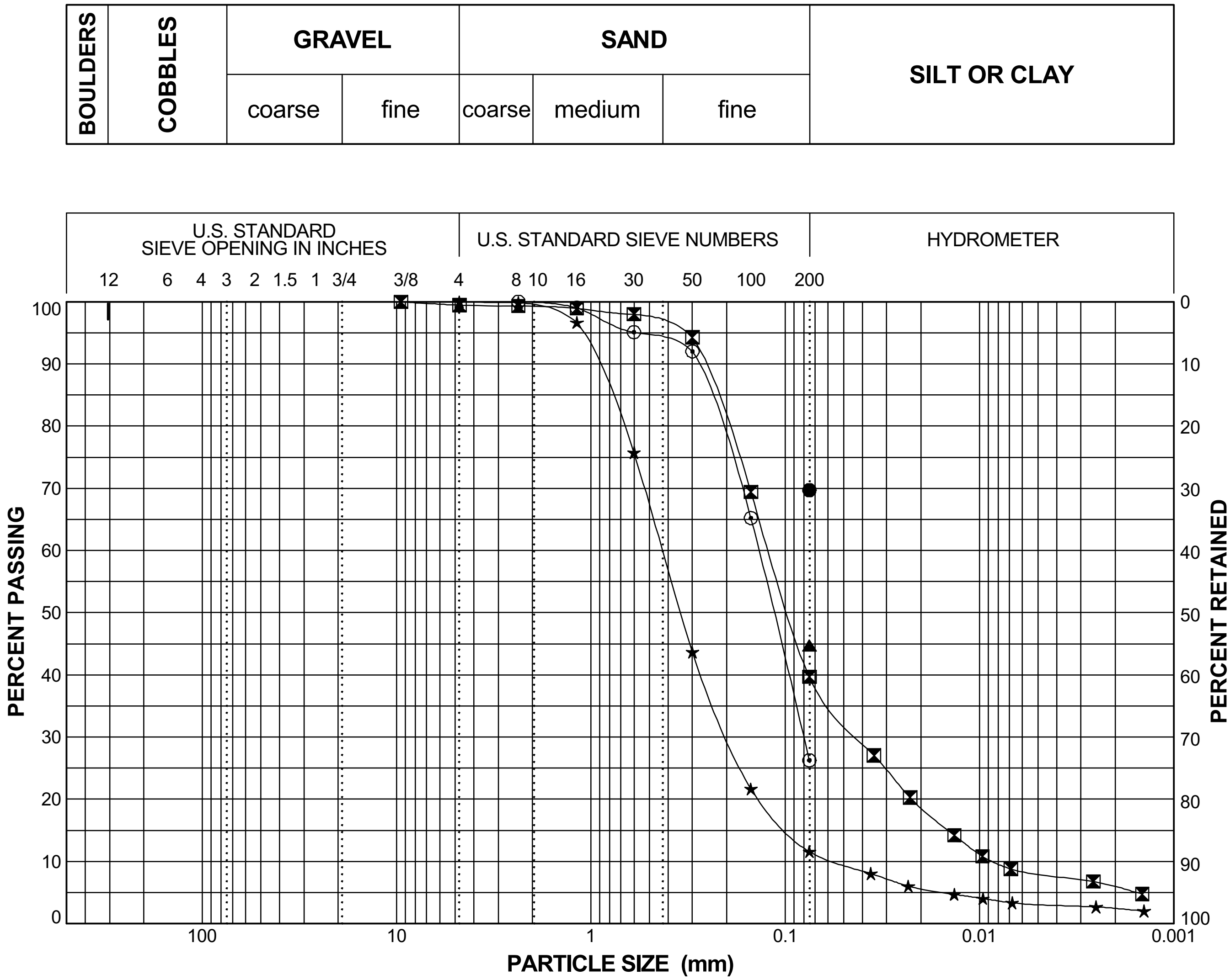
APPENDIX B

Laboratory Test Results (by others)

APPENDIX B



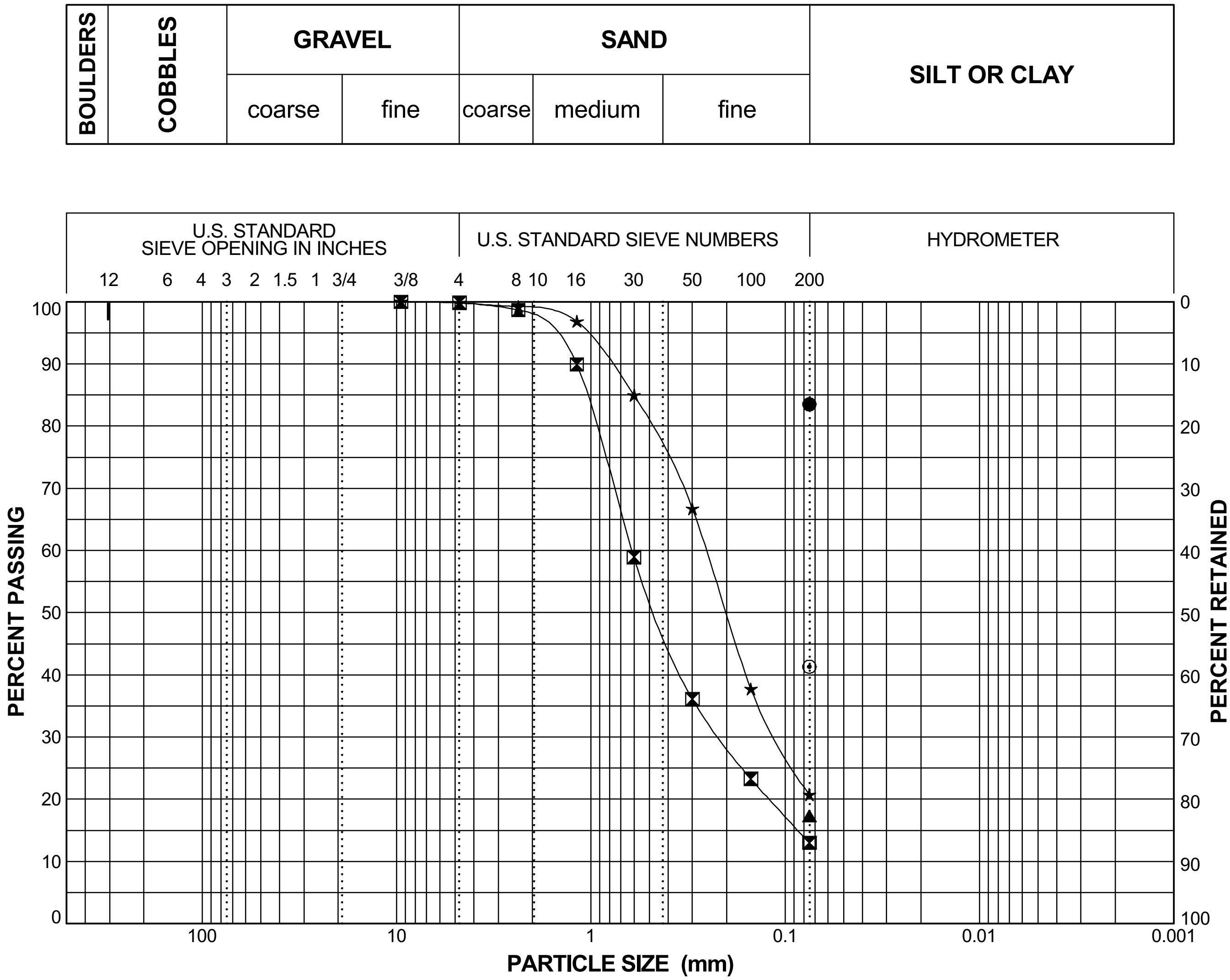
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_036B	13A	26.5	●	0	0	70	SANDY LEAN CLAY (CL)
WR0017_036B	15A	30	⊠	1	60	40	SILTY SAND (SM)
WR0017_036B	22A	48	▲	0	0	45	SILTY SAND (SM)
WR0017_036B	29A	65	★	0	88	12	Poorly Graded SAND with Silt (SP-SM)
WR0017_036B	30A	70	⊙	0	74	26	SILTY SAND (SM)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

