5' with Bentonite Pellets (1 bucket)

Used 2 sacks of Volclay

Used 3 buckets of Bentonite Pellets (80 lb bks)

Used 7' Sacks of 430 Sand (80 lb. sks.)

DRAWING NUMBER

DI. BY N

CHECKED BY

APPROVED BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~124~~ 1024
RKA 2/6/89

PREPARED FOR

FMPC RI/FS

000318

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAK

RKA 2/4/89

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 10/18/87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/4/89
BORING NO. ~~124~~ 1024 OB 1-5-89
PIEZOMETER NO. NA DATE OF INSTALLATION 10-18-87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0' TO 27'
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer
CASING SIZE (S) USED: WPK 4/23/88
SIZE 10" FROM Surface TO 27'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN.
TOTAL PERFORATED AREA 7'

RISER PIPE MATERIAL Stainless Steel (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10'
JOINING METHOD Flush joint thread

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE Ø.D. 10"

OTHER PROTECTION Locking cap with lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (FT.) MSL	
TOP OF RISER PIPE	2.8'			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	- 2'			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP - 0'	BOTTOM 10'	TOP	BOTTOM
BENTONITE	TOP 10'	BOTTOM 15'	TOP	BOTTOM
SAND	TOP 15'	BOTTOM 27'	TOP	BOTTOM
NO GRAVEL USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 17.5'	BOTTOM 24.5'	TOP	BOTTOM
PIEZOMETER TIP	WPK 4/23/88	27.0' (SILT TRAP)		
BOTTOM OF BOREHOLE	27'			
GWL AFTER INSTALLATION	= 9'			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS The white out corrections were made by B. Dunning at the time the form was completed. WPK 4/28/88

000319

FERNALD RI/FS

RKA 2/4/89

VISUAL CLASSIFICATION OF SOILS

WPK 4/23/88 RIG #1

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: ~~224~~ 2024 AB 1-5-89	COORDINATES:		DATE: NA
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST: W. REGLEY B DURNING	Depth	Date/Time	DATE COMPLETED: 10-29-87
DRILLING METHODS: CABLE TOOL			PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0							
5.0							
10.0							
15.0				FOR DESCRIPTION OF SOILS ENCOUNTERED IN WELL 224 SEE VISUAL CLASSIFICATION OF SOILS FOR WELL NO ~~224~~ 3024 RKA 2/6/89			NO SAMPLES collected DURING BORING OPERATIONS
20.0							
25.0							
30.0							
35.0							
40.0							
45.0							
50.0							
55.0							
60.0	000320						
65.0							
70.0				70.1 BOTTOM OF BORING AT 70.1 FEET			
75.0							

NOTES:

1. DRILLING CONTRACTOR PENNSYLVANIA DRILLING
   DRILLER : Tim Harris
   HELPER : Steve Rober
   RIG : Speed ~~King~~ Star 71
   WPK 4/23/88
2. WATER ADDED TO BORING DURING DRILLING OPERATIONS (1 = 5 gal)
3. SOIL SAMPLING AS per ASTM STANDARD PENETRATION TEST
4. color descriptions AS per MUNSELL
5. FIELD MEASUREMENTS: Background levels.
   HNu = 0
   γ = 0
   O/a = 40-100

402-11-86

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PA

KKA 2/4/89

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. Will Keeley DATE 10 29 87
PROJECT NO. 602 CHECKED BY [illegible] DATE 2/6/89
BORING NO. ~~224~~ 2024 BB 1-5-89
PIEZOMETER NO. ~~224~~ 2024 DATE OF INSTALLATION 10-29-87 thru 10 30 87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 TO 70.1 ft
FLUID NA FROM NA TO NA

TYPE OF BIT HAMMER (FLAT HEAD)
CASING SIZE (S) USED: (TEMPORARY)
SIZE 10" FROM 0 TO 73 ft
SIZE NA FROM NA TO NA.

PIEZOMETER DESCRIPTION

TYPE STAINLESS STEEL (316)
DIAMETER OF PERFORATED SECTION 4.0 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15 ft

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. ____ I.D. 4.0
LENGTH OF PIPE SECTIONS (1) 5 ft (2) 2 ft (4) 10 ft
JOINING METHOD FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE ~~O~~ I.D. 10 inch

OTHER PROTECTION Locking top with lock [illegible] 4/23/88

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	1.9			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.8			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 2.1	BOTTOM 34.5	TOP	BOTTOM
BENTONITE	TOP 34.5	BOTTOM 40.4	TOP	BOTTOM
SAND	TOP 40.4	BOTTOM 70.1	TOP	BOTTOM
NO GRAVEL USED	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 53.5	BOTTOM 68.5	TOP	BOTTOM
PIEZOMETER TIP	69.0			
BOTTOM OF BOREHOLE	70.1			
GWL AFTER INSTALLATION	NK			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

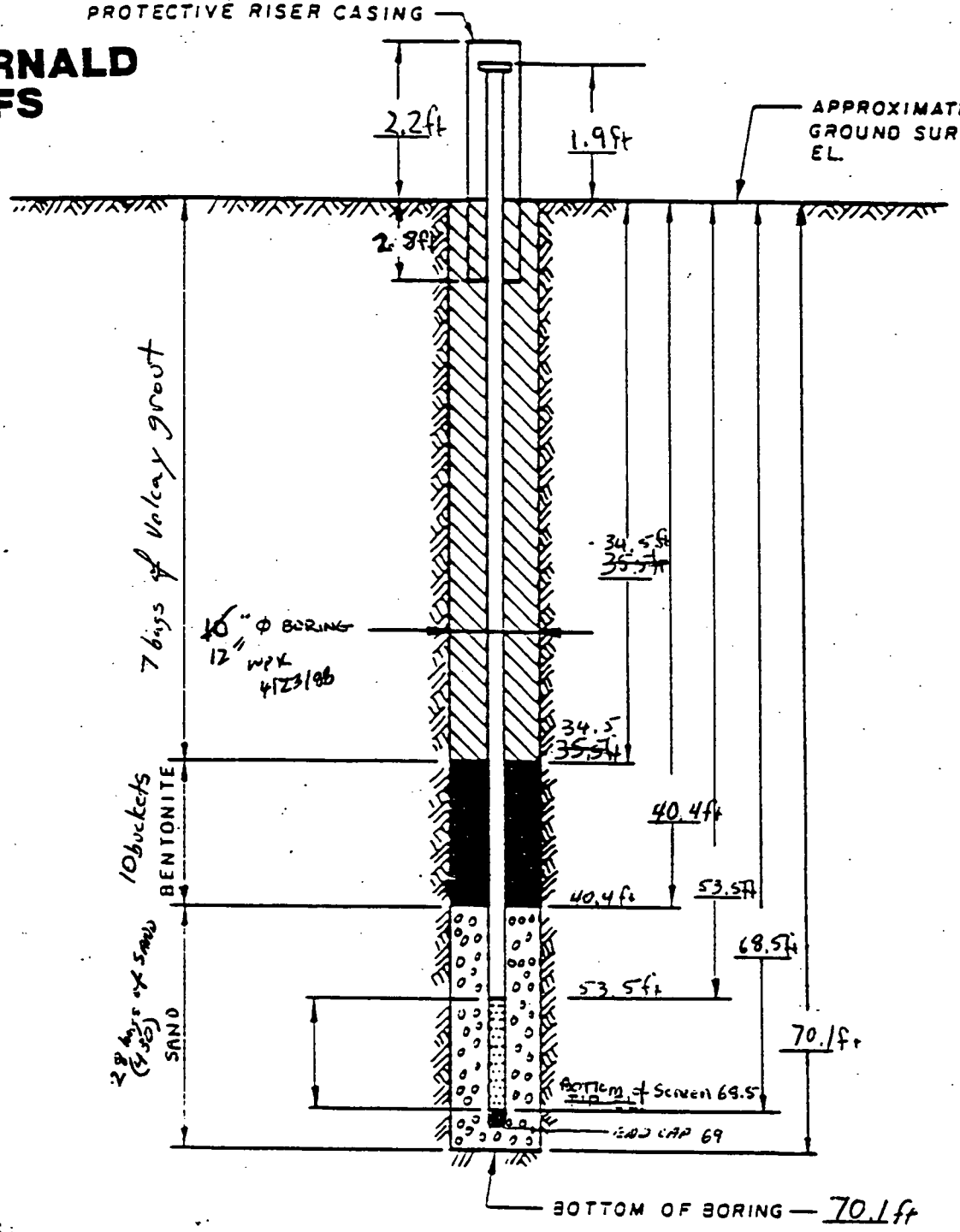
000321

BB 1-5

BORING 224 2024

RK 2/4

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~224~~ 2024 RMD 4/1/

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

000322

Black Ink corrections and White out corrections were made by Brad Dunning while the log was being completed. WPK 4/24/88

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

DAC RKA 2/31

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~324~~ 3024 BB	COORDINATES: N 482477.17 E 1378902.73	DATE: 9-14-87
ELEVATION: 579.9 ground	GWL: Depth – Date/Time –	DATE STARTED: 9-14-87 @ 1330
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 10/3/87
DRILLING METHODS: Cable Tool - Split Spoon Samples		PAGE 1 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.5 1.0'	S 07089	5 11 10	12"	Medium stiff, yellowish-brown clay with some sand, moist	CL		Background Gas $\gamma\beta$ = 40-60 α = 0 mm = 0 Sample Caught (1345)
2' 3'	S 07090	12 17 19	24"	Stiff, dark yellowish-brown silty sand with some fine gravel moist	SM		Background Levels (1400)
4'	S 07091	12 25 32	18	Medium dense dark yellowish-brown silty sand with some gravel moist	SP		Background Levels (1440)
				4.3' Coarse Gravel - grayish-brown	GW		
5' 6'	S 07092	22 12 15	14"	Medium dense dark yellowish-brown silty sandy gravel, moist.	GC		Background Levels (1445)
				5.5' Stiff yellowish-brown silty clay, moist	CL		
7'	S 07093	10 21 23	16"	Dense yellowish-brown silty gravel grading downward to a:	GC		Background Levels (1545)
				7' Hard dark gray clay with a trace of coarse sand and gravel moist 7'	CL	4.5	
8' 9'	S 07095	16 19 23	12"	Very stiff gray clay with a trace of fine gravel (slightly damp) moist.	CL	4.0	Background Levels End of Day 9-14-87 (1625)
10'	S 07096	6 11 15	6"	Medium dense, grayish-brown gravel moist.	GC		Start of Day 9-15-87 gravel is actually very loosely consolidated Background (0830)
11' 12'	S 07097	4 5 8	12"	Medium stiff olive-gray clay with a trace of fine gravel, moist.	CL	1.0	Background Lost entire first sample and had to use spring catcher (0935)
13	S 07098	6 11 17	18"		CL	.75	Background
				13.2' Loose gray, fine sand, moist. 13.2.	SM		(0942
14' 15'	S 07100	2. 2 3	18"	Soft olive-gray clay with a trace of fine gravel, moist.	CL	.50	Background (1030)

NOTES: Background Levels 9-14-87 $\gamma\beta$ = 40 - 140 cpm α = 0 hmm = 0

Background Levels 9-15-87 $\gamma\beta$ = 40 - 80 cpm α = 0 hmm = 0

Used 40 gallons of H_2O 9-14-87

000323

402-11-88

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		TASK 3.2
BORING NUMBER: ~~324~~ 3024	COORDINATES: See p1	DATE: 9-15 & 9-16-87	
ELEVATION: See p1	GWL: Depth 17.2 Date/Time 9-15 @ 1450	DATE STARTED: 9-14-87	
ENGINEER/GEOLOGIST: B. Dunning	Depth 11.3 Date/Time 9-15 / 1600	DATE COMPLETED: 10-3-87	
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 11	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16'	S 07101	6 6 9	18"	Soft, olive gray clay with a trace to some sand and gravel, MOIST	CL	.50	Background Levels (1040)
17'	S 07102	2 3 12	6"			.50	Background Levels (1350)
18'				18.2' Soft olive gray clay, MOIST. 18.2'		.50	
19'	S 07103	20 45 40	18"	Very dense gray fine gravel MOIST	GP		Background levels (1355)
20'	S 07104	46 30 27	18"	19.8 Dark yellowish-brown coarse sand 19.8	SW	–	Background
21'				Very dense gray coarse gravel, MOIST Wet	GP	–	End of Day 9-15-87 (1530)
22'	S 07105	16 33 47	18"	21.5 21.5 21.8 Very dense gray fine to medium sand MOIST 21.8	SC	–	Start Day 9-16-87 Sand is actually Medium dense
				22 Hard olive-gray clay, trace of gravel MOIST. 22	CL	>4.0	(0905)
23'	S 07106	14 16 22	18"	Dense gray unconsolidated gravel, MOIST. grading downwards to a:	GW		Background
24'				23.5 Hard gray clay, some gravel MOIST 23.5			(1005)
25'	S 07107	20 50 (3")	12"	Medium dense grayish-brown fine to medium sand with trace of large quatz rock fragments Wet	SP		Background Split Spoon jammed with large rock (1420)
26' 27'	S 07108	8 18 30	18"	Hard, dark gray olive-gray clay with some sand and fine gravel	CL	>4.5	Background (1440)
28	S 07110	35 52 30	18"	27.5 Very stiff, grayish-brown silty clay 27.5	ML	3.5	Background
				28 Very hard, gray clay 28	CL	>4.5	(1500)
29' 30'	S 07111	46 50 –	12"	Very stiff, gray clay with twig-like fragments ?? and a trace of gravel	CL		Background End Day 9-16-87 (1520)

NOTES: Background levels 9-15-87 $\gamma\beta$ = 40-80 cpm α = 0 hnge = 0

Background Levels 9-16-87 $\gamma\beta$ = 40-80 cpm α = 0 hnge = 0

Water level 9-15-87 @ 1600 was 11.3'

" " 9-16-87 @ 0800 " 9.3'

There appears to be a substantial aquafer at 18' - 21.5'

000324

402-11-86

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~324~~ 3024	COORDINATES: see p1	DATE: 9-17-87
ELEVATION: see p1	GWL: Depth 41.2 Date/Time 9-17-87 @ 1730	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 11

DEPTH (1 Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30'							Shift Day 9-17-87
31'	S 07112	12 20 24	6"	Stiff olive gray clay with a trace of fine gravel moist	CL	2.0	Background Levels (1045)
32' 33'	S 07113	10 11 16	18"	Very stiff gray clay with trace of gravel. moist			Background Levels-(B.G.) (1050)
34'	S 07114	10 25 37	24"	33.7 Stiff gray clay moist 33.7; 34 Very stiff olive-yellow clay moist 34'; Very dense yellow-brownish sand moist		1.5; 4.0	B.G. (1105)
35' 36'	S 07115	23 33 36	12"	Very dense yellowish-brown Sand moist.	SW	—	B.G. Sand is moist, but not saturated. (1400)
37'	S 07116	50 - -	9"	37' Medium stiff brownish-yellow silt clayey moist 37'	SM	—	B.G. (1530)
38' 39'	S 07117	9 24 42	13"	Very dense yellowish-brown, well soited, fine grain sand Moist, but basicly dry.			B.G. Very friable Sand Actually (1555)
40' 41' 42' 43' 44'					SW	—	Begin catching 5' Samples. Loose Unconsolidated Sand
45'	S 07118	25 43 45	18"				B.G. Sample 44'-45.5' End Day 9-17-87 1715

NOTES: Background Levels for 9-17-87 γB = 40-60 cpm, α = 0 hnu = 0

000325

402-11-86

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		8/11
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3024	COORDINATES: see p7	DATE: 9-18-87
ELEVATION: see p1	GWL: Depth Date/Time	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 4 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45'	07118	25 43 45	18"	SAND - As Described above	SW		End Day 9-17-87 (1715) Start Day 9-18-87
46' 47' 48' 49' 50'				Very dense yellowish-brown well sorted fine grain sand moist.	SW	–	
51'	S 07119	15 20 21	18"	Dense yellowish-brown, well sorted, damp, but not wet sand			B.G. Loose unconsolidated Sand (1345)
52' 53' 54' 55'							
56'	S 07120	13 27 (4")-50	12"	55.8 Loose grayish-brown coarse sand, moist 55.8 / 56.1 Hard gray clay moist. 56.1	CL		B.G. (1415)
57' 58'	S 07121	13 23 43	12"	Very dense gray, salt & pepper looking, medium to coarse grain sand with trace of fine gravel. moist	SW		B.G. Sand is actually loose & unconsolidated. (1440)
59' 60'							

NOTES:

000326

402-11-86

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		8/4
Hard Copy Verification		

JAC KKA 2/4/?

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~1-5-3432~~ 3024	COORDINATES: see p1	DATE: 9-19-87
ELEVATION: see p1	GWL: Depth 51.6 Date/Time 9-19/1030	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 62.6 Date/Time 9-19/1730	DATE COMPLETED: 10-3-87
DRILLING METHODS:		PAGE 5 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60'							
61'	S 07122	13 25 28	18"	Very dense, dark gray coarse sand with some fine gravel WET	SW		Background End of 9-18-87 (1515)
62'							~~End~~ Start of 9-19-87
63'							
64'	S 07123	6 3 3	14"	Loose gray, lightly salt & peppered looking fine to coarse grain sand with a trace of gravel WET	SW		Borehole drilled down to 70'. Blow sand came up hole to 63' where this sample was taken. B.G. Levels (1545)
65'							
66'	S None	5 2 2	0"	Sand pump indicates very loose, grayish-brown unconsolidated sand, WET	SM ?		Blow Sand coming into hole. Could not obtain a sample even with catcher End Day 9-19-87
67'							Start Day 9-20-87
68'							
69'							
70'							10" Temporary Casing driven to 80' to cut off blow sand.
71'	S 07124	6 14 21	12"	Dense, gray coarse sand with some fine & coarse gravel. Wet	SP		Background Levels Only (1000)
72'							
73'							Bailer - Sand Pump bringing up large cobbles i.e. 1½" x 2½" large - Diameter - ± 1½"
74'							
75'							

NOTES: Background Levels 9-19-87 β = 40-80 α = 0 hnu = 0
" " 9-20-87 β = 40-70 α = 0 hnu = 0

000327

402-11-86

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		8/11
Hard Copy Verification		

RKD 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~4324~~ 3024	COORDINATES: see p1	DATE: ~~9-19-87~~ MB 3-21-90 & 9-20
ELEVATION: see p1	GWL: Depth 61.5' Date/Time 9-20/0900	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 6 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Feet)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75'							
76'	S 07125	16 31 46	14"	Very dense grayish-brown gravel (Color: 2.5 Y, 5/2) and Coarse Sand See Remarks →	GP		Background levels (B.G.) (1140)
77'							Sand pump collecting large carbonate cobbles & gravel rocks with fossil Inclusions.
78'							
79'							
80'							
81'	S 07126	2 6 16	18"	Medium dense, gray, very coarse grain sand with some fine gravel (SC.8 / SO.8)	SW		Background levels (1350)
				Medium dense grayish-brown fine gravel with some coarse gravel	GW		
82'							Drove 10" Temporary Casing to 90'
83'							Sand Pump bringing up fine to coarse gravel
84'							
85'							
86'	S 07127	20 50 (3")-50	12"	Very dense, dark gray, sandy gravel with fine to coarse sand. (Color: 2.5 Y, N4/) & large cobbles ie. 1" x 2" x 1½".	GP		Large rock jammed in Split Spoon. Actually a loose gravel. Background levels (1600)
87'							
88'							
89'							
90'							

NOTES: Background levels 9-20-87 : $\gamma\beta$ = 40-75 cpm. $\alpha = 0$, hnu = 0

000328

402-11-86

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BO 1-2-3-4 3024	COORDINATES: See P1	DATE: 9-20 & 9/21/87
ELEVATION: See P1	GWL: Depth 52' Date/Time 9-20/1400	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 52' Date/Time 9-21/0730	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 7 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90'							
91'		2 2 5 3 8 4	0"	Sand Pump collecting fine grain Sand	SW		Lost Sample both times even with Catcher In.
92'							End 9-20-87 Start 9-21-87
93'				93 ± ? ? ?	?		Approximate depth of material change.
94'							
95'				Very Dark Gray, fine gravel with coarse sand (10YR 3/1)	GW		
96'	S 07128	18 29 36	24"	95.5 Dense gray fine to coarse gravel (2.5 Y N5) 95.5	GW		Background levels
				96.25 Very dense, grayish-brown silty sand moist. 96.25 (Color: 2.5 Y, 5/2)	GM		1350
97'							
98'							Sand pump quit sucking up sand. Sample Taken.
99'							
100'	S 07129	17 13 20	18"	Very Stiff, dark gray clay moist (Color: 5 Y, 4/1)	CL	3.5	Background levels (1500)
101'							
102'				? ? ?	?		
103'							
104'							
105'							

NOTES: Background Levels 9-21-87 $\gamma\beta$ = 40-80 cpm, α = 0, hnu = 0

000329

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: ~~324~~ 3024	COORDINATES: See p1	DATE: 9-22-87
ELEVATION: See p1	GWL: Depth 52' Date/Time 9-21/1700	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 64.5' Date/Time 9-22/1550	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool	92' 9-22/1715	PAGE 8 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105'							
106'	S 07130	6 7 14	6"	Medium dense, grayish-brown fine grain, well graded, silty Sand (Color: 2.5 Y, 5/2)	SM		Background levels (1620)
107'							End 9-21-87
108'							
109'							
110'							
111'	S 07131	6 10 11	12"	111.4' Soft, dark gray silty clay (Color: 5Y, 4/2) 111.4'	CL		Background levels (1035)
112'						~~.95~~ .5	
113'							Picking Up clay On hammer 113' - 115'
114'							
115'				Medium Stiff, Olive-Gray Clay (5Y, 4/2) 115.5' 115.5'			
116'	S 07132	9 14 18	18"	Very Stiff, olive gray clay (Color: 5Y, 4/2)	CL	.75 3.5	Background levels (1338)
117'							Casing Driven Down To 120'
118'							
119'							
120'							

NOTES: Background Levels 9-22-87: $\gamma\beta$ = 40-80 cpm, α = 0, hnu = 0

000330

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: BB 1-5-89 3274 3074	COORDINATES: see p1	DATE: 9/22 & 9/23/87
ELEVATION: see p1	GWL: Depth 64.5' Date/Time 9-22/1550	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 92' Date/Time 9-22/1715	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL	75' 9-23/1750	PAGE 9 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120'							
121'	S 07133	2 3 6	18"	Medium Stiff, gray (5Y, 5/1) to Olive gray (5Y, 5/2) clay with some fine gravel wet	CL		Moderately gravelly Sand. Background levels (1650)
122'							End Day 9-22-87 Start Day 9-23-87
123'				123.5'			Noticed Sand & Gravel On Sticking On Hammer
124'							
125'							
126'	S 07134	27 17 10	6"	Medium Dense, Olive-~~Gray~~-Brown, fine to coarse gravel wet (Color: 2.5 Y, 4/4)	GP		Scanned - Background Readings Only (1025)
127'							
128'							
129'							
130'							
131'	S 07135	18 33 19	5"	Very Dense, Olive-Brown Fine Gravel (Color: 2.5 Y, 4/4) wet	GW		Background levels. Spoon Plugged with light Olive-brown carbonate rock fragment (2.5 Y, 5/4) (1108)
132'							132' Drilling became more Difficult Lithology Change
133'							
134'							Drilled Down To 135' & Sand blew In To 124'
135'							Drive 10" Csg to 140'

NOTES: Water Level checked at 1550, 9-22-87 when temporary Casing was at 121'.

Background Levels 9-23-87: $\gamma\beta$ = 40-120 cpm hnu = 0

α = 0

Smelled Some Brackish, Semi-Petroliferous odor observed at 125'

Hole Monitored with LLE & hnu. No Readings Detected.

000331

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC

RKA 2/4/93

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB 1-5-3 ~~3024~~ 3024	COORDINATES: See pl	DATE: 9-24-87 / 9-29-87
ELEVATION: See pl	GWL: Depth 66.4' Date/Time 9-24/1245	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 58.5 Date/Time 9/29/0900	DATE COMPLETED: 10-3-87
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135'							End Day 9-23-87
136'		#1 11 13 14 #2 5 7 10	0"				Start Day 9-24-87 Attempted twice to obtain sample.
137'							Sand Pump indicates Fine Sand
138'							
139'							Drilled Down to 140', but sand blew in to 135'. Drive Csg to 145'
140'		#1 50-(4")					
141'	S 07136	#2 45 (2")-50	12"	Very Dense, very dark grayish-brown sand & fine gravel wet (Color: 2.5 Y, 3/2)	SW		B.G. Felt we hit a Rock (1115)
142'							
143'							Hammer Driving Hard Feels like we were pounding a large rock.
144'							
145'							End Day 9/24
146'	S 07137	38 (3") 50	12"	Very Dense, very dark brownish-gray sand with fine gravel, generally as above (Color: 2.5 Y, 3/2) wet	SP		Start Day 9/29 Background - Scanned. (1050)
147'							
148'							
149'							
150'							

NOTES: Water level with Csg at 145' 9-24 @ 1245 = 66.4'
" " " " " " 9-29 @ 58.5' after well sitting 4 days

000332

Background Levels 9/29/87: $\gamma\beta$ = 60-120
α = 0
hnu = 0

402-11-86

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RKD 2/24/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB ~~3024~~ 3024	COORDINATES: See p1	DATE: 9-29-87
ELEVATION: See p1	GWL: Depth 60.7 Date/Time 9-29/1615	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: B. Dunning	Depth 58.6 Date/Time 9-30/1340	DATE COMPLETED: 10-3-87
DRILLING METHODS: Cable Tool		PAGE 11 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
150							
151'	S 07138	20 37 (4")50	14"	Medium Dense, Gray Silty Sand grading downwards into: (Color 2.5 Y, N5/)	SM		Scanned - Background levels (1415)
				Very Dense, black fine gravel wet (Color: 2.5 Y, N2/)	GW		
152'							
153'							
154'							
155'					---		BOB.
156'	S 07139	7 22 45	18"	Very Dense, Dark gray coarse Sand w/ some fine gravel wet (Color: 5 Y, 4/1)			Scanned - Background levels (1540)
157'				Bottom of Borehole (10") = 155' Bottom of 1st Split Spoon = 156.5'			
158'							
159'							
160'							

NOTES: Blow Sand coming into hole with Csg @ 150'. to a depth of 147' 10" Csg Driven to 155' to obtain 150-151.5' Split Spoon Sample.

Used a total of 500 gallons to Drill Entire Well.

000333

while out corrections were made by Brad Dunning at the time the form was completed.
WPK 4/22/88

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

DAC
KKC 2/4/89

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 10/16/87
PROJECT NO. 602 CHECKED BY RM Zabowski DATE 2/6/89
BORING NO. BB1589 ~~324~~ 3024
PIEZOMETER NO. ~~BB 324~~ 3024 DATE OF INSTALLATION 10-3-87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 TO 155'
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" FROM 0' TO 155'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel MONITORING WELL
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10'

RISER PIPE MATERIAL Stainless Steel (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10'
JOINING METHOD Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE ~~Ø~~ I.D. 10"

OTHER PROTECTION LOCKING CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft.)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	+ 2.4'		582.3	
GROUND SURFACE	0.0		579.9	
BOTTOM OF PROTECTIVE PIPE	- ~~2.4~~ 2.6' RMZ 2/6/89		577.3	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 80'	TOP 579.9	BOTTOM 497.3
BENTONITE	TOP 80'	BOTTOM 92'	TOP 497.3	BOTTOM 485.3
SAND	TOP 92	BOTTOM 110'	TOP 485.3	BOTTOM 467.3
BENTONITE PELLETS	TOP 110'	BOTTOM 125'	TOP 467.3	BOTTOM 452.3
PERFORATED SECTION	TOP 97.5'	BOTTOM 107.5'	TOP 482.4	BOTTOM 472.4
PIEZOMETER TIP	~~NA~~ ~110'		467.3	
BOTTOM OF BOREHOLE	~~155.5~~ 155.0' WPK 4/24/88		422.3	
GWL AFTER INSTALLATION	58'		521.9	

000334

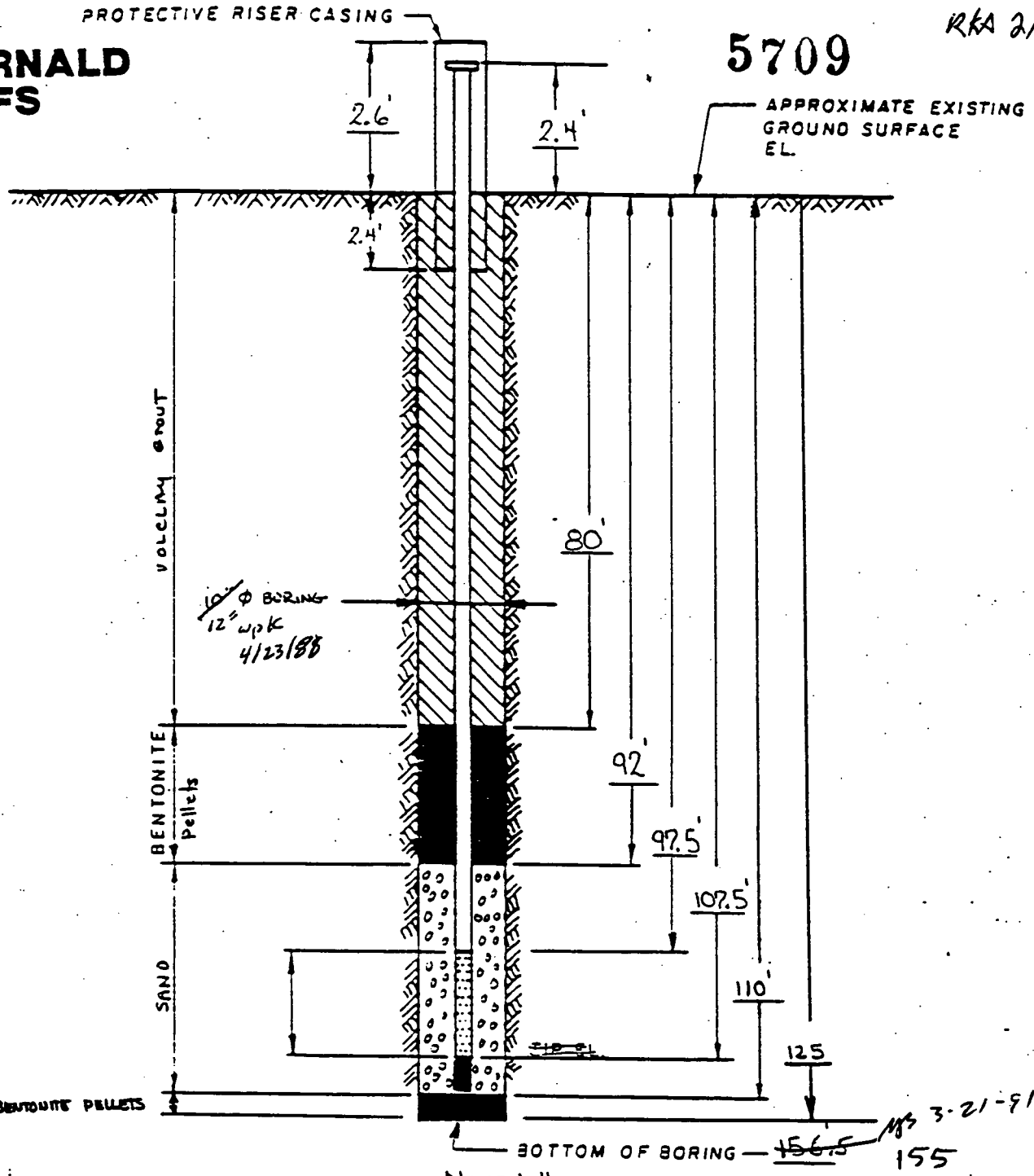
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS: Hole was drilled to 155' to clearly define stratigraphy. Casing was pulled up to 125' and sand-hole was allowed to collapse in. The well was then plugged from 125' to 110' with bentonite to insure that no communication through "Blue Clay" was present. Well was then set from 110'.

WELL # ~~324~~ 3024
OB 1-5
RKA 2/4/89

FERNALD RI/FS

5709



NOTE: HOLE WAS ALLOWED TO COLLAPSE TO 125'. Plugged with Bentonite 125'-110'.

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

white out corrections were made by B. Dunning at the time the form was completed
WPK
4/23/88

INSTALLATION DETAILS
MONITORING WELL ~~324~~ 3024 RMG 3/6/89

PREPARED FOR

FMPC RI/FS

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

000335

QC/DH/2/3/89

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB 1-5-3 ~~0125~~ 1025	COORDINATES: 482021.82 N 1378309.45 E	DATE: 12/21 – 12/23/87
ELEVATION:	GWL: Depth N/A Date/Time N/A	DATE STARTED: 12/21/87
ENGINEER/GEOLOGIST: B. Dunning	Depth N/A Date/Time N/A	DATE COMPLETED: 01/08/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	S 0 7 8 0 0	4 16 15	15"	.5' Dense yellowish-brown sand (10 YR, 5/4) wet .5' 1.0' Dense light gray gravel rock (10 YR, 6/1) wet 1.0'	SM GW	– –	Hnu = 0 α = 0 γβ = 80 c.p.m. (1500)
2	S 0 7 8 0 1	50 43 36	9"	Hard, dark brown clay (10 YR, 4/3) with some coarse gravel. Dry 2' 2.5 Hard dark olive gray clay (5 Y, 3/2) with some gravel	CL Dry	4.5 4.5+	Hnu = 0 α = 0 γβ = 60 c.p.m. (1504)
3				3' Light gray very dense gravel (10 YR, 6/1)	GP		
4	S 0 7 8 0 2	10 13 13	18"	Hard, olive clay (5 Y, 4/3). Dry 5' 5'	CL		Hnu = 0 Met refusal first Attempt. α = 0 γβ = 80 c.p.m. (1645)
5	S 0 7 8 0 3	31 22 28	18"	Hard, dark olive gray clay (5Y, 3/2) with a trace of fine gravel. Dry		4.5+	Hnu = 0 End Day 12/21/87 Start Day 12/21/87 α = 0 γβ = 80 c.p.m. (1016)
6							
7	S 0 7 8 0 4	19 23 30	6"	7.5' 7.5'			Hnu = 0 α = 0 γβ = 60 c.p.m. (1021)
8	S 0 7 8 0 6	13 17 20	15"	Hard, olive-gray clay (5Y, 4/2) with a trace of fine gravel Dry		4.5	Breeze picked-up & increased background levels. Hnu = 0 α = 0 γβ = 120 c.p.m. (1351)
9							
10	S 0 7 8 0 7	25 27 33	18"	10' 10'			Hnu = 0 α = 0 γβ = 120 c.p.m. (1357)
11	S 0 7 8 0 8	12 19 22	18"	Stiff, yellowish-brown clay (10 YR, 5/6) silty and Dry 11' 11' Hard, brownish-yellow clay (10 YR, 6/8) with a trace of fine gravel. Dry 12' 12'		1.5 4.5	Attempted Shelby tube, but lost recovery. Hnu = 0 α = 0 γβ = 120 c.p.m. (1525)
12							
13	S 0 7 8 0 9	5 7 11	12"	Very stiff, yellowish-brown clay (10 YR, 5/4) to (10 YR, 5/8) with a trace of gravel. Dry		3.5	End of Day 12/22/87 Start Day 12/23/87 Hnu = 0 α = 0 γβ = 60 c.p.m. (0826)
14	S 0 7 8 1 0	17 26 27	18"				Hnu = 0 α = 0 γβ = 40-60 c.p.m. (0840)
15							

NOTES:

I) Drilling Contractor: Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter

II) Samples color by Munsell Color Chart & blow counts via ASTM

III) Background Measurements
12/21/87 = Hnu = 0, α = 0, γβ = 25 c.p.m.
12/22/87 = α = 0, Hnu = 0, γβ = 180-250 c.p.m.

000336

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/24/91 QA/DA 12/3/89

5709

	Initial	Date
1st Key In		
2nd Key In		5/11
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 0B-549 125 1025	COORDINATES: SAME AS FIRST PAGE	DATE: 12/23/87
ELEVATION:	GWL: Depth N/A Date/Time N/A	DATE STARTED: 12/21/87
ENGINEER/GEOLOGIST: B. Dunning	Depth N/A Date/Time N/A	DATE COMPLETED: 01/08/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	ST 07 8 1 1	NA	14"	SHELBY TUBE PUSHED		~~4.5~~	Hnu = 0 α = 0 γB = 60-80 cpm. 0935
17	CS 07 8 1 2	16 16 22	14"	Hard, Brownish yellow clay w/ trace of gravel (5Y 6/6) slightly moist @ 18.4	CL	4.5	Hnu = 0 α = 0 γB = 60 cpm 0945
18	CS 07 8 1 3	24 22 27	12" 19.5				Hnu = 0 α = 0 γB = 50 cpm 1010
20	CS 07 8 1 4	12 17 18	12"	STIFF, Dark ~~[illegible]~~ gray clay (10YR 4/1) Trace of gravel. moist	CL	1.5	Hnu = 0 α = 0 γB = 60-80 cpm 1350
21							
22	CS 07 8 1 5	3 4 3	14"	STIFF Dark grey clay (10YR 3/1) Trace of gravel. ~~[illegible]~~ moist			Hnu = 0 α = 0 γB = 30 1500
23				23.0 ← BOTTOM OF BOREHOLE			
24							
25							
26							
27							
28							
29							
30							

NOTES: Background Levels 12/23/87
Hnu = 0
α = 0
γB = 180-250 cpm.

II. WATER USED: 30 + 20 = 50 gallons
15
65 gallons

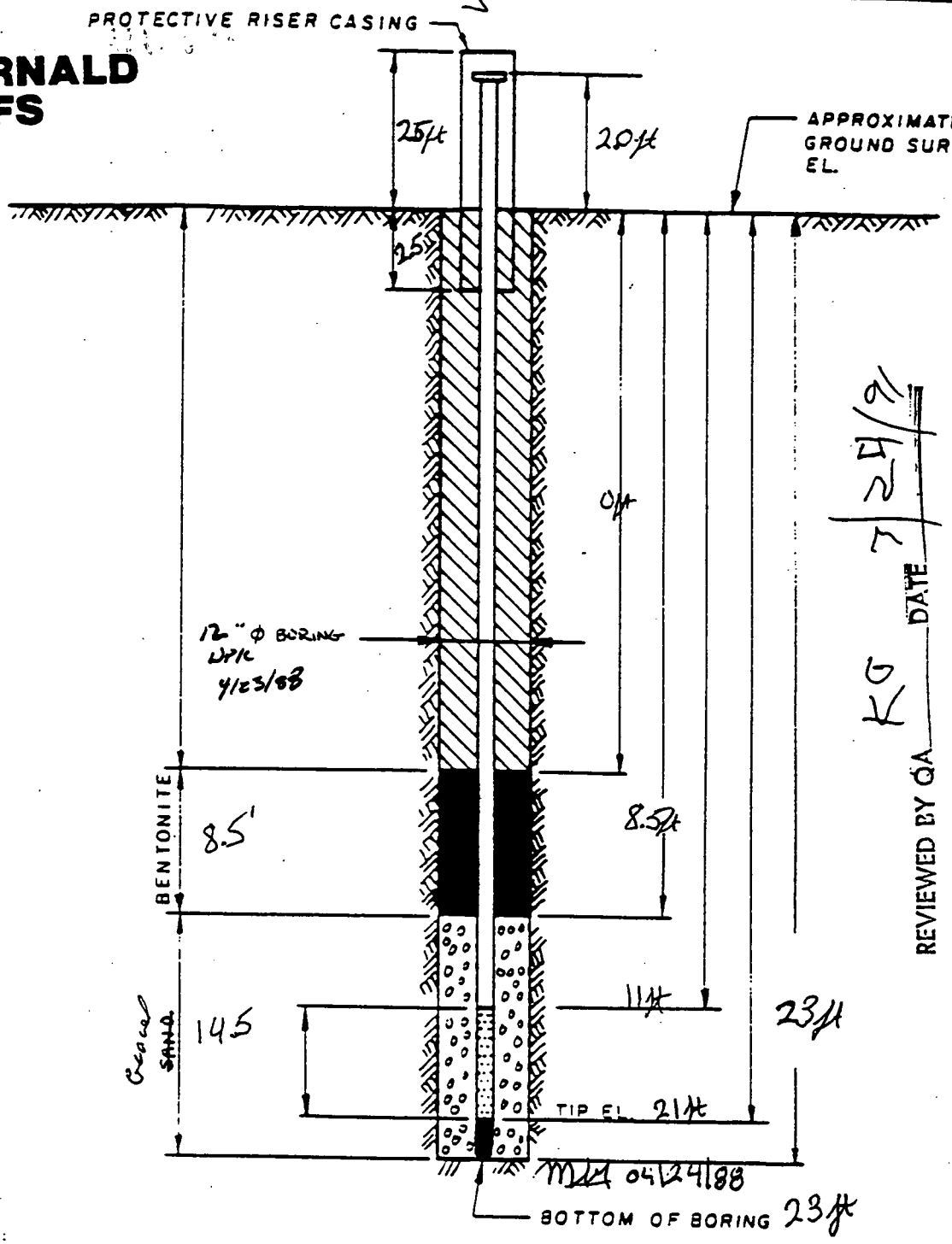
III Background Measurements
01/07/88 = Hnu = 0
γ = 0
γB = 200 cpm

000337

402-11-86

Monitoring Well #~~125~~ 1025 BB 1-5-89 #3

FERNALD RI/FS



DRAWING NUMBER

DRAWN BY

CHECKED BY

APPROVED BY

REVIEWED BY QA

DATE 7/27/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~125~~ 1025

PREPARED FOR RMG 2/6/89

Gravel From 23 - 8.5 ft
Bentonite From 8.5 - surface

000338

QC/DM/2.3.89

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 7/29/91

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Goldberg DATE 01/08/88
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~125~~ DB 1-5-89 1025
PIEZOMETER NO. ~~125~~ 1025 DATE OF INSTALLATION 01/08/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 3 ft TO 23
FLUID NA FROM NA TO NA

TYPE OF BIT Flathead
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 23 ft
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 inch
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4 in
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD Thread and couple (FLUSH JOINT THREADED)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE ~~Ø~~ I.D. 10" in

OTHER PROTECTION Lockable cap AND LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 ft		583.51	
GROUND SURFACE	0.0		581.51	
BOTTOM OF PROTECTIVE PIPE	2.5 ft		579.01	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
BENTONITE	TOP 0 ft	BOTTOM 8.5	TOP 581.51	BOTTOM 581.51
SAND	TOP 8.5 ft	BOTTOM 23 ft	TOP 573.01	BOTTOM 550.01
~~GRAVEL~~	TOP NA	BOTTOM NA	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 11.0	BOTTOM ~~22.0~~ 21.0 ft MLY 04/24/88	TOP 570.51	BOTTOM 549.51
PIEZOMETER TIP	23 ~~ft NA~~ MLY 04/24/88		558.51	
BOTTOM OF BOREHOLE	23		558.51	
GWL AFTER INSTALLATION	NA		N/A	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000339

WELL LOG AND DRILLING REPORT

2026
EF
BU-101

ORIGINAL

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 421162

2026

County Butler Township Ross Section of Township 34

Owner Elmer Fletcher Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 73

Type of screen Cook base #30 Length of screen 2

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 25 G.P.M. Duration of test 4

Drawdown 2 ft. Date 11/4/71

Static level-depth to water 37'6"

Quality (clear, cloudy, taste, odor) clear

Pump installed by Crane

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Top soil	0	1
Sand & gravel	1	75

000340

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, e

[redacted]

Drilling Firm Wm Crane Date 11/20/71

Address Box 33 Shandon, O Signed Wm Crane

*If additional space is needed to complete well log, use next consecutive numbered f

QC/DM/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023-2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~127~~ 1027 BB 1-5-89	COORDINATES:	DATE: 12-21-87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12-21-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 12-22-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (IN.) NA	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				SEE VISUAL CLASSIFICATION FOR WELL # ~~227~~. 2027 RMB 2/6/84			
10	ST 07SEP87 15:37						12-22-87 8:30
20	ST 07SEP87 10:10						
30				WELL TD 31.5 FT.			

NOTES:

WATER ADDED TO HOLE

EACH MARK REPRESENTS 10 gals

~~HH HH~~ III

000341

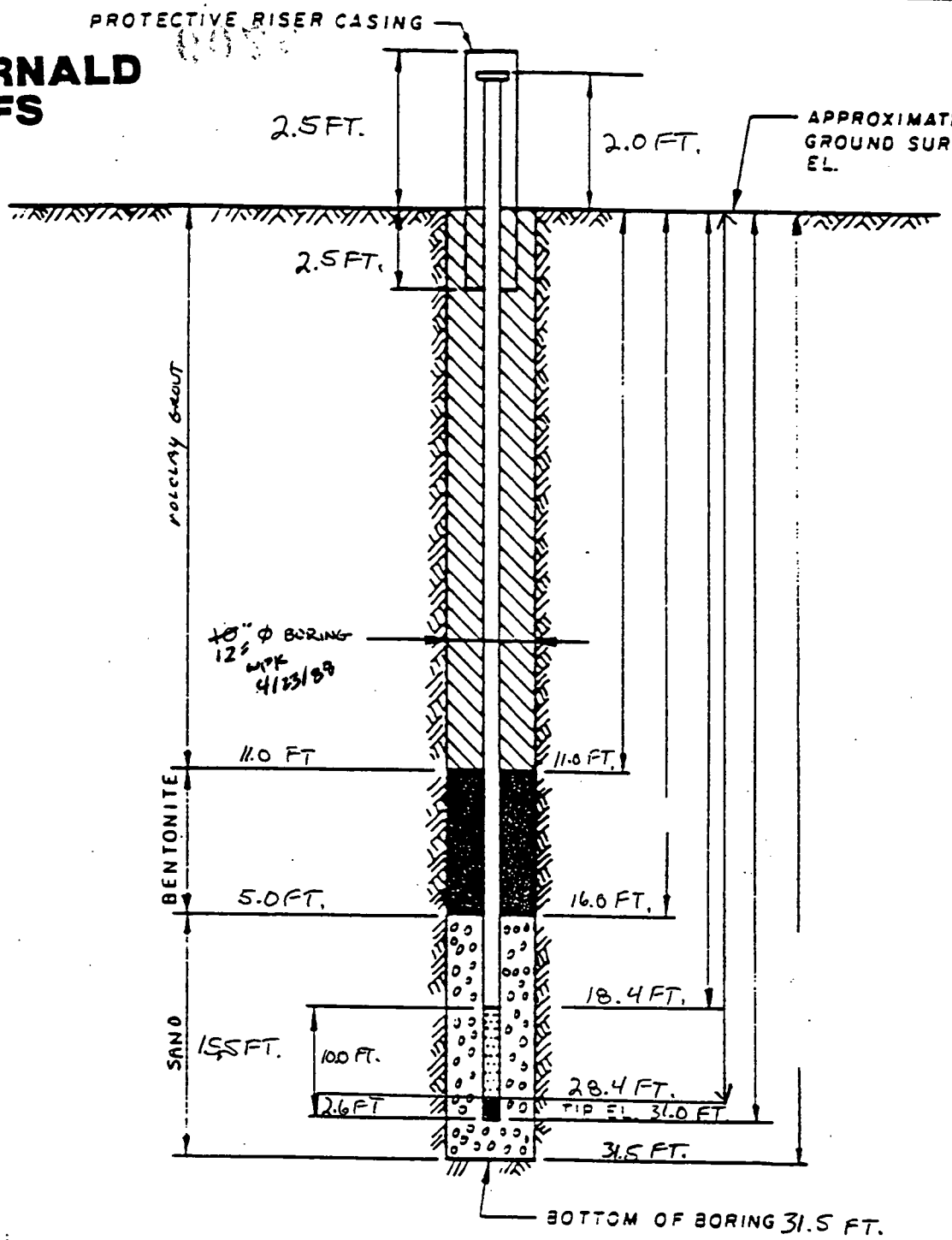
402-11-86

QC/DH/2.4.89

36

WELL # ~~127~~ 1027

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~127~~ 1027

PREPARED FOR

RWB 2/6/89

DRAWING NUMBER

CHECKED BY

APPROVED BY

D/30

DRAWN BY

000342

QC/DIT/2.4.89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 12-23-87
PROJECT NO. 662 CHECKED BY R Gallbraith DATE 2/6/89
BORING NO. ~~127~~ 1027 BA 1-5-89
PIEZOMETER NO. NA DATE OF INSTALLATION 12-22-87 - 12-23-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 4.0 TO 31.5 FT
FLUID _____ FROM _____ TO _____

TYPE OF BIT FLATHEAD
CASING SIZE (S) USED:
SIZE 10" IN FROM 0 TO 30 FT.
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 IN
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD AND COUPLE

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE I.D. 10 IN.

OTHER PROTECTION LOCKING CAP
with lock WPK 4/23/88

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.8 FT.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 11.0 FT.	TOP	BOTTOM
BENTONITE	TOP 11.0	BOTTOM 16.0 FT.	TOP	BOTTOM
SAND	TOP 16.0	BOTTOM 31.5 FT.	TOP	BOTTOM
~~GRAVEL~~	TOP N/A	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 18.4 FT.	BOTTOM 28.4 FT.	TOP	BOTTOM
PIEZOMETER TIP	WPK 4/23/88 31.0			
BOTTOM OF BOREHOLE	31.5 FT.			
GWL AFTER INSTALLATION	NK			

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Write out correction was made by DBO at the time the form was completed WPK 4/23/88

000343

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA KG. DATE 8/6/91

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 603	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~227~~ 2027	COORDINATES: 481969.29 N 1379317.37 E	DATE: 12-10-87	
ELEVATION: 583.2 Ground	GWL: Depth — Date/Time —	DATE STARTED: 12-10-87	
ENGINEER/GEOLOGIST: KELLEY/OAKLEY	Depth — Date/Time —	DATE COMPLETED: 12-17-87	
DRILLING METHODS: CABLE & TOOL		PAGE 1 OF 6	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07841 13:10	4 4 4	14	VERY STIFF YELLOWISH BROWN (10YR 5/4) SILT, SOME SAND AND GRAVEL, TRACE CLAY - ~~TRAC~~ DRY 1.7	ML	3.5	HNU-0PPM Bα - 120 CPM γ - 0CPM
2 3	07842 13:35	4 7 7	12	HARD GRAY (2.5,5/0) SILT, SOME SAND AND LIMESTONE GRAVEL. 2.9 TRACE CLAY - DRY	ML	4.5	HNU - 0PPM Bα - 120 CPM γ - 0CPM
4	07843 13:50	8 8 9	15	HARD YELLOWISH BROWN (10YR,5/4) SILT AND CLAY, SOME GRAVEL - DRY	ML	4.0	HNU-0PPM Bα 120CPM γ-0CPM
5 6	07844 14:00	14 24 28	15	HARD YELLOWISH BROWN (10YR,5/4) SILT 5.1 AND CLAY, SOME GRAVEL - DRY; DENSE LIGHT GRAY (10YR, 7/2) LIMESTONE GRAVEL AND CLAY - DRY 6.0	ML; GC	4.5; —	HNU-0PPM Bα - 120 CPM γ-0CPM
7	07845 14:10	14 23 26	15	HARD YELLOWISH BROWN (10YR,5/6) MOTTLED SILT AND CLAY, SOME GRAVEL AND SAND - DRY	ML	4.5+	HNU-0PPM Bα-120 CPM γ-0CPM
8 9	07846 16:23	4 12 19	14	HARD YELLOWISH BROWN (10YR,5/6) CLAY AND SILT, SOME SAND, TRACE GRAVEL - VERTICAL FRACTURES WITH IRON STAINING - DRY	CL	4.5+	HNU-0PPM Bα - 60 CPM γ - 0 CPM
10	07847 16:44	13 17 22	10 10	HARD STRONG BROWN (7.5YR,5/6) SILT, SOME SAND AND CLAY - DRY VERTICAL FRACTURES WITH IRON STAINING	ML	4.5+	HNU-0PPM Bα-60CPM γ-0CPM
11 12	07848 17:02	6 12 18	10	HARD YELLOWISH BROWN (10YR,5/6) SILT, SOME SAND AND CLAY - DRY. VERTICAL FRACTURES WITH IRON STAINING.	ML	4.5	HNU-0PPM Bα-60CPM γ-0CPM
13	07849 8:25	12 15 24	18	HARD LIGHT YELLOWISH BROWN (2.5Y,6/4) SILT, SOME CLAY AND GRAVEL, TRACE SAND - DRY.	ML	3.25	12-11-87 8:00 HNU-0PPM Bα-80CPM γ-0CPM
14 15	07850 8:50	7 12 6	13	VERY STIFF LIGHT YELLOWISH BROWN SILTY CLAY, TRACE FINE GRAVEL AND SAND - MOIST	CL	3.75	HNU-0PPM Bα-80CPM γ-0CPM

NOTES:

CONTRACTOR: PENNDRILL

RIG: CYCLONE 42

DRILLER: HARRY DYKES SR.

ASSISTANT: JOHN VANDINE

WATER ADDED TO HOLE

1 = 10 GALLONS

~~HH~~ ~~HH~~ ~~HH~~

~~HH~~ ~~HH~~ II

SAMPLES TAKEN ACCORDING TO ASTM STANDARD PENETRATION TESTS.

COLORS CLASSIFIED USING MUNSELL COLOR CHARTS

000344

402-11-86

QC/DH/2.4.89

[illegible] BY KA KL DATE 8/6/94

	Initial	Date
1st Key In		
2nd Key In	DH	8/10
Hard Copy Verification		

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 227 20.27 BB 1-5-88	COORDINATES: See P1	DATE: 12·11·87
ELEVATION: See P1	GWL: Depth – Date/Time	DATE STARTED: 12·10·87
ENGINEER/GEOLOGIST: D.OAKLEY	Depth – Date/Time	DATE COMPLETED: 12·17·87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	07851	5		VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SILT, TRACE FINE GRAVEL AND SAND, MOIST	CL	3.5	HNU - 0 PPM
16	9:05	7 12	15	15.4 VERY STIFF GRAY (5Y, 5/1) CLAY, TRACE SAND AND SILT - MOIST. 16.5	CL	1.5	Bα - 70 CPM γ - 0 CPM
17	07852	7		VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SILT, TRACE GRAVEL AND SAND - MOIST	CL	3.5	HNU - 0 PPM Bα - 70 CPM γ - 2 CPM
18	9:15	15 15	18	18.2			12-14-87 8:00
19	07853 8:20	3 7 11	5	VERY STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME SILT, TRACE GRAVEL AND SAND - WET.	CH	1.0	HNU - 0 PPM Bα - 60 CPM γ - 0 CPM
20 21	07854 8:40	4 5 8	9	STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME SILT AND GRAVEL - MOIST	CH	1.0	HNU - 0 PPM Bα - 50 CPM γ - 0 CPM
	07855	7		21.3 STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL AND SILT, TRACE SAND - WET	CH	1.25	HNU - 0 PPM
22	8:50	7 7	8	MEDIUM DENSE OLIVE GRAY (5Y, 5/2) SAND, SOME GRAVEL, TRACE CLAY - WET.	SW	–	Bα - 40 CPM γ - 0 CPM
23 24	07856 9:15	7 7 6	7	MEDIUM DENSE OLIVE GRAY (5Y, 5/2) SAND AND GRAVEL, TRACE CLAY - WET.	SW	–	HNU - 0 PPM Bα - 40 CPM γ - 0 CPM
25	07857 9:35	22 14 21	7	DENSE OLIVE GRAY (5Y, 5/2) SAND AND GRAVEL - WET. 25.4	SW	–	HNU - 0 PPM Bα - 50 CPM γ - 0 CPM
26 27	07858 10:40	11 31 37	5	26.7 HARD LIGHT OLIVE GRAY (5Y, 6/2) CLAY, SOME SAND AND GRAVEL, TRACE SILT - DRY	CL	–	DARKER THAN THE MUNSELL COLOR.
				VERY DENSE LIGHT OLIVE GRAY (5Y, 6/2) CLAYEY GRAVEL, SOME SAND - WET	GC	–	HNU - 0 PPM Bα - 40 CPM γ - 0 CPM
28	07859 11:00	24 44 27	16	27.4 VERY DENSE LIGHT OLIVE GRAY (5Y, 6/2) SAND AND GRAVEL - MOIST. 28.1	SW	–	HNU - 0 PPM Bα - 60 CPM γ - 0 CPM
				HARD GREEN(1) GRAY CLAY, SOME SILT - MOIST	CL	2.0	
29 30	07860 13:30	13 16 27	10	HARD OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL AND SAND, TRACE SILT - MOIST	CL	2.5	HNU - 0 PPM Bα - 100 CPM γ - 0 CPM

NOTES:

(1) NOT CLOSE TO ANY MUNSELL COLOR.

000345

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA K6 DATE 8/6/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 227 2027 BH 1-59	COORDINATES: See pl	DATE: 12.14.87	
ELEVATION: See pl	GWL: Depth — Date/Time	DATE STARTED: 12.10.87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth — Date/Time	DATE COMPLETED: 12.17.87	
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 6	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	07861 13:50	4 11 15	14	VERY STIFF OLIVE GRAY (5Y,5/2) CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST	CL	2.5	HWU - OCPM BA - 60CPM B - OCPM
32 33	07862 14:15	7 11 27	14	HARD OLIVE GRAY (5Y,5/2) CLAY, TRACE GRAVEL, SAND, AND SILT	CL	2.75	HWU - ? BA - 20CPM B - OCPM
34	07863 15:30	5 15 17	15	HARD OLIVE GRAY (5Y,5/2) CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST	CL	2.75	HWU - OCPM BA - 30CPM B - OCPM
35 36	07864 15:50	5 12 19	10	HARD OLIVE GRAY (5Y,5/2) CLAY, TRACE GRAVEL, SAND, AND SILT, - MOIST	CL	2.5	HWU - OCPM BA - 70CPM B - OCPM
37	07865 9:25	7 11 18	3	VERY STIFF OLIVE GRAY (5Y,5/2) CLAY, TRACE GRAVEL, SAND, AND SILT - MOIST	CL	—	HWU - OCPM BA - 60CPM B - OCPM
38 39	07866 9:40	7 12 15	14	VERY STIFF OLIVE GRAY (5Y,5/2) CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST	CL	1.75	HWU - OCPM BA - 60CPM B - OCPM
40	07867 10:05	8 20 30	6	VERY STIFF OLIVE GRAY (5Y,5/2) CLAY, SOME GRAVEL TRACE SAND AND SILT - MOIST	CL	1.5	HWU - OCPM BA - 60CPM B - OCPM
41 42	07868 11:05	7 9 13	16	40.7 VERY STIFF GRAY (5Y,6/1) SILT, WET.	ML	0.5	HWU - OCPM BA - 60CPM B - OCPM
43	07869 13:35	16 24 46	15	42.2 HARD GRAY (5Y,6/1) SILT - MOIST; 42.4 HARD GRAYISH BROWN (10YR,4/2) SILT - MOIST; VERY DENSE DARK YELLOWISH BROWN (10YR,4/4) SAND AND GRAVEL DRY	ML / ML / SW	— / — / —	HWU - OCPM BA - 60CPM B - OCPM
44							
45							

NOTES:

000346

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 8/6/90

	Initial	Date
1st Key In		
2nd Key In		8/15
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002	PROJECT NAME: FERNALD 121/FS	
BORING NUMBER: ~~227~~ 2027 SB 1-5-88	COORDINATES: Scap!	DATE: 12.15.87
ELEVATION: Scap!	GWL: Depth – Date/Time –	DATE STARTED: 12.10.87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth – Date/Time –	DATE COMPLETED: 12.17.87
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 6

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	07870 11:20	50-12 RF	5	VERY DENSE DARK YELLOWISH BROWN (10YR 4/4) ~~SANDY GRAVEL~~ GRAVEL AND SAND MOIST	GW	–	HNU-0 ppm
47							
48							
49							
50	07871 16:00	48 50 RF	10	VERY DENSE DARK YELLOWISH BROWN (10YR 4/4) GRAVEL AND SAND MOIST	GW	–	HNU ? BX - X - 0 ppm
51							
52							12.16.87 8:15
53							
54				54.5			DRILLER'S CONTACT.
55	07872 9:40	44 50 RF	0	VERY DENSE YELLOWISH BROWN (10YR 5/4) VERY FINE SAND - DRY	SP	–	HNU - 0 ppm BX - 1000 ppm X - 0 ppm
56							
57							
58							
59							
60							

NOTES:

000347

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA K.G DATE 8/6/9

	Initial	Date
1st Key In		
2nd Key In		8/5
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~227~~ 2077 BH	COORDINATES: Scan	DATE: 12.16.87	
ELEVATION: Scan	GWL: Depth / Date/Time	DATE STARTED: 12.10.87	
ENGINEER/GEOLOGIST: D. OATLEY	Depth / Date/Time	DATE COMPLETED: 12.17.87	
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 6	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	07873 13:35	30 49 32	0	VERY DENSE YELLOWISH BROWN (10YR, 6/4) GRAVEL AND SAND MOIST.	GW	-	HNU-0PPM 30α-100CPM γ-0CPM
				VERY DENSE GRAY (10YR, 5/1) SAND, SOME GRAVEL - MOIST	SW	-	
62							
63							
64							
65	07874 14:35	25 25 25	10	~~VERY~~ DENSE DARK GRAY (10YR, 4/1) SAND, SOME GRAVEL - WET	SW	-	HNU-0PPM 30α-70CPM γ-0CPM
66							
67							
68							
69							
70	07875 1 NS 55 50 15 15	11 13 15	7	MEDIUM DENSE DARK GRAY (10YR, 4/1) FINE SAND, TRACE GRAVEL - WET	SP	-	HNU-0PPM 30α-50CPM γ-0CPM
71							
72							
73							
74							
75							

NOTES: 1 3/8" x 1' 3" x 4"

000348

402-11-86

QC/DH/2.4.89

REVIEWED BY QA KG DATE 8/6/9

	Initial	Date
1st Review		
2nd Review		8/5
Final Copy Verification		

5709

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 227 2027 BB 1-5-87	COORDINATES: Seeps	DATE: 12.17.87
ELEVATION: Seeps	GWL: Depth 6 Date/Time	DATE STARTED: 12.10.87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 12.17.87
DRILLING METHODS: CASE TOOL		PAGE 6 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	07576 9:35	44 25 24	10	DENSE DARK GRAY (10YR, 4/1) SAND AND GRAVEL WET 76.5	SW	-	HNU - 0 PPM Bx - 60 CPM S - 0 CPM
77				BOTTOM OF BORING			
78							

NOTES:

000349

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA KG DATE 8/6/91

	Initial	Date
1st Key In		
2nd Key In		01-18-89
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602
BORING NO. ~~227~~ 2027 BB1-5S9
PIEZOMETER NO. NA

FIELD ENG./GEO. OATHEN/KEGLEY DATE 12-18-87
CHECKED BY R Tallentell DATE 2/6/89
DATE OF INSTALLATION 12-18-87 TO 12-20-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 3.0 TO 76.5 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD
CASING SIZE (S) USED:
SIZE 10 IN. FROM 0 TO 75
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitoring WPK 4/23/88
DIAMETER OF PERFORATED SECTION 4 IN
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15 FEET

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD ~~AND COUPLE~~ Flush Joint RMG 2/6/89

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FEET
PROTECTIVE PIPE O.D. 10 INCH

OTHER PROTECTION LOCKING CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		585.2	
GROUND SURFACE	0.0		583.2	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		580.7	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 2.0 FT.	BOTTOM 41.0 FT.	TOP 581.2	BOTTOM 542.2
~~BENTONITE~~ SAND	TOP 41.0 FT.	*BOTTOM 46.0 FT.	TOP 542.2	BOTTOM 536.2
~~SAND~~ BENTONITE	TOP * 46.0 FT.	*BOTTOM 56.0 FT.	TOP 536.2	BOTTOM 527.2
~~GRAVEL~~ SAND	TOP 56.0 FT.	BOTTOM 76.5 FT.	TOP 527.2	BOTTOM 506.7
PERFORATED SECTION	TOP 58.4 FT.	BOTTOM 73.4 FT.	TOP 524.8	BOTTOM 509.8
PIEZOMETER TIP	~~NA~~ 76 ft RMG 2/6/89		507.2	
BOTTOM OF BOREHOLE	76.5 FT.		506.7	
GWL AFTER INSTALLATION	64.0 FT.		519.2	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS * corrections were made by W. Kegley at the time the form was completed. WPK 4/23/88

REFER TO VARIANCE #6 in Field Activity Variances file. WPK 4/23/88

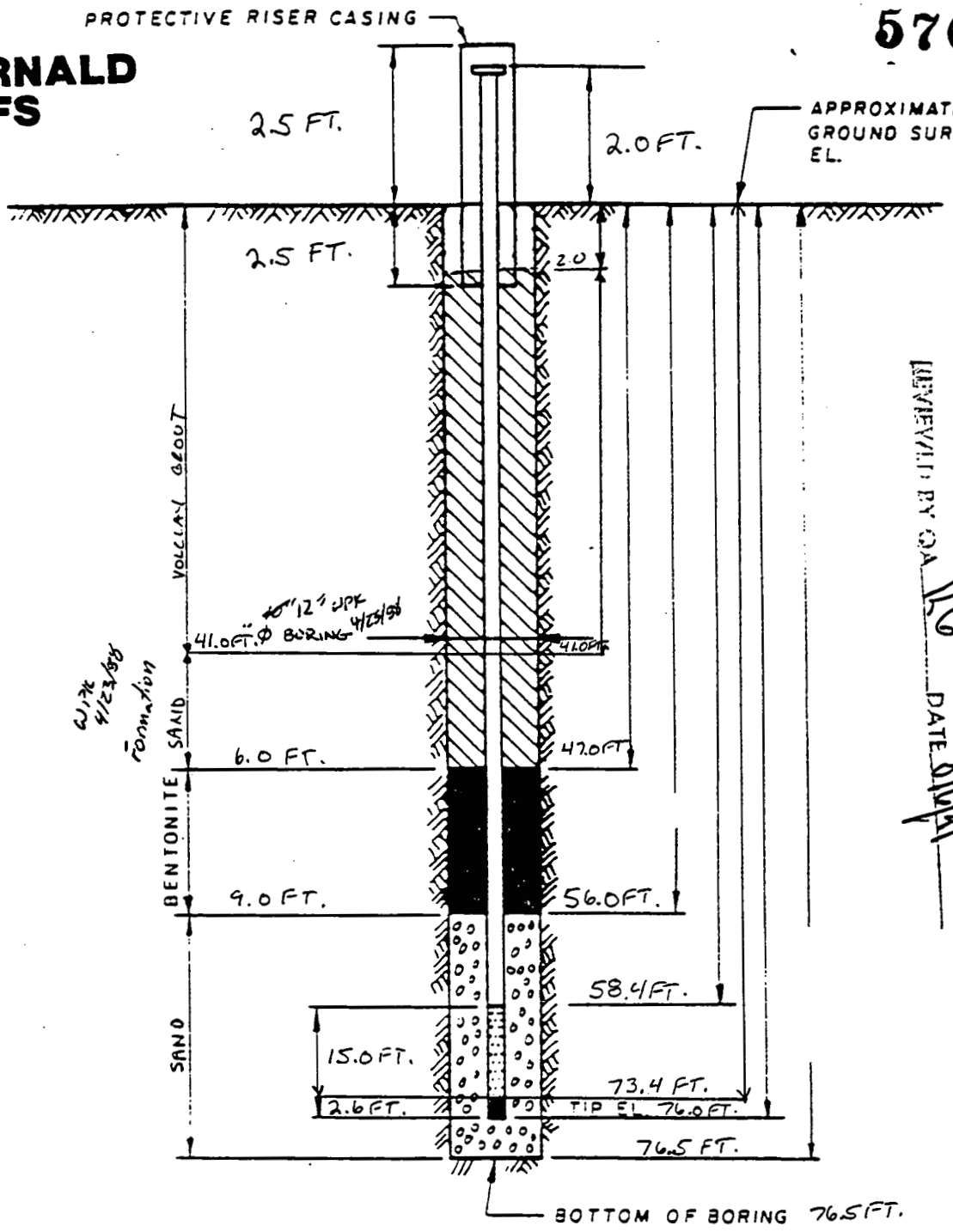
000350

QC/DH/2.4.89

WELL # ~~227~~ 2027 # 35 BB,

5709

FERNALD RI/FS



REVIEWED BY QA DATE 8/16/91

DRAWING NUMBER | CHECKED BY | APPROVED BY | DBO | DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~227~~ 2027 RAW 2/6/89

PREPARED FOR

000351

PROJECT NUMBER: 50.03.22	PROJECT NAME: CRU-K Additional Wells		
BORING NUMBER: 3027	COORDINATES:	DATE 7/30/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 7/28/93	
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 8/2/93	
DRILLING METHODS: Cable Tool		PAGE 11 OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1445 119624 7/30/93	10	6	V. Stiff 2.5Y(5/1) Gray gravelly clay, no plasticity dry.	CL	2.5	Mt = 0 ppm BK = 60 cpm
	1445 119625 7/30/93	17	5	SAA	CL	2.5	Mt = 0 ppm BK = 60 cpm
31		22	0	No Recovery	NA	NA	Mt = NA BK = NA
	1515 119626 7/30/93	10	6	Hard 2.5Y(5/1) Gray gravelly clay, no plasticity dry	CL	4.5	Mt = 0 ppm BK = 60 cpm
32	1515 119627 7/30/93	15	6	SAA	CL	4.25	Mt = 0 ppm BK = 60 cpm
		30	0	No Recovery	NA	NA	Mt = NA BK = NA

NOTES.

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Berkeley Erie

Driller: Chris Carter, Bill Sibert

SAA - same as above
NA - not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Block: Mt = 0 ppm BK = 40-60 cpm

000352

PROJECT NUMBER: 50:03.22	PROJECT NAME: CRU-5 Additional Wells		
BORING NUMBER: 3027	COORDINATES:	DATE 8/4/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 7/28/9	
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 8/3/9	
DRILLING METHODS: Cable Tool		PAGE 12 OF 21	

5709

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0943 1196228 8/4/93	39	6	V. Stiff. 2.5Y(5/1) Gray gravelly clay, no plasticity dry	CL	2.5	Mt = 0 ppm BZ = 60 cpm
		50/5	0	No Recovery	NA	NA	Mt = NA BZ = NA
34			0	No Recovery	NA	NA	Mt = NA BZ = NA
	0955	5	0	SAA (No Recovery)	NA	NA	Mt = NA BZ = NA
35		16	0	SAA (No Recovery)	NA	NA	Mt = NA BZ = NA
		27	0	SAA (No Recovery)	NA	NA	Mt = NA BZ = NA

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Berkeley Fru

Driller: Chris Carter, Bill Tibert

SAA - same as above
NA - not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Bkgd: Mt = 0 ppm BZ = 40-60 cpm

000353

PROJECT NUMBER: 50.03.22	PROJECT NAME: CRU-B Additional Wells		
BORING NUMBER: 3027	COORDINATES:	DATE 8/4/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 7/28/93	
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 8/31/93	
DRILLING METHODS: Cable Tool		PAGE 13 OF [illegible]	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1035 1P1629 8/4/93	10	6	V. Stiff. 2.5Y(5/1) Gray gravelly clay, no plasticity dry.	cl	3.25	Mt = 0ppm BK = 60cpm
		21	0	No Recovery	NA	NA	Mt = NA BK = NA
37		27	0	No Recovery	NA	NA	Mt = NA BK = NA
	1020 1P1630 8/4/93	10	6	V. Stiff. 2.5Y(5/1) Gray gravelly clay no plasticity dry	cl	3.0	Mt = 0ppm BK = 60cpm
38	1020 1P1631 8/4/93	23	5	SAA	cl	3.0	Mt = 0ppm BK = 60cpm
		31	0	No Recovery	NA	NA	Mt = NA BK = NA

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Berkeley Rig

Driller: Chris Carter, Bill Sibert

SAA - same as above
NA - not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Bkgd: Mt = 0 ppm BK = 40-60cpm

PROJECT NUMBER: 50.03.22	PROJECT NAME: CRU-B Additional Wells		
BORING NUMBER: 3027	COORDINATES:		DATE 8/4/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 7/28/93
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 8/31/93
DRILLING METHODS: Cable Tool			PAGE 14 OF 21

5709

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1345 119632 8/4/93	12	4	Hard. 2.5Y(5/1) Gray gravelly clay, low plasticity slightly moist	CL	>4.5	Mt = 0 ppm BG = 40 cpm
40		5	0	No Recovery	NA	NA	Mt = NA BG = NA
		6	0	No Recovery	NA	NA	Mt = NA BG = NA
41	1400 121000 8/4/93	15	6	Dark. 10YR(4/4) Dk yellowish brown mottled w/ gray silt & clay, dry	ML	NA	Mt = 0 ppm BG = 40 cpm
		17	0	No Recovery	NA	NA	Mt = NA BG = NA
		19	0	No Recovery	NA	NA	Mt = NA BG = NA

NOTES.

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Berkeley Erie

Driller: Chris Carter, Bill Sibert

Bkgd: Mt = 0 ppm BG = 40-60 cpm

SA - same as above
NA - not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PROJECT NUMBER: 50.08.22	PROJECT NAME: CRU-B Additional Wells		
BORING NUMBER: 3027	COORDINATES:	DATE: 8/14/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 7/28/93	
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 8/3/93	
DRILLING METHODS: Cable Tool		PAGE 13 OF [illegible]	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1410 12700 8/4/93	18	5	V. Dense 10YR (8/4) Yellowish brown med. to coarse grained ~~gravel~~ sand w/gravel poorly graded. dry	SP	NA	Mt = 0 ppm BG = 40 cpm
43		34	0	No Recovery	NA	NA	Mt = NA BG = NA
		47	0	No Recovery	NA	NA	Mt = NA BG = NA
				Begin SA sampling			Mt = BG =
44							Mt = BG =
							Mt = BG =

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Barkpes Erie

Driller: Chris Cautis, Bill Sibert

SA - same as above
NA - not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Bkgd: Mt = 0 ppm BG = 40-60 cpm

000356

PROJECT NUMBER: 10032	PROJECT NAME: CRU-15 Additional Drills		
BORING NUMBER: B-302 F	COORDINATES:		DATE: 5/4/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 7/20/
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 8/2
DRILLING METHODS: Cable Tool			PAGE 16 OF

5709

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46.5	1125 / 127002 / 1/4/93	50 / 50/3	4	V. Dark. 10YR(3/4) yellowish brown med. to coarse sand w/gravel poorly graded, dry	SP	NA	Mt = 0 ppm Bk = 40 cpm
50	1515 / 127003 / 1/4/93	15 / 27 / 39	5	V. Dark, SAA	SP	NA	Mt = NA Bk = NA
55	0915 / 127004 / 1/5/93	50/5	3	V. Dark. 10YR(3/4) yellowish brown fine to med grained sand w/gravel well graded, dry	SW	NA	Mt = 0 ppm Bk = 40 cpm
56.5							

NOTES.

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Buckeye F-C

Driller: Chris Coulter

Bill Sibert

Bkgd: Mt = 0 ppm Bk = 40-60 cpm

SAA: same as above
NA: not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PROJECT NUMBER: 50.03.22	PROJECT NAME: [illegible] Additional [illegible]		
BORING NUMBER: 3027	COORDINATES:	DATE: 8/5/93	
ELEVATION:	GWL: Depth: Date/Time	DATE STARTED: 1/28/6	
ENGINEER/GEOLOGIST: D. O'Brien	Depth: Date/Time	DATE COMPLETED: 8/3/6	
DRILLING METHODS: Cable Tool		PAGE 17	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61.5	0930 127003 5/4/93	12 50/5	5	V. Dense 2.5Y(5/4) Light Olive Brown sand poorly graded dry	SP	NA	Mt = 0 ppm BG = 40 cpm
65	1410 127006 5/4/93	12 37 35	8	V. Dense. 2.5Y(5/1) Gray Fine sand. little gravel, poorly graded wet	SP	NA	Mt = 0 ppm BG = 40 cpm
0508/5/93 65 66.5							
70 71.5	1440 127007 5/4/93	4 9 17	16	SAA, Med. Dense.	SP	NA	Mt = 0 ppm BG = 40 cpm

NOTES.

Drilling Contractor Anonymous Drilling

Drilling Equipment Bucyrus Erie

Driller. Chris Coulter

Bill Sibert

Bkgd: Mt = 0 ppm BG = 40-60 cpm

SAA: same as above
NA: not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PROJECT NUMBER: 30.03.22	PROJECT NAME: CRU-5 Additional Wells		
BORING NUMBER: 3027	COORDINATES:		DATE 8/6/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 7/28
ENGINEER/GEOLOGIST: D. O'Brien & Veazey	Depth	Date/Time	DATE COMPLETED: 8/2
DRILLING METHODS: Cable Tool			PAGE 18 OF

5709

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76.5	1400 127009 8/6/93	9 11 13	18	M. Dense. 2.5Y(5/1) Gray med to coarse sand w/gravel, well graded, wet	SW	NA	Mt = 0ppm BK = 40cpm
80	1430 127010 8-6-93	7 10 14	8	SAA	SW	NA	Mt = 0ppm BK = 40cpm
81.5							
83	127012 By 8-7-93			No Sample			Mt = NA BK = NA
86.5							

NOTES:

SAA: same as above
NA: not applicable

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Bucyrus Erie — Samples collected per ASTM standard penetration test

Driller: Chris Coulter, Bill Sibert

Colors identified using Munsell Color Chart

Rinse: Mt = 0ppm BK = HC-40cpm

PROJECT NUMBER: 40.03.22	PROJECT NAME: OU-5 Additional Wells		
BORING NUMBER: 3027	COORDINATES:	DATE: 8-9-93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 7/28/9	
ENGINEER/GEOLOGIST: D. O'Brien, B. Yeandle	Depth Date/Time	DATE COMPLETED: 8/1/9	
DRILLING METHODS: Cable Tool		PAGE 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
915	0905 127012 8-9-93	6 19 33	16	V. Dense, 2.5Y(5/1) Gray, med. to crse sand w/ gravel, well graded, wet	SW	NA	Mt = 0 ppm RS = 60 cpm
95	0920 127014 8/10/93	37 44 50/3	15	V. Dense. SAA	SW	NA	Mt = 0 ppm RS = 40 cpm
96.5							
100	0900 127015 8/10/93	13 37 50/3	14	SAA	SW	NA	Mt = 0 ppm RS = 40 cpm
101.5							

NOTES.

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Buckeyes Fru

Driller Chris Coulter

Bill Sibert

SAA: same as above
NA: not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Rkgd: Mt = 0 ppm RS = 40-60 cpm

000360

PROJECT NUMBER: 40.03.22	PROJECT NAME: CRU-5 Additional Wells		
BORING NUMBER: 3027	COORDINATES:		DATE 8/10/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 8/8/93
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 8/8/93
DRILLING METHODS: Cable Tool			PAGE 20 OF 9

5709

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1420	34					
		38	0	No Recovery			
106.5	8/10/93	42			NA	NA	Mt= NA BZ= NA
110	1320	20					
	27017	25	18	Dense. 2.5Y(5/1) Gray fine sand poorly graded. wet.	SP	NA	Mt= 0ppm BZ= 40cpm
111.5	8/10/93	16					
				Begin continuous sampling at 114.0ft See next page.			
114							
115							
116.5							Mt= BZ=

NOTES.

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Buckeyes Ecu

Driller Chris Coulter

Bill Sibert

SAA: same as above
NA: not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: Mt= 0ppm BZ= 40-60cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 50.03.22	PROJECT NAME: CRU-5 Additional Wells	
BORING NUMBER: 3027	COORDINATES:	DATE 8/13/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 7/28/93
ENGINEER/GEOLOGIST: D. Brown / B. Miller	Depth Date/Time	DATE COMPLETED: 8/3/93
DRILLING METHODS: Cable Tool		PAGE 21 OF 24

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
115	0840 27019 8/13/93	17 26 29	18	V. Dense. 5Y(4/3) Olive, medium sand, trace fine gravel, well graded, wet	SW	NA	Mt = 0 ppm Bk = 40 cpm
116 117	0855 27020 8/13/93	7 14 23	18	Dense. 5Y(3/1) V. dark gray medium sand, trace gravel well graded, wet.	SW	NA	Mt = 0 ppm Bk = 60 cpm
118	0925 27021 8/13/93	14 30 39	3	SAA, V. Dense.	SW	NA	Mt = 0 ppm Bk = 80 cpm
119 120	0930 8/13/93	6 19 32	0	No Recovery	NA	NA	Mt = NA Bk = NA
121	0935 8/13/93	100/5	2	V. Dense. 2.5Y(5/1) Gray coarse gravel, poorly graded, wet.	GP ~~SP~~ KA 10-20-93	NA	Mt = 0 ppm Bk = 60 cpm Not enough for archive
122 123	1010 27023 8/13/93	42 42 37	8	V. Dense. 2.5Y(5/4) Lt. olive brown med. to fine sand, poorly graded, wet	SP	NA	Mt = 0 ppm Bk = 40 cpm
124	1030 27024 8/13/93	60/6	6	SAA	SP	NA	Mt = 0 ppm Bk = 40 cpm
125 126				Resume 5 ft. sampling at 130.0 ft.			

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Buckeye Rig

Chris Coulter

Bill Sibert

SAA - Same as above
NA - Not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PROJECT NUMBER: 50.03.22	PROJECT NAME: CBU-5 Additional Wells		
BORING NUMBER: 5027	COORDINATES:	DATE: 8/17/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 8/16	
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 8/21	
DRILLING METHODS: Cable Tool		PAGE 22 OF 6	

5709

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
131.5	1100 127023 8/17/93	50/4	4	V. Dense. 2.87(5/6) Lt. olive brown fine sand, poorly graded, wet	SP	NA	Mt = 0ppm Bk = 40cpm
135	0910 127028 8/18/93	10 16 23	15	Dense. 2.54(8/1) Gray medium to fine sand, poorly graded, wet	SP	NA	Mt = 0ppm Bk = 40cpm
140 141.5	1515 127029 8/18/93	6 13 28	7	Dense. 2.54(8/1) Gray medium to coarse sand, well graded, wet	SW	NA	Mt = 0ppm Bk = 40cpm

NOTES.

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Buckeyes Fru

Driller: Chris Coulter

Bill Sibert

SAA: same as above
NA: not applicable

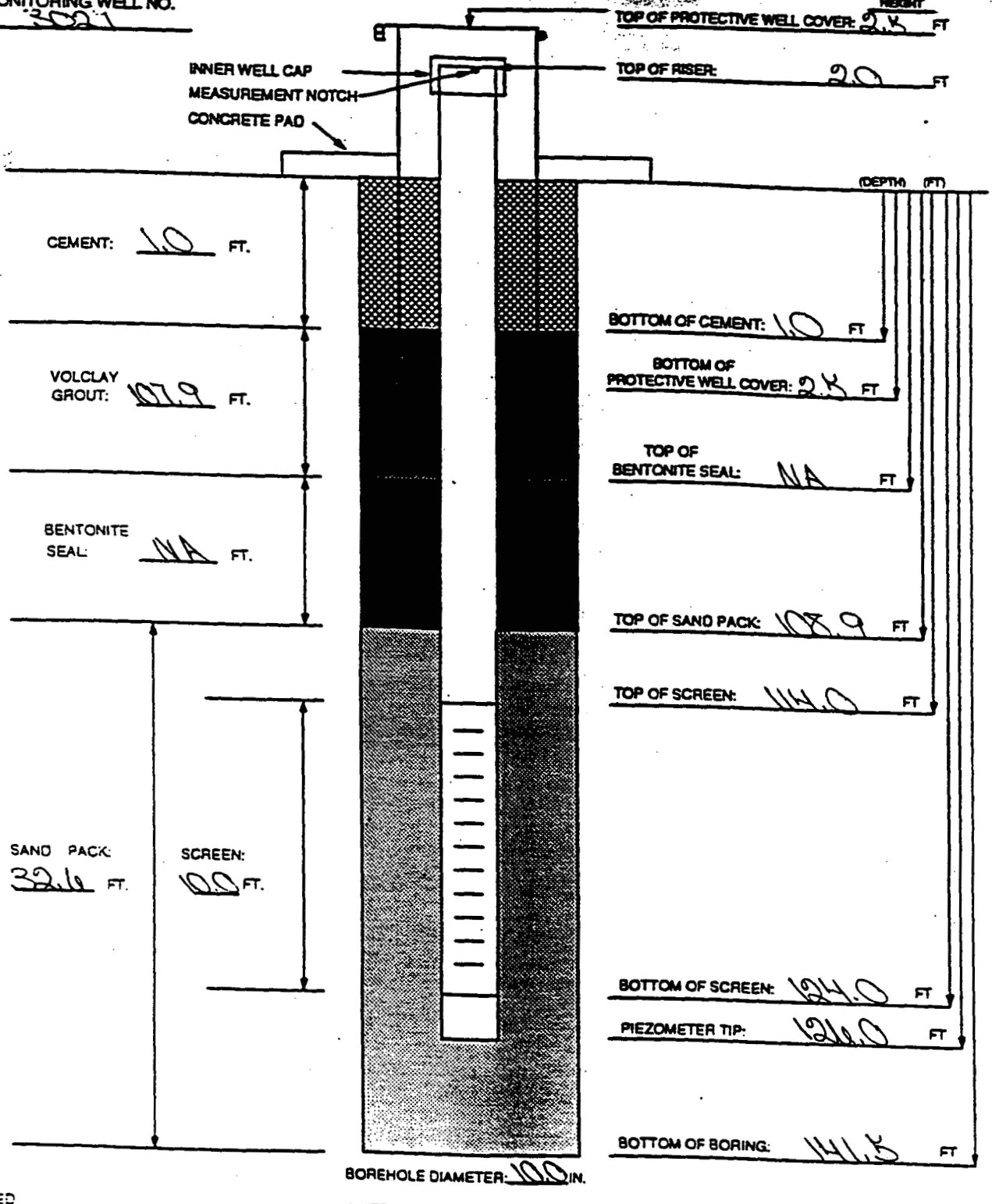
Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Bkgd: Mt = 0ppm Bk = 40-60cpm

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 3021

INSTALLATION DATE: 5/31/93



MATERIALS USED

SAND TYPE AND QUANTITY: 11 bag 4/30, 13 bag 10/20
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 29 bags
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 100 gallons
OTHER: 24 soil, 1 water drums
TASK: 20.03.22

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.010 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP
4) WATER DEPTH AND DATE 41.6 FT. 5/30/93
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK

GEOLOGIST/ENGINEER: D.O'Brien

ASI FORM 0157 REV. 01

000364

RI/FS

24 of 24

PIEZOMETER INSTALLATION SHEET

5709

PROJECT NAME CRUK Drilling FIELD ENG./GEO. D. O'Brien DATE 8/31/93
PROJECT NO. 40.03.220 CHECKED BY Keith Payne DATE 10/20/93
BORING NO. 3027
PIEZOMETER NO. 3027 DATE OF INSTALLATION 8/31/93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Churn Bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID H_2O FROM 0.0 ft TO 70.0 ft	SIZE 10.0 in FROM 0.0 ft TO 140.0 ft
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL 316 stainless steel
DIAMETER OF PERFORATED SECTION 4.0 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4.0 in
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 0-10ft, 1-4ft, 1-2ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD Flush joint
TOTAL PERFORATED AREA 10.0 ft	threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft	OTHER PROTECTION hinged locking cover
PROTECTIVE PIPE O.D. 10 3/4 in	with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
Cement GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 108.9	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP 108.9	BOTTOM 141.5	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	TOP 114.0	BOTTOM 124.0	TOP	BOTTOM
BOTTOM OF BOREHOLE	124.0			
GWL AFTER INSTALLATION	141.5			
	61.14 ft			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS None

FERNALD RI/FS

REVIEW K.G. 7/24/91

	Initial	Date
1st Key In		
2nd Key In		8/15
Hard Copy Verified		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS Task 3.2	
BORING NUMBER: 88 1-59 128 1028	COORDINATES: 48 1821.60 N 378 158.07 E	DATE:
ELEVATION:	GWL: Depth N/A Date/Time N/A	DATE STARTED: 01/10/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth N/A Date/Time N/A	DATE COMPLETED: 01/14/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 INCH	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07 ②	27 24 17	14"	Hard, yellowish brown silt (10YR 5/4) Dry	ML	4.5	Hnu = 0 α = 0 δB = 0 0930
2 3	07	11 10 7	12"	Very stiff, yellowish brownish silt w/ trace gravel (10YR 5/4) dry	ML	2.5	Hnu = 0 α = 0 δB = 240 0945
4	07	16 29 27	6"	Silt size Fly ash, dry (25Y 2/0) Brittle 5FT	ML	—	Hnu = 0 α = 0 δB = 240 cpm 0955
5 6	07	18 15 18	12"	Hard, Dark Brown clay (10YR 4/3) Trace of gravel Dry	CL	4.5	Hnu = 0 α = 0 δB = 240 cpm Ran Shelby #7 5.5-6.5' 1000
7	07 ②	18 22 21	18	Very stiff Dark Brown clay (10yr 4/3) Trace of gravel. Dry 8FT	CL	3.5	Hnu = 0 α = 0 δB = 120 cpm 1015
8 9	07	16 14 14	18"	Very stiff Dark Brown clay (10yr 4/3) with organics debris. dry 9FT	OL	2.5	Hnu = 0 α = 0 δB = 120 1020
10	07 ②	3 5 6	18"	Very stiff Dark Brown clay (10YR 4/3) with trace of gravel. moist	CL	3.0	Hnu = 0 α = 0 δB = 100 1415
11 12	07 ②	13 11 3	18"	Very stiff Dark Brown clay (10YR 4/3) w/ trace of gravel. encountered Lime sludge @ 12 Ft moist		2.5	Hnu = 0 α = 0 δB = 120 3-4inch lense of lime sludge 11.7-12 FT 1430
13	07	7 9 13	14"	Very stiff Dark Brown clay (10yr 4/3 trace of gravel. moist 13FT		3.0	Hnu = 0 α = 0 δB = 120 1440
14 15	07 ②	13 17 19	18"	Hard Dark grey clay (10YR 4/1) w/ gravel. Trace of lime sludge @ 13.5 Ft moist		4.0	Hn = 0 α = 0 δB = 120 1445

NOTES:

I) Drilling Contractor : Pennsylvania Drilling
Driller : Tim Harris
Helper : Craig Coulter

II) Background Measurements
A) Hnu = 0 B) α = 0 C) δB = 120cpm

III) Water used = 55 gallons + 80 = 135 gallons

IV) Samples via Munsell colors, ASTM

000366

402-11-86

REVIEWED BY QA K.G. DATE 7/29/91

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		8/15
Hard Copy		

RKA 2/4/8

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~128~~ 1023 BB 1-5-88	COORDINATES: same as page 1	DATE:
ELEVATION:	GWL: Depth N/A Date/Time N/A	DATE STARTED: 01/10/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth N/A Date/Time N/A	DATE COMPLETED: 01/14/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16–17	07828	NA	1.8 Ft	Shelby Tube			Hnu=0 α=0 δB=120 1630
17–18	07829	6 11 50	12"	Hard grey clay w/ trace of gravel (2.5Y 5/0) dry	CL	4.0	Hnu=0 α=0 δB=100 0830
19–20	07830	12 14 15	12"	Hard Dark grey clay (10YR 4/1) w/ trace of gravel dry	CL	4.0	Hnu=0 α=0 δB=100 0906
20–21	07831	7 11 7	12"	Hard Dark grey clay (10YR 4/1) w/ gravel. Dry 21.5	CL	4.0	Hnu=0 α=0 δB=100 0928
22–23	07832	8 13 18	10"	Hard yellowish Brown clay (10YR 5/4) trace of gravel. Dry			Hnu=0 α=0 δB=100 0955
23–24	07833	13 18 26	18"	Hard yellowish Brown clay (10yr 5/4) trace of gravel. Dry	CL		Hnu=0 α=0 δB=100 1025
25–26	07834	8 3 11	10"	Hard yellowish Brown clay (10yr 5/4) trace of gravel w/ Lense of Dark grey clay @ 25 Ft (10yr 5/4) Dry 26.5		4.0	Hnu=0 α=0 δB=100 1038
26–27	07835	16 18 21	18"	Dense yellowish Brown sand (10YR 5/6 Dry trace of gravel	SW	2.0	Hnu=0 α=0 δB=100 1306
28–29	07836	8 10 16	8"	Very stiff dark gray clay (10YR 4/1) moist	CL	3.5	Hnu=0 α= δB=50 1420
29–30	07837	9 17 29	14"	very stiff dark grey clay (10YR 4/1) moist	CL	3.5	HNU=0 α=0 δB=60 1450

NOTES: 30.5 TD

000367

SEE PAGE 1 OF 1

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.G DATE 7/24/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Goldberg DATE 01/14/88
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~128~~ 102S BB1-5-89
PIEZOMETER NO. N/A DATE OF INSTALLATION 01/14/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID water FROM 3 Ft TO 31 Ft
FLUID NA FROM NA TO NA

TYPE OF BIT Flathead
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 31 Ft
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 inches
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 Feet

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" in I.D. 4" in
LENGTH OF PIPE SECTIONS 10 Ft
JOINING METHOD Thread and couple
(FLUSH JOINT THREADED)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft
PROTECTIVE PIPE ~~O~~.D. 10" inches

OTHER PROTECTION Lockable cap AND lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FEET)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 Ft		589.01	
GROUND SURFACE	0.0		587.01	
BOTTOM OF PROTECTIVE PIPE	2.5		584.51	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 10.5	TOP 587.01	BOTTOM 576.51
BENTONITE	TOP 10.5	BOTTOM 16.5	TOP 576.51	BOTTOM 560.01
SAND	TOP 16.5	BOTTOM 31	TOP 560.01	BOTTOM 529.01
~~GRAVEL~~	TOP NA	BOTTOM NA	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 18 RMT 2/14/89	BOTTOM 28 RMT 2/16/89	TOP 589.01	BOTTOM 541.01
PIEZOMETER TIP	04/24/89 ~~31 Ft~~ 30 ft		557.01	
BOTTOM OF BOREHOLE	~~31~~ Ft 30.5 ft		556.51	
GWL AFTER INSTALLATION	N/A		N/A	

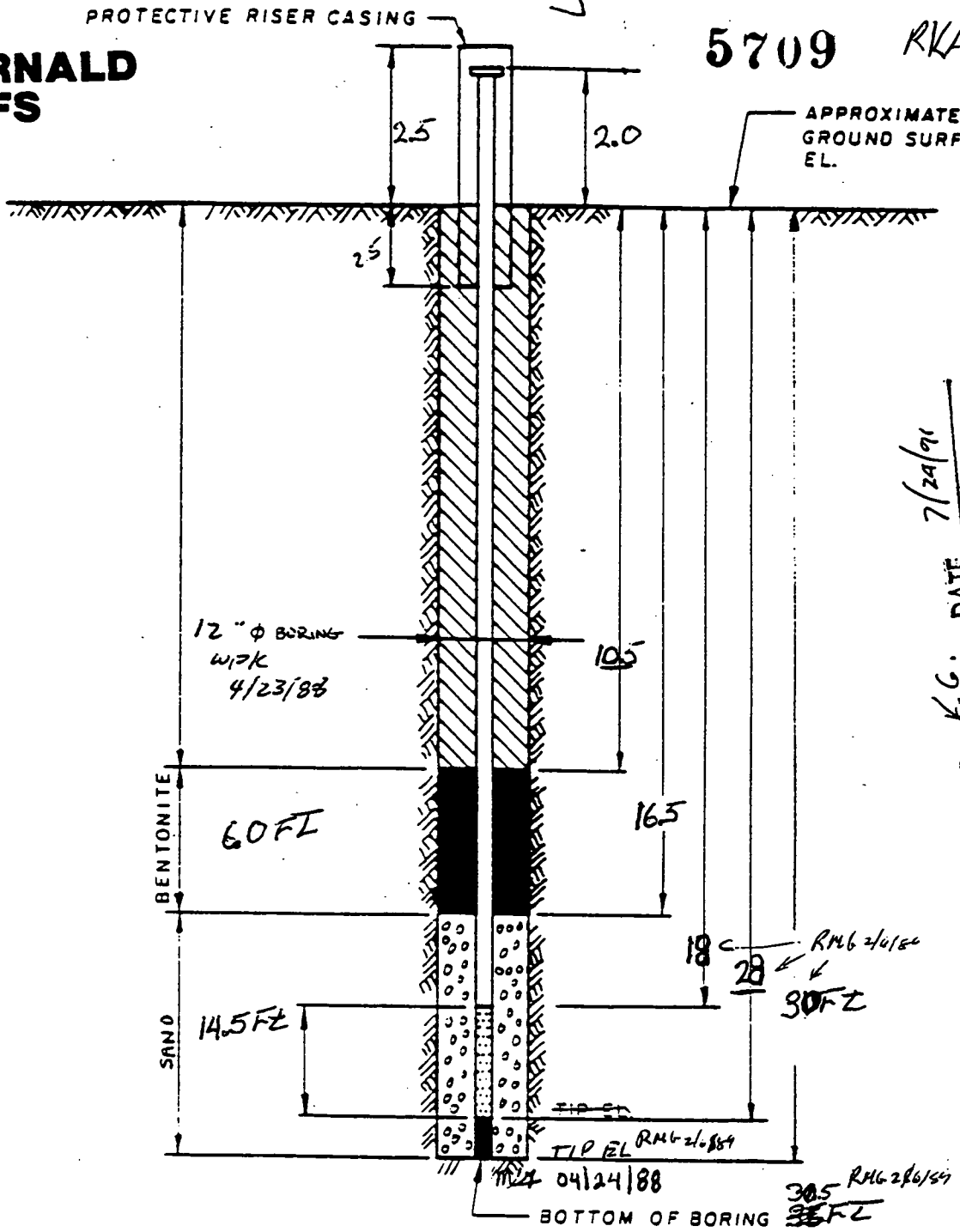
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS

000368

Monitoring Well #128 1028 BB 1-5-89

5709 RKA 2/4/89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

REVIEWED BY QA K.G. DATE 7/24/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~128~~ 1028 RMG 2/6/89

PREPARED FOR

FMPC RI/FS

000369

FERNALD RI/FS

Date	5/24/90			
Initial	ET			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2028	COORDINATES:	DATE: 05-06-90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-06-90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 05-19-90
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY ( ) in	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				For soil classification & descriptions refer to Visual Classification of Soils form # 1028. Sampling and describing of soil begins on MW #2028 from 30.0 FT			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

NOTES:

Drilling Contractor Pennsylvania Drilling Co.

Drilling Equipment 72 Speed Star

Driller: Joseph Barile

Helper: Brian Smorazzon

H&S Officer: Ben Brier

Samples collected per ASTM standard penetration test

Munsell color chart used for sample color identification

SAA = Same As Above

NR = No Recovery

Background Levels: HNU = 0 ppm

α = 0 cpm

BS = 60-90 cpm

HNU # 00221

000370

243B-3-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2028	COORDINATES:	DATE: 05-07-90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-06-90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 05-19-90
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY ( ) in	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15				See page 1			
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

NOTES:

Drilling Contractor Pennsylvania Drilling Co

Drilling Equipment 72 Speed Star

Driller: Joseph Barile

Helper: Brian Strapazzon

H&S Officer: Ben Brier

GWU #02221

Background Levels:

HNU = 0ppm

α = 0cpm

βγ = 60-90cpm

000371

2438-3-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2028	COORDINATES:	DATE: 05-07-90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-06-90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 05-19-90
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30	32689 1600 5-7	17 27 50/3	12	Hard (2.5Y5/4) light olive brown, silty clay, trace of sand and fine to medium gravel, medium plasticity, moist	CL	3.75	HNU = 0 ppm α = 0 cpm βγ = 60 cpm
31	32690 1630 5-7	11 24 24	15	Firm (2.5Y5/4) light olive brown silty to sandy clay, some sand, trace of fine to medium gravel low plasticity moist	CL	2.0	HNU = 0 ppm α = 0 cpm βγ = 40-60 cpm
32	32691 1455 5-8	7 27 30	14	Very hard (5Y4/1) dark gray silty clay, trace of sand and fine to medium gravel, low plasticity, moist	CL	>4.5	HNU = 0 ppm α = 0 cpm βγ = 60-70 cpm
33	32692 1530 5-8	11 19 27	18	Hard (5Y4/1) dark gray silty clay, trace of sand and fine gravel, low plasticity, moist	CL	3.75	HNU = 0 ppm α = 0 cpm βγ = 60 cpm
34	32693 1555 5-8	100/0	0	NR (Appears that spoon hit large chunk of limestone gravel in clay)	NA	NA	HNU = NA α = NA βγ = NA
35	32694 0900 5-9	16 20 25	13	Hard (5Y4/1) dark gray silty clay, trace of sand and fine to coarse gravel, low to medium plasticity, moist	CL	2.75	HNU = 0 ppm α = 0 cpm βγ = 50-90 cpm
36	32695 0930 5-9	27 32 50/3	14	SAA Very dense (2.5Y5/4) light olive brown silty sand, trace of fine gravel dry — Bottom of till 40.0 FT	CL SM	2.75 NA	HNU = 0 ppm α = 0 cpm βγ = 50-60 cpm
37				↓			HNU = α = βγ =
38				CB 5/9/90 ~~Aquifer~~ Aquifer will be sampled every 5.0 FT after 45 Feet. Once saturated zone is encountered 15 more Feet will be sampled			HNU = α = βγ =
39							HNU = α = βγ =
40							HNU = α = βγ =
41							
42							
43							
44							
45							

Bottom of Till

Top of Aquifer

NOTES:

Drilling Contractor Pennsylvania Drilling Co.

Drilling Equipment 72 Speed Star

Driller: Joseph Barile

Helper: Brian Strapozzon

H&S Officer: Ben Brier

NR = No Recovery

SAA = Same As Above

Background Levels:

HNU = 0 ppm

α = 0 cpm

βγ = 60-90 cpm

Note. Bit and Tool Length = 22.4 FT

HNU # 00221

000372

2438-3-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2028	COORDINATES:	DATE: 05-09-90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-06-90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 05-8-90
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45	32696	37		Very dense (2.5Y 4/4) olive brown poorly graded sand trace of silt and fine gravel, slightly moist	SP	NA	HNU = 0 ppm
46	1005	50/4	12				α = 0 cpm
	5-9						βγ = 50-60 cpm
47							
48							
49							
50	32697	31					
51	1035	50/4	9	SAA	SP	NA	HNU = 0 ppm
	5-9						α = 0 cpm
							βγ = 60-80 cpm
52							
53							
54							
GWL							
55	32698	17					HNU = 0 ppm
56	1135	47	11	SAA	SP	NA	α = 0 cpm
	5-9	50/3					βγ = 60-70 cpm
57							
58							
59							
60							

NOTES:

Drilling Contractor Pennsylvania Drilling Co.

Drilling Equipment 7.2 Speed Star

Driller: Joseph Barile

Helper: Brian Strapezzon

H&S Officer: Ben Brier

HNU serial # 00221

NR = No Recovery

SAA = Same As Above

000373

Background Levels:

HNU = 0 ppm

α = 0 cpm

βγ = 60-80 cpm

243B-3-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2028	COORDINATES:		DATE: 05-09-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 05-06-90
ENGINEER/GEOLOGIST: C. Grube	Depth	Date/Time	DATE COMPLETED: 05-19-90
DRILLING METHODS: CABLE TOOL			PAGE 5 OF 6

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60	32699 1440 5-9	33 50/4	13	Very Dense (2.5 Y 4/4) olive brown poorly to well graded sand, trace of silt and fine to medium gravel, moist	SP to SW	NA	HNU = 0ppm α = 0cpm βγ = 50-60 cpm
61							
62							
63							
64							
65	32700 1615 5-9	33 50/4	12	Very Dense (10 YR 5/4) yellowish brown poorly graded to silty sand, trace of fine to medium gravel, very moist	SP to SM	NA	HNU = 0 ppm α = 0cpm βγ = 60-70 cpm
66							
67							
68							
69							
70	32701 1630 5-9	21 24 26	12	Dense (10 YR 5/4) yellowish brown poorly to gravelly well graded sand, trace of silt, fine to coarse gravel, very moist	SP to SW	NA	HNU = 0 ppm α = 0cpm βγ = 40-50 cpm
71							
72							
73							
74							
75							

NOTES:

Drilling Contractor: Pennsylvania Drilling Co

Drilling Equipment: 72 Speed Star

Driller: Joseph Barile

Helper: Brian Strapazzon

HNS Officer: Ben Brier

NR = No Recovery

SAA = Same As Above

Background Levels:

HNU = 0ppm

α = 0cpm

βγ = 40-70 cpm

HNU serial # 00221

000374

243B-3-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2028	COORDINATES:	DATE: 05-10-90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05-04-90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 05-19-90
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	32702 0935 5-10	11 24 33	18	Very dense (10 YR 5/4) Yellowish brown well graded sand, some gravel, trace of silt, very moist	SW	NA	HNU = 0 ppm α = 0 cpm βγ = 50-60 cpm
77				Bottom of Sampling 76.5 FT Bottom of Bore hole at 79.0 FT			
78							
79							
80							
81							
82							
83							
84							
85							

NOTES:

Drilling Contractor: Pennsylvania Drilling Co

Drilling Equipment: 72 Speed Star

Driller: Joseph Barile

Helper: Brian Strapazzon

H+S Officer: Ben Brier

NR = No Recovery

SAA = Same As Above

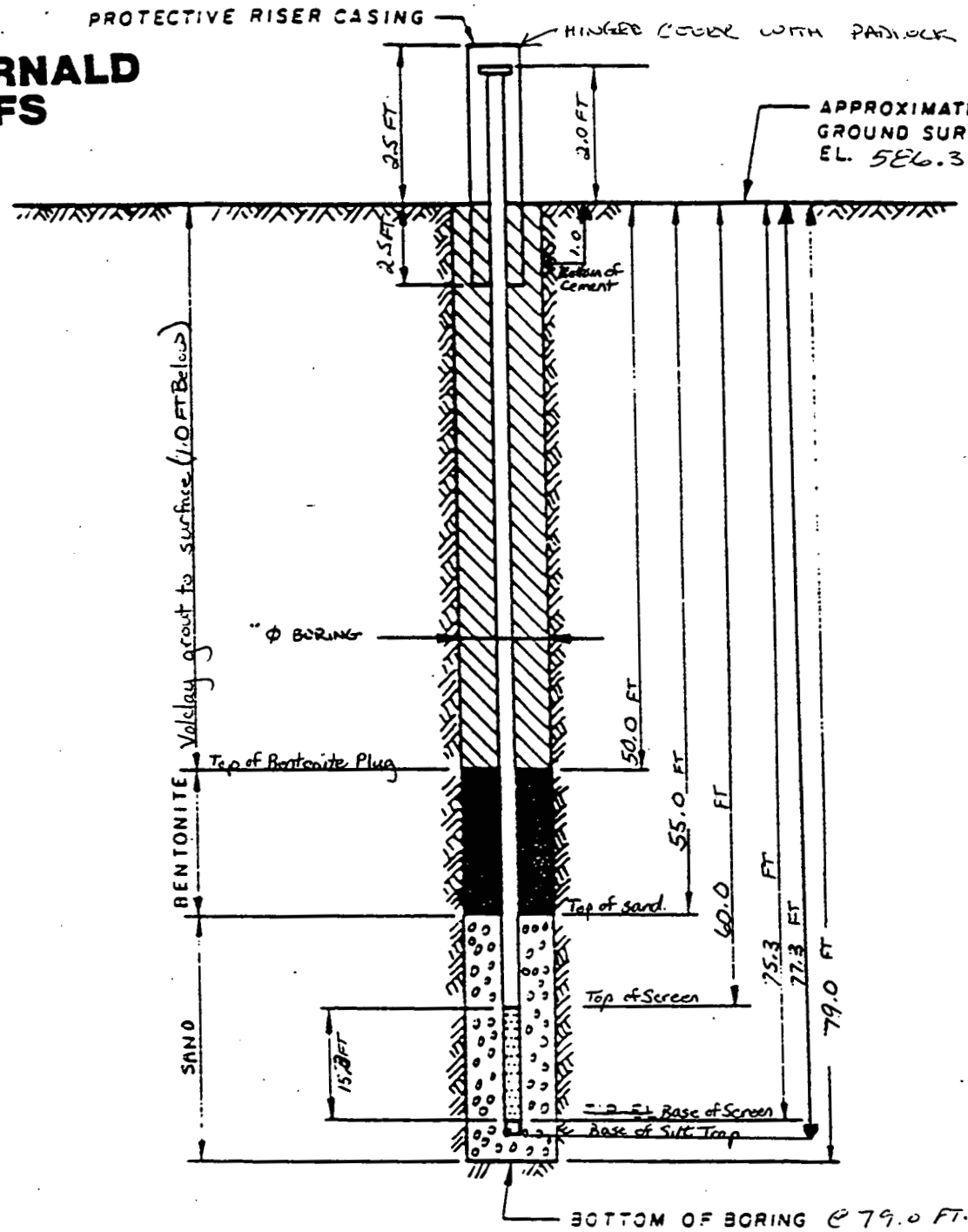
Background Levels:
HNU = 0 ppm
α = 0 cpm
βγ = 40-80 cpm

HNU Serial # 00221

000375

243B-3-86

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	CG 5-22-90

NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. (w/welded silt trap)
4. ELEVATION OF WATER LEVEL 61.75 FT
5. WATER LEVEL READING ON 05/20/90

Materials used during well installation:

Bags 10/20 sand (80 lb each) – 19
Bags volclay grout (50 lb each) – 10
Buckets Bentonite Pellets (5 gal each) – 8

1 – 15 Ft. screen with 2.0 FT welded silt trap and 0.3 FT Blank stick-up. ~~5-10 FT Sections~~ CH 5/13/90
1 – 2 FT riser, 6 – 10 FT risers

000376

INSTALLATION DETAILS
MONITORING WELL #2028

PREPARED FOR
Fernald RI/FS

Total water added during drilling and grouting = 600 gal

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Grube DATE 5-15-90
PROJECT NO. 6023.2.1
CHECKED BY E.T. DATE 5-20-90
BORING NO. 2028
PIEZOMETER NO. 2028
DATE OF INSTALLATION 5-17-90 to 5-19-90

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT. TO 79.0
FLUID NA FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10.0 in I.D FROM 0.0 TO FT
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitor Well
DIAMETER OF PERFORATED SECTION 4.0 in I.D
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 15.0 FT

RISER PIPE MATERIAL 316 Stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in
LENGTH OF PIPE SECTIONS 6 - 10.0 FT 1 - 2.0 FT
JOINING METHOD Threaded, flush jointed

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS: Cement	Top 0.0	Bottom 1.0		
GROUT/SLURRY	TOP 1.0	BOTTOM 50.0	TOP	BOTTOM
BENTONITE	TOP 50.0	BOTTOM 55.0	TOP	BOTTOM
SAND	TOP 55.0	BOTTOM 79.0	TOP	BOTTOM
GRAVEL (None used)	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 60.0	BOTTOM 75.3	TOP	BOTTOM
PIEZOMETER TIP	77.3			
BOTTOM OF BOREHOLE	79.0			
GWL AFTER INSTALLATION	61.75			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS CEMENT PLACED FROM 0.0 TO 1.0 FT TO HOLD PROTECTIVE PIPE IN PLACE

QC/DM/2.4.89

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____

	Initial	Date
1st Review		
2nd Review		8/15
Hard Copy Transmittal		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD	
BORING NUMBER: ~~129~~ 1029 BB 1-5-89	COORDINATES: DAMEAS page 1	DATE: 10.27.87
ELEVATION: 577.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 1023.87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 10-27-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.5	07405	6 4 6	11	STIFF OLIVE GRAY CLAY, SOME GRAVEL, TRACE SILT AND SAND - MOIST	CL	.75	MUNSELL 5Y 5/2 SAMPLE SCANNED AT BACKGROUND
18.0	07406	2 4	4	MEDIUM STIFF OLIVE GRAY ~~GRAVELLY~~ CLAY, TRACE SAND AND SILT - WET	CL	NA	MUNSELL 5Y 5/2 SAMPLE SCANNED - AT BACKGROUND.
19.5	NA	6 8 6	0				GRAVEL IN SPOON SHOE - NO RECOVERY
21.0	07412	4 4 5	12	STIFF OLIVE GRAY GRAVELLY Clay Trace SAND AND SILT - DRY	CL	NA	MUNSELL 5Y 5/2 SAMPLE SCANNED - BACKGROUND
22.5	07413	3 4 6	4	STIFF OLIVE GRAY GRAVELLY CLAY TRACE SAND AND SILT - DRY	CL	NA	MUNSELL 5Y 5/2 SAMPLE SCANNED - BACKGROUND
24	07414	5 15 25	4	HARD GRAY GRAVELLY CLAY - TRACE SAND - DRY	CL	1	MUNSELL 5Y, 5/1 SAMPLE SCANNED - BACKGROUND
25.5	07415	15 32 40	15	HARD OLIVE GRAY GRAVELLY CLAY - DRY	CL	4.5	MUNSELL 5Y 4/2 SAMPLE SCANNED - BACKGROUND
27	07416	8 12 19	3	VERY STIFF OLIVE GRAY GRAVELLY CLAY - WET	CL	.1	MUNSELL 5Y 5/2 SAMPLE SCANNED - BACKGROUND
				27.2 OLIVE GRAY GRAVELLY CLAY - WET	CL	1.5	MUNSELL 5Y 5/2
				27.5 GRAYISH BROWN FINE SAND - TRACE CLAY AND SILT	SW	NA	MUNSELL 2.5Y 3/2
28.5	07417	8 9 14	18	VERY STIFF OLIVE GRAY CLAY, SOME GRAVEL AND SAND, TRACE SILT. - MOIST	CL	1.5	MUNSELL 5Y 5/2 sample scanned - background
30.0	07418	4 8 13	18	VERY STIFF OLIVE GRAY CLAY, SOME FINE GRAVEL AND SAND, TRACE SILT. MOIST	CL	1.25	MUNSELL 5Y 5/2 sample scanned - background

NOTES:

000378

402-11-86

QC/DH/2.4.89 5709

PAC

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

CPK 4/23/88

RIG # 2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~12A~~ 12A 1034 BB 1-5-89	COORDINATES: 480826.11 N 1378398.38 E	DATE: 10.21.87
ELEVATION: 577.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10.21.87
ENGINEER/GEOLOGIST: D. CATLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 10.27.87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6/IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.5	07398	9 7 14	15	VERY STIFF YELLOWISH BROWN SILT, SOME CLAY, TRACE SAND DRY 0.9	ML	4.5+	MUNSELL 10YR 5/4 SAMPLE SCANNED AT BACKGROUND
				MEDIUM DENSE YELLOWISH BROWN SILTY SAND, SOME GRAVEL, TRACE CLAY - DRY. 1.7	SP	NA	MUNSELL 10YR 5/6
3.0	07399	11 8 9	14	MEDIUM DENSE YELLOWISH BROWN FINE SAND, TRACE SILT - DRY 2.9	SP	NA	MUNSELL 10YR 5/6 SAMPLE SCANNED AT BACKGROUND.
				VERY STIFF BROWNISH YELLOW SILT, SOME SAND AND CLAY - DRY, LIMESTONE GRAVEL 3.0	ML	3.0	MUNSELL 10YR 6/6
4.5	07400	20 27 21	18	HARD BROWNISH YELLOW SANDY CLAY, TRACE SILT - DRY 3.8	CL	2.75	MUNSELL 10 YR 6/8 SAMPLE SCANNED AT BACKGROUND.
				DENSE BROWNISH YELLOW SILTY SAND, SOME GRAVEL, TRACE CLAY - DRY 4.5	SP	NA	MUNSELL 10YR 6/8
6.0	07401	21 28 20	16	HARD BROWNISH YELLOW SILTY CLAY, TRACE GRAVEL AND SAND - DRY, LIMESTONE GRAVEL 6.0	CL	2.5	MUNSELL 10YR 6/6 SAMPLE SCANNED AT BACKGROUND
7.5	07402	14 16 21	18	HARD GRAY SILTY CLAY, TRACE SAND AND GRAVEL - DRY + LIMESTONE GRAVEL 7.6	CL	3.0	MUNSELL 10YR 6/1 SAMPLE SCANNED AT BACKGROUND.
9.0	07403	11 7 14	5	VERY STIFF PALE OLIVE GRAVELY CLAY, TRACE SAND AND SILT - MOIST	CL	1.0	MUNSELL 5Y 6/3 SAMPLE SCANNED AT BACKGROUND.
10.5	07404	5 9 12	9	VERY STIFF PALE OLIVE CLAY, SOME GRAVEL AND SAND, TRACE SILT, - MOIST	CL	1.25	MUNSELL 5Y 6/3 SAMPLE SCANNED AT BACKGROUND
12.0	NA	2 2 11	0				PUSHED SHELBY 12 IN. ATTEMPTED 3 SPOONS NO RECOVERY, 7:30 10.27.87
13.5	125 ST-07405 07406	6 6 10	5	VERY STIFF OLIVE GRAY CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST	CL	6.0	MUNSELL 5Y 5/2 SAMPLE SCANNED AT BACKGROUND
15.0	07407	4 6 8	12	STIFF OLIVE GRAY CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST	CL	.75	MUNSELL 5Y 5/2 SAMPLE SCANNED AT BACKGROUND

NOTES: RIG: CYCLONE 4/2

DRILLER: HARRY DYKES JR.

ASSISTANTS: JOE BARLE, JOHN VANOINE

WATER ADDED TO HOLE TICK = 5 GALLONS

~~HH HH HH~~ 1

BACKGROUND BETA/GAMMA AT SITE - 800 CPM

BACKGROUND LEVELS

HNU - ZERO

LEL - ZERO

ALPHA - ZERO

BETA/GAMMA - 40-80 CPM

000379

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____

	Initial	Date
1st Key In		
2nd Key In		8/16
Hard Copy Verification		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~LET~~ 1029 1-5	COORDINATES: Samples pool	DATE: 10.27.87	
ELEVATION: 577.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10.22.87	
ENGINEER/GEOLOGIST: D OATLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 10.27.87	
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 3	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31.5	07419	6 7 15	9	VERY STIFF GRAY CLAY, SOME GRAVEL, TRACE SILT AND SAND. MOIST	CL	1.5	MUNSELL 5Y 5/1 SAMPLE SCANNED - BACKGROUND
33.0	07490	7 10 16	7	VERY STIFF LIGHT OLIVE GREY GRAVELLY CLAY TRACE SAND AND SILT - WET	CL	NA	MUNSELL 5Y 6/2 SAMPLE SCANNED - BACKGROUND
			5	SOFT GRAY MOTTLED GRAVELLY CLAY TRACE SAND	CL	.25	MUNSELL 5Y 6/1
34.5	07491	16 18	9	DENSE BROWNISH YELLOW SAND - DRY	GP	NA	MUNSELL 10YR 6/6 SAMPLE SCANNED - BACKGROUND
36	07492	14 20 21	12	DENSE LIGHT YELLOWISH BROWN SAND DRY	GP	NA	MUNSELL 10YR 6/4 SAMPLE SCANNED - BACKGROUND
				BOTTOM OF BORING 360 FT.			

NOTES:

000280

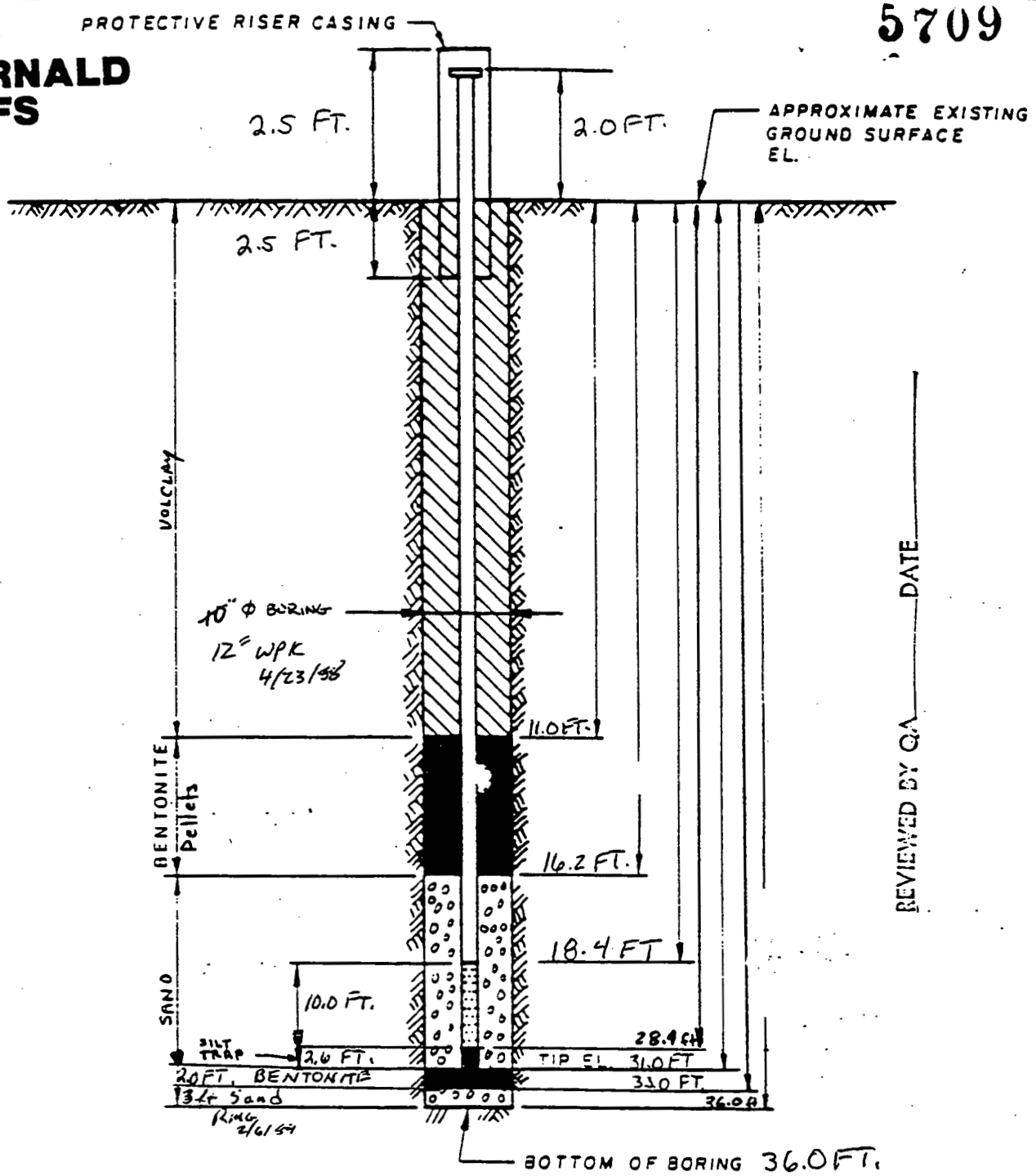
402-11-86

QC/DM/2.4.89

WELL # ~~129~~ 1029

5709

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DATE

DRAWN BY

REVIEWED BY QA

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~129~~ 1029

PREPARED FOR

RWL 2/6/89

White corrections were made by D. Oakley at the time the form was completed
4/23/88
WPK

000381

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602
BORING NO. ~~129~~ 1029 DB, 1-5-88
PIEZOMETER NO. ~~129~~ 1029

FIELD ENG./GEO. D. OAKLEY DATE 10-28-87
CHECKED BY R Galbraith DATE 2/6/89
DATE OF INSTALLATION 10-28-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 2 FT. TO 34 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD HAMMER
CASING SIZE (S) USED:
SIZE 10 IN FROM 0 TO 30
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 IN
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD AND Flush R 2/6/88
~~COUPLE~~

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 IN.

OTHER PROTECTION LOCKABLE CAP. AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		575.3	
GROUND SURFACE	0.0		577.3	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		574.8	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 11.0 FT.	TOP 577.3	BOTTOM 566.3
BENTONITE	TOP 11.0 FT.	BOTTOM 16.2 FT.	TOP 566.3	BOTTOM 550.1
SAND	TOP 16.2 FT.	BOTTOM 31.0 FT.	TOP 550.1	BOTTOM 519.1
BENTONITE pellets	TOP 31	BOTTOM 33	TOP 519.1	BOTTOM 517.1
SAND	TOP 33.0	BOTTOM 36.0	TOP 517.1	BOTTOM 514.1
PERFORATED SECTION	TOP 18.4 FT.	BOTTOM 28.4 FT.	TOP 558.9	BOTTOM 530.5
PIEZOMETER TIP	31.0		EL.6. ~~558.9~~	541.3
BOTTOM OF BOREHOLE	36.0 FT. 7/29/91		EL.6. ~~555.9~~	538.3
GWL AFTER INSTALLATION				

IS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS This form did not represent the installed monitoring well, therefore, it has been modified with white out by D. Oakley. 4/23/88 WPK

000382

FERNALD RI/FS

REVIEWED BY GA

	Initial	Date
1st Key In		
2nd Key In		
Final Review		

5709

WPK 4/23/88
RIG # 1

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: ~~130~~ 1030 BB 1554	COORDINATES: 481232.32 N 1378756.55 E	DATE: 3-16-88	
ELEVATION: 575.9	GWL: Depth N/A Date/Time N/A	DATE STARTED: 03/16/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth N/A Date/Time N/A	DATE COMPLETED: 03/17/88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 4	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08214	1 3 12	12"	Very STIFF Dark Yellowish Brown silty clay (10YR 4/4) Dry 1.5ft	ML	3.5	Hnu = 4ppm α = 0 δB = 120 1030
2 3	08215	10 13 15	14"	Very STIFF yellowish Brown silty clay (10YR5/6) Trace sand	OL	4.0	Hnu = 4ppm α = 0 δB = 100 1045
4	08216	15 18 22	18"	Very STIFF yellowish Brown (10YR5/6) silty clay trace sand. Dry	OL	4.0	Hnu = 4ppm α = 0 δB = 100 1050
5 6	08217	35 45 42	18"	Hard Dark yellowish Brown (10YR4/6) clay. Trace gravel w/silt 6.5ft	OL	4.0	Hnu = 2.5ppm α = 0 δB = 100 1100
7	08218	11 27 31	14"	Hard Yellowish Brown clay (10YR5/6) Trace gravel DRY 7.5ft	CL	4.0	Hnu = 0 α = 0 δB = 100 1450
8 9	08219	36 46 50	10"	Hard Dark gray clay (5Y 4/1) Dry Trace gravel	CL	4.0	Hnu = 0 α = 0 δB = 100 Blue clay fragments 1500
10	082201	12 14 24	12"	Hard Dark grey clay (5Y 4/1) DRY trace gravel	CL	4.0	Hnu = 0 α = 0 δB = 120 Shelby Tube No 08220 1600
11 12	082202	7 8 10	10"	Very STIFF Dark grey clay (5Y 4/1) Dry Trace gravel	CL	3.0	Hnu = 0 α = 0 δB = 120 1635
13	082203	11 17 13	10"	Very STIFF Dark grey clay (5Y 4/1) DRY Trace gravel			Hnu = 0 α = 0 δB = 120 1640
14 15	082204	7 8 15	10"	Very STIFF Dark gray clay (5Y4/1) Dry. gravel			Hnu = 0 α = 0 δB = 120 03/17/88 0930

NOTES:

I) Drilling Contractor: Pennsylvania Drilling Co.
Driller: Tim Harris
Helper: Craig Coulter

II) Background measurements
A) Hnu = 0 B) α = 0 C) δB = 120 cpm

III) Water used 85 gallons

IV Colors via Muncell color chart

000383

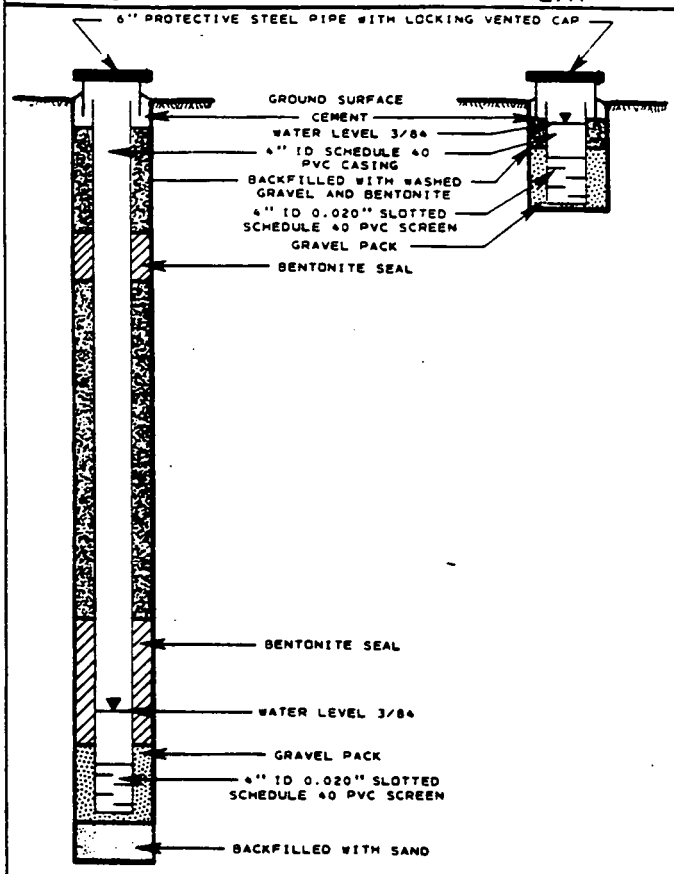
B121-221

2021 ~~221~~ CB

1021 ~~121~~ CB 5/23/94

WELL SCHEMATICS

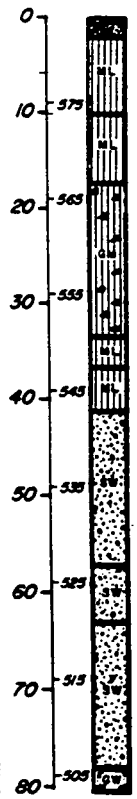
21S 21TP



BORING 21

SURFACE ELEVATION 21S 584.42'
21TP 584.06'

DEPTH IN FEET | ELEVATION IN FEET | GRAPHIC LOG



DESCRIPTIVE GEOLOGIC NOTES

ROAD FILL, COARSE GRAVEL

DARK YELLOWISH BROWN (10YR4/2) CLAYEY SILT UP TO 5% SAND AND GRAVEL

LIGHT OLIVE GRAY (5Y5/2) CLAYEY SILT, WITH UP TO 5% SAND OR GRAVEL

LIGHT OLIVE GRAY (5Y5/2) SILTY GRAVEL

LIGHT OLIVE GRAY (5Y5/2) SILTY GRAVEL

MIXTURE OF DARK YELLOWISH BROWN (10YR4/2) AND LIGHT OLIVE GRAY (5Y5/2) CLAYEY SILT, UP TO 5% GRAVEL, MEDIUM TO COARSE GRAINED SAND ENCOUNTERED AT 40.5'

LIGHT OLIVE GRAY (5Y5/2) MEDIUM TO CAORSE GRAINED WELL SORTED SAND, UP TO 3% GRAVEL

LIGHT OLIVE GRAY (5Y5/2) MEDIUM TO COARSE GRAINED SAND, SOME GRAVEL, CONTAINS THIN LAYER OF BROWNISH-YELLOW FINE SAND

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO COARSE GRAINED SAND (LESS THAN 1% GRAVEL) WITH SOME SILT

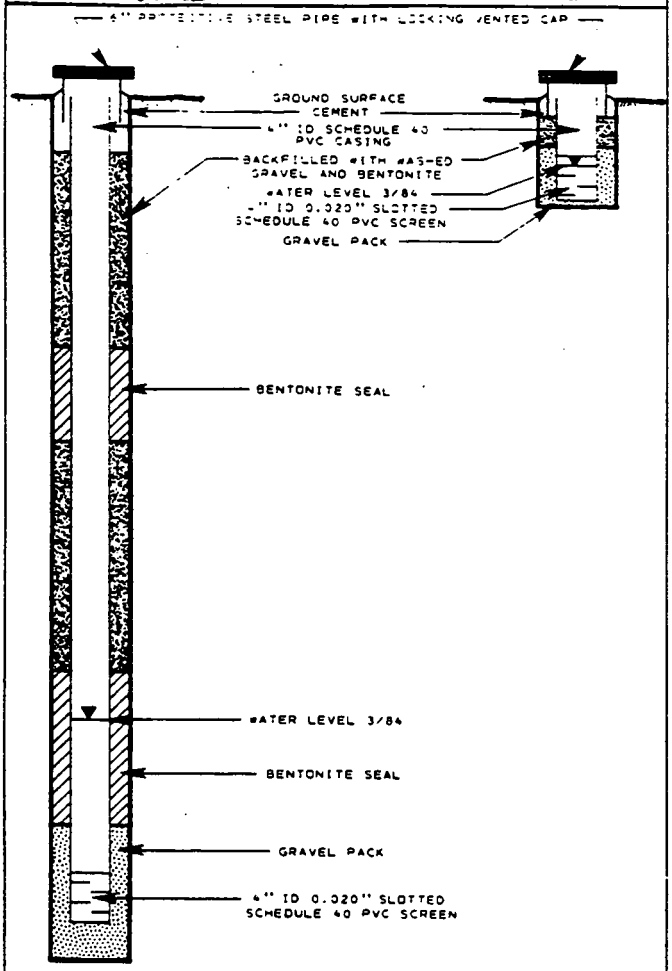
COARSE GRAVEL WITH SOME SAND
BORING TERMINATED AT A DEPTH OF 80.0' ON 2/13/85

000384

DAMES & MOORE

WELL SCHEMATICS

22S 2022 1022 22TP



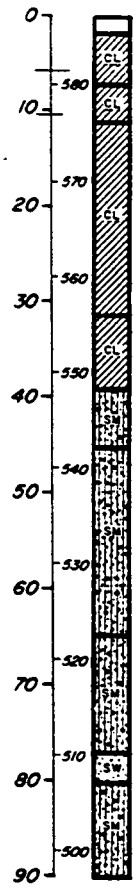
DEPTH IN FEET
ELEVATION IN FEET

GRAPHIC LOG

BORING 22, 0709

SURFACE ELEVATION 22S 582.33'
22TP 582.33'

DESCRIPTIVE GEOLOGIC NOTES



COARSE GRAVEL IN SILT MATRIX ON BERM

OLIVE GRAY (5Y3/2) SILTY CLAY, LESS THAN 1% VERY COARSE GRAVEL

DARK YELLOWISH BROWN (10YR4/2) SILTY CLAY, DRY, DENSE, STIFF

LIGHT OLIVE GRAY (5Y5/2) SILTY CLAY, STIFF, DRY, LESS THAN 1% GRAVEL

LIGHT OLIVE GRAY (5Y5/2) GRAVELLY SILTY CLAY

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO FINE GRAINED WELL SORTED SILTY SAND, GRADES INTO MEDIUM TO COARSE GRAINED SILTY SAND

LIGHT OLIVE BROWN (5Y5/6) MEDIUM TO FINE GRAINED SILTY SAND WITH SOME OLIVE BROWN CLAY

LIGHT OLIVE BROWN (5Y5/6) SILTY SAND, UP TO 15% GRAVEL

COARSE SAND AND GRAVEL, UP TO 15% SILT

LIGHT OLIVE BROWN (5Y5/6) SILTY SAND, UP TO 15% GRAVEL

BORING TERMINATED AT A DEPTH OF 90.0' ON 2/14/85

000385

DAMES & MOORE

FIGURE A4-12

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
NOT USE INK

BU-13

№ 366579

4023

County Butler Township Ross Section of Township 34

Owner Miami Conservancy Dist Address ~~Middletown~~ DAYTON, O

Location of property 38 E Monument Ave

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 139

Type of screen Cook Well Length of screen 5'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate 25 G.P.M. Duration of test 4 hrs

Drawdown ? air ft. Date 12/14/68

Static level-depth to water 23' ft

Quality (clear, cloudy, taste, odor)

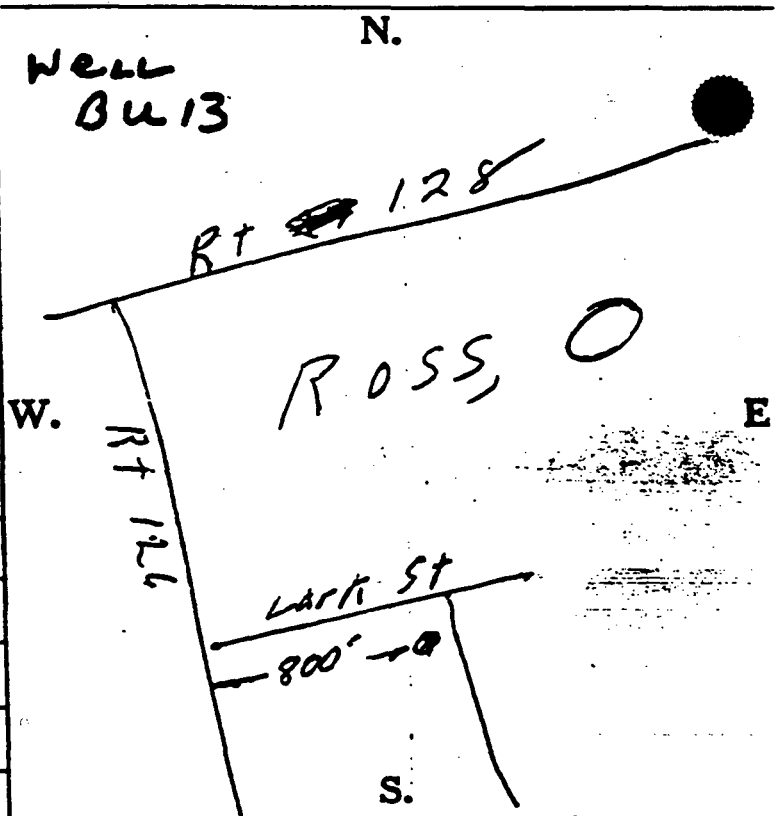
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From 0 Feet	To Ft.
Sand & gravel	0	5
Dirty sand & gravel	5	15
Yellow clay	15	21
Sand & gravel	21	45
Sand	45	90
Sand & some gravel	90	105
Sand & gravel	105	120
Sand	120	135
Sand & rocks	135	140
Yellow sandstone	140	154
Blue clay	154	155
Shale	155	157

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Wm Crane Date 4/8/69

Address Shandon, O Signed Wm Crane

*If additional space is needed to complete well log, use next consecutive numbered form.

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: ~~130~~ 1030 BD 1539	COORDINATES: See page 1	DATE: 3-17-88	
ELEVATION: see page 1	GWL: Depth / Date/Time	DATE STARTED: 03/16/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth / Date/Time	DATE COMPLETED: 3-18-88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 4	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08 5	14 14 12	10"	STIFF Dark gray clay (5Y 4/1) DRY. Gravel Fragments →	CL	1.5	Hnu = 0 α = 0 γB = 125 Blue Fragments 0935
17	08 6	6 6 7	10"	Very STIFF Dark gray clay (5Y 4/1) Dry Abundant Gravel		2.5	Hnu = 0 α = 0 γB = 100 1005
18							
19	08 7	N/A	24"	SHELBY Tube 20.0ft	NA	NA	1100
20	08 8	5 6	10"	Medium STIFF Dark grey silty clay (5Y 4/1) Trace sand. moist	ML	<1	Hnu = 5ppm α = 0 γB = 90 1450
21	08 9	2 2 3	8"	Medium STIFF Dark grey silty clay (5Y 4/1). moist	ML	<1	Hnu = 0 α = 0 γB = 90 1505
22	08 10	4 2 2	6"	Medium STIFF Dark grey silty clay (5Y 4/1) Trace gravel, moist	ML	<1	Hnu = 5ppm α = 0 γB = 110 1520
23	08 11	2 3 2	6"	Med STIFF Dark grey silty clay (5Y 4/1) Trace gravel 25.5ft	ML	<1	Hnu = 5ppm α = 0 γB = 110 1530
24							
25							
26	08 12	7 9 11	16"	Very STIFF olive gray clay (5Y 4/2) Trace gravel. DRY	CL	3.5	Hnu = 5ppm α = 0 γB = 110 1545
27							
28	08 13	18 22 31	18"	Very STIFF Dark gray clay (5Y 4/1) DRY Trace gravel	CL	3.5	Hnu = 7ppm α = 0 γB = 110 1630
29	08 14	10 14 18	18"	Very STIFF Dark gray clay (5Y 4/1) Dry trace gravel	CL	3.5	Hnu = 7ppm α = 0 γB = 110 1700
30							

NOTES:

000387

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____

	Initial	Date
1st Key In		
2nd Key In		8/15
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T32	
BORING NUMBER: BB 1-5-89 ~~1030~~ 1030	COORDINATES: See page 1	DATE: 3-18-88
ELEVATION: See page 1	GWL: Depth / Date/Time /	DATE STARTED: 03/16/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth / Date/Time /	DATE COMPLETED: 3-18-88
DRILLING METHODS: Cable Tool		PAGE 3 OF 4

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							03/18/88
31	03 2 3 5	12 16 32	18"	Very STIFF Dark gray clay (5Y 4/1) Dry Trace Gravel 31 FT	CL	3.5	Hnu = 0 ∝ = 0 ⅛ = 110 0945
				Very STIFF Dark Yellowish Brown clay (10YR 4/6) Dry Trace sand 31.5 FT			
32	08 2 3 6	6 19 19	18"	Dense Yellowish Brown sand (10YR 5/6) Dry	SP	<1	Hnu = 0 ∝ = 0 ⅛ = 110 0950
33							
34							
35							
36							
37							
38	08 2 3 12	19 50 50	18"	Very Dense yellowish Brown Sand (10YR 5/6) DRY	SP	<1	Hnu = 0 ∝ = 0 ⅛ = 110 1025
39							
40							
41							
42							
43	08 2 3 8	13 25 50/4	18"	Very Dense yellowish Brown gravel (10YR 5/6) with trace of sand, poorly sorted	GW	<1	Hnu = 0 ∝ = 0 ⅛ = 110 1515
44							
45							

NOTES:

5709

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

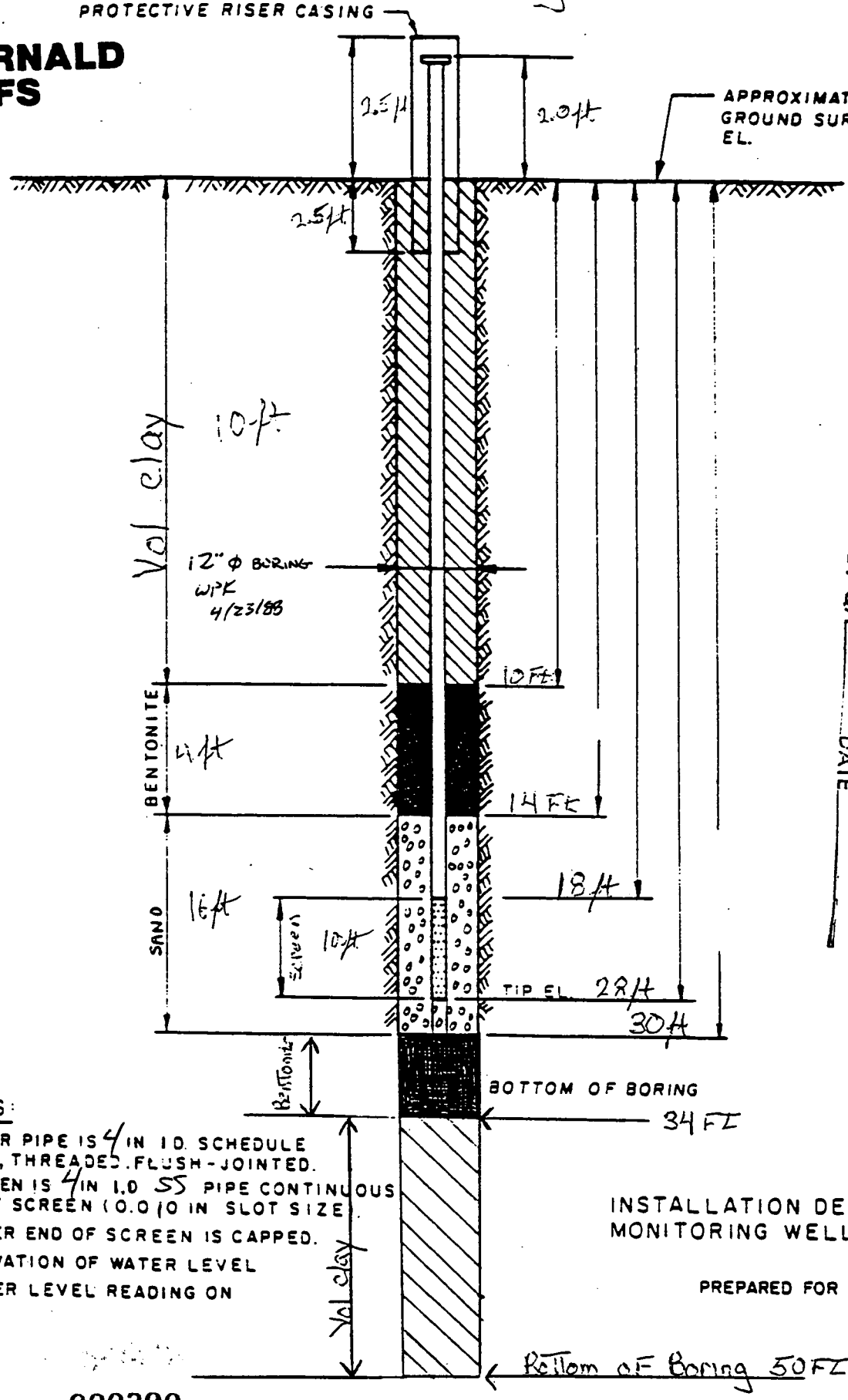
PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: BB 1-4-99 ~~1130~~ 1030	COORDINATES: See page 1	DATE: 3-18-88
ELEVATION: See page 1	GWL: Depth 1 Date/Time 1	DATE STARTED: 03/16/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-18-88
DRILLING METHODS: Cable Tool		PAGE 4 OF 4

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46							
47							
48				Very Dense gravel Yellowish Brown (10YR 4/4)	GW		
49	B 2 3 9	17 31 45 50	24"	Very Dense Yellowish Brown sand (10YR5/8) DRY.	SP	41	Ima=0 α=0 δB=90 1605
50				Bottom of Boring 50 FL.			

NOTES:

Monitoring Well # ~~130~~ 1030 BG

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1030

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

REVIEWED BY QA

DATE

000390

FERNALD RI/FS

RECEIVED BY G... DATE 5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M Goldberg DATE 03/19/88
PROJECT NO. 602 T3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~130~~ 1030 BB 1-5-89
PIEZOMETER NO. ~~NA~~ 1032 DATE OF INSTALLATION 03/19/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 3 ft TO 50 ft	SIZE 10" FROM 3 ft TO 50 ft
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE Monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION ____	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4" inches
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD Thread and couple
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE O.D. 10" inches	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 FT		~~573.9~~ KG 7/29/91 577.9	
GROUND SURFACE	0.0		575.9	
BOTTOM OF PROTECTIVE PIPE	2.5 FT		573.4	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 10 FT	TOP 575.9	BOTTOM 565.9
BENTONITE	TOP 10 ft	BOTTOM 14 ft	TOP 565.9	BOTTOM 551.9
~~SAND~~	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
GRAVEL	TOP 14 ft	BOTTOM 30 ft	TOP 551.9	BOTTOM 521.9
PERFORATED SECTION	TOP 18 ft	BOTTOM 28 ft	TOP 547.9	BOTTOM 519.9
PIEZOMETER TIP	30 FT		545.9	
BOTTOM OF BOREHOLE	30 FT		545.9	
GWL AFTER INSTALLATION	N/A		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒ 000391
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Well 130 was overdrilled to 50 ft to determine lithology. A Vol clay plug was set from 50 FT → 34 ft with a 4 FT Bentonite Plug from 34 ft - 30 ft to seal Base of Till/sand contact @ 34.5 ft. MS 2/4

FERNALD RI/FS REVIEWED BY QA K.G. DATE 7/25/91

RECEIVED 6/15/89

	Initial	Date
Data Keyed		
Data Verified		
Field Verification		

RKA 2/4/

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 131 1031 BB 1-5-89	COORDINATES: 481167.08N 1378126.65E	DATE: 4-5-88	
ELEVATION: 576.37	GWL: Depth N/A Date/Time N/A	DATE STARTED: 04/05/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth N/A Date/Time N/A	DATE COMPLETED: 4-7-88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 2	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							04/05/88
1	08 8 3 2	2 9 13	10"	Hard very dark grayish Brown clay (10YR 3/2) DRY	CL	>4	Hnu=0 α=0 γB=260 0915
2 3	08 8 3 3	6 6 8	12"	Hard Dark Brown clay (10YR 4/3) DRY.	CL	>4	Hnu=0 α=0 γB=260 0920
4	08 8 3 4	21 10 11	12"	Very STIFF Dark Brown clay (10YR 4/3) DRY	CL	>4	Hnu=0 α=0 γB=200 0925
5 6	08 8 3 5	9 11 7	10"	5.5ft Medium STIFF gray clay (5Y 5/1) MOIST Trace gravel. 6.0ft	CL	<1	Hnu=0 α=0 γB=200 0930
7	08 8 3 6	8 11 7	10	Medium STIFF Dark Brown clay (10YR 4/3) moist. 7.5	CL	<1	Hnu=0 α=0 γB=220 0935
8 9	08 8 3 7	9 11 12	12"	Medium STIFF gray clay (5Y 5/1) DRY trace gravel ← Shelby Tube 9.5	CL	<1	Hnu=0 α=0 γB=210 High Plasticity 0937
10	08 8 3 8	16 11 13	18	Medium STIFF Yellowish Brown clay (10YR 5/8) MOIST. trace gravel 10.5	CL	<1	Hnu=0 α=0 γB=210 High Plasticity Shelby N0008839 0940
11 12	08 8 4 0	4 5 9	18"	Medium STIFF olive gray clay 5Y 4/2) DRY Trace gravel	CL	<1	Hnu=0 α=0 γB=210 1400
13	08 8 4 1	5 7 11	18"	13 Ft Medium STIFF very Dark gray (2.5Y 3/0) Trace gravel 13.5 Ft	CL	<1	Hnu=0 α=0 γB=210 1410
14 15	08 8 4 2	7 5 12	10'	Medium STIFF olive gray clay (5Y 4/2) DRY Trace Gravel	CL	<1	Hnu=0 α=0 γB=210 1415

NOTES:

I) Drilling Contractor: Pennsylvania Drilling Co.
Driller: Tim Harris
Helper: Craig Coalter

II) Background Measurements
04/05/88 A) HNU=0 B) α=0 C) γB=460 cpm

III) Water used=

IV Color via Munsell Color Chart

000392

FERNALD RI/FS

RECEIVED

REVIEWED BY QA KC DATE 7/25/91 5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

KKA 2/4/

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: 88 1-5-89 ~~1-3~~ 1031	COORDINATES: Same as page 1	DATE: 4-6-88
ELEVATION: Same as page 1	GWL: Depth N/A Date/Time N/A	DATE STARTED: 04/05/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth N/A Date/Time N/A	DATE COMPLETED: 4-7-88
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	0 8 8 4 3	4 5 11	18	Medium STIFF Dark gray clay (5Y 4/1) DRY Trace gravel	CL	<1	Hna = 0 α = 0 δB = 200 1500
17	0 8 8 4 4	4 10 10	16"	Medium STIFF Dark gray clay (5Y 4/1) DRY Trace gravel	CL	<1	Hna = 0 α = 0 δB = 200 1510
18							
19	0 8 8 4 5	N/A	18"	Shelby Tube	N/A	N/A	Pushed 2.5Ft Recovered 1.5Ft 1645
20	0 8 8 4 6	2 2 2	8"	Medium STIFF Yellowish Brown clay (10YR 5/6) Trace gravel	CL	<1	Hna = 0 α = 0 δB = 200 04/07/88 0930
21							
22	0 8 8 4 7	5 4 7	10"	STIFF Dark Yellowish Brown clay (10YR 4/6) Trace gravel, DRY	CL	1.5	Hna = 0 α = 0 δB = 240 0940
23	0 8 8 4 8	16 13 14	6"	STIFF Dark Yellowish Brown clay (10YR 5/6) trace gravel. Trace gray clay (5Y 5/1) 24 ft	CL	1.5	Hna = 0 α = 0 δB = 240 0955
24							
25	0 8 8 4 9	15 22 ~~59~~ 3	18"	Very Dense Dark Brown sandy silt (10YR 4/3) DRY. No clay 26 ft	SM	4.0	Hna = 0 α = 0 δB = 240 1040
26	0 8 8 5 0	14 32 36	18"	Very Hard Yellowish Brown clay & silt (10YR 5/8) DRY trace gravel	CL	4.0	Hna = 0 α = 0 δB = 240 1055
27							
28	0 8 8 5 1	16 22 37	18"	Very Hard grayish Brown clay (2.5Y 5/2) Dry. Trace gravel 29 Ft	CL	>4.0	Hna = 0 α = 0 δB = 240 1300
29	0 8 8 5 2	20 22 17	18"	Dense yellowish Brown sand (10YR 5/8) Dry.	SW	<1	Hna = 0 α = 0 δB = 200 1315
30							
NOTES:				Bottom of Boring 30 ft			

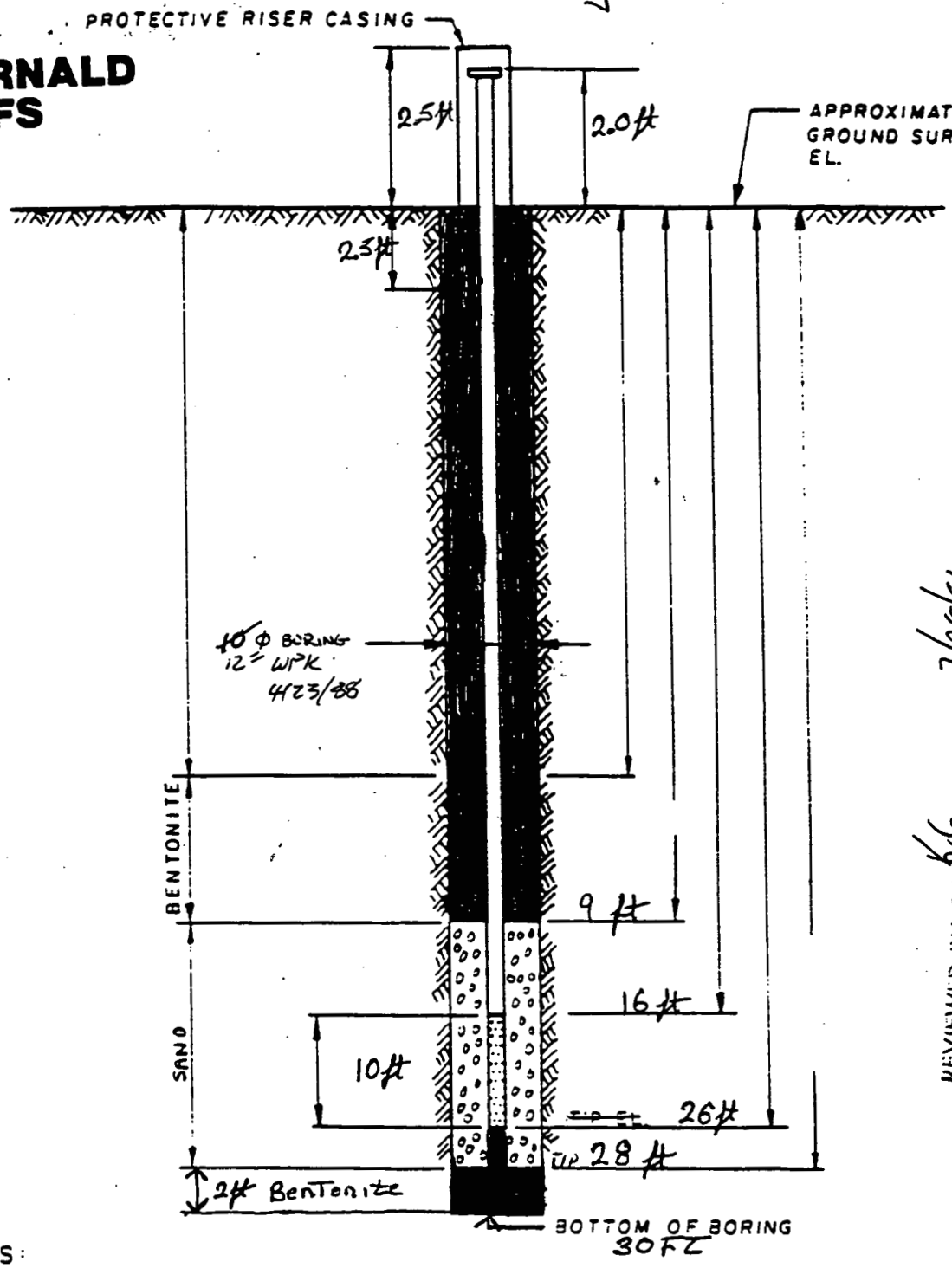
000393

N/A = NOT Applicable

Monitoring Well # ~~131~~ 1031 BB

RKA 2/4/83

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

REVIEWED BY QA K.G. DATE 7/25/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
FMPC RI/FS

000394

FERNALD RI/FS

REVIEWED BY QA D.G. DATE 7/25/91

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. M. Goldberg DATE 04/07/88
PROJECT NO. 602
CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~13~~ 1031 BB 1-5-89
PIEZOMETER NO. ~~N/A~~ 1031
DATE OF INSTALLATION 4-7-88

BOREHOLE DRILLING

DRILLING METHOD ~~Water~~ Cable Tool
DRILLING FLUID (S) USED: WPK 4/23/88
FLUID _____ FROM 3 ft TO 30 ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Flat Head
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 30 ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010" inches
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 Feet

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD Thread ~~and couple~~ Flush Joint RKA 2/6/

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE Ø.D. 10"

OTHER PROTECTION Lockable cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 ft		578.37	
GROUND SURFACE	0.0		576.37	
BOTTOM OF PROTECTIVE PIPE	2.5 ft		573.87	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
BENTONITE	TOP 0	BOTTOM 9	TOP 576.37	BOTTOM 567.37
~~SAND~~	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
GRAVEL	TOP 9	BOTTOM 28 ft	TOP 567.37	BOTTOM 539.37
PERFORATED SECTION	TOP 16 ft	BOTTOM 26 ft	TOP 560.37	BOTTOM 550.37
PIEZOMETER TIP	28 ft		548.37	
BOTTOM OF BOREHOLE	30 ft		546.37	
GWL AFTER INSTALLATION	N/A		N/A	

000395

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS A 2 ft Bentonite Plug was set from 30 ft - 28 ft to seal till/sand contact @ 29 ft

White out corrections were made by D. Oakley at the time the form was completed. WJK 4/23/88

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
3rd Verification		

K.G. 7/25/91 DJB 3/14/89 480515.31 N 1378296.81 E WJK 4/23/88 RIG # 2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~132~~ 1032 BB 1-5-89	COORDINATES: ~~1378296.81 N E~~ 9804 K.G.	DATE: 10-30-87	
ELEVATION: 569.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-30-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 10-30-87	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 2	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07494 7:40	4 3 3	14	MEDIUM STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) SILT, SOME CLAY, TRACE SAND AND GRAVEL 1.3	ML	3.0	HNU - 0 PPM γ - 0 CPM Bα - 80 CPM
2	07495 8:00	3 4 4	12	OLIVE GRAY (5Y, 5/2) CLAY, SOME SILT, TRACE SAND AND GRAVEL - DRY. MEDIUM STIFF OLIVE (5Y, 5/3) CLAY, SOME SILT, TRACE GRAVEL AND SAND - DRY 2.5	CL	1.5	HNU - 0 PPM γ - 0 CPM Bα - 70 CPM
3				LIGHT YELLOWISH BROWN (2.5Y, 6/4) SILT, SOME SAND AND CLAY - DRY. 3.0	ML	1.5	
4	07496 8:15	3 4 4	10	MEDIUM STIFF YELLOWISH BROWN (10YR, 5/4) CLAY AND SILT, TRACE SAND AND GRAVEL - DRY 4.3	CL	3.5	HNU - 0 PPM γ - 0 CPM Bα - 70 CPM
				4.6 DARK BROWN (10YR, 3/3) SILT, SOME CLAY, TR SAND AND GRAVEL - DRY	ML	—	
5	07497 8:25	8 8 11	14	VERY STIFF YELLOWISH BROWN (10YR, 5/4) CLAY, SOME SILT, TRACE SAND AND GRAVEL - DRY 5.6	CL	3.5	HNU - 0 PPM γ - 0 CPM Bα - 70 CPM
6				VERY STIFF BROWNISH YELLOW (10YR, 6/6) SILT, TRACE SAND AND CLAY AND GRAVEL - DRY.	ML	1.5	
7	07498 8:30	9 7 11	14	VERY STIFF BROWNISH YELLOW (10YR, 6/6) SILT, SOME GRAVEL AND SAND, TRACE CLAY - DRY. 7.5	ML	1.5	HNU - 0 PPM γ - 0 CPM Bα - 80 CPM
8 9	07499 10:10	13 14 17	12	MEDIUM DENSE BROWNISH YELLOW (10YR, 6/8) GRAVEL, SOME SAND AND SILT - DRY	GM	—	HNU - 0 PPM γ - 0 CPM Bα - 60 CPM
10	07500 10:30	8 7 10	10	BROWNISH YELLOW GRAVEL (10YR, 6/8) SOME SAND AND SILT 10.0			HNU - 0 PPM γ - 0 CPM Bα - 70 CPM
				VERY STIFF YELLOWISH BROWN (10YR, 5/4) CLAY, TRACE SILT AND SAND - MOIST 10.5	CL	4.5	
11	07501 10:40	3 5 7	14	MEDIUM DENSE LIGHT YELLOWISH BROWN (2.5YR, 6/4) GRAVEL, SOME CLAY, TRACE SAND AND SILT - MOIST 11.9	GC	—	HNU - 0 PPM γ - 0 CPM Bα - 80 CPM
12				STIFF YELLOWISH BROWN (10YR, 5/4) CLAY, SOME SILT, TRACE SAND - MOIST. 12.1	CL	2.5	
13	07502	1 2 2	0 0	SOFT BROWN (10YR, 5/3) CLAY, SOME ~~SILT, TRACE~~ SAND, ~~MOIST~~. TRACE GRAVEL AND SILT - ~~MOIST~~ WET.	CH	.25	HNU - 0 PPM γ - 0 CPM Bα - 70 CPM
14 15	07503	5 11 14	5	VERY STIFF BROWN CLAY (10YR, 5/3) SOME GRAVEL, TRACE SAND AND SILT - DRY	CH	.25	HNU - 0 PPM γ - 0 CPM Bα - 70 CPM

NOTES: DRILLING CONTRACTOR ~~000386~~
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANONE
WATER ADDED TO HOLE - TOTAL = 5 GALLONS
11

SAMPLES TAKEN USING ASTM STANDARD PENETRATION TEST.
COLORS CLASSIFIED USING MUNSELL COLOR CHARTS.

BACKGROUND READINGS AT SITE
HNU - 0 PPM
LEL - 0 %
ALPHA - 0 CPM
BETA/GAMMA - 800-900 CPM*

* SAMPLES SCANNED IN LEAD BOX FOR ~~BETA/GAMMA~~ Bα READINGS.

REVIEWED BY QA K.G. DATE 7/25/91

402-11-86

FERNALD RI/FS

5709

REVIEWED BY ... KG DIG 7/26/91

1st Key In	
2nd Key In	
Hard Copy Verification	

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~132~~ 1032 BB 1.5-5	COORDINATES: 480515.31 N 378296.81 E	DATE: 10.30.87	
ELEVATION: 569.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10.30.87	
ENGINEER/GEOLOGIST: D.OAKLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 10.30.87	
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 2	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	13:00 07504 13:30	5 11 18	13	VERY STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST.	CL	4.25	γ - 0 CPM BG - 60-80 CPM HNU - 0 PPM SHELBY PUSHED 6 IN. RECOVERED 6 IN.
17	07505 14:00	9 12 42	12	HARD OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST 16.3	CL	4.25	γ - 0 CPM BG - 60-80 CPM HNU - 0 PPM
18 19	07507 15:40	11 13 15	11	VERY STIFF YELLOWISH RED (5YR, 5/8) CLAY, SOME SAND, GRAVEL, AND SILT - DRY 19.4	CL	4.0	ATTEMPTED SHELBY - TUBE COLLAPSED - NO RECOVERY. γ - 0 CPM BG 60 CPM HNU - 0 PPM
20	07508	11 11 15	14	BROWNISH YELLOW (10YR, 6/8) SILT, SOME SAND - DRY 20.5	ML	.2	γ - 0 CPM BG - 80 CPM HNU - 0 CPM
				MEDIUM DENSE YELLOWISH BROWN (10YR, 5/6) FINE SAND TRACE SILT AND CLAY - DRY 20.8	SP	—	
21				21.2 BROWNISH YELLOW (10YR, 6/8) SILT, SOME SAND - DRY	ML	.2	
22	07509 16:25	8 11 17	12	MEDIUM DENSE YELLOWISH BROWN (10YR, 5/6) FINE SAND - DRY.	SP	—	γ - 5 CPM BG - 60 CPM HNU - 0 PPM
23 24	07510 16:35	12 14 18	14	MEDIUM DENSE YELLOWISH BROWN (10YR, 5/6) FINE SAND - DRY 24.0	SP	—	γ - 0 CPM BG 60 CPM HNU 0 PPM
				BOTTOM OF BORING - 24.0 ft			

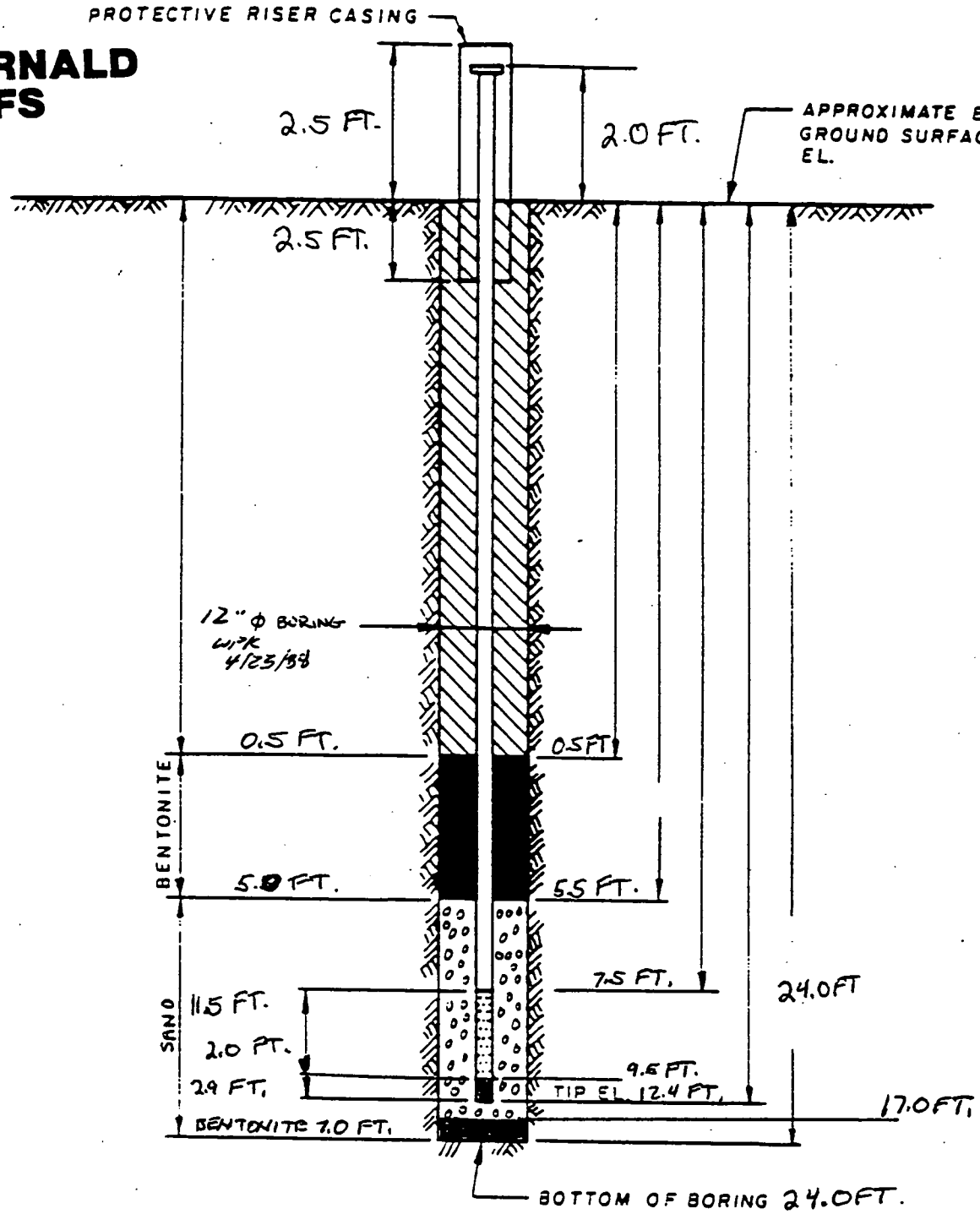
NOTES:

000397

402-11-86

WELL # ~~132~~ 103
AB 1-5-57

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~132~~ 1032

PREPARED FOR RWB 2/6/84

000398

FERNALD RI/FS

VIEWED BY QA [illegible] DATE 2/25/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 10-31-87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~132~~ 1032 BB 1-5-89
PIEZOMETER NO. ~~NA~~ 1032 DATE OF INSTALLATION 10-31-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 2 FT. TO 24 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD
CASING SIZE (S) USED:
SIZE 10 IN FROM 0 TO 20 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 IN
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 2.0 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT; 2 FT.
JOINING METHOD THREAD ~~AND COUPLING~~ Flush Joint

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE ~~O~~.D. 10 IN.

OTHER PROTECTION LOCKABLE CAP. AND LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		~~56~~ 571.5	
GROUND SURFACE	0.0		569.3	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		566.8	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~	TOP NA	BOTTOM NA	TOP N/A	BOTTOM N/A
BENTONITE	TOP 0.5 FT.	BOTTOM 5.5 FT.	TOP 568.8	BOTTOM 563.8
SAND	TOP 5.5 FT.	BOTTOM 17.0 FT	TOP 563.8	BOTTOM 552.3
~~GRAVEL~~ BENTONITE	TOP 17.0 FT.	BOTTOM 24.0 FT.	TOP 552.3	BOTTOM 528.3
PERFORATED SECTION	TOP 7.5 FT.	BOTTOM 9.5 FT.	TOP 520.8	BOTTOM 511.3
PIEZOMETER TIP	~~NA~~ 12.4 ft WPK 4/24/89		556.9	
BOTTOM OF BOREHOLE	24.0 FT.		545.3	
GWL AFTER INSTALLATION	NA		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000339

FERNALD
RI/FS

Date	3/2/90			
Initial	ST			
	Field Check	1st Rev.	2nd Rev.	Final

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2032	COORDINATES:		DATE: 2/6/90
ELEVATION: ~560.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: SWANSON, MINE	Depth	Date/Time	DATE COMPLETED: ~~2/13/90~~ 2/7/90
DRILLING METHODS: CABLE TOOL			PAGE 1 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
1	32451 1310 2/6	3 5 6	7	TOPSOIL, DEEP DARK BROWN (10YR 2/2) SILT, PEBBLES SLIGHTLY MOIST, SOFT PLASTICITY 0.3 HARD, GRAY - DARK GRAY (10YR 5/1, 2.5Y 4/0) SILTY CLAY, TRACE OF SAND, LOW PLASTICITY, DRY TO SLIGHTLY MOIST	ML	2.0		Hnu = .1 PPM α : 0 CPM βγ : 400-500 CPM
2 3	32452 1316 2/6	2 2 3	2	↓	CL	3.0		Hnu = .1 PPM α : 0 CPM βγ : 400-500 CPM
4	32453 1321 2/6	3 6 5	7	HARD, YELLOWISH BROWN (10YR 5/6) SILTY CLAY, TRACE OF SAND, LOW PLASTICITY, SLIGHTLY MOIST	CL	2.5		Hnu : .1 PPM α : 0 CPM βγ : 300-400 CPM
5 6	32454 1324 2/6	5 8 11	11	MEDIUM DENSE WELL GRADED GRAVELY SAND, BROWNISH YELLOW (10YR 6/6), SOME CLAY, TRACE OF SILT, SUBANGULAR GRAVEL & SAND SANDS, SLIGHTLY MOIST	SW	N/A		Hnu : 0 PPM α : 0 CPM βγ : 300-600 CPM
7	32455 1329 2/6	10 11 8	10	6.7 HARD, DARK YELLOWISH BROWN (10YR 4/6) SANDY, SILTY CLAY, TRACE OF PEBBLES, LOW PLASTICITY, SLIGHTLY MOIST	CL	3.5		Hnu : 0 PPM α : 0 CPM βγ : 400-600 CPM
8 9	32456 1335 2/6	8 8 8	13	VERY SOFT, LIGHT OLIVE BROWN (2.5Y 5/6) SANDY SILT, SOME CLAY, WET	ML	<.25		Hnu : 0 PPM α : 0 CPM βγ : 400-600 CPM
10	32457 1454 2/6	3 5 6	8	FIRM; LIGHT OLIVE BROWN (2.5Y 5/6) SANDY, CLAYEY SILT, SLIGHT PLASTICITY, SLIGHTLY MOIST TO MOIST	ML	1.0		Hnu : 0 PPM α : 0 CPM βγ : 400-500 CPM
11 12	32458 1501 2/6	6 6 11	9	10.8 HARD, GRAY (5Y 5/1) SILTY CLAY, TRACE OF SAND, LOW PLASTICITY, SLIGHTLY MOIST	CL	2.5		Hnu : .1 PPM α : 0 CPM βγ : 300-500 CPM
13	32459 1513 2/6	2 5 10	5					Hnu : .1 PPM α : 0 CPM βγ : 400-600 CPM
14 15	32460 1519 2/6	12 5 15	8	HARD, GRAY (5Y 5/1) SILTY CLAY, SOME PEBBLES AND GRAVEL, TRACE OF SAND. PEBBLES AND GRAVEL ABOUT 3 IN., LOW PLASTICITY, SLIGHTLY MOIST	CL	3.0		Hnu = 0 PPM α : 0 CPM βγ : 400-500 CPM

NOTES

Drilling Contractor: PENN-DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST.: B. JOHNSON

ALL SAMPLES IN ACCORDANCE WITH ASTM STANDARD PENETRATION TEST. MUNSELL COLOR CHART USED FOR SOIL SAMPLE COLOR DESCRIPTION.

BACKGROUND READINGS

Hnu = .1 PPM

α = 0 CPM

βγ = 600-1000 CPM

* HIGH BACKGROUND CAUSES DOUBT IN βγ READINGS F. SOIL SAMPLES.

000400

* ALL CORRECTIONS ON PAGES 1-2 WERE MADE ON 2/6/90 AND 2/7/90, AND 2/13/90, UNLESS OTHERWISE NOTED. Mine Swanson 2/28/90

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2032	COORDINATES		DATE 2/6/90-2/7/90
ELEVATION: ~569.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST M. SWANSON	Depth	Date/Time	DATE COMPLETED ~~2/13/90~~ 2/21
DRILLING METHODS CABLE TOOL			PAGE 2 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
15–16	32460 1553 2/6	25 16 16	7	HARD, OLIVE GRAY (2.5Y 4/2), SILTY CLAY, COBBLES, SOME SAND AND PEBBLES LOW PLASTICITY, TOP 3 in MOIST, BOTTOM 4 in. SLIGHTLY MOIST	CL	2.0		HNU = 0 PPM; α = 0 CPM; βγ = 300-400 CPM
17–18	32462 1601 2/6	25 36 40	16	VERY HARD, DARK GRAY (2.5Y 4/1) SILTY CLAY, TRACE OF SAND PEBBLES, ONE COBBLE, LOW PLASTICITY, DRY TO SLIGHTLY MOIST	CL	>4		HNU = 0 PPM; α = 0 CPM; βγ = 200-400 CPM
18–19	32463 1053 2/7/90	20 21 30	9	HARD, GRAY (5Y 5/1) SILTY CLAY, TRACE OF SAND, COBBLES (QUARTZ), LOW PLASTICITY, SLIGHTLY MOIST	CL	2.75		HNU = .1 PPM; α = 0 CPM; βγ = 600-800 CPM
20–21 (No sample signed)	MS 1345 2/7	48 50+ 4 in.	NONE	SPOON REFUSAL - ASSUMED THAT SPOON PICKED UP A COBBLE AT START OF SAND AQUIFER	N/A	N/A		HNU = N/A; α = N/A; βγ = N/A
21–22	MS 1412 2/7	12 13 19	13	DENSE BROWNISH YELLOW TO YELLOWISH BROWN (10YR, 6/8 TO 5/8), FINE, POORLY GRADED SAND, DRY	SP	N/A		HNU = .1 PPM; α = 0 CPM; βγ = 300-400 CPM
22.5–25 (SAMPLE IS FROM 25.0 TO 26.5 FOOT INTERVAL)	MS 1439 2/7	8 7 11	12	MEDIUM DENSE, BROWNISH YELLOW TO YELLOWISH BROWN (10YR 6/8 TO 5/8). POORLY GRADED SAND, DRY	SP	N/A		HNU = .1 PPM; α = 0 CPM; βγ = 400 CPM
25–30	~~32464~~ MS			25.0 - 26.5 FT. INTERVAL M.A. 2-7-90 SAMPLING WILL BE DONE EVERY 5.0 FT HEREAFTER, STARTING WITH SAMPLE NUMBER ~~32467~~ MS 32466 @ 30.0 TO 31.5 FT				HNU = ; α = ; βγ =
26	~~32468~~							HNU = ; α = ; βγ =
27	~~32469~~ MS							HNU = ; α = ; βγ =
28	~~32469~~ MS							HNU = ; α = ; βγ =
29–30	~~32469~~ ~~32470~~							HNU = ; α = ; βγ =

NOTES

Drilling Contractor: PENNAMAN DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEUMAN
ASST. B. JOHNSON

BACKGROUND
HNU = .2 PPM
α = 0 CPM
βγ = 600-900 CPM

000401

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60L 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2032	COORDINATES:		DATE: 2/7/90 ; 2/13/90
ELEVATION: ~ 589.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2/13/90
DRILLING METHODS: CABLE TOOL			PAGE 3 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED GAMMA (CPM)	WELL CONSTRUCTION	REMARKS
30	32466							
31	32469 1602 2/7	3 15 25	10	DENSE, LIGHT YELLOWISH BROWN (10YR, 6/4), WITH A 3 IN LAYER OF BLACK AND WHITE SAND; SAND, MEDIUM TO WELL GRADED, TRACE OF PEBBLES (.2 IN), COARSENING DOWNWARD, DRY	SW	N/A		Hnu = .1 PPM α = 0 CPM βγ = 350-450 CPM
32								
33								
34								
35	32467 32468 0916 2/13/90	13 27 50	9	VERY DENSE, YELLOWISH BROWN (10YR 5/6) WELL GRADED SAND, SOME PEBBLES (.2 IN) TRACE OF SILT, CLAY; ROUNDED TO SUBANGULAR, DRY	SW	N/A		Hnu = 0 PPM α = 0 CPM βγ = 350-450 CPM
36								
37								
38								
39								
40	32468 0946 2/13	11 18 23	3	DENSE, OLIVE YELLOW (2.5Y 6/6) POORLY GRADED FINE GRAINED SAND, DRY TO SLIGHTLY MOIST	SP	N/A		Hnu = .1 PPM α = 0 CPM βγ = 300-400 CPM
41								
42								
43								
44								
45				GWL = 44.9 FT FROM GROUND SURFACE				

NOTES

Drilling Contractor: PERRY DRILL CO.