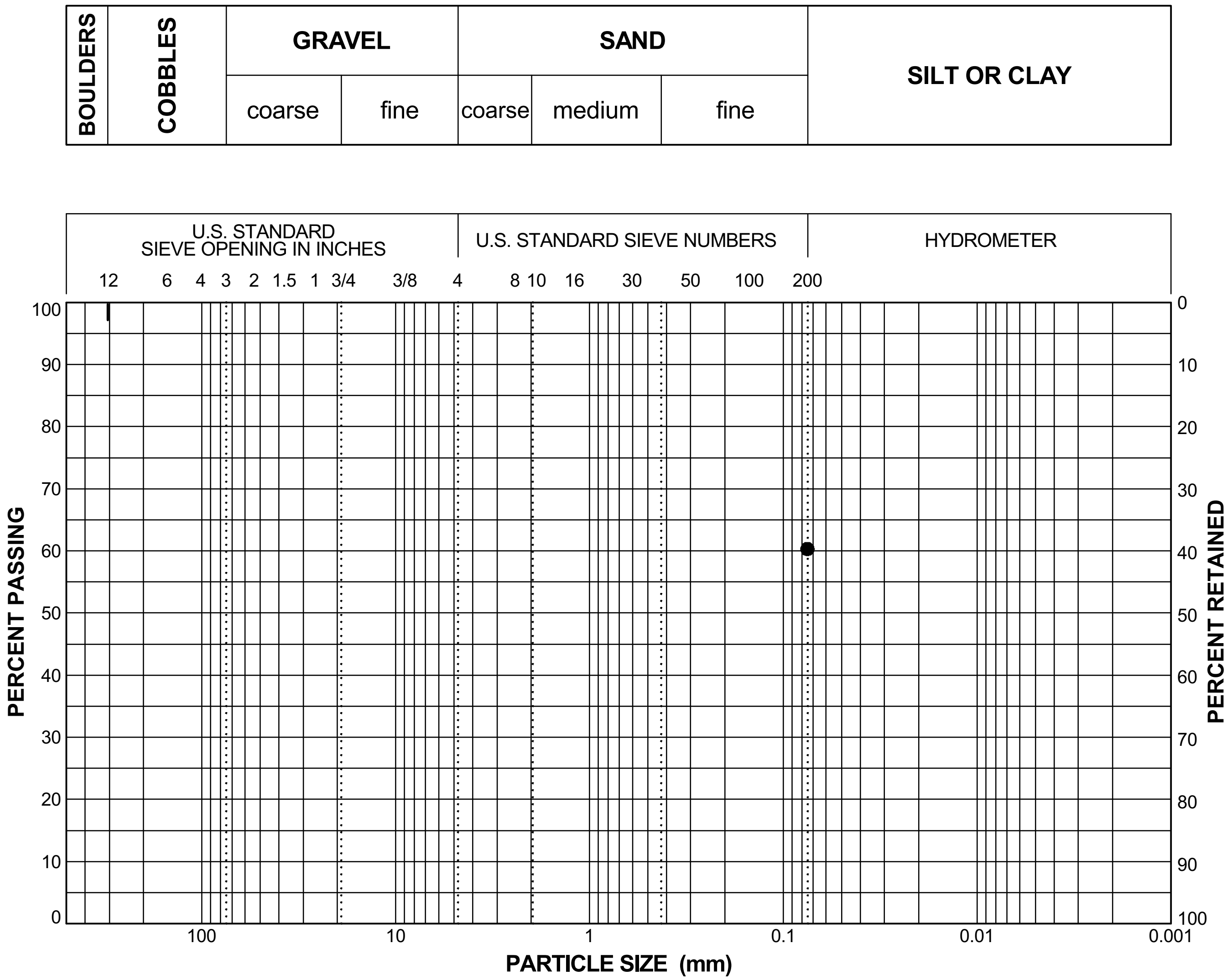


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_036B	33A	79	●	0	0	84	LEAN CLAY with Sand (CL)
WR0017_036B	35A	83	⧗	0	87	13	CLAYEY SAND (SC)
WR0017_036B	44A	105	▲	0	0	17	SILTY SAND (SM)
WR0017_036B	48A	115	★	0	79	21	CLAYEY SAND (SC)
WR0017_036B	55A	132.5	⊙	0	0	41	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

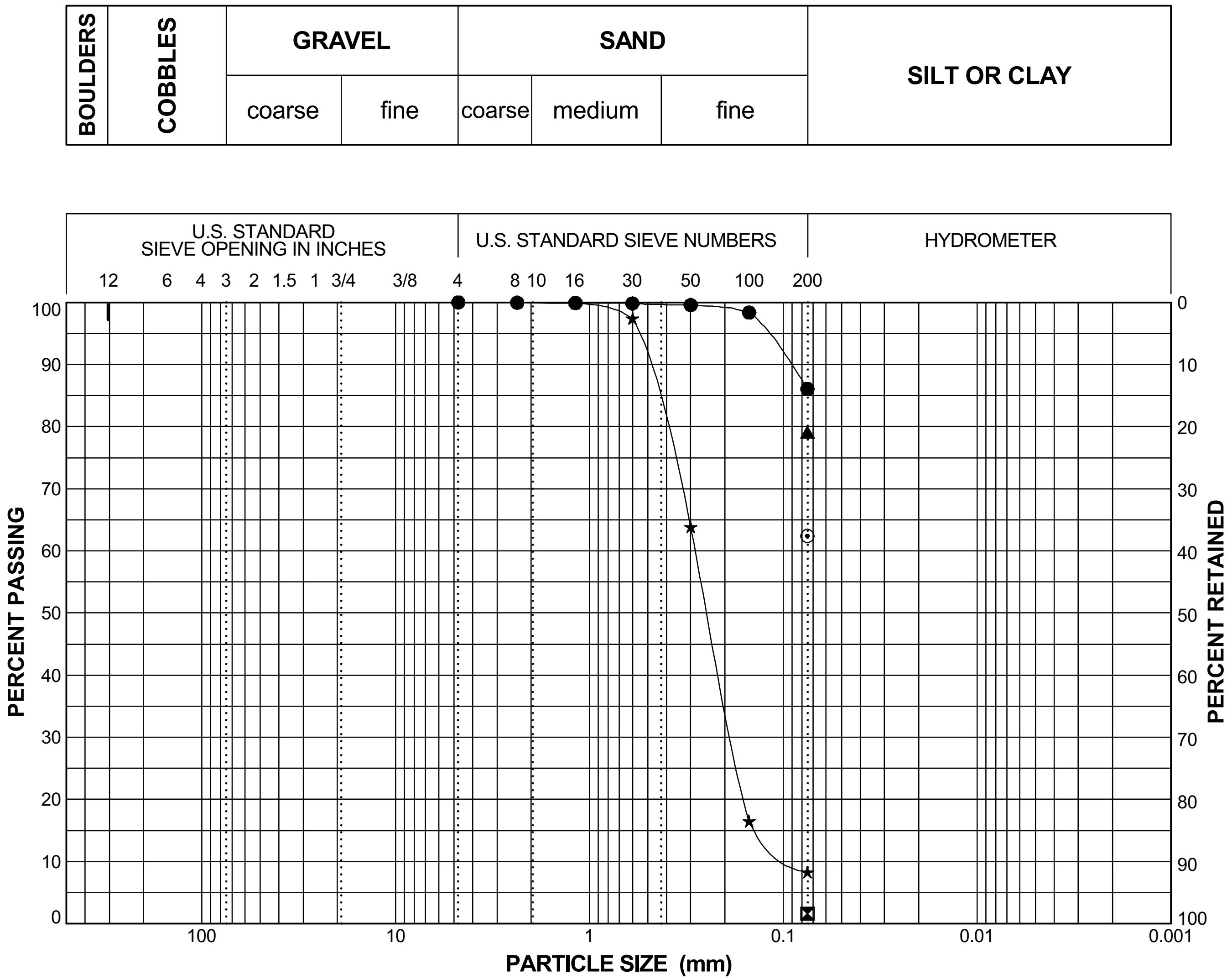


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_036B	57A	138	●	0	0	60	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

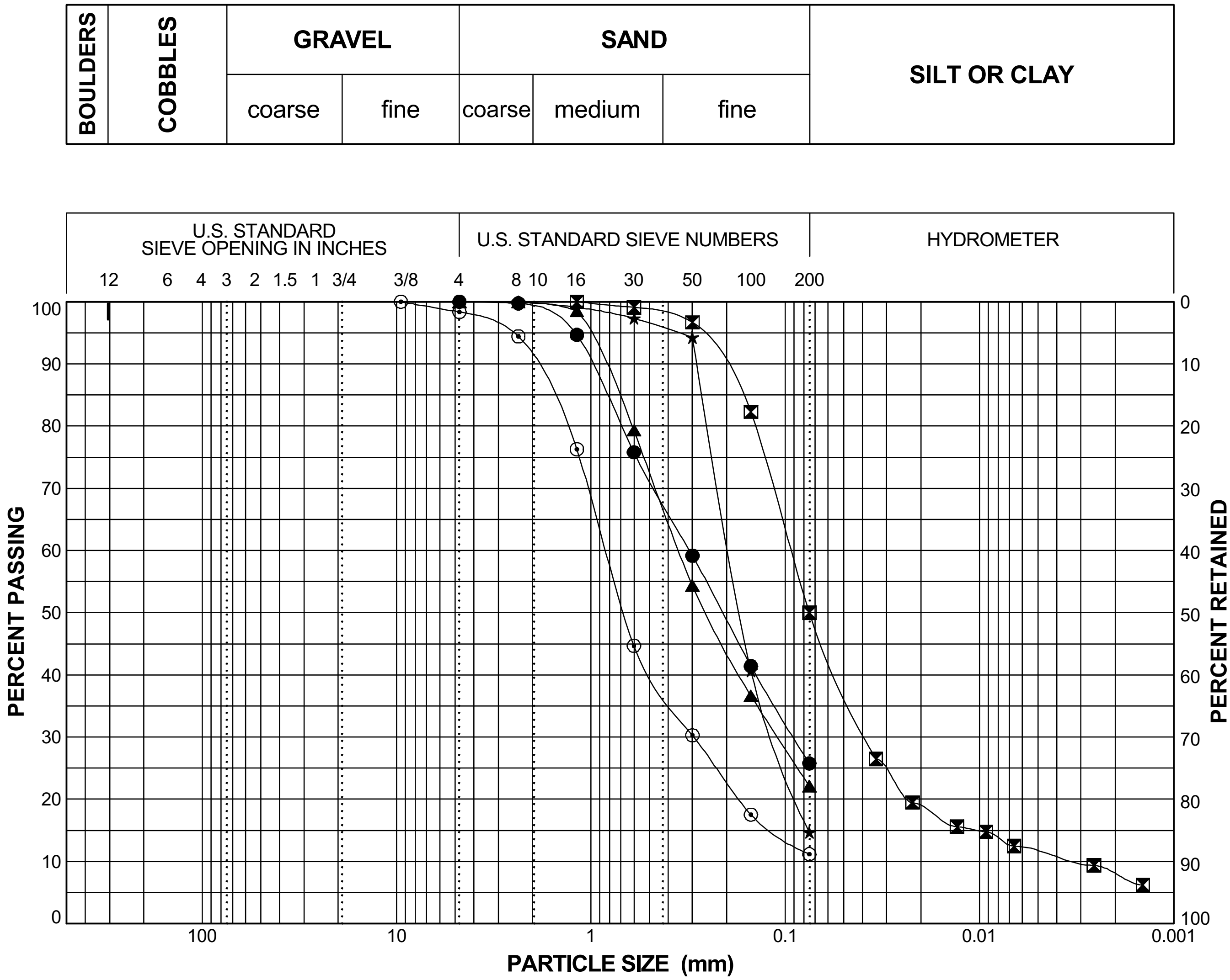


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_041B	4A	7.5	●	0	14	86	SILT (ML)
WR0017_041B	6A	14	⊠	0	0	2	Poorly Graded SAND (SP)
WR0017_041B	9A	18	▲	0	0	79	SILT with Sand (ML)
WR0017_041B	15A	25	★	0	92	8	Poorly Graded SAND with Silt (SP-SM)
WR0017_041B	17A	36.5	⊙	0	0	62	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

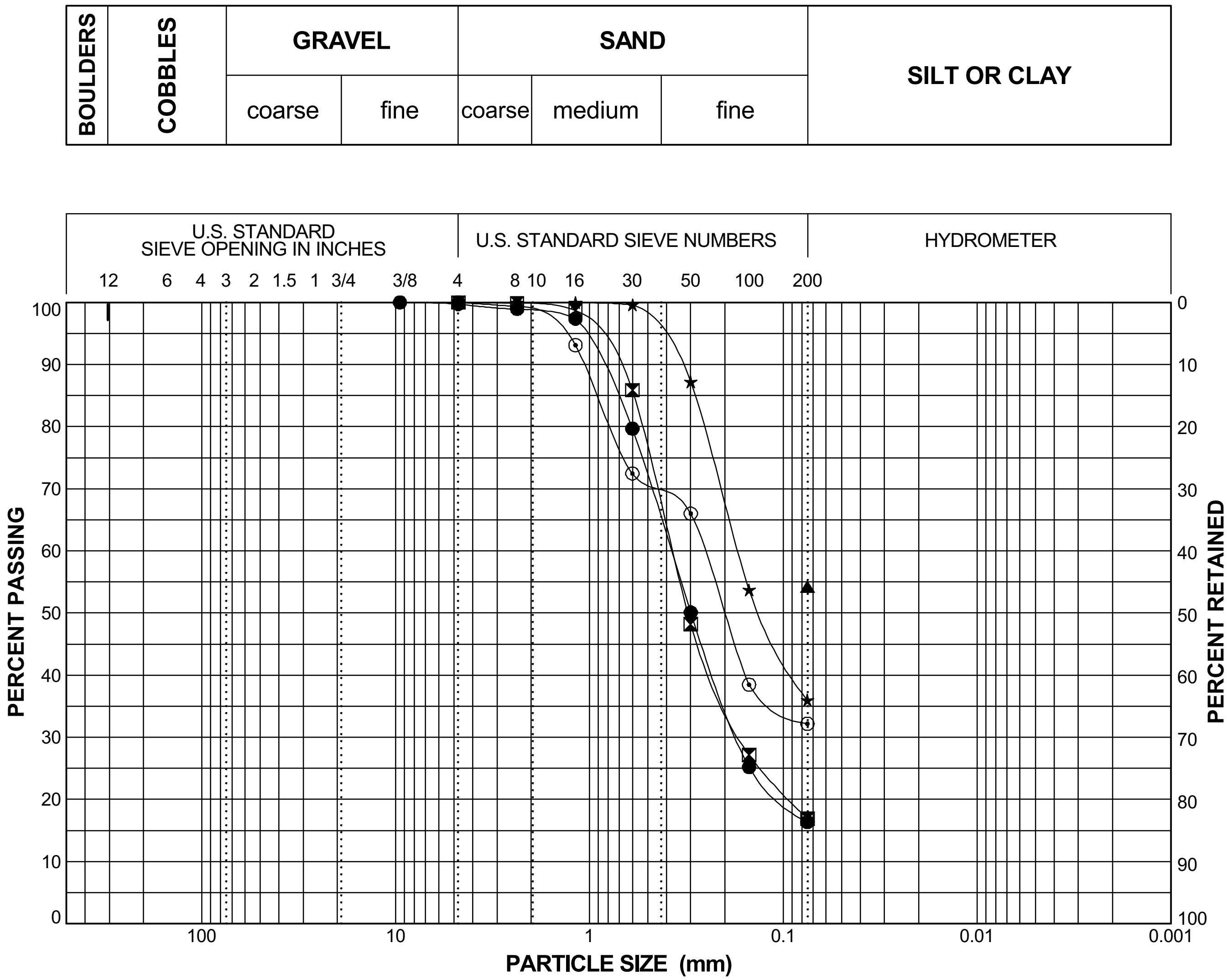


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_041B	20A	45	●	0	74	26	CLAYEY SAND (SC)
WR0017_041B	27A	60	⊠	0	50	50	CLAYEY SAND (SC)
WR0017_041B	28A	62	▲	0	78	22	CLAYEY SAND (SC)
WR0017_041B	32A	70	★	0	85	15	SILTY SAND (SM)
WR0017_041B	35A	77	⊙	2	87	11	Well-Graded SAND with Clay (SW-SC)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 7/21/08