Drilling Equipment: DEGAUSS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST. J. JOHNSON

BACKGROUND:
Hnu = 0.1 PPM
α = 0 CPM
βγ = 800-1000 CPM

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2032	COORDINATES:		DATE: 2/13/90
ELEVATION: ~584.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2/13/90
DRILLING METHODS: CABLE TOOL (BUCYRUS ERIE)			PAGE 4 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINATION (PPM)	WELL CONSTRUCTION	REMARKS
0	32469							
45	~~32470~~ 1114 2/13	10 15 23	8	DENSE, DARK YELLOWISH BROWN (10YR 4/6) WELL GRADED SAND, SOME PEBBLES, SUBROUNDED TRACE OF GRAVEL (.25-.5 IN) SUBANGULAR TO SUBROUNDED, SLIGHTLY MOIST	SW	N/A		H_{AU} = 0.0 PPM; α = 0 CPM; $\beta\gamma$ = 300-400 CPM
46								
47								
48								
49								
50	32470 1354 2/13	7 9 13	5	MEDIUM DENSE, DARK BROWN (10YR 3/3) WELL GRADED SANDY GRAVEL (.25-.4 IN) SUBANGULAR TO SUBROUNDED, WET	GW	N/A		H_{AU} = 0.0 PPM; α = 0 CPM; $\beta\gamma$ = 200-400 CPM
51								
52								
53								
54								
55	32471 ~~32472~~ 1423 2/13	5 5 8	6	MEDIUM DENSE, DARK BROWN (10YR 3/3) GRAVELLY SAND, WELL GRADED, SUBANGULAR TO ROUNDED, WET	SW	N/A		H_{AU} = 0.1 PPM; α = 0 CPM; $\beta\gamma$ = 250-300 CPM
56								
57								BLOW SANDS ENCOUNTERED
58								
59								
60								

NOTES:

Drilling Contractor: PERNA DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST.: B. JOHNSON

BACKGROUND:

H_{AU} = 0.0-0.1 PPM

α = 0 CPM

$\beta\gamma$ = 600-1100 CPM

000403

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2032	COORDINATES:		DATE: 2/13/90
ELEVATION: ~589.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2/13/90
DRILLING METHODS: CABLE TOOL			PAGE 5 OF 7

DEPTH (FT)	SAMPLE (TYPE & NO.)	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINATION (PPM)	WELL CONSTRUCTION	REMARKS
60	32472 ~~32473~~ 1537 2/13	2 3 6	7	LOOSE, LIGHT YELLOWISH BROWN (10YR 6/4) WELL GRADED GRAVELLY SAND (~.25-.5 IN) ANGULAR TO ROUNDED, WET	SW	N/A		H_{NU} = 0.1 ppm; α: 0 cpm; β/γ: 400-500 cpm
61								
62								
63								
64								
65	32473 1621 2/13	5 8 12	6	MEDIUM DENSE, DARK BROWN (10YR 3/3) (WITH BLACK AND WHITE PARTICLES) GRAVELLY SAND, SOME COBBLES (.5 IN-.75 IN) TRACE OF SILT, WET, WELL GRADED	SW	N/A		H_{NU}: 0.0 ppm; α: 0 cpm; β/γ: 300-450 cpm
66								
67				BOTTOM OF BORING @ 65.0 FT SAMPLED TO 66.5 FT.				
68								
69								
70								
71								
72								
73								
74								
75								

NOTES.

Drilling Contractor: PENN-DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST.: B. JOHNSON

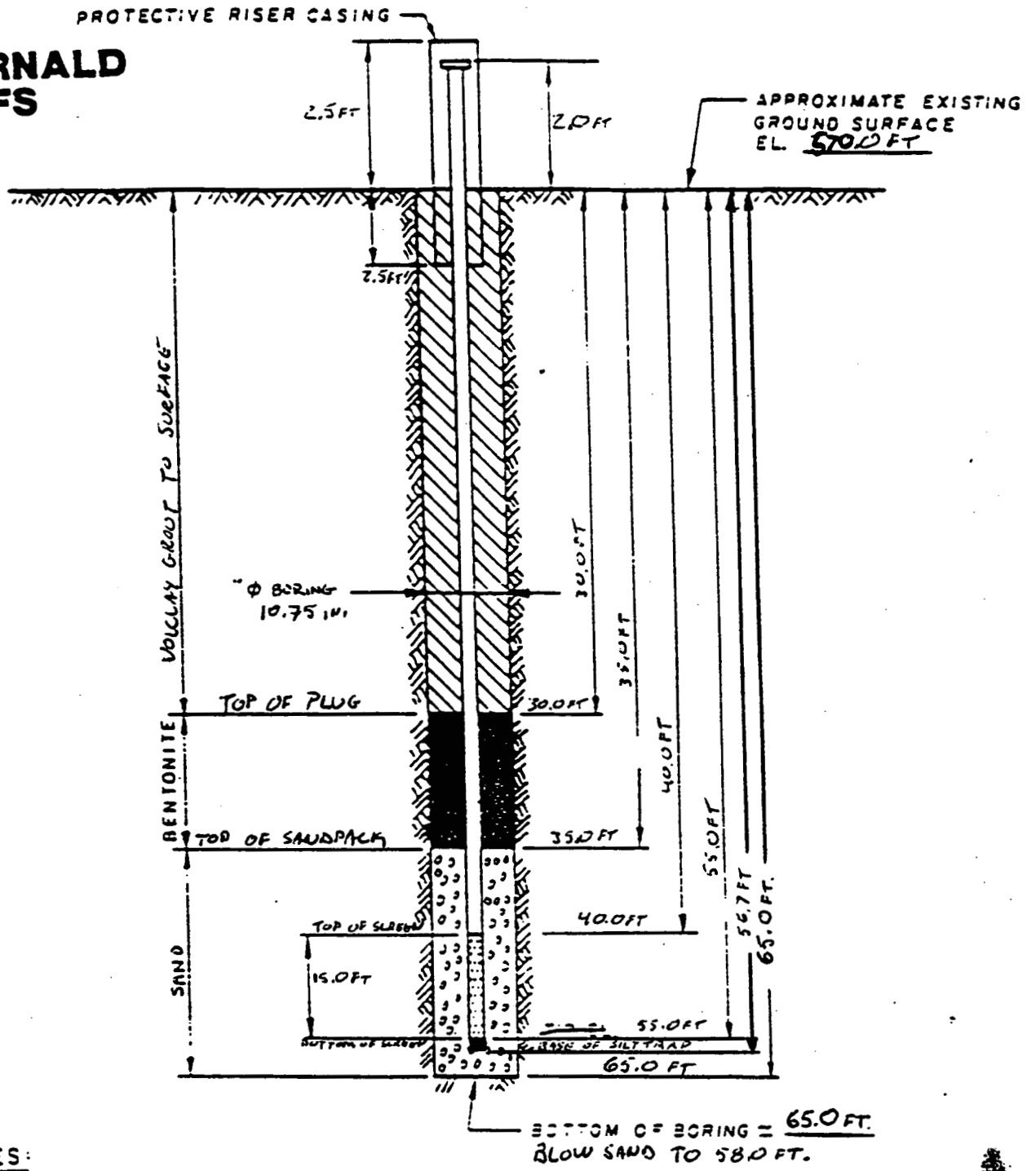
BACKGROUND

H_{NU}: 0.0-0.1 ppm

α: 0 cpm

β/γ: 800-1000 cpm

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4.0 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED (W/1.7 FT WELDED SILTTRAP)
4. ELEVATION OF WATER LEVEL 44.9 FT; 43.7 FT;
5. WATER LEVEL READING ON 2/14/90; 2/16/90;

MATERIALS USED FOR INSTALLATION:

22 BAGS OF 10/20 SAND (80 lbs, EACH)
6 BUCKETS OF BENTONITE PELLETS (5 gals. EACH)
10 BAGS OF VOLCLAY GROUT (50 lbs, EACH)
330 GALLONS OF H_2O USED FOR DRILLING & GROUTING
SS PIPE SECTIONS: 0 2 FT, 0 5 FT, 4 10 FT, 2 FT. STICKUP; 15 FT SCREEN

INSTALLATION DETAILS
MONITORING WELL # 2032

PREPARED FOR
FERNALD RI/FS

DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
2/17/90	
DRAWN BY	

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 602 3.2.1
BORING NO. 2032
PIEZOMETER NO. 2032

FIELD ENG./GEO. M. SWANSON DATE 2/14/90
CHECKED BY E.T. DATE 3/2/90
DATE OF INSTALLATION 2/17/90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0.0 FT TO 65.0 FT
FLUID – FROM – TO –

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN. I.D. FROM 0.0 FT TO 65.0 FT
SIZE – FROM – TO –

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN. ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 15.0 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4.0 IN.
LENGTH OF PIPE SECTIONS 5, 10 FT & 15 FT. SCREEN
JOINING METHOD THREADED, FLUSH MOUNTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 IN.

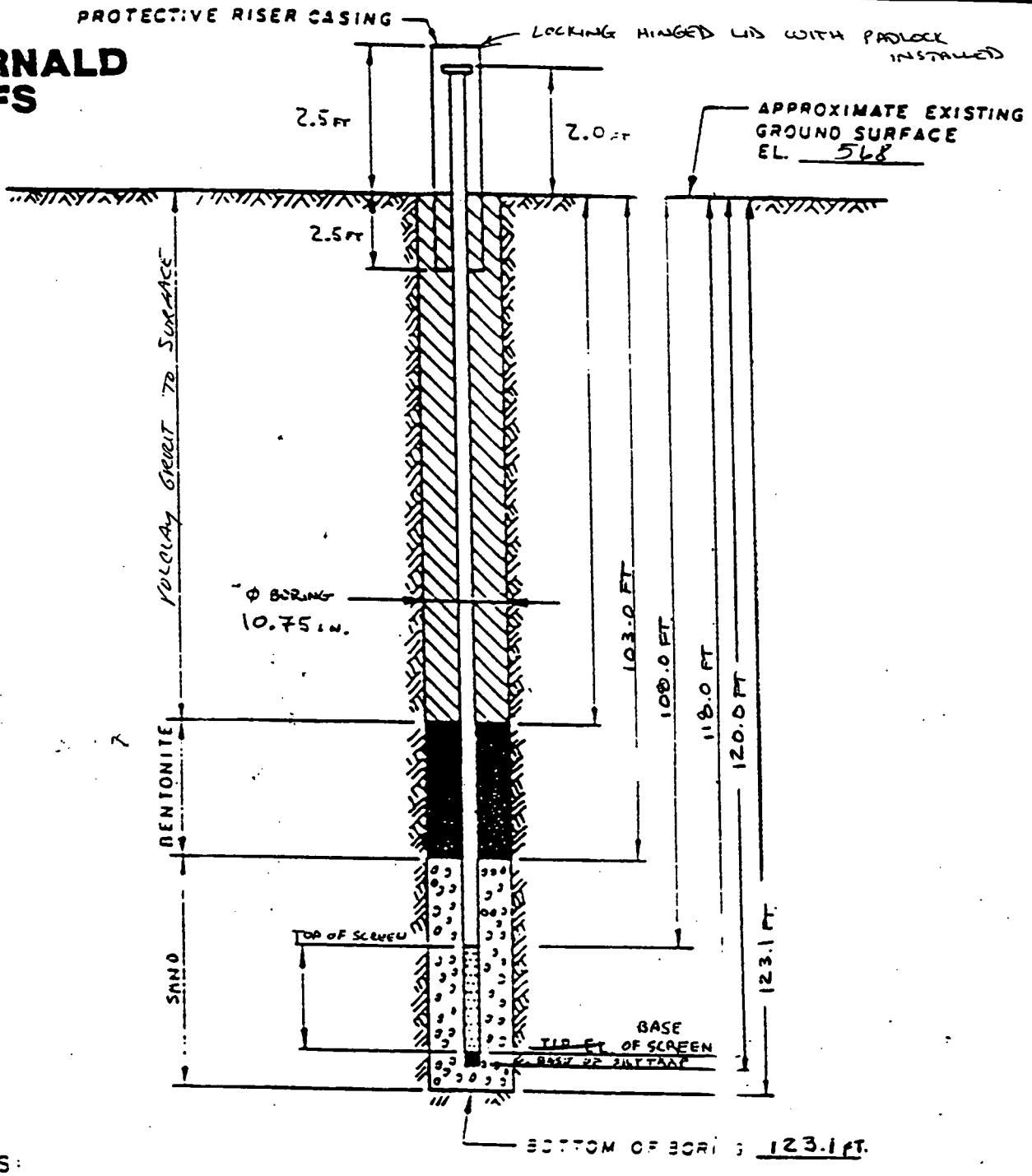
OTHER PROTECTION HINGED LID COVER WITH PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 30.0	TOP	BOTTOM
BENTONITE	TOP 30.0	BOTTOM 35.0	TOP	BOTTOM
SAND	TOP 35.0	BOTTOM 58.0	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 40.0	BOTTOM 55.0	TOP	BOTTOM
PIEZOMETER TIP	BASE OF SILTTRAP @ 56.7 FT			
BOTTOM OF BOREHOLE	65.0 FT			
GWL AFTER INSTALLATION	43.7 FT.			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS ONE BUCKET OF BENTONITE PUT IN PROTECTIVE PIPE, GROUTED TO SURFACE. SAND PACK ADDED ON TOP OF BLOW SANDS, WHICH OCCURRED FROM 65.0 FT TO 58.0 FT.

FERNALD RI/FS



DRAWN BY	MG 9-26-90	CHECKED BY / APPROVED BY	DRAWING NUMBER

NOTES:

1. RISER PIPE 1.5 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN 1.5 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. (WITH WELDED SILTTRAP)
4. ELEVATION OF WATER LEVEL 54.68 @ T.O.C.
5. WATER LEVEL READING ON 10-2-90

MATERIALS USED DURING WELL INSTALLATION:

13 80 LB. BAGS OF 10/20 SAND
25 50 LB BAGS OF VOLCLAY GROUT
1 5 GAL. BUCKETS OF BENTONITE PELLETS
800 GALLONS OF WATER USED DURING GROUTING AND DRILLING PROCEDURES
SS PIPE SECTIONS: 1-10 FT SCREEN w/ 2.0 FT. WELDED SILT TRAP - 11-10 FT SECTIONS OF STAINLESS STEEL RISER.

INSTALLATION DETAILS
MONITORING WELL #3032

PREPARED FOR
FERNALD RI/FS

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. M. GARMAN DATE 9-25-90
PROJECT NO. 602 3.2.1
CHECKED BY E. Trollinger DATE 10-2-90
BORING NO. 3032
PIEZOMETER NO. 3032
DATE OF INSTALLATION 9-27-90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOLS
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 FT TO 123.1 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN ID FROM 0 FT TO 120.0 FT
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN. I.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT
JOINING METHOD THREADED - FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 10 5 IN.

OTHER PROTECTION HINGED, LOCKING LID COVER WITH PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	+ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	- 2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 103.0	TOP	BOTTOM
BENTONITE NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 103.0	BOTTOM 123.1	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM ~~123.1~~ NA 9-25-90	TOP	BOTTOM
PERFORATED SECTION	TOP 108.0	BOTTOM 118.0	TOP	BOTTOM
PIEZOMETER TIP	120.0			
BOTTOM OF BOREHOLE	123.1			
GWL AFTER INSTALLATION	54.68 @ TOC			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS 1 BUCKET (5 gal.) BENTONITE WAS USED IN AND AROUND PROTECTIVE WELL COVER.

000408

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/25/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Filed		

5709 PAL
RKA 2/4
WPK 4/23/88
RIG # 1

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: BB 1.5.88 ~~1.25~~ 1033	COORDINATES: 480412.89 N 1378615.14 E	DATE: 04/08/88
ELEVATION: 577.06	GWL: Depth N/A Date/Time N/A	DATE STARTED: 04/08/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth N/A Date/Time N/A	DATE COMPLETED: 04/09/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	0888 53	3 4 6	18"	STIFF Dark Yellowish Brown clay (10YR 4/6) DRY.	CL	1.5	Hnu = 0 α = 0 δB = 600 1450
2 3	0888 54	9 7 11	12"	STIFF Yellowish Brown clay (10YR 5/8) DRY 3.4	CL	1.5	Hnu = 0 α = 0 δB = 600 cpm 1455
4	0888 55	10 11 14	18"	Very STIFF Yellowish Brown clay (10YR 5/8) Trace silt.	ML	2.5	Hnu = 0 α = 0 δB = 600 cpm 1530
5 6	0888 56	10 10 10	18"	Very STIFF Yellowish Brown clay (10YR 5/8) very silty. moist 6.1	ML	2.5	Hnu = 0 α = 0 δB = 600 cpm 1540
7	0888 57	N/A	18"	SHELBY Tube	N/A	N/A	Pushed 2.5 FT 04/09/88 1015
8 9	0888 58	1 1 1	12"	SOFT olive gray clay (5Y 5/2) DRY. High Plasticity	CL	<1	Hnu = 0 α = 0 δB = 600 1030
10	0888 59	1 2 2	18"	SOFT olive gray silty clay (5Y 5/2) DRY. Plastic	CL	<1	Hnu = 0 α = 0 δB = 600 1035
11 12	0888 60	4 5 3	18"	Soft gray ~~clay~~ silty clay (5Y 5/1) trace sand. moist - wet 11.5	CL	<1	Hnu = 0 α = 0 δB = 600 1040
13	0888 61	4 7 7	12"	Medium dense gray silty sand (5Y 5/1) WET	SM	<1	Hnu = 0 α = 0 δB = 450 1355
14 15	0888 62	12 10 11	14"	Medium dense gray silty sand (5Y 5/1) WET. Trace gravel	SM	<1	Hnu = 0 α = 0 δB = 400 1400

NOTES:

I) Drilling Contractor: Pennsylvania Drilling Co.
a) Driller: Tim Harris
b) Helper: Craig Coulter

II Background Measurements
A) HNU = 0 b) α 0 c) δB = 680 cpm

III Water used = 100

IV Color via Mancell Color Chart.

N/A = not applicable

000409

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/25/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: BB 1-5-89 ~~133~~ 1033	COORDINATES: see page 1 –	DATE:
ELEVATION: 577.00	GWL: Depth 4.5ft Date/Time 04/09/88-1330	DATE STARTED: 04/08/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth 5.5ft Date/Time 04/10/88-0830	DATE COMPLETED: 04/09/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15				15.5			
16	0 8 8 6 3	5 5 6	10"	Medium STIFF Dark gray sandy clay (5Y5/1) wet. Trace gravel.	CL	<1	Hnu=0 α=0 δB=400 1440
17	8 8 6 4	6 9 11	8"	STIFF Dark gray clay (5Y5/1) trace ~~sand~~ Gravel. moist.	CL	1.5	Hnu=0 α=0 δB=400 1530
18				18			
19	0 8 8 6 5	7 9 6	12"	Medium Dense sandy silt w/ trace of gravel (5Y5/1) moist	SM	<1	Hnu=0 α=0 δB=380 1535
				19.5			
20	0 8 8 6 6	6 6 8	12"	STIFF Dark gray clay (5Y5/1) trace of gravel. DRY.	CL	2.0	Hnu=0 α=0 δB=380 1630
21							
22				Bottom of Boring 21 ft			
23							
24							
25							
26							
27							
28							
29							
30							

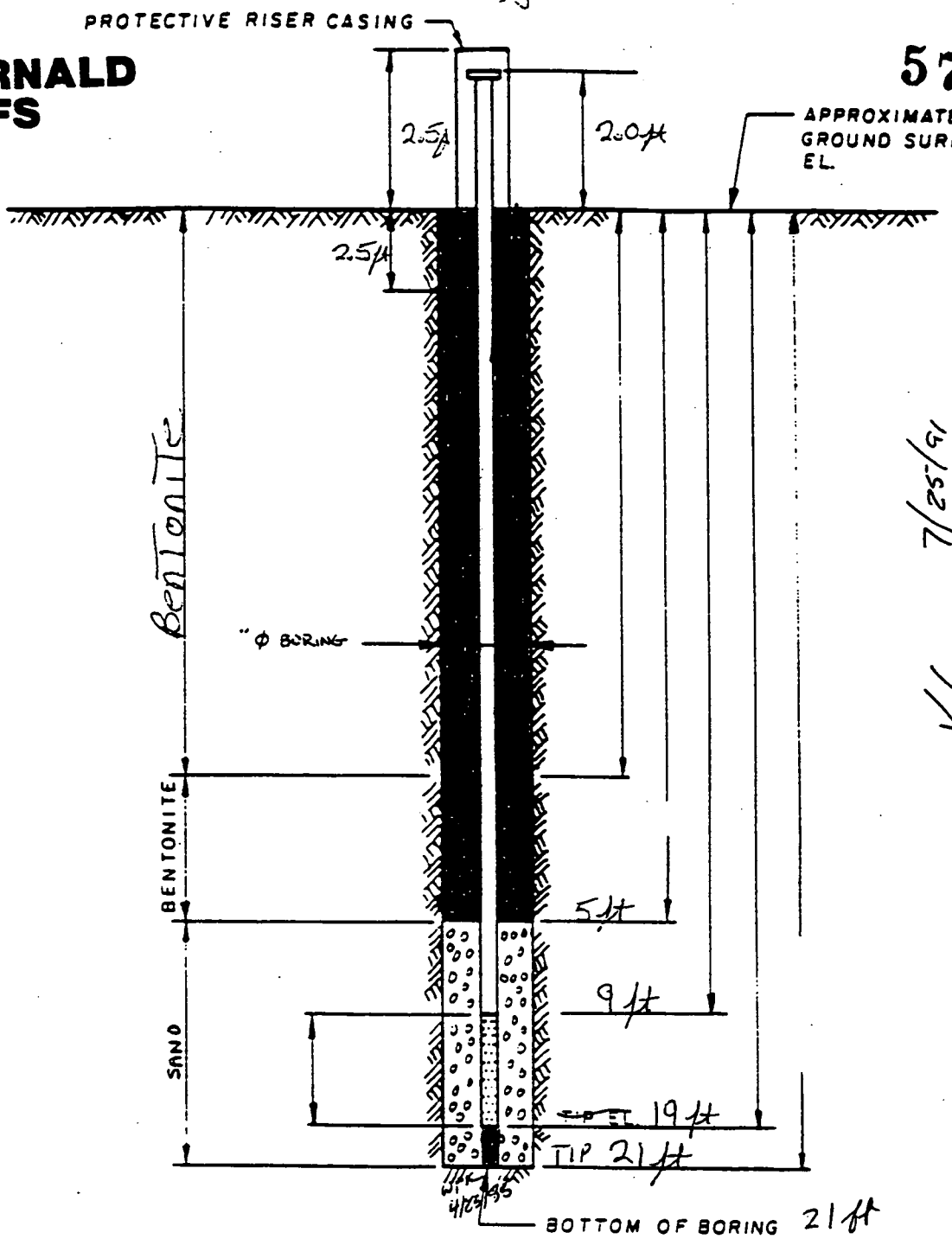
NOTES:

RKD 2/4/89

Monitoring Well #133 1033 BB 1-5-89

FERNALD RI/FS

5709



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

REVIEWED BY QA K.G. DATE 7/25/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. ~~SCH~~ SCH 40 PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

FMPC RI/FS

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/6/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M Goldberg DATE 04/10/88
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~133~~ 1033 BB 1-5-89
PIEZOMETER NO. N/A 1033 DATE OF INSTALLATION 04/10/88

BOREHOLE DRILLING

DRILLING METHOD ~~Water~~ Cable Tool WPK 4/23/88
DRILLING FLUID (S) USED:
FLUID N/A FROM 3 TO 21 ft
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Flat Head
CASING SIZE (S) USED:
SIZE 10" FROM 3 ft TO 21 ft
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010" inches
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 Feet

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4" inches
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD TH Read ~~and couple~~ Flush Joint

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE ~~O~~.D. 10"

OTHER PROTECTION Lockable cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 Ft		~~575~~ 579.0	
GROUND SURFACE	0.0		577.0	
BOTTOM OF PROTECTIVE PIPE	2.5 Ft		574.5	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
BENTONITE	TOP 0 ft	BOTTOM 5 ft	TOP 577.0	BOTTOM 572.0
~~SAND~~	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
GRAVEL	TOP 5 Ft	BOTTOM 21 ft	TOP 572.0	BOTTOM 556.0
PERFORATED SECTION	TOP 9 ft	BOTTOM 19 ft	TOP 568.0	BOTTOM 558.0
PIEZOMETER TIP	21 ft		556.0	
BOTTOM OF BOREHOLE	21 ft		656.0	
GWL AFTER INSTALLATION	N/A		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000412

FERNALD RI/FS

5709

Date	6/28/90			
Initial	E.T.			
#	Field Check	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2033	COORDINATES: N 480,411.1, E 1,378,687.33	DATE: 05-31-90	
ELEVATION: 577.0 GROUND	GWL: Depth	Date/Time	DATE STARTED: 05-31-90
ENGINEER/GEOLOGIST: C. Grube	Depth	Date/Time	DATE COMPLETED: 06-14-90
DRILLING METHODS: CABLE TOOL			PAGE 1 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				For soil classification and description of first 21.0 FT, refer to Visual Classification of Soils for MW#1033			
2							
3				Sampling and describing of soil samples begins on 2033 from 21.0 FT			
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

NOTES:

Drilling Contractor: Pennsylvania Drilling Co.

Drilling Equipment: 72 Speed Star

Driller: Joseph Barie

Helper: Gary Krepps

H&S Officer: Ben Brier

HNU serial # 00221

Samples collected per ASTM standard penetration test — Munsell color chart used for sample color identification

SAA = Same As Above

NR = No Recovery

Background Levels:

HNU = 0 ppm

α = 0 cpm

$\beta\gamma$ = 1000-1500 cpm

2438-3-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2033	COORDINATES:		DATE: 05-31-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 05-31-90
ENGINEER/GEOLOGIST: C. Grube	Depth	Date/Time	DATE COMPLETED: 06-14-90
DRILLING METHODS: CABLE TOOL			PAGE 2 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15				See page 1			
16							
17							
18							
19							
20							
21	32759 1535 05-31	7 14 15	5	Hard (5Y 4/1) dark gray sandy clay, trace of fine to coarse gravel, low plasticity, moist	CL	2.0	HNU = 0.2 ppm α = 0 cpm βγ = 220-240 cpm
23	32760 1600 05-31	5 7 9	6	Firm (5Y 4/1) dark gray silty clay, trace of sand and fine to medium gravel, medium plasticity, moist	CL	1.75	HNU = 0.2 ppm α = 0 cpm βγ = 190-200 cpm
25	32761 1035 06-05 ~~05-31~~	10 50 32	6	Firm (5Y 4/1) dark gray silty clay, some sand, trace of fine to coarse gravel, low plasticity, very moist	CL	.75	HNU = 1.0 ppm α = 0 cpm βγ = 190-200 cpm
26	32762 1100 06-05	32 27 30	9	Very hard (5Y 4/1) dark gray silty clay, trace of sand trace of fine to medium gravel, medium plasticity moist	CL	4.5	HNU = 1.0 ppm α = ~~[illegible]~~ 0 cpm βγ = 200-220 cpm
28	32763 1108 06-05	6 15 22	6	Very hard (5Y 4/1) dark gray silty clay, trace of sand, trace of fine to coarse gravel, low plasticity, moist	CL	>4.5	HNU = 1.0 ppm α = 0 cpm βγ = 220-240 cpm
29	32764 1400 06-05	4 12 18	7	Firm (5Y 4/1) dark gray silty clay, some fine to coarse gravel, trace of sand, low plasticity, moist. Bottom of Till 29.7 FT medium dense (2.5Y 5/4) light olive brown fine grained poorly graded sand, trace of silt, dry	CL / SP	1.0 / NA	HNU = 1.2 ppm α = 0 cpm βγ = 230-240 cpm
30							

Bottom of Till 29.7 FT

Top of aquifer

NOTES:

Drilling Contractor: Pennsylvania Drilling Co

Drilling Equipment: 72 Speed Star

Driller: Joseph Barile

Helper: Gary Krepps

H+S Officer: Ben Brier

SAA = Same As Above

NR = No Recovery

Background Levels:
HNU = 0.2 ppm
α = 0 cpm
βγ = 1000-1500 cpm
βγ = 200-300 cpm w/ lead brick

HNU Serial # 00221 on 5/31/90 HNU # A01345 on 6-5-90

243B-3-86

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.32.1	PROJECT NAME FMPC RI/FS	
BORING NUMBER 2033	COORDINATES	DATE 06-05-90
ELEVATION	GWL: Depth Date/Time	DATE STARTED 05-31-90
ENGINEER/GEOLOGIST C. Grube	Depth Date/Time	DATE COMPLETED 06-14-90
DRILLING METHODS Cable Tool		PAGE 3 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED [illegible] (TSF)	REMARKS
30				Top of aquifer at 29.7 FT			
31				Aquifer will be sampled every 5.0 FT after 30.0 FT. Once saturated zone is encountered 15 or more feet will be sampled			
32							
33							
34							
35	32765	10		Dense (10YR 5/4) yellowish brown well to poorly graded sand, trace of silt and fine to medium gravel moist	SW to SP	NA	HNU = 1.0 ppm
36	1435	14	12				α = 0 cpm
	0605	18					βγ = 200-220 cpm
37							
38							
39							
40	32766	15		very dense (2.5Y 5/4) light olive brown to (2.5Y 6/4) light yellowish brown poorly graded to silty sand, trace of fine gravel, moist	SP to SM	NA	HNU = 1.0 ppm
41	1455	45	18				α = 0 cpm
	06-05	45					βγ = 180-200 cpm
42							
43							
44							
45							

NOTES
Drilling Contractor: Pennsylvania Drilling Co.
Drilling Equipment: 72 Speedstar
Driller: Joseph Barile
Helper: Gary Krepps
H+S Officer: Ben Brier
HNU Serial # A01345

SAA = Same As Above
NR = No Recovery

Background Levels:
HNU = 1.0 ppm
α = 0 cpm
βγ = 200-250 cpm w/lead
1000-1300 cpm w/o lead

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 3.2.1	PROJECT NAME FMPC RI/FS	
BORING NUMBER 2033	COORDINATES	DATE 06-05-90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 05-31-90
ENGINEER/GEOLOGIST C. Grube	Depth Date/Time	DATE COMPLETED 06-14-90
DRILLING METHODS Cable Tool		PAGE 4 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45	32767 1600 06-05	35 50/4	10	Very Dense (2.5Y 6/4) light yellowish brown silty to gravelly well graded sand, dry to slightly moist	SM to SW	NA	HNU = 0.6 ppm α = 0 cpm $\beta\gamma$ = 220-230 cpm
46							
47							
48							
49							
50	32768 0955 06-07	18 25 45	12	Very dense (10YR5/4) yellowish brown, well to poorly graded sand, trace of fine to medium gravel, very moist	SW to SP	NA	HNU = 0.2 ppm α = 0 cpm $\beta\gamma$ = 200-220 cpm
51							
52							
53							
54							
55	32769 1100 06-07	3 8 20	8	medium dense (10YR4/4) dark yellowish brown poorly graded sand, trace of silt and fine gravel, wet	SP	NA	HNU = 0.2 ppm α = 0 cpm $\beta\gamma$ = 180-200 cpm
56							
57							
58							
59							
60							

NOTES
Drilling Contractor: Pennsylvania Drilling Co
Drilling Equipment: 72 Speedstar
Driller: Joseph Barile
Helper: Gary Krepps
H_2S Officer: Ben Bries

SAA = Same As Above
NR = No Recovery

Background levels:
HNU = 1.0 ppm
α = 0 cpm
$\beta\gamma$ = 170-230 cpm w/ lead
1000-1500 cpm w/o lead

HNU serial # A01345

000416

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS 5709

PROJECT NUMBER 6023.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 2039	COORDINATES		DATE 06-12-90
ELEVATION	GWL: Depth	Date/Time	DATE STARTED 05-31-90
ENGINEER/GEOLOGIST C. Grube	Depth	Date/Time	DATE COMPLETED 06-14-90
DRILLING METHODS Cable Tool			PAGE 5 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED [illegible] (ISH)	REMARKS
60	32770 1015 06-12	6 9 15	11	medium dense (10YR 5/4) yellowish brown silty to poorly graded sand, trace of fine gravel, wet	SM to SP	NA	HNU = 0.4 ppm α = 0 cpm βγ = 200-220 cpm
61							
62							
63							
64							
65	32771 1120 06-12	20 50/4	14	very dense (2.5Y 5/4) light olive brown poorly to well graded sand, trace of fine to medium gravel wet	SP to SW	NA	HNU = 0.2 ppm α = 0 cpm βγ = 160-170 cpm
66							
67							
68							
69							
70	32772 1555 06-12	10 20 35	10	very dense (2.5Y 5/4) light olive brown well graded sand, trace of fine to coarse gravel, wet	SW	NA	HNU = 0.4 ppm α = 0 cpm βγ = 180-200 cpm
71							
72				Bottom of sampling at 71.5 FT Bottom of Borehole at 70.0 FT			
73							
74							
75							

NOTES

Drilling contractor: Pennsylvania Drilling Co.
Drilling equipment: 72 speedstar
Driller: Joseph Berile
Helper: Gary Kreppes
H+S officer: Ben Brier

HNU serial # A013#5 EB 4/24/90

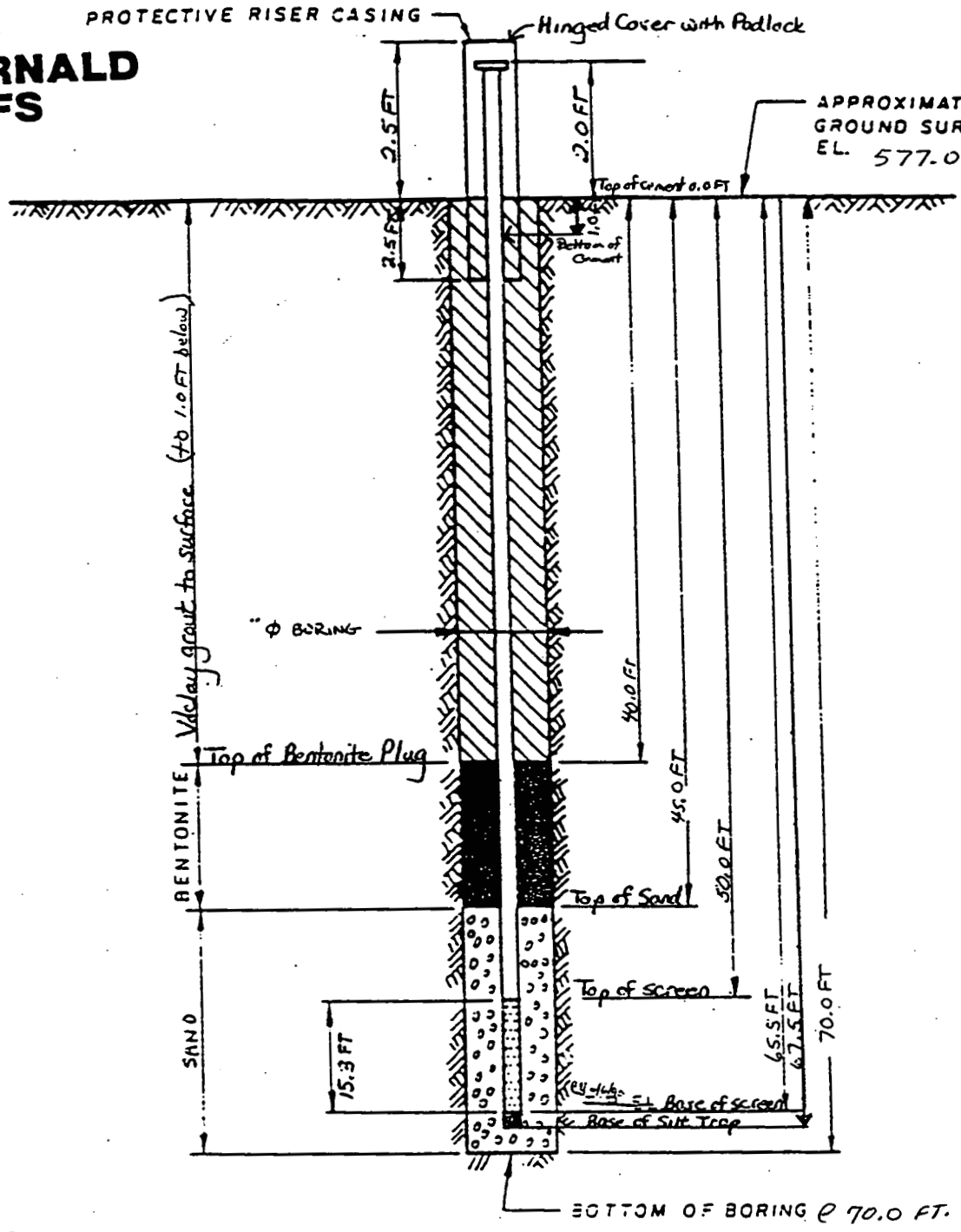
SAA = Same As Above
NR = No Recovery

000417

Background levels:
HNU = 0.4 ppm
α = 0 cpm
βγ = 160-250 cpm w/ head
900-1400 cpm w/o head

402-11-86

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY | APPROVED BY

CG 6-15-90

DRAWN BY

NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED (w/welded silt trap)
4. ELEVATION OF WATER LEVEL 57.25 FT – From top of stainless)
5. WATER LEVEL READING ON 06-15-90

Materials used during well installation:

Sacks 10/20 sand (80 lb each) – 17
Sacks Volclay grout (50 lb each) – 10
Buckets Bentonite Pellets (5 gal. each) – 8
1 – 15.5 FT Screen with 2.0 FT welded silt trap (0.5 of screen length is blank stick-up) 6/13/90
5 – 10 FT risers
1 – 2 FT riser

INSTALLATION DETAILS
MONITORING WELL # 2033

PREPARED FOR

Fernald RI/FS

Total water added during drilling and grouting = 600 gal

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Gruber DATE 06-~~15~~ 14 ET -90
PROJECT NO. 602 3.2.1 CHECKED BY E.T. DATE 6/28/90
BORING NO. 2033
PIEZOMETER NO. 2033 DATE OF INSTALLATION 06-14-90

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT TO ___
FLUID NA FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 FT TO 70.0 FT
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitor Well
DIAMETER OF PERFORATED SECTION 4.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL PERFORATED AREA 15.0 FT

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in
LENGTH OF PIPE SECTIONS 5-10.0 FT; 1-2 ft
JOINING METHOD Threaded, flush jointed

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) E.T. 6/28/90	
TOP OF RISER PIPE	2.0		579.0	
GROUND SURFACE	0.0		577.0	
BOTTOM OF PROTECTIVE PIPE	2.5		574.5	
BOREHOLE FILL MATERIALS:				
CEMENT GROUT/SLURRY	TOP 0.0	BOTTOM 1.0		
	TOP 1.0	BOTTOM 40.0	TOP 576.0	BOTTOM 537.0
BENTONITE PELLETS	TOP ET 6/28/90 ~~4.0~~ 40.0	BOTTOM 45	TOP 537.0	BOTTOM 532.0
SAND 16/20 SIZE	TOP 45	BOTTOM E.T. ~~50~~ 70.0	TOP 532.0	BOTTOM 517.0
GRAVEL (None used)	TOP NA	BOTTOM 6/28/90 NA	TOP n/A	BOTTOM n/A
PERFORATED SECTION	TOP 50	BOTTOM 65.5 FT	TOP 527.0	BOTTOM 511.5
PIEZOMETER TIP	67.5			
BOTTOM OF BOREHOLE	70.0			
GWL AFTER INSTALLATION	57.25 TOP OF RISER			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Cement placed from 0.0 to 1.0 FT to hold protective pipe in place

QC/DH/2-4-89

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/26/91

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~334~~ 3034 (OB 1-5-89)	COORDINATES: 480240.85 N 1378410.28 E	DATE: 3/7/88	
ELEVATION: 569.2	GWL: Depth NA Date/Time NA	DATE STARTED: 3/7/88	
ENGINEER/GEOLOGIST: W. Montgomery	Depth NA Date/Time NA	DATE COMPLETED: 3/7/88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 1	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0				See Boring Log for Boring ~~334~~ for Lithologic Descriptions 3034 RMB 2/6/89			
2.0							
3.0							
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0				Pushed Shelby Tube 11 inches and Recovered 8.5 inches			
19.0	08307 @ 1550	NA	NA	Medium Dense, Dark Gray (5Y 4/1) Sandy Clay with Some Gravel and Trace Silts, Moist		3.0	
20.0				Bottom of Boring 20.0 ft			

NOTES:

Pennsylvania Drilling Company
Drill Rig: Bucyrus Erie 24-W
Driller: Dave Newman
Helper: Bob Johnson

Water: 10 - 5 Gallon Buckets - 50 Gallons Total

Background β/γ = 800 cpm
α = 10 cpm
HNU = 3 ppm
Q_u = 20.6

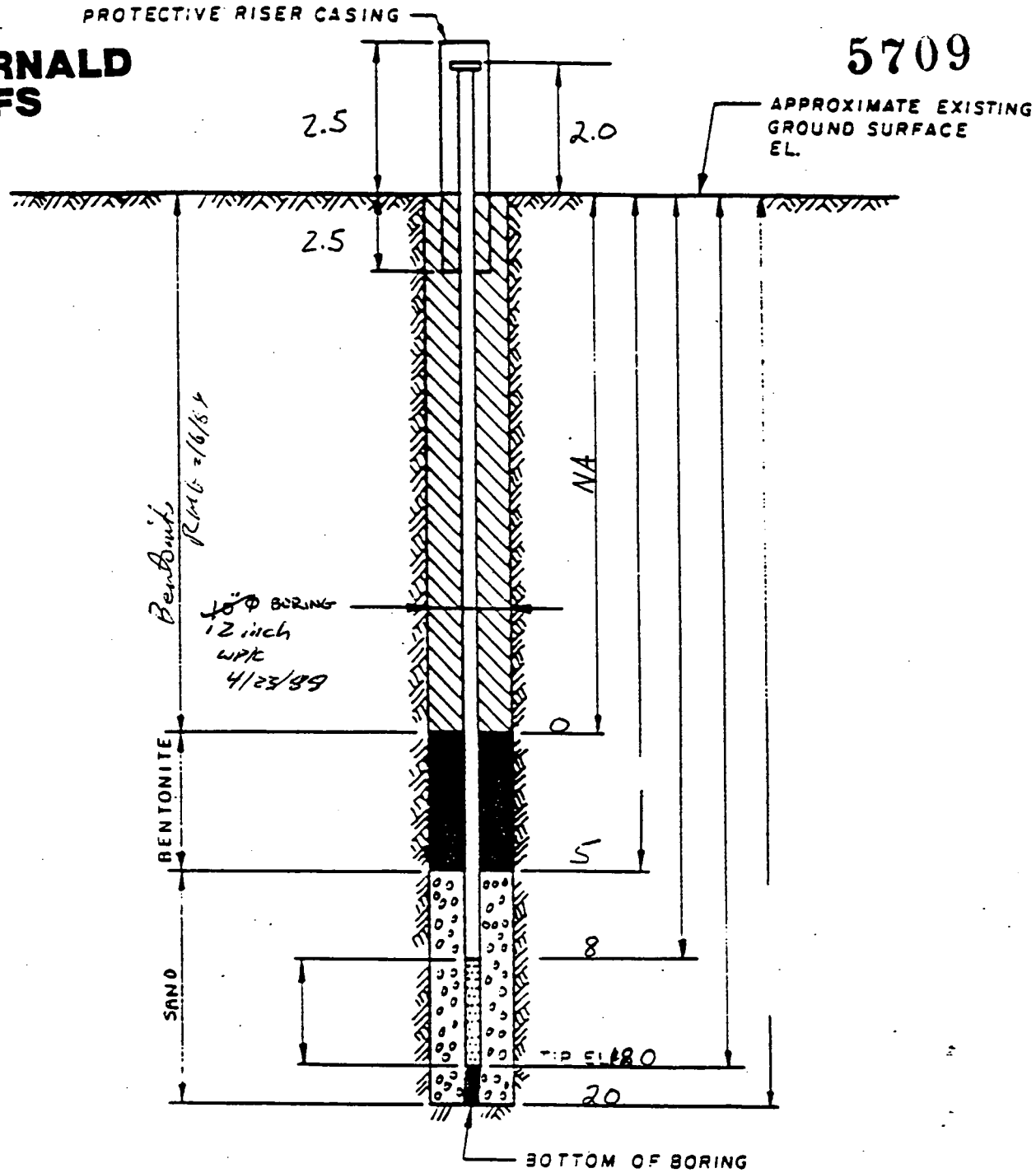
000420

402-11-86

REVIEWED BY QA K.G. DATE 7/26/91 QC/DH/2-7-89

FERNALD RI/FS

5709



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON DRY

INSTALLATION DETAILS
MONITORING WELL ~~134~~ 1034

PREPARED FOR
Fernald RI/FS BB 1-5-89

000421

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 2/26/91

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602.3.2
BORING NO. ~~134~~ 1034 BB 1-5-88
PIEZOMETER NO. ~~134~~ 1034

FIELD ENG./GEO. W. MONTGOMERY DATE 4/6/88
CHECKED BY R Galbraith DATE 2/4/89
DATE OF INSTALLATION 4/7/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED: WATER WPK 4/25/88
FLUID H_2O FROM 0 TO 20ft
FLUID — FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 18'
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10.0ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4 in
LENGTH OF PIPE SECTIONS 2 ft & 10ft
JOINING METHOD Threaded ~~Couple~~ Flush Joint

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Locking Cap w/ Master Lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0		~~56~~ 571.2	
GROUND SURFACE	0.0		569.2	
BOTTOM OF PROTECTIVE PIPE	2.5		566.7	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP —	BOTTOM —	TOP —	BOTTOM —
BENTONITE	TOP 0.0	BOTTOM 5.0	TOP 569.2	BOTTOM 564.2
SAND	TOP 5.0	BOTTOM 20.0	TOP 564.2	BOTTOM 544.2
GRAVEL	TOP —	BOTTOM —	TOP —	BOTTOM —
PERFORATED SECTION	TOP 8.0	BOTTOM 18.0	TOP 561.2	BOTTOM 551.2
PIEZOMETER TIP	20.0		549.2	
BOTTOM OF BOREHOLE	20.0		549.2	
GWL AFTER INSTALLATION	—		—	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS ~~000422~~

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Ck		

5709

WPK 4/23/88
RTC #3

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~234~~ 2034 00 1558	COORDINATES:	DATE: 3-31-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-30-88
ENGINEER/GEOLOGIST: F. Markert	Depth Date/Time	DATE COMPLETED: 3-31-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				See boring log ~~234~~ 2034 for lithologic description RTC 2/6/89			
10							
20	NA		NA	~~dense~~ medium dense gray (5Y 4/1) clay, some rounded gravel, trace sand and silt - dry	cl	3.0	no recovery 3-30-88 @ 1530
30							
40							
50							000423
60							

NOTES:

Pennsylvania Drilling Co
Bucyrus Erie 24-W Drilling Rig
Driller: Dave Neuman
Helper: Bob Johnson

water used while drilling 160 gallons
Shelby tube follow ASTM standard
colors follow munsell color chart
background BG = 0000cpm
σ = 10cpm
HNU = 0ppm

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

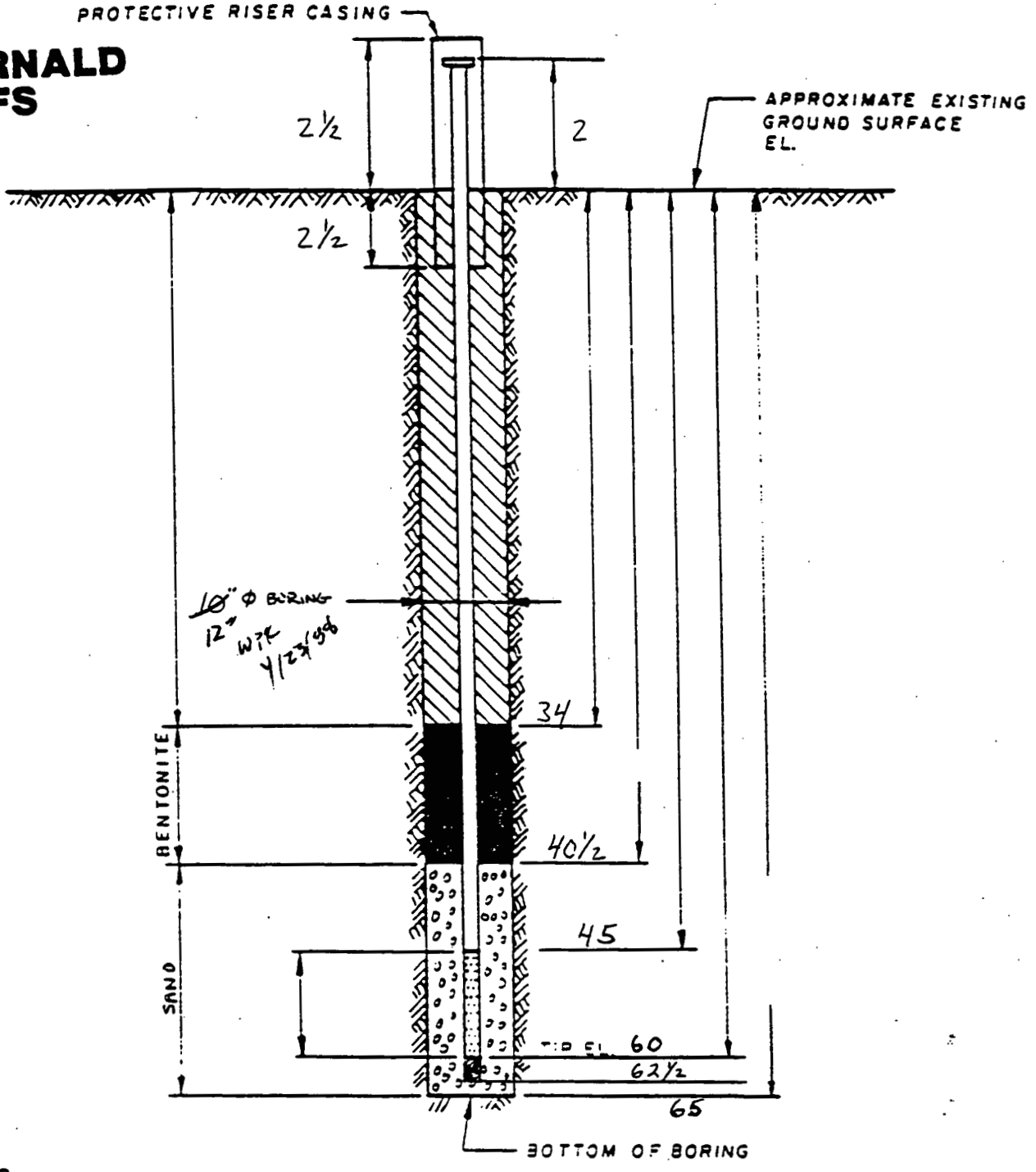
VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B334~~ B2034	COORDINATES:	DATE: 3-31-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-30-88
ENGINEER/GEOLOGIST: F. Morlent	Depth Date/Time	DATE COMPLETED: 3-31-88
DRILLING METHODS: Cable tool		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				bottom of boring 65.0 ft			
70							
80							
90							
100							
110							

NOTES:

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 49.0 from top of casing
5. WATER LEVEL READING ON @0815 4-5-88

well ~~334~~ 3034 BB 1-5-88 49.4 from top of casing @ 0810 4-5-88

INSTALLATION DETAILS
MONITORING WELL ~~234~~ 2034 BB 1-5-89

PREPARED FOR

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. E Meukert / L. Will DATE 4-5-88
PROJECT NO. 602.32 CHECKED BY R Gallbreath DATE 2/6/89
BORING NO. ~~B 234~~ B 2034 BB 1-5-89
PIEZOMETER NO. ~~234~~ WPL 4/24/88 2034 DATE OF INSTALLATION 4-5-88

BOREHOLE DRILLING

DRILLING METHOD cable tool	TYPE OF BIT drive shoe
DRILLING FLUID (S) USED: Water	CASING SIZE (S) USED:
FLUID Water FROM 0 TO 65	SIZE 10 in FROM 0 TO 65
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE monitoring well	RISER PIPE MATERIAL ~~Teflon~~ Stainless steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD screw
TOTAL PERFORATED AREA 15 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION none
PROTECTIVE PIPE O.D. 10 3/4 in	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (0)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 ~~2½~~ ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2½ ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 34	TOP	BOTTOM
BENTONITE	TOP 34 ft	BOTTOM 40½ ft	TOP	BOTTOM
SAND	TOP 40½ ft	BOTTOM 65 ft ~~62½~~	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 45 ft	BOTTOM 60 ft	TOP	BOTTOM
PIEZOMETER TIP	62½			
BOTTOM OF BOREHOLE	65			
GWL AFTER INSTALLATION	49.0 from top of casing @0815 on 4-5-88			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS

000426

QC/DA/2.4.89

AUG 16 1991

FERNALD RI/FS REVIEWED BY QA 116 DATE

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 334 3034	COORDINATES: 480290.230 E 1378431.39	DATE: 3/19/88 3/20/88
ELEVATION: 569.9 Ground	GWL: Depth 49.7 Date/Time 3/22/88 0745	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. MacNert	Depth 47.55 Date/Time 3/23/88 0730	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β = 250-300 cpm BG
0–1	08265 3/19/88 1645	2 5 6	17	Medium Dense, Dark Brown (10YR 3/3) Soil, Some Silt, Some Clay, Organic rich, roots, dry.	OH 0.5	2.0	α = 0 β = BG hnu = 0 ppm
2–3	08266 3/19/88 1700	3 8 15	15	Medium Dense, Brown (10YR 4/4) Clay, Trace Silt, Trace Organics, Mottled, Dry. Medium Dense, Grey (10YR 6/2) Clay, Some Silt, Trace Organics @ Top, Mottled, Dry.	CL CL	4.0 74.5	α = 2 cpm β = BG hnu = 0
4	08267 3/19/88 1715	15 18 21	18	Dense, Grey (10YR 5/2) Clay, Some Silt w/ silt leases, Trace Organics, Mottled Tan @ Bottom, Dry.	CL	74.5	α = 1 cpm β = BG hnu = 0
5	08268 3/19/88 1725	15 18 21	17	Dense, Grey (10YR 5/1) Clay, Trace Silt w/ Silt Leases, Mottled Tan, Dry.	CL	74.5	α = 0 β = BG hnu = 0
6–7	08269 3/19/88 1735	21 23 19	18	Dense, Grey (10YR 6/2) Clay, Some Silt w/ Silt Leases, Mottled Tan, Dry. Dense, Brown (10YR 5/4) Fine Sand, Some Silt, Some Angular Gravel, Mottled Dark Grey, Moist.	CL 6.9 SM	3.5 N/A	α = 1 cpm β = BG hnu = 0
8	08270 3/20/88 1045	1 3 7	7	Loose, Brown (2.5Y 4/2) Fine Sand, Some Gravel, Trace clay, Trace silt, Poorly Graded, Unstratified, Moist.	SP	N/A	α = No Reading 3/20/88 β = BG hnu = 0
9–10	08271 3/20/88 1100	5 9 10	9	Medium Dense, Brown (10YR 4/4) Fine Sand, Some Gravel, Trace Clay, Trace Silt, Poorly Graded, Unstratified, Moist. Medium Dense, Grey (10YR 4/2) Clay, Some Silt, Moist.	SP 9.5 CH	N/A 1.0	α = No Reading β = BG hnu = 0
11	08272 3/20/88 1120	4 5 9	10	Medium Dense, Grey (10YR 5/1) Clay, Some Silt, Dry.	CL	1.25	α = 0 β = BG hnu = 0
12–13	08273 3/20/88 1145	5 6 10	12	Medium Dense, Grey (5Y 4/1) Clay, Trace Angular Gravel, Some Silt, Dry. Medium Dense, Grey (5Y 3/1) Fine sand lens, Some Gravel, Some Silt, Moist.	CL 12.6-12.9 SM	2.75 N/A	α = 0 β = BG hnu = 0
14–15	08274 3/20/88 1340	3 5 9	9	Medium Dense, Grey (5Y 4/1) Clay, Trace Angular Gravel, Some Silt, Dry.	CL	2.5	α = 1 cpm β = BG hnu = 0 1st Sample lost.

NOTES:

3/20/88 - α meter discovered to be faulty. No readings taken on 1st Two samples as replacement meter had not arrived.

β = 200-250 cpm BG

Water Total = 300 gal for hole

000427

See Next Page for Additional notes

QC/DH/24.89

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		8/15/89
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~334~~ 3034 08 1-5-89	COORDINATES: See pl	DATE: 3/20/88
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Marhet	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β=200-250cpm BG
15 16	08275 3/20/88 1400	2 5	9	Loose, Grey (5Y 4/1) Clay, Some Angular Gravel, Trace Sand, Some Silt, Dry.	CL	0.75	α=0 β=BG hnu=0
17	08276 3/20/88 1415	7 19 22	15	Dense, Grey (5Y 3/1) Clay, Some Angular Gravel, Trace Sand, Some Silt, Dry.	CL	4.0	α=0 β=BG hnu=0
18 19	08277 3/20/88 1430	8 13 31	6	Dense, Grey (5Y 4/1) Clay, Some Angular Gravel, Some Sand, Some Silt, Dry.	CL	3.5	α=0 β=BG hnu=0
20	08278 3/20/88 1450	9 13 25	9	Dense, Grey (5Y 4/1) Clay, Some rounded gravel, Some Sand, Some silt, Dry.	CL	3.0	α=0 β=BG hnu=0
21 22	08279 3/20/88 1645	8 11 21	16	Dense, Grey (5Y 3/1) Clay, Some rounded gravel, Some Silt, Trace Sand, Dry.	CL	2.75	α=0 β=BG hnu=0 No recovery 1st Sample
23	08280 3/20/88 1700	9 15 22	14	Dense, Tan (10YR 6/4) Fine Sand, Extremely well Graded, Unstratified, Dry.	SW	N/A	α=0 β=BG hnu=0
24 25	08281 3/20/88 1715	8 21 23	15	Dense, Tan (10YR 7/4) Fine Sand, well Graded, Stratified, Some Silt in lenses of darker (10YR 5/6) 1/2" to 1" thick, dry.	SM	N/A	α=0 β=BG hnu=0
26 27 28 29 30							

000428

NOTES:

Pennsylvania Drilling Company
Bucyrus Erie 24-W Drilling Rig
Driller: Dave Newman
Helper: Bob Johnson
Blows on sampler follow ASTM standard for 2X18 inch split spoon samples.
Soil colors follow Munsell color charts.

QC/DH/24.89

5709

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

1st Key In
2nd Key In
Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 334 3034 BG 1-5-88	COORDINATES: Seep1		DATE: 3/21/88
ELEVATION: Seep	GWL: Depth	Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Markert	Depth	Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool			PAGE 3 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β=300-350cpm BG
30							
31	08282 3/21/88 0850	5 9 14	12	Medium Dense, Tan (10YR 5/6) Fine Sand, Trace Silt, Extremely Well Graded, Partially Stratified, Dry.	SW	N/A	hnu=0 α=0 β=BG
32							
33							
34							
35	08283 3/21/88 1030	14 49 Ref.	14	Very Dense, Tan (10YR 5/4) Fine Sand, Trace rounded gravel, Trace silt, Well graded, unstratified, Dry.	SW	N/A	hnu=0 α=0 β=BG Last 1" refused
36							
37							
38							
39							
40	08284 3/21/88 1050	12 15 17	13	Dense, Tan (10YR 6/4) Fine Sand, Trace Silt, Extremely Well Graded, Unstratified, Dry.	SW	N/A	hnu=0 α=0 β=BG
41							
42							
43							
44							
45							

NOTES:

QA/DM 2.4.89

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 1 1 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~334~~ 3034 BB 1-5-89	COORDINATES: Seep1		DATE: 3/21/88
ELEVATION: Seep1	GWL: Depth	Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Market	Depth	Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool			PAGE 4 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β=300-350cpm BG
45							
46	08285 3/21/88 1120	8 22 20	13	Dense, Light Tan (10YR 6/2) Fine Sand, Trace Silt, Extremely well Graded, Partially Stratified, Dry. ▽ Water Table	SW	N/A	hnu=0 α=1cpm β=BG
47							
48							
49							
50	08286 3/21/88 1335	9 14 17	11	Dense, Brown (10YR 4/2) Med to Cse Sand, Trace Rounded Gravel, Trace Silt, Fair-Poor grading, unstratified, wet	SP	N/A	hnu=0 α=0 β=BG
51							
52							
53							
54							
55	08287 3/21/88 1350	5 10 21	9	Dense, Brown (10YR 4/2) Med to Cse Sand, Some rounded gravel, Trace Silt, Poorly Graded, Unstratified, wet.	SP	N/A	hnu=0 α=0 β=BG
56					56.0		
57				Dense, Brown (10YR 4/2) Rounded Gravel, Some Med→Cse Sand, Some Silt, Poorly Graded, Unstratified, wet. Large 2" Chert pebble @ bottom	GM	N/A	
58							
59							
60							

NOTES:

000430

QC/DH/2.4.89

5709

AUG 16 1991

REVIEWED BY QA DC DATE

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~334~~ 3034	COORDINATES: See Pl	DATE: 3/21/88
ELEVATION: See Pl	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Manhart	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β = 300-350 cpm BG
60							
61	08258 3/21/88 1455	9 15 19	12	Dense, Brown (10YR 3/3) Fine → Cse Gravelly Sand, Some Rounded Gravel, Poorly Graded, Unstratified, Wet.	GP	N/A	hnu=0 α=0 β=BG
62							
63							
64							
65	08259 3/21/88 1635	10 20 24	14	Dense, Brown (10YR 3/3) Med → Cse Gravelly Sand, Some rounded gravel, Poorly Graded, Unstratified, Wet.	GP	N/A	hnu=0 α=0 β=BG
66							
67							
68							
69							
70	08290 3/21/88 1750	12 33 28	11	Very Dense, Brown (10YR 4/2) Med → Cse Gravelly Sand, Some round gravel (pebbles), Some Silt, Poorly Graded, Unstratified, Wet.	GM	N/A	hnu=0 α=0 β=BG
71							
72							
73							
74							
75							

NOTES:

000431

QC/DA/2.4.89

AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA KG DATE

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~334~~ 3034 BP 1-554	COORDINATES: Seep1		DATE: 3/22/88
ELEVATION: Seep1	GWL: Depth	Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Marhet	Depth	Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool			PAGE 6 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β=200-250cpm BG
75							
76	08291 3/22/88 0830	13 24 36	14	Very Dense, Brown (10YR 4/3). Gravelly Medium Sand, Some round gravel (pebbles) Trace Silt, Poorly graded, Unstratified, wet.	GM	N/A	hnu = — α = 0 β = BG
77							
78							
79							
80	08292 3/22/88 0945	15 29 26	12	Very Dense, Brown (10YR 3/3) Med → Cse Sand, Some rounded gravel, Some silt, Poorly Graded, Unstratified, wet.	GM 80.8	N/A	Drager = OK α = 2 cpm β = BG
81							
82				Very Dense, Brown (10YR 4/3) Fine Sand, Some Silt, well Graded, Unstratified, wet.	SM	N/A	
83							
84							
85	08293 3/22/88 1010	6 13 17	11	Medium Dense, Brown (10YR 3/3) Fine → Med Sand, Some Silt, well Graded, Unstratified, wet.	SM	N/A	Drager = OK α = 0 β = BG
86							
87							
88							
89							
90							

NOTES: hnu meter uncharged @ beginning of day. Had to switch to Drager Tubes.

QC/DA/2.4.89 5709

AUG 16 1991

REVIEWED BY QA KG DATE

	Initial	Date
1st Key In		
2nd Key In		8/16
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 334 3034 68 1-5-89	COORDINATES: See pl	DATE: 3/22/88
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Marhart	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 7 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β = 200-250cpm BG
90							
91	08294 3/22/88 1100	5 12 18	8	Medium Dense, Brown (10YR 3/2) Fine→Med Sand, Some Silt, Fair Grading, Unstratified, wet.	SM	N/A	Drager = OK α = 0 β = BG
92							
93							
94							
95	08295 3/22/88 1410	5 10 15	9	Medium Dense, Brown (10YR 3/2) Med→Cse Sand, Some Silt, Trace rounded gravel, Fair Grading, Unstratified, wet	SM	N/A	Drager = OK α = 0 β = BG
96							
97							
98							
99							
100	08296 3/22/88 1430	2 3 8	9	Medium Dense, Brown (10YR 4/2) Fine→Cse Sand, Trace Silt, Trace rounded gravel, Fair grading, Partially stratified, wet.	SM	N/A	Drager = OK α = 0 β = BG
101							
102							
103							
104							
105							

NOTES:

White out corrections were made by F. Market at the time the form was completed
WEK 4/23/88

QC/DH/24.89

FERNALD RI/FS

REVIEWED BY QA JG DATE AUG 1 6 1991

	Initial	Date
1st Key In		
2nd Key In		8/15
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~334~~ 3034 88 1-5-89	COORDINATES: Seep		DATE: 3/22/88 & 3/23/88
ELEVATION: Seep	GWL: Depth	Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Market	Depth	Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool			PAGE 8 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							β = 200-250 cpm BG
105	08297 3/22/88 1615	12 19 27	12	Dense, Brown (10YR 4/2) Medium Sand, Well Graded, Unstratified, Wet.	SW 106.0	N/A	Drager = OK α = 0 β = BG
106				Dense, Brown (10YR 5/2) Very Fine Sand, Some Silt, Extremely Well Graded, Partially Stratified, Wet.	SM	N/A	
107							
108							
109							
~~110~~	08298 3/22/88 1645	3 9 13	7	Medium Dense, Grey-Black (5Y 2.5/1) Clay, Some Silt, Trace Sand, Moist.	CL	2.75	Drager = OK α = 1 cpm β = BG Pushed Shelby @ 1800 112.1 - 114.1 Recovered 1.7 ft Sample #08299
111							
112							
113							
114							
~~115~~	08300 3/23/88 0800	4 5 5	16	Loose, Grey (5Y 3/1) Fine Sand, Some Silt, Some Clay, Well Graded, Unstratified, Wet. More Clay rich in last 4".	SM	N/A	3/23/88 Drager = OK α = 0 β = BG
116							
117							
118							
119							
120							

NOTES:

3/23/88 - β = 250-300 cpm BG

000434

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 16 1991

5709

	Initial	Date
1st Key In		
2nd Key In	[illegible]	8/15
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~334~~ 3034 OB 1-FS9	COORDINATES: See p1	DATE: 3/23/88
ELEVATION: See p1	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Mac Kent	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 9 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS B=250-300 cpm BG
120	08301 3/23/88 1030	5 8 15	11	Medium Dense, Grey (5Y 4/1) Fine→Cse Gravelly Sand, Some cse round gravel, Some Silt, Trace Clay, Poorly Graded, Unstratified, wet.	GM	N/A	hnu=0 α=1 cpm β=BG
121							
122							
123							
124							
125	08302 3/23/88 1155	32 48 37	11	Dense, Grey (5Y 3/2) Med→Cse Gravelly Sand, Some cse round gravel, Some silt, poorly graded, Unstratified, wet.	GM	N/A	hnu=0 α=0 β=BG
126							
127							
128							
129							
130	08303 3/23/88 1525	70 Ref.	8	Dense, Grey (2.5Y 5/2) Coarse Gravelly Sand, Some cse round gravel, Trace silt, poorly graded, unstratified, wet.	GP	N/A	hnu=0 α=0 β=BG
131							
132							
133							
134							
135							

NOTES:

QC/DH/2.4.89

FERNALD RI/FS REVIEWED BY QA 46 DATE AUG 1 F 1989

	Initial	Date
1st Key In		
2nd Key In		8/16/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~334~~ 3034 BB 1-5-89	COORDINATES: See pl	DATE: 3/23/88
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Markert	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 10 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							β = 250-300 cpm BG
~~135~~ 136	08304 3/23/88 1635	10 14 18	10	Dense, Grey-Brown (10YR 5/2) Med-Cse Sand, Trace rounded gravel, Trace Silt, Fair Grading, Unstratified, wet.	SP	N/A	Hnu = 0 α = 0 β = BG
137							
138							
139							
~~140~~ 141	08305 3/23/88 1745	5 11 19	9	Medium Dense, Grey-Brown (10YR 5/2) Fine→Med Sand, Trace Silt, Fair Grading, Unstratified, wet.	SP	N/A	Hnu = 0 α = 0 β = BG
142				Bottom of Boring 141½ft			

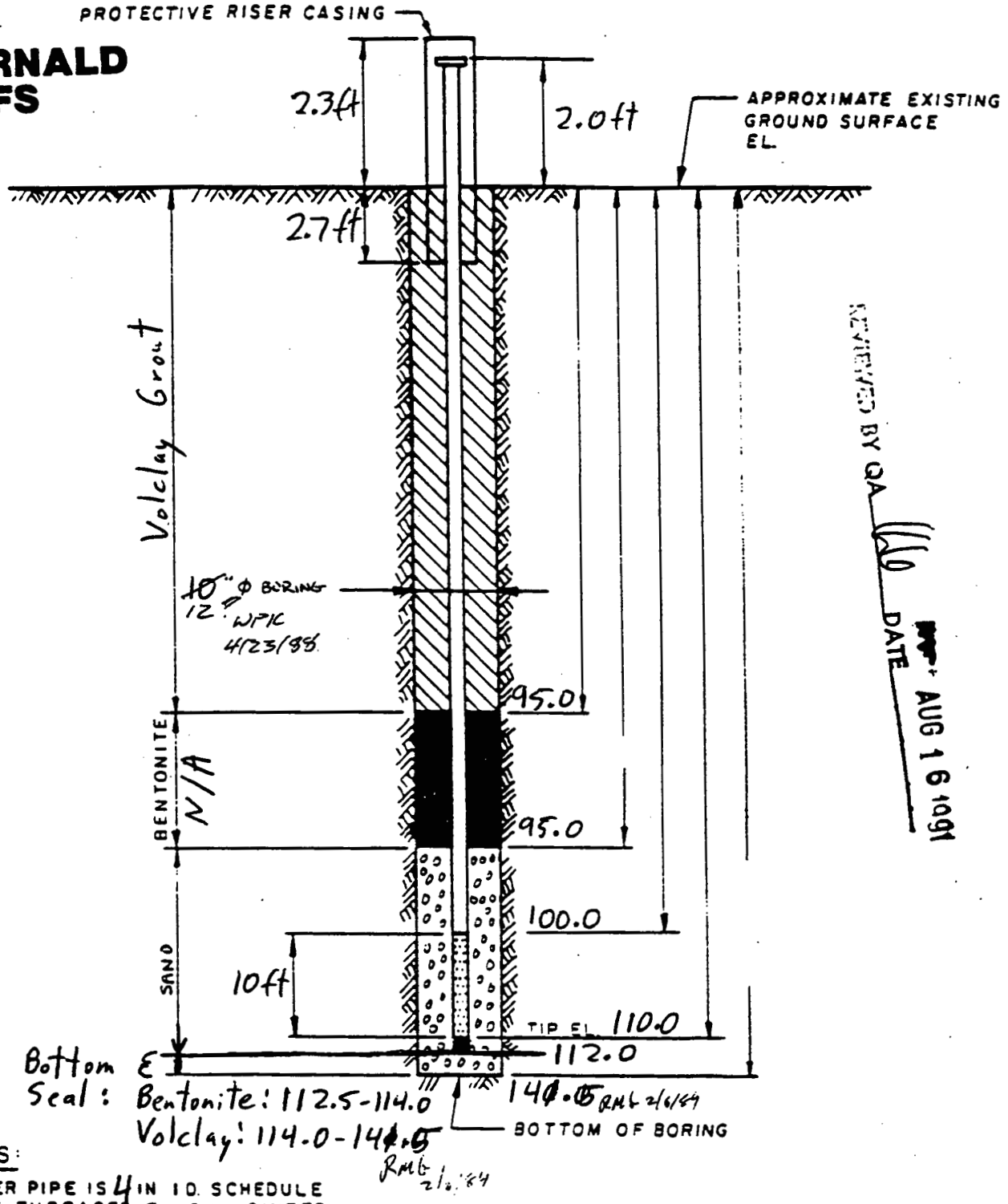
NOTES:

000436

5709

REVIEWED BY QA DATE Qd/DH/2.4.89

FERNALD RI/FS



REVIEWED BY QA DATE AUG 16 1991

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 50.14 from TOC
5. WATER LEVEL READING ON 3/30/88-0740

INSTALLATION DETAILS
MONITORING WELL ~~334~~ 3034

PREPARED FOR B8 1-5-89

000437

QC/DA/2.4.89

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. F. MacKert DATE 3/30/88
PROJECT NO. 602.3.2
CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~334~~ 3034 BB 1-5-89
PIEZOMETER NO. ~~334~~ 3034
DATE OF INSTALLATION 3/29/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 60 ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" ID FROM 0 TO 140 ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 ft

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4 in.
LENGTH OF PIPE SECTIONS 10 ft, 2 ft
JOINING METHOD Screw flush joint threads

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Locking Cap with lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.7			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 95.0	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP 95.0	BOTTOM 112.5	TOP	BOTTOM
PERFORATED SECTION	TOP 100.0	BOTTOM 110.0	TOP	BOTTOM
PIEZOMETER TIP	112.0			
BOTTOM OF BOREHOLE	140.5 RMG 2/6/89			
GWL AFTER INSTALLATION	50.14 from TOC - 3/30/85 - 0740			

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Bottom of borehole back filled to 112.5 ft.
Bentonite: 112.5 - 114.0 ft
Grout/Slurry: 114.0 - 140.0 ft

000438

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 7/26/91

5709 QA

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~1235~~ 1035 BB 1-5-89	COORDINATES: 482290.60 N 137 9710 .465	DATE: 03-21-88
ELEVATION: 584.15	GWL: Depth N/A Date/Time N/A	DATE STARTED: 03-20-88
ENGINEER/GEOLOGIST: H. SLUSARSKI	Depth N/A Date/Time N/A	DATE COMPLETED: 03-21-88
DRILLING METHODS: Cable tool		PAGE 1 OF 2

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08374 0933 03-20	1 3 4	8	MEDIUM STIFF, YELLOW-BROWN (10YR 4/2) CLAY, SOME SILT, ROOTLETS, DRY	CL	1.0	HNU = 0 x = – BG: 80 CPM
2	08375 0935 03-20	2 3 4	10	MEDIUM STIFF, YELLOW-BROWN (10YR 4/4) CLAY, SOME SILT, DRY 3.0	CL	1.0	HNU = 0 x = – BG: 80 CPM
4	08376 0938 03-20	4 6 8	14	STIFF, GREY (10YR 6/1) CLAY, SOME SILT, DRY 4.5	CL	1.5	HNU = 0 x = – BG: 80 CPM
5	08377 0941 03-20	7 8 9	12	STIFF, GREY (10YR 6/1) CLAY, TRACE MEDIUM GRAVEL, DRY 5.8	CL	2.0	HNU = 0 x = – BG: 80 CPM
6				SOFT, GREY (10YR 6/1) CLAY, SOME SILT, DAMP 7.0			
7	08378 0945 03-20	7 8 9	2	SOFT, GREY BROWN (10YR 5/4) CLAY SOME SILT, DAMP 7.5	CL	.5	HNU = 0 x = – BG: 80 CPM
8	08379 1031 03-20	6 8 12	18	STIFF, YELLOW-BROWN (10YR 5/3) CLAY, SOME SILT, SOME FINE GRAVEL, DRY	CL	2.0	HNU = 0 x = – BG: 80 CPM
9							
10	08380 1405 03-20	SHELBY TUBE		PUSHED SHELBY TUBE FROM 9.0 FT TO 11.0 FT, RECOVERED 1.3 FT			HNU = 0 x = – BG: 80 CPM
11							
12	08381 1518 03-20	12 20	10	STIFF YELLOW-BROWN (10YR 5/4) CLAY, SOME SILT AND MEDIUM GRAVEL, DRY	CL	2.0	HNU = 0 x = – BG: 80 CPM
13	08382 1540 03-20	12 10 13	12	STIFF, YELLOW-BROWN (10YR 5/4) CLAY. SOME SILT AND FINE GRAVEL, DRY	CL	1.5	HNU = 0 x = – BG: 80 CPM
14	08383 1550 03-20	3 5 6	14	SOFT GREY (5Y 5/1) CLAY, SOME SILT AND FINE GRAVEL, DAMP	CL	.5	HNU = 0 x = – BG: 80 CPM

SAMPLE # TIME DATE

NOTES: CONTRACTOR: PENDRILL
RIG: CYCLONE 42
DRILLER: HARVEY DYKES JR.
ASSISTANT: JOHN VANDINE

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS: IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 x = – BG = 80 CPM
LEL/O2: 0 PPM LEL 20.1% O2

WATER ADDED TO HOLE: 830

000439

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.L. DATE 7/26/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: G02 3.2	PROJECT NAME: FERNALD RI IFS	
BORING NUMBER: 1035 BB 1-5-89	COORDINATES: Same as previous	DATE: 03-21-89
ELEVATION: Same as page 1	GWL: Depth N/A Date/Time N/A	DATE STARTED: 03-20-89
ENGINEER/GEOLOGIST: M. SLUSARCZ	Depth N/A Date/Time N/A	DATE COMPLETED: 03-21-89
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	0934 1600 03-20	2 5 5	14	SOFT, GREY (5Y 5/1) CLAY, SOME SILT AND FINE GRAVEL, DAMP	CL	.5	HNU = 0 α = — BG = 50 CPM
17 18	0935 1608 03-20	2 3 4	14	SOFT, GREY (5Y 5/1) CLAY, SOME SILT AND FINE GRAVEL, DAMP	CL	.5	HNU = 0 α = — BG = 50 CPM
19	0936 1617 03-20	3 4 6	14	MEDIUM STIFF, GREY (5Y 5/1) CLAY SOME SILT AND FINE GRAVEL, DAMP	CL	1.0	HNU = 0 α = — BG = 50 CPM
20 21	0937 0957 03-21	5 5 7	8	PUSHED SHELBY FROM 19.5 FT TO 21.5 FT. NO RECOVERY. OPTED TO TAKE SPLIT SPOON SAMPLE FROM 19.5 FT TO 21.0' SOFT, GREY (5Y 5/1) CLAY, SOME MEDIUM-FINE GRAVEL, DAMP	CL	.5	HNU = 0 α = — BG = 50 CPM
22	0938 0920 03-21	5 13 >50	12	MEDIUM STIFF, GREY (5Y 5/1) CLAY SOME FINE GRAVEL DAMP 22.5	CL	1.0	HNU = 0 α = — BG = 50 CPM
23 24	0939 0955 03-21	14 50 34	10	STIFF, GREY-GREEN (5Y 5/2) SILTY CLAY, DRY 24.0	CL	1.5	HNU = 0 α = — BG = 50 CPM
25	0940 1051 03-21	9 14 23	16	MEDIUM DENSE, GREY (5Y 5/1) WELL GRADED GRAVEL-SAND MIXTURE, WET 24.9	GW		HNU = 0 α = —
				HARD, GREY (5Y 5/1) CLAY, SOME SILT DRY 26.5	CL	>4.0	BG = 50 CPM
26 27	0941 1117 03-21	11 18 20	14	MEDIUM DENSE, GREY (5Y 5/1) WELL GRADED GRAVEL SAND MIXTURE, WET 26.0	GW		HNU = 0 α = —
				STIFF, GREY (5Y 4/1) CLAY, SOME SILT DRY	CL	3.5	BG = 50 CPM
28				BOTTOM OF BOREHOLE 27.0 FT			

NOTES:

000440

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/26/94

DG 3/14/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 03-21-88
PROJECT NO. 602 22 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~1700~~ ~~135~~ 1035BB 1-5-89
PIEZOMETER NO. ~~1700~~ ~~135~~ 1035 DATE OF INSTALLATION 03-21-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 27.0 FT	SIZE 10" ID FROM 0.0 FT TO 27.0 FT.
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN. I.D. 4 IN
SLOTS ☐ HOLES ☐ SCREEN ☑	LENGTH OF PIPE SECTIONS
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD SCREW TYPE FLUSH
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 11.0 FT	JOINT THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN.	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (Ft.)	
TOP OF RISER PIPE	2.5		586.65	
GROUND SURFACE	0.0		584.15	
BOTTOM OF PROTECTIVE PIPE	2.5		581.65	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP —	BOTTOM —	TOP —	BOTTOM —
BENTONITE	TOP 0.0 FT.	BOTTOM 9.0 FT.	TOP 584.15	BOTTOM 575.15
SAND (10-20)	TOP 19.0 FT	BOTTOM 27.0 FT.	TOP 565.15	BOTTOM 557.15
GRAVEL (4-30)	TOP 9.0 FT.	BOTTOM 19.0 FT.	TOP 575.15	BOTTOM 529.15
PERFORATED SECTION	TOP 13.0 FT	BOTTOM 24.0 FT	TOP 571.15	BOTTOM 547.15
PIEZOMETER TIP	26.5 FT		557.65	
BOTTOM OF BOREHOLE	27.0 FT.		557.15	
GWL AFTER INSTALLATION	—		—	

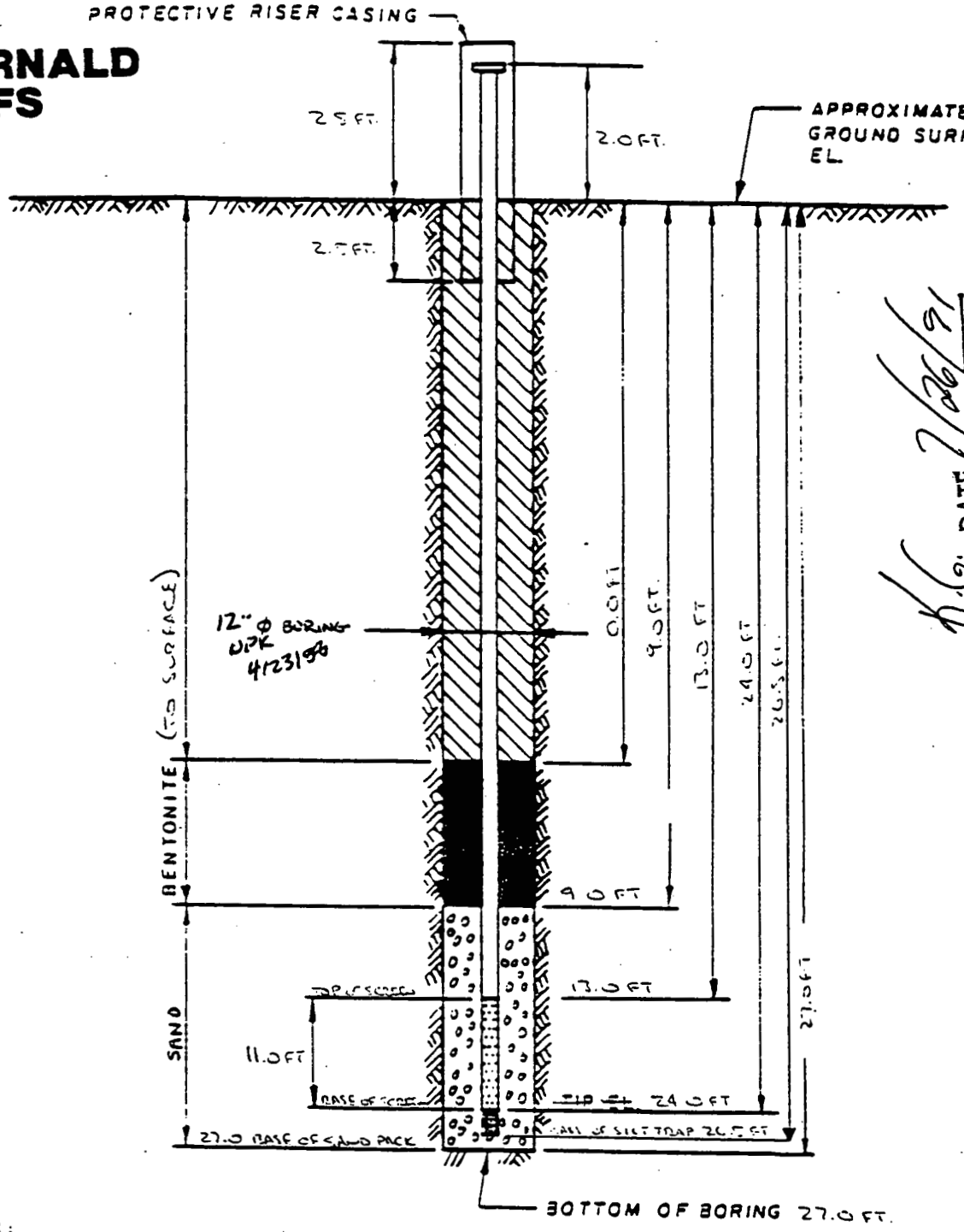
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

DLG 2/4/89

BORING # ~~D-5~~ 1035

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY / APPROVED BY

DRAWN BY

R.G. DATE 7/26/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL
03-21-88
PREPARED FOR

BORING # ~~D-5~~ 1035
BB 1-5-89

000442

WELL LOG AND DRILLING REPORT

5709

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

№ 366561

12-5
2036

County Hamilton Township Crosby Section of Township 12

Owner George Fuchs Address [redacted]

Location of property [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 101

Type of screen Cook brass #30 Length of screen 2'

Type of pump Submersible

Capacity of pump 14

Depth of pump setting 100'

Date of completion 4/8/68

BAILING OR PUMPING TEST

Pumping Rate 25 G.P.M. Duration of test 1 hrs.

Drawdown 2 ft. Date 4/8/68

Static level-depth to water 82 ft.

Quality (clear, cloudy, taste, odor) Cl

Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
well pit	0	4
Yellow clay	4	12
Blue clay	12	68
Yellow ~~sand~~ clay	68	72
Yellow sand	72	90
Gray sand	90	103
Sand & gravel	103	107

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

Drilling Firm Wm Crane Date 4/24/68

Address Shandon, O Signed Wm Crane 36

*If additional space is needed to complete well log, use next consecutive numbered form.

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RKA 2/4/

WPK 4/23/90

RIG #2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~1037~~ 1037 BB 1-589	COORDINATES: 482 151.80 N 137 979.65 E	DATE: 02-22-88
ELEVATION: 588.6	GWL: Depth Date/Time	DATE STARTED: 02-22-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 02-23-88
DRILLING METHODS: CABLE TOOLS		PAGE 1 OF 1

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							
22							
24							
26							
28							
30							
32							
34							
36							
38							
40				A SINGLE SPLIT SPOON SAMPLE WAS ACQUIRED FROM THE INTERVAL 40.0 - 41.5 FT. FOR THE PURPOSE OF VARIFYING THE PRESENCE OF THE GLACIAL TILL AT THIS INTERVAL.	BOTTOM OF BORING 41.5 feet. WPK 4/24/88		
42							
				WATER ADDED TO HOLE (1 MARK EQUALS 5 GAL)			

NOTES:

FOR DESCRIPTION OF SOILS PLEASE SEE DETAILED DESCRIPTIONS NOTED FOR BORING ~~222~~ 3037 RMG 2/6/89

000444

CONTRACTOR: PENNDRILL DRILLER: HARRY DYKES JR.
RIG: CYCLONE 42 ASSISTANT: JOHN VANDINE

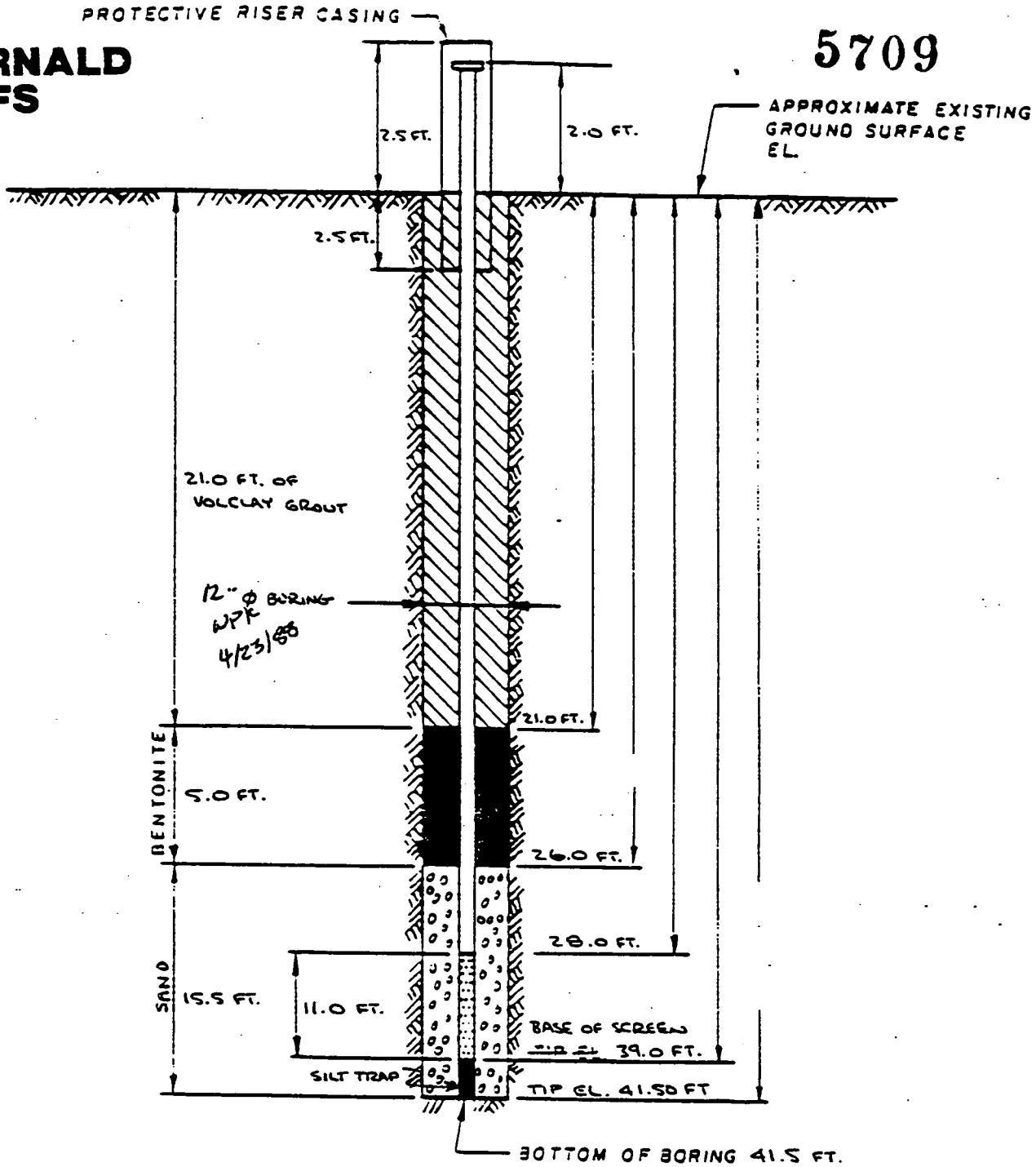
BACKGROUND LEVELS: HNU = 0
α = 0 PPM
BZ = 100 PPM
LEL O2: 0PPM LEL, 20.1% O2

402-11-86

BORING # 137 1037 01-5-89 02-23-88 RKA 2/4

FERNALD RI/FS

5709



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

BORING # 137
02-23-88

000445

M. SLUSARSKI

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Third Check		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 02-23-88
PROJECT NO. 602 TASK 3.2 CHECKED BY R Goldsmith DATE 2/[illegible]
BORING NO. SERIES 1000 ~~#137~~ 1037 BB1-5-89
PIEZOMETER NO. 1037 DATE OF INSTALLATION 02-23-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0 TO 41.5 FT.	SIZE 10" ID FROM 0 FT. TO 41.5 FT
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4"
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS
AVERAGE SIZE OF PERFORATIONS	JOINING METHOD SCREW FLUSH JOINT
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH ~11.0 FT	THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT	OTHER PROTECTION LOCKING CAP AND
PROTECTIVE PIPE O.D. 10 3/4 IN.	LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0		~~586.6~~ NB 590.6	
GROUND SURFACE	0.0		588.6 NB	
BOTTOM OF PROTECTIVE PIPE	2.5		~~591.1~~ 586.1	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 21.0	TOP 588.6	BOTTOM 567.6
BENTONITE	TOP 21.0	BOTTOM 26.0	TOP 567.6	BOTTOM 562.6
SAND	TOP 26.0	BOTTOM 41.5	TOP 562.6	BOTTOM 547.1
GRAVEL (NA)	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 28.0	BOTTOM 39.0	TOP 560.6	BOTTOM 549.6
PIEZOMETER TIP	41.5		547.1	
BOTTOM OF BOREHOLE	41.5		547.1	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000446

409-11-86

	Initial	Date
1st Key In		
2nd Key In		8/16
Hard Copy Verification		

KKA 2/4/89

4/23/88 WPK RIO #2

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~337~~ 2037 BB 1549	COORDINATES:	DATE: 02 17 88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 02 17 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth Date/Time	DATE COMPLETED: 02 28 88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	08/26 RMG 2/8/89			SHELBY TUBE PUSHED FROM 10.0 to 12.0 FEET RECOVERED 2.0 feet			
20		From Sample Collection log.					
	08/27 RMG 2/8/89			SHELBY TUBE PUSHED FROM 27.0 to 29.0 FEET, RECOVERED 0.5 Feet			
40							
60							
80							
84.0				BOTTOM OF BORING			

NOTES:
contractor Pennsylvania Drilling
Driller: Harry Dyke Jr
Assistant: John VanDine

FOR DESCRIPTION OF SOILS PLEASE REFER TO BORING 337 VISUAL CLASSIFICATION OF SOILS LOG.

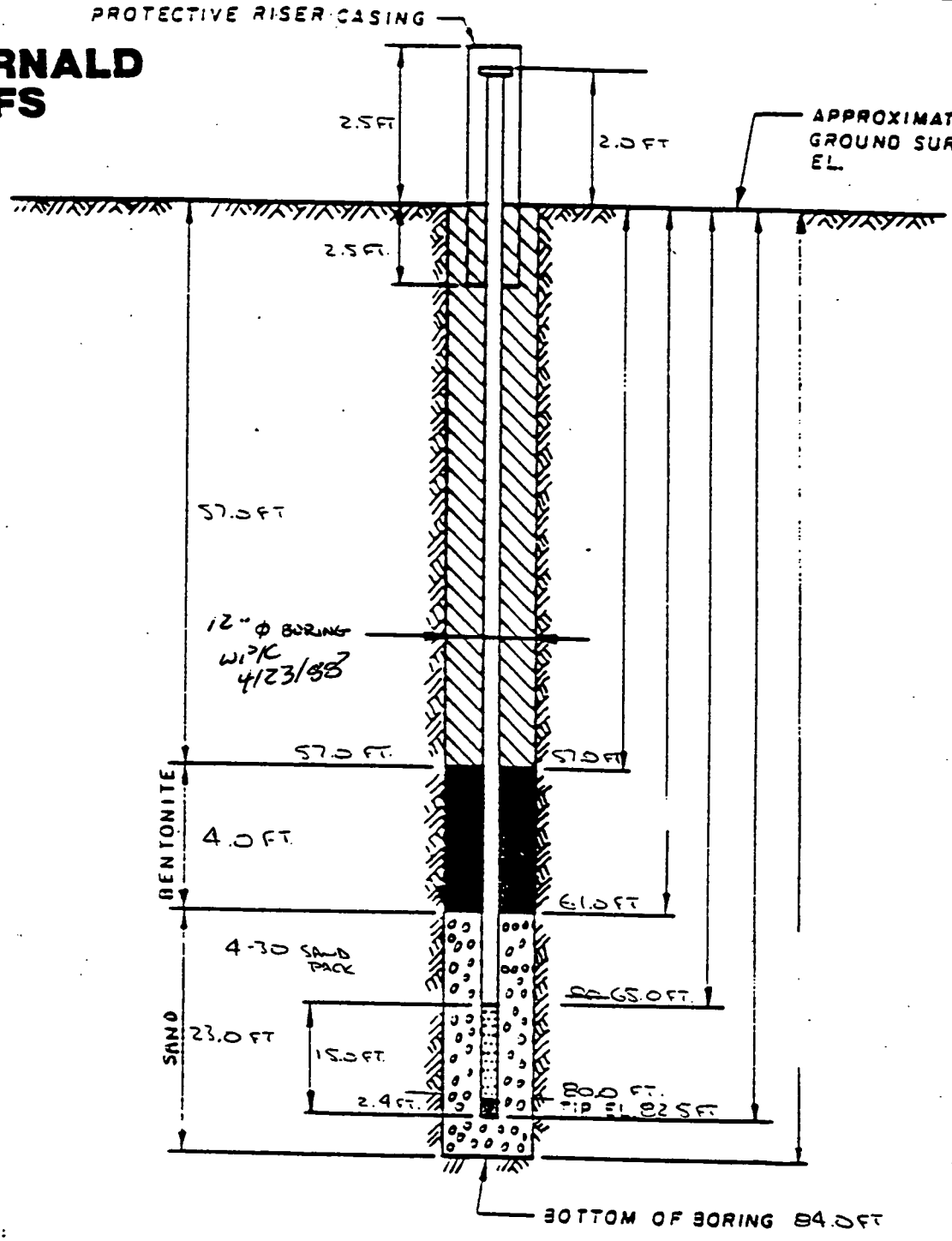
WATER ADDED TO HOLE 15 00 gal

402-11-88

WELL # ~~2272~~ 2037 66 1-3
02-20-88

RKA
2/4/89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL #2037

PREPARED FOR

000448

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RKA 2/4/8

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. MARK SLUSARSKI DATE 02-20-88
PROJECT NO. 603 T 3.2 CHECKED BY R Galbraith DATE 2/4/89
BORING NO. 255 2037 BB, 1-5-89
PIEZOMETER NO. 2037 DATE OF INSTALLATION 02-20-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 4.0 FT TO 84.0 FT.
FLUID _____ FROM _____ TO _____

TYPE OF BIT FLAT HEAD
CASING SIZE (S) USED:
SIZE 10 IN FROM 0 TO 84.0
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE SERIES 200 MONITORING WELL
DIAMETER OF PERFORATED SECTION 4 IN.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15 FT.

RISER PIPE MATERIAL _____
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS 6-10 FT, 1-5 FT, 2-2 FT
JOINING METHOD THREAD AND COUPLE

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE ~~Ø~~ O.D. 10 IN.

OTHER PROTECTION LOCKABLE CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 FT.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT	BOTTOM 57.0	TOP	BOTTOM
BENTONITE	TOP 57.0 FT	BOTTOM 61.0 FT	TOP	BOTTOM
SAND	TOP 61.0 FT.	BOTTOM 84.0 FT	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 65.0 FT.	BOTTOM 80.0 FT.	TOP	BOTTOM
PIEZOMETER TIP	82.5 FT			
BOTTOM OF BOREHOLE	84.0 FT.			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FERNALD RI/FS

44 RKA 2/4/9

	Initial	Date
1st Key In		
2nd Key In		8/16
Data Entry Verification		

PK 4/23/88

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~337~~ 3037 BB 1-5-89	COORDINATES: N 482141.43 E 1379791.96	DATE: 01 19 88
ELEVATION: 588.5 ground	GWL: Depth — Date/Time —	DATE STARTED: 01 19 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth — Date/Time	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL / SPLIT SPOON		PAGE 1 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07a53 1103	3 17 19	17	HARD BROWN (10YR 5/3) CLAY some Gravel and silt - Dry.	CL	4.5+	Hnu = 0 ppm Bγ = 60 cpm α = 0 cpm
2 3	07a54 1105	8 8 13	16	STIFF BROWN (10YR 5/3) silt some Sand and Clay Trace Gravel - Dry	ML	2.0	Hnu = 0 ppm Bγ = 60 cpm α = 0 cpm
4	07a55 1300	12 10 9	10	STIFF Light Yellowish Brown (2.5Y 6/4) Silt and SAND SOME GRAVEL TRACE CLAY DRY	ML	1.0	Hnu = 0 ppm Bγ = 60 cpm α = 0 cpm
5 6	07a56 1314	6 6 6	4	VERY SOFT OLIVE BROWN (2.5Y 4/4) CLAY SOME Sand and silt trace gravel moist	CL	<.25	Hnu = 0 ppm Bγ = 60 cpm α = 0 cpm
7	07a57 1321	5 5 10	10	6.8 VERY STIFF VERY DARK GREY (2.5 5/0) CLAY SOME SILT DRY	CL	3.0	Hnu = 0 ppm Bγ = 60 cpm α = 0 cpm
8 9	07a58 0950	5 7 10	12	STIFF DARK GREY (5Y 4/1) CLAY SOME SILT - DRY	CL	1.5	Hnu = 0 Begin 01 20 88 Bγ = 60 cpm α = 0
10	07a59 0930	3 5 8	15	4.6 VERY STIFF BRAWNISH Yellow (10YR 6/8) Mottled clay some silt - Dry	CL	2.5	Hnu = 0 Bγ = 60 cpm α = 0
11 12	07a60 0928	4 5 8	17	VERY STIFF Yellowish Brown (10YR 5/8) mottled clay and silt - Dry	CL	2.5	Hnu = 0 Bγ = 60 cpm α = 0
13	07a61 0942	45 57 11 8	16	VERY STIFF Yellowish Brown (10YR 5/4) CLAY AND SILT Trace Gravel - Dry	CL	2.5	Hnu = 0 Bγ = 60 α = 0
14	07a62 0959	6 12 15	18	VERY STIFF Yellowish Brown (10YR 5/4) CLAY AND SILT TRACE GRAVEL - DRY	CL	2.5	Hnu = 0 Bγ = 60 cpm α = 0

NOTES:

CONTRACTOR: PENNDRILL
RIG CYCLONE 42
DRILLER: HARRY DUKES Jr.
Assistant: JOHN VANDINE
WATER ADDED TO HOLE 1 mark = 5 gal

SAMPLES COLLECTED AS PER ASTM STANDA PENETRATION TEST.
COLORS: Identified using munsell color chart
Background Levels
Hnu = 0 Bγ = 60 cpm
LEL-O_2 = 0 ppm LEL + 20.1% O_2 α = 0 cpm

000450

FERNALD RI/FS

5709

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

KKA 2/4/

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~337~~ BB1-5-89 3037	COORDINATES: see p1	DATE: 01 20 88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 01 19 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth – Date/Time –	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	07963 1007	10 16 24	18	VERY STIFF STRONG BROWN (7.5YR 5/6) SILT AND CLAY SOME GRAVEL - TRACE SAND - DRY	ML	3.5	Hnu=0 Bq=80cpm α=0
17	07964 1330	21 33 41	6	HARD DARK BROWN (10YR 5/3) SILT AND CLAY SOME GRAVEL - DRY	ML	4.25	Hnu=0 Bq=80cpm α=0
18				18.8			
19	07965 1426	15 13 23	12	VERY STIFF DARK GREY SILT SOME CLAY and gravel - DRY	ML	4.0	Hnu=0 Bq=80cpm α=0
20	07966 1439	4 10 14	16	VERY STIFF DARK GREY (5Y 5/1) CLAY and silt SOME Gravel - Dry	CL	2.5	Hnu=0 Bq=80cpm α=0
21 22	07967 1505	6 10 12	13	VERY STIFF DARK GREY (5Y 4/1) CLAY and silt some gravel - DRY	CL	2.5	Hnu=0 Bq=80cpm α=0
23 24	07968 1527	4 8 14	14	STIFF GREY (5Y 5/1) CLAY and silt SOME GRAVEL - DRY	CL	1.25	Hnu=0 Bq=80cpm α=0
25	07969 1542	6 8 13	18	STIFF DARK GREY (5Y 4/1) Clay and silt some gravel - Dry	CL	1.25	Hnu=0 Bq=80cpm α=0
26 27	07970 1551	4 7 12	12	STIFF DARK GREY (5Y 5/1) CLAY AND SILT SOME GRAVEL TRACE SAND - DRY	CL	1.5	Hnu=0 Bq=80cpm α=0
28	07971 0920	4 5 11	4	VERY SOFT GREY (5Y 5/1) CLAY and SILT SOME GRAVEL - DRY 28.5	CL	<1.25	Hnu=0 Begin 01 22 88 Bq=120cpm α=0
29	07972 0945	27 50/3	6	VERY DENSE GREY (5Y 5/1) clayey sand and gravel - DRY	SC	<4.5	Hnu=0 Bq=100cpm α=0

NOTES:

No Drilling was Performed on 1/21/88

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~337~~ 3037 BB 1-5-88	COORDINATES: see p1	DATE: 01 22 88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 01 19 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth – Date/Time –	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	0 7 9 7 3 1007	14 22 26	12	30.3 Hard grey (5Y 5/1) Clay some Gravel trace silt - DRY	CL	74.5	HNU=0 BG=80cpm α=0 0.1 coming up in slurry Negative readings on instruments
32	0 7 9 7 4 1034	20 21 27	15	HARD GREY (5Y 5/1) CLAY SOME GRAVEL TRACE SILT - DRY	CL	3.75	HNU=0 BG=80cpm α=0
33	0 7 9 7 5 1056	6 13 16	16	VERY STIFF GREY (5Y 5/1) CLAY SOME GRAVEL AND SAND TRACE SILT - DRY	CL	4.0	HNU=0 BG=80cpm α=0
35	0 7 9 7 6 1335	11 12 15	15	STIFF GREY (5Y 5/1) CLAY AND SILT SOME GRAVEL AND SAND - DRY	CL	1.75	HNU=0 BG=80cpm α=0
36 37	0 7 9 7 7 1445	5 8 13	10	STIFF GREY (5Y 5/1) SILTY CLAY ~~and~~ SOME GRAVEL AND SAND - DRY	CL	1.5	HNU=0 BG=80cpm α=0
38.5	0 7 9 7 8 1505	5 10 13	3	VERY SOFT GREY (5Y 5/1) GRAVELLY CLAY SOME SAND AND SILT - MOIST	CL	0.25	HNU=0 BG=80cpm α=0
39.5 40.5	0 7 9 7 9 1535	1 5 8	12	STIFF GREY (5Y 5/1) SILTY CLAY SOME SAND AND GRAVEL - MOIST	CL	1.25	HNU=0 BG=80cpm α=0
41.5	0 8 1 0 5 1600	5 28 12	9	STIFF GREY (5Y 5/1) GRAVELLY CLAY SOME Sand and Silt - Moist	CL	1.5	HNU=0 BG=80cpm α=0
42.5 43	0 8 1 0 6 1625	5 15 23	10	42.5 DENSE Yellowish BROWN (10YR 5/4) Sand - DRY	SP	—	HNU=0 BG=80cpm α=0
44							

NOTES:

000452

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: see p1	
BORING NUMBER: 337 BD 1-5-89 3037	COORDINATES: see p1	DATE: 1 22 88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 1 19 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth – Date/Time –	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08 107 1646	27 40 26	13	VERY DENSE YELLOWISH BROWN (10YR 5/4) SAND - DRY	SP	–	HNU=0 BG=80cpm α=0
47							
48							
49							
50							BGy.4 1/23/88
51	08 108 1010	50/3 50/2	5	VERY DENSE YELLOWISH BROWN (10YR 5/6) GRAVELLY SAND - DRY	SW	–	HNU=0 ppm BG=60cpm α=0
52							
53							DRILLER NOTED SAND WAS Difficult to Drill from 51.5-55.0 feet
54							
55							
56	08 109 1411	50 50/4	8	VERY DENSE DARK YELLOWISH BROWN (10YR 3/4) SAND SOME GRAVEL - MOIST	SW	–	HNU=0 BG=80cpm α=0
57							
58							
59							

NOTES:

000453

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~337~~ 3037 60 1-739	COORDINATES: See p1	DATE: 1 23 88
ELEVATION: See p1	GWL: Depth — Date/Time —	DATE STARTED: 1 19 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth — Date/Time —	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	08 11 0 1530	31 50/5	6	VERY DENSE YELLOWISH BROWN (10YR 5/4) SAND SOME GRAVEL - DRY	SW	—	Hnu = 0 Bg = 60 cpm α = 0
62							
63							
64							
65							
66	08 11 1 1710	15 50/5	10	VERY DENSE GRAYISH BROWN (10YR 5/2) SAND SOME GRAVEL - MOIST	SW	—	Hnu = 0 Bg = 60 cpm α = 0
67							
68							DRILLER NOTED FORMATION Easier to Drill 68.5 feet
69							
70							Begin 1 24 88
71	08 11 2 1008	41 40 42	10	VERY DENSE DARK GREY (10YR 4/1) GRAVELLY SAND - WET	SW	—	Hnu = 0 Bg > 100 cpm α = 0
72							
73							BLOW SAND Encountered at 73.5 feet
74							

NOTES:

000454

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		8/14
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~3373037~~ BB 1-5-89	COORDINATES: see p1	DATE: 1 24 88
ELEVATION: see p1	GWL: Depth 77.35 Date/Time 1/24/88 1753	DATE STARTED: 1 19 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth 52.80 Date/Time 1/25/88 0910	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	08113 1420	17 27 27	14	VERY DENSE GREY (10YR 5/1) SAND TRACE GRAVEL AND SILT - WET	SP	-	Hnu=0 Bq=60cpm ∝=0
77							
78							
79							
80							
81	08114 1554	30 27 32	15	VERY DENSE GREY (10YR 5/1) SAND SOME GRAVEL TRACE SILT - DRY	SP	-	Hnu=0 Bq 60cpm ∝=0
82							
83							
84							Oil smell coming from Bailer at 84.0 feet
85							
86	08115 1739	50/4 50/1	12	VERY DENSE (10YR 5/1) GRAVELLY SAND Trace Silt - DRY	SP		Hnu=0 Bq=60cpm ∝=0
87							Begin 01 25 88
88							
89							STRONG CRUDE OIL smell coming from Boring while Bailing is in operation

NOTES:

BAILED BORING DRY check water Level at 1753 1/24/88 77.35 ft

000455

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		8/12
Hard Copy Verification		

PA

RKA

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPL RI/FS	
BORING NUMBER: ~~337~~ 3037 BB 1-5-89	COORDINATES: See P1	DATE: 1 25 89
ELEVATION: See P1	GWL: Depth ~ Date/Time ~	DATE STARTED: 01 19 87
ENGINEER/GEOLOGIST: W. KEGLEY	Depth ~ Date/Time	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	0 8 11 6 1100	6 7 9	5	MEDIUM DENSE OLIVE GREY (5Y 5/2) SANDY GRAVEL TRACE SILT - WET	GW	—	HNU=0 Bγ=60cpm α=0
92							
93							
94							
95							
96	0 8 11 7 1330	14 19 28	10	DENSE GREY (10YR 5/1) SAND SOME GRAVEL TRACE SILT - WET	SW	—	HNU=0 Bγ=40cpm α=0
97							
98							
99							
100							
101	0 8 11 8 1455	9 13 23	12	DENSE VERY DARK GREY (10YR 3/1) SAND TRACE GRAVEL AND SILT - WET	SP	—	HNU=0 Bγ=40cpm α=0
102							
103							
104							

NOTES:

000456

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC

RKA 2/4/8

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 337 3037 1-5-91	COORDINATES: see pl	DATE: 1 25 88
ELEVATION: see pl	GWL: Depth 72.6 Date/Time 1 26 88 0940	DATE STARTED: 1 19 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth 67.6 Date/Time 1 27 88 0940	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	8 9 11 9 1610	3 4 10	18	MEDIUM DENSE VERY DARK GREY (10YR 3/1) SAND-WET 106.5	SP	–	Hnu=0 Bγ=60cpm α=0
107				MEDIUM DENSE VERY DARK GREY (10YR 3/1) GRAVEL SOME SAND-W	GW	–	BEGIN 1/26 88
108							
109							
110	9 8 12 20 1315	23 26 27	15	VERY DENSE DARK OLIVE GREY (5Y 5/2) SAND TRACE GRAVEL AND SILT-WET	SP	–	Hnu= Bγ=40cpm α=0
111							
112							Begin 1/27/88
113							
114							
115	9 8 12 21 1050	46 48 50/5	10	VERY DENSE GREY (5Y 5/1) FINE GRAINED SAND SOME GRAVEL TRACE SILT WET	SP	–	Hnu=0 Bγ=60cpm α=0
116							
117							
118							
119							

NOTES:

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

PAC RKA

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~3373037~~ 1-5-89 BB	COORDINATES: see p1	DATE: 01 27 88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 1 19 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth – Date/Time –	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 10

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	1418	3 8 15	0	NO RECOVERY - Probably VERY FINE Grained Sand as indicated by Bailer slurry			Hnu= Tried to Push Bz= spoon 2 times α= with 2 Different Sand catchers
122							
123							
124							
125							
126	0 3 1 2 2 1555	15 5015	15	VERY DENSE GREY (5Y 5/1) FINE GRAINED SAND SOME SILT-WET	SP	-	Hnu=0 Bz=60cpm α=0
127							BEGIN 01 28 88
128							
129							
130							
131	0920	3 13 23	0	NO RECOVERY - Probably Very Fine Grained sand as indicated by Bailer slurry			BLOW SAND 130.0ft sand came up 6.0 feet inside casing
132							Tried to Drive spoon 2 times.
133							
134				134.9			MARKED DRILLING CHANGE BLUE CLAY CONTACT

NOTES:

000458

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~337~~ 3037 B0, -559	COORDINATES:	DATE: 02 03 88
ELEVATION:	GWL: Depth 69.70 Date/Time 02 03 88 0830	DATE STARTED: 01 19 88
ENGINEER/GEOLOGIST: William Kegley	Depth Date/Time	DATE COMPLETED: 02 03 88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 10

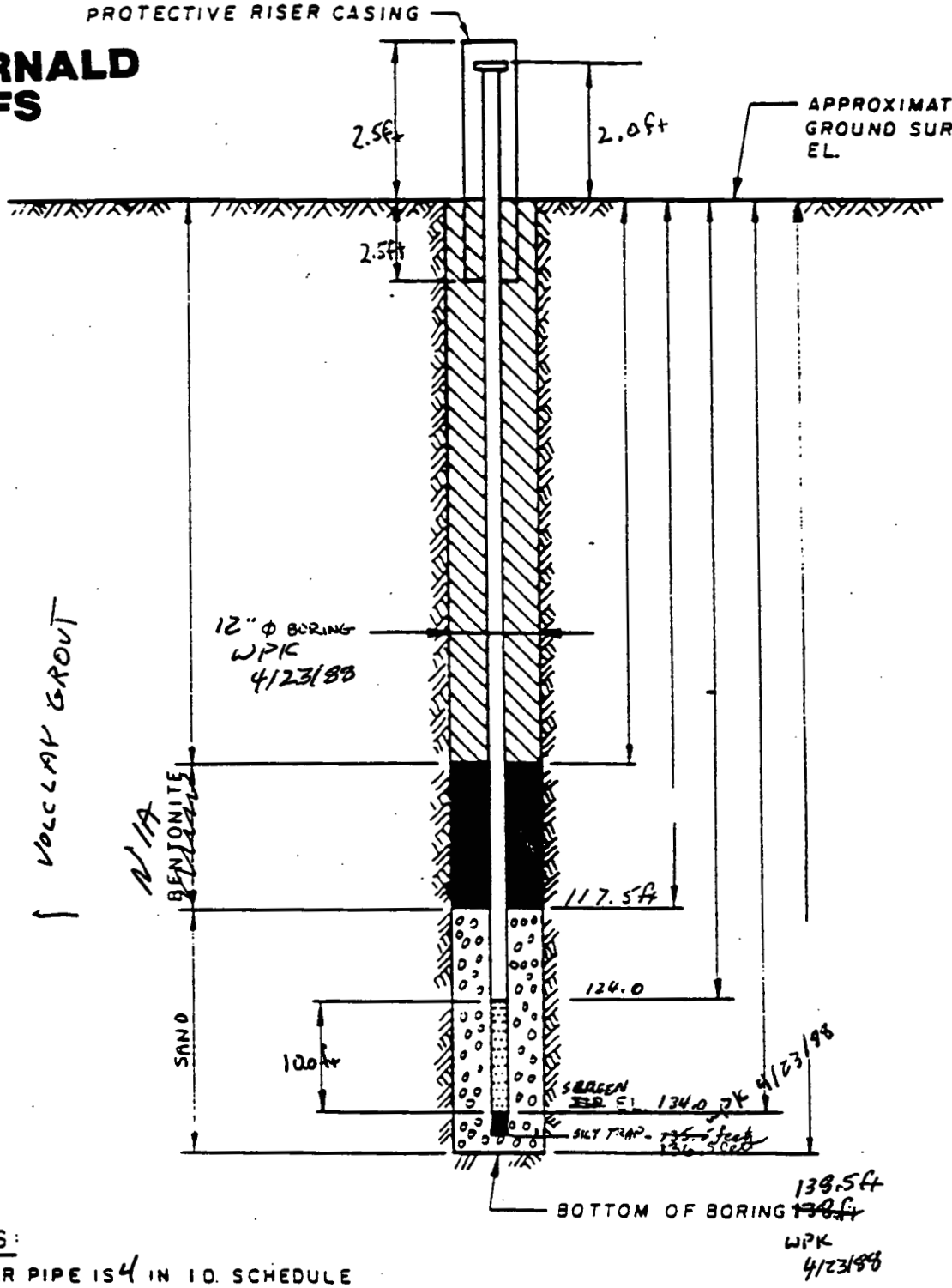
DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	0 8 1 2 3 0420	4 11 20	12	STIFF DARK GREY (5Y 4/1) Clay Trace SILT - Moist	CL	1.0	H_{AU} = 0 BZ = 60 cpm d = 0
137	0 8 1 2 4			SHELBY TUBE			Shelby Tube from 136.5 - 138.5 feet 2 feet recovery
138	1030						
				BOTTOM OF BORING 138.5 feet			

NOTES:

000459

RKA 2/4/89

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 337
3037

PREPARED FOR BB 1-5-89

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

000460

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

KK 2/4

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. W. KEGLEY
DATE 02 04 88
PROJECT NO. 602 T3.2
CHECKED BY R Galbraith
DATE 2/6/89
BORING NO. ~~337~~ 3037 BB 1-5-89
PIEZOMETER NO. ~~337~~ 3037
DATE OF INSTALLATION 02 08 88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0.0 ft TO 138.5
FLUID _____ FROM _____ TO _____

TYPE OF BIT FLAT Head
CASING SIZE (S) USED:
SIZE 10 inch FROM 0.0 feet TO 135 feet
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 inch
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 ft

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 inch I.D. 4.0 inch
LENGTH OF PIPE SECTIONS 10 feet & 2 feet
JOINING METHOD Thread ~~Couple~~ Flush Joint

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 feet
PROTECTIVE PIPE ~~Ø~~ I.D. 10 inch

OTHER PROTECTION LOCKABLE CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	2.5 ft		591.0	
GROUND SURFACE	0.0		588.5	
BOTTOM OF PROTECTIVE PIPE	2.5 ft		586.0	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 117.5 ft	TOP 588.5	BOTTOM 471.0
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM ~~460~~
SAND	TOP 117.5 ft	BOTTOM 138.5 ft	TOP 471.0	BOTTOM 460
GRAVEL	TOP NA	BOTTOM ~~135.5~~ 136.5 UPK 4/24/88	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 124	BOTTOM 134	TOP 464.5	BOTTOM 454.5
PIEZOMETER TIP	~~135.5~~ 136.5 UPK 4/24/88		452	
BOTTOM OF BOREHOLE	138.5		449.5	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000481

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		4/14
Hard Copy Verification		

PAC #20

WPK 4/23/89 R16 H 2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~135~~ 1038 DB 1-5-89	COORDINATES: 482055.43 N 1379622.44 E	DATE: 01 / 11 / 88
ELEVATION: 502.61	GWL: Depth N/A Date/Time N/A	DATE STARTED: 01 / 11 / 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 01/13/88
DRILLING METHODS: CABLE TOOL, SPLIT SPOON		PAGE 1 OF 2

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	C 7896 1105	50/4 31 12	12	VERY STIFF DARK YELLOWISH BROWN (10YR 4/4) silt and gravel with clay - DRY	ML	3.0	Hav = 0ppm βγ = 100cpm α = 0cpm
2	C 7897 1130	10 13 14	15	2.5			Hav = 0ppm βγ = 60-80 cpm α = 0cpm
3				STIFF VERY DARK GREY (5Y 3/1) Clay - DRY	CL	1.5	
4	C 7898 1305	15 20 26	14	STIFF VERY DARK GREY (5Y 3/1) clay with silt TRACE SAND - DRY 4.6	CL	2.0	Hav = 0ppm βγ = 100-120cpm α = 0cpm
5	C 7899 1310	10 12 12	18	STIFF Yellowish BROWN (10YR 5/6) MOTTLED Clay TRACE GRAVEL AND SILT - DRY	CL	1.5	Hav = 0ppm βγ = 80-100cpm α = 0cpm
6 7	C 7900 1315	9 10 12	16	STIFF YELLOWISH BROWN (10YR 5/6) Mottled Clay TRACE GRAVEL AND SILT - DRY	CL	2.0	Hav = 0ppm βγ = 80-100cpm α = 0cpm
8 9	C 7901 0800	10 13 21	18	VERY STIFF YELLOWISH BROWN (10YR 5/4) mottled Clay TRACE GRAVEL AND SILT - DRY	CL	3.0	Hav = 0ppm BEGIN 01 12 88 βγ = 80-100cpm α = 0cpm
10	C 7902 0815	17 16 21	7	STIFF Yellowish BROWN (2.5Y 6/4) MOTTLED ~~CLAY~~ SILT AND ~~SILT~~ CLAY WITH GRAVEL, SOME SAND - DRY,	ML	2.0	Hav = 0ppm βγ = 80-100cpm α = 0cpm
11 12	C 7903 0850	12 20 26	17	HARD LIGHT YELLOWISH BROWN (2.5Y 6/4) MOTTLED CLAY AND SILT WITH GRAVEL, SOME SAND - DRY	CL	4.5	Hav = 0ppm βγ = 80-100cpm α = 0cpm
13	C 7904 0910	14 24 26	18	HARD STRONG BROWN (7.5YR 5/6) CLAY AND SILT WITH GRAVEL, SOME SAND - DRY 13.4	CL	4.5	Hav = 0ppm βγ = 80-100cpm α = 0cpm
14	C 7905 0930	10 20 24	16	VERY STIFF GREY (5Y 5/1) CLAY and SILT, TRACE GRAVEL - DRY Tight Vertical Fracture with Fe_2O_3 Stains	CL	3.0	Hav = 0ppm βγ = 80-100cpm α = 0cpm

NOTES:

CONTRACTOR: PENN DRILL

DRILLER: HARRY DUKES, JR.

ASSISTANT: JOHN JANDINE

WATER ADDED TO BORING 1 = 5 gal

HTI HTI HTI HTI HTI HTI

SAMPLES TAKEN USING ASTM STANDARD PENETRATION TEST.

COLOR identified using Munsell color chart

BACKGROUND LEVELS

Hav = 0 ppm α = 0 cpm

βγ = 80-120 cpm LEL/O_2 = 0 ppm Explosive/20.5% O_2

000462

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.6 DATE 7/29/91 DLG 01/41/89 5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T 3.2	PROJECT NAME: FMPC RI IFS	
BORING NUMBER: ~~138~~ 1038 BB 1-5-89	COORDINATES: see 1st Page	DATE: 1 12 88
ELEVATION: See 1st Page	GWL: Depth n/a Date/Time n/a	DATE STARTED: 1 11 88
ENGINEER/GEOLOGIST: W. KEGLEY	Depth n/a Date/Time n/a	DATE COMPLETED: 1 13 88
DRILLING METHODS: CABLE TOOL / SPLIT SPOON.		PAGE 2 OF 2

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16 / 16.5	07906 1049	4 8 14	8	Shelby TUBE STIFF DARK GREY (5Y 4/1) CLAY SOME GRAVEL TRACE SAND	CL	1.5	Shelby TUBE 15.0-15.9' SAMPLE # 07906 @ 1000hr. Hnu = 0ppm α = 0cpm Bα = 100cpm
17 / 18	07908 1325	13 8 16	10	VERY STIFF GREY (5Y 5/1) CLAY SOME GRAVEL AND SAND - DRY 17.9	CL	3.0	Hnu = 0ppm Bα = 100cpm α = 0cpm
19	07909 1345	22 50/5 50/3	12	VERY DENSE GREY 5Y 5/1 SAND AND SILT, TRACE GRAVEL - TOP DRY BOTTOM MOIST	SM	4.5	Hnu = 0ppm Bα = 100cpm α = 0cpm
20 / 21	07945 1415	50/4 50/2	6	VERY DENSE GREY (5Y 5/1) SAND SOME SILT TRACE GRAVEL AND CLAY-MOIST	SM	4.0	Hnu = 0ppm Bα = 100cpm α = 0cpm
22	07946 1435	50/3 50/4	7	VERY DENSE GREY (5Y 5/1) SAND SOME SILT TRACE GRAVEL AND CLAY-MOIST	SM		Hnu = 0ppm Bα = 100cpm α = 0cpm
23 / 24	07947 1451	30 42 50/4	15	HARD GREY (5Y 5/1) silt and SAND SOME CLAY AND GRAVEL - DRY 23.8	ML	4.5+	Hnu = 0ppm Bα = 100cpm α = 0cpm
25	07948 1536	15 28 29	10	VERY STIFF GREY (5Y 5/1) clay and silt some SAND AND GRAVEL - DRY	CL	3.5	Hnu = 0ppm Bα = 100cpm α = 0cpm
26 / 27	07949 1621	10 19 26	13	STIFF OLIVE (5Y 5/3) CLAY SOME GRAVEL AND SILT, TRACE WOOD FRAGMENTS - DRY	CL	2.0	Hnu = 0ppm Bα = 100cpm α = 0cpm
28	07950 0857	18 22 24	14	Shelby TUBE HARD, OLIVE GREY (5Y 5/2) CLAY SOME SILT, TRACE GRAVEL 28.5 ft.	CL	4.5	Hnu = 0ppm Bα = 100cpm α = 0cpm Begin 1 13 88 Shelby tube Taken @ 0857 SAMPLE # 07950
				BOTTOM OF BORING			

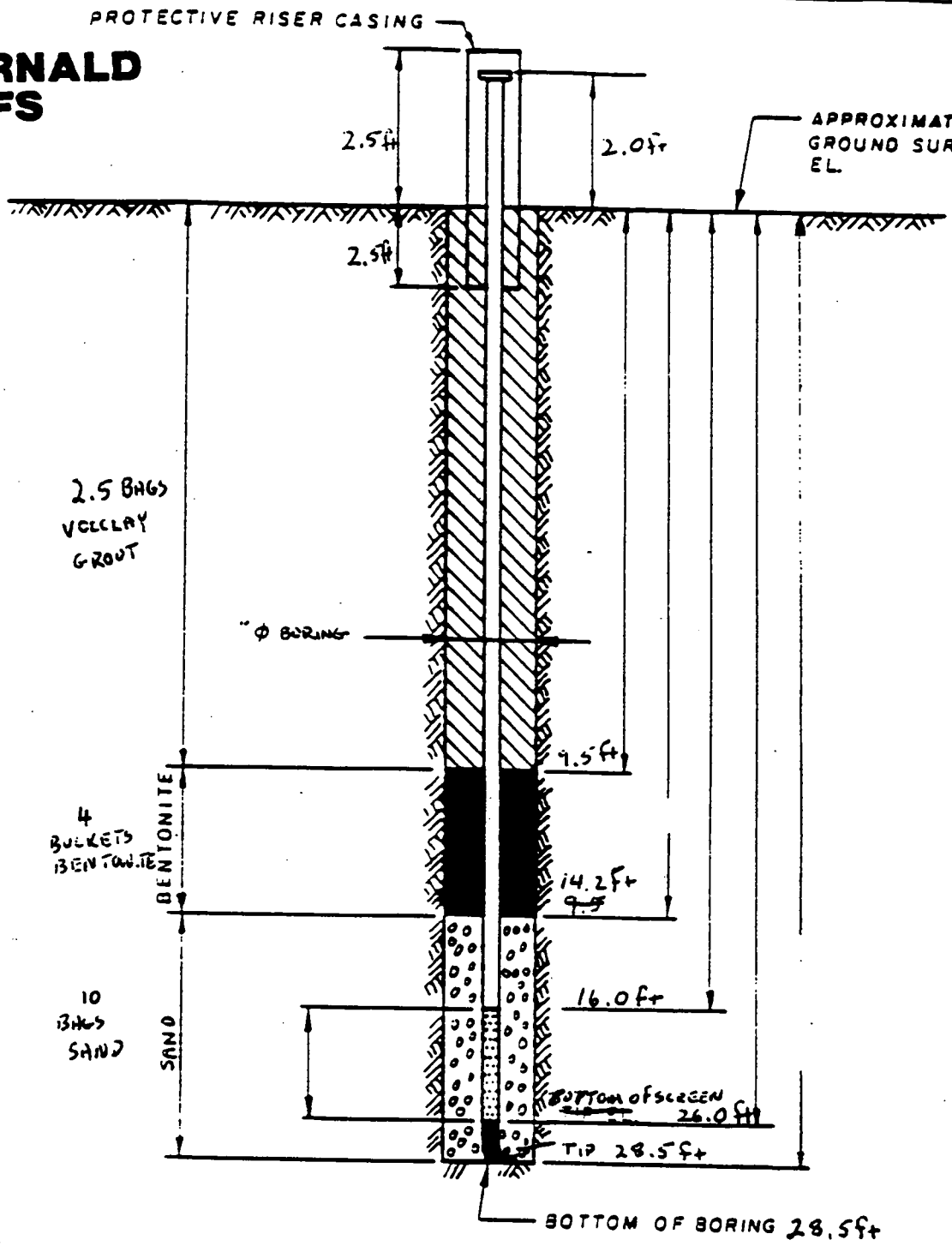
NOTES:

000453

402-11-86

BORING 199

FERNALD RI/FS



NOTES:

1. RISER PIPE IS IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~138~~ 1038 CB 3/23/94

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

WPK

DRAWN BY

000464

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91 **5709**

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. W. KEGLEY DATE 01 13 89
PROJECT NO. 602 T3.2
CHECKED BY R Galbreath DATE 2/6/89
BORING NO. ~~139~~ 1038 BB 1-5-89
PIEZOMETER NO. ~~135~~ 1038
DATE OF INSTALLATION 01 13 89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 TO 28.5 feet
FLUID NA FROM NA TO NA

TYPE OF BIT FLAT HEAD
CASING SIZE (S) USED:
SIZE 10 inch FROM 0.0 TO 28.5 feet
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 inch
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FEET

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 inch I.D. 4 inch
LENGTH OF PIPE SECTIONS 10 feet
JOINING METHOD ~~THREADED COUPLE~~ (FLUSH JOINT THREADED)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 feet
PROTECTIVE PIPE ~~O~~ I.D. 10 inch

OTHER PROTECTION LOCKABLE CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (feet)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 feet		588.61	
GROUND SURFACE	0.0		582.61	
BOTTOM OF PROTECTIVE PIPE	2.5 feet		580.11	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 ft	BOTTOM 9.5 ft	TOP 582.61	BOTTOM 573.11
BENTONITE	TOP 9.5 ft	BOTTOM 14.2 ft	TOP 573.11	BOTTOM 568.41
SAND	TOP 14.2 ft	BOTTOM 28.5 ft	TOP 568.41	BOTTOM 554.11
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM N/A
PERFORATED SECTION	TOP 16.0 ft	BOTTOM 26.0 ft	TOP 566.61	BOTTOM 556.61
PIEZOMETER TIP	28.5 feet		~~550~~ 554.11	
BOTTOM OF BOREHOLE	28.5 feet		554.11	
GWL AFTER INSTALLATION	N/A		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000465

FERNALD RI/FS

DLE 2/4/89

REVIEWED BY QA K.G. DATE 7/27/91

	Initial	Date
1st Key In		
2nd Key In		8/16
Verification		

123/88 WPL 216 D.2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~129~~ 1039 BB 1-5-89	COORDINATES: N 480729.12 E 1379659.05	DATE: 04-09-88
ELEVATION: 577.4 GROUND	GWL: Depth Date/Time	DATE STARTED: 04-08-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 04-09-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08431 0921 04-08	3 8 10	12	VERY STIFF, BROWN (10YR 3/2) CLAY ROOTLETS, DRY	CL	2.5	HNU = 0 α = – BG = 120 CPM
2 3	08432 0924 04-08	5 7 8	14	STIFF, GREY/BROWN, (10YR 4/1) CLAY DRY	CL	2.0	HNU = 0 α = – BG = 120 CPM
4	08433 0933 04-08	5 9 12	8	VERY STIFF, OLIVE/BROWN (5Y 4/3) MOTTLED, CLAY, DRY	CL	3.5	HNU = 0 α = – BG = 100 CPM
5 6	08434 0938 04-08	11 13 15	10	VERY STIFF, ~~OLIVE~~ GREY/BROWN (10YR 5/1) MOTTLED, CLAY, DRY	CL	2.5	HNU = 0 α = – BG = 100 CPM
7	08435 0941 04-08	15 15 18	12	VERY STIFF, GREY/BROWN (10YR 5/1) MOTTLED, CLAY, DAMP	CL	2.0	HNU = 0 α = – BG = 100 CPM
8 9	08436 0946 04-08	11 14 14	12	STIFF, GREY (2.5Y 6/2) CLAY, DAMP	CL	1.5	HNU = 0 α = – BG = 100 CPM
10 11	08437 1327 04-08		24	PUSHED SHELBY TUBE FROM 9.0 FT TO 11.0 FT. RECOVERED 2.0 FT.			HNU = 0 α = – BG = 100 CPM
12	08438 1414 04-08	4 6	10	MEDIUM STIFF, GREY, (5Y 5/1) SILTY CLAY, DAMP	CL	.5	HNU = 0 α = – BG = 100 CPM
13	08439 1421 04-08	4 7 11	14	MEDIUM STIFF, GREY (5Y 5/1) SILTY CLAY, DAMP	CL	1.0	HNU = 0 α = – BG = 100 CPM
14	08440 1426 04-08	10 12 19	12	MEDIUM STIFF, GREY (5Y 5/1) SILTY CLAY, DAMP	CL	1.0	HNU = 0 α = – BG = 100 CPM

NOTES:
CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST.
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 α = – BG = 140 CPM
LEL: 0 PPM LEL 21.6% O2

WATER ADDED TO BOREHOLE: 150 GALLONS

000466

402-11-86

FERNALD RI/FS

5709

REVIEWED BY: K.G. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1039	COORDINATES: See p1	DATE: 04-09-88
ELEVATION: See p1	GWL: Depth Date/Time	DATE STARTED: 04-08-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 04-09-88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08441 1430 04-08	17 20 17	14	MEDIUM STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE SAND, DAMP	1.0 CL		HNU = 0 α = – BG = 80 CPM
17	08442 1505 04-08	2 5 13	14	MEDIUM STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE SAND, DAMP 18.0	1.5 CL		HNU = 0 α = – BG = 80 CPM
18 19	08443 1508 04-08	6 12 15	14	MEDIUM DENSE, GREY (5Y 4/1) WELL GRADED, GRAVELLY SAND, WET.	SW		HNU = 0 α = – BG = 80 CPM
20 21	08444 1511 04-08	10 16 18	14	DENSE, GREY (5Y 4/1) WELL GRADED, GRAVELLY SAND, WET.	SW		HNU = 0 α = – BG = 80 CPM
22	08445 1513 04-08	14 20 21	14	DENSE, GREY (5Y 4/1) WELL GRADED, GRAVELLY SAND, WET. 22.5	SW		HNU = 0 α = – BG = 80 CPM
23	08446 1651 04-08	10 8 14	14	MEDIUM DENSE, GREY (5Y 4/1) CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE, WET 23.5	GC		HNU = 0 α = – BG = 80 CPM
24				VERY STIFF, GREY (5Y 4/1) CLAY, SOME FINE GRAVEL AND SILT, DRY	CL	2.5	
25	08447 1712 04-08	7 10 11	8	VERY STIFF, GREY (5Y 4/1) CLAY, SOME FINE GRAVEL AND SILT, DRY	CL	2.5	HNU = 0 α = – BG = 80 CPM
26							
27				BOTTOM OF BORING 27.0 FT			
28							
29							

NOTES:

000467

402-11-86

FERNALD RI/FS

DLG 2/4/89

REVIEWED BY Q.C. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

CPA

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 04-09-88
PROJECT NO. 602 3.2 CHECKED BY R Calkins DATE 2/6/89
BORING NO. ~~29~~ 1031 BB1-5-89
PIEZOMETER NO. ~~29~~ 1039 DATE OF INSTALLATION 04-09-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 27.0 FT.
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT TO 27.0 FT.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN
TOTAL PERFORATED AREA 11.0 FT.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (ft.)	
TOP OF RISER PIPE	~~2.5~~ 2.0 RWG 2/6/89		579.27	
GROUND SURFACE	0.0		577.4	
BOTTOM OF PROTECTIVE PIPE	2.5		574.9	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
BENTONITE	TOP 0.0	BOTTOM 8.0	TOP 577.4	BOTTOM 569.4
SAND (10-20)	TOP 8.0 FT	BOTTOM 27.0	TOP 569.4	BOTTOM 550.4
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 13.0	BOTTOM 24.0	TOP 564.4	BOTTOM 553.4
PIEZOMETER TIP	26.5 FT.		550.9	
BOTTOM OF BOREHOLE	27.0 FT.		550.4	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

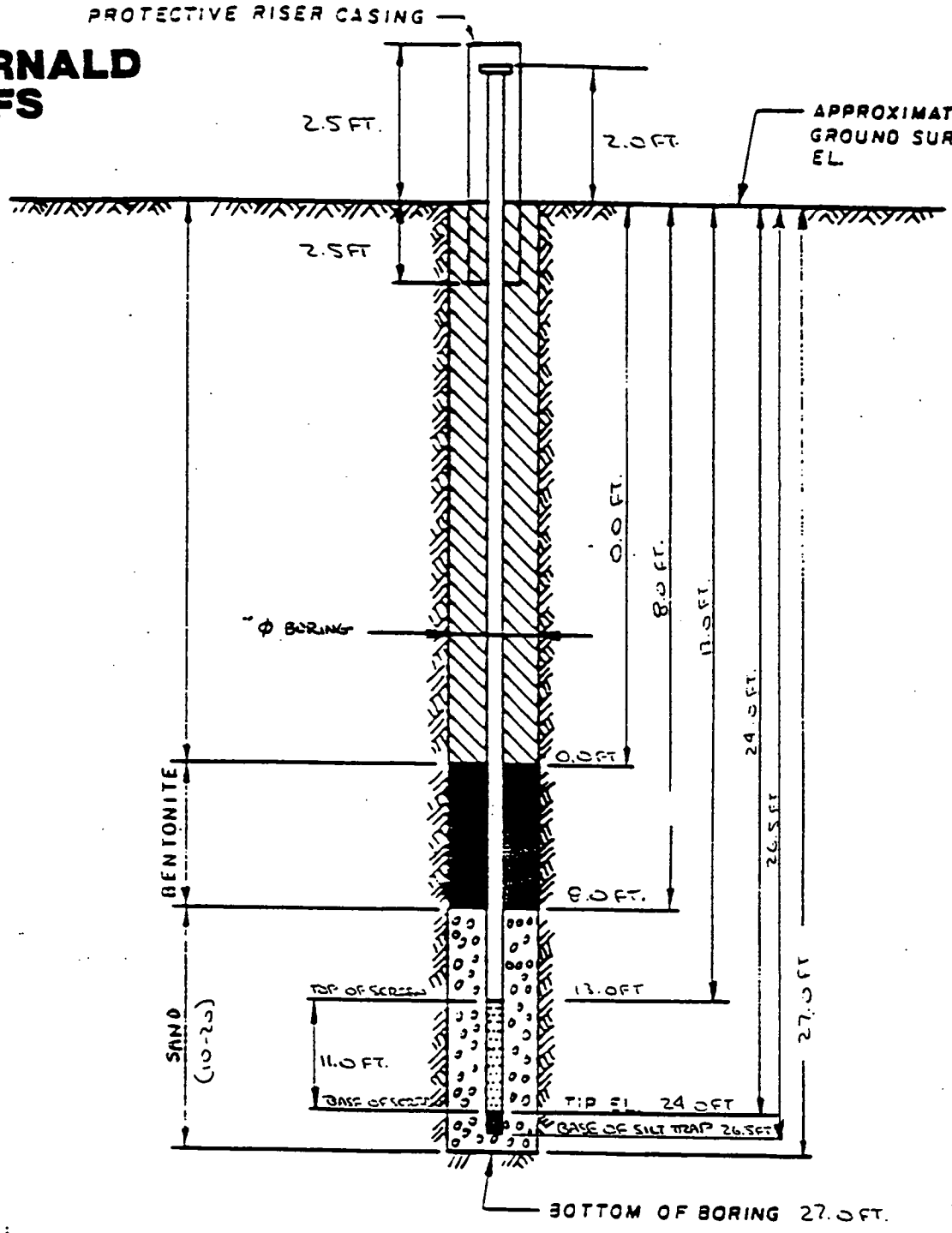
000468

409-11-86

REVIEWED BY QA K.G. 7/29/91 2:14PM 5709 BORING # ~~129~~ 1039

BB 1-5-89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY KLS

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL
04-09-88
PREPARED FOR

BORING # ~~129~~ 1039 BB 1-5-89

MATERIALS USED: 10-20 SAND (100 LB SACKS) - 7 SACKS
BENTONITE: 8 BUCKETS

000469

WEL LOG AND DRILLING REP RT

1040 ORIGINAL

470766

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Geological Survey
Fountain Square
Columbus, Ohio 43224 Phone (614) 466-5344

NO CARBON PAPER NECESSARY-FOR TRANSCRIBING

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP OR LOT NUMBER 31

OWNER Foxx Const Co ADDRESS 3031 Laybigh Rd Hamilton, O

LOCATION OF PROPERTY 4210 Morgan Ross Rd

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 55

Type of screen Cook brass #30 Length of screen 5" incl 3" Tail pipe

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 20 gpm Duration of test 4 hrs

Drawdown 8 ft Date 5/10/74

Static level (depth to water) 38' ft

Quality (clear, cloudy, taste, odor)

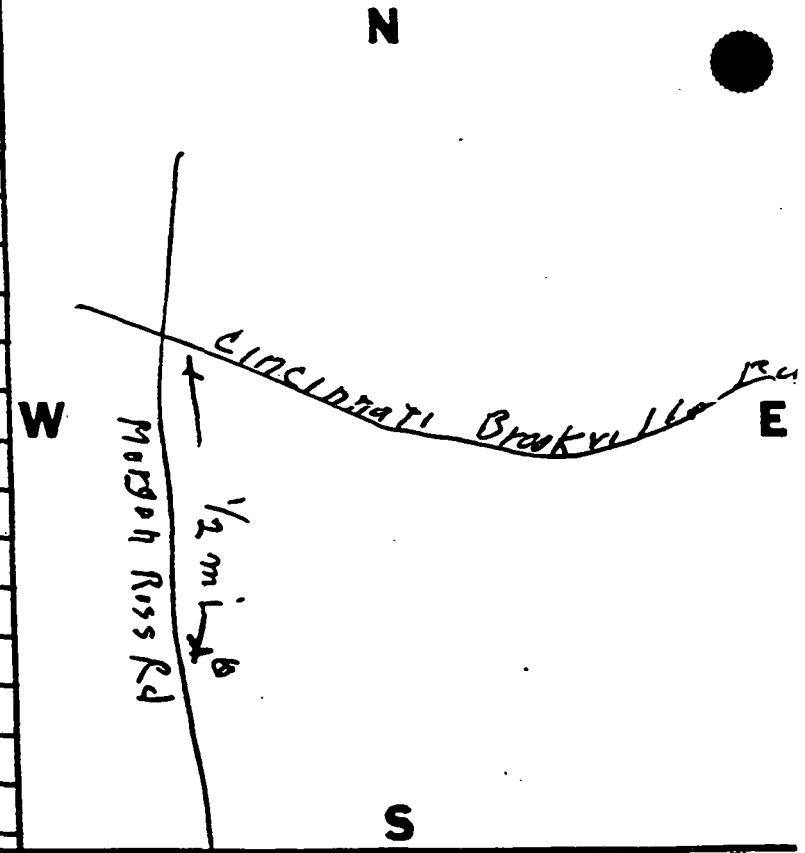
Pump installed by W Crane

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Topsoil clay	0 ft	11 ft
Blue clay	11	40
Sand & gravel	40	45
Blue clay	45	54
Sand & gravel	54	57
Blue clay	57	60

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



DRILLING FIRM Wm Crane DATE 7/10/74

ADDRESS Box 33 Shandon O SIGNED [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

000470

2

FERNALD RI/FS

DLG 2/4/88 **5709**

REVIEWED BY QA KG. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		5/16
3rd Key Verification	WPK	4/23/88

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~HT~~ 1641 GD 1-5-89	COORDINATES: 480550.16 N 1379798.62 E	DATE: 04-11-88
ELEVATION: 581.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 04-10-88
ENGINEER/GEOLOGIST: M. SLUMSKI	Depth N/A Date/Time N/A	DATE COMPLETED: 04-11-88
DRILLING METHODS: Cable Tool WPK 4/24/88		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08448 1409 04-10	2 4 7	12	STIFF YELLOW-BROWN CLAY (10YR 4/2) SOME FINE GRAVEL ROOTLETS, DRY	CL	2.0	HNU=0 α: — BG: 140 CPM
2 3	08449 1412 04-10	3 5 17	12	STIFF YELLOW-BROWN CLAY (10 YR 4/2) SOME FINE GRAVEL ROOTLETS, DRY	CL	2.0	HNU=0 α: — BG: 140 CPM
4	08450 1417 04-10	18 20 18	18	VERY STIFF YELLOW-BROWN (5Y 4/4) CLAY SOME FINE GRAVEL, DRY 4.0	CL	2.5	HNU: 0 α: — BG: 120 CPM
				STIFF GREY-BROWN, MOTTLED (10YR 3/1) CLAY, SOME FINE GRAVEL, DRY 4.5		2.0	
5 6	08451 1421 04-10	24 25 30	18	VERY STIFF YELLOW-BROWN GREY MOTTLED (10 YR 4/4) CLAY DRY	CL	3.0	HNU: 0 α: — BG: 120 CPM
7	08452 1426 04-10	24 26 24	14	STIFF GREY-YELLOW BROWN, MOTTLED, (10YR 5/1) CLAY, DRY	CL	2.0	HNU: 0 α: — BG: 120 CPM
8 9	08453 1428 04-10	25 28 27	8	STIFF GREY-YELLOW BROWN, MOTTLED, (10YR 5/1) CLAY, DRY	CL	2.0	HNU: 0 α: — BG: 120 CPM
10 11	08454 0908 04-11			PUSH SHELBY TUBE FROM 9.0 FT TO 11.0 FT. RECOVERED: .75 FT			HNU: 0 α: — BG: 120 CPM
12	08455 0937 04-11	3 9	12	STIFF, GREY (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.0	HNU: 0 α: — BG: 120 CPM
13	08456 0940 04-11	5 6 8	12	STIFF, GREY (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.0	HNU: 0 α: — BG: 100 CPM
14	08457 0944 04-11	5 5 7	12	STIFF, GREY (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.0	HNU: 0 α: — BG: 100 CPM

NOTES: CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER HARRY DYKES JR
ASSISTANT JOHN VANDING
WATER ADDED TO BOREHOLE: 150 GALLONS

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU=0
α: —
BG: 140 CPM
LELO$_2$: 0 PPM LEL
20.6% O$_2$

000471

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~IAT~~ 1041 BB,-5-89	COORDINATES: See page 1	DATE: 04-11-88
ELEVATION: See page 1	GWL: Depth N/A Date/Time N/A	DATE STARTED: 04-10-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth N/A Date/Time N/A	DATE COMPLETED: 04-11-88
DRILLING METHODS: Cable tool WPK 4/24/88		PAGE 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08458 0948 04-11	3 4 4	12	STIFF, GREY (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.0	HNU = 0 α = — BG = 100 CPM
17 18	08459 0951 04-11	4 4 6	12	STIFF, GREY (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.0	HNU = 0 α = — BG = 100 CPM
19	08460 1100 04-11	1 5 6	14	STIFF, GREY (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.0	HNU = 0 α = — BG = 100 CPM
20 21	08461 1102 04-11	3 4 4	18	STIFF, GREY, (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.0	HNU = 0 α = — BG = 100 CPM
22	08462 1115 04-11	2 2 4	18	STIFF, GREY (5Y5/1) CLAY, SOME SILT, DAMP	CL	2.0	HNU = 0 α = — BG = 100 CPM
23 24 25 26 27 28 29				BOTTOM OF BORING @ 22.5 FT			

NOTES:

000472

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91 D.G. 2/4/89 5709

	Initial	Date
1st Key In		
2nd Key In		011889
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Slusarski DATE 04-11-88
PROJECT NO. 602 3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~1AT~~ 1041 BB1-5-89
PIEZOMETER NO. ~~1AT~~ 1041 DATE OF INSTALLATION 04-11-88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 0.0 FT TO 22.5 FT	SIZE 10" ID FROM 0.0 FT TO 22.5 FT
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS N/A
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD Screw Type
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.	Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION Locking Cap
PROTECTIVE PIPE O.D. 10 3/4 in.	

ITEM	DISTANCE ABOVE/BELOW * GROUND SURFACE (FT)		ELEVATION (ft)	
TOP OF RISER PIPE	~~3.5~~ 3.0 RMG.		578.8	
GROUND SURFACE	0.0		581.3	
BOTTOM OF PROTECTIVE PIPE	1.5		579.8	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
BENTONITE	TOP 0.0	BOTTOM 5.0	TOP 581.3	BOTTOM 576.3
SAND (10-20)	TOP 5.0	BOTTOM 22.5	TOP 576.3	BOTTOM 558.8
GRAVEL	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 10.0 FT.	BOTTOM 20.0 FT	TOP ~~N/A~~ 571.3 K.G. 7/29/91	BOTTOM 561.3
PIEZOMETER TIP	22.5		558.8	
BOTTOM OF BOREHOLE	22.5		558.8	
GWL AFTER INSTALLATION	N/A		N/A	

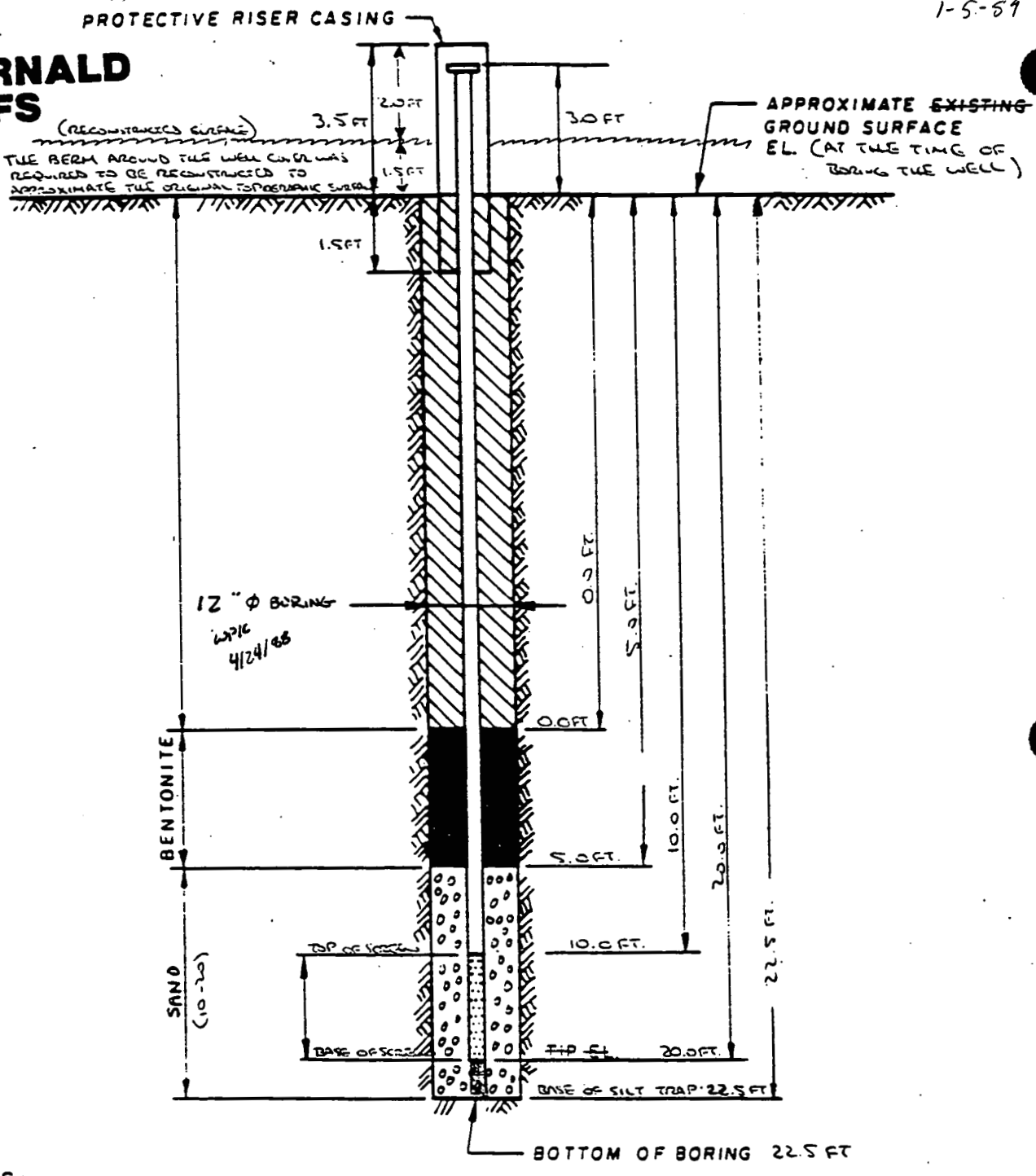
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒ 000473
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS * All measurement were made from the excavated ground surface which existed during the drilling of the well. After the well was constructed site restoration was required by WMCO. The berm was reconstructed at the location of the well. The ground surface is now 1.5 ft higher than the surface which existed at the time of drilling. The protective pipe stands ~2.0 ft above the present ground surface.

REVIEWED BY GA K.G. DATE 7/29/91 DLG 2/4/89

BORING # ~~14~~ 1041 BB 1-5-89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY MCS

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL #1041
04-11-88
PREPARED FOR
BORING # ~~14~~ 1041
BB 1-5-89

MATERIALS USED: 10-20 SAND (100 LB SACKS) - 8 BAGS
BENTONITE: 7 BUCKETS

000474

QC/D#/2.4.89

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: BB-589 ~~1442~~ 1042	COORDINATES:	DATE: 4-21-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/21/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 04/21/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See Boring 2042 For Soil Lithology (RLG 2/6/89)			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

NOTES:

I) Drilling Contractor: Pennsylvania Drilling Co
Driller: Tim Harris
Helper: Craig Coulter

II Background Measurements
A) HNU = 0 B) α = 0 C) γB = 1240 cpm

III Water 100 gallons

IV Color Via Munsell Color Chart

402-11-86

QC/DH/2.489

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: BB ~~142~~ 1D42	COORDINATES:	DATE: 4-21-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/21/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 04/21/88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 2	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16				See Boring 2042 RLB 2/6/89			
17				FOR			
18				Soil Lithology			
19							
20							
21				Bottom of Boring 21 ft			

NOTES:

000476

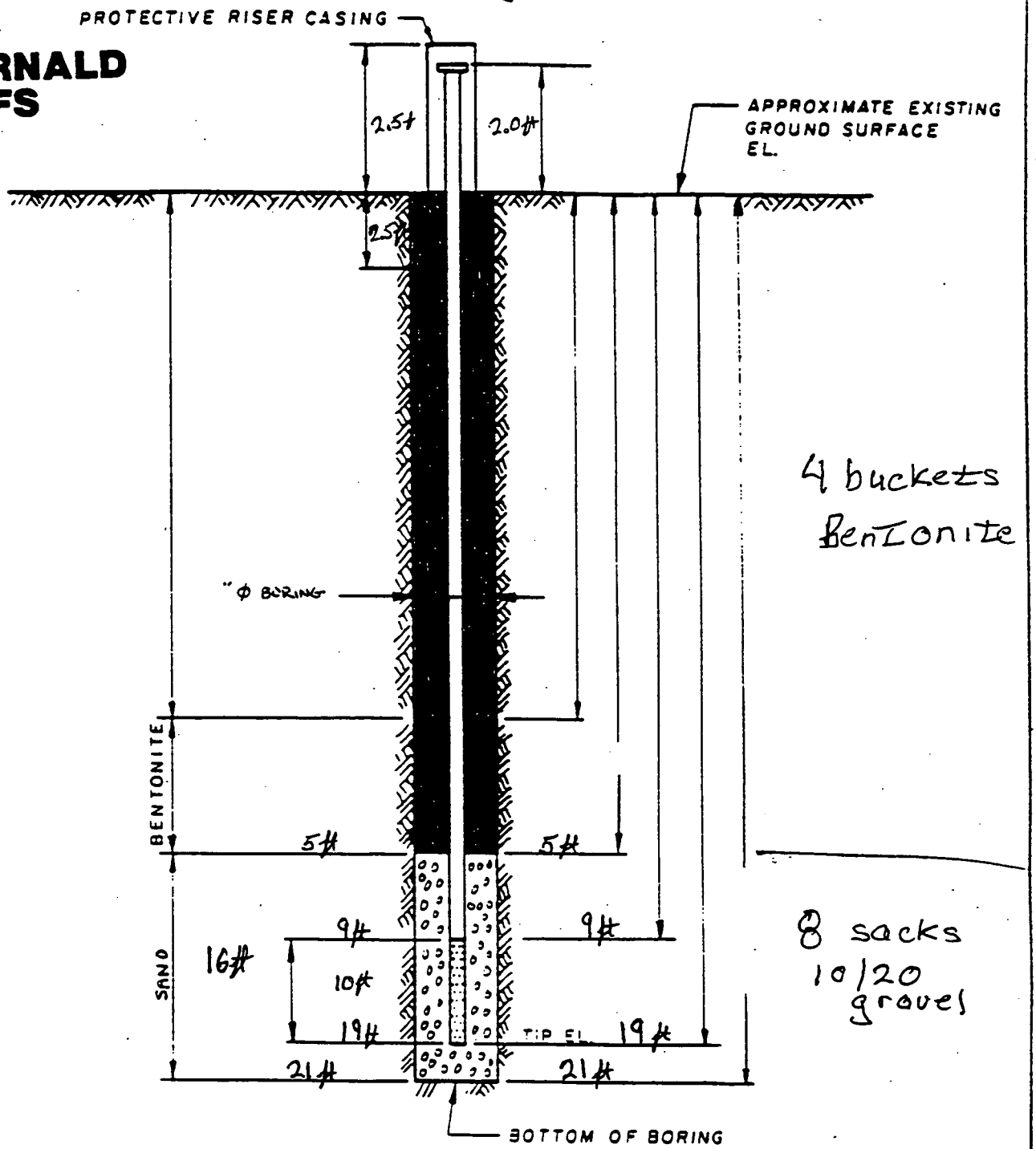
402-11-86

5709

DC/DH/2.4.89

Monitoring Well #~~142~~ 1042 BB 1-5-89

FERNALD RI/FS



4 buckets Bentonite

8 sacks 10/20 gravel

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1042

PREPARED FOR

FMPC RI/FS

000477

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS T32 FIELD ENG./GEO. M. Goldberg DATE 04/21/88
PROJECT NO. 602 CHECKED BY R Galloway DATE 2/6/89
BORING NO. 142 / 042 BB 1-5-89
PIEZOMETER NO. N/A 1042 DATE OF INSTALLATION 04/21/88

BOREHOLE DRILLING

DRILLING METHOD Water
DRILLING FLUID (S) USED:
FLUID _____ FROM 3 ft TO 21 ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Flat Head
CASING SIZE (S) USED:
SIZE 10" FROM 0 ft TO 21 ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 inches
TOTAL PERFORATED AREA 10 ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" inches I.D. 4" inches
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD Thread and couple

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft
PROTECTIVE PIPE O.D. 10" inches

OTHER PROTECTION Lockable cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 Ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 Ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP	BOTTOM
BENTONITE	TOP 0 ft	BOTTOM 5 ft	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP 5 ft	BOTTOM 21 ft	TOP	BOTTOM
PERFORATED SECTION	TOP 9 ft	BOTTOM 19 ft	TOP	BOTTOM
PIEZOMETER TIP	21 ft			
BOTTOM OF BOREHOLE	21 ft			
GWL AFTER INSTALLATION	5.3 Ft @ 0830 04/22/88			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000478

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA K6 DATE 8/7/91 5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 5.2	
BORING NUMBER: BB 1-5-89 242 2042	COORDINATES: 480344.27 N 1379592.73 E	DATE: 4/11/88
ELEVATION: 575.58	GWL: Depth – Date/Time –	DATE STARTED: 04/11/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth – Date/Time –	DATE COMPLETED: 04/19/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	CE E 6 7	2 3 6	14"	Very STIFF Dark Yellowish Brown clay (10YR 4/4) DRY 1.5	CL	2.5	Hnu=0 α=0 δB=90 0845
2 3	CE E 6 8	6 10 9	14"	Very STIFF Dark Brown clay (10YR 3/3) DRY 3.0	CL	2.5	Hnu=0 α=0 δB=90 0850
4	CE E 6 9	10 11 11	18"	STIFF Dark Yellowish Brown clay (10YR 4/6) DRY	CL	1.0	Hnu=0 α=0 δB=90 0852
5 6	CE E 7 0	E 6 8	8"	STIFF Dark Yellowish Brown clay (10YR 4/6) DRY 6.5	CL	1.0	Hnu=0 α=0 δB=90 0855
7	CE E 7 1	5 6 6	18"	Loose Yellowish Brown silty sand (10YR 5/8) WET 7.0	SM		Hnu=0 α=0 δB=90 0900
8 9	CE E 7 2	6 6 7	18"	STIFF light gray silty clay (10YR 7/1) wet STIFF light gray silty clay (10YR 7/1) WET. Trace sand wet 9.5	CL CL	1.5 1.0	Hnu=0 α=0 δB=100 Pushed Shelby No.08874@1330 0903
10	CE E 7 3	6 8 10	18"	STIFF Yellowish Brown silty clay (10YR 5/8) Trace sand WET 10.5	CL	1.0	Hnu=0 α=0 δB=100 0905
11 12	OE 4 9 0	4 7 6	12"	STIFF light gray silty clay w/ sand (10YR 7/1) WET 12ft	CL	1.0	Hnu=0 α=0 δB=100 1355
13	OE 4 9 1	9 7 13	14"	Medium dense light gray silty sand (10YR 7/1) WET	SM		Hnu=0 α=0 δB=100 1400
14 15	OE 4 9 2	9 11 13	14"	Medium dense gray silty sand (10YR 5/1) WET	SM		Hnu=0 α=0 δB=100 1405

NOTES:

I) Drilling Contractor: Pennsylvania Drilling Co
Driller: Tim Harris
Helper: Craig Coulter

II) Background Measurements 000479
A) HNU=0 B) α=0 C) δB=140ppm

III) Water used = 600 gallons

IV Color via Muncell Color chart

402-11-86

ac/D # 2-4-89

FERNALD RI/FS REVIEWED BY QA KL DATE 8/7/91

	Initial	Date
1st Key In		
2nd Key In		8/14
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB 1-5-89 242 2042	COORDINATES: Seep1	DATE:
ELEVATION: Seep1	GWL: Depth 9.3 ft Date/Time 04/12/88 0820	DATE STARTED: 04/11/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 4/19/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08493	11 12 15	18"	Medium dense gray silty sand (10YR5/1) wet 16.5ft	SM	<1	Hna=0 α=0 δB=90 1410
17	08494	8 9 9	18"	Medium dense gray sand (10YR5/1) wet, Trace silt 18.0	SP	<1	Hna=0 α=0 δB=90 1415
18							
19	08495	3 3 3	10"	Stiff gray clay (10YR5/1) wet Trace sand 19.5	CL	1.5	Hna=0 α=0 δB=96 1535
20	08496	10 15 11	8"	Medium dense gray sand (10YR5/1) wet 20.5	SW	<1	Hna=0 α=0 δB=90 1540
21				Hard Dark gray clay (5Y 4/1) DRY	CL	≥4	
22	08497	N/A	12"	Shelby Tube	N/A	N/A	Pushed 1.5ft Recovery 1.0ft 1630
23	08498	6 10 12	14"	Medium Stiff Dark gray clay (5Y 4/1) DRY	CL	1.0	Hna=0 α=0 δB=90 04/12/88 0830
24	08499	3 4 8	18"	Stiff Dark gray clay (5Y 4/1) DRY.	CL	2.0	Hna=0 α=0 δB=100 0845
25							
26	08500	1 2 3	10"	Stiff olive gray clay (5Y 5/2) Trace gravel. DRY	CL	1.5	Hna=0 α=0 δB=90 0920
27	08501	10 13 16	14"	Very Stiff Dark gray clay (5Y4/1) trace gravel. DRY	CL	4.0	Hna=0 α=0 δB=90 0940
28							
29	08502	10 16 21 24	20"	Very Stiff Dark gray clay (5Y4/1) Trace gravel. DRY	CL	4.0	Hna=0 α=0 δB=90 0950
30							

NOTES:

000480

402-11-86

FERNALD RI/FS

QC/DM/2-4-89

REVIEWED BY QA K6 DATE 8/7/91

	Initial	Date
1st Key In		
2nd Key In		8/16
Hard Copy Verified		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: BB 1-5-59 2042 2042	COORDINATES: See P'	DATE:
ELEVATION: See P'	GWL: Depth – Date/Time –	DATE STARTED: 04/11/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth – Date/Time –	DATE COMPLETED: 4/19/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	08503	8 13 50	18"	Hard gray clay (5Y5/1) trace gravel. DRY	CL	7.0	Hna=0 α=0 δB=90 1020
32	08504	15 14 21	18"	Very STIFF gray clay (5Y5/1) Trace gravel. DRY.	CL	3.0	Hna=0 α=0 δB=90 1030
33							
34	08505	8 14 15	18"	Very STIFF gray clay (5Y5/1) trace gravel. DRY	CL	2.5	Hna=0 α=0 δB=90 1050
35	08506	8 12 14	18"	Very STIFF gray clay (5Y5/1) trace gravel. DRY	CL	2.0	Hna=0 α=0 δB=90 1320
36				36.5			
37	08507	5 9 20	18"	Very STIFF Dark Yellowish Brown clay (10YR4/6) DRY. Trace gravel 37.5	CL	2.5	Hna=0 α=0 δB=90 1340
38	08508	10 16 50	10"	Very Dense yellowish Brown Sand (10YR 5/8) DRY	SW	<1	Hna=0 α=0 δB=90 1400
39							
40							
41							
42							
43							
44							
45							

NOTES:

000481

402-11-86

QC/DH/2-4-89

	Initial	Date
1st Key In		
2nd Key In		8/16
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA KG DATE 8/9/91

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: 1-5-89 242 2042	COORDINATES: Seep1	DATE:
ELEVATION: Seep1	GWL: Depth - Date/Time -	DATE STARTED: 04/11/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth - Date/Time -	DATE COMPLETED: 4/19/88 RMP 2/6/8
DRILLING METHODS: Cable Tool		PAGE 4 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	08 5 09	25 90 50	18"	Very dense Gravel (10YR/5/8) DRY yellowish Brown 46	GW	<1	Hna=0 α=0 δB=80 1610
47				Very dense yellowish Brown sand (10YR5/8) DRY	SW	<1	04/13/88
48							
49							
50	08 5 10	10 23 27	16"	Dense yellowish Brown sand (10YR 5/8) DRY	SW	<1	Hna=0 α=0 δB=80 0910
51							
52							
53							
54							
55	08 5 11	6 10 14	14"	Dense yellowish Brown sand (10YR5/8) wet	SW	<1	Hna=0 α=0 δB=80 1040
56							
57							
58							
59							
60							

NOTES:

000482

402-11-86

QC/DH/2-4-89

FERNALD RI/FS

REVIEWED BY QA KL DATE 8/7/91

5709

	Initial	Date
1st Key In		
2nd Key In		8/16
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: 88 1-5-89 242 2042	COORDINATES: See P1	DATE:
ELEVATION: See P1	GWL: Depth 54.85 Date/Time 04/13/88-1905	DATE STARTED: 04/11/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth 56.0 Date/Time 04/20/88-0840	DATE COMPLETED: 4/19/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	08 5 1/2	12 19 23	18"	Dense Yellowish Brown gravel (10YR5/8) Trace sand & wet	GW	<1	Hnu=0 α=0 δB=80 1110
62							
63							
64							
65							
66	08 5 1/3	18 16 19	16"	Dense Yellowish Brown gravel (10YR5/8) Wet	GW	<1	Hnu=0 α=0 δB=80 1430
67							
68				Bottom of Boring 68 Ft			
69							
70							
71							
72							
73							
74							
75							

NOTES:

000483

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA KG DATE 8/7/91

	Initial	Date
1st Key In		
2nd Key In		2/1/89
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS T3.2 FIELD ENG./GEO. M. Goldberg DATE 04/14/88
PROJECT NO. 602 CHECKED BY R Gallowayette DATE ~~[illegible]~~ 2/1/89
BORING NO. ~~242~~ 2042 RB 1-5-89
PIEZOMETER NO. N/A 2042 DATE OF INSTALLATION 04/19/88

BOREHOLE DRILLING

DRILLING METHOD Water	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID _____ FROM 3 ft TO 68 ft	SIZE _____ FROM 0 TO 68 ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4" inches
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD Thread and couple
TOTAL PERFORATED AREA 15 Ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE O.D. 10" inches	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0 ft		577.58	
GROUND SURFACE	0.0		575.58	
BOTTOM OF PROTECTIVE PIPE	2.5 ft		573.08	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0 ft	BOTTOM 42.9 ft	TOP 575.58	BOTTOM 532.68
BENTONITE	TOP 42.9 ft	BOTTOM 46 ft	TOP 532.68	BOTTOM 529.58
SAND	TOP N/A	BOTTOM N/A	TOP –	BOTTOM –
GRAVEL	TOP 46 ft	BOTTOM 68 ft	TOP 529.58	BOTTOM 507.58
PERFORATED SECTION	TOP RMG 3/6/89 50 ft	BOTTOM 66 ft	TOP 524.58	BOTTOM 509.58
PIEZOMETER TIP	68 ft		507.58	
BOTTOM OF BOREHOLE	68 ft		507.58	
GWL AFTER INSTALLATION	56 ft @ 0845 4/20/88		Variable	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Screen Interval is 16 ft Due to No 15 ft screens left, a 10 ft and 5 ft were put Together Total length 16 ft.

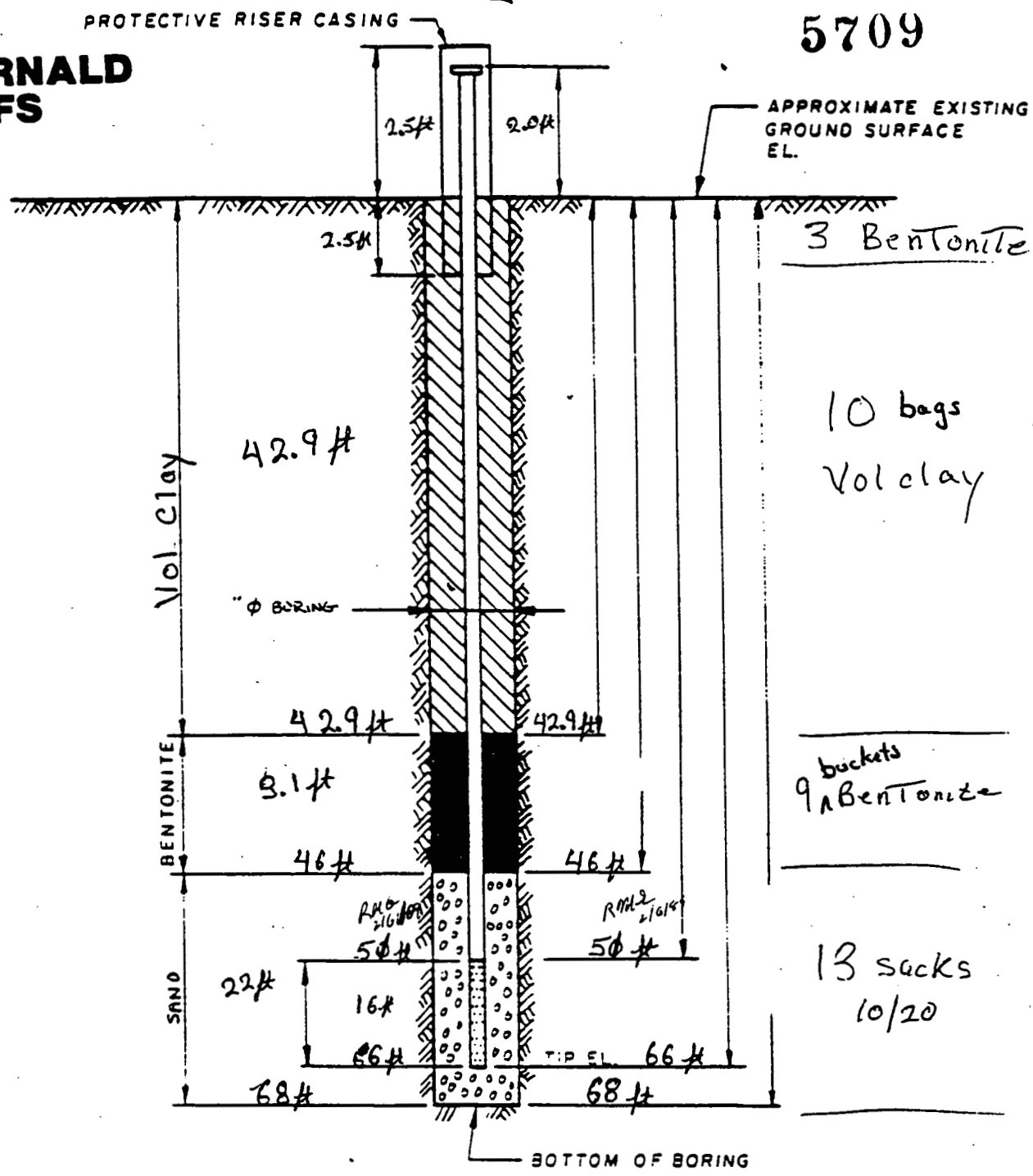
000484

QC/DH/2-4-89

Monitoring Well # ~~2422~~ 2042 BB

5709

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 2042

PREPARED FOR
FMPC RI/FS

DRAWING NUMBER
CHECKED BY
APPROVED BY
DRAWN BY

REVIEWED BY QA DATE 8/1/89

000485

FERNALD RI/FS

REVIEWED BY QA KG DLG 2/4/89 DATE AUG 31 1989

	Initial	Date
1st Key In		
2nd Key In		8/18
Hard Copy Verification		4/23/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB 1-5-89 ~~243~~ 2043	COORDINATES: 48120.81N 1377051.91E	DATE: 12/14 & 12/15/87
ELEVATION: 578.26	GWL: Depth – Date/Time	DATE STARTED: 12/14/87
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time	DATE COMPLETED: 12/16/87
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				Refer to sample descriptions from well ~~243~~ 3043 RMB 2/6/89			
3							
5	ST 07795	NA	24"	SHELBY TUBE	CL		(1130)
7							
10							
	S 07796	12 11 13		Duplicate Sample Taken	CL	1.5	Anu=0 βB=20-40 α=0 (1348)
13							
15	ST 07797	NA	21"	SHELBY TUBE "	CL		(1618)
18							
20							
23							
25							
27							
30							

NOTES:

I.) Background Measurement 12/14 & 12/15/87 = α=0
Anu=0
βB = 40-60 c.p.m.

II.) Drilling Contractor: Pennsylvania Drilling
Drilling Personnel.
Driller: Tim Harris
Helper: Craig Coulter

III. WATER USED 12/14 = 13 gal.
" " 12/15 = 80 gal.

000486

FERNALD RI/FS

REVIEWED BY QA K6 DATE DLG 2/4/89

5709

AUG 07 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BP 1-5-89 ~~2-45~~ 2043	COORDINATES: See pl	DATE: 12/15 & 12/16/87
ELEVATION: See pl	GWL: Depth — Date/Time —	DATE STARTED: 12/14/87
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 12/16/87
DRILLING METHODS: Cable Tool		PAGE 2 OF 3

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
32				See Descriptions on Soil log ~~343~~ 3043 RMG 2/10/89			
35							
40							End of Day 12/15/87 Start Day 12/16/87
45							
50							
55							
60							

NOTES:

I.) Background Measurements 12/16/87

Hnu = 0

α = 0

βγ = 40-50 c.p.m.