Engineering Support Services
Urban Levee Geotechnical Evaluations Program
RD 17

PARTICLE SIZE DISTRIBUTION CURVES

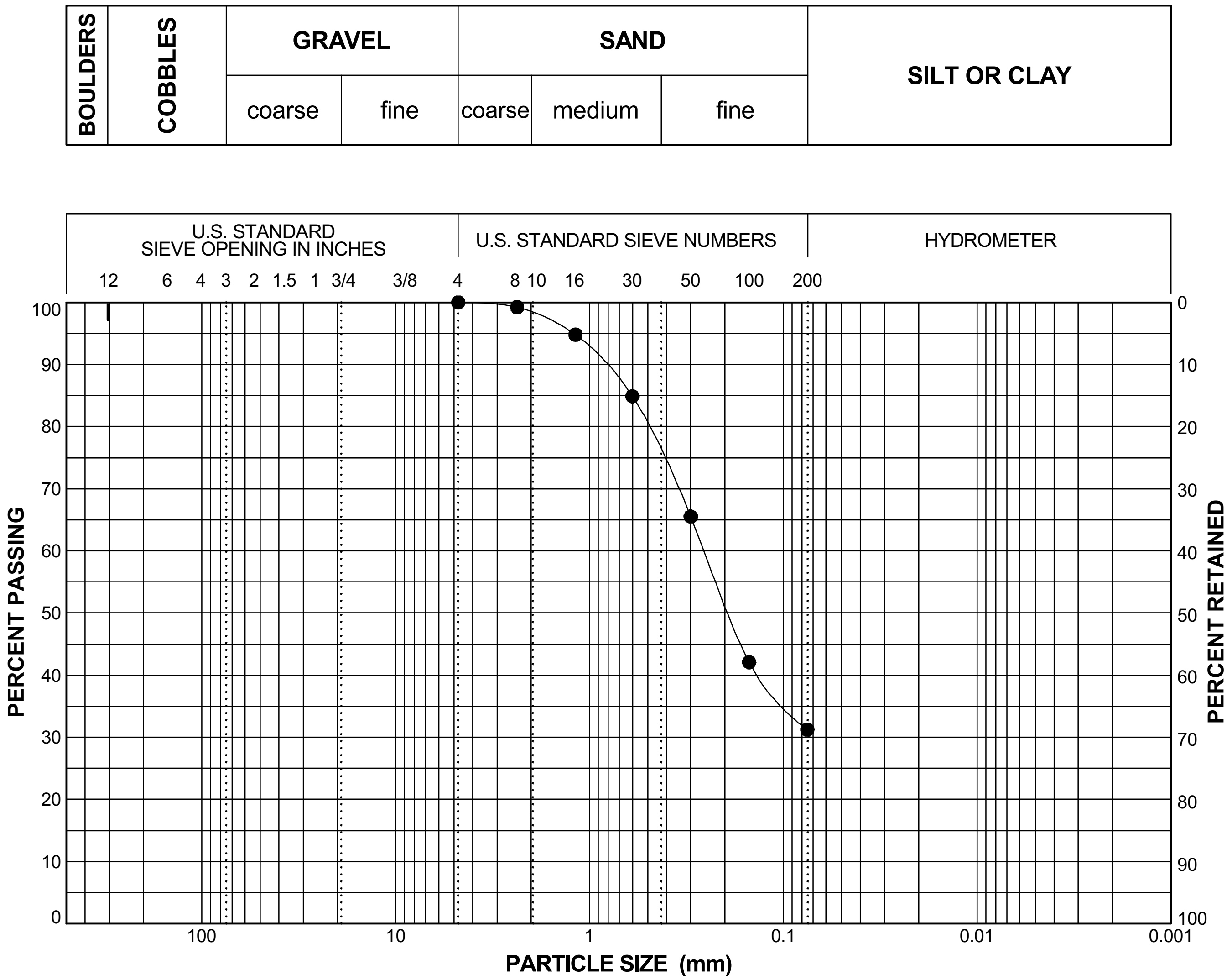


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_041B	39A	86	●	0	83	16	SILTY SAND (SM)
WR0017_041B	45A	100	⊠	0	83	17	CLAYEY SAND (SC)
WR0017_041B	50A	115	▲	0	0	54	SANDY SILT (ML)
WR0017_041B	53A	120	★	0	64	36	SILTY SAND (SM)
WR0017_041B	55A	125	⊙	0	68	32	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

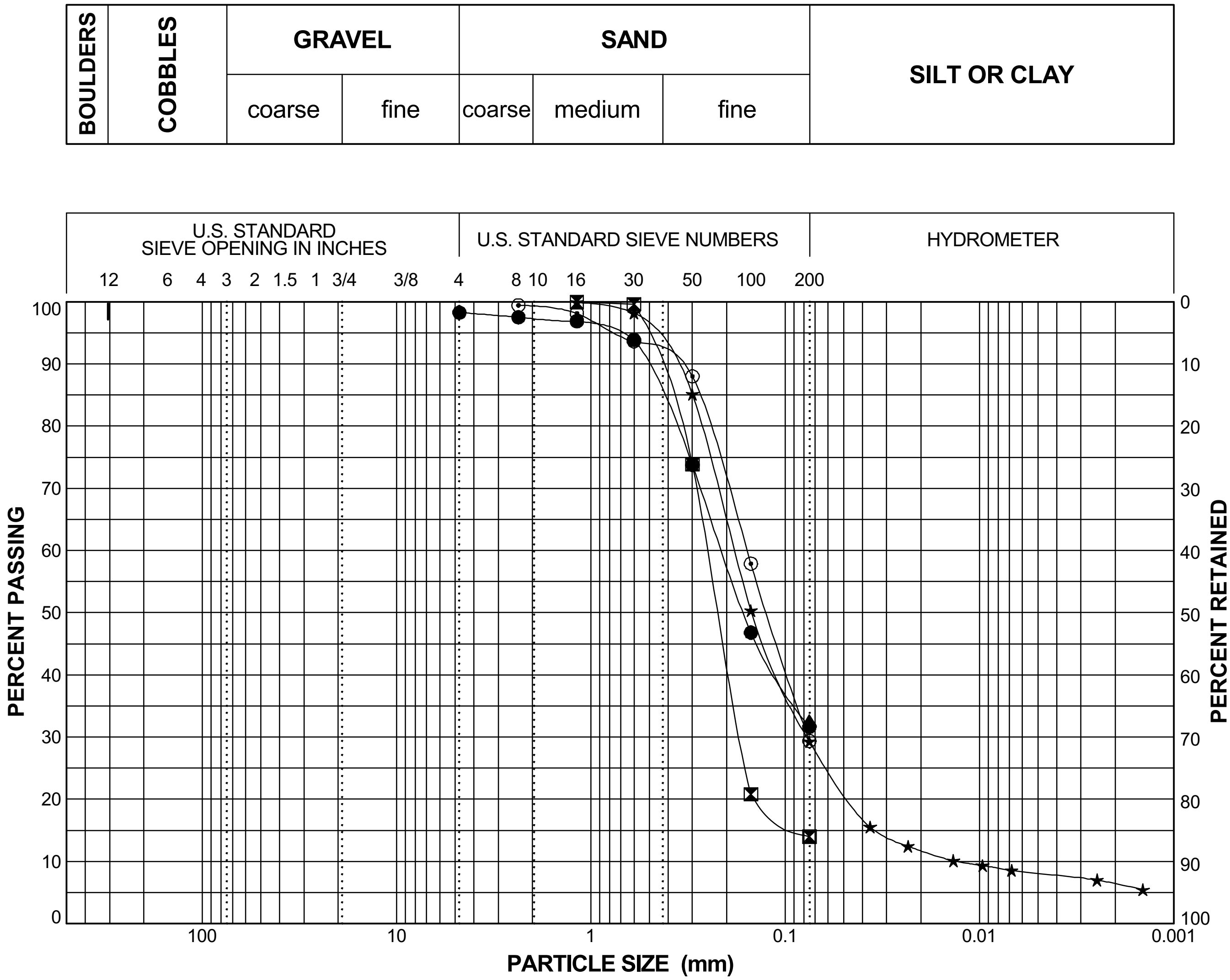


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_041B	57A	130	●	0	69	31	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

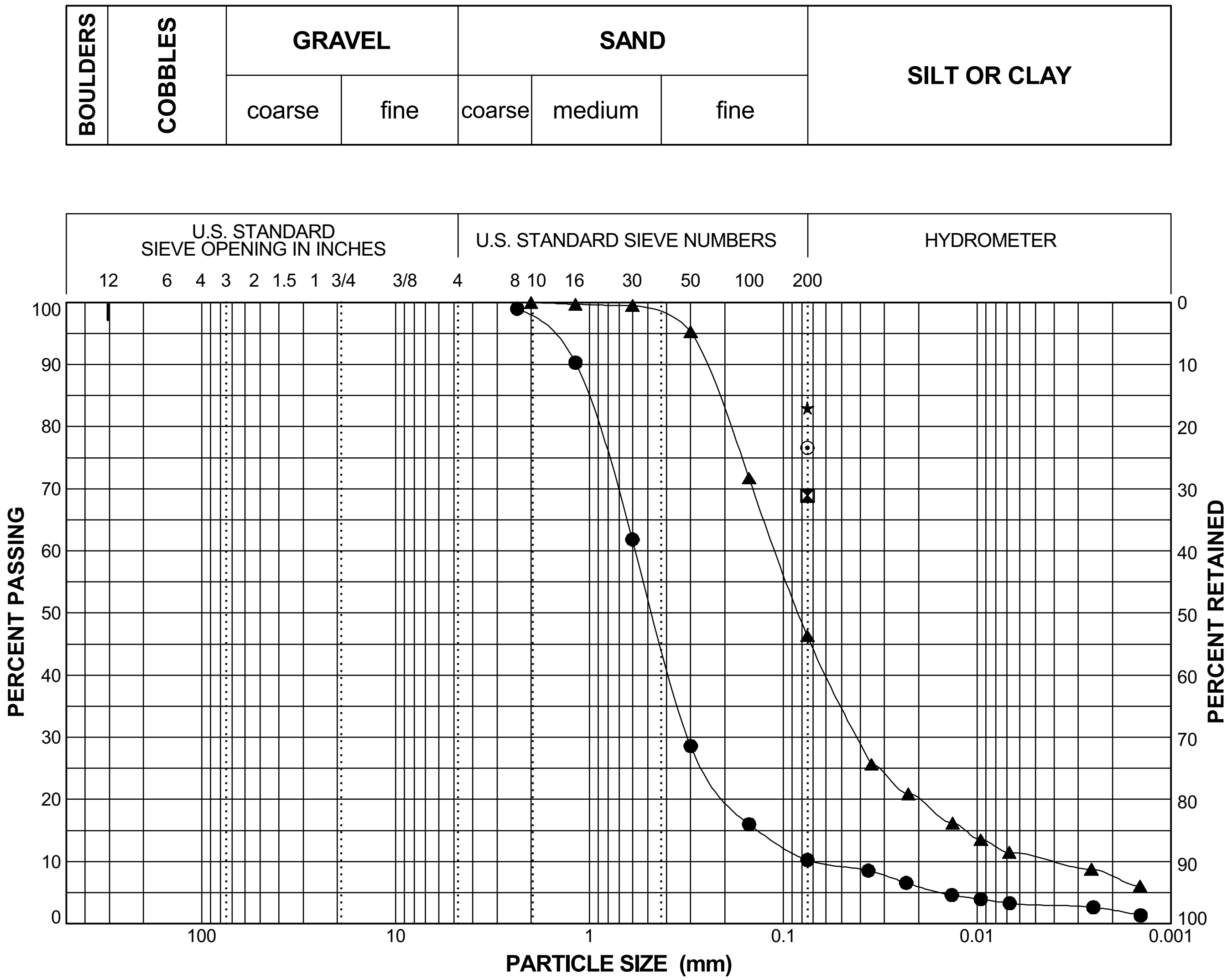


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_047B	3A	6.5	●	0	67	32	CLAYEY SAND (SC)
WR0017_047B	8A	20	⧗	0	86	14	CLAYEY SAND (SC)
WR0017_047B	10A	25.5	▲	0	0	33	SILTY SAND (SM)
WR0017_047B	11A	28	★	0	71	29	SILTY SAND (SM)
WR0017_047B	15A	36	⊙	0	70	29	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

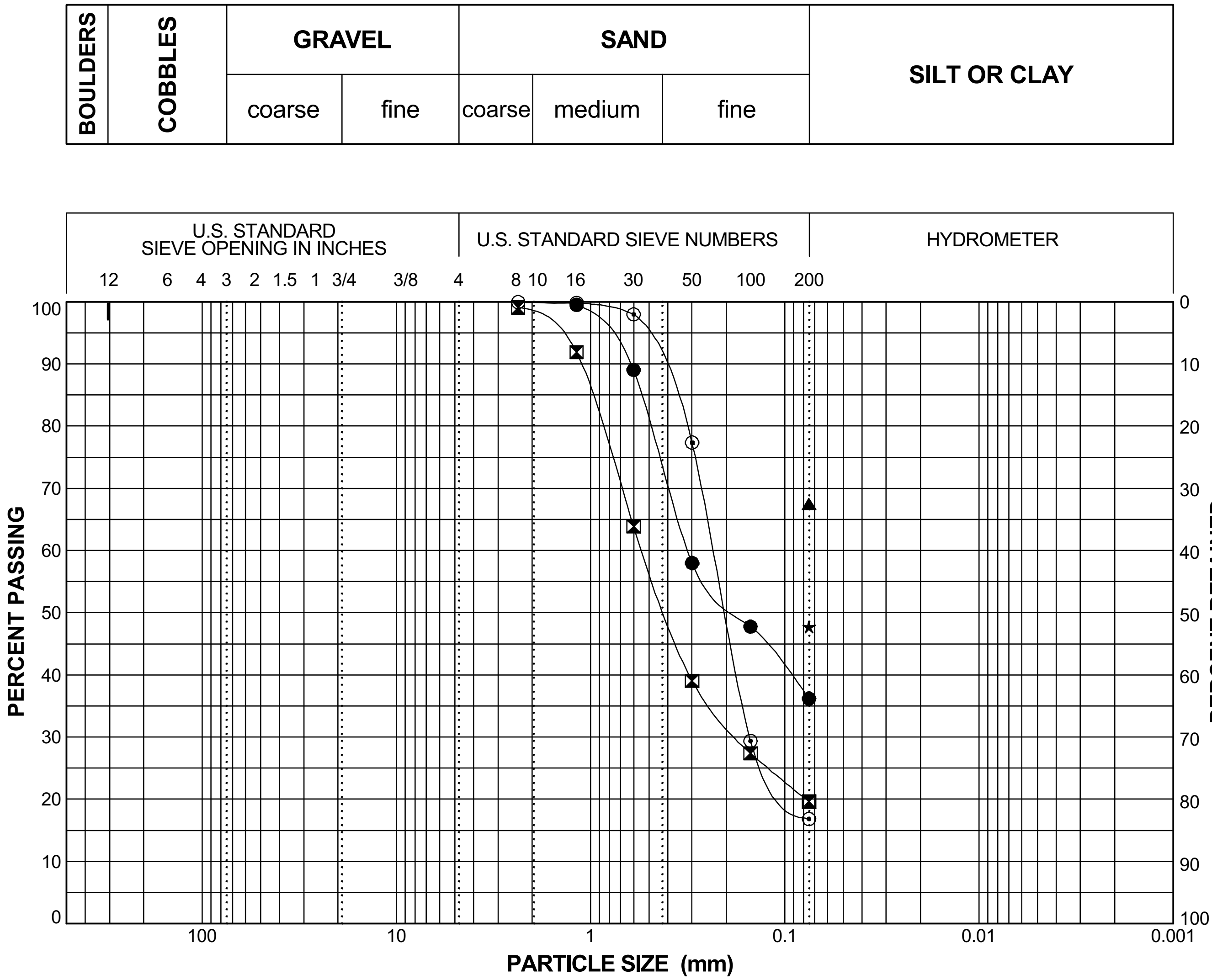


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_047B	17A	42	●	0	89	10	Poorly Graded SAND with Clay (SP-SC)
WR0017_047B	22A	55	⊠			69	SANDY SILT (ML)
WR0017_047B	25A	62	▲	0	54	46	SILTY SAND (SM)
WR0017_047B	29A	73	★			83	LEAN CLAY with Sand (CL)
WR0017_047B	32A	80	⊙			77	LEAN CLAY with Sand (CL)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST 81507.GDT 7/21/08