II.) Water Used 12/16/87 = 29 gallons

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		8/8
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 07 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: ~~343~~ 3043	COORDINATES: See pl		DATE: 12/16/87
ELEVATION: See pl	GWL: Depth 57'	Date/Time 12/16/87 @ 1100	DATE STARTED: 12/14/87
ENGINEER/GEOLOGIST: B. Dunning	Depth	Date/Time	DATE COMPLETED: 12/16/87
DRILLING METHODS: Cable Tool			PAGE 3 OF 3

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60				See Soil Descriptions on Log for well ~~343~~ 3043 2/6/89 RMG			
63							
65	S 07798	9 14 17	36"	Duplicate Sample Taken	SW		Hnu = 0 αβ = 40-60 cpm. α = 0 (1452)
68							Drilled Well To 69.3'
				69.3 ↑ Bottom of Boring			
70							Had to Drive 10" casing to 73' & keep a full hydrostatic head in to keep sand from coming into borehole.
75							
80							

NOTES:

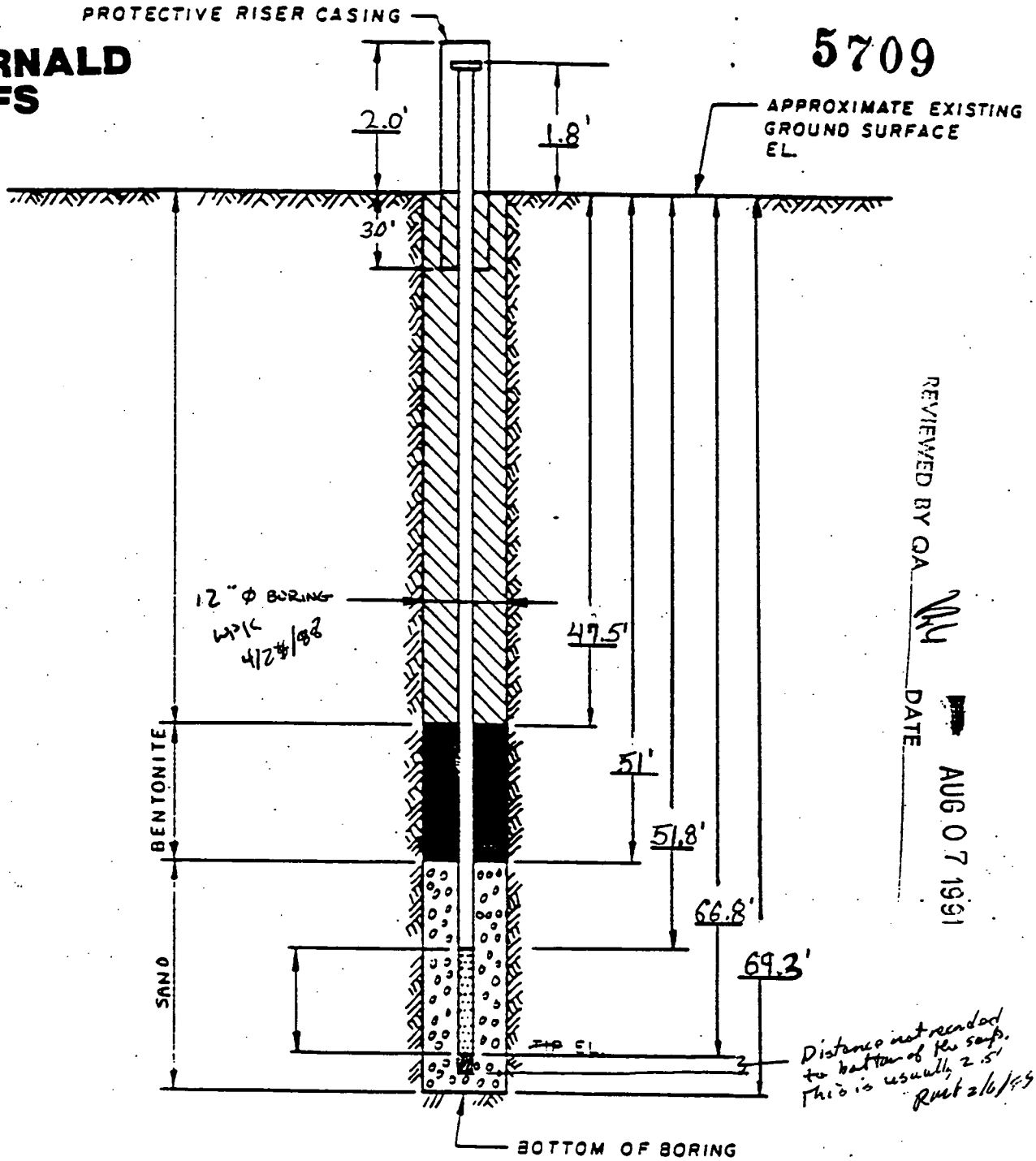
000488

DLG 2/4/19 2043 BB 1-5-89 # 34

MONITOR WELL ~~243~~

FERNALD RI/FS

5709



Distance not recorded to bottom of the scrp. This is usually 2.5' RWT 2/6/89

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

REVIEWED BY QA

DATE AUG 07 1991

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~243~~ 2043 RWT 2/6/89

PREPARED FOR

FMPC RI/FS

FERNALD RI/FS

REVIEWED BY QA KG ~~DAC~~ AUG 0 1 1991

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 602 T 3.2
BORING NO. ~~243~~ 2043 BB 1-5-89
PIEZOMETER NO. NA 2043

FIELD ENG./GEO. B. Dunning DATE 12/18/87
CHECKED BY R Galbraith DATE 2/6/89
DATE OF INSTALLATION 12/18/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 69.2
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer-Type
CASING SIZE (S) USED:
SIZE 10" FROM 0' TO 69.2'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel
DIAMETER OF PERFORATED SECTION 4" Ø
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH ~~10'~~ 15' RHG 2/6/89

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10' & 2½'
JOINING METHOD Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE I.D. 10 inches

OTHER PROTECTION LOCKING CAP WITH LOCK.

ITEM	DISTANCE ABOVE BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	+1.8 FT		580.06	
GROUND SURFACE	0.0		578.26	
BOTTOM OF PROTECTIVE PIPE	3.0'		575.26	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 47.5'	TOP 578.26	BOTTOM 530.76
BENTONITE	TOP 47.5'	BOTTOM 51'	TOP 530.76	BOTTOM 527.26
SAND	TOP 51.0'	BOTTOM 69.3	TOP 527.26	BOTTOM 508.96
GRAVEL	TOP NA	BOTTOM NA	TOP —	BOTTOM —
PERFORATED SECTION	TOP 51.8	BOTTOM 66.8	TOP 526.46	BOTTOM 511.46
PIEZOMETER TIP	NA		—	
BOTTOM OF BOREHOLE	69.3		508.96	
GWL AFTER INSTALLATION	57.0' TOC WJC 4/24/89		√ Arrible	

IS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS ~~000490~~

Ohio correction was made by Brad Dunning at the time this form was completed. DLG 2/4/89 5709pAC

FERNALD RI/FS

REVIEWED BY QA BG DATE AUG 16 1991

4/23/88 WPIC RIG # 1

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS Task 3.2		
BORING NUMBER: B3 7-5-89 ~~3043~~ 3043	COORDINATES: N 481 770.91 E 1377060.55	DATE: 12/4/87	
ELEVATION: 578.50 Conc.	GWL: Depth Date/Time	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 1 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	S 0 7 6 1 4	2 6 7	12"	Very soft, very dark grayish-brown clay (2.5 Y, 3/2). Silty & Dry with rootlets	OL	<.5	Hnu = 0 α = 0 γβ = 20-40 cp.m. Time Sample Collected (0800)
2	S 0 7 6 1 5	5 7 8	12"	Very stiff, grayish-brown clay (2.5 Y, 5/2) Damp	CL	3.5	Hnu = 0 α = 0 γβ = 20-50 cp.m (0810)
3 4	S 0 7 6 1 6	11 11 14	12"	Stiff, light olive-brown clay. (2.5 Y, 4/4) with a trace of very fine gravel. Damp	CL	2.0	Hnu=0 α = 0 γβ = 20-50 cp.m. (0835)
5 6	S 0 7 6 1 7	9 11 10	15"	Soft, light olive-brown clay (2.5 Y, 5/6) Silty & Damp	CL	.50	Hnu=0 α = 0 γβ = 20-40 cp.m. (0840)
7	S 0 7 6 1 8	8 11 7	9"	Very soft, light olive-brown clay (2.5 Y, 5/6) Fair amount of moisture noted.	CL	<.25	Hnu=0 α = 0 γβ = 20-40 cp.m. (0850)
8 9	S 0 7 6 1 9	10 10 10	18"		CL		a/a (1055)
10	S 0 7 6 2 0	7 8 11	18"	Medium stiff, olive-yellow clay (2.5 Y, 6/8) Damp 10' 10.5' Stiff Olive-brown clay (2.5 Y, 4/4) Moist 10' 10.5'	CL	1.0	a/a (1105)
11	S 0 7 6 2 1	12 11 13	18"	11' Medium stiff, light olive-brown clay (2.5 Y, 5/6) Dry 11.2' Stiff, dark grayish-brown clay (2.5 Y, 4/2) 11.7' 11'	CL	1.5	Hnu=0 α = 0 γβ = 20-50 cp.m. (1120)
12	S 0 7 6 2 2	3 7 4	18"	Medium dense, light olive brown silty sand (2.5 Y, 5/6) Damp 12.5' 12.5'	SM		Hnu=0 α = 0 γβ = a/a (1130)
13				13' Medium dense, grayish-brown sand (2.5 Y, 5/2) 13'	SC		
				Medium dense, light olive-brown sand (2.5 Y, 5/6)	SP		
14 15	S 0 7 6 2 3	11 13 17	18"	Very stiff, dark gray clay (5 Y, 4/1) with a trace of fine gravel Damp	CL	2.0	Hnu=0 α=0 γβ = a/a (1140)

NOTES:

I.) Drilling Contractor : Pennsylvania Drilling
DRILLER : Tim Harris
HELPER : Craig Coulter

II.) Background Measurements
A.) Hnu = 0 B) α = 0 C) γβ = 40-60 cp.m.

III. WATER USED 12/4
20 gallons.

IV. a/a = As Above

V) Samples via Munsell Colors, ASTM

000491

402-11-88

FERNALD RI/FS

DIG 3/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC

REVIEWED BY QA KG DATE AUG 16 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	TASK 3.2
BORING NUMBER: 88 7-5-89 ~~3043~~ 3043	COORDINATES: See P1	DATE: 12/4 & 12/5/87
ELEVATION: See P1	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 2 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	S 0 7 6 2 4	7 8 12	18"	Stiff, dark grayish-brown (2.5Y, 4/2) clay. Slightly silty. Dry	CL	1.5	Hnu = 0 α = 0 γβ = 20-60 c.p.m. (1540)
17	S 0 7 6 2 5	7 8 11	12"	17.5' 17.5'			Hnu = 0 α = 0 γβ = 20-60 c.p.m. (1550)
18				Medium dense, dark gray sand (5Y, 4/1), silty with some gravel	SP	–	
19	S 0 7 6 2 6	5 9 9	18"	Stiff, olive gray clay (5Y, 5/2) with a trace of gravel. Dry	CL	1.55	End of Day 12-4-87 Start Day 12-5-87 Hnu=0 α=0 γβ=50 c.p.m. (0830)
20	S 0 7 6 2 7	14 22 27	15"				Hnu = 0 α = 0 γβ = 40-60 c.p.m. (0841)
21							
22	S 0 7 6 2 8	8 11 16	6"	Medium dense, olive gray clayey gravel (5Y, 5/2), with some coarse gravel and rock fragments. Moist	GC	–	Hnu = 0 α = 0 γβ = 40-60 c.p.m. (0944)
23	S 0 7 6 2 9	15 37 29	18"	Hard, dark gray clay (5Y, 4/1) with a trace of fine to coarse gravel Damp.	CL	4.5+	Hnu = 0 α = 0 γβ = 20-50 (0950)
24							
25	S 0 7 7 7 0	17 22 31	18"	Stiff, gray clay (5Y, 5/1) with a trace of gravel. Dry 25.3' 25.3'		1.5	Hnu = 0 α = 0 γβ = 20-40 c.p.m. (1024)
26	S 0 7 7 7 1	17 24 30	6"	Very dense, gray to dark gray gravel (5Y, 5/1 to 4/1), clayey in parts. Wet.	GC	–	a/a (1035)
27				27.5' 27.5'			
28	S 0 7 7 7 2	5 17 17	18"	Stiff, dark gray clay (5Y, 4/1) with a trace of gravel	CL	1.5-20	a/a (1045)
29	S 0 7 7 7 3	4 11 17	15"	Stiff, dark gray clay (2.5Y, N/4) with a trace of gravel	CL	1.5	a/a (1400)
30							

NOTES: 1.) Background Readings for 12/5/87
1) Hnu = 0
2) α = 0
3) γβ = 20-60 c.p.m.

II.) Water Used 12/5/87 = 37 gallons

III.) a/a = as above

000492

5709

DLG 2/4/89

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		8/18
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: BB 5-89 ~~3043~~ 3043	COORDINATES: See P1	DATE: 12/5/87 & 12/7/87
ELEVATION: See P1	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 3 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	S 0774	10 13 18	18"	Medium stiff, dark gray clay (2.5 Y, N 4/) with a trace of fine gravel.	CL	.75	Hnu = 0 α = 0 γβ = 40-60 c.p.m. (1405)
32	S 0775	10 14 17	16"	32' Very stiff, dark yellowish-brown clay (10 YR, 4/4) 32'	CL	3.75	Hnu = 0 α = 0 γβ = 40-60 c.p.m. (1420)
33				33' 33.2 Dark gray, dense, fine gravel (2.5 Y, N 4) 33.2 33'	GW		
34	S 0776	11 14 15	18"	Medium dense, yellowish-brown sand (10 YR, 5/8) with a trace of fine gravel. Dry.			Hnu = 0 α = 0 γβ = 40-60 c.p.m. (1440)
35							
36				Upper Sand & Gravel contact @ 33.2 Ft.			Began collecting 5' Sample
37							
38							
39							
40				Very dense, multicolored brown, 40.5 loose, fine gravel 40.5			
41	S 0777	10 22 33	18"	Very dense, yellowish-brown sand (10 YR, 5/6) with a trace of fine gravel. Dry			Hnu = 0 α = 0 γβ = 40-60 c.p.m. (1657)
42							
43							
44							
45							

NOTES:
I.) Background Measurements 12/7/87
Hnu = 0
α = 0
γβ = 20-50 c.p.m.

II.) Water Used 12/7/87 = 23 gallons

000493

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 16 1991

VISUAL CLASSIFICATION OF SOILS

	Initial	Date
1st Key In		
2nd Key In		8/28
Hard Copy Verification		

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: BD 1-5-91 ~~3443~~ 3043	COORDINATES: Seep	DATE: 12/7/87	
ELEVATION: Seep	GWL: Depth	Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth	Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool			PAGE 4 OF 9

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							12-7-87
46	S 6 7 7 8	11 28 30	16"	Very dense, yellowish-brown sand (10YR. 5/6). Damp	SW		Hnu = 0 α = 0 γβ = 20-50 c.p.m. 0940
47							
48							
49							
50	S 0 7 7 9	12 22 26	18"	Dense, yellowish-brown sand as above. Damp but not saturated.	SW		Hnu = 0 α = 0 γβ = 30 c.p.m. 1006
51							
52							
53							
54							
55	S 0 7 7 8 0	12 23 29	18"	56' 56'			Hnu =
56				Very dense, dark grayish-brown (2.5Y, 4/2) sand gray sand fairly moist	SW		α =
57							γβ = 1032
58							
59							
60							

gray-Y

NOTES: Background Measurements for 12/8/87

1.) Hnu = 0

2.) α = 0

3.) γβ = 20-50 c.p.m.

000494

402-11-88

5709

FERNALD RI/FS

REVIEWED BY QA K6 DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		8/16
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~3-43~~ 3043 BB 1-5-89	COORDINATES: Local	DATE: 12/7/87
ELEVATION: Local	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 5 OF 9

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61 (gy-brn)	S 0 7 7 8 1	9 17 26	16"	Dense, dark grayish-brown (2.5Y, 4/2) sand w/some fine gravel Moist, but questionable about being wet.	SW		Hnu = 0 α = 0 γβ = 40-50 c.p.m. 1108
62							
63							
64							
65	S 0 7 7 8 2	9 14 17	18"	Dense, dark grayish-brown (10 YR, 4/2) coarse sand. Appears wet.	SW		Hnu = 0 α = 0 γβ = 40-60 c.p.m. 1316
66				66.2 Dense, olive-gray (5Y, 4/2) fine sandy gravel 66.2	GW		
67							
68							
69							
70	S 0 7 7 8 3	50 50/4"	10"+	Very dense, dark grayish-brown sand (2.5Y, 4/2) WET	SW		Hnu = 0 α = 0 γβ = 40-60 c.p.m. 1456
71				Very dense, dark gray (5Y, 4/1) clayey gravel	GC		
72							
73							
74							
75							

NOTES:

000495

402-11-86

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 1 6 1991

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: ~~3443~~ 3043 BB 1-54	COORDINATES: See map	DATE: 12/7 & 12/8/87	
ELEVATION: See map	GWL: Depth 78' Date/Time 12/8/87-0800	DATE STARTED: 12/4/87	
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87	
DRILLING METHODS: Cable Tool		PAGE 6 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	S 07784	19 39 50	18"	Very dense, very dark gray sand with some fine to coarse gravel (5Y, 3/1)	SP		Hnu = 0 α = 0 γβ = 40 c.p.m. 1621
77							Had to drive casing to 80' in order to obtain 75-76.5 & 80-81.5' Samples
78							
79							
80	S 07785	10 13 18	14"	Dense, multicolored (brown, grays, white, black) loose poorly graded fine to coarse gravel	GP		Hnu = 0 α = 0 γβ = 40 c.p.m. 1648
81							
82							End of Day 12/7/87 Start Day 12/8/87
83							
84							
85	S 07786	18 39 50/2"	18"	multicolored gravel, gen a/a	GW		Hnu = 0 α = 0 γβ = 30 c.p.m. 0845
86				Very dense, dark gray silty to clayey gravel (5Y, 4/1)	GM		
87							
88							
89							
90							

NOTES: Background 12/8/87

Hnu = 0

α = 0

γβ = 30 - 60 c.p.m.

000496

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3-2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB 3043	COORDINATES: see pl	DATE: 12/8/87
ELEVATION: see pl	GWL: Depth Date/Time	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST:	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS:		PAGE 7 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90							
91	S 0 7 7 8 7	7 17 29	16"	Dense, dark grayish-brown (2.5 Y, 4/2) sand with some fine gravel	SW		Hnu = 0 α = 0 βB = 40 c.p.m. 1006
92							
93							
94							
95							
96	S 0 7 7 8 8	17 25 35	18"	Very dense, dark grayish-brown (2.5 Y, 4/2) sand	SW		Hnu = 0 α = 0 βB = 40-50 c.p.m. 1113
97							
98				WET			
99							
100	S 0 7 7 8 9	23 35 38		Very dense, dark grayish-brown sand (a/a). 100.8			Hnu = 0 α = 0 βB = 40-60 c.p.m. 1137
101				Very dense, dark grayish-brown silty sand. (2.5 Y, 4/2)			
102							
103							
104							
105							

NOTES:

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 1 5 1993

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		8/8
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS TASK 3.2	
BORING NUMBER: BB 1-5-99 ~~343~~ 3043	COORDINATES: Sept	DATE: 12/8/87
ELEVATION: Grade	GWL: Depth 68' Date/Time 12-8-87/0730	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B.D.	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 8 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106							While sandpumping the 105-106.5 Sample was missed. Loose sand
107							
108							
109	S 079 0	20 37 44	18"	Very dense, dark gray sand. (5Y, 4/1) silty with a trace of clay.	SM		Hnu = 0 α = 0 γB = 40 c.p.m. (1417)
110							
111							10" Casing had to be drove down to 120 Ft. inorder to obtain 115' Split Spoon sample Blow Sand.
112							
113							
114							
115							
116	S 079 1	1 2 9	12"	Medium dense, bluish-green type of sand (No Muncell color chart correlation). Silty and slightly clayey.			Hnu = 0 α = 0 γB = 30 c.p.m. (1657)
117							Split Spoon began to sink once it was on bottom. (Strap line depth.) 116.5' End of Day 12/8/87 Start of Day 12/9/87
118							
119	S 079 2	7 4 12	18"	Medium dense, bluish-green sand with some gravel. very clayey.	SC		Hnu = 0 α = 0 γB = 30-40 c.p.m. (1055)
120							

NOTES: I.) Background Measurements 12/9/87 No Water added to hole 12/8 or 12

1.) Hnu = 0
2.) α = 0
3.) γB = 20-50 c.p.m.

000498

5709

DLG 2/14/89

FERNALD RI/FS

REVIEWED BY QA 116 DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		8/18
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS TASK 3.2	
BORING NUMBER: BB 1-5-84 ~~3-43~~ 3043	COORDINATES: Surpl	DATE: 12/9/87
ELEVATION: Surpl	GWL: Depth 56.7' Date/Time 12-17-87/1000	DATE STARTED: 12/4/87
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 12/9/87
DRILLING METHODS: Cable Tool		PAGE 9 OF 9

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120				120' Medium dense, bluish-green to dark olive-gray clayey gravel. (5Y, 3/2). 120'	GC		Could not get below casing depth without blow sand coming into borehole (120'-) Had to catch sample @ 119'.
121							
122							
123							
124							
125	S 0 7 9 3	2 2 3	18"	Loose, olive-gray silty sand 125.6' (5Y, 5/2) 125.6'			Hnu = 0
126				Soft, "blue-gray" clay. (No Munsell color correlation) closest correlation is (5Y, 4/1).		<1.0	α = 0 γβ = 40 cpm. (1336)
127							
128				— Bottom of Borehole @ 126.5' —			
129							
130							
131							
132							
133							
134							
135							

NOTES:

TOTAL WATER ADDED TO WELL TO DRILL. = 80 gallons

000499

402-11-86

FERNALD RI/FS

REVIEWED BY QA KG DATE ~~AUG 1 6 1991~~ DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 12/11/87
PROJECT NO. 602 Task 3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~3043~~ 3043 BB 1-5-89
PIEZOMETER NO. NA 3043 DATE OF INSTALLATION 12/10/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 126.5'
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer - Type
CASING SIZE (S) USED:
SIZE 10" FROM 0' TO 125'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless Steel
DIAMETER OF PERFORATED SECTION 4" Ø
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10'

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10' & 2½'
JOINING METHOD Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft.
PROTECTIVE PIPE Ø.D. 10 Inches

OTHER PROTECTION LOCKING CAP WITH LOCK.

ITEM	DISTANCE ABOVE BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	+ 2.5'		586.2	
GROUND SURFACE	0.0		577.7	
BOTTOM OF PROTECTIVE PIPE	2.4'		575.3	
BOREHOLE FILL MATERIALS:	(Surface)			
GROUT/SLURRY	TOP 0'	BOTTOM 94'	TOP 577.7	BOTTOM 483.7
BENTONITE	TOP 94'	BOTTOM 98'	TOP 483.7	BOTTOM 479.7
SAND	TOP 98'	BOTTOM 120'	TOP 479.7	BOTTOM 457.7
GRAVEL	TOP NA	BOTTOM NA	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 107.6'	BOTTOM 117.6'	TOP 470.0	BOTTOM 460.1
PIEZOMETER TIP	120'		457.7	
BOTTOM OF BOREHOLE	~~120'~~ 126.5 RWG 2/6/89		451.2	
GWL AFTER INSTALLATION	56.7' TOC WPK 1/24/89		521.0	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS This well was drilled to a total depth of 126.5' thus penetrating into the "Blue Clay". It was allowed to collapse to 120' and the well was completed from that depth.

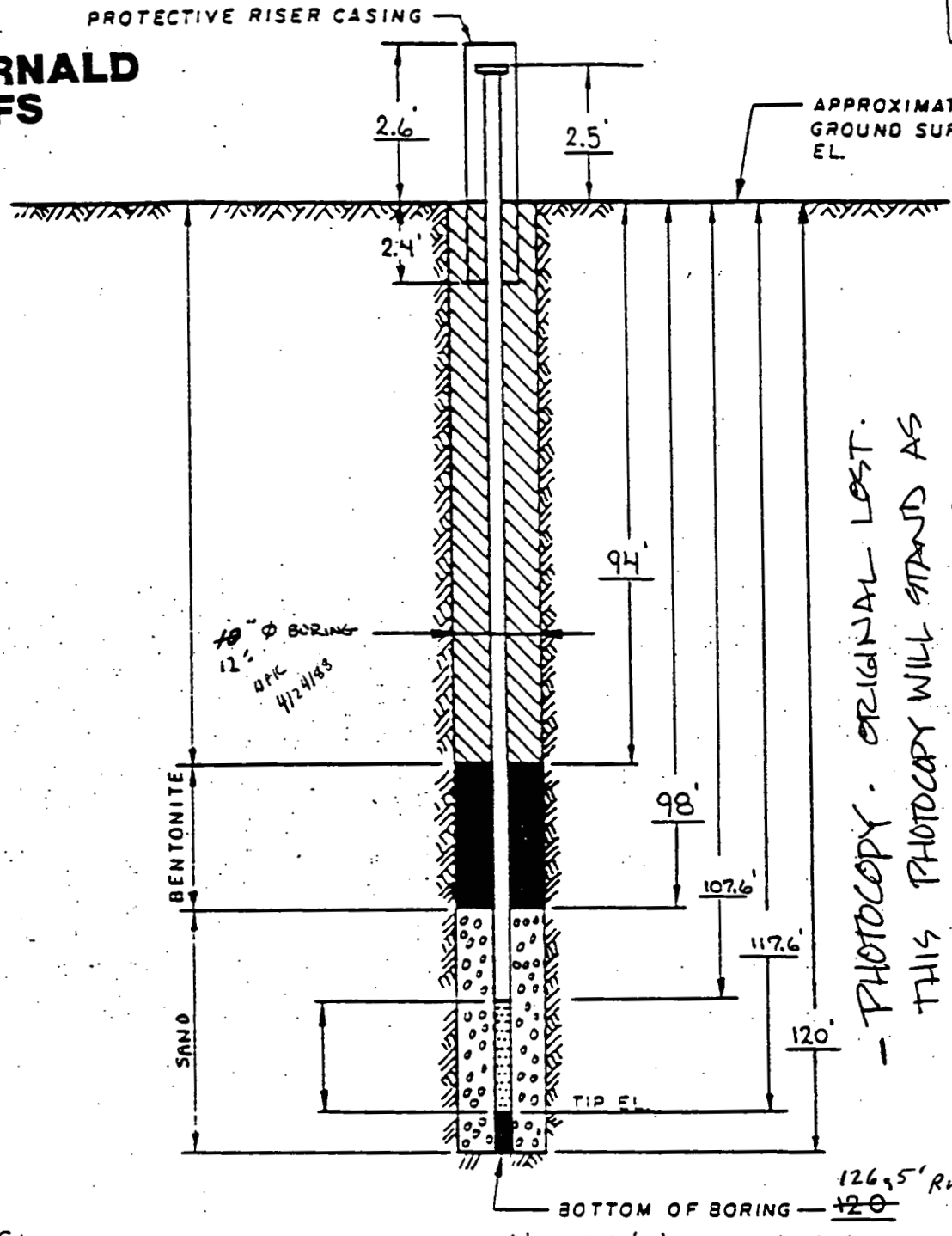
000500

REVIEWED BY QA 66 DATE AUG 1 6 1991 5709 # 3

BOREHOLE - MONITOR WE

3~~43~~ 3043 BB

FERNALD RI/FS



- PHOTOCOPY. ORIGINAL LOST. THIS PHOTOCOPY WILL STAND AS THE ORIGINAL. MZ 1-21-90

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

NOTE: Well was drilled to 126.5' to tag the "Blue clay" then allowed to collapse in to 120'.

INSTALLATION DETAILS
MONITORING WELL ~~343~~ 3043

PREPARED FOR BB 1-5-89

FMPC RI/FS

000501

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B~~244~~ 2044	COORDINATES:	DATE: 3/15/88
ELEVATION: 08/31/99	GWL: Depth 51.23 Date/Time 3/17/88-0730	DATE STARTED: 3/9/88
ENGINEER/GEOLOGIST: FXM/TCS	Depth Date/Time	DATE COMPLETED: 3/15/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 1

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5				For description of soils and deposits encountered see visual classification log for B344.			
10	ST 1						ST 1: Attempted pushing shelby tube in weathered till - tube was refused and dented.
15	ST 2						ST 2: Pushed Shelby tube 2 ft. in unweathered till, no recovery.
20							
25							
30							
35							
40							
45							
50							
55							
60							
65				Bottom of boring @ 65.8 ft			

NOTES:

Pennsylvania Drilling Co., Bucyrus Erie 24W Drill Rig.
Driller: Dave Newman Helper: Bob Johnson
Sampling follows ASTM standards.
Approximate Water Used Drilling: ~~IIII~~ ~~IIII~~ ~~IIII~~ = 125 gal (5 gal. buckets)

Background
HNU = 0 ppm
γB = 40-100 cpm
α = 0-2 cpm

000502

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernall RI/FS FIELD ENG./GEO. F. MacKert DATE 3/16/88
PROJECT NO. 607.3.2 CHECKED BY _____ DATE _____
BORING NO. ~~244~~ 2044
PIEZOMETER NO. ~~244~~ 2044 DATE OF INSTALLATION 3/16/88
CB 3/22/94

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 0 TO 70 ft	SIZE 10" ID FROM 0 TO 70 ft
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft, 2 ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD Screw flush joint
TOTAL PERFORATED AREA 15 ft	threads

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION Locking cap
PROTECTIVE PIPE O.D. 10 3/4 in	with lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	1.8			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.0			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 40.5	TOP	BOTTOM
BENTONITE	TOP 40.5	BOTTOM 45.3	TOP	BOTTOM
SAND	TOP 45.3	BOTTOM 65.8	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 48.2	BOTTOM 63.2	TOP	BOTTOM
PIEZOMETER TIP	65.2			
BOTTOM OF BOREHOLE	65.8			
GWL AFTER INSTALLATION	51.23 from TOC			

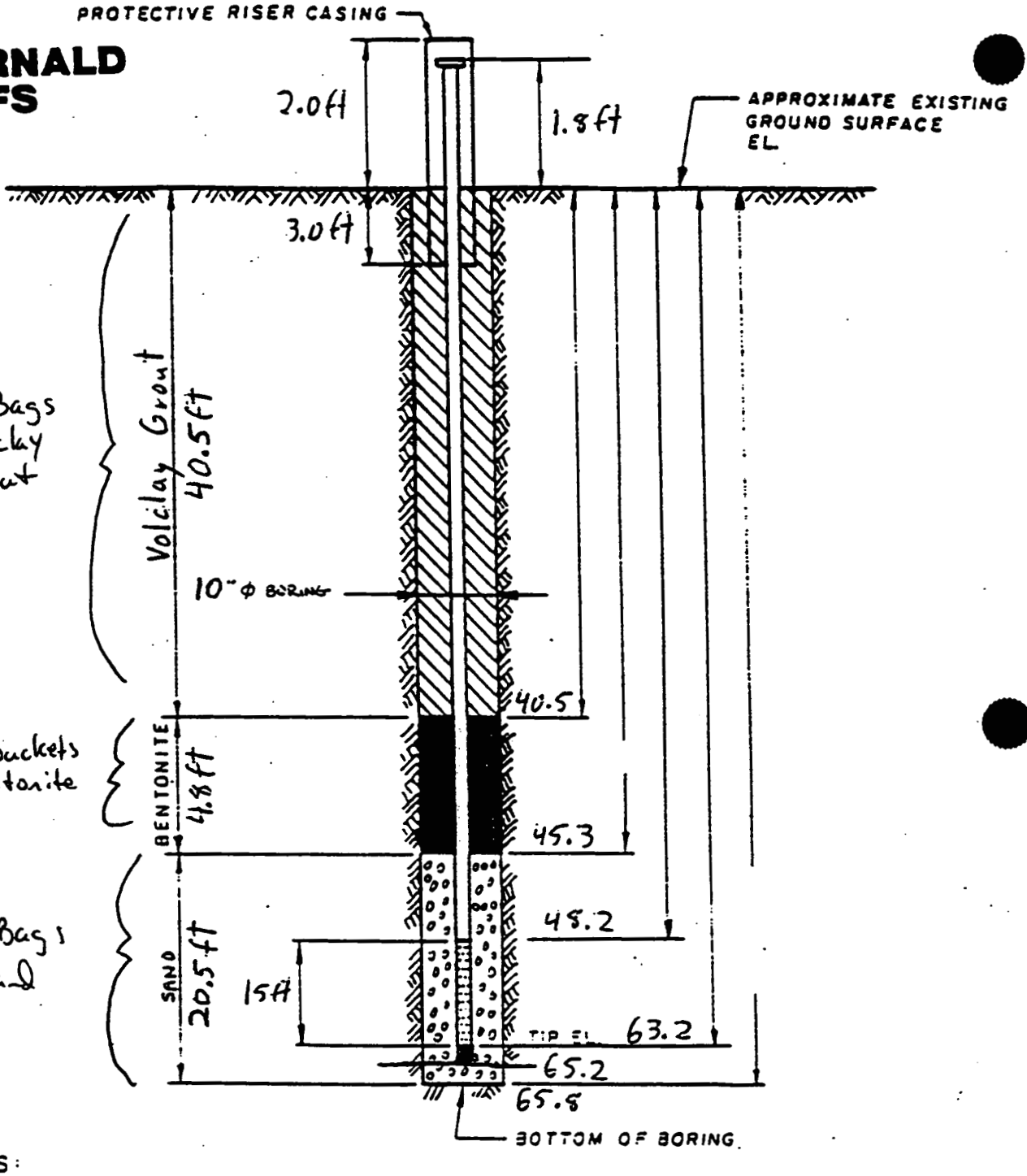
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

725 gallons

54

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 51.23 ft below top casing
5. WATER LEVEL READING ON 3/17/88 0730

INSTALLATION DETAILS eB 3/28/94
MONITORING WELL ~~244~~ 2044

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

000504

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B ~~344~~ 3044 (~~B3/22/84~~)	COORDINATES:	DATE: 3/1/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1½ ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08083 1010 3/1	2 3 4	13	stiff, brown 10YR 4/2 organic rich silt and clay, abundant roots, dry. 0.5	ml/cl	1.5	HNU=0 ppm ⊮B=100 cpm α=0 cpm
				very stiff, yellow-brown 10YR 4/4 clay, trace organic material.	cl	2.75	
2	08084 1030 3/1	2 3 6	14	very stiff, yellow-brown 10YR 4/4 clay, slightly mottled, dry.	cl	2.5	HNU=0 ppm ⊮B=30 cpm α=0 cpm
3 4	08085 1035 3/1	3 6 7	15	very stiff, yellow-brown 10YR 4/4 clay, trace silt, slightly mottled, 1" silt lens at 4.3', dry.	cl	2.75	HNU=0 ppm ⊮B=140 cpm α=4 cpm
5	08086 1040 3/1	7 10 9	18	hard, yellow-brown 10YR 5/4 clay, slightly mottled, trace silt in bottom 2", dry.	cl	4.25	HNU=0 ppm ⊮B=120 cpm α=2 cpm
6 7	08087 1042 3/1	10 11 11	16	very stiff, yellow-brown 10YR 5/4 mottled with light gray 10YR 6/3 clay, trace silt, dry. 7.3	cl	3	HNU=0 ppm ⊮B=100 cpm α=2 cpm
8	08088 1430 3/1	4 8 13	14	very stiff, yellow-brown 10YR 6/4 clay with some fine gravel, trace silt, dry.	cl	3.25	HNU=0 ppm ⊮B=100 cpm α=2 cpm; Duplicate sample
9				very stiff, yellow-brown 10YR 6/6 clay, some silt, slightly mottled, dry. 9.0	cl	3.5	
10	08091 1450 3/1	3 11 13	10	med. dense, yellow-brown 10YR 4/4 sand, some silt, some clay, trace gravel, moist, sandy clay lens at 9.6' and 10.0', 1" thick.	sm	NA	HNU=0 ppm ⊮B=80 cpm α=0 cpm
11	08092 1515 3/1	10 8 14	6	med. dense, yellow-brown 10YR 4/4 sand, some silt and clay, trace fine gravel, moist. 11.3	sm	NA	HNU=0 ppm ⊮B=80 cpm α=0 cpm
12	08093 1525 3/1	4 9 9	11	very stiff, yellow-brown 10YR 5/4 clay, trace gravel, dry. 12.0	cl	2.5	HNU=0 ppm ⊮B=20 cpm α=0 cpm
13				med. stiff, gray 10YR 4/1 sandy clay, some silt, moist, bottom 3" very sandy.	cl	1.0	
14	08094 1540 3/1	4 4 3	1	gray-brown 10YR 4/3 sandy clay, trace gravel, some silt, moist.	cl	Unk	HNU=0 ppm ⊮B=80 cpm α=2 cpm; No recovery on 1st & 2nd try, 1" 3rd try. Insufficient recovery for consistency.

NOTES:

Pennsylvania Drilling Co., Bucyrus Erie 24-W Drilling Rig.
Driller: Dave Newman, Helper: Bob Johnson
Blows on sampler follow ASTM standard for 2x13in. split spoon.
Soil colors follow Musell color charts.
Approximately 300 gallons used in drilling.

Background
HNU=0 ppm
⊮B=60-120 cpm
α=0-2 cpm

000505

402-11-86

ERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B ~~3044~~ 3044	COORDINATES:		DATE: 3/1/88
ELEVATION: 3/3/88/94	GWL: Depth	Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth	Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool			PAGE 2 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/3 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08095 1605 3/1	2 2 3	1	gray 10YR 4/1 clay, some silt and sand, trace gravel, moist.	cl	insufficient recovery	HNU = 0 ppm; ⊥B = 80 cpm; α = 0 cpm; No recovery 1st try, 1" 2nd try.
17	08096 1615 3/1	3 2 5	6	stiff, gray 10YR 5/1 clay, trace silt, trace gravel, moist. 18.0	cl	1.5	HNU = 0 ppm; ⊥B = 80 cpm; α = 0 cpm
19	08097 1630 3/1	7 26 26	5	very dense, gray-brown 10YR 5/2 coarse sand, some gravel, some silt and clay, moist. 19.3	SM	NA	HNU = 0 ppm; ⊥B = 80 cpm; α = 0 cpm
20	08098 1725 3/1	15 25 28	8	hard, gray-brown 10YR 5/2 clay, some coarse gravel, trace silt, dry. 19.5	cl	>5	HNU = 0 ppm; ⊥B = 100 cpm; α = 2 cpm
21				hard, gray-green 5Y 3/2 clay, trace silt, trace gravel, dry. 21.0	cl	>5	
22	08099 0805 3/2	8 15 21	13	dense, yellow-brown 10YR 4/4 fine to med. sand, trace silt, dry.	SM	NA	HNU = 0 ppm; ⊥B = 80 cpm; α = 0 cpm
23–24	08100 0820 3/2	9 19 23	14	dense, yellow-brown 10YR 4/4 fine grained sand, trace silt, dry.	SM	NA	HNU = 0 ppm; ⊥B = 60 cpm; α = 2 cpm
25	08101 0850 3/2	9 10 18	11	med. dense, yellow-brown 10YR 5/4 very fine sand, some silt, dry.	SM	NA	HNU = 0 ppm; ⊥B = 100 cpm; α = 2 cpm
26							
27							
28							
29							

NOTES: Base of till at 21.0 ft.

000506

402-11-86

ERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B344 3044	COORDINATES:	DATE: 3/2/88	
ELEVATION: CA2/2344	GWL: Depth Date/Time	DATE STARTED: 3/1/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 9	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08102 1035 3/2	6 11 13	9	med. dense, gray 10YR 5/3 fine sand, some silt, dry.	SM	NA	HNU=0ppm γB=100cpm α=2cpm
32							
33							
34							
35	08103 1100 3/2	18 17 22	17	dense, tan 10YR 5/4 very fine sand, some silt, dry, gravel in bottom 2".	SM	NA	HNU=0ppm γB=100cpm α=2cpm
36							
37							
38							
39							
40	08104 1335 3/2	14 27 30	11	very dense, tan 10YR 5/4 med. to coarse sand, trace silt, some gravel, dry.	SM	NA	HNU=0ppm γB=80cpm α=2cpm
41							
42							
43							
44							

NOTES:

402-11-86

ERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344 3044	COORDINATES:	DATE: 3/2/88
ELEVATION: CB 3/23/91	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 4 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08245 1445 3/2	17 55 —	8	very dense, brown-gray 10YR 5/3 fine-medium sand, some silt, trace clay, dry.	SM	NA	HNU=0ppm JB=80cpm α=0cpm
47							
48							
49							
50	08246 1520 3/2	11 16 18	13	dense, gray-brown 10YR 4/3 medium-coarse sand, trace silt, trace fine gravel, wet.	SM	NA	HNU=0ppm JB=100cpm α=0cpm
51							
52							
53							
54							
55	08247 1545 3/2	8 8 11	8	med. dense, gray-brown 10YR 4/2 medium sand, trace silt, trace fine gravel, wet.	SM	NA	HNU=0ppm JB=80cpm α=0cpm / No recovery 1st try - cobble caught in spoon, 8" recovery 2nd try.
56							
57							
58							
59							

NOTES:

000508

402-11-86

ERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6022.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344 3044	COORDINATES:	DATE: 3/5/83
ELEVATION:	GWL: Depth 48.05 Date/Time 3/5/83 09:00	DATE STARTED: 3/1/83
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/83
DRILLING METHODS: Cable Tool		PAGE 5 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	08248 1010 3/5	5 12 21	13	dense, brown-gray 10YR 4/2 medium sand, some silt, trace fine gravel, wet.	SM	NA	HNU = 0 ppm; γB = 60 cpm; α = 0 cpm
62							
63							
64							
65	08249 1310 3/5	5 12 14	13	med. dense, brown-gray 10YR 4/2 medium sand, some silt, trace fine to coarse gravel, wet.	SM	NA	HNU = 0 ppm; γB = 80 cpm; α = 0 cpm
66							
67							
68							
69							
70	08250 1500 3/5	22 53 34	17	very dense, brown-gray 10YR 4/2 medium to coarse sand, some silt, wet. (70.3)	SM	NA	HNU = 0 ppm; γB = 100 cpm; α = 0 cpm; Cobble, smashed in spoon
71				dense, brown-gray 10YR 4/2 coarse sand, gravelly, some silt, wet.	SW		
72							
73							
74				74.0			

NOTES:

402-11-86

ERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.7	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344 3044	COORDINATES:	DATE: 3/5/88
ELEVATION: [illegible]	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 6 OF 9

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	08251 1535 3/5	9 13 14	18	med. dense, gray-brown 10YR 4/3 medium sand, trace silt, wet.	SM	NA	HNU=0 ppm γB=90cpm α=2cpm
77							
78							
79							
80	08252 1555 3/5	4 10 12	17	med. dense, brown 10YR 4/2 fine-medium sand, some silt, wet. 81.0	SM	NA	HNU=0 ppm γB=80cpm α=2cpm
81				med. dense, brown 10YR 4/2 medium to coarse sand, some coarse gravel, some silt, wet.	SP		
82							
83							
84				84.0			
85	08253 1735 3/5	12 24 24	18	dense, brown 10YR 4/2 fine to medium sand, some silt, wet. 85.5	SM	NA	HNU=0 ppm γB=100cpm α=0 cpm
86				dense, brown 10YR 4/2 sandy gravel, medium to coarse sand, some pebbles, some silt, wet.	SP		
87							
88							
89				87.0			

NOTES:

000510

402-11-86

ERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B344 3044	COORDINATES:	DATE: 3/6/88	
ELEVATION: 38 3/2/84	GWL: Depth 49.75 Date/Time 3/6/88 08:00	DATE STARTED: 3/1/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88	
DRILLING METHODS: Cable Tool		PAGE 7 OF 9	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	08254 08255 3/6	5 6 7	11	med. dense, brown 10YR 4/2 fine sand, some silt, uniform grain size, wet. Gravelly lens at 90.1 to 90.2 ft.	Sm	NA	HNU=0 ppm JB=60 cpm α=0 cpm
92							
93							
94							
95	08255 1030 3/6	15 22 24	16	dense, brown 10YR 3/3 very fine sand, well graded, some silt, wet.	Sm	NA	HNU=0 ppm JB=40 cpm α=0 cpm
96							
97							
98							
99							
100	08256 1100 3/6	5 4 5	18	loose, gray-brown 10YR 4/2 very fine grained sand, some silt, some clay, wet.	Sm	NA	HNU=0 ppm JB=60 cpm α=0 cpm
101							
102							
103							
104							

NOTES:

000511

402-11-86

ERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~3344~~ 3044	COORDINATES:		DATE: 3/6/88
ELEVATION: CB 3/22/94	GWL: Depth	Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth	Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool			PAGE 8 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	08257 1335 3/6	2 3 4	16	loose, gray 10YR3/1 fine sand, some silt, trace clay, well graded, wet.	sm	NA	HNU=0 ppm γB=30 cpm α=0 cpm
107							
108							
109							
110	08258 1450 3/6	5 9 13	16	med. dense, gray 10YR 4/1 fine sand, some silt, trace clay, wet. 111.3	sm	NA	HNU=0 ppm γB=30 cpm α=2 cpm
111							
112				gray 10YR 4/1 very fine sand and silt, some clay, wet.	ml		
113							
114				114.0			
115	08259 1630 3/6	5 15 28	18	dense, gray 10YR 4/1 fine - medium sand, some silt, trace clay, wet.	sm	NA	HNU=0 ppm γB=60 cpm α=0 cpm
116							
117							
118							
119							

NOTES:

000512

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B344.3044	COORDINATES:	DATE: 3/6/88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88	
DRILLING METHODS: Cable Tool		PAGE 9 OF 9	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	08260 1745 3/6	8 24 26	18	dense, gray 10YR4/1 fine sand, some silt, trace clay, wet.	SM	NA	HNU=0ppm γB=60cpm α=0cpm
122							
123							
124				124-124.5 ft.			"Blue" clay encountered at approximately 124 to 124.5 ft.
125	08261 0920 3/7	4 7 8	18	stiff, gray-green 5Y4/1 clay, some silt, moist.	cl	1.25	HNU=0ppm γB=60cpm α=2cpm
126							
127	08260 1040 3/7	Shelby Tube		very stiff, gray-green 5Y 3/1 clay, some silt, dry.	cl	2.5	HNU=0ppm γB=60cpm α=0cpm
128				E.O.B. 126.5 ft. Shelby Tube 126.5-127.4 ft.			Pushed Shelby Tube at 126.5 ft.; 1.7 ft. penetrated, 0.9 ft. recovered. Approximately 0.6 ft. of sand cleaned out of tube.

NOTES:

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. T. Sullivan DATE 3/8/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. ~~344~~ 3044
PIEZOMETER NO. ~~344~~ 3044 DATE OF INSTALLATION 3/8/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 0 TO 90 ft.	SIZE 10in ID FROM 0 TO 125 ft.
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4in.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in. I.D. 4 in.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10ft., 5ft., 2ft.
AVERAGE SIZE OF PERFORATIONS 0.010 in.	JOINING METHOD Screw flush
TOTAL PERFORATED AREA 10 ft.	joint threads.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.	OTHER PROTECTION Locking cap
PROTECTIVE PIPE O.D. 10 3/4 in.	and lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 106.0	TOP	BOTTOM
BENTONITE (None used)	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 106.0	BOTTOM 126.5	TOP	BOTTOM
GRAVEL (None used)	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 113.0	BOTTOM 123.0	TOP	BOTTOM
PIEZOMETER TIP	125.4			
BOTTOM OF BOREHOLE	126.5			
GWL AFTER INSTALLATION	51.3 ft.			

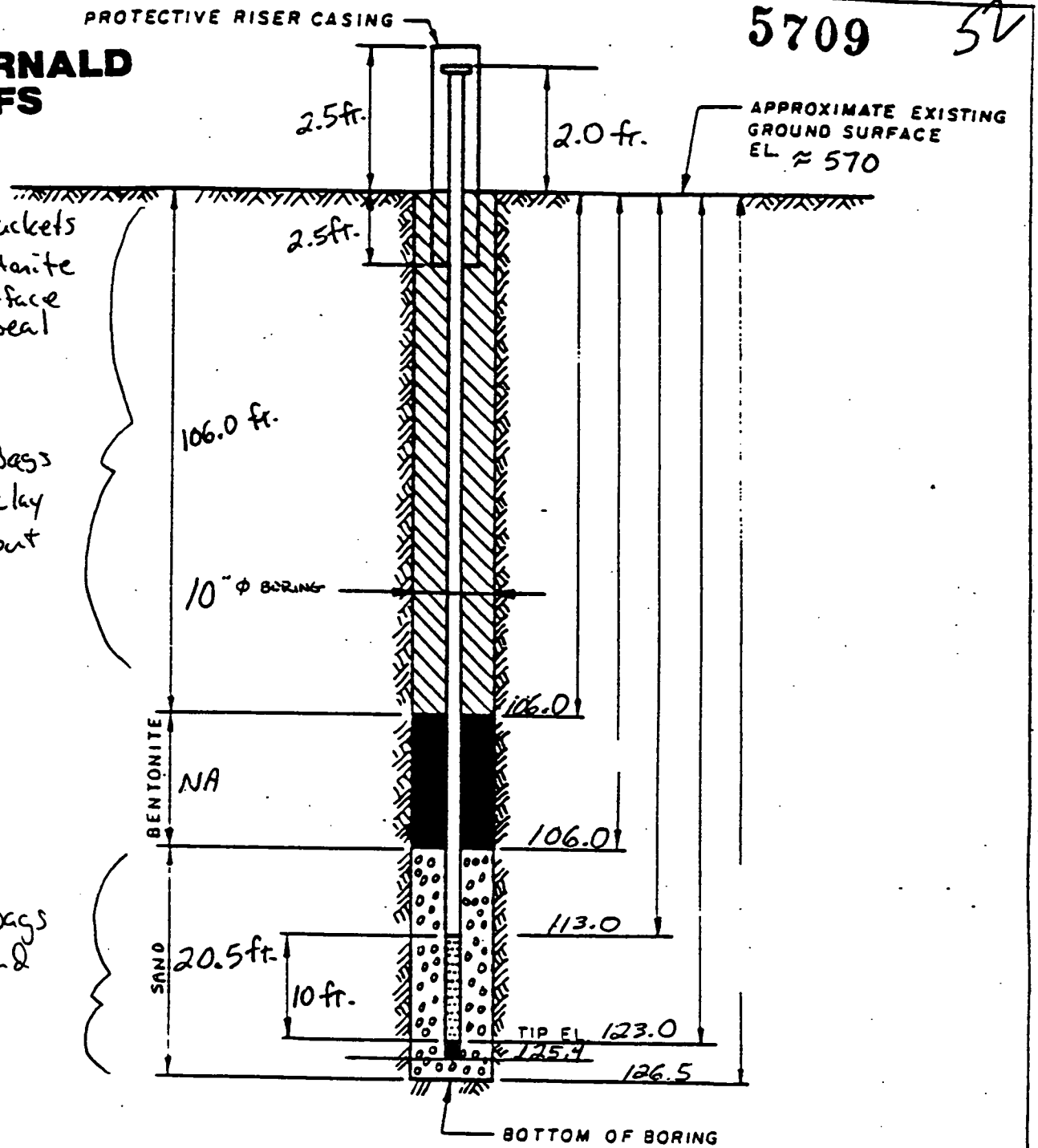
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS _____

000514

409-11-86

5709 5V

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 51.3 ft. below grd. surface, 53.3 ft. below TOC.
5. WATER LEVEL READING ON 3/9/88 13:20

INSTALLATION DETAILS MONITORING WELL ~~344~~ 3044 3/23/88

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY Z. Sullivan

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE 7/29/91 QC/DH 6-24-89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

JPK 4/23/88

R16 #2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 145 1045 BP-5-87	COORDINATES: N 477134.69 E 1379751.49	DATE: 10-6-87
ELEVATION: 545.59 GROUND	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-6-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 10-7-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.5	7201	2 3 2	10	MEDIUM STIFF, VERY DARK GRAY SILT AND SAND SIZED FLY ASH. - DRY	ML	EST .1	MUNSELL 7.5YR N3 SAMPLE SCANNED-AT BACKGROUND
				BLACK SILT AND SAND SIZED FLY ASH - DRY.			MUNSELL 7.5YR N2
3.0	7202	1 3 7	11	STIFF BLACK SILT AND SAND SIZED FLY ASH. - DRY. 2.5	ML	EST. .1	MUNSELL 7.5 YR N2 SAMPLE SCANNED-AT BACKGROUND.
				YELLOWISH BROWN CLAY, SOME SILT, TRACE SAND - DRY	CL		MUNSELL 10YR 5/4
4.5	7203	20 16 21	18	HARD YELLOWISH BROWN CLAY, SOME SILT, TRACE SAND, - DRY		4.5+	MUNSELL 10 YR 5/4 SAMPLE SCANNED-AT BACKGROUND.
6.0	7204	26 31 39	13	5.5		4.5	SAMPLE SCANNED-AT BACKGROUND. MUNSELL 10YR 5/4
				STIFF YELLOWISH BROWN CLAY, TRACE SILT AND SAND. - DRY.			
7.5	7205	18 19 21	11	HARD YELLOWISH BROWN CLAY, TRACE SILT AND SAND, - DRY.	CL	3.5	MUNSELL 10YR 5/6 SAMPLE SCANNED-AT BACKGROUND.
9.0	7207	6 13 18	14	STIFF DARK YELLOWISH BROWN CLAY, TRACE ~~SAND~~ SILT AND SAND - DRY		3.5	7:30 10-7-87 ADDED 15 GALLONS WATER. MUNSELL 10 YR 4/6 SAMPLE SCANNED AT BACKGROUND
10.5	7208	2 4 6	10	SOFT DARK YELLOWISH BROWN CLAY, ~~AND SAND - DRY~~ SOME SILT, TRACE SAND - DRY. 10.6		1.0	MUNSELL 10 YR 4/4 SAMPLE SCANNED-AT BACKGROUND.
12.0	ST-7210 7209	1 2 1	10	VERY SOFT DARK YELLOWISH BROWN CLAY AND SAND. - DRY SAND COARSER AT BOTTOM OF SPOON. 12.2	CL	EST. .2	SHELBY TUBE 10.5-12.5 FT. RECOVERED 20 INCHES. MUNSELL 10YR 4/4 SAMPLE SCANNED-AT BACKGROUND.
13.5	7211	7 9 9	3	MEDIUM DENSE YELLOWISH BROWN COARSE SAND AND GRAVEL, SOME CLAY. DRY.	SW	EST. .2	10 YR 5/6 SAMPLE SCANNED-AT BACKGROUND.
15.0	7212	10 12 10	10	BROWNISH YELLOW COARSE SAND AND GRAVEL, TRACE CLAY.		EST. .2	MUNSELL 10YR 6/6 SAMPLE SCANNED ~~FOR~~ AT BACKGROUND

NOTES:

R16: CYCLONE 4/2

DRILLER: HARRY DYKES JR.

ASSISTANT: JOHN VANDINE

000516

BACKGROUND

HNU - ZERO ppm

LEL - ZERO ppm

ALPHA - ZERO COUNTS/MIN.

BETA/GAMMA - 40 - 80 COUNTS/MIN.

402-11-86

QC/DH 12.4.89

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: L45 1045 68 1-5-89	COORDINATES: See P1	DATE: 10-7-87
ELEVATION: See P1	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-6-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 10-7-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.5	7213	15 11 8	11	MEDIUM DENSE BROWNISH YELLOW COARSE SAND AND GRAVEL - DRY	SW	EST .2	MUNSELL 10YR 6/6 SAMPLE SCANNED AT BACKGROUND
18.0	7214	7 9 4	10	MEDIUM DENSE YELLOWISH BROWN COARSE SAND AND GRAVEL. WELL TD - 18.0 FT.	SW	EST .2	MUNSELL 10 YR 5/4 SAMPLE SCANNED - AT BACKGROUND.
							WELL SCREEN SET AT 2.5 - 7.5 FT.

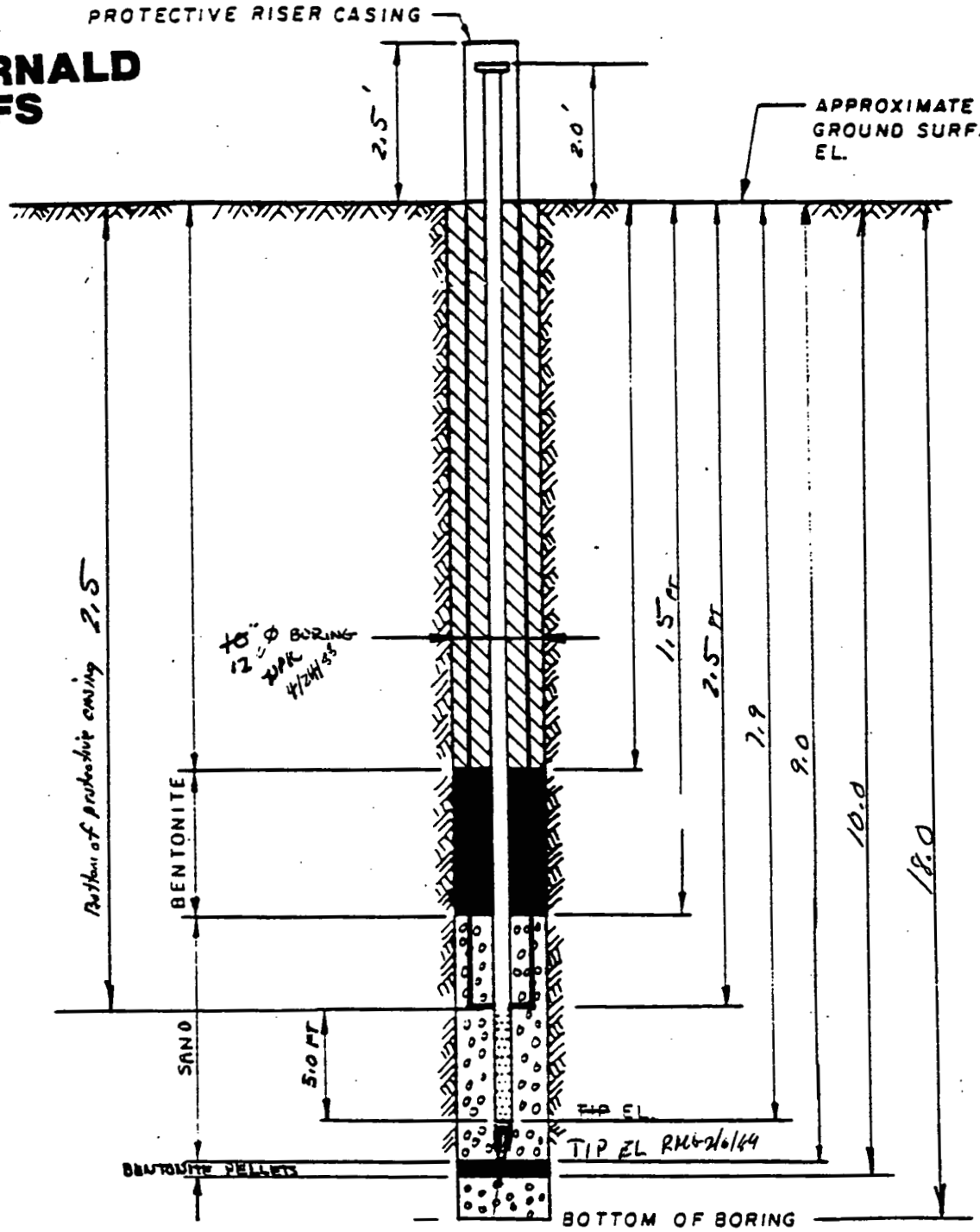
NOTES:

000517

402-11-86

REVIEWED BY QC K.L. 7/29/91 QC/DH/24.89 WELL ~~145~~ 1045 BB 1-

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~145~~ 1045

PREPARED FOR BB 1-5-89

FMPC RI/FS

000518

TLE 10/20/87

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald
PROJECT NO. 607
BORING NO. ~~145~~ 1045 BB 1-5-89
PIEZOMETER NO. ~~145~~ 1045

FIELD ENG./GEO. D Oakley DATE 10 07 87
CHECKED BY McGalbraith DATE 2/6/89
DATE OF INSTALLATION 10/09/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 TO 18 FT
FLUID — FROM — TO —

TYPE OF BIT Flat head HAMMER
CASING SIZE (S) USED: (TEMPORARY)
SIZE 10" FROM 0 TO 15'
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE monitoring WELL
DIAMETER OF PERFORATED SECTION 4 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 in
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 5 FT

RISER PIPE MATERIAL 316 stainless Steel
RISER PIPE DIAMETERS:
O.D. 4.3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 5' sections
JOINING METHOD Thread couple (FLUSH JOINT THREAD)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE Ø.D. 10"

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (ft.)	
TOP OF RISER PIPE	2.0 FT.		547.59	
GROUND SURFACE	0.0		545.59	
BOTTOM OF PROTECTIVE PIPE	-2.5 FT.		543.09	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM —	TOP	BOTTOM
BENTONITE PELLETS	TOP ~~NA~~ 0	BOTTOM 1.5 FT.	TOP 545.59	BOTTOM 541.59
SAND	TOP 1.5 FT.	BOTTOM 9.0 FT.	TOP 541.59	BOTTOM 534.09
~~GRAVEL~~ BENTONITE Pellets	TOP 9.0 FT.	BOTTOM 10.0 FT.	TOP 534.09	BOTTOM 533.09
PERFORATED SECTION	TOP 2.5	BOTTOM 7.9	TOP 543.09	BOTTOM 537.69
PIEZOMETER TIP	~~7.9~~ 9.0 RMG 3/6/89		536.59	
BOTTOM OF BOREHOLE	18.0		527.59	
GWL AFTER INSTALLATION				

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

900519

REMARKS BENTONITE PELLETS USED TO SEAL TIP FROM AQUIFER —

FERNALD RI/FS

	Initial	Date
Field Check	BD	12/12
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2045	COORDINATES:	DATE: 12-0[illegible]-88
ELEVATION: 546.2 (Est)	GWL: Depth 27.80 Date/Time 0820 12/7/88	DATE STARTED: 12-05-88
ENGINEER/GEOLOGIST: W.A. Hertel	Depth Date/Time	DATE COMPLETED: 12-08-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 3

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 In.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See Log of boring 1045			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

NOTES:

000520

Pennsylvania Drilling Rig #4
Driller : Craig Coulter
Helper : Jim Lang

See Page 3 of 3 for further info

Total Water added to well 400 gallons

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2045	COORDINATES:	DATE: 12-5-88
ELEVATION: 546.26 GL (Est)	GWL: Depth Date/Time	DATE STARTED: 12-5-88
ENGINEER/GEOLOGIST: K. HEMOLEIN	Depth Date/Time	DATE COMPLETED: 12-08-88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16				See Log of boring 1045			
17							
18							Bottom of Boring 1045 @ 18 feet
19							
20							
21							
22	8945 1617	11/15/17	18/10	VERY DENSE GRAY (10YR 5/1) SILTY SAND W/ GRAVELS, DRY, APP. 20% GRAVEL	SW	—	HNU – 0 ppm BB – 40-80 cpm
23							
24							
25							
26	8946 0755	27/48/52	12 inch	Very dense, Gray (10YR 3-2) grades to yellowish brown (10YR 5-6) silty sand with ~10% gravel	SW	—	HNU – 0 ppm BB – 40-80 cpm
27							
28							
29							

NOTES:

A.S.T.
PENN DRILLING RIG #4

000521

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FN PC RI/FS		
BORING NUMBER: 2045	COORDINATES:	DATE: 12-06-88	
ELEVATION: 546.2 GL (Est)	GWL: Depth 29.5 Date/Time 12-06-88 12[illegible]	DATE STARTED: 12-05-88	
ENGINEER/GEOLOGIST: W.A. Hertel	Depth 27.85 Date/Time 12-06-88 1320	DATE COMPLETED: 12-08-88	
DRILLING METHODS: Cable Tool	27.80 12-07-88 0820	PAGE 3 OF 3	

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 inches	RECOVERY (inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	8947	38 61 74	12	Very Dense, Brown (2.5Y/5/6) clean sand with 40% Gravel M-CGR Sand subangular to rnd	SW	—	HNU - 0 ppm BG - 60-80 cpm
32				well graded gravelly sand			
33							
34							
35							
36	8948	16 24 37	12	Very Dense, Brown (10YR 5/6) M.to CGR Sand, subangular to rounded. Poorly graded gravelly sand	SP	—	HNU 0 ppm BG - 60-80 cpm
37							
38							
39							
40							
41	8949	24 28 46	12	Very Dense, Grayish Brown (10YR 5/2) Fine gravel and sand	SW	—	HNU 0 ppm BG 60-80 cpm
42				UAH 12-8-88			
43				Total Depth Drilled = 45 feet			
44				10 inch casing driven to 45 feet			

NOTES:

A.S.I 000522
PENN. DRILLING RIG #4
Driller: Craig Coulter
Helper: Jim Lang

Samples collected as per ASTM Standard penetration test. Colors identified using Munsell Color chart.
Background Levels: HNU = 0
BG = 60-80 cpm
LEL O_2 = 0%
O_2 = 22.3%
Water Added to Well 400 gallons

FERNALD RI/FS

5709

Date	12/12/88		
Initial			
1st Ck.	2nd Ck.	Final Copy Verification	

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. W.A. Hertel DATE 12-08-88
PROJECT NO. 602 3.2 CHECKED BY B.N. DATE 12/12/88
BORING NO. Monitoring Well 2045
PIEZOMETER NO. MW 2045 DATE OF INSTALLATION 12-08-88 & 12-08-88

BOREHOLE DRILLING

DRILLING METHOD Cable Tools
DRILLING FLUID (S) USED:
FLUID Water FROM Surface TO 45.0
FLUID _____ FROM _____ TO _____

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" FROM 0.0 Ft. TO 45.0 Ft.
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 inch ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 Inch
TOTAL PERFORATED AREA 15.0 Ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 inch I.D. 4.0 inch
LENGTH OF PIPE SECTIONS 10 ft., 5 ft., 1.5 ft.
JOINING METHOD Screw Type, Threaded Flush Joint

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft.
PROTECTIVE PIPE O.D. 10 3/4 inch

OTHER PROTECTION Locking Lid

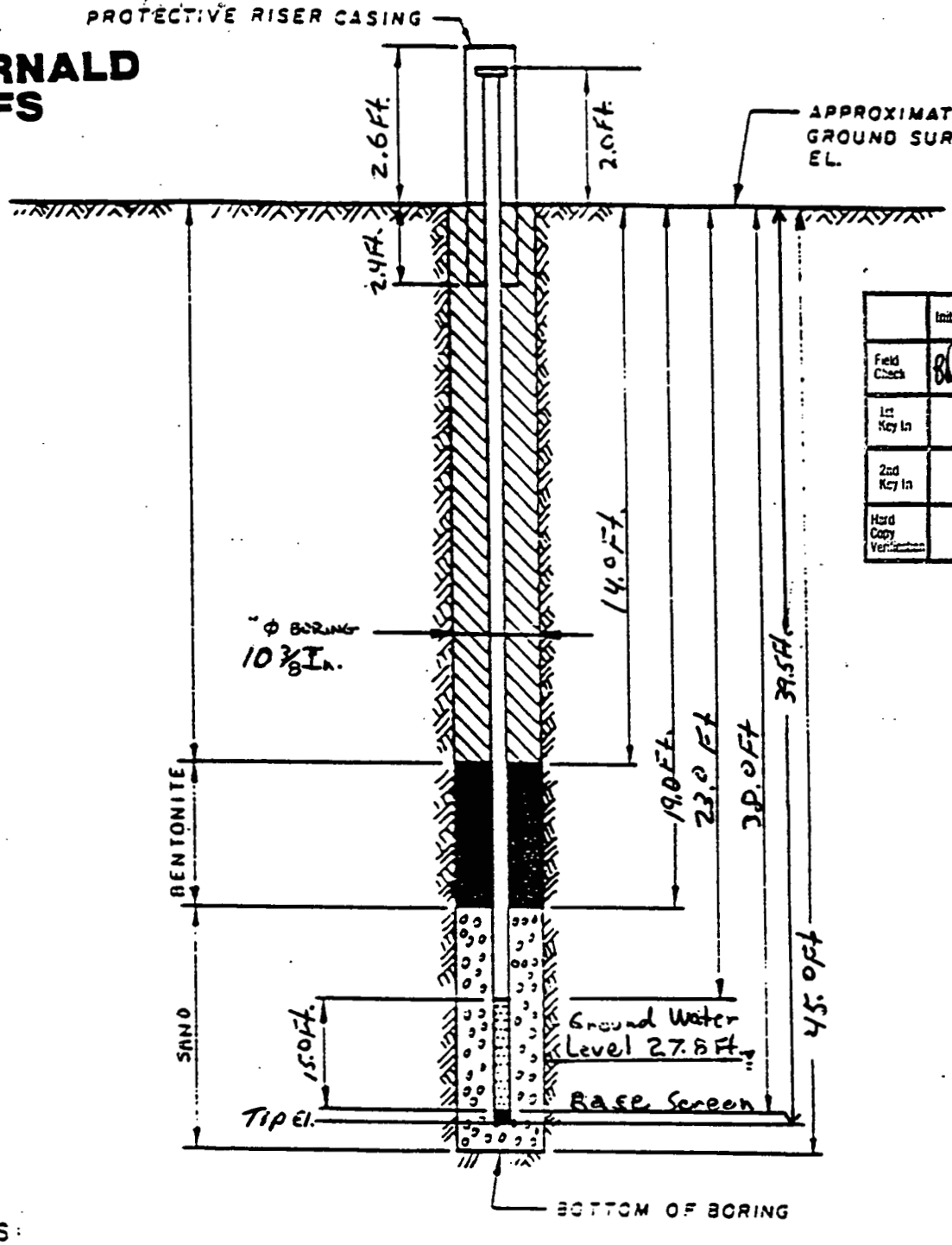
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 Feet above Ground			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.4 Feet Below Ground			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (Volclay	TOP Surface	BOTTOM 14.0	TOP	BOTTOM
BENTONITE	TOP 14.0	BOTTOM 19.0	TOP	BOTTOM
SAND (10 x 20)	TOP 19.0	BOTTOM 45.0	TOP	BOTTOM
GRAVEL (None Used)	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 23.0	BOTTOM 38.0	TOP	BOTTOM
PIEZOMETER TIP	39.5			
BOTTOM OF BOREHOLE	45.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS

000523

FERNALD RI/FS



	Initial	Date
Field Check	BD.	12/12/88
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 27.8 Ft.
5. WATER LEVEL READING ON 12-07-88

Materials Used: 15 foot Screen with a welded 18 inch silt trap, 25 feet of Stainless steel casing, 20-80 Lb. bags of 10x20 sand, 10-5 gallon buckets of bentonite pellets, and 4 bags of Volclay, 5 foot long well cover (10 inch diameter) and a lock. Water added to well while drilling & in volclay is 400 gallons total.

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
Monitoring Well 2045

000524

FERNALD
RI/FS

5709

Date	5/18/94			
Initial	KT			
	Field Check	1st Key In	2nd Key In	Hard Copy Validated

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.3.2.1	PROJECT NAME FMPC RI/FS	
BORING NUMBER 3045	COORDINATES	DATE 5-5-90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 5-5-90
ENGINEER/GEOLOGIST M. GARMAN	Depth Date/Time	DATE COMPLETED 5-17-90
DRILLING METHODS CABLE TOOL		PAGE 1 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	NA WELL CONSTRUCTION	REMARKS
0				SEE VISUAL CLASSIFICATION LOG FOR MW 1045 (0.0 – 18.0 FT)				
5								
10				12.2 FT – BASE OF TILL				
15								
20				20.97 FT ▼				
				SEE VISUAL CLASSIFICATION LOG FOR MW 2045 (20.0 – 45.0 FT)				
25								
30								
35								
40								
45								

NOTES.

Drilling Contractor PENNSYLVANIA DRILLING

Drilling Equipment CYCLONE 43

Driller: CRAIG COULTER

ASST. CHRIS COULTER

BACKGROUND

HNU = 0 PPM

α = 0 CPM

γB = 40-100 CPM

000525

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3045	COORDINATES:		DATE: 5-7-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5-5-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth:	Date/Time	DATE COMPLETED: 5-17-90
DRILLING METHODS: CABLE TOOL			PAGE 2 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (PER 6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED BOREHOLE DENSITY (PPM)	NA WELL CONSTRUCTION	REMARKS
45	32597	4		DENSE (10YR, 4/2) DARK GRAYISH BROWN WELL GRADED SAND. SOME SILT. WET.	SW	NA		HNU = 0
46	5-7 1050	16 23	18					α = 0
								βB = 60 cpm
47								
48								
49								
50	32596	6		MEDIUM DENSE (10YR, 5/3) BROWN WELL GRADED SAND. TRACE SILT. WET.	SW	NA		HNU = 0
51	5-7 1117	6 6	14					α = 0
								βB = 80 cpm
52								
53								
54								
55	32599	11		MEDIUM DENSE (10YR, 4/3) BROWN WELL GRADED SAND. SOME SILT. TRACE GRAVEL. WET.	SW	NA		HNU = 0
56	MG ~~13~~ 5-7 1340	14 15	17					α = 0
								βB = 80 cpm
57								
58								
59								
60								

NOTES.

Drilling Contractor: PENNSYLVANIA DRILLING

Drilling Equipment: CYCLONE 43

Driller: CRAIG COULTER

ASST: CHRIS COULTER

BACKGROUND
HNU = 0 ppm
α = 0 cpm
βB = 40-100 cpm

000526

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.3.2.1	PROJECT NAME FMPC RI/FS		
BORING NUMBER 3045	COORDINATES		DATE 5-7-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5-5-90
ENGINEER/GEOLOGIST M. GARMAN	Depth	Date/Time	DATE COMPLETED 5-17-90
DRILLING METHODS CABLE TOOL			PAGE 3 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINANT (PPM)	NA WELL CONSTRUCTION	REMARKS
60	32600 5-7 1405	6 15 8	15	MEDIUM DENSE (10YR, 5/3) BROWN WELL GRADED SAND, SOME FINE GRAVEL. TRACE SILT. WET.	SW	NA		HNU = 0 α = 0 βB = 60 cpm
61								
62								
63								
64								
65	32601 5-7 1530	24 20 25	18	DENSE (10YR, 5/3) BROWN WELL GRADED SAND SOME SILT (9 IN.) WET. GRADING TO (10YR, 5/3) FINE SAND WITH SOME SILT. WET. (9 IN)	SW SP	NA NA		HNU = 0 α = 0 βB = 80 cpm
66								
67								
68								
69								
70	32602 5-8 0855	5 5 7	12	MEDIUM DENSE (10YR, 5/3) BROWN GRAVELLY WELL GRADED SAND. TRACE SILT. WET.	SW	NA		HNU = 0 α = 0 βB = 70 cpm
71								
72								
73								
74								
75								

NOTES.

Drilling Contractor PENNSYLVANIA DRILLING

Drilling Equipment CYCLONE 43

Driller: CRAIG COULTER

ASST. CHRIS COULTER

BACKGROUND:
HNU = 0 ppm
α = 0 cpm
βB = 40-100 cpm

000527

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3045	COORDINATES:		DATE: 5-8-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5-5-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth	Date/Time	DATE COMPLETED: 5-17-90
DRILLING METHODS: CABLE TOOL			PAGE 4 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	NA WELL CONSTRUCTION	REMARKS
75	32603	26		VERY DENSE (10YR, 4/2) DARK GRAYISH BROWN GRAVELLY WELL GRADED SAND. SOME SILT. WET.	SW	NA		HNU = 0
76	5-8 1050	37 35	18					α = 0
								γB = 50 cpm
77								
78								
79								
80	32604	16		DENSE (10YR, 5/3) BROWN WELL GRADED SAND. TRACE SILT. WET.	SW	NA		HNU = 0
81	5-8 1127	16 16	18					α = 0
								γB = 80 cpm
82								
83								
84								
85	32605	12		MEDIUM DENSE (10YR, 4/2) DARK GRAYISH BROWN WELL GRADED SAND. TRACE GRAVEL. TRACE SILT. WET.	SW	NA		HNU = 0
86	5-8 1447	13 13	16					α = 0
								γB = 60 cpm
87								
88								
89								
90								

NOTES.

Drilling Contractor: PENNSYLVANIA DRILLING

Drilling Equipment: CYCLONE 43

Driller: CRAIG COULTER

ASST: CHRIS COULTER

BACKGROUND:
HNU = 0
α = 0
γB = 40-100 cpm

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI\FS		
BORING NUMBER: 3045	COORDINATES:		DATE: 5-8-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5-5-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth	Date/Time	DATE COMPLETED: 5-17-90
DRILLING METHODS: CABLE TOOL			PAGE 5 OF 8

DEPTH (FT)	SAMPLE (TYPE & NO.)	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED EXPLOSIMETER (PPM)	NA WELL CONSTRUCTION	REMARKS
90	32606 5-8 1550	3 4 6	NA	NO RECOVERY - IN BLOW SAND. 2ND ATTEMPT.	NA	NA		HNU = NA α = NA γB = NA
91								
92								
93								
94								
95	32607 5-8 1710	31 ~~40~~ 39 40	18	VERY DENSE (10YR, 4/1) DARK GRAY WELL GRADED SAND. SOME SILT. TRACE GRAVEL. WET,	SW	NA		HNU = 0 α = 0 γB = 80 cpm
96								
97								
98								
99								
100	32608 5-9 0840	14 17 18	12	DENSE (5Y, 4/1) DARK GRAY SILT. GRADING FROM SANDY SILT TO A ~~SAR~~ NG SILT WITH SOME CLAY AT 101.5 FT. WET.	ML	NA		HNU = 0 α = 0 γB = 70 cpm
101								
102								
103								
104								
105								

NOTES.

Drilling Contractor: PENNSYLVANIA DRILLING

Drilling Equipment: CYCLONE 43

Driller: CRAIG COULTER

ASST. CHRIS COULTER

BACKGROUND
HNU = 0 PPM
α = 0 cpm
γB = 40-100 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: FMPC RI\FS		
BORING NUMBER: 3045	COORDINATES:		DATE: 5-9-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5-5-90
ENGINEER/GEOLOGIST: M. GARMAN	Depth	Date/Time	DATE COMPLETED: 5-17-90
DRILLING METHODS: CABLE TOOL			PAGE 6 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	NA WELL CONSTRUCTION	REMARKS
105	32609 5-9 1046	14 25 50/4"	16	VERY DENSE (54; 4/1) DARK GRAY SILT. TRACE SAND. WET. TRACE GRAVEL.	ML	NA		HNU = 0 α = 0 βB = 90cpm
106								
107				Bottom of Borehole 106.5 Sampling ended @ 106.5 FT				
108								
109								
110								

NOTES.

Drilling Contractor: PENNSYLVANIA DRILLING

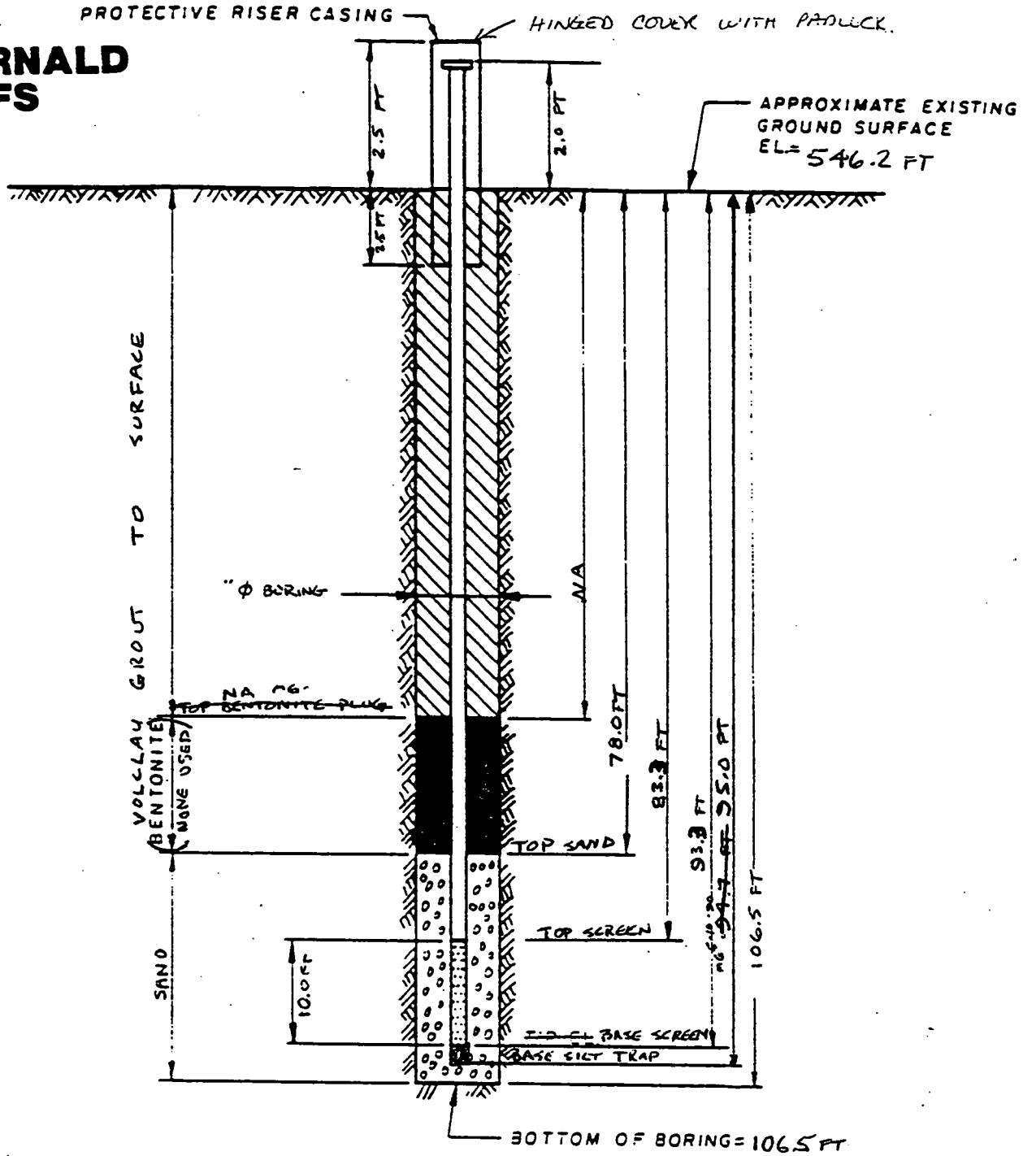
Drilling Equipment: CYCLONE 43

Driller: CRAIG COULTER

Asst. CHRIS COULTER

BACKGROUND
HNU = 0 PPM
α = 0 cpm
βB = 40-100 cpm

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
MG	
5-15-90	
DRAWN BY	

NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED (w/ WELDED SILT TRAP)
4. ELEVATION OF WATER LEVEL 20.97
5. WATER LEVEL READING ON 5-18-90

MATERIALS USED DURING WELL INSTALLATION:

17 BAGS 10/20 SAND (80 lb. EACH)
26 BAGS VOLCLAY GROUT (50 lb. EACH)
2 BUCKETS BENTONITE PELLETS (5 gal EACH)
1-10 FT SCREEN with 1.7 FT WELDED SILT TRAP AND .4 FT BLANK STICK-UP, 8-10 FT SECTIONS, 1-5 FT SECTION OF 4.0 IN I.D. STAINLESS STEEL RISER.

INSTALLATION DETAILS
MONITORING WELL #3045

PREPARED FOR
FERNALD RI/FS

TOTAL WATER ADDED TO BORING DURING DRILLING AND GROUTING = 800 gal.

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI\FS FIELD ENG./GEO. M. GARMAN DATE 5-9-90
PROJECT NO. 602.3.2.1 CHECKED BY _____ DATE _____
BORING NO. 3045
PIEZOMETER NO. 3045 DATE OF INSTALLATION 5-17-90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 TO 106.5
FLUID NA FROM _____ TO _____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN I.D. FROM 0 TO 103 FT
SIZE N.A FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITOR WELL
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.01 IN
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN
LENGTH OF PIPE SECTIONS 10.0 FT, 5.0 FT
JOINING METHOD THREADED, FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 IN

OTHER PROTECTION HINGED LOCKING COVER WITH PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 78.0	TOP	BOTTOM
BENTONITE NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 78.0	BOTTOM 106.5	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 83.0	BOTTOM 93.0	TOP	BOTTOM
PIEZOMETER TIP	94.7			
BOTTOM OF BOREHOLE	106.5			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS 2 BUCKETS BENTONITE ADDED INSIDE AND OUTSIDE PROTECTIVE WELL COVER

5709

FERNALD RI/FS

REVIEWED BY QA K.G DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Verification		

RKA 2/4/89 8-9-86 WPK 4/23/88 RI6 # 3

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B146~~ B1046 DB 1-17-89	COORDINATES: 478054.76N 1379428.95E	DATE: 2/6/88
ELEVATION: 576.5	GWL: Depth NA Date/Time NA	DATE STARTED: 2/6/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth NA Date/Time NA	DATE COMPLETED: 2/9/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08014 1120 2/6	5 5 7	14	hard, dark brownish gray 10YR 3/1 silt (topsoil), organic rich, dry. 0.7	ol	>5	HNU=0ppm γB=60cpm α=2 cpm
				hard, yellow-brown 10YR 3/6 silty clay, dry.	cl	>5	
2 3	08015 1128 2/6	6 9 14	17	hard, yellow-brown 10YR 3/6 silty clay, dry.	cl	3.0	HNU=0ppm γB=60cpm α=2cpm
4	08016 1135 2/6	10 8 7	16	soft, yellow-brown 10YR 3/6 silty clay, dry. 4.5	cl	0.5	HNU=0ppm γB=80cpm α=0cpm
5 6	08017 1140 2/6	7 11 15	18	soft yellow-brown 10YR 3/4 silt, trace sand, wet. 6.0	ml	1.0	HNU=0ppm γB=60 cpm α=2 cpm
7	08018 1145 2/6	5 10 15	17	medium dense, yellow-brown 10YR 3/4 fine grained sand, some silt, wet.	sm	NA	HNU=0ppm γB=100 cpm α=0 cpm — Saturated sand, may yield water.
8	08019 1455 2/7	4 7 7	11	medium dense, yellow-brown 10YR 4/6 fine grained sand and silt, wet. 8.5	sm	NA	HNU=0ppm γB=100cpm α=0cpm
9				very stiff, yellow-brown 10YR 4/4 clay, trace silt, dry. 8.9	cl	3.0	
10	08020 1645 2/7	3 5 4	11	very stiff gray 10YR 4/1 clay, dry.	cl	3.5	HNU=0ppm γB=100cpm α=2cpm
				stiff, gray 10YR 5/1 clay, some silt, dry.	cl	1.25	
11 12	08021 1730 2/7	NA Shelby	NA Tube	gray 10YR 5/1 clay, trace gravel, dry. (Shelby Tube 10.5-12.2 ft.) 12.2	cl	NA	HNU=0ppm γB=100cpm α=2 cpm — Pushed shelby tube 2ft., 1.7ft. recovered.
13	08022 0815 2/8	– 4 6	8	loose, gray-brown 10YR 4/2 fine grained sand, some silt, moist. 12.6	sm	NA	HNU=0ppm γB=100 cpm α=0cpm
				very stiff, gray 10YR 4/1 clay, trace silt, moist.	cl	2.25	
14	08023 0825 2/8	6 6 5	7	stiff, gray 10YR 4/1 clay, trace silt, moist. 14.8	cl	1.5	HNU=0ppm γB=80cpm α=2cpm
				medium dense, gray-brown 10YR 3/2 sand, some silt and clay, moist.	sm	NA	

NOTES:
Pennsylvania Drilling Co.
Bucyrus Erie 24-W drilling rig.
Driller: Dave Newman
Helper: Joe Barile
Blows on sampler follow ASTM standard for 2in x 18in. split spoon sampler.
Soil colors follow Munsell color charts. Approx. 95 gallons used in drilling.

Background: 2/6/88 HNU=0ppm γB=60-100cpm α=0-2cpm

000533

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B196~~ B1046 BB 1-5-91	COORDINATES: See pl	DATE: 2/8/88
ELEVATION: See pl	GWL: Depth 4.05 Date/Time 2/9/88 09:50	DATE STARTED: 2/6/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/9/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	03024 0840 2/8	6 7 7	13	medium dense, gray-brown 10YR 3/2 sand, some silt and clay, trace gravel, moist. 16.1	SM	NA	HNU = 0ppm γB = 100cpm α = 2cpm
17	03027 0910 2/8	5 4 5	13	stiff, gray 10YR 4/1 silt and clay, some sand, moist.	CL	1.25	HNU = 0 ppm γB = 100cpm α = 2cpm
18				stiff gray 10YR 4/1 clay and silt, trace sand, moist. 17.6	CL	1.25	
19	03028 0940 2/8	5 6 8	8	loose, gray 10YR 4/1 sand, some silt and clay, trace gravel, moist. 18.0	SM	NA	HNU = 0ppm γB = 100cpm α = 0cpm
				very stiff, gray-brown 10YR 3/1 clay, some gravel, dry. 18.4	CL	4	
20	03029 1025 2/8	3 3 6	9	stiff, gray 10YR 5/1 clay, some gravel, dry.	CL	1.25	HNU = 0ppm γB = 80cpm α = 0cpm
21				stiff, gray 10YR 4/1 clay, some silt, trace gravel, dry. 21.0	CL	1	
22	03030 1040 2/8	3 13 18	18	hard, green-gray 5Y 4/1 clay, some gravel and pebbles, wood fragments, dry.	CL	>5	HNU = 0ppm γB = 110cpm α = 0cpm
23	03031 1145 2/8	8 18 20	13	hard, green-gray 5Y 4/1 clay, some gravel and pebbles, dry.	CL	>5	HNU = 0ppm γB = 100cpm α = 2cpm; Cobble smashed in spoon.
24				very stiff, green-gray 5Y 4/1 clay, some gravel, dry. 24.2	CL	3.0	
25	03032 1400 2/8	9 19 23	16	hard, yellow-brown 10YR 4/4 clay, some gravel, dry. 24.8	CL	>5	HNU = 0ppm γB = 100cpm α = 0cpm
				dense, brown 10YR 4/3 sand, some silt and gravel, trace clay, dry.	SP	NA	
26	No Sample	NS	NS			NA	Driller missed interval, no sample collected.
27							
28	03033 1455 2/8	14 23 24	14	dense, yellow-brown 10YR 4/4 sand, some gravel and silt, dry.	SP	NA	HNU = 0ppm γB = 80 cpm α = 2 cpm
29				End of boring 28.5 ft.			

NOTES:

Base of till: 24.8 ft.

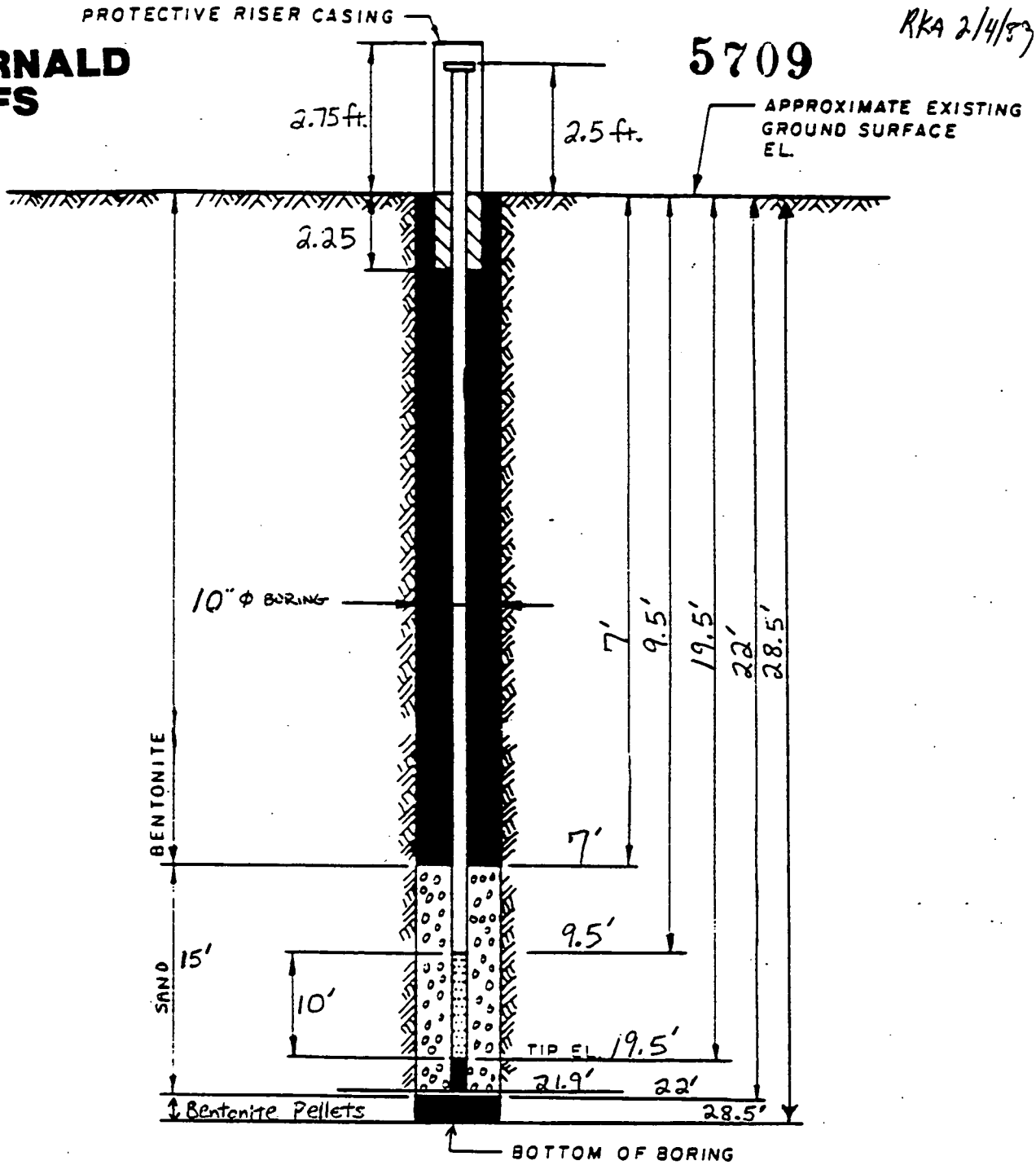
402-11-88

REVIEWED BY QA H.C. DATE 7/29/91 ~~B146~~ B1046 BB

RKA 2/4/83

FERNALD RI/FS

5709



DRAWING NUMBER

CHECKED BY

APPROVED BY

T. Sullivan

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 6.55 ft. below TOC,
5. WATER LEVEL READING ON 2/9/83 09:50 4.05 ft. below ground surface.

INSTALLATION DETAILS
MONITORING WELL ~~146~~ 1046 BB 1-7-89

PREPARED FOR
FMPC RI/FS

(Bentonite plug from total depth up to 22 ft.)

000535

This form did not represent the installed monitoring well, therefore, it has been modified with whiteout by Tom Sullivan.

FERNALD RI/FS

REVIEWED BY QA K.G DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

DAC

RKA 2/4/91

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. T. Sullivan DATE 2/9/88
PROJECT NO. 6.02.3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~B146~~ B1046 BB1-5-89
PIEZOMETER NO. ~~146~~ 1046 DATE OF INSTALLATION 2/9/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 27 ft.
FLUID — FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" ID FROM 0 TO 25 ft.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS
JOINING METHOD Screw flush joint threads.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Locking cap and lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION (ft.)	
TOP OF RISER PIPE	2.5		579	
GROUND SURFACE	0.0		576.5	
BOTTOM OF PROTECTIVE PIPE	2.25		574.25	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (None used)	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
BENTONITE	TOP 0	BOTTOM 7	TOP 576.5	BOTTOM 569.5
SAND	TOP 7	BOTTOM 22	TOP 569.5	BOTTOM 554.5
GRAVEL (None used)	TOP NA	BOTTOM NA	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 9.5	BOTTOM 19.5	TOP 567	BOTTOM 557
PIEZOMETER TIP	21.9		554.6	
BOTTOM OF BOREHOLE	28.5		548	
GWL AFTER INSTALLATION	4.05 below grd. surface, 6.55 below TOC.		572.45	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Bentonite pellets from total depth to 22 ft., tip of sump on well is just above bentonite plug.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

5709

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 2046	COORDINATES:	DATE: 12-13-88
ELEVATION: 577.0 est. G.L.	GWL: Depth Date/Time	DATE STARTED: 12-13-88
ENGINEER/GEOLOGIST: W.A. Hertel	Depth Date/Time	DATE COMPLETED: 12-15-88
DRILLING METHODS: Cable Tools		PAGE 1 OF 5

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See sample log of boring 1046.			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

NOTES:
Contractor: Pennsylvania Drilling
Driller: Craig Coulter
Helper: Bob Johnson
Rig Type: Cyclone model 42
Total water added to well is 600 gallons

Backround: H_{NU} = 0 ppm
$\gamma\beta$ = 40-80 (cpm)
α = 0 (cpm)
O_2 = 20.8%
LEL = 0%

000537

402-11-5

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 2046	COORDINATES:		DATE: 12-13-88
ELEVATION: 577.06L (estimate)	GWL: Depth	Date/Time	DATE STARTED: 12-13-88
ENGINEER/GEOLOGIST: W.J. Hertel	Depth	Date/Time	DATE COMPLETED: 12-18-88
DRILLING METHODS: Cable Tools			PAGE 2 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5 ft)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15				See sample log of boring 1046.			
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
				Bottom of Boring 1046 is 28.5 ft.			
29							

NOTES:

Contractor: Pennsylvania Drilling
Driller: Craig Coulter
Helper: Bob Johnson
Background: HNU = 0 ppm
$\beta\gamma$ = 40-80 cpm α = 0 cpm LEL = 0%

Samples will be collected at 5.0 foot intervals starting at 30.0 feet, as per ASTM standard penetration test. Colors identified using Munsell color chart.

000538

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 2046	COORDINATES: 475054.76 N/1379428.45 E		DATE: 12-14-88
ELEVATION: 577.4' G.L. (est.)	GWL: Depth	Date/Time	DATE STARTED: 12-13-88
ENGINEER/GEOLOGIST: W.A. Hertel	Depth	Date/Time	DATE COMPLETED: 12-18-88
DRILLING METHODS: Cable Tools			PAGE 3 OF 5

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	08950 1350 12-14	17 22 27	15	Dense, Yellowish Brown (10YR 5/6) Poorly Graded Sand <5% Gravel	SP	N/A	Hnu = 0 ppm (DRY) βγ = 40-60 cpm α = 0 cpm
32							
33							
34							
35							
36	8951 1450 12-14	9 35 38	15	Very Dense, Yellowish Brown (10YR 5/6) Poorly Graded Sand <1% Gravel	SP	N/A	Hnu = 0 ppm (DRY) βγ = 40-80 cpm α = 0-1 cpm
37							
38							
39							
40							
41							
42	8952 1520 12-14	16 46 43	14	Very Dense, light yellowish brown, (10YR 6/4) Well Graded Sand and Gravel	SW	N/A	Hnu = 0 ppm (Dry) βγ = 40-80 cpm α = 0-1 cpm
43							
44							

NOTES:
Contractor: Pennsylvania Drilling
Driller: Craig Coulter
Helper: Bob Johnson
Rig Type: Cyclone Model #42

Samples collected per standard ASTM penetration test. Colors Identified using Munsell color chart.

Background: Hnu = 0ppm, βγ = 40-80cpm, α = 0-1 cpm, LEL = 0%, O2 = 20.7%

000539

402-11

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 2046	COORDINATES: 478054.76 N/1379428.45 E	DATE: 12-14-88	
ELEVATION: 577.06 (est.)	GWL: Depth Date/Time	DATE STARTED: 12-13-88	
ENGINEER/GEOLOGIST: W.A. Hertel	Depth Date/Time	DATE COMPLETED: 12-18-88	
DRILLING METHODS: Cable Tools		PAGE 4 OF 5	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 0.5 (ft)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	8953 16:25 12-14	47 50+	8	Very Dense, Yellowish Brown (10YR 5/6) Well Graded Sand and Gravel	SW	NA	HNU = 0ppm (Dry) βγ = 40-80cpm α = 0cpm
47							
48							Very Hard Couldn't get a full sample - gravel catching on the tip of the split spoon
49							
50							
51	8954 0900 12-15	43 50+	6	Very Dense, Top 2in-light gray 10YR 7/2, To dark gray 10YR 3/1, To Yellowish Brown 10YR 6/6, To very dark gray 10YR 3/1, well graded sand and gravel	SW	NA	HNU = 0ppm (Dry) βγ = 40-80cpm α = 0cpm
52							
53							
54							
55	8955 10:45 12-15	50+	6	Very Dense, Pale brown, 10YR 6/3 well graded sand and gravel	SW	NA	HNU = 0ppm βγ = 40-80cpm α = 0cpm
56							
57							
58							
59							

NOTES:
Contractor: Pennsylvania Drlg.
Driller: Craig Coulter
Helper: Bob Johnson
Rig Type: Cyclone Model #42

Samples collected per ASTM standard penetration test. Colors identified using Munsell Color Chart.
Coordinates used for this well are those of well 1046 which is approximately 10ft. E-NE of this well

Background: HNU = 0ppm, βγ = 40-80cpm, α = 0-1cpm, LEL = 0%, O_2 = 20.7%

000540

402-11-

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 2046	COORDINATES: 478654.76N/1379429.45E	DATE: 12-15-88
ELEVATION: 577.06 (est)	GWL: Depth 63.55ft Date/Time 1500/12-15-88	DATE STARTED: 12-13-88
ENGINEER/GEOLOGIST: W.A. Hertel	Depth 59.15ft Date/Time 1630/12-15-88	DATE COMPLETED: 12-18-8
DRILLING METHODS: Cable Tools	" 58.80ft 0735/12/16/88	PAGE 5 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61							
62	08956 1330 12-15	5 6 11	15	Medium Dense, Yellowish Brown (10YR/5/6) Poorly Graded Sand < 5% gravel	SP	N/A	H_{NU} = 0ppm (wet) $\beta\gamma$ = 40-80cpm α = 0cpm
63							
64							
65							
66	WAH 12-15-88						
67	08957 1430 12-15	20 27 26	12	Very Dense, Pale Brown, (10YR 6/3) Well Graded Sand and Gravel ~10% Gravel	SW	N/A	H_{NU} = 0ppm (wet) $\beta\gamma$ = 40-80cpm α = 0cpm
68							
69							
70							
71							
72	08958 1600 12-15	6 7 9	15	Medium Dense, Brown (10YR 4/3) Well Graded Sand and Gravel ~10% gravel	SW	N/A	H_{NU} = 0ppm $\beta\gamma$ = 40-80cpm α = 0cpm
73							
74							

NOTES:
Contractor: Penn. Drilling
Driller: Craig Coulter
Helper: Bob Johnson
Rig Type: Cyclone Model #42

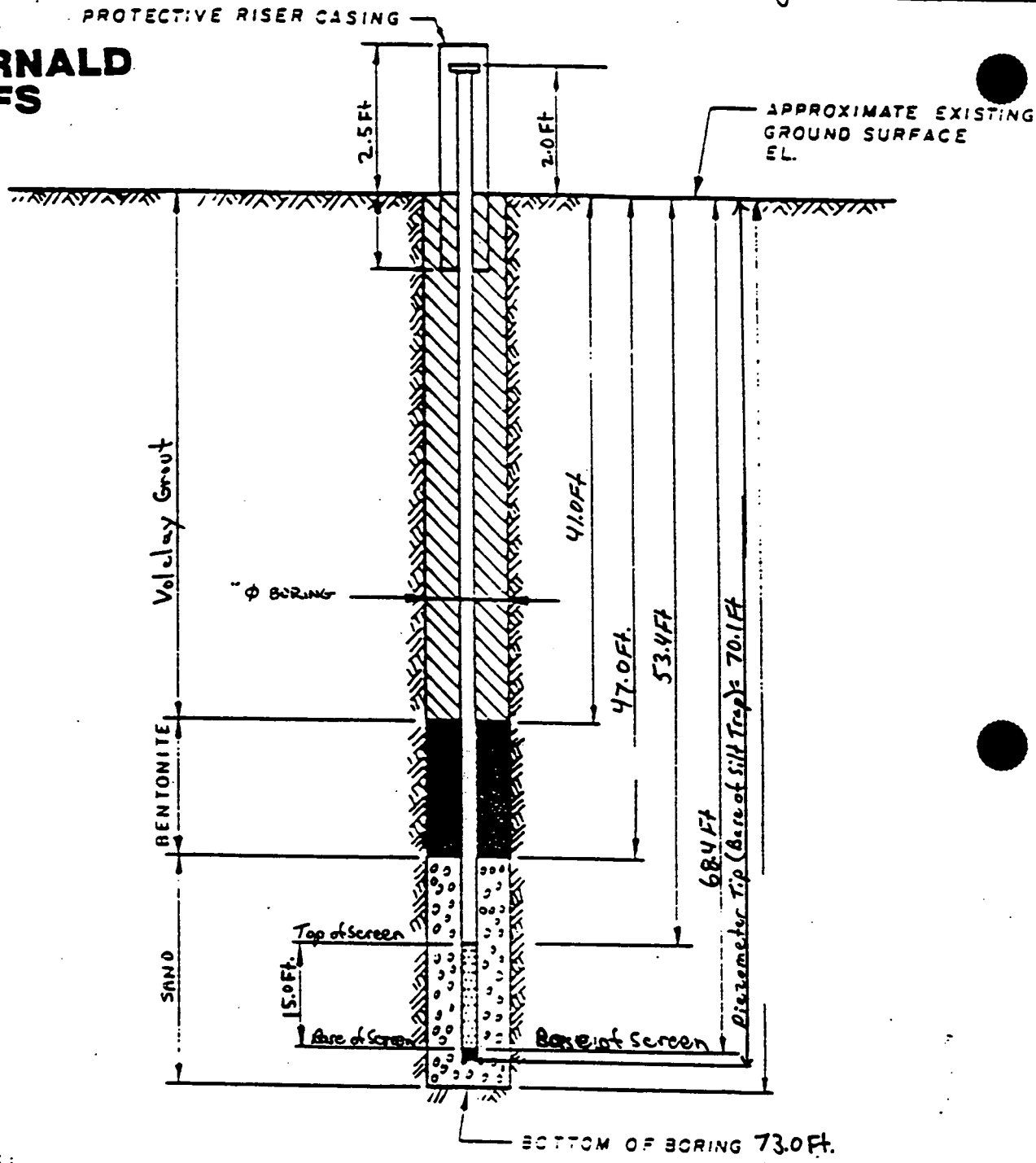
Samples collected per ASTM standard penetratio test. Colors identified using Munsell color chart.

Background: H_{NU} = 0ppm $\beta\gamma$ = 40-80cpm, α = 0-1cpm, LEL = 0%, O_2 20.7%

402-1

Monitoring Well 2046

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4.0 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 588 Ft
5. WATER LEVEL READING ON 12-16-88 @ 0735

Materials Used: 15.0 Ft. Screen with a 1.7 Ft. silt trap and 0.4 Ft. length on top., 55.0 Ft. of 310 stainless steel pipe (4.0 inch I.D.) consisting of 5-10 Ft. lengths and 1-5 Ft. length. 27 bags of 10 x 20 Sand (80 pounds each), 7 buckets of bentonite pellets (5 gallons each) and 10 bags of Volclay grout., 1-5.0 Ft. long well cover (10 inch I.D.) with locking cover and padlock, 600 gallons of water were added to wel

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
Monitoring Well # 2046
12-18-88

000542

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
PROJECT NO. 602 3.2
BORING NO. M.W. 2046
PIEZOMETER NO. 2046

FIELD ENG./GEO. W.A. Hentel DATE 12-19-8
CHECKED BY ____ DATE ____
DATE OF INSTALLATION 12-13-88 to 12-18-88

BOREHOLE DRILLING

DRILLING METHOD Cable Tools
DRILLING FLUID (S) USED:
FLUID Water FROM Surface TO 73.0Ft.
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10inch (ID) FROM Surface TO 73.7Ft.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4inch
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 inch
TOTAL PERFORATED AREA 15.0Ft.

RISER PIPE MATERIAL 310 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 3/8 inch I.D. 4.0inch
LENGTH OF PIPE SECTIONS 5.0Ft., 10.0Ft.
JOINING METHOD Threaded, Screw Type Flush Jointed.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0Ft
PROTECTIVE PIPE O.D. 10.75 inch

OTHER PROTECTION Locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 Ft		—	
GROUND SURFACE	0.0Ft.		—	
BOTTOM OF PROTECTIVE PIPE	2.5 Ft		—	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (Volclay)	TOP Surface	BOTTOM 41.0Ft.	TOP	BOTTOM
BENTONITE (Pellets)	TOP 41.0Ft	BOTTOM 47.0Ft	TOP	BOTTOM
SAND (10 x 20)	TOP 47.0Ft.	BOTTOM 73.0Ft	TOP	BOTTOM
GRAVEL (None Used)	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 53.4Ft.	BOTTOM 68.4Ft.	TOP	BOTTOM
PIEZOMETER TIP	70.1Ft.			
BOTTOM OF BOREHOLE	73.0 Ft.			
GWL AFTER INSTALLATION	Not Checked			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000543

FERNALD
RI/FS

	Date	Initial	
Field Check	6/28/90	EJ	
1st Key In			
2nd Key In			
Hard Copy Verification			

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 607 3.2.1 | PROJECT NAME: FMPC RI/FS
BORING NUMBER: 3046 | COORDINATES: N.478,051.23, E.1,319,438.64 | DATE: 5/23/90
ELEVATION: 578.6 TOP OF RISER | GWL: Depth 57.05 FT Date/Time 5/30/90 @ 0840 | DATE STARTED: 5/22/90
ENGINEER/GEOLOGIST: M. SWANSON | Depth 53.7 FT Date/Time 6/6/90 @ 0905 | DATE COMPLETED: 6/04/90
DRILLING METHODS: CABLE TOOL | PAGE 1 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	WELL CONSTRUCTION	REMARKS
0	1			SEE VCS LOG OF B-2046 FOR SOIL CLASSIFICATIONS OF FIRST 75 FEET OF B-3046. SAMPLING OF B-3046 WILL BEGIN AT 75.0 FT., IN 5 FT. INCREMENTS.			2A	
12								
24								
36								
48								
60								
72								

NOTES.
Drilling Contractor: Penn Drill
Drilling Equipment: Bucyrus Erie
Driller: Dave Newman
Bob Johnson Assis.

000544

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3046	COORDINATES:		DATE: 5/24/90 ; 5/30/90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5/22/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 6/4/90
DRILLING METHODS: CABLE TOOL			PAGE 2 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINATION (PPM)	WELL CONSTRUCTION	REMARKS
75	32704 1041 5/24/90	16 21 27	18	DENSE, GRAY TO DARK GRAY (10YR 5/1 TO 4/1) WELL GRADED COARSE SAND, SOME SILT AND COBBLES (TO .75 in.), SATURATED	SW	N/A		H_{NU} = 0.1 ppm; α = 0 cpm; βγ = 60-85 cpm
76								
77								
78								
79								
80	32705 0905 5/30/90	10 21 22	15	DENSE, DARK GRAYISH BROWN (10YR 4/2) POORLY GRADED FINE SAND; TRACE OF SUBROUNDED PEBBLES; SOME SILT, SATURATED	SP	N/A		H_{NU} = 0.2 ppm; α = 0 cpm; βγ = 40-50 cpm
81								
82								
83								
84								
85	32706 0925 5/30	15 20 22	18	DENSE, DARK BROWN (7.5YR 4/2) SILTY FINE GRAINED POORLY GRADED SAND, SOME ROUNDED PEBBLES, (TO .2 in.) SATURATED	SM	N/A		H_{NU} = 0.2 ppm; α = 0 cpm; βγ = 40-60 cpm
86								
87								
88								
89								
90								

NOTES.

Drilling Contractor: PENAL DRILL CO.

Drilling Equipment: BUCYRUS ERIE

Driller: D. NEWMAN

ASST.: B. JOHNSON

ALL SOIL SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST. SOIL SAMPLE COLORS IDENTIFIED USING MUNSELL COLOR CHARTS.

INSTRUMENT	SERIAL #	INST. #	BACKGROUND READINGS
H_{NU}	N/A	1015	0.2-0.4 ppm
α	50767	13	0 cpm
βγ	55339	8	20-80 cpm

000545

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3046	COORDINATES:		DATE: 5/30/90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5/22/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 6/04/90
DRILLING METHODS: CABLE TOOLS			PAGE 3 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINATION (PPM)	WELL CONSTRUCTION	REMARKS
90	32707 0956 5/30	7 7 8	15	MEDIUM DENSE, BROWN (10YR [redacted]), SILTY WELL GRADED COARSENING SAND (ASSUME 5/3), SOME ROUNDED PEBBLES, SATURATED	SM	N/A		H_{au} = 0.1 ppm; α = 0 cpm; $\beta\gamma$ = 50-70 cpm
91								
92								
93								
94								
95	32708 1347 5/30	33 76 50+/5 in.	17	VERY DENSE, GRAYISH-BROWN (10YR 5/2), POORLY GRADED COARSE SAND, TRACE OF SILT, PEBBLES (TO .15 in.), SATURATED	SP	N/A		H_{au} = 0.2 ppm; α = 0 cpm; $\beta\gamma$ = 70-90 cpm
96								
97								
98								
99								
100	32709 1418 5/30	3 9 22	18	DENSE, GRAYISH BROWN (10YR 5/2) WELL GRADED COARSE SAND, SOME SILT, SATURATED	SW	N/A		H_{au} = 0.1 ppm; α = 0 cpm; $\beta\gamma$ = 60-80 cpm
101								
102								
103								
104								
105								

NOTES.

Drilling Contractor: PENN. DRILL CO.

Drilling Equipment: BUCYRUS ERIE

Driller: D. NEWMAN

ASST.: B. JOHNSON

BACKGROUND
H_{au} = 0.2-0.6 ppm
α = 0 cpm
$\beta\gamma$ = 40-100 cpm

000546

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3046	COORDINATES:		DATE: 5/30/90 - 5-31-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5/22/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 6/04/90
DRILLING METHODS: CABLE TOOL			PAGE 4 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED GAMMA RADIOACTIVITY (CPM)	WELL CONSTRUCTION	REMARKS
105	32710	4		MEDIUM DENSE, GRAYISH BROWN (10YR 5/2), WELL GRADED FINE SAND, SOME SILT, SATURATED	SW	N/A		H_{nu} = 0.1 ppm
	1620	11	16					α = 0 cpm
106	5/30	15						βγ = 40-50 cpm
107								
108								
109								
110	32711	2		MEDIUM DENSE, DARK GRAY (2.5Y 4/0), WELL GRADED FINE SAND, SOME SILT, TRACE OF ROUNDED PEBBLES (TO .25 IN.); SATURATED	SW	N/A		H_{nu} = 0.06 ppm
	1642	3	14					α = 0 cpm
111	5/30	11						βγ = 60-70 cpm
112								
113								
114								
115	32712	8		DENSE, DARK GRAY (10YR 4/1), POORLY GRADED FINE SILTY SAND, SATURATED	SM	N/A		H_{nu} = 0.15 ppm
	1033	20	16					α = 0 cpm
116	5/31/90	22						βγ = 40-50 cpm
117								
118								
119								
120								

NOTES.

Drilling Contractor: PENN DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST.: B. JOHNSON

BACKGROUND:

H_{nu} = 0.1 - 0.4 ppm

α = 0 cpm

βγ = 20 - 80 cpm

000547

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3046	COORDINATES:		DATE: 5-31-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5-22-90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 6/04/90
DRILLING METHODS: CABLE TOOL			PAGE 5 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (PSI)	WELL CONSTRUCTION	REMARKS
120	32713	6		DENSE, DARK GRAY (10YR 4/1), WELL-GRADED SILTY SAND, SOME PEBBLES (TO .2 in.). SUBROUNDED; COARSE SAND; SATURATED	SW	N/A		H_{AU} = 0.15 ppm
121	1441 5/31	13 20	13					α = 0 cpm; $\beta\gamma$ = 60-80 cpm
122								
123								
124								
125	32714	7		MEDIUM DENSE, GRAY (2.5Y 5/0), POORLY GRADED MEDIUM TO COARSE SAND, SOME SILT, SATURATED.	SP	N/A		H_{AU} = 0.1 ppm
126	1552 5/31	9 18	17					α = 0 cpm; $\beta\gamma$ = 40-70 cpm
127								
128								
129								
130	32715	2		MEDIUM DENSE, DARK GRAY (2.5Y 4/0) WELL GRADED GRAVEL-SAND MIXTURE, SOME SILT, GRAVEL TO 1.0 in., FRACTURED LIMESTONE COBBLE, SATURATED	GW	N/A		H_{AU} = 0.1 ppm
131	1727 5/31	3 16	18					α = 0 cpm; $\beta\gamma$ = 40-60 cpm
132								
133								
134								
135								

NOTES.

Drilling Contractor: PENN DRILL CO.

Drilling Equipment: BUCYRUS ERIE

Driller: D. NEWMAN

ASST.: B. JOHNSON

BACKGROUND:

H_{AU} = 0.05 - 0.2 ppm

α = 0 cpm

$\beta\gamma$ = 20-60 cpm

000548

FERNALD
RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3046	COORDINATES:		DATE: 6-1-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5-22-90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 6/04/90
DRILLING METHODS: CABLE TOOL			PAGE 6 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
135	32716	22		DENSE, GRAY (2.5Y 5/0) SILT-GRAVEL-SAND MIXTURE, GRAVEL TO 1.25 IN., SATURATED	GM	N/A		H_{NU} = 0.08 PPM
136	1115	16	14					α = 0 CPM
	6-1-90	15						$\beta\gamma$ = 50 CPM
137				BOTTOM OF BORING, DRILLED & SAMPLED TO 136.5 FT. NO "BLUE CLAY" ENCOUNTERED.				
138								
139								
140								

NOTES.

Drilling Contractor: PENN DRILL CO.

Drilling Equipment: BUCYRUS ERIE

Driller: D. NEWMAN

ASST.: B. JOHNSON

BACKGROUNDS

H_{NU} = 0.08 PPM

α = 0 CPM

$\beta\gamma$ = 40-50 CPM

000549

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 602 3.2.1
BORING NO. 3046
PIEZOMETER NO. 3046

FIELD ENG./GEO. M. SWANSON DATE 6-1-90
CHECKED BY E. Trollinger DATE 6/28/90
DATE OF INSTALLATION 6-04-90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOLS
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 FT TO 136.5 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN ID FROM 0 FT TO 136.5 FT
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4 IN. ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 10 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT
JOINING METHOD THREADED - FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 10.75 IN.

OTHER PROTECTION HINGED, LOCKING LID COVER

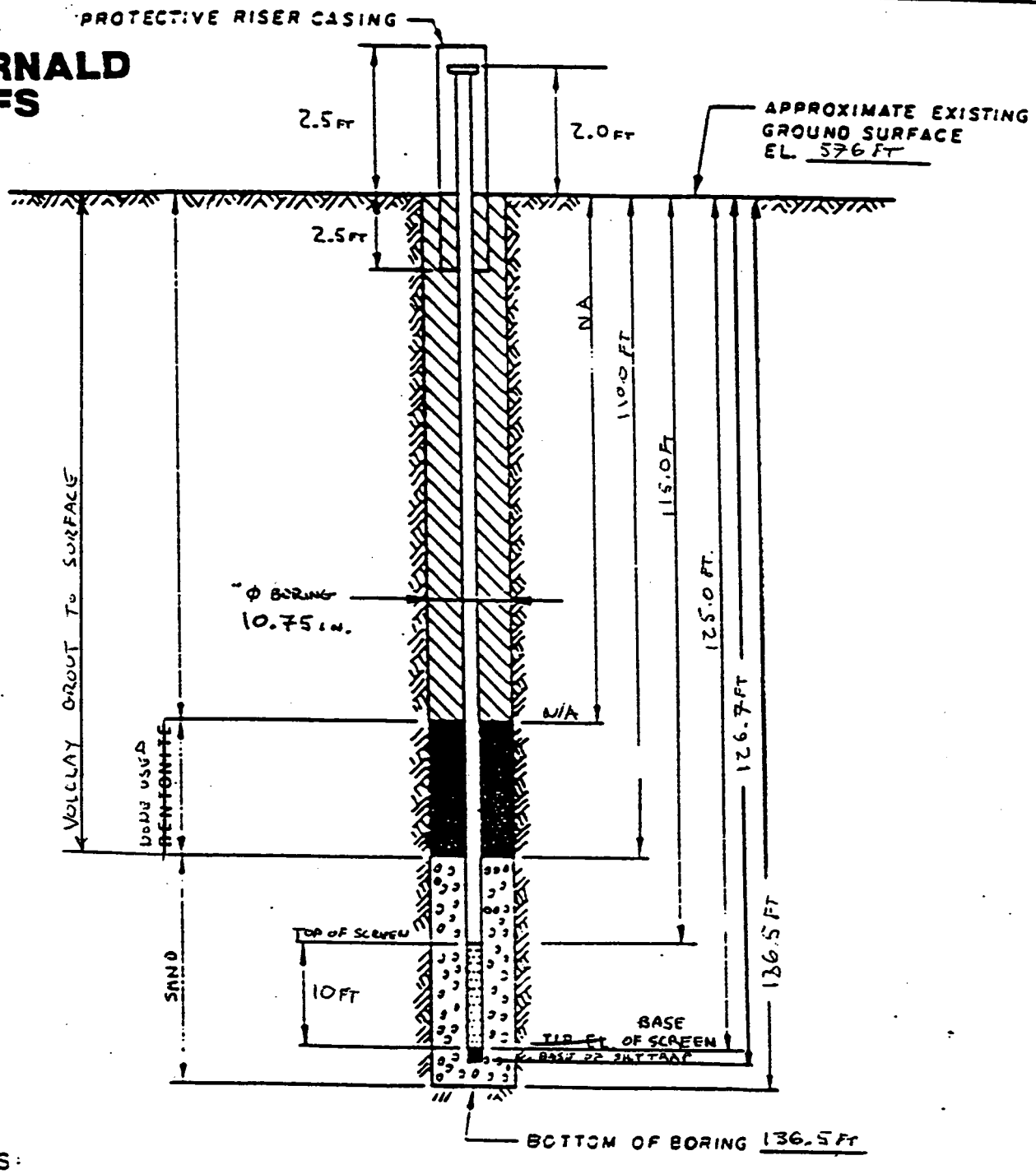
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) E.T. 6/28/90	
TOP OF RISER PIPE	+ 2.0		578.60	
GROUND SURFACE	0.0		Ground Elevation/NOT MEASURED	
BOTTOM OF PROTECTIVE PIPE	- 2.5			
BOREHOLE FILL MATERIALS:				
VOLCLAY GROUT ~~/SLURRY~~ ET 6/28/90	TOP 0.0 FT	BOTTOM 110.0 FT	TOP	BOTTOM
BENTONITE NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND 10/20 SIZE	TOP 110.0 FT	BOTTOM 136.5 FT	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 115.0 FT	BOTTOM 125.0 FT	TOP	BOTTOM
PIEZOMETER TIP	126.7 FT			
BOTTOM OF BOREHOLE	136.5 FT			
GWL AFTER INSTALLATION	52.8 FT BELOW GROUND SURFACE			

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS 3 BUCKETS OF BENTONITE PELLETS ADDED AROUND PROTECTIVE CASING

8/8

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

6-2-90

DRAWN BY

NOTES:

1. RISER PIPE IS 4.0 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. (WITH WELDED SILTTRAP)
4. ELEVATION OF WATER LEVEL 52.05 FT; 53.7 FT
5. WATER LEVEL READING ON 5/30/90; 6/1/90

MATERIALS USED DURING WELL INSTALLATION:

20 80 LB. BAGS OF 10/20 SAND

29 50 LB. BAGS OF VOLCLAY GROUT

3 5 GAL. BUCKETS OF BENTONITE PELLETS

800 GALLONS OF WATER USED DURING GROUTING AND DRILLING PROCEDURES

SS PIPE SECTIONS: 11-10' SECS.; 1-5' SEC.; 1-10' SCREEN W/ WELDED SILT TRAP

INSTALLATION DETAILS MONITORING WELL #3046

PREPARED FOR FERNALD RI/FS

000551

Black ink corrections were made by L. Willie who changed Recovery in feet to Recovery in inches. WPIC 4/24/88

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91 QC/DM/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RIG #3

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B147 B(047) B13 1-5-89	COORDINATES: 478258.44 N 1379062.43 E	DATE: OCT 15-1987
ELEVATION: 568.7 Ground	GWL: Depth N/A Date/Time N/A	DATE STARTED: OCT 15-1987
ENGINEER/GEOLOGIST: Lowell Willie	Depth N/A Date/Time N/A	DATE COMPLETED: OCT 17-1987
DRILLING METHODS: Cable tool		PAGE 1 OF 2

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1½ Ft	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	S1 7295 1730	3 5 10	13	soft black (7½YR, 3/6) ~~black~~ organic rich silt, some sand and clay - moist 0.5	OL	0.5	Scanned sample background
				brown (10YR 5/3) silty clay, trace sand - dry 1.0	ML	2.0	
2	S2 7296 1735	6 13 20	12	hard brown (10YR, 5/6) clay - some silt trace fine sand - dry	CL	<.5	Scanned sample background
				hard brown (10YR, 5/6) mottled gray clay, ~~some~~ silt - dry	CL	<.5	
4	S3 7297 1740	8 16 21	11	hard brown (10YR, 4/6) mottled gray clay ~~some~~ silt, trace sand and gravel - dry 4.0	CL	<.5	Scanned sample background
				hard gray (7½YR) silty clay trace gravel, some sand - dry 4.5	CL	<.5	Scanned sample background
6	S4 7298 1745	23 27 31	16	hard brown (10YR, 3/4) mottled gray clay trace sand and gravel ~~some~~ silt - dry	CL	<.5	
	S5 7299 1045	6 11 14	13	hard brown (10YR, 5/4) clay, some silt and fine sand, trace med to coarse sand - dry	CL	4.0	Scanned sample background
8	S6 7300 1050	15 18 21	12	hard brown (10YR, 5/4) gravelly clay, sand silt and sand, trace pebbles - dry sandy 9.0	CL	NA	Scanned sample background
10	S7 7301 1130	2 4 5	11	soft gray (7½YR, 5/0) ~~silty~~ clay some silt and gravel, trace pebbles, - dry	CL	0.5	Scanned sample background
12	S8 7302 1140	8 10 13	14	soft gray (7½YR 5/0) clay some sand and silt trace fine gravel - moist	CL	0.5	Scanned sample background
	S9 7303 1530	NA	14	hard gray (7½YR, 5/0) ~~gr~~ sandy clay some silt and gravel, trace pebbles - dry	CL	<.5 bottom of tube	Scanned sample background 1st try at shelby tube sample was no return
NA 14							second try at same interval was 1.7' return
	S10 7304 1610	5 15 37	14	stiff gray 7½YR 5/0 sandy clay some silt and gravel, trace pebbles - dry 1.5	CL	<.5	Scanned samples S9 and S10 background

NOTES:

Pennsylvania Drilling Co.
Driller Dave Neuman
Helper Bob Johnson

S-1 thru S-4 OCT 15-1987
S5 thru S-13 OCT 16-1987
background 10-15-87 Alpha = 1.5
Beta/Gamma = 45

water added to hole (5 gallon buckets) ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ II

5709

QC/DT/2.4.89

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602332	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B147~~ B1047 BB 1-5-88	COORDINATES: See pl	DATE: 10-16-87
ELEVATION: See pl	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-15-87
ENGINEER/GEOLOGIST: Lowell Wile	Depth N/A Date/Time N/A	DATE COMPLETED: 10-17-87
DRILLING METHODS: Cable tool		PAGE 2 OF 2

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 Ft	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0							
				stiff gray 7/2 YR 5/1 sandy clay some silt, gravel and pebbles-dry	Cl	<5	
16	S11 7305 1640	24 50+	12	~~stiff~~ hard sandy clay some silt gray 7/2 YR 5/1 gravel-trace pebbles-dry	Cl	<5	Scored sample background
	S12 7306 1720	11 41 48	1.6	hard gray 7/2 YR 5/1 sandy clay some silt gravel-trace pebbles-dry 17.5	Cl	<5	Scored sample background
18				~~dense~~ brown 10YR 5/6 fine sand-some silt, clay and medium sand-dry 18	SW	NA	
	S13 7307 1745	14 40 50	18	~~hard~~ dense brown 10YR 5/6 sand some gravel, silt and clay-dry 18.5	SP	NA	Scored sample background
20				dense brown 10YR 7/6 sand some gravel silt and clay trace pebbles-dry	SP	NA	
22				bottom of boring 20.0			
24							

NOTES:

base of till at 18.0 feet, when set well placed bentonite pellets in boring up to 17.4 ft

background 10-16-87 — ~~α~~ alpha = 2 cpm beta/gamma = 60 cpm

background 10-17-87 — alpha = 2 cpm beta/gamma = 70 cpm

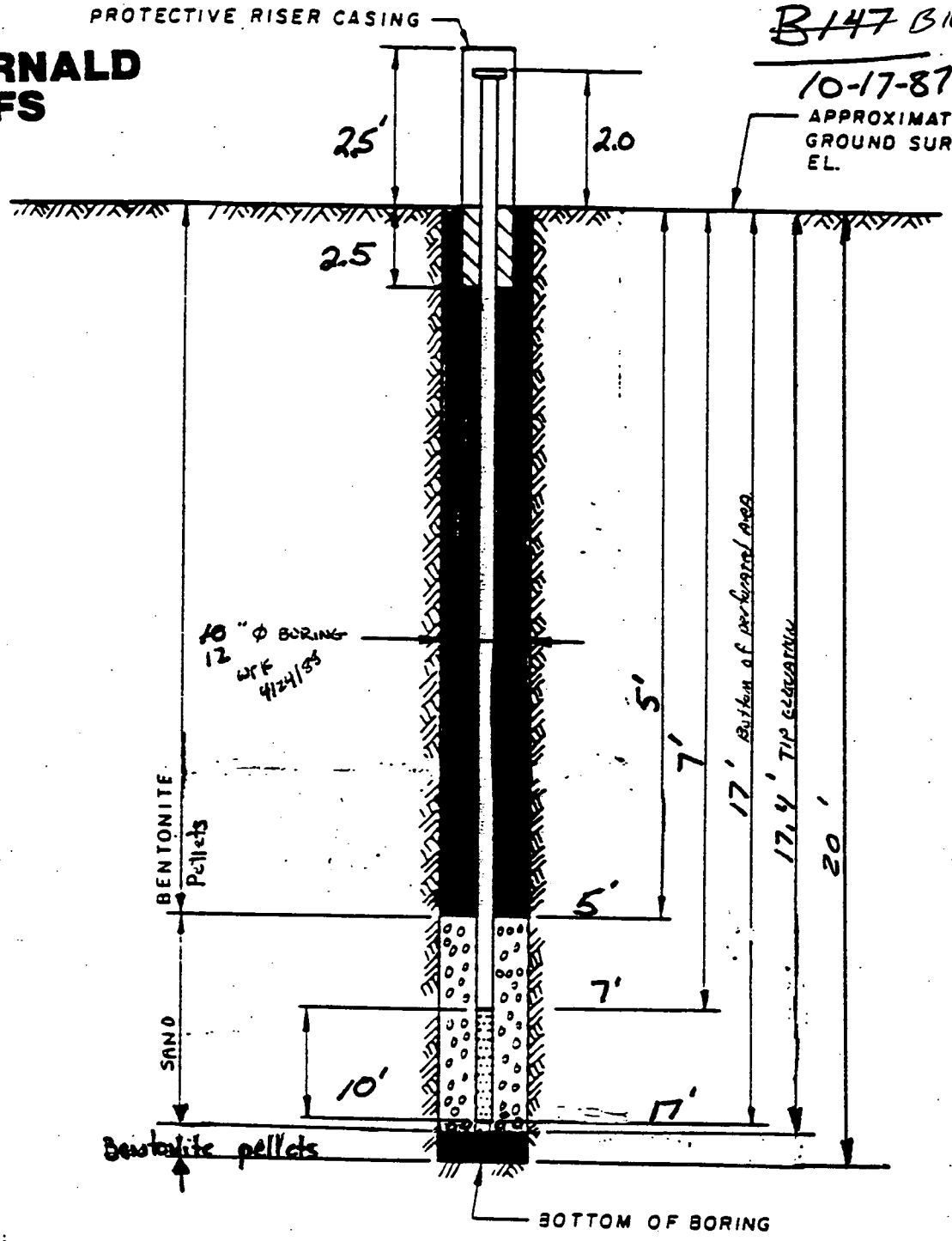
000553

REVIEWED BY QA K.C. 7/29/91 QC/DH/2.4.89

B147 B1047 BB 1-5-89

10-17-87

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON (dry)

This form did not represent the installed monitoring well, therefore, it was modified with white out by L. Willie.

WPK 4/24/88

INSTALLATION DETAILS
MONITORING WELL ~~147~~ 1049BB 1-5-89

PREPARED FOR

FMPC RI/FS

000554

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 7/29/91

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. Lowell Wille DATE 10-17-87
PROJECT NO. 602.3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~B147~~ B1047 BB 1-5-89
PIEZOMETER NO. ~~B147~~ 1047 DATE OF INSTALLATION 10-17-87

BOREHOLE DRILLING

DRILLING METHOD cable tool
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 TO 20 FT
FLUID NA FROM NA TO NA

TYPE OF BIT ~~NA~~ HAMMER
CASING SIZE (S) USED:
SIZE 10" FROM 0 FT TO 20 FT
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010"
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10'

RISER PIPE MATERIAL stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 5' + 2' + 2' = 9'
JOINING METHOD screw (FLUSH JOINT THREAD)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE ~~Ø~~ I.D. 10" (minimum)

OTHER PROTECTION ~~NA~~ LOCKING TOP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0		566.7	
GROUND SURFACE	0.0		568.7	
BOTTOM OF PROTECTIVE PIPE	2.5		571.2	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM —	TOP NA	BOTTOM NA
BENTONITE	TOP 0	BOTTOM 5	TOP 568.7	BOTTOM 563.7
SAND	TOP 5	BOTTOM 17.4	TOP 563.7	BOTTOM 551.3
BENTONITE PELLETS	TOP 17.4	BOTTOM 20.0	TOP 551.3	BOTTOM 548.7
PERFORATED SECTION	TOP 7	BOTTOM 17	TOP 561.7	BOTTOM 551.7
PIEZOMETER TIP	17.4		551.3	
BOTTOM OF BOREHOLE	20		548.7	
GWL AFTER INSTALLATION	dry		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Dry Well

000555

FERNALD RI/FS

	Initial	Date
Field Check	MLS	01-10-89
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 2047	COORDINATES: 473258.44N/1379052.43E	DATE: 12-20-88
ELEVATION: 563.0 GL (Estimate)	GWL: Depth 51.75 ft. Date/Time 12-22-88/0815	DATE STARTED: 12-20-88
ENGINEER/GEOLOGIST: W.A. Hertel	Depth 50.4 ft. Date/Time 01-03-89/0835	DATE COMPLETED: 01-05-89
DRILLING METHODS: Cable Tools		PAGE 1 OF 5

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.50Ft.)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See Visual Classification of Soils Log of Monitoring Well #1047. for description of samples to 20.0 Ft.			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

NOTES:

Contractor: Penn Drill
Rig Type: Cyclone Model #42
Driller: Craig Coulter
Helper: Greg Coughenour
Background: HNu = 0 ppm, α = 0 cpm, βγ = 40-60 cpm

Samples will be collected @ 5.0 Ft intervals starting @ 20.0 Ft. Samples will be collected using ASTM standard penetration test. Colors will be identified using the Munsell color chart.

Water used during installation = 600 gallons

0556

402-11-6

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 603 32	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 2047	COORDINATES: 479258.4411/1370652.43 E	DATE: 12-20-88
ELEVATION: 5680 GL (Estimate)	GWL: Depth Date/Time	DATE STARTED: 12-20-88
ENGINEER/GEOLOGIST: W.A. Harrel	Depth Date/Time	DATE COMPLETED: 01-05-89
DRILLING METHODS: Cable Tools		PAGE 2 OF 5

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.3 ft.)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16 17 18 19 20				See Visual Classification of Soils Log of Monitoring Well #1047 for description of samples to 20.0 ft. Bottom of boring = 1047			
21	08359 15 20 12-20	16 28 32	10	Very Dense, Brown (10YR 4/3) Well Graded, Gravelly Sand ~10% Gravel	SW	NA	H_{NU} = 0 ppm Sample is Dry. α = 0 cpm $\beta\gamma$ = 60-80 cpm
22 23 24 25							
26	08300 1040 12-20	9 13 24	10	Dense, Yellowish Brown (10YR 5/4) Poor, Graded Sand, No Gravel	SP	NA	H_{NU} = 0 ppm Dry α = 0 cpm $\beta\gamma$ = 40-60 cpm
27 28 29							

NOTES:

Contractor: Penn Drill
Rig Type: Cyclone Model #42
Driller: Craig Coulter
Helper: Greg Coughenour
Background: H_{NU} = 0 ppm, α = 0 cpm, $\beta\gamma$ = 40-60 cpm

Sample: Collected per ASTM standard penetration test. Colors identified using the Munsell color chart.

000557

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 2047	COORDINATES: 473258.4411/377052.43 E	DATE: 12-20 & 21-88
ELEVATION: 568.0 GL (Estimate)	GWL: Depth Date/Time	DATE STARTED: 12-20-88
ENGINEER/GEOLOGIST: W.A. Hertel	Depth Date/Time	DATE COMPLETED: 01-05-89
DRILLING METHODS: Cable Tools		PAGE 3 OF 5

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5Ft)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	D8961 1635 12-20	11 28 50	15	Very Dense, Brown (10YR 5/3) Poorly Graded Sand Top 12 In., No Gravel To Well Graded Sand and Gravel bottom 3 In	SP SW	NA	H_{NU} = 0 ppm α = 0 cpm $\beta\gamma$ = 40-60 cpm DRY
32				[illegible]			
33							
34							
35	D8962 (Lost 12-21-88)						
36	D8962 1025 12-21	50+	6	Very Dense, Brown (10YR 5/3) Well Graded Sand and Gravel	SW	NA	H_{NU} = 0 ppm α = 0 cpm $\beta\gamma$ = 40-60 cpm DRY
37							
38							
39							
40							
41	D8963 1050 12-21	19 13 50+	10	Very Dense, Light Gray (10YR 7/2) Well Graded Sand and Gravel	SW	NA	H_{NU} = 0 ppm α = 0 cpm $\beta\gamma$ = 40-60 cpm DRY
42							
43							
44							

NOTES:

402-11-6

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6022 3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 2047	COORDINATES:	DATE: 12
ELEVATION: 568.0 ft (Estimate)	GWL: Depth Date/Time	DATE STARTED: 12-20-88
ENGINEER/GEOLOGIST: WA Hertel	Depth Date/Time	DATE COMPLETED: 01-03-89
DRILLING METHODS: Cable Tools		PAGE 4 OF 5

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5 ft)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08964 1145 12-21	20 50+	6	Very Dense, Grayish Brown (10YR 5/2) Poorly graded Sand <5% Gravel	SP	NA	HNU = 0ppm (DRILLP) α = 0ppm ββ = 60-80ppm
47							
48							
49							
50	08965 1455 12-21	14 24 27	14	Very Dense, Brown (10YR 5/3) Poorly graded Sand < 5% Gravel	SP	NA	HNU = 0ppm α = 0ppm ββ = 40-60 ppm
51							
52							
53							
54							
55							
56	08966 1535 12-21	15 34 34	16	Very Dense, Yellowish Brown (10YR 5/4) Top 12In is well graded sand and gravel Bottom 4In is poorly graded Fine Sand	SW SP	NA	HNU = 0ppm α = 0ppm ββ = 40-60ppm
57				[illegible]			
58							
59							

NOTES:

000559

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 2047	COORDINATES:	DATE: 12-21-88
ELEVATION: 568.0 GL (Estimate	GWL: Depth 52.3 Ft Date/Time 12/21/88 16:25	DATE STARTED: 12-20-88
ENGINEER/GEOLOGIST: W.A. Hertel	Depth 51.75 Ft Date/Time 12/22/88 0815	DATE COMPLETED: 01-05-89
DRILLING METHODS: Cable Tools	Depth 50.4 Ft Date/Time 01/03/89 0835	PAGE 5 OF 5

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.50 Ft.)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	0897 1600 12-21	5 6 7	15	Medium Dense, Brown (10YR 5/3) Poorly Graded Sand < 5% Gravel	SP	NA	HNU 0 ppm α = 0 cpm βγ = 40-60 cpm
62							
63					WAH 1-16-89		
64				Bottom of Boring 2047 = 64.0 Ft.			
65							

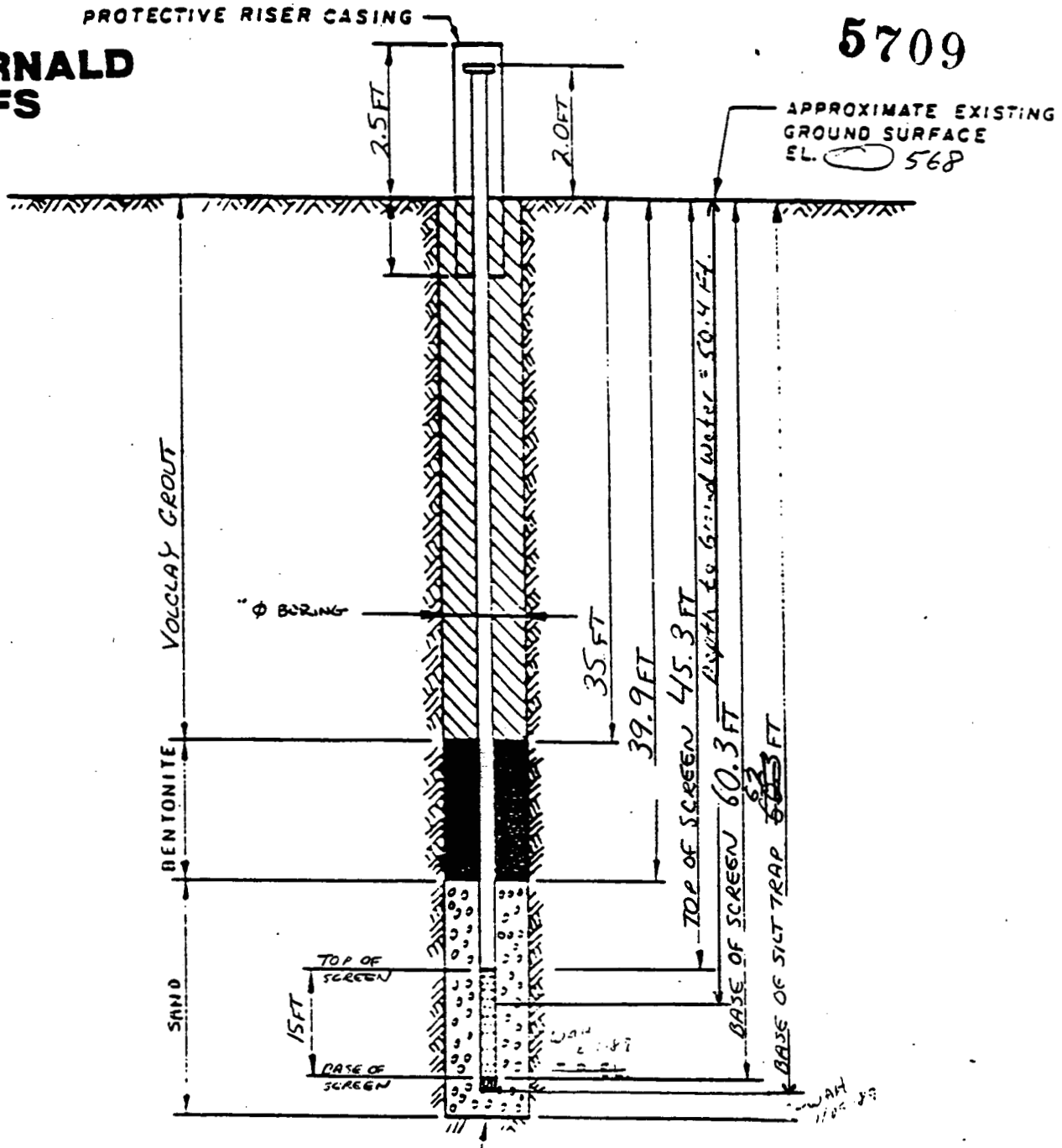
NOTES:

000560

MONITORING WELL 2047

5709

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4.0 IN. I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 50.4 FT
5. WATER LEVEL READING ON 1-3-89

MATERIALS USED: 15.0 FT SCREEN WITH A 1.7FT SILT TRAP, 47FT OF 310 STAINLESS STEEL PIPE (4" I.D.) CONSISTING OF 4-10FT LENGTHS, 1-5FT LENGTH AND 1-2 FT LENGTH. 15 BAGS OF 10x20 SAND (80 LB), 5 BUCKETS BENTONITE (5 GAL) AND 10 BAGS VOLCLAY GROUT (50 LB each) 1-5FT LONG PROTECTIVE COVER (10 IN ID) W/ LOCKING COVER + PADLOCK 600 GALLONS ADDED TO WELL [illegible]

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

MONITORING WELL 2047
1-5-89

DRAWN BY	K. Hanlein	CHECKED BY	W. Hertel	DRAWING NUMBER
		APPROVED BY		

000561

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. [illegible]/K. Hem[illegible] DATE 1-5-89
PROJECT NO. 602 3.2
CHECKED BY W. [illegible] DATE 2-9-89
WAH 1-5-89
BORING NO. 2047
PIEZOMETER NO. 2047
DATE OF INSTALLATION 1-3, 4, 5-89

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM Surface TO 64.0 Ft.
FLUID — FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10 In. ID. FROM Surface TO 65.0 Ft.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 In. ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.01 In.
TOTAL PERFORATED AREA 150 Ft.

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 In. I.D. 4.0 In.
LENGTH OF PIPE SECTIONS 10 Ft, 5.0 Ft, 2.0 Ft.
JOINING METHOD Screw Type, Threaded Flush Joints

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 Ft
PROTECTIVE PIPE O.D. 10.5 In.

OTHER PROTECTION Locking Cover w/ Padlock

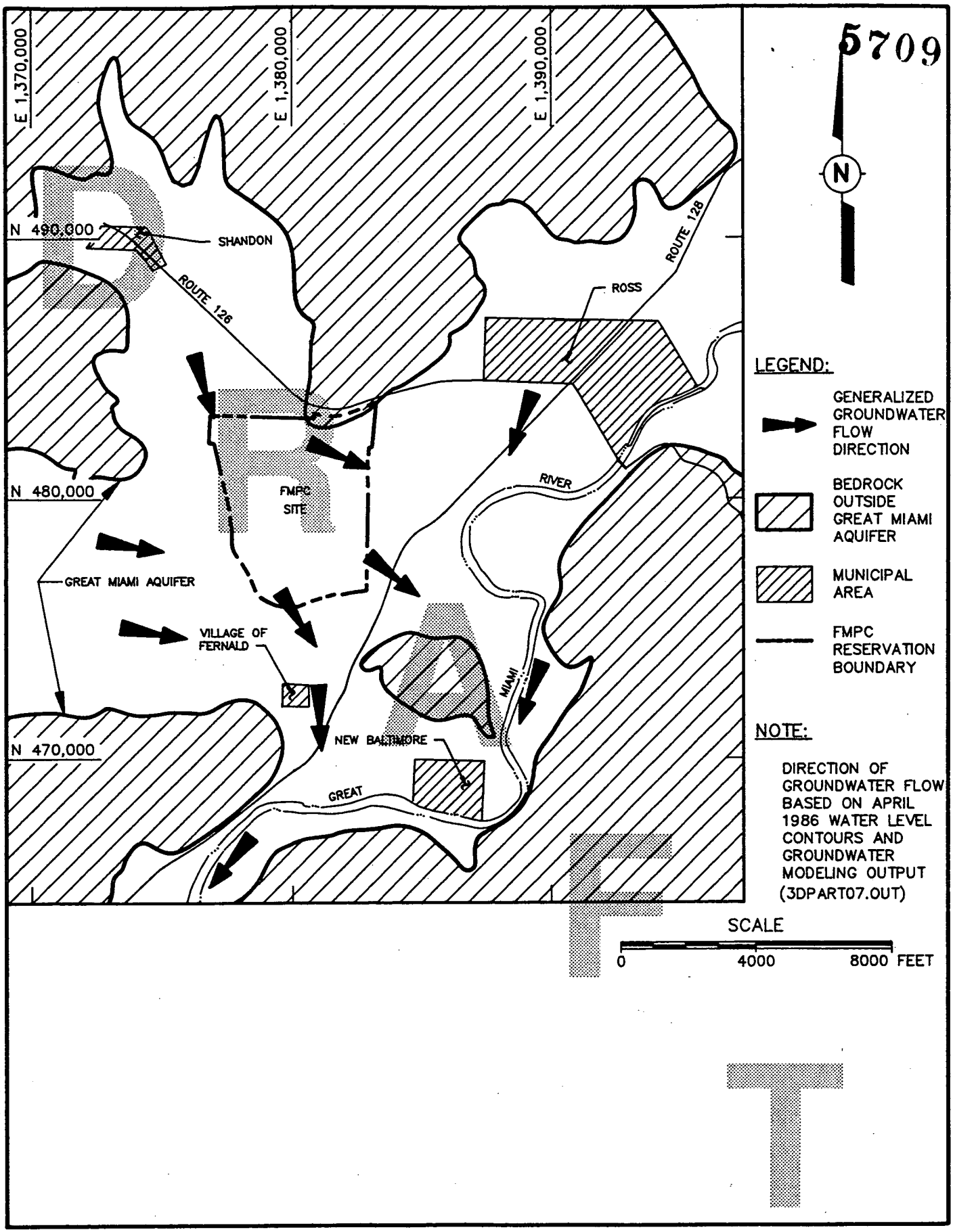
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	-2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 35.0 Ft	TOP	BOTTOM
BENTONITE	TOP 35.0 Ft	BOTTOM 39.0 Ft	TOP	BOTTOM
SAND (10-20)	TOP 39.0 Ft	BOTTOM 44.0 Ft	TOP	BOTTOM
GRAVEL 1/4	TOP ---	BOTTOM ---	TOP	BOTTOM
PERFORATED SECTION	TOP 45.3 Ft.	BOTTOM 60.3 Ft	TOP	BOTTOM
PIEZOMETER TIP	62.0 Ft			
BOTTOM OF BOREHOLE	64.0 Ft			
GWL AFTER INSTALLATION	Not Checked			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS

000562

409-11



303317-A170 (GW) /01 (PGH)

FIGURE 2-7
GENERALIZED GROUNDWATER FLOW DIRECTION
IN GREAT MIAMI AQUIFER

FERNALD RI/FS

DLG 2/4/89

REVIEWED BY QA KG. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In	KG	9-[illegible]-88
Hard Copy Verification		

4/23/88 WPK

R16 # 2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~148~~ 1148 BB 1-5-89	COORDINATES: 477477.45 N 1377077.15 E	DATE: 10 13 87	
ELEVATION: 571.64 Ground	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10 13 87	
ENGINEER/GEOLOGIST: WILL KEGLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 10 14 87	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 2	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.5	7216	4 17 22	14 in	~~VERY STIFF~~ HARD YELLOWISH BROWN SILT - DRY	ML	4.5	MUNSELL 10 YR 5/4 SAMPLE SCANNED - BACKGROUND
3	7220 7217	12 29 50/5	11 in	HARD, VERY PALE BROWN SILT TRACE SAND - DRY	ML	4.5+	MUNSELL 10 YR 7/3 7220 DUBLICATE SAMPLE SAMPLE SCANNED - AT BACKGROUND
4.5	7218	27 33 50/5	15 in	HARD, LIGHT YELLOWISH BROWN SILT SOME CLAY TRACE SAND - DRY	ML	4.5+	MUNSELL 10 YR 6/4 SAMPLE SCANNED - AT BACKGROUND
6	7219	50/4	6 in	HARD, light Yellowish BROWN CLAY SOME SILT TRACE SAND - DRY	CL	4.5+	MUNSELL 10 YR 6/4 SAMPLE SCANNED - AT BACKGROUND
7.5	7221	5 22 27	13 in	VERY STIFF, BROWNISH YELLOW CLAY TRACE SILT - DRY	CL	2.5	MUNSELL 10 YR 6/6 SAMPLE SCANNED - AT BACKGROUND
				~~MEDIUM~~ DENSE, BROWN FINE SAND, CLAY, AND SILT SOME GRAVEL - DRY	GM		MUNSELL 10 YR 5/3
9	7222	15 20 21	17 in	~~MEDIUM~~ DENSE, YELLOWISH BROWN FINE SAND AND SILT - DRY	SM	1	MUNSELL 10 YR 5/4 SAMPLE SCANNED - AT BACKGROUND 10/14/87
10.5	7223 7224	6 9 12	13 in	VERY SOFT YELLOWISH BROWN SILT SOME SAND - DRY ← SHELBY TUBE 9.0 - 9.7	ML	.1	MUNSELL 10 YR 5/4 SHELBY TUBE SAMPLE NO. 7224 SAMPLE SCANNED - BACKGROUND
12	7225	12 9 8	11 in	~~LOOSE~~ Medium Dense YELLOWISH BROWN SAND AND GRAVEL SOME SILT - MOIST	GM	.5	MUNSELL 10 YR 5/6 SAMPLE SCANNED - AT BACKGROUND
13.5	7226	6 10 14	10 in	~~STIFF~~ VERY stiff WPK 4/23/88 GREY SILT SOME GRAVEL SOME CLAY - DRY	ML	3.0	MUNSELL 10 YR 5/1 SAMPLE SCANNED - AT BACKGROUND
15	7227	7 16 20	13 in	~~STIFF~~ VERY STIFF WPK GREY SILT SOME GRAVEL SOME SAND - DRY	ML	3.0	MUNSELL 10 YR 5/1 SAMPL SCANNED - AT BACKGROUND

NOTES:

Rig R16: CYCLONE 42
DRILLER HARRY DYKES
ASSISTANT JOHN VANDINE

WATER USED IN DRILLING OPERATION 15 gal

BACKGROUND LEVELS

HNU = ZERO ppm
CEL = ZERO ppm
ALPHA = ZERO/min
BETA/GAMMA = 40 - 80 CPM

WPK 4/23/88

000564

FERNALD RI/FS

DLG 2/4/89

REVIEWED BY QA K.G. DATE 7/25/89 5709

	Initial	Date
1st Key In		
2nd Key In	KG	3/10-55
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60Z	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~1448~~ 1048 OB 1-5-89	COORDINATES: See pl	DATE: 10 14 87
ELEVATION: See pl	GWL: Depth NA Date/Time NA	DATE STARTED: 10 13 87
ENGINEER/GEOLOGIST: WILL KEGLER	Depth NA Date/Time NA	DATE COMPLETED: 10 14 87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.5	7228	16 22 30	15 in	VERY STIFF, SILT SOME GRAVEL SOME SAND - DRY	ML	3.5	MUNSELL 10 YR 5/1 SAMPLE SCANNED - AT BACKGROUND
		7		MEDIUM STIFF, GREY SILT SOME GRAVEL - DRY	ML	1.0	MUNSELL 10 YR 5/1
18	7229	16 25	11 in	~~MEDIUM~~ DENSE, BROWNISH YELLOW FINE SAND AND SILT SOME CLAY	SM	3.5	MUNSELL 10 YR 6/8 SAMPLE SCANNED - AT BACKGROUND
19.5	7230	23 36 41	15 in	VERY DENSE ~~DENSE~~ BROWNISH YELLOW SAND SOME GRAVEL - DRY BOTTOM OF BORING	GW	2.0	SAMPLE SCANNED - AT BACKGROUND MUNSELL 10 YR 6/6

NOTES:

Rig R16 : CYCLONE 42
DRILLER HARRY DYKES
ASSISTANT John VANDINE

BACKGROUND LEVELS
HNU = ZERO ppm
LEL = ZERO ppm
ALPHA = ZERO/min
BETA GAMMA = 40 - 80 CPM

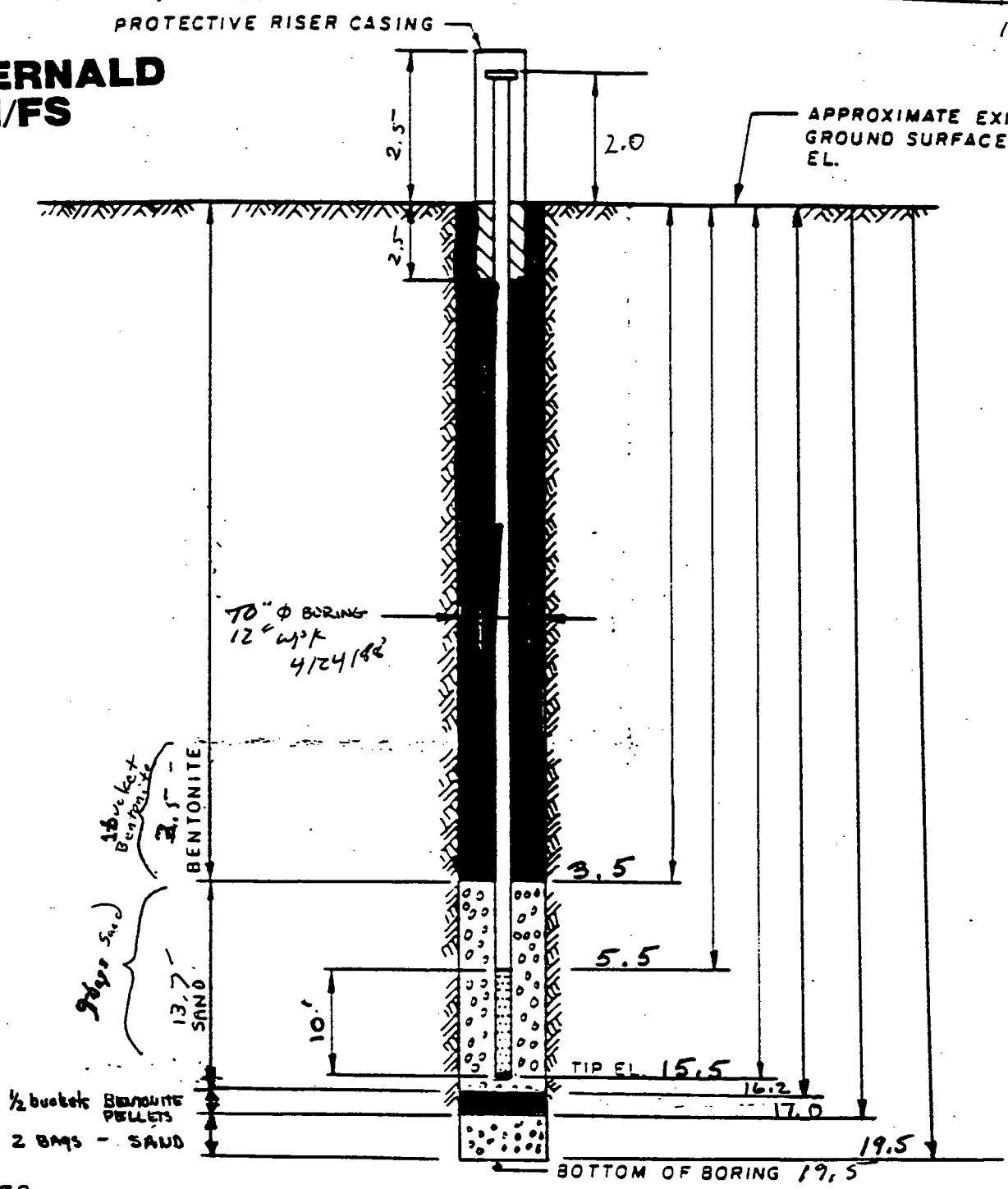
000565

402-11-86

REVIEWED BY QA KG 6/29/98 LG 7/14/99

WELL ~~148~~ 1048 BK 1-5-99

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~148~~ 1048
BB 1-5-99

PREPARED FOR

FMPC RI/FS

This Form did not represent the installed monitoring well, therefore, it has been modified with white out.
WPK 4/24/88

000566

FERNALD RI/FS

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

REVIEWED BY QA K.G. DATE 7/29/91

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. Will Kegley DATE 10 14 87
PROJECT NO. 602 CHECKED BY A Galbraith DATE 2/6/89
BORING NO. ~~148~~ 1048 BA1-5-89
PIEZOMETER NO. ~~148~~ 1048 DATE OF INSTALLATION 10 / 14 / 87

BOREHOLE DRILLING

DRILLING METHOD CABEL TOOL	TYPE OF BIT Flat head HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED: (TEMPORARY)
FLUID WATER FROM 0 TO 19.5'	SIZE 10" FROM 0 TO 18'
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE monitoring well	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4"
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 5' sections
AVERAGE SIZE OF PERFORATIONS .010 in	JOINING METHOD Thread Couple
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10'	(PLUSH JOINT THREAD)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft.	OTHER PROTECTION LOCKING TOP AND LOCK
PROTECTIVE PIPE Ø.D. 10"	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 ft		573.64	
GROUND SURFACE	0.0		571.64	
BOTTOM OF PROTECTIVE PIPE	-2.5 FT		569.14	
BOREHOLE FILL MATERIALS:				
NO GROUT/SLURRY USED	TOP —	BOTTOM —	TOP NA	BOTTOM NA
BENTONITE	TOP 0	BOTTOM 3.5	TOP 571.64	BOTTOM 568.14
SAND	TOP 3.5	BOTTOM 16.2	TOP 568.14	BOTTOM 555.44
BENTONITE PELLETS	TOP 16.2	BOTTOM 17.0	TOP 555.44	BOTTOM 554.69
SAND	TOP 17.0	BOTTOM 19.5	TOP 554.69	BOTTOM 552.14
PERFORATED SECTION	TOP 5.5	BOTTOM 15.5	TOP 566.14	BOTTOM 556.14
PIEZOMETER TIP	15.5		556.14	
BOTTOM OF BOREHOLE	19.5		552.14	
GWL AFTER INSTALLATION	—		—	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS This form did not represent the installed monitoring well, therefore, it has been modified with white out.
WPL 4/24/86

000567

FERNALD RI/FS

	Initial	Date
Field Check	BD.	12/12/88
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2048	COORDINATES:	DATE: 11-20-88
ELEVATION: 571.0 FT.	GWL: Depth 54 Ft Date/Time 0900 11/20/88	DATE STARTED: 11-20-88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 12/3/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 5

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 inch	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				Previously Described in Boring 1048, completed 10/14/87 by W. Kegley, depth of Boring 1048 is 19.5'	ML		
5					CL		
					CL		
					GM		
					SM		
10					ML		
					GM		
					ML		
15					ML		

NOTES:
Contractor: Penn Drill
Driller: Craig Coulter
Helper: Bob Slopsy
Rig: Cyclope 42

000568

Samples collected as per ASTM standard penetration test
colors identified by using Munsell color chart
Back ground levels: Hnu 10.2ev PID = 0 ppm
α = 0.2 ppm LEL O_2 = 0 ppm LEL
$\beta\gamma$ = 60-80 cpm O_2 = 20.5 %

WATER USED DURING DRILLING AND WELL INSTALLATION: 500 GALLONS

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2048	COORDINATES:	DATE: 11-20-88
ELEVATION: 571	GWL: Depth Date/Time	DATE STARTED: 11/20/88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 12/3/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 5

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15					ML		
16							
17					ML		
18					SM		
19				Bottom of Boring 1048	GW		
20				visual classification of soils in Boring 2048 to commence at 25'			
21							
22							
23							
24							
25	20490 1640 11-20-88	15 41 50	8	Dense, yellowish brown (10YR 5/3) poorly graded fine sand with some 1/4" gravel, Dry	SP	N/A	HNU = 0 ppm γ = 0 cpm βγ = 60 cpm
30							

NOTES:

402-11

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2048	COORDINATES:	DATE: 11-21-88
ELEVATION: 571	GWL: Depth Date/Time	DATE STARTED: 11-20-88
ENGINEER/GEOLOGIST: D Hoekstra	Depth Date/Time	DATE COMPLETED: 12/3/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 5

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 inch	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30	20491 1440 11-21-88	11 17 21	9	Dense, yellowish brown (10YR 5/3) poorly graded fine sand, no fines, maximum size 1/16", Dry to moist	SP	N/A	Hnu = 0 ppm α = 0 cpm βγ = 60 cpm
35	20492 1605 11-21-88	26 50/4in 50/2in	10	Very Dense, yellowish brown (10YR 5/3) poorly graded fine sand trace coarse sand and fine gravel, moist	SP	N/A	Hnu = 0 ppm α = 0 cpm βγ = 50 cpm Den[illegible] likely due to action o[illegible] hammer in casing.
40	20493 1630 11-21-88	23 38 41	6	Very Dense, yellowish Brown (10YR 5/3) well graded sand, fine sand to 1/4" gravel) Dry to moist	SW	N/A	Hnu = 0 ppm α = 0 cpm βγ = 60 cpm
45							

NOTES:

402-1

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2048	COORDINATES:	DATE: 11-22-88
ELEVATION: 571	GWL: Depth Date/Time	DATE STARTED: 11-20-88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 12/3/88
DRILLING METHODS: Cable Tool		PAGE 4 OF 5

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 inch	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45	204994 0845 11-22-88	16 50 50/2"	5	very dense, yellowish brown, (10YR 5/3), wellgraded sand, fine to 1/8", moist	SW	N/A	Hnu = 0 ppm α = 0 cpm βγ = 40 cpm
50	204995 0930 11-22-88	14 25 33	8	very Dense, yellowish brown (10YR 4/3) poorly graded ~~sand~~ medium sand, some coarse sand and 1/4" gravel, moist	SP	N/A	Hnu = 0 ppm α = 0 cpm βγ = 50 cpm
55	204996 1030 11-22-88	27 49 57		very Dense, yellowish brown (10YR 4/3) wellgraded sand (fine sand to 1/4" Ø) wet	SW	N/A	Hnu = 0 ppm α = 0 cpm βγ = 60 cpm
60							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2048	COORDINATES:	DATE:
ELEVATION: 571	GWL: Depth 54.0 Ft Date/Time 0900 11-30-88	DATE STARTED: 11-20-88
ENGINEER/GEOLOGIST: Dave Hoekstra	Depth Date/Time	DATE COMPLETED: 12/3/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 5

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 inch	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60	~~60~~ 20497 1135 11-22-88	12 41 45	11	Very Dark, Gray-Brown (10YR 5/2) Med → Crse Sand, Some Red Fn → Crse Gravel, Trace Silt, Poorly Sorted, Poorly Graded, Wet,	SW	N/A	HNu = 0 ppm β-γ = BG α = BG
65	6 20498 1123 11-30	3 8 15	12	MEDIUM DENSE, GRAY BROWN (10YR 5/2) WELL GRADED SAND, WET.	SW	N/A	HNu = 0 ppm βγ = BKG α = BKG
				BOTTOM OF BORING 68.0 FT			
70							
75							

Tr. over on 11-30-88

NOTES:

11-30-88 { HNu BKG = 0.3 ppm; α BKG = 0-5 CPM; βγ BKG = 120-140 CPM }

000572

402-1

5109

	Date	Initial	Field Check	1st Key In	2nd Key In	Hard Copy Verification
	12/12/88	BD				

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. BILL HERTEL DATE 12-07-88
PROJECT NO. 602 3.2 CHECKED BY B. Dunning DATE 12/12/88
BORING NO. 2048
PIEZOMETER NO. 2048 DATE OF INSTALLATION 11-30-88 — 12-03-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT. TO 68.0 FT.
FLUID _____ FROM _____ TO _____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 3/4 O.D. FROM 0.0 FT. TO 70.0 FT
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01 IN
TOTAL PERFORATED AREA 15.0 FT.

RISER PIPE MATERIAL 318 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 I.D. 4.0
LENGTH OF PIPE SECTIONS 2.0 FT, 10.0 FT
JOINING METHOD FLUSH THREAD SCREW TYPE JOINT

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 39.0	TOP	BOTTOM
BENTONITE	TOP 39.0	BOTTOM 45.0	TOP	BOTTOM
SAND	TOP 45.0	BOTTOM 68.0	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 50.0	BOTTOM 65.0	TOP	BOTTOM
PIEZOMETER TIP	66.5			
BOTTOM OF BOREHOLE	68.0			
GWL AFTER INSTALLATION				

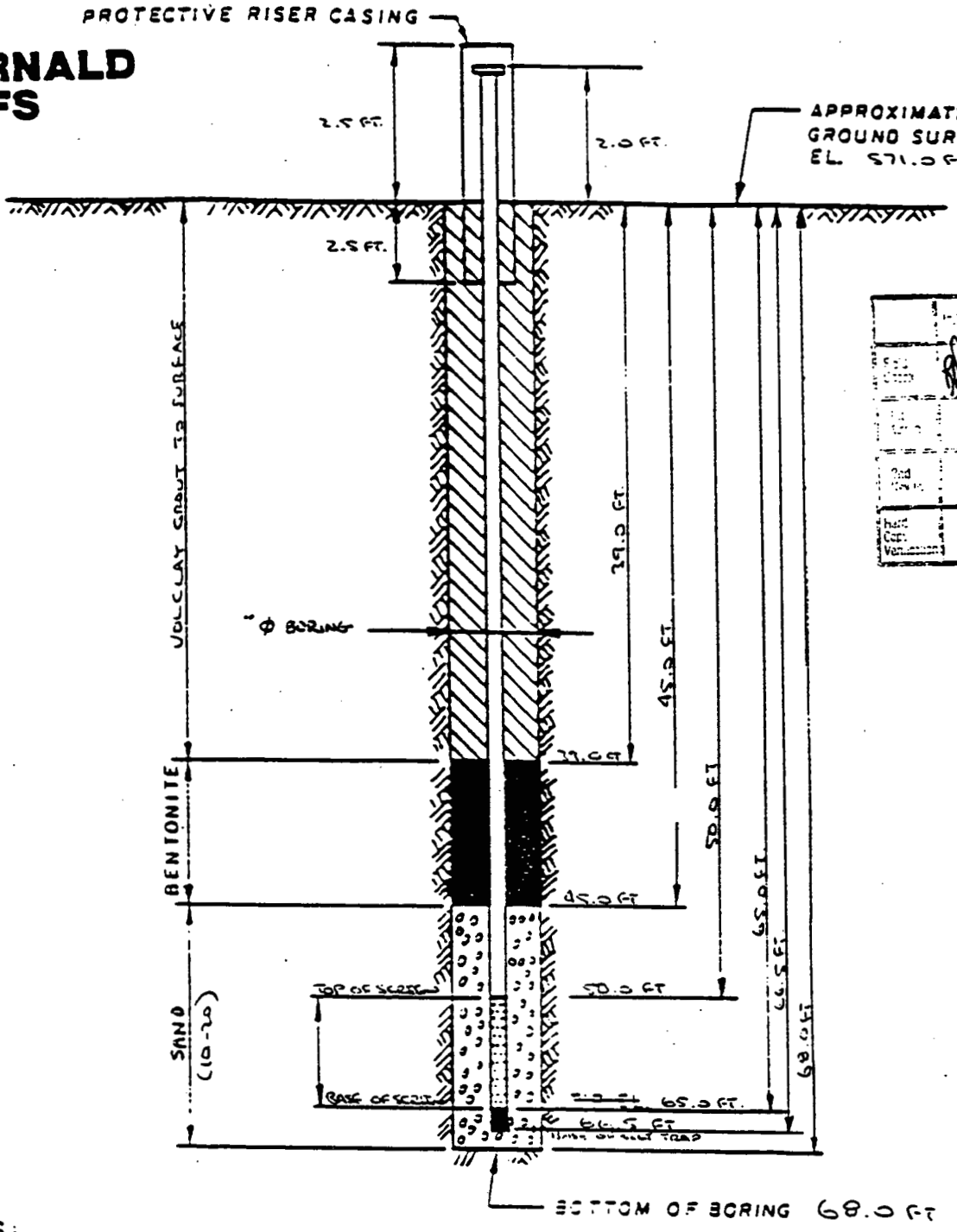
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS ONE BUCKET OF BENTONITE PELLETS WAS POURED AROUND THE PROTECTIVE PIPE AT THE SURFACE TO SERVE AS A SEAL

000573

409-11-86

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	MLC

12/12/88

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED DURING WELL INSTALLATION:

25: 80LB SACKS OF 10-20 SAND

6: BUCKETS BENTONITE

10: 40 LB SACKS VOLCLAY GROUT

WATER USED DURING DRILLING: 500 GALLONS

INSTALLATION DETAILS
MONITORING WELL 2048

PREPARED FOR

000574

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B249	COORDINATES:		DATE: 10-6-87
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10-6-87
ENGINEER/GEOLOGIST: Lowell Wille	Depth	Date/Time	DATE COMPLETED: 10-14-87
DRILLING METHODS: Cable Tool			PAGE 1 OF 3

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 Ft	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	S1 7280 1630	6 9 7	16	0.5 Soft black (1½YR,3/6) organic silty clay some sand and flyash - moist	CL	NA	S1 - Background (scaned)
				Limestone rock	NA	NA	
2	S2 7281 1730	6 5 5	16	Stiff brown (10YR,5/4) silty clay some sand and pebbles - dry	CL	3.5	S2 - scaned sample, - background
				Stiff brown (10YR,4/6) silty clay trace sand, some pebbles and gravel - dry	CL	3.0	
4	S3 7282 1740	30 42 20	17	Stiff brown - (10YR,4/6) silty clay trace sand and pebbles, some gravel - dry 4.0	CL	3.7	S3 - scaned sample - background
				dense brown (10YR,5/5) sand and gravel some silt and clay - dry	GM	NA	
6	S4 7283 1415	6 7 9	11	loose brown (10YR,5/4) sand and gravel some silt and clay - silty clay dense at 5.5 foot - dry	GM	NA	S4 scaned sample - background
	S5 7284 1450	18 17 21	16	DENSE, brown (10YR,6/5) sand and gravel some pebbles, trace silt and clay - dry	GM	NA	S5 scaned sample - background
8	S6 7285 1530	18 20 15	16	DENSE, brown (10YR,4/5) sand and gravel some silt and clay, trace pebbles - dry 8.5	GM	NA	S6 scaned sample - background
				DENSE, brown (10YR,5/4) medium to fine sand - trace silt and clay - dry	SM	3.0	
10	S7 7286 1715	18 26 38	16	DENSE, brown (10YR,5/4) medium to fine sand - trace silt and clay - dry 10.0	SM	2.8	S7 scaned sample - background
	S8 7287 1725	27 50+	12	dense brown (10YR,6/4) sand and gravel some silt and clay trace pebbles - dry	GM	NA	S-8 SAMPLE SCANNED - Background
12				dense, brown (10YR,5/4) sand and gravel some silt, clay and pebbles dry	GM	NA	
14							

NOTES:

Pan Drill.
driller - Dew Newman
helper - Bob Johnson
10-6-87 0-4½
10-7-87 4½-10½
10-8-87 10½-21½

10-6-87 hit ~6" diameter black iron pipe at 2 feet, @ 1730
10-7-87 back rig up ~5' and started boring over again did not resample 0-4½

000575

water added to hole (5 gallon buckets) per man.