Engineering Support Services
Urban Levee Geotechnical Evaluations Program
RD 17

PARTICLE SIZE DISTRIBUTION CURVES



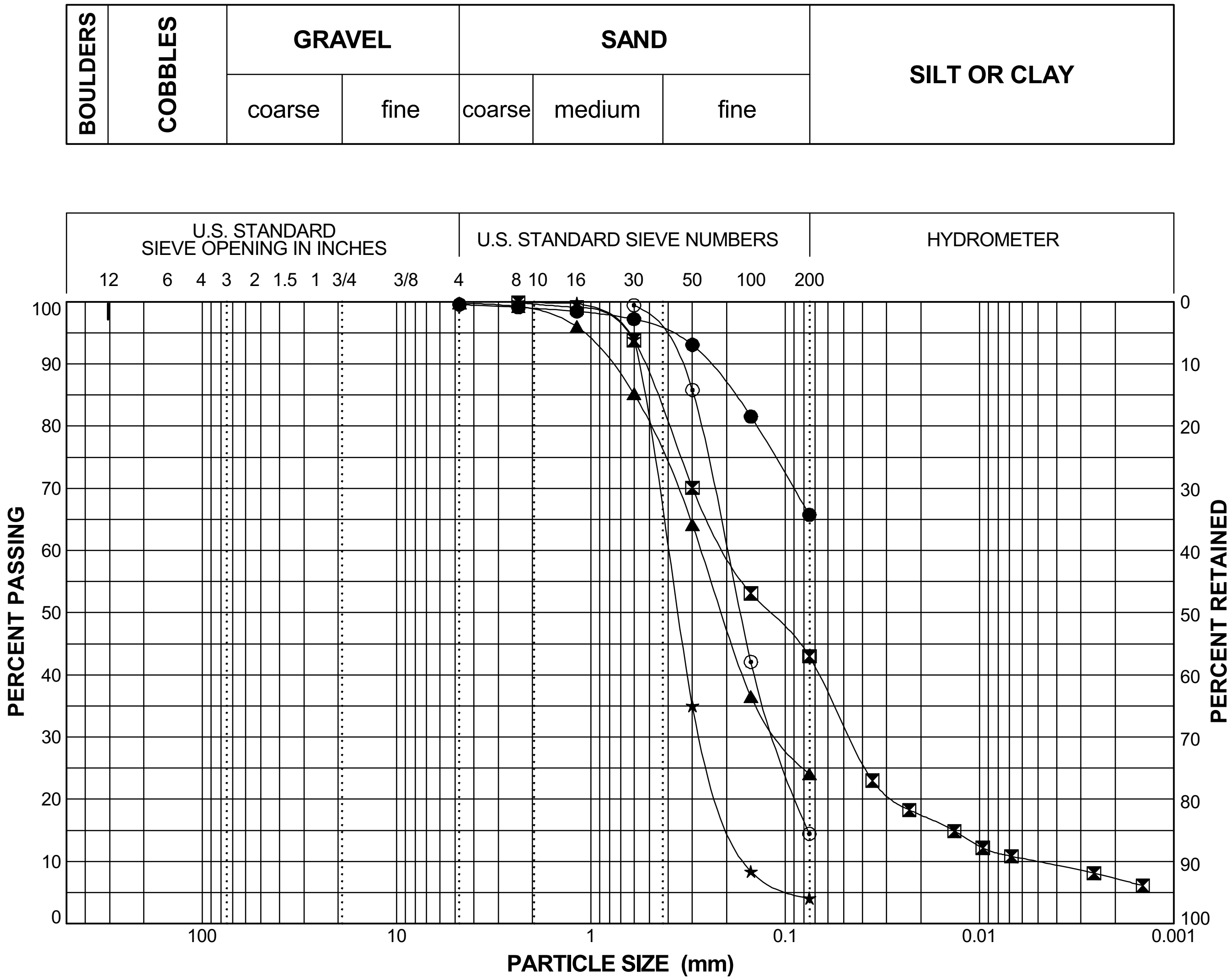
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_047B	33A	82	●	0	63	36	CLAYEY SAND (SC)
WR0017_047B	35A	87	⧗	0	79	20	CLAYEY SAND (SC)
WR0017_047B	38A	95	▲	0	0	68	SANDY LEAN CLAY (CL)
WR0017_047B	39A	98	★	0	0	48	SILTY CLAYEY SAND (SC-SM)
WR0017_047B	43B	105	⊙	0	83	17	CLAYEY SAND (SC)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST 81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

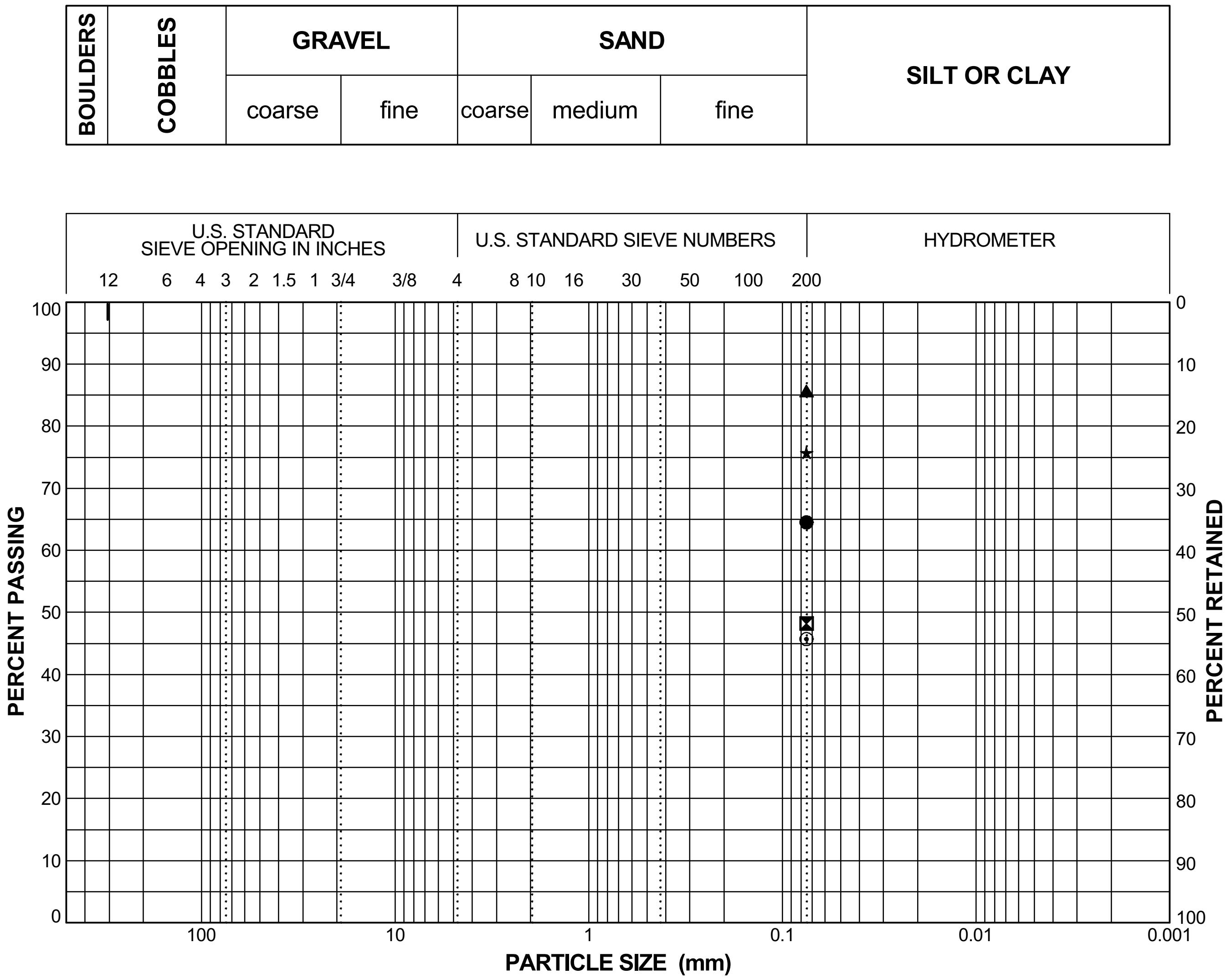


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_052B	2B	5.5	●	0	34	66	SANDY LEAN CLAY (CL)
WR0017_052B	5A	12.5	⊠	0	57	43	SILTY SAND (SM)
WR0017_052B	8A	21.5	▲	0	76	24	CLAYEY SAND (SC)
WR0017_052B	10A	28	★	0	96	4	Poorly Graded SAND (SP)
WR0017_052B	11A	31	⊙	0	85	14	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