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B249	COORDINATES:	DATE: 10-7-87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-6-87
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: 10-14-87
DRILLING METHODS: Cable Tool		PAGE 2 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (12x6")	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0							
16	S9 7288 0930	15 22 28	1.6	dense, brown (10YR 5/6) sand and gravel some silt, clay and pebbles - dry	GM	NA	S9 Second sample - background
18							
20	S10 7289 1030	17 22 21	1.6	dense, brown (10YR 5/6) sand and gravel some silt, and clay and pebbles - dry	GM	NA	S10 second sample - background
22							
24							▽ water table at 17:30 on 10/13/87
26	S11 7290 910	9 9 8	1.3	loose brown (10YR 5/6) sandy gravel some silt and clay - moist	GM	NA	S-11 second sample - background
28							

NOTES:

10-7-87 @ 4½-10½

10-8-87 10½-21½

10-13-87 21½-41½

000076

402-11-86

PAR

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B249	COORDINATES:	DATE: 10-13-87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-6-87
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: 10-14-87
DRILLING METHODS: cable tool		PAGE 3 OF 3

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1½ Ft	RECOVERY (Ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	S12 7291 1105	35 30 26	1.7	dense, brown (10YR 5/6) sandy gravel, some silt and clay trace pebbles and cobbles - moist	GM	<0.1	S-12 Scaned sample-background. ▽ water table 1215 10-13-87
32							
34				34.0			
				loose brown sand, some silt and clay trace gravel - wet	SM	NA	
	S13 7292 1335	6 6 8	1.8	loose brown (10YR 5/4) sand, some silt and clay - trace gravel - wet	SM	<0.1	S-13 Scaned sample-background
36							
38							
40	S14 7293 1515	6 9 25	1.8	loose, brown (10YR 5/4) sand - some silt and clay, and gravel - wet	SM	<0.1	S-14 Scaned sample background
				dense, brown (10YR 5/6) sandy gravel some pebbles, cobbles, silt and clay - wet	GM		
42				bottom of boring 41½ feet			
44							

NOTES:

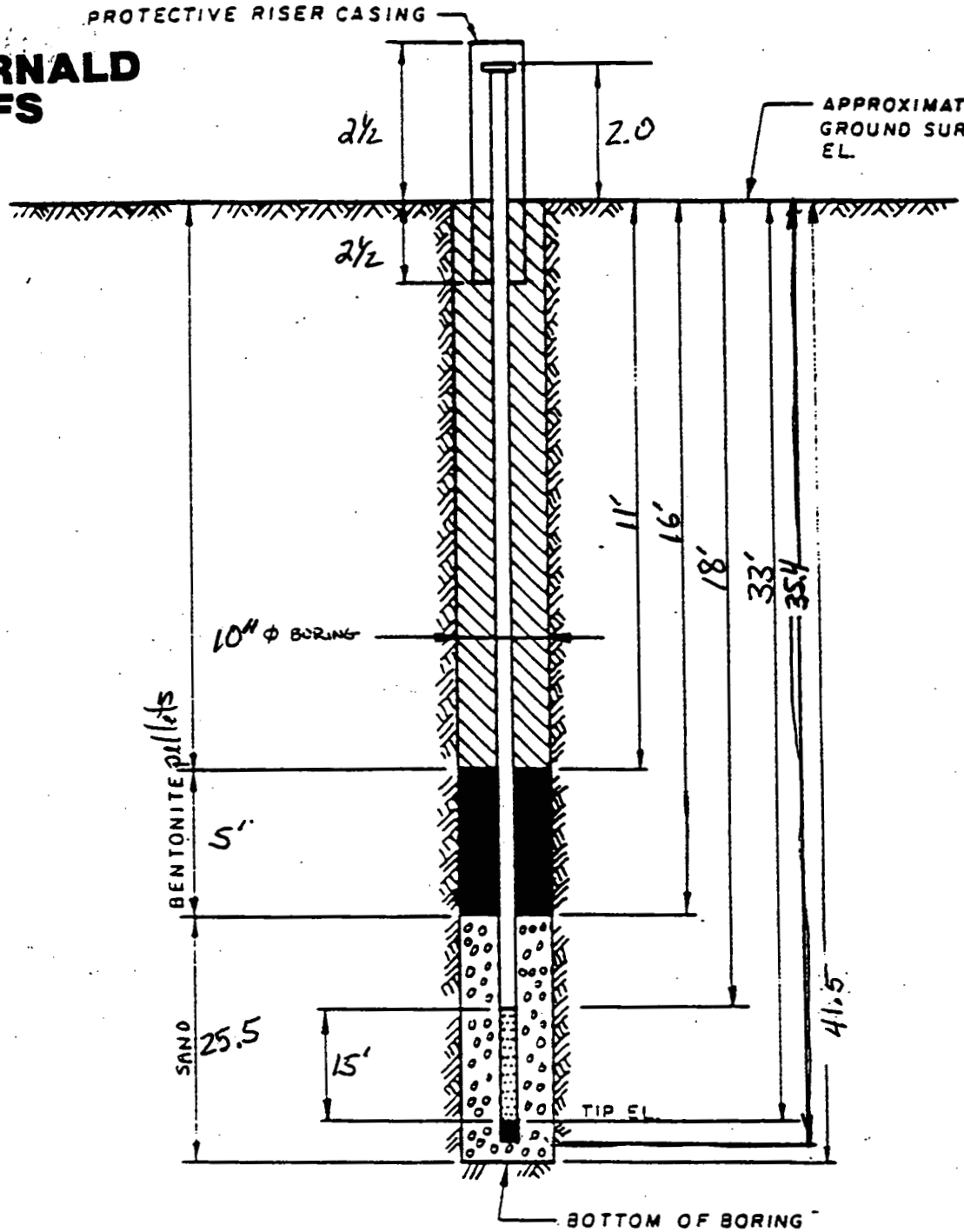
BACKGROUND LEVELS

10-6-87 alpha = 2 cpm, beta/gamma = 70 cpm
10-7-87 alpha = 1 cpm, beta/gamma = 70 cpm
10-8-87 alpha = 1 cpm, beta/gamma = 65 cpm
10-13-87 alpha = 1 cpm, beta/gamma = 65 cpm
10-14-87 alpha = 2 cpm, beta/gamma = 70 cpm

000577

WELL 249

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~216~~ 249

PREPARED FOR

FMPC RI/FS

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

000578

PHK

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. Lowell Wille DATE 10-14-87
PROJECT NO. 802 CHECKED BY _____ DATE _____
BORING NO. B 249
PIEZOMETER NO. 249 DATE OF INSTALLATION 10-14-87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 TO 23
FLUID NA FROM NA TO NA

TYPE OF BIT ~~[illegible]~~ HAMMER
CASING SIZE (S) USED: (TEMPORARY)
SIZE 10" FROM 0 ft TO 41.5 ft
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010"
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL Stainless steel (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10 foot
JOINING METHOD Screw (FLUSH JOINT THREAD)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE O.D. 10" (nominal)

OTHER PROTECTION ~~[illegible]~~ LOCKING CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0'			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2 1/2'			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM ~~[illegible]~~ 11	TOP	BOTTOM
BENTONITE Pellets	TOP 11'	BOTTOM 16'	TOP	BOTTOM
SAND	TOP 16'	BOTTOM 41 1/2'	TOP	BOTTOM
~~GRAVEL~~	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 18	BOTTOM 33	TOP	BOTTOM
PIEZOMETER TIP	35.4' (BOTTOM OF SILT TRAP)			
BOTTOM OF BOREHOLE	41.5'			
GWL AFTER INSTALLATION	21.4' below grand surface			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS _____

000579

409-11-86

FERNALD RI/FS

	Initial	Date
Field Check	[illegible]	12/12
1st Key In		
2nd Key In		
Hard Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI FS		
BORING NUMBER: 3049	COORDINATES:	DATE: 11/2/88	
ELEVATION: 540.7 Ft.	GWL: Depth Date/Time	DATE STARTED: 11/1/88	
ENGINEER/GEOLOGIST: L. Adams	Depth Date/Time	DATE COMPLETED: 11/14/88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 9	

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				Interval 0.0 Ft to 40.0 Ft. previously sampled in Boring # 2049.			
2							
3				Sampling to commence at 45.0 Ft. in Boring 3049.			
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

NOTES: Contractor: Penn Drill
Rig: Bucyrus-Erie
Driller: Dave Newman
Assistant: Jim Lang

Samples collected as per ASTM Standard penetration test.
Colors identified using Munsell Color Chart
Background Levels: H_{rel} - 0ppm $LeLO_2$: 0pp
α - 0-5 cpm =20
β - 20-40 cpm =21.1

Water added to hole: 1000 Gal.

000580

402-1

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI FS		
BORING NUMBER: 3049	COORDINATES:	DATE: 11/2/88	
ELEVATION: 540.7	GWL: Depth Date/Time	DATE STARTED: 11/1/88	
ENGINEER/GEOLOGIST: L. Adams	Depth Date/Time	DATE COMPLETED: 11/14/88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 9	

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6-INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16				See Boring 2049 Descriptions			
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

NOTES:

000581

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 3049	COORDINATES:		DATE: 11/2/88
ELEVATION: 540.7	GWL: Depth	Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 11/14/88
DRILLING METHODS: Cable Tool			PAGE 3 OF 9

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6-INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31				See Boring 2049 descriptions			
32							
~~33~~ 49							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

NOTES:

000582

402-11-

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI\FS		
BORING NUMBER: 3049	COORDINATES:		DATE: 11/2/88
ELEVATION: 540.7	GWL: Depth	Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 11/14/88
DRILLING METHODS: Cable Tool			PAGE 4 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	11000 1440 11-2	20 24 44	10	Very dense, Grayish brown (10YR-4/2) well graded gravel sand mixture, wet.	GW	N/A	Hnu = 0ppm α = 0 cpm β = 20 cpm
47 48 49							
50 51	11001 1545 11-2	6 8 9	14	medium dense gray-brown (10YR 4/2) well graded gravelly sand - wet 50.7 Stiff, yellow brown (10YR 5/3) gravelly clay (to .25 in.) Damp 51.2	SW CL	N/A 2.0	Hnu = 0ppm α = 0 cpm β = ~~β~~ 20 cpm
52 53 54 55				medium dense gray-brown (10YR 4/2), well graded ~~sand~~ gravel sand mixture. (Gravel .25 to .50 in.) wet. 51.5 encountered blow sand @ 55 ft	GW	N/A	
56	11002 0950 11-3	25 28 41	18	very dense, gray brown (10YR-4/3) well graded gravel sand mixture (gravel size .25-.75 in.) wet	GW	N/A	Hnu = 0ppm α = 0 cpm β = 20 cpm
57 58 59							

NOTES:

000583

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 3049	COORDINATES:		DATE: 11/3/88
ELEVATION: 540.7 Ft.	GWL: Depth	Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 11/14/88
DRILLING METHODS: Cable Tool			PAGE 5 OF 9

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	11003 1135 11-3-88	8 9 10	18	Med. dense, Gray brown (4yr 10/4/3) well graded gravel sand mixture, very wet (60.8 Ft.)	GW	N/A	Hnu = 0ppm α = 0cpm β = 20 cpm
				med. dense, gray orangish brown poorly graded sands, trace gravel (10YR 4/4) wet - (Gravel .5in)	SP		
62							
63							
64							
65	11004 1555 11-3-88	85 70 56	18	very dense, brown to orange-brown (10yr 4/3) med. to well sorted gravel sand mixture (Gravel .1-1 in.) wet	GW	N/A	Hnu = 0ppm α = 2cpm β = 20cpm
66							
67							
68							
69							
70	11005 0925 11-6-88	9 10 13	12	med. dense, dark grayish brown (10yr-4/3) poorly sorted sand, trace gravel (3/8 in) damp-dry. trace clay	SC	N/A	Hnu = 0ppm α = 0cpm β = 30 cpm
71							
72							
73							
74							

NOTES:

000584

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 3049	COORDINATES:	DATE: ~~11-10~~ 11-6-88	
ELEVATION: 540.7 Ft.	GWL: Depth Date/Time	DATE STARTED: 11-1-88	
ENGINEER/GEOLOGIST: L. Adams	Depth Date/Time	DATE COMPLETED: 11-14-88	
DRILLING METHODS: Cable Tool		PAGE 6 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	11006 1133 11-6-88	32 25 20	12	Very dense, dark brown gray (10yr-4/2) poorly sorted sand, some gravel (gravel to .8 in) damp	SP	N/A	Hnu = 0 ppm α = 0 cpm β = 40 cpm
77							
78							
79							
80							
81	11007 0846 11-7-88	12 13 14	10	med. dense dark grayish brown (10yr-3/3) poorly sorted, very fine sand, some gravel. wet.	SP	N/A	Hnu = 0 ppm α = 0 cpm β = 100 cpm
82							
83							
84							
85							
86	11008 1030 11-7-88	6 9 9	8	med. dense - med. to dark grayish brown (10yr-4/2) poorly graded gravelly sand (gravel to .75 in.) wet.	SP	N/A	Hnu = 0 ppm α = 0 cpm β = 40 cpm
87							
88							
89							

NOTES:

000585

4G2-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RIFS		
BORING NUMBER: 3049	COORDINATES:		DATE: 11-7-88
ELEVATION: 540.7	GWL: Depth	Date/Time	DATE STARTED: 11-1-88
ENGINEER/GEOLOGIST: L. Adams	Depth	Date/Time	DATE COMPLETED: 11-14-88
DRILLING METHODS: Cable Tool			PAGE 7 OF 9

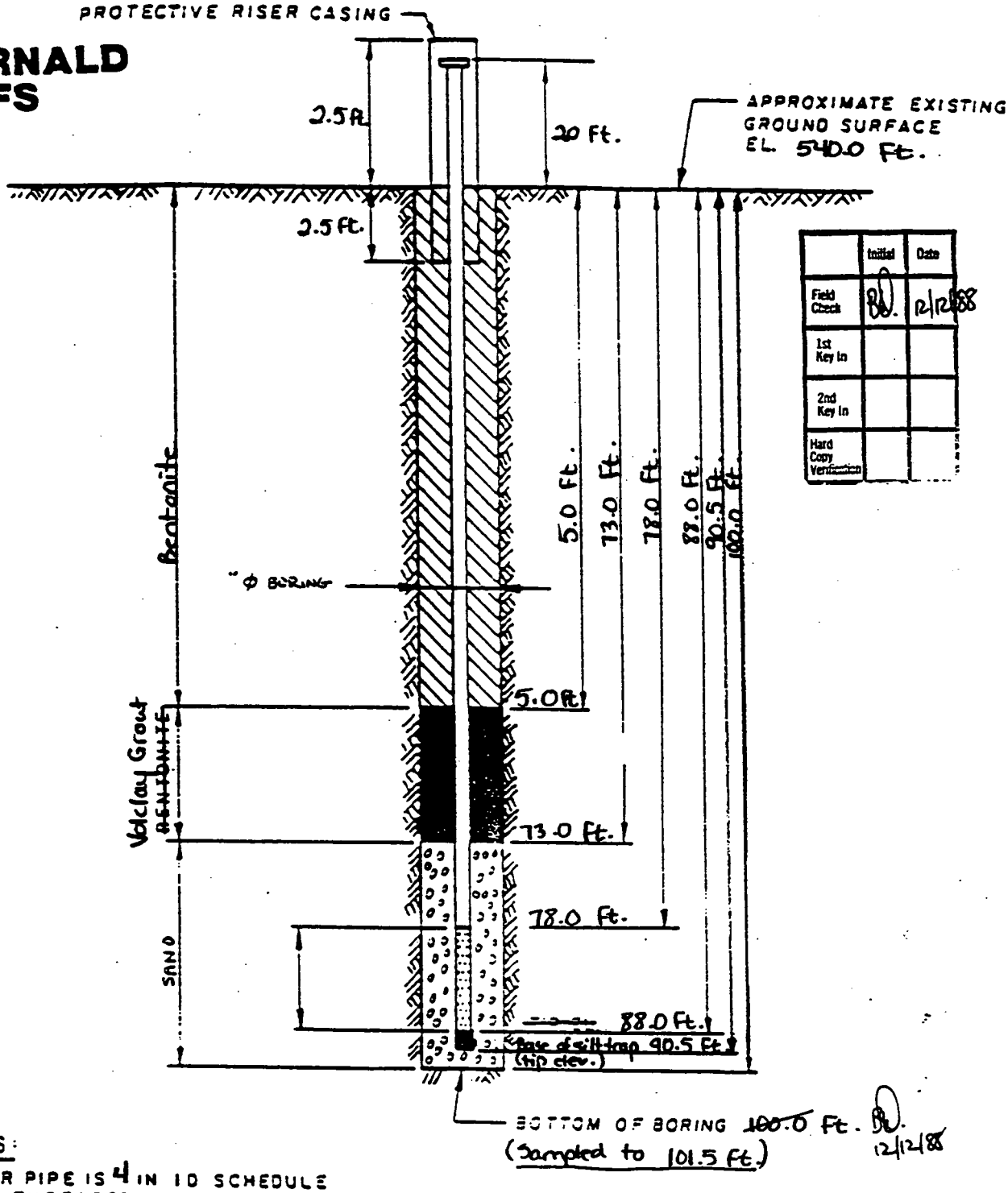
DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90 91	11009 1510 11-7-88	13 14 10	11	med. dense dark grayish brown (10yr 4/2) med. to well sorted gravelly sand (Gravel to .75 in.) wet	SW	N/A	Hnu = 0ppm α = 0cpm β = 40-60 cpm
92 93 94 95							
96	11010 1626 11-7-88	18 16 15	6	Dense-dark gray brown (10yr 4/2) well sorted gravelly sand (Gravel to .5 in.) wet.	SW	N/A	Hnu = 0ppm α = 1cpm β = 40cpm
97 98 99 100							
101	11011 0900 11-8-88	18 20 19	12	Dense, gray brown (10yr 4/2) poorly sorted fine sand. Damp - med. wet.	SP	N/A	Hnu = 0ppm α = 0cpm β = 20-40 cpm.
102 103 104							

NOTES:

000586

Well No. 3049

FERNALD RI/FS



	Initial	Date
Field Check	BD.	12/12/88
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
BD	BD.		12/12/88

NOTES:

1. RISER PIPE IS 4 IN ID SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

Materials used in well construction:

4-30 sand: 4-80 lb. sacks
10-20 sand: 13-80 lb. sacks
Volclay grout: 20-40 lb bags
Bentonite Pellets: 8 buckets

Water added to hole while drilling: 1000 gal.

INSTALLATION DETAILS
MONITORING WELL 3049

PREPARED FOR

000587

FERNALD RI/FS

Date	12/12/88			
Initial	BD			
Field Check	1st Key In	2nd Key In		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. L. Adams DATE 11-10-88
PROJECT NO. 602 3.2 CHECKED BY B Dunning DATE 12/12/88
BORING NO. 3049
PIEZOMETER NO. 3049 DATE OF INSTALLATION 11-8-88 – 11-14-88

BOREHOLE DRILLING

DRILLING METHOD Cabletool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 Ft TO 100.0 Ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10.0" I.D. FROM 0.0 Ft TO 100.0 Ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION ~~4~~ 4.0" I.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01 in.
TOTAL PERFORATED AREA 10.0 Ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. ~~4~~ 4.0 in.
LENGTH OF PIPE SECTIONS 10.0 ft., 2.5 ft.
JOINING METHOD Flush joint, threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft.
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Locking Cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 ft.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 ft.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 5.0	BOTTOM 73.0	TOP	BOTTOM
BENTONITE (Pellets)	TOP 0.0	BOTTOM 5.0	TOP	BOTTOM
SAND (10-20)	TOP 73.0	BOTTOM 88.0	TOP	BOTTOM
GRAVEL (4-30)	TOP 88.0	BOTTOM 92.0	TOP	BOTTOM
PERFORATED SECTION	TOP 78.0	BOTTOM 88.0	TOP	BOTTOM
PIEZOMETER TIP	90.5			
BOTTOM OF BOREHOLE	~~100.0~~ 101.5			
GWL AFTER INSTALLATION	BD 12/12/88			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Open hole interval from 100.0 Ft. to 92.0 Ft. was allowed to collapse on itself. Eight buckets of Bentonite pellets were used to fill open hole interval from 0.0-5.0 ft. and to serve as a surface seal around the protective well cover.

000588

409-1

WE LOG AND DRILLING RE ORT

Pallet Co. 164
641364
2050
5709

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY-
ELF-TRANSCRIBING

COUNTY HAMILTON TOWNSHIP CROSBY SECTION OF TOWNSHIP 6

OWNER SCHAEFER BOX CO ADDRESS 5537 ST RT 128

LOCATION OF PROPERTY PADDY'S RUN RD AT BUTLER CO LINE

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 69'6"

Type of screen COOK SS #40 Length of screen 4

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 80 gpm Duration of test 4 hrs

Drawdown 7 ft Date 8/25/87

Static level (depth to water) 46'4"

Quality (clear, cloudy, taste, odor)

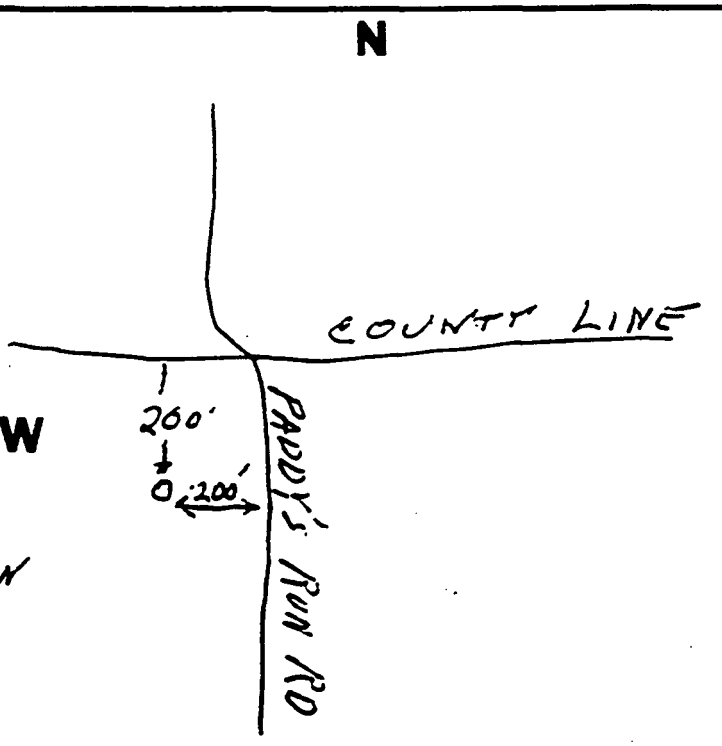
Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
FILL	0 ft	1 ft
TOP SOIL	1	5
BROWN CLAY & GRAVEL	5	12
GRAY CLAY & GRAVEL	12	36
VERY DIRTY GRAVEL	36	37
YELLOW CLAY & GRAVEL	37	50
SANDY YELLOW CLAY	50	55
VERY DIRTY GRAY SAND	55	72
SAND & FINE GRAVEL	72	75
SAND	75	78
VERY FINE SAND	78	90
3/4TS OF THIS ON .008 SCREEN AND PAN		
SET SCREEN FROM	69'6"	TO 73'6"
WITH 5" PVC TO 90'		

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



000589

DRILLING FIRM WM CRANE CO DATE 9/6/84

ADDRESS BOX 33 SHANDON, O SIGNED WM Crane

*If additional space is needed to complete well log, use next consecutive numbered form.

16

ORIGINAL COPY - ODNR, DIVISION OF WATER, FOUNTAIN SQ., COLS., OHIO 43224

White out correction were made by J. W. at the time

FERNALD RI/FS 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Copy Verification		

#24

VISUAL CLASSIFICATION OF SOILS

RIG #3

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B2051 B2051, 1-5-88	COORDINATES: N 481597.05 E 1383279.97	DATE: Nov 12, 1987
ELEVATION: 607.38 ground	GWL: Depth Date/Time	DATE STARTED: Nov 12, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: Nov 19, 1987
DRILLING METHODS: Cable tool		PAGE 1 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Detailed Soil Classification refer to Boring 3051			Consistency and density based on relative soil texture
5				hard brownish yellow 10YR 6/8 clay, some silt, and gravel, trace sand and pebbles-dry	cl	NA	
10	ST 07425	1.0	1.0				Sample # 07425 10-14-87 @ 0800
				16.0			
				hard gray 10YR 5/1 clay, some gravel and silt, trace sand and pebbles-dry			
15					cl	NA	
20	ST	1.0	0.0				pushed shelby tubes at 20 ft, NO RETURN, tried again at 22.0 ft. 10-14-87 @ 1115 Sample# 07426
	ST 07426	1.0	0.9				
25							

NOTES:
Pennsylvania Drilling Co
Driller Dave Neumann
Helper Bob Johnson
Drilling Rig Bucyrus Erie W24
water added to boring: 450 gallons

000590

Shelby tube sampling follow ASTM Standard for undisturbed 2 in diameter, thin wall, 2 foot sampling tube
Background γ: 2cpm ANU: 0ppm
αβ: 140cpm

402-11-86

FERNALD RI/FS

yd 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B251~~ B2051 BB 1-5-89	COORDINATES: See p1	DATE: Nov 18, 1987
ELEVATION: See p1	GWL: Depth Date/Time	DATE STARTED: Nov 12, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: Nov 19, 1987
DRILLING METHODS: Cable Tool		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
35				stiff gray 10YR 5/1 ~~gr~~ mottled brown 10YR 4/2 gravelly clay some silt and gravel, trace pebbles-dry	cl	NA	No ~~soil~~ soil samples collected
40							
45				46.0			
50				dense gray 5YR 5/1 sand and gravel mixed with gray silty clay, some pebbles-dry	SM	NA	
55				53.0 dense gray 5YR 5/1 sand and gravel some silt, clay and pebbles-moist	SM	NA	

NOTES:

000591

402-11-88

FERNALD RI/FS JJ 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B25~~ ~~B02~~ B2051	COORDINATES: See p1		DATE: Nov 19, 1987
ELEVATION: See p1 HB 1-5-89	GWL: Depth	Date/Time	DATE STARTED: Nov 2, 1987
ENGINEER/GEOLOGIST: Lowell Witke	Depth	Date/Time	DATE COMPLETED: Nov 19, 1987
DRILLING METHODS: Cable tool			PAGE 3 OF 4

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				dense gray 5YR 5/1 sand and gravel, some silt and clay - trace pebbles - moist			no soil samples collected
65							
					SW	NA	
70							
75							
80				very dense gray 5YR 5/1 sand, some gravel and silt, trace clay and pebbles - moist	SW		very hard drilling
85						NA	

NOTES:

000592

402-11-86

FERNALD RI/FS

2/4/89

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B251~~ B2051 BB 1-54	COORDINATES: See p1	DATE: Nov 16, 19, 87	
ELEVATION: See p1	GWL: Depth	Date/Time	DATE STARTED: Nov 12, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth	Date/Time	DATE COMPLETED: Nov 19, 1987
DRILLING METHODS: Cable Tool			PAGE 4 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				dense gray 7½YR 6/0 sand and gravel, some silt, clay and pebbles - ~~dr~~ wet			No soil samples collected
95					SM	NA	
100							
105				105.0			
				bottom of boring			
110							
115							

NOTES:

000593

402-11-86

FERNALD RI/FS

2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. Lowell Wille DATE Nov 19, 1987
PROJECT NO. 602.3.2 CHECKED BY R Galbreath DATE 2/6/89
BORING NO. ~~B251~~ B2051 BB 1-5-89
PIEZOMETER NO. 2051 DATE OF INSTALLATION Nov 17, 18 and 19

BOREHOLE DRILLING

DRILLING METHOD cable tool	TYPE OF BIT N/A
DRILLING FLUID (S) USED:	CASING SIZE (S) USED: NB 3-21-90
FLUID N/A FROM ___ TO ___	SIZE ~~N/A~~ FROM N/A TO ___
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring well	RISER PIPE MATERIAL Stainless steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD screw FLUSH JOINT
TOTAL PERFORATED AREA ___	THREADS.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION N/A locking cap
PROTECTIVE PIPE O.D. 10 3/4 in	AND lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	~~2.5~~ 2.0 RMF 2/6/89		609.38	
GROUND SURFACE	0.0		607.38	
BOTTOM OF PROTECTIVE PIPE	2.5		604.88	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP RMF 2/6/89 0	BOTTOM 2/6/89 77 ~~78~~	TOP 607.38	BOTTOM 530.38
BENTONITE	TOP 77 ~~78~~	BOTTOM 82	TOP 530.38	BOTTOM 525.38
SAND	TOP 82	BOTTOM 105 ~~103.5~~ 3-21-90	TOP 525.38	BOTTOM 502.38
NO GRAVEL USED.	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 85	BOTTOM 100	TOP 522.38	BOTTOM 507.38
PIEZOMETER TIP	102.4		504.98	
BOTTOM OF BOREHOLE	~~103.5~~ 105 RMF 4-22-88		502.38	
GWL AFTER INSTALLATION	91.7 top of casing			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

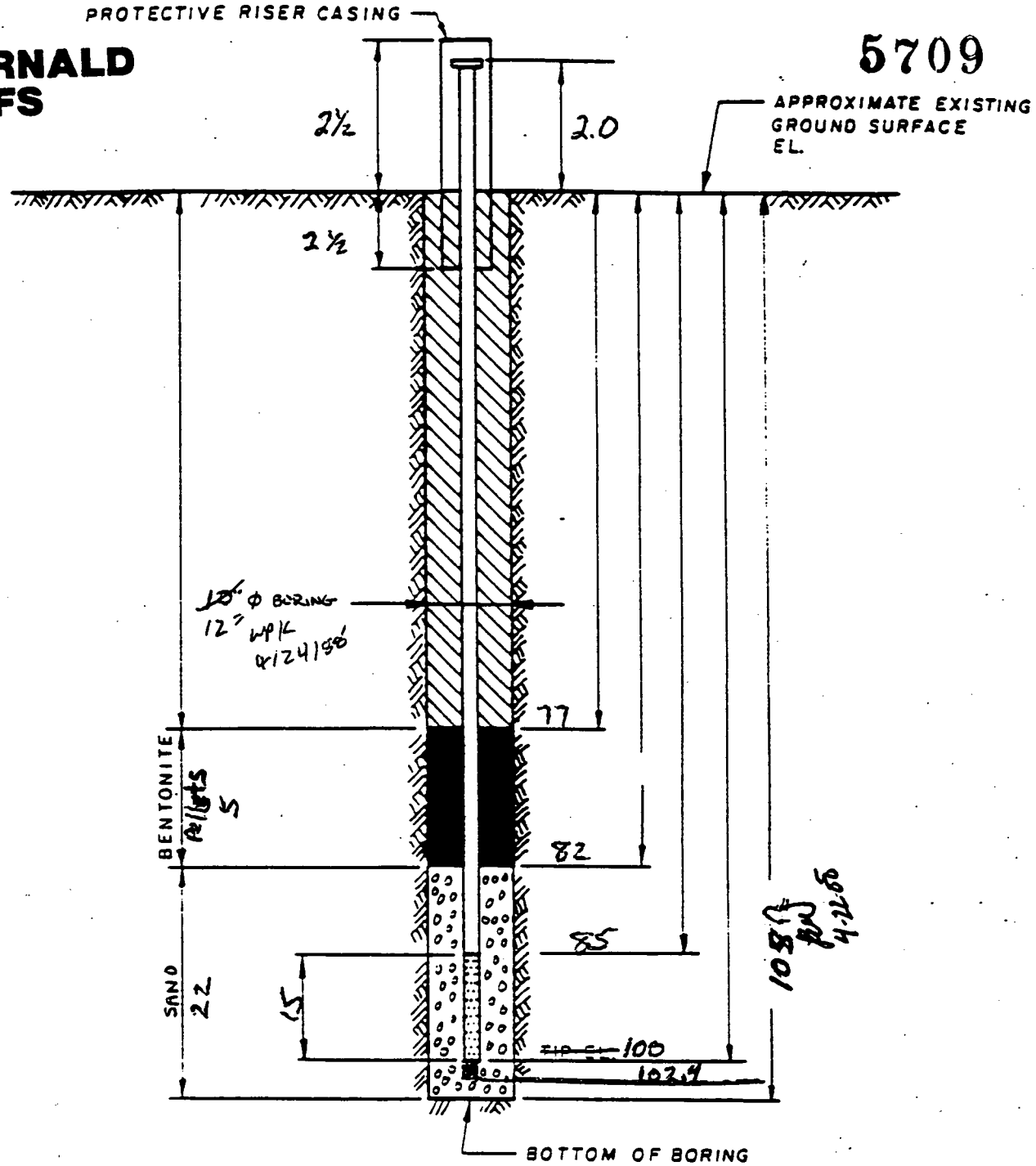
000594

2/4/89

WELL ~~251~~ 2051 BB 1-5-89 # 24

FERNALD RI/FS

5709



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D ~~stainless~~ steel PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 91.7 below top of Stainless steel casing
5. WATER LEVEL READING ON Nov 19, 1987

INSTALLATION DETAILS
MONITORING WELL ~~251~~ 2051

PREPARED FOR BB 1-5-89

000595

FERNALD RI/FS

REVIEWED BY QA K6 DATE AUG 1 6 1991

24189

	Initial	Date
1st Key In		
2nd Key In	KP	8-11-88
Verification		

WPF 4/23/88

RIG # 3

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B351	COORDINATES: N 481588.05 E 1383278.57	DATE: 10-21-87
ELEVATION: 606.87 ground	GWL: Depth — Date/Time —	DATE STARTED: 10-21-87
ENGINEER/GEOLOGIST: Lowell Willo	Depth — Date/Time —	DATE COMPLETED: 11-13-87
DRILLING METHODS: Cable Tool		PAGE 1 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	7333 1130	6 8 22	12	hard yellowish brown 10YR5/8 clay, trace silt and sand - dry	cl	>5	very slight "O" horizon at surface HNU = 0 ppm γβ = 50 cpm α = 1 cpm
2, 3	7334 1140	15 32 36	13	hard brownish yellow 10YR6/6 clay, some silt, trace gravel and pebbles - dry	cl	>5	HNU = 2 ppm γβ = 60 α = 2
4	7335 1145	33 42 33	16	hard, brownish yellow 10YR6/8 clay, some silt, sand and gravel, trace pebbles - dry	cl	>5	HNU = 2 ppm γβ = 60 α = 2
5, 6	7336 1310	27 33 26	18	hard brownish yellow 10YR6/8 clay some silt, sand and gravel, trace pebbles, limestone rock @ 5.5' - dry	cl	>5	HNU = 2 ppm γβ = 60 α = 2
7	7 1315	22 28 49	18	hard yellowish brown 10YR5/8 clay, some silt, sand, gravel and pebbles - dry	cl	>5	HNU = 2 ppm γβ = 60 α = 2
8, 9	8 1515	11 18 19	7	hard brownish yellow 10YR6/8 mottled gray 10YR6/1, red and black silty clay some sand and gravel - dry	cl	4.5	HNU = 2 ppm γβ = 60 α = 2
10	39 1530	25 43 50	18	very stiff brownish yellow 10YR6/6 mottled gray 10YR6/1 red and black gravelly clay some silt and sand, trace pebbles - dry	cl	2.5	HNU = 2 ppm γβ = 60 α = 2
11, 12	40 1610	6 18 33	11	hard yellowish brown 10YR5/4 mottled gray 10YR6/1 red and black gravelly clay some silt and sand - dry 12.0	cl	3.5	HNU = 2 ppm γβ = 60 α = 2
13	1 1630	3 7 10	7	hard to stiff gray 10YR5/1 gravelly clay some silt and pebbles, red 10YR 8/6 sand lense at 13 ft - dry	cl / cl	3.5 / 2.5	HNU = 2 ppm γβ = 66 α = 2
14	2 1645	6 10 20	12	hard gray 10YR 5/1 gravelly clay some silt and pebbles, trace sand - dry	cl	3.5	HNU = 2 ppm γβ = 66 α = 2

NOTES:

Pennsylvania Drilling Co.
Driller Dave Newman
Helper Bob Johnson
Drilling Backus Erie 310

Background
γβ = 60 cpm
α = 2 cpm
HNU = 2 ppm
LEL = 0

samples taken with standard ASTM 2" OD split barrel sampler follow ASTM standard penetration test
Color based on Munsell Soil Color Chart.

water added to boring (5 gallon buckets) ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~

000596

FERNALD RI/FS

JJ 2/4/89

REVIEWED BY QA KG DATE AUG 16 1991

	Initial	Date
1st Rev/In		
2nd Rev/In	JJ	8-11-88
Hard Copy Verification		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.32	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B351 B3051 BB 1-5-88	COORDINATES: See p1	DATE: Oct 21, 1987
ELEVATION: See p1	GWL: Depth - Date/Time -	DATE STARTED: Oct 21, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth - Date/Time	DATE COMPLETED: 11-13-87
DRILLING METHODS: Cable Tool		PAGE 2 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	7343 1100	4 7 12	12	hard gray 10YR5/1 gravelly clay some sand trace silt, dry	cl	3.5	HNU = 1 ppm γβ = 60 α = 2
17	7344 930	5 5 8	7	stiff gray 10YR5/1 clay, some sand silt and gravel - dry	cl	1.5 1.0	HNU = 1 ppm γβ = 60 α = 2
18 19	7345 1000	4 5 10	9	very stiff gray 10YR5/1 gravelly clay some silt and sand - moist	cl	3.5	HNU = 1 ppm γβ = 60 α = 2
20 21	7346 1115	7 7 9	7	very stiff gray 10YR6/1 clay, some sand, ~~silt~~ and silt, trace gravel and pebbles - dry	cl	3.0	HNU = 1 ppm γβ = 66 α = 2
22	7347 1140	6 7 12	8	stiff gray 10YR6/1 gravelly clay, some silt and sand, trace pebbles - moist	cl	1.5	HNU = 1 ppm γβ = 60 α = 2
23 24	7348 1150	5 6 12	7	hard gray 10YR6/1 clay, some sand, silt and gravel - moist	cl	4.5	HNU = 1 ppm γβ = 60 α = 2
25	7349 1205	6 8 18	10	very stiff gray 10YR5/1 clay some gravel, sand and silt - moist	cl	3.5	HNU = 1 ppm γβ = 60 α = 2
26 27	7455 905	7 10 16	15	very stiff gray 10YR6/1 clay, some silt, sand and gravel - moist	cl	3.5	HNU = 1 ppm γβ = 60 α = 2
28	7456 925	12 12 15	16	stiff gray 2.5YR6/0 gray mottled dark brown 7.5YR3/2 clay, some silt, trace sand and gravel, trace wood - moist	cl	2.0	HNU = 1 ppm γβ = 60 α = 2 wood (spruce) encountered
29	7457 945	7 11 26	15	very stiff gray 5YR5/1 mottled dark brown 10YR3/1 clay, some silt, trace sand gravel and wood - moist	cl	2.5	HNU = 1 ppm γβ = 60 α = 2 several pieces of wood (spruce)

NOTES:

000597

402-11-86

JJ 2/4/89

FERNALD RI/FS

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

REVIEWED BY QA AUG 1 0 1991 DATE

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60232	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B351 B305	COORDINATES: see p1	DATE: 10-27-87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 10-22-87
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 11-13-87
DRILLING METHODS: Cable Tool		PAGE 3 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ Ft.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	7458 1115	9 15 26	18	Stiff gray 7½YR 5/1 silty clay, some sand trace gravel - moist	cl	2.0	HNU = 0 ppm β: 70 cpm α: 2 cpm
32 33	7459 1140	6 9 15	15	Stiff gray 7½YR 5/1 silty clay some sands trace gravel moist	cl	1.5	HNU = 0 ppm β: 60 cpm α = 2 cpm
34	7460 1200	6 18 22	12	Stiff gray 5YR 5/1 silty clay some sand, trace gravel and pebbles-moist	cl	1.5	HNU = 0 ppm β = 70 cpm α = cpm
35 36	7461 1345	5 10 21	16	Stiff gray 7½YR 5/0 clay, some silt and sand, trace gravel -moist	cl	2.0	HNU = 0 ppm β = 75 α = 2
37	7462 1410	11 23 22	15	Stiff gray 7½YR 5/0 clay some silt and sand, trace gravel and wood moist	cl	1.5	HNU = 0 ppm β = 80 cpm α = 2 cpm wood
38 39	7463 1430	11 33 36	18	Stiff gray 7½YR 5/0 clay some silt trace sand, gravel and pebbles - moist	cl	2.0	HNU = 0 ppm β = 60 cpm α = 2 cpm
40	7464 1455	12 30 35	18	very stiff gray 7½YR 5/0 silty clay some sand, trace gravel-moist	cl	2.5	HNU = 0 ppm β = 75 cpm α = 3 cpm
41 42	7465 1615	14 27 35	18	Stiff light gray 7½YR 7/0 silty clay some sand and gravel-moist	cl	2.0	HNU = 0 ppm β = 60 cpm α = 2 cpm
43	7466 1705	16 22 32	15	very stiff light gray 7½YR 7/0 clay some silt, trace sand, gravel and wood moist	cl	3.5	HNU = 0 ppm β = 80 cpm α = 2 cpm wood
44	7467 1725	12 22 33	18	Stiff gray 10YR 5/1 clay some silt trace sand and gravel -moist	cl	2.5	HNU = 0 ppm β 260 cpm α 21 cpm

NOTES:

000598

402-11-86

FERNALD RI/FS

LJ 2/4/89

5709

AUG 1 9 1991

16

REVIEWED BY QA 16 DATE

	Initial	Date
1st Review		
2nd Review		8-11-93
Hard Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.32	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B35T~~ B3041 BD 1-5-89	COORDINATES: see p1	DATE: Oct 28, 1987
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Oct 21, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 11-13-87
DRILLING METHODS: Cable Tool		PAGE 4 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	7468	10 14 19	16	very stiff gray 5YR 6/1 clay some silt trace gravel and sand, some calicification cement - moist	cl	3.5	HNU = 0 ppm BG = 60 cpm α = 2 cpm
47	7469	6 12 18	18	hard gray 5YR 6/1 clay some sand and silt, trace gravel - moist	sp	4.0	HNU = 0 ppm BG = 70 cpm α = 2 cpm
48				dense gray 5YR 6/1 sand and gravel some silt and clay - moist	sg	NA	
49	7470	7 16 24	18	very stiff gray 5YR 6/1 clay some sand and clay, trace gravel moist	cl	3.5 3.5	HNU = 0 ppm BG = 55 cpm α = 3 cpm
50	7471	8 14 31	18	very stiff gray 10YR 6/1 clay some sand and silt, trace gravel - moist	cl	4.0	HNU = 0 ppm BG = 80 cpm α = 4 cpm
51				very stiff gray 10YR 6/1 clay and silt some fine sand - dry	cl	1.5	
52	7472	39 44 50+	15	stiff brown 10YR 5/3 silt and fine sand, some clay - dry	sm	1.5 NA	HNU = 0 ppm BG = 70 cpm α = 2 cpm
53	7473	16 41 50	15	stiff brown 10YR 5/3 silt and fine sand some clay - dry 52.0	sm	NA	HNU = 0 ppm BG = 60 cpm α = 2 cpm
54				dense brown 10YR 5/6 sand and fine gravel some silt, trace clay and medium gravel - dry	sp		
55	7474	34 25+	12	dense yellowish brown 10YR 5/6 sand and gravel, some silt and clay, trace cobbles dry	sp	NA	HNU = 0 ppm BG = 70 cpm α = 3 cpm
56							
57				dense yellowish brown 10YR 5/6 sand some gravel and silt, trace clay - dry	sp		
58							
59							

NOTES:

000599

402-11-86

FERNALD RI/FS

2/4/89

REVIEWED BY QA LG DATE AUG 16 1989

	Initial	Date
1st Review		
2nd Review		
Final Review		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B351~~ B3051 OB 1-5-89	COORDINATES: see p1	DATE: OCT 28, 1987
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Oct 26, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 11-13-87
DRILLING METHODS: Cable Tool		PAGE 5 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	7475 1415	34 75	12	dense brownish gray 10YR 5/2 sand and gravel some silt clay and pebbles - moist 60ft	gc	NA	HNU = 0ppm βγ: 60 cpm α: 2 cpm
				hard brownish yellow 10YR 6/6 silty clay some sand - dry 61	cl	3.5	
62				very dense brownish yellow 10YR 6/6 coarse sand and gravel some silt and clay, trace % pebbles - moist	gc		only able to drive split spoon 12 in.
63							
64							
65							
66	7476 1530	43 72	12	dense brownish yellow 10YR 6/6 coarse sand and gravel, some silt, trace clay and pebbles dry	gm	NA	HNU = 0 ppm βγ: 70 cpm α: 2 cpm
67				dense ~~brownish~~ yellowish brown 10YR 5/6 sand, some silt, trace gravel and clay - moist	SW		only able to drive split spoon 12 in.
68							
69							
70							
71	7477 850	16 78	12	very dense light ~~gray~~ brownish gray 10YR 6/2 sand and gravel, some % pebbles, cobbles silt and clay - dry	gc	NA	HNU = 0 ppm βγ: 60 cpm α: 2 cpm
72							only able to drive split spoon 12 in.
73							
74							

NOTES:

000800

402-11-86

FERNALD RI/FS

2/4/89 . 5709

REVIEWED BY QA DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS Nov 1	
BORING NUMBER: ~~B351~~ B3051 OB 1-5-88	COORDINATES: see p1	DATE: ~~Oct 29~~, 1987
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Oct 21, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 11-13-87
DRILLING METHODS: Cable tool		PAGE 6 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	7478 1415	16 78	12	dense brownish yellow 10YR 5/6 sand some gravel, trace silt and clay - moist	gc	NA	HNU=0 ppm γβ=60cpm α=2 cpm
77							only able to drive split spoon 12 in.
78							
79							
80	7479 1630	20 30 40	11	dense brownish yellow 10YR 5/8 sand and gravel some silt clay and pebbles - moist	gc	NA	HNU=0ppm γβ=60cpm α=2cpm
81							
82							
83							
84							
85	7480 1745	29 22 27	12	dense brownish yellow 10YR 5/8 sand and gravel, some silt and clay - moist	gc	NA	HNU=0ppm γβ=60cpm α=0cpm
86							
87				87	---		
88				dense gray 7.5YR 5/0 sand, some silt and clay, trace gravel - moist	SP		density based on relative soil texture
89							

NOTES:

000601

402-11-86

FERNALD RI/FS

REVIEWED BY QA 2/4/89 DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		8-11-89
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.32	PROJECT NAME: Fernald RI/FS	Nov 2
BORING NUMBER: ~~B351~~ B3051 BB 1-5-91	COORDINATES: see p1	DATE: ~~Oct~~ 1987
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Oct 21, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 11-13-87
DRILLING METHODS: Cable tool		PAGE 7 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	7481 940	9 25 26	18	dense gray 2½YR5/0 fine to medium sand some coarse sand and silt, trace clay, gravel and pebbles - moist	SP	NA	HNU = 0ppm ∂B = 50cpm α = 2cpm
92							
93							
94							
95							
96	7482 1045	9 20 31	18	dense gray 7½PB5/0 fine to medium sand, some coarse sand and fine gravel trace silt and clay - moist	SP	NA	HNU = 0ppm ∂B = 60cpm α = 2cpm
97							
98							
99							
100							
101	7483 1640	5 8 10	17	dense gray 7½YR5/0 sand, some silt and clay. trace gravel - moist	SP	NA	HNU = 0ppm ∂B = 50cpm α = 2cpm
102							
103							
104							

NOTES:

000602

FERNALD RI/FS

5709

2/4/89

AUG 1 6 199

REVIEWED BY QA DATE

	Initial	Date
1st Key In		
2nd Key In		9/11/86
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60232	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B351~~ B305 BB 1-5-89	COORDINATES: see p1	DATE: Nov 3, 1987
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Oct 21, 1987
ENGINEER/GEOLOGIST: Howell Willo	Depth — Date/Time —	DATE COMPLETED: Nov 13, 1987
DRILLING METHODS: Cable tool		PAGE 8 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ½ FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	7484 1740	10 21 35	18	dense gray 7½YR 5/0 sand - some silt and clay, trace fine gravel - moist	SP	NA	HNU = 0ppm γβ = 60cpm α = 2cpm
107							
108							
109							
110	7485 900	5 15 28	18	dense gray 7½YR 5/0 sand, some gravel, silt and clay - wet	SP	NA	HNU = 0ppm γβ = 60cpm α = 2cpm
111							
112							
113				113	---		
114							
115	7486 945	5 7 13	18	dense gray 7½YR 5/0 sand and gravel some cobbles, silt and clay - wet	gm	NA	HNU = 0ppm γβ = 60cpm α = 2cpm
116							
117							
118				118	---		
119					SP		

NOTES:

000603

402-11-86

FERNALD RI/FS

2/4/89 REVIEWED BY QA DATE AUG 16 1991

1st Key In	
2nd Key In	
Hard Copy Verification	

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	Nov 4, 1987
BORING NUMBER: ~~B35~~ B3057 BP-5-89	COORDINATES: see p1	DATE: ~~Oct 21, 1987~~
ELEVATION: see p1	GWL: Depth 90.0 Date/Time 800 11-4-87	DATE STARTED: Oct 21, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth 89.7 Date/Time ~~800~~ 730 11-5-87	DATE COMPLETED: Nov 13, 1987
DRILLING METHODS: Cable Tool		PAGE 9 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	7487 1330	4 9 21	1.8	dense gray 10YR 6/1 sand, some silt and clay, trace gravel - wet	SP	NA	HNU = 0 ppm; γB = 60 cpm; α = 2 cpm
122							
123							
124							
125							
126	7488 1500	7 17 30	1.8	dense gray 10YR 6/1 sand and fine gravel, some silt and clay, trace mud to coarse gravel - wet	SP	NA	HNU = 0 ppm; γB = 60 cpm; α = 2 cpm
127							
128							
129							
130							
131	7489 1630	19 31 45	1.8	dense gray 10YR 6/1 sand and fine gravel some silt, clay and medium gravel, & trace coarse gravel and pebbles - wet	SP	NA	HNU = 0 ppm; γB = 60 cpm; α = 2 cpm
132							
133							
134							

NOTES:

000604

402-11-86

FERNALD RI/FS

5709

REVIEWED BY QA 2/4/89 DATE AUG 16 1990

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B35~~ B305 BB 4-5-89	COORDINATES: see p1	DATE: Nov 5, 1987
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Oct 21, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: Nov 13, 1987
DRILLING METHODS: Cable tool		PAGE 10 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	7420 840	10 11 17	18	dense gray 10YR 5/1 sand and fine gravel some silt, clay and medium to coarse gravel, trace pebbles-wet	SP	NA	HNU = 0ppm γβ = 40cpm α = 2cpm
137							
138				138 1/2			
139					GM		density based on relative soil textures
140				loose gray 10YR 5/1 fine sand and silt, some clay-wet 140 1/2			
141	7421 1145	14 16 18	12	dense gray 10YR 5/1 sand and gravel, some silt, clay and pebbles-wet	SP	NA	HNU = 0ppm γβ = 50cpm α = 2cpm
142							
143							
144							
145							
146	7422 1530	30 40 50+	12	very dense gray 10YR 5/1 sand and fine to medium gravel, some silt and clay-trace pebbles-wet	SP	NA	HNU: 0ppm γβ: 50cpm α = 2cpm
147							
148							
149							

NOTES:

000605

402-11-86

FERNALD RI/FS

2/4/89 REVIEWED BY QA DATE AUG 16 1989

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 802.	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B35+ B3051 BB 1+9	COORDINATES: see p1	DATE: Nov 5, 1987
ELEVATION: see p1	GWL: Depth 89.6 Date/Time Nov 6/0800	DATE STARTED: Oct 21, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: Nov 13, 1987
DRILLING METHODS: Cable Tool		PAGE 11 OF 11

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ Ft)	RECOVERY (In)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	7423 1705	15 32 42	18	dense gray 10YR 5/1 sand and fine gravel some medium to coarse gravel, silt and clay, trace pebbles-wet	SP	NA	HNU = 0 ppm γβ = 50 cpm α = 2 cpm
152				bottom of boring 151½ ft			
153							
154							
155							
156							
157							

NOTES:

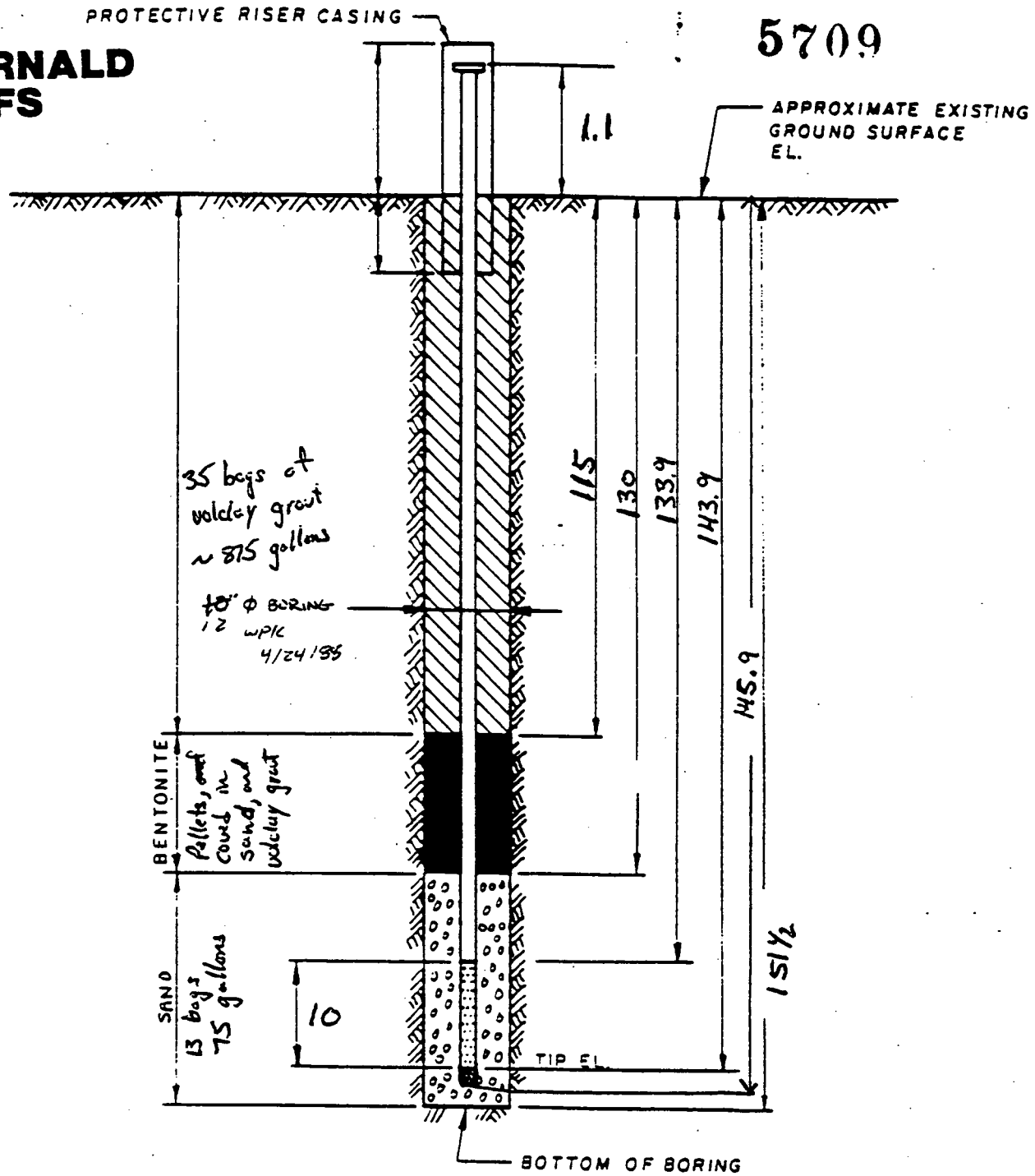
000606

402-11-86

2/4/89 REVIEWED BY GA DATE: AUG 30 1991 2B 1-5-89 3051

5709

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. ~~Stainless~~ PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 89.9, ~~[illegible]~~
5. WATER LEVEL READING ON 11-17-87 @ 0800

INSTALLATION DETAILS
MONITORING WELL ~~351~~ 3051 BB

PREPARED FOR 1-5-89

000607

JD 2/4/89 white out correction were made by L. Willie at the time this form was completed 4/24/88 wpk PAC

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

REVIEWED BY QA DATE AUG 16 1990

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. Lowell Wille DATE Nov 12, 87
PROJECT NO. 602.3.2 CHECKED BY R Galbraith DATE 2/8/89
BORING NO. ~~351~~ 3051 BB 1-5-89
PIEZOMETER NO. ~~351~~ 3051 DATE OF INSTALLATION Nov 10, 11, 12, 1987

BOREHOLE DRILLING

DRILLING METHOD cable tool
DRILLING FLUID (S) USED: WATER
FLUID WATER FROM 0 TO 50 ft
FLUID NA FROM NA TO NA

TYPE OF BIT HAMMER
CASING SIZE (S) USED: TEMPORARY
SIZE 10 IN FROM 0 TO 150 ft
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 4 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 ft.

RISER PIPE MATERIAL Stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4 in
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD screw JOINT

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH ~~10~~ 5 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION LOCKING CAP AND LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	1.1		607.97	
GROUND SURFACE	0.0		606.87	
BOTTOM OF PROTECTIVE PIPE	2.5		604.37	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 1	BOTTOM 115	TOP 605.87	BOTTOM 491.87
BENTONITE Pellets and coved in sand	TOP 115	BOTTOM 130	TOP 491.87	BOTTOM 476.87
SAND	TOP 130	BOTTOM ~~146~~ ~~151.5~~ 150	TOP 476.87	BOTTOM 456.87
NO GRAVEL USED	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 133.9	BOTTOM 143.9	TOP 472.97	BOTTOM 462.97
PIEZOMETER TIP	145.9		460.97	
BOTTOM OF BOREHOLE	151.5		455.37	
GWL AFTER INSTALLATION	89.9 TOC WPK 4/24/88			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS From 130 to 115 foot depth below ground surface, bentonite seal had formation sand and gravel mixed in with it. JD

000608

FERNALD RI/FS

DLG 2/14/89 5709

REC'D AUG 4 1989

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

RIG # 1

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS TASK 3.2	
BORING NUMBER: ~~152~~ 102 BB 1-5-89	COORDINATES:	DATE: 11/5 & 11/6/87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11/5 @ 1500
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/10/87
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.5, 1, 1.5, 2				SEE DETAILED SOIL DESCRIPTIONS ON WELL LOG FOR BOREHOLE 252			BEGAN WELL AT 1500 11/5/87
3, 4	ST 07562		16"	SHELBY TUBE	CL		SAMPLE DRIVEN AT 1700. 3'-4.4'
5							END OF DAY 11/5/87 START OF DAY 11/6/87
6, 7, 8, 9, 10, 11							
12	ST 07563		8½"	Shelby Tube			TAKEN @ 1115 - 11/6/87
13, 14, 15							END OF DAY 11/6/87

NOTES: 1.) Drilling Contractor:
Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter
Rig #2
Type: 71 Speed Star

2.) Water Used (1=5 gal.)

3.) Background Readings for 1115 & 000609
α B = 60-140
γ = 0
Hnu = 0

402-11-86

FERNALD RI/FS

DLG 2/4/89

REC'D AUG 4 1989

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BB 1-5-89 1512 ~~1057~~ 1052	COORDINATES:	DATE: 11/7/87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11/5 @ 1500
ENGINEER/GEOLOGIST: B. Dunning	Depth Date/Time	DATE COMPLETED: 11/10/87
DRILLING METHODS: Cable Tool		PAGE 2 OF 2

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16							Beginning of Day 11/10/87
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30				BOB(*) = 30 Feet			End of Day 11/10/87

NOTES: 1.) Background Level 11/10/87 * BOB - BOTTOM OF BORING

Hmu = 0

γ = 0

α, β = 40-140 cpm

000610

402-11-86

DLG 2/4/89

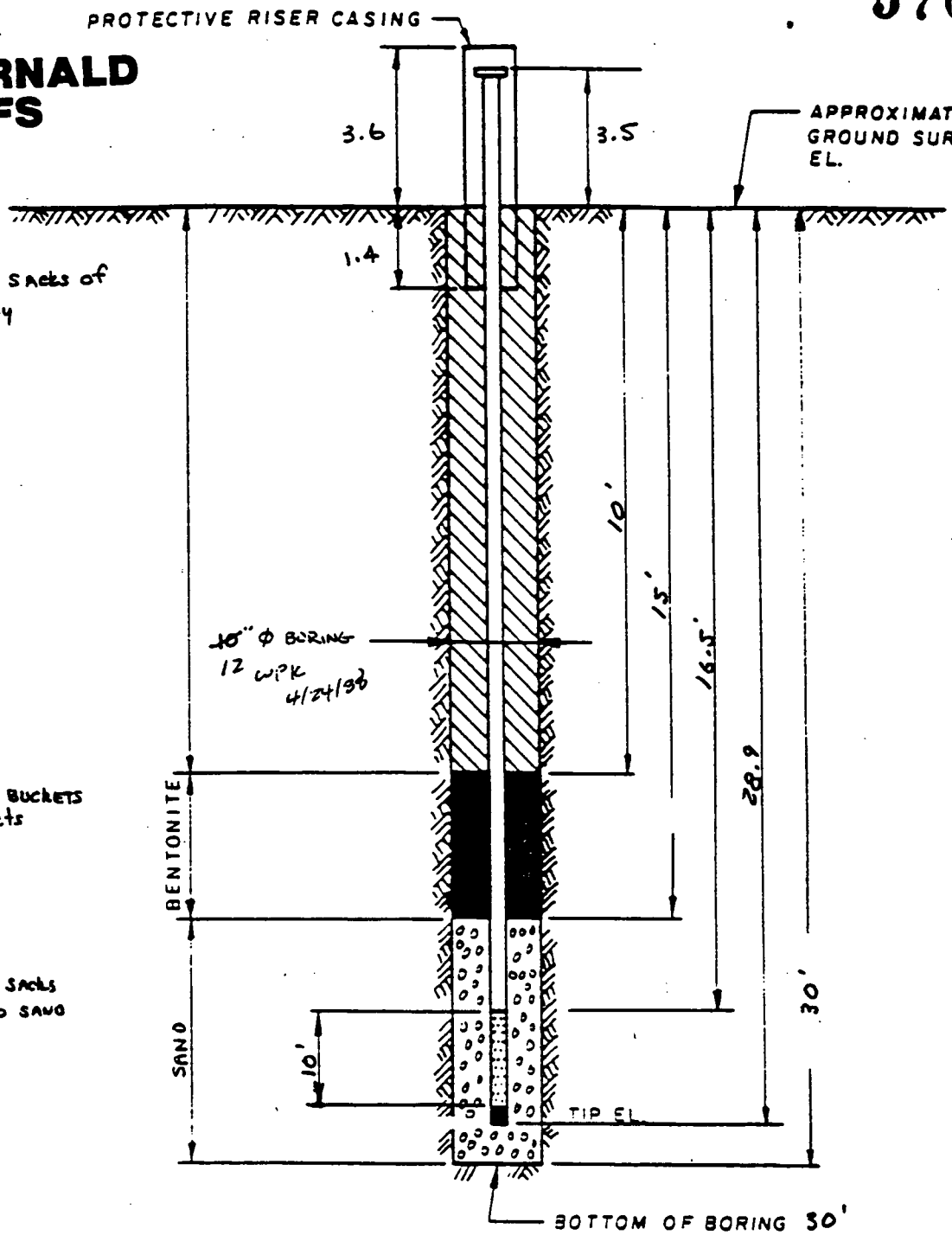
REC'D AUG 4 1989

BORING ~~152~~ 1052 BB 1-5-89

#2.

5709

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~152~~ 1052

PREPARED FOR BB 1-5-89

000611

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REC'D AUG 4 1989

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B DUNNING DATE 11/10/87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~152~~ 1052 BB 1-5-89
PIEZOMETER NO. ~~152~~ 1052 DATE OF INSTALLATION 11/10/87

BOREHOLE DRILLING

DRILLING METHOD cable Tool
DRILLING FLUID (S) USED: Potable water
FLUID H_2O FROM 0 TO 30'
FLUID NA FROM NA TO NA

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 30'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE STAINLESS STEEL (316)
DIAMETER OF PERFORATED SECTION 4" INCHES
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10'

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 INCHES I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10'
JOINING METHOD FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5'
PROTECTIVE PIPE O.D. 10"

OTHER PROTECTION LOCKING CAP AND LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	3.4			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	1.4			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 10'	TOP	BOTTOM
BENTONITE	TOP 10'	BOTTOM 15'	TOP	BOTTOM
SAND	TOP 15'	BOTTOM 30'	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 16.5	BOTTOM 26.5	TOP	BOTTOM
PIEZOMETER TIP	~~5.4~~ 28.4' (sump)			
BOTTOM OF BOREHOLE	30'			
GWL AFTER INSTALLATION	25.5 TOC GPC 01/24/86			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000612

Groundwater level taken from daily log on 4/24/88

~~C 537~~ WPK 4/24/88

FERNALD RI/FS

REC'D AUG 4 1989 DLE 8/4/89

~~REVIEWED BY QA~~ ~~DATE~~

	Initial	Date
1st Key In		
2nd Key In		

WPK 8-17-88 WPK 8/23/88

PAC 5700

VISUAL CLASSIFICATION OF SOILS

RIG # 2

PROJECT NUMBER: 602-3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~281~~ 2052 BD 1-5-89	COORDINATES: N 98507.16 E 1380139.73	DATE: 11/1/87
ELEVATION: 584.46	GWL: Depth 53.7 Date/Time 11/4/87 @ 0815	DATE STARTED: 11/1/87
ENGINEER/GEOLOGIST: W. KEGLEY	Depth Date/Time	DATE COMPLETED: 11/3/87
DRILLING METHODS:		PAGE 1 OF 5

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 inch	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0	7 2 4 9 0850	9 13 7	10	HARD OLIVE BROWN (2.5 4/4) CLAY. DRY	CL	4.5+	Hnu=0ppm β α = 60-80 cpm γ = 0cpm
2.0	7 2 5 0 0915	6 10 8	6	HARD DARK GRAYISH BROWN (2.5 4/2) clay some silt - Dry	CL	4.5+	Hnu = 0ppm β α = 60-80 cpm γ = 0cpm
3.0 4.0	7 2 5 1 0930	7 6 8	16	VERY STIFF GRAYISH BROWN (2.5 5/2) CLAY · SOME SILT TRACE SAND - DRY	CL	3.0	Hnu = 0ppm β α 60-100 cpm γ = 0cpm
5.0	7 2 5 2 0945	8 6 8	18	STIFF YELLOW (2.5 7/6) Silt Some clay TRACE SAND ~~MOIST~~ - DRY	ML	1.5	Hnu = 7ppm β α = 60-100 cpm γ = 0cpm 7255 VOLITILE VOA VIAL
6.0 7.0	7 2 5 4 1015	8 5 6	18	STIFF YELLOW (2.5 7/6) SILT SOME clay Trace SAND - MOIST	ML	1.5	Hnu = 0ppm β α 60-100 cpm γ = 0cpm 7255 VOA VIAL
8.0 9.0	7 2 5 6 1045	8 7 10	18	VERY STIFF LIGHT OLIVE BROWN (2.5Y 5/4) SILT SOME CLAY AND SAND TRACE GRAVEL - MOIST	ML	2.5	Hnu 0ppm β α 60-100 cpm γ = 0cpm
10.0	7 2 5 7 1330	8 9 14	12	MEDIUM STIFF GRAYISH BROWN (2.5Y 5/2) CLAY AND SILT SOME GRAVEL - MOIST	ML	1.5	Hnu = 0ppm β α 60-100 cpm γ = 0cpm
11.0 12.0	7 2 5 8 1410	13 9 11	13	VERY STIFF GRAY (2.5Y 5/0) SILT SOME SAND AND GRAVEL - DRY	ML	2.5	Hnu = 0ppm β α 60-100 cpm γ = 0cpm
13.0				NO SAMPLE TAKEN			DRILLER DRILLED THRU THIS SECTION WITHOUT SAMPLING IT
14.0	7 2 60 1420	3 7 12	14	VERY STIFF GRAY (5Y 5/1) SILT SOME SAND TRACE OF GRAVEL - DRY	ML	2.5	Hnu = 0ppm β α 60-100 cpm γ = 0cpm

NOTES:

(1) DRILLING CONTRACTOR: Pennsylvania DRILLING
DRILLER: TIM HARRIS
ASSISTANT: STEVE REBER
RIG: 71 SPEED STAR

(2) WATER ADDED DURING DRILLING (V = 5 gal) WTI WTI WTI WTI WTI WTI

(3) SOIL SAMPLING AS PER ASTM STANDARD PENETRATION TEST

(4) COLOR DESCRIBTION AS PER MUNSELL

(5) FIELD MEASUREMENT BACKGROUND LEVELS
Hnu = 0ppm
γ = 0ppm
βα = 60-100 cpm

REVIEWED BY QA _____ DATE ~~AUG 07 1991~~

402-11-86

FERNALD RI/FS

REC'D AUG 4 1989

~~REVIEWED BY QA~~ ~~DATE~~

DLG 2/4/89

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~252~~ 2052 BB 1-5-89	COORDINATES:	DATE: ~~11/11/6~~ 11 / 87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11 / 87
ENGINEER/GEOLOGIST: W. KEGLEY	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	7 2 6 1 1530	14 16 19	18	VERY STIFF GRAY (5Y 5/1) SILT SOME CLAY TRACE OF SAND AND GRAVEL - DRY	ML	3.5	HNU 0ppm β α 60-100cpm γ = 0cpm
17	7 2 6 2 1545	8 18 12	12 ~~9~~	VERY STIFF GRAY (5Y 5/1) SILT SOME SAND AND GRAVEL TRACE CLAY - DRY	ML	2.5	HNU = 0ppm β α 60-100 cpm γ = 0cpm
18 19	7 2 6 3 1600	7 9 11	9	VERY STIFF GRAY (5Y 5/1) SILT AND SAND SOME GRAVEL - DRY	ML	2.5	HNU = 0ppm β α 60-100 cpm γ = 0cpm
20	7 2 6 4 1630	1 3 2	2	LOOSE GRAY (5Y 6/1) GRAVEL AND COURSE SAND TRACE CLAY WET	GW	-	HNU = 0ppm β α 60-120 γ = 0cpm cpm
21 22	7 2 6 5 1725	3 5 8	1	MEDIUM DENSE (5Y 5/1) GRAY GRAVEL AND COURSE SAND SOME CLAY WET	GC		HNU = 0ppm β α 60-120 γ = 0cpm cpm USED CATCHER BUT LITTLE RECOVERED
23 24	7 2 6 6 1730	11 9 9	14	VERY STIFF (5Y 5/1) GRAY SAND AND GRAVEL ~~WITH~~ SOME CLAY AND SILT - MOIST	SM	2.5	HNU = 0ppm β α 60-120 cpm γ = 0cpm
25	7 2 6 7 1750	7 9 11	18	MEDIUM DENSE GRAY (2.5Y 5/1) ~~SILT AND~~ SAND ~~SOME GRAVEL AND CLAY - WET~~ AND SILT WITH SOME GRAVEL AND CLAY	SM ~~ML~~	1.5 ~~-~~	HNU = 0ppm β α 60-120 cpm γ = 0cpm END 11/11/87
26 27	7 2 6 8 0810	2 3 4	15	BEGIN 11/12/87 LOOSE GRAY (2.5Y 5/0) SILT AND SAND SOME GRAVEL AND CLAY WET	ML	-	HNU = 0ppm β α 60-120 cpm γ = 0cpm
28	7 2 6 9 1000	2 3 5	2	LOOSE GRAY (2.5Y 5/0) GRAVEL AND CLAY SOME SILT - WET	GL	-	HNU = 0ppm β α 60-120 cpm γ = 0cpm Catcher USED BUT LITTLE RECOVERY
29	7 2 7 0 1325	3 7 13	14	MEDIUM STIFF LIGHT OLIVE GRAY (5Y 6/2) SILT AND CLAY SOME GRAVEL - DRY	ML	.5	HNU = 0ppm β α 60-120 cpm γ = 0cpm

NOTES:

REVIEWED BY QA AUG 07 1991 DATE

000614

402-11-86

FERNALD RI/FS

5709 DLG 2/14/89

RECD AUG 4 1989

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~252~~ 2052 BIB 1-5-91	COORDINATES:	DATE: 11 2 87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11 1 87
ENGINEER/GEOLOGIST: W KEGLEY	Depth Date/Time	DATE COMPLETED: 11 3 87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	7 2 7 1 1345	3 6 13	10	VERY STIFF OLIVE GRAY (5Y 5/2) CLAY AND SILT SOME GRAVEL TRACE OF WOOD FRAGMENTS - DRY	CL	3.5	HNU = 0ppm β α = 60-120 CPM γ = 0cpm
32	7 2 7 2 1405	6 11 11	18	VERY STIFF OLIVE GRAY (5Y 5/2) SILT AND CLAY SOME GRAVEL TRACE OF SAND - DRY	ML	3.0	HNU = 0ppm β α 60-120 CPM γ = 0cpm
33	7 2 7 3 1435	16 36 30		STIFF OLIVE GRAY (5Y 5/2) SILT AND CLAY SOME GRAVEL AND SAND - DRY	ML	1.0	HNU = 0ppm β α 60-120 CPM γ = 0cpm
34				DENSE LIGHT OLIVE BROWN (2.5Y 5/4) SAND SOME GRAVEL - DRY	GW	-	
35							
36	7 2 7 4 1625	16 17 22	15	DENSE STRONG BROWN (7.5YR 4/6) SAND AND GRAVEL SOME SILT DRY	GW	-	HNU = 0ppm β α 60-120 γ = 0cpm CPM
37							
38							
39							
40							
41	7 2 7 5 1655	21 27 31	13	VERY DENSE STRONG BROWN (7.5YR 5/6) SAND TRACE GRAVEL SILT - WET	SP	-	HNU = 0ppm β α 60-120 CPM γ = 0cpm
42							~~GROUND~~ SMALL POCKET OF WATER DETECTED BY DRILLER AT 42'
43							
44							

NOTES:

000615

AUG 07 1991

REVIEWED BY QA_____ DATE_____

402-11-86

FERNALD RI/FS

DLG 2/14/91

REC'D AUG 4 1989

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 607 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~252~~ 2052 BB 9-5-91	COORDINATES:	DATE: 11/13/87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11/87
ENGINEER/GEOLOGIST: W KEGLEY	Depth Date/Time	DATE COMPLETED: 11 3 87
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	7 2 7 6 1700	11 30 42	12	VERY DENSE STRONG BROWN (7.5YR 5/6) SAND AND GRAVEL - DRY	GW	–	CRUDE OIL SMELL COMING FROM BORING HNU = 0 PPM β 260-120 cpm γ = 0 cpm
47							END 11 2 87
48							
49							
50							BEGIN 11 3 87
51	7 2 7 7 0855	37 47 50	13	VERY DENSE YELLOW (10YR 7/6) SAND SOME GRAVEL TRACE SILT DRY	GW	–	HNU = 0 PPM β 60-120 cpm γ = 0 cpm
52							
53							
54							
55							ENCOUNTERED BLOW SAND
56	7 2 7 8 1150	29 23 24	12	DENSE DARK YELLOWISH BROWN (10YR 4/6) SAND SOME GRAVEL - WET	GW	–	HNU = 0 ppm β 60-120 cpm γ = 0 cpm
57							DROVE CASING TO 60 feet which stopped SAND from blowing UP Hole
58							
59							

NOTES:

000616

REVIEWED BY QA _____ DATE AUG 07 1991

402-11-86

FERNALD RI/FS

DLG 2/4/15 5709

REC'D AUG 4 1989

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 607 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~252~~ 2052	COORDINATES:	DATE: 11 3 87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11 1 87
ENGINEER/GEOLOGIST: W KEGLEY	Depth Date/Time	DATE COMPLETED: 11 3 87
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	72 74 1555	2 9 50/5	15	VERY DENSE Yellowish Brown (10YR 5/4) SAND AND GRAVEL TRACE SILT	GW	-	Hnu = 0 ppm BG 60-120 cpm γ = 0 cpm
62							
63							
64							
65							
66	75 60 1535	3 5 9	7	MEDIUM DENSE YELLOWISH BROWN SAND AND GRAVEL - WET (10YR 5/4) 665	GW	-	Hnu = 0 ppm BG 60-120 cpm γ = 0 cpm
67				BOTTOM OF BORING.			

NOTES:

AUG 07 1991

REVIEWED BY QA _____ DATE _____

000617

402-11-86

FERNALD RI/FS

DLG 2/4/89

REC'D AUG 4 1989

	Initial	Date
1st Key In	TSF	9/6/88
2nd Key In	DLG	9/12
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B 252 B2052 BB 1-5-99	COORDINATES: N 48250 7.16 E 1380139.73	DATE: 07 22 88
ELEVATION: 584.46	GWL: Depth NOT MEASURED Date/Time 7.23.88	DATE STARTED: 07 21 88
ENGINEER/GEOLOGIST: Schwartz	Depth NOT MEASURED Date/Time 7.23.88	DATE COMPLETED: 07 23 88
DRILLING METHODS: Cable tool		PAGE 1 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61				well reconstructed in the same hole			
62							
63							
64							
65				See logs from previous boring for soil descriptions			
66							
67							
68							
69							
70	072288	27		dense grey ~~gr~~ (10YR 5/2) gravelly sand, well graded, wet			
71	1030 08628	16 23	9		SW	NA	HNu = 0ppm α = 0-1 cpm β = 20-40 cpm
72							
73							
74							

NOTES:

Drill Contr: Penn Drill
Driller: Harry Dykes 000618
Helper: Tim Harris
Rig: Speed Star

water used: ≈600 gallons

Background:
HNu = 0ppm
β = 20-40 cpm
α = 0-2 cpm

AUG 07 1989

REVIEWED BY QA _____ DATE _____

402-11-86

FERNALD RI/FS

DLG 2/14/87 5709

REC'D AUG 4 1989

	Initial	Date
1st Key In	TSF	9/6/89
2nd Key In	[illegible]	9/12
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~B257~~ B2057 BR 1-5-89	COORDINATES: See p.1	DATE: 07 22 88
ELEVATION: See p.1	GWL: Depth p.1 Date/Time p.1	DATE STARTED: 07 21 88
ENGINEER/GEOLOGIST: Schwartz	Depth p.1 Date/Time p.1	DATE COMPLETED: 07 23 88
DRILLING METHODS: Cable tool		PAGE 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	072288 ~~08629~~			no sample return			
77				Sample No 08629 is assigned to interval 80.0-81.5' RMD 12/19/90			
78							
79							
80				end of boring			
81	072288 1430 ~~08630~~	13 22 22	3	dense coarse gravelly ~~=~~ grey (10YR 5/1) sand wet	SW	NA	HNu = 0ppm γβ = 80-100cpm α = NA
82	Sample Void			DED 8.1.89			
83							
84				Sample number 08630 is assigned to well 2054 for sample interval 15.0-16.5' RMD 12/19/90			
85	~~072288~~	few					
86	~~08631~~	few					
87							
88							
89							

NOTES:

000619

AUG 07 1991

Background:
HNu = 0 ppm
γβ = 80-100 cpm
α = Instrument not working

REVIEWED BY QA _____ DATE _____

402-11-86

FERNALD RI/FS

REC'D AUG 4 1989

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. M KEELEY DATE 11/3/87
PROJECT NO. 602.3.2
CHECKED BY R Galbraith DATE 2/6/89
BORING NO. 2052
PIEZOMETER NO. 2052
DATE OF INSTALLATION 7/23/88

BOREHOLE DRILLING

This is a reconstruction of a well that originally was completed at too shallow a depth.

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 0 TO 81.5	SIZE ___ FROM ___ TO ___
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitor Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS .01 in	JOINING METHOD Flush joint threaded
TOTAL ~~PERFORATED AREA~~ Well Screen 15'	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION Locking cap with lock
PROTECTIVE PIPE O.D. 10 3/4"	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0		586.46	
GROUND SURFACE	0.0		584.46	
BOTTOM OF PROTECTIVE PIPE	2.5		581.96	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 47	TOP 584.46	BOTTOM 537.46
BENTONITE	TOP 47	BOTTOM 52	TOP 537.46	BOTTOM 532.46
SAND	TOP 52	BOTTOM 77	TOP 532.46	BOTTOM 507.46
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 60	BOTTOM 75	TOP 524.46	BOTTOM 509.46
PIEZOMETER TIP	77.0		507.46	
BOTTOM OF BOREHOLE	81.5		502.96	
GWL AFTER INSTALLATION	NA		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS This is the final installation of the deepened Well 2052. The original well 252 was distroyed in the process.

000620

REVIEWED BY QA _____ DATE AUG 07 1991

FERNALD RI/FS

REC'D AUG 4 1989

5709

Initial	Date
1st Key In	
2nd Key In	
Hard Copy Verification	

PIEZOMETER INSTALLATION SHEET

PROJECT NAME [illegible] RI/FS FIELD ENG./GEO. [illegible] DATE 11/4/87
PROJECT NO. [illegible] CHECKED BY S.T. DATE 3/20/91
BORING NO. 2052 BB 1-5-89
PIEZOMETER NO. [illegible] 2052 DATE OF INSTALLATION 11 [illegible] 87

BOREHOLE DRILLING

DRILLING METHOD [illegible]	TYPE OF BIT FLAT HEAD
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID [illegible] FROM [illegible] TO [illegible]	SIZE 10 inch FROM 0 TO 65.0 feet
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE 4" Ø - 316 STAINLESS STEEL WIRE WOUND	RISER PIPE MATERIAL [illegible]
DIAMETER OF PERFORATED SECTION 4 inch	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. [illegible] 3/4 inch I.D. 4 inch
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 5 [illegible] (1) 2 ft
AVERAGE SIZE OF PERFORATIONS .010 inch	JOINING METHOD [illegible]
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15 feet	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 feet	OTHER PROTECTION STEEL PROTECTIVE CASING with locking top AND lock.
PROTECTIVE PIPE Ø.D. 10 inch	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	1.96		586.46	
GROUND SURFACE	0.0		584.5	
BOTTOM OF PROTECTIVE PIPE	3.04		581.46	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP -1½'	BOTTOM 41'	TOP 583.0	BOTTOM 543.5
BENTONITE	TOP 41'	BOTTOM 46'	TOP 543.5	BOTTOM 538.5
SAND	TOP 46'	BOTTOM 66.5'	TOP 538.5	BOTTOM 518.0
GRAVEL	TOP None	BOTTOM None	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 48'	BOTTOM 63'	TOP 536.5	BOTTOM 521.5
PIEZOMETER TIP	65.5 feet		519.0	
BOTTOM OF BOREHOLE	66.5 feet		518.0	
GWL AFTER INSTALLATION	not measured		not measured	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000621

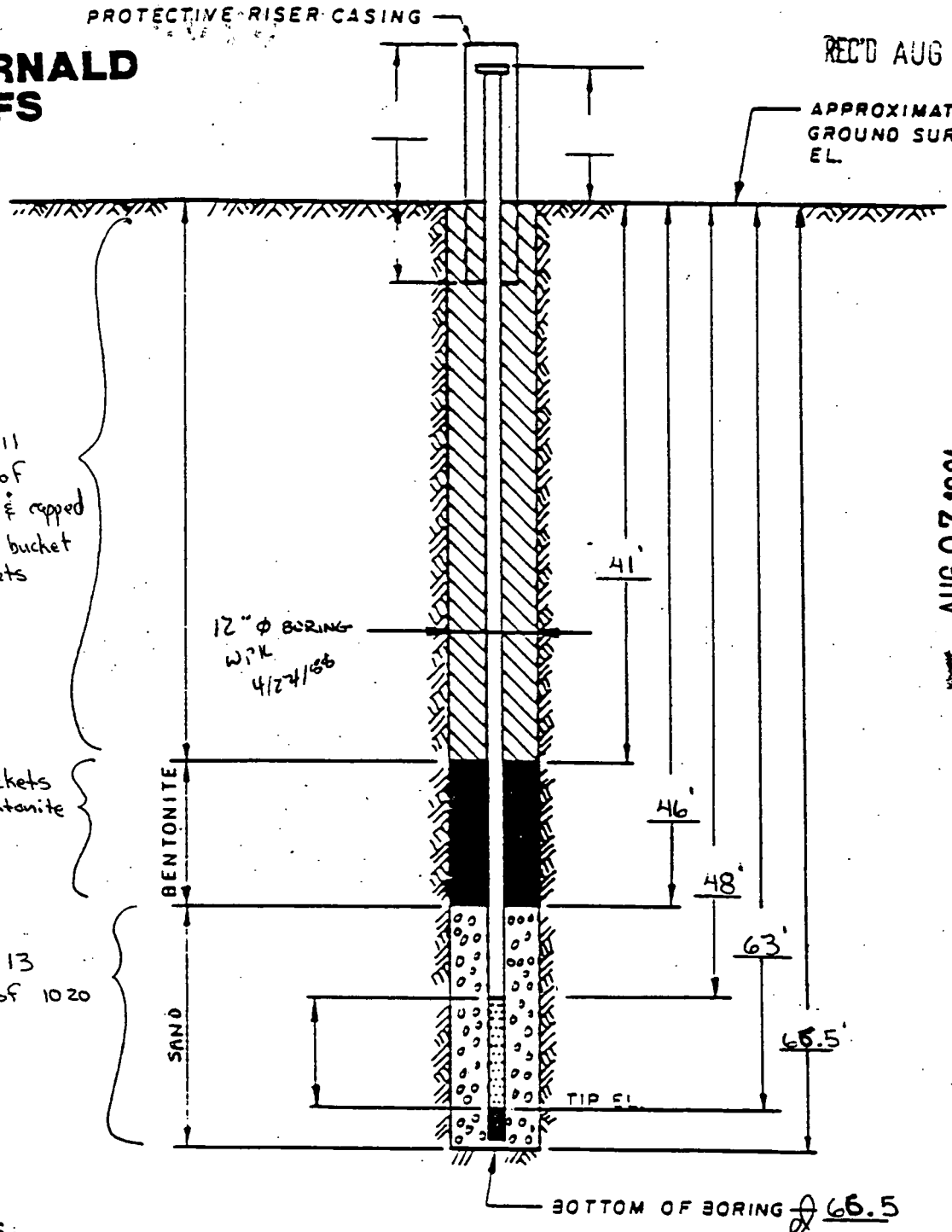
REVIEWED BY QA DATE AUG 07 1991

DLG 2/4/89

WELL ~~252~~ 2052 BB 1-5-89

REC'D AUG 4 1989

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

AUG 07 1989

DATE

REVIEWED BY QA

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS MONITORING WELL ~~252~~ 2052 BB 1-5-89

PREPARED FOR

This was original Well which was removed and a new well installed deeper in the same hole. RHB 2/6/89

000622

5709

FERNALD RI/FS

REC'D AUG 4 1989

PIEZOMETER INSTALLATION SHEET

0722 88 ₹

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. Schwartz DATE 07 22 88
PROJECT NO. 602 03 02 CHECKED BY T.T. DATE 3-20-91
BORING NO. B0-59B ~~252~~ (reconstruction) B2052
PIEZOMETER NO. ~~252~~ 2052 DATE OF INSTALLATION 07 22 88 - 07 23 88

BOREHOLE DRILLING

DRILLING METHOD cable tool	TYPE OF BIT flat head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 0 TO 80	SIZE 10" FROM 0 TO 80
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE	RISER PIPE MATERIAL stainless steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. ____ I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD thread & couple
TOTAL PERFORATED AREA 15'	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0	OTHER PROTECTION Protective lid cover
PROTECTIVE PIPE O.D. 10 in	with padlock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (FT.)	
TOP OF RISER PIPE	+ 2.0		586.46	
GROUND SURFACE	0.0		584.46	
BOTTOM OF PROTECTIVE PIPE	-2.5		581.96	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM -47	TOP 584.46	BOTTOM 537.46
BENTONITE	TOP -47	BOTTOM -52	TOP 537.46	BOTTOM 532.46
SAND	TOP -52	BOTTOM -80	TOP 532.46	BOTTOM 504.46
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP -60	BOTTOM -75	TOP 524.46	BOTTOM 509.46
PIEZOMETER TIP	-77*		507.46	
BOTTOM OF BOREHOLE	-80*		504.46	
GWL AFTER INSTALLATION	-65		519.46	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS water level measured at 65 ft

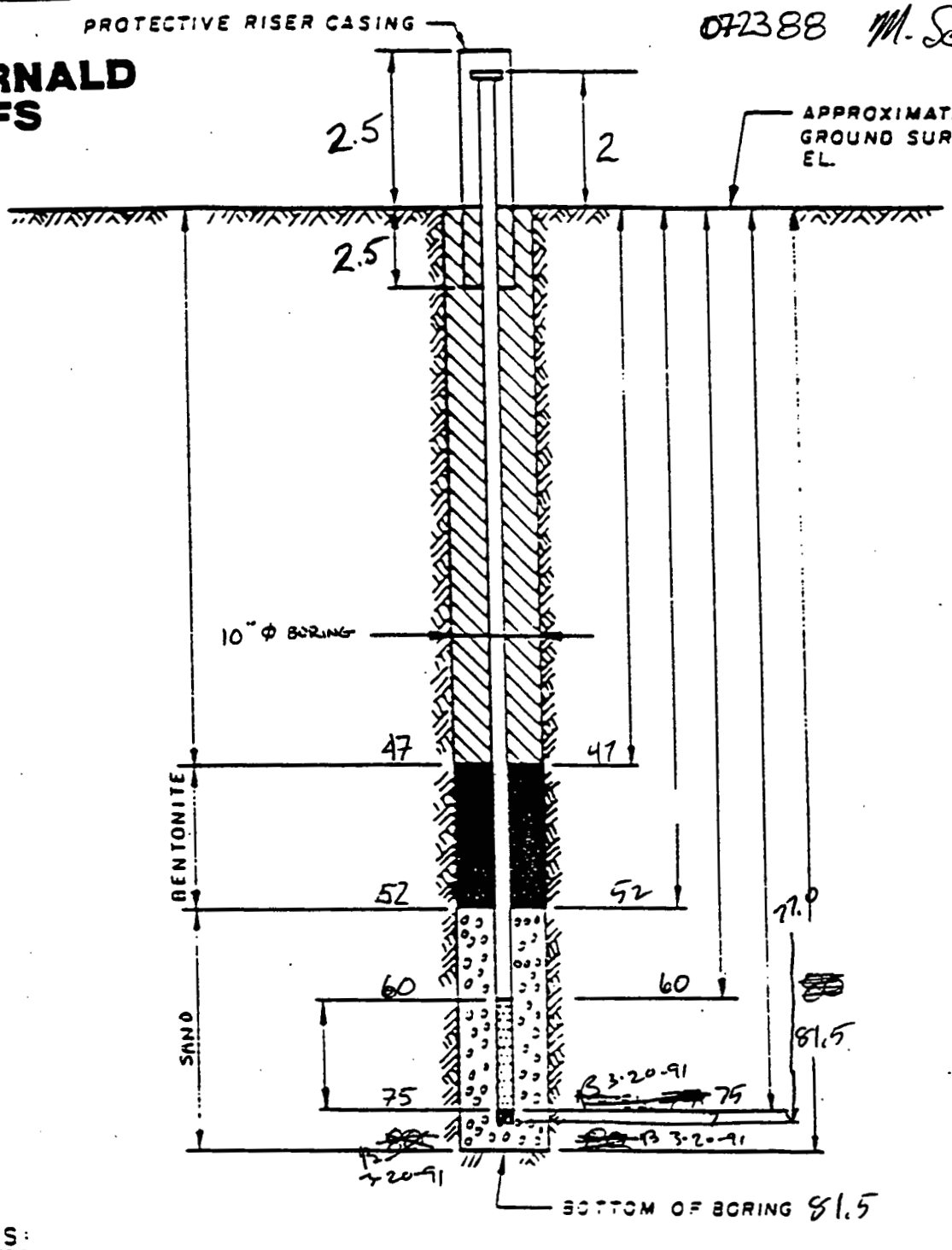
900623

REVIEWED BY QA [signature] DATE AUG 07 1991

DLG 2/14/89 REC'D AUG 4 1989

072388 M. Schwartz

FERNALD RI/FS



DRAWING NUMBER	3/24/91	3.7.	CHECKED BY	APPROVED BY		DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~252~~ 2052

PREPARED FOR BB 1-5-89

000624

AUG 07 1991

REVIEWED BY QA _____ DATE _____

1053

5709

ERM-MIDWEST [redacted] Inc.

Drilling Log

Project: Fernald Owner: Westinghouse/Bechtel

Location: Fernald Ohio W.O. Number:

Well/Boring No.: [illegible] #[illegible] Total Depth: 18.1' Diameter: 6"

Surface Elevation: Water Level: Initial: Dry 24-hrs.:

Screen: Dia.: 2" Length: 11.1' Slot Size: .010

Casing: Dia.: [illegible] Length: 10.4' Type: SS

Drilling Company: Soil & Rock Engrs Drilling Method: 3 3/4" I.D. HSA

Driller: E. Moore Log By: R.R. Richards Date Drilled: 10/2/86

Sketch Map

Notes: Surface Cond.-Grass
Weather-Overcast, 73°

Depth (feet)	Graphic Log	Well Construction	Sample Type	Cohesive Strength (TSF/SQ.FT.) or Penetration Test (Blows per 6")	Sample Interval	Description Interval	Description/Soil Classification (Color, Texture, Structures)
	3.97'						
2				1/2/1/3	0-2.5'	0-2.5'	Clay layer, brown, silt loose, soft, pebbly
	2.9'					2.5-8.5'	Sand fine-medium, brown, loose, dry, moderately well sorted, med grained
5							- Some small pebbles
	5.9'						
	7.0						
10				3/5/7		8.5-13.5'	Clay; blue-gray, loose, soft, pebbly
15				2/2/1/2	13.5-15.5'		- Some 2' sand lense 13.5'-13.7', brown, dry, loose, moderately well sorted med grained
	18.1						
20		SS PIG					
							Total Depth 18.1'
							H: Hard Digging R: Refusal Digging

C00625

FERNALD RI/FS

Field Check	WAH	2-3-89
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2053	COORDINATES:	DATE: 2-10-89
ELEVATION:	GWL: Depth 60.4 FT. Date/Time @ 2-11-89 1045	DATE STARTED: 2-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 59.8 FT. Date/Time @ 2-25-89 1630 WAH 3-7-89	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (WAH 3-3-89)
1	10700 0950 02-10	30 50 13	11	HARD, LIGHT YELLOWISH BROWN, (10YR 6/4) CLAYEY SILT, LOW PLASTICITY, MOIST.	ML	>4.0	Hnu = BKG. α = BKG. βγ = 120 CPM. MANMADE FILL FROM 0-6 in. SOME LARGE GRAVEL GRASS.
2 3	10701 0955 02-10	11 11 11	15	STIFF, YELLOWISH BROWN, (10YR 5/4), SILTY CLAY, MEDIUM PLASTICITY, TRACE OF FINE GRAVEL (3/8-#4), MOIST.	CL	1.75	Hnu = BKG. α = BKG. βγ = 130 CPM
4	10702 0958 02-10	2 5 9	12	VERY STIFF, DARK YELLOW-BROWN (10YR 4/6) CLAY, MEDIUM PLASTICITY, MOIST.	CL	2.5	Hnu = BKG. α = BKG. βγ = 100 CPM
5 6	10703 1005 02-10	10 11 15	16	VERY STIFF, YELLOWISH BROWN-GRAY, (10YR 5/4) CLAY, MEDIUM PLASTICITY, MOIST.	CL	3.0	Hnu = BKG. α = BKG. βγ = 100 CPM
7	10704 1010 02-10	14 16 19	16	VERY STIFF, YELLOWISH BROWN, (10YR 5/4) CLAY, MEDIUM PLASTICITY, MOIST.	CL	2.75	Hnu = BKG. α = BKG. βγ = 100 CPM
8 9	10705 1015 02-10	16 15 12	16	VERY STIFF, GRAYISH BROWN, (10YR 5/2), CLAYEY SILT, LOW PLASTICITY, MOIST TO WET.	ML	2.5	Hnu = BKG. α = BKG. βγ = 100 CPM
10	10706 1020 02-10	9 6 8	10	SOFT, GRAY, (10YR 5/1), CLAYEY SILT, SLIGHTLY PLASTIC, WET.	ML	0.5	Hnu = BKG. α = BKG. βγ = 80-90 CPM
11 12	10707 1025 02-10	13 12 11	10	SOFT, GRAYISH BROWN, (10YR 5/3), VERY SILTY CLAY, LOW PLASTICITY, MOIST TO WET.	CL	0.5	Hnu = BKG. α = BKG. βγ = 80-90 CPM
13	10708 1255 02-10	8 10 14	12	VERY STIFF, GRAYISH BROWN, (2.5Y 5/2), SILTY CLAY, LOW PLASTICITY, MOIST.	CL	2.25	Hnu = BKG. α = BKG. βγ = 80-90 CPM
14	10709 1305 02-10	36 50+/5in	7	VERY STIFF, DARK GRAYISH BROWN, (2.5Y 4/2), CLAY, MOIST; (2.5Y 5/2) VERY FINE CLAYEY-SILTY SAND @ 14.5-15.0 FT.. MOIST TO DRY, SAME COLOR AS CLAY.	CL / ML	2.75	Hnu = BKG. α = BKG. βγ = 80-90 CPM. INTERN. CONTS APPLY TO BOTH MATERIALS.

NOTES: PENN. DRILL CO.
DRILLER: HARRY DYKES
ASSIST.: Robert Yost

MATERIALS USED:
SAND: 10/20 19 BAGS 80 lb.
VOLCLAY GROUT: 10 BAGS 50 lb.
BENTONITE PELLETS: 3 5 gal. BUCKETS
WATER: 750 GALS TOTAL

DRILLING AND SAMPLING DONE IN ACCORDANCE WITH ASTM STANDARDS; DESCRIPTION (color) UTILIZING MUNSELL COLOR CHART. MEASURED CONSISTENCY BY POCKET PENETROMETER. WAH 3-3-89

INSTRU. BACKGROUND
Hnu = 0.4 ppm
α = 0 CPM
βγ = 90-100 CPM
EXO TOX LOL = -1%

000626

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2053	COORDINATES:	DATE: 2-10-89 / 2-11-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-10-89
ENGINEER/GEOLOGIST: E. TRALLINGER	Depth Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL		PAGE 2 OF ~~5~~ 7

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10710 1325 02-10	11 15 11	12	MEDIUM DENSE, LIGHT BROWNISH GRAY, (10YR 6/2), SILTY SAND, TRACE OF GRAVEL (.25 IN.), WET.	SM	N/A	Hmu = BKG. α = BKG. βγ = 90 CPM
17–18	10711 1434 02-10	4 10 13	10	MEDIUM STIFF, GRAY, (10YR 5/1), FINE SANDY SILT, TRACE OF FINE GRAVEL AND COARSE SAND, WET.	ML	1.0	Hmu = BKG. α = BKG. βγ = 90-160 CPM
19	10712 1489 02-10	9 12 14	13	STIFF, GRAY (10 YR 5/1), SANDY SILT, TRACE OF COARSE SAND, NON PLASTIC, WET.	ML	1.5	Hmu = BKG. α = BKG. βγ = 90-100 CPM
20–21	10713 1446 02-10	6 14 16	12	MEDIUM STIFF, GRAY, (10YR 5/1) SILT, TRACE OF MEDIUM TO COARSE SAND, NON PLASTIC, WET.	ML	1.0	Hmu = BKG. α = BKG. βγ = 90-100 CPM
22	10714 1454 02-10	10 12 37	14	HARD, GRAY, (10YR 5/1), SILTY CLAY, LOW PLASTICITY, MOIST.	CL	>4.0	Hmu = BKG. α = BKG. βγ = BKG. (90-100 CPM)
23–24	10715 1530 02-10	4 17 35	16	VERY STIFF, DARK GRAY, (10YR 4/1), SILTY CLAY, LOW TO MEDIUM PLASTICITY, MOIST.	CL	3.0	Hmu = BKG α = BKG. βγ = 90-100 CPM
25	10716 0915 02-11	8 13 23	16	VERY STIFF, DARK GRAY, (10YR 4/1), SILTY CLAY, MEDIUM PLASTICITY, MOIST.	CL	3.5	Hmu = BKG. α = BKG. βγ = 80 CPM
26	10717 0930 02-11	11 20 50/5 in	10	VERY STIFF, GRAY, (10YR 4/1) SILTY CLAY, MOIST TO DRY.	CL	3.0	Hmu = BKG α = BKG βγ = 90 CPM
27				VERY DENSE, BROWN (10YR 4/3) POORLY GRADED SAND, DRY.	SP	N/A	
28–29				* TILL DEPTH EXTENDED TO 26.5 FT BELOW SURFACE ELEVATION; SAMPLING AT 5 FT. INTERVALS HEREAFTER.			

TILL DEPTH 26.5 FT.

NOTES

DRILLER: HARRY DYKES JR.
ASSIST: ROBERT YOST

INSTRU. BACKGROUND
Hmu = 0.4 PPM
α = 0 CPM
βγ = 90-100 CPM

000827

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2053	COORDINATES:	DATE: 2-11-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 5

WAH 3-3-8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	10718 0945 02-11	12 20 36	16	VERY DENSE, LIGHT BROWN, (10YR 4/4) FINE POORLY GRADED SAND, DRY.	SP	N/A	Hnu = BKg. α = BKg. βγ = 80 CPM
32 33 34 35							
36	10719 1006 02-11	36 40 50	17	VERY DENSE, LIGHT YELLOWISH BROWN, (10 YR 4/5), POORLY GRADED SAND, DRY.	SP	N/A	Hnu = BKg. α = BKg. βγ = 80-90 CPM
37 38 39 40							
41	10720 1050 02-11	21 36 50	16	VERY DENSE, LIGHT YELLOWISH BROWN, (10 YR 4/5), POORLY GRADED SAND, TRACE OF FINE GRAVEL, DRY.	SP	N/A	Hnu = BKg. α = BKg. βγ = 80 CPM
42 43 44							

NOTES

DRILLER: HARRY D. JR.
ASSIST.: ROBERT YOST.

INSTRU. BKg.
Hnu = 0.4 PPM
α = 0 CPM
βγ = 80-90 CPM

000628

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2053	COORDINATES:	DATE: 2-22-89
ELEVATION:	GWL: Depth 60.6 FT Date/Time 2-22-89 @ 1345	DATE STARTED: 2-16-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 2-25-89
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 5,7

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10721 1050 02-22	25 50+/4in	10	VERY DENSE, YELLOWISH BROWN, (10YR 4/3), WELL GRADED SAND; TRACE of GRAVEL (.25-.75 IN); MOIST TO DRY.	SW	N/A	Hmax = BKg. α = BKg. βγ = 80 CPM
47							
48							
49							
50							
51	10722 1335 02-22	40 50+/5in	8	VERY DENSE, BROWN, (10YR 4/3), GRAVELLY SAND, WELL GRADED, MOIST.	SW	N/A	Hmax = BKg. α = BKg. βγ = 80 CPM
52							
53							
54							
55							
56	10723 1450 02-22	40 50+/4in	6	VERY DENSE, BROWN, (10YR 4/2), POORLY GRADED GRAVELLY SAND, MOIST.	SP	N/A	Hmax = BKg. α = BKg. βγ = 70-80 CPM
57							
58							
59							

NOTES

DRILLER: Harry Dykes Jr.
ASSIST.: Robert Yost.

INSTRU. BKg.

Hmax = 0.4 mR
α = 0 CPM
βγ = 100 CPM

000629

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2053	COORDINATES:	DATE: 2-22-89 / 2-23-89	
ELEVATION:	GWL: Depth 60.4 FT Date/Time 2-11-89 @ 1045	DATE STARTED: 2-10-89	
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 60.6 FT Date/Time 2-22-89 @ 1345	DATE COMPLETED: 2-25-89	
DRILLING METHODS: CABLE TOOL	60.6 FT 2-23-89 @ 0900	PAGE 5 OF 5	

60.4 FT
60.6 FT. FROM GSL 2-22-89 AND 2-23-89

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10724 1530 2-22	12 13 22	15	DENSE, GRAYISH BROWN (10 YR 5/2) POORLY GRADED SAND, WET.	SP	N/A	Hmu = BKG α = BKG βγ = 80 CPM
62							
63							
64							
65							
66	10725 1615 02-22	4 50+ 4 IN	5	VERY DENSE, GRAYISH BROWN, (10 YR 5/2), WELL GRADED GRAVELLY SAND, WET.	SW	N/A	Hmu = BKG α = BKG βγ = 70-80 CPM
67							
68							
69							
70							
71	10726 1310 02-23	12 11 22	10	DENSE, GRAYISH BROWN, (10YR 4/3), WELL GRADED SAND, SOME GRAVEL (.25-.50 IN), WET.	SW	N/A	Hmu = BKG α = BKG βγ = 80 CPM
72				DRILLING STOPPED @ 70.0 FT. SAMPLING STOPPED @ 71.5 FT.			
73							
74							

NOTES:

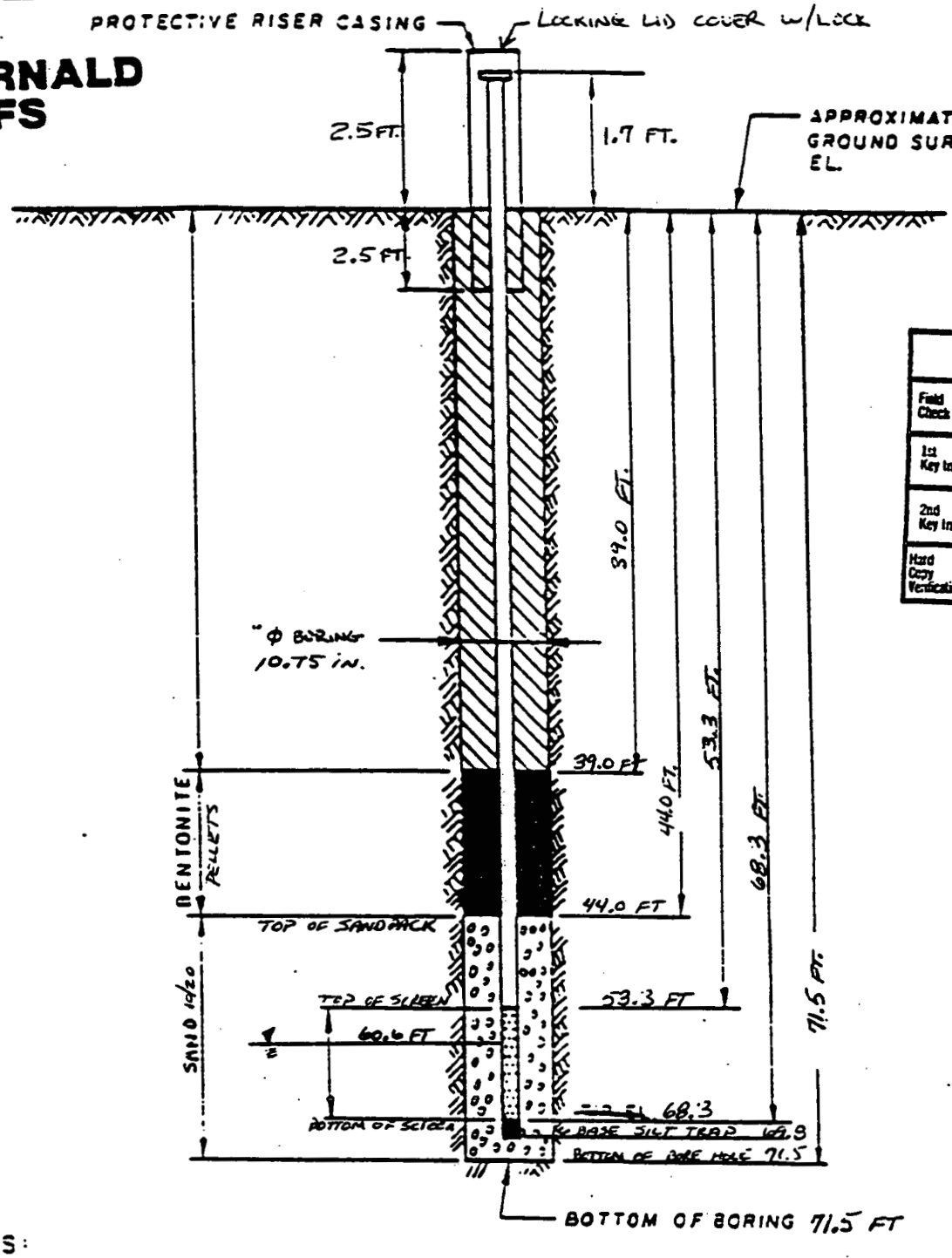
DRILLER: Harry Dykes Jr.
ASSIST.: Robert Yost

INSTRU. BKG.
Hmu = 0.4 ppm
α = 0 CPM
βγ = 100-110 CPM

000630

MW-2053 0709

FERNALD RI/FS



	Initial	Date
Field Check	WAH	3-3-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWN BY	ETL	CHECKED BY / APPROVED BY	WAH	3-3-89	DRAWING NUMBER MW-2053

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. WELDED SILT TRAP
4. ELEVATION OF WATER LEVEL 60.4 FT. @ 2-11-89
5. WATER LEVEL READING ON 60.6 FT ON 2-22-89
   60.6 FT. ON 2-23-89
   59.8 FT. ON 2-25-89

MATERIALS USED:

SAND: 17 BAGS 10/20 80 lb.
BENTONITE PELLETS: 5 5 gal. BUCKETS
VOLCLAY GROUT: 10 BAGS 50 lb.
WATER: DRILLING: 600 GALS.
GROUTING: 150 GALS
> TOTAL = 750 gals.

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

MW-2053

FROM 2-10-89 TO 2-25-89

Commenced Drilling and Sam, on 2-10-89. Hole Cover complete on 2-25-89. (WAH 3-3-89)

000631

FERNALD RI/FS

Field Check	WAH	3-3-89
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. E. TROWINGER DATE 2-25-89
PROJECT NO. 6002 TASK 3.2.1 CHECKED BY W A Hertel DATE 3-3-89
BORING NO. 2053
PIEZOMETER NO. 2053 DATE OF INSTALLATION 2-10-89 TO 2-25-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 TO 70.0 FT.	SIZE 10 in ID FROM 0.0 TO 71.0 FT.
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4.0 in ID	RISER PIPE DIAMETERS:
PERFORATION TYPE: 3-3-89 WAH	O.D. 4 3/8 in. I.D. 4.0 in
SLOTS ☒ HOLES ☐ SCREEN ~~☒~~	LENGTH OF PIPE SECTIONS 2, 5, 10, SCREEN 16.5 FT. & Silt trap
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD SCREW TYPE, FLUSH JOINT
TOTAL PERFORATED AREA 15.0 FT.	MOUNTED.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION LOCKING HD COVER
PROTECTIVE PIPE O.D. 10 3/4 in.	W/LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	ET 2-25-89 ~~2.0~~ 1.7 FT			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM ~~44.0~~ 39.0 ET 2-25-89	TOP	BOTTOM
BENTONITE PELLETS	TOP 39.0	BOTTOM 44.0	TOP	BOTTOM
SAND 10/20	TOP 44.0	BOTTOM ~~70.0~~ 71.5	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A WAH 3-3-89	TOP	BOTTOM
PERFORATED SECTION	TOP 53.3	BOTTOM 68.3	TOP	BOTTOM
PIEZOMETER TIP	69.8 FT.			
BOTTOM OF BOREHOLE	71.5 FT.			
GWL AFTER INSTALLATION	59.8 FT.			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS SAND BLOWING IN AT DEPTH ≈ 71.0 FT HENCE TOP OF SCREEN 7.3 FT. ABOVE WATER TABLE ~2.0 FT. HIGHER THAN SPEC. 1.5 FT. SETTLEMENT OF SUSPENDED MATERIAL BEFORE PLACEMENT OF STAINLESS RISER PIPE.

000632

409-11

3053

WESTON

WELL COMPLETION RECORD

5709

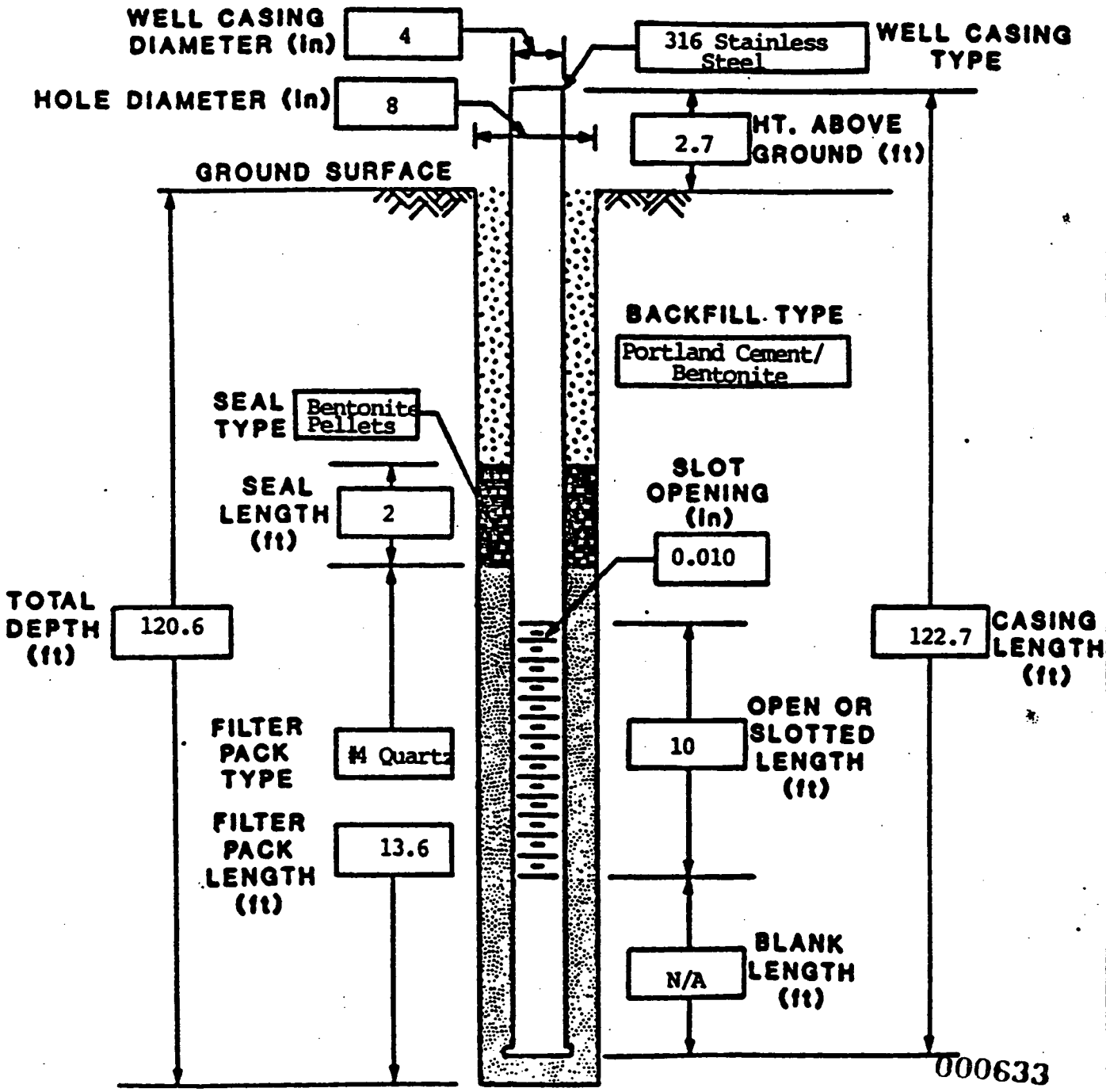
SITE ID: FMPC LOCATION ID: Well A DATE INSTALLED: 25 May 87

APPROX. SITE COORDINATES:(FT.) S 27 + 50.25 E 38; + 40.5

OPEN AREA PER LINEAL FT. ($IN^2/FT.$) N/A

FORMATION OF COMPLETION: Glacial Outwash

FIELD REP.: James Spratt DRILLER: S.C. Patterson



000633

COMMENTS: HT above ground does not represent surveyed elevations.

WESTON

BOREHOLE/WELL CONSTRUCTION LOG

SITE ID: FMPC LOCATION ID: Well A RI/FS 3053 FIELD REP: J. Spratt

APPROX. SITE COORDINATES (FT.): S27 +50.25 E 38 + 40.5

GROUND ELEVATION (FT. MSL): N/A COMPLETION DATE: 25 May 1987

BOREHOLE SUMMARY

DRILLER: S.C. Patterson

RIG TYPE: Cable Tool Bucyrus Erie 22W

BIT TYPE	HOLE DIA. (in.)	END DEPTH ● (ft.)	FLUID TYPE
Cable Tool	8	120.6	Potable Water

CASING SUMMARY

CASING TYPE●	DESCRIPTION	DIA. (in.)	END DEPTH ● (ft.)
P	Steel	10	4
B	316 Stainless Steel	4	112.7
S	Stainless, 0.010 Slot	4	122.7

P-Protective S-Screen B-Blank O-Open N-None

● Depth from Top of Casing

CONSTRUCTION TIME LOG

ACTIVITY	START DATE	START TIME	END TIME
DRILLING	05/23 05/24	0800 0800	1805 1600
CASING	05/24	1630	1700
FILTER PACK	05/24	1700	1730
SEAL	05/24	1730	1800
BACKFILL	05/25	0810	1500
DEVELOPMENT	05/28	1010	1210
OTHER	N/A		

WELL CONSTRUCTION

TYPE CODE●	DESCRIPTION	END DEPTH ● (ft.)
B	Portland Cement/Bentonite	105
S	Bentonite Pellets	107
F	No. 4 Quartz Sand	120.6

000634

B - Backfill S - Seal F - Filter Pack

● Depth from Ground Surface

WELL DEVELOPMENT

Surged (4" block) w/2' drop for 45 min.

Overpumped (red jacket CN1100, 1.5 hp, rated 22 gpm) at 20 gpm for 50 min. 1000 gal. removed.

Sand pump (bailer) used for coarser sediments. Well depth: before: 120.6, after 120.6

COMMENTS: Static water level, 05/25, 54.3[illegible] feet below top of casing.

WESTON

5709

BOREHOLE AND TEST PIT SUMMARY

SITE ID: FMPC
LOCATION ID: Well A RI/FS 3053
LOCATION COORDINATES:
S 27 + 50.25
E 38 + 40.5
GROUND ELEVATION (FT. MSL): NK

BH-BOREHOLE/TP-TEST PIT: BH
DRILLER/EXCAVATOR: Bowser Morner
COMPLETION DATE: 25 May 1987
BOREHOLE DIAMETER (IN): 8
TOTAL DEPTH (FT.): 120.6

WELL SUMMARY

WELL OWNER:
INSTALLER: WESTON
INSTALLATION DATE: 25 May 1987
CASING ELEV. (FT. MSL): NK
CASING LENGTH (FT.): 122.7
CASING DIA. (IN.): 4
SEAL END DEPTH (FT.): 107

FILTER PACK LENGTH (FT.): 13.6
FORMATION OF COMPLETION: Glacial Outwash
STRATIGRAPHIC ORDER: N/A
OPEN/SCREEN DEPTH (FT.): 112.7
OPEN/SCREEN LENGTH (FT.): 10
OPEN/SCREEN AREA (IN.²/FT.): NK
*FLOW RELATIONSHIP: NK

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT.)	UNIFIED SOIL/ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT.)	SAMPLE METHOD	N* VALUE
0							
1							
2	MH		Yellow (10 yr7/6) SILT, clayey	01	2-4	S	NK
3			Dry-moist, cohesive				
4	MH		Yellow (10 yr 7/6-10 yr 4/6)	02	4-6	S	NK
5			SILT ,clayey, dry-moist, cohesive				
6	MH		Yellow (10 yr 7/6) SILT	03	6-8	S	NK
7			clayey, dry-moist, cohesive				
8	MH-CH		Red-gray (7.5 yr 5/6) CLAY	04	8-10	S	NK
9			and CLAY, moist, plastic				
10							

000635

FLOW RELATIONSHIP:
U-Upgradient
D-Downgradient
C-Cross Gradient

SAMPLE METHODS:
A-Auger Cuttings
S-2" O.D. 1.38" I.D. drive sample
H-8 1/2 Hollow Stem Auger
C-4 1/2 Continous Flight Auger
NQ-NQ Wireline Rock Coring

WESTON

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N * VALUE
15	MH		Blue-gray (7.5 yr 5/10) SILT,	05	15-17	S	NK
			clayey, little gravel, dry-				
			moist, cohesive				
20	MH		Blue-gray (7.5 yr 5/10)	06	20-22	S	NK
			SILT, clayey, some gravel,				
			dry-moist.				
25	SP		Lt. Brn. (7.5 yr 5/6) med.	07	25-27	S	NK
			SAND, dry.				
000636							
30	SP		Lt. brn (7.5 yr 5/6) fn.-med. SAND, dry.	08	30-32	S	NK

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE

WESTON

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N * VALUE
35	SP		Lt. brn (7.5 yr 5/6) SAND	09	35-37	S	NK
			fine-med., dry.				
40	SP		Lt. brn. (7.5 yr 5/6, 6/6	10	40-42	S	NK
			SAND, fn.-med., little				
			gravel.				
45	SP		Lt.brn (7.5 yr 5/6) SAND	11	45-47	S	NK
			med., and gravel, trace rock				
			frags., dry.				
50	SP		Lt. brn.(7.5 yr 5/6) SAND	12	50-52	S	NK

000637

SAMPLE METHODS

A - AUGER CUTTINGS
B - 2" O.D. 1.38" I.D. DRIVE SAMPLER
H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING

WESTON

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N* VALUE
			med., and gravel, dry.				
55	SP		Lt. gray (7.5 yr 4/0) SAND,	13	55-57	S	NK
			med.-coarse, and gravel, dry.				
60	SP		Lt. gray (7.5 yr 4/0) SAND,	14	60-62	S	NK
			med.-coarse, trace gravel, wet				
65	SP		Lt. gray (7.5 yr 4/0) SAND	15	65-67	S	NK
			med.-coarse, and gravel, wet				
70	SP		Lt. gray (7.5 yr 4/0) SAND	16	70-72	S	NK

000638

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE

WESTON

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N* VALUE
			med-coarse, and gravel, wet				
75	SP		Lt. gray (7.5 yr 4/0) SAND	17	75-77	S	NK
			med.-coarse, and gravel, wet				
80	SP		Lt. gray (7.5 yr 4/0) SAND	18	80-82	S	NK
			med.-coarse, wet				
85							
90	SP		Lt. gray (7.5 yr 4/0) SAND	19	90-92	S	NK

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE

000639

WESTON

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N VALUE
			med.-coarse, lit. gravel, wet				
95							
100	SP		Lt. gray (7.5 yr 4/0) SAND	20	100-102	S	NK
			med.-coarse, lit. gravel, wet				
105	SP						
000540							
110	SP		Lt. gray (7.5 yr 4/0) SAND	21	110-112	S	NK

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE

H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER

NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE

WESTON

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N * VALUE
			med, lit. gravel, wet				
115							
	SP		Lt. gray (7.5 yr 4/0-5/0)	22	118-120	S	NK
			SAND, fn-med, lit.gravel,wet				
120			TOTAL DEPTH = 120.6 feet				
			* N value is unreported as				
			ASTM procedure was not				
			followed. Hammer wt. was				
			>140 pounds.				

SAMPLE METHODS

000641

A – AUGER CUTTINGS
S – 2" O.D. 1.38" I.D. DRIVE SAMPLE
U – 3" O.D. 2.42" I.D. TUBE SAMPLE

H – 6 1/2 HOLLOW STEM AUGER
C – 4 1/2 CONTINUOUS FLIGHT AUGER

NX – NX ROCK CORING
NQ – NQ WIRELINE ROCK CORING
B – UNDISTURBED BLOCK SAMPLE

ERM-[redacted], Inc. MIDWEST

1054

Drilling Log

Project _____ Owner Fernald

Location South Side Building 6 W.O. Number _____

Well / Boring No. Shallow #1 Total Depth 18.7' Diameter 2"

Surface Elevation _____ Water Level: Initial Dry 24-hrs. 6.10' (Rising) 20 feet

Screen: Dia. 2" Length 11.1' Slot Size .010

Casing: Dia. 2" Length 10.9' (Top S.S. Riser 12.29') Type S.S.

Drilling Company Soil Test of Ohio Drilling Method 3 3/4 I.D.

Driller Findley Morris Log By KR Richards Date Drilled 10/1/86

Sketch Map

Notes: Surf. Cond - Gravel
Weather - overcast, 75°

Depth (feet)	Drawing Log	Well Construction	Sample Type	Cohesive Strength (Tons/sq.ft.) or Penetration Test (Blows per 6")	Sample Interval	Description Interval	Description/Soil Classification (Color, Texture, Structures)
				H:0 R:0	0-2'	0-0.2'	Gravel Fill, light gray, dry
				13" Blows	H:0 R:0	0.2-13.9'	Clay, Dark brown, stiff, sl. moist, heavy Fe-oxide stain
				5/3/5/9	2-4'		— med brown, slightly stiff, moist, pebbly, heavy Fe-oxide stain
				H: zero	H:0 R:0		
				11:9	4.5-6.5'		— silty, very moist, soft, pebbly, heavy Fe-oxide stain
	7.6'			17" Blows	H:0 R:0		
				5/3/2	[illegible]		— some, higher % of pebbles, slightly moist, stiff, less Fe-oxide stain
				[illegible]	H:0 R:0		
				[illegible]	13.5-15.5	13.9-18.7'	Clay, blue-gray, silty, pebbly, stiff, slightly moist
				H: zero	H:0 R:0		
	18.7'						

Total Depth 18.7'
NO EVIDENCE OF CONTAMINATION
From Monitoring Wells

H: Hnu meter Reading
R: Radiation Meter Reading

000642

FERNALD RI/FS

5709

Date	12/12/88	12/12/88	12/12/88	
Initial	BD	KB	BD	
	Field Check	Data Review	Data Entry	Data Verification

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. E. TROWNGER DATE 12-5-88
PROJECT NO. 6002 TASK 3.2
CHECKED BY B. Dunning DATE 12-12-88
BORING NO. 2054
PIEZOMETER NO. 2054
DATE OF INSTALLATION OF WELL 11-17-88 TO 12-5-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 80.0 FT
FLUID _____ FROM _____ TO _____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN FROM 0.0 TO 80.0 FT
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☑
AVERAGE SIZE OF PERFORATIONS 0.01 IN
TOTAL PERFORATED AREA 15 FT.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4.0"
LENGTH OF PIPE SECTIONS 10 FT, 2 FT, 2.8 FT. Sump
JOINING METHOD SCREW TYPE, THREADED FLUSH JOINTED
BD. 12/12

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10.75 IN

OTHER PROTECTION LOCKING LID COVER

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	3.0 FT.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	1.5 ~~2.8 FT~~ BD. 12/12/88			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 45.0 FT	TOP	BOTTOM
BENTONITE	TOP 45.0 FT.	BOTTOM 50.0 FT	TOP	BOTTOM
SAND	TOP 50.0 FT	BOTTOM ~~80.0~~ 81.5 FT BD. 12/12/88	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 62.0 FT	BOTTOM 77.0 FT	TOP	BOTTOM
PIEZOMETER TIP	79.0 FT			
BOTTOM OF BOREHOLE	~~80.0 FT~~ 81.5 FT. BD. 12/12/88			
GWL AFTER INSTALLATION	65.5 FT.			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS RISER PIPE 6" TO HIGH, COULDN'T PULL UP AND DIDN'T CUT STAINLESS TO CORRECT HEIGHT, BUT LEFT AT 6" HIGHER THAN SPECIFICATIONS.

000643

429-11-86

FERNALD RI/FS

	Initial	Date
Field Check	BN	12/12/88
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WCC TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2054	COORDINATES:	DATE: 11-17-88
ELEVATION:	GWL: Depth 63.5 ft Date/Time 1000 10/21/88	DATE STARTED: 11-17-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 12-5-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10410 1537 11-17	12 10 16	4	VERY STIFF, BROWN (7.5YR 4/4), CLAY, SOME SILT AND TRACE OF GRAVEL, MOIST	CL	4.0	HNu = 0 ppm α = 0-5 cpm βγ = 1100 cpm
2 3	10411 1546 11-17	7 9 16	7	STIFF, YELLOW BROWN (7.5YR 5/6), CLAY, TRACE OF ORGANIC MATERIAL, MOIST.	CL	1.75	HNu = 0 ppm α = 0-5 cpm βγ = 140 cpm
4	10412 1545 11-17	10 10 9	16	STIFF, YELLOW BROWN (7.5YR 5/4) CLAY, TRACE OF GRAVEL (.5"), MOIST.	CL	2.0	HNu = 0 ppm α = 0-5 cpm βγ = 140 cpm
5 6	10413 1549 11-17	7 4 7	15	SOFT, LIGHT OLIVE BROWN (2.5Y 5/4) SILTY CLAY, SOME INTERMIXED SAND, MOIST.	CL	.25	HNu = BKG. α = 0-5 cpm βγ = 140 cpm
7	10414 1553 11-17	2 5 4	4	SOFT, OLIVE YELLOW, (2.5Y 6/4) ~~SILTY CLAY~~ CLAYEY SILT, SOME FINE SAND, WET. PERCHED AQUIFER ZONE	ML	1.0	HNu = 0 ppm α = 0-5 cpm βγ = 140 cpm
8 9	10415 1600 11-17	7 12 18	18	SOFT, OLIVE YELLOW, (2.5Y 6/4), ~~SILTY CLAY~~ CLAYEY SILT, LOW PLASTICITY, WET	ML	.5	HNu = BKG α = 0-5 cpm βγ = 140 cpm
10	10416 1615 11-17	8 14 12	15	STIFF, OLIVE BROWN, (2.5Y 4/4), CLAY, VERY LITTLE SILT, MEDIUM PLASTICITY, WET.	CL	1.5	HNu = BKG. α = 0-5 cpm βγ = 140 cpm
11 12	10417 1033 11-18	5 10 23	8	STIFF, YELLOW BROWN (~~7.5~~ 10YR 5/4) CLAY, SOME GRAVEL (.25") MED TO HIGH PLASTICITY, MOIST.	CL	1.5	HNu = 0 ppm α = 0-5 cpm βγ = 120 cpm
13	10418 1050 11-18	5 9 14	9	STIFF, YELLOW BROWN (10YR 6/4) FINE SANDY CLAY, MEDIUM PLASTICITY, MOIST.	CL	1.5	HNu = 0 ppm α = 0-5 cpm βγ = 140 cpm
14	10419 1058 11-18	8 15 15	15	VERY STIFF, GREY BROWN (10YR 5/2) SANDY CLAY, MED TO HIGH PLASTIC, MOIST.	CL	2.0	HNu = 0 ppm α = 0-5 cpm βγ = 120 cpm

NOTES: PENNSYLVANIA DRILLING COMPANY.
72 SPEEDSTAR DRILL RIG
DRILLER: HARRY DYKES JR.
ASSISTANT: CARL S. RABER

INSTUMENTS USED: BACKGROUND
HNu BKg. = 0 ppm - 0.4
α BKg. = 0-5 cpm
βγ BKg. = 140 cpm
120 cpm

WATER ADDED TO DRILL BOREHOLE = 650 gallons

000844

402-11-

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2054	COORDINATES:	DATE: 11-18-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11-17-88
ENGINEER/GEOLOGIST: C. TRILLINGER	Depth Date/Time	DATE COMPLETED: 12-5-88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08630 1108 11-18	10 14 19	9	STIFF, BROWNISH GREY, (10 YR 5/2) SANDY CLAY, MED. PLASTICITY, MOIST.	CL	1.5	H_{NU} = 0 PPM - BKG α = 0-5 CPM $\beta\gamma$ = 140 CPM
17 18	08631 1411 11-18	6 8 10	10	MEDIUM STIFF, GRAY (7.5 YR 5/0) CLAY, HIGH PLASTICITY, MOIST TO WET.	CL	1.0	H_{NU} = 0 PPM - BKG α = 0-5 CPM $\beta\gamma$ = 140 CPM
19	08632 1430 11-18	40 42 70	5	STIFF, GRAY, (7.5 YR 5/0), GRAVELLY CLAY, HIGH PLASTICITY, WET	CL	1.5	H_{NU} = 0 PPM - BKG α = 0-5 CPM $\beta\gamma$ = 140 CPM
20 21	08633 1502 11-18	24 ET 24 37 26 22 32	10	HARD, GRAYISH BROWN (10 YR 5/2), GRAVELLY CLAY, HIGH PLASTICITY, MOIST.	CL	>4.0	H_{NU} = 0.4 PPM α = 0-5 CPM $\beta\gamma$ = 120 CPM
22	08634 1528 11-18	10 22 30	8	VERY STIFF, GRAY-BROWN (10 YR 4/2) GRAVELLY CLAY, MED TO HIGH PLASTICITY, MOIST.	CL	3.0	H_{NU} = 0 - 0.4 PPM α = 0-5 CPM $\beta\gamma$ = 140 CPM
23 24	08635 1619 11-18	11 16 18	12	HARD, GRAY BROWN (10 YR 6/1) CLAY, MED TO HIGH PLASTICITY, MOIST — END OF TILL CLAY —	CL	>4.0	H_{NU} = .6 PPM α = 0-5 CPM $\beta\gamma$ = 120 CPM
25	08636 1637 11-18	12 16 25	10	DENSE, GRAYISH BROWN (10 YR 5/2) POORLY SORTED SAND, VERY LITTLE FINE GRAVEL, MOIST	SP	N/A	H_{NU} = 0.4 PPM α = 0-5 CPM $\beta\gamma$ = 120 CPM
26 27 28 29				* TILL ENDED AT 24.0 FT			

NOTES:

BKG. INSTRUMENTS.
H_{NU} = 0.6 PPM
α = 0-5 CPM
$\beta\gamma$ = 100 - 140 CPM

000645

402-11

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6-02 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2054	COORDINATES:	DATE: 11-20-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11-17-88
ENGINEER/GEOLOGIST: E TRULLINGER	Depth Date/Time	DATE COMPLETED: 12-5-88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08637 1023 11-20	26 44 50+	13	VERY DENSE, GRAYISH BROWN, (10YR 5/2), POORLY GRADED COARSE GRAVELLY SAND, DRY TO MOIST.	SP	N/A	HNU = 0.4 ppm α = 0-5 cpm βγ = 140 cpm
32							
33							
34							
35							
36	08638 1127 11-20	60 T / 6"	5	VERY DENSE, GRAY, (10 YR 5/1) POORLY GRADED SAND, VERY LITTLE GRAVEL, WET.	SP	N/A	HNU = 0 PPM - 0.4 [illegible] α = 0-5 cpm βγ = 120 cpm
37							
38							
39							
40	08639 1200 11-20	50/5"	5	VERY DENSE, GRAYISH BROWN, (10 YR 5/2) POORLY GRADED SAND, TRACE OF FINE GRAVEL (.25"), MOIST TO DRY.	SP	N/A	HNU = 0-0.4 ppm α = 0-5 cpm βγ = 140 cpm
41							
42							
43							
44							

NOTES:

BKG INSTRUMENTS
HNU = 0.6 ppm
α = 0-5 cpm
βγ = 120-140 cpm

000646

402-11-

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6C3 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3054	COORDINATES:	DATE: 11-20-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11-17-88
ENGINEER/GEOLOGIST: E. TRELLINGER	Depth Date/Time	DATE COMPLETED: 12-5-88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 8

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08640 1540 11-20	50/5"	5	VERY DENSE, GRAYISH BROWN (10 YR 5/2), POORLY GRADED SAND MED. TO COARSE PREDOMINANTLY, MOIST.	SP	N/A	HNU = 0 ppm α = 0 cpm βγ = 150 cpm
47							
48							
49							
50	08641 1627 11-20	44 50/4"	5	VERY DENSE, GRAYISH BROWN, (10 YR 5/2), POORLY GRADED SAND, TRACE OF GRAVEL (.25"-.50"), DRY.	SP	N/A	HNU = 1.4 ppm α = 0-5 cpm βγ = 140 cpm
51							
52							
53							
54							
55	08642 0840 11-21	25 50/4"	4	VERY DENSE, GRAYISH BROWN, (10 YR 5/2), POORLY GRADED SAND, MEDIUM TO COARSE, DRY TO MOIST.	SP	N/A	HNU = 0.6 ppm α = 0-5 cpm βγ = 120 cpm
56							
57							
58							
59							

NOTES:

BKG. INSTRUMENTS
HNU = 0.6 ppm
α = 0-5 cpm
βγ = 120-140 cpm

000647

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2054	COORDINATES:	DATE: 11-21-88
ELEVATION:	GWL: Depth 65.0 Date/Time 0830	DATE STARTED: 11-17-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 12-5-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	08643 0932 11-21	21 36 36	8	VERY DENSE, GRAYISH BROWN, (2.5Y 5/2) POORLY GRADED SAND, SOME GRAVEL, (.25"-.5"), DRY TO MOIST.	SP	N/A	H_{NU} = 1.2 ppm α = 0-5 cpm $\beta\gamma$ = 120 cpm
62							
63							
64							
65							
66	08644 1045 11-21	50 50/4"	7	VERY DENSE, GRAYISH BROWN (10YR 5/2) POORLY GRADED SAND, COARSE TO MEDIUM, WET	SP	N/A	H_{NU} = 0-0.2 ppm α = 0-5 cpm $\beta\gamma$ = 120 cpm
67							
68							
69							
70							
71	08645 1107 11-21	31 24 21	18	DENSE, GRAYISH BROWN, (10YR 4/1) POORLY GRADED SAND, SOME GRAVEL, (.25"-.5"), WET	SP	N/A	H_{NU} = 1.4 ppm α = 0-5 cpm $\beta\gamma$ = 140 cpm
72							
73							
74							

NOTES:

BKG. INSTRUMENTS
H_{NU} = 0.5 ppm
α = 0-5 cpm
$\beta\gamma$ = 120-140 cpm

000648

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2054	COORDINATES:	DATE: 11-21-88
ELEVATION:	GWL: Depth 63.5' Date/Time 11-21-88 @ 1000	DATE STARTED: 11-17-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth BGS Date/Time	DATE COMPLETED: 12-5-88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	08646 1425 11-21	21 41 50/4"	10	VERY DENSE, GRAYISH BROWN (2.5 Y 4/2) WELL GRADED SAND, SOME GRAVEL (.50" - .25"), WET	SW	N/A	HNU = 0.4 ppm; α = 0-5 cpm; βγ = 140 cpm
77							
78							
79				BOTTOM OF BORING			
				HAMMER STOPPED AT 80' SETTLEMENT TO 79.0'			
80	08647 1500 11-21	S 20 15	6	DENSE, GRAYISH BROWN (10 YR 5/2), POORLY GRADED SAND, SOME GRAVEL, (.50"-.25"), WET	SP	N/A	HNU = 0 ppm; α = 0-5 cpm; βγ = 140 cpm
81							
82				SAMPLER STOPPED AT 81.5 FT.			

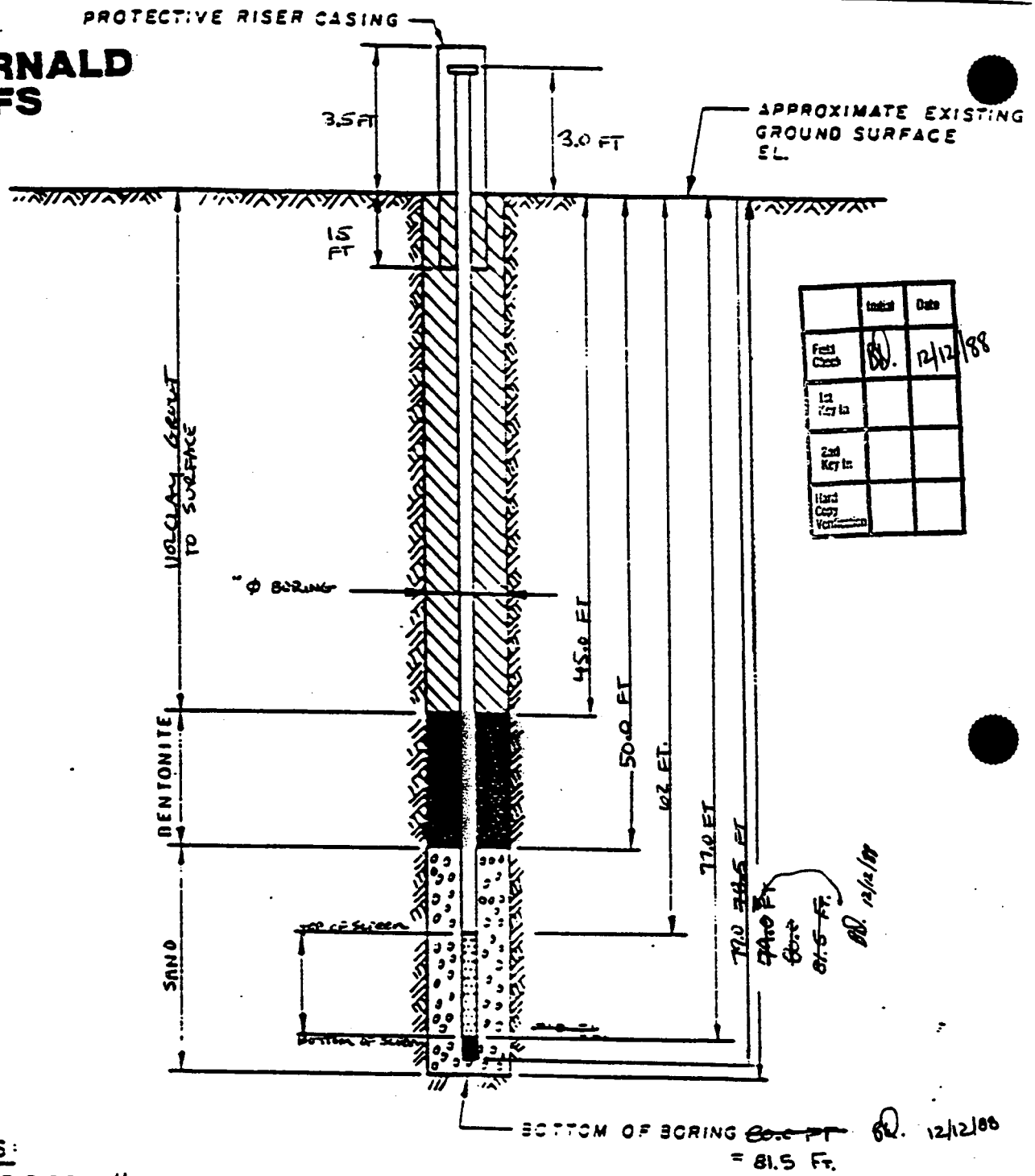
NOTES:

000649

402-11-8

WELL # 2054

FERNALD RI/FS



	Initial	Date
Field Check	BD.	12/12/88
1st Check		
2nd Check		
Final Check Verification		

DRAWN BY: C.T. | CHECKED BY / APPROVED BY: BD. | DRAWING NUMBER: 12/12/88

NOTES:

1. RISER PIPE IS 4 IN ID SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 65.5 Below ground surface
5. WATER LEVEL READING ON 12-5-88

MATERIALS:

20 BAGS 10/20 SAND
7 BUCKETS BENTONITE PELLETS
12 BAGS VOLCLAY GROUT
650 GALLONS TOTAL WATER USED FOR WELL COMPLETION.

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
WELL # 2054 / 12-06-88

000650

WESTON

WELL COMPLETION RECORD

5709

RI/FS 3054

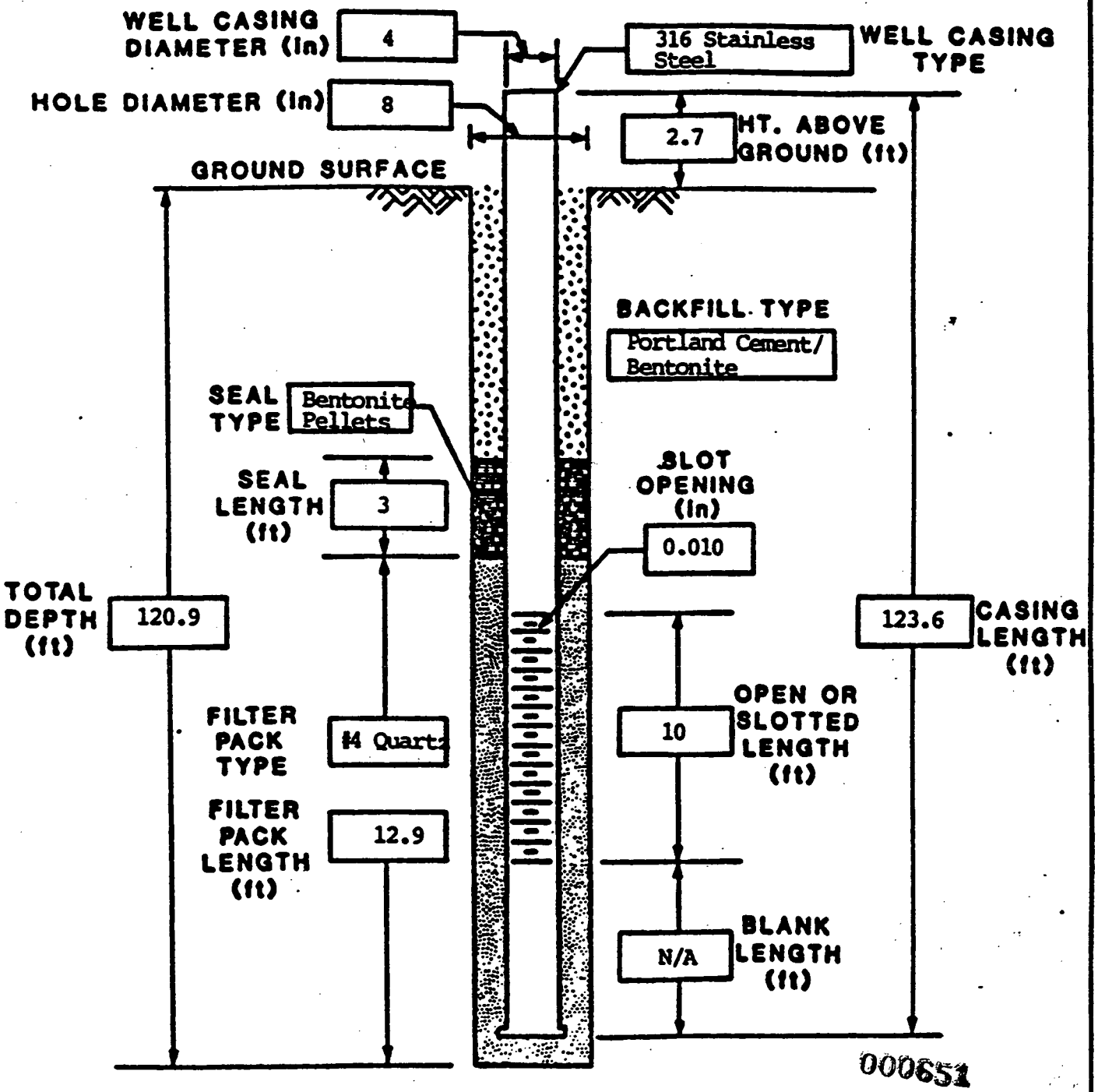
SITE ID: FMPC LOCATION ID: Well B DATE INSTALLED: 21 May 87

APPROX. SITE COORDINATES: (FT.) S 26 + 08.5 E 50 + 18.2

OPEN AREA PER LINEAL FT. ($IN^2/FT.$) N/A

FORMATION OF COMPLETION: Glacial Outwash

FIELD REP.: James Spratt DRILLER: S.C. Patterson



000651

COMMENTS: HT above ground does not represent surveyed elevations.

WESTON

BOREHOLE/WELL CONSTRUCTION LOG

SITE ID: FMPC LOCATION ID: Well B FIELD REP: J. Spratt

APPROX. SITE COORDINATES N: S 26 + 08.5 E 50 + 18.2

GROUND ELEVATION (FT. MSL): N/A COMPLETION DATE: 21 May 1987

BOREHOLE SUMMARY

DRILLER: S.C. Patterson

RIG TYPE: Cable Tool Bucyrus Erie 22W

BIT TYPE	HOLE DIA. (in.)	END DEPTH (ft.)	FLUID TYPE
able Tool	8	120.9	Potable Water

CASING SUMMARY

CASING TYPE	DESCRIPTION	DIA. (in.)	END DEPTH (ft.)
	Steel	10	4
B	316 Stainless Steel	4	113.6
S	Stainless, 0.010 Slot	4	123.6

P-Protective S-Screen B-Blank O-Open N-None

Depth from Top of Casing

CONSTRUCTION TIME LOG

ACTIVITY	START DATE	START TIME	END TIME
DRILLING	05/18 05/19 05/20	1445 0815 0810	1740 1810 1345
CASING	05/20	1345	1430
FILTER PACK	05/20	1430	1530
SEAL	05/21	0810	0825
BACKFILL	05/21	0825	1430
DEVELOPMENT	05/27	1010	1250
OTHER	N/A		

WELL CONSTRUCTION

TYPE CODE	DESCRIPTION	END DEPTH (ft.)
B	Portland Cement/Bentonite	105
S	Bentonite Pellets	108
F	No. 4 Quartz Sand	120.9

B - Backfill S - Seal F - Filter Pack

WELL DEVELOPMENT

Surged (4" block) w/2' drop, 45 min.

Overpumped (red jacket CN1100, 1.5 hp, rated 22 gpm) at 20 gpm for 50 min, 1000 gal. removed.

Sand pump used for coarser sediments.
Well depth: before: 120.9
after : 120.9

COMMENTS:

Static water level, 05/27, 58.15 feet below top of casing .

WESTON

5709

BOREHOLE AND TEST PIT SUMMARY

SITE ID: FMPC
LOCATION ID: Well B RI/FS 3054
LOCATION COORDINATES:
S 26 + 08.5
E 50 + 18.2
GROUND ELEVATION (FT. MSL):

BH-BOREHOLE/TP-TEST PIT: BH
DRILLER/EXCAVATOR: Bowser Morner
COMPLETION DATE: 21 May 1987
BOREHOLE DIAMETER (IN): 8
TOTAL DEPTH (FT.): 122

WELL SUMMARY

WELL OWNER:
INSTALLER: Weston
INSTALLATION DATE: 21 May 1987
CASING ELEV. (FT. MSL): NK
CASING LENGTH (FT.): 123.6
CASING DIA. (IN.): 4
SEAL (END) DEPTH (FT.): 108

FILTER PACK LENGTH (FT.): 12.9
FORMATION OF COMPLETION: Glacial Outwash
STRATIGRAPHIC ORDER: N/A
OPEN/SCREEN DEPTH (FT.): 112.7
OPEN/SCREEN LENGTH (FT.): 10
OPEN/SCREEN AREA (IN.^{2}/FT.): NK
*FLOW RELATIONSHIP: NK

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT.)	UNIFIED SOIL/ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT.)	SAMPLE METHOD	N* VALUE
1							
2			No Recovery	01	2-4	S	NK
3							
4	MH		Lt. brn. (7.5 yr 6/4) SILT,	02	4-6	S	NK
5			clayey, tr. sand, tr. gravel,	moist			
6	MH		Lt. brn (7.5 yr 6/4) SILT,	03	6-8	S	NK
7			clayey, lit. sand, tr. gravel, moist.				
8	MH		Lt brn (7.5 yr 6/4) SILT,	04	8-10	S	NK
9			clayey, lit. sand, tr. gravel, moist.				
10	ML		Bl-gray (7.5 yr 5/0) SILT,	05	10-12	S	NK
			clayey, trace gravel, dry.	000653			

FLOW RELATIONSHIP:
U-Upgradient
D-Downgradient
C-Cross Gradient
O-On Site

SAMPLE METHODS:
A-Auger Cuttings
S-2" O.D. 1.38" I.D. drive sample
U-3" O.D. 2.42" I.D. tube sample
H-6 1/2 Hollow Stem Auger
C-4 1/2 Continous Flight Auger
GB-Gear Bit
NQ-NQ Wireline Rock Coring
B-Undisturbed Block Sample

WESTON

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N * VALUE
15	ML		Bl-gray (7.5 yr 5/0) SILT,	06	15-17	S	NK
			clayey, tr. gravel, dry.				
20	ML		Bl-gray (7.5 yr 5/0) SILT,	07	20-22	S	NK
			clayey, tr. gravel, dry.				
25	SP		Lt. brn-gray (5 yr 6/1) SAND	08	25-27	S	NK
			med, some coarse sand, dry.				
000654							
30	SP		Lt. brn-gray (5 yr 6/1) SAND,	09	30-32	S	NK
			med-coarse, tr. gravel, dry.				

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
[illegible] TUBE SAMPLE

H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER

NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
[illegible] DISTURBED BULK SAMPLE

WESTON

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N * VALUE
35	SP		Lt. brn-gray (5 yr 6/1) SAND,	10	35-37	S	NK
			med, lit. coarse sand, tr.				
			gravel, dry.				
40	SP		Lt. brn-gray (5 yr 6/1) SAND,	11	40-42	S	NK
			med, tr. gravel, dry.				
45	SP		Lt. brn-gray (5 yr 6/1) SAND,	12	45-47	S	NK
			med-coarse, tr. gravel, dry.				
50	SP		Lt. brn-gray (5 yr 6/1) SAND,	13	50-52	S	NK
			med-coarse, some gravel, dry				

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE

H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER

NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N * VALUE
55	SP		Lt. brn-gray (5 yr 6/1) SAND,	14	55-57	S	NK
			med-coarse, tr. gravel, dry				
60	SP-GP		Gray (7.5 yr 4/0) SAND and	15	60-62	S	NK
			GRAVEL, med-coarse, wet.				
65	SP		Gray (7.5 yr 4/0) SAND, med.,	16	65-67	S	NK
			trace gravel, wet.				
70	SP		Gray (7.5 yr 4/0) SAND, med.,	17	70-72	S	NK
			wet.				

000656

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE
H - 8 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N* VALUE
75	SP		Gray (7.5 yr 4/0) SAND, med-	18	75-77	S	NK
			coarse, lit. gravel, wet.				
80	SP		Gray (7.5 yr 4/0) SAND, med-	19	80-82	S	NK
			coarse, some gravel, wet.				
85	SP		Gray (7.5 yr 4/0) SAND, med-	20	85-87	S	NK
			coarse, wet				
90							

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE
H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

000657

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N* VALUE
95	SP		Gray (7.5 yr 4/0) SAND, med-	21	95-97	S	NK
			coarse, some gravel, wet.				
100							
105	SP		Gray (7.5 yr 4/0) SAND, med	22	105-107	S	NK
			coarse, some gravel, wet.				
110							

000658

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE

H - 8 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT

NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N VALUE
115	SP-GP		Gray (7.5 yr 4/0) SAND and	23	115-117	S	NK
			GRAVEL, med-coarse, wet				
120	SP-GP		Gray (7.5 yr 4/0) SAND and	24	120-122	S	NK
			GRAVEL, med, lit. coarse, wet				
			TOTAL DEPTH 122 feet				
			* N value not reported as ASTM procedures were				
			not followed. Hammer weight was > 140 lb.				

000659

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE

H - 8 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT

NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N VALUE
115	SP-GP		Gray (7.5 yr 4/0) SAND and	23	115-117	S	NK
			GRAVEL, med-coarse, wet				
120	SP-GP		Gray (7.5 yr 4/0) SAND and	24	120-122	S	NK
			GRAVEL, med, lit. coarse, wet				
			TOTAL DEPTH 122 feet				
			* N value not reported as ASTM procedures were				
			not followed. Hammer weight was > 140 lb.				

000660

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE

H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT

NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

1055

ERM-MIDWEST, Inc.

Drilling Log

5709

Project [illegible] Owner [illegible]

Location [illegible] W.O. Number [illegible]

Well/Boring No. [illegible]3 Total Depth 19.0' Diameter 6

Surface Elevation _____ Water Level: Initial 13.5' 24-hrs. _____

Screen: Dia. [illegible] Length 11.1' Slot Size .010

Casing: Dia. [illegible] Length 10.9' Type SS

Drilling Company [illegible] Drilling Method 3¼ I.C. HSA

Driller [illegible] Log By [illegible] Date Drilled 10/2/86

Sketch Map

Notes: Surf. Cond. - Grass
Weather - [illegible]

Depth (Feet)	Graphic Log	Well Construction	Sample Type	Cohesive Strength (Tons/Sq. Ft.) or Penetration Test (Blows per 6")	Sample Interval	Description Interval	Description/Soil Classification (Color, Texture, Structures)
	2.8'						
				3/5/7/9		0-8.5'	Clay - brown to gray, heavy Fe-oxide stains, silty, slightly moist, stiff,
				4/6/8			- Same
5	4.5						- Same
	6.5						
	7.9'					8.5-11	Clay, [illegible] color, silty, moist, [illegible]
			SS	3/7/8			[illegible] 13.5
			SS	11/17/4			- Same, wet sand & gravel lense 13.8-14.2
	11.0'						
		Sealing					

Boring total depth 19'

H: Hole Reading
R: Rad. meter Reading

000661

FERNALD RI/FS

(ORIGINAL)

(* ELEVATION AND COORDINATES ESTABLISHED UPON SURVEY.)

	Initial	Date
Field Check	JLS	08-22
1st Key In		
2nd Key In		
Final Copy Verified		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2055	COORDINATES:	DATE: 3-10-89
ELEVATION:	GWL: Depth 68.1 Date/Time 3-12/0830	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 68.2 Date/Time 3-13/1000	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL '72 SPEED STAR		PAGE 1 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10735 1338 03-10	2 8 8	8	SOFT, DARK YELLOWISH BROWN (10 YR 5/4), CLAYEY SILT, TRACE OF FINE GRAVEL, MOIST, MED. PLASTICITY.	ML	.25	Hnu = BKg α = 0 CPM βγ = 100-110 CPM
2 3	10736 1345 03-10	5 7 11	6	SOFT, YELLOWISH BROWN (10 YR 5/6) CLAYEY SILT, TRACE OF FINE GRAVEL, MOIST, LOW PLASTICITY.	ML	.25	Hnu = BKg α = 0 CPM βγ = 120-130 CPM
4	10737 1350 03-10	13 17 20	12	SOFT, LIGHT OLIVE BROWN (2.5 Y 5/4) CLAYEY SILT, TRACE OF FINE GRAVEL, MOIST, LOW TO MED. PLASTICITY.	ML	.50	Hnu = BKg α = 0 CPM βγ = 120-140 CPM
5 6	10738 1357 03-10	19 23 25	10	MEDIUM STIFF, BROWN (10 YR 5/3), SILTY CLAY, TRACE OF FINE TO MED. GRAVEL, MED. PLASTICITY, MOIST.	CL	.50	Hnu = BKg α = 0 CPM βγ = 120-140 CPM
7	10739 1407 03-10	46 42 37	6	MEDIUM STIFF, DARK GRAYISH BROWN, (10 YR 5/2), TRACE OF MED. GRAVEL, MED. PLASTICITY, MOIST.	CL	.75	Hnu = BKg α = 0 CPM βγ = 120-140 CPM
8 9	10740 1410 03-10	26 32 40	12	MEDIUM STIFF, GRAY, (10 YR 5/1), CLAY, TRACE OF MED. COARSE GRAVEL, MEDIUM PLASTICITY, MOIST.	CL	.50	Hnu = BKg α = 0 CPM βγ = 120 CPM
10	10741 1415 03-10	20 18 20	15	MEDIUM STIFF, DARK GRAY, (5 Y 4/1), CLAY, TRACE OF FINE GRAVEL, MED. PLASTICITY, MOIST TO WET. SOFT, CLAYEY SILT, (5 Y 4/1), WET.	CL ML	.75 .50	Hnu = 0.8 PPM α = 0 CPM βγ = 110-120 CPM
11 12	10742 1535 03-10	11 19 11	8	SOFT, GRAY (5 Y 4/2), SANDY CLAY, TRACE OF FINE GRAVEL, MOIST TO WET SATURATED, MED TO LOW PLASTICITY.	CL	.50	Hnu = BKg α = 0 CPM βγ = 120 CPM
PERCHED ZONE 13	10743 0910 03-11	4 4 T	8	SOFT, GRAY, (2.5 Y 5/0), SLIGHTLY SILTY CLAY, LOW TO MED. PLASTICITY, MOIST TO WET.	CL	.25	Hnu = BKg α = 0 CPM βγ = 120-140 CPM
14	10744 0915 03-11	12 10 13	10	STIFF, GRAYISH BROWN, (2.5 Y 5/2), CLAY, TRACE OF FINE GRAVEL, MOIST, MED. PLASTICITY.	CL	1.75	Hnu = 0.8 PPM α = 0 CPM βγ = 120-130 CPM

NOTES: PENN. DRILLING CO.
DRILLER: HARRY DYKES JR.
HELPER: ROBERT YOST.

MATERIALS USED:
SAND: 20 80 lb. BAGS
GROUT: 12 50 lb. BAGS
BENTONITE: (5) 5 gal. BUCKETS, 1 AROUND TOP
WATER: 550 GALS DRILL, 300 GROUTING
850 TOTAL GALS.

SAMPLING IN ACCORDANCE WITH ASTM STANDARDS USING 18" SPLITSPOON.
MUNSELL COLOR CHART FOR DESCRIPTION.
Color UAH 3-27-89

INSTRU. BACKGROUND
Hnu = 0.6 PPM
α = 0 CPM
βγ = 100-120 CPM
LEL O_2 = 0-1 %

000662

402-11-E

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2055	COORDINATES:		DATE: 3-11-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth	Date/Time	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL			PAGE 2 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10745 0922 03-11	10 9 9	9	MEDIUM STIFF, DARK GRAY (2.5Y 4/0), SANDY CLAY, TRACE OF COARSE SAND THROUGHOUT, LOW PLASTICITY, MOIST.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 110-120 CPM
17–18	10746 0934 03-11	5 9 9	10	MEDIUM STIFF, GRAY (2.5Y 5/0), CLAY, TRACE OF COARSE SAND THROUGHOUT, MOIST, MED. PLASTICITY.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 110-140 CPM
19	10747 1048 03-11	4 4 4	14	SOFT, OLIVE GRAY (5Y 5/1), CLAY, TRACE OF FINE GRAVEL, MOIST TO WET, LOW TO MED. PLASTICITY.	CL	.25	Hnu = BKG. α = 0 CPM βγ = 120 CPM
20–21	10748 1055 03-11	5 7 10	16	SOFT, OLIVE GRAY, (5Y 5/2), CLAY, TRACE OF FINE GRAVEL, MOIST, MED. PLASTICITY.	CL	.50	Hnu = BKG. α = 0 CPM βγ = 120 CPM
22	10749 1315 03-11	3 5 5	16	SOFT, GRAY, (5Y 5/1), GRAVELLY CLAY, MOIST, LOW TO MED. PLASTICITY.	CL	.35	Hnu = BKG. α = 0 CPM βγ = 110-120 CPM
23–24	10750 1325 03-11	6 8 9	8	MEDIUM STIFF, GRAY, (5Y 5/1), CLAY, TRACE OF FINE GRAVEL AND COARSE SAND THROUGHOUT, MOIST, MED. PLASTICITY.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 100-120 CPM
25	10751 1336 03-11	7 8 8	8	MEDIUM STIFF, GRAY (5Y 5/1) SANDY CLAY, TRACE OF FINE GRAVEL, MOIST, MED. PLASTICITY.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 100-120 CPM
26–27	10752 1350 03-11	2 6 9	6	MEDIUM STIFF, GRAY, (5Y 5/1), GRAVELLY CLAY, MOIST, MED. PLASTICITY.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 120 CPM
28	10753 1427 03-11	20 29 39	15	STIFF, VERY DARK GRAY, (5Y 3/1) GRAVELLY CLAY, MOIST, MED. PLASTICITY.	CL	2.0	Hnu = BKG. α = 0 CPM βγ = 120-140 CPM
29	10754 1450 03-11	48. 50+ 5 in.	9	HARD, DARK OLIVE GRAY (5Y 4/2) SANDY CLAY, TRACE OF FINE GRAVEL, MOIST, MED PLASTICITY.	CL	>4.0	Hnu = BKG. α = 0 CPM βγ = 120 CPM

NOTES:

DRILLER: Harry Dykes.
HELPER: Robert Yost.

INSTRU. BKG.
Hnu = 0.4-0.8 ppm
α = 0 CPM
βγ = 150-180 CPM
LEL O_2 = 0%

000663

402-11-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2055	COORDINATES:	DATE: 3-11-89 / 3-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	10755 1630 03-11	39 18 24	10	VERY STIFF, DARK OLIVE GRAY, (5Y 5/1), GRAVELLY CLAY, MOIST, MED. PLASTICITY.	CL	3.0	Hnu = Bkg. α = 0 cpm βγ = 120-130 cpm
32 33	10756 1636 03-11	30 50+ 3in	8	VERY STIFF, DARK OLIVE GRAY (5Y 4/1), GRAVELLY CLAY, MOIST, MED. PLASTICITY.	CL	3.0	Hnu = Bkg. α = 0 cpm βγ = 130 cpm
34	10757 0848 03-12	6 16 21	10	~~MEDIUM~~ STIFF, DARK OLIVE GREEN-GRAY (5Y 4/1), SANDY CLAY, TRACE OF FINE GRAVEL, MOIST, LOW TO MED PLASTICITY.	CL	2.0	Hnu = Bkg. α = 0 cpm βγ = 120-130 cpm
35 36	10758 0900 03-12	9 12 21	16	MEDIUM STIFF, OLIVE GRAY, (5Y 5/2), SANDY CLAY, TRACE OF FINE GRAVEL AND SILT THROUGHOUT, MOIST MED. PLASTICITY.	CL	1.0	Hnu = Bkg. α = 0 cpm βγ = 120-130 cpm
37	10759 0910 03-12	5 16 15	8	DENSE, GRAYISH BROWN, (10YR 5/2), SANDY SILT, NON PLASTIC, MOIST.	ML	N/A	Hnu = Bkg. α = 0 cpm βγ = 120-130 cpm
				DENSE, GRAYISH BROWN, (10YR 5/2), POORLY GRADED SAND, MOIST TO DRY. 37.5	SP	N/A	
TILL DEPTH 38 39 40				EXTENT OF GLACIAL TILL, SAMPLING AT 5.0 FT INTERVALS FROM 40.0 FT. THEREAFTER.			
41	10760 1035 03-12	19 30 45	11	VERY DENSE, YELLOWISH BROWN, (10YR 5/4), POORLY GRADED SAND, MOIST TO DRY.	SP	N/A	Hnu = Bkg. α = 0 cpm βγ = 120 cpm
42 43 44							

NOTES:

DRILLER: Harry Dykes
HELPER: Robert Yost.

INSTRU. BACKGROUND
Hnu = 0.6-0.8 ppm
α = 0 cpm
βγ = 120-150 cpm

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2055	COORDINATES:	DATE: 3-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10761 1100 03-12	50+ / 5 IN	5	VERY DENSE, YELLOWISH BROWN (10YR 5/4) POORLY GRADED SAND, MOIST.	SP	N/A	Hnu = BKg. α = 0 CPM βγ = 120 CPM
47							
48							
49							
50							
51	10762 1345 03-12	50+ / 4 IN	4	VERY DENSE, GRAYISH BROWN, (10YR 5/2), POORLY GRADED SAND, TRACE OF FINE GRAVEL, MOIST.	SP	N/A	Hnu = BKg. α = 0 CPM βγ = 120-130 CPM
52							
53							
54							
55							
56	10763 1540 03-12	50+ / 5 IN	5	VERY DENSE, GRAYISH BROWN, (10 YR 5/2), POORLY GRADED SAND, TRACE OF FINE GRAVEL, MOIST.	SP	N/A	Hnu = BKg. α = 0 CPM βγ = 120 CPM
57							
58							
59							

NOTES:

DRILLER: HARRY DYKOS JR
HELPER: ROBERT YOST

INSTRU. BKg.

Hnu = 0.6 PPM
α = 0 CPM
βγ = 150 CPM

000665

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.21	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2055	COORDINATES:	DATE: 3-12-89 / 3-13-89
ELEVATION:	GWL: Depth 68.2 Date/Time 3-11 @ 1645	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 68.1 Date/Time 3-12 @ 0830	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL	68.2 3-13 @ 1000	PAGE 5 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10764 1630 03-12	50+ / 5in	5	VERY DENSE, GRAYISH BROWN (10YR 5/2), POORLY GRADED SAND, TRACE OF FINE GRAVEL, MOIST.	SP	N/A	Hnu = BKg. α = 0 cpm βγ = 120 cpm
62							
63							
64							
65							
66	10765 1000 03-13	50+ / 6in	6	VERY DENSE, GRAYISH BROWN, (10YR 5/2), POORLY GRADED SAND, MOIST.	SP	N/A	Hnu = BKg α = 0 cpm βγ = 110-120 cpm
67							
68				WATER TABLE ELEVATION FROM GROUND SURFACE 68.2 FT.			
69							
70							
71	10766 1250 03-13	32 22 24	8	DENSE, DARK GRAYISH BROWN, (10YR 4/2), WELL GRADED SAND, TRACE OF FINE GRAVEL THROUGHOUT, WET.	SW	N/A	Hnu = BKg. α = 0 cpm βγ = 110-120 cpm
72							
73							
74							

NOTES:

DRILLER: Harry Dykos Jr.
HELPER: Robert Yost.

INSTRU. BKg.
Hnu = 0.6 ppm
α = 0 cpm
βγ = 150-170 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

5709

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2055	COORDINATES:		DATE: 3-13-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth	Date/Time	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL			PAGE 6 OF 8

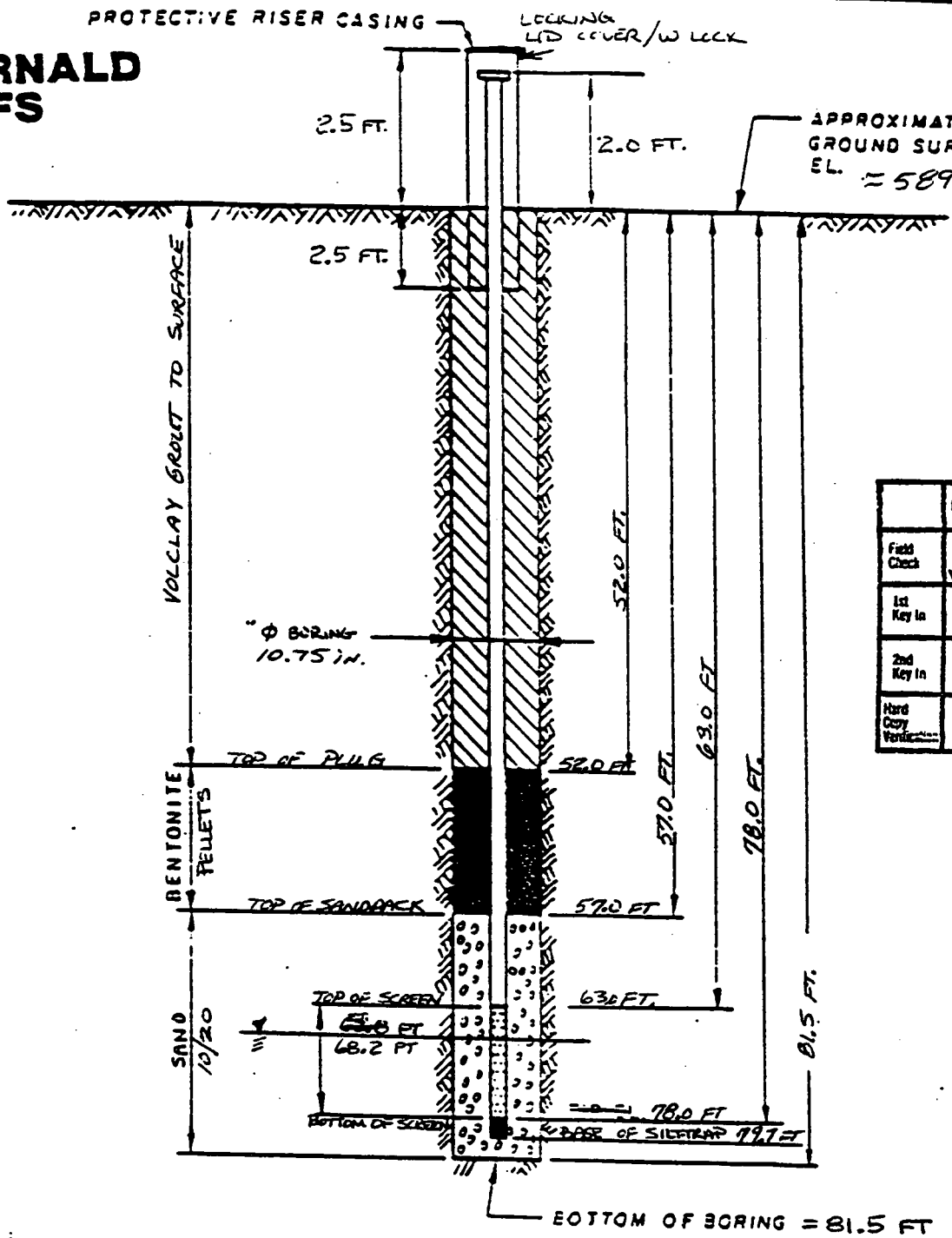
DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10767 1310 03-13	22 27 36	10	VERY DENSE, DARK GRAYISH BROWN, (10 YR 4/2), WELL GRADED SAND, WET.	SW	N/A	Hnu = Bkg. α = 0 cpm β/γ = 120 cpm
				VERY DENSE, DARK GRAYISH BROWN (10 YR 4/2), POORLY GRADED SAND, WET.	SP		
77							
78							
79							
80							
81	10768 1430 03-13	48 45 36	15	VERY DENSE, DARK GRAYISH BROWN, (10 YR 4/2), WELL GRADED GRAVELLY SAND, WET.	SW	N/A	Hnu = Bkg. α = 0 cpm β/γ = 110-120 cpm
82				SAMPLING ENDED AT 81.5 FT. DRILLING STOPPED AT 80.0 FT.			
83							
84							
85							

NOTES:

INSTRU. BKg.
Hnu = 0.6 ppm
α = 0 CPM
β/γ = 140 CPM - 160 CPM

7/8

FERNALD RI/FS



	Initial	Date
Field Check	WAH	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWING NUMBER MW-2055

CHECKED BY / APPROVED BY

E.T.

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED (1.7 FT WELDED SILT TRAP)
4. ELEVATION OF WATER LEVEL 68.2 FT, 68.2 FT, 68.1 FT
5. WATER LEVEL READING ON 3-11-89, 3-12-89, 3-13-89

MATERIALS USED TO COMPLETE

10/20 SAND = (20) 80lb. BAGS

BENTONITE PELLETS = (5) 5 gal. BUCKETS PLUG, 1 AROUND CASING AT TOP.

VOLCLAY GROUT 50(lb) = 12 BAGS

WATER = 550 gals DRILLING, 300 gals GROUTING ⇒ 850 TOTAL GALLONS WATER

PIPE SECTIONS: 5 FT., 10 FT., 15 FT. SCREEN, 1.7 FT SILT TRAP (WELDED), PROTECTIVE RISER CASING

INSTALLATION DETAILS
MONITORING WELL #2055

PREPARED FOR
FMPC RI/FS

000668

Field Check	DWH	3-27-89
1st Key In		
2nd Key In		
Copy Verification		

8/8

5709

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. E. TRCLUNGER DATE 3-14-89 3-19-89
PROJECT NO. 602 3.2 CHECKED BY _____ DATE _____
BORING NO. 2055
PIEZOMETER NO. 2055 DATE OF INSTALLATION 3-19-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT. TO 81.5 FT.
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10.0 IN ID FROM 0.0 FT. TO 82.0 FT
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN. ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 15.0 FT.

RISER PIPE MATERIAL STAINLESS STEEL (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4.0 IN
LENGTH OF PIPE SECTIONS 5, 10 FT., 15 FT SCREEN
JOINING METHOD THREADED, FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10.75 IN.

OTHER PROTECTION HINGED LID COVER WITH PADLOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 52.0	TOP	BOTTOM
BENTONITE PELLETS	TOP 52.0	BOTTOM 57.0	TOP	BOTTOM
SAND 10/20	TOP 57.0	BOTTOM 81.5	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 63.0	BOTTOM 78.0	TOP	BOTTOM
PIEZOMETER TIP	79.7 FT.			
BOTTOM OF BOREHOLE	81.5 FT.			
GWL AFTER INSTALLATION	68.4 FT			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS

000669

409-1

WESTON

WELL COMPLETION RECORD

RI/FS 3055

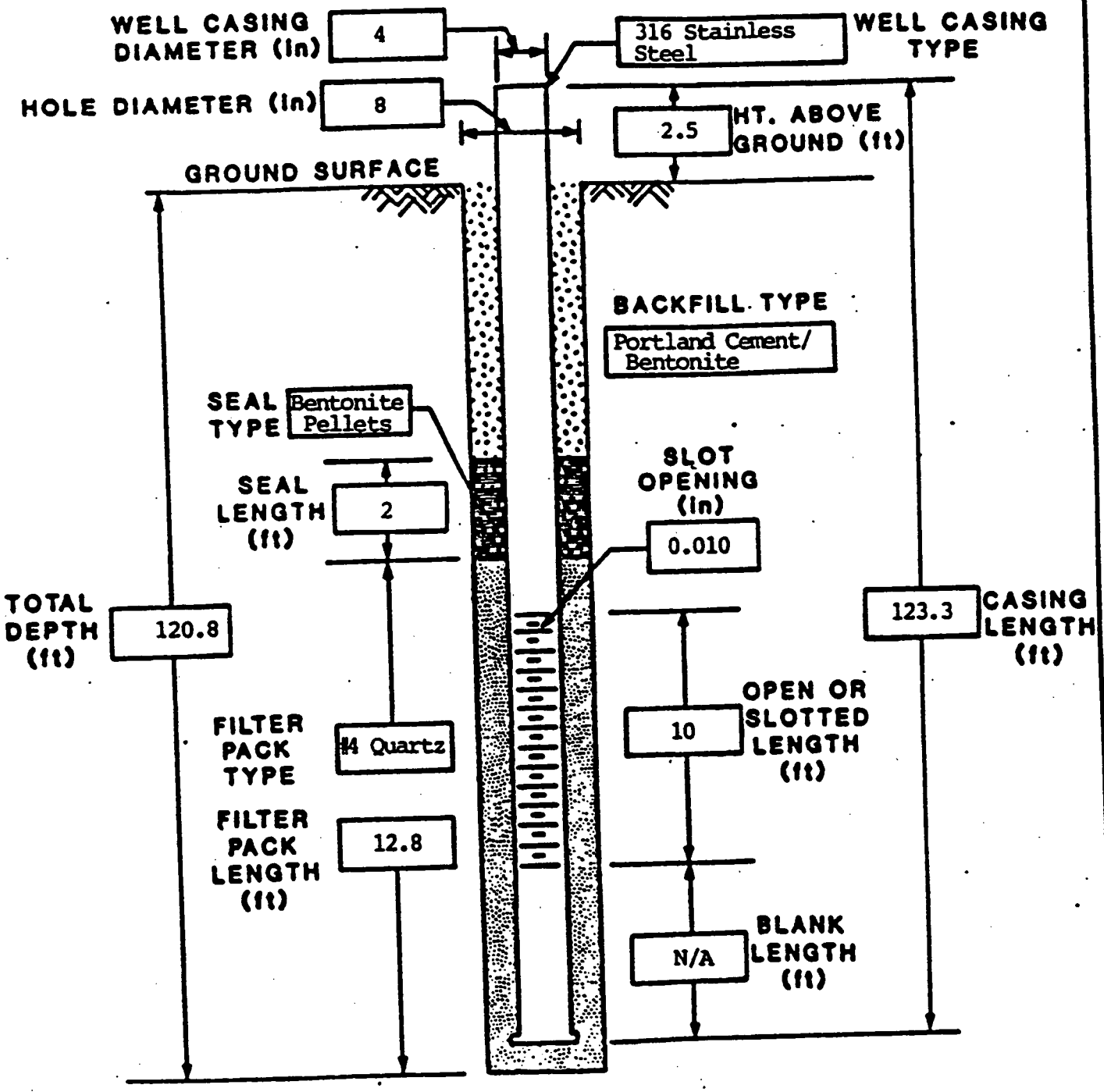
SITE ID: FMPC LOCATION ID: Well C DATE INSTALLED: 14 May 87

APPROX. SITE COORDINATES: (FT.) S 12 + 10 E 41 + 58.5

OPEN AREA PER LINEAL FT. ($IN^2/FT.$) N/A

FORMATION OF COMPLETION: Glacial Outwash

FIELD REP.: James Spratt DRILLER: S.C. Patterson



COMMENTS: HT above ground does not represent surveyed elevations.