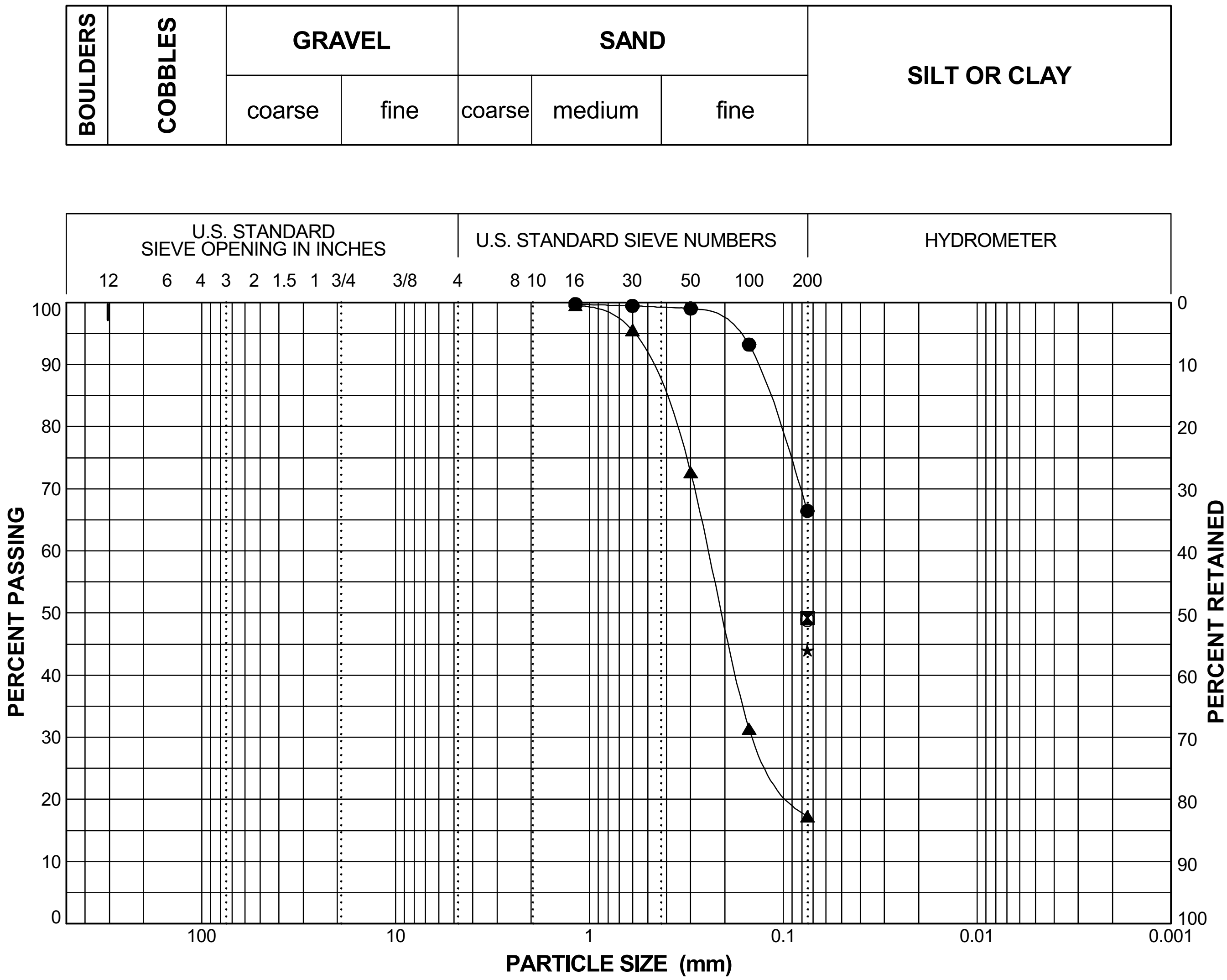


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_052B	15A	38	●	0	0	65	SANDY LEAN CLAY (CL)
WR0017_052B	17A	44	⊠	0	0	48	CLAYEY SAND (SC)
WR0017_052B	19A	47	▲	0	0	86	LEAN CLAY (CL)
WR0017_052B	25A	62	★	0	0	76	LEAN CLAY with Sand (CL)
WR0017_052B	26A	66	⊙	0	0	46	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

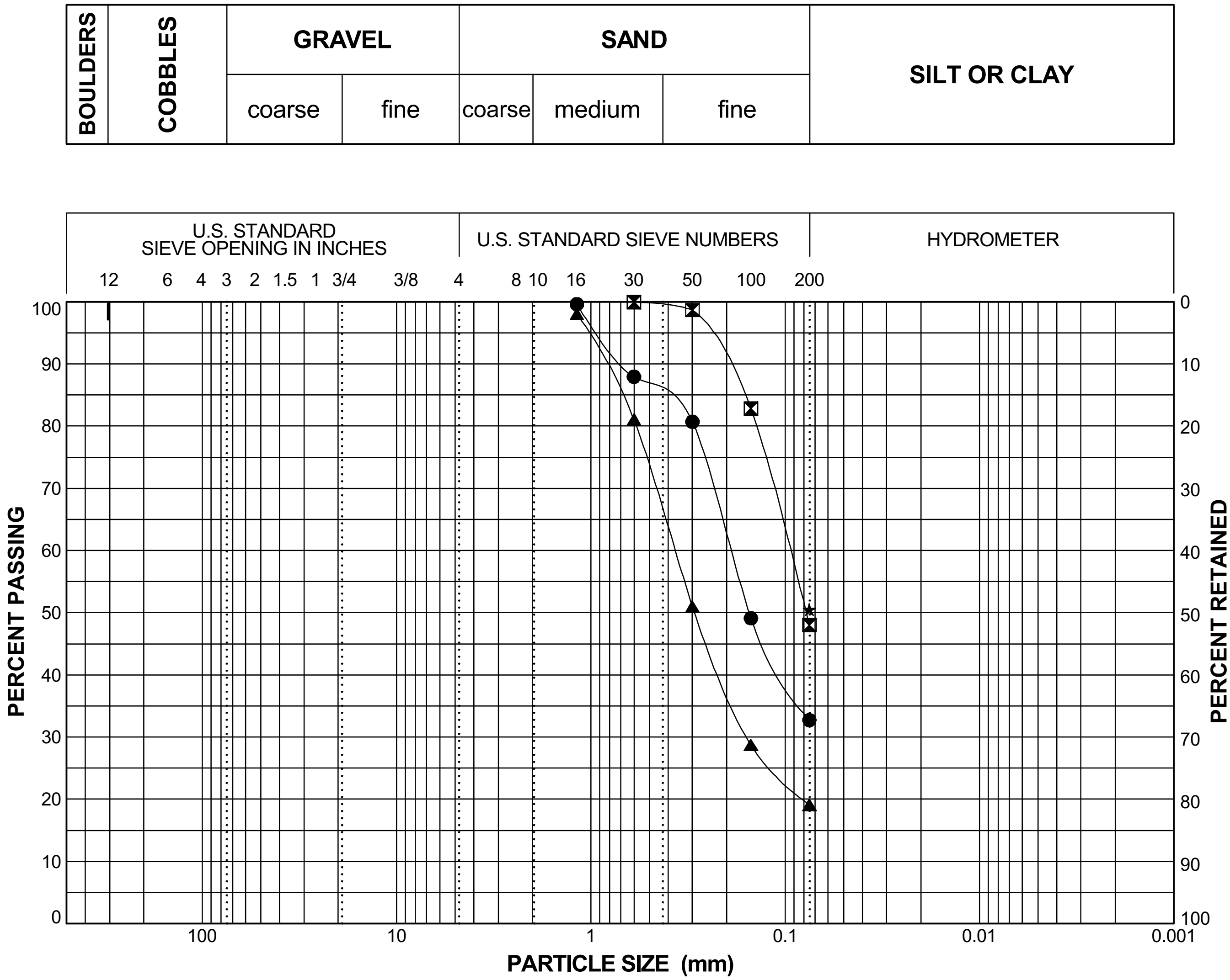


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_052B	31A	75	●	0	33	66	SANDY LEAN CLAY (CL)
WR0017_052B	33A	80	⊠	0	0	49	SILTY SAND (SM)
WR0017_052B	35A	86	▲	0	82	17	CLAYEY SAND (SC)
WR0017_052B	43A	101.5	★	0	0	44	SILTY SAND (SM)
WR0017_052B	47A	113	⊙	0	0	49	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