000670

WESTON

BOREHOLE/WELL CONSTRUCTION LOG

SITE ID: FMPC LOCATION ID: K1/E3 3055 Well C FIELD REP: J. Spratt 5709

APPROX. SITE COORDINATES (FT.): S 12 + 10 E 41 + 58.5

GROUND ELEVATION (FT. MSL): N/A COMPLETION DATE: 14 May 1987

BOREHOLE SUMMARY

DRILLER: S.C. Patterson

RIG TYPE: Cable Tool Bucyrus Erie 22W

BIT TYPE	HOLE DIA.* (In.)	END DEPTH● (ft.)	FLUID TYPE
able Tool	8	120.8	Potable Water

CASING SUMMARY

CASING TYPE●	DESCRIPTION	DIA. (In.)	END DEPTH● (ft.)
P	Steel	10	4
B	316 Stainless Steel	4	110.8
S	Stainless Steel 0.010 Slot	4	120.8

● P-Protective S-Screen B-Blank O-Open N-None

* Depth from Top of Casing

WELL CONSTRUCTION

TYPE CODE●	DESCRIPTION	END DEPTH● (ft.)
B	Portland Cement/Bentonite	106
S	Bentonite Pellets	108
F	No. 4 Quartz Sand	120.8

● B - Backfill S - Seal F - Filter Pack

● Depth from Ground Surface

CONSTRUCTION TIME LOG

ACTIVITY	START DATE	START TIME	END TIME
DRILLING	05/08	1100	1530
	05/11	0810	1530
	05/12	0830	1530
CASING	05/13	0845	0945
FILTER PACK	05/13	0945	1015
SEAL	05/14	0850	0915
BACKFILL	05/14	0915	1630
DEVELOPMENT	05/26	1430	1630
OTHER	N/A		

WELL DEVELOPMENT

Surged (4" block) w/2' drop, 45 min.

Over pumped (red jacket CN1100, 1.5 hp, rated 22 gpm) at 20 gpm for 50 min. 1000 gal removed.

Sand Pump used for coarser sediments.
Well depth: before: 119.9
after : 120.8

COMMENTS:

Static water level, 05/16, 65.5 feet below top of casing.

WESTON

BOREHOLE AND TEST PIT SUMMARY

SITE ID: FMPC
LOCATION ID: Well C RI/RS 3055
LOCATION COORDINATES:
S 12 + 10
E 41 + 58.5
GROUND ELEVATION (FT. MSL): NK

BH-BOREHOLE/TP-TEST PIT: BH
DRILLER/EXCAVATOR: Bowser Morner
COMPLETION DATE: 14 May 1987
BOREHOLE DIAMETER (IN): 8
TOTAL DEPTH (FT.): 120.8

WELL SUMMARY

WELL OWNER:
INSTALLER: WESTON
INSTALLATION DATE: 14 May 1987
CASING ELEV. (FT. MSL): NK
CASING LENGTH (FT.): 123.3
CASING DIA. (IN.): 4
SEAL (END) DEPTH (FT.): 108

FILTER PACK LENGTH (FT.): 12.8
FORMATION OF COMPLETION: Glacial Outwash
STRATIGRAPHIC ORDER: N/A
OPEN/SCREEN DEPTH (FT.): 110.8
OPEN/SCREEN LENGTH (FT.): 10
OPEN/SCREEN AREA (IN.^{2}/FT.): NK
*FLOW RELATIONSHIP: NK

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT.)	UNIFIED SOIL/ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT.)	SAMPLE METHOD	N* VALUE
1							
2	ML-SM		Brn.(7.5 yr 4/4) SILT,	01	2-4	S	NK
3			sandy, some clay, dry.				
4	ML-SM		Brn.(7.5 yr 5/6) SILT,	02	4-6	S	NK
5			some clay, some gravel, dry.				
6	ML-SM		Brn-gray (7.5 yr 5/2)	03	6-8	S	NK
7			SILT, sandy, some clay, dry.				
8	ML-SM		Brn.(7.5 yr 4/4) SILT,	04	8-10	S	NK
9			sandy, some clay, dry.				
10							
000872							

FLOW RELATIONSHIP:
U-Upgradient
D-Downgradient
C-Cross Gradient

SAMPLE METHODS:
A-Auger Cuttings
S-2" O.D. 1.38" I.D. drive sample
H-8 1/2 Hollow Stem Auger
C-4 1/2 Continous Flight Auger
NQ-NQ Wireline Rock Coring

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N* VALUE
35	ML-SM		Gray (2.5 yr 5/0) SILT	09	35-57	S	NK
			clayey, with brn. yellow				
			(10 yr 6/6) SAND, fine,				
			dry.				
40	SP		Brn.yell.(10 yr 6/6) SAND	10	40-42	S	NK
			fine-med., dry.				
45	SP		Yell. brn.(10 yr 7/6)	11	45-47	S	NK
			SAND, med., dry.				
50	SP		Brn.(10 yr 7/3) SAND, med,	12	50-52	S	NK
			some gravel, dry.				

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE
H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

WESTON

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N* VALUE
55	SP		Brn.(10 yr 7/3) SAND,med.	13	55-57	S	NK
			coarse, some gravel, dry.				
60	GP-SP		Brn.(10 yr 7/3) SAND, med	14	60-62	S	NK
			coarse, and GRAVEL, grades				
			into SAND, fine, dry.				
65	SP		Gray (7.5 yr 4/0) SAND,	15	65-67	S	NK
			med., wet.				
70	SP		Gray (7.5 yr 4/0) SAND,	16	70-72	S	NK
			med-coarse, wet.				

000674

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE
H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N* VALUE
75							
80	SP-GP		Gray (7.5 yr 4/0) SAND,	17	80-82	S	NK
			med.-coarse, and GRAVEL,				
			wet.				
85							
90	SP-GP		Gray (7.5 yr 4/0) SAND,	18	90-92	S	NK
			med-coarse, and GRAVEL, wet.				

SAMPLE METHODS

000675

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE
H - 8 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N * VALUE
95							
100	SP		Gray (7.5 yr 4/0) SAND,	19	100-102	S	NK
			med, trace gravel, wet.				
105							
110	GP-SP		Gray (7.5 yr 3/0) SAND,	20	110-112	S	NK
			med-coarse and GRAVEL, gray (10 yr 4/1) sand, f, wet.				

000676

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE

H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT

NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

5709

LITHOLOGICAL SUMMARY

SOIL/ROCK PROFILE				STD. PENETRATION TEST			
DEPTH (FT)	UNIFIED SOIL/ ROCK CLASS	STRAT. ORDER	VISUAL DESCRIPTION	SAMPLE ID	DEPTH INTERVAL (FT)	SAMPLE METHOD	N* VALUE
115	GP		Gray (7.5 yr 4/0) SAND,	21	115-117	S	NK
			med-coarse, and GRAVEL				
			wet.				
			Sample taken at 115 ft.				
			depth to attempt to locate				
			"blue clay".				
			TOTAL DEPTH 120.8 ft.				
			* N value is unreported				
			as ASTM procedure was				
			not followed. Hammer				
			wt. was >140 lb.				

SAMPLE METHODS

A - AUGER CUTTINGS
S - 2" O.D. 1.38" I.D. DRIVE SAMPLE
U - 3" O.D. 2.42" I.D. TUBE SAMPLE
T - 3" O.D. THIN-WALLED SHELBY TUBE
H - 6 1/2 HOLLOW STEM AUGER
C - 4 1/2 CONTINUOUS FLIGHT AUGER
GB - GEAR BIT
NX - NX ROCK CORING
NQ - NQ WIRELINE ROCK CORING
B - UNDISTURBED BLOCK SAMPLE
D - DISTURBED BULK SAMPLE

000677

2056

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY – SELF-TRANSCRIBING

619130

COUNTY BUTLER TOWNSHIP MORGAN SECTION OF TOWNSHIP 25

OWNER MARY FRANCIS ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS SHANDON, O

Casing diameter 6" Length of casing 72
Type of screen COOK STAINLESS #12 Length of screen 5'
Type of pump SUBMERSIBLE
Capacity of pump 12
Depth of pump setting 70'
Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 20 gpm Duration of test 4
Drawdown 4 ft Date 9/23/83
Static level (depth to water) 28' 10"
Quality (clear, cloudy, taste, odor)
Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
TOP SOIL	0 ft	3 ft
SILTY CLAY	3	12
BLUE CLAY	12	60
DIRTY DARK GRAY SAND	60	70
SAME BUT CLEANER	70	77

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

~~000678~~

DRILLING FIRM WM CRANE CO DATE 9/28/83
ADDRESS BOX 53 SHANDON, O SIGNED [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

WELL LOG AND DRILLING REPORT

ORIGINA

2057

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

PLEASE USE PENCIL OR TYPEWRITER DO NOT USE INK.

Nº 291492

5709

County Hamilton Township Crosby Section of Township 1

Owner Nu Maid Farms Address Rt #1 Harrison, O

Location of property

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 120'

Type of screen Cook Brass #20 Length of screen 5'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate G.P.M. Duration of test hrs.

Drawdown ft. Date 6/4/64

Static level-depth to water 86'6" ft.

Quality (clear, cloudy, taste, odor)

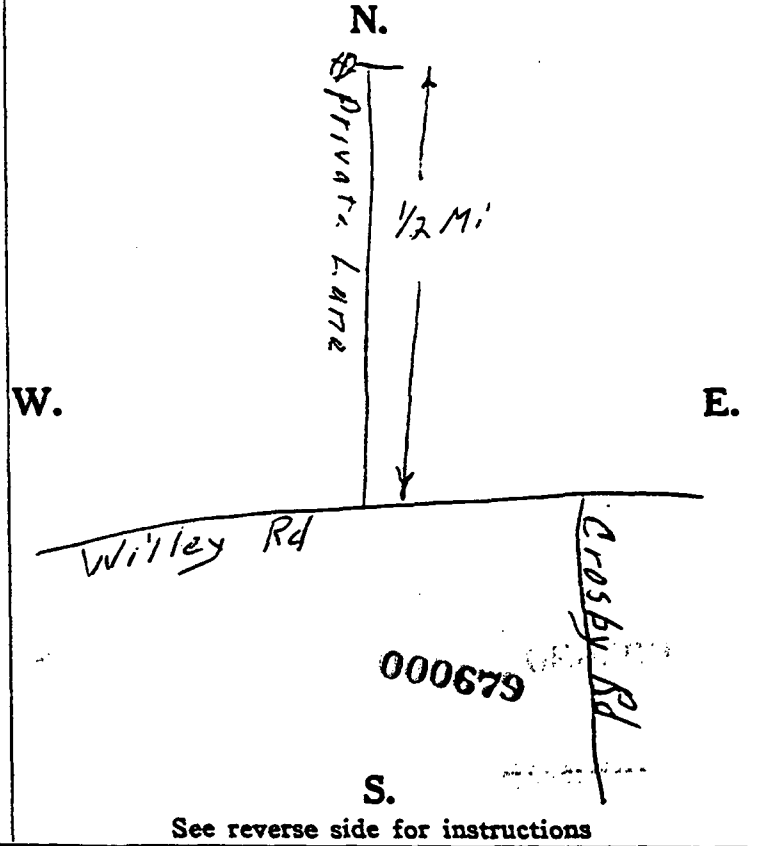
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Yellow clay	0	12
Blue clay	12	97
Gravel	97	103
Sand	103	125

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



000679

See reverse side for instructions

Drilling Firm Wm Crane Date 6/4/64

Address Shandon, O Signed Wm Crane

16

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

HK-5
EMR-12
2060

No. 115637

1,384500
475305

County Hamilton Township Crosby Section of Township or Lot Number Wilson Road

Owner Henry Knolman Address [redacted]

[redacted]erty [redacted]

CONSTRUCTION DETAILS

Casing diameter 5 5/8 Length of casing 84

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 29 ft water ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	84 Ft.
Sand & gravel	0	84

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

[redacted]

000680

Drilling Firm Camp & McCornell Date 2-12-54

Address R.R. 4 Hamilton Signed Nate McCornell

31

RECEIVED
JUN 18 1971
MOBIL CHEM. CO.
CARBONDALE PLP

NECESSARY—
SELF-TRANSCRIBING

WELL LOG AND DRILLING REPORT

#3062 CUSTOMER'S COPY

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

#3A AW
No. 402882
South well #4

County HAMILTON Township CROSBY Section of Township 7

Owner MOBIL CHEMICAL CO Address RT 1 HARRISON OHIO

Location of property

CONSTRUCTION DETAILS

Casing diameter 12" Length of casing 81'
Type of screen COOK BRAS SEE BELOW Length of screen 20
Type of pump TURBINE
Capacity of pump 225
Depth of pump setting 55'
Date of completion 6/7/71

BAILING OR PUMPING TEST
(Specify one by circling)

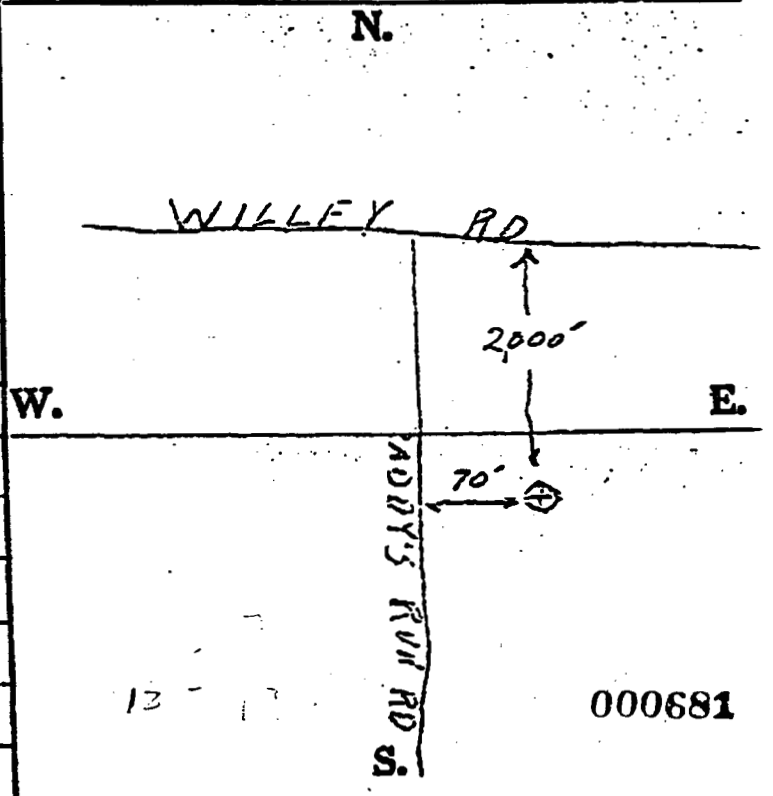
Test Rate 405 G.P.M. Duration of test 4 hrs.
Drawdown 10' ft. Date 6/7/71
Static level-depth to water 11'6" ft.
Quality (clear, cloudy, taste, odor) CLEAR
Pump installed by WM CRANE CO

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From 0 Feet	To Ft.
Top soil	0	3
Clay & gravel	3	8
Dirty gravel	8	15
Sand gravel & silt	15	55
Coarse sand	55	80
Fine sand NOT well	80	82
Strainer detail		
Top 5ft # 30 slot		
Next 5ft # 20 slot		
Next 7ft # 25 slot		
Bottom 3ft # 45 slot		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm WM CRANE CO
Address BOX 33 SHANNON OHIO

Date 6/15/71
Signed [signature]

*If additional space is needed to complete well log, use next consecutive numbered form

000681

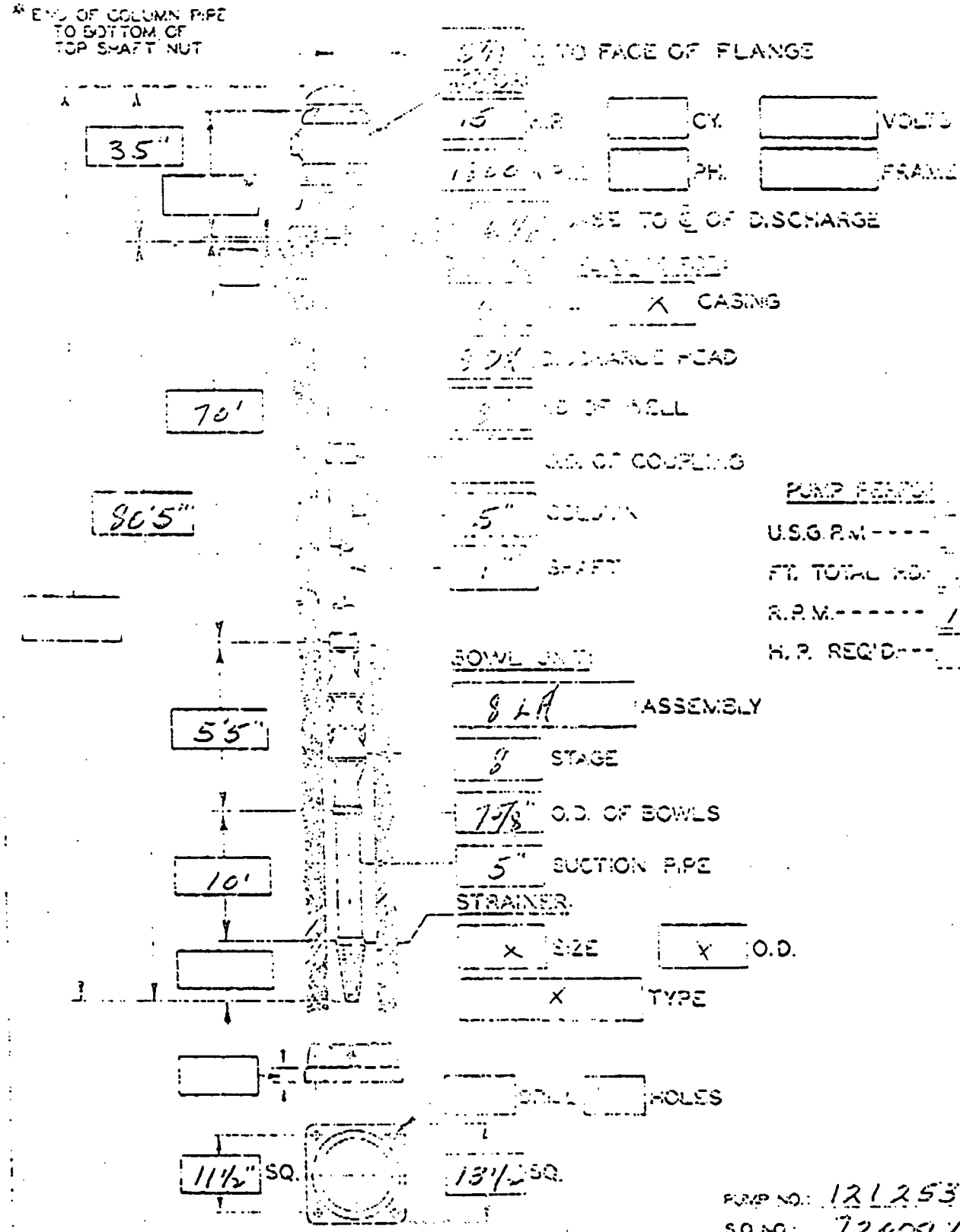
210-101

South well

#4

PEERLESS MOTORPO

WATER LUBRICATED — SURFACE DISCHARGE



000682

PEERLESS PUMP DIVISION
OF
FOOD MACHINERY CORPORATION

PUMP NO.: 121253
S.O. NO.: 726091
CUST. STD. NO.: 6045
CUSTOMER: Virginia Carolina Chemical Corp.

WELL LOG AND DRILLING REPORT

ORIGINAL

3063

512160

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY– SELF-TRANSCRIBING

COUNTY Butler TOWNSHIP Ross SECTION OF TOWNSHIP 33

OWNER James Dill ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 77'

Type of screen Cock brass 30 Length of screen 3'

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 2.5 gpm Duration of test 4

Drawdown 2' ft Date 7/25/77

Static level (depth to water) 47' 1"

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Yellow clay & gravel	0 ft	9 ft
Dirty gravel	9	20
Sand & gravel	20	42
Fine sandrock	42	58
Sand & gravel	58	80

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

DRILLING FIRM Wm Crane DATE 11/24/77

ADDRESS Box 33 Sharon, O SIGNED [signature]

*If additional space is needed to complete well log, use next consecutive numbered form.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1064	COORDINATES:	DATE: 12-07-88
ELEVATION: Approx. 588.30	GWL: Depth Date/Time	DATE STARTED: 12-05-88
ENGINEER/GEOLOGIST: L. ADAMS, M. SLOWINSKI	Depth Date/Time	DATE COMPLETED: 12-07-88
DRILLING METHODS: CARBIDE TOOL		PAGE 1 OF 1

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6"/6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10, 20, 30				* DETAILED SAMPLE DESCRIPTION OF INTERVAL 0.0 FT TO 31.0 FT IS AVAILABLE FROM VISUAL CLASSIFICATION OF SOILS LOG FOR BORING # 1064			
				BOTTOM OF BORING = 31.0 FT.			

NOTES: CONTRACTOR: PENN DRILL
RIG: CYCLONE 42
DRILLER: JOE BARILE
ASSISTANT: SID SMITH

BACKGROUND LEVELS: HNU: 0 PPM
α: 0 2 CPM
β: 40 CPM
LEL CO_2: 0 PPM LEL
20.6% O_2

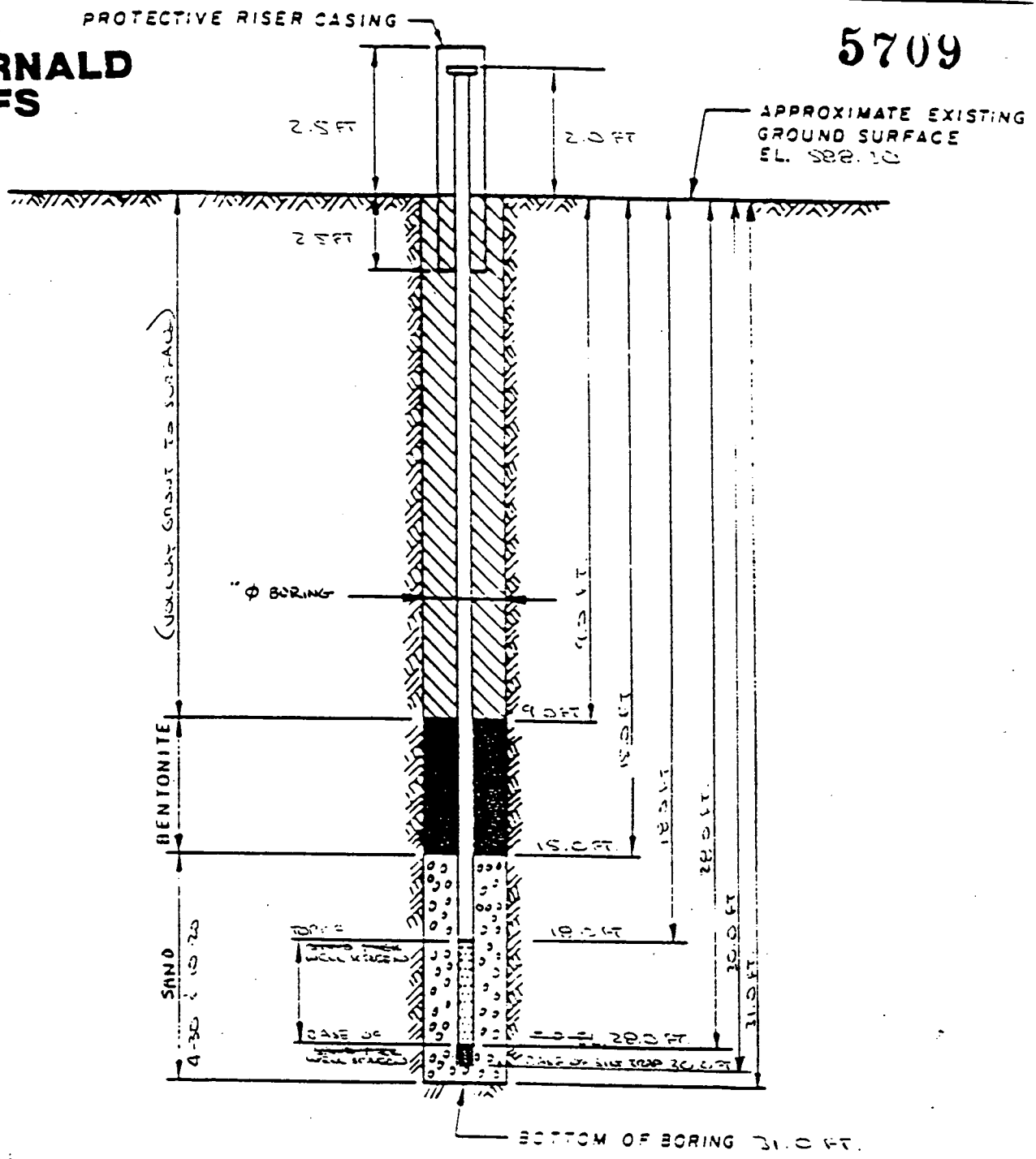
(INCLUDING WELL INSTALLATION ACTIVITIES)
WATER USED DURING DRILLING ACTIVITIES: 175 GALLONS

000684

BORING # 1064

5709

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY HCS

NOTES:

1. RISER PIPE IS 4.0 IN ID SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN 1.0 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED DURING WELL INSTALLATION

2 - 4-30 SAND (80 LB SACKS)
9 - 10-20 SAND (80 LB SACKS)
3 - USCLOY GROUT (40 LB SACKS)
8 - BENTONITE (PELLETS) PELLETS

WATER ADDED TO HOLE DURING DRILLING & WELL INSTALLATION ACTIVITIES 175 GALLONS.

INSTALLATION DETAILS
MONITORING WELL 1064

PREPARED FOR

000685

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. M. Sullivan DATE 12-07-88
PROJECT NO. 602 2 2
CHECKED BY W.A. Hedden DATE 01-06-89
BORING NO. 1064
PIEZOMETER NO. 1064
DATE OF INSTALLATION 12-07-88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 0.0 FT TO 31.0 FT	SIZE 10 3/4 IN OD FROM 0.0 FT. TO 30.0 FT
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4.0 IN ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/4 IN I.D. 4.0 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10.0 FT 2.0 FT
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD Screw Type Flush
TOTAL PERFORATED AREA 10.0 FT	Thread

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION Locking Cap
PROTECTIVE PIPE O.D. 10 3/4 IN	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	-2.5 FT			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (Volclay)	TOP 0.0	BOTTOM 9.0	TOP	BOTTOM
BENTONITE	TOP 9.0	BOTTOM 15.0	TOP	BOTTOM
SAND (10-20)	TOP 15.0	BOTTOM 28.0	TOP	BOTTOM
GRAVEL (4-30)	TOP 28.0	BOTTOM 31.0	TOP	BOTTOM
PERFORATED SECTION	TOP 18.0	BOTTOM 28.0	TOP	BOTTOM
PIEZOMETER TIP	30.0 FT			
BOTTOM OF BOREHOLE	31.0 FT			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS 1 (one) bucket of Bentonite pellets was poured around protective well cover @ the surface to serve as packing material & surface seal

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA DATE AUG 1 0 1991

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. T. Sullivan DATE 12/23/87
PROJECT NO. 602.3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. ~~364~~ 3064 BB 1-5-89
PIEZOMETER NO. ~~364~~ 3064 DATE OF INSTALLATION finished 1-10-88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED: NA
FLUID WATER FROM 0 TO 65 ft.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD
CASING SIZE (S) USED: NA
SIZE 10" ID FROM 0 TO 141.5 ft.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4 in.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT

RISER PIPE MATERIAL Stainless steel (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8 I.D. 4 in.
LENGTH OF PIPE SECTIONS 10 ft.
JOINING METHOD Screw. FLUSH JOINT THREADS.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION LOCKING CAP AND LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.5		58.7	
GROUND SURFACE	0.0		588.2	
BOTTOM OF PROTECTIVE PIPE	2.0 RMG 2/6/89		586.2	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 2.0	BOTTOM 122.5	TOP 586.2	BOTTOM 465.7
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
SAND	TOP 122.5	BOTTOM 141.5	TOP 465.7	BOTTOM 446.7
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 127.5	BOTTOM 137.5	TOP 460.7	BOTTOM 450.7
PIEZOMETER TIP	139.9		448.3	
BOTTOM OF BOREHOLE	~~141.5~~ 142.6 RMG 2/6/89		445.6	
GWL AFTER INSTALLATION	72.25 (12/23, 0915)		TOC - WPK 4/24/88	variable
	71.7 1-10-88 1515		TOC	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS White out corrections were made by T. Sullivan at the time this form was completed. WPK 4/24/88

000687

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		8-12-88
Hard Copy		

WFK 4/23/88

RIG # 3

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B 264~~ B204H	COORDINATES:	DATE: Jan 11, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 11, 1988
ENGINEER/GEOLOGIST: Lowell Willo	Depth Date/Time	DATE COMPLETED: JAN 15, 1988
DRILLING METHODS: Cable Tool		PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (ft)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				stiff brown 10YR 5/6 gravelly clay some silt and sand, trace cobbles dry			Consistency and density based on relative soil textures.
5					Cl		Soil Descriptions based on soil cuttings ~~dr~~ observed while drilling and boring ~~SEE~~ drilling log 3064 RMG 2/6/89
10	7762 ST 845	NA	1.2				
				13.0			
15				~~dense~~ stiff gray 10YR 5/6 gravelly clay, some silt and sand, trace cobbles - dry	Cl		
20	ST 1030	NA	0.4				did not keep first try, not enough recovery
	7763 1130	NA	0.8				
25							

NOTES: Pennsylvania Drilling Co
Driller Dave Neuman
Helper Bob Johnson
water added ~~while~~ while drilling - 230 gallons

Shelby tube sample collected following ASTM Standard, color follow Munsell soil color chart

background HNU = 0ppm
$\gamma\beta$ = 160ppm
α = 20ppm

000688

QC/DH/2-4-89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B264~~ B2064 DB 1-5-89	COORDINATES:	DATE: Jan 12, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 11, 1988
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: JAN 15, 1988.
DRILLING METHODS: Cable Tool		PAGE 2 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				stiff gray 10YR 5/8 gravelly clay, some silt, ~~sand~~ and sand, trace cobbles. dry 34.0	CL		
35				dense gray 10YR 5/0 sand, some silt and clay, trace gravel and cobbles. dry			
40							
					SP		
45							
50							
55							

NOTES:

See page 1 of 3.

QC/DH/2.4.89

FERNALD RI/FS

1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B264~~ B2064 BB 1-13-89	COORDINATES:	DATE: Jan 13, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 11, 1988
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: JAN 15 1988
DRILLING METHODS: Cable tool		PAGE 3 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				dense gray 10YR 5/0 sand, some silt, clay and gravel, trace cobbles - dry			
65							
70				71.0			
				dense gray 10YR 5/0 sand, some silt, clay and gravel, trace cobbles - wet	SP		
75							
80							
85				85.0			
				bottom of boring			

NOTES:

000690

see page 1 of 3.

QC/DA/2-4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. Lowell Willis DATE 1-15-88
PROJECT NO. 602.3.2 CHECKED BY R Galbraith DATE 2/6/89
BORING NO. B264 B2064 BB 1-5-89
PIEZOMETER NO. MW264 2064 DATE OF INSTALLATION

BOREHOLE DRILLING

DRILLING METHOD cable tool
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 TO 80 ft
FLUID NA FROM NA TO NA

TYPE OF BIT drive shoe
CASING SIZE (S) USED: 10 inch
SIZE 10 in FROM 0 TO 85 ft.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 4 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15 feet

RISER PIPE MATERIAL Stainless steel (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8 I.D. 4 in
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD Screw FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION LOCKING CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	3.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.0			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 57	TOP	BOTTOM
BENTONITE	TOP 57	BOTTOM 62	TOP	BOTTOM
SAND	TOP 62	BOTTOM 85	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 65	BOTTOM 80	TOP	BOTTOM
PIEZOMETER TIP	82.5			
BOTTOM OF BOREHOLE	85			
GWL AFTER INSTALLATION	705 Jan 15, 1988			

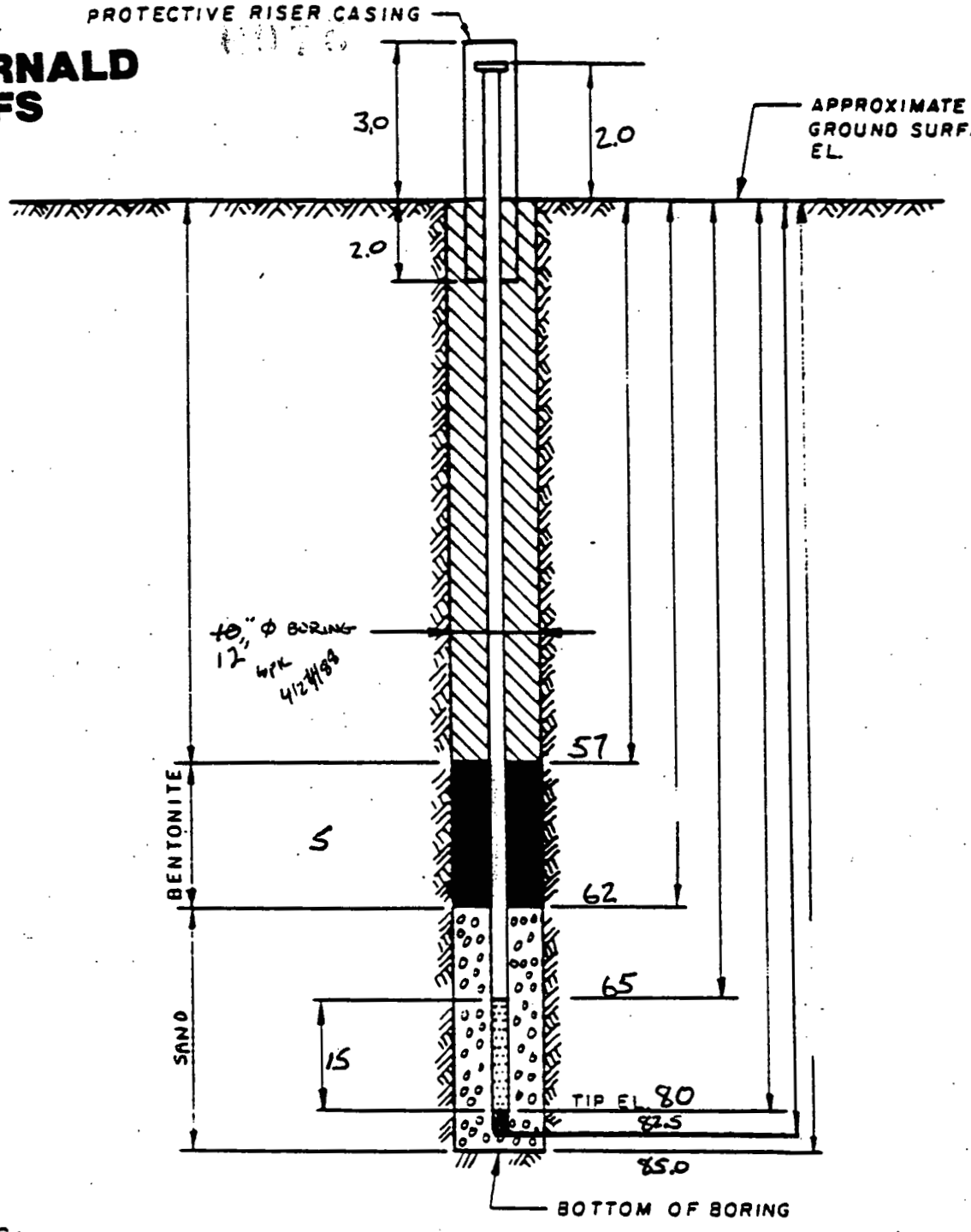
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

000691

REMARKS White corrections were made by Lowell Willis at the time this form was completed. WPK 4/24/88

QC/DH/24.89 WELL ~~264~~ 2064 BB 1-5-89 # 42

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE 5 PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 70.5
5. WATER LEVEL READING ON 1-15-88

INSTALLATION DETAILS
MONITORING WELL ~~264~~ 2064
PREPARED FOR BB 1-5-89

000692

For Central files
Original has been lost
Lowell E Wells 2-11-88

#364 entered from original #3 QC/DH/2.4.89 PAG 5709

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 16 1991

RIG #3 WPK 4/23/88

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B364 B3064 BB 1-5-89	COORDINATES: N480730.53 E1382718.22		DATE: 12/14/87
ELEVATION: 588.2	GWL: Depth	Date/Time	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth	Date/Time	DATE COMPLETED: 12/17/87
DRILLING METHODS: Cable Tool			PAGE 1 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07716 1100 12/11	2 3 8	4	Soft brown 7.5YR 3/2 clay, organic rich, dry. 0.5 Soft brown 7.5YR 3/2 clay, some silt, dry 1.5	OH cl	NA	HNU = 0ppm βB = 160 cpm α = 2cpm No recovery 1st try.
2	07717 1115 12/11	3 10 8	10	Fill, hard brown 10YR 4/4 silty clay, some gravel, dry.		NA	HNU = 0ppm βB = 140 cpm α = 2 cpm
3 4	07718 1120 12/11	10 11 18	8	Fill, hard brown 10YR 4/4 clay with some cobbles and slag, gravel, dry 4.5	NA	NA	HNU = 0 ppm βB = 140 cpm α = 2 cpm
5 6	07719 1125 12/11	17 21 21	16	Hard, brown 10YR 3/4 clay with some silt and gravel, dry.	cl	>5	HNU = 0 ppm βB = 160 cpm α = 2 cpm
7	07720 1130 12/11	23 22 21	18	very stiff, yellowish brown 10YR 5/4 clay with some silt, trace gravel	cl	4	HNU = 0ppm βB = 120 cpm α = 2 cpm
8 9	07721 1055 12/14	4 8 10	11	very stiff, yellowish brown 10YR 4/4 mottled clay with some silt, trace sand and gravel, dry.	cl	2.5	HNU = 0ppm βB = 100 cpm α = 2cpm
10	07722 1135 12/14	5 6 11	17	very stiff yellowish brown 10YR 4/4 clay with some silt, trace sand and gravel, dry.	cl	4	HNU = 0ppm βB = 100cpm α = 2 cpm
11 12	07723 1150 12/14	6 7 10	18	very stiff yellowish brown 10YR 4/4 clay with some silt, gravel, trace sand, dry. 12.0	cl	2.5	HNU = 0ppm βB = 100cpm α = 2cpm
13	07724 1330 12/14	2 6 6	10	very stiff yellowish brown 10YR 4/4 silty clay, some sand, gravel, dry. 13.5	cl	2.5	HNU = 0ppm βB = 120 cpm α 2cpm
14	07725 1340 12/14	5 10 15	9	very stiff gray 2.5Y 4/0 clay, some silt and gravel, dry. 15.0	cl	3.0	HNU = 0 ppm βB = 120cpm α = 2cpm

NOTES: Pennsylvania Drilling Co.
Bucyrus Erie 24-W drilling rig.
Driller: Dave Newman
Helper: Bob Johnson

Background Dec. 14, 1987 HNU = 0 ppm βB = 140 cpm α = 2 cpm

000693

Blows on sampler follow ASTM standard for 2in x 18in split spoon sampler.
Soil colors follow Munsell color charts. Approx. 700 gallons needed in drilling.

QC/DH/2-4-89

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B364~~ B3064 BB	COORDINATES: See p1	DATE: 12/19/87	
ELEVATION: See p1	GWL: Depth	Date/Time	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool			PAGE 2 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1½ ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15–16	07726 1355 12/14	5 6 5	4	stiff gray 10YR 5/1 silty clay, some gravel, sand, dry.	cl	1.5	HNU = 0ppm γB = 130cpm α = 2 cpm
17–18	07727 1405 12/14	3 5 8	6	very stiff gray 10YR 5/1 silty clay, some gravel, sand, dry.	cl	2.5	HNU = 0ppm γB = 120cpm α = 2 cpm
18–19	07728 1430 12/14	2 7 13	6	very stiff gray 10YR 5/1 silty clay, some gravel, sand, dry.	cl	4	HNU = 0ppm γB = 120cpm α = 2cpm
20–21	07729 1555 12/14	6 6 8	2	very stiff gray 10YR 5/1 silty clay, some gravel, cobbles, sand, dry. 21.0	cl	2.5	HNU = 0ppm γB = 110cpm α = 2cpm
22	07730 1610 12/14	3 7 16	9	very stiff gray 10YR 4/1 clay, trace gravel and silt.	cl	3	HNU = 0ppm γB = 100cpm α = 2cpm
23–24	07731 1640 12/14	4 7 13	13	very stiff gray 10YR 4/1 clay, some gravel, silt, dry. 24.0	cl	3.5	HNU = 0 ppm γB = 120 cpm α = 2cpm
25–26	07732 0830 12/15	9 19 22	11	very stiff gray 7.5YR 4/0 gravelly clay, some silt, dry.	cl	4	HNU = 0ppm γB = 120 cpm α = 2 cpm
26–27	07733 0845 12/15	7 11 14	12	very stiff gray 7.5YR 4/0 gravelly clay, some silt, dry	cl	3.5	HNU = 0 ppm γB = 100 cpm α = 2 cpm
28	07734 0900 12/15	11 14 20	3	very stiff gray 7.5YR 4/0 gravelly clay, some silt, dry	cl	3	HNU = 0ppm γB = 100 cpm α = 2 cpm | No recovery 1st try, 3in. 2nd try
29–30	07735 0950 12/15	7 10 15	9	very stiff gray 7.5YR 4/0 gravelly clay, some silt, dry	cl	2.5	HNU = 0ppm γB = 100cpm α = 2cpm

NOTES:

000694

QC/DH/2.489

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA [signature] DATE AUG 16 1991 5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B364~~ B304 CB 1-5-89	COORDINATES: See pl	DATE: 12/15/87
ELEVATION: See pl	GWL: Depth Date/Time	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 3 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/6 ft)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	07736 1125 12/15	50 - -	2	gray 7.5YR 5/0 gravelly clay, some silt, dry 31.5	cl	Unk	HNU=0ppm / 50 blows/2 in. / βB=100cpm / Insufficient / α=2cpm / sample for consistency.
32	07737 1150 12/15	9 31 40	16	very stiff gray 10YR 5/1 clay, some gravel, silt, dry. 32.5	cl	3.5	HNU=0ppm βB=100cpm α=2cpm
33				dense gray 10YR 5/1 sand, some silt, clay, dry. 33.0	sm	NA	
34	07738 1440 12/15	19 35 37	13	dense gray 10YR 5/1 gravelly sand, some silt, dry. 34.5	sm	NA	HNU=0ppm βB=100cpm α=2cpm
35							
36	07739 1445 12/15	12 22 27	14	med. dense gray 10YR 4/1 sand with some gravel, silt, dry.	sm	NA	HNU=0 ppm βB<100cpm α=2cpm
37							
38							
39							
40	07740 1545 12/15	40 40 32	14	dense gray 10YR 5/1 sand with some gravel, silt, dry.	sm	NA	HNU=0ppm βB=120cpm α=2cpm
41							
42							
43							
44							
45							

NOTES:

000695

402-11-

20/DH/2-4-89

	Initial	Date
1st Key In		
2nd Key In		8-12
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA DATE AUG 16 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3-2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B364 B3064	COORDINATES: See01	DATE: 12/16/87
ELEVATION: See01	GWL: Depth Date/Time	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 4 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45	07741 1620 12/15	27 32 30	14	med. dense gray 10YR5/1 sand with some gravel and silt, dry.	SM	NA	HNU=0 ppm γB=160 cpm α=2 cpm
46							
47							
48							
49				47			
50	07742 0840 12/16	22 35 37	9	dense gray 10YR 5/1 gravelly sand, some silt, trace clay, dry.	SW	NA	HNU=0 ppm γB=100 cpm α=2 cpm
51							
52							
53							
54							
55	07743 0915 12/16	97 for 6 in.	6	very dense gray 10YR 4/1 gravelly sand, some pebbles, some silt and clay, dry.	SW	NA	HNU=0 ppm γB=110 cpm α=2 cpm
56							
57							
58							
59							
60							

NOTES:

000696

QA/DH/2489

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 1 6 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B364~~ B3064 BB 1-5-89	COORDINATES: Secol	DATE:
ELEVATION: Secol	GWL: Depth Date/Time	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 5 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	07744 1140 12/16	22 50 39	10	dense gray 10YR 4/1 gravelly sand, some pebbles, some silt, trace clay, dry.	SW	NA	HNU = 0 ppm γB = 100 cpm α = 2 cpm
62							
63							
64							
65	07745 1345 12/16	33 32 35	7	dense gray 10YR 5/1 gravelly sand, some silt and clay, dry.	SW	NA	HNU = 0 ppm γB = 120 cpm α = 2 cpm
66							
67							
68				68			
69							
70	07746 1550 12/16	13 14 14	8	med. dense gray 10YR 4/1 sand, some silt, trace gravel, moist?	SM	NA	HNU = 0 ppm γB = 140 cpm α = 2 cpm
71							
72							
73							
74							
75							

NOTES:

000697

402-11-86

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA [redacted] DATE AUG 16 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B369~~ B3064 BB 2-89	COORDINATES: see 1	DATE: 12/17/87	
ELEVATION: See 1	GWL: Depth	Date/Time	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable tool.			PAGE 6 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75	07747	13					
76	0830 12/17	26 28	8	med. dense gray 10YR 4/1 sand with some gravel and silt, trace clay, wet.	sm	NA	HNU=0ppm γB=110cpm α=2cpm
77							
78							
79							
80	07748	7					
81	0955 12/17	12 14	2	med. dense gray 10YR 4/1 sand with some gravel and pebbles, some silt and clay, wet.	sm	NA	HNU=0ppm γB=140cpm α=2cpm
82							
83				83			
84							
85	07749	12					
86	1150 12/17	11 14	4	med. dense gray 10YR 4/1 fine grained sand, some silt and clay, wet.	sp	NA	HNU=0ppm γB=120cpm α=2cpm
87							
88							
89							
90							

NOTES:

000698

FERNALD RI/FS

QC/D#/24.89

5709

REVIEWED BY QA HG DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B364~~ B3064 BB 1-5-99	COORDINATES: seep1	DATE: 12/18/87
ELEVATION: seep1	GWL: Depth 72.25 Date/Time 12/17 0915	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: cable Tool		PAGE 7 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90	07750	10		med. dense gray 10YR 4/1 sandy gravel, some silt, uniform fine gravel. 91.0	gp	NA	HNU = 0 ppm
91	1355 12/17	12 21	18	gray 10YR 4/1 fine grained sand layer, some silt and clay. 91.3	sp		γB = 180 cpm α = 2 cpm
92				gray 10YR 4/1 sandy gravel, some pebbles, trace silt, wet.	gp		
93							
94							
95	07751	14		dense gray 10YR 4/1 sand and gravel, some silt and clay, some pebbles, wet.	gm	NA	HNU = 0 ppm
96	1620 12/17	23 38	13				γB = 120 cpm α = 2 cpm
97							
98				98			
99							
100	07752	6		med dense gray 10YR 5/1 fine grained sand, some silt and clay, 2 in. gray 10YR 4/1 sandy gravel lens at 101.3 ft., wet.	sp	NA	HNU = 0 ppm
101	1705 12/17	7 11	12				γB = 130 cpm α = 2 cpm
102							
103				103			
104							
105							

NOTES:

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 16 1991

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B364 B304 B304	COORDINATES: Surv	DATE: 12/ /87
ELEVATION: Surv	GWL: Depth 71.05 Date/Time 12/18 0745	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 8 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106	07753 0810 12/18	2 3 3	4	very loose grayish brown 10YR 4/2 sandy gravel, trace silt, some ~~clay~~ pebbles, wet.	gp	NA	HNU = 0ppm γB = 120cpm α = 2cpm
107				107.5			
108							
109							
110	07754 1115 12/18	2 4 5	16	loose gray 10YR 4/2 sand with some silt and trace gravel, uniformly fine grained sand, wet. 111.2	sp	NA	HNU = 0ppm γB = 100cpm α = 2cpm
111							
112				gray 10YR 4/1 sandy gravel, some silt, wet, well graded.	gp		
113							
114				114			
115	07755 1405 12/18	19 23 22	18	med dense grayish brown 10YR 5/2 fine grained sand, some silt, wet. 116.0	sp	NA	HNU = 0ppm γB = 100cpm α = 3cpm
116				gray 10YR 4/1 sandy gravel, some silt, well graded, wet.	gp		
117							
118							
119							Had problem with sand coming up casing after bailing.
120							

NOTES:

000700

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 16 1989 QC/DH/2.4.89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B364 A3044 BB 1-759	COORDINATES: Secpl	DATE: 12/18/87
ELEVATION: Secpl	GWL: Depth Date/Time	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 9 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120	07756 1530 12/18	15 14 13	6	med. dense gray 10YR 4/1 sand and gravel, some silt, trace pebbles and clay, wet.	gm	NA	HNU = 0ppm γB = 110cpm α = 2cpm
121							
122							
123							
124							
125	07757 1630 12/18	4 8 9	2	loose gray 10YR 4/1 sand and gravel, some silt, trace clay, wet.	gm	NA	HNU = 0ppm γB = 130cpm α = 3cpm
126							
127							
128							
129				129			
130	07758 1720 12/18	6 7 10	12	loose gray 10YR 4/1 sand, some silt and clay, trace gravel, wet.	sm	NA	HNU = 0 ppm γB = 120cpm α = 2cpm
131							
132							
133							
134							
135							

NOTES:

000701

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA [signature] DATE AUG 16 1989

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B364 ~~B365~~ B366	COORDINATES: Seep	DATE: 12/19/87
ELEVATION: Seep BB 1-5-88	GWL: Depth 70.35 Date/Time 12/19 0755	DATE STARTED: 12/11/87
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 10 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1 1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135							
136	07759 0920 12/19	3 9 12	11	med dense gray 10YR 4/1 sand, some silt and gravel, trace clay, wet.	SM	NA	HNU = 0 ppm BB = 100 cpm α = 2 cpm
137							
138							
139							
140				140.0			
141	07760 1110 12/19	7 8 12	12	stiff bluish green 2.5Y 4/0 clay, some silt, moist. At 140.6 ft. the clay is more greenish 5Y 4/1 and is a silty clay, moist.	CL	2.0	HNU = 0 ppm BB = 120 cpm α = 2 cpm
142	ST 1 1430 12/19						Pushed Shelby tube at 141.5 ft, penetrated 1.1 ft, recovered 1.1 ft.
143				E.O.B. 141.5 ft. Shelby tube to 142.6 ft.			

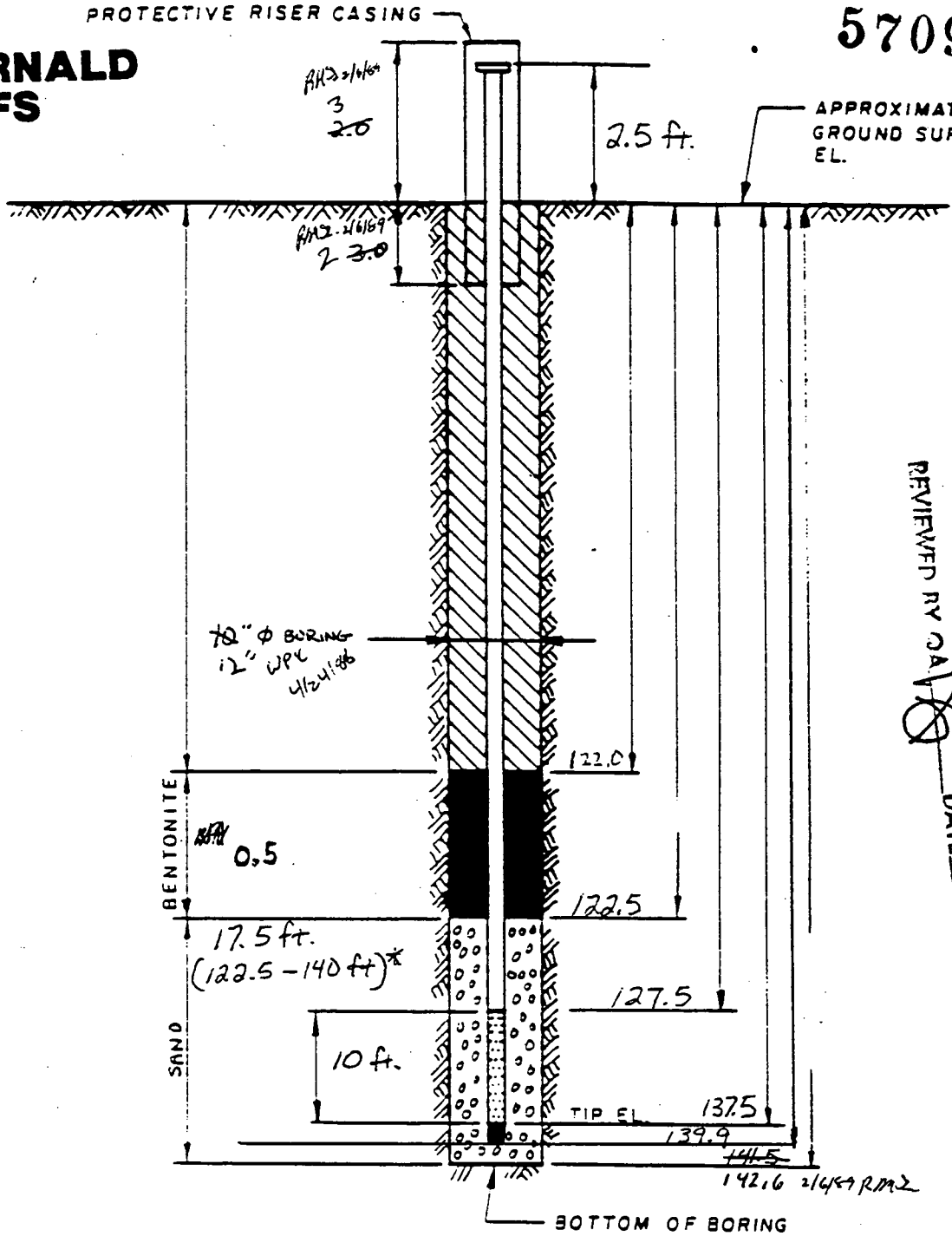
NOTES:

000702

QC/DH/2-4-89 WELL 364 #39
3064 BB 1-5-89

5709

FERNALD RI/FS



REVIEWED BY QA
DATE AUG 16 1991

DRAWING NUMBER
CHECKED BY
APPROVED BY
DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D 5.5 PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 72.25 ft.
5. WATER LEVEL READING ON 12/23/87 0915

INSTALLATION DETAILS
MONITORING WELL ~~364~~
PREPARED FOR 3064
BB 1-5-89

* Bottom 1.5 ft. of borehole cased in, sand is from 122.5 to 140

000703

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4064	COORDINATES:	DATE: 11-16-88	
ELEVATION: 588.3	GWL: Depth Date/Time	DATE STARTED: 11-14-88	
ENGINEER/GEOLOGIST: EVERETT TROLLINGER / Kris Hamline.	Depth Date/Time	DATE COMPLETED: 11-22-88	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 15	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				INTERVAL 0.0 FT. TO 141.5 FT PREVIOUSLY SAMPLED IN BORING #3064. BASE OF TILL AT 32.5 FT. RIG UP ON LOCATION (MW 4064) ON 11-14-88, ONLY 3.0 FT. DRILLED. DRILLING TO COMMENCE ON 11-15-88 AT 3.0 FT. SAMPLING TO COMMENCE AT 145.0 FT. TO BEDROCK.			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

NOTES:

000704

A.S.I.
PENN. DRILLING RIG #3
DRILLER: JOE BARILE
HELPER: SID SMITH

USED 1400 gallons of W[illegible] to drill and mix Volclay grout.
[illegible] 12/13/88

402-11-6

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-16-88
ELEVATION: 588.3 FT	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROWINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16				SEE BORING LOG 3064 ↓			
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

NOTES:

A.S.I

PENN DRILLING RIG #3

DRILLER: JOE BARILE

HELPER: SID SMITH

000705

4G2-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-16-88
ELEVATION: 588.3 FT	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31				SEE BORING LOG 3064 FOR SAMPLE DESCRIPTIONS			
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

NOTES:

000706

402-1

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-16-88
ELEVATION: 580.3 FT.	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46				SEE BORING LOG #3064			
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							

NOTES:

A.S.I.
PENN DRILLING RIG #3
DRILLER: JOE BARILE

000707

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-16-88
ELEVATION: 588.3	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS:		PAGE 5 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61				SEE BORING LOG # 3064			
62							
63							
64							
65							
66							
67							
68							
69							
70							
71							
72							
73							
74							

NOTES:

A.S.I.

PENN DRILLING RIG #3

DRILLER: JOE BARILE

000708

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-16-88
ELEVATION: 588.3 FT.	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76				SEE BORE LOG #3064			
77							
78							
79							
80							
81							
82							
83							
84							
85							
86							
87							
88							
89							

NOTES:

A.S.I.

PENN. DRILLING RIG #3

DRILLER: JOE BARILE

000709

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4064	COORDINATES:		DATE: 11-16-88
ELEVATION: 588.3 FT.	GWL: Depth	Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL			PAGE 7 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91				BORELOG # 3064			
92				CONTAINS SOIL			
93				DESCRIPTION			
94							
95							
96							
97							
98							
99							
100							
101							
102							
103							
104							

NOTES:

A.S.I. 000710

PENN DRILLING RIG #3

DRILLER: JOE BARILE

402-1

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-16-88
ELEVATION: 588.3 FT.	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E TROLLINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106				SEE BORE LOG 3064			
107							
108							
109							
110							
111							
112							
113							
114							
115							
116							
117							
118							
119							

NOTES:

A.S.I.

PENN DRILLING RIG #3

DRILLER: JOE BARILE

000711

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-16-88
ELEVATION: 588.3 FT.	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E TROLLINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121				SEE BORELOG # 3064			
122							
123							
124							
125							
126							
127							
128							
129							
130							
131							
132							
133							
134							

000712

NOTES:

A.S.I.
PENN. DRILLING RIG #3
DRILLER: JOE BARILE

402-1

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4064	COORDINATES:		DATE: 11-17-88
ELEVATION: 588.3 FT.	GWL: Depth	Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL			PAGE 10 OF 15

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136							
137							
138							
139							
140							
141							
142							
143							
144							
145	11098	7/10/16	14	STIFF, OLIVE GRAY, (5Y 3.1) SILTY CLAY W/ TRACE V.F. SAND. MOIST, ROOTLETS,	cl	1.45	H_{Nu} = 0 ppm
146	1655						α = 0 cpm
							$\beta\gamma$ = 100 cpm
147							
148							
149							

NOTES:

A.S.I.
PENN. DRILLING RIG #3
DRILLER: JOE BARILE

000713

402-1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 4064	COORDINATES:		DATE: 11-18-88
ELEVATION: 588.3	GWL: Depth	Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TRILLINGER	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL			PAGE 11 OF

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS * ∝ PROBE BROKEN
151	11049 0940	12/17/21	18	STIFF, OLIVE GREY (5Y 3.1) SILTY CLAY W/TRACE TO SOME V.F. SAND, MOIST, ROOTLETS.	CL	2.2	HNU = 0 ppm ∝ = 0 cm * BY = 100 cm
152							
153							
154							
155							
156	11050 1130	14/21/29	10	STIFF, OLIVE GREY (5Y 3.2) SILTY CLAY W/TRACE TO SOME V.F. SAND, MOIST SOME WHITE SHELL FRAGMENTS	CL	1.45	HNU = 0 ppm ∝ = * BY = 40-80 cm
157							
158							
159							
160							
161	11051 1345	22/15/11	6	LOOSE, GRAY (10YR 4/1) GRAVEL W/ TRACE COARSE SAND, WET, ANGULAR TO SUB-ANGULAR, 1/4 TO 1" DIAM.	GP	NA —	HNU = 0 ppm ∝ = * BY = 40-80 cm
162							
163							
164							

NOTES:

A.S.I.

PENN DRILLING #3

DRILLER: JOE BARILE

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-18-88
ELEVATION: 588.3 FT.	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 12 OF

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS * α PROBE NOT WORKIN
166	11052 1530	19/20/19	14	DENSE, GREY (10YR 5/1) SILTY SAND SOME SILT, WET, MED TO COARSE, SUB-ROUNDED TO SUB-ANGULAR	SP	NA	H_{NU} = 0 ppm α = * PX = 40-100 cpm
167							
168							
169							
170							
171	11053 1500	8/14/20	6	DENSE, GREY (10YR 5/1) SILTY SAND WET, MED TO COARSE, SUB-ROUNDED TO SUB-ANGULAR.	SP	NA	H_{NU} = 0 ppm α = PX = 20-60 cpm
172							
173							
174							
175							
176	11054 1715	50 FOR 5"	12	VERY DENSE, GREY (10YR 5/1) SILTY SAND, WET, VERY FINE	SP	NA	H_{NU} = 0 ppm α = * PX = 20-80 cpm
177							
178							
179							

NOTES:

A.S.I

PENN DRILLING RIG #3

DRILLER: JOE BARILE

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-19-88
ELEVATION: 588.3 FT	GWL: Depth Date/Time	DATE STARTED: 11-19-88
ENGINEER/GEOLOGIST: K. HEMLEIN	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 13 OF

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (FT)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS * α PROBE NOT WORKING
181	11055 1045	8/10/13	18	DENSE, GREY (10YR 5/1) SILTY SAND WET, V.F. TO COARSE GRAINED, SUB-ANGULAR TO SUB-ROUNDED.	SP	NA	HNU = 0 PPM α = * βγ = 40-60 CPM
182							
183							
184							
185	11056 1130	30/42/45	12	VERY DENSE GREY (10YR5/1) SILTY SAND, WET, V.F.-MED GRAINED, SUB-ROUNDED	SP	NA	HNU = 0 PPM α = * βγ = 40-50 CPM
186							
187							
188							
189							
190	11057 1430	7/15/22	12	VERY DENSE GREY (10YR 5/1) SILTY SAND W/ BRN GRAVELS, WET, MED TO COARSE GRAINED, SUB-ROUNDED TO SUB-ANGULAR	SP	NA	HNU = 0 PPM α = * βγ = 40-80 CPM
191							
192							
193							
194							

NOTES:

000716

A.S.I.

PENN DRILLING RIG #3

DRILLER J. BARILE

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-20-88
ELEVATION: 588.3 FT.	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 14 OF

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
196	11058 1530	6/8/12	10	VERY DENSE, GREY (10YR 5/1) SILTY SAND, WET, V.F. GRADING TO MED GRAINED AT 96.5'.	SW	NA	HNU - 0 PPM α - * βγ - 40-60 cpm
197							
198							
199							
200	11059 1700	16/13/18	15	VERY DENSE, GREY (10YR 5/1) SILTY SAND, WET, VERY FINE W/ OCCASIONAL PEBBLES AT 201 FT.	SP	NA	HNU - 0 PPM α - * βγ - 40-60 cpm
201							
202							
203							
204							
205							
206							
207	11060 1115	5/7/15	2	LOOSE, GREY, (10YR 5/1) GRAVELS W/ SOME SILTY SAND, WET, 1/4 TO 1" DIAM, SUB-ANGULAR TO SUB-ROUNDED, SAND V.F. TO COARSE	GM	NA	HNU = 0 PPM α = βγ = 80-160 cpm
208							
209							

NOTES:

A.S.I.

PENN DRILLING RIG #3

000717

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4064	COORDINATES:	DATE: 11-21-88
ELEVATION: 588.3	GWL: Depth Date/Time	DATE STARTED: 11-14-88
ENGINEER/GEOLOGIST: K. HEMLEIN	Depth Date/Time	DATE COMPLETED: 11/21/88
DRILLING METHODS: CABLE TOOL		PAGE 15 OF 15

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
211	11061 1445	11/9/10	6	LOOSE, GREY (10YR 5/1) GRAVEL WITH SILTY SAND, WET, SAND V.F. TO COARSE, SUB-ROUNDED	GM	NA	H_{NU} = 0 ppm α = ✱ BG = 40-80 cpm
212							
213							
214							
215	11062 1630	150 FOR 5"	8	DENSE, GREY (10YR 5/2) SILTY SAND, WET, MED GRAINED. 2" PIECE OF GRAVEL STUCK IN TOE OF SAMPLER.	SP	NA	H_{NU} = 0 ppm α = ✱ BG = 40-60 cpm
216							
217							
218	11063	150 FOR 2"	1.5"	HARD GRAY, (2.5Y N/5) CLAYSTONE, DRY TO MOIST, HIGHLY WEATHERED, FRIABLE.		NA	H_{NU} = 0 ppm α = ✱ BG = 40-60 cpm
219				TD BORING 218.2 FT.			
220							
221							
222							
223							
224							

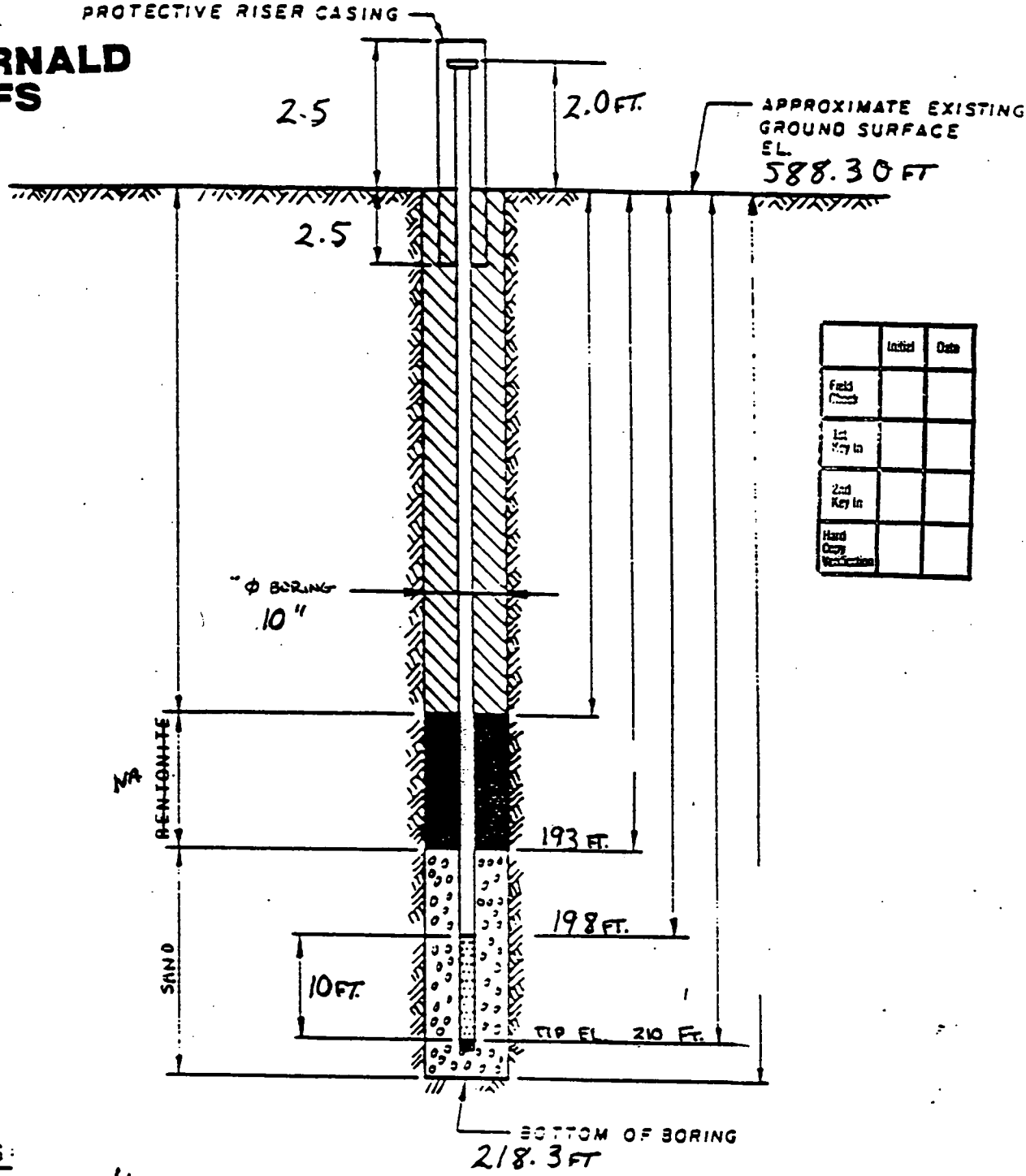
NOTES:

A.S.I

PENN DRILLING RIG #3

000718

FERNALD RI/FS



	Initial	Date
Field Check		
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWING NUMBER		
		8/2/88
CHECKED BY / APPROVED BY	K.K.	
DRAWN BY	K.H.	

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 3064

PREPARED FOR

FMPC RI/FS

FERNALD RI/FS

Date				
Initial				
				Hard Copy Verification

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD FMPC RI/FS FIELD ENG./GEO. K. HEMLEIN DATE 11-22-88
PROJECT NO. 602 3.2 CHECKED BY _____ DATE _____
BORING NO. 4064
PIEZOMETER NO. _____ DATE OF INSTALLATION 11-22-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT _____
CASING SIZE (S) USED:
SIZE 10 IN FROM 0 TO 218 FT
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4 INCH
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA 10 FEET

RISER PIPE MATERIAL 316 L STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 INCHES I.D. _____
LENGTH OF PIPE SECTIONS 10 FEET
JOINING METHOD FLUSH THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 0.5 FT

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT)	
TOP OF RISER PIPE	2 FT		590.30 FT	
GROUND SURFACE	0.0		588.30 FT	
BOTTOM OF PROTECTIVE PIPE	2.5 FT		585.80 FT	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 193	TOP 588.30	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND	TOP	BOTTOM	TOP	BOTTOM
GRAVEL	TOP 193	BOTTOM 218	TOP 395.30	BOTTOM 370.
PERFORATED SECTION	TOP 198	BOTTOM 208	TOP 390.30	BOTTOM 380.
PIEZOMETER TIP				
BOTTOM OF BOREHOLE	218.30		370.0	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐

REMARKS

000720

5709
RKA 2/4/89

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

4/23/88 WPK
RIG #2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD	
BORING NUMBER: ~~165~~ 1065 BB 10-5-87	COORDINATES:	DATE: 10-4-87
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-4-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 10-6-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0							
1				SEE SOIL BORING LOG FOR BORING/WELL NO. 2065 ~~265~~ FOR STATIGRAPHY. RMB 2/6/89 ON this hole.			Drilling only-no samples collected.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							30 gallons water added to boring while drilling
12							
13							
14				14.0 14.0			
15				BOTTOM OF BORING 14.0'			

NOTES:

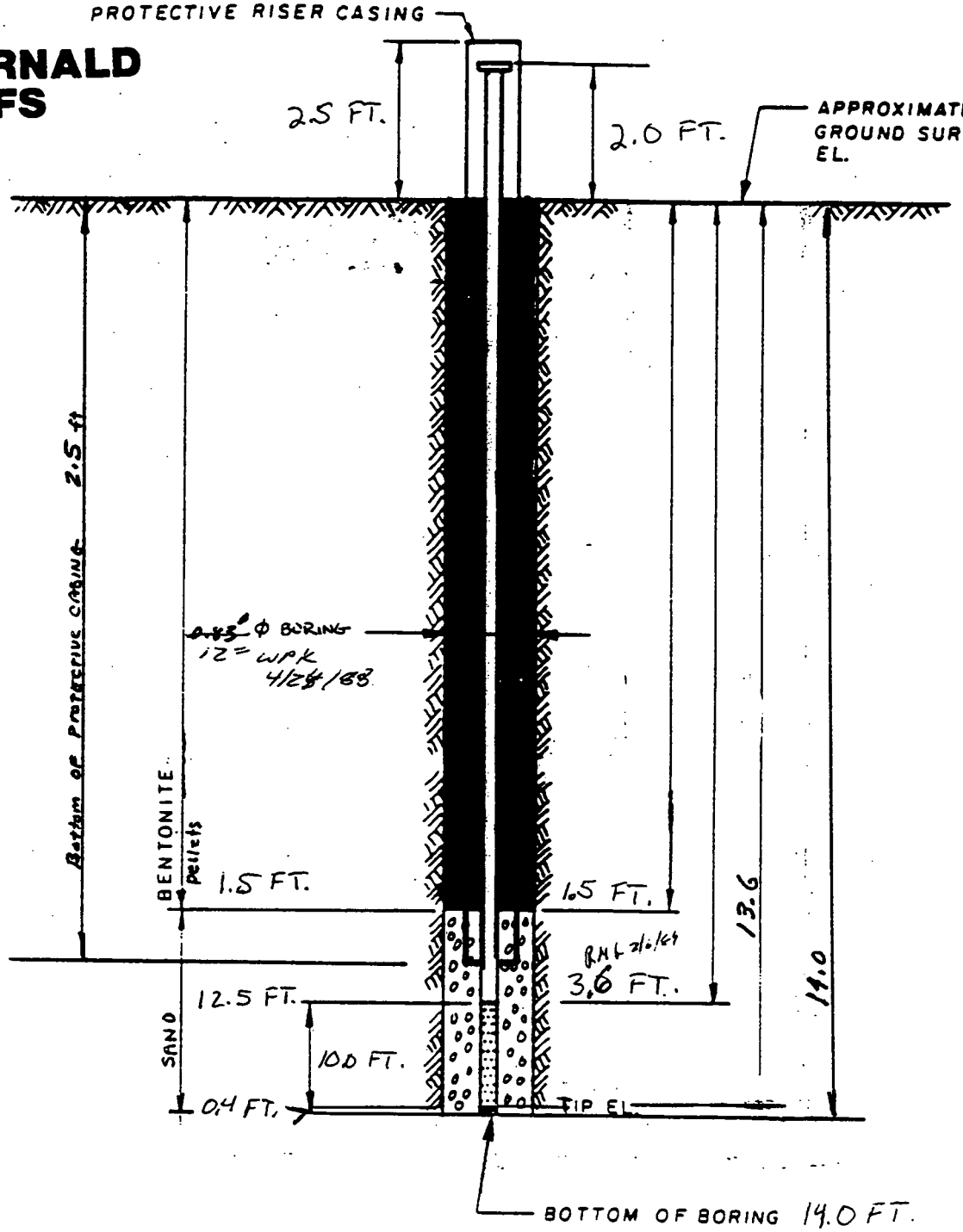
DRILLING CO. Pennsylvania Drilling
DRILL RIG Cyclone 42
Driller Harry Dykes
HELPER Tim Harris

BACKGROUND READINGS
HNU - zero
LEL - zero
ALPHA - zero/min
BETA/GAMMA - 40-80/min

000721

RKA 2/4/89
WELL # ~~165~~ 1065 BB 1-5

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

D N

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE 5 PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~165~~ 1065
BB 1-5-89

PREPARED FOR

FMPC - RI/FS

This form does not represent the installed monitoring well therefore it has been modified with white out by J. Oakley WPK 4/24/88

000722

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC R&A 2/4/89

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 10-6-87
PROJECT NO. 602 CHECKED BY D. HOLEMAN DATE 10-7-87
BORING NO. ~~165~~ 1065 BB 1-5-89
PIEZOMETER NO. ~~165~~ 1065 DATE OF INSTALLATION 10-6-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 2 FT. TO 14 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLAT HEAD
CASING SIZE (S) USED:
SIZE 10 IN. FROM 0 TO 14 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 IN. I.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 5 FT.
JOINING METHOD THREAD AND COUPLE (FLUSH JOINT THREADS)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 IN

OTHER PROTECTION LOCKING CAP AND LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM NA	TOP	BOTTOM
BENTONITE	TOP 0	BOTTOM 1.5 FT.	TOP	BOTTOM
SAND	TOP 1.5 FT	BOTTOM 14 FT.	TOP	BOTTOM
NO GRAVEL USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 3.6 FT.	BOTTOM 13.6 FT.	TOP	BOTTOM
PIEZOMETER TIP	~~NA~~ 14.0			
BOTTOM OF BOREHOLE	14.0 FT.			
GWL AFTER INSTALLATION	NONE			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

000723

REMARKS DRY WELL, NO VOLCLAY NEEDED BECAUSE OF SHALLOW DEPTH.

FERNALD RI/FS

* Note: After several discrepancies were found on the original field log the original author rewrote the log on a later date. this version of the log supersedes all other older versions

REVIEWED BY QA [illegible] DATE AUG 09 1991

Lowell Wille 4-22-88

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3-2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B-265~~ B2065	COORDINATES: 477866.51N 1380934.37E		DATE: Sept 24, 1987
ELEVATION: 571.56 Ground 88-5-89	GWL: Depth	Date/Time	DATE STARTED: Sept 24, 1987
ENGINEER/GEOLOGIST: D. Oakley / L. Wille	Depth	Date/Time	DATE COMPLETED: Oct 1, 1987
DRILLING METHODS: Cable Tool			PAGE 1 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07175	5 12 11	12	very ~~stiff~~ soft dark yellowish brown 10YR4/4 silt, some clay, trace gravel and sand, moist 1.0	ml	0.2	HNU = 0ppm α = 0cpm γβ = 40-80cpm
2	07176	8 7 12	10	hard brownish yellow 10YR6/6 clay some silt, trace gravel and sand - dry 2.0 hard brownish yellow 10YR6/8 silt, some clay, trace gravel and sand, dry	cl	4.5	HNU = 0ppm α = 0cpm γβ = 40-80cpm
3	07177	4 5 7	9	medium stiff yellowish brown 10YR5/4 silt, some clay, trace gravel and sand dry 3.5	ml	0.5	HNU = 0ppm α = 0cpm γβ = 40-80cpm
5	07178	7 11 12	16	very stiff ~~brownish yellow~~ yellowish brown 10YR5/6 silt some clay trace gravel - dry	ml	1.25	HNU = 0ppm α = 0cpm γβ = 40-80cpm
7	07179	9 10 10	13	very stiff brownish yellow 10YR6/8 silt, some sand and clay - dry 7.5	ml	2.0	HNU = 0ppm α = 0cpm γβ = 40-80cpm
8	07180 1015	22 23 22	14	dense brown 7½YR5/6 sand and gravel some silt and clay - moist 8.0	ml	3.0	HNU = 0ppm α = 0cpm γβ = 40-80cpm
9				stiff brown 7½YR5/6 mottled orange and red silty clay, trace sand - moist 9.0	ml	1.0	HNU = 0ppm α = 0cpm γβ = 40-80cpm
10	07181 1040	2 4 11	11	medium stiff gray 5YR4/2 silty clay some pebbles trace fine sand and gravel moist 10.5	ml	0.5	HNU = 0ppm α = 0cpm γβ = 40-80cpm
11 12	07182 1100	3 3 14	10	stiff brown gray 5YR4/2 silty clay some pebbles trace fine sand - moist	ml	1	HNU = 0ppm α = 0cpm γβ = 40-80cpm
13	07183 1110	10 20 25	12	medium stiff gray 5½YR3/0 silty clay some pebbles, trace fine sand - dry	ml	0.5	HNU = 0ppm α = 0cpm γβ = 40-80cpm
14	07184 1240	4 9 14	12	stiff gray 5YR3/0 silty clay some pebbles and fine sand - moist	ml	1.0	HNU = 0ppm α = 0cpm γβ = 40-80cpm

REMARKS	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

NOTES:
Pennsylvania Drilling Co
Drill Rig: Cyclone
Driller: Harry Dykes
Helper: Tim Harris
Samples collected as per ASTM standard penetration test
Colors identified using Munsell Color Chart

Background levels
HNU = 0ppm, LEL = 0ppm
γβ = 40-80cpm
α = 0 cpm

000724

402-11-86

FERNALD RI/FS

REVIEWED BY QA LLG DATE AUG 09 1991

5709 RKA 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 2065	COORDINATES: See pl	DATE: Sept 29, 1987
ELEVATION: See pl	GWL: Depth — Date/Time —	DATE STARTED: Sept 24, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: Oct 1, 1988
DRILLING METHODS: Cable Tool		PAGE 2 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	7185 1205	10 33 50	14	very dense brown 10YR 5/2 sand and gravel, some silt and clay, trace pebbles moist	SP	1.25	HNU = 0ppm γB = 40-80cpm α = 0cpm
17–18	7186 1320	25 40 34+	12	very dense brown 10YR 4/2 coarse sand to fine gravel some medium to coarse sand silt and clay ~~moist~~ dry	SP	1.25	HNU = 0ppm γB = 40-80cpm α = 0cpm
19	7187 1445	18 30 44	12	very dense brown 10YR 4/2 sand and gravel some silt and clay, trace pebbles dry	SP	1.5	HNU = 0ppm γB 40-80cpm α = 0cpm
20	7188 1515	19 31 27	14	dense brown 10YR 5/2 sand and gravel some silt clay and pebbles trace stones dry	SP	1.5	HNU = 0ppm γB = 40-80cpm α = 0cpm
21							
22							
23							
24							
25							
26	7189 1550	6 29 50+	1.6	very dense brown 10YR 5/4 sand and gravel some silt, clay and pebbles dry	SP	2.0	HNU = 0ppm γB = 40-80cpm α = 0cpm
27							
28							
29							

NOTES:

O_2 = 21%
LEL = 0ppm

000725

402-11-86

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 0 9 1991 RKA 2/4/89

	Initial	Date
1st Key In		
2nd Key In		8/15/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.32	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B2065	COORDINATES: Sept	DATE: Sept 29, 1987
ELEVATION: Sept	GWL: Depth – Date/Time	DATE STARTED: Sept 24, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth – Date/Time –	DATE COMPLETED: Oct 1, 1987
DRILLING METHODS: Cable tool		PAGE 3 OF 5

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ Ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	07190 1610	20 55 50+	18	very dense brown 10YR 3/4 sand some gravel, pebbles and silt, trace clay dry	SP	3.5	HNU=0ppm βγ=40-80cpm α:0cpm
32							
33							
34							
35	07191 1645	8 17 22	18	dense brown 10YR 4/3 brown sand some silt, clay and fine gravel trace med to coarse gravel and pebbles-moist	SP	0.5	HNU=0ppm βγ-40-80cpm α-0cpm
36							
37							
38							
39							
40	07192 1725	20 45 50+	18	very dense brown-red 10YR 6/4 sand some gravel, silt, trace pebbles and clay-moist	SP	0.25	HNU=0ppm βγ-40-80cpm α-0cpm
41							
42							
43							
44							

NOTES:
heavy rain ~65°F

000726

402-11-86

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 09 1991 RKA 12/4/89

	Initial	Date
1st Key In		
2nd Key In	JDR	8/15/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.2	PROJECT NAME: Fernald RI/FS		DATE: ~~Sept 29, 1988~~ Oct 1, 1988
BORING NUMBER: B-2065	COORDINATES: Scap1		DATE STARTED: Sept 24, 1987
ELEVATION: Scap1	GWL: Depth	Date/Time	DATE COMPLETED: Oct 1 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth	Date/Time	PAGE 4 OF 5
DRILLING METHODS: Cable tool			

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	07193	18 14 18	18	dense brown 10YR 5/4 coarse sand and gravel some silt, clay and pebbles trace stones, moist (possible wet)	SP	NA	HNU = 0ppm γβ = 40-80cpm α = 0cpm
47							
48							
49							
50	07194	6 17 20	7	loose brown 10YR 3/2 sand and gravel some silt and clay, trace cobbles and stones, moist (possible wet)	SP	NA	HNU = 0ppm γβ = 40-80cpm α = 0cpm
51							
52							
53							
54							
55	07195	6 6 12	7	55.0 loose gray 7½YR 4/0 sand, some fine gravel and silt, trace clay wet	SP	NA	HNU = 0ppm γβ = 40-80cpm α = 0cpm
56							
57							
58							
59							

NOTES:

000727

402-11-86

FERNALD RI/FS

REVIEWED BY QA KG DATE AUG 09 1988

RKA 2/4/89

	Initial	Date
1st Key In		
2nd Key In	RDC	6/15/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B-2065	COORDINATES: see pl	DATE: Sept 1, 1988
ELEVATION: see pl	GWL: Depth 52 TOC Date/Time 10-1-88	DATE STARTED: Sept 24, 1988
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: Oct 1, 1987
DRILLING METHODS: Cable Tool		PAGE 5 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	07196	11 7 7	7	loose gray 7½YR 4/0 sand, some fine gravel and silt, trace clay-wet			HNU=0ppm γB=40-80cpm α=0cpm
62							
63							
64							
65	07197	4 11 15	7	loose gray 5YR5/0 sand and gravel some silt & pebbles and clay-wet			HNU=0ppm γB=40-80cpm α=0cpm
66							
67				Bottom of Boring 66½ ft			
68							
69							
70							

NOTES:

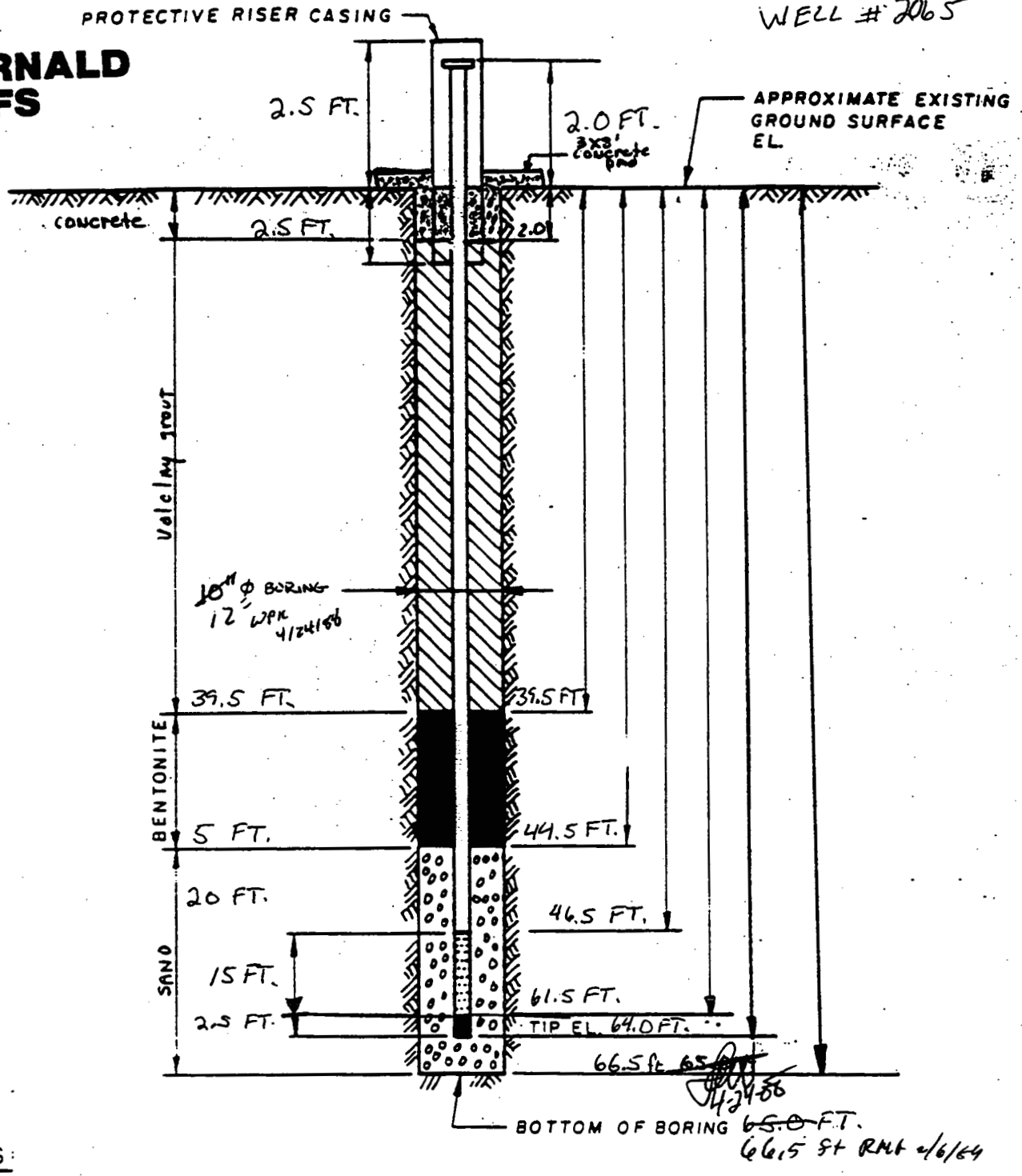
000728

402-11-86

REVIEWED BY QA 66 DATE AUG 0 9 1991 5709 RKA 2/4/89

WELL # 2065

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE 5 PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~265~~ 2065 BB 1-5-89

PREPARED FOR
FMPC RI/FS

DRAWING NUMBER | CHECKED BY | APPROVED BY | DBO

FERNALD RI/FS

REVIEWED BY QA KC DATE AUG 09 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RKA 2/4/89

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. L. WILLIE DATE 10-6-87
PROJECT NO. 602 CHECKED BY D. HOLZMANN DATE 10-7-87
BORING NO. ~~265~~ 2065 BB 1-5-87
PIEZOMETER NO. ~~265~~ 2065 DATE OF INSTALLATION 10-3-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 2 FT. TO 64 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD HAMMER
CASING SIZE (S) USED: (TEMPORARY)
SIZE 10 IN. FROM 0 TO 64 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4 IN. ID.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☑
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD AND COUPLE
(FLUSH JOINT THREADS)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 IN.

OTHER PROTECTION LOCKING CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	+ 2.0		573.56	
GROUND SURFACE	0.0		571.56	
BOTTOM OF PROTECTIVE PIPE	-2.5 FT.		569.06	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 2 FT.	BOTTOM 39.5 FT.	TOP 569.56	BOTTOM 532.06
BENTONITE Pellets	TOP 39.5 FT.	BOTTOM 44.5 FT	TOP 2/6/89 532.06	BOTTOM 527.06
SAND	TOP 44.5 FT	BOTTOM ~~65.0~~ 66.5 FT	TOP 527.06	BOTTOM 505.06
NO GRAVEL USED	TOP NA	BOTTOM NA	TOP —	BOTTOM —
PERFORATED SECTION	TOP ~~47~~ 46.5 FT	BOTTOM 61.5 FT	TOP 525.06	BOTTOM 510.06
PIEZOMETER TIP	64.0 (SILT TRAP)		507.56	
BOTTOM OF BOREHOLE	~~65.0~~ 66.5 ft		505.06	
GWL AFTER INSTALLATION	4-22-88 —		—	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS White correction was made by L. Willie at the time this form was completed. WPK 4/24/88

5709

	Initial	Date
Field Check	BO.	12/12
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B 3065	COORDINATES:	DATE: 11/1/88
ELEVATION: 572 ft GS	GWL: Depth 56.26' Date/Time 11/10/88	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 9

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				previously Describe in Boring 2065	1.0 ML		
2					CL 2.0		
3				Drilled Sept 24, 1987 to Oct 1, 1987 by D. Oakley / L. Willie	ML		
4							
5				Depth of Boring ~~265~~ 2065 =66.5 ft.	12/12/88		
6							
7							
8							
9							
10							
11							
12							
13							
14							
15					ML		

NOTES:

Contractor: Penn Drill
Rig: Cyclone 42
Driller: Joe Barile
Assistant: Sid Smith

1100 gallon water Total added to hole

Samples collected as per ASTM standard Penetration Test
Colors Identified using Munsell Co ch

Background Levels HNU = 0 ppm
α = 0-2 cpm LEL = 0 ppm LEL
$\beta\gamma$ = 60-80 cpm O_2 = 20.9 %

000731

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B 3065	COORDINATES:	DATE: 11/1/88
ELEVATION: 572 ft. GS	GWL: Depth Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 9

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15					SP		
16				Previously Described in Boring 2065			
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30					SP		

NOTES:

000732

402-11-

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B 3065	COORDINATES:	DATE: 11/2/88
ELEVATION: 572 ft GS	GWL: Depth Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30					SP		
31				Previously Described			
32				in Boring 2065			
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45					SP		

NOTES:

000733

402-1?-E

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B 3065	COORDINATES:	DATE: 11/2/88
ELEVATION: 572 ft GS	GWL: Depth Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool		PAGE 4 OF 9

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45				Previously Described	SP		
46				in Boring 2065			
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60					SP		

NOTES:

000734

Original 5709
12/12/88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B 3065	COORDINATES:	DATE: 11/2/88
ELEVATION: 572 ±65	GWL: Depth Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D Hoekstra	Depth Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 9

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60				Previously Described in Boring 265	SP		
61							
62							
63							
64							
65							
66				BOTTOM OF ~~Extent of~~ Boring 265			Black Ink copied or written on top of preexisting red ink by BD. 12/12/88
67				VISUAL CLASSIFICATION OF SOILS IN BORING 3065 TO COMMENCE @ 70.0 FT.			
68							
69							
70	11035	17		Very Dense, Grey brown (10YR 5/2) well graded ~~Sandy gravel~~ gravelly sand (1/8"-1 1/4") ~~little~~ some fine sand 71.0'	SP		500 gallons water added Hnu = 0 ppm α = 0-2 cpm βγ = 70 cpm
71	0920	25	12				
	11-3-88	30					
72				Dark grey (10YR 3/1) well graded gravelly sand, wet			
73							
74							
75							

NOTES:

000735

FERNALD RI/FS

This is original copy
Bd. 12/14/88

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FMPC · RI/FS		
BORING NUMBER: B 3065	COORDINATES:		DATE: 11/3/88
ELEVATION: 572 ft GS	GWL: Depth	Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D. Hekstra	Depth	Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool			PAGE 6 OF 9

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75	11036	8		Very Dense, Dark ye[redacted] Brown,			[redacted] 0 cpm
76	1115	40	18	(10YR 3/2), very well [redacted]	SW		[redacted] 58 cpm High blow count possible caused by presence of large gravel spoon
	11-3-88	66		gravelly sand (medium [redacted] 76.0 1" gravel), little or no fines, wet			
77				Brown [redacted] Brown (10 YR 4/2) poorly [redacted] medium sand no gravel [redacted] or no fines, wet	SP		
78							
79							
80	11037	[redacted]		very Loose, Greyish brown (10YR 4/2) well graded, gravelly sand (fine sand to 1/4" gravel) wet	SW		Hnu = 0 α = 0 cpm β8 = 50 cpm
81	1320	2	6				
	11-3-88	2					
82							
83							
84							
85	11038	2		medium dense, Greyish brown			Hnu = 0
86	1345	3	2	(10YR 4/2) well graded gravelly	SW		α = 0 cpm
	11-3-88	13		sand (fine [redacted] to 1/4" g[redacted])			β8 = 50 cpm
87							
88							
89							
90							

NOTES:

000736

402-1

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 8 #3065	COORDINATES:	DATE: 11/3/88
ELEVATION: 572.65	GWL: Depth Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool		PAGE 7 OF 9

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90	11039	24		very dense, dark brown (10YR 3/2)			Hnu = 0 ppm
91	1617	54	14	well graded coarse sand, trace gravel, wet	SW		α = 2 cpm
	11-3-88	50					βγ = 60 cpm
92							
93							
94							
95	11040	9		very dense, dark brown, yelowish			Hnu = 0 ppm
96	1645	20	4	(10YR 4/2) well graded sandy	GW		α = 0 cpm
	11-3-88	23		Gravel (coarse sand to 1/4"), wet			βγ = 50 cpm
97							
98							
99							
100	11041	9		medium dense, brown (10YR 4/2)			Hnu = 0 ppm
101	1710	9	6	poorly graded coarse sand, ~~trace~~ some 1/4" gravel, some	SP		α = 2 cpm
	11-3-88	10		fines, wet			βγ = 40 cpm
102							
103							
104							
105							

NOTES:

000737

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: B 3065	COORDINATES:		DATE: 11/6/88
ELEVATION: 572 ft 65	GWL: Depth	Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth	Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool			PAGE 8 OF 9

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105	11042	29	12	very dense. dark brown grayish (10YR 4/1) well graded gravely sand (med. sand to 1/2" gravel), wet	SW		Hnu = 0 ppm; α = 1 cpm; βγ = 60 cpm; very dense Refusal at 12"
106	9935 11-6-88	50/.3 50/.2	out of 12"				
107							
108							
109							
110	11043	7	2	medium dense, grayish dark brown (10YR 4/1) well graded sand with some gravel (med sand to 1/4") wet	SW		Hnu = 0 ppm; α = 1 cpm; βγ = 50 cpm
111	9930 11-6-88	10 16					
112							
113							
114							
115	11044	12	10	very dense grayish dark brown (10YR 4/1) poorly graded medium sand, some gravel (1/4") wet	SP		Hnu = 0 ppm; α = 1 cpm; βγ = 80 cpm
116	1150 11-6-88	42 50+					
117							
118							
119							
120							

NOTES:

000738

402-11-8

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B-3065	COORDINATES:	DATE: 11/7/88
ELEVATION: 572 ft GS	GWL: Depth Date/Time	DATE STARTED: 11/1/88
ENGINEER/GEOLOGIST: D. Hoekstra	Depth Date/Time	DATE COMPLETED: 11/9/88
DRILLING METHODS: Cable Tool		PAGE 9 OF 9

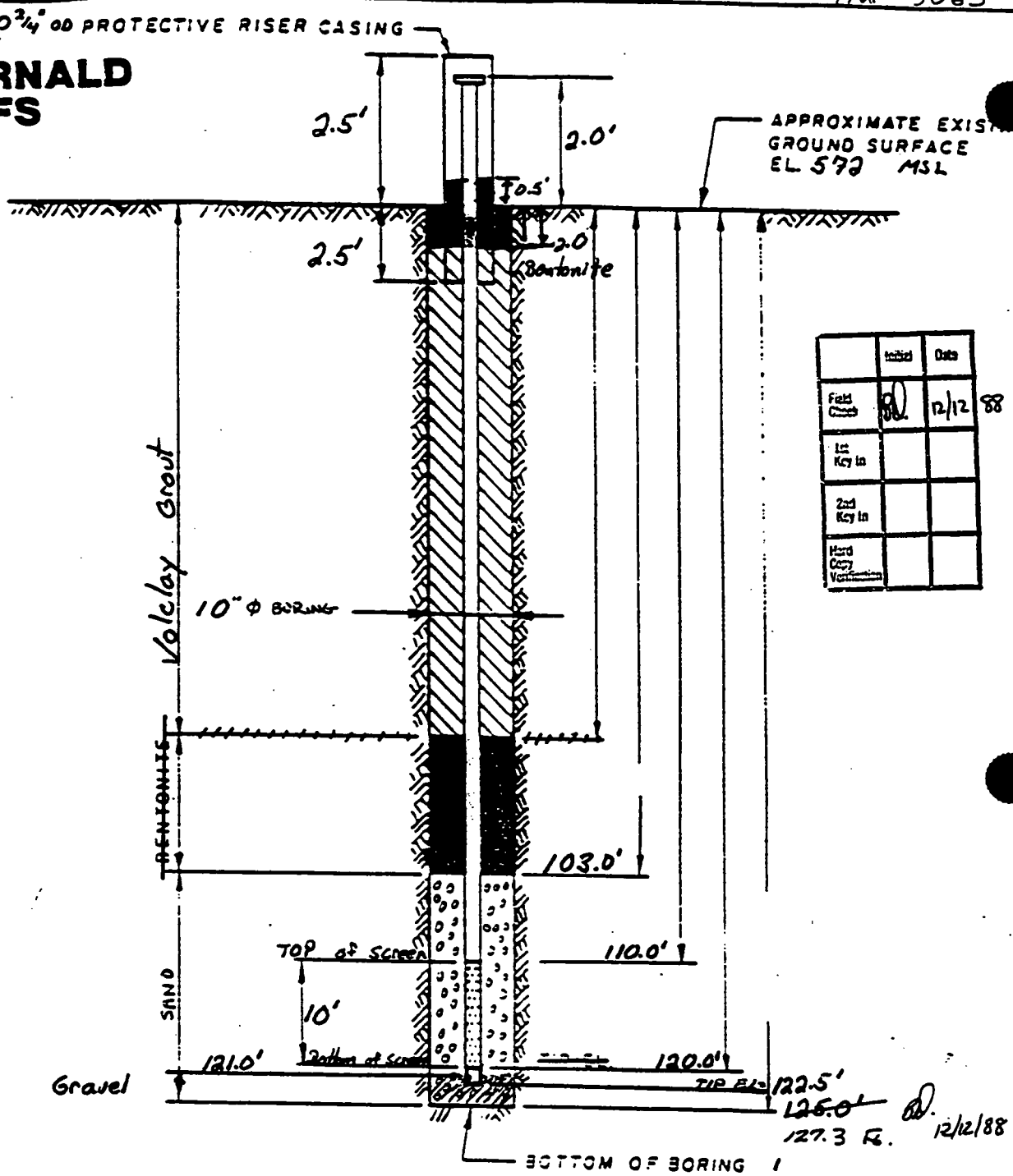
DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120	110445	17		medium dense, dark brown tan,			Hno = 0 ppm
121	0830	11	2	(10YR 5/2) wellgraded sand	SW		α = 0 cpm
	11-7-88	13		(med to ~~coarse~~) some gravel			βγ: 50 cpm
122				(1/4" to 1/2") wet			
123				ESTIMATED clay/ sand-gravel Horizon			
124							
125				Stiff olive gray (5YR 4/1)			
	110446	16		"Blue Clay" ~~wet~~ lean clay			Hnu = 0 ppm Drove
126	1000	21	14	with trace silt	CL	1.2	α = 1 ppm SHELBY
	11-7-88	30					βγ = 50 cpm TUBE from
127				some black organic			125.3-127.3
				material present, wet.			: Full Clay Recovery
128				SHELBY TUBE, sample ~~[illegible]~~			
129				time: 1330 DATE: 11-7-88 #110447			
				DEPTH INTERVAL 125.3' – 127.3"			
				2 ft Recovery of clay as described			
130				above			
131				BOTTOM OF THE BORING			
				127.3 Ft.			
132				RD. 12/12/88			
133							
134							
135							

NOTES:

000739

MW- 3065

FERNALD RI/FS



	Initial	Date
Field Check		12/12/88
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. 10' PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 56.26' T.O.C.
5. WATER LEVEL READING ON 11-10-88

materials used:

1-10' screen w/ 2.5' welded silt trap
11-10' riser pipe
1-2' riser pipe
2 sacks 4-30 Gravel

INSTALLATION DETAILS
MONITORING WELL 3065

PREPARED FOR
FMPC RI/FS 602.3.2

1½ buckets Bentonite pellets (crumbled)
8 sacks 10-20 sand
20 sacks volclay grout
1100 gallons water ADDED TO BOREHOLE DURING DRILLING, SAMPLING AND WELL INSTALLATION ACTIVITIES

12/12/88

000740

5709

	Date			
	Initial	BD		
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. D. Hoekstra DATE 11-9-88
PROJECT NO. 602 3.2 CHECKED BY B. Nunning DATE 12/12/88
BORING NO. 3065
PIEZOMETER NO. MW-3065 DATE OF INSTALLATION 11-9-88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0' TO ~~125.0'~~ 127.3 Ft.
FLUID _____ FROM _____ TO _____

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0' TO ~~130.0'~~ 127.3 Ft.
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4 3/8" OD
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01 in
TOTAL PERFORATED AREA 10.0'

RISER PIPE MATERIAL 4" ID 316 stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4.0"
LENGTH OF PIPE SECTIONS 10.0', 2.0' & 1.25' (sump)
JOINING METHOD Screw type - Flush thread

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0'
PROTECTIVE PIPE O.D. 10 3/4"

OTHER PROTECTION Locking Cap
master Lock 3217

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0'			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5'			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 2.0	BOTTOM 103.0'	TOP	BOTTOM
BENTONITE	TOP ~0.5 (above GS)	BOTTOM 2.0	TOP	BOTTOM
SAND	TOP 103.0'	BOTTOM ~~121.0'~~ 122.5 Ft.	TOP	BOTTOM
GRAVEL	TOP ~~121.0'~~ 122.5 Ft. BD 12/12/88	BOTTOM 125'	TOP	BOTTOM
PERFORATED SECTION	TOP 110.0'	BOTTOM 120.0'	TOP	BOTTOM
PIEZOMETER TIP	122.5'			
BOTTOM OF BOREHOLE	~~125.0'~~ 127.3 Ft.		BD 12/12/88	
GWL AFTER INSTALLATION	56.26' T.O.C.			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS 1½ buckets Bentonite Pellets added after grout settled inside protective casing and around protective casing on the outside

000741

409-11

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 0 9 1991

DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In	[illegible]	
Hard Verification		

VISUAL CLASSIFICATION OF SOILS

RIG #2

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~2606~~ 2066 BB 1.5.89	COORDINATES: 48393[illegible].95 N 1316[illegible].48 E	DATE: 8/25/87	
ELEVATION: 578.2 GROUND	GWL: Depth	Date/Time	DATE STARTED: 8/25/87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth	Date/Time	DATE COMPLETED: 8/31/87
DRILLING METHODS: CABLE TOOL			PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.5	7000	6 6 5	13"	STIFF BROWN SILT, TRACE FINE SAND.	ML		SAMPLE SCANNED - BACKGROUND READINGS
3.0	7001	6 6 6	14"	STIFF BROWN SILTY CLAY, TRACE FINE SAND.	CL		SAMPLE SCANNED - BACKGROUND READINGS
4.5	7002	1 2 3	14"	MEDIUM STIFF REDDISH YELLOW CLAY - TRACE SILT	CL		SAMPLE SCANNED - BACKGROUND READINGS.
6.0	7003	1 2 3	17"	MEDIUM STIFF LIGHT GRAY CLAY TRACE SAND AND SILT	CL		SAMPLE SCANNED - BACKGROUND READINGS
				MEDIUM STIFF LIGHT GRAY CLAY, TRACE SAND AND SILT.	CL		
7.5	7004	1 1 2	14"	SOFT LIGHT YELLOWISH BROWN CLAY	CL		SAMPLE SCANNED - BACKGROUND READINGS 7.45 8-26-87
				SOFT LIGHT GRAY SILT, TRACE FINE SAND AND CLAY	ML		
9.0	7005	1 3 2	14"	LIGHT YELLOWISH BROWN SILT, SOME CLAY.	ML		SAMPLE SCANNED - BACKGROUND READINGS
				SOFT LIGHT GRAY CLAY, TRACE SILT.	CL		
				MEDIUM STIFF YELLOWISH BROWN CLAY, SOME SILT, TRACE SAND.	CL		
10.5	7006	6 7 10	13"	MEDIUM DENSE YELLOWISH BROWN ~~GRAY~~ COARSE SAND, TRACE GRAVEL AND SILT.	SP		SAMPLES SCANNED - BACKGROUND READINGS
12.0	7007	6 7 11	8"				SAMPLE SCANNED - BACKGROUND READINGS
				VERY STIFF YELLOWISH RED SILT, SOME SAND TRACE CLAY	ML		
				~~VERY STIFF~~ REDDISH BROWN ~~COARSE~~ SAND ~~TRACE~~ MEDIUM DENSE TRACE ~~TRACE~~ GRAVEL, ~~AND~~ SILT.	SP		
13.5	7008	4 16 17	17"	~~SAMPLE~~ HARD ~~SA~~ GRAY SANDY SILT, TRACE GRAVEL.	ML		PANCAKE - 100-120 COUNTS PER MINUTE. OTHER METER READINGS AT BACKGROUND.
				LENS REDDISH BROWN MEDIUM SAND, TRACE GRAVEL AND SILT.	SP		
15.0	7009	2 5 6	9"	STIFF GRAY SILT, TRACE CLAY	ML		SAMPLE SCANNED - BACKGROUND READINGS
				STIFF DARK GRAY MEDIUM SAND, SOME SILT, TR. GRAVEL	SM		

NOTES:

DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS
RIG - CYCLONE 42

SAMPLES TAKEN WITH STANDARD SPLIT SPOON SAMPLER - 2.0" OD.

FERNALD RI/FS

REVIEWED BY QA DATE AUG 09 1991

5709

	Initial	Date
1st Key In		
2nd Key In		8/15/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2266	COORDINATES: see p1	DATE: 8-26-87
ELEVATION: See p1	GWL: Depth – Date/Time	DATE STARTED: 8-25-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 8-31-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 5

DEPTH (6")	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.5	7010	3 6 7	9"	STIFF GRAY CLAY, SOME SILT, TRACE SAND AND GRAVEL.	CL		SAMPLE SCANNED – BACKGROUND READINGS.
18.0	7011	5 7 8	13"				SAMPLE SCANNED – BACKGROUND READINGS
19.5	7012	4 5 9	9"	STIFF GRAY SILT, SOME CLAY, TRACE GRAVEL	ML		SAMPLE SCANNED BACKGROUND READINGS
21.0	7013 7014	11 13 22	15"	HARD GRAY & CLAY AND SILT, TRACE GRAVEL.	CL		SAMPLE SCANNED BACKGROUND READINGS
22.5	7015	8 12 20	13"	HARD GRAY SILTY CLAY, TRACE GRAVEL AND SAND.	CL		SAMPLE SCANNED, BACKGROUND READINGS
24.0	7016 7017	20 15 25	12"				8-27-87 8:00 SAMPLE SCANNED- BACKGROUND READINGS
25.5	7018	9 19 26	13"				SAMPLE SCANNED – BACKGROUND READINGS
27.0	7019	5 26 REF. 50	10"				SAMPLE SCANNED- BACKGROUND READINGS
28.5	7020 7021	7 10 50	16"				SAMPLE SCANNED- BACKGROUND READINGS
30.0	7022 7023	17 27 40	14"				SAMPLE SCANNED- BACKGROUND READINGS.

NOTES:

DRILLER – HARRY DYKES
ASSISTANT – TIM HARRIS
RIG – CYCLONE 42

SAMPLES TAKEN WITH STANDARD SPLIT SPOON SAMPLER – 2.0" OD

000743

402-11-86

FERNALD RI/FS REVIEWED BY K6 DATE AUG 05 1991

1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~266~~ 2066 BB	COORDINATES: See p1	DATE: 8-27-87
ELEVATION: See p1	GWL: Depth 19.5' Date/Time 8-28-87 8:00	DATE STARTED: 8-25-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 8-31-87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31.5	7024	13 17 37	13	HARD GRAY CLAY, SOME SILT AND GRAVEL, TRACE ~~FE~~ SAND.	CL		SAMPLE SCANNED - BACKGROUND READINGS.
				HARD GRAY SILTY CLAY, TRACE GRAVEL AND SAND.	CL		
33.0	7025	5 7 10	10	VERY STIFF GRAY SILTY CLAY, TRACE SAND AND GRAVEL.	CL		SAMPLE SCANNED - BACKGROUND READINGS
34.5	7026	13 16 40	16	VERY DENSE STRONG BROWN SAND, TRACE GRAVEL AND SILT.	SP		SAMPLE SCANNED - BACKGROUND READINGS.
36.6	7027	14 51 REF 20	12	VERY DENSE STRONG BROWN SAND, TRACE GRAVEL.	SP		8-28-87 8:00 SAMPLE SCANNED - BACKGROUND READINGS
40.0							
41.5	7028	30 50 REF	9"	VERY DENSE STRONG BROWN SANDY GRAVEL, TRACE CLAY.	GP		SAMPLE SCANNED, BACKGROUND READINGS
45.0				HARD GRAY SILT, TRACE CLAY AND SAND.	ML		

NOTES:

DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS
R/6 - CYCLONE 42

SAMPLES TAKEN WITH STANDARD SPLIT SPOON SAMPLER - 2.0" O.D.

000744

402-11-86

FERNALD RI/FS REVIEWED BY QA LC DATE AUG 09 1991 5709

	Initial	Date
1st Key In		
2nd Key In		8/15/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~2660~~ 2066 BB 1-5-59	COORDINATES: See pl	DATE: 8-31-87	
ELEVATION: See pl	GWL: Depth 39.45 Date/Time 8:10 8-31-87	DATE STARTED: 8-25-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time 13:00 8-31-87	DATE COMPLETED: 8-31-87	
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46.5	7029	18 25 17	17	HARD GRAY SILT, TRACE CLAY AND SAND, LENS GRAY CLAY.	ML		8-31-87 8:10 SAMPLES SCANNED - BACKGROUND READINGS.
50.0							ADDED ~15 GAL. OF WATER TO HOLE.
51.5	7030	4 20 18	16	HARD GRAY CLAY, TRACE SILT	CL		SAMPLE SCANNED - BACKGROUND READINGS IN WATER ?.
				HARD GRAY SILT, SOME SAND, TRACE CLAY.	ML		
55.0							
56.5	7031 7032		18"	VERY STIFF GRAY SILT, SOME SAND, TRACE CLAY.	ML		SAMPLE SCANNED - BACKGROUND READINGS.
				VERY STIFF GRAY CLAY, SOME SAND, TRACE SILT.	CH		
				MEDIUM DENSE ~~SOFT~~ GRAY ~~SAND~~, TRACE CLAY, SOME SILT.	SM		WET SAND
60.0							

NOTES:

DRILLER - HARRY DYKES

ASSISTANT - TIM HARRIS

RIG - CYCLONE 42

SAMPLES TAKEN WITH STANDARD SPLIT SPOON SAMPLER - 2.0" O.D.

000745

402-11-86

White correction was made by D. Oakley at the time this form was completed. WPK 4/24/88

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE 2/4/10 AUG 09 1991

	Initial	Date
1st Key In		
2nd Key In	[illegible]	8/15/26
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~2066~~ 2066 BB 1-5-89	COORDINATES: See pl	DATE: 8-31-87	
ELEVATION: See pl	GWL: Depth 52.5 Date/Time 8/31/87 14:25	DATE STARTED: 8-25-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth 51.65 Date/Time 8/31/87 14:45	DATE COMPLETED: 8-31-87	
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	7033	6	18	MEDIUM DENSE GRAY SAND, SOME SILT, TRACE CLAY			
	7034	6					
61.5		10		VERY STIFF GRAY CLAY, TRACE SAND AND SILT.			
62.0							
63.0				63.0' TD			NEW TD 9-9-87

NOTES:

DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS
RIG - CYCLONE 42

000746

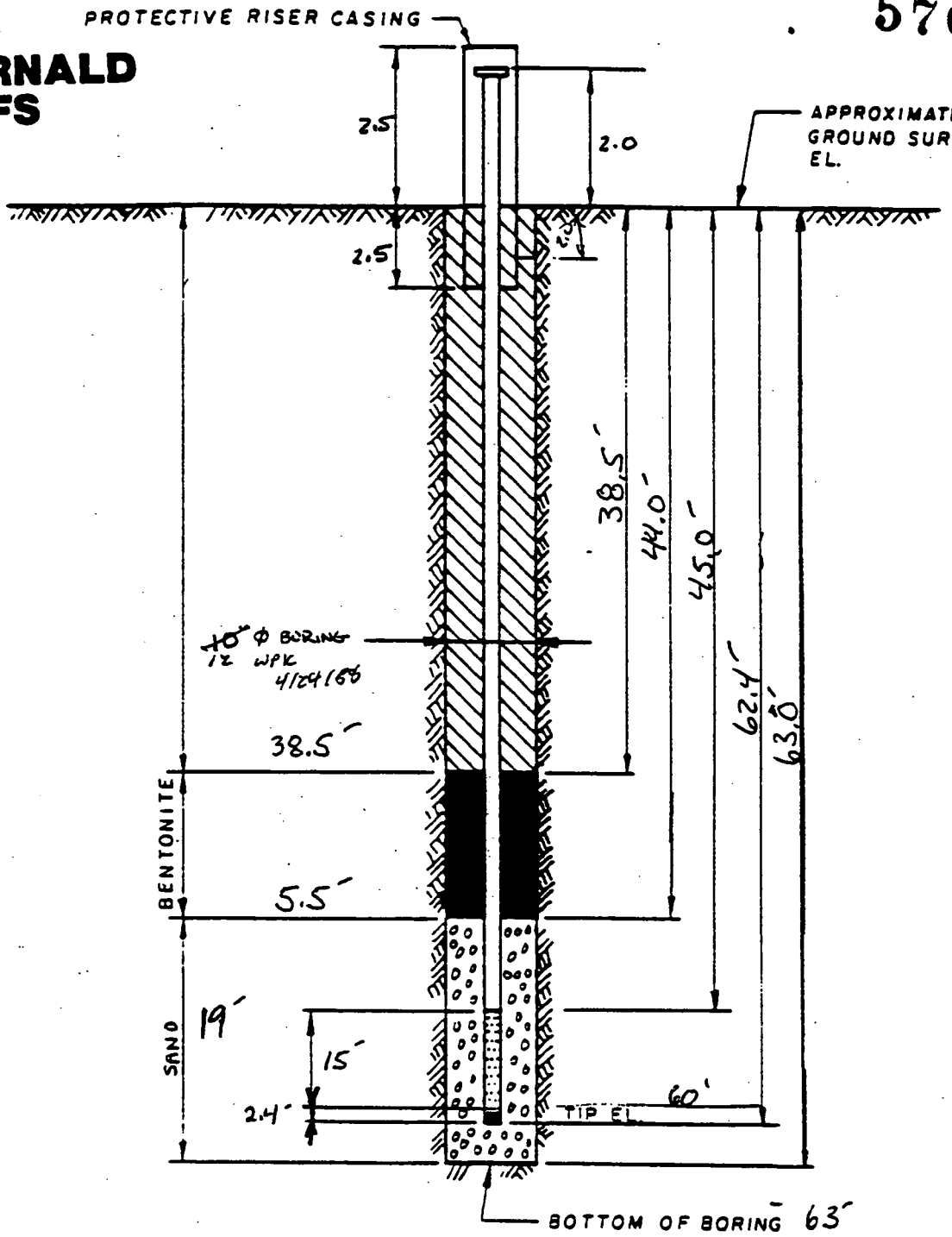
SPLIT SPOON SAMPLES TAKEN WITH STANDARD TUBE - 2.0" OD

REVIEWED BY QA KG DATE AUG 09 1989 DLG 8/4/89

WELL #~~266~~ 2066 BB

5704

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~266~~ 2066 BB
PREPARED FOR 1-5-89
FMPC RI/FS

while out correction was made by D Dudley at the time this form was completed.
WPK 4/24/86

DRAWING NUMBER
CHECKED BY
APPROVED BY
D130
DRAWN BY

000747

FERNALD RI/FS

DIG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

REVIEWED BY QA DATE AUG 0 0 1989

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 9-23-87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~2066~~ 2066 BB 1-5-89
PIEZOMETER NO. ~~266~~ 2066 DATE OF INSTALLATION 8-31-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 5 TO 62'
FLUID ~~oil~~ FROM NA TO NA

TYPE OF BIT FLAT HEAD HAMMER
CASING SIZE (S) USED: TEMPORARY
SIZE 12" FROM 0 TO 60'
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE STAINLESS STEEL (316)
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .01 INCH
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15'

RISER PIPE MATERIAL STAINLESS STEEL (316)
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD AND COUPLE (FLUSH JOINT THREADED)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE ~~O.D.~~ 10 INCHES

OTHER PROTECTION LOCKABLE CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		580.2	
GROUND SURFACE	0.0		578.2	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		575.7	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (NOLCLAY)	TOP 2'	BOTTOM 38.5	TOP 576.2	BOTTOM 539.7
BENTONITE PELLETS	TOP 38.5	BOTTOM 44.0'	TOP 539.7	BOTTOM 534.2
SAND	TOP 44.0	BOTTOM 63'	TOP 534.2	BOTTOM 515.2
NO ~~GRAVEL~~ USED	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 45'	BOTTOM 60'	TOP 533.2	BOTTOM 518.2
PIEZOMETER TIP	62.4' (SILT TRAP)		515.8	
BOTTOM OF BOREHOLE	63'		515.2	
GWL AFTER INSTALLATION	39'		539.2	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS WELL TO BE DEVELOPED LATER.

0748 White out corrections were made by D. Oakley at the time this form was completed.

FERNALD RI/FS

REVIEWED BY QA 46 DATE AUG 16 1991 DLG 2/4/89

	Initial	Date
1st Key In		
2nd Key In		8/17/86
Final Verification		

PAC 5709

WPC 4/23/88 RIG # 2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 002	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~366~~ 3066 HB 1-5-89	COORDINATES: N 48 3951.29 E 1376706.27	DATE: 9-16-87
ELEVATION: 578.2	GWL: Depth ~ Date/Time NA	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth, NA Date/Time NA	DATE COMPLETED: 9-19-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
66.5				FOR DESCRIPTION OF SOILS FROM 0 – 62.0 ft SEE VISUAL CLASSIFICATION OF SOILS FROM WELL 266.			
63.5	ST 7041	NA	24	62.0			SHELBY TUBE.
65							
66.5	7035 7036	6 ~~[illegible]~~ 23 ~~[illegible]~~ 50	14	HARD, GRAY SILT, SOME CLAY, - MOIST	ML		SAMPLE SCANNED – BACKGROUND READINGS.
70				68.5			ADDED 20 GALLONS WATER.
71.5	7037 7038	15 25 40	18	HARD GRAY SILTY CLAY - DRY	CL	2.25 TONS/FT²	SAMPLE SCANNED – BACKGROUND READINGS

NOTES: SEE LOG FROM WELL # 266 FOR DESCRIPTION OF FIRST 62'.

RIG - CYCLONE 42

DRILLER - HARRY CYKES

ASSISTANT - TIM HARRIS

BACKGROUND READINGS

HNU - ZERO

ALPHA - 0 COUNTS/MIN.

BETA/GAMMA - 40-80 COUNTS/MIN.

000749

402-11-86

FERNALD RI/FS

REVIEWED BY QA DATE AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~366~~ 3066	COORDINATES: See pl	DATE: 9-16-87	
ELEVATION: See pl	GWL: Depth – Date/Time –	DATE STARTED: 9-14-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth – Date/Time –	DATE COMPLETED: 9-19-87	
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 7	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
70.5	7039 7040	8 15 19	16	HARD GRAY SILTY CLAY-MOIST	CL	1.5	SAMPLE SCANNED - BACKGROUND READINGS.
80				79.5			ADDED 25 GALLONS WATER.
81.5	7042 7043	11 22 31	18	HARD GRAY CLAY, TRACE SILT, - DRY	CL	3.0	SAMPLE SCANNED - BACKGROUND READINGS.
85				84.0			
87.5							
89	7044 7045	6 15 14	18	MEDIUM DENSE GRAY FINE SAND - WET 88.5	SP	.20	SAMPLE SCANNED - BACKGROUND READINGS.
				GRAY CLAY, SOME SAND, TRACE SILT 89.3	CL		

NOTES: SEE LOG FROM WELL #266 FOR DESCRIPTION OF FIRST 62'.

RIG - CYCLONE 42
DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS

BACKGROUND READINGS

HNU - 2 E120
ALPHA - 0 COUNTS/MIN.
BETA/GAMMA - 40-80 COUNTS/MIN.

000750

402-11-86

FERNALD RI/FS

DLG 2/4/87 5709

	Initial	Date
1st Key In		
2nd Key In		8/5/87
Hard Copy Verification		

PAC

REVIEWED BY DATE AUG 1 6

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 3/60 3066 BB 1-5-88	COORDINATES: See pl	DATE: 9-17-87	
ELEVATION: See pl	GWL: Depth ✓ Date/Time ✓	DATE STARTED: 9-14-87	
ENGINEER/GEOLOGIST: D. OATLEY	Depth ✓ Date/Time	DATE COMPLETED: 9-19-87	
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 7	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS 7:30 9-17-87
91.5	7046 7047	7 9 11	18	MEDIUM DENSE DARK GRAY FINE GRAINED SAND, TRACE CLAY AND SILT - WET. 91.4	SP	.20	SAMPLE SCANNED - BACKGROUND READINGS.
				GRAY CLAY, TRACE SAND AND SILT 92	CL		ADDED 25 GALLONS WATER.
95				DARK GRAY FINE GRAINE SAND. 94.5	SP		
96.5	7048	30 50REF	8	~~DRY~~ HARD GRAY CLAY, SOME SILT, TRACE SAND - DRY	CL	2.5	SAMPLE SCANNED - BACKGROUND READINGS.
100				99			ADDED 20 GALLONS WATER.
101.5	7049	9 14 25	13	HARD GRAY SILT, SOME CLAY, TRACE SAND - DRY	ML	.75	SAMPLE SCANNED - BACKGROUND READINGS
							ADDED 20 GALLONS WATER.

NOTES: SEE LOG FROM WELL #266 FOR FIRST 62'.

RIG - CYCLONE 42

DRILLER - HARRY DYKES

ASSISTANT - TIM HARRIS

BACKGROUND READINGS

HNU - @ ZERO

ALPHA - 0 COUNTS/MIN

BETA/GAMMA - 40-80 COUNTS/MIN.

000751

402-11-86

FERNALD RI/FS

REVIEWED BY GA — AUG 10 1991

	Initial	Date
1st Key In		
2nd Key In		7/15/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 366 3066	COORDINATES: See pl	DATE: 9-17-87	
ELEVATION: See pl	GWL: Depth – Date/Time –	DATE STARTED: 9-14-87	
ENGINEER/GEOLOGIST: D. OAHLEY	Depth – Date/Time –	DATE COMPLETED: 9-19-87	
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 7	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106.5	7050 7051	27 50 REF. 50	16	HARD GRAY SILTY CLAY, TRACE SAND - DRY	CL	3	SAMPLE SCANNED - BACKGROUND READINGS
110							ADDED 25 GALLONS WATER.
111.5	7052 7053	11 24 43	18	HARD DRY SILTY CLAY	CL	2.5	SAMPLE SCANNED - BACKGROUND READINGS.
113.5	ST 7054	NA	23				SHELBY TUBE
115							ADDED 20 GALLONS WATER.
116.5	7055	11 16 23	12	HARD GRAY SILTY CLAY - DRY	CL	2.5	SAMPLE SCANNED - BACKGROUND READINGS
							7:30 9-18-87

NOTES: SEE LOG FROM WELL #266 FOR FIRST 62'.

RIG - CYCLONE 42
DRILLER - HARRY DYNES
ASSISTANT - TIM HARRIS

000752

BACKGROUND READINGS
HNU - ZERO
ALPHA - 0 COUNTS/MIN.
BETA/GAMMA - 40-80 COUNTS/MIN.

FERNALD RI/FS

REVIEWED BY QA [signature] DATE AUG 1 5 1991

DLG 2/4/91 5709

	Initial	Date
1st Key In		
2nd Key In	FR	2/15/88
Hard Copy Verification		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 366 3066 BB 1-549	COORDINATES: See pl	DATE: 9-18-87	
ELEVATION: See pl	GWL: Depth 15 Date/Time /	DATE STARTED: 9-14-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth / Date/Time /	DATE COMPLETED: 9-19-87	
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 7	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				HARD GRAY CLAY, TRACE SILT - MOIST	CL	2.0	SAMPLE SCANNED - BACKGROUND READINGS
	7056	12	18	DENSE GRAY SAND, SOME CLAY - MOIST	SP	1.0	
	7057	16 21		DENSE DARK GRAY SAND, SOME CLAY, TRACE GRAVEL - MOIST	SW	0.5	
121.5							
125							
	7058	16	18	VERY DENSE GRAY SAND, TRACE GRAVEL, TRACE CLAY - WET, MEDIUM GRAIN SIZE.	SW	0.2	SAMPLE SCANNED - BACKGROUND READINGS
126.5	7059	25 50					WELL MAKING LARGE AMOUNTS OF WATER - 55' WATER IN CASING.
130							
	7060	17	18	VERY DENSE GRAY COARSE SAND, SOME GRAVEL - WET	SW	0.3	SAMPLE SCANNED - BACKGROUND READINGS
131.5	7061	38 46					ADDED 25 GALLONS WATER.

NOTES: SEE LOG FROM WELL # 266 FOR FIRST 62'.

RIG - CYCLONE 42
DRILLER - HARRY DYKES
ASSISTANT - TIM HARRIS
SCREEN SET FROM 125-135'.

BACKGROUND
HNU - ZERO
ALPHA - 0 COUNTS/MIN.
BETA/GAMMA - 40-80 COUNTS/MIN.

000753

402-11-86

FERNALD RI/FS

REVIEWED BY QA DATE AUG 1 9 199

DLG 2/4/94

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~366~~ 3066 BB 1-5-89	COORDINATES:	DATE: 9-18-87	
ELEVATION:	GWL: Depth / Date/Time /	DATE STARTED: 9-14-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth / Date/Time /	DATE COMPLETED: 9-19-87	
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 7	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136.5	7062	11 17 31	8	VERY DENSE GRAY SAND - WET MEDIUM GRAIN SIZE	SP	0.2	FIRST SPLIT SPOON EMPTY - PUT IN TRAP. SAMPLE SCANNED - BACKGROUND READINGS.
140				139			
141.5	7063 7064	9 18 19	18	HARD ~~GRAY~~ DARK GRAY SANDY CLAY, TRACE SILT - MOIST	CL	1.0	SAMPLE SCANNED BACKGROUND READINGS
145							
146.5	—	17 50 50	0				~~AS~~ TWO ATTEMPTED SPLIT SPOONS WERE EMPTY.
148							
149.5	7065 7066	21 31 35	15	GRAY SANDY CLAY - MOIST 148.5 HARD, GRAY CLAY, SOME SILT - MOIST	CL	.75	SAMPLE SCANNED - BACKGROUND READINGS

NOTES: SEE LOG FROM WELL #266 FOR FIRST 62'.

RIG - CYCLONE 42

DRILLER - HARRY DYKES

ASSISTANT - TIM HARRIS

000754

BACKGROUND

HNU - ZERO

ALPHA - 0 COUNTS/MIN.

BETA/GAMMA - 40-80 COUNTS/MIN.

5709

FERNALD RI/FS

write out correction was made by D. Oakley at the time this form was completed

REVIEWED BY QA [illegible] DATE AUG 4 1990

	Initial	Date
1st Key In		
2nd Key In	[illegible]	8/15/89
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 3066 3066 BB 1-5-89	COORDINATES: Seep	DATE: 9-19-87
ELEVATION: Seep	GWL: Depth Date/Time	DATE STARTED: 9-14-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 9-19-87
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
150							
152	ST-7067	NA	20	HARD, GRAY SILTY CLAY, MOIST. SAMPLE TD 152 ft.			SHELBY TUBE Description based on previous sample and classification of soils observed at ends of tube

NOTES: SEE LOG FROM WELL #266 FOR FIRST 62'.

RIG - CYCLONE 42

DRILLER - HARRY DYKES

ASSISTANT - TIM HARRIS

~~BACKGROUND~~

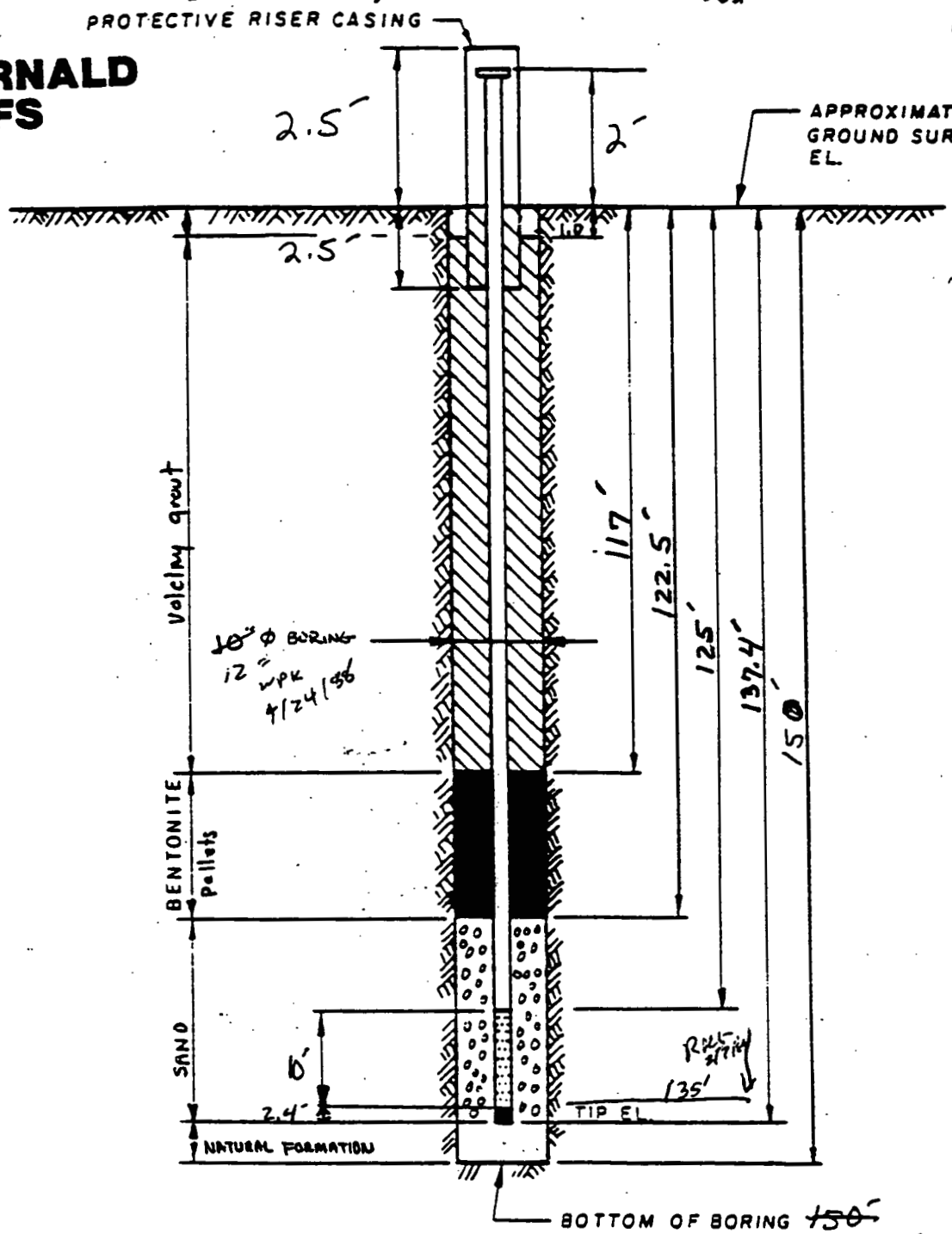
HOLE TD 150' - SHELBY TAKEN FROM 150 TO 152' - APPARENTLY IN SILTAND CLAY.

000755

402-11-86

REVIEWED BY QA DATE: AUG 16 1991 DLG 2/4/89 WELL # ~~366~~ 3066 BB 1-5-89

FERNALD RI/FS



DRAWN BY	DBO	CHECKED BY / APPROVED BY	DRAWING NUMBER

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~366~~ 3066 BB 1-5-89

PREPARED FOR

FMPC RI/FS

000756

FERNALD RI/FS

5709

AUG 16 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602
BORING NO. ~~366~~ 3066 DB 1-5-89
PIEZOMETER NO. ~~366~~ 3066

FIELD ENG./GEO. D. OAKLEY DATE 9-22-87
CHECKED BY R Galbraith DATE 2/7/89
DATE OF INSTALLATION 9-22-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 5' TO ~~145~~ 132'
FLUID — FROM — TO —

TYPE OF BIT FLAT HEAD HAMMER
CASING SIZE (S) USED: TEMPORARY
SIZE 10" FROM 0 TO 150'
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE 316 STAINLESS STEEL MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 inch
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15'

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD ~~AND COUPLE~~ RWF 2/7/
(FLUSH JOINT THREADED)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 INCHES

OTHER PROTECTION LOCKABLE CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		580.2	
GROUND SURFACE	0.0		578.2	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		575.7	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY VOLCLAY	TOP 1'	BOTTOM 117'	TOP 577.2	BOTTOM 461.2
BENTONITE PELLETS	TOP 117'	BOTTOM 122.5'	TOP 461.2	BOTTOM 455.7
SAND	TOP 122.5'	BOTTOM 137.4'	TOP 455.7	BOTTOM 440.8
FORMATION	TOP 137.4'	BOTTOM 152	TOP 440.8	BOTTOM 419.2
PERFORATED SECTION	TOP 125'	BOTTOM 135'	TOP 453.2	BOTTOM 443.2
PIEZOMETER TIP	137.4		440.8	
BOTTOM OF BOREHOLE	152'		426.2	
GWL AFTER INSTALLATION	NA		NA	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

000757

REMARKS SHELBY TUBE TAKEN FROM 150' - 152'

WELL TO BE DEVELOPED LATER.

while corrections were made by D. Oakley at the time this form was completed.
2/7/89 RWF

2067

DATE BEGAN: 3-12-86
DATE FINISHED: 3-14-86
GROUND SURFACE EL.: 593.2

BORING NO. IT-2

N 479,761 E 1,382,997

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		S 1		LOOSE BROWN AND GRAY COARSE SAND AND FINE GRAVEL, SOME SILT, SOME ORGANIC MATERIAL, WET 0.3'	sp/gp		
590.0		S 2			cl		
	5.0	S 3		STIFF ORANGE-BROWN AND GRAY SILTY CLAY TO CLAY, SOME SILT, TRACE MEDIUM SAND, MOIST 2.0'	cl		WATER TRICKLING INTO HOLE AT 6.5'. (VISIBLE AFTER AUGER REMOVAL)
				STIFF ORANGE-BROWN AND GRAY CLAY, TRACE SILT, TRACE MEDIUM SAND, MOIST 3.5'			
	10.0	S 4		MEDIUM STIFF ORANGE-BROWN AND GRAY CLAY, TRACE SILT, SOME COARSE SAND AND FINE GRAVEL, WET ~7.0'	cl gc		
580.0				STIFF BROWN CLAY, TRACE SILT, TRACE COARSE SAND AND FINE GRAVEL, MOIST 9.3'			
	15.0	S 5		DENSE GRAY CLAYEY FINE TO COARSE GRAVEL, TRACE FINE TO COARSE SAND, MOIST 13.0'	cl		
	20.0	S 6		STIFF GRAY CLAY, TRACE COARSE SAND AND FINE GRAVEL, MOIST TO WET ~17.0'	cl	74/0.8'	
570.0	25.0	S 7		MEDIUN STIFF GRAY CLAY, TRACE FINE TO COARSE SAND AND FINE GRAVEL, WET	cl		
	30.0	S 8			cl		
				32.5'			
560.0	35.0	S 9		VERY DENSE LIGHT BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, MOIST ~37.0'	sp		
	40.0	S-10			sw	78/0.7'	
550.0	45.0			VERY DENSE LIGHT BROWN FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE SILT, MOIST BECOMES MOIST TO WET AT 48.5'			
	50.0	S 11					

PROJECT NO. 303063

000758

BORING NO. IT- 2
SHEET 1 OF 3

DATE BEGAN: 3-12-86
DATE FINISHED: 3-14-86
GROUND SURFACE EL.: 593.2

BORING NO. IT-2

N 479,761 E 1,382,997

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
540.0	55.0			VERY DENSE LIGHT BROWN FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE SILT, MOIST TO WET			
				59.1'	sw		
	60.0	S 12		DENSE GRAY FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE FINE GRAVEL, DRY TO MOIST	sp		
				62.0'			
530.0	65.0	S 13			sw/gp	80	
	70.0			VERY DENSE LIGHT BROWN FINE TO COARSE SAND AND FINE GRAVEL, TRACE TO SOME MEDIUM TO COARSE GRAVEL, TRACE SILT, WET			
3-14-86							
520.0	75.0	S 14			sw/gp	97/0.5'	
				~79.0'			
	80.0			VERY DENSE GRAY FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE FINE TO COARSE GRAVEL			
510.0	85.0	S 15		GRADES TO ~84.5'	sp / sw/gp		
	90.0			VERY DENSE GRAY FINE TO COARSE SAND AND GRAVEL, TRACE MEDIUM TO COARSE GRAVEL, WET			
500.0	95.0	S 16			sw/gp		
	100.0	S 17			sw/gp	84	

000759

PROJECT NO. 303063

BORING NO. IT- 2
SHEET 2 OF 3

DATE BEGAN: 3-12-86
TE FINISHED: 3-14-86
GROUND SURFACE EL.: 593.2

BORING NO. IT-2

N 479,761 E 1,382,997

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
490.0 / 489.7	103.5			VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, TRACE MEDIUM TO COARSE GRAVEL, TRACE SILT, WET			
				BOTTOM OF BORING 103.5'			

000760

PROJECT NO. 303063

BORING NO. IT- 2
SHEET 3 OF 3

QC/DH/2.4.89

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In		
Copy Verification		

32

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B36T~~ B3067BB	COORDINATES: N 479760.13 E 1382988.18	DATE: Nov 21, 1987
ELEVATION: 595.15 top 1-5-89	GWL: Depth — Date/Time —	DATE STARTED: Nov 20, 1987
ENGINEER/GEOLOGIST: Lowell Willo	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable tool		PAGE 1 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 Ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	11-20 1330 7427	8 14 18	13	Soft black 7½YR 3/0 sandy clay some silt, organic plant matter - moist ½	OH	NA	HNU = 0 ppm
				rock - slag 1	NA	NA	γβ = 60 cpm
				Fill: (hard yellowish brown silty clay, trace sand and gravel slag - dry 1½	NA	>5	α = 2 cpm
2	11-20 1335 7428	16 10 10	12	Fill: (hard yellowish brown 10YR 5/4 silty clay some sand and gravel slag - dry	NA	>5	HNU = 0 ppm γβ = 60 cpm α = 2 cpm
3 4	11-20 1340 7429	9 10 11	10	Fill - (hard yellowish brown 10YR 5/4 mottled gray 10YR 5/1 and brownish yellow 10YR 6/8 silty clay some sand and gravel slag - dry 4.6	NA NA	>5	HNU = 0 ppm γβ = 80 cpm α = 20 cpm
5	11-20 1345 7430	10 10 12	11	hard yellowish brown 10YR 5/6 mottled gray 10YR 5/1 and red(?) silty clay some sand and gravel - dry	CL	>5	HNU = 0 ppm γβ = 70 cpm α = 20 cpm
6 7	11-20 1350 7431	8 10 12	10	hard yellowish brown 10YR 5/6 mottled dark gray 10YR 4/1 silty clay some sand trace gravel and pebbles - dry	CL	>5	HNU = 0 ppm γβ = 60 cpm α = 20 cpm
8	11-20 1645 7432	4 9 20	11	hard yellowish brown 10YR 5/6 mottled gray 10YR 5/1 silty clay some sand trace gravel - dry 8½	CL	>5	HNU = 0 ppm γβ = 70 cpm α = 20 cpm
9				hard yellowish brown 10YR 5/6 gravelly clay some silt and sand - dry 9	CL		
10	11-20 1700 7433	6 15 21	11	hard yellowish brown 10YR 5/4 gravelly clay, some silt and sand, trace pebbles - dry	CL	>5	HNU = 0 ppm γβ = 60 cpm α = 20 cpm
11 12	NS	NA	NA	11.5		NA	0935 pushed Shelby tube - No return 1.2 ft
13	11-21 1015 7434	8 10 16	12	hard gray 10YR 5/1 gravelly clay some silt and sand, trace pebbles - dry	CL	>5	HNU = 0 ppm γβ = 60 cpm α = 2 cpm
14	11-21 1040 7435	8 13 22	12	hard gray 10YR 5/1 gravelly clay some silt and sand - dry	CL	>5	HNU = 0 ppm γβ = 70 cpm α = 2 cpm

NOTES:
Pennsylvania Drilling Co
Bucyrus Erie 24-W drilling rig
Driller Dave Neuman
Helper Bob Johnson
Blows on sampler follow ASTM standard for 2 in by 18 in split spoon sampler
Soil color description follow Munsell color charts

Background Nov 20, 1987
HNU = 0 ppm
γβ = 60 cpm
α = 2 cpm

000761

402-11-86

QC/DH/24.89

	Initial	Date
1st Review		
2nd Review		8/16/89
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B 367~~ B3067 BG 1-5-88	COORDINATES: see pl	DATE: Nov 21, 1987
ELEVATION: see pl	GWL: Depth — Date/Time —	DATE STARTED: Nov 20, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable Tool		PAGE 2 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (density and consistency based on relative soil texture)
16	11-21 1100 7436	2 10 13	3	hard gray 10YR 6/1 gravelly clay, some silt, sand, trace pebbles - dry	cl	UNKOWN	No return first try, second try got 3 inches HNU = 0 ppm γβ = 60 cpm α = 2 cpm
17 18	11-21 1120 7437	4 9 13	10	hard gray 10YR 6/1 silty clay, trace sand and gravel, dry	cl	4.5	HNU = 0 ppm γβ = 70 cpm α = 2 cpm
19	11-21 1140 7438	6 9 13	18	very stiff gray 10YR 5/1 silty clay, some sand, trace gravel, dry	cl	3.5	HNU = 0 ppm γβ = 60 cpm α = 2 cpm
20 21	NS	NA	NA			NA	HNU = 0 ppm γβ = 70 cpm α = 1 cpm Pushed shelby tube 1.3 feet got 0.2 return did not keep sample
22	11-21 1430 7439	3 6 10	11	very stiff gray 10YR 5/1 silty clay, some sand, trace gravel - dry	cl	3.5	HNU = 0 ppm γβ = 60 cpm α = 2 cpm
23 24	11-21 1450 7440	8 6 10	14	very stiff gray 10YR 6/1 gravelly clay some silt and sand - dry	cl	3.5	HNU = 0 ppm γβ = 80 cpm α = 3 cpm
25	11-21 1500 7441	3 5 7	14	very stiff gray 10YR 5/1 gravelly clay some silt, trace sand - dry	cl	3.2	HNU = 0 ppm γβ = 70 cpm α = 2 cpm
26 27	11-21 1515 7442	3 8 39	2	rock, very stiff gray 10YR 6/1 gravelly clay some silt and sand - dry	NA	NA	HNU = 0 ppm γβ = 80 cpm α = 2 cpm
28	11-21 1530 7443	13 13 17	12	hard gray 10YR 6/1 gravelly clay some sand, silt and pebbles, trace pebbles - dry	cl	<5	HNU = 0 ppm γβ = 60 cpm α = 1 cpm
29	11-21 1600 7444	7 10 28	12	very stiff gray 10YR 5/1 gravelly clay, some sand, silt and pebbles dry	cl	3.5	HNU = 0 ppm γβ = 60 cpm α = 0 cpm

NOTES:

000762

402-11-86

QC/DH/2.4.89

5709

	Initial	Date
1st Key In		
2nd Key In		8/22/88
Hard Copy Verification		

PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60232	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B367~~ B3067 BB 1-5-88	COORDINATES: see p1	DATE: Nov 22, 1987
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Nov 20, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable tool		PAGE 3 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ ft)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	11-22 730 7445	8 10 15	10	very stiff gray 10YR 5/1 gravelly clay some silt and sand, trace pebbles dry 31½	cl	3.5	HNU=0ppm βB=70cpm α=2cpm
32	11-22 810 7446	3 16 27	8	dense yellowish brown 10YR5/8 sand, some silt and clay, trace gravel - dry	sp	NA	HNU=0ppm βB=60cpm α=0cpm
33							
34	11-22 900 7447	8 12 13	12	dense brownish yellow 10YR5/6 sand some silt and clay, trace gravel dry	sp	NA	HNU=0ppm βB=60cpm α=0cpm
35							
36	11-22 920 7448	8 18 19	12	dense brownish yellow 10YR5/6 sand and fine gravel - some silt, trace clay and pebbles - dry	sp	NA	HNU=0ppm βB=60cpm α=0cpm
37							
38							
39							
40							
41	12-1 945 7449	32 38 50	18	dense yellowish brown 10YR6/8 sand and gravel, some silt and clay, dry	SM	NA	HNU=0ppm βB=800cpm α=2cpm
42							
43							
44							

NOTES:

000763

402-11-88

QC/ DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In	JDC	8/16/90
Hard Copy Verification		

PA

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 4 602.3 2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 3067	COORDINATES: see p1	DATE: 12/1/87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Nov 20, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 12/2/87
DRILLING METHODS: Cable tool		PAGE 4 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1½ ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	12-1 1340 7450	26 36 37	12	dense yellowish brown 10YR 6/8 sand and fine gravel, some silt, clay and med to coarse gravel, dry.	SM	NA	HNU = 0 ppm γB = 80 cpm α = 2 cpm
47							
48							
49							
50	12-1 1550 7451	20 23 30	8	med. dense, yellow brown 10YR 6/8 sand and gravel, some silt, clay and med. to coarse gravel, brown silty fine sand lens @ 50.5 ft., dry.	SM	NA	HNU = 0 ppm γB = 60 cpm α = 2 cpm
51							
52							
53							
54							
55	12-1 1630 7452	16 30 42	11	dense brown 10YR 6/4 sand and gravel, some silt, dry. 56.0	SM	NA	HNU = 0 ppm γB = 90 cpm α = 2 cpm
56				brown-gray 10YR 6/3 med. sand, some silt, clay, gravel, dry.	SM		
57							
58							
59							

NOTES:

000764

402-11-86

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verified		

FRAC

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.7	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B3367	COORDINATES: See p1	DATE: 12/2/87
ELEVATION: See p1	GWL: Depth – Date/Time –	DATE STARTED: 11/20/87
ENGINEER/GEOLOGIST: L. Wille/T. Sullivan	Depth – Date/Time –	DATE COMPLETED: 12/6/87
DRILLING METHODS:		PAGE 5 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	07453 12-2 0820	11 33 42	12	dense brown gray 10YR 5/4 sand with some gravel and pebbles, some silt and clay, dry.	SM	NA	HNU = 0ppm ßB = 80cpm α = 2 cpm
62							
63							
64							
65	07454 12-2 1130	75 for 6in.	6	very dense brown 10YR5/3 sand and gravel, some silt and clay, trace pebbles, dry.	SM	NA	HNU = 0ppm ßB = 60cpm α = 2 cpm
66							
67							
68							
69							
70	07700 12-2 1420	16 33 29	9	med. dense, brown-gray 10YR 5/3 sand and gravel, some pebbles, silt and clay, dry.	SM	NA	HNU = 0ppm ßB = 60cpm α = 2cpm
71							
72							
73							
74							
75							

NOTES:

000765

402-11-86

88/04/24-89

	Initial	Date
1st Key In		
2nd Key In		8/16/88
Hard Copy Verification		

PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B367~~ B3067 88-1649	COORDINATES: see p1	DATE: 12/2/87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 11/20/87
ENGINEER/GEOLOGIST: L. Wille/T. Sullivan	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS:		PAGE 6 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75	07701 12-2 1520	16 13 18	6	med. dense, dark brown gray 10YR 4/1 Sand with trace gravel, some silt, clay, moist.	SM	NA	HNU = 0ppm γB = 60cpm α = 2cpm
76							
77							
78							
79							
80	07762 12-2 1710	11 15 11	10	med dense, gray 10YR 4/1, sand and gravel, with some silt, pebbles, and clay, wet.	SM	NA	HNU = 0ppm γB = 60cpm α = 2cpm
81							
82							
83							
84				84.0 very dense gray 10YR 4/1 fine Sand, some silt and clay - wet	SW		
85	7703 12-3 1140	48 72	10	85.5 very dense gray 10YR 4/1 sand and gravel some silt and clay - wet	SM	NA	HNU = 0ppm γB = 80cpm α = 2cpm
86							
87							
88							
89							
90							

NOTES:

000766

402-11-88

QC/DH/5-4-89

FERNALD RI/FS

5709

	Initials	Date
1st Key In		
2nd Key In		8/16/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B367~~ B3067 BB 12-3-89	COORDINATES: see p1	DATE: 12-3-87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 11-20-87
ENGINEER/GEOLOGIST: L. Wille / T. Sullivan	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable Tool		PAGE 7 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	7707 12-3 1400	7 7 14	15	medium dense gray 10YR 4/1 sand with some gravel, silt and clay, some gravel lens with some silt, pebbles sand and clay @ 91 ft - wet	SM	NA	HNU = 0 ppm γB = 80 cpm α = 2 cpm
92							
93							
94							
95	7705 12-3 1620	32 63	18	very dense gray 10YR 4/1 sand with some silt, gravel and clay - wet	SM	NA	HNU = 0 ppm γB - 100 cpm α = 2 cpm
96							
97							
98							
99							
100	7706 12-4 0900	5 5 11	10	medium dense, gray 10YR 4/1 sand with some gravel, silt and clay - wet	SM	NA	HNU = 0 ppm γB = 80 cpm α = 2 cpm
101				101 medium dense gray 10YR 4/1 sandy gravel, some silt and clay, trace pebbles	gm		
102							
103							
104							

NOTES:

000767

402-11-86

QC/DH/24-89

1st Key In		
2nd Key In	BC	8/16/88
Hard Copy Verification		

PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B367 B3067 BB 1-5-89	COORDINATES: see p1	DATE: 12-4-87
ELEVATION: see p1	GWL: Depth 77.3 Date/Time 12/4 0800	DATE STARTED: 11-20-87
ENGINEER/GEOLOGIST: L. Wille / T. Sullivan	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable Tool		PAGE 8 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	7707 12-4 1315	20 50 35	13	very dense gray 10YR 4/1 sandy gravel with some silt and clay - wet	gm	NA	HNU = 0 ppm; γβ = 80 cpm; α = 2 cpm
107							
108							
109							
				109½			
110	7708 12-4 1415	4 5 16	11	loose gray 10YR 4/1 sand with some gravel and pebbles, some silt and clay, wet	sm	NA	HNU = 0 ppm; γβ = 80 cpm; α = 2 cpm; NO RETURN 1st Try, 11 in second try; blowcounts (first try)
111							
112							
113							
114							
115				115			
116	7709 12-4 1600	33 50 57	12	very dense gray 10YR 4/1 gravelly sand with some silt and clay - wet	gm	NA	HNU = 0 ppm; γβ = 80 cpm; α = 2 cpm
				115½ very dense gray 10YR 4/1 sand with some gravel, silt and clay - wet	gm		
117							
118							
119							

NOTES:

000768

402-11-86

FERNALD RI/FS

QC/04/24/89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B367~~ B3067 BB 1-5-89	COORDINATES: see p1	DATE: 12-5-87
ELEVATION: see p1	GWL: Depth 77.0 Date/Time 12/5 0740	DATE STARTED: 11/20/87
ENGINEER/GEOLOGIST: L. Willey/T. Sullivan	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable tool		PAGE 9 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1½ ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120	7710 12-5 0845	7 13 21	18	med. dense gray 10YR 4/1 sand with some silt, clay, gravel and pebbles, wet.	gm	NA	HNU=0 ppm γB = 100 cpm α = 2 cpm
121							
122							
123							
124							
125	7711 12-5 1500	17 56 66	7	very dense gray 10YR 4/1 sand and gravel, some silt, clay, and pebbles, wet.	gm	NA	HNU=0 ppm γB = 80 cpm α = 2 cpm
126							
127							
128							
129							
130	7712 12-5 1555	4 7 12	6	med. dense gray 10YR 4/1 sand and gravel, some pebbles, silt, and clay, wet.	gm	NA	HNU=0 ppm γB = 80 cpm α = 2 cpm
131							
132							
133							
134							
135							

NOTES:

000769

402-11-88

QC/DH/2-4-89

	Initials	Date
1st Key In		
2nd Key In	DC	8/16/89
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B367~~ B3067BB 1-5-89	COORDINATES: see pg	DATE: 12/5/87-12/6/87
ELEVATION: see pg	GWL: Depth 76.0 Date/Time 12/6 0735	DATE STARTED: 11/20/87
ENGINEER/GEOLOGIST: L. Wille/T. Sullivan	Depth 76.0 Date/Time 12/6 1010	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable tool		PAGE 10 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135							
136	7713 12-5 1710	7 6 9	2	loose, gray 10YR 4/1 sand and gravel, some pebbles, silt, and clay, wet.	gm	NA	HNU=0ppm γB=100cpm α=2 cpm
137							
138							
139							
140	7714 12-6 0930	11 9 10	3	loose gray 10YR 4/1 sand with some gravel, silt, and clay, some pebbles present, wet.	gm	NA	HNU=0 ppm γB=100 cpm α=2 cpm
141							
142				E.O.B. 141.5 ft.			

NOTES:

000770

402-11-86

This form did not represent the installed monitoring well, therefore, it has been modified with white out by L. Williams WPK 4/24/88

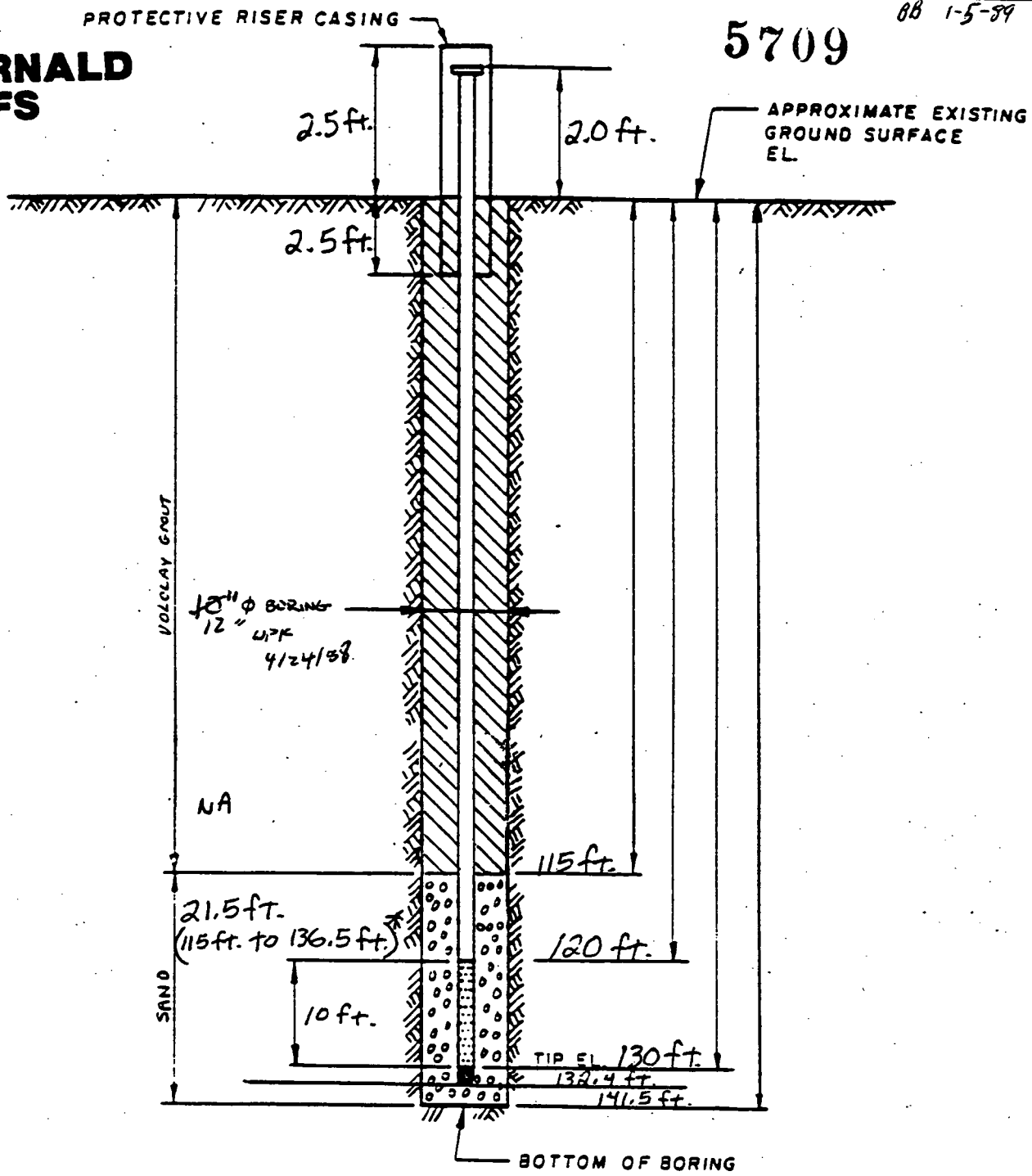
QC/DH/2.4.89

367 3067

BB 1-5-89

5709

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 75.75 ft. below ground surface
5. WATER LEVEL READING ON 12/10/87 0725 (77.75 ft. below T.O.C.)

INSTALLATION DETAILS
MONITORING WELL 367

PREPARED FOR 3067
BB 1-5-89

000771

*Bottom 5 ft. of hole caved in, sand is placed above 136.5 ft.

QC/DH/2.489

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. L. Wille/ T. Sullivan DATE 12/10/87
PROJECT NO. 602.3.2 CHECKED BY R Galbraith DATE 2/7/87
BORING NO. ~~B367~~ B3067 BB 1-5-89
PIEZOMETER NO. ~~367~~ 3067 DATE OF INSTALLATION 12/7-9/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT FLATHEAD HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM ____ TO ____	SIZE 10 FROM 0 TO 141.5'
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4 in.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft.
AVERAGE SIZE OF PERFORATIONS 0.010 in.	JOINING METHOD Screw thread flush
TOTAL PERFORATED AREA 3 in²/ft.	Joint Rubber 2/2/84

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE Ø.D. 10" (nom)	WITH LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0		595.15	
GROUND SURFACE	0.0		593.15	
BOTTOM OF PROTECTIVE PIPE	2.5		590.6	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 115	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 115	BOTTOM 136½	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 120	BOTTOM 130	TOP	BOTTOM
PIEZOMETER TIP	132.4			
BOTTOM OF BOREHOLE	141.5			
GWL AFTER INSTALLATION	75.9 0750 12/8/87	75.75 0725 12/10/87		

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Cave in from 136.5 to 141.5 4-2-91

000772

409-11-86

5709

FERNALD RI/FS

RECEIVED 6/23/89

REVIEWED BY QA DATE AUG 2 7 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 4067	COORDINATES: See pl	DATE: 1-5 Through 1-19-89	
ELEVATION: 593.0 GL estimate	GWL: Depth Date/Time	DATE STARTED: 1-5-89	
ENGINEER/GEOLOGIST: See Notes	Depth Date/Time	DATE COMPLETED: 1-19-89	
DRILLING METHODS: Cable Tool		PAGE 1 OF 3	

WAH 3-3-89

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
50, 100, 150, 200				See Visual Classification of Soils Log For Boring 4967 for sample description to 221.5 Ft.			
250				Bottom of Boring 4067 is 220.7 Ft.			

NOTES: Personnel involved in supervision of this boring: K. Hemlein, L. Adams, M. Sluzerski, S. Moore
This page was completed by W.A. Hertel on 2-08-89

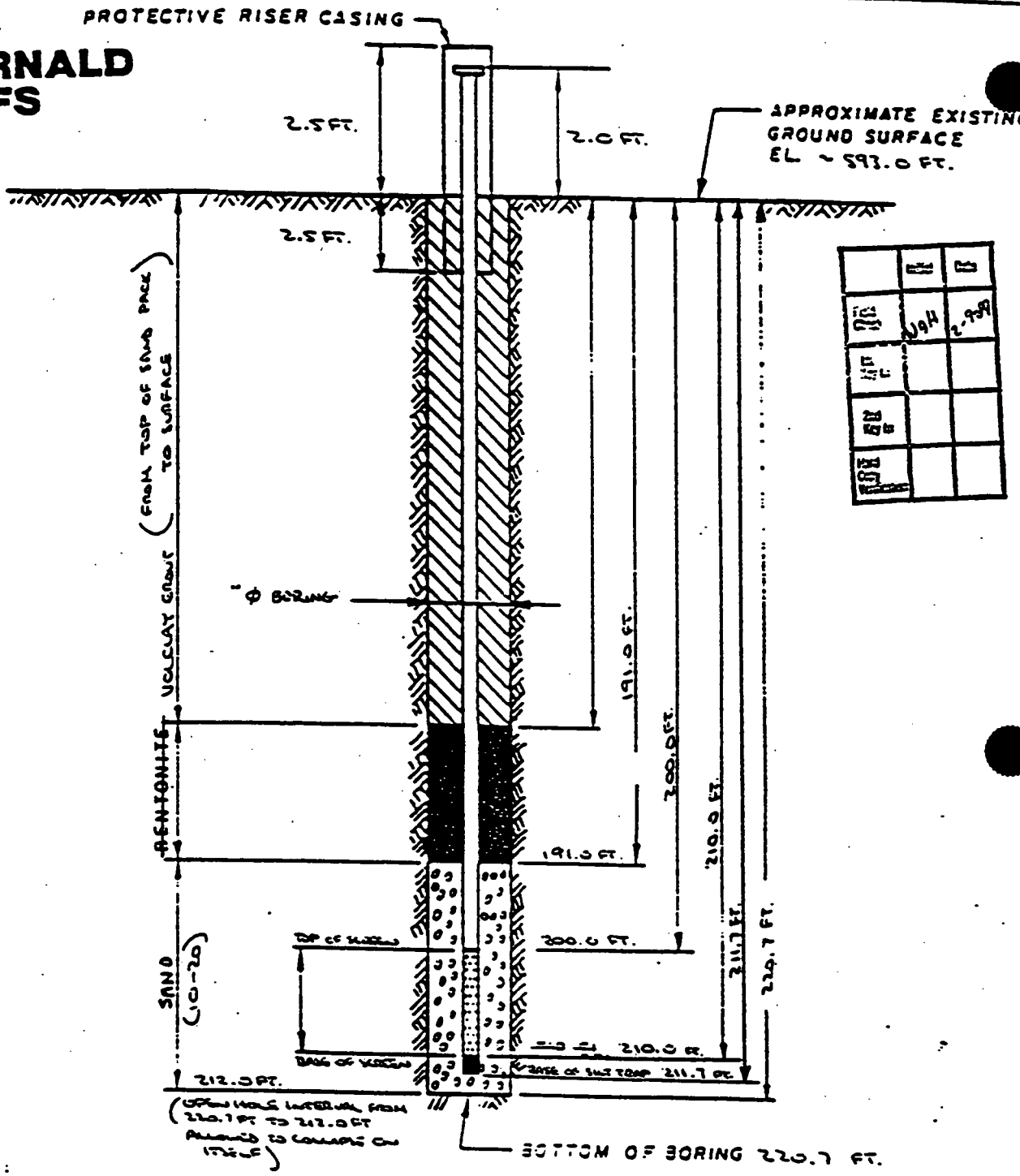
000773

402-11-6

REVIEWED BY C.A. DATE AUG 2 7 1991

BORING 4067

FERNALD RI/FS



DRAWN BY	HLS. 2-1-89	CHECKED BY	UAH	2-7-89	DRAWING NUMBER
		APPROVED BY			

	UAH	2-7-89

NOTES:

1. RISER PIPE IS 4.0 IN ID SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED DURING WELL INSTALLATION:

10-20 SAND : 7 - 80 LB SACKS

VOLCLAY GROUT : 66 - 50 LB SACKS

BENTONITE PELLETS : 6 BUCKETS

TOTAL WATER USED DURING DRILLING AND WELL INSTALLATION ACTIVITIES: 1920 GAL.

INSTALLATION DETAILS
MONITORING WELL 02-01-89

PREPARED FOR
BORING 4067

STAINLESS STEEL RISER PIPE: 1 - 2.0' SECTION
20 - 10.0' SECTIONS

STAINLESS STEEL WELL SCREEN : 1 - 10.0' SECTION

STAINLESS STEEL SILT TRAP : 1 - 1.7' SILT TRAP

000774

5709

FERNALD RI/FS

REVIEWED BY QA [signature] DATE AUG 27 1998

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602 3.2
BORING NO. 4067
PIEZOMETER NO. 4067

FIELD ENG./GEO. M. SLUSARSKI DATE 02-01-89
CHECKED BY [signature] DATE 2-9-89
DATE OF INSTALLATION 01-20-89 TO 01-26-89, 01-31
INSTALLATION COMPLETED 01-7

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT. TO 220.7 FT.
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10.0 IN ID FROM 0.0 FT TO 100.0 FT.
SIZE 8.0 IN ID FROM 0.0 FT. TO 220.0 FT

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN ~~[X]~~ WAH 2-9-89
AVERAGE SIZE OF PERFORATIONS .010 IN
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN.
LENGTH OF PIPE SECTIONS 1.7 FT/2.0 FT/10.0 FT.
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN

OTHER PROTECTION LOCKING CAP & LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0		591.0	
GROUND SURFACE	0.0		593.0	
BOTTOM OF PROTECTIVE PIPE	2.5		595.5	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0	BOTTOM 191.0	TOP 593.0	BOTTOM 402.0
BENTONITE	TOP —	BOTTOM —	TOP —	BOTTOM —
SAND (10-20)	TOP 191.0	BOTTOM 212.0	TOP 402.0	BOTTOM 381.0
GRAVEL None Used WAH 2-9-89	TOP —	BOTTOM —	TOP —	BOTTOM —
PERFORATED SECTION	TOP 200.0	BOTTOM 210.0	TOP 393.0	BOTTOM 383.0
PIEZOMETER TIP	211.7		381.3	
BOTTOM OF BOREHOLE	220.7		372.3	
GWL AFTER INSTALLATION	Not Checked WAH 2-9-89		—	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

000775

REMARKS OPEN HOLE INTERVAL FROM 220.7 FT TO 212.0 FT WAS ALLOWED TO COLLAPSE ON ITSELF. SIX (6) BUCKETS OF BENTONITE PELLETS WERE POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE.

268

DATE BEGAN: 3-15-86
DATE FINISHED: 3-16-86
ROUND SURFACE EL.: 577.9'

BORING NO. IT-1

N 478,683 E 1,381,391

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		S 1		SOFT BLACK ORGANIC SILTY CLAY, TRACE FINE TO COARSE SAND, WET 0.5'	d		
		S 2		MEDIUM STIFF GRAY AND ORANGE BROWN CLAYEY SILT, TRACE FINE TO COARSE SAND, ROOTS, MOIST 3.5'	ml/cl		
	5.0	S 3		STIFF GRAY AND BROWN VARVED SILTY CLAY, MOIST 8.0'	cl/ml		3.5' TO 8.0': GRAY AND BROWN VARVES PREDOMINATELY MORE BROWN WITH DEPTH.
570.0							
	10.0	S 4		LOOSE BROWN CLAYEY-SILTY FINE TO COARSE SAND AND FINE GRAVEL, WET 8.7'	gm/gc cl/gc		PERCHED WATER ZONE FROM 8.0' TO 8.7'.
				STIFF BROWN CLAY, SOME SILT, SOME FINE TO COARSE SAND AND FINE GRAVEL, MOIST 9.5'	cl		
	15.0	S 5		MEDIUM STIFF GRAY CLAY, TRACE FINE TO COARSE SAND, MOIST ~12.0'	cl		
560.0				STIFF GRAY CLAY, TRACE TO SOME FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST ~17.0'			
	20.0	S 6		STIFF GRAY CLAY, TRACE FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST 22.5'	cl		
	25.0	S 7		DENSE FINE GRAY SAND, SOME MEDIUM TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, DRY TO MOIST ~27.0'	sp		
550.0							
	30.0	S 8		DENSE GRAY FINE SAND, SOME MEDIUM TO COARSE SAND AND FINE TO COARSE GRAVEL, DRY TO MOIST ~34.0	sp		
	35.0			DENSE GRAY FINE SAND, TRACE MEDIUM TO COARSE SAND AND FINE GRAVEL, DRY TO MOIST 39.0'			
540.0							
	40.0	S 9		DENSE GRAY FINE SAND, TRACE MEDIUM TO COARSE SAND, DRY TO MOIST ~44.0'	sp sp		
	45.0			VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, DRY TO MOIST			
530.0		S-10			sw/sw	69/0.9'	
	50.0						

PROJECT NO. 303063

BORING NO. IT-1
SHEET 1 OF 2

000776

DATE BEGAN: 3-15-86
DATE FINISHED: 3-16-86
GROUND SURFACE EL.: 577.9'

BORING NO. IT-1

N 478,683 E 1,381,391

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
				VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, DRY TO MOIST ~54.0'			
3-19-86	55.0						
3-15-86 520.0							
	60.0	S 11		VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, WET	sw/gw		S-11: RETAINED FOR CHEMICAL ANALYSES.
	65.0						
510.0							
	70.0	S 12		69.3' DENSE GRAY FINE TO COARSE SAND, TRACE SILT, WET 69.8'	sw/gw sw sw/gw		
				VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, WET ~74.0'			
	75.0						
500.0							
	80.0	S 13		DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, WET	sw/gw		
	85.0	S 14			sw/gw		
491.4 489.4	88.5						
				BOTTOM OF BORING 88.5'			

000777

PROJECT NO. 303063

BORING NO. IT-1
SHEET 2 OF 2

Already have —

74

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B368	COORDINATES:	DATE: Jan 20, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 20, 1988
ENGINEER/GEOLOGIST: Lowell/Wilk	Depth Date/Time	DATE COMPLETED: Jan. 28, 1988
DRILLING METHODS: Cable Tool		PAGE 1 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ½ ft	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07764 945	1 6 6	11	soft black 7½YR 2/0 silty clay some sand-moist	ol	0.5	HNU=0ppm γβ=80cpm α=0cpm
				stiff yellowish brown 10YR 5/6 clay some silt, trace sand-moist		2.0	
2	07765 950	4 5 5	9	stiff brownish yellow 10YR 6/6 silty clay trace sand, caliche lens at 3.0 ft-moist		2.0	HNU=0ppm γβ=60cpm α=0cpm
3, 4	07766 955	3 3 4	11	stiff brownish yellow 10YR 6/6 clay trace sand and silt-moist		<1	HNU=0ppM γβ=80cpm α=0cpm
5, 6	07767 1000	6 6 8	12	stiff brownish yellow 10YR 6/6 silty clay trace sand-moist		1.5	HNU=0ppm γβ=60cpm α=0cpm
7	07768 1005	10 11 13	14	very stiff brownish yellow 10YR 6/6 silty clay, trace sand-moist	cl	2.5	HNU=0ppm γβ=60cpm α=0cpm
8, 9	07769 1125	7 10 25	15	very stiff brownish yellow 10YR 6/6 clay with trace silt and sand-moist 9.0		3.5	HNU=0ppm γβ=60cpm α=0ppm
10	07980 1155	6 12 12	11	very stiff gray 7½YR 5/0 clay trace sand and gravel-moist		3.5	HNU=0ppm γβ=60cpm α=0cpm
11	NO SAMPLE						Tried Shelby tube-No Return
12	07981 1430	4 7 5	6	stiff gray 7½YR 5/0 silty clay ~~with~~ some gravel and sand-moist	cl	1.25	HNU=0ppm γβ=40cpm α=0cpm
13	NO SAMPLE						Tried Shelby Tube No Return
14	07982 1515	8 9 15	9	very stiff gray 7½YR 5/0 clay some gravel and sand, trace pebbles-moist		3.5	HNU=0ppm γβ=60cpm α=0cpm

NOTES:

Pennsylvania Drilling Co.
Driller Don Neuman
Helper Bob Johnson

Background
HNU=0ppm
γβ=80cpm
α=2cpm

Blows on sampler follow ASTM for Standard penetration test for 2in diameter by 2 ft length standard split spoon
Soil color description follow Munsell color chart

water added to boring (5 gallon buckets) ΉΗ ΉΗ ΉΗ ΉΗ ΉΗ ΉΗ ΉΗ ΉΗ ΉΗ ΉΗ

000778

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B368	COORDINATES:	DATE: Jan 20, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 20, 1988
ENGINEER/GEOLOGIST: L. Wille/J. O'Connor	Depth Date/Time	DATE COMPLETED: Jan 28, 1988
DRILLING METHODS: Cable Tool		PAGE 2 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	7983 1530	5 11 16	14	~~gray~~ very stiff gray 7½YR 5/0 clay, some silt, gravel, trace sand - moist		4.5	HNU = 0ppm ∫β = 100cpm α = 2cpm
17 18	7984 1550	5 11 18	18	very stiff gray 7½YR 5/0 clay ~~trace~~ some gravel, trace silt and sand - moist	cl	4.0	HNU = 0ppm ∫β = 100cpm α = 2cpm
19	7985 1610	12 21 20	18	very stiff dark gray 7½YR 4/0 silty clay some sand and gravel - moist		3.0	HNU = 0ppm ∫β = 60cpm α = 0cpm
20 21	7986 820	5 6 10	11	stiff dark gray 7½YR 4/0 silty clay with some sand and gravel - moist	cl	1.5	HNU = 0ppm ∫β = 40 cpm α = 0 cpm
22	7987 845	3 16 40	15	very stiff gray 7½YR 5/0 silty clay some sand and trace gravel - moist 21½		2.0	HNU = 0ppm ∫β = 60 cpm α = 2 cpm
23 24	7988 930	34 37 32	12	loose gray 2½Y 5/0 silty sand trace gravel - dry dense gray 5Y 5/1 sand some gravel and silt, trace pebbles - moist	SM	NA	HNU = 0ppm ∫β 40 α = 0 cpm
25	7989 945	16 23 33	12	dense light gray olive gray 5Y 6/2 sand, some gravel trace silt - moist	SW	NA	HNU = 0ppm ∫β = 60 cpm α = 4 cpm
26							
27							
28							
29							

NOTES:

000779

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.32	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B368	COORDINATES:	DATE: Jan 21, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 20, 1988
ENGINEER/GEOLOGIST: L Wille/T O'Connor	Depth Date/Time	DATE COMPLETED: Jan 28, 1988
DRILLING METHODS: Cable Tool		PAGE 3 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ ft)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	7990 1405	8 16 16	9	dense gray 5Y 6/1 sand, some gravel trace silt and pebbles-dry	SP	NA	HNU=0ppm γB=60cpm α=20cpm
32							
33							
34							wood encountered while drilling 30-35 ft
35	7991 1550	8 45 50r	17	very dense gray 5Y 6/1 sand some gravel ~~trace~~ silt-dry	SP	NA	HNU=0ppm γB=80cpm α=0cpm
36							
37							
38							
39							
40	7992 1600	12 24 22	17	medium dense gray 5YR 6/1 medium to coarse sand, some coarse sand silt and clay - dry	SP SW	NA	HNU=0ppm γB=60cpm α=0cpm
41							
42							
43							
44							

NOTES:

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B368	COORDINATES:	DATE: Jan 21, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 20, 1988
ENGINEER/GEOLOGIST: L. Wille/J O'Connor	Depth Date/Time	DATE COMPLETED: Jan. 28, 1988
DRILLING METHODS: Cable tool		PAGE 4 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	7993 1645	27 25 35	14	very dense gray 5YR6/1 gravelly sand some pebbles, trace silt-dry	SM SP	NA	HNU=0ppm $\gamma\beta$=60cpm α=0cpm
47							
48							
49							
50	7994 950	30 28 23	14	very dense gray 7½YR 6/1 sand and gravel, some silt and clay dry	SM SP	NA	HNU=0ppm $\gamma\beta$=60cpm α=0cpm
51							
52							
53							
54							
55	7995 1155	9 24 50+	18	very dense gray 7½YR 6/1 sand and gravel, some silt and clay-dry	SM	NA	HNU=0ppm $\gamma\beta$=60cpm α=0cpm
56							
57							
58							
59							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.32	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 13368	COORDINATES:	DATE: Jan 22, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 20, 1988
ENGINEER/GEOLOGIST: L. Wittel/T. Okamoto	Depth Date/Time	DATE COMPLETED: Jan 28, 1988
DRILLING METHODS: Cable tool		PAGE 5 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	7996 1400	12 15 11	11	medium dense gray 10YR 5/1 gravelly coarse sand some pebbles, silt and fine to medium sand - wet	gm	NA	HNU = 0 ppm; γβ = 70 cpm; α = 0 cpm
62							
63							
64							
65	7997 1540	25 40 40	18	very dense gray 5Y 5/1 sandy gravel some pebbles and silt wet	gm	NA	HNU = 0 ppm; γβ = 80 cpm; α = 0 cpm
66							
67							
68							
69							
70	7998 1630	7 10 10	10	dense gray 5YR 5/1 sand and gravel some silt, clay and pebbles - wet	gm	NA	HNU = 0 ppm; γβ = 60 cpm; α = 0 cpm
71							
72							
73							
74							

NOTES:

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60232	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B358	COORDINATES:	DATE: Jan 23, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 20, 1988
ENGINEER/GEOLOGIST: L.Willey/J.O'Connor	Depth Date/Time	DATE COMPLETED: Jan 28, 1988
DRILLING METHODS: Cable Tool		PAGE 6 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1½ ft)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	7999 930	6 15 23	14	dense olive gray 5Y 5/2 sandy gravel some pebbles, trace silt and clay - wet	gm	NA	HNU = 0 ppm; β = 80 cpm; α = 0 cpm
77							
78							
79							
80	8000 1015	6 5 8	14	medium dense gray 7½YR 5/0 sandy gravel some silt, clay and pebbles - wet	gm	NA	HNU = 0 ppm; β = 20 cpm; α = 0 cpm
81							
82							
83							
84							
85	8001 1335	17 36 32	12	very dense gray 7½YR 5/0 gravelly sand some pebbles, trace silt and clay - wet	gm	NA	HNU = 0 ppm; β = 40 cpm; α = 0 cpm
86							
87							
88							
89							

NOTES:

000783

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B368	COORDINATES:	DATE: Jan 23, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 20, 1988
ENGINEER/GEOLOGIST: L. Wille/J. O'Connor	Depth Date/Time	DATE COMPLETED: Jan 28, 1988
DRILLING METHODS: Cable ~~Ext~~ Tool		PAGE 7 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	1500 8002	9 19 21	18	dense gray 10YR 5/1 sandy gravel with some pebbles, trace silt-wet			HNU=0ppm γβ=40cpm α=0cpm
92							
93							
94							
95							
96	910 9003	29 72	12	very dense gray 7½YR 5/1 coarse sand with some silt and trace clay-wet			HNU=0ppm γβ=40cpm α=0cpm
97							
98							
99							
100							
101	945 8004	4 6 11	18	medium dense gray 5YR 5/1 gravelly sand, some silt, trace clay and pebbles-wet			HNU=0cpm γβ=80cpm α=0cpm
102							
103							
104							

NOTES:

000784

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B368	COORDINATES:	DATE: Jan 24, 1988
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: Jan 20, 1988
ENGINEER/GEOLOGIST: L. Wille/J. O'Connor	Depth Date/Time	DATE COMPLETED: Jan 28, 1988
DRILLING METHODS: Cable Tool		PAGE 8 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ FT)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	8005 1100	6 32 54/4	15	very dense gray 10YR 6/0 sand, some gravel, silt and clay, trace pebbles - wet	SM	NA	HNU=0ppm β=60cpm α=2 cpm
107							
108							
109							
110	8006 1145	5 7 7	13	medium dense gray 7½YR 6/1 sand and gravel, some silt and clay, trace pebbles - wet	SM	NA	HNU=0ppm β=4cpm α=2cpm
111							
112							
113							
114							
115	8007 1445	12 32 54	18	very dense 7½YR 6/0 sand some gravel, silt and clay - wet	SM	NA	HNU=0ppm β=60cpm α=1cpm
116							
117							
118							
119							

NOTES:

000785

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B368	COORDINATES:	DATE: Jan 25, 1988
ELEVATION:	GWL: Depth 60.3 Date/Time 1/25/88 0800	DATE STARTED: Jan 20 1988
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: Jan 28 1988
DRILLING METHODS: Cable Tool		PAGE 9 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	1/25/88 0845 08003	7 6 7	8	med. dense, gray 10YR 4/1 sand with some gravel, trace pebbles, trace silt and clay wet.	SM	NA	HNU = 0ppm HB = 60ppm α = 2cpm
122							
123							
124							
125	1/25/88 10:35 08004	13 12 8	11	med. dense, gray 10YR 4/1 gravelly sand, some pebbles, trace silt and clay, wet.	SM	NA	HNU = 0ppm HB = 30ppm α = 2cpm
126							
127							
128							
129							
130	1/25/88 1345 08010	10 12 12	12	med. dense, gray 10YR 4/1, gravelly sand, some pebbles, some silt, wet.	SM	NA	HNU = 0ppm HB = 50ppm α = unknown, not functioning.
131							
132							
133							
134							

NOTES:

000786

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 3363	COORDINATES:	DATE: Jan. 25, 1988
ELEVATION:	GWL: Depth 60.45 Date/Time 1/26/88 0715	DATE STARTED: Jan. 20, 1988
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: Jan 28, 1988
DRILLING METHODS: Cable Tool		PAGE 10 OF 10

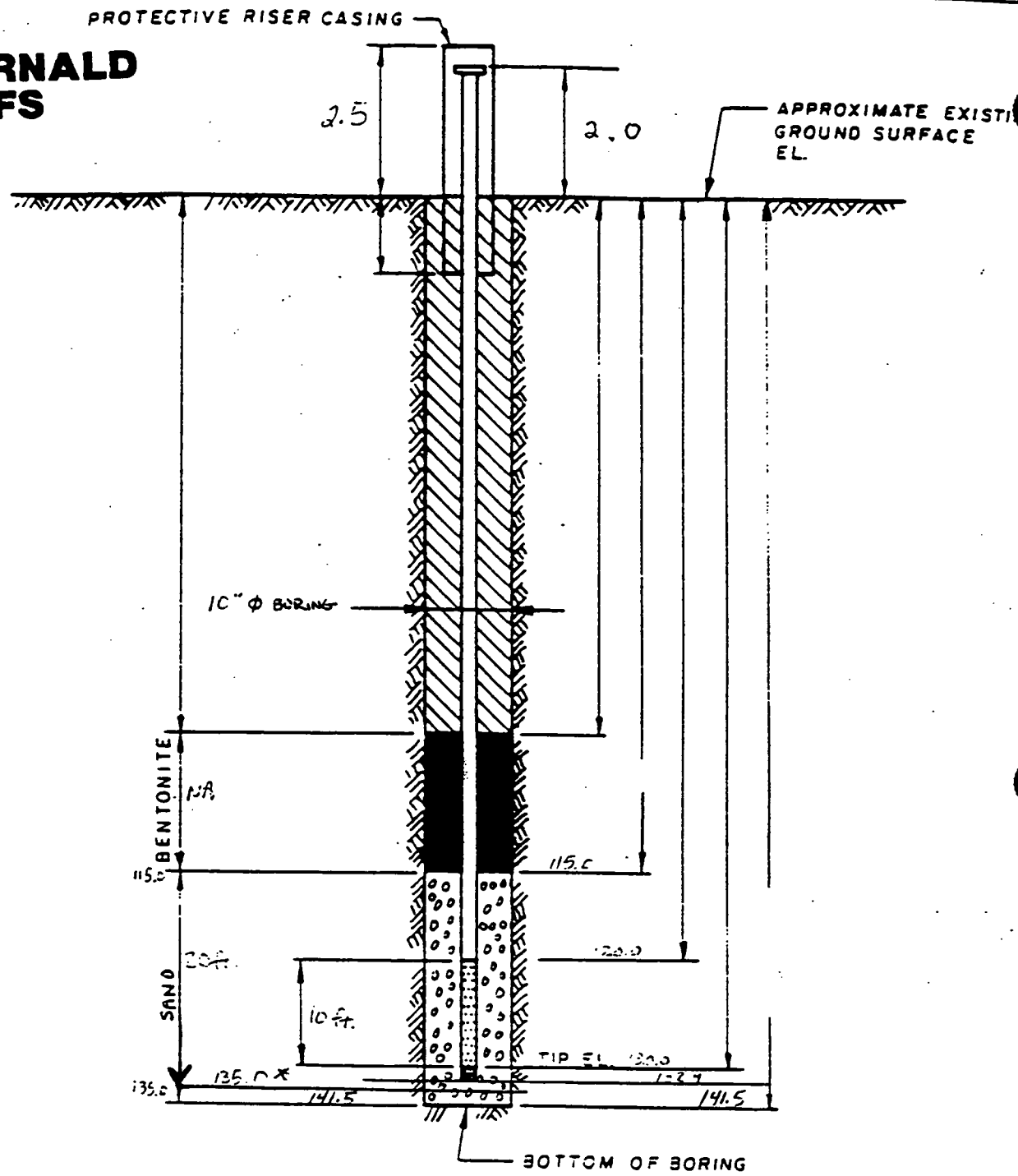
DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135	1/25/88 1505 080011	6 6 12	3	med. dense, gray 10YR4/1, sand, trace gravel and silt, wet.	SM	NA	HNU = 0ppm HB = 60cpm α = 2cpm
136							
137							
138							
139							
140	1/25/88 1630 080012	42 44 45	16	very dense, gray 10YR4/1 sand, some silt, trace gravel, wet. 140.5	SM	NA	HNU = 0ppm HB = 100cpm α = 2cpm
141				very dense, gray 10YR4/1 sandy gravel, some pebbles, some silt, wet	SP		
142				Bottom of Boring 141½ ft			
				E.O.B. 141.5			

NOTES:

00787

402-11-86

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 61.65 ft.
5. WATER LEVEL READING ON 2/3/82, 16:30

INSTALLATION DETAILS
MONITORING WELL B368

PREPARED FOR

* Bottom 5 ft. of boring caved in with natural formation sand and gravel. Sand pack placed above cave in.

PA

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. T. Sullivan DATE 2/3/83
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. B368
PIEZOMETER NO. 368 DATE OF INSTALLATION 1/26/83 – 2/3/83

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Drive Shoe
DRILLING FLUID (S) USED: NA	CASING SIZE (S) USED: NA
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless steel
DIAMETER OF PERFORATED SECTION 4in.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in. I.D. 4in.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft./2 ft.
AVERAGE SIZE OF PERFORATIONS 0.010 in.	JOINING METHOD Screw joints.
TOTAL PERFORATED AREA 3 in²/ft.	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.	OTHER PROTECTION Padlock on cap
PROTECTIVE PIPE O.D. 10 3/4 in.	of protective pipe.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 115.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 115.0	BOTTOM 135.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 120.0	BOTTOM 130.0	TOP	BOTTOM
PIEZOMETER TIP	132.4			
BOTTOM OF BOREHOLE	141.5			
GWL AFTER INSTALLATION	61.65			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

000789

2069

DATE BEGAN: 4-9-86
DATE FINISHED: 4-10-86
GROUND SURFACE EL.: 574.1'

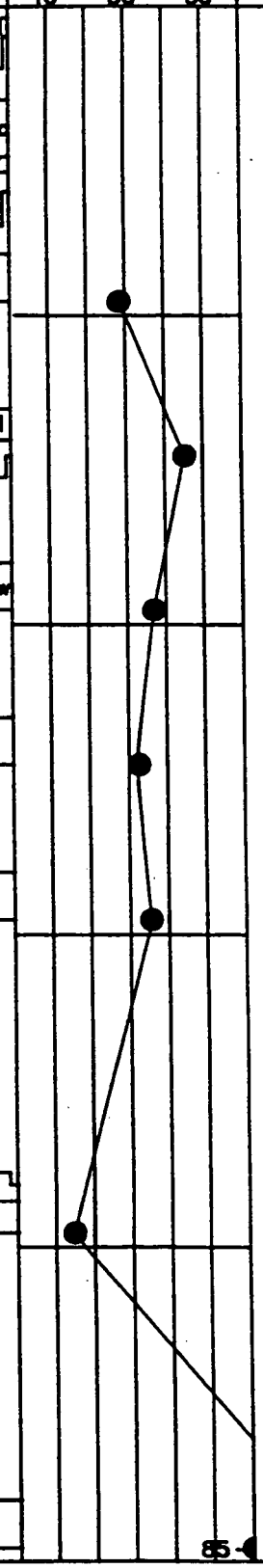
BORING NO. IT-6

N 476,416 E 1,380,706

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.
		S 1	MEDIUM STIFF BROWN SILT, TRACE CLAY, TRACE FINE TO COARSE SAND AND ROOTS 0.5'	ml / ml/cl
		S 2	MEDIUM STIFF BROWN SILTY CLAY, TRACE FINE SAND, TRACE ROOTS MOIST 1.0'	ml
570.0	5.0	S 3	MEDIUM STIFF BROWN AND GRAY MOTTLED SILT, TRACE CLAY, MOIST 3.0'	gm/gc / sm/sc / ml/cl
	10.0	S 4	DENSE BROWN COBBLES AND FINE TO COARSE GRAVEL AND SILTY CLAY, SOME FINE TO COARSE SAND, MOIST 4.9'	ml/cl
			DENSE FINE TO COARSE SAND AND SILTY CLAY, TRACE FINE GRAVEL, WET 5.3'	
560.0	15.0	S 5	STIFF BROWN SILTY CLAY, TRACE FINE TO COARSE SAND, MOIST ~7.5'	ml/cl / sw/gw
			STIFF BROWN AND GRAY MOTTLED SILTY CLAY, TRACE FINE TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, MOIST ~11.0'	
	20.0	S 6	STIFF GRAY SILTY CLAY, TRACE FINE TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, MOIST 14.0'	sw/gw
550.0	25.0	S 7	DENSE BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE TO SOME SILTY CLAY, MOIST 21.0'	sw
			DENSE BROWN FINE TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, TRACE SILT, MOIST ~26.0'	
	30.0	S 8	DENSE BROWN FINE SAND, SOME MEDIUM TO COARSE SAND, TRACE FINE GRAVEL, TRACE SILT, DRY ~34.0'	sp
540.0	35.0		MEDIUM DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE FINE GRAVEL, TRACE SILT, DRY 38.5'	sp
	40.0	S 9	MEDIUM DENSE GRAY FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE FINE GRAVEL, DRY 45.5'	sp
530.0	45.0		VERY DENSE BROWN FINE TO COARSE SAND AND FINE GRAVEL, TRACE MEDIUM TO COARSE GRAVEL, TRACE SILT, DRY	
	50.0	S 10		sw

PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50



REMARKS

85

PROJECT NO. 303063

BORING NO. IT-6
SHEET 1 OF 2

000790

DATE BEGAN: 4-9-86
DATE FINISHED: 4-10-86
GROUND SURFACE EL.: 574.1'

BORING NO. IT-6

N 476,416 E 1,380,706

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
				VERY DENSE BROWN FINE TO COARSE SAND AND FINE GRAVEL, TRACE MEDIUM TO COARSE GRAVEL, TRACE SILT, DRY ~54.0'			
520.0' 4-10-86	55.0			DENSE BROWN FINE SAND, WET 58.4'	sp		
	60.0	S 11		DENSE BROWN FINE TO COARSE SAND AND FINE GRAVEL, TRACE SILT, WET 59.0'	sw sp		S-11 RETAINED FOR CHEMICAL ANALYSES
510.0'	65.0			DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET ~64.0'			
	70.0	S 12		DENSE BROWN FINE TO COARSE SAND AND FINE GRAVEL, TRACE SILT, WET ~74.0'	sw		
500.0'	75.0			MEDIUM DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET 79.3'	sp sw		
	80.0	S 13		DENSE BROWN FINE TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, TRACE SILT, WET			
490.0	85.0	S 14			sw		
487.6	86.5'			BOTTOM OF BORING 86.5'			

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 3069	COORDINATES:	DATE: 4/5/88
ELEVATION: ~ 574 Ft	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	08739	3 4 6	14	St.H, Dark Yellowish Brown (10YR 4/6) Silty Clay, trace sand, trace fine gravel, moist 1.0 St.H, Brownish Yellow (10YR 6/6) Silty Clay, trace sand trace fine gravel, moist. 1.5	CL	1.5	t: 1145 Hnu: 0ppm α: 2cpm γ/β: 60cpm
2.5	08740	4 13 13	17	Very St.H, Yellowish Brown (10YR 5/6) Clay, some silt. Moist. 3.0	CL	2.2	t: 1152 Hnu: 0ppm α: 2cpm γ/β: 60cpm
	08741	10 11 18	18	Very St.H, light Yellowish Brown (10YR 6/4) Clay, some silt, trace sand. Moist 4.5	CL	3.0	t: 1158 Hnu: 0ppm α: 2cpm γ/β: 60cpm
5.0	08742	18 23 25	18	Very St.H, Brownish Yellow (10YR 6/6) Silt, some very fine sand and clay. Moist. 6.5	ML	2.5	t: 1202 Hnu: 0ppm α: 2cpm γ/β: 60cpm
	08743	35 30 31	18	Hard, Brown (10YR 5/3), Clay, some silt, trace sand and gravel. Moist 7.5	CL	>4.5	t: 1210 Hnu: 0ppm α: 2cpm γ/β: 60cpm
7.5	08744	5 10 16	16	Hard, Gray (7.5YR 5/0) Clay, some fine to coarse gravel, trace sand and silt. Moist with Brown (Iron Oxide) stained fracture surfaces.	CL	>4.5	t: 1635 Hnu: 0ppm α: 2cpm γ/β: 60cpm
10.0	08745 08746 08747	8 9 10	14	Hard, Gray (7.5YR 5/0) Clay, some fine to coarse gravel, trace sand, trace silt. Moist with Brown stained fracture surfaces.	CL	>4.5	t: 1655 Hnu: 0ppm α: 2cpm γ/β: 60cpm
	08748	8 12 18	18	Hard, Gray (7.5YR 5/0) Clay, some fine to coarse gravel, trace sand, trace silt, moist.	CL	>4.5	t: 1735 Hnu: 0ppm α: 2cpm γ/β: 60cpm
12.5	08749	8 19 25	16	Hard, Gray (7.5YR 5/0) Clay, some fine to coarse gravel. trace sand, trace silt. moist. 13.4	CL	>4.5	t: 0746 4/6/88 Hnu: 0ppm α: 2cpm γ/β: 50cpm
15.0	08750	20 20 29	15	Dense, Yellowish Brown (10YR 5/6) Fine to medium sand, some silt, trace fine gravel, moist interbedded with sandy silt.	SM/ML	—	t: 0803 Hnu: 0ppm α: 2cpm γ/β: 50cpm

NOTES:

Contractor : Pennsylvania Drilling
Driller : Joe Barile
Helper : Tod Brooks/John Rhodes
Rig : 72 Speedstar

Water Used During Drilling = 800 gallons
Soil Sampling as per ASTM
Color Descriptions as per Munsell
Field Measurements : Hnu, α, γ/β

000792

402-11-88

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/6/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 6in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0							
	08751	17 18 13	16	Dense, Yellow Brown (10YR 5/6) fine to coarse sand, trace silt. Moist 16.2	SP		t: 0825 Hnu: 0ppm α: 1cpm γ/β: 50cpm
				Hard, Gray (7.5YR 5/0) Clay with some gravel. Moist.	CL	4.0	
17.5	08752	8 12 13	12	Hard, Gray (7.5YR 5/0) Clay, trace gravel. Moist. 18.2	CL	>4.5	t: 0840 Hnu: 0ppm α: 2cpm γ/β: 50cpm
	08753	31 50/5"	11	Very Stiff, Yellowish Brown (10YR 5/6) very fine sandy Silt. Moist. 19.7	ML	3.0	t: 0855 Hnu: 0ppm α: 2cpm γ/β: 50cpm
20.0	08754	13 17 21	14	Dense, Brownish Yellow (10YR 6/6) Sand, fining upward, some gravel, trace silt. Moist 21.0	SW		t: 0802 4/7/88 Hnu: 0ppm α: 1cpm γ/β: 40cpm
22.5	08755	26 50/5.5"	11	Very Dense, Brownish Yellow (10YR 6/6) Sand, fine to coarse, poorly sorted, some fine to coarse gravel, trace silt. Moist	SP		t: 0940 Hnu: 0ppm α: 2cpm γ/β: 60cpm
25.0	08756	10 50/5.5"	11	Very Dense, Yellowish Brown (10YR 5/6) Sand, fine to coarse, poorly sorted, some fine gravel, trace silt. Moist.	SP		t: 1117 Hnu: 0ppm α: 2cpm γ/β: 50cpm
27.5							
30.0							

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/7/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	08757	14 27 36	16	Very Dense, Brownish Yellow (10YR 6/6) Sand, fine to coarse, poorly sorted, some fine gravel, trace silt. Moist	SP		t = 1155 Hnu = 0ppm α = 2cpm γ/β = 40cpm
32.5							
35.0	08758	27 47 50/5"	16	35.1 Very Dense, Yellowish Brown (10YR 5/8) fine sand, well sorted, some silt, trace gravel. Moist	SM		t = 1412 Hnu = 0ppm α = 2cpm γ/β = 60cpm
37.5							
40.0	08759	27 47 46	18	Very Dense, Yellowish Brown (10YR 5/8) fine sand, some silt, trace gravel. Moist 41.0	SM		t = 1437 Hnu = 0ppm α = 2cpm γ/β = 60cpm
42.5				Very Dense, Brownish Yellow (10YR 6/8) fine sand, some coarse gravel, some silt, Moist.			
45.0							

NOTES:

402-11-86

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/7/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45	08760	30 50/2"	4	Very Dense, Yellowish Brown (10YR 5/4), Gravelly Sand, poorly sorted, some silt. Moist.	SP		C = 1651 Hau = 0ppm α = 2cpm γ/β = 50cpm
47.5							
50.0	08761	37 28 40	16	Very dense, Brownish Yellow (10YR 6/6) Sand, poorly sorted, some gravel, trace silt. Moist.	SP		C = 1733 Hau = 0ppm α = 2cpm. γ/β = 40cpm
52.5				53			
55.0	08762	13 21 33	12	Very Dense, Dark Yellowish Brown (10 YR 4/6) Sand, fine to medium, some gravel, trace silt. Moist.	SW		C = 0834 4/8/88 Hau = 0ppm α = 2cpm γ/β = 60cpm
57.5				58			
60.0							

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/8/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60.0	08763	18 32 30	15	Very Dense, Dark Yellowish Brown (10YR 4/4) Sand, Fine to coarse, poorly sorted, trace fine gravel, trace silt. Wet	SP		t: 1135 Hnu: 0ppm α: 2cpm β/γ: 50cpm
62.5				63			Blow sand previous to sample.
65.0	08764	50/4"	4	Very Dense, Yellowish Brown (10YR 5/4), Silty Sand with some fine gravel. Wet.	SM		t: 1208 Hnu: 0ppm α: 2cpm β/γ: 50cpm
67.5				68			
70.0	08765	37 33 38	17	Very Dense, Dark Yellowish Brown (10YR 4/4) Sand, Fine to coarse, poorly sorted, trace fine gravel, trace silt. Wet.	SP		t: 1329 Hnu: 0ppm α: 2cpm β/γ: 50cpm
72.5							
75.0							

NOTES:

000796

402-11-86

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/8/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75.0	08766	50/5.5" 50/5"	8	Very Dense, Dark Yellowish Brown (10YR 4/4), Gravelly Sand, poorly sorted, trace silt. Wet.	SP		t: 1515 Hnu: 0ppm α: 2cpm γ/β: 40cpm
77.5							
80.0	08767	13 16 21	14	Dense, Dark Yellowish Brown (10YR 4/6) Sand, fine to coarse, poorly sorted, trace gravel, trace silt. Wet.	SP		t: 1558 Hnu: 0ppm α: 2cpm γ/β: 50cpm
82.5							
85.0	08768	38 50/5"	10	Very Dense, Yellowish Brown (10YR 5/6), Gravelly Sand, poorly sorted, trace silt. Wet.	SP		t: 1705 Hnu: 0ppm α: 2cpm γ/β: 40cpm
87.5							
90.0							

NOTES:

402-11-86

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/9/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth. Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 10

DEPTH (FT) 90	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	08769	11 17 26	16	Dense, Yellowish Brown (10YR 5/4) Sand, poorly sorted, some gravel, trace silt. Wet.	SP		t: 0837 Hau: 0ppm α: 2cpm γ/β: 50cpm
92.5							
95.0	08770	40 50/5"	10	Very Dense, Dark Yellowish Brown (10YR 4/6), Gravelly Sand, poorly sorted fine sand to fine gravel, trace silt. Wet.	SP		t: 1000 Hau: 0ppm α: 2cpm γ/β: 50cpm
97.5							
100.0	08771	8 13 15	8	Medium Dense, Dark Yellowish Brown (10 YR 4/6) Gravelly Sand, poorly sorted fine sand to fine gravel, trace Silt, Wet.	SP		t: 1050 Hau: 0ppm α: 2cpm γ/β: 50cpm
102.5							
105.0							

NOTES:

000798

402-11-86

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/9/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105	08772	30 50/5"	10	Very Dense, Dark Yellowish Brown (10YR 4/4) Sand, fine to coarse, poorly sorted, trace gravel, trace silt. wet	SP		t: 1301 Hau: 0ppm α: 2cpm β/β: 40cpm
107.5							
110.0	08773	11 13 18	6	Dense, Dark Yellowish Brown (10YR 4/4) Gravelly Sand, fine sand to coarse gravel, poorly sorted, trace silt. wet.	SP		t: 1352 Hau: 0ppm α: 2cpm β/β: 70cpm
112.5							
115.0	08774	22 27 24	15	Very Dense, Dark Yellowish Brown (10YR 4/4), Sand, poorly sorted. Some fine to coarse gravel, trace silt. wet.	SP		t: 1533 Hau: 0ppm α: 2cpm β/β: 50cpm
117.5							
120.0							

NOTES:

000799

402-11-86

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/9/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120	08775	2 9 16	9	Medium Dense, Yellowish Brown (10YR 5/4) Sand, fine to coarse, poorly sorted, some fine gravel, trace silt. wet.	SP		t: 1616 Hau: 0ppm α: 2cpm γ/β: 60cpm
122.5							
125.0	08776	5 11 17	12	Medium Dense, Gray (7.5 YR 5/0) Sand, fine to coarse, poorly sorted, trace fine gravel. wet.	SP		t: 1725 Hau: 0ppm α: 2cpm γ/β: 40cpm
127.5							
130.0	08777	6 9 15	6	Medium Dense, Gray (7.5 YR 5/0), Gravelly Sand, fine sand to coarse gravel, poorly sorted, trace silt. wet	SP		t: 0852 4/10/88 Hau: 0ppm α: 2cpm β/β: 50cpm
132.5							
135.0							

NOTES:

000800

402-11-86

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/10/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135	08778	25 25 19	16	Dense, Brown (10YR 5/3) Sand poorly sorted, trace gravel, trace silt. wet.	SP		t: 1035 Hnu: 0ppm α: 2cpm γ/β: 50cpm
				END OF BORING			
137.5							
140.0							

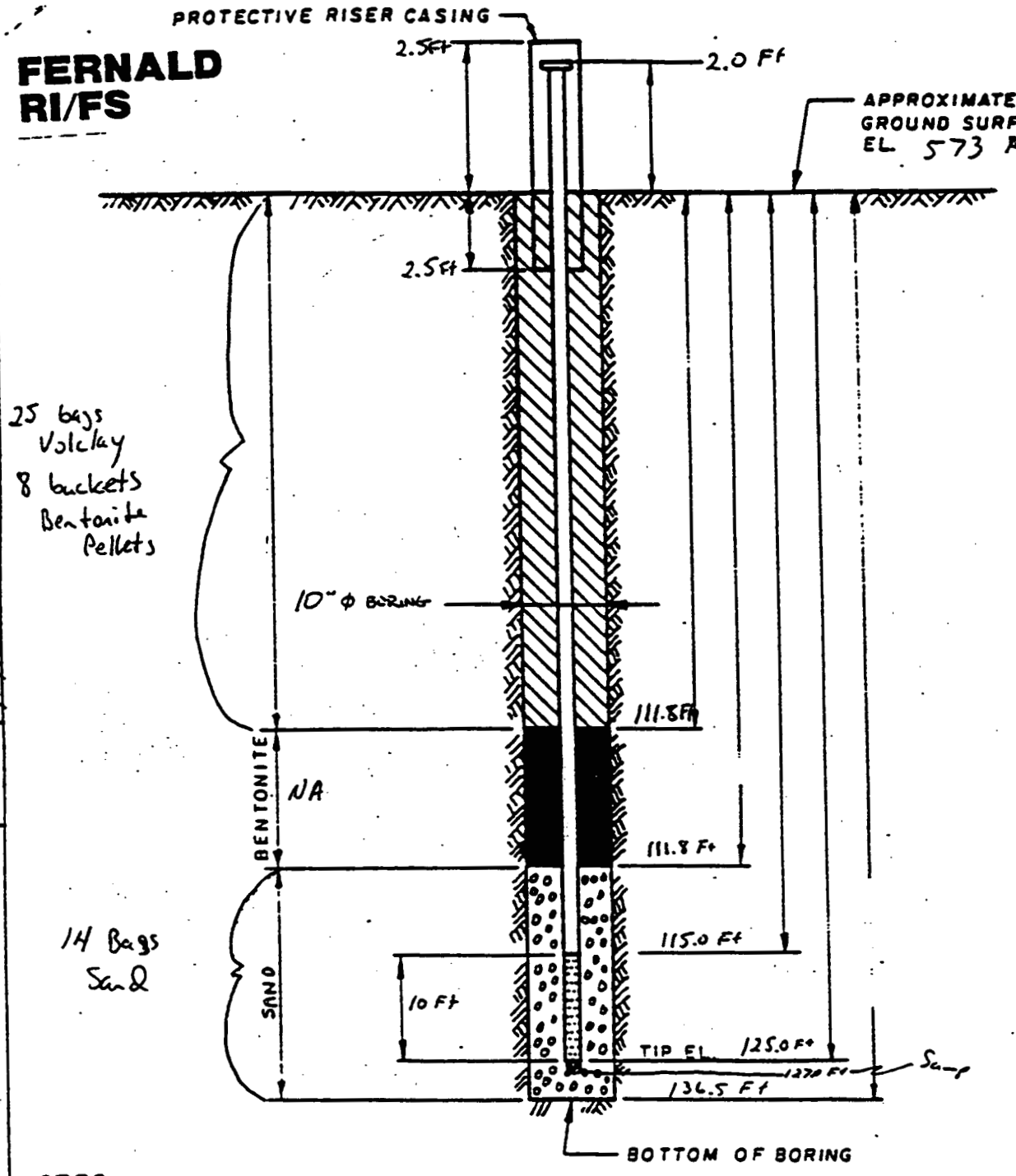
NOTES:

C00801

402-11-86

300 gal.

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	APPROVED BY
DAVIES	4/1-/88
DRAWN BY	

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. S.S. PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 369

PREPARED FOR

000802

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. DAVIES DATE 4/12/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. 369
PIEZOMETER NO. 369 DATE OF INSTALLATION 4/12/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT Steel Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID H_2O FROM 0 TO 136.5 Ft	SIZE 10 in FROM 0 TO 135.0 Ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4.0 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10, 5, 2 Ft.
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD Screw ~~weld~~ Lift
TOTAL PERFORATED AREA 10 Ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft	OTHER PROTECTION Locking cap and
PROTECTIVE PIPE O.D. 10 3/4 in	padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.0~~ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 111.8	TOP	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND	TOP 111.8	BOTTOM 136.5	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 115.0	BOTTOM 125.0	TOP	BOTTOM
PIEZOMETER TIP	127.0			
BOTTOM OF BOREHOLE	136.5			
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Natural caving to 131.0 Ft

000803

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.22	PROJECT NAME: FEMP RI/FS EWMF		
BORING NUMBER: 1070	COORDINATES:	DATE	1-6-92
ELEVATION: 598A	GWL: Depth Date/Time	DATE STARTED:	1-4-92
ENGINEER/GEOLOGIST: J. Lear	Depth Date/Time	DATE COMPLETED:	1-6-92
DRILLING METHODS: Cable Tool		PAGE	1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				N.R. - No Recovery			
	100602 1030 1-4-92	5	6	med dense, (10yr, 5/4) yellowish brown, silt, some organics, some clay, moist	ML	NA	Hnu - 0 ppm
1	100603 1030 1-4-92	5	6	S.A.A.	ML	NA	Bg - 40 cpm
	100604 1030 1-4-92	12	2	stiff, brownish yellow. (10yr, 6/4) clayey silt, some organics, moist	CL	1.75	α - 0 cpm
2	100605 1035 1-4-92	5	6	S.A.A.	CL	1.75	Hnu - 0 ppm
	100606 1035 1-4-92	6	6	med dense, brownish yellow (10yr, 6/4) clayey silt, trace organics, moist.	ML	NA	Bg - 40 cpm
3	100606 1035 1-4-92	9	3	S.A.A.	ML	NA	α - 0 cpm
	100606 1040 1-4-92	12	6	S.A.A.	ML	NA	Hnu - 0 ppm
4	100606 1040 1-4-92	18	3	S.A.A	ML	NA	Bg - 40 cpm
turbed stech	100606 1040 1-4-92	22	0	N.R.	NA	NA	α - 0 cpm
5	100606 1045 1-4-92	25	0	N.R.	↓	↓	Hnu - 0 ppm
	1045 1-4-92	26	0	N.R.			Bg - 40 cpm
6	100606 1045 1-4-92	28	0	N.R.	NA	NA	α - 0 cpm
	100606 1050 1-4-92	13	6	Dense, yellowish brown, (10yr, 5/6) clayey silt, trace gravel, moist	ML	NA	Hnu - 0 ppm
7	100606 1050 1-4-92	18	6	Dense, yellowish brown. (10yr, 5/6) silt, some sand, trace clay, moist	ML	NA	Bg - 40 cpm
	100606 1050 1-4-92	27	6	S.A.A.	ML	NA	α - 0 cpm

NOTES
Drilling Contractor - Penn Drilling
Drilling Equipment - Cyclone 43
Driller - Craig Coulter
Asst. - Gary Dye

Backgrounds
Hnu - 0 ppm
Bg - 40 cpm
α - 0 cpm
#100600 - Full HSL, Full Rad
#100607 - Rad Screen (Geotech)

402-11-88

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.22.	PROJECT NAME: FEMP RI/FS CWMF	
BORING NUMBER: 1070	COORDINATES:	DATE 1-4-92
ELEVATION: See p. 1	GWL: Depth Date/Time	DATE STARTED: 1-4-92
ENGINEER/GEOLOGIST: J. Leer	Depth: Date/Time	DATE COMPLETED: 1-6-92
DRILLING METHODS: Cable Tool		PAGE 2 OF 6 7

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	100608 1315 1-4-92	22	6	Dense, brown (10yr, 5/3) poorly graded sand, some silt, V. moist.	SP	NA	Hnu - 0 ppm
	100610 1315 1-4-92	20	6	Dense, brown, (10yr, 5/3) sandy silt, grading to sandy clay, wet to moist.	ml/cl	NA	Bq - 40cpm
ochem	100612 1315 1-4-92	23	0	N.R.	NA	NA	
9	100613 1315 1-4-92	27	0	N.R.	NA	NA	α - 0 cpm
10	100614 1530 1-4-92	Shelby tube remains No blow counts Possible	12	yellowish brown (10yr, 5/4) silty clay, trace gravel, Low to med plasticity moist. Shelby could not be fully penetrated	CL	NA	Hnu - 0 ppm Bq - 20-40 cpm α - 0 cpm
11	100615 1600 1-4-92	NA	16	Gray, (10yr, 5/1) silty clay, trace gravel, low Plasticity, sl. moist. -11.8'	CL	NA	Hnu - 0 ppm Bq - 40cpm α - 0 cpm
12				~~N.R.~~ J.L. 1-4-92			
13	100617 0930 1-5-92	30	0	N.R.	NA	NA	Hnu - 0 ppm
14	100618 0930 1-5-92	21	0	N.R.	NA	NA	Bq - 50cpm
	100619 0930 1-5-92	19	0	N.R.	NA	NA	α - 0 cpm
14.5				cont. Pg 3			

NOTES

#100609 - Rad Screen 7.5-8.0ft Geochem
#100611 - Rad Screen 8.0-8.5ft. Geochem
#100616 - Rad Screen 10.5-13.0 Shelby

000805

402-11-88

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.22.	PROJECT NAME: CEMP RI/FS - CLOSE		
BORING NUMBER: 1070	COORDINATES:	DATE: 1-5-92	
ELEVATION: See p. 1	GWL: Depth / Date/Time	DATE STARTED: 1-4-92	
ENGINEER/GEOLOGIST: J. Lear	Depth / Date/Time	DATE COMPLETED: 1-6-92	
DRILLING METHODS: Cable Tools		PAGE 3 OF 4	

DEPTH (FT.)	SAMPLE (TYPE & NO.)	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.5							
15	100620 0935 1-5-92	10	6	V. stiff, gray, (10yr. 5/1) silty clay, some gravel, low plasticity, moist.	CL	2.75	Hnu - 0 ppm
	100621 0935 1-5-92	10	0	N.R.	NA	NA	By - 40 cpm
16	100622 0935 1-5-92	16	0	N.R.			α - 0 cpm
	100623 0935 1-5-92	18	0	N.R.	NA	NA	
17	100624 0940 1-5-92	3	6	stiff, gray, (10yr. 5/1) silty clay, some gravel, low to mid plasticity, V. moist.	CL	1.0	Hnu - 0 ppm
	100625 0940 1-5-92	5	5	S.A.A.	CL	1.0	By - 40 cpm
18	100624 0940 1-5-92	9	0	N.R.	NA	NA	α - 0 cpm
	100626 1000 1-5-92	3	6	V. stiff, gray (10yr. 5/1) silty clay, some gravel, low plasticity, moist.	CL	3.0	Hnu - 0 ppm
19	100627 1000 1-5-92	7	0	N.R.	NA	NA	By - 40 cpm
	100628 1000 1-5-92	13	0	N.R.	NA	NA	α - 0 cpm
20	100629	No blow counts	18	Gray, (10yr. 5/1) silty clay some gravel, low plasticity, moist.	CL	NA	Hnu - 0 ppm
21	100629 1100 1-5-92	on Shelby tube		~~N.R.~~ J.L. 1-5-92			By - 40 cpm α - 0 cpm
22				Continued - Pg 4			

ochem

Hnu

shelby

NOTES

#100630 - Rad Screen - Shelby 19.5-22.5

402-11-88

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.22	PROJECT NAME: TEMP RI/FS EWMF	
BORING NUMBER: 1070	COORDINATES:	DATE: 1-5-92
ELEVATION: See p. 1	GWL: Depth Date/Time	DATE STARTED: 1-4-92
ENGINEER/GEOLOGIST: J. Lear	Depth Date/Time	DATE COMPLETED: 1-6-92
DRILLING METHODS: Cable Tool		PAGE 4 OF 7

DEPTH (FT)	SAMPLE (Type & No)	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
clay	100600 1000 1-5-92	NA	~~18~~	Shelby cont. S.A.A.			
23	100631 1300 1-5-92	4	6	Stiff, gray (10yr, 5/1) silty clay, some gravel low to med plasticity, moist.	CL	2.0	Hnu - 0 ppm
	100632 1300 1-5-92	10	0	NR.	NA	NA	Bd - 40 cpm
24	100633 1300 1-5-92	12	0	NR	NA	NA	α - 0 cpm
	100634 1310 1-5-92	6	6	Stiff, gray, (10yr, 5/1) silty clay, some gravel, low to med plasticity, moist. 24.25	CL	1.5	Hnu - 0 ppm
25	100635 1310 1-5-92	5	0	Med dense, gray, (10yr, 5/1) Poorly graded fine sand, some gravel, sl. moist. 24.5	SP	NA	Bd - 50 cpm
	100636 1310 1-5-92	6	0	N.R.	NA		α - 0 cpm
26	100637 0900 1-6-92	5	0	N.R.	NA		Hnu - 0 ppm
	100638 0900 1-6-92	6	0	N.R.	NA		Bd - 50 cpm
27	100639 0900 1-6-92	5	0	N.R.	NA		α - 0 cpm
	100640 0915 1-6-92	6	0	N.R.	NA		Hnu - 0 ppm
28	100641 0915 1-6-92	9	0	N.R	NA		Bd - 40 cpm
	100642 0915 1-6-92	13	0	N.R.	NA		α - 0 ppm
29	100643 1015 1-6-92	7	6	V. dense, gray, (10yr, 5/1) Gravelly clay, some sand, saturated, use of penetrometer Not Applicable Too soupy	CL		Hnu - 0 ppm
	100645 1015 1-6-92	9	5	S.A.A.	CL	NA	Bd - 50 cpm

↑ ochem ↓

NOTES

#100644 - Rad Screen, Geochem 28.5-29.0'
#100646 - Rad Screen, Geochem 29.0-29.5'

000807

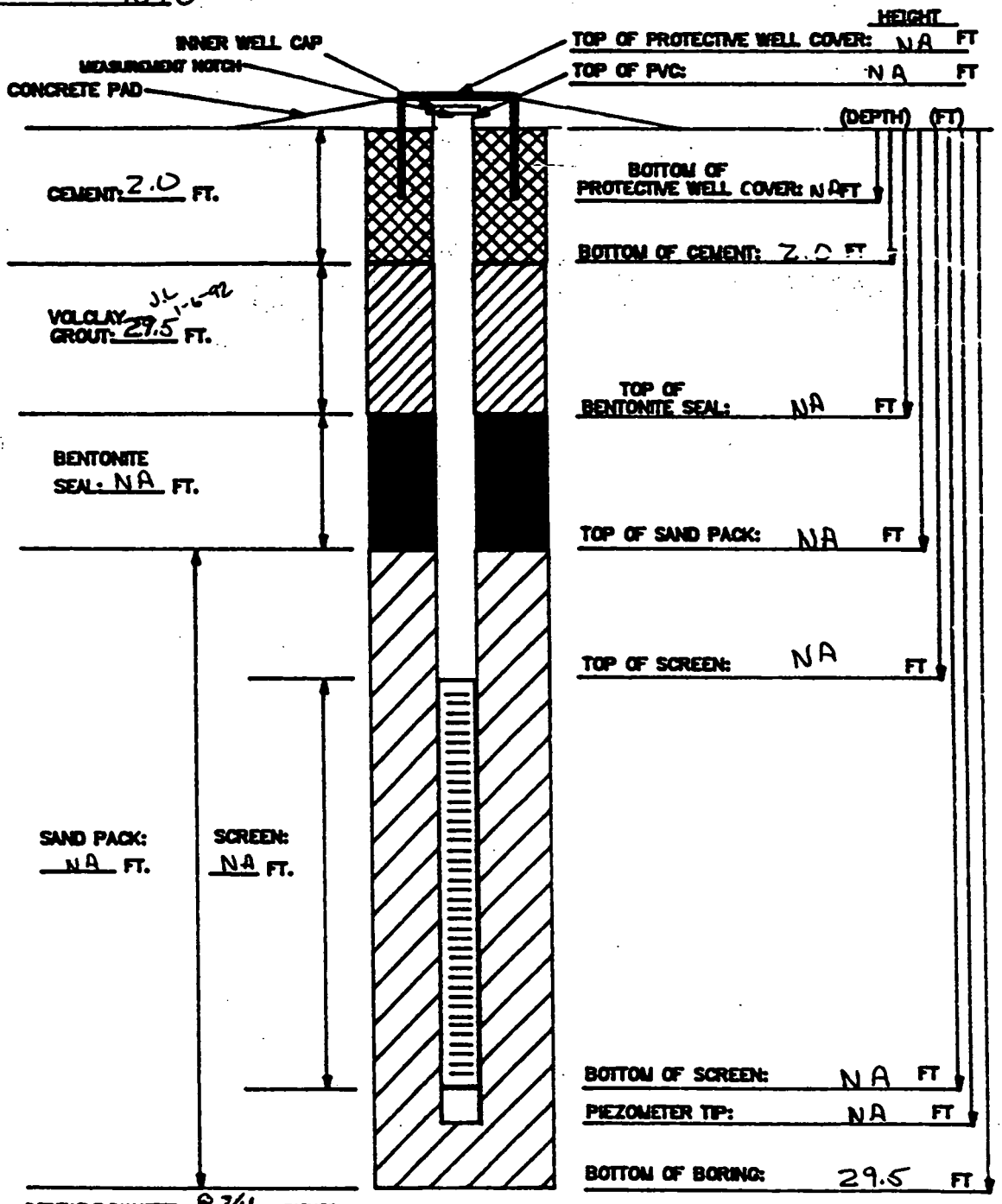
402-11-86

FERNALD RI/FS

INSTALLATION DIAGRAM

JL 1-6-92 ~~MONITORING WELL~~ NO. Aug/Co Boring 1070

INSTALLATION DATE: 1-6-92



BOREHOLE DIAMETER: 8 3/4 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 5.8 lb bags
AMOUNT OF CEMENT: 1 94 lb bag
AMOUNT OF WATER USED: 100 gals
OTHER: NA

NOTES: NA

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: NA
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602.3.22 GEOLOGIST/ENGINEER: J. Lear

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: ~~FEM~~ JL 602.3.22	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2070	COORDINATES: [redacted]	DATE: 1-6-92
ELEVATION: See p. 1	GWL Depth: [redacted] Date/Time: [redacted]	DATE STARTED: 1-4-92
ENGINEER/GEOLOGIST: J. Lear	Depth: [redacted] Date/Time: [redacted]	DATE COMPLETED: 1-6-92
DRILLING METHODS: Cable Tool		PAGE 5 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
29.5							
30	NA	50/0		Spoon Did not penetrate any further than 29.5	NA	NA	α - 0 cpm
				No water encountered in boring. Boring plugged and Abandoned			

5709

NOTES
See Pgs 1-4

000809

402-11-86

FERNALD RI/FS

7/7

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FEMP RI/FS CWMF FIELD ENG./GEO. J. Lear DATE 1-7-92
PROJECT NO. 602.3.22 CHECKED BY _____ DATE _____
BORING NO. 1070
PIEZOMETER NO. NA DATE OF INSTALLATION 1-6-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 TO 29.5
FLUID NA FROM ~~FROM~~ TO ~~TO~~

TYPE OF BIT Cable Tool
CASING SIZE (S) USED:
SIZE NA ~~FROM~~ ~~TO~~
SIZE 8 in FROM 0 TO 29.5

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE: NA
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (~~ft~~)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS: Cement GROUT / SLURRY	TOP 0.0	BOTTOM J.L. 1-7-92 ~~0~~ 2.0		
	TOP 2.0	BOTTOM 29.5	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	29.5			
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS

000810

2010

5709

DATE BEGAN: 3-24-86
DATE FINISHED: 3-25-86
GROUND SURFACE EL.: 592.2'

BORING NO. IT-5A

N 476,752 E 1,382,029

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
590.0		S 1		SOFT DARK BROWN-ORANGE SILT AND CLAY, TRACE ROOTS, MOIST 0.7'	ol		
		S 2		SOFT ORANGE-BROWN AND DARK GRAY MOTTLED SILTY CLAY, TRACE ROOTS, MOIST 3.8'	ml/cl		
	5.0	S 3		SOFT ORANGE-BROWN AND LIGHT GRAY MOTTLED SILTY CLAY, TRACE FINE TO COARSE SAND AND FINE GRAVEL, WET ~7.0'	ml/cl		PERCHED GROUND WATER FROM 6.5' TO 7.5'; VISIBLE AFTER AUGER REMOVAL.
		S 4		MEDIUM STIFF BROWN SILTY CLAY, SOME FINE TO MEDIUM GRAVEL, TRACE FINE TO COARSE SAND, MOIST 8.5'	ml/cl ml/cl		
	10.0						
580.0				MEDIUM STIFF BROWN SILTY CLAY, TRACE FINE GRAVEL, MOIST ~12.0'			
		S 5		MEDIUM STIFF GRAY CLAY, TRACE FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST 14.4'	cl ml		
	15.0						
		S 6		VERY STIFF GRAY SILT, TRACE FINE TO COARSE SAND AND FINE GRAVEL, SOME FINE SAND STRINGERS, MOIST ~22.0'	ml		HARD GRAVELLY MATERIAL FROM 19.75' TO 21.5'.
	20.0						
570.0		S 7		MEDIUM STIFF GRAY CLAYEY SILT, TRACE FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST ~26.0'	cl/ml		
	25.0						
		S 8		MEDIUM STIFF GRAY CLAY, SOME SILT, TRACE FINE TO COARSE SAND AND FINE GRAVEL, MOIST 32.5'	cl		GRAVELLY ZONES AT 31' AND 32'
	30.0						
560.0		S 9		DENSE GRAY FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE SILT, MOIST TO DRY ~38.0'	sw		
	35.0						
	40.0						
550.0		S 10		VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, TRACE SILT, DRY TO MOIST ~48.0'	sw	67	
	45.0						
	50.0			DENSE GRAY FINE SAND, TRACE FINE GRAVEL, DRY			

PROJECT NO. 303063

BORING NO. IT-5A
SHEET 1 OF 6

000811

DATE BEGAN: 3-24-86
DATE FINISHED: 3-25-86
GROUND SURFACE EL.: 592.2'

BORING NO. IT-5A

N 476,752 E 1,382,029

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
540.0							
	55.0	S 11		DENSE GRAY FINE SAND, TRACE FINE GRAVEL, DRY	sp		
				~58.0'			
	60.0						
530.0				VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, DRY			
	65.0	S 12			sw	61	
				~66.0'			
3-25-86	70.0	S 13		VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, DRY	sw/gw	98	
520.0							
				73.2'	sw/gw		
	75.0	S 14			sp		S-14 RETAINED FOR CHEMICAL ANALYSES.
				DENSE GRAY FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET			
				~79.0'			
	80.0						
510.0							
	85.0	S 15		VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, TRACE COARSE GRAVEL, TRACE SILT, WET	sw		
	90.0						
				~91.0'			
500.0							
	95.0	S 16		VERY DENSE GRAY FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE COARSE GRAVEL, TRACE SILT, WET	sw	82	
				~96.0'			
	100.0	S 17		VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, WET	sw/gw	62	

PROJECT NO. 303063

BORING NO. IT-5A
SHEET 2 OF 3

DATE BEGAN: 3-24-86
DATE FINISHED: 3-25-86
GROUND SURFACE EL: 592.2'

BORING NO. IT-5A

N 476,752 E 1,382,029

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
490.0				VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, WET			
489.2	103.0						
				BOTTOM OF BORING 103.0'			

PROJECT NO. 303063

PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B370	COORDINATES:	DATE: 2/10/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS	
1	02035 1320 2/10	1 2 3	13	stiff, yellow-brown 10YR 3/6 silt and clay, abundant organic material, roots, dry. (0.4)	cl	1.75	HNU=0 ppm JB=60 cpm α=0 cpm	
				stiff, yellow-brown 10YR 3/6 clay and silt, some organic material, dry.	cl			
2	02036 1325 2/10	2 4 4	12	stiff, yellow-brown 10YR 3/6 clay with some silt, trace organic material	cl	1.5	HNU=0 ppm JB=60 cpm α=0 cpm	
3								
4	02037 1330 2/10	4 4 4	2	(very soft) yellow-brown 10YR 3/4 silt and clay, wet.	cl	link.	HNU=0 ppm JB=60 cpm α=0 cpm	Insufficient recovery for consistency.
5	02038 1335 2/10	3 4 4	8	soft, yellow-brown 10YR 3/4 silt and clay, wet. (4.7)	cl	0.5	HNU=0 ppm JB=100 cpm α=0 cpm	Cobble smashed in spoon.
6				medium stiff, yellow-brown 10YR 4/4 clay with some silt, sand, and gravel, moist. (6.0)	cl	0.75		
7	02039 1340 2/10	3 5 8	18	very loose, yellow-brown 10YR 3/4 sand, some silt, clay, and gravel, wet. (6.5)	Sm	NA	HNU=0 ppm JB=80 cpm α=0 cpm	Abundant red sand and gravel 6.0-6.5
8	02040 1450 2/10	7 6 10	13	stiff, yellow-brown 10YR 4/4 gravelly clay, some sand and silt, moist. (7.3)	cl	1.25		
9				very soft, yellow-brown 10YR 4/4 silty clay, some gravel, trace sand, moist. (8.0)	cl	<0.25	HNU=0 ppm JB=80 cpm α=0 cpm	Cobble in spoon
10	02041 1505 2/10	6 15 23	13	very stiff, yellow-brown 10YR 4/4 clay with some sand and gravel, moist.	cl	3.5	HNU=0 ppm JB=80 cpm α=0 cpm	Pushed shelby tube 0.5 ft., no recovery, bent tube.
				very stiff, yellow-brown 10YR 4/4 clay with some gravel, moist.				
11	02042 1610 2/10	12 17 23	16	hard, yellow-brown 10YR 3/3 clay, some gravel and pebbles, dry. (11.0)	cl	>5	HNU=0 ppm JB=60 cpm α=0 cpm	
12				hard, gray 10YR 4/1 clay, some gravel, dry. (12.0)	cl			
13	02043 1645 2/10	3 9 11	14	very stiff, gray-green 5Y 4/1 clay with some fine gravel, wood fragments present, dry.	cl	3.5	HNU=0 ppm JB=80 cpm α=2 cpm	
14	02044 1705 2/10	4 9 14	14	very stiff, gray 10YR 4/1 clay with some gravel, trace silt, dry. (gravelly clay at 14.9-15.0)	cl	3.25	HNU=0 ppm JB=80 cpm α=0 cpm	

NOTES:

Pennsylvania Drilling Co.
Bucyrus Erie 24-W Drilling Rig
Driller: Dave Newman
Helper: Joe Banks/Joe Johnson
Blows on sampler taken ASTM standard for 2in x 18in split spoon.
Soil Colors from Munsell color charts. Approx. 350 gallons used in drilling.

Background: HNU=0 ppm JB=60-100 cpm α=0-2 cpm 2/10/88

000814

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.7	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B370	COORDINATES:	DATE: 2/10/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1½ ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08045 1720 2/10	5 7 9	10	hard, gray 10YR 4/1 clay with trace gravel and silt, dry.	cl	4.25	HNU=0ppm ∂B=80cpm α=0cpm
17	08046 0845 2/11	7 9 13	18	very stiff, gray 10YR 4/1 clay, some gravel and silt, dry.	cl	2.25	HNU=0 ppm ∂B=80cpm α=0 cpm
18				very stiff, gray 10YR 5/1 clay, some silt, trace gravel, dry. 18.5	cl	2.50	
19	08047 0900 2/11	4 10 14	14	very stiff, gray 10YR 5/1 clay and silt, some gravel, dry. 19.5	cl/ml	3.50	HNU=0 ppm ∂B=60cpm α=0 cpm
20	08048 1050 2/11	NA Shelby	NA Tube	very stiff, gray 10YR 4/1 clay, some gravel, dry. 21.0	cl	>5	HNU=0ppm ∂B=60cpm α=0cpm; Shelby tube pushed 1.0 ft., 0.9 ft. recovered. Tube was dented.
21							
22	08049 1115 2/16	6 8 12	7	stiff, gray-green 5Y 4/1 clay, some gravel, trace silt, dry. 22.5	cl	2.0	HNU=0ppm ∂B=80cpm α=0cpm
23	08050 1130 2/16	7 10 12	14	stiff, gray-green 5Y 4/1 gravelly clay, trace silt, dry. 22.9	cl	2.0	HNU=0ppm ∂B=100cpm α=Unknown; Alpha meter not functioning.
24				very stiff, gray-green 5Y 4/1 clay, some gravel and pebbles, dry.	cl	2.5	
25	08051 1145 2/16	6 8 12	7	very stiff, gray-green 5Y 4/1 clay, some gravel and pebbles, dry.	cl	3.5	HNU=0ppm ∂B=60cpm α=Unknown; No recovery 1st try, 7in. 2nd try.
26	08052 1250 2/16	5 10 13	13	hard, gray-green 5Y 4/1 clay, some gravel and pebbles, dry.	cl	4.25	HNU=0ppm ∂B=80cpm α=Unknown
27							
28	08053 1305 2/16	8 13 19	18	hard, gray-green 5Y 4/1 clay, some gravel, trace silt, dry.	cl	4.25	HNU=0ppm ∂B=80cpm α=Unknown
29	08054 1330 2/16	4 8 15	14	very stiff, gray-green 5Y 4/1 clay, some gravel, trace silt, dry.	cl	3.5	HNU=0ppm ∂B=140cpm α=Unknown

NOTES:

000815

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.3	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B370	COORDINATES:	DATE: 2/16/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/3 ft.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	03055 1440 2/16	8 10 17	5	very stiff, gray-green 5y 4/1 clay, some gravel and pebbles, trace silt, dry.	cl	3.25	HNU = 0 ppm ⊮B = 80 cpm α = Unknown
32	03056 1455 2/16	12 7 13	13	very stiff, gray-green 5y 5/1 clay, some gravel, some silt, dry.	cl	3.5	HNU = 0 ppm ⊮B = 60 cpm α = Unknown
33	03057 1525 2/16	15 17 19	14	very stiff, gray-green 5y 4/1 clay, some gravel, some silt, dry. 33.5	cl	2.5	HNU = 0 ppm ⊮B = 80 cpm α = Unknown
34				dense, gray 10YR 4/1 gravelly sand, some silt, dry.	SW	NA	
35	03058 1540 2/16	15 27 32	7	very dense, gray 10YR 5/1 gravelly sand, some silt, dry.	SW	NA	HNU = 0 ppm ⊮B = 110 cpm α = Unknown; Cobble smashed in spoon.
36							
37							
38							
39							
40							
41	03059 1620 2/16	37 25 38	15	very dense, gray 10YR 4/1 gravelly sand, some pebbles, some silt, dry.	SW	NA	HNU = 0 ppm ⊮B = 60 cpm α = Unknown
42							
43							
44							

NOTES:

Base of till at 33.5 ft.

000816

402-11-86

PAC

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6022.33	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B370	COORDINATES:	DATE: 2/16/88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88	
DRILLING METHODS: Cable Tool		PAGE 4 OF 11	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/3 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	03060 0905 2/17	27 32 29	12	very dense, gray 10YR 4/1 gravelly sand, some silt, some pebbles, dry.	SW	NA	HNU = 0ppm ∂B = 80cpm α = Unknown
47							
48				48.0			
49							
50	03061 1035 2/17	7 13 21	11	dense, gray 10YR 4/1 medium sand, trace gravel, some silt, dry.	SM	NA	HNU = 0ppm ∂B = 100cpm α = Unknown
51							
52							
53							
54							
55	03062 1305 2/17	6 22 50	14	very dense, gray 10YR 3/1 fine sand, some silt, trace gravel, dry.	SM	NA	HNU = 0ppm ∂B = 60cpm α = Unknown
56							
57							
58							
59							

NOTES:

000817

402-11-86

PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 370	COORDINATES:	DATE: 2/17/83
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/83
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/83
DRILLING METHODS: Cable Tool		PAGE 5 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	03063 1340 2/17	8 13 30	13	dense, gray 10YR 4/1 fine sand, some silt, dry.	Sm	NA	HNU = 0ppm dB = 30 cpm α = Unknown
62							
63							
64							
65				very dense, gray 10YR4/1 fine sand, some silt, dry. 65.2	Sm		
66	03064 1520 2/17	8 48 50	15	very dense, gray 10YR4/1 sand and gravel, some pebbles, some silt, trace clay, dry.	gm	NA	HNU = 0 ppm dB = 60 cpm α = Unknown
67							
68							
69							
70							
71	03065 1635 2/17	17 21 39	14	very dense, gray 10YR 5/1 sand and gravel, some pebbles, some silt, trace clay, dry.	gm	NA	HNU = 0ppm dB = 60 cpm α = Unknown
72							
73				73.0			
74							

NOTES:

000818

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 370	COORDINATES:	DATE: 2/18/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 6 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	0306-6 0315 2/13	10 11 18	11	med. dense, gray 10YR 4/1 fine to medium sand, some silt, trace gravel, wet.	SM	NA	HNU=0ppm YB & α = no meters
77							
78							
79							
80				med. dense, gray 10YR 4/1 medium sand, some silt, wet. 80.3	SM		
81	0306-7 0355 2/18	8 9 11	10	med. dense, gray 10YR 4/1 sandy gravel, some pebbles, some silt, wet. 80.6	GP	NA	HNU=0ppm YB, α = no meters.
82				med. dense, gray 10YR 3/1 coarse sand, some gravel, some silt, wet.	SP		
83							
84							
85	0306-8 1030 2/18	3 14 22	13	dense, gray 10YR 4/1 medium to coarse sand, some gravel, some silt, trace clay, wet.	SP	NA	HNU=0 ppm YB, α = No meters.
86							
87							
88				88.0			
89							

NOTES:

000819

402-11-86

PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 370	COORDINATES:	DATE: 2/18/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 7 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	08069 1100 2/18	1 7 10	13	med. dense, gray 10YR 4/1 fine gravel and coarse sand, some silt, wet. 90.3 / 90.6	gm / gsm	NA	HNU=0 ppm ⊮B, α = No meters. Cobble smashed in spoon.
92				med. dense, gray 10YR 3/1 fine sand, some silt, wet.	SW		
93				med. dense, gray 10YR 4/1 gravelly sand; fine to coarse sand, some silt, some pebbles, trace clay, wet.			
94				94.0			
95	08070 1305 2/18	3 24 34	13	very dense, gray 10YR 4/1 fine to coarse sand, some gravel, some silt, wet. 96.0	sm	NA	HNU=0ppm ⊮B=6.0cpm α=0cpm
96				very dense, gray 10YR 5/1 gravel, some sand, some pebbles, some silt, trace clay, wet.	gm		
97							
98							
99				99.0			
100	08071 1350 2/18	5 6 3	11	med. dense, gray 10YR 4/1 coarse sand, some gravel, some silt, wet.	sm	NA	HNU=0ppm ⊮B=80cpm α=0cpm
101							
102							
103							
104							

NOTES:

000020

402-11-86

PAC

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B370	COORDINATES:	DATE: 2/18/88
ELEVATION:	GWL: Depth 76.05 Date/Time 2/17/88 0340	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 8 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/3 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	08073 1555 2/18	5 10 16	13	med. dense, gray 10YR 3/1 coarse sand, some fine gravel, some silt, wet.	SM	NA	HNU= 0ppm γB= 60cpm α= 2cpm
107							
108							
109							
110				med. dense, gray 10YR 4/1 coarse sand, some fine gravel, trace silt, wet. 110.3	SM		
111	08073 1635 2/18	5 10 14	12	med. dense, gray 10YR 4/1 fine sand, some silt, trace fine gravel, wet. (1" fine gravel lens at 111.0).	SM	NA	HNU= 0ppm γB= 60cpm α= 2 cpm
112							
113							
114							
115	08074 0905 2/19	5 21 43	18	very dense, gray 10YR 4/1 fine to coarse sand, some fine gravel, some pebbles, some silt, trace clay, wet.	SM	NA	HNU= 0ppm γB= 60 cpm α= 4 cpm
116							
117							
118							
119							

NOTES:

000821

402-11-86

PA

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B370	COORDINATES:	DATE: 2/19/88
ELEVATION:	GWL: Depth 75.3 Date/Time 2/20/88 0300	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 9 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	03075 0950 2/19	1 4 5	17	loose, gray 10YR 4/1 fine to medium sand, some silt, trace coarse sand, trace silt, wet. 120.5	Sm	NA	HNU = 0ppm; γB = 60cpm; α = 2cpm
122				loose, gray 10YR 4/1 sand and gravel; fine to coarse sand, fine gravel with some pebbles, some silt, wet.	gm		
123							
124				124.0			
125	08076 1450 2/19	27 34 46	18	very dense, gray 10YR 4/1 fine to medium sand, some silt, trace clay, wet. 125.3	Sm	NA	HNU = 0ppm; γB = 60cpm; α = 0cpm
126				very dense, gray 10YR 3/1 sandy gravel; fine to coarse sand, fine gravel with some pebbles, some silt, wet.	gp		
127							
128				128.0			
129							
130	08077 0877 2/20	7 24 52	11	very dense, gray 10YR 3/1 medium sand, some silt, wet. 131.2	Sm	NA	HNU = 0ppm; γB = 60cpm; α = 2cpm; Cobble caught in mouth of spoon
131				very dense, gray 10YR 4/1 gravelly sand; fine to coarse sand, some pebbles, some silt, wet.	SW		
132							
133							
134				134.0			

NOTES:

000822

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B370	COORDINATES:	DATE: 2/20/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 10 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	08078 0900 2/20	13 16 17	16	dense, gray 10YR 5/1 gravelly sand; fine to coarse sand, some clay, some silt, some pebbles, wet. 135.3	GC Sm	NA	HNU = 0ppm RB = 60cpm α = 2cpm
137							
138				dense, gray 10YR 3/1 fine to coarse sand, some silt, trace gravel, wet.			
139							
140	08079 1105 2/20	4 9 22	18	dense, gray 10YR 4/1 fine to coarse sand, some silt, trace fine gravel, wet.	Sm	NA	HNU = 0ppm RB = 60cpm α = 2cpm
141							
142							
143				143.0			
144							
145	08080 1335 2/20	11 43 54	8	very dense, gray 10YR 4/1 sandy gravel; fine gravel to pebbles, medium to coarse sand, trace silt, wet.	SP	NA	HNU = 0ppm RB = 60cpm α = 2cpm
146							
147							
148							
149				149.0			

NOTES:

000823

402-11-86

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B370	COORDINATES:	DATE: 2/20/88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88	
DRILLING METHODS: Cable Tool		PAGE 11 OF 11	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1 1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	08081 1600 2/20	14 19 17	7	dense, gray 10YR 4/1 coarse sand, some gravel and pebbles, trace silt, wet.	SW	NA	HNU=0 ppm β=60 cpm α=2 cpm
152				End of boring 151.5 ft.			

NOTES:

000824

402-11-86

FMC

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. T. Sullivan DATE 2/23/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. 370
PIEZOMETER NO. 370 DATE OF INSTALLATION 2/23/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 0 TO 90 ft.	SIZE 10in. ID FROM 0 TO 150 ft.
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4in.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in. I.D. 4in.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10ft., 2 ft.
AVERAGE SIZE OF PERFORATIONS 0.010in.	JOINING METHOD Screw flush
TOTAL PERFORATED AREA 10 ft.	joint threads.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.	OTHER PROTECTION Locking cap
PROTECTIVE PIPE O.D. 10 3/4 in.	and lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 125	TOP	BOTTOM
BENTONITE (None used)	TOP —	BOTTOM —	TOP	BOTTOM
SAND	TOP 125	BOTTOM 145	TOP	BOTTOM
GRAVEL (None used)	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 130	BOTTOM 140	TOP	BOTTOM
PIEZOMETER TIP	142.4			
BOTTOM OF BOREHOLE	151.5			
GWL AFTER INSTALLATION	73.65			

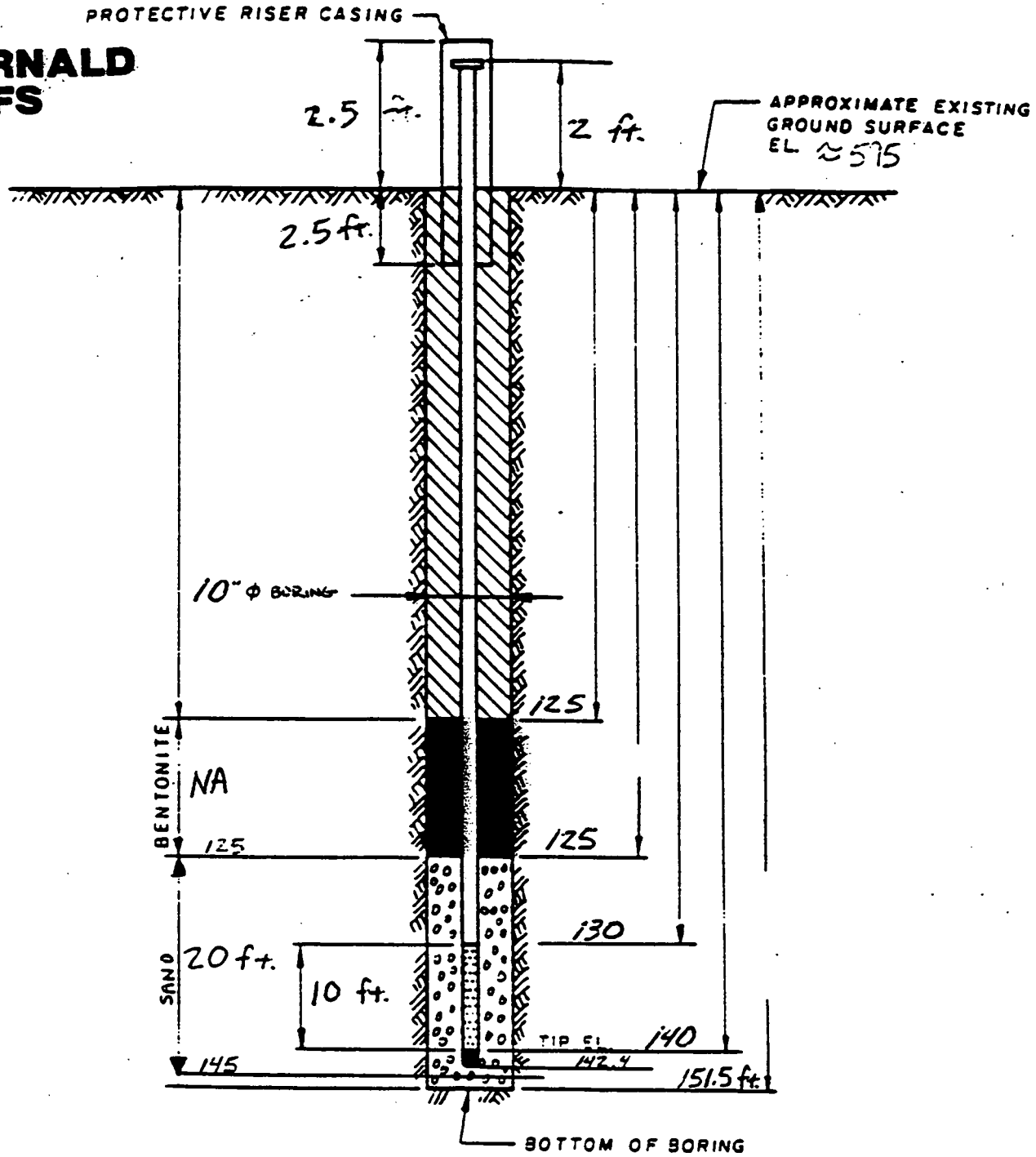
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Natural material cave-in from 151.5 up to 145 ft., sand pack placed above 145 ft.

000825

409-11-86

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 73.65 ft. below grd. surface.
5. WATER LEVEL READING ON 2/24/88, 12:50

INSTALLATION DETAILS
MONITORING WELL 370

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

000826

*Natural material cave-in 145 to 151.5 ft.

2071 5709

DATE BEGAN: 4-9-86
DATE FINISHED: 4-9-86
GROUND SURFACE EL.: 536.6'

BORING NO. IT-4

N 481,528 E 1,384,984

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		S 1		STIFF DARK BROWN SILT, TRACE CLAY, TRACE FINE TO COARSE SAND, MOIST 0.5'	ml		
		S 2		STIFF DARK BROWN CLAYEY SILT, SOME FINE TO COARSE SAND, MOIST 1.9'	ml/cl		
	5.0	S 3		DARK BROWN CLAYEY SILT AND FINE SAND 3.0'	ml/cl		
530.0				MEDIUM STIFF DARK BROWN CLAYEY SILT, SOME FINE SAND, MOIST 3.5'	ml/cl		
	10.0	S 4		MEDIUM STIFF DARK BROWN CLAYEY SILT, TRACE FINE SAND, MOIST 4.0'	gc		
4-9-86				DENSE BROWN COBBLES AND FINE TO COARSE GRAVEL AND SILTY CLAY, SOME FINE TO COARSE SAND 5.3'	sw/gw		
	15.0			MEDIUM DENSE LIGHT BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE TO SOME SILT, MOIST 13.0'	sw/gw		
520.0							
	20.0	S 5		MEDIUM DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE FINE GRAVEL, TRACE SILT, WET	sp		S-5 RETAINED FOR CHEMICAL ANALYSES
				~23.5'			
	25.0						
510.0							
	30.0	S 6		DENSE BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL, TRACE SILT, WET	sw		
				~34.0'			
	35.0						
500.0							
	40.0	S 7		DENSE BROWN FINE TO COARSE SAND AND FINE GRAVEL, TRACE SILT, WET	sw		
	45.0	S 8			sw		
490.6	46.0			BOTTOM OF BORING 46.0'			

000827

PROJECT NO. 303063

BORING NO. IT- 4
SHEET 1 OF 1

DATE BEGAN: 3-17-86
DATE FINISHED: 3-17-86
GROUND SURFACE EL.: ~592'

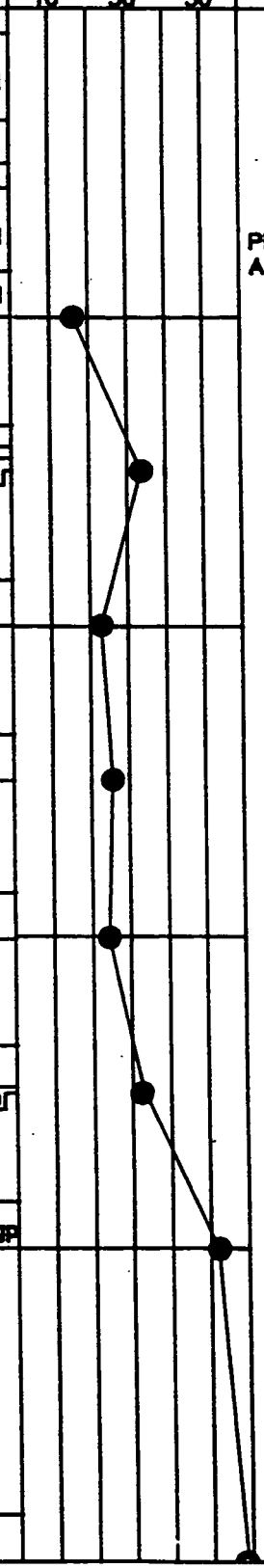
BORING NO. IT-5

N ~476,760 E ~1,382,030

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
590.0		S 1	SOFT DARK BROWN-ORANGE SILT AND CLAY, TRACE ROOTS, MOIST 0.7'	cl	
		S 2	SOFT ORANGE-BROWN AND DARK GRAY MOTTLED SILTY CLAY, TRACE ROOTS, MOIST 3.8'	ml/cl	
	5.0'	S 3	SOFT ORANGE-BROWN AND LIGHT GRAY MOTTLED SILTY CLAY, SOME FINE GRAVEL, TRACE FINE TO COARSE SAND, MOIST 5.0'	ml/cl	
3-18-86				ml/cl	PERCHED WATER AT 8.5'.
	10.0'	S 4	SOFT ORANGE-BROWN AND LIGHT GRAY MOTTLED SILTY CLAY, MOIST 5.9'	ml/cl	
580.0			MEDIUM STIFF ORANGE-BROWN AND LIGHT GRAY MOTTLED SILTY CLAY, SOME FINE GRAVEL, TRACE FINE TO COARSE SAND, MOIST ~8.0'		
	15.0'	S 5	MEDIUM STIFF BROWN SILTY CLAY, SOME FINE TO MEDIUM GRAVEL, TRACE TRACE FINE TO COARSE SAND, MOIST TO WET 12.0'	cl / sw / cl	
	20.0'	S 6	STIFF GRAY CLAY, TRACE FINE TO COARSE SAND AND FINE GRAVEL, MOIST 14.2'	cl	
570.0			LOOSE ORANGE-BROWN FINE TO COARSE SAND, SOME SILT, WET 14.6'		
	25.0	S 7	STIFF GRAY CLAY, TRACE FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST	cl	
	30.0	S 8		cl	
560.0					
	35.0	S 9	34.9'	cl	
			MEDIUM DENSE GRAY VERY FINE SILTY SAND, MOIST TO WET 35.5'	sm	
	40.0	S 10	VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, TRACE MEDIUM TO COARSE GRAVEL, TRACE SILT, MOIST TO DRY	sw/gp	
550.0			~44.0'		
	45.0		VERY DENSE GRAY FINE SAND, SOME MEDIUM TO COARSE SAND, SOME FINE GRAVEL, MOIST TO DRY		
	50.0	S 11		sp	

PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50



PROJECT NO. 303083

000828

BORING NO. IT- 5
SHEET 1 OF 2

DATE BEGAN: 3-17-88
DATE FINISHED: 3-17-88
GROUND SURFACE EL.: ~592'

BORING NO. IT-5

N ~478,760 E ~1,382,030

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
540.0				VERY DENSE GRAY FINE SAND, SOME MEDIUM TO COARSE SAND, SOME FINE GRAVEL, MOIST TO DRY			
3-18-88	55.0						
533.5	58.5						
				BOTTOM OF BORING 58.5'			

000829

PROJECT NO. 303083

BORING NO. IT- 5
SHEET 2 OF 2

FERNALD RI/FS

JD 2-4-89

REVIEWED BY CA K.G. DATE 7/29/91

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy		

UPK 4/23/88

R16 #1

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: 1072	COORDINATES: N 481625.93 E 1378476.33	DATE: 3-6-88
ELEVATION: 575.9 ground	GWL: Depth — Date/Time —	DATE STARTED: 03/06/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth — Date/Time —	DATE COMPLETED: 03/15/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 4

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08 1 8	3 5 7	12"	Very STIFF light olive Brown clay (2.5Y 5/4) DRY 1.5ft	2.5	CL	Hna=0 α=0 γB=120 1035
2 3	08 1 8	3 6 6	14"	STIFF Dark grayish Brown clay (10YR 4/2) DRY 3 Ft	2.0	CL	Hna=0 α=0 γB=100 1045
4	08 1 8	9 13 14	14"	STIFF yellowish Brown clay (10YR 5/6) DRY Trace sand & silt	1.5	ML	Hna=0 α=0 γB=120 1050
5 6	08 1 9	14 34 43	18"	Very STIFF Yellowish Brown clay (10YR 5/6) Trace sand and silt 6 Ft	2.5	ML	Hna=0 α=0 γB=120 1055
7	08 1 9 2	NA	12"	Shelby Tube 7 Ft	N/A	N/A	Hna= α= 1600
8 9	08 1 9 3	2 3 2	12"	STIFF Yellowish Brown clay (10YR 5/6) wet 9 Ft	2.0	CI	γB= Hna=0 α=0 γB=140 very plastic 1635
10	08 1 9 4	3 4 3	18"	Very Soft yellowish Brown clay (10YR 5/4) Wet 10.5 Ft	<1	CH	Hna=0 α=0 γB=160 Very plastic 1640
11 12	08 1 9 5	13 16 23	18"	Very STIFF yellowish Brown clay (10YR 5/8) DRY 12 Ft	2.5	CL	Hna=0 α=0 γB=150 3/7/88 0850
13	08 1 9 6	20 23 26	18"	Very STIFF Reddish Brown clay (5YR 4/4) Trace gravel. DRY 14 Ft	2.5	CL	Hna=0 α=0 γB=150 0900
14 15	08 1 9 7	11 12 16	18"	STIFF gray clay (5Y 5/1) DRY Trace gravel	1.5	CL	Hna=0 α=0 γB=130 0935

NOTES:

I) Drilling Contractor: Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter

II) Background measurements
a) Hna = 0 B) α = 0 c) γB = 120cpm

III Water used ≈ 400 gall

IV Samples via Munsell Color chart

N/A = not Applicable

000830

5709

FERNALD RI/FS

2-4-89

REVIEWED BY GA K.G DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		8/18
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: 1072	COORDINATES: see p1	DATE: 3-7-88
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 3-6-88
ENGINEER/GEOLOGIST: M. Goldberg	Depth — Date/Time —	DATE COMPLETED: 3-15-88
DRILLING METHODS: Cable Tool		PAGE 2 OF 4

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08198	3 5 7	12"	STIFF gray clay (5Y 5/1) DRY trace gravel	1.5	CL	Hnu = 0 α = 0 γB = 130 0940
17	08199	6 7 9	18"	Medium STIFF gray clay (5Y 5/1) Dry trace gravel	1.0	CL	Hnu = 0 α = 0 γB = 120 0945
18							
19	08200	2 6 6	18"	Soft gray clay (5Y 5/1) Dry Trace gravel	<1	CL	Hnu = 0 α = 0 γB = 140 1410
20	08201	6 9 12	18"	Soft gray clay (5Y 5/1) DRY Trace gravel	<1	CL	Hnu = 0 α = 0 γB = 140 1417
21							
22	08202	NA	24"	SHELBY Tube	NA	NA	= = = = 1555
23	08203	3 6 6	12"	medium STIFF gray clay (5Y 5/1) DRY trace gravel	1.0	CL	α = 0 Hnu = 0 γB = 140 1635
24							
25	08204	5 6 13	12"	Medium STIFF Dark gray clay (5Y 5/1) Dry trace gravel			Hnu = 0 α = 0 γB = 110 03/08/88 0850
26	08205	3 4 6	10"	STIFF Dark gray clay (5Y 5/1) DRY Trace gravel	1.5	CL	Hnu = 0 α = 0 γB = 100 0915
27							
28	08206	4 6 18	16"	STIFF Dark gray clay (5Y 5/1) DRY Trace gravel.	1.5		Hnu = 0 α = 0 γB = 100 1020
29	08207	22 30 41	18"	Hard Dark gray clay (5Y 5/1) DRY Trace gravel. Blue gravel and clay STRINGERS	4.0	CL	Hnu = 0 α = 0 γB = 120 Bright Blue Traces of clay 1105
30							

NOTES:

000832

FERNALD RI/FS

2-4-89

REVIEWED BY QA K-6 DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		8/18
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: ~~172~~ 1072 BB 1-55	COORDINATES: see p 1	DATE: 3-8-88
ELEVATION: see p 1	GWL: Depth — Date/Time —	DATE STARTED: 03/06/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth — Date/Time —	DATE COMPLETED: 3-15-88
DRILLING METHODS: Cable Tool		PAGE 3 OF 4

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	0 8 2 0 8	12 22 41	18"	Very Stiff Dark olive grey clay (5Y 3/2) Abundant Gravel, DRY.	3.5	CL	Hnu = 0 α = 0 δB = 100 1425
32	0 8 2 0 9	12 22 38	18"	Very Stiff Yellowish Brown silty clay (10YR 6/8) DRY 32 Ft	2.5	CL	Hnu = 0 α = 0 δB = 100 1600
33				Dense Yellowish Brown sand (10YR 6/6) dry 32.75 Ft	<1	SW	
34							
35							
36							
37							
38	0 8 2 10	17 31 37	18"	Very Dense Yellowish Brown sand (10YR 6/6) DRY	<1	SW	Hnu = 0 α = 0 δB = 140 03/09/88 0930
39							
40							
41							
42							
43	0 8 2 1 1	26 28 34	18"	Very Dense Yellowish Brown sand (10YR 6/6) DRY. Trace gravel	<1	SW	Hnu = 0 α = 0 δB = 160 1035
44							
45							

NOTES:

000832

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

2-4-89

REVIEWED BY CA K.G DATE 7/29/91

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: 1072	COORDINATES: see p1	DATE: 3-8-88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 03/06/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth – Date/Time –	DATE COMPLETED: 3-15-88
DRILLING METHODS: Cable Tool		PAGE 4 OF 4

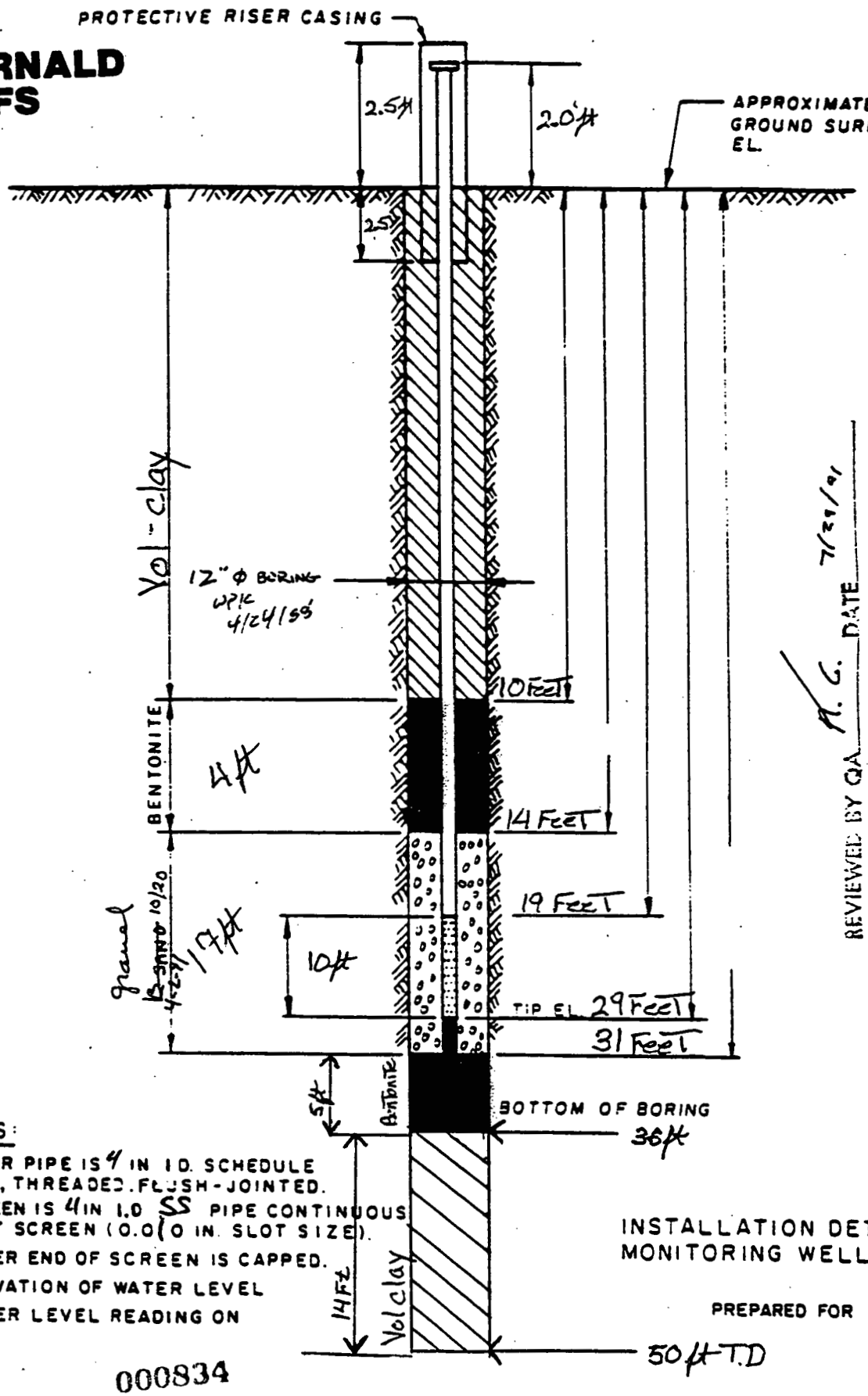
DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46							
47							
48							
49	8 2 1/2	10 28 50 30	20"	Very Dense yellowish Brown sand (10YR 6/6) DRY trace gravel	SW		Hnu = 0 α = 0 δB = 140cpm 1115
50				Bottom of Boring 50 FT			

NOTES:

000833

87
2-4-89 Monitoring Well #172 1072 BB 1-5-5

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

REVIEWED BY QA R. G. DATE 7/29/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR FMPC RI/FS

000834

5709

FERNALD RI/FS

2-4-89

REVIEWED BY QA K.G. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Goldberg DATE 03/15/88
PROJECT NO. 602 CHECKED BY R Carbrwith DATE 2/7/89
BORING NO. ~~172~~ 1072 BB 1-5-89
PIEZOMETER NO. N/A 1072 DATE OF INSTALLATION 03/15/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 3 TO 50ft
FLUID — FROM — TO —

TYPE OF BIT Flat Head
CASING SIZE (S) USED:
SIZE 10" FROM 3ft TO 50ft
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010" inches
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 Feet

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4" inches
LENGTH OF PIPE SECTIONS 10 Ft
JOINING METHOD Thread ~~and couple~~
Flush Jointed Rub. 2/7/89

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft
PROTECTIVE PIPE O.D. 10" inches

OTHER PROTECTION Lockable cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0 Ft		577.9	
GROUND SURFACE	0.0		575.9	
BOTTOM OF PROTECTIVE PIPE	2.5 Ft		573.4	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 10Ft	TOP 575.9	BOTTOM 565.9
BENTONITE	TOP 10 Ft	BOTTOM 14ft	TOP 565.9	BOTTOM 551.9
~~SAND~~	TOP N/A	BOTTOM N/A	TOP —	BOTTOM —
GRAVEL	TOP 14 Ft	BOTTOM 31 Ft	TOP 551.9	BOTTOM 520.9
PERFORATED SECTION	TOP 19 Ft	BOTTOM 29 Ft	TOP 556.9	BOTTOM 546.9
PIEZOMETER TIP	31 ft		551.9	
BOTTOM OF BOREHOLE	31 ft		551.9	
GWL AFTER INSTALLATION	N/A		N/A	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Well 172 was overdrilled to 50 ft to determine Lithology. A Volclay plug was set from 50ft → 36ft with a 5Ft Bentonite Plug from 36ft → 31ft to seal Till/sand contact @ 33Ft.

000835

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VPAC KKA2/

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 173-B 1073-B BB 1-5-89	COORDINATES: 481417.65 1378202.72	DATE: 04-20-88
ELEVATION: 583.2 ground	GWL: Depth — Date/Time —	DATE STARTED: 04-19-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth — Date/Time —	DATE COMPLETED: 04-20-88
DRILLING METHODS: Cable tool		PAGE 1 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08479 0908 04-19	4 18 10	12	VERY STIFF, BROWN (10YR 4/2) CLAY, SOME SILT, ROOTLETS, DRY (1.0); FRIABLE BLACK SLUDGE (1.5)	CL	2.0	HNU = 5-11 PPM; α = —; LELO2 = 2-3% EXPL.; Bγ = 80 CPM
2	08480 0915 04-19	6 17 25	10	VERY STIFF, BROWN (2.5Y 4/4) CLAY, SOME SILT, DRY (2.0); FRIABLE BLACK SLUDGE; MAX. RAD COUNT = 1200 CPM	CL	2.0	HNU = 5-8 PPM; α = —; LELO2 = 2-3% EXPL.; Bγ = 1200 CPM
3 4	08481 0920 04-19	30 31 28	14	STIFF, BROWN (2.5Y 4/4) CLAY, SOME SILT, DRY	CL	1.5	HNU = 5 PPM; α = —; LELO2 = 2-3% EXPL.; Bγ = 80 CPM
5 6	08482 0926 04-19	20 24 21	14	MEDIUM STIFF, BROWN (2.5Y 4/4) CLAY SOME SILT, DRY	CL	1.0	HNU = 3-5 PPM; α = —; LELO2 = 2-3% EXPL.; Bγ = 80 CPM
7	08483 0931 04-19	14 12 14	14	MEDIUM STIFF, OLIVE-GREY (5Y 4/2) CLAY, SOME SILT, DAMP	CL	.5	HNU = 3-5 PPM; α = —; LELO2 = 2-3% EXPL.; Bγ = 80 CPM
8 9	08484 0940 04-19	12 13 12	18	MEDIUM STIFF, OLIVE-GREY (5Y 4/2) CLAY, SOME SILT, DAMP	CL	.5	HNU = 3-5 PPM; α = —; LELO2 = 2-3% EXPL.; Bγ = 80 CPM
10 11	08485 1115 04-19			PUSHED SHELBY TUBE FROM 9.0 FT TO 11.0 FT. RECOVERED 1.1 FT.			HNU = 2 PPM; α = ; Bγ = 80 CPM
12	08486 1315 04-19	2 4	12	MEDIUM STIFF, OLIVE-GREY (5Y 4/1) CLAY, SOME SILT, DAMP	CL	.5	HNU = 1-2 PPM; α = —; Bγ = 140 CPM
13	08487 1317 04-19	7 2 4	16	MEDIUM STIFF, OLIVE-BROWN (5Y 5/2) CLAY, ORANGE-BROWN LATERING, SOME SILT, DAMP	CL	.5	HNU = 1-2 PPM; α = —; Bγ = 360 CPM
14	08488 1320 04-19	3 2 6	18	MEDIUM STIFF, OLIVE-BROWN (5Y 5/2) CLAY, ORANGE-BROWN LATERING, SOME SILT, DAMP	CL	.5	HNU = 1-2 PPM; α = —; Bγ = 900 CPM

NOTES: CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 α = — Bγ = 140 CPM LELO2 = 0 PPM LEL 20.6% O2

000836

WATER ADDED TO HOLE: 200 GALLONS

402-11-88

QC/DH/2489

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 7/29/91

5709

1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~1273-B~~ 1073-B	COORDINATES: See pg	DATE: 04-20-88
ELEVATION: See pg	GWL: Depth — Date/Time —	DATE STARTED: 04-19-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth — Date/Time —	DATE COMPLETED: 04-20-88
DRILLING METHODS: Cable tool		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08489 1330 04-19	9 13 16	14	MEDIUM STIFF, OLIVE-BROWN, MOTTLED YELLOW-BROWN, (2.5Y 4/4) CLAY, SOME SILT DAMP 16.0 FRIABLE BLACK SLUDGE MAX. HNU READING = 17 PPM 16.5	CL	.5	HNU = 1-2 PPM α = – BG = 100 CPM
17–18	08560 1430 04-19	7 13 12	14	STIFF, OLIVE-BROWN (2.5Y 5/2) CLAY, SOME SILT, DRY	CL	2.0	HNU = 1-2 PPM α = – BG = 80 CPM
19	08561 1445 04-19	5 15 12	12	STIFF, OLIVE-BROWN (2.5Y 5/4) CLAY, SOME SILT, DRY	CL	2.0	HNU = 0 α = – BG = 80 CPM
20–21	08562 1600 04-19	5 8 12	12	VERY STIFF, OLIVE-BROWN (2.5Y 5/4) CLAY, SOME SILT, SOME FINE GRAVEL, DRY	CL	2.5	HNU = 0 α = – BG = 80 CPM
22	08563 1613 04-19	8 11 15	12	STIFF, YELLOW-BROWN (10YR 5/4) CLAY, SOME SILT, DAMP	CL	2.0	HNU = 0 α = – BG = 80 CPM
23–24	08564 1630 04-19	9 15 17	14	STIFF, YELLOW-BROWN (10YR 5/4) CLAY, SOME SILT DAMP 23.0 VERY STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DRY	CL	2.5	HNU = 0 α = – BG = 80 CPM
25	08565 0847 04-20	5 9 14	14	VERY STIFF, BROWN (2.5Y 5/4) CLAY, SOME SILT, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5 - 1.0 IN.) DRY	CL	2.5	HNU = 0 α = – BG = 80 CPM
26–27	08566 0854 04-20	25 30 30	14	VERY STIFF, BROWN (2.5Y 5/4) CLAY, SOME SILT, TRACE COARSE GRAVEL (.5-1.0 IN.) DRY	CL	2.5	HNU = 0 α = – BG = 80 CPM
28	08567 0924 04-20	7 20 29	14	VERY STIFF, BROWN (2.5Y 5/4) CLAY, SOME SILT, SOME FINE GRAVEL, DRY	CL	2.5	HNU = 0 α = – BG = 80 CPM
29				BOTTOM OF BORING @ 29.0 FT.			

NOTES:

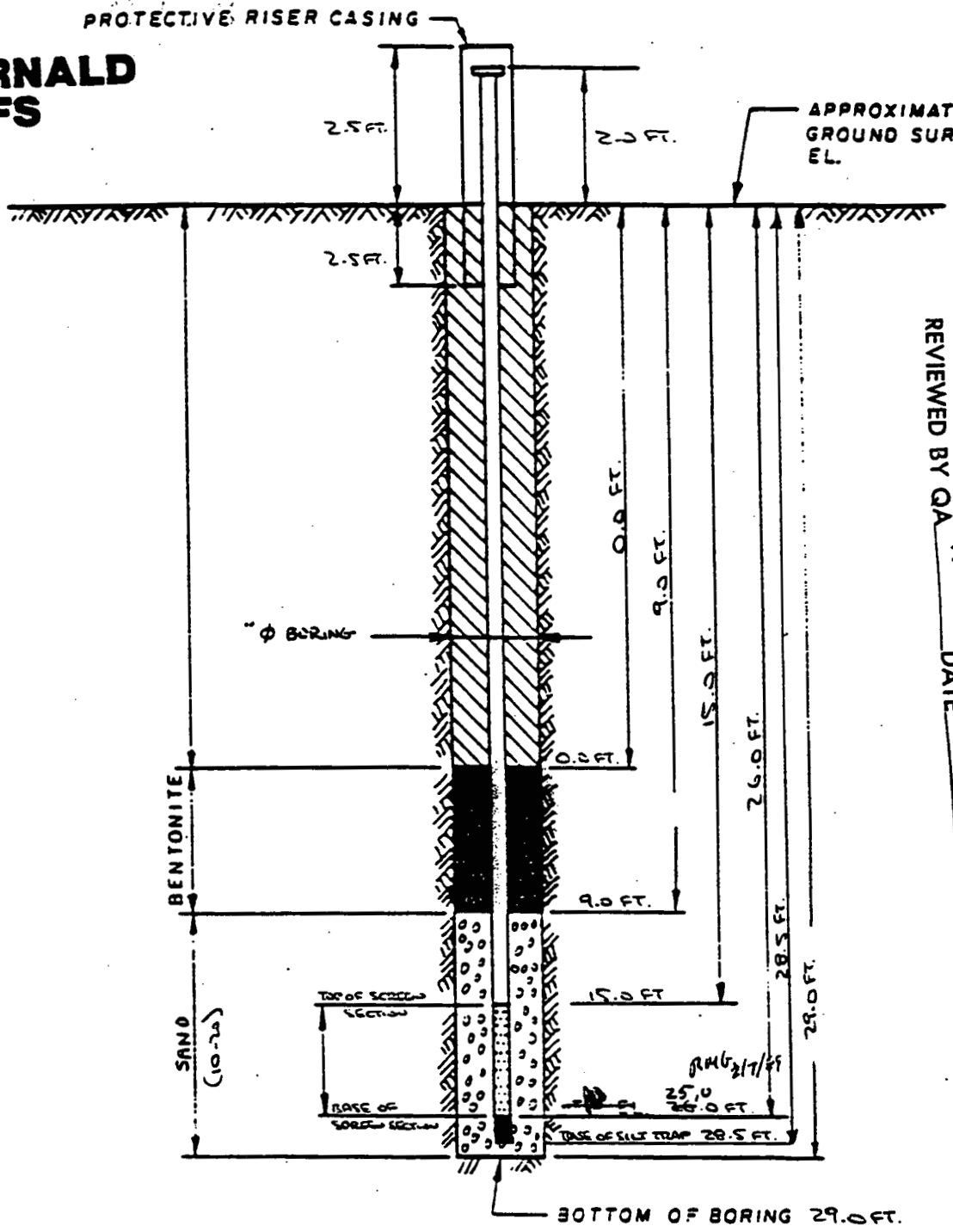
000837

402-11-86

QC/DH/2-4-89 1073-B

BORING # ~~173-B~~ BB 1-5

FERNALD RI/FS



REVIEWED BY QA K.G DATE 7/24/91

DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	MLS

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED: 10-20 SAND (100 LB. SACKS) = 9 SACKS
BENTONITE: 9 BUCKETS

INSTALLATION DETAILS
MONITORING WELL
04-20-88
PREPARED FOR
BORING # ~~173-B~~
1073-B
BB 1-5-89

000838

FERNALD RI/FS

REVIEWED BY QA K.G DATE 7/29/91 QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 04-20-88
PROJECT NO. 602 3.2 481 417.65 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. 1073-B 1378202.72
PIEZOMETER NO. ~~1073B~~ 1073-B 08 1-5-89 DATE OF INSTALLATION 04-20-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 29.0 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT TO 29.0 FT
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010
TOTAL PERFORATED AREA 10 FT

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN
LENGTH OF PIPE SECTIONS ~~SCREW TYPE~~
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (ft)	
TOP OF RISER PIPE	2.5		585.7	
GROUND SURFACE	0.0		583.2	
BOTTOM OF PROTECTIVE PIPE	2.5		580.7	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP —	BOTTOM —	TOP —	BOTTOM —
BENTONITE	TOP 0.0 FT.	BOTTOM 9.0 FT.	TOP 583.2	BOTTOM 574.2
SAND	TOP 9.0 FT.	BOTTOM 29.0 FT	TOP 574.2	BOTTOM 560.2
GRAVEL	TOP ~~9.0 FT~~	BOTTOM ~~29.0 FT~~	TOP /	BOTTOM /
PERFORATED SECTION	TOP 15.0 FT.	BOTTOM ~~25.0 FT~~ RWO 2/7/89	TOP 568.2	BOTTOM 558.2
PIEZOMETER TIP	28.5 FT.		559.7	
BOTTOM OF BOREHOLE	29.0 FT		559.2	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

000839

REMARKS

409-11-86

FERNALD RI/FS

DLG 2/4/89

	initials	date
1st Key In		
2nd Key In		6/10
3rd Entry Verification		12/14

12/3/88 WJK

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~174~~ 1074 BB 1-5-89	COORDINATES: N 481187.08 E 1378638.79	DATE: 04-13-88
ELEVATION: 578.1 gnd.	GWL: Depth – Date/Time –	DATE STARTED: 04-12-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth – Date/Time –	DATE COMPLETED: 04-13-88
DRILLING METHODS: Cable tool		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08463 0940 04-12	3 7 18	12	VERY STIFF YELLOW-BROWN (10YR 5/3) CLAY, SOME SILT, ROOTLETS, DRY	CL	4.0	HNU = 0 α = – BG = 140 CPM
2 3	08464 0952 04-12	7 23 26	14	VERY STIFF, YELLOW-BROWN (10YR 5/3) CLAY SOME SILT, SOME FINE GRAVEL, DRY	CL	4.0	HNU = 0 α = – BG = 140 CPM
4	08465 0957 04-12	25 35 31	14	VERY STIFF, YELLOW-BROWN (10YR 5/3) CLAY SOME SILT, SOME FINE GRAVEL, DRY	CL	4.0	HNU = 1 PPM α = – BG = 140 CPM
5 6	08466 1003 04-12	32 35 32	18	VERY STIFF, YELLOW-BROWN (10YR 5/4) CLAY SOME SILT, SOME FINE GRAVEL, DRY	CL	3.5	HNU = 1 PPM α = – BG = 140 CPM
7	08467 1011 04-12	28 32 32	18	VERY STIFF, YELLOW-BROWN (10YR 5/4) CLAY SOME SILT, SOME FINE GRAVEL, TRACE COARSE GRAVEL (~.5 IN) DRY	CL	3.5	HNU = 0 α = – BG = 140 CPM
8 9	08468 1018 04-12	33 37 47	18	VERY STIFF, YELLOW-BROWN (10YR 5/4) CLAY SOME SILT, SOME FINE GRAVEL, TRACE COARSE GRAVEL (~.5 IN) DRY 8.5	CL	3.5	HNU = 0 α = – BG = 140 CPM
10 11	08469 1500 04-12			VERY STIFF (5Y 4/1) GREY, CLAY, SOME FINE GRAVEL, DRY PUSHED SHELBY TUBE FROM 9.0 FT TO 11.0 FT RECOVERED 1.5 FT			HNU = 0 α = – BG = 140 CPM
12	08470 1539 04-12	9 10	12	STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE GRAVEL, WET	CL	1.5	HNU = 0 α = – BG = 120 CPM
13	08471 1620 04-12	23 17 15	4	STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (~.5 – 1.0 IN) WET	CL	1.5	HNU = 0 α = – BG = 120 CPM
14	08472 1630 04-12	2 3 4	12	STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE GRAVEL, WET	CL	1.5	HNU = 0 α = – BG = 120 CPM

NOTES: CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VAN DINE
000840

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 LEL O_2 = 0 PPM LEL
α = – 20.6% O_2
BG = 140 CPM

WATER ADDED TO HOLE: 200 GALLONS

402-11-86

FERNALD RI/FS

DIG 2/4/89 5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: DT4 1074 BB 1-5-89	COORDINATES: See p1	DATE: 04-13-88
ELEVATION: Sup1	GWL: Depth — Date/Time —	DATE STARTED: 04-12-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth — Date/Time —	DATE COMPLETED: 04-13-88
DRILLING METHODS: Cable tool		PAGE 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08473 1647 04-12	4 5 6	4	STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (~.5-1.0 in) WET	CL	1.5	HNU = 0 α = — BG = 120 CPM
17	08474 1650 04-12	4 9 10	10	STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE SAND, SOME FINE GRAVEL, WET 18.5	CL	1.5	HNU = 0 α = — BG = 120 CPM
18 19	08475 1717 04-12	5 5 7	6	STIFF, GREY (5Y 5/1) CLAY, SOME FINE GRAVEL, DRY 19.5	CL	2.0	HNU = 2-3 PPM α = — BG = 120 CPM
20 21	08476 1731 04-12	4 7 13	14	STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE SAND, DRY	CL	1.5	HNU = 0 α = — BG = 120 CPM
22	08477 0951 04-13	7 6 8	6	STIFF, GREY (5Y 5/1) SILTY CLAY, SOME FINE SAND, TRACE FINE GRAVEL, DRY 22.5	CL	1.5	HNU = 0 α = — BG = 120 CPM
23 24	08478 1001 0413	5 5 6	14	STIFF GREY (5Y 5/1) CLAY, SOME SILT AND FINE GRAVEL, TRACE FINE SAND, DRY	CL	1.5	HNU = 0 α = — BG = 120 CPM
25 26 27 28 29				BOTTOM OF BORING @ 24.0 FT.			

NOTES:

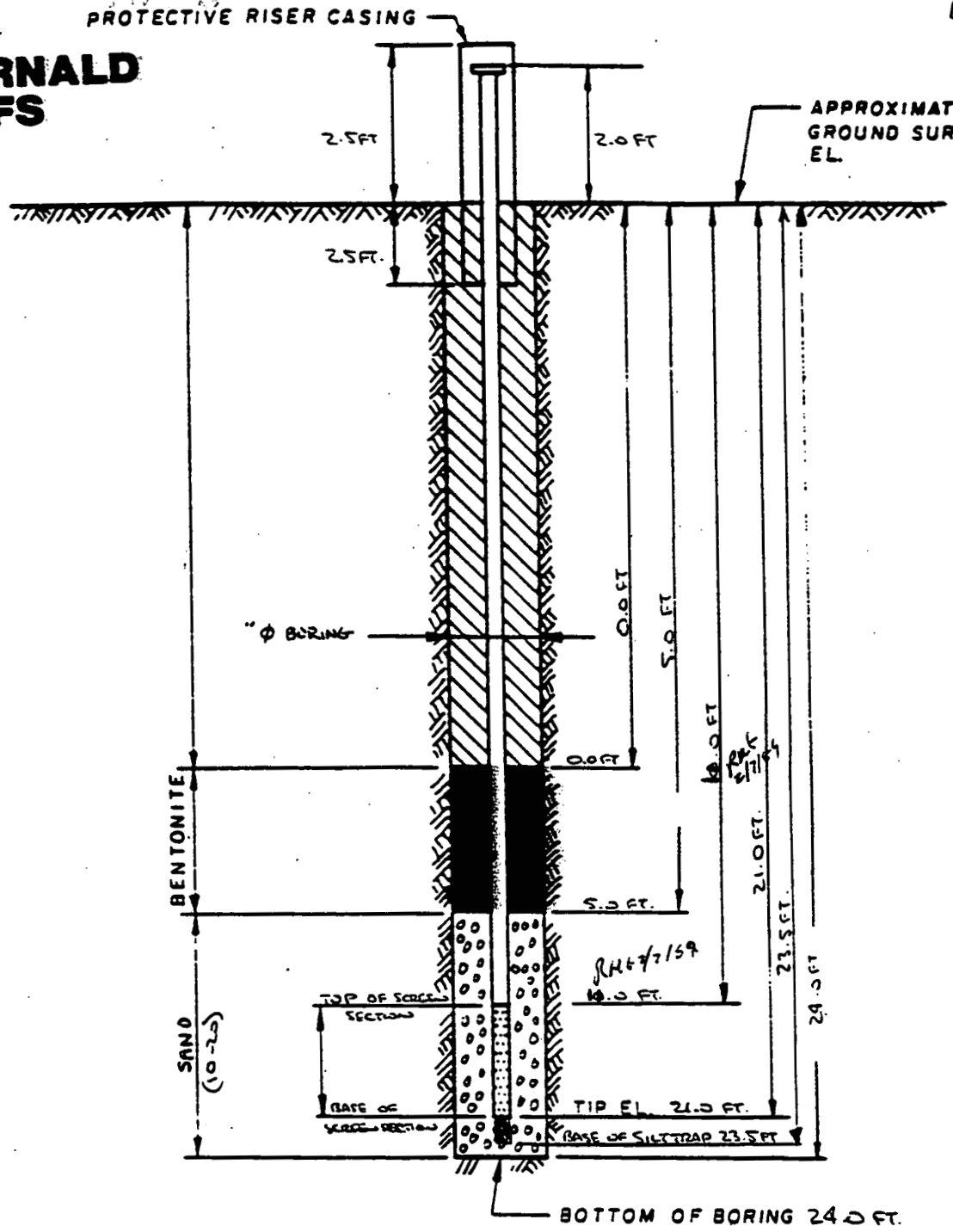
000841

402-11-86

DLG
2/4/89

BORING # ~~174~~ 1074
BB 1-5-89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

C00842

INSTALLATION DETAILS
MONITORING WELL
04-13-88
PREPARED FOR
BORING # ~~174~~
1074
BB 1-5-89

MATERIALS USED: 10-20 SAND (100LB SACKS): 8 SACKS
BENTONITE: 5 BUCKETS

FERNALD RI/FS

DLG 2/14/89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 04-13-88
PROJECT NO. 602 3.2 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~174~~ 1074 OB 1-5-89
PIEZOMETER NO. ~~174~~ 1074 DATE OF INSTALLATION 04-13-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT. TO 24.0 FT	SIZE 10" ID FROM 0.0 FT TO 24.0 FT
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN I.D. 4.0 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS ____
AVERAGE SIZE OF PERFORATIONS 0.010	JOINING METHOD SCREW TYPE
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.	FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT)	
TOP OF RISER PIPE	2.5		580.6	
GROUND SURFACE	0.0		578.1	
BOTTOM OF PROTECTIVE PIPE	2.5		575.6	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP	BOTTOM
BENTONITE	TOP 0.0 FT.	BOTTOM 5.0 FT	TOP 578.1	BOTTOM ~~583.1~~ 573.1
SAND	TOP 5.0 FT	BOTTOM 24.0 FT.	TOP ~~583.1~~ 573.1	BOTTOM ~~602.1~~ 554.1
GRAVEL	TOP N/A Rwb 2/7/89	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP ~~14~~ 11.0 FT.	BOTTOM 21.0 FT	TOP 567.1	BOTTOM 557.1
PIEZOMETER TIP	23.5		554.6	
BOTTOM OF BOREHOLE	24.0		554.1	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000943

409-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA K.G DATE 7/30/91

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~TTS~~ 1075	COORDINATES: 481637.42 N 1378748.84 E	DATE: 04-23-88
ELEVATION: 581.5 GROUND	GWL: Depth NA Date/Time NA	DATE STARTED: 04-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth NA Date/Time NA	DATE COMPLETED: 04-22-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				* NO SAMPLES WERE COLLECTED OVER THE 1ST 15.0 FT. OF THE BOREHOLE DUE TO ELEVATED HNU INSTRUMENT READINGS. THE INTERVAL FROM 0.0 FT TO 15.0 FT WAS DRILLED OUT AND CASED. SAMPLING WAS CONDUCTED OVER THE INTERVAL 15.0 FT THROUGH 25.5 FT. THE BORING WAS DRILLED OUT TO 28.0 FT.			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

NOTES:

CONTRACTOR: PENNDRILL
RIG: CYCLONE 000844
DRILLER: HARRY DYESS JR.
ASSISTANT: JOHN VANDINE

WATER ADDED TO HOLE: 150 GALLONS

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST

COLORS IDENTIFIED USING MUNSELL COLOR CHART

BACKGROUND LEVELS AT SURFACE:
HNU = 0
α = –
BZ = 1200 CPM
LEL O_2 : 0 PPM LEL
20.6% O_2

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.G DATE 7/30/91

QC/DA 7/24.89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~175~~ 3-22-89 1075	COORDINATES: Seep 1	DATE: 04-23-89
ELEVATION: Seep 1	GWL: Depth NA Date/Time NA	DATE STARTED: 04-21-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth NA Date/Time NA	DATE COMPLETED: 04-22-89
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08568 1518 04-21	6 7 9	10	MEDIUM STIFF, OLIVE-BROWN (2.5Y 4/4) CLAY, SOME SILT, DAMP	CL	1.0	HNU = 8 PPM α = — BG = 140 CPM
17–18	08569 1534 04-21	2 4 8	8	SOFT, OLIVE-BROWN (2.5Y 4/4) CLAY, SOME SILT, TRACE FINE GRAVEL, DAMP	CL	.5	HNU = 0 α = — BG = 140 CPM
19	08570 1607 04-21	10 15 23	14	VERY STIFF, OLIVE-BROWN (2.5Y 4/4) CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.25 TO .50 IN.) DRY	CL	3.0	HNU = 0 α = — BG = 140 CPM
20–21	08571 1644 04-21	9 17 26	12	VERY STIFF, OLIVE-BROWN (2.5Y 4/4) CLAY, SOME SILT, SOME FINE GRAVEL DRY	CL	3.0	HNU = 0 α = — BG = 140 CPM
22	08572 0825 04-22	8 14 19	12	VERY STIFF, OLIVE-BROWN (2.5Y 4/4) CLAY, SOME SILT, SOME FINE GRAVEL DRY	CL	3.0	HNU = 0 α = — BG = 140 CPM
23–24	08573 0908 04-22	11 18 20	12	HARD, OLIVE-BROWN (2.5Y 4/4) CLAY, SOME SILT, SOME FINE GRAVEL DRY	CL	>4.0	HNU = 0 α = — BG = 140 CPM
25	08574 0940 04-22	6 9 21	14	HARD, OLIVE-BROWN (2.5Y 4/4) CLAY, SOME SILT, SOME FINE GRAVEL TRACE COARSE GRAVEL (~.5 IN.) DRY	CL	>4.0	HNU = 0 α = — BG = 140 CPM
26–27				A SHELBY TUBE WAS PUSHED OVER THE INTERVAL 25.5 FT TO 27.5 FT. THERE WAS NO RECOVERY AND NO SAMPLE WAS COLLECTED			
28–29				BOTTOM OF BORING @ 28.0 FT.			

NOTES:

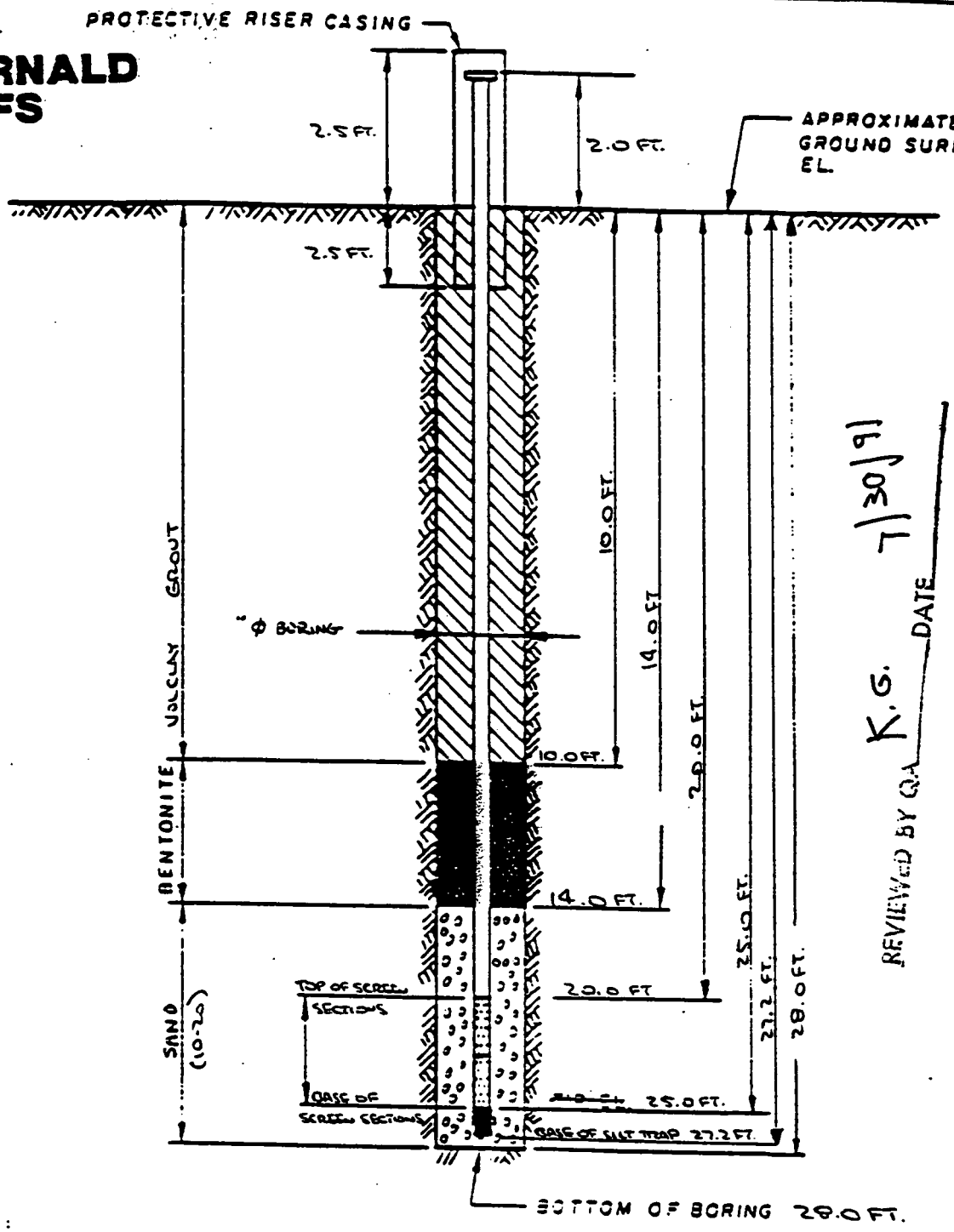
000845

402-11-86

QC/DH/2-4-89

BORING # 175

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY / APPROVED BY

MLS

DRAWN BY

REVIEWED BY Q.A. K.G. DATE 7/30/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL
04-22-88
PREPARED FOR
BORING # ~~175~~ 1075
3-22-89

MATERIALS USED: 10-20 SAND (100 LB. SACKS) = 5 SACKS
BENTONITE: 5 BUCKETS
GROUT: 3 BAGS

000846

FERNALD RI/FS

REVIEWED BY QA KG DATE 7/30/91

SC/DH/2.4.89

5709

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 04-22-88
PROJECT NO. 602 3.2 CHECKED BY R Galbreith DATE 2/7/89
BORING NO. ~~175~~ 1075
PIEZOMETER NO. 175 DATE OF INSTALLATION 04-22-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 28.0 FT	SIZE 10" ID FROM 0.0 FT TO 28.0 FT
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN I.D. 4.0 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS ____
AVERAGE SIZE OF PERFORATIONS 0.010	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 4.0 FT.	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (FT.)	
TOP OF RISER PIPE	2.5		~~579~~ KG 7/30/91 584	
GROUND SURFACE	0.0		581.5	
BOTTOM OF PROTECTIVE PIPE	2.5		579	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 10.0 FT.	TOP 581.5	BOTTOM 571.5
BENTONITE	TOP 10.0 FT.	BOTTOM 14.0 FT.	TOP 571.5	BOTTOM 567.5
SAND	TOP 14.0 FT.	BOTTOM 28.0 FT.	TOP 567.5	BOTTOM 553.5
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION(S)	TOP 20.0 FT	BOTTOM 25.0 FT.	TOP 561.5	BOTTOM 556.5
PIEZOMETER TIP	27.2 FT.		554.3	
BOTTOM OF BOREHOLE	28.0 FT		553.5	
GWL AFTER INSTALLATION	NA		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS * 2 - 2.5 FT STAINLESS STEEL SECTIONS WERE USED. THE ACTUAL PERFORATED AREA INCORPORATED OVER THESE SECTIONS IN 4.0 FT.

000847

FERNALD
FILE

FERNALD RI/FS

2-4-89

REVIEWED BY QA K.L DATE 7/20/92

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

1/23/89 WPK

RIG #2

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: D6 1076 BB 1/5/89	COORDINATES: 481825.85 N 1378742.84 E	DATE: 3-6-88
ELEVATION: 582.5 GROUND	GWL: Depth N/A Date/Time N/A	DATE STARTED: 03-06-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth N/A Date/Time N/A	DATE COMPLETED: 3-8-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 4

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08148 1045 03-06	3 5 7	12	STIFF, YELLOWISH BROWN (10YR 3/4) CLAY SOME FINE GRAVEL, ROOTLETS, DRY	CL	2.0	HNU = 0 α = — BG = 100 CPM
2 3	08149 1050 03-06	1 4 5	10	VERY STIFF, YELLOWISH BROWN (10YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	2.5	HNU = 0 α = — BG = 100 CPM
4	08150 1053 03-06	4 4 5	10	VERY STIFF, YELLOWISH BROWN (10 YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	2.5	HNU = 0 α = — BG = 100 CPM
5 6	08151 1056 03-06	3 4 5	9	MEDIUM STIFF YELLOWISH BROWN SILTY CLAY; SOME GRAVEL (10YR 4/5) WET 5.8	CL	1.0	HNU = 0 α = — BG = 100 CPM
7	08152 1059 03-06	3 4 4	10	MEDIUM STIFF OLIVE-GRAY (5Y 3/3) SILTY CLAY, SOME GRAVEL MOIST		1.0	HNU 0 α = — BG = 100 CPM
8 9	08153 1410 03-06	1 2 1	8		CL	1.0	HNU = 0 α = — BG = 100 CPM
10	08154 1430 03-06	NA	18"	SHELBY TUBE PUSHED FROM 9.0 FT. TO 10.5 FT, SAMPLE RECOVERED FROM 9.0 FT TO 10.5 FT 10.5			NA
11 12	08155 1035 03-07	7 14 25	18	VERY STIFF, YELLOWISH BROWN (10YR 4/5) SILTY CLAY, TRACE OF FINE SAND, SOME FINE GRAVEL DRY		3.0	HNU = 0 α = — BG = 160 CPM
13	08156 1047 03-07	14 18 25	18		CL	3.0	HNU = 0 α = — BG = 140 CPM
14	08157 1100 03-07	7 13 15	18	14.0 VERY STIFF, GREY (5Y 4/1) CLAY SOME FINE GRAVEL, DRY		2.0	HNU = 0 α = — BG = 100 CPM

NOTES:
CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR
ASSISTANT: JOHN VANDIVER

000848

WATER ADDED TO HOLE: 500 GALLONS

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST

COLORS: IDENTIFIED USING MUNSELL COLOR CHART

BACKGROUND LEVELS: HNU = 0
LEL O_2: 0 PPM LEL, 20.1% O_2
BG = 120 CPM
α = 0 CPM

FERNALD RI/FS

2-4-89 REVIEWED BY KC DATE 1/30/91 5709

	Initial	Date
1st Key In		
2nd Key In		3/9
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 176 10% DB 1-5-89	COORDINATES: See pl	DATE: 3-7-88
ELEVATION: See pl	GWL: Depth NA Date/Time NA	DATE STARTED: 03-06-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth NA Date/Time NA	DATE COMPLETED: 3-8-88
DRILLING METHODS: Cable tool		PAGE 2 OF 4

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08158 1107 03-07	3 8 14	16	VERY STIFF, MEDIUM GRAY (5Y 4/1) CLAY, WITH SOME FINE GRAVEL AND SILT, DRY	CL	2.0	HNU = 0 α = — BG = 140 CPM
17 18	08159 1115 03-07	8 7 11	14		CL	2.0	HNU = 0 α = — BG = 140 CPM
19	08160 1320 03-07	6 8 10	12	19.5	CL	2.0	HNU = 0 α = — BG = 120 CPM
20 21	~~08160~~ 08161 1525 03-07	9 5 8	4	VERY STIFF, MEDIUM GRAY (5Y 4/1) GRAVELLY CLAY, SOME SAND AND SILT, WET 21.2	CL	2.0	HNU = 0. α = — BG = 120 CPM ATTEMPTED TO PUSH SHELBY TUBE FROM 19.5 FT TO 21.5 FT TUBE COLLAPSED NO RECOVERY SPLIT SPOON SAMPLE TAKEN
22	08162 1538 03-07	2 5 8	10	VERY STIFF, OLIVE-GRAY, SILTY (10 YR 4/1) CLAY, SOME FINE GRAVEL, SOME FINE SAND, MOIST	CL	2.5	HNU = 0 α = — BG = 120 CPM
23 24	08163 1548 03-07	2 4 8	10		CL	2.5	HNU = 0 α = — BG = 140 CPM
25	08164 1557 03-07	2 4 6	10		CL	2.5	HNU = 0 α = — BG = 120 CPM
26 27	08165 1603 03-07	4 6 10	12	26.5	CL	—	HNU = 0 α = — BG = 120 CPM
28	08166 1640 03-07	3 6 9	14	MEDIUM DENSE, OLIVE-GRAY (10 YR 4/1) COARSE SAND AND GRAVEL, SILTY, WET 27.0 VERY STIFF, OLIVE GRAY (10YR 4/1) CLAY, SOME FINE GRAVEL, MOIST	CL	3.0	HNU = 0 α = — BG = 80 CPM
29	08167 1650 03-07	4 8 12	16		CL	3.0	HNU = 0 α = — BG = 80 CPM

NOTES:

000849

FERNALD RI/FS

2-4-89

REVIEWED BY QA K.L. DATE 7/20/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1076 1076 DB 1-5-89	COORDINATES: See p1	DATE: 3-8-88
ELEVATION: See p1	GWL: Depth NA Date/Time NA	DATE STARTED: 03-06-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth NA Date/Time NA	DATE COMPLETED: 3-8-88
DRILLING METHODS: Cable tool		PAGE 3 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08168 1705 03-07	4 7 11	12	VERY STIFF, OLIVE-GRAY (10YR 4/1) CLAY, SOME FINE GRAVEL, TRACE SAND, MOIST	CL	3.5	HNU = 0 α = — BX = 80 CPM
32	08169 0900 03-08	4 7 11	14		CL	4.0	HNU = 0 α = — BX = 120 CPM
33	08170 0920 03-08	16 25 50	16	HARD, OLIVE-GRAY, SILTY (10YR 4/1) CLAY, SOME FINE GRAVEL, TRACE SAND, MOIST	CL	>4.0	HNU = 0 α = — BX = 120 CPM
34							
35	08171 0940 03-08	50 50 50	8			>4.0	HNU = 0 α = — BX = 120 CPM
36				36.0 VERY DENSE, OLIVE-GRAY (5Y 5/1) CLAYEY GRAVEL AND SAND, DAMP 37.0	GC		
37	08172 1313 03-08	26 32 41	12	VERY STIFF, OLIVE-GRAY (5Y 5/1) CLAY SOME SAND AND GRAVEL, DAMP 37.5	CL	>4.0	HNU = 0 α = — BX = 100 CPM
				VERY DENSE, OLIVE-GRAY (5Y 5/1) CLAYEY GRAVEL AND SAND, DAMP 38.0	GC		
38	08173 1400 03-08	26 30 36	12	VERY DENSE, YELLOWISH-BROWN (10YR 5/4) SAND, DRY	SP		HNU = 0 α = — BX = 100 CPM
39							
40							
41							
42							
43							
44							

NOTES:

000850

402-11-86

FERNALD RI/FS

2-4-89

5709

REVIEWED BY QA KG DATE 7/30/91

1st Key In		
2nd Key In		8/19
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~176~~ 1076 BB 1/5/89	COORDINATES: see pl	DATE: 3-8-88
ELEVATION: see pl	GWL: Depth NA Date/Time NA	DATE STARTED: 03-06-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth NA Date/Time NA	DATE COMPLETED: 3-8-88
DRILLING METHODS: Cable Tool		PAGE 4 OF 4

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08176 1601 03-08	22 45 43	14	VERY DENSE, YELLOWISH-BROWN (10 YR 5/4) SAND, DRY, SOME FINE GRAVEL	SP		HNU = 0 α = — BG = 120 CPM
47							
48							
49	08350 1640 03-08	25 45 50	16	VERY DENSE, YELLOWISH-BROWN (10 YR 5/4) SAND, DRY, SOME FINE GRAVEL,	SP		HNU = 0 α = — BG = 120 CPM
50				BOTTOM OF BOREHOLE - 50.0 FT			

NOTES:

000851

402-11-86

FERNALD RI/FS

SJ 2-4-89

REVIEWED BY QA K.C. DATE 2/3/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS — FIELD ENG./GEO. M. SLUSARSKI — DATE 03-09-88
PROJECT NO. 602 TASK 3.2 — CHECKED BY R Galbraith — DATE 2/7/89
BORING NO. ~~176~~ 1076 BB 1076
PIEZOMETER NO. ~~176~~ 1076 — DATE OF INSTALLATION 03-09-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 FT. TO 48.5 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0 FT. TO 48.5 FT.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10.0 FT. RMG 2/7/89

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10' RMG 2/7/89
JOINING METHOD SCREW FLUSH JOINT THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.5		585	
GROUND SURFACE	0.0		582.5	
BOTTOM OF PROTECTIVE PIPE	2.5		580	
BOREHOLE FILL MATERIALS:	(1) 0.0	10.0	582.5	572.5
GROUT/SLURRY (1) UPPER PLUG (2) BASAL PLUG	TOP (2) 38.0	BOTTOM 44.0	TOP 544.6	BOTTOM 538.5
BENTONITE (1) UPPER PLUG (2) BASAL PLUG	TOP (1) 10.0 (2) 32.5	BOTTOM 15.0 38.0	TOP 572.5 550	BOTTOM 567.5 544.5
SAND	TOP 15.0	BOTTOM 32.5	TOP 567.5	BOTTOM 550
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 18	BOTTOM 28	TOP 564.5	BOTTOM 554.5
PIEZOMETER TIP	31.5 RMG 2/7/89		551	
BOTTOM OF BOREHOLE	50.0		532.5	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

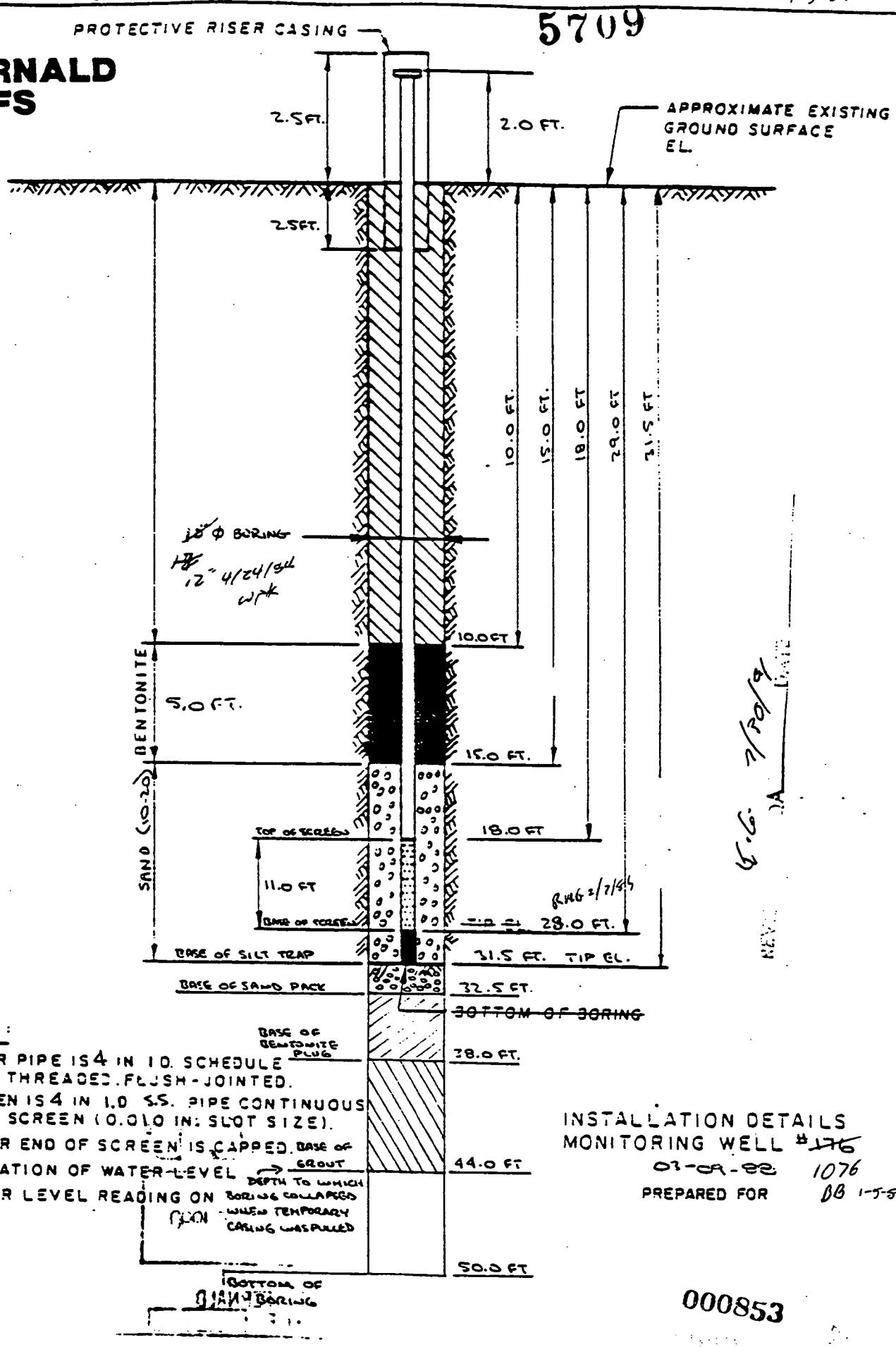
000852

2-4-89

BORING #176 BB. 1-5-89

5709

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL #~~176~~ 1076
03-08-88
PREPARED FOR BB 1-5-89

DRAWING NUMBER

CHECKED BY
APPROVED BY

DRAWN BY

000853

FERNALD RI/FS

REVIEWED BY QA KG DATE 7/30/91

BC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Final Copy Verification		

DPK 4/23/88 RIG # 2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~1077~~ 1076 ~~80~~ ~~1-F-84~~ KNE 2/6/89	COORDINATES: 481888.88N 1378704.29E	DATE: 03-18-88
ELEVATION: 581.59	GWL: Depth NA Date/Time NA	DATE STARTED: 03-15-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth NA Date/Time NA	DATE COMPLETED: 03-18-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08352 1320 03-15	1 4 10	12	STIFF, YELLOW-BROWN (10YR 4/3) SILTY CLAY, SOME FINE GRAVEL, TRACE ORGANIC MATERIAL AND ROOTLETS, DRY 1.5	CL	2.0	HNU = 0 ∝ = — BK = 120 CPM
2	08353 1324 03-15	7 7 9	14	VERY STIFF YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	3.5	HNU = 0 ∝ = — BK = 140 CPM
3 4	08354 1328 03-15	8 12 16	14	VERY STIFF YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	4.0	HNU = 0 ∝ = — BK = 140 CPM
5 6	08355 1332 03-15	20 28 25	8	HARD, YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	>4.0	HNU = 0 ∝ = — BK = 140 CPM
7	08356 1339 03-15	23 30 30	7		CL	>4.0	HNU = 0 ∝ = — BK = 140 CPM
8 9	08357 1345 03-15	30 35 40	18		CL	>4.0	HNU = 0 ∝ = — BK = 140 CPM
10 11	08358 1614 03-15	SHELBY TUBE		PUSHED SHELBY TUBE FROM 9.0 FT TO 11.0 FT. RECOVERED 1.5 FT	CL	3.0	HNU = 0 ∝ = — BK = 120 CPM
12	08359 1656 03-15	12 16	12	VERY STIFF, YELLOW-BROWN (10YR 4/6) SILTY CLAY, SOME FINE GRAVEL, DRY 13.8	CL	3.0	HNU = 0 ∝ = — BK = 140 CPM
13	08360 0835 03-16	6 15 20	14				HNU = 0 ∝ = — BK = 140 CPM
14	08361 0903 03-16	6 12 15	12	STIFF, GRAY (5YR 4/1) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	1.5	HNU = 0 ∝ = — BK = 120 CPM

SAMPLE # TIME DATE

NOTES: CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDING
WATER ADDED TO HOLE: 500 GALLONS

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0
∝ = 0 CPM
BK = 120 CPM
HLO_2 = 0 PPM LEL 20.9% O_2

000854

402-11-86

QC/DH/2-4-89 3709

	Initial	Date
1st Key in		
2nd Key in		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 7/30/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~1077~~ 1077 BB 1-5-89	COORDINATES: See p1	DATE: 03-18-88
ELEVATION: See p1	GWL: Depth NA Date/Time NA	DATE STARTED: 03-15-88
ENGINEER/GEOLOGIST: M. Sluzarski	Depth NA Date/Time NA	DATE COMPLETED: 03-18-88
DRILLING METHODS: Cable Tool		PAGE 2 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08362 0912 03-16	5 9 11	14	STIFF, GREY (5Y 4/1) SILTY CLAY SOME FINE GRAVEL DAMP	CL	2.0	HNU: 0 α: — BZ: 140 CPM
17	08363 0924 03-16	3 6 9	8	18.0			HNU: 0 α: — BZ: 140 CPM
18 19	08364 0937 03-16	2 6 12	8	VERY STIFF, GRY (5Y 4/1) GRAVELLY CLAY, SOME SILT, WET 19.5	CL	2.5	HNU: 0 α: — BZ: 140 CPM
20	08365 0945 03-16	6 5 6	8	MEDIUM, GREY (5YR 4/1) SILTY SAND, WITH SOME FINE GRAVEL, WET	SM		HNU: 0 α: — BZ: 120 CPM
21 22	08366 1030 03-16	SHELBY TUBE		PUSHED SHELBY TUBE FROM 21.0 FT TO 22.5 FT. RECOVERED 1.1 FT.			HNU: 0 α: — BZ: 120 CPM
23 24	08367 1115 03-16	2 14 11	10	VERY STIFF, GREY (5YR 5/1) GRAVELLY CLAY, WET 24.0	CL	2.5	HNU: 0 α: — BZ: 120 CPM
25	08368 1336 03-16	43 41 29	10	MEDIUM DENSE (5YR 5/1) SILTY GRAVEL WITH SOME SAND, WET 26.0	GM		HNU: 0 α: — BZ: 140 CPM
26 27	08369 1417 03-16	15 15 15	10	MEDIUM DENSE (5YR 5/1) GREY, WELL-GRADED GRAVEL-SAND MIXTURE, WET	GW		HNU: 0 α: — BZ: 140 CPM
28	08370 1517 03-16	14 23 19	12				HNU: 0 α: — BZ: 140 CPM
29	08371 1556 03-16	33 23 14	12				HNU: 0 α: — BZ: 140 CPM

NOTES:

000855

402-11-86

FERNALD RI/FS

QC/DH/2.489

REVIEWED BY QA KLG DATE 7/30/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1077 BB 1-5-89	COORDINATES: Seep1	DATE: 03-18-88
ELEVATION: Seep1	GWL: Depth NA Date/Time NA	DATE STARTED: 03-15-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth NA Date/Time NA	DATE COMPLETED: 03-18-88
DRILLING METHODS: Cable Tool		PAGE 3 OF 3

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	09372 1626 03-16	22 24 13	12	MEDIUM DENSE, GREY (5YR 5/1) WELL-GRADED, GRAVEL-SAND MIXTURE, WET	GW		HNU = 0 x = — BG = 140 CPM
32							
33				BOTTOM OF BOREHOLE: 33.0 FT			

NOTES:

000856

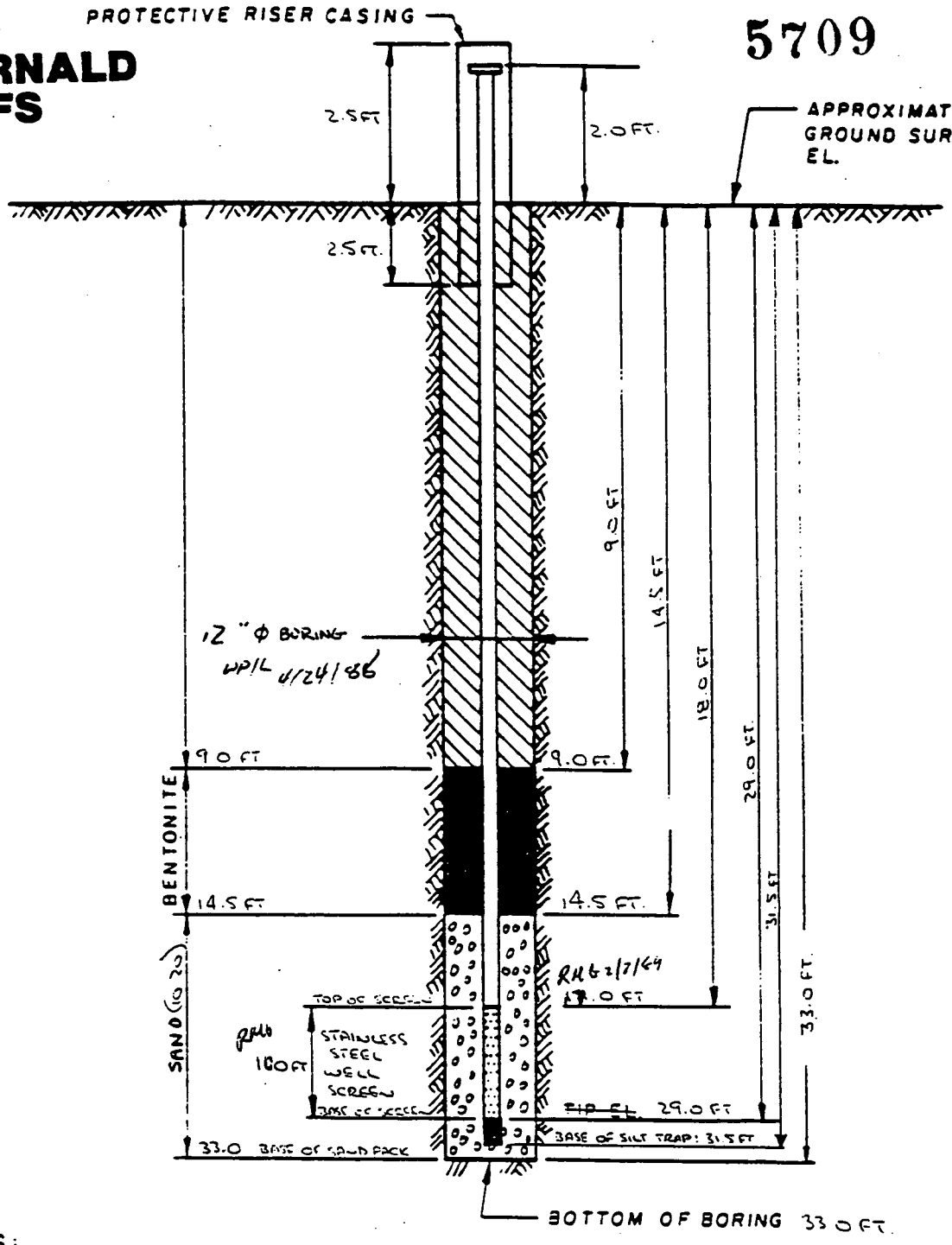
REVIEWED BY QA KG DATE 3/30/89 QC/DH/2.9.89

55

BORING # ~~LFT~~ 1077 BB 1-5-89

FERNALD RI/FS

5709



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL
03-18-88
PREPARED FOR

BORING # ~~LFT~~ 1077 BB 1-5-89

000857

QC/DH/2-4-89

K.G. 7/30/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLOWARSKI DATE 02-18-88

PROJECT NO. 602 TASK 32 CHECKED BY R M Galbraith DATE 2/6/89

BORING NO. ~~177~~ 1077 BB 1-5-89

PIEZOMETER NO. ~~177~~ 1077 DATE OF INSTALLATION 02-18-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 33.0 FT	SIZE 10" ID FROM 0.0 FT TO 35.0 FT
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN I.D. 4 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS ____
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD SCREW FLUSH JOINT
~~TOTAL PERFORATED AREA~~ SCREEN LENGTH 10.0 FT RMG-2/7/89	THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.5		584.09	
GROUND SURFACE	0.0		581.59	
BOTTOM OF PROTECTIVE PIPE	2.5		579.09	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 9.0 FT.	TOP 581.59	BOTTOM 572.59
BENTONITE	TOP 9.0 FT	BOTTOM 14.5 FT	TOP 572.59	BOTTOM 567.09
SAND	TOP 14.5 FT	BOTTOM 33.0 FT	TOP 567.09	BOTTOM 548.59
GRAVEL	TOP N/A	BOTTOM N/A	TOP ~	BOTTOM .
PERFORATED SECTION	TOP 19.0 FT	BOTTOM 29.0 FT.	TOP 564.59	BOTTOM 552.59
PIEZOMETER TIP	RMG-2/7/89 31.5 FT		550.09	
BOTTOM OF BOREHOLE	33.0 FT		548.59	
GWL AFTER INSTALLATION	NA		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒

WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

000858

5709

5709

FERNALD RI/FS

REVIEWED BY: K.G. 7/30/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

KKA 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~170~~ 1075 BB 1-5-89	COORDINATES: 481888.88 1378704.29	DATE: 12-7-87
ELEVATION: 583.49 riser pipe	GWL: Depth — Date/Time —	DATE STARTED: 12-7-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth — Date/Time —	DATE COMPLETED: 12-8-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07675 10:15	2 3 7	13	STIFF BROWN (10YR, 5/3) SILT, SOME CLAY, TRACE SAND - 1.5-1 1.4 ft	ML	2.0	HNU - 0PPM BG - 1400CPM ↓ 0CPM
2	07676 10:20	10 8 6	8	STIFF BLACK ASH SILT TO ~~GRAV~~ FINE GRAVEL IN SIZE. - DRY. 2.6	ML	15	HNU - 0PPM BG - 200CPM ↓ - 0CPM
3 4	07677 10:25	3 6 8	10	STIFF BLACK ASH SILT TO FINE GRAVEL IN SIZE - MOIST 4.1	ML	1.5	HNU - 1 PPM BG - 250CPM (ASH) 60 CPM (CLAY) ↓ - 10 CPM (CLAY)
				STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME SILT, TRACE SAND AND FINE GRAVEL (MOIST) 4.6	CL	2.5	
5	07678 10:55 07679 VERY MOIST	6 7 26	14	STIFF BLACK ASH, SILT TO FINE GRAVEL IN SIZE - ~~DRY~~ WET 5.2	ML	1.5	HNU 3 PPM BG - 80CPM (CLAY) 350CPM (ASH) ↓ - 10CPM (CLAY)
6				STIFF OLIVE GRAY CLAY, (5Y, 5/2) SOME SAND, TRACE ~~SILT AND~~ SILT AND FINE GRAVEL 6.2 MOIST	CL	2.5	
	~~07679~~	10	18	VERY STIFF BLACK ASH - SILT TO FINE GRAVEL SIZE, ~~TRACE~~ - WET. 6.6	ML	1.0	HNU - 0PPM BG 60CPM (CLAY) 150CPM (ASH) ↓ - 0CPM
7	07680 13:50	13 11		VERY STIFF OLIVE (5Y, 5/3) CLAY, ~~SOME~~ SILT TRACE SILT, FINE GRAVEL, AND ~~SAND~~ MOIST	CH	2.75	
				VERY ~~MOIST~~ - STIFF OLIVE (5Y, 5/3) SILT, SOME CLAY, TRACE SAND - 7.6-9	ML	—	
9	07681 16:15	2 3 5	14	MEDIUM STIFF OLIVE (5Y, 5/3) CLAY, SOME SILT, TRACE GRAVEL AND SAND MOIST	CL	-	HNU - 0PPM BG - 60CPM ↓ - 0CPM
10	07682 07683 R: 20	3 4 7	4	MEDIUM STIFF OLIVE (5Y, 5/3) CLAY, SOME ~~GRAV~~ FINE GRAVEL, TRACE SILT AND SAND.	CH	—	HNU - 0PPM BG - 60CPM ↓ - 0CPM 12-8-87 8:00
11		4 3		MEDIUM STIFF OLIVE (5Y, 5/3) CLAY, TRACE SILT, FINE GRAVEL AND ~~SAND~~ - WET.	CH	.25	HNU - 0PPM BG - 40CPM ↓ - 0CPM
12	07684 8:50	9	14	VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) SILTY CLAY, SOME GRAVEL, TRACE SAND - MOIST	CL	3.5	
13	07685 8:50	5 10 15	15	VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SILT, TRACE FINE GRAVEL AND SAND MOIST	CL	3.5	HNU 0PPM BG - 60CPM ↓ - 0CPM
14 15	07686 9:00	6 14 15	8	VERY STIFF BROWNISH YELLOW (10YR, 6/6) CLAY, SOME SAND, TRACE ~~GRA~~ SILT AND FINE GRAVEL - MOIST	CL	1.25	HNU - 0PPM BG - 70CPM ↓ - 2CPM

NOTES: CONTRACTOR: PENNWILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES
ASSISTANT: JOHN VARIONE.
WATER ADDED TO HOLE: 1 TICK = 10 GALLONS

SAMPLES TAKEN ACCORDING TO ASTM STANDARD PENETRATION TESTS.
COLORS CLASSIFIED USING MUNSELL COLOR CHARTS.
*PIECES OF ORANGE TAPE FOUND IN SPOON NUMBERS 07677 AND 07678 IN ASH.
0-6 FT - SAMPLES FROM FIRST LOCATION 10 FT. OUT OF PERMANENT WELL.

000859

FERNALD RI/FS

REVIEWED BY K.G. 7/30/91

	Initial	Date
1st Key In		
2nd Key In		8/19
Hard Copy		

PAC KKA 2/4/5

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 078	COORDINATES: see p1	DATE: 12-8-87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 12-7-87
ENGINEER/GEOLOGIST: D OAKLEY	Depth — Date/Time —	DATE COMPLETED: 12-8-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 3

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				MEDIUM DENSE BROWN (10YR 5/3)			
16	07683 10:10	11 9 7	15	~~VERY STIFF~~ CLAYEY SAND, SOME GRAVEL - MOIST. 16.3	SC	—	HNU - 0 PPM Bd - 60 CPM γ - 0 CPM
17	07685 10:35	3 6 11	9	VERY STIFF BROWN (10YR, 5/3) CLAY, ~~TRACE~~ FINE GRAVEL AND SAND - MOIST.	CL	1.75	HNU - 0 PPM Bd - 70 CPM γ - 0 CPM
18				VERY STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME GRAVEL AND SAND - MOIST	CL	3.5	
19	07689 10:45	6 9 17	9	VERY STIFF BROWN (10YR, 5/3) CLAY, SOME SAND AND GRAVEL - MOIST	CL	1.75	HNU - 0 PPM Bd - 40 CPM γ - 0 CPM
20	07690 13:10	2 2 2	3	VERY STIFF BROWN (10YR, 5/3) CLAY, SOME GRAVEL AND SAND - MOIST. SOFT GRAY (5Y, 5/1) CLAY, TRACE GRAVEL AND SAND - MOIST	CH	.1	HNU - 0 PPM Bd - 60 CPM γ - 0 CPM
21	07691 13:20	1 3 6	11	~~MEDIUM~~ STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL, TRACE SAND, ~~MOIST~~ ~~WET~~. MOIST	CH	.1	HNU - 0 PPM Bd - 60 CPM γ - 0 CPM
23	07692 13:30	3 3 7	14	~~MEDIUM~~ STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL, TRACE SAND. ~~WET~~ MOIST	CH	.1	HNU - 0 PPM Bd - 60 CPM γ - 0 CPM
24	07693 14:45	10 7 8	8	STIFF OLIVE GRAY (5Y, 5/2) GRAVELY CLAY, SOME SAND - ~~WET~~ MOIST 25.6	CH	—	HNU - 0 PPM Bd - 40 CPM γ - 0 CPM
26	07694 15:00	7 7 6	12	MEDIUM DENSE OLIVE GRAY (5Y, 5/2) GRAVELY SAND, SOME CLAY - MOIST. 26.3	SC	—	HNU - 0 PPM Bd - 80 CPM γ - 0 CPM
27				STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME SAND, TRACE GRAVEL - MOIST.	CH	—	
28	07695 15:00	3 5 6	3	STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME FINE GRAVEL AND SAND, 28.3 MOIST.	CH	—	HNU - 0 PPM Bd - 70 CPM γ - 0 CPM
29 30	07696 15:50	2 4 5	4	MEDIUM DENSE OLIVE GRAY ~~GRAVEL~~ (5Y, 5/2) GRAVEL AND CLAY, TRACE SAND - MOIST	GC	—	HNU - 0 PPM Bd - 60 CPM γ - 0 CPM

000860

NOTES:

BACKGROUND (12-4-87)
HNU - 0 PPM
LEL - 0 %
Bd - 100 CPM (AIR) - 200 CPM (GROUND)
γ - 0 CPM

FERNALD RI/FS

REVIEWED BY K.G. 7/30/91

5709

	Initials	Date
1st Key In		
2nd Key In		8/9
Hard Copy Verification		

RKA 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1078	COORDINATES: see p1	DATE: 12-8-87
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 12-7-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth – Date/Time –	DATE COMPLETED: 12-8-87
DRILLING METHODS: CARYE TOOL		PAGE 3 OF 3

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	07647 16:40	2 4 14	11	VERY STIFF OLIVE GRAY (5Y, 5/2) CLAY AND GRAVEL + TRACE SAND - MOIST	CL	–	HNU - 0PPM Bd - 70CPM γ - 0CPM
				31.1 ~~DENSE~~ GRAY (5Y, 5/1) FINE SAND, TRACE CLAY.	SP	–	
32	07648 16:30	7 11 15	14	DENSE GRAY (5Y, 5/1) FINE SAND, TRACE CLAY AND GRAVEL - MOIST,	SP	–	HNU - 0PPM Bd - 70 CPM γ - 0CPM
33				33.6			
34	07649 17:15	15 11 20	8	HARD OLIVE GRAY (5Y, 5/2) CLAY, SOME SILT, TRACE ~~SAND~~ SAND AND FINE GRAVEL - MOIST	CL	1.25	HNU - 0PPM Bd - 80 CPM γ - 0 CPM
35				WELL TD - 34.6 FT.			

NOTES:

000861

FERNALD RI/FS

REVIEWED BY CA K.C. DATE 7/30/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

DA KKA 2/

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 12.9.87
PROJECT NO. 602 CHECKED BY [illegible] DATE 2/6/89
BORING NO. 1078
PIEZOMETER NO. MA 1078 DATE OF INSTALLATION 12.9.87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 4 FT. TO 34.6 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD
CASING SIZE (S) USED:
SIZE 10 IN. FROM 0 TO 34.5 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 IN
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 IN.
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD ~~AND COUPLE~~
Flush Joint RHL 2/7/89

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE Ø.D. 10 IN.

OTHER PROTECTION LOCKABLE CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		583.49	
GROUND SURFACE	0.0		581.49	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		578.99	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 1.5 FT.	BOTTOM 14.5 FT.	TOP 579.99	BOTTOM 566.99
BENTONITE	TOP 14.5 FT.	BOTTOM 19.5 FT.	TOP 566.99	BOTTOM 561.99
SAND	TOP 19.5 FT.	BOTTOM 34.6 FT.	TOP 561.99	BOTTOM 546.89
GRAVEL	TOP NA	BOTTOM NA	TOP /	BOTTOM /
PERFORATED SECTION	TOP 22.0 FT.	BOTTOM 32.0 FT.	TOP 559.99	BOTTOM 549.99
PIEZOMETER TIP	34.6 FT		546.89	
BOTTOM OF BOREHOLE	34.6 FT.		546.89	
GWL AFTER INSTALLATION	NA		/	

IS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS 000862

REVIEWED BY QA K.L. DATE 7/30/91

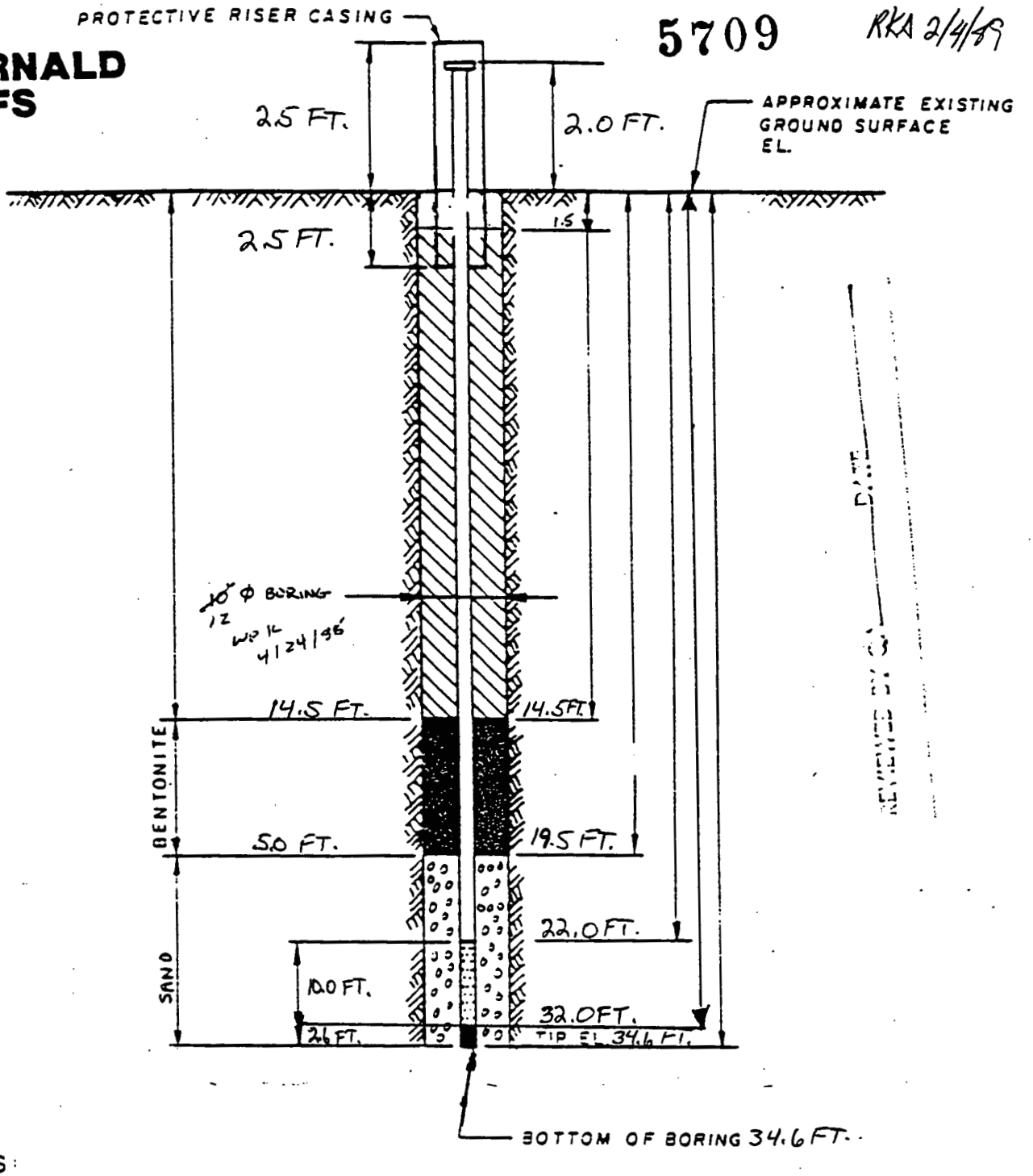
#31

WELL # ~~178~~ 1078 BH

5709

RKA 2/4/89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DBO

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

This form did not represent the installed monitoring well, therefore it has been modified without sign out by D. Oakley. WPK 4/24/88

INSTALLATION DETAILS
MONITORING WELL ~~178~~ 1078

PREPARED FOR BB 1-5-89

000863

write out corrections were made by D. Oakley at the time this form was completed. WPK 4/24/86

QC/DH/2.489

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 8/1/91

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 179 1179 BB 1-5-94	COORDINATES: 482273.70 1378165.47	DATE: 10.19.87	
ELEVATION: 583.98 TOW	GWL: Depth — Date/Time —	DATE STARTED: 10-19-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth — Date/Time —	DATE COMPLETED: 10-20-87	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 3	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6/in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.5	7369	5 13 17	13	YELLOWISH BROWN SILT, TRACE GRAVEL AND CLAY - DRY HARD, VERY PALE BROWN CLAY, TRACE SILT AND TRACE SAND - DRY	ML CL	4.5+	MUNSELL 10YR 5/4 MUNSELL 10YR 7/4 SAMPLE SCANNED AT BACKGROUND
3.0	7370	26 24 33	18	HARD, LIGHT YELLOWISH BROWN CLAY AND SILT, TRACE SAND - DRY	CL ML	4.5+	MUNSELL 10YR 6/4 SAMPLE SCANNED - AT BACKGROUND
4.5	7371	50 REF	4	HARD, LIGHT YELLOWISH BROWN CLAY, SOME SILT AND SAND, TRACE GRAVEL - DRY 4.6 "	CL	4.5+	MUNSELL 10YR 6/4 SAMPLE SCANNED - AT BACKGROUND
6.0	7372	8 11 13	14	MEDIUM STIFF GRAY SILT, TRACE CLAY AND SAND - DRY 5.5 MEDIUM STIFF LIGHT YELLOWISH BROWN 6.0 CLAY, TRACE SILT, GRAVEL, AND SAND - DRY 6.3 COAL GRAVEL AND SILT, TRACE SAND AND CLAY.	ML CL GM	4.5+ 3.5	MUNSELL 5Y 6/1 SAMPLE SCANNED AT BACKGROUND MUNSELL 10YR 6/4
7.5	7373	8 6 8 15	12	MEDIUM STIFF GRAY SILT, TRACE CLAY AND SAND - DRY	ML	NK	1ST SPOON EMPTY SAMPLE SCANNED - AT BACKGROUND
9.0	7374	6 8 13	14	MEDIUM STIFF GRAY SILT, SOME CLAY, TRACE SAND - DRY 8.8 GRAVEL AND MEDIUM STIFF, OLIVE CLAY, SOME SILT DRY	ML CL	2.0	SAMPLE SCANNED - AT BACKGROUND MUNSELL 5/3
10.5	7375	5 6 8	16	STIFF YELLOWISH RED CLAY, TRACE SILT, 9 - DRY WOOD FRAGMENTS 10.3 STIFF GRAY SILT, SOME CLAY - MOIST 10.9 LIGHT YELLOWISH BROWN SILT, TRACE SAND AND CLAY.	OL ML ML	1.25 .1 .1	MUNSELL 5YR 5/8 SAMPLE SCANNED AT BACKGROUND. MUNSELL 5Y 5/1 MUNSELL 10YR 6/4
12.0	7376	5 6 8	18	STIFF REDDISH YELLOW CLAY - TRACE SILT AND SAND - DRY 11.5 GRAY CLAY SOME SILT, TRACE SAND - DRY	CL CL	1.75	MUNSELL 7.5YR 6/8 SAMPLE SCANNED AT BACKGROUND. MUNSELL 5Y 5/1
13.5	7377	2 10 12	10	OLIVE GRAY SILT, TRACE GRAVEL AND SAND - MOIST MEDIUM DENSE OLIVE YELLOW SAND, SOME GRAVEL, SOME CLAY, TRACE SILT 13.6 PALE OLIVE CLAY, TRACE SILT, GRAVEL, SAND - MOIST	ML SC CL	.2 -	MUNSELL 5Y 5/2 MUNSELL 2.5Y 5/4 SAMPLE SCANNED - AT BACKGROUND.
15.0	7378	8 10 15	12	VERY STIFF LIGHT YELLOWISH BROWN GRAVEL, SOME CLAY, TRACE SILT AND SAND - MOIST 14 LIGHT OLIVE BROWN CLAY, SOME SILT TRACE SILT, MOIST	GC CH	- -	MUNSELL 5Y 6/3 SAMPLE SCANNED - AT BACKGROUND

NOTES:

216 - CYCLONE 42

DRILLER - HARRY DYKES JR

ASSISTANT - JOE BARILE

JOHN VANDINE

WATER ADDED TO HOLE - TICK = 5 GALLONS

BACKGROUND

HNU - ZERO

LEL - ZERO

ALPHA - ZERO

BETA/GAMMA - 40-80 COUNTS/MIN

000864

5709 QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA K.G DATE 8/6/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1079	COORDINATES: see p1	DATE: 10.19.87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 10.19.87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth — Date/Time —	DATE COMPLETED: 10.20.87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.5	7379	10 16 27	12	15.5 GRAY CLAY, SOME ~~SILT GRAVEL~~ SILT, TRACE SAND	CL	1.25	MUNSELL 5Y 5/1
				HARD, GRAY CLAY, SOME GRAVEL, TRACE SILT AND SAND, MOIST	CL		MUNSEL 2.5Y N/6 SAMPLE SCANNED AT BACKGROUND. 730 10-2
18.0	7381 / 7380	2 7 13	10	VERY STIFF, LIGHT GRAYISH BROWN CLAY, SOME GRAVEL, TRACE SILT AND SAND - MOIST	CH	.25	ST 7380 FULL REC. MUNSELL 2.5Y 6/2
19.5	7382	2 6 10	5	VERY STIFF, LIGHT GRAYISH BROWN CLAY, SOME GRAVEL, TRACE SILT AND SAND - MOIST	CL	2.0	MUNSELL 2.5Y 6/2
21.0	7383	10 12 20	13	HARD, LIGHT GRAYISH BROWN CLAY, SOME GRAVEL, TRACE SALT AND SAND - WET	CL	1.25	MUNSELL 2.5Y 6/2
22.5	7384	5 10	3	STIFF LIGHT YELLOWISH BROWN CLAY SOME GRAVEL, TRACE SILT AND SAND - WET	CH		1ST BARREL EMPTY MUNSELL 2.5Y 6/2
24.0	7385	4 6 9	15	STIFF, LIGHT YELLOWISH BROWN CLAY, SOME GRAVEL, TRACE SAND AND SILT - WET	CH	1.25	MUNSELL 2.5Y 6/2 LESS GRAVEL THAN PREV. SAMPLES.
25.5	7386	4 6 15	18	STIFF, LIGHT YELLOWISH BROWN CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST	CH	1.25	MUNSELL 2.5Y 6/2
27.0	7387	5 20 48	13	STIFF LIGHT YELLOWISH BROWN CLAY, WET ~~SOME GRAVEL, TRACE SAND AND SILT~~	CH	1.0	MUNSELL 2.5Y 6/2
				VERY DENSE, GRAY GRAVEL, SOME SAND, TRACE CLAY AND SILT - WET	GC		MUNSELL 2.5Y N5/1
28.5	7388	34 20 29	15	DENSE, LIGHT YELLOWISH BROWN, WET GRAVEL, SOME SAND, TRACE CLAY	GC		MUNSELL 2.5Y 6/2
				HARD, LIGHT YELLOWISH BROWN CLAY, TRACE GRAVEL, SAND, AND SILT - MOIST	CL	4.5	
30.0	7389	10 17 35	15	HARD, LIGHT YELLOWISH BROWN CLAY, SOME GRAVEL AND SILT, TRACE SAND - MOIST	CL	4.5	MUNSELL 2.5Y 6/2

NOTES: WATER ADDED TO HOLE - TOTAL = 5 GALLONS

~~HH~~ ~~HH~~ 1

000865

FERNALD RI/FS

REVIEWED BY QA K.C. DATE 8/9/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Indicator		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1079	COORDINATES: see p1	DATE: 10.20.87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 10.19.87
ENGINEER/GEOLOGIST: D OATLEY	Depth — Date/Time —	DATE COMPLETED: 10.20.87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 3

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				30.3 LIGHT YELLOWISH BROWN CLAY SOME GRAVEL TRACE SILT DRY	CL		MUNSELL 2.5Y 6/2
31.5	7390	12 22 32	17	~~OLIVE~~ HARD OLIVE CLAY, SOME GRAVEL, AND SILT, TRACE SAND — DRY.	CL	4.5	MUNSELL 5Y 5/3
				32.0 OLIVE CLAY, SOME GRAVEL ~~AND~~ TRACE ~~SA~~ SILT AND SAND DRY			MUNSELL 5Y 5/3
33.0	7391	11 50LEF	~~14~~ 12	HARD LIGHT BROWNISH GRAY SILT, SOME SAND ~~SAND GRAVEL AND WOOD~~, — ~~DRY~~ MOIST	ML	2.0	MUNSELL 2.5Y 6/2
34.5	7392	20 28 30	18	HARD LIGHT BROWNISH GRAY SILT, SOME SAND, TRACE GRAVEL — ~~DRY~~ MOIST	ML	2.5	MUNSELL 2.5Y 6/2
				34.1 HARD OLIVE CLAY SOME FINE GRAVEL, TRACE SILT AND SAND	~~SW~~	4.5	MUNSELL 5Y 5/3
36.0	7393	9 17 27	18	HARD OLIVE CLAY, SOME GRAVEL, TRACE SILT AND SAND-MOIST	CL	4.25	MUNSELL 5Y 5/3
37.5	~~7394~~ 7394	9 10 13	13	VERY STIFF, OLIVE SILT, TRACE CLAY - WET	ML	1.25	LACUSTRIAN DEPOSIT ~~BY THINGELLS~~ LAYERED SILT MUNSELL 5Y 5/3
				37.3 OLIVE SILT, SOME CLAY - WET	ML		
				37.7 OLIVE SILT, SOME CLAY, TRACE SAND - WET			MUNSELL 5Y 5/3
39.0	7395	0 0 18 30	15	HARD BROWNISH YELLOW SILT, SOME CLAY - MOIST	ML	3.5	MUNSELL 10YR 6/8
				38.3 DENSE YELLOWISH BROWN SAND TRACE SILT.	SW	1.5	MUNSELL 10YR 5/6
				TD 39.0 FT.			

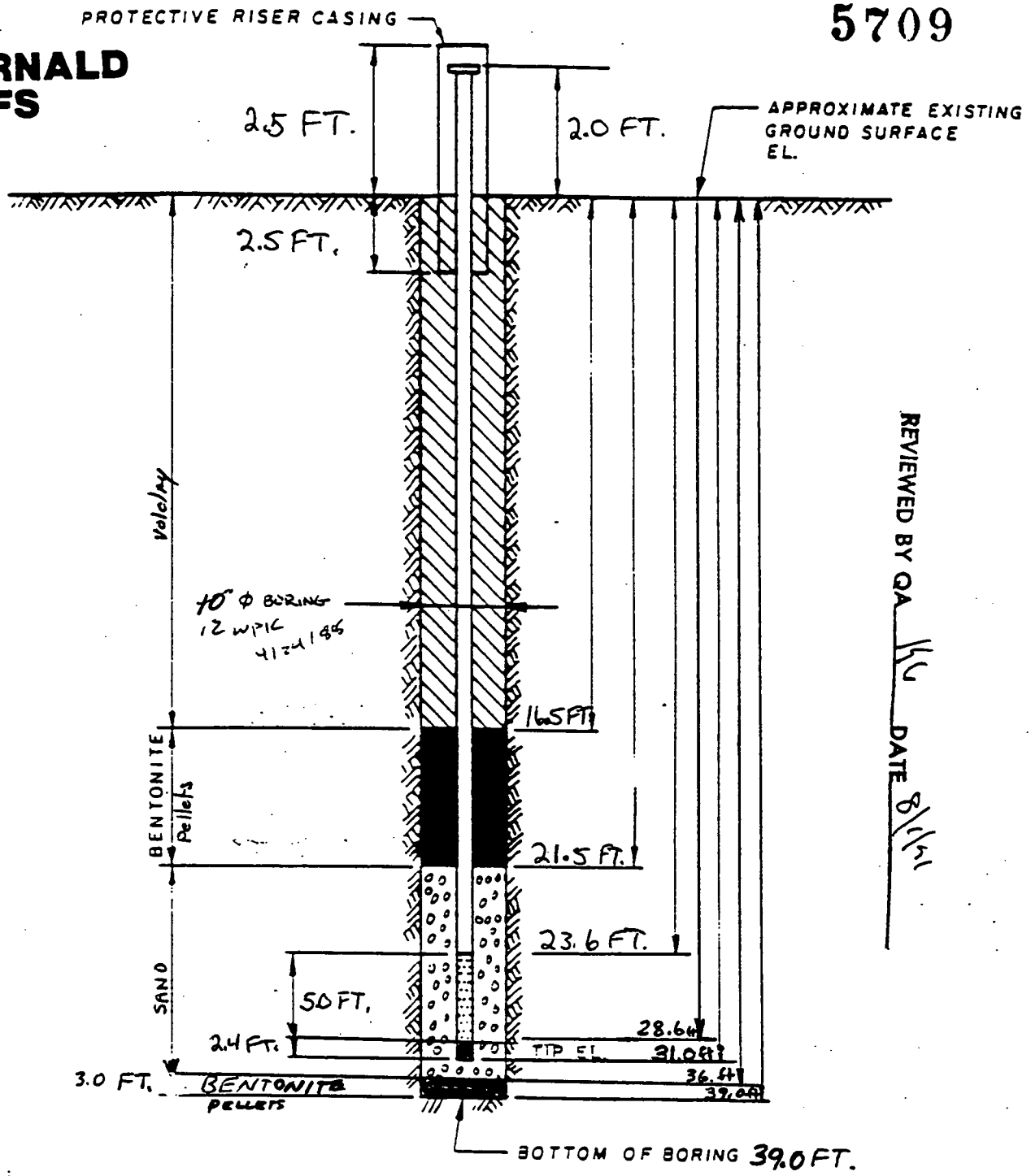
NOTES:

000866

QC/DH/2.4.89
WELL # ~~179~~ 1079 BB

5709

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

REVIEWED BY QA DATE 8/1/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~179~~ 1079 BB

PREPARED FOR 1-5-89

White out corrections were made by D. Oakley at the time this form was completed.
4/24/89 WPIC

000867

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAK

FERNALD RI/FS

REVIEWED BY QA KL - DATE 8/6/91

REVIEWED

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD
PROJECT NO. 602
BORING NO. 1079
PIEZOMETER NO. NA 1079

FIELD ENG./GEO. D. OAKLEY DATE 10.21.87
CHECKED BY R Galbraith DATE 3/7/89
DATE OF INSTALLATION 10.21.87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 1 TO 26 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD HAMMER
CASING SIZE (S) USED:
SIZE 10 IN FROM 0 TO 35 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING 316 STAINLESS
DIAMETER OF PERFORATED SECTION 4 IN
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 INCH
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 5 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD AND COUPLE

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE ~~O.D.~~ I.D. 10 INCH

OTHER PROTECTION LOCKABLE CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT		583.98	
GROUND SURFACE	0.0		581.98	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		574.48	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 1.0 FT	BOTTOM 16.5 FT.	TOP 580.98	BOTTOM 565.48
BENTONITE	TOP 16.5 FT	BOTTOM 21.5 FT.	TOP 565.48	BOTTOM 560.48
SAND	TOP 21.5 FT	BOTTOM 36.0 FT.	TOP 560.48	BOTTOM 545.98
~~NO GRAVEL USED~~ BENTONITE	TOP 36.0	BOTTOM 39.0 MS 4-2-91	TOP 545.98	BOTTOM 542.98
PERFORATED SECTION	TOP 23.6 FT. MS 4-2-91	BOTTOM 28.6 FT.	TOP 558.38	BOTTOM 553.38
PIEZOMETER TIP	31.0		550.98	
BOTTOM OF BOREHOLE	39.0 FT. MS 4-2-91		542.98	
GWL AFTER INSTALLATION	—		—	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS While corrections were made by D. Oakley at the time this form was completed

000868

FERNALD RI/FS

REVIEWED BY QA KG. DATE 8/1/91 5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy		

RKA 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 180 1050 BD 1-5-89	COORDINATES: 482219.86N 1378630.45E	DATE: 4/26/88
ELEVATION: 581.7 GROUND	GWL: Depth N/A Date/Time N/A	DATE STARTED: 4/26/88
ENGINEER/GEOLOGIST: DAVIES	Depth N/A Date/Time N/A	DATE COMPLETED: 4/27/88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 4

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0	08780	3 7 5	6	M. Dense, Very Pale Brown (10YR 8/4) Gravelly Sand. Fill. Dry			t = 0918 Hnu = 0ppm α = 2cpm γ/β = 40cpm
2.5	08781	4 5 6	4	Very Stiff, Dark Yellowish Brown (10YR 4/4) Clay, some silt. Moist.	CL		t = 0924 Hnu = 0ppm α = 2cpm γ/β = 40cpm Pebble blocked spoon.
	08782	5 9 11	12	Very Stiff, Dark Brown (10YR 3/3) Silty Clay, trace sand, trace gravel. Moist	CL	3.7	t = 0928 Hnu = 0ppm α = 2cpm γ/β = 40cpm
5.0	08783	8 10 14	13	Very Stiff, Dark Yellowish Brown (10YR 4/4) with gray mottled Silty Clay, trace gravel, trace sand. Moist.	CL	2.7	t = 0933 Hnu = 0ppm α = 2cpm γ/β = 40cpm
	08784	14 17 19	13	Very Stiff, Very Dark Brown (10YR 2/2) Silty Clay, trace gravel, trace sand. Moist.	CL	3.3	t = 0940 Hnu = 0ppm α = 2cpm γ/β = 40cpm
7.5	08785	5 11 15	14	Very Stiff, Dark Gray (2.5Y 4/0) Clay, some silt, trace gravel, trace sand. Moist.	CL	3.5	t = 1118 Hnu = 0ppm α = 2cpm γ/β = 40cpm
10.0	08786	2 10 17	12	Very Stiff, Very Dark Gray (2.5Y 3/0) Clay, some silt, trace sand. Moist	CL	2.8	t = 1142 Hnu = 0ppm α = 2cpm γ/β = 55cpm
	ST 08787	NA	12				t = 1327 Pushed Shelby 1.5 Ft 1.0 Ft recovery
12.5	08788	16 24 32	18	Hard, Yellowish Brown (10YR 5/6) Silty Clay, trace sand and gravel. Moist	CL	4.1	t = 1339 Hnu = 0ppm α = 2cpm γ/β = 40cpm
15.0	08789	4 14 25	9	Very Stiff, Brownish Yellow (10YR 6/8) Silty Clay, trace sand and gravel. ~~Moist~~ B.D Dry	CL	2.5	t = 1355 Hnu = 0ppm α = 2 cpm γ/β = 40cpm

NOTES: Drilling Contractor : Pennsylvania Drilling
Driller : Joe Basile
Helper : John Vandine
Rig : 72 Speedstar

Water Used During Drilling = 350 gallons
Soil Sampling as per ASTM
Color Descriptions as per Munsell
Field Measurements : Hnu, γ/β, α

000869

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 8/1/91

1st Key In		
2nd Key In		
Hard Copy Verification		

PA

RKA 2/4/93

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 180 1050 BB 1-5-90	COORDINATES: See p1	DATE: 4/26/88
ELEVATION: See p1	GWL: Depth NA Date/Time N/A	DATE STARTED: 4/26/88
ENGINEER/GEOLOGIST: DAVIES	Depth NA Date/Time N/A	DATE COMPLETED: 4/27/88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 4

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	08790	9 34 14	16	Hard, Yellowish Brown (10YR 5/4) Silty Clay, trace sand and gravel. Moist 16.4	CL	>4.5	t: 1416 Hm: 0 ppm α: 2cpm γ/β: 60cpm
17.5	08791	3 8 11	12	Very Stiff, Gray (2.5Y 5/0) Silty Clay, trace sand and gravel. Moist.	CL	2.5	t: 1430 Hm: 0ppm α: 2cpm γ/β: 40cpm
	08792	4 8 13	17	Stiff, Dark Gray (2.5Y 4/0) Silty Clay trace sand and gravel. Moist	CL	1.6	t: 1450 Hm: 0ppm α: 2cpm γ/β: 40cpm
20.0	08793	2 5 8	14	Stiff, Gray (2.5Y 5/0) Silty Clay trace sand and gravel. Moist.	CL	1.6	t: 1501 Hm: 0ppm α: 2cpm γ/β: 40cpm
							t: 1605 Pushed Shelby no recovery
22.5	08668	8 10 15	13	Stiff, Gray (2.5Y 5/0) Silty Clay trace sand and gravel. Moist.	CL	1.1	t: 1629 Hm: 0ppm α: 2cpm γ/β: 40cpm
25.0	08794	NA	21				t: 1715 Pushed Shelby 2.0 Ft ~~into~~ 2.0. 1.75 Ft recovery
	08795	5 9 40	5	Stiff, Gray (2.5Y 5/0) Silty Clay, some gravel, trace sand. Moist	CL	1.5	t: 0743 4/27/88 Hm: 0ppm α: 2cpm γ/β: 40cpm
27.5	08796 08797 08798	12 36 58	14	Hard, Dark Gray (2.5Y 4/0) Silty Clay, some gravel, trace sand. Moist.	CL	>4.5	t: 0805 Hm: 0ppm α: 2cpm γ/β: 40cpm
30.0	08799	15 50 50/4"	16	Hard, Gray (2.5Y 5/0) Silty Clay, trace sand and gravel. Moist. 29.6	CL	>4.5	t: 0833 Hm: 0ppm α: 2 γ/β: 40cpm
				~~Hard~~ V. Dense, Gray 2.5Y 5/0 Fine sand some silt 29.8	SW		

NOTES:

See Following page

Pushed Shelby from 21.0-23.0 Feet. No recovery.

000870

402-11-86

5709

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 8/1/91

1st Key In		
2nd Key In		
Hard Copy Verification		

RKA 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3-2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~180~~ 1080 BB 1-5-89	COORDINATES: See P'	DATE: 4/27/88
ELEVATION: See P'	GWL: Depth N/A Date/Time N/A	DATE STARTED: 4/26/88
ENGINEER/GEOLOGIST: DAVIES	Depth N/A Date/Time N/A	DATE COMPLETED: 4/27/88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 4

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	08800	38 50/4	10	Hard, Dark Gray (5Y 4/1) Sandy Silt, some clay. moist. ~31 Ft.	ML	>4.5	t: 0857 Hm = 0ppm α = 2cpm γ/β = 40cpm
32.5	08801	14 24 29	18	Very Stiff, Dark Gray (5Y 4/1) Clay, some silt, trace sand and gravel. Moist	CL	3.5	t: 0958 Hm = 0ppm α = 2cpm γ/β = 40
	08802	5 11 18	4	Dark Gray (5Y 4/1) Clay, some silt and gravel. Moist.	CL		t: 1015 Hm = 0cpm α = 2cpm γ/β = 40cpm Rock in end of sampler
35.0	08803	5 9 12	17	Very Stiff Dark Gray (5Y 4/1) Silty Clay trace sand and gravel. moist			t: 1027 Hm = 0ppm α = 2cpm γ/β = 40cpm
	08804	7 21 27	15	Very Stiff, Dark Gray (5Y 4/1) Silty Clay trace sand and gravel moist. 36.6 Hard, Brownish Yellow (10YR 6/8) Silty Clay. Moist. 36.8	CL CL SW	2.1 >4.5	t: 1042 Hm = 0ppm α = 2cpm γ/β = 50cpm
37.5				Very Dense, Very Pale Brown (10YR 7/4) Fine sand, well sorted, trace silt. Dry			
40.0	08665	16 36 50	16	Very Dense, Very Pale Brown (10YR 7/4) Fine Sand, well sorted, trace silt. Slightly Moist.	SW		t: 1100 Hm = 0ppm α = 2cpm γ/β = 50cpm
42.5							
45.0							

NOTES: Bottom of hill 36.8 Feet

000871

402-11-86

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 8/1/91

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

RKA 2/4/5

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 1080	COORDINATES: See p1	DATE: 4/27/88
ELEVATION: See p1	GWL: Depth N/A Date/Time N/A	DATE STARTED: 4/26/88
ENGINEER/GEOLOGIST: DAVIES	Depth N/A Date/Time N/A	DATE COMPLETED: 4/27/88
DRILLING METHODS:		PAGE 4 OF 4

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45.0	08666	35 49 44	18	Very Dense, Very Pale Brown (10YR 7/4) fine sand, trace med. sand to fine gravel, trace silt. Slightly Moist	SW		t: 1258 Hmax = 0ppm α: 2cpm γ/β: 40cpm
47.5							
50.0	08667	22 33 50	17	Very Dense Brownish Yellow (10YR 6/6) fine sand, trace med. sand to fine gravel, trace silt, Moist.			t: 1411 Hmax = 0ppm α: 2cpm γ/β: 40cpm
51.5				END OF BORING 51.5 Ft.			

NOTES:

000872

402-11-8

FERNALD RI/FS

REVIEWED BY QA K.G. DATE 8/11/91 5709

1st Key In		
2nd Key In		
Hard Copy Verification		

RKA 2

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. DAVIES DATE 4/28/88
PROJECT NO. 602.3.2 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~180~~ 1080 BB 1-5-89
PIEZOMETER NO. 1080 DATE OF INSTALLATION 4/28/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID 350 gallon H_2O FROM 0 TO 51.5
FLUID - FROM - TO -

TYPE OF BIT Steel
CASING SIZE (S) USED:
SIZE ~~4 in~~ BD FROM ~~30.7~~ BD TO
SIZE 10 in FROM 0.0 TO 46.0 Ft

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL PERFORATED AREA 10 Ft

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in
LENGTH OF PIPE SECTIONS 10 Ft.
JOINING METHOD Screw wrench tight

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Steel cover, lockable Stainless Steel vented cap.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0		K.G. 8/17/91 ~~589.7~~ 583.7	
GROUND SURFACE	0.0		581.7	
BOTTOM OF PROTECTIVE PIPE	2.6		579.4	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 9.1	TOP 581.7	BOTTOM 572.6
BENTONITE	TOP 9.1	BOTTOM 14.1	TOP ~~567.6~~ 572.6	BOTTOM 567.6
SAND	TOP 14.1	BOTTOM 31.3	TOP 567.6	BOTTOM 550.9
~~GRAVEL~~ Bentonite Grout	TOP 31.3 31.9	BOTTOM 31.9 49.5	TOP 550.9 549.8	BOTTOM 549.8 532.2
PERFORATED SECTION	TOP 18.5 Start 2/7/89	BOTTOM 28.5 Start 2/7/89	TOP 563.2	BOTTOM 534.7
PIEZOMETER TIP	30.9		550.8	
BOTTOM OF BOREHOLE	51.5		530.2	
GWL AFTER INSTALLATION	NA		N/A	

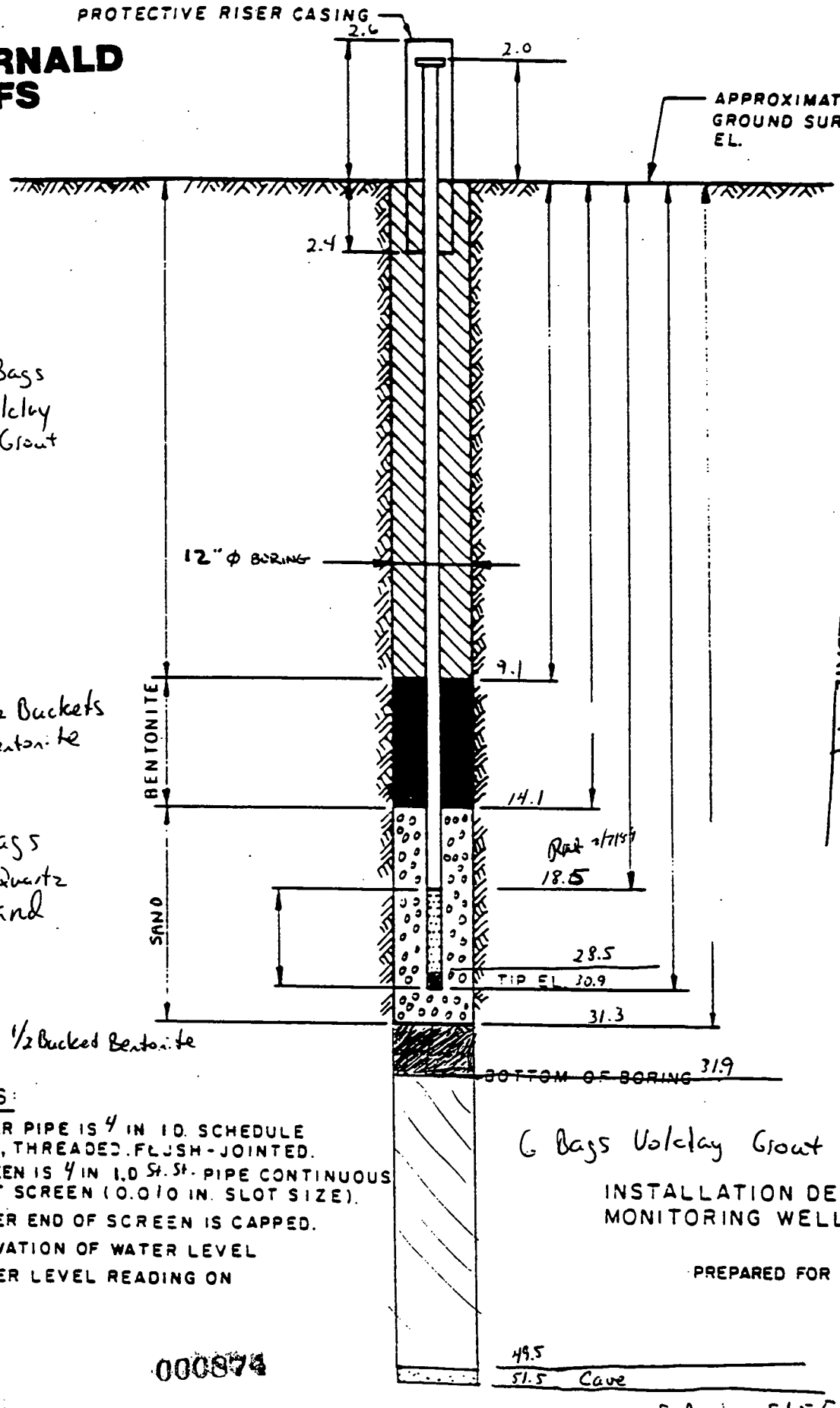
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Screen section measured 10.5 Ft with 10.0 Ft perforated

000873

Boring #~~180~~ 1050 BB 1-5-59

RKA 2/4

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

BD

DRAWN BY

REVIEWED BY QA K.G. DATE 8/1/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D St. St. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL #1086

PREPARED FOR

000874

FERNALD RI/FS

DLG 2/4/89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Check		

WJK 4/22/88

RIG #2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1081	COORDINATES: 482641.23 N 1378003.696	DATE: 12.1.87	
ELEVATION: 590.7 Ground	GWL: Depth NA	Date/Time NA	DATE STARTED: 12.1.87
ENGINEER/GEOLOGIST: D. OATLEY	Depth NA	Date/Time NA	DATE COMPLETED: 12.2.87
DRILLING METHODS: CABLE TOOL			PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6/IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				6.3 STIFF BROWN (10YR 5/3) SILT, TRACE CLAY AND SAND - DRY	ML	3.0	
1	07633 8:50	5 6 6	12	STIFF LIGHT GRAY (5Y, 6/1) SILT, SOME CLAY, TRACE GRAVEL AND SAND - DRY	ML	3.5	HNU - 0 PPM Bd - 60 CPM γ - 0 CPM
2 3	07634 9:20	4 9 19	14	VERY STIFF LIGHT GRAY (5Y, 6/1) SILT, SOME CLAY AND GRAVEL - DRY.	ML	4.0	HNU - 0 PPM Bd - 50 CPM γ - 0 CPM
4	07635 10:00	12 16 17	15	3.4 HARD YELLOWISH BROWN (10YR, 5/4) CLAY, SOME SAND AND SILT, TRACE FINE GRAVEL DRY 4.1	CL	4.0	HNU - 0 PPM Bd - 70 CPM γ - 0 CPM
				HARD PALE BROWN (10YR, 6/3) CLAY, SOME 4.5 SAND, TRACE SILT - DRY	CL	3.5	
5 6	07636 10:15	12 12 8	11	VERY STIFF BROWNISH YELLOW (10YR, 6/4) CLAY, SOME ~~SILT~~ SAND, TRACE GRAVEL AND SILT - DRY	CL	2.25	HNU - 0 PPM Bd - 70 CPM γ - 0 CPM
7	07637 10:50	4 5 4	14	6.6 STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, 7.2 SOME SILT - MOIST	CL	1.0	HNU - 0 PPM Bd - 50 CPM γ - 0 CPM
				STIFF LIGHT YELLOWISH BROWN (2.5Y 6/4) CLAY, SOME SILT, TRACE SAND AND FINE GRAVEL - DRY.	CL	2.5	
8 9	07638 11:00	6 6 7	13	STIFF BROWN (10YR, 5/4) CLAY, SOME SILT, TRACE SAND AND GRAVEL - DRY	CL	2.5	HNU - 0 PPM Bd - 60 CPM γ - 0 CPM
10	07639 14:50	9 9 13	14	VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SAND AND SILT - MOIST.	CL	2.5	HNU - 0 PPM Bd - 40 CPM γ - 0 CPM
11 12	07640 15:10	5 7 9	15	VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SAND AND SILT, 11.8 TRACE GRAVEL - MOIST	CL	2.5	HNU - 0 PPM Bd - 40 CPM γ - 0 CPM
				VERY STIFF DARK YELLOWISH BROWN (2.5Y 4/2) 12.2 SILT, SOME CLAY, TRACE SAND - DRY	ML	—	
13	07641 15:25	7 9 10	4	VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SAND AND SILT - MOIST.	CL	2.5	HNU - 0 PPM Bd - 90 CPM γ - 0 CPM
14 15	07642 15:50	3 7 9	9	VERY STIFF YELLOWISH BROWN (10YR, 5/4) SILTY CLAY, TRACE GRAVEL AND SAND - MOIST	CL	2.25	HNU - 0 PPM Bd - 50 CPM γ - 0 CPM

NOTES: CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE.
WATER ADDED TO HOLE: 1 TICK - 5 GALLONS.
~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ II

SAMPLES TAKEN USING ASTM STANDARD PENETRATION TEST.
COLORS CLASSIFIED USING MUNSELL COLOR CHARTS.

BACKGROUND
HNU - 0 PPM
LEL - 0%
γ - 0 CPM
Bd 60-140 CPM
(AIR) (GROUND)

000875

402-11-88

FERNALD RI/FS

DLG 2/4/89

1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~1ST~~ 1081 DB 5-89	COORDINATES: See p1	DATE: 12-2-87
ELEVATION: See p1	GWL: Depth NA Date/Time NA	DATE STARTED: 12-1-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth NA Date/Time NA	DATE COMPLETED: 12-2-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	9:05 07643 ST-07644	4 7 10	8	LIGHT YELLOWISH BROWN (2.5Y, 6/4) VERY STIFF ~~BROWNISH YELLOW (10YR 5/4)~~ CLAY, SOME GRAVEL AND SILT, TRACE SAND - MOIST	CL	1.25	HNU - 0PPM Bd - 30CPM γ - 0CPM
17	07645 10:20	3 4 10	10	STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SILT, TRACE FINE GRAVEL AND SAND MOIST	CL	1.5	HNU - 0PPM Bd - 40CPM γ - 0CPM
19	07646 10:30	5 12 18	15	VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SILT, TRACE FINE GRAVEL AND SAND - ~~DRY~~ MOIST	CL	3.0	HNU - 0PPM Bd - 50CPM γ - 0CPM
20	07647 10:50	3 12 18	14	VERY STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME SILT, SAND, AND FINE GRAVEL - MOIST	CL	2.75	HNU - 0PPM Bd - 50CPM γ - 0CPM
21 22	07648 11:15	5 14 27	16	HARD LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME GRAVEL, SILT, AND SAND. - MOIST	CL	4.0	HNU - 0PPM Bd - 60CPM γ - 0CPM
23 24	07649 13:20	~~3 5 8~~	6	STIFF LIGHT YELLOWISH BROWN (2.5Y, 6/4) CLAY, SOME GRAVEL, SILT, AND SAND - MOIST	CL	2.0	HNU - 0PPM Bd - ~~40~~CPM γ - 0CPM
25	07650 13:45	4 10 13	11	VERY STIFF GRAYISH BROWN (2.5Y, 5/2) ~~SILTY~~ CLAY, SOME SILT AND SAND, TRACE FINE GRAVEL - ~~DRY~~ MOIST	CL	1.0	HNU - 0PPM Bd - 40CPM γ - 0CPM
26 27	07651 14:00	2 8 12	14	VERY STIFF GRAYISH BROWN (2.5Y, 5/2) CLAY, TRACE SILT, SAND, AND FINE GRAVEL - MOIST.	CH	.75	HNU - 0PPM Bd - 40CPM γ - 0CPM
28	07652 14:45	1 4 7	5	STIFF GRAYISH BROWN (2.5Y, 5/2) CLAY, ~~TRACE~~ SOME GRAVEL, TRACE SILT AND SAND - MOIST.	CH	.75	HNU - 0PPM Bd - 40CPM γ - 0CPM
29 30	07653 15:00	5 7 9	13	VERY STIFF GRAYISH BROWN (2.5Y, 5/2) CLAY, TRACE SAND, GRAVEL, AND SILT, MOIST	CH	.5	HNU - 0PPM Bd - 40CPM γ - 0CPM

NOTES:

000876

402-11-86

FERNALD RI/FS

DLG 2/14/89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PRC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD	
BORING NUMBER: ~~1ET~~ 1081 66 1-5-89	COORDINATES: see pl	DATE: 12.2.87
ELEVATION: see pl	GWL: Depth NA Date/Time NA	DATE STARTED: 12/1/87
ENGINEER/GEOLOGIST: D. OATHLEY	Depth NA Date/Time NA	DATE COMPLETED: 12.2.87
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 3

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	07654 15:40	4 7 10	14	VERY STIFF GRAYISH BROWN (2.5Y 5/2) CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST	CH	1.0	HNU - OPPM BZ - 60CPM γ - 0CPM
32	07655 15:55	3 7 9	14	VERY STIFF GRAYISH BROWN (2.5Y 5/2) CLAY, SOME GRAVEL, TRACE SAND AND SILT - MOIST	CH	1.0	HNU - OPPM BZ - 50CPM γ - 0CPM
33				WELL TD 33.0 FT. Bottom of Boring			

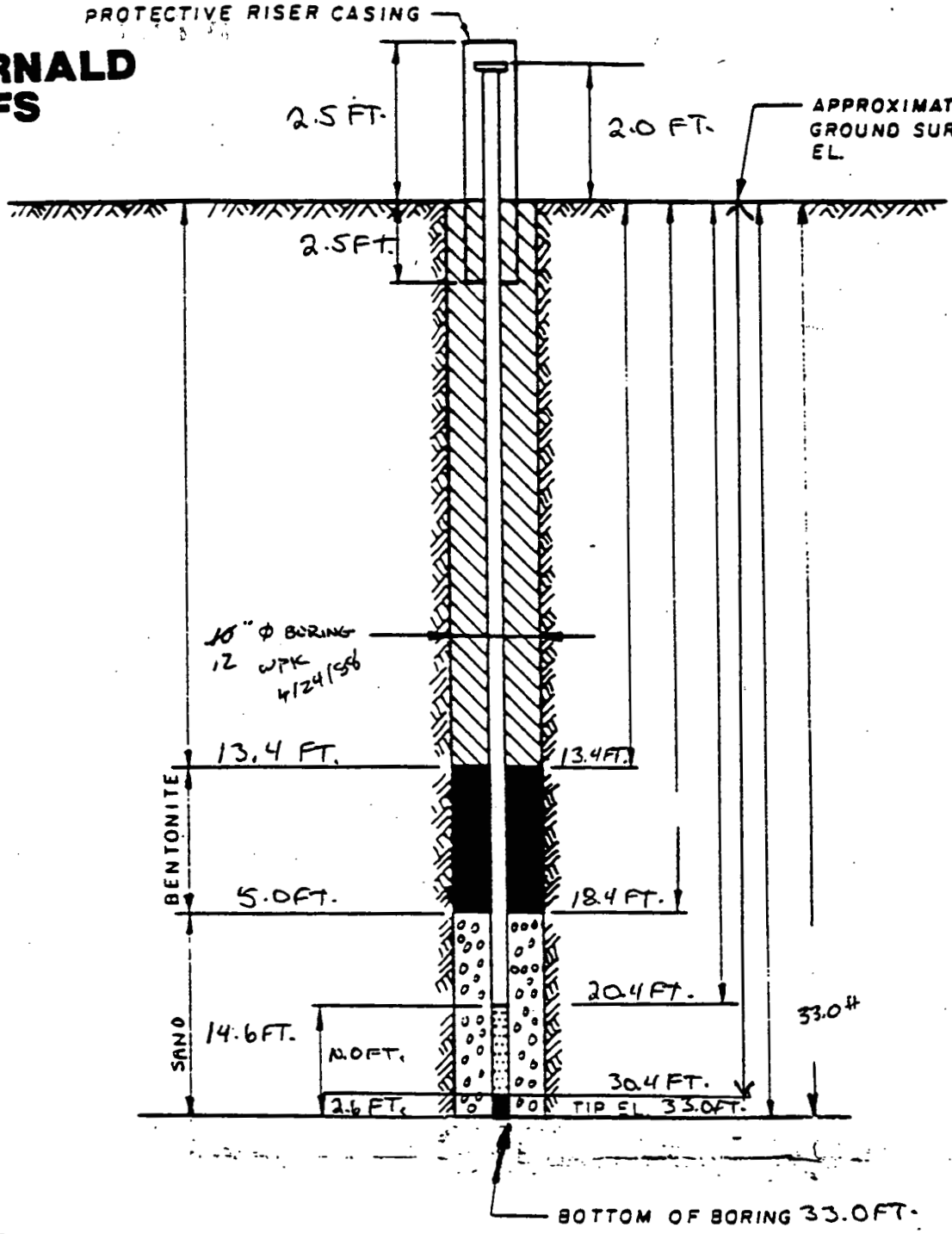
NOTES:

000877

402-11-86

DLG 2/4/89 WELL # ~~101~~ 108 DB 1-5-89 #29

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY DSO

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

~~white out corrections~~ this form did not represent the installed monitoring well, therefore, it has been modified with white out by D. Oakley, WPK 4/24/88

INSTALLATION DETAILS
MONITORING WELL ~~101~~ 108 DB 1-5-89

PREPARED FOR

FERNALD RI/FS

DLG 2/4/89

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD FIELD ENG./GEO. D. OAKLEY DATE 12-3-87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~181~~ 1081 RA 1-5-89
PIEZOMETER NO. ~~NA~~ 1081 WPK 4/24/88 DATE OF INSTALLATION 12.3.87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 4 TO 33 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 30 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 INCH
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 INCH
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10.0 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN
LENGTH OF PIPE SECTIONS 10.0 FT. PMC 2/7/89
JOINING METHOD THREAD ~~AND COUPLE~~
(FLUSH JOINT THREAD)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE ~~O~~.D. 10 INCH

OTHER PROTECTION LOCKING CAP WITH LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		592.7	
GROUND SURFACE	0.0		590.7	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		588.2	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 13.4 FT.	TOP 590.7	BOTTOM 577.3
BENTONITE	TOP 13.4 FT.	BOTTOM 18.4 FT.	TOP 577.3	BOTTOM 572.3
SAND	TOP 18.4 FT.	BOTTOM 33.0 FT.	TOP 572.3	BOTTOM 557.7
~~GRAVEL~~	TOP NA	BOTTOM NA	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 20.4 FT.	BOTTOM 30.4 FT.	TOP 570.3	BOTTOM 560.3
PIEZOMETER TIP	33.0 FT		557.7	
BOTTOM OF BOREHOLE	33.0 FT.		557.7	
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS White out correction was made by D. Oakley at the time this form was completed. WPK 4/24/88

000879

QC/DH/2/4/89

	Initial	Date
1st Key In		
2nd Key In		
Copy Verification		

FERNALD RI/FS

REVIEWED BY QA KG DATE 8/1/91

VISUAL CLASSIFICATION OF SOILS

RIG #2

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 182 1092 BB 1-5-89	COORDINATES: 482011.94 1379087.14	DATE: 12-4-87
ELEVATION: 583.9 Ground	GWL: Depth — Date/Time —	DATE STARTED: 12-4-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth — Date/Time	DATE COMPLETED: 12-4-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07657 9:50	5 6 23	8	VERY STIFF YELLOWISH BROWN (10YR, 5/4) SILT, SOME CLAY, TRACE SAND AND GRAVEL - ~~DRY~~, MOIST.	ML	2.25	HNU - 0PPM Bd - 20CPM γ - 0CPM
				1.5 STIFF YELLOWISH BROWN ~~CLAY~~ (10YR/5/4) SILT, SOME CLAY, TRACE SAND - MOIST	ML	—	
2 3	07658 10:00	8 5 5	11	STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME SILT, TRACE GRAVEL AND SAND - MOIST	CL	1.25	HNU - 0PPM Bd - 100CPM γ - 0CPM
4	07659 10:10	5 4 6	6 0	STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME SILT AND GRAVEL, TRACE SAND. MOIST.	CL	1.25	HNU - 0PPM Bd - 160CPM γ - 0CPM
5 6	07660 10:20	6 14 16	11	VERY STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) SILTY CLAY, ~~SOME~~ TRACE SAND - MOIST	CL	2.5	HNU - 0PPM Bd - 80CPM γ - 0CPM
7	07661 10:40	15 17 19	18	HARD LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME SILT, TRACE SAND AND FINE GRAVEL - DRY	CL	2.75	HNU - 0PPM Bd - 80CPM γ - 0CPM
8 9	07662 13:00	5 9 15	18	VERY STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME SILT, TRACE FINE GRAVEL AND SAND - ~~MOIST~~ DRY.	CL	3.0	HNU - 0PPM Bd - 60CPM γ - 0CPM
10	ST 07663 13:20 07664 14:00	5 16 13	14	VERY STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME SILT, TRACE GRAVEL AND SAND - MOIST	CL	3.5	HNU - 0PPM Bd - 60CPM γ - 0CPM
11 12	07665 14:30	3 10 15	14	VERY STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME SILT, TRACE FINE GRAVEL AND SAND - MOIST	CL	4.0	HNU - 0PPM Bd - 60CPM γ - 0CPM
13	07666 14:45	6 20 22	12	VERY STIFF YELLOWISH BROWN (10YR, 5/4) CLAY, SOME SILT AND GRAVEL, TRACE SAND - MOIST	CL	3.5	HNU - 0PPM Bd - 60CPM γ - 0CPM
14 15	07667 15:00	7 16 25	14	HARD YELLOWISH BROWN (10YR, 5/4) CLAY, SOME SILT, TRACE GRAVEL AND SAND - MOIST	CL	4.25	HNU - 0PPM Bd - 80CPM γ - 0CPM

NOTES: CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY OYMES JR.
ASSISTANT: JOHN VANDINE
WATER ADDED TO HOLE 17 ICH = 10 GALLONS

SAMPLES TAKEN USING ASTM STANDARD PENETRATION TESTS.
SOILS COLORS CLASSIFIED ACCORDING TO MUNSELL COLOR CHARTS.
BACKGROUND
HNU - 0PPM Bd 100 (AIR) - 800 (GROUND) CPM
LEL - 0% γ - 0 CPM

000890

402-11-86

QC/DH/2-4-89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA 1.6. DATE 8/1/91

5749

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 603 ~~FERNALD RI/FS~~	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 102 1082 BB 1-5A	COORDINATES: see p1	DATE: 12-4-87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 12-4-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth — Date/Time —	DATE COMPLETED: 12-4-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	07668 15:10	15 18 20	18	HARD YELLOWISH BROWN CLAY, SOME SILT, TRACE GRAVEL AND SAND. MOIST 15:8	CL	3.5	HNU-0PPM BZ-50CPM Z-0CPM
				HARD GRAY (10YR, 6/1) CLAY, SOME GRAVEL, TRACE SILT AND SAND - MOIST	CL	2.5	
17	07669 16:00	6 10 21	8	HARD GRAY (10YR, 6/1) CLAY, TRACE GRAVEL, SILT, AND SAND - MOIST	CL	3.5	HNU-0PPM BZ-60CPM Z-0CPM
18	07670 16:15	6 10 11	15	VERY STIFF GRAY (10YR, 5/1) CLAY, TRACE ~~GRAVEL~~, SILT, GRAVEL, AND SAND - ~~DRY~~ MOIST	CL	2.0	HNU-0PPM BZ-60CPM Z-0CPM
19							
20	07671 16:30	5 10 12	12	VERY STIFF OLIVE GRAY (5Y, 5/2) CLAY, ~~SO~~ TRACE GRAVEL, SILT, AND SAND - MOIST	CL	2.0	HNU-0PPM BZ-50CPM Z-0CPM
21							
22	07672 16:45	5 7 12	13	VERY STIFF OLIVE GRAY (5Y, 5/2) CLAY, TRACE GRAVEL, SILT, AND SAND - MOIST	CL	2.0	HNU-0PPM BZ-40CPM Z-0CPM
23	07673 17:00	2 4 7	7	STIFF OLIVE GRAY (5Y, 5/2 CLAY, SOME GRAVEL, TRACE SILT AND SAND - MOIST	CL	1.5	HNU-0PPM BZ-60CPM Z-0CPM
~~25~~ 24				WELL TD 24.0 FT.			
~~26~~							

NOTES:

000881

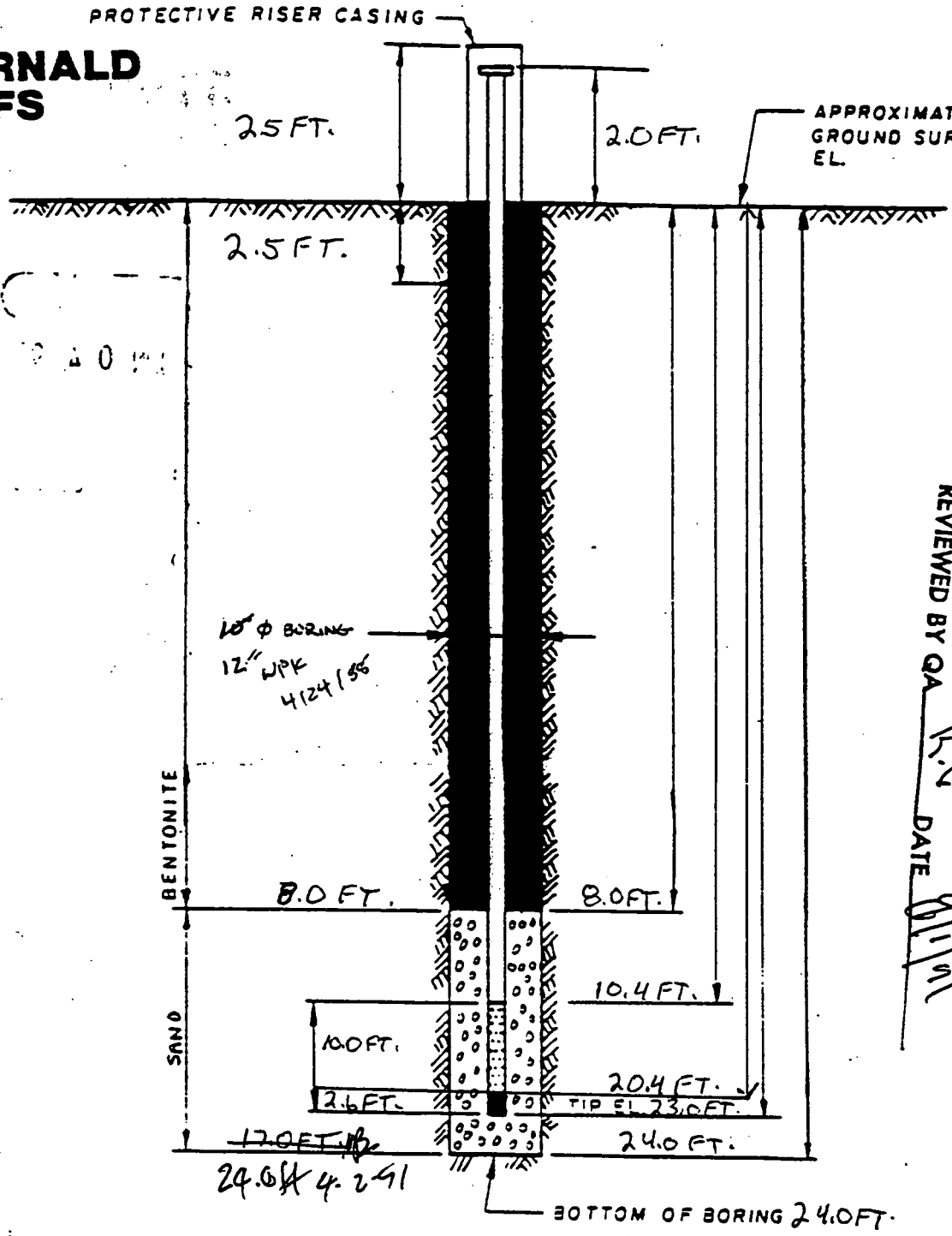
402-11-86

QC/DH/2.4.89

WELL # ~~182~~ 1082 BB #30

1-5-89

FERNALD RI/FS



DRAWN BY DBO

CHECKED BY

APPROVED BY

DRAWING NUMBER

REVIEWED BY QA K.V. DATE 8/1/91

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~182~~ 1082 BB

PREPARED FOR 1-5-89

This form did not represent the installed monitoring well, therefore, it has been modified with white out by D. Oakley.
WPK 4/24/86

000882

QCDH/24.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PHC

FERNALD RI/FS

REVIEWED BY QA KG DATE 8/1/91

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 12-5-87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~182~~ 1082 BB 1-5-89
PIEZOMETER NO. ~~AA~~ 1082 WPK 4/24/88 DATE OF INSTALLATION 12-5-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 4 TO 24 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD
CASING SIZE (S) USED:
SIZE 10 IN FROM 0 TO 20 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 IN.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 SLOT
TOTAL PERFORATED AREA 10 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4 IN.
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD ~~AND COUPLE~~ RWG 2/7/89
FLUSH JOINT THREAD

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 IN.

OTHER PROTECTION LOCKING CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		585.9	
GROUND SURFACE	0.0		583.9	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.		581.4	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
BENTONITE	TOP 0.0 FT.	BOTTOM 8.0 FT.	TOP 583.9	BOTTOM 575.9
SAND	TOP 8.0 FT.	BOTTOM 24.0 FT.	TOP 575.9	BOTTOM 559.9
~~GRAVEL~~	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 10.4 FT.	BOTTOM 20.4 FT.	TOP 573.5	BOTTOM 563.5
PIEZOMETER TIP	23.0		560.9	
BOTTOM OF BOREHOLE	24.0 FT.		559.9	
GWL AFTER INSTALLATION	NA - DRY		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS white out correction was made by D. Oakley when this form was completed. WPK 4/24/88

000883

409-11-86

~~REVIEWED BY QA~~ ~~DATE~~

SAMPLE # 07894 was a Shelby tube taken 10/88 a 3 feet Deep hole was excavated beside boreing 183 and the tube was pushed from 3 to 5.0 feet with 1.9 feet recovery. WPK 4/24/88

DIG 2/4/89

WPK 4/23/88 RIG # 2

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: ~~183~~ 1083 1-5-89	COORDINATES: 481804.99 N 1379239.99 E	DATE: 01 07 88	
ELEVATION: 583.60	GWL: Depth NA Date/Time NA	DATE STARTED: 01 07 88	
ENGINEER/GEOLOGIST: W. KEGLEY	Depth NA Date/Time NA	DATE COMPLETED: 01 09 88	
DRILLING METHODS: CABLE TOOL / SPLIT SPOON		PAGE 1 OF 2	

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	078 7 1345	9 9 5	13	VERY STIFF, BROWN (10YR 5/3) Silt and clay with gravel - Dry	ML	3.5	HNU = 0ppm Bγ = 180 cpm unshielded α = 0cpm
2	078 8 0 1350	6 7 11	12	HARD, BROWN (10YR 5/3) clay and silt with gravel - DRY	CL	4.5+	HNU = 0ppm Bγ = 180cpm unshielded α = 0cpm
3				Shelby Tube			HNU = 0ppm Shelby Tube ~~07894~~ TAKEN 01 10 88 @ 1430 Bγ = 140 cpm unshielded α = 0 cpm
4	078 8 1 1355	9 10 11	12	3.8' VERY STIFF LIGHT YELLOWISH BROWN (10YR 6/4) MOTTLED CLAY WITH ~~AND~~ SILT - DRY	CL	2.5	
5	078 8 2 1400	13 12 10	12 WPK 4/24	STIFF LIGHT YELLOWISH BROWN (10YR 6/4) MOTTLED CLAY WITH SAND	CL	1.5	HNU = 0ppm Bγ = 140 cpm unshielded α = 0cpm
6 7	078 8 3 1405	5 5 6	18	6.3' MEDIUM DENSE, LIGHT YELLOWISH BROWN (10YR 6/4) SAND AND CLAY - WET 7.4'	SC	0.5	HNU = 0ppm Bγ = 200cpm unshielded α = 0cpm
8 9	078 8 4 1300	6 14 11	15	MEDIUM STIFF, LIGHT YELLOWISH BROWN (10YR 6/4) CLAY AND SILT SOME SAND - MOIST	CL	1.5	HNU = 0ppm BEGIN ON 7 88 Bγ = 180cpm α = 0 cpm
10	078 8 5 1305	2 3 18	8	9.2' MEDIUM DENSE, YELLOWISH BROWN (10YR 5/4) SAND AND GRAVEL SOME SILT - WET	SW		HNU = 0ppm Bγ = 180cpm α = 0cpm
11 12	078 8 6 1430	30 16 21	16	10.9 DENSE YELLOWISH BROWN (10YR 5/4) SAND SOME SILT AND CLAY - WET	SP		HNU = 0ppm Bγ = 180 cpm ~~shielded~~ α = 0cpm
13	078 8 7 1500	12 23 7	15	MEDIUM DENSE YELLOWISH BROWN (10YR 5/4) GRAVEL AND SAND SOME SILT - WET	GW		HNU = 0ppm Bγ = 120 shielded α = 0cpm
14	078 8 8 1530	6 4 7	7	13.9 VERY SOFT OLIVE GREY (5Y 5/2) clay SOME SILT TRACE GRAVEL - DRY	CL ~~0.25~~	0.25	HNU = 0ppm Bγ = 120 shielded α = 0cpm

NOTES: CONTRACTOR: PENNDRILL
RIR: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE
WATER ADDED HOLE: 1 Tick = 5 gal
~~LHT LHT LHT LHT LHT~~

SAMPLES TAKEN USING ASTM STANDARD Penetration TEST.
COLORS CLASSIFIED USING MUNSELL COLOR CHARTS.
BACKGROUND LEVELS
LEL - O_2: 0.0 ppm HNU: 0ppm Bγ = 180 cpm α = 0 cpm

000884

1st Key In
2nd Key In
Hard Copy Verification

402-11-86

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____ DLG 2/4/89

5709

	Initial	Date
1st Key In		
2nd Key In		3/32/86
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 1083	COORDINATES: Scap1	DATE: 01 08 87
ELEVATION: Scap1	GWL: Depth ~1 Date/Time ~ 1	DATE STARTED: 01 07 87
ENGINEER/GEOLOGIST: W. KEGLEY	Depth ~ Date/Time ~	DATE COMPLETED: 01 09 87
DRILLING METHODS: CABLE TOOL / SPLIT SPOON		PAGE 2 OF 2

DEPTH (inch)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	0 0 7 7 8 8 8 9 9 0 1630	2 2 2	6in	SOFT OLIVE GREY ~~CLAY~~ (5Y 5/2) clay with gravel moist	CL	0.5	SAMPLE 7889 IS SINGLY TUBE TAKEN AT 1545 hr. Hnu = 0 ppm Bd = 110 cpm shielded γ = 0 cpm
17							BEGIN 01 07 88 Tried to ~~take~~ Drive Sample Three times no Recovery
18–19	0 7 8 9 1 1055	1 2 12	5	VERY SOFT OLIVE GREY (5Y 5/2) CLAY with Gravel ~~moist~~ WET	CL	0.25	Hnu = 0 ppm Bd = 120 cpm shielded γ = 0 cpm
20–21	0 7 8 9 2 1105	2 4 5	10	VERY SOFT OLIVE GREY (5Y 5/2) Clay with Gravel - moist	CL	0.25	Hnu = 0 ppm Bd = 120 cpm shielded γ = 0 cpm
22	0 7 8 9 3 1110	1 2 3	8	VERY SOFT OLIVE GREY (5Y 5/2) Clay with gravel - wet	CL	0.25	Hnu = 0 ppm Bd = 120 cpm shielded γ = 0 cpm
				BOTTOM OF BORING 22.5' WPK 4/24/88			

NOTES:

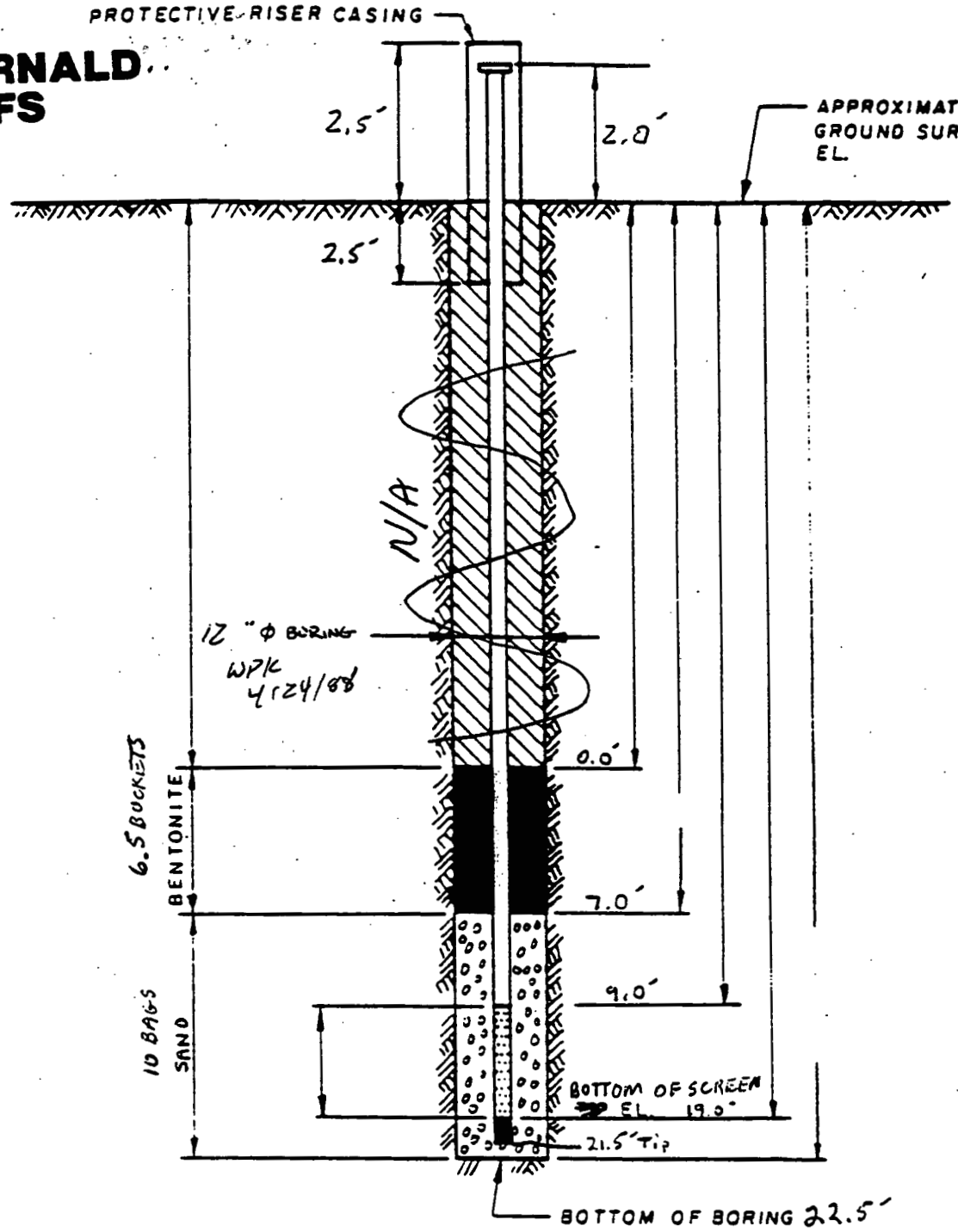
000885

402-11-86

REVIEWED BY QA _____ DATE _____ DLG 2/4/89

BORING ~~183~~ 1083 #58 BB 1-5-89

FERNALD RI/FS



NOTES:

1. RISER PIPE IS IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~183~~ 1083

PREPARED FOR BB 1-5-89

DRAWN BY	KEGLEY 01 09 88	CHECKED BY / APPROVED BY		DRAWING NUMBER

FERNALD RI/FS

REVIEWED BY QA _____ DATE _____

DLG 2/4/89

5700

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI IFS
FIELD ENG./GEO. W. KEGLEY
DATE 01 09 88
PROJECT NO. 602 T3.2
CHECKED BY R Galbraith
DATE 2/7/89
BORING NO. ~~183~~ 1083 BB 1-5-89
PIEZOMETER NO. ~~183~~ 1083
DATE OF INSTALLATION 01 09 88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0.0' TO 21.5'
FLUID NA FROM NA TO NA

TYPE OF BIT FLAT HEAD
CASING SIZE (S) USED:
SIZE 10 in FROM 0 TO 21.5
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 inch
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 inch
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 feet

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 inch I.D. 4 inch
LENGTH OF PIPE SECTIONS 10 feet
JOINING METHOD THREAD ~~AND COUPLE~~ DMG 2/2/89
(FLUSH JOINT THREADED)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Feet
PROTECTIVE PIPE ~~Ø~~ I.D. 10 inch

OTHER PROTECTION LOCKABLE CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0'		585.6	
GROUND SURFACE	0.0		583.68	
BOTTOM OF PROTECTIVE PIPE	2.5'		581.1	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
BENTONITE	TOP 0.0'	BOTTOM 7.0'	TOP 583.6	BOTTOM 576.6
SAND	TOP 7.0'	BOTTOM 22.5'	TOP 576.6	BOTTOM 561.1
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 9.0'	BOTTOM 19.0'	TOP 581.6	BOTTOM 571.6
PIEZOMETER TIP	21.5 feet		562.1	
BOTTOM OF BOREHOLE	22.5 feet		561.1	
GWL AFTER INSTALLATION				

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐

REMARKS

NA

000080

FERNALD RI/FS

REVIEWED BY QA_____ DATE_____

1st Key In		
2nd Key In		8/22/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

RIG # 2

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 184 1084 BB 1-5-88	COORDINATES:	DATE: 11-20-87	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 11-20-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 11-20-87	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				SEE SOIL DESCRIPTION FOR WELL ~~559~~. 3084 RMG. 2/7/89			
	SU ST-01632						
10	9.5						
20							
30				TD 33.0 FT			
				BOTTOM OF BORING			

NOTES: CONTRACTOR: RENNACILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE

WATER ADDED TO HOLE 1 TICK = 5 GALLONS
~~HH~~ ~~HH~~ ~~HH~~ I

000888

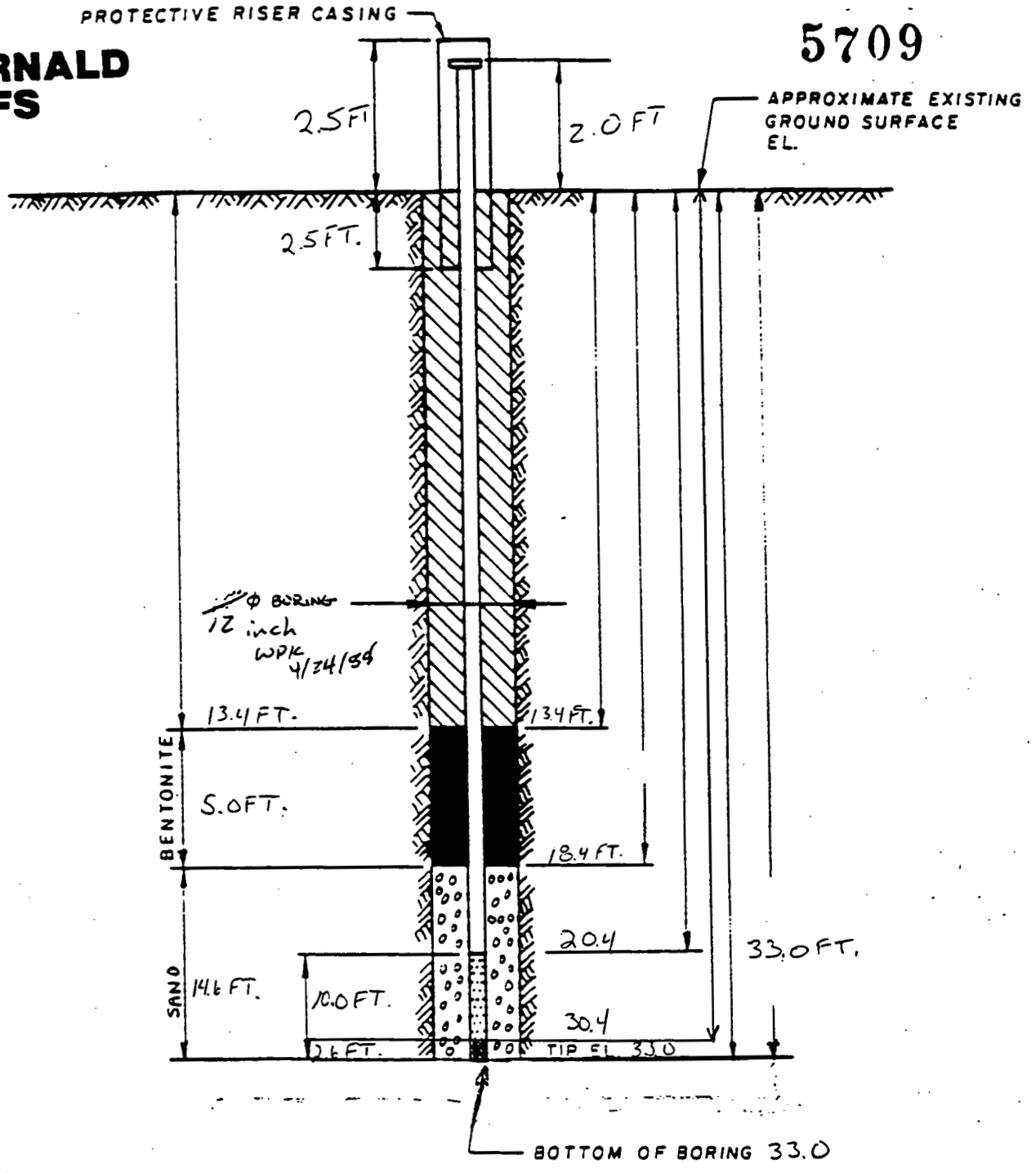
402-11-88

REVIEWED BY Q.A. _____ DATE QC/DH/2-4-89

WELL # ~~184~~ 1084 #27 BG. 1-5

FERNALD RI/FS

5709



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY DRO

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~184~~ 1084

PREPARED FOR BB 1-5-89

This Form did not represent the installed monitoring well, therefore, it has been modified by D. Oakley. WPK 4/24/88

000889

QC/DH/2.4.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA_____ DATE_____

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FEIRNALD RI/FS
FIELD ENG./GEO. D CARLEY DATE 11-21-87
PROJECT NO. 602
CHECKED BY K Galbraith DATE 2/7/89
BORING NO. ~~184~~ 1084 OB 1-5-89
PIEZOMETER NO. NA 1084
DATE OF INSTALLATION 11-21-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
TYPE OF BIT FLATHEAD
DRILLING FLUID (S) USED:
FLUID WATER FROM 4 TO 33 FT.
FLUID – FROM – TO –
CASING SIZE (S) USED:
SIZE 10 IN FROM 0 TO 33 FT
SIZE – FROM – TO –

PIEZOMETER DESCRIPTION

TYPE MONITORING - RCRA
DIAMETER OF PERFORATED SECTION 4 IN
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 INCH
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.
RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD AND COUPLE

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE ~~O~~.D. 10 IN
OTHER PROTECTION LOCKABLE CAP WITH LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		585.33	
GROUND SURFACE	0.0		583.33	
BOTTOM OF PROTECTIVE PIPE	2.5 FT.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.5 FT.	BOTTOM 13.4 FT	TOP 582.83	BOTTOM 569.93
BENTONITE	TOP 13.4 FT.	BOTTOM 18.4 FT	TOP 569.93	BOTTOM 564.93
SAND	TOP 18.4 FT	BOTTOM 33.0 FT	TOP 564.93	BOTTOM 550.33
~~GRAVEL~~	TOP NA	BOTTOM	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 20.4 FT.	BOTTOM 30.4 FT.	TOP 562.93	BOTTOM 552.93
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	33.0 FT.		550.33	
GWL AFTER INSTALLATION	NA		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS

000830

409-11-86

QC/DH/2.4.89

FERNALD RI/FS

5709

	Initial	Date
1st Key In		
2nd Key In	KJB	2/8/88
Hard Copy Validation		

4/23/88 WPK

RIG #2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD 121/FS	
BORING NUMBER: 2084	COORDINATES:	DATE: 11-16-87
ELEVATION:	GWL: Depth 63.3 FT Date/Time 11-18-87/17:00	DATE STARTED: 11-16-87
ENGINEER/GEOLOGIST: D. OAITLEY	Depth Date/Time	DATE COMPLETED: 11-18-87
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				SEE VISUAL CLASSIFICATION of soils FOR WELL # ~~384~~. 3084 RMG 2/7/89			
15	17.0FT / ST-01631 / 19.0FT						
30							
45							
60							WATER LEVEL 63.3 FT.
75				WELL TO 77 FT. BOTTOM OF BORING			

NOTES: CONTRACTOR - PENNDRILL
DRILLER - HARRY DYKES
ASSISTANT - JOHN VANDINE
RIG: CYCLONE 42

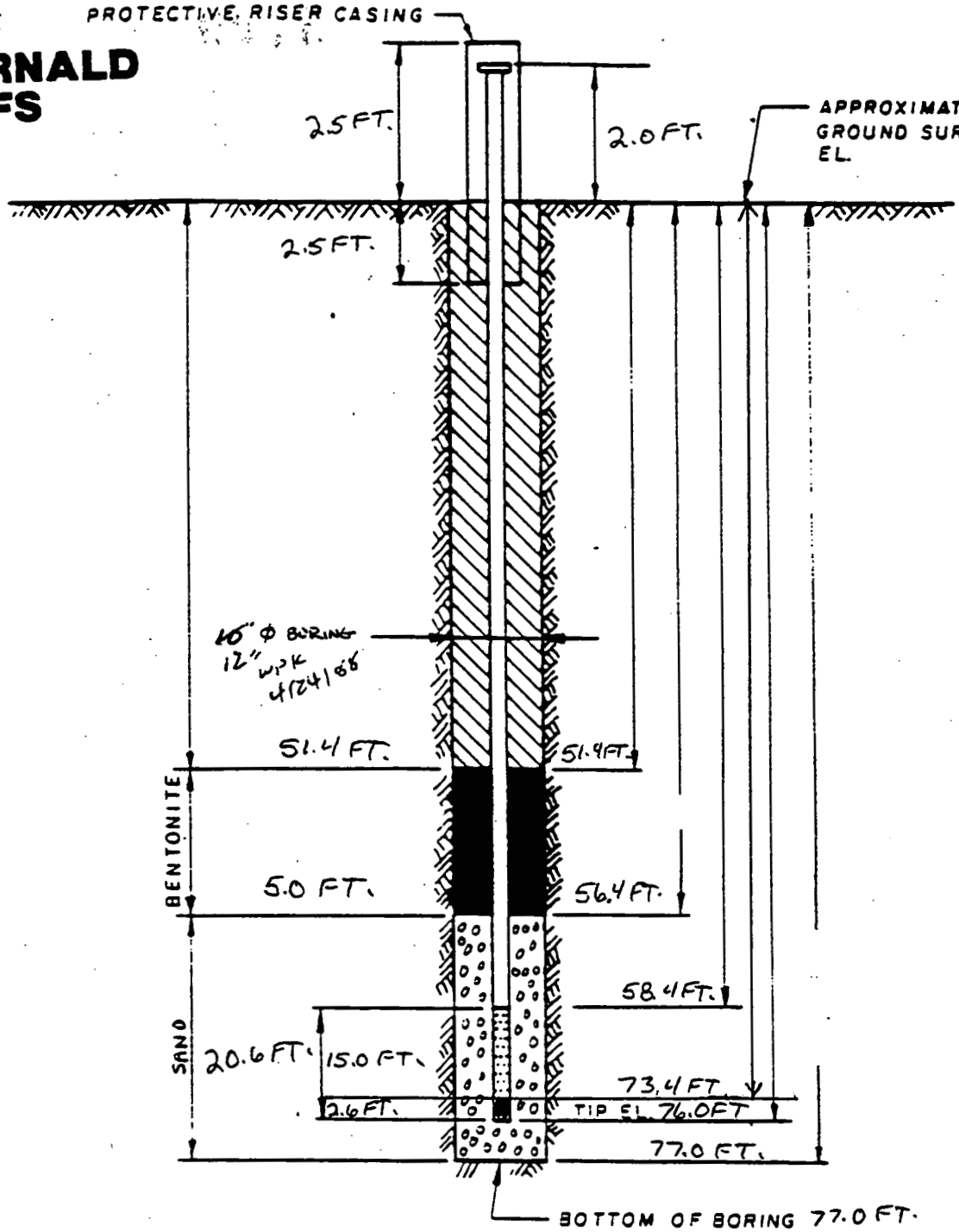
WATER ADDED TO HOLE - 1 TICK = 5 GALLONS
~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ IIII
SCREEN - 58.4 - 73.4 FT.

000891

402-11-86

QC/DIT/2-4-89
WELL # 2084

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~284~~ 2084

PREPARED FOR BB 1-5-89

DRAWING NUMBER
CHECKED BY
APPROVED BY
DATE
DRAWN BY

000892

QC/DH/2.4.89

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

DAL

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 11-19-87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~[illegible]~~ ~~2084~~ 2084 DB 1-5-89
PIEZOMETER NO. NA 2084 DATE OF INSTALLATION 11-19-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 4 TO 77 FT.
FLUID NA FROM NA TO NA

TYPE OF BIT FLATHEAD
CASING SIZE (S) USED:
SIZE 10 IN FROM 0 TO 77 FT.
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION 4 IN
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 INCH
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 15 FT.

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4 IN
LENGTH OF PIPE SECTIONS 10 FT.
JOINING METHOD THREAD AND COUPLE.
(FLUSH JOINT THREADS)

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 INCH

OTHER PROTECTION LOCKABLE CAP AND LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 51.4 FT.	TOP	BOTTOM
BENTONITE	TOP 51.4 FT.	BOTTOM 56.4 FT.	TOP	BOTTOM
SAND (WPK 4/24/88 TOP 56.4)	TOP ~~58.4 FT~~	BOTTOM ~~70.0~~ FT	TOP	BOTTOM
NO GRAVEL USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 58.4	BOTTOM 73.4	TOP	BOTTOM
PIEZOMETER TIP	76.0 ft			
BOTTOM OF BOREHOLE	77.0 FT			
GWL AFTER INSTALLATION	63.3 FT. ~~TOC~~ WPK 4/24/88			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS

000893

409-11-86

FERNALD RI/FS REVIEWED BY QA KS DATE AUG 19 1991

1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

RIG #2

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 3184	COORDINATES: N481920.37 E1378947.28	DATE: 11-3-87	
ELEVATION: 583.47	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11-23-87	
ENGINEER/GEOLOGIST: D. OAKLEY	Depth N/A Date/Time N/A	DATE COMPLETED: 11-12-87	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 9	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	07512 8:00 07534 07535	3 12 12	12	VERY STIFF DARK BROWN (10YR, 3/3) SILT, TRACE CLAY, SAND AND GRAVEL - DRY	ML	2.0	HNU - 0PPM γ - 0CPM Bd - 1000 CPM
2 3	07513 8:10	9 10 12	15	VERY STIFF YELLOWISH BROWN (10YR, 5/4) SILT, SOME CLAY, TRACE SAND AND GRAVEL - DRY	ML	4.0	HNU - 0PPM γ - 0CPM Bd - 60CPM
4	07514 8:25	15 17 21	15	VERY STIFF GRAYISH BROWN (10YR, 5/2) 3.6 SILT, SOME CLAY, TRACE SAND - DRY	ML	4.0	HNU - 0PPM γ - 0CPM Bd - 60 CPM
				HARD DARK BROWN (10YR, 4/3) CLAY, SOME SILT, TRACE SAND - DRY	CL	3.5	
5 6	07515 8:40	22 26 19	16	HARD DARK BROWN (10YR, 3/3) CLAY, SO SOME SILT, TRACE SAND - DRY	CL	3.5	HNU - 0PPM γ - 0CPM Bd - 60 CPM
				HARD YELLOWISH BROWN (10YR, 5/4) CLAY, 6.5 SOME SILT, TRACE SAND - DRY	CL	3.5	
7	07516 15:55	3 4 8	10	STIFF GRAYISH BROWN (10YR 5/2) CLAY, 6.4 SOME SILT, TRACE SAND - MOIST.	CH	1.0	HNU - 0PPM γ - 0CPM Bd - 60 CPM
				STIFF YELLOWISH BROWN (10YR, 5/6) CLAY, SOME SILT, TRACE SAND - DRY	CL	2.0	
8 9	07517 16:10	2 2 6	15	MEDIUM STIFF BROWN (10YR, 6/3) CLAY, TRACE SAND AND SILT - MOIST.	CH	1.0	HNU - 0PPM γ - 0 CPM Bd - 60CPM
10	07518 7:50	3 4 7	13	STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME GRAVEL, ~~AND~~ TRACE SAND AND SILT - MOIST	CH	1.25	HNU - 0 PPM γ - 0 CPM Bd - 50 CPM
11 12	07519 8:05	6 8 12	16	VERY STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME GRAVEL AND SAND, TRACE SILT - MOIST.	CL	2.5	HNU - 0PPM γ - 0CPM Bd 60 CPM
13	07520 8:20	3 11 15	17	VERY STIFF LIGHT YELLOWISH BROWN (10YR, 6/4) CLAY, SOME SAND, TRACE GRAVEL AND SILT - DRY	CL	2.75	HNU - 0PPM γ - 0CPM Bd - 50CPM
14 15	07521 8:35	4 11 15	18	VERY STIFF LIGHT YELLOWISH BROWN (10YR, 6/4 CLAY, SOME SAND, TRACE 14.6 FINE GRAVEL AND SILT - MOIST	CL	2.75	HNU - 0PPM γ - 0CPM Bd - 50 CPM
				VERY STIFF GRAY (5YR, 5/1) CLAY, SOME SAND, TRACE GRAVEL AND SILT - MOIST	CL	3.25	

NOTES: CONTRACTOR: PENADRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE
WATER ADDED TO HOLE - 1 TICK = 5 GALLONS

ASTM STANDARD PENETRATION TEST USED FOR SPLIT SPOON SAMPLING
COLORS CHARACTERIZED USING MUNSELL COLOR CHARTS.

BACKGROUND
HNU - 0PPM
γ - 0CPM
LEL - 0 %
Bd - 300 CPM - GROUND

000894

402-11-86

QC/DH/2-4-89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA YG DATE AUG 19 1991 5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6.02	PROJECT NAME: FERNALD	
BORING NUMBER: ~~384~~ 3084BB 1-5-91	COORDINATES: Local	DATE: 11-4-87
ELEVATION: Local	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11-3-87
ENGINEER/GEOLOGIST: D. DATTLE	Depth N/A Date/Time N/A	DATE COMPLETED: 11-12-87
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 9

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	07522 8:55	3 8 12	18	VERY STIFF GRAY (5Y, 6/1) CLAY, SOME SAND, TRACE GRAVEL AND SILT - MOIST	CL	3.25	HNU - 0 PPM Bα - 60 CPM γ - 0 CPM
17 18	07523 10:00	3 6 9	12	STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME SAND, TRACE GRAVEL AND SILT - MOIST.	CL	1.25	HNU - 0 PPM Bα - 60 CPM γ - 0 CPM
19	07524 10:20	3 4 5	8	STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME SAND, TRACE GRAVEL AND SILT, MOIST.	CH	.75	HNU - 0 PPM Bα - 60 CPM γ - 0 CPM
20 21	07525 10:35	5 6 11	13	VERY STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME SAND, TRACE GRAVEL AND SILT - MOIST	CH	1.25	HNU - 0 PPM Bα - 50 CPM γ - 0 CPM
22	07526 10:50	5 6 12	15	VERY STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME SAND, TRACE FINE GRAVEL AND SILT - MOIST	CH	1.0	HNU - 0 PPM Bα - 50 CPM γ - 0 CPM
23 24	07527 11:10	2 6 7	13	STIFF OLIVE GRAY (5Y 5/2) CLAY SOME SAND AND GRAVEL, TRACE SILT, MOIST	CH	.75	HNU - 0 PPM Bα - 50 CPM γ - 0 CPM
25	07528 11:40	1 3 7	10	STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME FINE GRAVEL, TRACE SAND AND SILT - MOIST	CH	.75	HNU - 0 PPM Bα - 50 CPM γ - 0 CPM
26 27	07529 15:20	4 5 7	12	STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL AND SAND, TRACE SILT, MOIST	CH	0.5	HNU - 0 PPM Bα - 50 CPM γ - 0 CPM
28	07530 15:50	2 4 7	12	STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL AND SAND, TRACE SILT - MOIST	CH	0.5	HNU - 0 PPM Bα - 50 CPM γ - 0 CPM
29 30	07531 16:10	6 6 7	6	STIFF OLIVE GRAY (5Y, 5/2) CLAY, SOME GRAVEL AND SAND, TRACE SILT - MOIST	CH	1.0	HNU - 0 PPM Bα - 70 CPM γ - 0 CPM

NOTES:

BACKGROUND IN LEAD SHIELD - 40-70 CPM.

000835

402-11-86

QC/DH/2-4-89

	Initials	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

REVIEWED BY QA 16 DATE AUG 1 9 1991

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602		PROJECT NAME: FERNALD RI/FS			
BORING NUMBER: ~~384~~ 3084 BB 1-5-89		COORDINATES: LOCAL N/A SLCP1		DATE: 11-4-87	
ELEVATION: N/A		GWL: Depth N/A	Date/Time N/A	DATE STARTED: 11-3-87	
ENGINEER/GEOLOGIST: D. OAKLEY/W. REGLEY		Depth N/A	Date/Time N/A	DATE COMPLETED: 11-12-87	
DRILLING METHODS: CABLE TOOL				PAGE 3 OF 9	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	07537 1630	9 10 21	13	HARD OLIVE GRAY (5Y 5/2) CLAY, SOME GRAVEL AND SAND TRACE ~~GRA~~ SILT, MOIST	CL	3.25	HNU - 0 PPM BQ - 70 CPM γ - 0 CPM
32	07538 1645	22 24 24	15	HARD OLIVE GRAY (5Y 5/2) CLAY, SOME GRAVEL AND SAND, TRACE SILT - DRY	CL	4.5	HNU - 0 (PPM) BQ - 50 CPM γ - 0 CPM END 11 4 87
33							
34	07536 0840	7 16 22	14	VERY STIFF OLIVE GRAY (5Y 5/2) CLAY SOME GRAVEL AND SILT - DRY	CL	2.5	BEGIN 11 5 87 HNU = 0 ppm BQ = 60 CPM γ = 0 cpm
35	07537 845	16 18 22	16	HARD GREY (5Y 5/1) CLAY ~~GRAVEL~~ SOME GRAVEL TRACE SAND	CL	4.5	HNU = 0 ppm BQ = 60 cpm γ = 0 cpm
36							
37	07538 1040	8 11 19	12	VERY STIFF GREY (5Y 5/1) CLAY SOME GRAVEL AND SAND TRACE OF SILT - MOIST	CL	2.5	HNU - 0 ppm BQ = 60 cpm γ 0 cpm
38	07539 1126	6 12 16	12	38.0 ~~VER~~ MEDIUM DENSE ~~CLY~~ ~~SANDY~~ ~~AND~~ SILT SILT AND SAND reddish BROWN (7.5 YR 6/5) - MOIST	SM	1.0	HNU 0 ppm BQ 60 cpm γ 0 cpm
39							
40							
41	07540 07541 07542 1330	11 22 26	14	DENSE Yellowish Brown (10 YR 5/4) FINE SAND TRACE SILT - moist	SP ~~SW~~		HNU = 0 ppm BQ = 60 cpm γ = 0 cpm
42							
43							
44							
45							

NOTES:

000896

402-11-86

QC/DM/2-4-89

FERNALD RI/FS

16-5709

REVIEWED BY QA 16- DATE AUG 19 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 - 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~284~~ ~~3084~~ 3084 BB 1-3-89	COORDINATES: N/A	DATE: 11 5 87
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11 3 87
ENGINEER/GEOLOGIST: D KEGLEY/DCH	Depth N/A Date/Time N/A	DATE COMPLETED: 11-12-87
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 9

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6"/6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	07543 1600	12 23 30	13	VERY DENSE DARK YELLOWISH BROWN (10YR 4/4) SAND TRACE OF GRAVEL - DRY	SP	—	HNU = 0ppm BG = 60cpm γ = 0cpm
47							
48							
49							
50	07544 1640	16 36 37	12	VERY DENSE DARK YELLOWISH BROWN (10YR 4/3) SAND TRACE OF GRAVEL - DRY	SP	—	HNU 0ppm BG 60-80cpm γ = 0cpm
51				VERY DENSE YELLOWISH BROWN 10YR 5/4 FINE SAND MOIST			
52							
53							
54							7:15 11-6-87 D CAMLEY
55	07545 8:30	17 27 50	18	VERY DENSE DARK YELLOWISH BROWN (10YR 4/3) FINE SAND - TRACE GRAVEL - MOIST	SP	—	HNU 0PPM BG - 50 CPM γ - 0CPM
56							
57							
58							
59							

NOTES:

000897

402-11-86

FERNALD RI/FS

QC/DH/2.4.89

REVIEWED BY QA [illegible] DATE AUG 19 1991

	Initial	Date
1st Key In		
2nd Key In	UC	8/22/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 384 3084 BB 1-599	COORDINATES: [illegible]	DATE: 11-6-87
ELEVATION: [illegible]	GWL: Depth 62.75 Date/Time 11-10-87 8:00	DATE STARTED: 11-3-87
ENGINEER/GEOLOGIST: D. OAKLEY	Depth Date/Time	DATE COMPLETED: 11-12-87
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 9

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	07546 9:00	10 21 30	16	VERY DENSE DARK YELLOWISH BROWN (10YR,4/4) 60.8 SAND AND GRAVEL - MOIST	SW	—	HNU - 0 PPM γ - 0 CPM Bα - 60 CPM
				VERY DENSE DARK GRAY (10YR,4/1) FINE SAND, TRACE GRAVEL - DRY	SP	—	
62							
63							GWL 62.75 ✓
64							
65	07547 9:55	14 22 35	18	VERY DENSE DARK GRAY (10YR,4/1) FINE SAND, TRACE FINE GRAVEL - WET.	SP	—	HNU - 0 PPM γ - 0 CPM Bα - 70 CPM
66							
67							
68							
69							
70	07548 10:40	6 16 28	18	DENSE DARK GRAY (10YR,4/1) FINE SAND, 70.6 TRACE FINE GRAVEL - WET.	SP	—	HNU - 0 PPM γ - 0 CPM Bα - 60 CPM
71				DENSE DARK YELLOWISH BROWN (10YR,4/4) FINE SAND, TRACE GRAVEL - WET	SP	—	11-10-87 7:50
72							
73							
74							
75							

NOTES:

000898

402-11-86

FERNALD RI/FS

5709 QC/DH/2.4.89

REVIEWED BY QA KG DATE AUG 19 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

pMC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~384~~ 3084 BB 1-5-89	COORDINATES: local		DATE: 11-10-87
ELEVATION: bum	GWL: Depth	Date/Time	DATE STARTED: 11-3-87
ENGINEER/GEOLOGIST: D.OAKLEY	Depth	Date/Time	DATE COMPLETED: 11-12-87
DRILLING METHODS: CABLE TOOL			PAGE 6 OF 9

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75.5				MEDIUM DENSE GRAYISH BROWN (10YR 5/2) VERY FINE SAND-WET	SP	—	HNU-0PPM
76	07549 13:20	6 11 15	12	MEDIUM DENSE GRAY (5Y 4/1) SAND, SOME FINE GRAVEL-WET.	SW	—	γ-0CPM Bα-60CPM
77							
78							
79							
80							
81	07550 15:40	8 5 7	6	MEDIUM DENSE GRAYISH BROWN (10YR,5/2) SAND, SOME FINE GRAVEL-WET.	SW	—	HNU-0PPM γ-0CPM Bα-60CPM
82							
83							
84							
85							
86	07551 8:30	18 30 45	12	VERY DENSE GRAYISH BROWN (10YR,5/2) GRAVELLY SAND-WET.	SW	—	HNU-0PPM γ-0CPM Bβ-60CPM
87							
88							
89							
90							

NOTES:

000899

402-11-86

FERNALD RI/FS

QC/DA/24.89

REVIEWED BY QA 16 DATE AUG 1 9 1989

	Initial	Date
1st Key In		
2nd Key In		2/22/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 384 3084 BB 1-5-89	COORDINATES: NCP	DATE: 11-11-87
ELEVATION: NCP	GWL: Depth Date/Time	DATE STARTED: 11-3-87
ENGINEER/GEOLOGIST: D.O AHLEY	Depth Date/Time	DATE COMPLETED: 11-12-87
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 9

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	07552 10:15	6 8 10	13	MEDIUM DENSE GRAYISH BROWN (10YR, 5/2) SAND, SOME FINE GRAVEL - WET 90.8	SW	—	HNU - 0PPM γ - 0CPM βα - 70CPM
				MEDIUM DENSE YELLOWISH BROWN (10YR, 5/6) FINE SAND - WET	SP	—	
92							
93							
94							
95	07553 13:45	25 39 42	16	VERY DENSE GRAYISH BROWN (2.5Y, 5/2) MEDIUM SAND, TRACE FINE GRAVEL - 95.9 WET.	SP	—	HNU - 0PPM γ - 0CPM βα - 60 CPM
96				VERY DENSE DARK BROWN (10YR, 4/3) MEDIUM SAND, TRACE FINE GRAVEL - WET 97.0	SP	—	DRILLERS ESTIMATE
97							
98							
99							
100	07554 16:25	11 7 7	8	MEDIUM DENSE GRAYISH BROWN (2.5Y, 5/2) SAND AND GRAVEL - WET.	SW	—	HNU - 0PPM γ - 0CPM βα - 60 CPM
101							
102							
103							
104							
105							

NOTES:

000900

402-11-86

FERNALD RI/FS

QC/DH/2-4-89

5709

REVIEWED BY QA DATE AUG 19 1991

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 384 3084 BB 1-5-89	COORDINATES: see p1	DATE: 11-11-87
ELEVATION: see p1	GWL: Depth Date/Time	DATE STARTED: 11-3-87
ENGINEER/GEOLOGIST: D OAKLEY	Depth Date/Time	DATE COMPLETED: 11-12-87
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 9

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	07555 16:55	17 31 42	18	VERY DENSE GRAYISH BROWN (2.5Y, 5/2) SAND AND FINE GRAVEL - WET. 105.8 VERY DENSE DARK GRAYISH BROWN (2.5Y, 4/2) VERY FINE SAND - WET	SW SP	- -	HNU - 0 PPM γ - 0 CPM Bα - 60 CPM
107							
108							
109							
110 111	07556 9:40	3 5 8	14	MEDIUM DENSE DARK GRAYISH BROWN (2.5Y, 4/2) VERY FINE SAND - WET	SP	-	HNU - 0 PPM γ - 0 CPM Bα - 40 CPM
112							
113							
114							
115 116	07557 10:45	3 7 16	18	MEDIUM DENSE DARK GRAYISH BROWN (2.5Y, 4/2) VERY FINE SAND - WET	SP	-	HNU - 0 PPM γ - 0 CPM Bα - 40 CPM
117							
118							
119				119.0 "BLUE CLAY"			DRILLERS CONTACT.
120					CL	-	

NOTES:

000901

402-11-86

QC/DH/2.4.89

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 19 1991

	Initial	Date
1st Key In		
2nd Key In		8/23/90
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 384 3084 B/B 1-5-91	COORDINATES: Incl	DATE: 11-12-87
ELEVATION: Incl	GWL: Depth Date/Time	DATE STARTED: 11.3.87
ENGINEER/GEOLOGIST: D OATLEY	Depth Date/Time	DATE COMPLETED: 11.12.87
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 9

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	07558 13.45	9 16 25	15	HARD OLIVE GRAY (5Y, 4/2) CLAY, TRACE SILT-MOIST	CL	2.5	HNU-0PPM 8-0CPM BG-50CPM *
122							* MUNSELL COLOR NOT ACCURATE. MORE OF A SILVER-BLUE COLOR-NOT FOUND IN CHARTS
123	51 07559	NA	24				
124				WELL TO 124.0 FT.			

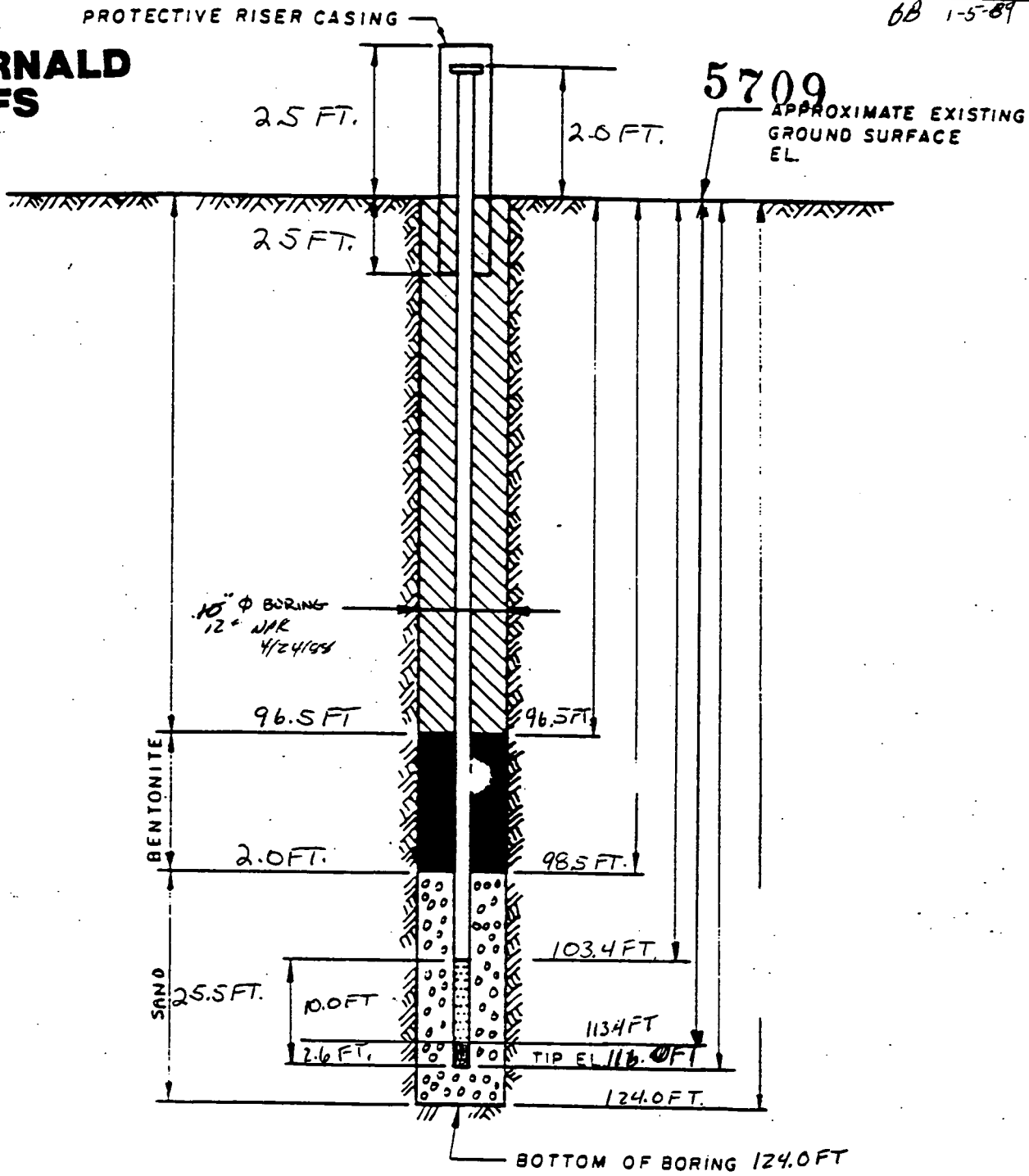
NOTES:

000902

402-11-86

QC/DH/2.4.89
WELL # ~~384~~ 3084 #2
BB 1-5-89

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~384~~ 3084

PREPARED FOR BB 1-5-89

DRAWING NUMBER
CHECKED BY
APPROVED BY
DRAWN BY DJS

000903

QC/DH/24.89

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. D. OAKLEY DATE 11-18-87
PROJECT NO. 602 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~3084~~ 3054 GB 1-5-91
PIEZOMETER NO. ~~NA~~ 3084 DATE OF INSTALLATION 11-14-87, 11-15-87

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT FLATHEAD
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 2 FT. TO 124 FT.	SIZE 10" FROM 0 FT. TO 124 FT.
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING	RISER PIPE MATERIAL 316 STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4 IN.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" IN I.D. 4 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 FT.
AVERAGE SIZE OF PERFORATIONS .010 INCH	JOINING METHOD THREAD AND
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 FT.	COUPLE.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.	OTHER PROTECTION LOCKABLE CAP.
PROTECTIVE PIPE O.D. 10 IN	WITH LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	2.0 FT.		585.47	
GROUND SURFACE	0.0		583.47	
BOTTOM OF PROTECTIVE PIPE	2.5 FT		580.97	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT	BOTTOM 96.5 FT	TOP 583.47	BOTTOM 486.97
BENTONITE	TOP 96.5 FT.	BOTTOM 98.5 FT.	TOP 486.97	BOTTOM 484.97
SAND	TOP 98.5 FT.	BOTTOM 124.0 FT	TOP 484.97	BOTTOM 459.97
~~GRAVEL~~	TOP NA	BOTTOM NA	TOP N/A	BOTTOM NA
PERFORATED SECTION	TOP 103.4 FT.	BOTTOM 113.4 FT.	TOP 480.07	BOTTOM 470.07
PIEZOMETER TIP	116.		467.47	
BOTTOM OF BOREHOLE	124.0 FT.		459.47	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS White correction was made by D. Oakley at the time this form was completed. WPK 4/24/88

000304

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 402 T3.8	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~1085~~ 1085	COORDINATES:	DATE: 3 19 88
ELEVATION: CB 03/23/88	GWL: Depth 10.6 ft Date/Time 3/30/88@0910	DATE STARTED: 3 19 88
ENGINEER/GEOLOGIST: W. Kegley	Depth Date/Time	DATE COMPLETED: 3 19 88
DRILLING METHODS: Rotary Auger / Split Spoon		PAGE 1 OF 2

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0	2 0 1 4 0 0848	3 6 8	15	Hard Dark Yellowish Brown (10YR 4/4) clayey silt trace gravel and sand-Dry	ML	4.5+	Hnu=0 βγ=180cpm α=
2.0 3.0	2 0 1 4 1 0900	10 11 36	16	very stiff yellowish brown (10YR 5/4) clayey silt trace gravel and sand Dry	ML	3.5	Hnu=0 βγ=100cpm α=
4.0	2 0 1 4 2 0910	11 11 15	11	Hard Brownish Yellow (10YR 6/6) clayey silt some gravel and sand - Dry	ML	4.5+	Hnu=0 βγ=120cpm α=
5.0 6.0	2 0 1 4 3 0913	7 12 17	14	very stiff pale Brown (10YR 6/5) silty Clay Trace gravel - Dry	CL	3.5	Hnu=0 βγ=120cpm α=
7.0	2 0 1 4 4 0919	9 15 27	18	very stiff strong brown (7.5YR 5/6) Clay and silt trace gravel - Dry	CL	3.75	Hnu=0 βγ=120cpm α=
9.0 9.0	2 0 1 4 5 0956	11 10 21	18	Hard Pale Brown (10YR 6/3) clayey silt Trace gravel and sand Dry	ML	4.5+	Hnu=0 βγ=120cpm α=
10.0	2 0 1 4 6 1010	9 13 22	18	Hard Yellowish Brown (10YR 5/6) clayey silt some sand - moist. 10.3	ML	4.5+	Hnu=0 βγ=120cpm α=
11.0 12.0	2 0 1 4 7 1020	35 24 22	12	very stiff grey (5Y 5/1) silt some Clay and ~~gravel~~ - limestone gravel - Dry	ML	3.5	Hnu=0 βγ=100cpm α=
13.0	2 0 1 4 8 1041	5 12 18	8	very stiff grey (5Y 5/1) silt some Clay Dry	ML	3.25	Hnu=0 βγ=120cpm α=
14.0	2 0 1 4 9 1058	5 9 14	6	very stiff grey (5Y 5/1) silt some clay Trace gravel and sand - Dry.	ML	3.75	Hnu=0 βγ=90cpm α=

NOTES:

Contractor: Pennsylvania Drilling
Driller: Pete Martin
Assistant: Mark Rebold
Drill Rig: Rotary, ~~mobil 50~~ CME 55

Background levels
βγ 120 cpm
α = 0 cpm
Hnu = 0 ppm

soil samples taken per ASTM standard penetration test
colors identified with munsell color chart.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T 3.8	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~185~~ 1085	COORDINATES:	DATE: 3/19/88
ELEVATION: CA 3/23/94	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: W. Keyley	Depth Date/Time	DATE COMPLETED: 3/19/88
DRILLING METHODS: Rotary Auger / Split Spoon		PAGE 2 OF 2

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	20 50 1111	7 11 12	18	Very stiff grey (5Y 5/1) silt some clay Trace gravel - Dry	ML	3.5	HNU = 0 BZ = 100cpm α =
	20 5 1119	9 12 8	18	Stiff grey (5Y 5/1) clay some silt trace gravel - Dry	CL	2.0	HNU = 0 BZ = 100cpm α =

NOTES:

000906

402-11-8

FERNALD RI/FS

5709

	Initial	Date
1st Key In	JPC	6/1/88
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. W. Kegley DATE 03 19 88
PROJECT NO. 602 T3.8 CHECKED BY _____ DATE _____
BORING NO. ~~CB3-2014-44~~ ~~1085~~ 1085
PIEZOMETER NO. ~~1085~~ 1085 DATE OF INSTALLATION 03 19 88

BOREHOLE DRILLING

DRILLING METHOD Auger 4 inch + 8 inch
DRILLING FLUID (S) USED:
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Auger 4 inch + 8 inch
CASING SIZE (S) USED:
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION 4 inch
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 inch
TOTAL PERFORATED AREA 10 feet

RISER PIPE MATERIAL 316 STAINLESS
RISER PIPE DIAMETERS:
O.D. ~~4~~ 3/8 inch I.D. 4.0 inch
LENGTH OF PIPE SECTIONS 5 feet + 2 feet
JOINING METHOD Threaded Couple

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 feet
PROTECTIVE PIPE O.D. 10.0 inch

OTHER PROTECTION Lockable cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP	BOTTOM	TOP	BOTTOM
BENTONITE	TOP 0.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP	BOTTOM	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0	BOTTOM 15.0	TOP	BOTTOM
PIEZOMETER TIP	18.0			
BOTTOM OF BOREHOLE	18.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

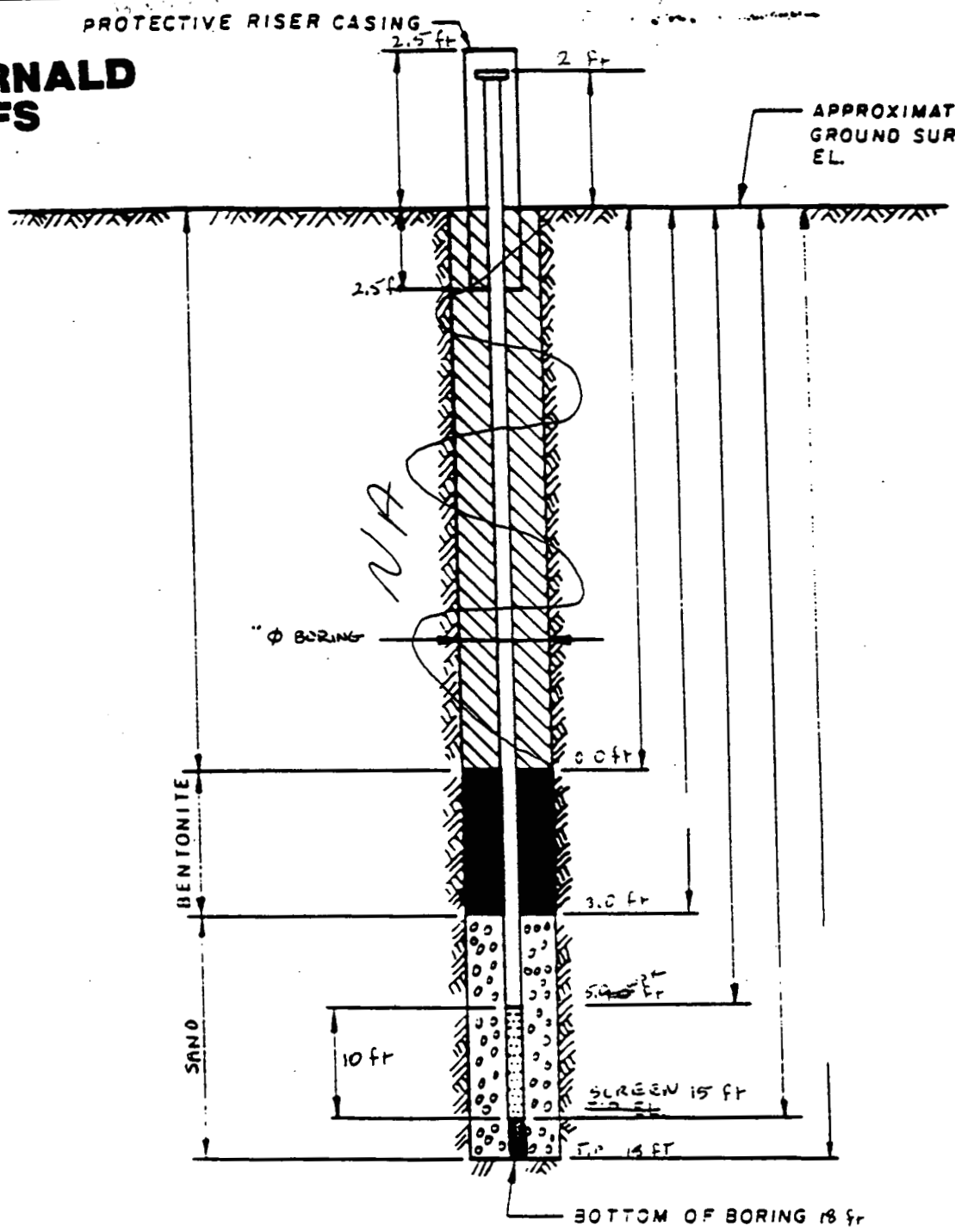
REMARKS The Boring was drilled using a 4 inch diameter Auger, The hole was the expanded using an 8 inch diameter Auger

000907

409-11-88

BORING 1085

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. ~~SCHEDULE~~ 316 STAINLESS STEEL PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1085

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

000808

FERNALD RI/FS

5709

1st Key In	pmc	3/
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T3.8	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: CB 3/23/94 ~~TSB~~ 1086	COORDINATES:	DATE: 3 / 20 / 88
ELEVATION:	GWL: Depth 15.04 TOC Date/Time 3/30/88 2:00	DATE STARTED: 3/20/88
ENGINEER/GEOLOGIST: W. REGLEY	Depth Date/Time	DATE COMPLETED: 3/20/88
DRILLING METHODS: Rotary Auger / SPLIT SPOON		PAGE 1 OF 2

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0	2 0 1 5 3 1037	4 11 13	2	Medium stiff very dark brown (10YR 2/2) silt some clay - wet	ML	1.0	Hnu = 0 BG = 120 cpm α =
2.0 3.0	2 0 1 5 4 1041	8 13 15	12	Very stiff very dark brown (10YR 2/2) silty clay some gravel - Dry	CL	3.5	Hnu = 0 BG = 120 cpm α =
4.0	2 0 1 5 5 1046	7 12 10	17	Very stiff Brown (10YR 5/3) silty clay some gravel trace sand - moist	CL	2.5	Hnu = 0 BG = 100 cpm α =
5.0 6.0	2 0 1 5 6 1054	6 14 17	18	Stiff Yellowish Brown (10YR 5/4) Clayey silt Trace sand moist	ML	1.25	Hnu = 0 BG = 120 cpm α =
7.0	2 0 1 5 7 1105	12 13 37	14	Very stiff Yellowish Brown (10YR 5/4) silt trace clay and gravel - moist	ML	3.5	Hnu = 0 BG = 120 cpm α =
8.0 9.0	2 0 1 5 8 1401	6 8 11	10	Very stiff Reddish brown (5YR 4/4) silt some clay trace gravel - Dry	ML	3.0	Hnu = 0 BG = 120 cpm α =
10.0	2 0 1 5 9 1410	2 5 9	2	Very stiff very dark greyish Brown ~~(10YR 1~~) silty clay trace gravel - Dry 10.4 ft	CL	3.0	Hnu = 0 BG = 120 cpm α =
11.0 12.0	2 0 1 8 0 1426	2 4 6	8	Hard Grey (5Y 5/1) silt some clay trace gravel and sand - Dry	ML	4.5	Hnu = 0 BG = 120 cpm α =
13.0	2 0 1 6 1 1440	2 4 7	8	STIFF GREY (5Y 5/1) clay some silt Trace sand and gravel - Dry	CL	1.5	Hnu = 0 BG = 120 cpm α =
14.0	2 0 1 6 2 1450	4 3 7	10	soft grey (5Y 5/1) sandy silt some clay and gravel - moist.	ML	0.25	Hnu = 0 BG = 120 cpm α =

NOTES:

DRILLING CONTRACTOR: PENNSYLVANIA DRILLING

DRILLER: PETE MARTIN

ASSISTANT: MARK REEBOLD

RIG: ~~MOBIL B-80~~ CME 55

BACKGROUND LEVELS
BG = 120 cpm
Hnu = 0 ppm
α = 0 ppm

soil samples collected per ASTM STANDARD PENETRATION TEST

colors identified with Munsell color chart

000909

402-11-

FERNALD RI/FS

	Initial	Date
1st Review	PR	5/26/89
2nd Review		
Final Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T 3.8	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~1B6~~ 1086	COORDINATES:	DATE: 3 20 88
ELEVATION: CB 2/23/94	GWL: Depth Date/Time	DATE STARTED: 3 20 88
ENGINEER/GEOLOGIST: W. Keyley	Depth Date/Time	DATE COMPLETED: 3 20 88
DRILLING METHODS: Rotary		PAGE 2 OF 2

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.0	20 1 6 3 1454	2 4 6	12	Medium stiff Grey (5Y 5/1) silty clay some sand trace gravel - Dry	CL	0.75	Hnu=0 Bg=120cpm α =
17.0 18.0	30 1 6 4 1505	1 2 5	12	Medium stiff Grey (5Y 5/1) clay some silt trace gravel - Dry	CL	1.0	Hnu=0 Bg=120cpm α =

NOTES:

000910

402-11-86

FERNALD RI/FS

5709

	Initial	Date
1st Key In	APC	6/1/88
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. W. KEGLEY DATE 03 20 88
PROJECT NO. 602 T3.8 CHECKED BY _____ DATE _____
BORING NO. ~~186~~ CB3/03/94 1086
PIEZOMETER NO. ~~186~~ 1086 DATE OF INSTALLATION 03 20 88

BOREHOLE DRILLING

DRILLING METHOD Rotary Auger
DRILLING FLUID (S) USED:
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT 8 inch Auger
CASING SIZE (S) USED:
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 inch
TOTAL PERFORATED AREA 10 ft

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 inch I.D. 4.0 inch
LENGTH OF PIPE SECTIONS 2 ft and 5 feet
JOINING METHOD THREADED COUPLE

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10.0 inch

OTHER PROTECTION Lockable Cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.5~~ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP	BOTTOM	TOP	BOTTOM
BENTONITE	TOP 0.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 13.0	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0	BOTTOM 15.0	TOP	BOTTOM
PIEZOMETER TIP	15.0			
BOTTOM OF BOREHOLE	15.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

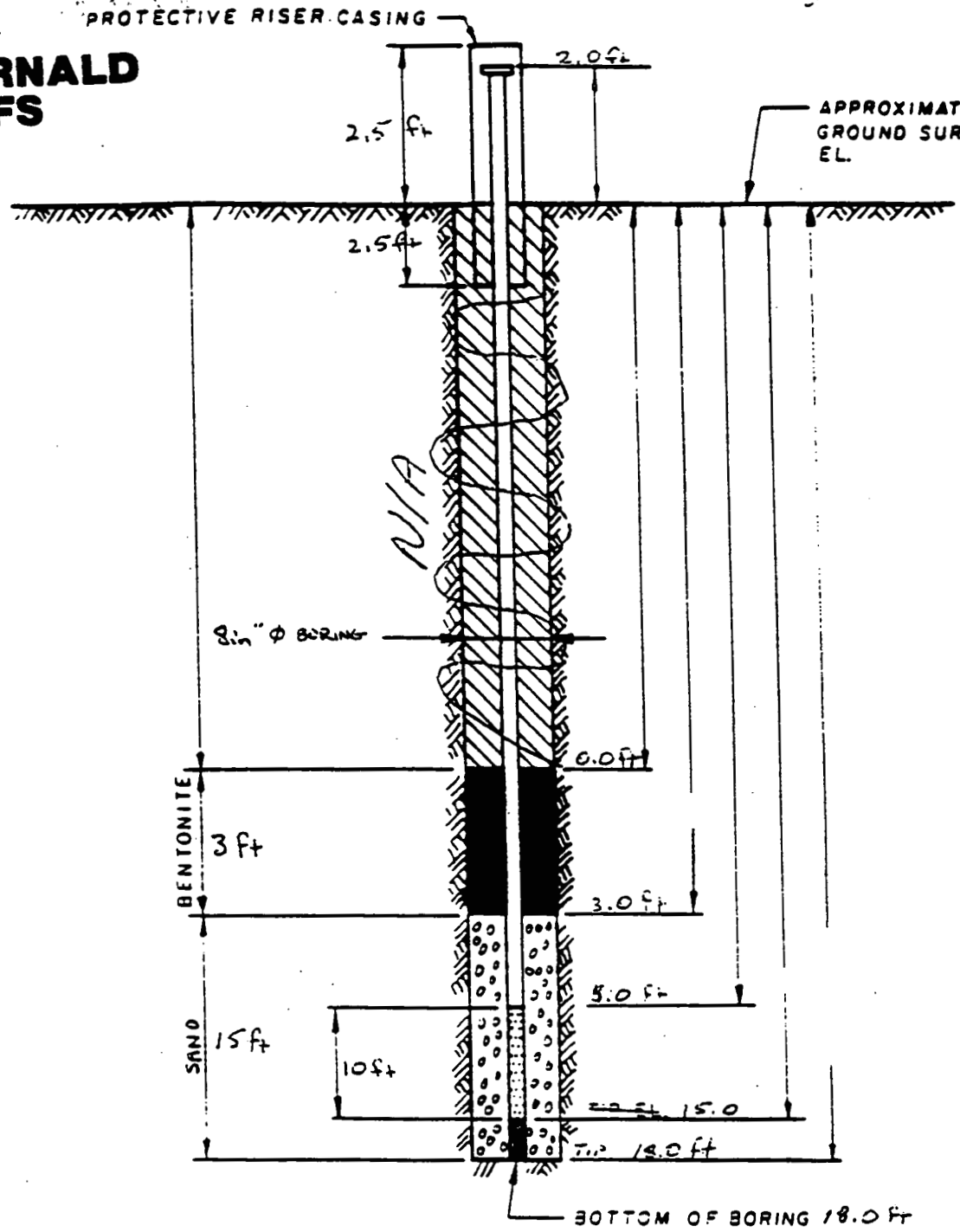
REMARKS _____

000911

409-11-8

Boring 1086

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. P.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1086

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY WPK

000912

FERNALD RI/FS

5709

	Initial	Date
1st Key In	PAC	5/26/88
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.8	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~187~~ 1087	COORDINATES:	DATE: 3 21 88
ELEVATION: 03/23/94	GWL: Depth 16.2ft TOC Date/Time 3/30/88 0915	DATE STARTED: 3 21 88
ENGINEER/GEOLOGIST: W. Keyley	Depth Date/Time	DATE COMPLETED: 3 21 88
DRILLING METHODS: 8 inch Rotary Auger / SPLITSPOON		PAGE 1 OF 2

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0	2 0 1 6 7 0956	3 9 9	6	Hard very dark greyish brown silt some sand and gravel - Dry	ML	4.5t	Hnu = 0 βγ = 180 cpm α =
2.0	2 0 1 6 8 1005	7 17 17	15	Hard Yellowish Brown (10YR 5/6) Silt some clay Trace gravel - Dry	ML	4.5	Hnu = 0 βγ = 100 cpm α =
3.0 4.0	2 0 1 6 9 1011	11 15 12	6	Hard Yellowish Brown (10YR 5/4) silt some clay and gravel - Dry	ML	4.5	Hnu = 0 βγ = 100 cpm α =
5.0 6.0	2 0 1 8 0 1016	5 8 13	18	very stiff Brown (10YR 5/3) silt some clay trace gravel - Dry	ML	3.5	Hnu = 0 βγ = 100 cpm α =
7.0	2 0 1 7 1 1027	5 7 11	18	very stiff Brown (10YR 5/3) silt some clay trace sand and gravel - Dry	ML	3.5	Hnu = 0 βγ = 100 cpm α =
8.0 9.0	2 0 1 7 2 1113	11 14 19	17	Hard Yellowish Brown (10YR 5/4) Clay silt some sand trace gravel Dry	ML	4.5	Hnu = 0 βγ = 100 cpm α =
10.0	2 0 1 7 3 1126	7 11 17	18	very stiff Brown (10YR 5/3) clayey silt trace gravel and sand - Dry	ML	3.5	Hnu = 0 βγ = 100 cpm α =
11.0 12.0	2 0 1 4 3 1430	6 9 11	6	stiff Brown (10YR 5/3) clayey silt trace gravel and sand Dry 11.8	ML	2.0	Hnu = 0 βγ = 100 cpm α =
13.0	2 0 1 7 5 1450	8 9 13	15	Stiff grey (5Y 5/1) clayey silt some gravel - Dry	ML	1.5	Hnu = 0 βγ = 100 cpm α =
14.0	2 0 1 7 6 1454	6 7 13	16	stiff grey (5Y 5/1) silty clay some gravel - Dry	CL	1.75	Hnu = 0 βγ = 100 cpm α =

NOTES:

Contractor: Pennsylvania Drilling
Driller: Pete Martin
Assistant: Mark Rebold
Rig: ~~Mobil 90~~ CME 55

Background levels
Hnu = 0 ppm
βγ = 100 cpm
α = 0 cpm

Samples taken per ASTM STANDARD PENETRATION Test

color identified by Munsell color charts.

000913

402-11

FERNALD RI/FS

	Initials	Date
1st Key In	PAC	5/26/
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 T8	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~L87~~ 1087	COORDINATES:	DATE: 3 21 88
ELEVATION: CA 3/23/89	GWL: Depth Date/Time	DATE STARTED: 3 21 88
ENGINEER/GEOLOGIST: W. Kegley	Depth Date/Time	DATE COMPLETED: 3 21 88
DRILLING METHODS: Rotary Auger / SPLIT SPOON		PAGE 2 OF 2

DEPTH (feet)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inch)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.0	2 0 1 7 7 1500	6 9 11	18	STIFF Olive Grey (5Y 5/2) Silty Clay some gravel - Dry	CL	1.5	HNU = 0 BZ = 100 ppm α =
17.0 18.0	2 0 1 7 8 1524	4 9 11	14	STIFF Olive Grey (5Y 5/2) Silty Clay some gravel - Dry	CL	1.5	HNU 0 BZ = 100 ppm α =
				BOTTOM OF BORING			

NOTES:

000814

402-11-81

FERNALD RI/FS

5709

	Initial	Date
1st Rev to	PAC	6/11/88
2nd Rev to		
Final Copy Transmittal		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC 121/FS FIELD ENG./GEO. W Keyley DATE 3 21 88
PROJECT NO. 602 T 3.8 CHECKED BY DATE
BORING NO. ~~187~~ CB 4/23/94 1087
PIEZOMETER NO. ~~187~~ 1087 DATE OF INSTALLATION 3 21 88

BOREHOLE DRILLING

DRILLING METHOD Rotary Auger	TYPE OF BIT Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4 inch	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 inch I.D. 4 inch
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 2 feet 10 feet
AVERAGE SIZE OF PERFORATIONS 0.010 inch	JOINING METHOD Threaded couple
TOTAL PERFORATED ~~AREA~~ Length 10 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE O.D. 10 inch	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP	BOTTOM	TOP	BOTTOM
BENTONITE	TOP 0.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 18.0	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0	BOTTOM 15.0	TOP	BOTTOM
PIEZOMETER TIP	18.0			
BOTTOM OF BOREHOLE	18.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

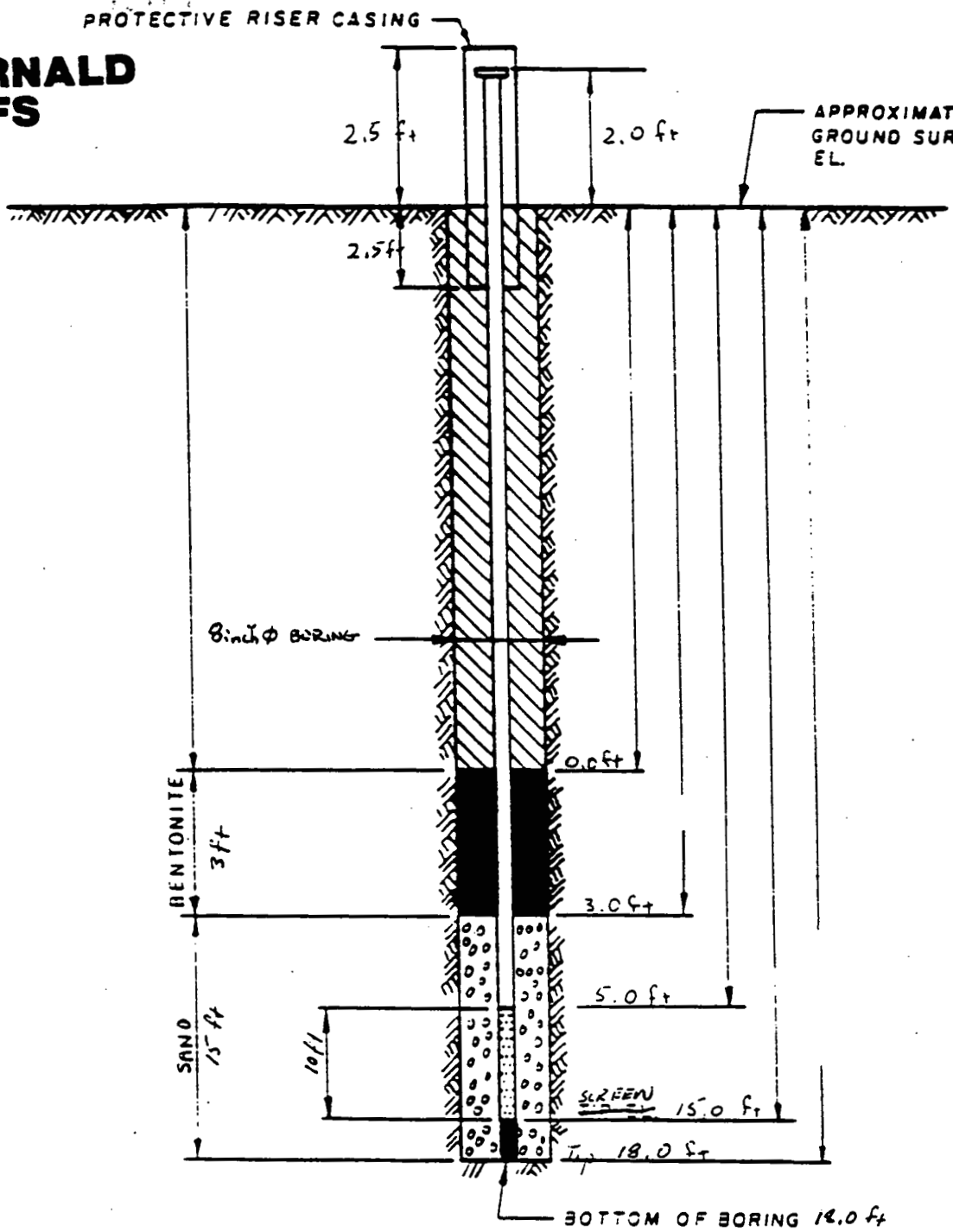
REMARKS

000315

409-11-80

Boring 1087

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

WP/L

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D 4 PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1087

PREPARED FOR

FERNALD RI/FS

5709

	Initial	Date
1st Key In	pAC	5/31/90
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: FMPC RI/FS	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~455~~ 1088	COORDINATES:	DATE: 3/22/88
ELEVATION: CA 3/22/94	GWL: Depth 12.7ft TOC Date/Time 3/30/88 0920	DATE STARTED: 3/22/88
ENGINEER/GEOLOGIST: W. Keyley	Depth Date/Time	DATE COMPLETED: 3/22/88
DRILLING METHODS: Rotary Auger		PAGE 1 OF 2

DEPTH (Since 4')	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 Since 4')	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1 ~~100~~	20 1 8 1 1420	3 5 9	8	very stiff brown (10YR 5/3) silt some clay sand gravel and slag - Dry 1.8	ML	3.25	βγ = 260 cpm Hnu = 0 α 0
2 ~~170~~ 3	20 1 8 2 1437	8 13 17	15	Hard Yellowish Brown (10YR 5/4) silt some clay trace gravel - Dry	ML	4.5+	Hnu = 0 βγ = 100 cpm α =
4	20 1 8 3 1442	7 9 15	18	Hard Yellowish Brown (10YR 5/4 silt some clay trace gravel - Dry	ML	4.0	Hnu = 0 βγ = 100 cpm α =
5 6	20 1 8 3 1445	6 13 16	19	Hard Yellowish Brown (10YR 5/4) silt some clay trace gravel sand Dry.	ML	4.25	Hnu = 0 βγ = 100 cpm α =
7	20 1 8 3 1451	6 12 17	18	Hard Brown (10YR 5/3) clayey silt ~~some~~ trace gravel Dry	ML	4.0	Hnu = 0 βγ = 100 cpm α =
8 9	20 1 8 6 1512	5 8 12	8	very stiff Dark grey (5Y 4/1) silt some clay and gravel - Dry	ML	2.5	Hnu = 0 βγ = 100 cpm α =
10	20 1 8 3 1530	3 7 10	12	very stiff grey (5Y 5/1) clayey silt some gravel trace sand - Dry	ML	2.75	Hnu = 0 βγ = 100 cpm α =
11 12	20 1 8 4 1532	9 12 9	10	Very stiff Dark grey (5Y 4/1) silt some clay trace sand and gravel - Dry	ML	3.75	Hnu = 0 βγ = 100 cpm α =
13	20 1 8 3 1545	2 4 7	16	very stiff grey (5Y 5/1) silt some clay trace gravel - Dry	ML	2.5	Hnu = 0 βγ = 100 cpm α =
14	20 1 8 5 1550	9 4 6	17	Stiff Dark grey (5Y 4/1) silt some clay trace gravel	ML	1.5	Hnu = 0 βγ = 100 cpm α =

NOTES:

Contractor: Pennsylvania Drilling
Driller: Pete Martin
Assistant: Mark Rebold
Rig: ~~Mobil 80~~ CME 55

Background levels
Hnu = 0 ppm
βγ = 100 cpm
α = 0 cpm

Samples taken per ASTM standard Penetration Test
color identified by Munsell color charts

FERNALD RI/FS

	Initial	Date
1st Key In	JAC	5/31/90
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 607 T3.8	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~198~~ 1088	COORDINATES:	DATE: 3/22/88
ELEVATION: CB 3/23/91	GWL: Depth Date/Time	DATE STARTED: 3/22/88
ENGINEER/GEOLOGIST: W. Kegley	Depth Date/Time	DATE COMPLETED: 3/22/88
DRILLING METHODS: Rotary Auger		PAGE 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	2 0 1 9 1609 1	2 3 5	13	Medium Stiff Olive grey (5Y 5/2) Clay some silt trace gravel Dry	CL	.75	Hnu = 0 Bd = 1000cpm α =
	2 0 1 9 1607 2	1 2 5	14	Medium Stiff Olive grey (5Y 5/2) Clay some silt trace gravel and clay Dry	CL	.75	Hnu = 0 Bd = 1000cpm α =
				Bottom of Boring.			

NOTES:

000918

402-11-

FERNALD RI/FS

5709

	Initials	Date
1st Key In	PMC	6/1/88
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. D. Kegley DATE 3/22/88
PROJECT NO. 602 T 3.8 CHECKED BY _____ DATE _____
BORING NO. ~~188~~ CP 3/23/94 1088
PIEZOMETER NO. ~~188~~ 1088 DATE OF INSTALLATION 3/22/88

BOREHOLE DRILLING

DRILLING METHOD Rotary Auger
DRILLING FLUID (S) USED:
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Auger 8 inch
CASING SIZE (S) USED:
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010
TOTAL PERFORATED ~~AREA~~ Length 10 feet

RISER PIPE MATERIAL 316 stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 inch I.D. 4 inch
LENGTH OF PIPE SECTIONS 2 + 10 feet
JOINING METHOD Threaded couple

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 feet
PROTECTIVE PIPE O.D. 10 inch

OTHER PROTECTION Lockable cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP	BOTTOM	TOP	BOTTOM
BENTONITE	TOP 0	BOTTOM 3	TOP	BOTTOM
SAND	TOP 3	BOTTOM 18	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 5	BOTTOM 15	TOP	BOTTOM
PIEZOMETER TIP	18			
BOTTOM OF BOREHOLE	18			
GWL AFTER INSTALLATION				

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐

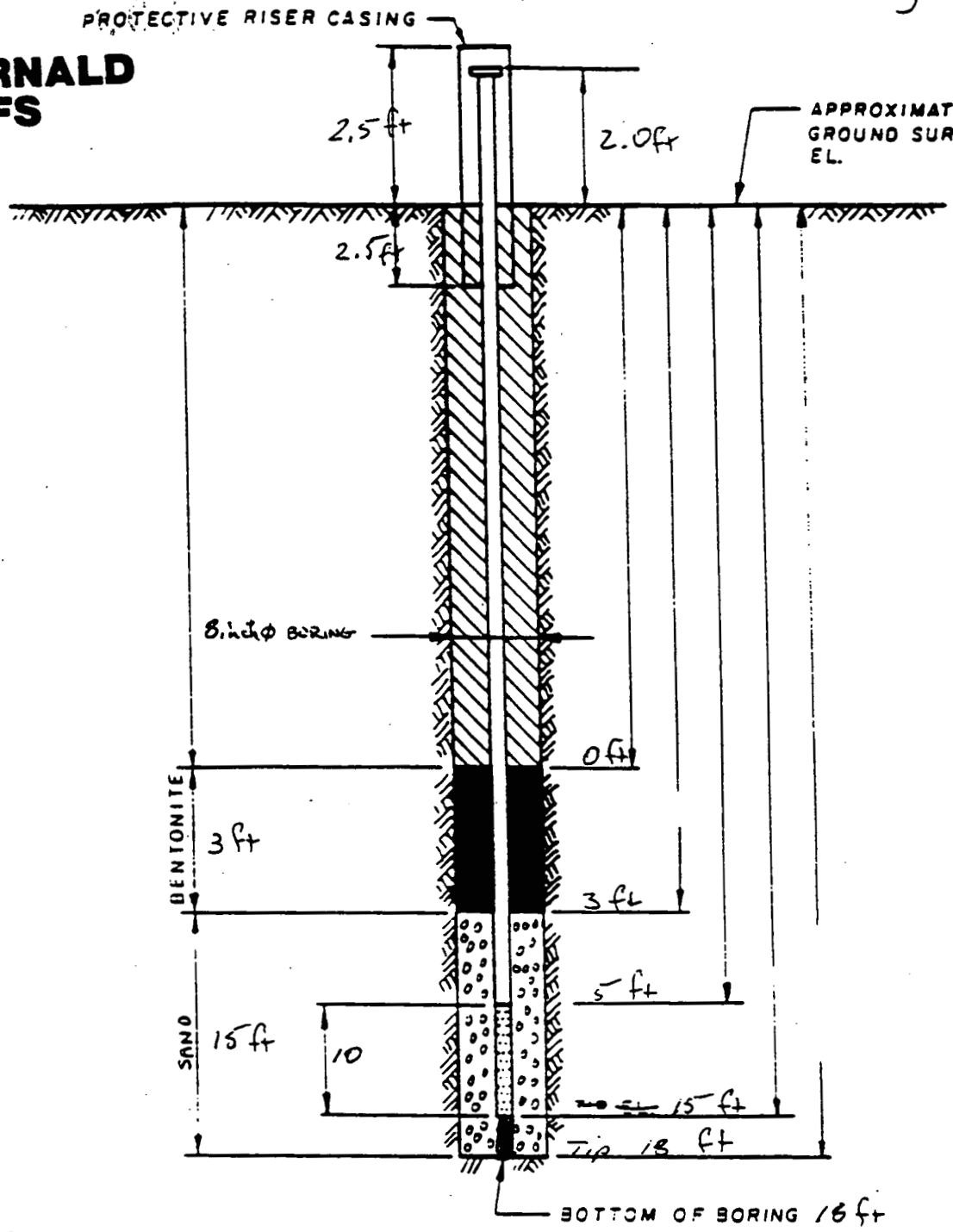
REMARKS

000919

409-11-

Boring 1088

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D 4 PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1088

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

WDK

DRAWN BY

FERNALD RI/FS

5709

1st Key In	PAC	5/31/90
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.08	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~184~~ 1089	COORDINATES:	DATE: 3/23/88	
ELEVATION: CAD 03/23/94	GWL: Depth 18.5ft TOC Date/Time 3/30/88 0915	DATE STARTED: 3/23/88	
ENGINEER/GEOLOGIST: W. MONTGOMERY	Depth Date/Time	DATE COMPLETED: 3/23/88	
DRILLING METHODS: ROTARY AUGER		PAGE 1 OF 2	

DEPTH (FT)	SAMPLE TYPE & NO. / TIME	BLOWS ON SAMPLER PER (6/N)	RECOVERY (/N)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0	20193 1120	7 4 6	7	FILL; (Very Stiff, Dark Brown (10YR 3/3) silt with Some Clay and Trace Gravel and Sand, Dry	ML	3.5	β/γ = 270 cpm α = 0 cpm HNU = 0 ppm
2.0	20194 1135	8 11 10	16	2.85 Hard, Dark Yellowish Brown (10YR 4/4) silt with Some Clay and Trace Sand and Gravel Dry	ML	74.0	β/γ = 170 cpm α = 0 cpm HNU = 0 ppm
4.0	20195 1255	6 8 9	16	Very Stiff, Dark Brown (10YR 4/3) Silt with Some Clay and Gravel and Trace Sand, Dry	ML	3.0	β/γ = 120 cpm α = 0 cpm HNU = 0 ppm
5.0 6.0	20196 1302	8 10 15	18	Hard, Dark Yellowish Brown (10YR 4/4) Silt with Some Clay and Gravel and Trace Sand, Dry	ML	4.5	β/γ = 110 cpm α = 0 cpm HNU = 0 ppm
7.0	20197 1311	4 11 23	18	Hard, Dark Grayish Brown (10YR 4/2) silt with Some Clay and Trace Gravel and Sand, Dry	ML	4.25	β/γ = 140 cpm α = 0 cpm HNU = 0 ppm
8.0 9.0	20198 1326	9 13 16	15	Hard, Dark Grayish Brown (10YR 4/2) Clayey Silt with Some Gravel and Trace Sand, Dry	ML	4.5	β/γ = 135 cpm α = 0 cpm HNU = 0 ppm
10.0	20199 1341	12 10 18	18	9.5 Very Stiff, Dark Gray (10YR 4/1) Clayey silt with Some Gravel and Trace Sand, Dry	ML	2.5	β/γ = 125 cpm α = 0 cpm HNU = 0 ppm
11.0 12.0	20200 1357	4 8 12	4	Very Stiff, Dark Gray (10YR 4/1) Clayey Silt with Some Gravel and Trace Sand, Moist	ML	2.5	β/γ = 120 cpm α = 0 cpm HNU = 0 ppm
13.0	20201 1410	32 9 12	15	Stiff, Dark Gray (5Y 4/1) Silty Clay with Trace Gravel, Moist	CL	1.5	β/γ = 120 cpm α = 0 cpm HNU = 0 ppm
14.0 15.0	20202 1417	20. 13 12	7	Stiff, Dark Olive Gray (5Y 4/2) Silty Clay with Some Gravel and Trace Sand, Moist	CL	1.5	β/γ = 115 cpm α = 0 cpm HNU = 0 ppm

NOTES:
Pennsylvania Drilling Company
Drill Rig: CME 55.
Driller: Pete Martin
Helper: Mark Rebald
Samples obtained via ASTM standard penetration test.
Soil colors follow Munsell color charts.

Background: β/γ = 110 cpm
α = 0 cpm
HNU = 0 ppm

000921

402-11-8

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 607.03.08	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~1084~~ 1089	COORDINATES:		DATE: 3/23/88
ELEVATION: CD 03/23/94	GWL: Depth	Date/Time	DATE STARTED: 3/23/88
ENGINEER/GEOLOGIST: G. MONTGOMERY	Depth	Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: ROTARY AUGER			PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.0	20203 1420	3 5 7	15	Stiff, Dark Gray (5Y 4/1) Silty Clay with Some Gravel, Moist	CL	1.5	β/γ = 110 cpm α = 0 cpm HNU = 0 ppm
17.0	20204 1435	3 6 7	14	Medium Stiff, Dark Gray (5Y 4/1) Clay with some Silt and Gravel, Moist	CL	0.75	β/γ = 130 cpm α = 0 cpm HNU = 0 ppm
18.0				Bottom of Boring			

NOTES:

Pennsylvania Drilling Company
Drill Rig: CME 55
Driller: Pete Martin
Helper: Mark Rebold
Samples obtained via ASTM standard penetration test.
Soil Colors follow Munsell color charts.

000922

Background: β/γ = 110 cpm
α = 0 c
HNU = 0 ppm

402-11-8

FERNALD RI/FS

5709

	Initials	Date
1st Key In	PAC	6/1/88
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. W. MONTGOMERY DATE 3/24/88
PROJECT NO. 602.03.08 CHECKED BY _____ DATE 3/24/88
BORING NO. ~~1089~~ 1089
PIEZOMETER NO. ~~1089~~ 1089 DATE OF INSTALLATION 3/24/88

BOREHOLE DRILLING

DRILLING METHOD ROTARY AUGER	TYPE OF BIT 8 INCH AUGER
DRILLING FLUID (S) USED: NA	CASING SIZE (S) USED:
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4 inch	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 inch I.D. 4 inch
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 2 and 5 feet
AVERAGE SIZE OF PERFORATIONS _____	JOINING METHOD Thread and Couple
TOTAL PERFORATED AREA _____	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft	OTHER PROTECTION Lockable Cap
PROTECTIVE PIPE O.D. 10 in.	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 ft		NA	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP —	BOTTOM —	TOP	BOTTOM
BENTONITE	TOP 0.0 ft	BOTTOM 3.0 ft	TOP	BOTTOM
SAND	TOP 3.0 ft	BOTTOM 18.0 ft	TOP	BOTTOM
GRAVEL	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0 ft	BOTTOM 15.0 ft	TOP	BOTTOM
PIEZOMETER TIP	18.0 ft			
BOTTOM OF BOREHOLE	18.0 ft			
GWL AFTER INSTALLATION				

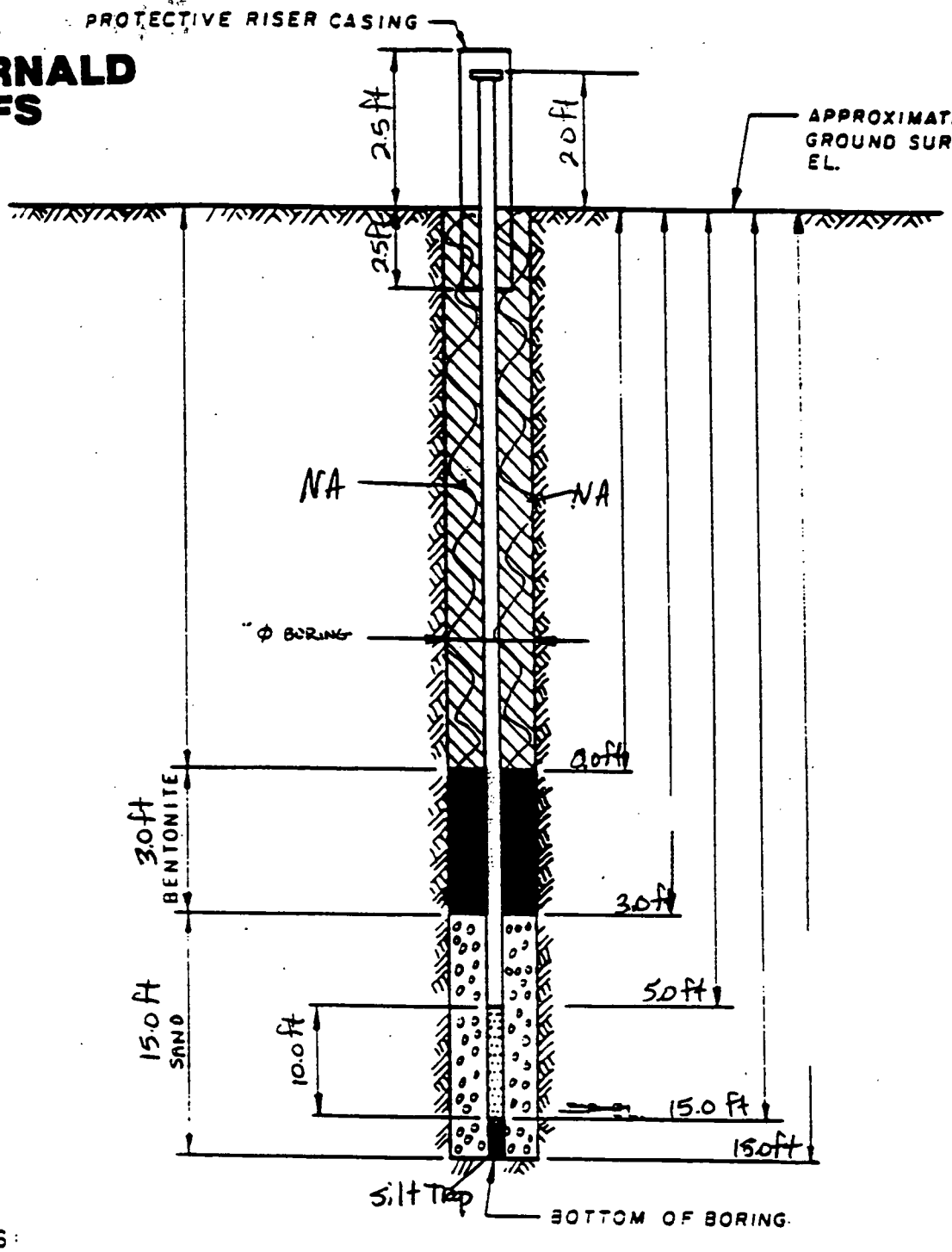
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

000033

409-11

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	NAG 9/24/86

NOTES:

1. RISER PIPE IS IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1089

PREPARED FOR
CAL 3/23/94

000924

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.08	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~190~~ 1090	COORDINATES: N/A	DATE: 3/28/88	
ELEVATION: CA 3/23/94	GWL: Depth 18.2 ft Date/Time 3/30/88 @ 0925	DATE STARTED: 3/28/88	
ENGINEER/GEOLOGIST: W. MONTGOMERY	Depth Date/Time	DATE COMPLETED: 3/28/88	
DRILLING METHODS: ROTARY AUGER		PAGE 1 OF 2	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0	20206 1015	2 5 7	5	FILL, STIFF DARK GRAYISH BROWN (10YR 3/2) SILTY CLAY WITH SOME GRAVEL AND TRACE SAND, MOIST	CL	1.5	β/γ = 250 cpm α = 0 cpm Hnu = 0 ppm
2.0	20207 1020	6 9 13	18	2.0' VERY STIFF, BROWN (10YR 4/3) SILT WITH SOME CLAY AND GRAVEL AND TRACE SAND, DRY	ML	3.5	β/γ = 110 cpm α = 0 cpm Hnu = 0 ppm
3.0 4.0	20208 1025	10 11 11	14	VERY STIFF, BROWN (10YR 5/3) SILT WITH SOME CLAY AND GRAVEL AND TRACE SAND, DRY	ML	4.0	β/γ = 100 cpm α = 0 cpm Hnu = 0 ppm
5.0 6.0	20209 1030	8 11 15	18	VERY STIFF, DARK BROWN (10YR 4/3) CLAYEY SILT WITH SOME GRAVEL AND TRACE FINE SAND, DRY	ML	4.0	β/γ = 110 cpm α = 0 cpm Hnu = 0 ppm
7.0	20210 1035	9 14 17	18	7.0' VERY STIFF, DARK GRAY (10YR 4/1) CLAYEY SILT WITH SOME GRAVEL AND TRACE SAND, DRY	ML	3.5	β/γ = 95 cpm α = 0 cpm Hnu = 0 ppm
8.0 9.0	20211 1045	6 7 10	5	VERY STIFF, DARK GRAY (5Y 4/1) CLAYEY SILT WITH SOME GRAVEL AND TRACE SAND DRY	ML	3.25	β/γ = 105 cpm α = 0 cpm Hnu = 0 ppm
10.0	20212 1055	6 6 14	7	VERY STIFF DARK GRAY (5Y 4/1) SILT AND CLAY WITH SOME GRAVEL AND TRACE SAND, MOIST	ML CL	3.0	β/γ = 115 cpm α = 0 cpm Hnu = 0 ppm
11.0 12.0	20213 1100	7 9 10	16	VERY STIFF, DARK GRAY (5Y 4/1) SILTY CLAY WITH SOME GRAVEL AND TRACE SAND, MOIST	CL	3.0	β/γ = 90 cpm α = 0 cpm Hnu = 0 ppm
13.0	20214 1110	7 9 9	17	VERY STIFF, DARK GRAY (5Y 4/1) SILTY CLAY WITH SOME GRAVEL AND TRACE SAND, MOIST	CL	2.5	β/γ = 110 cpm α = 0 cpm Hnu = 0 ppm
14.0 15.0	20215 1118	6 8 10	18	VERY STIFF, DARK GRAY (5Y 4/1) SILTY CLAY WITH SOME GRAVEL AND TRACE SAND	CL	2.25	β/γ = 100 cpm α = 0 cpm Hnu = 0 ppm

NOTES:
Pennsylvania Drilling Company
Drill Rig: CME-55 Rotary Auger
Driller: Pete Martin
Helper: Mark Rebold
Samples obtained via ASTM standard penetration test.
Soil colors follow MUNSELL soil color charts.

Background: β/γ = 90 cpm
α = 0 cpm
Hnu = 0 ppm

000925

402-11

FERNALD RI/FS

	Initials	Date
1st Key In	PAC	5/31/88
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.08	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~1590~~ 1090	COORDINATES: NA		DATE: 3/28/88
ELEVATION: 03/93/94	GWL: Depth	Date/Time	DATE STARTED: 3/28/88
ENGINEER/GEOLOGIST: W. MONTGOMERY	Depth	Date/Time	DATE COMPLETED: 3/28/88
DRILLING METHODS: ROTARY AUGER			PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.0	2 02/6 1253	4 9 14	5	STIFF, DARK GRAY (5Y 4/1) SILTY CLAY WITH SOME GRAVEL AND TRACE SAND, MOIST	CL	1.75	β/γ = 95 cpm α = 0 cpm Hnu = 0 ppm
17.0	2 02/7 1301	8 13 12	12	STIFF, DARK GRAY (5Y 4/1) SANDY SILT WITH SOME CLAY AND GRAVEL, WET	ML	1.75	β/γ = 110 cpm α = 0 cpm Hnu = 0 ppm
18.0				BOTTOM OF BORING			

NOTES:

Pennsylvania Drilling Company
Drill Rig = CME 55 Rotary Auger
Driller: Pete Martin
Helper: Mark Repold
Samples obtained via ASTM standard penetration test.
Soil colors follow MUNSELL soil color charts

Background β/γ = 90 cpm
α = 0 c[illegible]
Hnu = 0 p[illegible]

000936

402-11-

FERNALD RI/FS

5709

	Initials	Date
1st Key In	PAC	6/1/88
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. W. MONTGOMERY DATE 3/28/88
PROJECT NO. 603.03.08 CHECKED BY _____ DATE _____
BORING NO. CP 3/22/94 ~~190~~ 1090
PIEZOMETER NO. ~~190~~ 1090 DATE OF INSTALLATION 3/28/88

BOREHOLE DRILLING

DRILLING METHOD ROTARY AUGER TYPE OF BIT 8" AUGER
DRILLING FLUID (S) USED: NA CASING SIZE (S) USED: NA
FLUID _____ FROM _____ TO _____ SIZE _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____ SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING RISER PIPE MATERIAL 316 STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4.0 inch RISER PIPE DIAMETERS:
PERFORATION TYPE: O.D. 4 3/8 inches I.D. 4.0 inches
SLOTS ☐ HOLES ☐ SCREEN ☒ LENGTH OF PIPE SECTIONS 2 and 5 feet
AVERAGE SIZE OF PERFORATIONS 0.010 inches JOINING METHOD Threaded Couple
TOTAL PERFORATED AREA 10 feet

PROTECTION SYSTEM

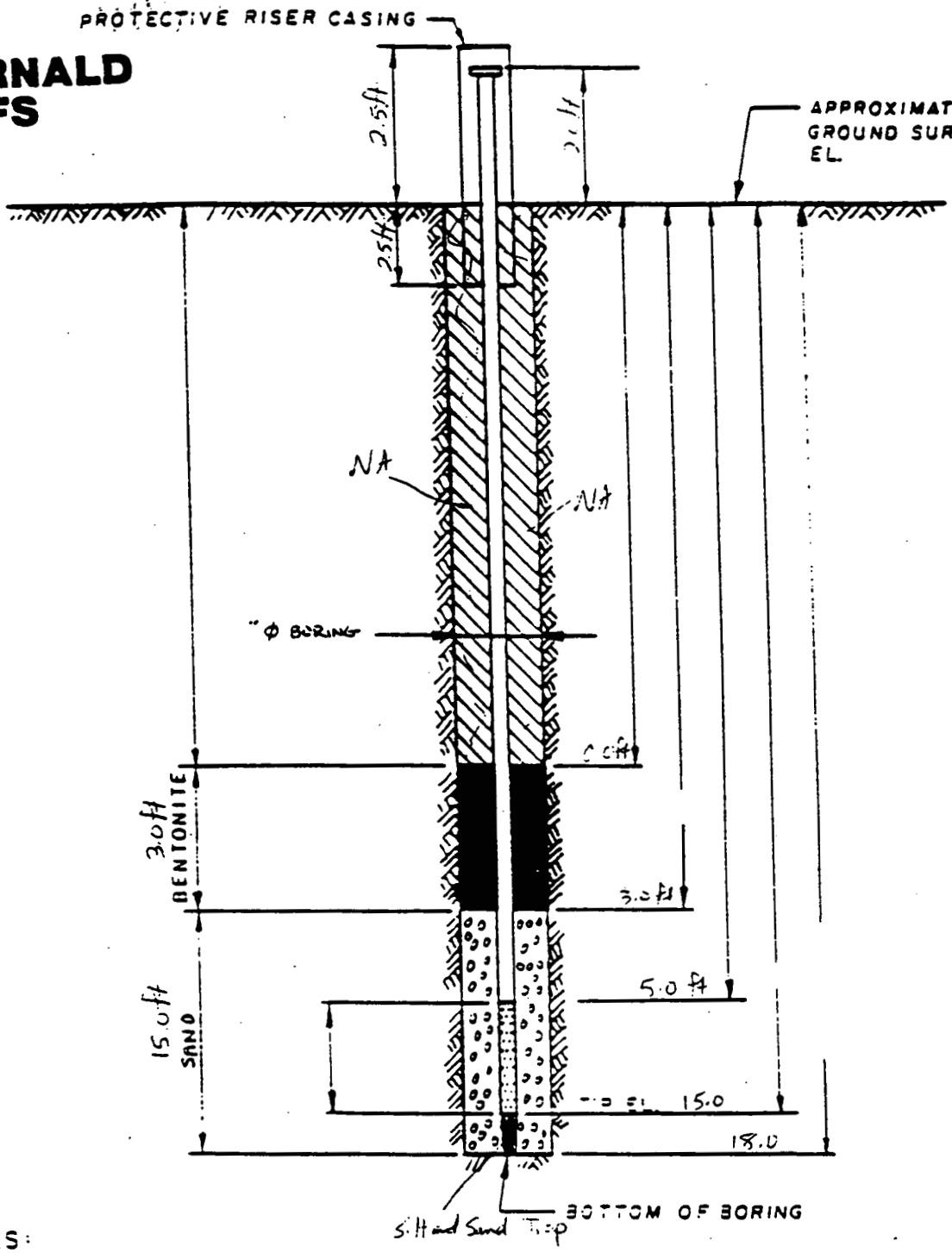
RISER PROTECTIVE PIPE LENGTH 5 feet OTHER PROTECTION Lock
PROTECTIVE PIPE O.D. 10.0 inches

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE				
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP —	BOTTOM —	TOP	BOTTOM
BENTONITE	TOP 0.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 18.0	TOP	BOTTOM
GRAVEL	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0	BOTTOM 15.0	TOP	BOTTOM
PIEZOMETER TIP	18.0			
BOTTOM OF BOREHOLE	18.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Upon installation of protective pipe riser pipe was dented approximate 1 foot below the ground surface. Riser pipe was pulled boring was cleaned out and installation was repeated with no complications on 3/29.

409-11-8

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
3/26/88	
DRAWN BY	

NOTES:

1. RISER PIPE IS IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D. PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR # 1090

000928

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~241~~ 2091	COORDINATES:	DATE: 5/24/88
ELEVATION: CB 3/23/94	GWL: Depth Date/Time	DATE STARTED: 5/23/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 5/24/88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	NA	NA	NA	See Boring CB 3/23/94 ~~441~~ 4091 for details of Lithology			
10							
20							
30							
				End of Boring 35.0 Ft.			

NOTES:
Drilling Contractor: Pennsylvania Drilling
Driller: Joe Barile
Helper: John Vandine
Rig: 72 Speedstar

H_2O used during drilling ≈ 175 gallon

000329

402-11-

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. DAVIES DATE 6/1/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. ~~291~~ CAB 3/23/94 2091
PIEZOMETER NO. ~~291~~ 2091 DATE OF INSTALLATION 6/1/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT Steel
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID H_2O FROM 0 TO 35	SIZE 10" FROM 0 TO 35 Ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 Ft, 2 Ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD Screw wrench tight
TOTAL PERFORATED AREA 15.0 Ft	

PROTECTION SYSTEM

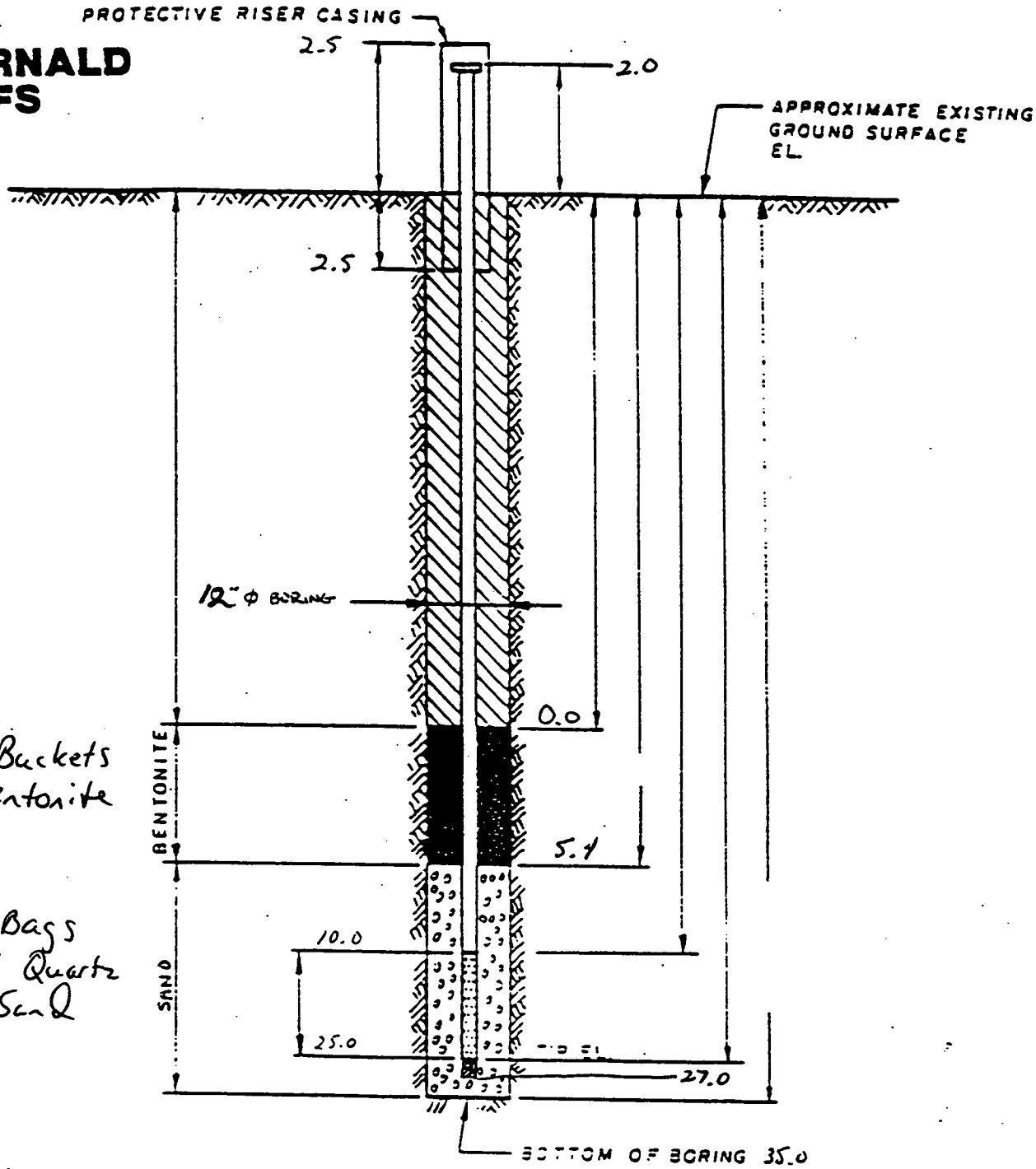
RISER PROTECTIVE PIPE LENGTH 5 Ft	OTHER PROTECTION Vented Cap and Locking Cover
PROTECTIVE PIPE O.D. 10 3/4	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM NA	TOP	BOTTOM
BENTONITE	TOP 0.0	BOTTOM 5.4	TOP	BOTTOM
SAND	TOP 5.4	BOTTOM 27.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 10.0	BOTTOM 25.0	TOP	BOTTOM
PIEZOMETER TIP	27.0 Ft			
BOTTOM OF BOREHOLE	35			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Cave to 27.0 Ft, set well and added sand pack

000930

FERNALD RI/FS



DRAWN BY	BD 6/1/88	CHECKED BY / APPROVED BY	DRAWING NUMBER

NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

2091
MW #224 CB 3/23/94

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 802.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~3921~~ 3091	COORDINATES:	DATE: 5/21/88
ELEVATION: 08/22/91	GWL: Depth Date/Time	DATE STARTED: 5/19/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 5/21/88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	NA	NA	NA	See Boring Log for 4091 for description of soils. No samples taken.			
20							
40							
60							
80							
100				End of Boring 95 Ft.			

NOTES:

Drilling Contractor : Pennsylvania Drilling

Driller : Joe Boriik

Helper : Pete Martin / John Vandine

Rig : 72 Speedstar

Total H_2O used ≈ 450 gallons

402-11-86

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. DAVIES DATE 5/22/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. ~~391~~ ~~3091~~ 3091
PIEZOMETER NO. ~~391~~ 3091 DATE OF INSTALLATION 5/21 - 5/22/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 TO 95 Ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Steel
CASING SIZE (S) USED:
SIZE 10 in FROM 0 TO 95 Ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitor Well
DIAMETER OF PERFORATED SECTION 4 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL PERFORATED AREA 10 Ft

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4.375 in I.D. 4 in
LENGTH OF PIPE SECTIONS 10 Ft
JOINING METHOD Screw wrench tight

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft
PROTECTIVE PIPE O.D. 10.~~5~~ in

OTHER PROTECTION locking covers, vented cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.5~~ BD 1.8			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 73.5	TOP	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND	TOP 73.5	BOTTOM 95.0	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 80.5	BOTTOM 90.5	TOP	BOTTOM
PIEZOMETER TIP	93.0			
BOTTOM OF BOREHOLE	95.0			
GWL AFTER INSTALLATION	NA			

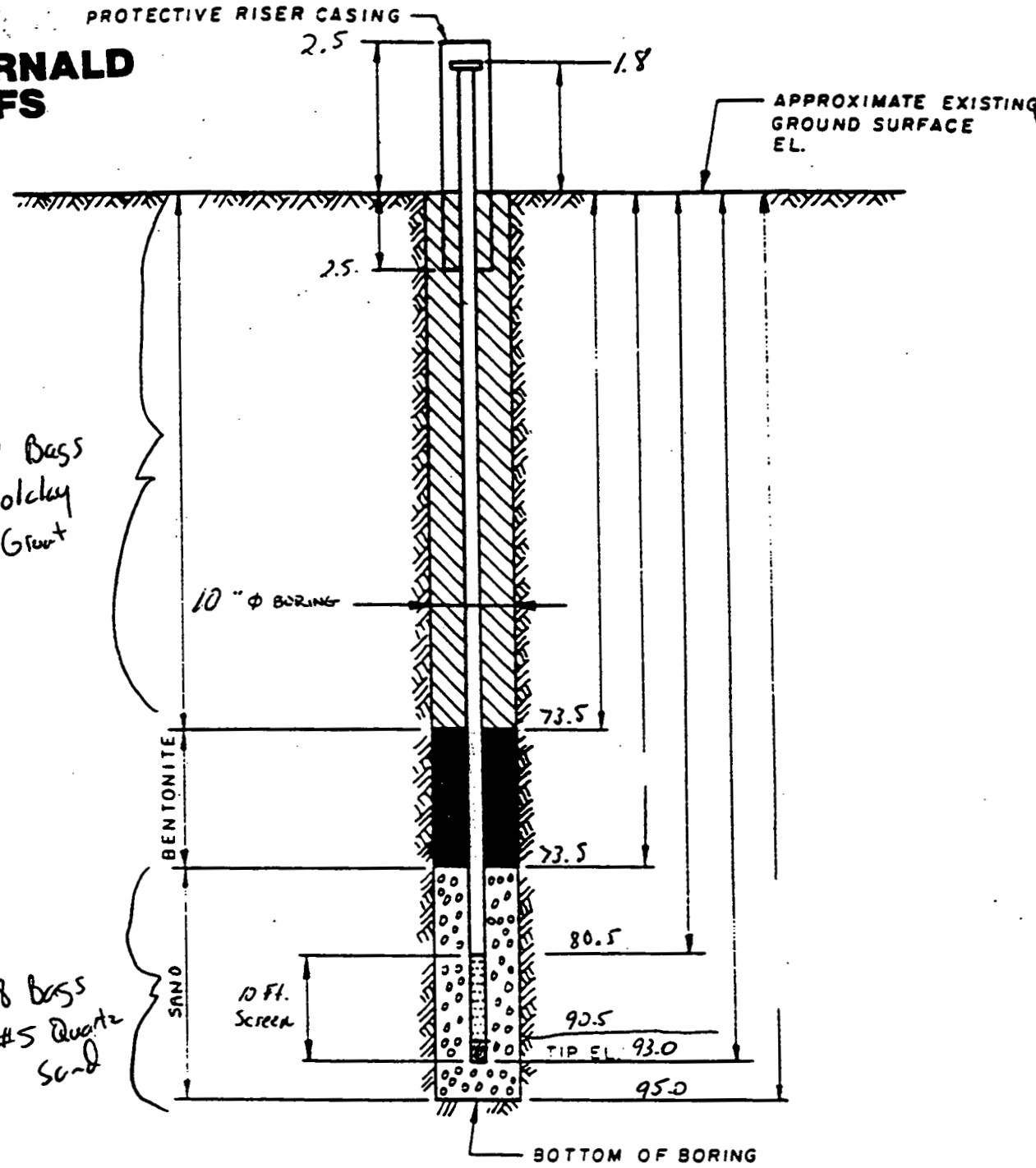
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

000933

409-11-86

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

All measurements in Feet

INSTALLATION DETAILS
MONITORING WELL ~~321~~ 3091 CAB 3/23/94

PREPARED FOR

000934

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 2 27/5/91 QC Dot

5709

	Initial	Date
1st Key In	JPC	9/1/92
2nd Key In	[illegible]	9/12
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~491~~ 4091 MLS 10-31-83	COORDINATES N477843.69 E1384459.52 MLS 10-31-83	DATE: 5/7/88
ELEVATION: 533.4 FT. MLS 10-31-83	GWL: Depth — Date/Time —	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: Goldberg/Sullivan	Depth — Date/Time —	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 1 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	5/7 10000 1530	4 6 6	18	med. stiff, dark yellowish brown silt (10YR 4/4), trace sand, dry.	ml	<1	HNU=0 ppm γB=90 cpm α=0 cpm
2 3	5/7 10001 1535	1 2 3	12	med. stiff, dark yellowish brown (10YR 4/4) silt, trace sand, dry.	ml	<1	HNU=0 ppm γB=80 cpm α=0 cpm
4	5/7 10002 1540	3 4 5	18	med. stiff, dark yellowish brown (10YR 4/4) silt, trace sand, dry. 4.5	ml	<1	HNU=0 ppm γB=80 cpm α=0 cpm 2 inch lens of fine sand (10YR 4/4).
5 6	5/7 10003 1545	4 4 4	18	med. stiff, yellow brown (10YR 5/4) silty sand, moist.	sm	NA	HNU=0 ppm γB=80 cpm α=0 cpm
7	5/7 10004 1550	4 6 7	18	med. stiff, yellowish brown silty sand, (10YR 5/4), moist. 7.0		<1	HNU=0 ppm γB=80 cpm α=0 cpm
8 9 10				med. stiff, yellowish brown sand (10YR 5/6), moist. 10.0	sw		
11 12 13 14	5/8 10005 1000	31 28 29	18	very dense, yellowish brown (10YR 5/4) very coarse gravel, dry.	gw	NA	HNU=0 ppm γB=60 cpm α=0 cpm Rock fragments from cobbles.

NOTES: Drilling Contractor: Pennsylvania Drilling
Driller: Joe Barille
Helpers: Pete Martin

000935

- Colors follow Munsell color charts.
- Blows on split spoon follow ASTM standards.

Total Water Used for Drilling: 400 gallons

402-11-8

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 2 [illegible] 5/13/89

	Initial	Date
1st Key In	DPF	7/14/89
2nd Key In	[illegible]	8/2
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03-02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 49/4091 MLS 10-03-88	COORDINATES: N 477843.69 E 1384459.58 MLS 10-07-88	DATE: 5/8/88
ELEVATION: 533.4 FT MLS 10-07-88	GWL: Depth — Date/Time —	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth — Date/Time —	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 2 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	5/8 10006 1440	4 26 30	14	very dense, yellow-brown (10YR 5/4) coarse gravel, some pebbles, broken cobbles, trace sand, wet.	gw	NA	HNU = 0ppm γB = 60cpm α = 0cpm
17							Large cobbles jammed the hammer in the casing.
18							
19				19.0			
20	5/8 10007 1525	12 15 18	8	dense brown (10YR 4/2) fine gravel, some sand, trace silt, trace pebbles, wet.	gp	NA	HNU = 0ppm γB = 80cpm α = 0cpm
21							
22							
23							
24							
25	5/8 10008 1650	15 25 35	10	very dense, orange-brown (7.5YR 5/8) med. to coarse gravel, some coarse sand, trace pebbles, wet. (Sample appears very oxidized and "rusty" looking).	gp	NA	HNU = 6ppm abv. bkg. γB = 60cpm α = 0cpm
26							
27							HNU is functioning properly - "oxidized" sample causing readings on 11.7 probe (?) No VOA jars available to put sample in.
28							
29				29.0			

NOTES:

000936

402-11-86

FERNALD RI/FS

REVIEWED BY QA DATE AUG 2 1 QC 2/5/89

58709

	Initial	Date
1st Key In		
2nd Key In		
Rev Key In		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4091 ACRI MLS 10-07-93	COORDINATES: N 477843.69 E 1324459.58 MLS 10-01-93	DATE: 5/9/88
ELEVATION: 533.4 FT. MLS 10-01-93	GWL: Depth 17.1 Date/Time 5/9/88 - 0720	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth – Date/Time –	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 3 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	5/9 10009 1005	13 33 30	14	very dense, brown (10YR 4/3) fine gravel and coarse sand, some pebbles, some med. sand, trace silt, wet.	gm	NA	HNU=0 ppm γB=60 cpm α=0 cpm
32							Tried to drill out below casing but borehole caved, drove 10 ft. casing to 40 ft.
33							
34							
35	5/9 10010 1115	13 24 25	14	dense, brown (10YR 4/3) fine gravel and coarse sand, some med. sand, trace pebbles, trace silt, wet.	gm	NA	HNU=0 ppm γB=40 cpm α=0 cpm
36							
37							
38							
39							
40	5/9 10011 1150	5 7 13	11	med. dense, brown (10YR 4/3) fine gravel and med. to coarse sand, trace silt, wet.	gm	NA	HNU=0 ppm γB=60 cpm α=0 cpm
41							
42							
43							
44							

NOTES:

000937

402-11-66

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 2 7 1991 DA# 2/5/89

	Initial	Date
1st Key In	[illegible]	7/11/90
2nd Key In	[illegible]	9/12
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 49 4-91 MCS 10-03-92	COORDINATES: N 477843.69 E 1384459.52 MCS 10-03-92	DATE: 5/9/88
ELEVATION: 533.4 FT MCS 10-03-92	GWL: Depth – Date/Time –	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth – Date/Time –	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 4 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	5/9 10012 1345	25 30 50	16	very dense, brown (10YR 4/2) med. sand and fine gravel, trace pebbles and silt, wet.	gm	NA	HNU = 0ppm γB = 60cpm α = 0cpm
47							
48							
49							
50	5/9 10013 1425	9 12 20	9	dense, brown (10YR 4/2) med. to coarse sand and fine gravel, trace pebbles and silt, wet.	gm	NA	HNU = (11.7 probe) 1 ppm above background, γB = 60cpm α = 0cpm
51							
52							after sample was put in jar 2-3ppm above background from headspace. (0ppm 10.2 probe).
53							
54							
55	5/9 10014 1525	13 20 33	12	very dense, brown-gray (10YR 3/1) coarse sand and fine gravel, trace pebbles, trace silt, wet.	gm	NA	HNU = (11.7 probe) 1ppm above background, γB = 60cpm α = 0cpm
56							
57							after sample was put in jar 2ppm above background from head space. (0ppm 10.2 probe).
58							
59							

NOTES:

000938

402-11-86

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE ~~AUG 2 7 1991~~ 2/5/89

	Initial	Date
1st Key In	[illegible]	[illegible]
2nd Key In	[illegible]	9/12
Hard Copy		
Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4991 4091	COORDINATES: N477843.69 E1384459.58	DATE: 5/9/88
ELEVATION: 533.4 FT	GWL: Depth 19.4 Date/Time 5/10/88-0715	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth — Date/Time —	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 5 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	5/9 10015 1625	8 10 15	5	med. dense, brown-gray (10YR 4/1) fine gravel and coarse sand, trace fine sand and silt, wet. (1 in. wood fragments in sample).	gm	NA	HNU = (11.7 probe) 1 ppm; JB = 60 cpm; α = NA above background, (10.2 probe) 0 ppm.
62							
63							
64				64.0			
65	5/10 10016 0745	23 35 40	14	very dense, brown-gray (10YR 3/2) gravelly sand, med. to coarse sand, fine gravel, trace pebbles, wet.	SW	NA	HNU = 0 ppm (11.7), 0 ppm (10.2); JB = 80 cpm; α = NA
66							
67							
68							
69				69.0			
70	5/10 10017 0820	6 10 11	13	med. dense, brown-gray (10YR 3/2) fine gravel and med. to coarse sand, trace fine sand and silt, wet.	gm	NA	HNU = 0 ppm (11.7), 0 ppm (10.2); JB = 40 cpm; α = NA
71							
72							
73							
74				74.0			

NOTES:

Large wood fragment from 60-61.5 ft. placed in VOA vial, headspace readings: 5 ppm (11.7), 0 ppm (10.2). HNU readings on 11.7 probe may be due to decaying organic material (?).

000939

402-11-86

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 2 7 1999 [illegible]/6/89

	Initial	Date
1st Key In	[illegible]	[illegible]
2nd Key In	[illegible]	[illegible]
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FEMPC RI/FS	
BORING NUMBER: 4091 4091 MKS 10-07-93	COORDINATES: N 477843.69 E 1324459.58 MKS 10-07-93	DATE: 5/10/88
ELEVATION: 533.4 FT MKS 10-01-93	GWL: Depth Date/Time	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 6 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	5/10 10018 0940	13 23 40	18	very dense, gray-brown (10YR 4/1) med. sand, trace silt and fine sand, trace fine gravel, wet.	Sm	NA	HNU = 1 ppm (11.7), 0 ppm (10.2). γB = 60 cpm α = NA
77							Headspace after sample was put in jar: 2 ppm (11.7) 0 ppm (10.2).
78							
79				79.0			
80	5/10 10019 1010	4 19 29	13	dense, gray-brown (10YR 3/2) sandy gravel, fine to med. gravel, med. to coarse sand, wet. 81.3	gp	NA	HNU = 4 ppm (11.7), 0 ppm (10.2). γB = 60 cpm α = NA
81							
82				gray-brown (10YR 3/2) very fine sand, some silt, wet.	Sm		Headspace after sample was put in jar: 5 ppm (11.7) 0 ppm (10.2)
83				83.0			
84							
85	5/10 10020 1150	22 37 38	13	very dense, gray-brown (10YR 3/2) sandy gravel, med. to coarse sand, fine gravel, trace silt, wet.	gp	NA	HNU = 4 ppm (11.7), 0 ppm (10.2) γB = 40 cpm α = NA
86							
87							
88							
89				89.0			

NOTES:

(HNU readings noted are concentrations above background levels).

000940

402-11-88

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 27 1989

	Initial	Date
1st Key In	[illegible]	7/25/89
2nd Key In	[illegible]	9/12
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 4091 4091 MLS 10-07-88	COORDINATES: N 477843.69 E 1394451.58 MLS 10-07-88	DATE: 5/10/88
ELEVATION: 533.4 FT MLS 10-07-88	GWL: Depth Date/Time	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 7 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	5/10 10021 1340	7 10 11	5	med. dense, brown-gray (10YR 4/1) fine gravel and coarse sand, some large gravel, trace fine sand and silt, wet.	gm	NA	HNU=0 ppm (10.2) γB=80 cpm α=NA
92							
93							
94							
95	5/10 10022 1505	19 50/5"	11	very dense, brown-gray (10YR 4/1) fine to coarse gravel and coarse sand, trace fine sand and silt, trace pebbles, wet.	gm	NA	HNU=0 ppm (10.2) γB=60 cpm α=NA
96							
97							
98							
99							
100	5/10 10023 1620	65/5"	4	brown-gray (10YR 4/1) fine to coarse gravel and med. to coarse sand, some silt, some pebbles and broken cobble fragments, wet.	gm	NA	HNU=0 ppm (10.2) γB=60 cpm α=NA
101							
102							Cobble broken in split spoon mouth caused high blow count. Can not use blow counts for density.
103							
104							

NOTES:

000941

402-11-86

FERNALD RI/FS

REVIEWED BY QA _____ DATE AUG 2 7 1991 2/5/89

	Initial	Date
1st Key In	JPC	7/6/88
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 49 4091 MLS 10-31-88	COORDINATES: N 477843.69 E 1284459.58	DATE: 5/11/88
ELEVATION: 533.4 FT. MLS 10-31-88	GWL: Depth 20.0 Date/Time 5/11/88 0725	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 8 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	5/11 10024 0855	80/5"	2	brown-gray (10YR 4/1) fine gravel and coarse sand, trace silt, wet. 107.0	gm	NA	HNU=0ppm (10.2) γB=40cpm α=NA
107							Broken cobble caught in spoon mouth caused high blow count - can not use blow counts for density.
108							
109							
110	5/11 10025 0940	6 12 18	10	med. dense, brown (10YR 3/3) fine to med. sand, uniform grain size, wet.	SW	NA	HNU=0 ppm (10.2) γB=60 α=NA
111							
112							
113				113.0			
114							
115	5/11 10026 1105	10 14 20	15	dense, gray-brown (10YR 3/2) very fine sand, some silt, uniform grain size, wet.	Sm	NA	HNU=0 ppm (10.2) γB=80 α=NA
116							
117							
118							
119							

NOTES:

000342

402-11-86

FERNALD RI/FS

REVIEWED BY QA DATE AUG 2 1989

5709

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 491	COORDINATES: N 477843.69 E 1394459.58	DATE: 5/11/88
ELEVATION: 533.4 FT	GWL: Depth Date/Time	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 9 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	5/11 10027 1140	7 13 16	9	med. dense, gray-brown (10YR 4/1) very fine to fine sand, some silt,	Sm	NA	HNU=0 ppm (10.2) γB=80cpm α=NA
122							
123				123.0			
124							
125	5/11 10028 1335	22 45 42	11	very dense, gray-brown (10YR 4/1) med. to coarse sand, some fine gravel, trace silt, wet.	SP	NA	HNU=0 ppm (10.2) γB=100cpm α=NA
126							
127							
128							
129				129.0			
130	5/11 10029 1430	37 22 17	10	dense, brown (10YR 3/3) gravelly sand, coarse gravel, med. to coarse sand, trace silt and trace pebbles, wet	SW	NA	HNU=0 ppm (10.2) γB=60 cpm α=NA
131							
132							Borehole staying open ahead of casing. Sample at 135-136.5 ft taken ahead of casing.
133							
134				134.0			

NOTES:

000943

402-11-86

FERNALD RI/FS

REVIEWED BY QA [signature] DATE AUG 2 [illegible] 1989

	Initial	Date
1st Key In	[illegible]	[illegible]
2nd Key In	[illegible]	[illegible]
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.02.01	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 491 4091 MLS 10-07-88	COORDINATES: N 477843.69 E 1384457.58	DATE: 5/11/88
ELEVATION: 533.4 FT MLS 10-07-88	GWL: Depth 15.1 Date/Time 5/12/88-0730	DATE STARTED: 5/7/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 10 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	5/11 10030 1510	42 45 50/4"	13	very dense, brown (10YR 4/1) med. sand and fine to coarse gravel, some silt and clay, wet. 0.5" lens of yellow-brown (10YR 5/4) clay at 135.5 ft. 137.5	gm	NA	HNU=0ppm (10.2) γB=80cpm α=NA
137							Fossiliferous limestone rock fragment caught in mouth of spoon.
138	5/12 0755	33 52/3"	NA	Attempted sample at 137.8 ft, drove spoon 0.8 ft. to 138.6 ft. - NO RECOVERY			
139	5/12 10031 0855	50/4"	1.5	gray-green (5Y 4/1) clay, trace angular limestone fragments, dry. 138.6	cl		Angular limestone fragments in cuttings.
140							HNU=0ppm (10.2) γB=80cpm α=NA
141				soft, gray-green (5Y4/1) friable, extremely weathered, shaly limestone, dry.	LS		Could only drive spoon 0.3 ft., sample at 138.5-138.8 ft.
142							
143							
144				Bedrock at 138.6 ft.			
145							
146				* Drilled out to 140 ft. so the casing would not get stuck in the bedrock.			
147							
148							
149							

NOTES: Drove casing from 130-138.5 ft. after collecting 135-136.5 ft. sample. Casing would not drive past 138.5 ft. - bedrock (?). Cleaned out casing to 137.8 ft., attempted sample at 137.8-138.6 ft, spoon would only drive 0.8 ft. No Recovery. Cleaned out casing to 138.5 ft., attempted sample at 138.5-138.8 ft., spoon would only drive 0.3 ft.

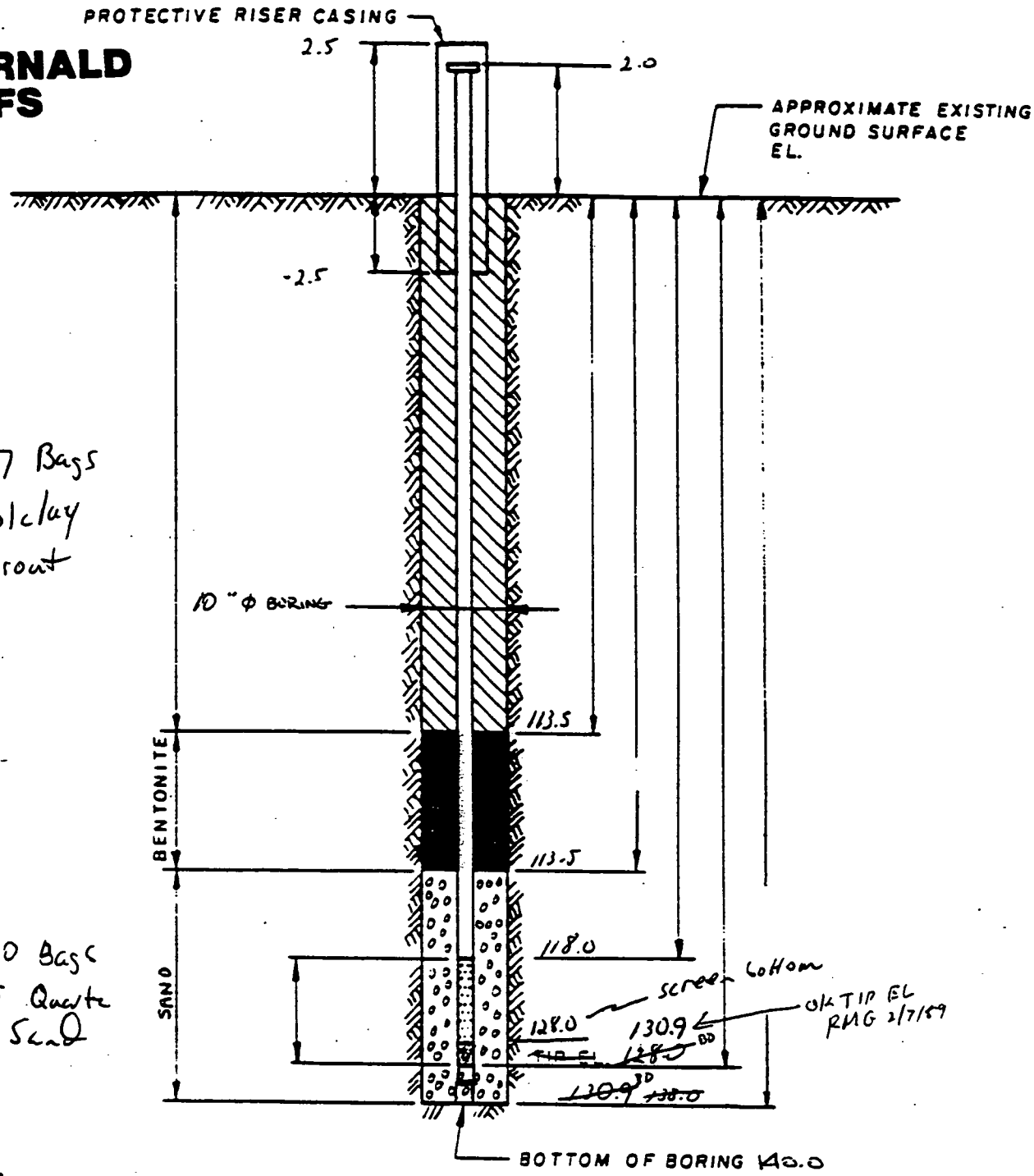
000944

402-11-86

REVIEWED BY QA DATE AUG 2 7 1991

5709

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DATE	5/19/88
DRAWN BY	

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.020 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

Measurements in Feet

Bentonite pellet surface seal

MLS 10-07-88

INSTALLATION DETAILS
MONITORING WELL 4091

PREPARED FOR MLS 10-07-88

000945

FERNALD RI/FS

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

REVIEWED BY QA _____ DATE AUG 27 1991

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. DAVIES DATE 5/19/88
PROJECT NO. 6013.2 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. 490 4091 MLS 10-03-88
PIEZOMETER NO. 490 4091 MLS 10-03-88 DATE OF INSTALLATION 5/17 through 5/18/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 TO 138 Ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Steel hammer
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 140 Ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 4 inch
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 inch
TOTAL PERFORATED AREA 10 Ft.

RISER PIPE MATERIAL Stainless steel
RISER PIPE DIAMETERS: MLS 10-03-88
O.D. 4 3/8 in MLS 10-03-88 I.D. 4.0 in
LENGTH OF PIPE SECTIONS 10 Feet
JOINING METHOD Screw wrench tight

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Feet
PROTECTIVE PIPE O.D. 10 inch

OTHER PROTECTION locking cover on protective casing vented cap on well

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION (Ft)	
TOP OF RISER PIPE	~~2.0~~ 2.0 Ft		535.4	
GROUND SURFACE	0.0		533.4	
BOTTOM OF PROTECTIVE PIPE	2.5 Ft		530.9	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 113.5	TOP 533.4	BOTTOM 419.9
BENTONITE	TOP NA MLS 10-03-88	BOTTOM NA MLS 10-03-88	TOP —	BOTTOM —
SAND	TOP 113.5	BOTTOM 135.5	TOP 419.9	BOTTOM 397.9
GRAVEL	TOP NA	BOTTOM NA MLS 10-03-88	TOP —	BOTTOM —
PERFORATED SECTION	TOP 118.0	BOTTOM 128.0	TOP 415.4	BOTTOM 405.4
PIEZOMETER TIP	130.9		402.5	
BOTTOM OF BOREHOLE	140.0 RWB 2/7/89		393.9	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

C00946

REMARKS Boring drilled to 140.0 ~~138~~ Ft MLS 10-03-88 caved to 135.5 Ft when 1st casing pulled back. Sand pack to 113.5 Ft, Volclay grout to surface, 2 Buckets bentonite pellets placed around protective casing both inside and outside

409-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 3/23/94 292 2092	COORDINATES:	DATE:	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/23/88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 5	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 NA	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See Boring 3092			
2				For			
3				Soil Lithology			
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

NOTES:

I) Drilling contractor: Pennsylvania Drilling Co.
A) Driller: Harry Dykes Jr
B) Helper: Tim Harris

II) Background Measurements
A) HNU = 0 B) α = 0 C) γB = 60 cpm

III) Water used = 300 ga

000947

IV) Colors via Munsell Color chart

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: CA 3/23/94 ~~292~~ 2092	COORDINATES:		DATE:
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 05/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth	Date/Time	DATE COMPLETED: 05/23/88
DRILLING METHODS: Cable Tool			PAGE 2 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16				See Boring 392			
17				For			
18				Soil Lithology			
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

NOTES:

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 32	
BORING NUMBER: CS 3b/94 292 2092	COORDINATES:	DATE:
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/23/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31				See Boring 3092			
32				For			
33				Soil Lithology			
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 99 3/23/94 ~~292~~ 2092	COORDINATES:		DATE:
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 05/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth	Date/Time	DATE COMPLETED: 05/23/88
DRILLING METHODS: Cable Tool			PAGE 4 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46				See Boring 3092			
47				FOR			
48				Soil Lithology			
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							

NOTES:

000950

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: CB 5/23/88 ~~292~~ 2092	COORDINATES:	DATE:
ELEVATION:	GWL: Depth 65.72 Date/Time 05/23/88 1512	DATE STARTED: 05/20/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth 54.72 Date/Time 06/01/88 -1400	DATE COMPLETED: 05/23/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 5

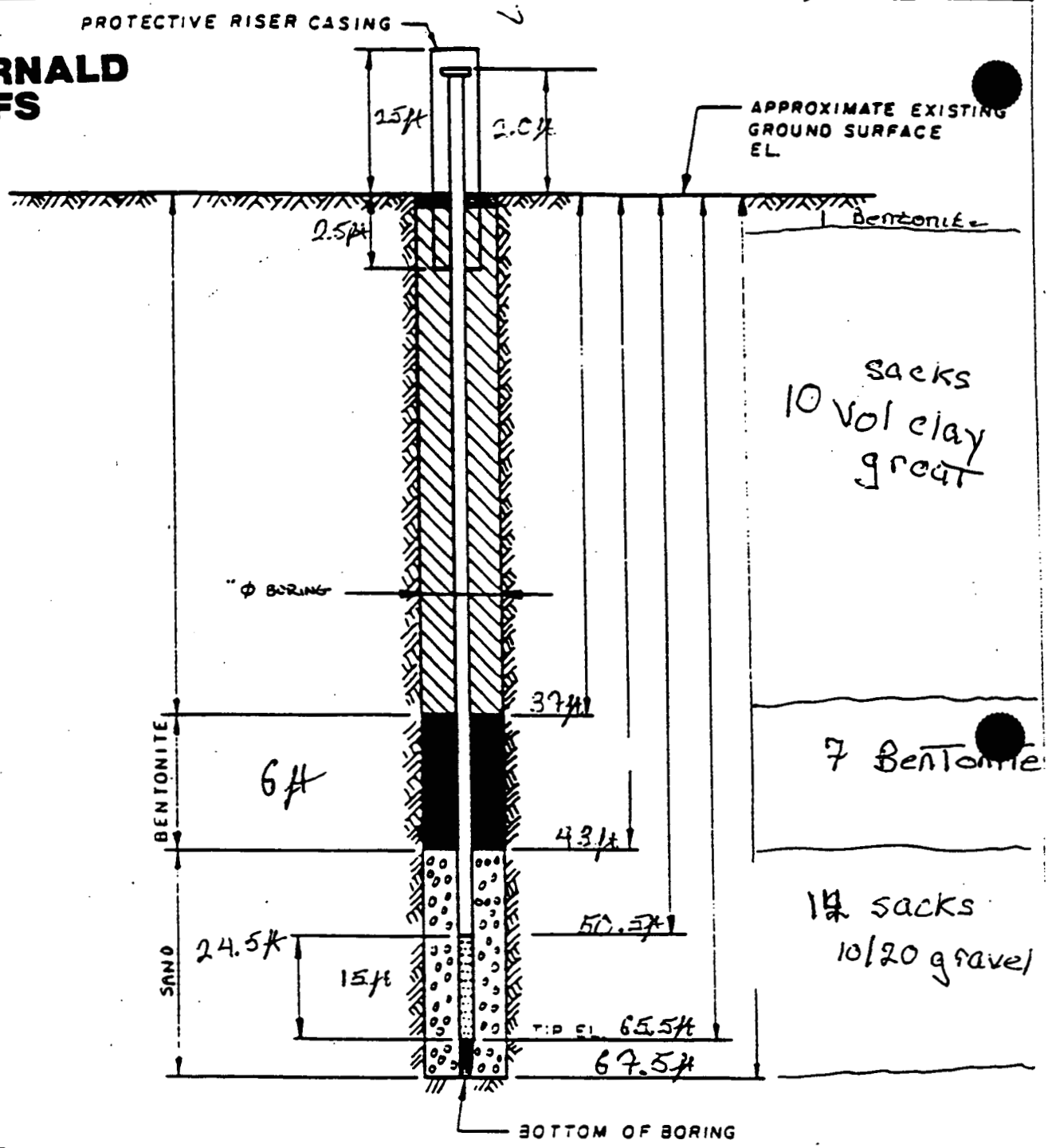
DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61				See Boring 392			
62				FOR			
63				Soil Lithology			
64							
65							
66							
67							
68							
69				Bottom of Boring			
70				68 ft			

NOTES:

000951

Monitoring Well #2092

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 2092

PREPARED FOR

FMPC RI/F

000952

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M. Goldberg DATE 06/02/88
PROJECT NO. 607 TC3C2 CHECKED BY _____ DATE _____
BORING NO. CB ~~297~~ 2092
PIEZOMETER NO. 3/23/94 ~~297~~ 2092 DATE OF INSTALLATION 06/01-02/88

BOREHOLE DRILLING

DRILLING METHOD CABLE Tool	TYPE OF BIT FLATHEAD
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 6 ft TO 70 ft	SIZE 10" FROM 0 TO 70 ft
FLUID N/A FROM N/A TO N/A	SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" inches I.D. 4" inch
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 Feet
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD Thread and couple
TOTAL PERFORATED AREA 15 Feet	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 feet	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE O.D. 10" inches	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0 ft	BOTTOM 37 ft	TOP	BOTTOM
BENTONITE	TOP 37 ft	BOTTOM 43 ft	TOP	BOTTOM
SAND	TOP N/A	BOTTOM ~~N/A~~	TOP	BOTTOM
GRAVEL	TOP 43 ft	BOTTOM 68 Ft	TOP	BOTTOM
PERFORATED SECTION	TOP 50.5 ft	BOTTOM 65.5 ft	TOP	BOTTOM
PIEZOMETER TIP	67.5 ft			
BOTTOM OF BOREHOLE	70 ft			
GWL AFTER INSTALLATION	56.70 ft			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS _____

000953

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: CB 3092	COORDINATES:	DATE: 5-10-88	
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED: 05/10/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth / Date/Time	DATE COMPLETED: 05/18/88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 9	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft	RECOVERY (inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1 10 0 20 8	24 5	14	Medium STIFF Dark Brown silt (10YR 3/3) DRY 1.5ft	ML	<1	Hnu = 6ppm / 11.7 probe α = 0 γB = 60 1250
2	1 10 0 7 1	5 7 6	14"	Very STIFF Dark Yellowish Brown silty clay (10YR 4/6) DRY	ML	2.0	Hnu = 6ppm / 11.7 probe α = 0 γB = 60 1257
3							
4	1 10 0 7 2	5 5 7	16"	Medium STIFF Dark Yellowish Brown silty clay (10YR 4/6) DRY 4.5ft	ML	<1	Hnu = 6 / 11.7 probe α = 0 γB = 60 1300
5	1 10 0 7 3	10 11 13	18	Dense light yellowish Brown sand (10YR 6/4) DRY. Trace gravel	SW	<1	Hnu = 7 / 11.7 probe α = 0 γB = 60 13
6							
7	1 10 0 7 4	13 15 18	16"	Dense light yellowish Brown sand (10YR 6/4) Dry trace gravel	SW	<1	Hnu = 7 / 11.7 probe α = 0 γB = 60 1305
8	1 10 0 7 5	10 20 19	16"	Dense light yellowish Brown sand (10YR 6/4) Dry. trace gravel	SW	<1	Hnu = 6 / 11.7 probe α = 0 γB = 60 1307
9							
10							
11							
12							
13							
14							
15							

NOTES:

I) Drilling Contractor: Pennsylvania Drilling Co.
A) Driller: Harry Dykes Jr.
B) Helper: Tim Harris

II) Background Measurements.
A) HNU = 0 B) α = 0 C) γB = 60

III) Water used = 1000 gallons

IV Colors via Muncell Color Chart

000954

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: CR 3/23/94 ~~392~~ 3092	COORDINATES:	DATE: 5-11-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/10/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/18/88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 9	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	1 0 0 7 6	24 35 30	14"	Very Dense Light Yellowish Brown sand (10YR6/4) DRY Gravel	SW	<1	Hna = 5ppm / 11.9 probe α = 0 γB = 50cpm 1715
17				17.5 ft fow			05/11/88
18							
19				GRAVEL			11.7 probe w/HNU.
20				19.5 ft fow			
21	1 0 0 7 7	23 20 24	16"	Dense Light Yellowish Brown Sand (10YR 6/4) DRY. Gravel	SW	<1	Hna = 3ppm α = 0 γB = 50 0830
22							
23							
24							
25							
26	1 0 0 7 8	14 38 50	18"	Very Dense Light Yellowish Brown sandy gravel (10YR 6/4) DRY	GW		Hna = 2ppm α = 0 γB = 50 0935
27							
28							
29							
30							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: CG 3/23/94 ~~398~~ 3092	COORDINATES:	DATE: 5-11-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/10/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/12/88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 9	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	100 79	35 50/4	10"	Very Dense Yellowish Brown sandy Gravel (10YR 5/6) moist. very coarse.	GW	<1	Hnu = 3 ppm α = 0 βB = 40cpm 1100
32							
33							
34				33.5 ft			
35	100 80	12 40 50/3	10"	Very Dense yellowish Brown sand (10YR 5/6) Gravel. moist	SW	<1	Hnu = 3 ppm α = 0 βB = 40cpm 1350
36							
37							
38							
39				39.0 ft			
40	100 81	50/3	4"	Very Dense Yellowish Brown sandy Gravel (10YR 5/6) moist very coarse	GW	<1	Hnu = 1 ppm 10.2 probe α = 0 βB = 40 1455
41							
42							
43							
44							
45							

NOTES:

000356

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2	
BORING NUMBER: 03/3/91 ~~3092~~ 3092	COORDINATES:	DATE: 5-12-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/10/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/18/88
DRILLING METHODS: Cable Tool		PAGE 4 OF 9

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							05/11/88
46	1008 2	62 50/4	8"	Very Dense grayish Brown gravel (10YR 5/2) wet. very coarse. (Sample wet Due to coarse gravel and lack of Penetration) 48.5 ft	GW	<1	Hna = 0 α = 0 δB = 40 10.2 probe Iron staining orange 1655
47							05/12/88
48							
49							
50							
51	1008 3	120/5	6"	Very Dense yellowish Brown sand (10YR 5/4) moist. very coarse 54.0 ft	SW	<1	Hna = 0 α = 0 δB = 40 10.2 probe no penetration 0905
52							
53							
54							
55							
56	1008 4	150/4	4"	Very Dense grayish Brown gravel (10YR 5/2) wet. Rock Fragments	GW	<1	Hna = 0 α = 0 δB = 30 cpm 1010
57							
58							
59							
60							

NOTES:

000957

402-11-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2	
BORING NUMBER: CB 3/23/94 3902-3092	COORDINATES:	DATE: 5-12-88
ELEVATION:	GWL: Depth 45.05 Date/Time 05/17/88-0800	DATE STARTED: 05/10/88
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/18/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 9

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	100 85	50 50 30	14"	Very dense Yellowish Brown sand (10YR 5/4) w/ very coarse gravel. Rock Fragments. wet	SW	<1	Hna = 0 α = 0 δB = 40 1130 05/14/88
62							
63							
64							
65							
66	100 86	115 85 65	18"	Very dense yellowish Brown sand (10YR 5/4) w/ very coarse gravel. wet	SW	<1	Hna = 0 10.2 Prcae α = 0 δB = 60 0845
67							
68				~~68.0~~			
69							
70							
71	100 87	12 50 30	18"	Very dense yellowish Brown sand (10YR 5/4) wet trace gravel	SW	<1	Hna = 0 α = 0 δB = 50 1000
72							
73							
74							
75							

NOTES:

000958

402-11-86

FERNALD RI/FS

57^^

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 03/23/91 ~~392~~ 3092	COORDINATES:	DATE: 5-17-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/10/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/18/88	
DRILLING METHODS: Cable Tool		PAGE 6 OF 9	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/6 (ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	100 8 8	22 18 20	18"	Dark Dense Grayish Brown (10YR 4/2) sand wet.	SW	<1	Hnu = 0 10.2 ppm α = 0 δB = 40 cpm 1045
77							
78							
79							
80							
81	100 8 9	74 40 33	12"	~~Very Dense~~ 80.5 Very Dense yellowish Brown ~~sand~~ (10YR 5/4) gravely sand wet	GW	<1	Hnu = 0 α = 0 δB = 40 cpm 1130
82							
83							
84							
85							
86	100 9 0	40 125/5	14"	Very Dense yellowish Brown ~~San~~ gravely sand (10YR 5/4) wet	SW	<1	Hnu > 0 α = 0 δB = 40 cpm 1325
87							
88							
89							
90							

NOTES:

000959

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: CB 2/20/94 ~~392~~ 3092	COORDINATES:	DATE: 5-12-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/10/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/18/88	
DRILLING METHODS: Cable Tool		PAGE 7 OF 9	

DEPTH (FT) 90	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS 05/17/88
91	10 0 9 1	6 12 18	8"	Medium dense Yellowish Brown gravely sand (10YR5/4) wet.	SW	<1	Hnu=0 α=0 GB=40 Drove spoon twice w/ little Recovery 1415
92							
93							
94				94			
95							
96	10 0 9 2	16 24 33	16"	very dense grayish Brown sand (10YR5/2) gravely. wet	SW	<1	Hnu=0 α=0 GB=40 1545
97							
98							
99							
100							
101	10 0 9 3	6 10 12	16"	Medium Dense Dark gray gravel (10YR4/1) well sorted wet	GW	<1	Hnu=0 α=0 GB=40 1630
102							
103							
104							
105							

NOTES:

000980

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: CP 3/3364 ~~3092~~ 3092	COORDINATES:	DATE: 5-18-88	
ELEVATION:	GWL: Depth 68.34 Date/Time 05/17/88-1930	DATE STARTED: 05/10/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth 58.32 Date/Time 05/18/88-0745	DATE COMPLETED: 05/18/88	
DRILLING METHODS: Cable Tool		PAGE 8 OF 9	

DEPTH (ft) 105	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS 05/18/88
106	100 9 9	24 32 50	12"	Very dense Dark grayish Brown sand (2.5Y 4/2) wet	SW	<1	Hnu ~0 10.2 probe α = 0 γB = 50cpm 0850
107							
108							
109							
110	100 9 5	8 24 17	12"	~~Very~~ dense Dark grayish Brown sand (10YR 4/2) Trace gravel. ~~Dev~~ wet	SW	<1	Hnu = 0 α = 0 γB = 50cpm 0940
111							
112							
113							
114							
115	100 9 6	10 15 13	10"	Dense Dark grayish Brown gravely sand (10YR 4/2). wet	SW	<1	Hnu = 0 α = 0 γB = 40cpm 1055
116							
117							
118							
119							
120							

573
450
123-
10
138

NOTES:

000961

402-11-8

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T. 0302		
BORING NUMBER: ~~3092~~ 3092	COORDINATES:	DATE: 5-18-88	
ELEVATION:	GWL: Depth 54.2 Date/Time 05/19/88-0845	DATE STARTED: 05/10/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 05/18/88	
DRILLING METHODS: Cable Tool		PAGE 9 OF 9	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120							
121	1 0 0 9 7	16 20 14	12"	Dense Dark grayish Brown sandy gravely ~~sand~~ (10YR 4/2) wet Trace clay @ 121.5ft	GW GW	<1	Hnu = 0 α = 0 δB = 60cpm 1200
122							
123							
124							
125	1 0 0 9 8	15 25 29	14"	Very Dense grayish Brown gravely sand (10YR4/2) wet. No clay	SW	<1	Hnu = 0 α = 0 δB = 50cpm 1410
126							
127							
128							
129							
130	1 0 0 9 9	10 13 20	4"	Dense gray sand (10YR5/1) wet	SW	<1	Hnu = 0 α = 0 very Fine δB = 40 1545
131							
132							
133				Bottom of Boring 133 ft			

NOTES:

000952

402-11-8

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M. Goldberg DATE 05/19/88
PROJECT NO. 602 T 0302 CHECKED BY _____ DATE _____
BORING NO. CB ~~392~~ 3092
PIEZOMETER NO. 3/23/94 ~~N/A~~ 3092 DATE OF INSTALLATION 05/19/88 - 05/20

BOREHOLE DRILLING

DRILLING METHOD Water	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID _____ FROM 3 TO 133 ft	SIZE _____ FROM 0 TO 133 ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring well	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION _____	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4"
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 Ft
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD Thread and couple
TOTAL PERFORATED AREA 10 Ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE ~~O.D.~~ ID 10" inches	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 Ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 Ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0 ft	BOTTOM 106 ft	TOP	BOTTOM
~~BENTONITE~~	TOP N/A	BOTTOM N/A	TOP	BOTTOM
~~SAND~~	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP 106	BOTTOM 125	TOP	BOTTOM
PERFORATED SECTION	TOP 113	BOTTOM 123	TOP	BOTTOM
PIEZOMETER TIP	125 Ft			
BOTTOM OF BOREHOLE	133 Ft			
GWL AFTER INSTALLATION				

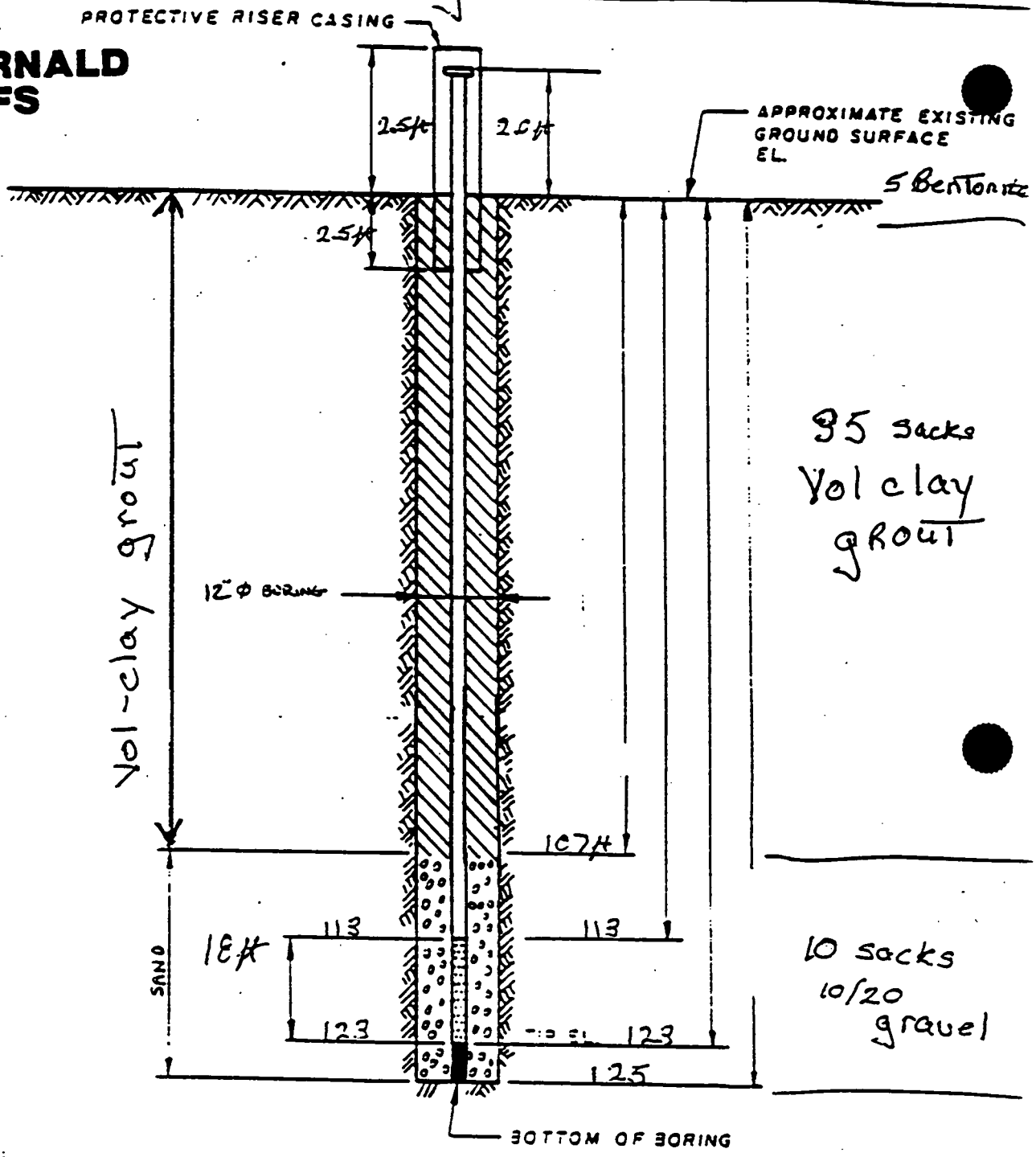
000963

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Boring was overdrilled 10 Ft in search of Blue clay @ 113 ft 450 Ft elevation. Drilled to 133 Ft 440 Ft with no Blue cla
casing was pulled back 10 Ft to 125 Ft and well was set.

409-11-

Monitoring Well #3092

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 3092

PREPARED FOR

FMPC RI/FS

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

000964

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6021.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~295~~ 2093	COORDINATES:	DATE: 06-16-88
ELEVATION: CB 3/23/94 595.0	GWL: Depth Date/Time	DATE STARTED: 06-08-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-16-88
DRILLING METHODS: CASE TOOL		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* DETAILED SAMPLE DESCRIPTION IS AVAILABLE FROM LOG FOR BORING #3093 ~~2993~~ CB 3/23/94			
20							
40							
60							
80				BOTTOM OF BORING @ 81.0 FT.			
				MATERIALS USED IN WELL INSTALLATION: VOLCLAY GROUT: 11 BAGS; 10-20 SAND (100LB SACKS): 13 SACKS; BENTONITE PELLETS: 7 BUCKETS			

000965

NOTES: CONTRACTOR: PENN DRILL
RIG: BUCYRUS-ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: BOB JOHNSON

BACKGROUND LEVELS: H_{MW} = 0PPM; α = 0.5 CPM; β = 5-10 CPM

$LELO_2$: 0 PPM LEL; 20.6% O_2

* SEE LOG FOR BORING #393 FOR DETAILED DESCRIPTION OF SAMPLES

DEPTH TO WATER TABLE IN BORING 393: 67.0' @ 0830, 06-08-88

WATER ADDED TO HOLE: 600 GALLONS

ERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. H. SLUSARSKI DATE 06-16-88
PROJECT NO. 602 3.2 CHECKED BY _____ DATE _____
BORING NO. ~~293~~ 2093
PIEZOMETER NO. ~~293~~ 2093 DATE OF INSTALLATION 06-15-88 / 06-16-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 81.0 FT	SIZE 10" ID FROM 0.0 FT. TO 80.0 FT
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN I.D. 4.0 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 5', 10', 17.5'
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 15.0 FT.	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.2 FT			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT.			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0	BOTTOM 53.0	TOP	BOTTOM
BENTONITE	TOP 53.0	BOTTOM 57.8	TOP	BOTTOM
SAND (10-20)	TOP 57.8	BOTTOM 80.3	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 62.8	BOTTOM 77.8	TOP	BOTTOM
PIEZOMETER TIP	80.3			
BOTTOM OF BOREHOLE	000966 81.0			
GWL AFTER INSTALLATION				

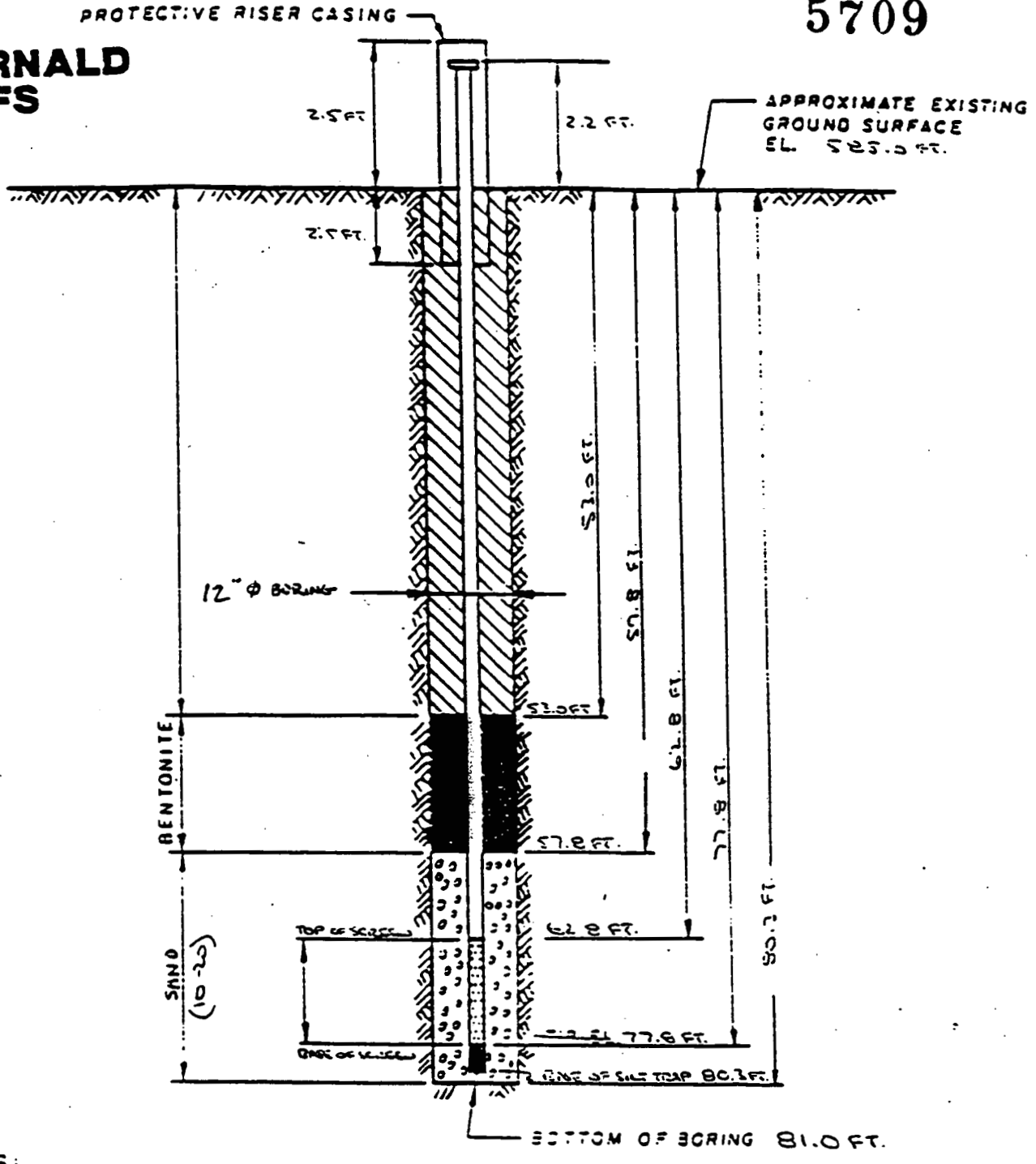
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE FROM 80.3 FT TO 81.0 FT WAS ALLOWED TO COLLAPSE ON ITSELF. ONE BUCKET OF BENTONITE PELLETS WAS POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE. SEE LOG FOR DETAILS. #293 CAN BE TRACED BEFORE AT A DEPTH OF 81.0 FT

Boring # 2093

5709

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED: 10-20 SAND: 13 (100 LB SACKS)
VOLCLAY GROUT: 11 BAGS
BENTONITE PELLETS: 7 BUCKETS

INSTALLATION DETAILS
MONITORING WELL 2093

PREPARED FOR
Boring # ~~2093~~ 2093 06-16-88 3/22/94

000967

DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	HLS

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~397~~ 3093	COORDINATES:	DATE: 06-07-88
ELEVATION: 585.0 FT.	GWL: Depth Date/Time	DATE STARTED: 05-24-88
ENGINEER/GEOLOGIST: M SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-07-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10105 1502 05-24	3 6 6	14	VERY SOFT, YELLOW-BROWN (10YR 6/3) SILTY CLAY, WITH ROOTLETS, DRY	CL	<.25	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
2 3	10106 1510 05-24	4 8 8	10	VERY STIFF, YELLOW-BROWN (10YR 4/4) SILTY CLAY, DRY	CL	3.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
4	10107 1514 05-24	6 12 16	14	VERY STIFF, YELLOW-BROWN (10YR 5/3) CLAY, SOME SILT, DRY	CL	3.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
5 6	10108 1524 05-24	20 18 15	18	VERY STIFF, YELLOW-BROWN (10YR 5/3) CLAY, SOME SILT, DRY	CL	3.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
7	10109 1528 05-24	13 18 18	18	VERY SOFT, YELLOW-BROWN (10YR 5/4) CLAY, SOME SILT, DAMP	CL	<.25	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
8 9	10110 0755 05-25	4 8 18	14	VERY STIFF, YELLOW-BROWN (10YR 5/4) CLAY, SOME SILT, SOME FINE GRAVEL DAMP	CL	3.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
10	10111 0814 05-25	7 12 20	12	VERY STIFF, YELLOW-BROWN (10YR 5/4) CLAY, SOME SILT, SOME FINE GRAVEL, TRACE MEDIUM GRAVEL (.25" TO .50") DAMP	CL	3.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
11 12	10112 0832 05-25	7 15 21	12	VERY STIFF, YELLOW-BROWN (10YR 5/4) CLAY, SOME SILT, SOME FINE GRAVEL, TRACE MEDIUM GRAVEL (.25" TO .50") DAMP 12.5	CL	3.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
13	10113 0955 05-25	6 17 17	14	VERY STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, TRACE MEDIUM GRAVEL (~.5"), DAMP	CL	3.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
14	10114 0922 05-25	7 11 15	4	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP	CL	1.5	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM

NOTES: CONTRACTOR: PENNDRILL
RIG: BUCYRUS-ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: BOB JOHNSON

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
LELO2 = 0 PPM LEL 20.6% O2

WATER ADDED TO HOLE: 1200 GALLONS

000968

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~3093~~ 3093	COORDINATES:	DATE: 06-07-89
ELEVATION: 585.0 FT	GWL: Depth Date/Time	DATE STARTED: 05-24-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-07-89
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10115 0935 05-25	6 11 15	16	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP	CL	2.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
17–18	10116 0950 05-25	6 9 11	6	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP	CL	2.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
19	10117 1109 05-25	6 15 15	14	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP	CL	2.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
20–21	10118 1130 05-25	9 9 18	14	STIFF GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP 21.5	CL	2.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
22	10119 1324 05-25	5 25 23	14	STIFF GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, SOME MEDIUM GRAVEL (.25" TO .75") DRY 22.0	CL	2.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
23–24	10120 1340 05-25	6 16 13	8	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, TRACE SAND TRACE COARSE GRAVEL (~1.0") DAMP	CL	2.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
25	10121 1355 05-25	2 4 6	8	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP	CL	2.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
26–27	10122 1411 05-25	9 11 13	14	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP	CL	1.5	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
28	10123 1430 05-25	6 7 9	12	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP	CL	1.5	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
29	10124 1445 05-25	5 7 9	12	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP	CL	1.5	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~3923~~ 3093	COORDINATES:		DATE: 06-07-93
ELEVATION: 585.0'	GWL: Depth	Date/Time	DATE STARTED: 05-24-93
ENGINEER/GEOLOGIST: M. SLUJANSKI	Depth	Date/Time	DATE COMPLETED: 06-07-93
DRILLING METHODS: CABLE TOOL			PAGE 3 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	10125 1539 05-25	4 8 10	12	STIFF, GREY (5Y 4/1) CLAY, SOME SILT, SOME FINE GRAVEL, DAMP 32.0	CL	2.0	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
32	10126 1600 05-25	3 7 13	14	HARD, BROWN (10YR 4/3) CLAY, SOME FINE GRAVEL, SOME SAND, DRY - BASE OF TILL - 32.8 FT 32.8	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 5-10 CPM
33 34 35				MEDIUM DENSE, YELLOW-BROWN (10YR 5/6) FINE TO MEDIUM SAND, SOME SILT, TRACE FINE GRAVEL, INTERBEDDED WITH YELLOW-BROWN (10YR 5/6) SILTY CLAY	SM/SW	N/A	
36	10127 1655 05-25	21 25 22	14	DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED, GRAVELLY SAND, DRY	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
37 38 39							
40 41	10128 0805 05-26	35 >50	12	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, DRY	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
42 43 44							

NOTES:

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI / FS	
BORING NUMBER: ~~3093~~ 3093	COORDINATES:	DATE: 06-07-88
ELEVATION: 525.0'	GWL: Depth Date/Time	DATE STARTED: 05-24-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-07-88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 11

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10129 0925 05-26	16 60 50	12	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, DRY	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
47							
48							
49							
50	10130 0958 05-26	18 21 26	12	VERY DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, DRY	SP	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
51							
52							
53							
54							
55	10131 1055 05-26	>50/4"	4	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, DRY	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
56							
57							
58							
59							

NOTES:

000971

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~397~~ 3093	COORDINATES:		DATE: 06-07-98
ELEVATION: 595.0'	GWL: Depth	Date/Time	DATE STARTED: 05-24-98
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth	Date/Time	DATE COMPLETED: 06-07-98
DRILLING METHODS: CABLE TOOL			PAGE 5 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10132 0912 06-01	15 21 23	12	DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, DRY	SP	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
62							
63							
64							
65							
66	10133 0940 06-01	45 50 —	14	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, DRY	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
67							
68							
69							
70							
71	10134 1135 06-01	8 25 25	14	VERY DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED GRAVELLY SAND, TRACE COARSE GRAVEL (1.0"-1.5") WET	SP	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
72							
73							
74							

NOTES:

000972

FERNALD RI/FS

5700

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~3073~~ 3093	COORDINATES:	DATE: 06-07-88
ELEVATION: 585.0	GWL: Depth Date/Time	DATE STARTED: 05-24-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-07-88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 11

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10135 1335 06-01	22 46 50	14	VERY DENSE, YELLOW-BROWN (10YR 5/3) POORLY GRADED GRAVELLY SAND, TRACE COARSE GRAVEL (1.5"-1.5") WET	SP	N/A	HNU = 0 PPM α = 0.5 CPM γ = 5-10CPM
77							
78							
79							
80							
81	10136 1448 06-01	5 5 6	12	MEDIUM DENSE, YELLOW-BROWN (10YR 5/3) POORLY GRADED GRAVELLY FINE SAND, WET	SP	N/A	HNU = 0 PPM α = 0.5 CPM γ = 5-10CPM
82							
83							
84							
85	10137 1552 06-01	8 19 28	14	DENSE, YELLOW-BROWN (10YR 4/3) WELL GRADED GRAVEL, SOME SAND WET	GW	N/A	HNU = 0 PPM α = 0.5 CPM γ = 5-10CPM
86							
87							
88							
89							

NOTES:

000973

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 7.2	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: ~~3095~~ 3093	COORDINATES:		DATE: 06-07-88
ELEVATION: 525.0'	GWL: Depth	Date/Time	DATE STARTED: 05-24-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth	Date/Time	DATE COMPLETED: 06-07-88
DRILLING METHODS: CARLE TOOL			PAGE 7 OF 11

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10138 1642 06-01	2 3 5	1	VERY LOOSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
92							
93							
94							
95							
96	10139 0842 06-02	8 23 36	14	VERY DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
97							
98							
99							
100							
101	10140 0941 06-02	11 11 9	16	MEDIUM DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
102							
103							
104							

NOTES:

000974

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2B 3/21/94 ~~393~~ .3093	COORDINATES:	DATE: 06-07-88
ELEVATION: 585.0'	GWL: Depth Date/Time	DATE STARTED: 05-24-88
ENGINEER/GEOLOGIST: M. SWISMSKI	Depth Date/Time	DATE COMPLETED: 06-07-88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	10141 1148 06-02	11 18 23	14	DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM γ = 5-10 CPM α = 0-5 CPM
107							
108							
109							
110							
111	10142 1406 06-02	4 7 10	12	MEDIUM DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
112							
113							
114							
115							
116	10143 1625 06-02	15 25 39	14	VERY DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
117							
118							
119							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~3075~~ 3093	COORDINATES:	DATE: 06-07-88
ELEVATION: 525.0'	GWL: Depth Date/Time	DATE STARTED: 05-24-88
ENGINEER/GEOLOGIST: M. SWIARSKI	Depth Date/Time	DATE COMPLETED: 06-07-88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	10144 0835 06-03	10 9 12	14	MEDIUM DENSE, GREY-BROWN (10YR 5/2) WELL GRADED SAND, SOME FINE GRAVEL, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
122							
123							
124							
125	10145 1034 06-03	11 25 40	14	VERY DENSE, GREY-BROWN (10YR 5/2) WELL GRADED SAND, SOME FINE GRAVEL, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
126							
127							
128							
129							
130	10146 1115 06-03	16 19 15	12	MEDIUM DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
131							
132							
133							
134							

NOTES:

DEPTH TO WATERTABLE: 0742 06-03-88 : 67.3 FT

000976

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: GO2 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~3095~~ 3093	COORDINATES:	DATE: 06-07-88
ELEVATION: 585.0'	GWL: Depth Date/Time	DATE STARTED: 05-24-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-07-88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 11

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	10147 1405 06-03	28 32 50	18	VERY DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
137							
138							
139							
140	10148 1515 06-03	3 3 12	14	MEDIUM DENSE, GREY-BROWN (10YR 5/2) POORLY GRADED SAND, WET.	SP	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
141							
142							
143							
144							
145	10149 1655 06-03	4 40 25	14	VERY DENSE, GREY-BROWN (10YR 5/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 PPM α = 0-5 CPM γ = 5-10 CPM
146							
147							
148							
149							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~2993~~ 3093	COORDINATES:	DATE: 06-07-88
ELEVATION: 585.0'	GWL: Depth Date/Time	DATE STARTED: 05-24-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 06-07-88
DRILLING METHODS: CABLE TOOL		PAGE 11 OF 11

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	10150 1016 06-04	28 40 37	14	VERY DENSE, GREY-BROWN (10YR 5/2) WELL GRADED GRAVELLY SAND, TRACE COARSE GRAVEL (1.0"-1.5"), WET	SW	N/A	HNU = 0 PPM α : 0-5 CPM γ : 5-10 CPM
152 153 154 155				DEPTH OF BOREHOLE: 155.0 FT			
156	10151 1220 06-04	>50/6	6	VERY DENSE, GREY-BROWN (10YR 5/2) CLAYEY GRAVEL, SOME SAND, SOME COARSE GRAVEL (1.0"-1.5"), WET.	GC	N/A	HNU = 0 PPM α : 0-5 CPM γ : 5-10 CPM
157				*WELL WAS BORED OUT TO 155.0 FT. WELL WAS SAMPLED TO 156.5 FT WITH SPLIT SPOON			

C00578

NOTES:

DEPTH TO WATER TABLE: 0812 06-04-88 : 67.1 FT.

DEPTH TO WATER TABLE: 0730 06-05-88 : 67.6 FT.

MATERIALS USED IN WELL COMPLETION: 10-20 SAND (100LB SACKS): 10 SACKS BENTONITE PELLETS: 2 PAILS

VOLCLAY GROUT: 06-05-88: 10 BAGS
06-06-88: 21 BAGS
06-07-88: 5 BAGS
} 36 TOTAL

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. H. SLUSARSKI DATE 06-07-88
PROJECT NO. 602 32 CHECKED BY _____ DATE _____
BORING NO. ~~3993~~ 3093
PIEZOMETER NO. ~~3993~~ 3093 DATE OF INSTALLATION 06-07-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 155.0 FT	SIZE 10" ID FROM 0.0 FT TO 155.0 FT
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN I.D. 4 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 2' 5' & 10'
AVERAGE SIZE OF PERFORATIONS 0.010 IN.	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 10.0 FT.	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0	BOTTOM 126.0	TOP	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND (10-20)	TOP 126.0	BOTTOM 145.0	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 133.0	BOTTOM 143.0	TOP	BOTTOM
PIEZOMETER TIP	145.0			
BOTTOM OF BOREHOLE	155.0			
GWL AFTER INSTALLATION	67.0 FT @ 0830 06-08-88			

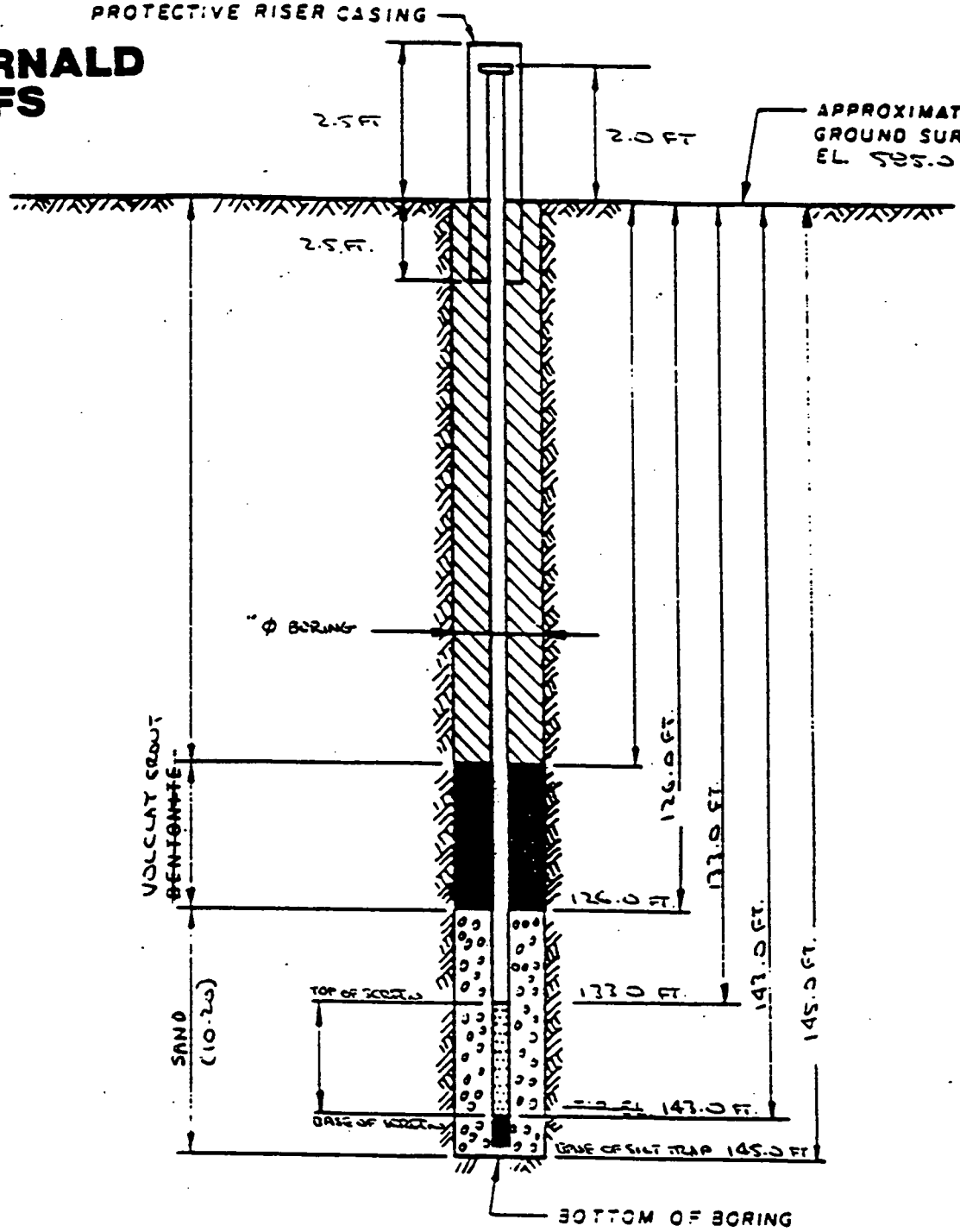
000979

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE SECTION OF BOREHOLE BELOW 145.0 WAS ALLOWED TO COLLAPSE ON ITSELF. TWO BUCKET OF BENTONITE PELLETS WERE POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIALS AT THE SURFACE. WELL WAS DRILLED TO 155.0 FT AND SAMPLED TO 156.5 WITH SPLIT SPOON

CB 3/24/94
BORING # ~~377~~ 3093

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 67.0 FT.
5. WATER LEVEL READING ON 0830 06-08-88

MATERIALS USED: 10-20 SAND: 10 (100LB SACKS)
VOLCLAY GROUT: 36 BAGS
BENTONITE PELLETS: 2 BUCKETS (USED AS PACKING AND SEALING MATERIAL AROUND PROTECTIVE CASING)
WATER ADDED TO HOLE DURING DRILLING: 1200 GALLONS

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
BORING # ~~377~~ CB 3/24/94 3093 06-07-88

DRAWING NUMBER
CHECKED BY
APPROVED BY
DRAWN BY
MLS.

000980

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~294~~ 2094	COORDINATES:	DATE: 6/17/88
ELEVATION: CB 3/24/94	GWL: Depth Date/Time	DATE STARTED: 6/17/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 6/ /88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	~~NA~~ BD	NA		For full details of lithology see Boring log CB 3/24/94 ~~294~~ 3094.			
5.0							
10.0							
15.0	10170 10171	NA	14	Black stained Sand and Gravel	SP/GP		Sample not fully described due to rush in containing volatiles for analysis. t = 1645 Hm = 0ppm α = 1cpm d/β : 40cpm
20.0							
25.0							
30.0				End of Boring 30.0 Ft			

NOTES:

Driller : Joe Baile
Helper : John Vandine
Contractor : Pennsylvania Drilling
Rig : 72 Speedstar

H_2O used during drilling = 200 Gallons
Sample taken 16-18 Ft for volatile analysis
Sample of drilling fluid + Background water taken after 16 Ft.

000981

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. DAVIES DATE 6/20/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. 3/3/3/3/3 ~~294~~ 2094
PIEZOMETER NO. ~~294~~ 2094 DATE OF INSTALLATION 6/20/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT Steel
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID H_2O FROM 0 TO 30 Ft	SIZE 10" FROM 0 TO 30 Ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 1-10 Ft 1-2 Ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD Screw wand tight
TOTAL PERFORATED AREA 15 Ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft	OTHER PROTECTION locking lid and
PROTECTIVE PIPE O.D. 10 3/4 in	vented cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 Ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 Ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM NA	TOP	BOTTOM
BENTONITE	TOP 0.0	BOTTOM 4.9	TOP	BOTTOM
SAND	TOP 4.9	BOTTOM 36.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 10.5 Ft	BOTTOM 25.5 Ft	TOP	BOTTOM
PIEZOMETER TIP	27.5 Ft			
BOTTOM OF BOREHOLE	30.0 Ft			
GWL AFTER INSTALLATION	NA			

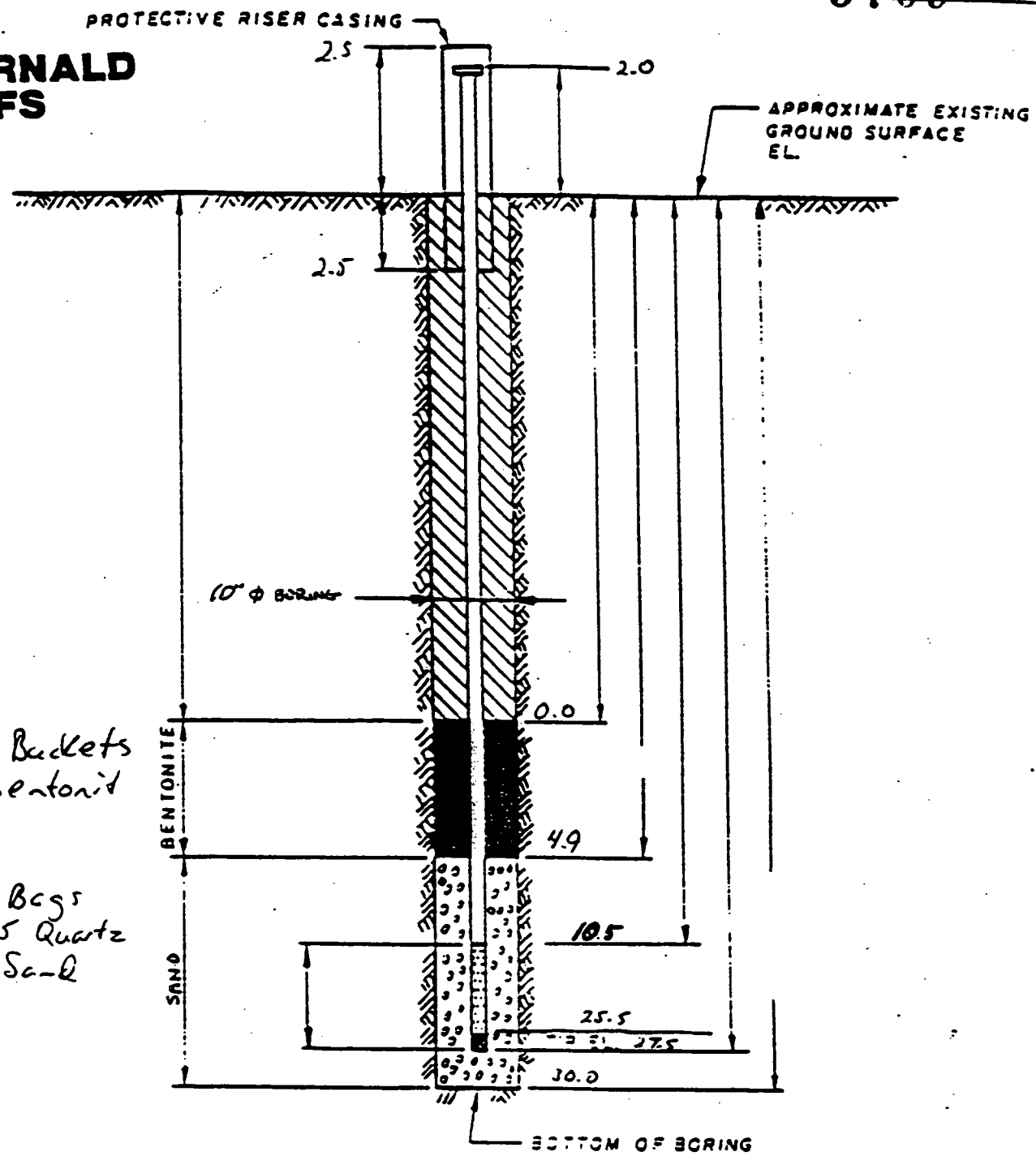
AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS _____

000982

5709

FERNALD RI/FS



DRAWN BY	CHECKED BY	DRAWING NUMBER
BD 6/20/88	APPROVED BY	

NOTES:

1. RISER PIPE IS 4 IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN 1.0 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~294~~ 2094 CB 3/24/94

PREPARED FOR

000983

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~394~~ 3094	COORDINATES:	DATE: 6/7/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 6/14/88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	10032	3 12 12	17	Stiff, Brown (7.5YR 5/4) Gravelly Silt, Some sand, trace clay, Dry (Fill)		1.5	t: 1540 6/7/88 Hnu: 0ppm α: 1cpm β/β: 40cpm
2.5	10033	4 6 8	1	Hard, Dark Yellowish Brown (10YR 4/4) Sandy Clay, some gravel, trace silt Moist	CL	>4.5	t: 1545 Hnu: 0ppm α: 1cpm β/β: 40cpm Low recovery due to coarse gravel
	10034	9 14 16	7	Hard, Dark Yellowish Brown (10YR 4/4) Silty Clay, Some Gravel, trace sand Moist	CL	>4.5	t: 1549 Hnu: 0ppm α: 1cpm β/β: 60cpm
5.0	10152	11 18 18	13	Medium Stiff, Dark Yellowish Brown (10YR 4/4) Silty Clay, trace sand and gravel. Moist.	CL	.9	t: 1555 Hnu: 0ppm α: 1cpm β/β: 40cpm
	10153	20 18 18	11	Soft, Yellowish Brown (10YR 5/6) Silty Clay, some sand, trace gravel. Moist	CL	.5	t: 1605 Hnu: 0ppm α: 1cpm β/β: 50cpm
7.5	10154	18 44 50	18	Stiff, Very Dark Grayish Brown (10YR 3/2) Gravelly Clay, some silt, trace sand, moist. 3.5 ft	CL	1.5	t: 0814 6/8/88 Hnu: 0ppm α: 1cpm β/β: 50cpm
				Very Dense, Light Yellowish Brown (10YR 6/4) Gravelly Sand, trace silt Moist	SP		
10.0	10155	17 23 25	10	Dense, Light Yellowish Brown (10YR 6/4) Sandy Gravel, trace silt, Moist	GP		t: 0837 Hnu: 0ppm α: 1cpm β/β: 40cpm
12.5							
15.0							

NOTES:
Contractor: Pennsylvania Drilling
Driller: Joe Barile
Helper: John Vandine
Rig: 72 Speedstar

Colors as per Munsell
Blow counts for 140 lb Hammer as per ASTM
Total H_2O used during drilling = 450 gallons

000984

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~3094~~ 3094	COORDINATES:	DATE: 6/8/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 6/14/88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	10156	8 36 40	12	Very Dense, Gray (2.5Y 6/0) Gravelly Sand, poorly sorted, trace silt. Wet.	SP		t: 1018 6/8/88 Hnu: 0ppm α: 1cpm r/β: 40cpm Drilling water smells, no readings on Hnu
17.5							
20.0	10157	27 47 38	12	Very Dense, Gray (2.5Y 6/0) Coarse Sand, some gravel, poorly sorted trace silt wet.	SP		t: 1114 Hnu = 5ppm on sample α: 1cpm r/β: 40cpm Drilling water smells, no read.
22.5							
25.0	10158	12 20 20	16	Dense, Yellowish Brown (10YR 5/6) Sand. Some gravel, poorly sorted, trace silt wet	SP		t: 1332 Hnu: 0ppm α: 1cpm r/β: 40cpm
27.5							
30.0							

NOTES:

Positive reading on sample # 10157, drilling fluid and cuttings smell but no reading on Hnu was found to be positive.

000985

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~3094~~ 3094	COORDINATES:	DATE: 6/8/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 6/14/88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 6

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	10159	4 6 8	10	Medium Dense, Yellowish Brown (10YR 5/4) Gravelly Sand, poorly sorted, trace silt wet	SP		t: 1409 6/8/88 Hm: 0ppm α: 1cpm r/β: 40cpm
32.5							
35.0	10160	24 34 24	16	Very Dense, Yellowish Brown (10YR 5/4) Sand, some gravel, poorly sorted trace silt, wet	SP		t: 1512 Hm: 0ppm α: 1cpm r/β: 40cpm
37.5							
40.0	10161	9 9 12	18	Medium Dense, Gray (10YR 5/1) Gravelly Sand, poorly sorted, trace silt, wet.	SP		t: 1552 Hm: 0ppm α: 1cpm r/β: 40cpm
42.5							
45.0							

NOTES:

000986

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~CB 3094~~ 3094	COORDINATES:	DATE: 6/8/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 6/14/88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45.0	10162	23 27 40	18	Very dense, Brown (10YR 5/3) Gravelly Sand, poorly sorted, trace silt. wet.	SP		t: 1655 6/8/88 Hm: 0 ppm α: 1cpm γ/β: 40cpm
47.5							
50.0	10163	7 14 22	9	Dense, Brown (10YR 5/3) Sand with some gravel, poorly sorted, trace silt, wet.	SP		t: 0755 6/9/88 Hm: 0ppm α: 1cpm γ/β: 40cpm
52.5							
55.0	10164	19 29 35	14	Very dense, Brown (10YR 5/3) Sand, some gravel, poorly sorted, trace silt, wet.	SP		t: 0913 Hm: 0ppm α: 1cpm γ/β: 40cpm
57.5							
60.0							

NOTES:

000987

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~CB394~~ 3094 3/24/94	COORDINATES:	DATE: 6/9/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 6/14/88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 6

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60.0	10165	17 7 9	10	Medium Dense, Gray (10YR 5/1) Sand, some gravel, poorly sorted, trace silt. wet.	SP		t: 1002 6/9/88 Hm: 0ppm α: 1cpm r/β: 50cpm
62.5							
65.0	10166	8 16 21	12	Dense, Grayish Brown (10YR 5/2), Sand, some gravel, poorly sorted, trace silt wet,	SP		t: 1059 6/14/88 Hm: 0ppm α: 1cpm r/β: 60cpm
67.5							
70.0	10167	5 14 17	10	Dense, Gray (10YR 5/1) Sand, some gravel, poorly sorted, trace silt. Wet.	SP		t: 1132 Hm: 0ppm α: 1cpm r/β: 40cpm
72.5							
75.0							

NOTES:

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~CB 394~~ 3094 3/24/89	COORDINATES:	DATE: 6/14/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 6/7/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 6/14/88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 6

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75.0	10168	14 21 22	16	Dense, Grayish Brown (10 YR 5/2) Sand with some gravel, poorly sorted, trace silt. wet	SP		t: 1351 6/14/88 Hm: 0ppm α: 1cpm r/β: 40cpm
77.5							
80.0	10169	27 26 32	6	Dense, Grayish Brown (10 YR 5/2) Gravelly Sand, poorly sorted with very coarse gravel, trace silt wet	SP		t: 1447 Hm: 0ppm α: 1cpm r/β: 40cpm
81.5				END OF BORING 81.5 Ft			

NOTES:

000989

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. DAVIES DATE 6-16-88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. ~~394~~ 3094
PIEZOMETER NO. ~~394~~ 3094 DATE OF INSTALLATION 6-15 thru 6-16-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT Steel
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID H_2O FROM 0 TO 81.5	SIZE 10 in FROM 0 TO 80 Ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION _____	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4 in
SLOTS [X] HOLES [ ] SCREEN [X]	LENGTH OF PIPE SECTIONS 6-10 Ft 1 2 Ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD Screw wrench tight
TOTAL PERFORATED AREA 10 Ft	

PROTECTION SYSTEM

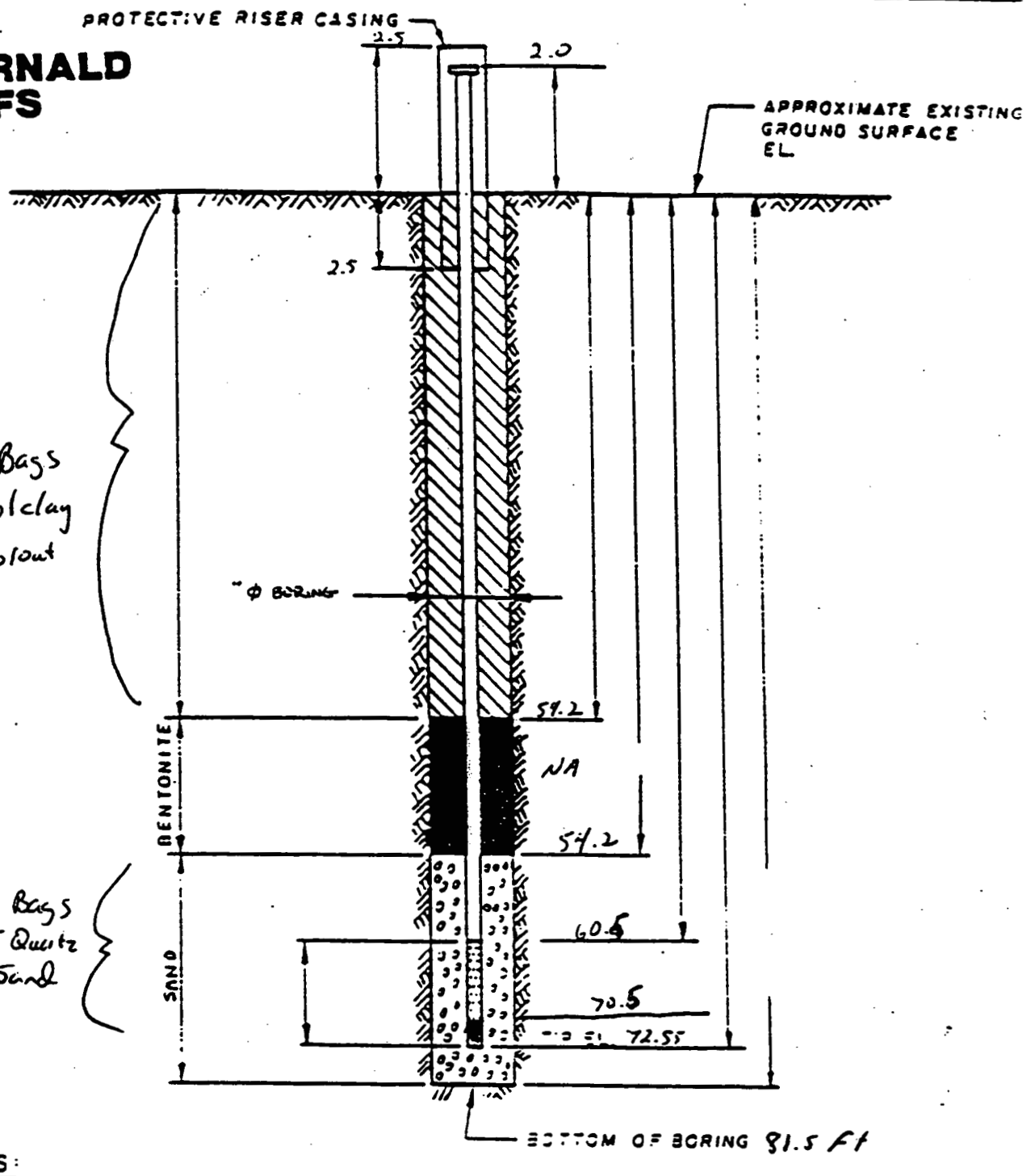
RISER PROTECTIVE PIPE LENGTH 5 Ft	OTHER PROTECTION locking cover,
PROTECTIVE PIPE O.D. 10 3/4 in	screw on cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.0~~ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 54.2	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM	TOP	BOTTOM
SAND	TOP 54.2	BOTTOM 76.2	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 60.5	BOTTOM 70.5	TOP	BOTTOM
PIEZOMETER TIP	72.5			
BOTTOM OF BOREHOLE	81.5			
GWL AFTER INSTALLATION				

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Drilled to 81.5 Ft cave to 76.2 Ft

000990

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
BD	
6/4/92	
DRAWN BY	

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 3094 ~~394~~

PREPARED FOR CA 5/24/94

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1.02.3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~295~~ 2095	COORDINATES:	DATE: 07 13 88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 07 13 88
ENGINEER/GEOLOGIST: SCHWARTZ	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 1 OF 2

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				for soil descriptions			
2				see log for B ~~395~~ 3095			
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

000992

NOTES:

water level in B ~~395~~ 3095 ≈15 ft

driller - Harry Dykes

helper - Tim Harris

method - Cable tool

drilling fluid - Rig Used - speed star

≈50 gallons of water used in drilling

402-11-8

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1.02.3.7	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~B265~~ 2095	COORDINATES:	DATE: ~~07/13/88~~ 07/14/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 07/13/88
ENGINEER/GEOLOGIST: SCHWARTZ	Depth Date/Time	DATE COMPLETED: 07/14/88
DRILLING METHODS:		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16				see log for B ~~265~~ 3095			
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30				END OF BORING 30.0 ft			

NOTES:

000993

FERNALD RI/FS

	Initial	Date
1st Key In	JMC	7/28/88
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 6C2.3.2
BORING NO. ~~B 295~~ 2095
PIEZOMETER NO. ~~295~~ 2095

FIELD ENG./GEO. SCHWARTZ DATE 7-14-88
CHECKED BY _____ DATE _____
DATE OF INSTALLATION 7-14-88

BOREHOLE DRILLING

DRILLING METHOD Cable tool
DRILLING FLUID (S) USED:
FLUID water FROM 0 TO 30
FLUID _____ FROM _____ TO _____

TYPE OF BIT flathead
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 30
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE _____
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010
TOTAL PERFORATED AREA 15 ft

RISER PIPE MATERIAL stainless
RISER PIPE DIAMETERS:
O.D. _____ I.D. 4"
LENGTH OF PIPE SECTIONS 10'
JOINING METHOD thread & couple

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH ~~2'~~ 5'
PROTECTIVE PIPE O.D. 10"

OTHER PROTECTION _____

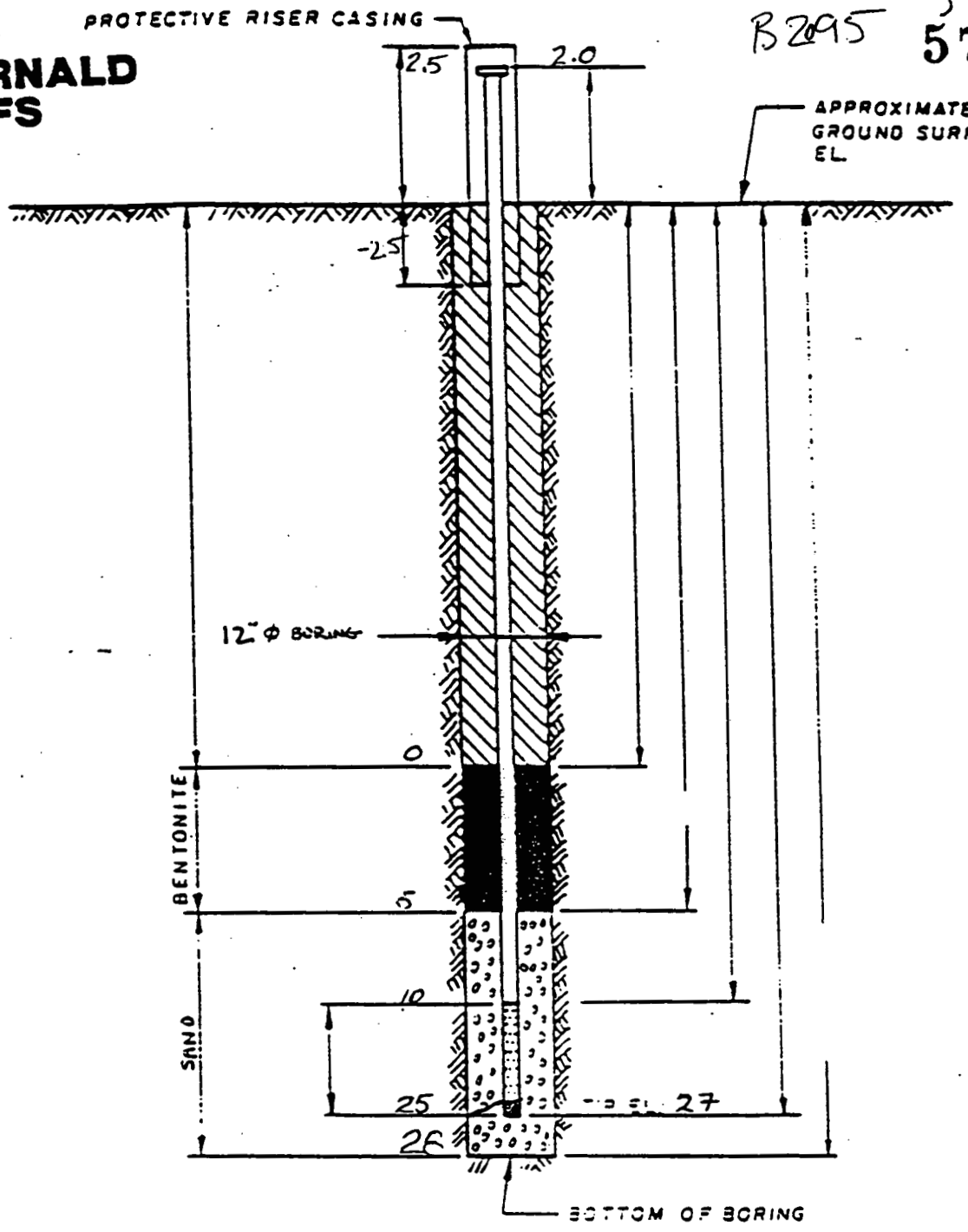
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	-2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP	BOTTOM	TOP	BOTTOM
BENTONITE	TOP 0	BOTTOM ~~10~~ -5	TOP	BOTTOM
SAND	TOP ~~[illegible]~~ -5	BOTTOM -28	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP -10	BOTTOM -25	TOP	BOTTOM
PIEZOMETER TIP	-27			
BOTTOM OF BOREHOLE	-28			
GWL AFTER INSTALLATION	15			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS boring was completed to 30 ft and collapsed (~~or filled~~) to 28 ft before well construction began

M Schwartz C7 14

B2095 5709

FERNALD RI/FS



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	

NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~295~~ 2095
CB 2/21/91

PREPARED FOR

000995

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6062 03 02	PROJECT NAME: FMPC	
BORING NUMBER: B ~~345~~ 3095 CB 3/24/90	COORDINATES:	DATE: 7-7-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 7-7-88
ENGINEER/GEOLOGIST: SCHWARTZ	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 1 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 (6/1)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	7/7 0800 10173	7 19 21	12	~~soft~~ dark brown topsoil (10YR)) hard yellow brown sandy silt (10YR 4/4) dry	ml	<1 / >5	HNU = 0ppm; γβ = 40 cpm; α = 0cpm
2	7/7 10174	15 25 50	12	Dense ~~brown~~ yellow silty sand, some gravel (2.5YR 7/6) dry	sm	NA	HNU = 0ppm; γβ = 40cpm; α =
3	7/7 10035	50 46 50	6	dense brown yellow (2.5YR 7/6) silty sand, some gravel, well graded, dry	sm	NA	HNU = 0ppm; γβ = 40cpm; α = 0cpm
5							
6							
7							
8							
9							
10	7/7 10036	20 31 40	12	dense yellow brown sand, some gravel, well graded (10YR 5/6) moist	sw	NA	HNU = 0ppm; γβ = 40cpm; α = 0cpm
12							
13							
14							

NOTES: Drilling contractor : Penn Drill
Drill Rig : Speedstar
Driller : Harry Dykes
Helper : Tim Harris
Geologist : Mike Schwartz

000996

background : HNU = 0ppm
γβ = 40 cpm
α = 0cpm
blows counted on standard splitspoon
Munsell Color Chart used

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1.00 03 02	PROJECT NAME: FMPC		
BORING NUMBER: B ~~345~~ 3095	COORDINATES:		DATE: 7-7-88
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 7-7-88
ENGINEER/GEOLOGIST: SCHWARTZ	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool			PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	T/C HAD 100 37	90	6	very dense yellow brown (10YR 5/4) fine to med. sand, some clay inclusions, poorly graded moist	SW	NA	HNu = 0ppm β = 40cpm α = 0cpm
16							
17							
18							
19							
20	7-7 1545 10038	24 13 18	9	med. dense well graded med to coarse yellow brown (10YR 4/3) sand, tr. gravel wet	SW	NA	HNu = 0ppm β = 40cpm α = 0cpm
21							
22							
23							
24							
25							
26	10039	22 28 35	15	med. dense to dense, well graded med. to coarse yellow brown (10YR 4/3) sand, tr. gravel, wet	SW	NA	HNu = 0ppm β = 40cpm α = 0cpm
27							
28							
29							

NOTES:

background: HNu = 0 ppm
β = 40 cpm
α = 0 cpm

000997

402-11-8

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B ~~395~~ 3095	COORDINATES:		DATE: July 8, 1988
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: July 7, 1988
ENGINEER/GEOLOGIST: L. Wile / M. Schuette	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool			PAGE 3 ~~7~~ OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1½ FT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	7-8 0840 10040	12 11 11	14	medium dense brown 10YR5/3 sand and gravel some silt and clay, moderately sorted, rounded - wet	gm	NA	HNU = 0ppm γB = 40cpm α = 0 cpm
32							
33							
34							
35							
36	7-8 1030 10041	18 29 38	18	very dense ~~brownish~~ grayish brown 10YR5/2 sand, some silt and clay trace gravel, and pebbles - wet	gm	NA	HNU = 0ppm γB = 20cpm α = 0cpm
37							
38							
39							
40							
41	7-8 1100 10042	2 7 5	6	medium dense grayish brown 10YR5/2 sand and gravel some silt clay and pebbles poorly sorted - wet	gm	NA	HNU = 0 ppm γB - 30cpm α - 1 cpm
42							
43							
44							

NOTES:

background: HNU = 0ppm
γB = 20-40cpm
α = 0cpm

000998

402-11-8

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: Fernald RI/FS	PROJECT NAME: Fernald RI/FS 602.3.2		
BORING NUMBER: K ~~395~~ 3095 CB 3/24/94	COORDINATES:		DATE: July 8, 1988
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: July 7, 1988
ENGINEER/GEOLOGIST: L.Willis/M.Schuele	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool			PAGE 4 ~~5~~ OF 7

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	7-8 1340 10043	11 24 18	18	dense brown 10YR 5/3 sand and gravel some silt, clay and pebbles poorly sorted wet	gm	NA	HNU: 0ppm γβ: 60cpm α: 0cpm
47							
48							
49							
50	7-8 1435 10044	4 4 5	18	loose gray 7½YR 5/0 fine to medium sand some silt, clay and coarse sand trace gravel - wet	gm	NA	HNU: 0ppm γβ = 60cpm α = 0cpm 2 tries to get sample
51							
52							
53							
54							
55	7-9 0825 10045	23 40	12	dense brown gray (10YR 4/2) coarse sand some gravel, well graded - wet	sw	NA	HNU = 0 ppm γβ = 40-60cpm α = 0cpm
57							
58							
59							

NOTES:

background: 7-9 HNU = 0 ppm γβ = 40-60 cpm α = 0cpm

000999

402-

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1.02.3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~3095~~ 3095	COORDINATES:	DATE: 7-9-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 7-7-88
ENGINEER/GEOLOGIST: SCHWEGRATE	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable tool		PAGE 5 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	7-9 1020 10046	6 7 9	12	loose to med dense olive gray (5Y 4/2) gravelly sand, wet	GW	NA	HNu = 0ppm γ = 60 cpm α = 0cpm
62							
63							
64							
65	7-9 1125 10047	22 24 29	15	dense dark gray brown (2Y 4/2) gravelly sand wet	GW	NA	HNu = 0 ppm γ = 60 cpm α = 0 cpm
66							
67							
68							
69							
70	7-9 1340 10048	17 22 25	12	med. dense grey fine to med. sand grading to med. to coarse near bottom (10YR 5/1) wet	SP	NA	HNu = 0 ppm γ = 80-100 cpm α = 0 cpm 2 trays for sample
71							
72							
73							
74							

NOTES:

background: HNu = 0 ppm
79 γ = 80-100 cpm
α = 0 cpm

count rose from 40-60 cpm in afternoon

001000

402-11-86

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1001 05, 06	PROJECT NAME: FMPC	
BORING NUMBER: 3095	COORDINATES:	DATE: 7-9-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 07-07-88
ENGINEER/GEOLOGIST: SCHWARTZ	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE 6 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	7-9 1520 10049	11 16 17	12	med. dense grey (10YR 5/1) med. sand, poorly graded, wet	SP	NA	HNu = 0 ppm; β = 80-100 cpm; α = 0 cpm
77							
78							
79							
80	7-9 1550 10050	7 16 19	12	med. dense grey (10YR 4/1) sand, some gravel, poorly graded, wet	SP	NA	HNu = 0 ppm; β = 80-100 cpm; α = 0 cpm
81							
82							
83							
84							
85							
86	7-10 0925 10051	42 36 39	12	dense grey (10YR 5/1) sand, tr gravel and clay, well graded, wet	SW	NA	HNu = 0 ppm; β = 40 cpm; α = 0 cpm
87							
88							
89							

NOTES:

background: HNu = 0 ppm
7-10 β = 40-60 cpm
α = 0 cpm

19
22

001001

402-11-F

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1002 0319	PROJECT NAME: FMPC	
BORING NUMBER: ~~3095~~ 3095	COORDINATES:	DATE: 7-10-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 7-7-88
ENGINEER/GEOLOGIST: SCHWARTZ	Depth Date/Time	DATE COMPLETED: 7-10-88
DRILLING METHODS: Cable Tool		PAGE 7 OF 7

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	7-10 1155 10052	16 19 22	9	med. dense gray (10YR 5/1) sand, well graded, wet	SW	NA	HNu = 0ppm βg = 40 cpm α = 0 cpm
92				END OF BORING			
93							
94							
95							

NOTES:

Total of ≈600-gallons of water used, large amount due to blow sand

001002

FERNALD RI/FS

5709

	Initial	Date
1st Key In	[illegible]	7/12/88
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC FIELD ENG./GEO. SCHWARTZ DATE 07-12-88
PROJECT NO. 602 03 02 CHECKED BY _____ DATE _____
BORING NO. 8 ~~395~~ 3095
PIEZOMETER NO. ~~395~~ 3095 DATE OF INSTALLATION 07-12-88

BOREHOLE DRILLING

DRILLING METHOD Cable tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 90
FLUID _____ FROM _____ TO _____

TYPE OF BIT 10" hammer flathead
CASING SIZE (S) USED:
SIZE 10 in FROM 0 TO 90
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE _____
DIAMETER OF PERFORATED SECTION 4 in
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010
TOTAL PERFORATED AREA 10 ft

RISER PIPE MATERIAL Stainless steel
RISER PIPE DIAMETERS:
O.D. _____ I.D. 4 in
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD thread

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0
PROTECTIVE PIPE O.D. 10

OTHER PROTECTION _____

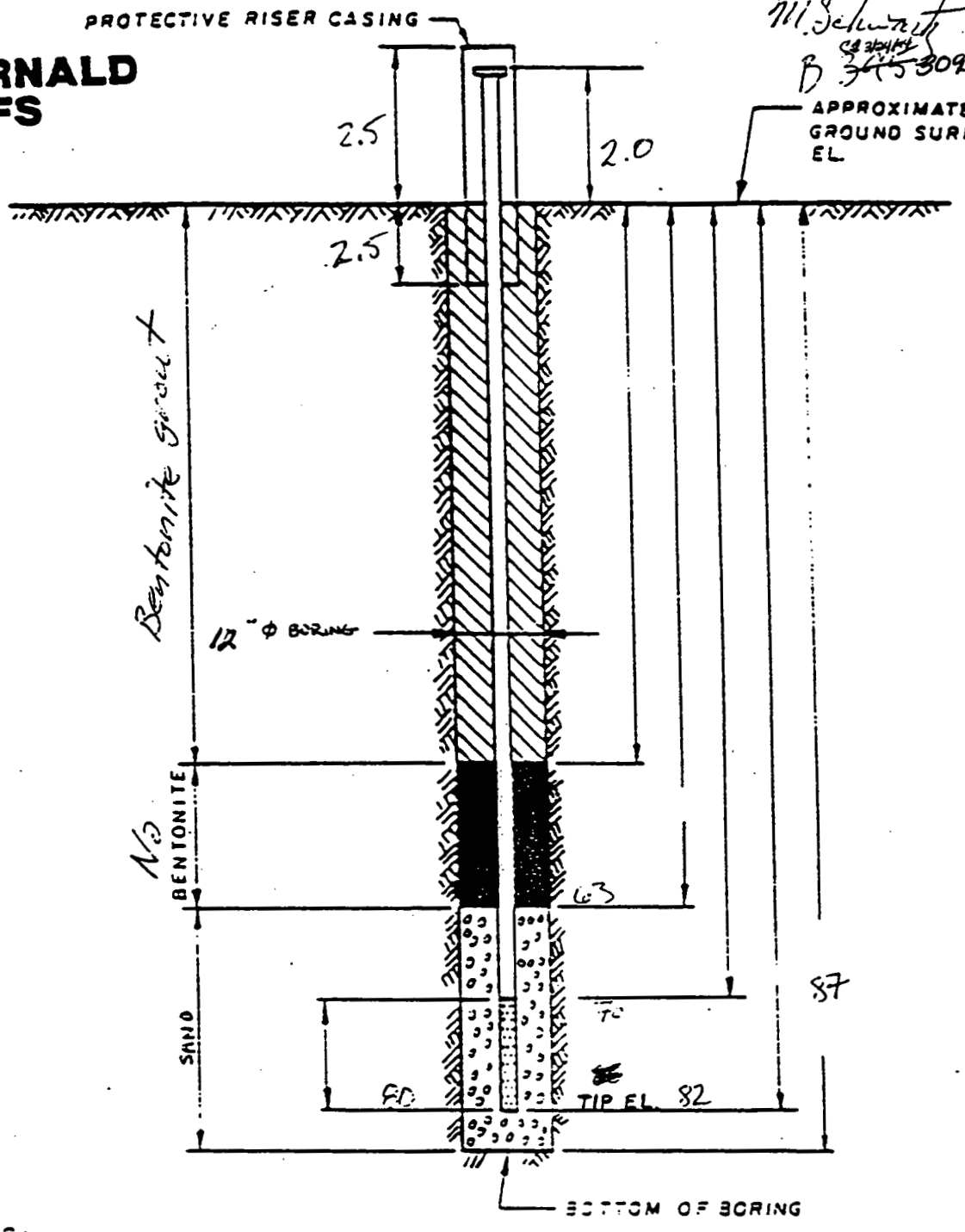
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	-2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM -63	TOP	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND	TOP ~~63~~	BOTTOM ~~87~~	TOP	BOTTOM
GRAVEL	TOP -63	BOTTOM -87	TOP	BOTTOM
PERFORATED SECTION	TOP -70	BOTTOM 80	TOP	BOTTOM
PIEZOMETER TIP	-82			
BOTTOM OF BOREHOLE	-87			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

001003

REMARKS _____

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL ~~395~~ 3095

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

001004

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~2900~~ 2096 10-07-88	COORDINATES:	DATE: 08-19-88
ELEVATION: 550.0 FT.	GWL: Depth Date/Time	DATE STARTED: 08-11-88
ENGINEER/GEOLOGIST: M. ELUSARRI	Depth Date/Time	DATE COMPLETED: 08-19-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

5709

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* SEE VISUAL CLASSIFICATION OF SOILS FOR BORING # ~~4096~~ 4096 RAB 2/7/89 FOR DESCRIPTION OF SAMPLES OVER INTERVAL 0.0 FT - 74.0 FT			
15							
30							
45							
60							
75				74.0 BOTTOM OF BOREHOLE @ 74.0 FT BORE HOLE WAS DRILLED TO 74.0 FT AND ALLOWED TO COLLAPSE ON itself TO 72.5 FT			

NOTES: CONTRACTOR: TRANSTERRA
RIG: BUCYRUS-ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: CRAIG COULTER

* BACKGROUND LEVELS: [illegible] PPM
[illegible] CPM
[illegible] CPM
LEL O_2 = [illegible] PPM LEL
[illegible] % O_2

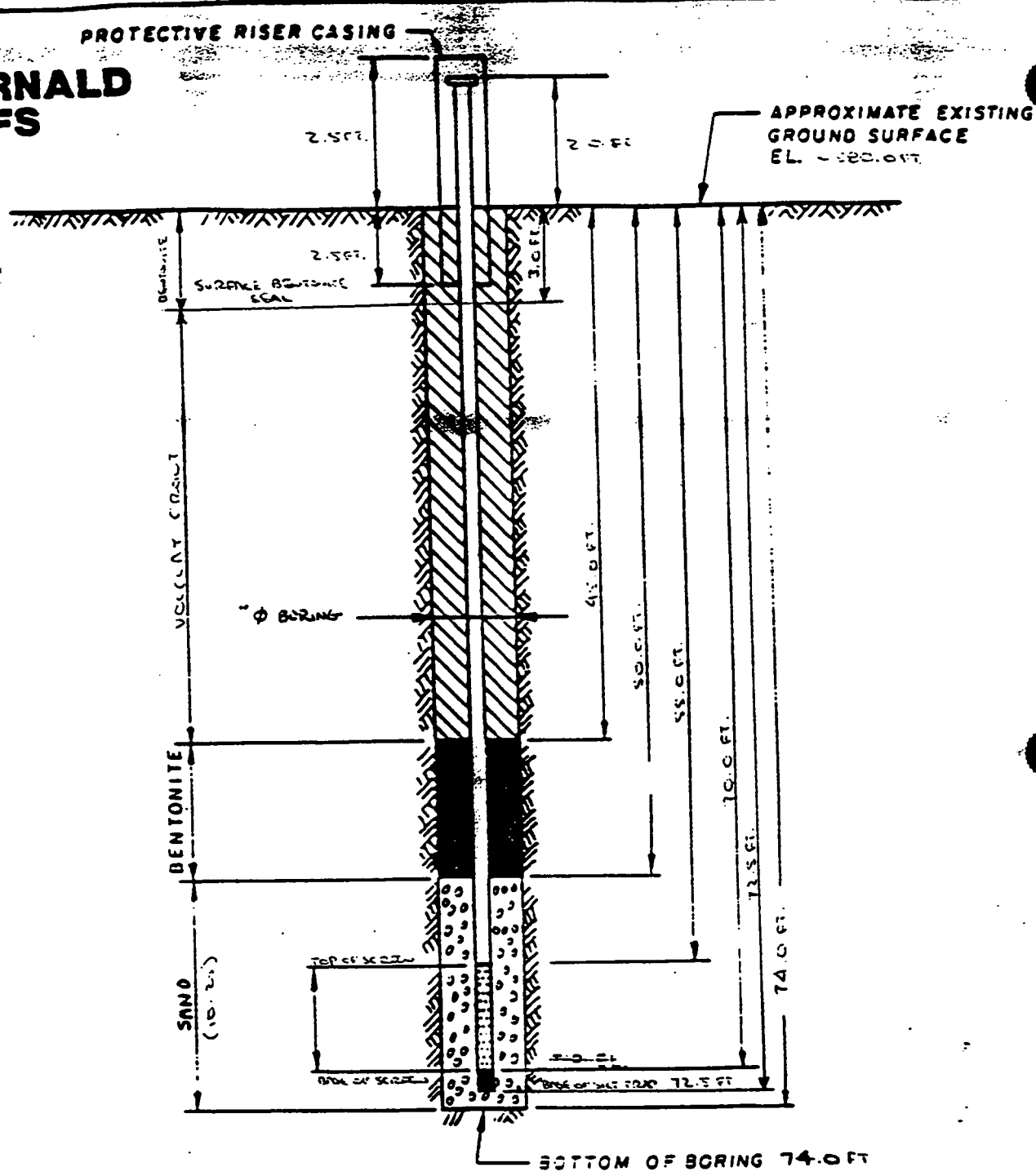
WATER ADDED TO BOREHOLE: 350 GALLONS

001005

402-11-86

BORING 296

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED:

002006

10-20 SAND (100LB SACKS) : 12 SACKS

VOLCLAY GROUT (50 LB BAGS) : 10 BAGS

BENTONITE PELLETS (BUCKETS) : 8 BUCKETS

WATER ADDED TO HOLE : 750 GALLONS

INSTALLATION DETAILS
MONITORING WELL
08-19-88
PREPARED FOR
BORING # 296
2096
HLS 10-07-92

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
PROJECT NO. 6032 3.2
BORING NO. 2096
PIEZOMETER NO. 2096

FIELD ENG./GEO. M. Sucharski DATE 08-19-88
CHECKED BY R Galbraith DATE 2/7/89
DATE OF INSTALLATION 08-18-88 TO 08-19-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID _____ FROM 0.0 FT TO 74.0 FT.	SIZE 10" ID FROM 0.0 FT. TO 75.0 FT.
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4 IN ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN. I.D. 4 IN.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 2 FT, 5 FT, 10 FT.
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 10.0 FT.	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	SURFACE BENTONITE PLUG TOP: 0.0	BOTTOM: 3.0		
GROUT/SLURRY (JOINT)	TOP 3.0	BOTTOM 45.0	TOP	BOTTOM
BENTONITE	TOP 45.0	BOTTOM 50.0	TOP	BOTTOM
SAND (10-20)	TOP 50.0	BOTTOM 72.5	TOP	BOTTOM
GRAVEL	TOP [redacted]	BOTTOM [redacted]	TOP	BOTTOM
PERFORATED SECTION	TOP 55.0	BOTTOM 70.0	TOP	BOTTOM
PIEZOMETER TIP	72.5			
BOTTOM OF BOREHOLE	74.0			
GWL AFTER INSTALLATION				

001007

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE INTERVAL FROM 74.0 FT TO 72.5 FT. WAS ALLOWED TO COLLAPSE ON ITSELF. THREE BUCKETS (3) OF BENTONITE PELLETS WERE USED TO PROVIDE A SURFACE SEAL AND PACKING MATERIAL AROUND THE PROTECTIVE CASING.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~3096~~ 3096	COORDINATES:	DATE: 08-10-88
ELEVATION: 530.0 FT	GWL: Depth Date/Time	DATE STARTED: 08-02-88
ENGINEER/GEOLOGIST: M. SLUCZARSKI	Depth Date/Time	DATE COMPLETED: 08-10-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* SEE VISUAL CLASSIFICATION OF SOILS FOR BORING #3096 FOR DESCRIPTION OF SAMPLES			
10							
20							
30							
40							
50							

NOTES: CONTRACTOR: POWDRILL
RIG: BUCYRUS - ERIE
DRILLER: DAVE NEWMAN
ASSISTANTS: RICK BRANNAN, CRAIG COULTER

001008

* SAMPLES AND SHELBY TUBE WERE COLLECTED FOR ARCHIVE PURPOSES

BACKGROUND LEVELS: H_{2O} = 0 PPM
α = 0-5 CPM
β = 20-30 CPM
LEL O_2 = 0 PPM LEL
20.6% O_2

WATER ADDED TO HOLE: 1000 GALLONS

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~[illegible]~~ 3096	COORDINATES:	DATE: 05-10-88
ELEVATION: 583.0 FT.	GWL: Depth Date/Time	DATE STARTED: 05-02-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 05-10-88
DRILLING METHODS: CABLE TOOL		PAGE 2. OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
70							
80							
90							
100				104.7 SHELBY TUBE PUSHED FROM 104.7 TO 106.7 FT. RECOVERED 2.0 FT. @ 1100 ON 05-06-88 SPLIT SPOON SAMPLES COLLECTED OVER INTERVAL 106.0 FT TO 112.0 FT 112.0 FT.			
110							

NOTES: TOP OF UPPER CLAY LAYER: 104.7 FT.
BASE OF UPPER CLAY LAYER: [redacted] 112.0 FT.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~3963~~ 3096	COORDINATES:	DATE: 08-10-88
ELEVATION: 560.0 FT.	GWL: Depth Date/Time	DATE STARTED: 08-02-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 08-10-88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
130				SHELBY TUBE PUSHED FROM 131.5 FT TO 133.5 FT. NO "CUT" RECOVERED. A REPRESENTATIVE SAMPLE OVER THE INTERVAL 131.5 FT TO 133.5 FT WAS COLLECTED.			
140				BASE OF BOREHOLE @ 140.0 FT.			

NOTES: BOREHOLE WAS ALLOWED TO COLLAPSE UNTILL FROM 140.0 FT TO 134 FT.

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI / FS
FIELD ENG./GEO. M SLUSARSKI
DATE 08-10-88
PROJECT NO. 602 3.2
CHECKED BY
DATE
BORING NO. ~~396~~ 3096
PIEZOMETER NO. ~~396~~ 3096
DATE OF INSTALLATION 08-08-88 TO 08-10-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 140.0 FT	SIZE 10" ID FROM 0.0 FT. TO 140.0 FT.
FLUID ____ FROM ____ TO ____	SIZE ← FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN. I.D. 4 IN.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 FT, 2 FT.
AVERAGE SIZE OF PERFORATIONS 0.010 IN.	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 10.0 FT.	JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN.	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 FT.			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0 FT.	BOTTOM 112.0 FT	TOP	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND (10-20)	TOP 112.0 FT	BOTTOM 124.0 FT	TOP	BOTTOM
GRAVEL (4-30)	TOP 124.0 FT	BOTTOM 134.5 FT.	TOP	BOTTOM
PERFORATED SECTION	TOP 128.0 FT.	BOTTOM 118.0 FT.	TOP	BOTTOM
PIEZOMETER TIP	130.2 FT.			
BOTTOM OF BOREHOLE	140.0 FT.			
GWL AFTER INSTALLATION				

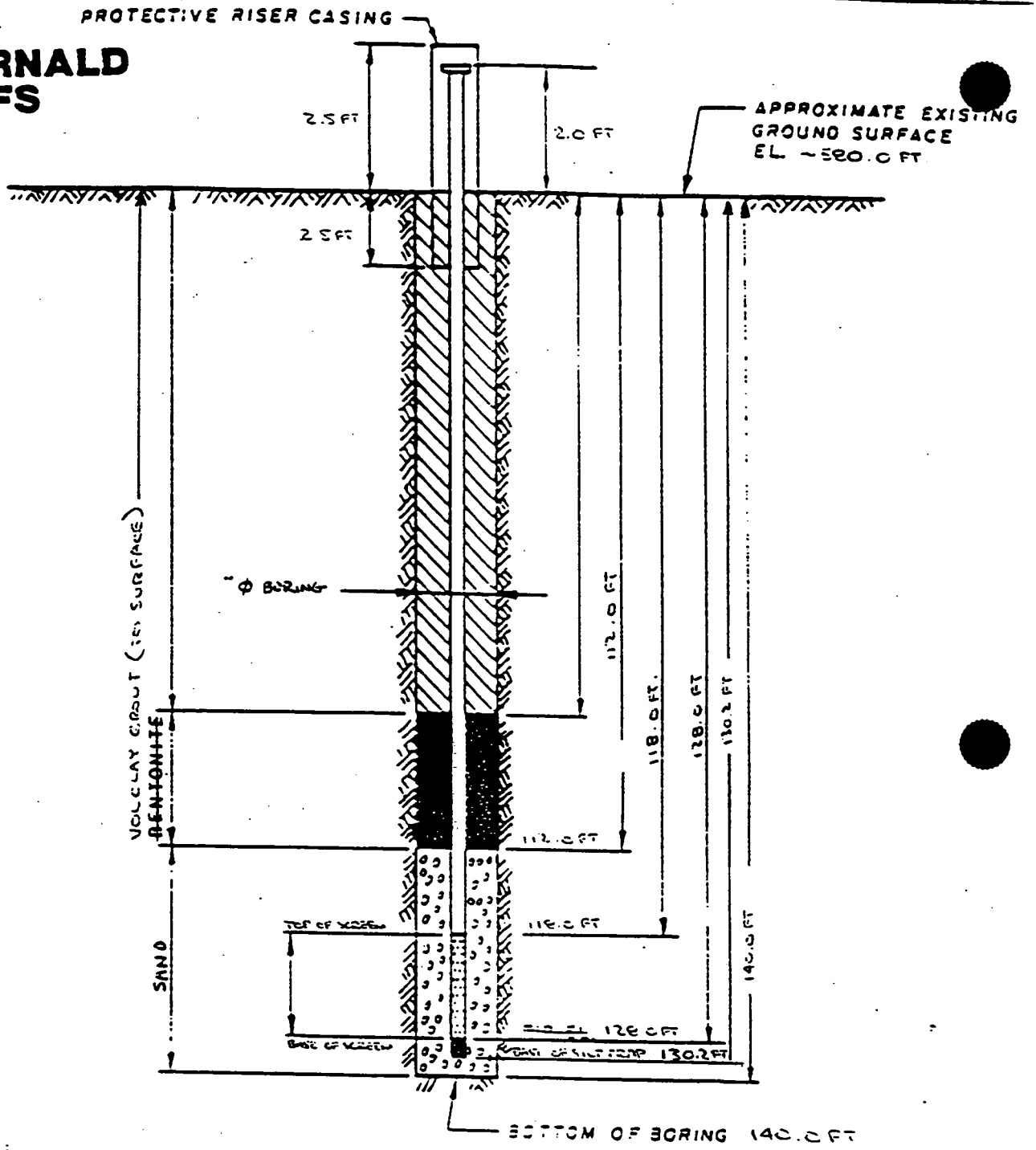
002011

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE INTERVAL FROM 140.0 FT TO 134.5 FT WAS ALLOWED TO COLLAPSE ON ITSELF. ONE BUCKET OF BENTONITE PELLETS WERE POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE

BORING #3096 ~~391~~

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL: 61.2 FT. ON 08-06-88 @ 1000
5. WATER LEVEL READING ON 60.5 FT ON 08-01-88 @ 0740
   59.1 FT ON 08-08-88 @ 0725

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR BORING #~~2916~~ 3096 08-10-88

MATERIALS USED:

4 30 SAND (80 LB SACKS): 2 SACKS @ BASE OF HOLE (134.5 FT) TO 124.0 FT (OPEN HOLE ALLOWED TO COLLAPSE TO 134.5 FT.)

10-20 SAND (100 LB SACKS): 8 SACKS FROM 124.0 FT TO 112.0 FT

VOLCLAY GROUT (50 LB BAGS): 34 BAGS FROM 112.0 FT TO SURFACE

BENTONITE PELLETS: 1 BUCKET AS PACKING AND SEALING MATERIAL AROUND PROTECTIVE CASING

WATER ADDED TO HOLE DURING DRILLING: 1000 GALLONS

001012

FERNALD RI/FS REVIEWED BY QA K6 DATE AUG 27 1991

TSF (10185) DH 2/5/89

5709

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096 MLS 10-07-88	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: ~~SEE C~~ PT. 579.4 FT MLS 10-01-88	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10185 0910 06-22	8 9 11	14	STIFF, YELLOW-BROWN (10 YR 5/4) — GREY (10YR 5/1) MOTTLED, SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
17	10186 0958 06-22	6 9 12	12	17.5	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
18				VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE FINE GRAVEL, DAMP			
19	10187 1016 06-22	3 8 9	12		CL	2.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
20	10188 1124 06-22	4 6 11	12	STIFF, GREY (5Y 4/1) SILTY CLAY SOME FINE GRAVEL, TRACE SAND, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
21 22	10189 1136 06-22	6 8 11	12	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	2.0	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
23 24	10190 1345 06-22	9 12 15	12	STIFF, GREY, (5Y4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
25	10191 1404 06-22	10 12 12	12	STIFF, GREY, (5Y4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
26 27	10192 1447 06-22	8 17 21	14	STIFF, GREY, (5Y4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0), DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
28	10193 1509 06-22	9 20 17	12	STIFF, GREY (5Y 4/1), FINE SANDY CLAY SOME SILT, SOME FINE GRAVEL, TRACE COARSE GRAVEL (.5-1.0 IN) DAMP — 28.0 STIFF, GREY (5Y 4/1) SILTY CLAY, SOME FINE GRAVEL, TRACE COARSE GRAVEL (0.5-1.0 IN) DAMP — 28.5	CL	1.5	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
29	10194 1533 06-22	6 17 40	14	HARD, YELLOW-BROWN (10YR4/4) SILTY CLAY, SOME FINE TO MEDIUM GRAVEL (0.25-0.50 IN) WOOD FRAGMENTS, DRY — 29.5 DENSE, YELLOW-BROWN (10YR5/6), FINE-MEDIUM WELL GRADED SAND, SOME SILT, TRACE FINE GRAVEL, DRY — 29.8	CL SW	1.5 N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM

NOTES:

* BASE OF TILL @ 29.8 FT.

001013

402-11-86

FERNALD RI/FS REVIEWED BY QA KS DATE AUG 2 7 1991

D# 2/5/89

	Initial	Date
1st Key In	TSF	9/8/89
2nd Key In		9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N476552.30 E1377207.31	DATE: 07-26-88
ELEVATION: 580.0 FT. 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10175 1053 06-21	2 3 6	12	STIFF YELLOW-BROWN (10YR 6/3) SILTY CLAY, ROOTLETS, DRY	CL	1.5	HNU = 0 α = 0-5 CPM γ = 40-60 CPM ON SURFACE
2 3	10176 1100 06-21	6 10 11	12	HARD YELLOW-BROWN (10YR 5/4) SILTY CLAY, DRY	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 40-50 CPM
4	10177 1107 06-21	10 13 15	12	HARD YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE OF FINE GRAVEL, DRY	CL	>4.0	HNU = 0 α = 0-5 CPM γ = 50-60 CPM
5 6	10178 1110 06-21	20 25 30	14	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE FINE GRAVEL, TRACE COARSE GRAVEL (~1.0 IN), DRY	CL	2.5	HNU = 0 α = 0-5 CPM γ = 50-60 CPM
7	10179 1117 06-21	23 21 22	18	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE FINE GRAVEL, TRACE COARSE GRAVEL (~1.0 IN), DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 40 CPM
8 9	10180 1530 06-21	2 6 10	12	VERY STIFF, MOTTLED YELLOW-BROWN-GREY (10YR 5/4 - 10YR 5/1), SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
10	10181 1545 06-21	2 8 9	14	VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	2.5	HNU = 0 α = 0-5 CPM γ = 30 CPM
11 12	10182 1638 06-21	9 13 15	18	VERY STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP.	CL	3.0	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
13	10183 0831 06-22	3 3 8	12	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM
14	10184 0850 06-22	2 3 7	12	STIFF, YELLOW-BROWN (10YR 5/4) SILTY CLAY, TRACE FINE GRAVEL, DAMP	CL	1.5	HNU = 0 α = 0-5 CPM γ = 30-40 CPM

NOTES: CONTRACTOR: PENNDRILL
RIG: BUCYRUS-ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: BOB JOHNSON

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 α = 0-5 CPM γ = 40-60 CPM
$LEL O_2$: 0 PPM LEL = 20.6% O_2

WATER ADDED TO HOLE: 1200 GALLONS

402-11-86

FERNALD RI/FS

REVIEWED BY QA LG DATE AUG 2 7 1991 5709

DH 2/5/89

	Initial	Date
1st Key In	TSP	9/8/89
2nd Key In	[illegible]	9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: # 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: 580.0 FT. 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31							
32							
33							
34							
35	10195	16		VERY DENSE, YELLOW-BROWN (10YR 5/4)			HNU = 0
36	0905 06-23	53 54	14	POORLY GRADED, FINE SAND, DRY	SP	N/A	α = 0-5 CPM γ = 20-30 CPM
37							
38							
39							
40	10196	11		DENSE, YELLOW-BROWN (10YR 5/4)			HNU = 0
41	0925 06-23	16 21	14	POORLY GRADED, FINE SAND, DRY	SP	N/A	α = 0-5 CPM γ = 20-30 CPM
42							
43							
44							

NOTES:

002025

402-11-86

FERNALD RI/FS REVIEWED BY QA VG DATE AUG 2 7 1991

Dt 2/5/89

	Initial	Date
1st Key In	TSF	9/8/82
2nd Key In		9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: # 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: 580.5 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10197 0955 06-23	17 16 17	12	DGNSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, DRY	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
47							
48							
49							
50	10198 1054 06-23	5 17 30	12	DGNSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, DRY	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
51							
52							
53							
54							
55	10199 1124 06-23	7 17 18	12	DGNSE, BROWN-GREY (10YR 5/2) POORLY GRADED FINE SAND, DRY	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
56							
57							
58							
59							

NOTES:

001016

402-11-86

FERNALD RI/FS

REVIEWED BY QA K6 DATE AUG 2 7 1991 5709

	Initial	Date
1st Key In	TSF	7/8/88
2nd Key In		8/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~#496~~ 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: ~~580.0~~ FT 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10200 0920 07-06	4 8 12	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
62							
63							
64							
65	10201 0948 07-06	8 17 31	14	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
66							
67							
68							
69							
70	10202 0830 07-07	5 8 13	18	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED, FINE SAND, TRACE FINE ~~SAND~~ GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
71							
72							
73							
74							

NOTES:

001017

402-11-66

FERNALD RI/FS REVIEWED BY QA KG DATE AUG 27 1991

DM 8/5/89

	Initial	Date
1st Key In	TSF	9/8
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~#496~~ 4096 MW 10-DMW	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-89
ELEVATION: ~~580.0 FT~~ 579.4 FT MW 10-DMW	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-89
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10203 0938 07-07	15 21 22	10	DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY FINE SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
77							
78							
79							
80							
81	10204 1431 07-07	7 10 13	10	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
82							
83							
84							
85							
86	10205 1656 07-07	8 9 12	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) WELL GRADED, GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
87							
88							
89							

NOTES:

001018

402-11-86

FERNALD RI/FS

5709

REVIEWED BY QA 46 DATE AUG 2 7 1991

	Initial	Date
1st Key In	TSF	9/9
2nd Key In		9/13
Hard Copy Verification		

709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10206 0910 07-09	17 31 42	18	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 "BLOW SAND" α = 0-5 CPM γ = 20-30 CPM
92							
93							
94							
95	10207 1145 07-09	41 30 35	14	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
96							
97							
98							
99							
100	10208 1425 07-09	17 36 50	18	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
101							
102							
103							
104							

NOTES:

001019

402-11-86

FERNALD RI/FS

REVIEWED BY QA KB DATE AUG 2 7 1991

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3:2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~#496~~ 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: ~~580.0~~ FT. 579.4 FT.	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	10209 1554 07-09	28 24 9	18	VERY DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET 106.3	SP	N/A	HNU = 0 α = 0-5CPM γ = 20-30CPM
107 108 109 110				STIFF, GREY (10YR4/1) CLAY, ORGANIC FRAGMENTS, TRACE SILT, DAMP	CL	1.5	
111	10210 0820 07-10	5 17 22	14	VERY STIFF, GREY (10YR4/1) CLAY TRACE SILT, DAMP	CL	3.0	HNU = 0 α = 0-5CPM γ = 20-30CPM
112 113 114				114.0			
116	10211 1005 07-10	5 14 21	10	DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5CPM γ = 20-30CPM
117 118 119							

NOTES: WATER LEVEL 07-10-88 @ 0812 : 58.6FT

001020

402-11-86

FERNALD RI/FS REVIEWED BY QA KG DATE AUG 27 1991 5709

	Initial	Date
1st Key In	JSF	9/9/88
2nd Key In		9/9/89
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~4096~~ 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: ~~580.0~~ FT 579.4 FT.	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	10212 1445 07-10	10 21 47	12	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
122							
123							
124							
125							
126	10213 1650 07-12	11 19 24	14	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
127							
128							
129							
130	10214 0810 07-13	9 10 14	14	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, SOME SILT, WET 131.3	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
131				STIFF, GREY-BROWN (10YR 4/1) SILTY CLAY, LAMINATED, DK GREY ORGANIC STREAKS, VARVES, DAMP	CL	1.5	
132							
133				BASE OF "BLUE CLAY" 133.8			
134				MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET 134.1	SP	N/A	
				MEDIUM DENSE, YELLOW-BROWN (10YR 4/2) POORLY GRADED FINE SAND, WET 134.5			

NOTES:

SAMPLES WERE COLLECTED AND ARCHIVED FOR FUTURE REFERENCE OVER THE INTERVAL 131.5 FT. TO 134.5 FT. NO SAMPLE NUMBERS WERE ASSIGNED, HOWEVER, THE BORING NUMBER, SAMPLE INTERVAL LOCATION, DATE, AND TIME WERE RECORDED. PHOTOGRAPHS OF THE INTERVAL 133.0 FT TO 134.5 FT. WERE TAKEN.

001021

402-11-86

FERNALD RI/FS

REVIEWED BY QA 66 DATE AUG 2 7 1991

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: 580.0 FT. 579.4 FT.	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SWIARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	10215 1350 07-13	9 28 31	18	VERY DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET 136.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
137				VERY DENSE, YELLOW-BROWN (10YR4/2) POORLY GRADED FINE SAND, WET	SP	N/A	
138							
139							
140							
141	10216 1430 07-13	6 11 23	18	MEDIUM DENSE, GREY-BROWN (10YR4/2) POORLY GRADED SAND, TRACE FINE GRAVEL, WET 141.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
142				MEDIUM DENSE, YELLOW-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	
143							
144							
145							
146	10217 1625 07-13	15 18 22	10	DENSE, GREY-BROWN (10YR4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
147							
148							
149							

NOTES:

001022

402-11-86

FERNALD RI/FS REVIEWED BY QA 116 DATE AUG 27 1991 5709

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 11 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	10218 1705 07-13	22 21 15	10	DENSE, GREY-BROWN, (10YR 4/2) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
152							
153							
154							
155	10219 0921 07-14	60+/5"	5	VERY DENSE, GREY-BROWN (10YR 4/2) WELL GRADED GRAVEL-SAND-SILT MIXTURE, WET	GM	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
156							
157							
158							
159							
160	10220 1002 07-14	6 8 6	12	MEDIUM DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
161							
162							
163							
164							

NOTES:

001023

402-11-86

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 2 7 1991

DM 2/6/89

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In	[illegible]	9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~#498~~ 4096 MLS 10-07-88	COORDINATES: N476552.3 E1377207.31	DATE: 07-26-88
ELEVATION: MLS 10-07-88 580.0 ~~FT.~~ 579.4 FT.	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 12 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
166	10221 1010 07-19	12 15 13	4	MEDIUM DENSE, GREY-BROWN (10YR4/2) POORLY GRADED FINE SAND, TRACE FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
167							
168							
169							
170	10222 1052 07-19	6 11 21	14	DENSE, YELLOW-BROWN (10YR4/3) POORLY GRADED FINE SAND, SOME FINE GRAVEL, WET 171.3	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
171							
172				VERY SOFT, YELLOW-BROWN (10YR4/3) SILTY CLAY, TRACE SAND, WET	CL	0.25	
173							
174							
175	10223 1414 07-19	9 24 27	16	VERY DENSE, YELLOW-BROWN (10YR4/3) POORLY GRADED SAND, SOME FINE GRAVEL, WET			HNU = 0 α = 0-5 CPM γ = 20-30 CPM
176							
177							
178							
179							

NOTES:

001024

402-11-86

FERNALD RI/FS REVIEWED BY QA DATE AUG 2 7 1991 5709

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In		9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: # 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-89
ELEVATION: 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 13 OF 14

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
181	10224 1618 07-19	18 31 30	10	VERY DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
182							
183							
184							
185	10225 1705 07-19	15 16 21	10	DENSE, GREY-BROWN (10YR 4/2) POORLY GRADED SAND, SOME FINE GRAVEL, WET. 186.0	SP	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
186				DENSE, GREY-BROWN (10YR 4/2), SILTY SAND, SAND-SILT MIXTURE, WET	SM	N/A	
187							
188							
189							
190	10226 0745 07-21	50/4	4	VERY DENSE, YELLOW-BROWN (2.5Y 5/4) COARSE GRAVEL (~1.0-1.5 IN) - SAND - SILT MIXTURE, WET	GM	N/A	HNU = 0 α = 0-5 CPM γ = 20-30 CPM
191							
192							
193							
194							

NOTES:

001025

402-11-86

FERNALD RI/FS

REVIEWED BY QA _____ DATE AUG 2 7 1991

	Initial	Date
1st Key In	TJF	9/9/89
2nd Key In		9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: #496 4096	COORDINATES: N 476552.3 E 1377207.31	DATE: 07-26-88
ELEVATION: 580.9 FT. 579.4 FT	GWL: Depth Date/Time	DATE STARTED: 06-21-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 07-26-88
DRILLING METHODS: CABLE TOOL		PAGE 14 OF 14

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
196				NO RECOVERY OF SAMPLE FROM INTERVAL 195.0 FT TO 196.5 FT ON 2 ATTEMPTS			
197							
198				BEDROCK PENETRATED @ 198.5 FT			
199	10227 1500 07-21	50+/3	3	U. DEVIL, GREY (10 YR 5/1) SHALEY LIMESTONE INTERVAL SAMPLED: 198.5 FT TO 198.8 FT.			HNU=0 α = 0.5 CPM γ = 25-30 CPM
200							
201							
202							
203							
204							
205							
206							
207							
208							
209							

NOTES: MATERIALS USED IN WELL COMPLETION/INSTALLATION: 2 - 80LB. SACKS, 4-30 SAND
7 - 100 LB. SACKS 10-20 SAND
VOLCLAY GROUT:

001026

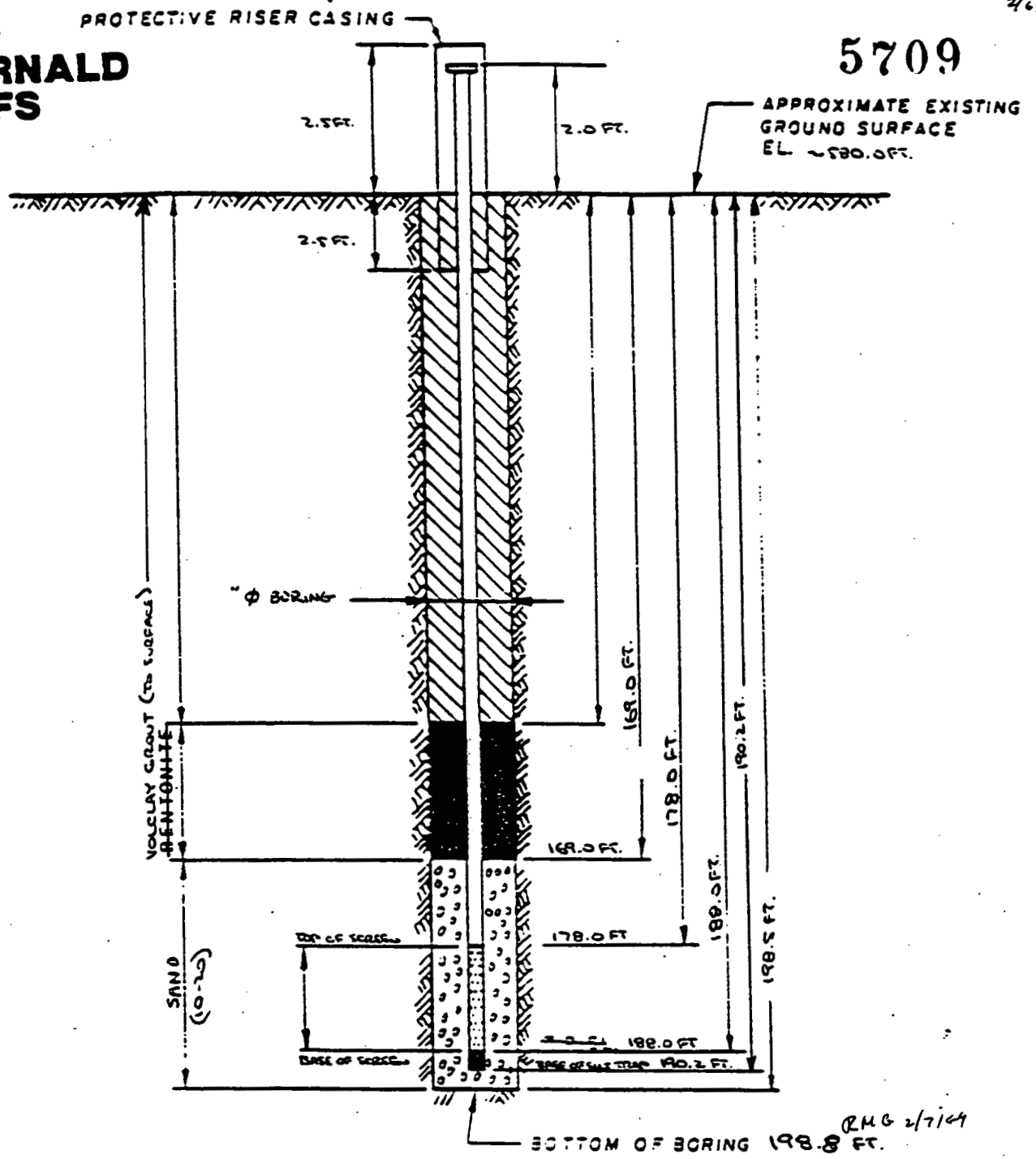
402-11-86

REVIEWED BY QA 166 DATE AUG 2 7 1991

BVA 2/5/89 BORING #496 4096 RLK 2/6/89

FERNALD RI/FS

5709



RMG 2/7/89

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN 10 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED:

4-30 SAND (80 LB SACKS): 2 SACKS @ BASE OF HOLE TO 190.0 FT.
10-20 SAND (100 LB SACKS): 7 SACKS TO 169.0 FT.
VOLCLAY GROUT (50 LB BAGS): 34 BAGS TO SURFACE
BENTONITE PELLETS: 1 BUCKET AS PACKING AND SEALING MATERIAL AROUND PROTECTIVE CASING
WATER ADDED TO HOLE DURING DRILLING: 1200 GALLONS

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

BORING #496 07-26-88
4096

MLS 10-07-88

001027

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 27 1991

	Initial	Date
1st Rev In	[illegible]	11/13/88
2nd Rev In		
[illegible]		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
FIELD ENG./GEO. M. SLUSARSKI DATE 07-26-88
PROJECT NO. 602 7.2
CHECKED BY R Galbraith DATE 2/7/89
BORING NO. 4096 MLS 10-01-88
PIEZOMETER NO. 4096 MLS 10-07-88
DATE OF INSTALLATION 07-22-88 TO 07-26-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 198.8 FT.
FLUID _____ FROM _____ TO _____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT. TO 120.0 FT.
SIZE 8" ID FROM 120.0 FT TO 200.0 FT.

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" I.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN
TOTAL PERFORATED AREA 10.0 FT.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS 10 FT, 2 FT.
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0		581.4	
GROUND SURFACE	0.0		579.4	
BOTTOM OF PROTECTIVE PIPE	2.5 FT		576.9	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0 FT.	BOTTOM 169.0 FT.	TOP 579.9	BOTTOM 410.9
BENTONITE	TOP NA MLS 10-07-88	BOTTOM NA MLS 10-07-88	TOP NA	BOTTOM NA
SAND (10-20)	TOP 169.0 FT.	BOTTOM 190.0 FT.	TOP 410.9	BOTTOM 389.4
GRAVEL (4-30)	TOP 190.0 FT.	BOTTOM 192.0 FT.	TOP 389.4	BOTTOM 387.4
PERFORATED SECTION	TOP 178.0 FT.	BOTTOM 188.0 FT.	TOP 401.4	BOTTOM 391.4
PIEZOMETER TIP	190.2 FT.		389.2	
BOTTOM OF BOREHOLE	198.8 FT. RAW 2/7/89		380.6	
SWL AFTER INSTALLATION				

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE SECTION OF BOREHOLE BELOW 192.0 FT WAS ALLOWED TO COLLAPSE ON ITSELF. ONE BUCKET OF BENTONITE PELLETS WERE POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE.

FERNALD RI/FS

5709 DH 2/6/89

	Date		
	Initial		
	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~297~~ 2097 MLS 8-02-88	COORDINATES: N 480283.63 E 1386936.00	DATE: 8-10-88
ELEVATION: 537.04 TOW	GWL: Depth — Date/Time —	DATE STARTED: 8-10-88
ENGINEER/GEOLOGIST: B. Dunning/L. Wille	Depth — Date/Time —	DATE COMPLETED: 8-17-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 1

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10				See visual classification of soils for Boring ~~#97~~ for description of samples over intervals 0-40 ft 4097 RMG 2/7/89			
20							
30							
40				40.0 Bottom of boring (Because of heaving sand boring was overdrilled to this ~~pad~~ depth)			
50							

NOTES:
Contractor Pennsylvania Drilling
Rig Speedstar 72
Driller Henry Dykes
Helper Tim Farris

Background HNu = 0ppm
α = 0-2cpm
γβ = 40-80cpm
LEL/O2 = 0ppm LEL
20.1 %O2

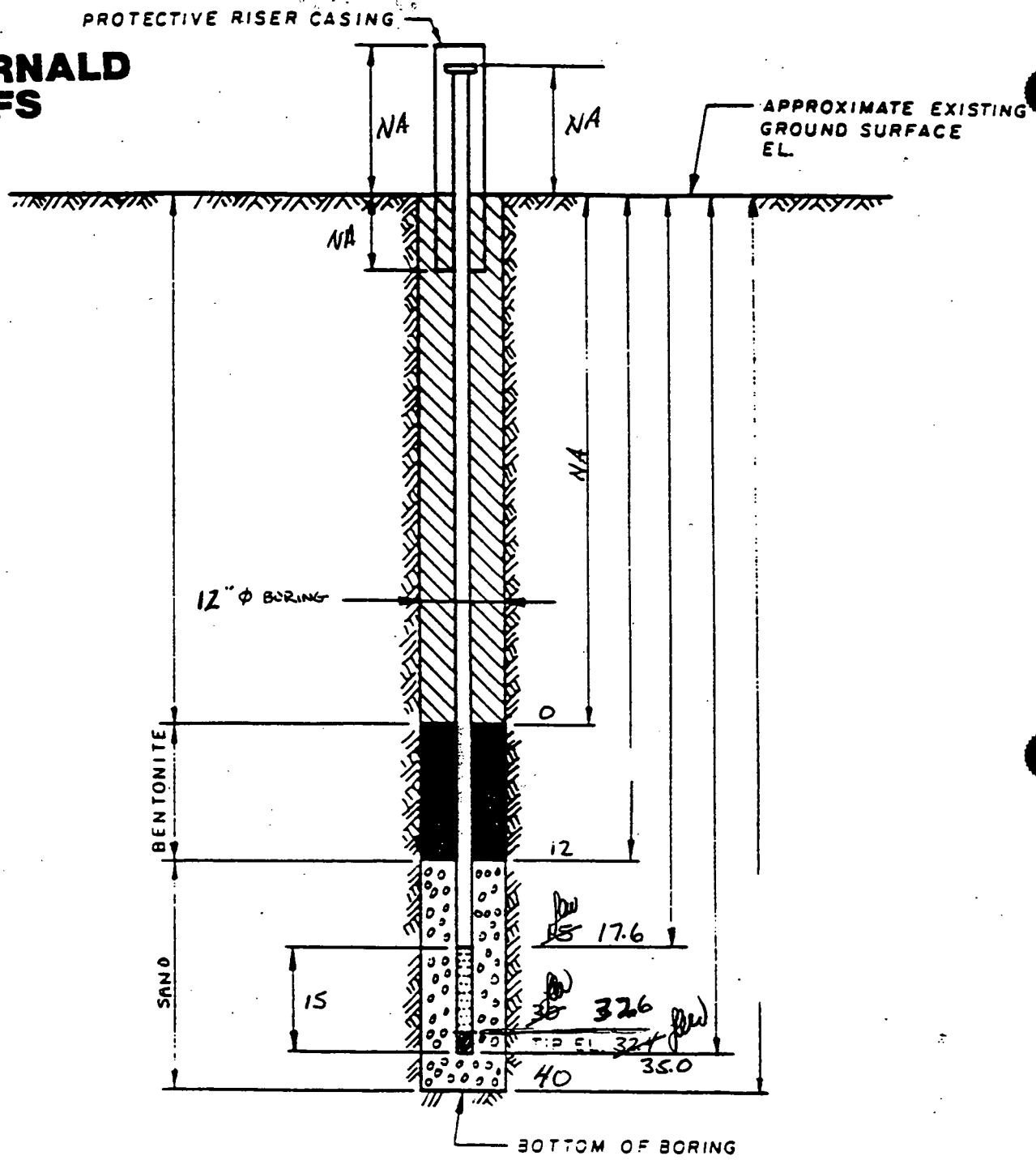
Water added to borehole - ~~4~~ 800 gallons

001029

402-11-86

DH 2/5/89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 297

PREPARED FOR 2097

001030

bages of sand
buckets of bentonite pellets

FERNALD RI/FS

5709

DA 2/6/89

Date	11/13/89		
Initial	DAC		
	1st Key In	2nd Key In	3rd Key In (Verification)

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. B. Downing/L. Wille DATE 8-19-88
PROJECT NO. 602.3.2 CHECKED BY R.M. Goldbraith DATE 2/7/89
BORING NO. ~~2097~~ 2097 MW 10-01-88
PIEZOMETER NO. ~~2097~~ 2097 MW 10-01-88 DATE OF INSTALLATION 8-19-88

BOREHOLE DRILLING

DRILLING METHOD Cable tool	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED: ID
FLUID Water FROM 0 TO 40	SIZE 10" FROM 0 TO 40
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE Monitor Well SMK 2/7/89	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 I.D. 4 in
SLOTS ☐ HOLES ☐ SCREEN ☑	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD thread couple flush
TOTAL PERFORATED AREA 15 ft	

ROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA	OTHER PROTECTION
PROTECTIVE PIPE O.D. NA	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION (ft)	
TOP OF RISER PIPE	NA		537.04	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP NA	BOTTOM	TOP	BOTTOM
BENTONITE	TOP ~~0~~ 0.5	BOTTOM 12	TOP	BOTTOM
SAND	TOP 12	BOTTOM ~~35~~ 40	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION 15ft	TOP ~~15~~ 17.6	BOTTOM ~~30~~ 32.5	TOP	BOTTOM
PIEZOMETER TIP	~~32.4~~ 35.0 ~~32.6~~			
BOTTOM OF BOREHOLE	40			
GWL AFTER INSTALLATION				

S THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
AS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

001031

REMARKS Ground flush protective casings

FERNALD RI/FS

DA 2/5/89

	Date	
	Initial	
	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6020309	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B97~~ 3097 MLS 10-07-88	COORDINATES:	DATE: 08 07 88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 08 07 88
ENGINEER/GEOLOGIST: M. Schwartz	Depth Date/Time	DATE COMPLETED: 08 09 88
DRILLING METHODS: Cable tool		PAGE OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				see log of ~~B497~~ 4097 MLS 10-07-88 for lithology & stratigraphy			
10							
20							
30							
40							
50							

NOTES:
Drill Contractor: Penn Drill
Driller: Harry Sykes
Helper: Tim Harris
Water used: 700 gallons

001032

402-11-86

FERNALD RI/FS

5709

Date		
Initial		
1st Key In	2nd Key In	Hard Copy

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B397~~ 3097 MLS 10-07-88	COORDINATES:	DATE: 08 08 88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 08 07 88
ENGINEER/GEOLOGIST: M Schwartz	Depth Date/Time	DATE COMPLETED: 08 08 88
DRILLING METHODS: Cable tool		PAGE 2 OF 2

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
70							
80							
90							
100	080888 1700	NA	NA	#10266 Shelby tube			
				end of boring			
110							

NOTES:

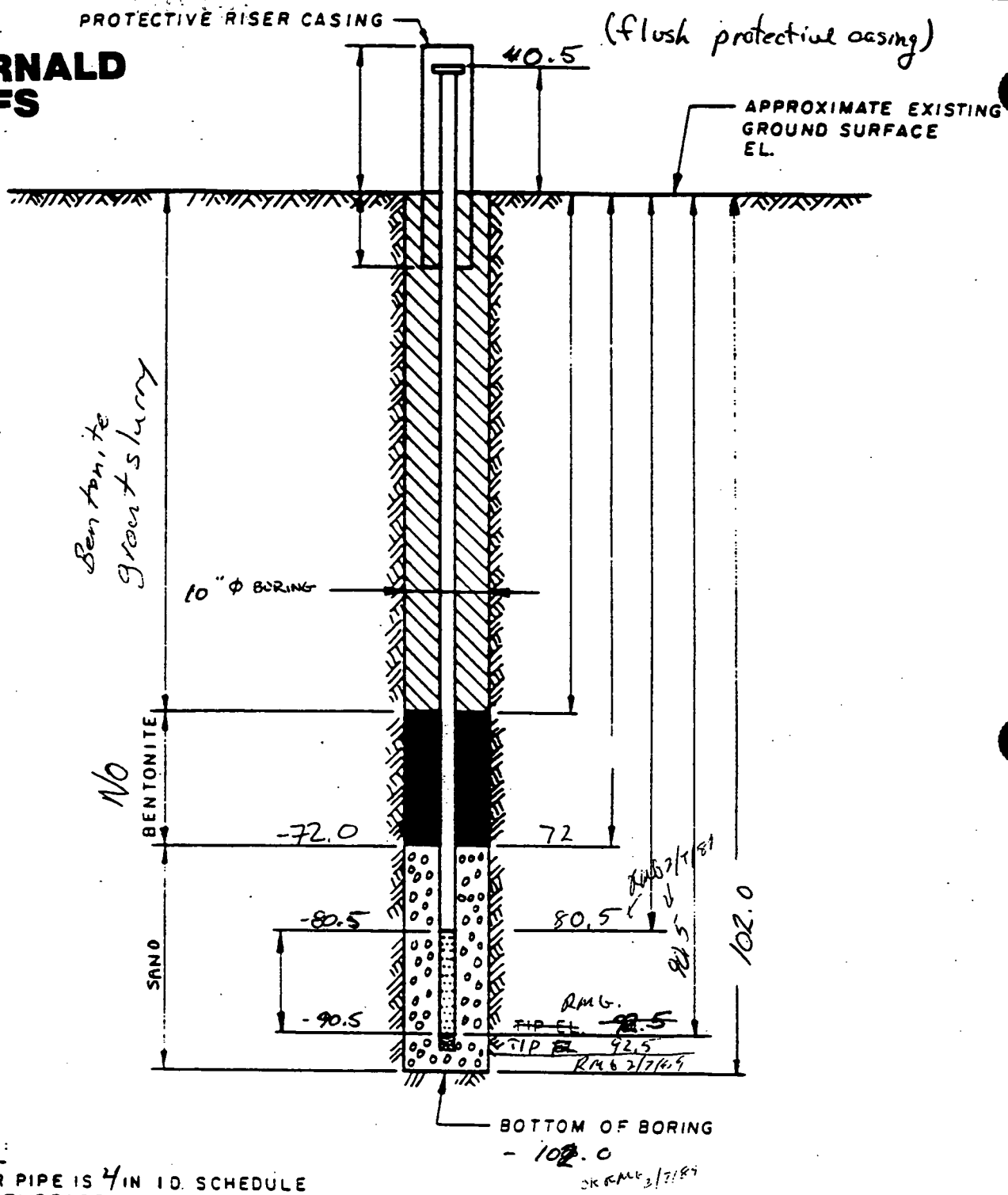
clay encountered at 99ft

001033

402-11-86

BH 2/15/89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 3097

PREPARED FOR

001034

FERNALD RI/FS

AM 2/5/89

5709

Date	11/13/8		
Initial	DAC		
	1st Key In	2nd Key In	Hard Copy Verification

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Schwartz DATE 081088
PROJECT NO. 1002 03 02 CHECKED BY _____ DATE _____
BORING NO. ~~B397~~ 3097 MLS 10-07-88
PIEZOMETER NO. ~~MW 397~~ 3097 MLS 10-01-88 DATE OF INSTALLATION 080988 081088

BOREHOLE DRILLING

DRILLING METHOD Cable tool
DRILLING FLUID (S) USED: MLS 10-01-88
FLUID Water FROM 0 TO ~~100~~ 102.5
FLUID _____ FROM _____ TO _____

TYPE OF BIT flathead hammer
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 100
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE monitoring well
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010
TOTAL PERFORATED AREA 10ft

RISER PIPE MATERIAL 316 stainless
RISER PIPE DIAMETERS:
O.D. 4 2/5 RMG 2/7/89 I.D. 4"
LENGTH OF PIPE SECTIONS 10ft
JOINING METHOD thread & couple

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE O.D. 10 3/4 in
OTHER PROTECTION LOCKING CAP MLS 10-07-88

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	~~-0.5~~ N/A RMG 2/7/89			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A RMG 2/7/89			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP -2.0	BOTTOM -72.0	TOP	BOTTOM
BENTONITE	TOP ~~N/A~~	BOTTOM ~~N/A~~	TOP	BOTTOM
SAND	TOP ~~N/A~~	BOTTOM ~~N/A~~	TOP	BOTTOM
GRAVEL	TOP -72.0	BOTTOM 100	TOP	BOTTOM
PERFORATED SECTION	TOP -80.5	BOTTOM -90.5	TOP	BOTTOM
PIEZOMETER TIP	MLS ~~-92~~ -92.5			
BOTTOM OF BOREHOLE	-102.0 MLS			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

001035

FERNALD RI/FS

REVIEWED BY QA DATE AUG 2 7 1991

Dt 2/5/89

	Initial	Date
1st Key In	TS	9/7/88
2nd Key In		9/19/93
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 607 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B497 4097	COORDINATES: 480297.99 1386949.96	DATE: 07 25 88
ELEVATION: 536.95 TOW	GWL: Depth — Date/Time —	DATE STARTED: 07 25 88
ENGINEER/GEOLOGIST: Schwartz	Depth — Date/Time —	DATE COMPLETED: 08 03 88
DRILLING METHODS: Cable tool		PAGE 1 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	072588 1100 10053	5 6 7	6	stiff brown (10YR 3/2) topsoil clayey silt, dry	ml	1.5	HNu = 0 ppm γB = 20 cpm α = NA
2	072588 1105 10054	10 13 16	6	stiff brown (10YR 3/2) clayie silt	ml	1.5	HNu = 0 ppm γB = 20 cpm
3 4	072588 1110 10055	9 11 13	3	very stiff yellow brown (10YR 4/3) silty clay to clayie silt, dry	ml	2.5	HNu = 0 ppm γB = 20 cpm
5 6	072588 1118 10056	11 8 10	15	very stiff yellow brown (10YR 4/3) clayie silt, dry	ml	2.5	HNu = 0 ppm γB = 20 cpm
7	072588 1124 10057	7 9 12	15	stiff dark grey brown (10YR 4/2) silty clay, dry	cl	1.5	HNu = 0 ppm γB = 20 cpm
8 9	072588 1130 10058	7 10 10	12	soft ~~stiff~~ dark grey brown (10YR 4/2) silty clay, moist	cl	<1	HNu = 0 ppm γB = 20 cpm
10	072588 1140 10059	6 6 7	12	soft dark grey brown (10YR 4/2) silty clay, some sand lenses	cl	<1	HNu = 0 ppm γB = 20 cpm
11 12	072588 1150 10060	6 7 20	15	soft dark grey brown silty clay	cl	<1	HNu = 0 ppm γB = 20 cpm
				soft dark brown clayie sand (10YR 4/3), moist	SC	<1	
				grey brown sand some clay, gravel, moist	SC	NA	
13 14				001036			

NOTES:

Drilling Contr. : Penn Drill.
Driller : Harry Dykes Jr
Helper : Tim Harris
Rig : Speed star
Water used : 700 gallons

- Color follow Munsell color charts
- Blows on split spoon follow ASTM standard

Background :
HNu = 0 ppm
γB = 20 cpm
α = No instrument

FERNALD RI/FS

REVIEWED BY QA ____ DATE AUG 27 1991

D# 21589

	Initial	Date
1st Key In		
2nd Key In		8/13
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B497 4097	COORDINATES: see pl	DATE: 07 25 88
ELEVATION: see pl	GWL: Depth — Date/Time	DATE STARTED: 07 25 88
ENGINEER/GEOLOGIST: Schwartz	Depth — Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable tool		PAGE 2 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	072588 1600 10061	28 50 60	12	very dense sandy gravel, brown (10 YR 5/3) moist	gw	NA	HNu = 0ppm γB = 20 cpm
17							
18							
19							
20	072688 0800 10062	23 26 30	12	very dense brown sandy gravel, (10YR 5/3), moist	gw	NA	HNu=0ppm γB = 40-60cpm
21							
22	10063	27 27 31	12	very dense brown (10 YR 5/3) sandy gravel, moist	gw	NA	HNu = 0ppm γB = 40-60cpm
23				very dense brown (10YR 5/3) sandy gravel, wet	gw	NA	HNu = 0ppm γB = 40-60cpm
24			12				
25	072688 0915 10064	87 90	12	very dense brown (10YR 5/3) sandy gravel, wet	gw	NA	HNu = 0 ppm γB = 40-60 cpm
26							
27							
28							
29							

Composite sample → 10 composite sample

NOTES:

001037

Background:
HNu = 0 ppm
γB = 20-60 cpm (RG)
α = No instrument

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 2 7 1991

DA 2/5/89

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In	[illegible]	9/15
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: BA97 4097 MLS 10-07-88	COORDINATES: see pl	DATE: 07 26 88
ELEVATION: see pl	GWL: Depth — Date/Time —	DATE STARTED:
ENGINEER/GEOLOGIST: Schwartz	Depth — Date/Time —	DATE COMPLETED:
DRILLING METHODS: Cable tool		PAGE 3 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	072688 1105 10065	26 39 53	6	very dense brown (10YR 5/3) sandy gravel, wet	gw	NA	HNu = 0ppm γβ = 100-120cpm (BG)
32							
33							
34							
35	072688 1150 10066	32 36 43	12	very dense brown (10YR 5/3) to yellow brown (10YR 5/4) sandy gravel, wet	gw	NA	HNu = 0ppm γβ = 100-120cpm (BG)
36							
37							
38							
39							
40	072688 1400 10067	10 11 9	6	med. dense gravelly sand grey brown (10YR 4/2), wet	sw	NA	HNu = 0 ppm γβ = 100-120cpm (BG)
41							
42							
43							
44							

NOTES:

Background: α = no instrument
HNu = 0ppm
γβ = 100-120 cpm

001038

402-11-86

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE AUG 2 7 1991

BA 2/5/89

	Initial	Date
1st Key In	TSF	9/9/88
2nd Key In	[illegible]	9/13
Hard Copy Verification		

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: FMPC / RI-FS	
BORING NUMBER: ~~B497~~ 4097 MLS 10-07-88	COORDINATES: see p1	DATE: 07 27 88
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 07 25 88
ENGINEER/GEOLOGIST: Schwartz	Depth — Date/Time —	DATE COMPLETED:
DRILLING METHODS: Cable tool		PAGE 4 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	072688 1500 10068	15 18 24	12	dense grey brown (10YR 4/2) sand, ~~trace~~ ~~some~~ gravel, wet	SP	NA	HNu = 0ppm γB = BG
47							
48							
49							
50	072688 1540 10069	5 6 7	3	med dense grey brown (10YR 4/2) sand, wet	SP	NA	HNu = 0ppm γB = BG
51							
52							
53							
54							
55	072788 0830 10245	15 18 23	12	med dense grey brown (10YR 4/2) sand, tr. gravel, wet	SP	NA	HNu = 0ppm γB = 20-40 cpm (BG)
56							
57							
58							
59							

NOTES:

001039

Background:
γ = no instrument
HNu = 0 ppm
γB = (BG)

402-11-86

FERNALD RI/FS REVIEWED BY QA [illegible] DATE AUG 2 7 1992

	Initial	Date
1st Key In	mb	9/12/89
2nd Key In	[illegible]	9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: B497 4097 MLS 10-01-89	COORDINATES: see p 1	DATE: 07 27 88
ELEVATION: see p 1	GWL: Depth — Date/Time —	DATE STARTED:
ENGINEER/GEOLOGIST: Schwartz	Depth — Date/Time —	DATE COMPLETED:
DRILLING METHODS: Cable tool		PAGE 5 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	072788 0910 10246	18 13 11	12	med dense grey brown (10YR 4/2) sand, wet	SP	NA	HNu = 0ppm γB = 20-40cpm (BG)
62							
63							
64							
65	072788 1100 10247	30 65 50	10	very dense grey brown (10YR 4/2) sand, some gravel, tr. clay, wet	SW	NA	HNu = 0ppm γB = 60-80 cpm (BG) last blow count is for 2 in
66							
67							
68							
69							
70	072788 1150 10248	5 4 3	12	loose dark grey brown (2.5Y 4/2) sand, some gravel, wet	SW	NA	HNu = 0 ppm γB = 40 cpm (BG)
71							
72							
73							
74							

NOTES:

001040

Background:
HNu = 0ppm
γB = (BG)
= no instrument

402-11-86

FERNALD RI/FS REVIEWED BY QA [illegible] DATE AUG 27 1991

DA 2/5/89

5709

	Initial	Date
1st Key In	MB	9/12/88
2nd Key In	[illegible]	9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~8497~~ 4097 MLS 10-07-88	COORDINATES: see p1	DATE: 07 27 88
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 07 25 88
ENGINEER/GEOLOGIST: Schwartz	Depth — Date/Time —	DATE COMPLETED:
DRILLING METHODS: Cable tool		PAGE 6 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	072788 A05 10249	38 36 50	12	very dense dark grey (5Y 4/1) sand, some gravel, wet	SW	NA	HNu = 0 γ = 40-60 (BG)
77							
78							
79							
80	072788 1500 10250	5 6 6	9	loose dark grey (5Y 4/1) sand, some gravel, wet	SW	NA	HNu = 0 γ = 40-60 cpm (BG)
81							
82							
83							
84							
85	072788 0730 10251	18 29 34	~~16~~ 12 ~~29~~ ~~35~~	very dense dark grey (5Y 4/1) sand, some gravel, wet	SW	NA	HNu = 0 ppm γ = 20-40 cpm (BG)
86							
87							
88							
89							

NOTES:

001041

402-11-86

FERNALD RI/FS

REVIEWED BY QA [signature] DATE AUG 2 7 1991

DA 2/4/89

	Initial	Date
1st Key In	MB	9/14/88
2nd Key In	[signature]	9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6007 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~5497~~ 4097 MLS 10-01-88	COORDINATES: see p 1	DATE: 07 28 88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED:
ENGINEER/GEOLOGIST: Schwartz	Depth – Date/Time –	DATE COMPLETED:
DRILLING METHODS: Cable tool		PAGE 7 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	072888 0820 10252	7 6 7	9	loose dark grey (5Y 4/1) sand, some gravel, wet	SW	NA	HNu = 0ppm γB = 20-40 cpm (BG)
92							
93							
94							
95	072888 0950 10253	22 45 56	6	very dense dark grey (5Y 4/1) sand, some gravel, wet	SW	NA	HNu = 0ppm γB = 20-40cpm (BG)
96							
97							appeared to hit clay at 97 ft first cuttings were varved with trace to some silt.
98							
99							
100	072888 1150 10254	16 16 21		dense blue gray clay very plastic	ch-cl	1.5-2.5 ##	HNu = 0ppm γB = (BG)
101							
102							extremely clean clay becoming more plastic toward bottom of unit
103							
104							

NOTES:

001042

402-11-86

FERNALD RI/FS REVIEWED BY QA KO DATE AUG 27 1991

DK 2/5/89

5709

	Initial	Date
1st Key In	MB	9/11/18
2nd Key In	[illegible]	9/13
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~B497~~ 4097 MLS 10-01-98	COORDINATES: see p1	DATE: 08 02 88
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED:
ENGINEER/GEOLOGIST: Schwartz	Depth — Date/Time —	DATE COMPLETED:
DRILLING METHODS: Cable tool		PAGE 8 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	080288 1005 10255	7 12 16	18	clean bluish gray clay, highly plastic	ch	<1	HNu = 0 ppm γB = 40-60 cpm (BG)
107							apparent end of clay
108							
109							
110	080288 1045 10256	7 8 9	3	Med. dense gray sandy gravel, wet	gp	NA	HNu = 0 ppm γB = 40-60 (BG)
111							
112							
113							
114							
115	080288 1325 10257	100 110 —	12	very dense grey (10YR 5/1) sandy med. to coarse gravel, wet	gw	NA	HNu = 0 ppm γB = 60-100 cpm (BG)
116							
117							
118							
119							

NOTES:

0010

water level measured @ 0900 = 23.5 ft

Background:
HNu = 0 ppm
γB = (BG)
— no instrument

FERNALD RI/FS

REVIEWED BY QA [signature] DATE AUG 2 7 1991

2/5/89

1st Key In MB 8/14/8
2nd Key In [signature] 9/13
Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 03 02	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: ~~8497~~ 4097 MW1004S00	COORDINATES: see p1	DATE: 08 02 88	
ELEVATION: See p1	GWL: Depth – Date/Time –	DATE STARTED:	
ENGINEER/GEOLOGIST: Schwartz	Depth – Date/Time –	DATE COMPLETED:	
DRILLING METHODS: Cable tool		PAGE 9 OF 10	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	C80288 1430 10258	12 12 10	6	med. dense grey brown fine to med. sand, wet ~~2.5Y~~ (2.5Y 5/0)	Sp	NA	HNu = 0 ppm γB = 60-100 cpm (BG) 2 trips for sample
122							
123							
124							
125							
126	080288 1530 10259	7 7 9	18	med dense to loose olive brown med sand, tr gravel, wet ~~(2.5Y 4/4)~~ (2.5Y 4/4)	Sp	NA	HNu = 0 ppm γB = 60-100 cpm (BG)
127							
128							
129							
130							
131	080288 1630 10260	24 29 50	12	dense brown (10YR 5/3) med. sand, tr. gravel, wet	Sp	NA	HNu = 0 ppm γB = 60-100 cpm (BG)
132							
133							
134							

NOTES:

BACKGROUND
HNu = 0 ppm
γB = 60-100 cpm (BG)
α = no instrument

001044

402-11-86

FERNALD RI/FS

REVIEWED BY QA [signature] DATE ~~AUG 2 7 1991~~ 5709 DH 2/6/89

	Initial	Date
1st Key In	MB	2/14/90
2nd Key In	[signature]	9/3
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002 03 02	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~8497~~ 4097 MES 10-07-89	COORDINATES: see p 1	DATE: 08 03 88
ELEVATION: see p 1	GWL: Depth — Date/Time —	DATE STARTED:
ENGINEER/GEOLOGIST: Schwartz	Depth — Date/Time —	DATE COMPLETED: 080388
DRILLING METHODS: Cable tool		PAGE 10 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	080388 0820 10261	30 50 60	15	dense gray brown (2.5Y 5/2) sand, tr. gravel, wet	SW	NA	HNu = 0ppm γB = 20-40cpm (BG)
137							
138							
139							
140	080388 0930 10262	5 7 9	12	loose to med dense yellow brown (10YR 5/6) med. to coarse sand, tr. gravel, wet	SW	NA	HNu = 0ppm γB = 40-60 cpm (BG)
141							
142							
143							
144							
145	080388 1130 10263	35 150 —	6	sandy coarse gravel fragments of limestone	gw	NA	HNu = 0ppm γB = 40-60cpm (BG)
146							
147							
148							
149	~~080388~~ 1430 10264	60	2	shale bedrock			
				end of boring			

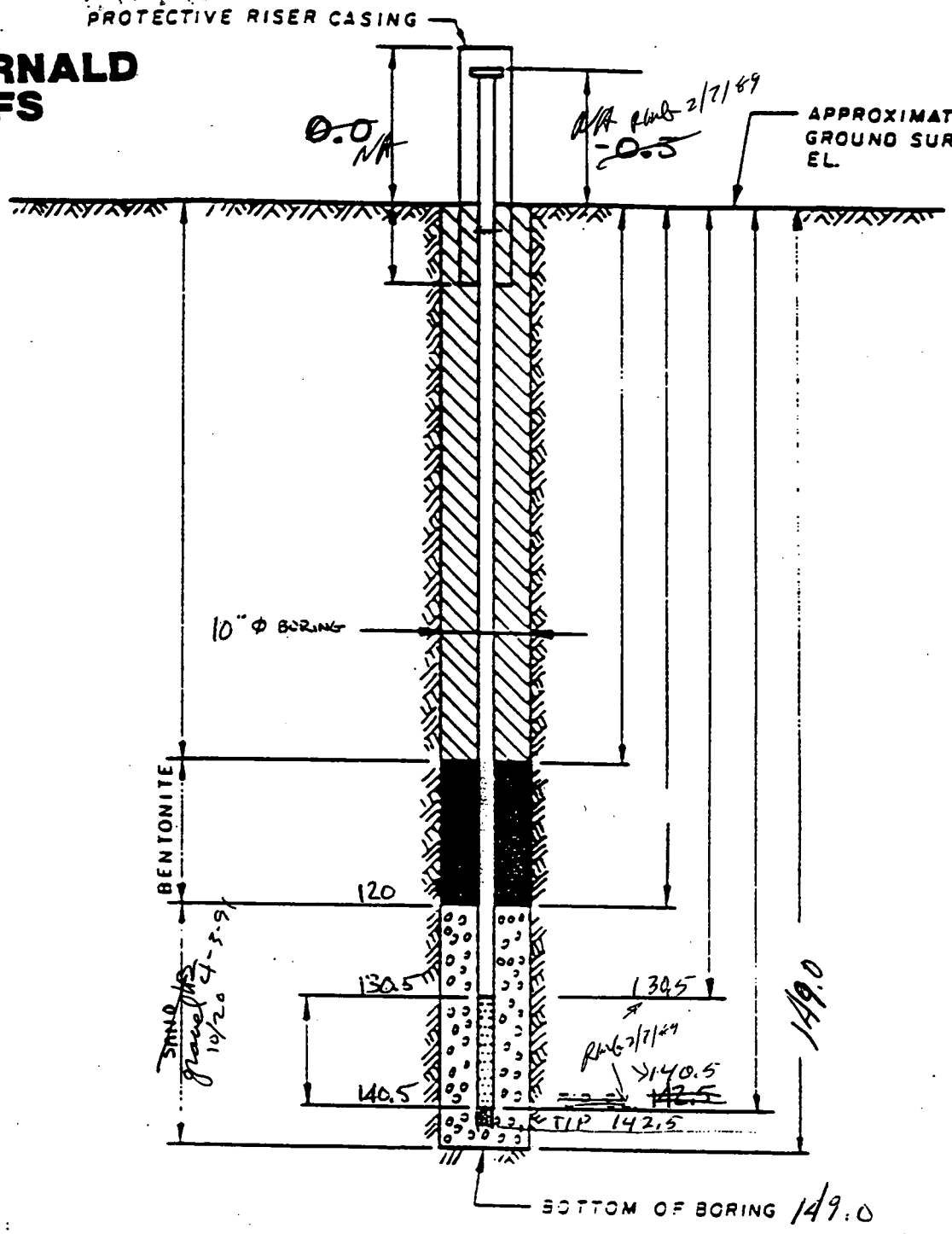
NOTES:

Background: 001045
HNu = 0ppm
γB = BG
— = no instrument

402-11-86

REVIEWED BY QA DATE AUG 2 '1991 M. Schwartz 2/5/89 08 06 88

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 4097

PREPARED FOR

001046

FERNALD RI/FS

REVIEWED BY QA [signature] DATE AUG 2 7 1990

DAH 2/5/89

	Initial	Date
1st Key In	[illegible]	11/13/89
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET 5709

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. Schwartz DATE 08/06/88
PROJECT NO. 602 03 02 CHECKED BY R Gallowaith DATE 2/7/89
BORING NO. ~~497~~ 4097 MLS 10-07-89
PIEZOMETER NO. ~~497~~ 4097 MLS 10-07-89 DATE OF INSTALLATION 8/16/88

BOREHOLE DRILLING

DRILLING METHOD cable tool
DRILLING FLUID (S) USED: water
FLUID 0 FROM 149 TO ____
FLUID ____ FROM ____ TO ____

TYPE OF BIT flat head hammer
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 149
SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL MLS 10-07-89
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010
TOTAL PERFORATED AREA 10ft

RISER PIPE MATERIAL stainless 314
RISER PIPE DIAMETERS: MLS 10-07-89
O.D. 4 3/8 in MLS 10-07-89 I.D. 10" 4.0 in
LENGTH OF PIPE SECTIONS 10ft
JOINING METHOD thread & couple

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 4
PROTECTIVE PIPE O.D. ____

OTHER PROTECTION LOCKING CAP MLS 10-07-89

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (~~ft~~)		ELEVATION (ft)	
TOP OF RISER PIPE	~~-0.5~~ NA RMG 2/7/89			
GROUND SURFACE	0.0		536.95	
BOTTOM OF PROTECTIVE PIPE	~~NO~~ NA RMG 2/7/89			
BOREHOLE FILL MATERIALS:	-2	-9	534.5	527.5
GROUT/SLURRY upper layer	TOP -15	BOTTOM -120	TOP 521.5	BOTTOM 416.5
BENTONITE	TOP -9	BOTTOM -15	TOP 527.5	BOTTOM 521.5
SAND	TOP ——	BOTTOM ——	TOP —	BOTTOM —
GRAVEL	TOP -120	BOTTOM -149	TOP 416.5	BOTTOM 387.5
PERFORATED SECTION	TOP -130.5	BOTTOM -140.5	TOP 406	BOTTOM 396
PIEZOMETER TIP	-142.5		394	
BOTTOM OF BOREHOLE	-149.0		387.5	
GWL AFTER INSTALLATION				

IS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
IS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

001047

REMARKS ____

DLS 3/6/89

	Initial	Date
1st Key In	DAC	9/28/88
2nd Key In	[illegible]	09/28/88
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~298~~ 2098 MLS 10-07-88	COORDINATES: N 483385.79 E 1386326.37	DATE: 09-11-88
ELEVATION: 550.0 FT (547.4 ground)	GWL: Depth Date/Time	DATE STARTED: 09-07-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 09-11-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* SEE VISUAL CLASSIFICATION OF SOILS FOR BORING #398 FOR DESCRIPTION OF SAMPLES			
5							
10	10332 1025 09-08-88			* DUPLICATE/TRIPLICATE SAMPLES COLLECTED OVER INTERVAL 10.5 -12.0 FT @ 1025 ON 09-08-88			
15							
20							
25							

001048

NOTES: CONTRACTOR: PENN DRILL
RIG: BUCYRUS - ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: BOB JOHNSON
WATER LEVEL IN BORING #398: 32.2 FT @ [illegible] 09-[illegible]-88
WATER ADDED TO HOLE: 300 GALLONS

BACKGROUND LEVELS: α = 0.5 CPM
β = 40-60 CPM
LEL O_2 = 0 PPM LEL
20.6% O_2

DIA 2/6/89

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: ~~2098~~ 2098	COORDINATES: See P1	DATE: 09-11-88
ELEVATION: 550.0 FT. See P1	GWL: Depth Date/Time	DATE STARTED: 09-07-88
ENGINEER/GEOLOGIST: M. SWIONSKI	Depth Date/Time	DATE COMPLETED: 09-11-88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
35							
40							
45				BOTTOM OF BORING @ 46.0 FT. 09-09-88			
50							

NOTES:

MATERIALS USED IN WELL INSTALLATION:

10 20 SAND (100 LB SACKS): 13 SACKS

VOLCLAY GROUT (50 LB BAGS): 6 BAGS

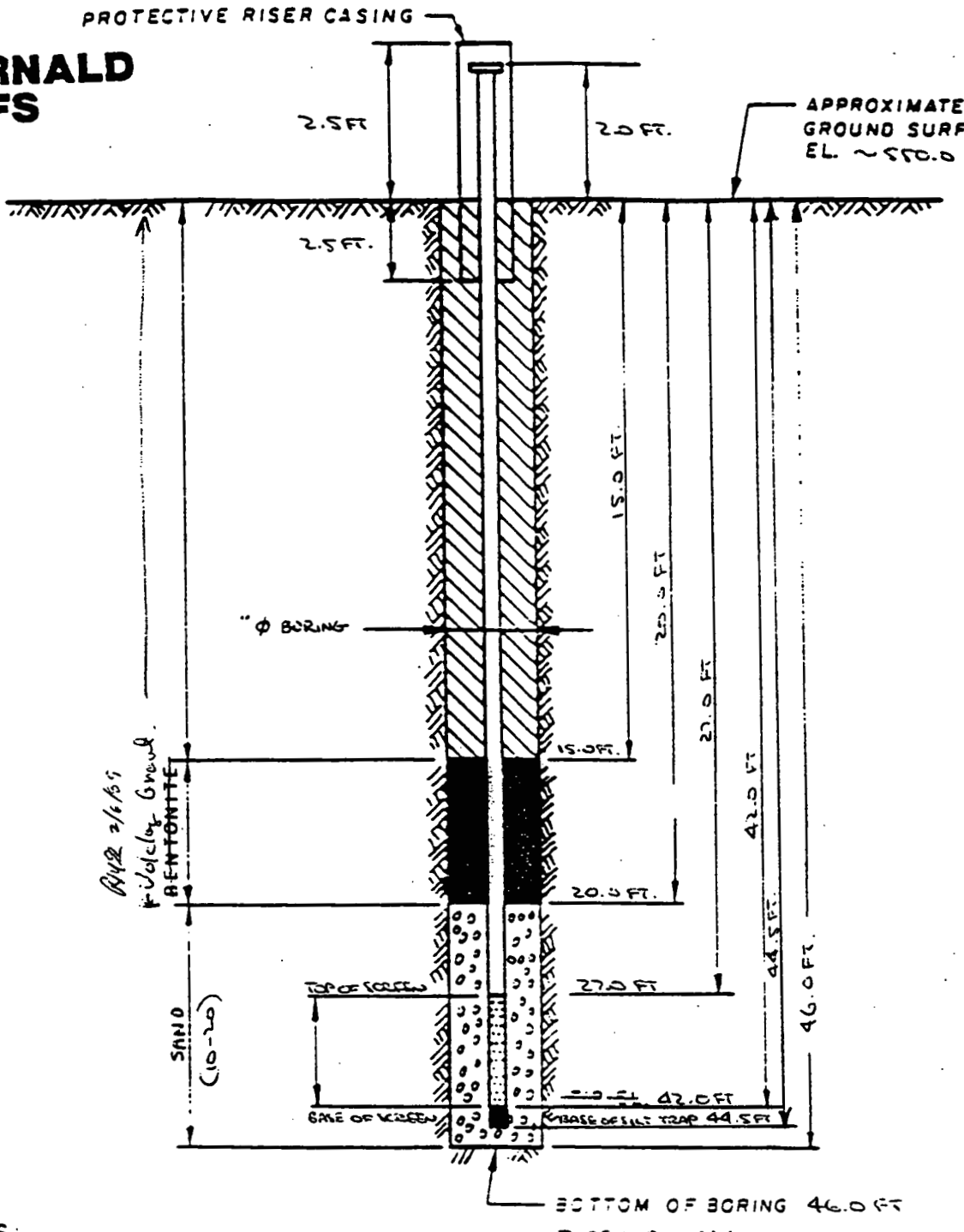
BENTONITE PELLETS: 5 BUCKETS

001049

DH 2/5/89

BORING # ~~298~~ 2098 MWS 2/6/89

FERNALD RI/FS



BOREHOLE WAS ALLOWED TO COLLAPSE OVERNIGHT FROM 46.0 FT TO 44.5 FT.

NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON 32.2 FT IN BORING #398 ON 08-09-88

MATERIAL USED:

10-20 SAND (100 LB. SACKS): 13 SACKS FROM 44.5 FT TO 20.0 FT

BENTONITE PELLETS: 5 BUCKETS TOTAL, 4 BUCKETS FROM 20.0 FT TO 15.0 FT AND 1 BUCKET AT SURFACE AROUND PROTECTIVE CASING

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

BORING ~~298~~ 2098 09-11-88

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY MWS

001050

DH 2/5/89

FERNALD RI/FS

5709

	Initial	Date
1st Key In	DAC	11/13/89
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 09-11-88
PROJECT NO. 602 32 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~2098~~ 2098 RMG 2/6/89
PIEZOMETER NO. ~~2098~~ 2098 RMG 2/6/89 DATE OF INSTALLATION 09-10-88 TO 09-11-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 46.0 FT
FLUID _____ FROM _____ TO _____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT TO 45.0 FT
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 15.0 FT.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN. I.D. 4.0 IN
LENGTH OF PIPE SECTIONS 2.0 FT. 5.0 FT. 10.0 FT.
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0		549.4	
GROUND SURFACE	0.0		547.4	
BOTTOM OF PROTECTIVE PIPE	2.5		544.9	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (VOLCLAY)	TOP 0.0 FT.	BOTTOM 15.0 FT.	TOP 547.4	BOTTOM 532.4
BENTONITE	TOP 15.0 FT.	BOTTOM 20.0 FT.	TOP 532.4	BOTTOM 527.4
SAND (10-20)	TOP 20.0 FT.	BOTTOM 44.5 FT.	TOP 527.4	BOTTOM 503.4
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION (15.0 FT)	TOP 27.0 FT.	BOTTOM 42.0 FT.	TOP 520.4	BOTTOM 505.4
PIEZOMETER TIP	44.5 FT		502.9	
BOTTOM OF BOREHOLE	46.0 FT.		501.4	
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒ 001051
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE INTERVAL OF BOREHOLE BELOW 44.5 FT WAS ALLOWED TO COLLAPSE ON ITSELF. ONE (1) BUCKET OF BENTONITE PELLETS WAS POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE

FERNALD RI/FS

GM 3/5/89

	Initial	Date
1st Key In	MB	9/20
2nd Key In		9/22
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: (398) 3098 MCS 10-07-88	COORDINATES: N 483386.93 E 1386314.65	DATE: 8/22/88
ELEVATION: 546.8	GWL: Depth 31.45 Date/Time 8-31-88 @ 0940	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth 31.15 Date/Time 9-2-88 @ 1000	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCH)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1 0 2 6 7	2 9 12	18"	STIFF BROWNISH YELLOW CLAY (10 YR, 6/6) DRY	CL	1.5	βγ = 40 c.p.m. Hnu = 0 0835
2	1 0 2 6 8	9 11 11	15"	VERY STIFF YELLOWISH BROWN CLAY (10 YR, 5/6) DRY WITH SOME CARBONATE ALLUVIUM ROCK FRAGMENTS	CL	2.5	βγ = 40 c.p.m. Hnu = 0 0840
3 4	1 0 2 6 9	8 9 11	10"	MEDIUM STIFF YELLOWISH BROWN CLAY (10 YR, 5/6) DRY	CL	1.0	βγ = 40 c.p.m. Hnu = 0 0845
5	1 0 2 7 0	8 8 9	14"	HARD DARK YELLOWISH BROWN CLAY (10 YR, 4/4) DRY	CL	4.5+	βγ = 40 c.p.m. Hnu = 0 0850
6 7	1 0 2 7 1	11 10 13	16"	HARD DARK YELLOWISH BROWN CLAY (10 YR, 4/6) DRY	CL	4.5+	βγ = 40 c.p.m. Hnu = 0 0855
8	1 0 2 7 2	10 12 11	16"	LITHOLOGY AS ABOVE	CL	4.5+	βγ = 40 c.p.m. Hnu = 0 0900
9 10	1 0 2 7 3	8 18 17	18"	HARD DARK YELLOWISH BROWN CLAY (10 YR, 6/4) GRADING DOWNWARD INTO 10' STIFF YELLOW SILTY SAND (10 YR, 7/6) 10'	CL / SM	2.0	βγ = 20 c.p.m. Hnu = 0 1426
11 12	1 0 2 7 4	17 21 43	18"	VERY DENSE YELLOWISH BROWN FINE SAND (10 YR, 5/4) DRY	SM		βγ = 40-60 c.p.m. Hnu = 0 1445
13	1 0 2 7 5	21 50/4"	8"	VERY DENSE YELLOWISH BROWN SAND (10 YR, 5/4) WITH SOME MODERATELY LARGE ROCK FRAGMENTS DRY 13.5'	SM		βγ = 40-60 c.p.m. Hnu = 0 * DETECTED GASEOUS ODOR & FAIRLY STRONG 1450
14 15	1 0 2 7 6	30 23 17	18"	DENSE BROWNISH YELLOW SANDY GRAVEL (10 YR, 6/6) DRY 13.5'	GM		βγ = 40-60 c.p.m. Hnu = 0 1655

NOTES:

1.) BACKGROUND LEVELS FOR 8-22-88 : βγ = 40-60 c.p.m. (BETA-GAMMA)
Hnu = 0

001052

2.) USED APPROXIMATELY 140 GALLONS OF WATER TO DRILL HOLE. 8/22/88

3.) USED A TOTAL OF 300 GALLONS OF WATER TO DRILL HOLE PRIOR TO CONTACTING WATER TABLE.

402-11-86

Dft 2/15/89

	Initial	Date
1st Key In	MB	9/20
2nd Key In	[illegible]	9/20
Hard Copy Verification		

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~398~~ 3098 MLS 10-02-88	COORDINATES: see pl	DATE: 8/23 & 8/24/88
ELEVATION: see pl	GWL: Depth – Date/Time –	DATE STARTED: 8/22/88
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 8/30/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1 0 2 7 7	30 41 50/4	15"	Very Dense, Light Yellowish Brown sandy Gravel (10 YR, 6/4) Poorly Sorted with carbonate Rock Fragment Jamming Spoon Dry	GP		γB = 60 c.p.m. Hnu = 0 1705
17							End Of Day 8-22-88 Begin Day 8-23-88
18							
19							Stop Drilling 8-23-88 Due To Rain Begin Day 8-24-88
20							
21	1 0 2 7 8	30 31 50	18"	Very Dense, Light Yellowish Brown Poorly Sorted sandy Gravel (10 YR, 6/4) Dry	GP		γB = 60 c.p.m. Hnu = 0 0830
22							
23							
24							
25							
26	1 0 2 7 9	21 24 40	18"	Very Dense Dark Yellowish Brown Sandy Gravel Becoming increasingly Sandy with gravel decreasing in size (10 YR, 4/4) Moist	GP		γB = 40 c.p.m. Hnu = 0 0952
27							
28							
29							
30							

NOTES: 1.) Background Levels For 8-23-88 : γB = 40-60 c.p.m. Hnu = 0

2.) Background Levels For 8-24-88 : γB = 70 c.p.m. Hnu = 0

3.) Used Approximately 160 Gallons of Water 8/23 & 8/24/88.

001053

BH 2/5/89

	Initial	Date
1st Key In	MB	9/26
2nd Key In	[illegible]	9/26
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS		
BORING NUMBER: ~~398~~ 3098 MLS 10-07-88	COORDINATES: see p1	DATE: 8/24/88	
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 8/22/88	
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 8/30/88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 8	

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	1 0 3 1 5	13 23 21	14"	Dense, yellowish brown sand with some gravel (10 YR, 5/8). Moist	SP		γB = 60 Hnu = 0 1352
32							
33							
34							
35	1 0 3 1 6	8 13 17	18"+	MEDIUM DENSE, DARK GRAYISH BROWN SAND (10 YR, 4/2) WET	SW		γB = 60 c.p.m Hnu = 0 2 bottles 1457
36							
37							
38							
39							
40	1 0 3 1 7	7 13 16	15"	MEDIUM DENSE, VERY DARK GRAYISH BROWN SAND (10 YR, 3/2) WITH A TRACE OF SOME GRAVEL WET	SW		γB = 60 c.p.m. Hnu = 0 1551
41							
42							
43							
44							
45							

NOTES: BACKGROUND LEVELS 8-24-88 : γB = 60-80 c.p.m. Hnu = 0

001054

DA 2/5/89

	Initial	Date
1st Key In	MB	9/20
2nd Key In	[illegible]	9/20
Hard Copy Verification		

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~398~~ 3098 MCS 10-07-88	COORDINATES: see pl	DATE: 8-24-88 & 8-25-88
ELEVATION: see pl	GWL: Depth 36.3 Date/Time 8-25 @ 0700	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time 8-25 @ 1200	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6" INCHES	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	1 0 3 1 8	5 5 11	18" +	MEDIUM DENSE DARK GRAYISH BROWN SAND (2.5 Y, 4/2) WITH A TRACE OF GRAVEL WET	SW		γB = 50 c.p.m. Hnu = 0 1620
47							
48							
49							End of Day 8-24-88 Start Day 8-25-88
50				DENSE DARK GRAYISH BROWN SAND (2.5Y 4/2)	SW		
51	1 0 3 1 9	8 18 21	18" +	DENSE MULTI-COLORED FINE GRAVEL	GW		γB = 50 c.p.m. Hnu = 0 0855
52				DENSE LIGHT OLIVE BROWN SILTY SAND (2.5 Y, 5/6) WITH TR GRAVEL WET	SM		
53							
54							
55							
56	1 0 3 2 0	13 21 25	14"	DENSE DARK GRAYISH BROWN fine gravel (2.5 Y, 4/2) WELL SORTED WITH LITTLE TO NO FINES WET			γB = 50 c.p.m. Hnu = 0 1045
57							
58							
59							
60							

NOTES: Background Levels for 8-24-88 : γB = 60-80 c.p.m.
Hnu = 0

Background Levels for 8-25-88 : γB = 60-80 c.p.m.
Hnu = 0

001055

	Initial	Date
1st Key In	MR	9/20
2nd Key In		9/27
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI / FS	
BORING NUMBER: ~~3B~~ 3098 MW 10-07-83	COORDINATES: see pl	DATE: 8-29-88
ELEVATION: see pl	GWL: Depth — Date/Time —	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	1 0 3 2 1	3 6 8	8"	MEDIUM DENSE GRAY, GRAYISH BROWN & BROWN FINE GRAVEL (2.5Y, 4/2, N 6/ & 10 YR, 5/3) WET	GW		Hnu = 0 ~~8B~~ = 50 c.p.m. 1120
62							END OF DAY 8-25-88 START OF DAY 8-29-88
63							
64							
65	1 0 3 2 2	10 23 48	18"	VERY DENSE, ~~DARK~~ BROWN SAND (10YR, 5/3) grading DOWNWARD INTO	SW		Hnu = 0 ~~8B~~ = 20-40
66				66 VERY DENSE DARK YELLOWISH BROWN FINE SAND WITH SOME GRAVEL (10 YR, 4/4) WET	SM		1038
67							
68							
69							
70	1 0 3 2 3	12 21 25	18"+	DENSE GRAYISH BROWN SANDY GRAVEL (10 YR, 5/2) GRADING DOWNWARD TO	GW		Hnu = 0 ~~8B~~ = 40 c.p.m.
71				70.5 DENSE DARK YELLOWISH BROWN SAND (10YR, 4/4)	SW		1110
72				71 DENSE DARK GRAYISH BROWN SANDY GRAVEL (10 YR, 4/2) WITH SOME ½" gravel COBBLES WET	GP		
73							
74							
75							

NOTES: BACKGROUND LEVELS FOR 8-29-88 : Hnu = 0
~~8B~~ = 40-60 c.p.m.

001056

DAF 2/5/89

	Initial	Date
1st Key In	MB	9/20
2nd Key In	[illegible]	9/22
Hard Copy Verification		

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~398~~ 3098 MLS 10-07-88	COORDINATES: see p1	DATE: 8-29 & 8-30-88
ELEVATION: see p1	GWL: Depth – Date/Time –	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth – Date/Time –	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	1 0 3 2 4	20 36 54	18"+	VERY DENSE DARK BROWN SANDY FINE GRAVEL (10 YR, 3/3) WET	GW		BB = 40-60 c.p.m. Hnu = 0 1340
77							
78							ENCOUNTERED BLOW SAND WHICH MADE DRILLING LOWER DIFFICULT
79							
80	1 0 3 2 5	9 12 15	18"	MEDIUM DENSE BROWN SAND (10 YR, 4/3) GRADING DOWNWARDS INTO A GRAVELY SAND (OR WITH SOME GRAVEL WET	SW / SP		BB = 20-40 c.p.m. Hnu = 0 1515
81							
82							
83							
84							
85	1 0 3 2 6	24 30 47	18"	VERY DENSE VERY DARK GRAYISH BROWN SAND (10 YR, 3/2) WET	SW		BB = 40 c.p.m. Hnu = 0 1711
86							
87							END OF DAY 8-29-88 START OF DAY 8-30-88
88							ENCOUNTERED HARD-SLOW DRILLING.
89							
90							

NOTES: BACKGROUND LEVELS 8/29/88 : BB = 60-80 c.p.m. Hnu = 0
8/30/88 : BB = 60-80 c.p.m. Hnu = 0

DA 2/5/89

	Initial	Date
1st Key In	MB	9/6
2nd Key In		9/22
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~298~~ 3098 MLS 10-07-88	COORDINATES: see p1	DATE: 8-30-88
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. Dunning	Depth — Date/Time —	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 8

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90							
91	1 0 3 2 7	4 7 14	18"	MEDIUM DENSE BROWN - DARK BROWN COARSE SAND (10 YR, 4/3) TERMINATED WITH A ½" x 1" CARBONATE ROCK FRAGMENT WET	SW		γB = 40 c.p.m. Hnu = 0 0953
92							
93							
94							
95	1 0 3 2 8	26 30 34	18"	VERY DENSE DARK BROWN SAND (10 YR, 3/3) WITH SOME FINE TO MEDIUM SIZE GRAVEL WET	SP		γB = 20 c.p.m. Hnu = 0 1005
96							
97							
98							
99							
100	1 0 3 2 9	15 16 9	16"	MEDIUM DENSE BROWN MEDIUM GRAIN - COARSE GRAIN SAND (10YR, 4/3) 100.7 GRADING DOWNWARDS INTO AN OLIVE GRAY TO OLIVE POORLY SORTED SANDY GRAVEL (5Y, 4/2 to 4/4) CARBONATE SAND & GRAVEL WET 100.7	SW GP		γB = 40 c.p.m. Hnu = 0 1355
101							
102							
103							
104							
105							

NOTES: BACKGROUND LEVELS FOR 8-30-88 : γB = 60-80 c.p.m.
Hnu = 0

001058

DH 2/5/89

	Initial	Date
1st Key In	MB	2/10
2nd Key In		
Hard Copy Verification		

FERNALD RI/FS

5709

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: ~~5398~~ 3098 HLS 10-01-88	COORDINATES: see p1	DATE: 8-30-88
ELEVATION: see p1	GWL: Depth 31.45 Date/Time 8-31-88 @ 0940	DATE STARTED: 8-22-88
ENGINEER/GEOLOGIST: B. DUNNING	Depth — Date/Time —	DATE COMPLETED: 8-30-88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 8

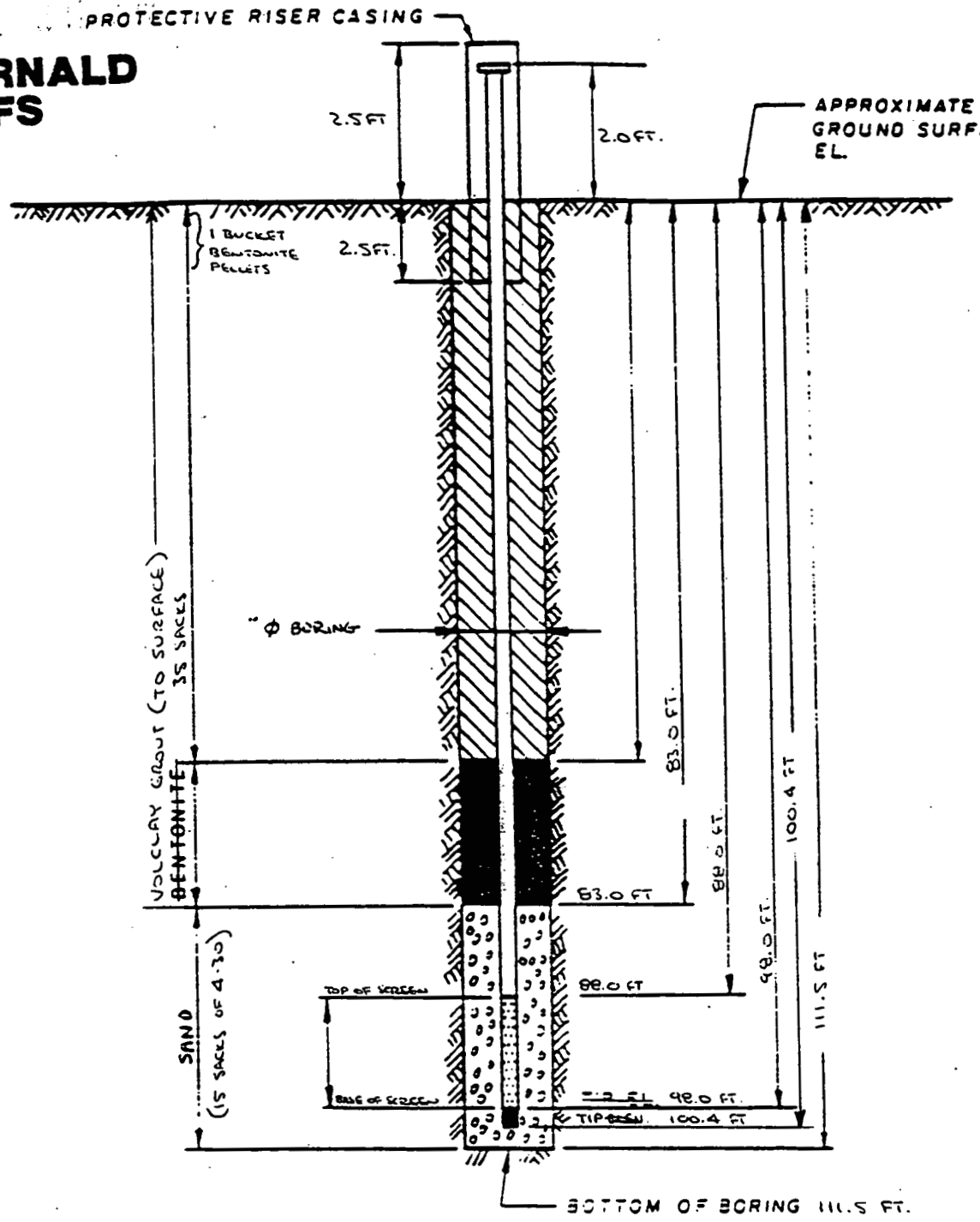
DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 INCHES)	RECOVERY (INCHES)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105							
106	1 0 3 3 0	50 65/6	14"	VERY DENSE BROWN WELL SORTED SAND (10 YR, 5/3) WITH A VERY PALE BROWN FOSSILIFEREOUS CARBONATE ROCK JAMMING THE SPLIT SPOON (10 YR, 7/4) WET	SW		γB = 20-40 c.p.m. Hnu = 0 1508
107					GP		
108							
109							
110	1 0 3 3 1	50/4	14"	~~SA~~ VERY DENSE BROWN SAND AS ABOVE WITH YELLOW CLAYEY GRAVEL (10 YR, 7/6) WET	SW		γB = 40 c.p.m. Hnu = 0
111					GC		1554
112				WELL DRILLED TO A TOTAL DEPTH OF 111.5 FEET			Brad Dunning
113							
114							
115							
116							
117							
118							
119							
120							

NOTES: BACKGROUND LEVELS FOR 8-30-88: γB = 60-80 c.p.m.
Hnu = 0

001059

DH 7/5/89

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I D SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR 3098

1 BUCKET OF BENTONITE PELLETS WAS USED AT THE SURFACE AROUND THE PROTECTIVE CASING TO SERVE AS A SEAL

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

001080

DAT 4/5/89

FERNALD RI/FS

5709

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. B. Dunning DATE 9/7/88
PROJECT NO. 602 TASK 3.2 CHECKED BY R Galbraith DATE 2/7/89
BORING NO. ~~598~~ 3098 MLS 10-07-88
PIEZOMETER NO. DATE OF INSTALLATION 9/2/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID FRESH WATER FROM 0 Ft TO 110 Ft.
FLUID FROM TO

TYPE OF BIT FLAT HEAD HAMMER-TYPE
CASING SIZE (S) USED:
SIZE 10 INCH FROM 0 Ft. TO 110 Ft.
SIZE FROM TO

PIEZOMETER DESCRIPTION

TYPE ~~FLUSH~~ THREADED MONITORING WELL MLS 10-07-88
DIAMETER OF PERFORATED SECTION 4 INCH O.D.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .01 INCH
TOTAL PERFORATED AREA 10 Ft.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 INCH I.D. ~~3~~ 4 INCH
LENGTH OF PIPE SECTIONS 90 Ft. (10 Ft. SECTIONS)
JOINING METHOD FLUSH THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 PIPE
PROTECTIVE PIPE O.D. 10 3/4 INCH MLS 10-07-88

OTHER PROTECTION ~~NONE~~ MLS 10-07-88
LOCKING CAP & VENTED COVER MLS 10-07-88

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft) MLS 10-07-88		ELEVATION (MSL)	
TOP OF RISER PIPE	+ 2.0 Ft		548.8	
GROUND SURFACE	0.0		546.8	
BOTTOM OF PROTECTIVE PIPE	- 2.5 Ft.		544.3	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP - 1.0 Ft.	BOTTOM ~~85~~ 83 Ft. MLS 10-07-88	TOP 545.8	BOTTOM 463.8
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
SAND	TOP ~~85~~ 83 Ft. MLS 10-07-88	BOTTOM (102.4 Ft.) MLS 10-07-88	TOP 463.8	BOTTOM 444.4
GRAVEL	TOP NA MLS 10-07-88	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP ~~90~~ 80 Ft. MLS 10-07-88	BOTTOM (100) Ft. MLS 10-07-88	TOP	BOTTOM
PIEZOMETER TIP				
BOTTOM OF BOREHOLE	~~100~~ 111.4 Ft. MLS 10-07-88 (DRILLED TO 110 Ft.) 111.5 FT 4/4 pm 2/7/89			
GWL AFTER INSTALLATION	31.15 Ft.			

IS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

001061

REMARKS

WELL LOG AND DRILLING REPORT

3099

634852

NO CARBON PAPER NECESSARY– SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

COUNTY BUTLER TOWNSHIP ROSS SECTION OF TOWNSHIP 33

OWNER BOB JAMES ADDRESS [redacted]

LOCATION OF PROPERTY [redacted]

CONSTRUCTION DETAILS

Casing diameter 6 Length of casing 58

Type of screen SS #18 Length of screen 3

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST (specify one by circling)

Test rate 15 gpm Duration of test 4

Drawdown 4'6" ft Date 11/6/86

Static level (depth to water) 26'10"

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
CRETE PIT	0 ft	6 ft
SAND + GRAVEL	6	28
COARSE SAND	28	61

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.

[redacted]

001062

DRILLING FIRM WM CRANE CO. DATE 2/18/86

ADDRESS Box 33 SHANDON O. SIGNED [illegible]

*If additional space is needed to complete well log, use next consecutive numbered form.

ORIGINAL COPY - ODNR. DIVISION OF WATER. FOUNTAIN SQ.. COLS.. OHIO 43224