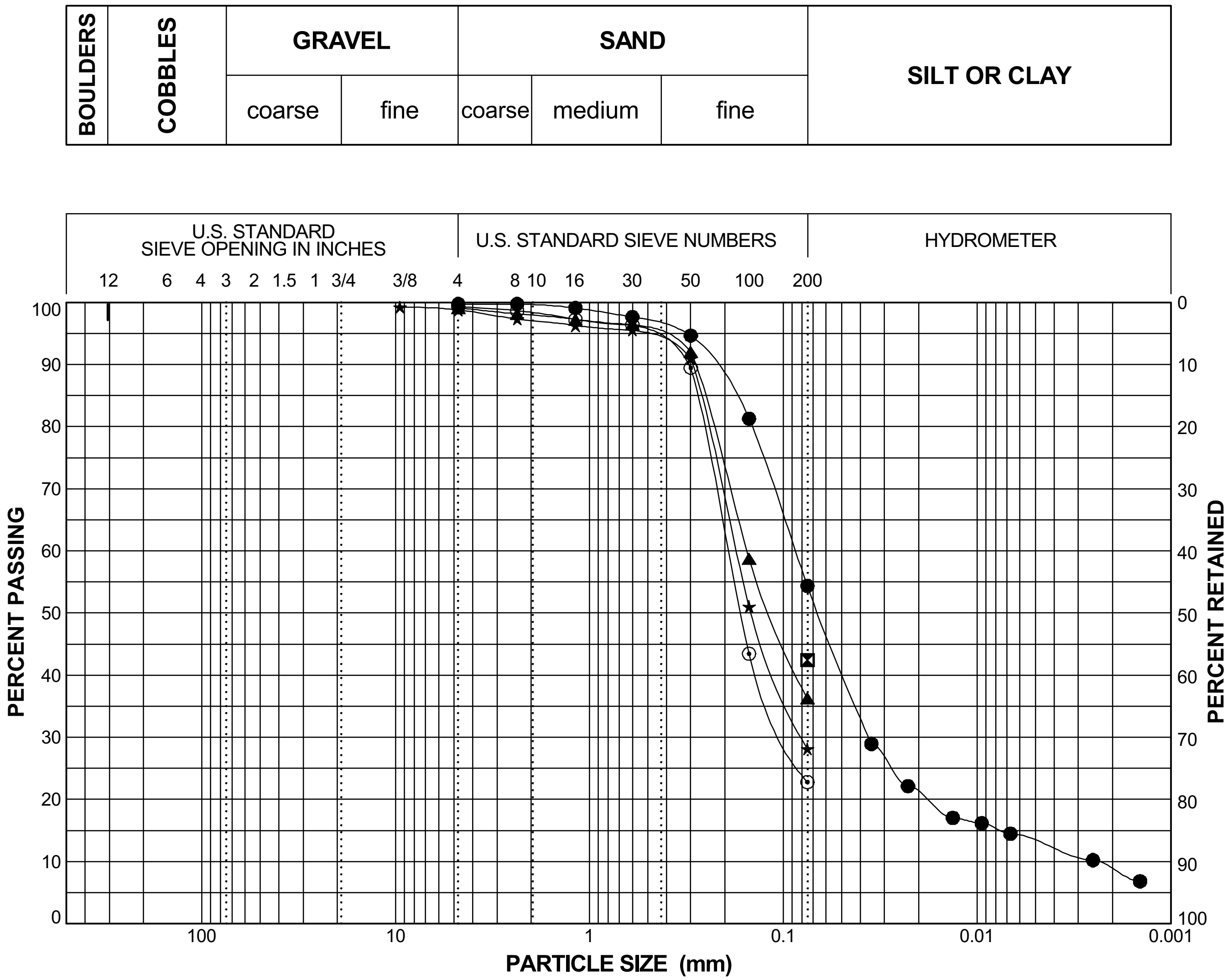
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_052B	49A	116	●	0	67	33	CLAYEY SAND (SC)
WR0017_052B	53A	127	⧗	0	52	48	CLAYEY SAND (SC)
WR0017_052B	54A	130	▲	0	79	19	CLAYEY SAND (SC)
WR0017_052B	55A	131.5	★	0	0	51	SANDY SILT (ML)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

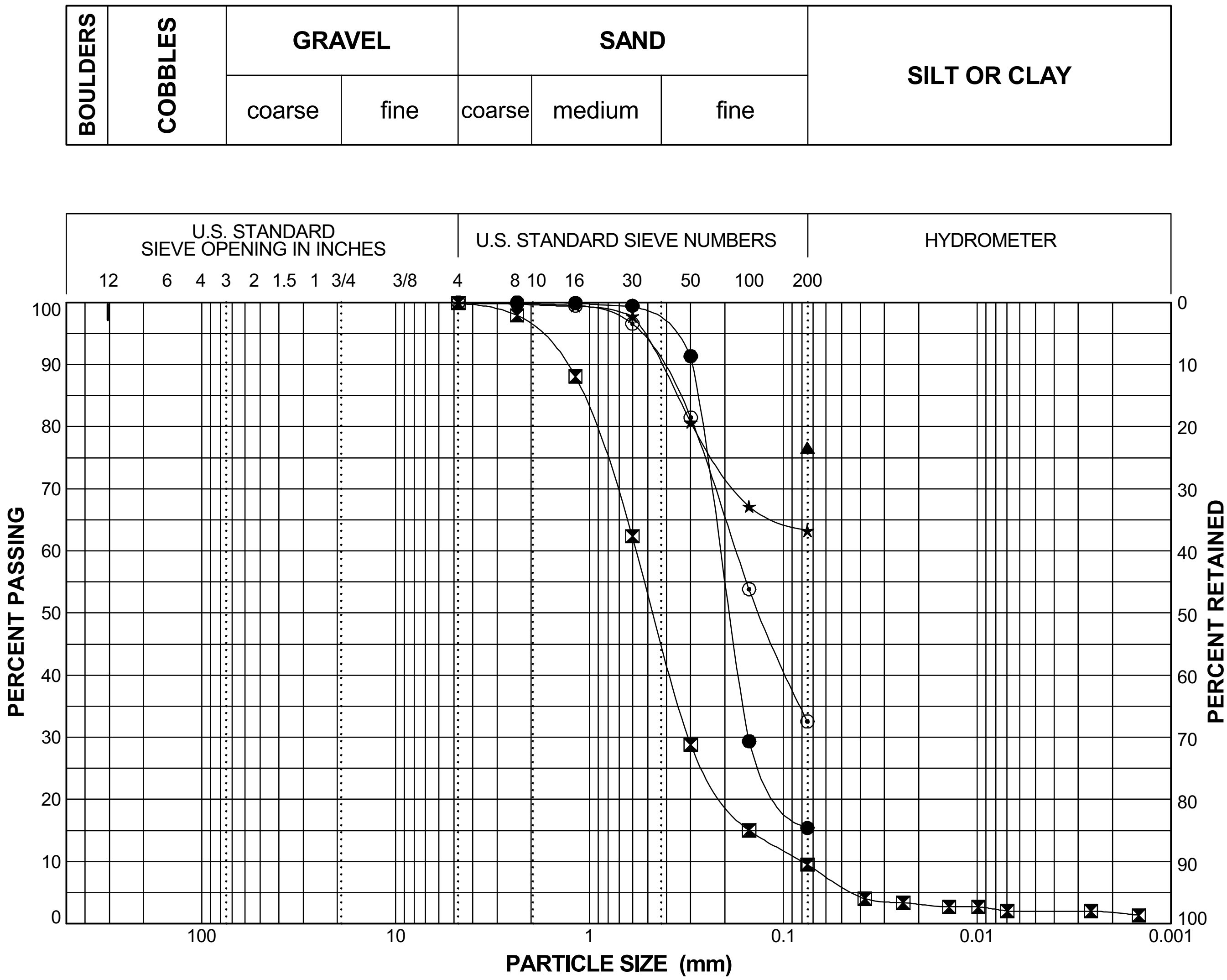


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_057B	2A	5	●	0	45	54	SANDY LEAN CLAY (CL)
WR0017_057B	5A	15	⊠			42	SILTY SAND (SM)
WR0017_057B	7A	21.5	▲	0	63	36	CLAYEY SAND (SC)
WR0017_057B	9A	26	★	0	71	28	CLAYEY SAND (SC)
WR0017_057B	11A	31	⊙	0	77	23	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program
RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST 81507.GDT 7/23/08

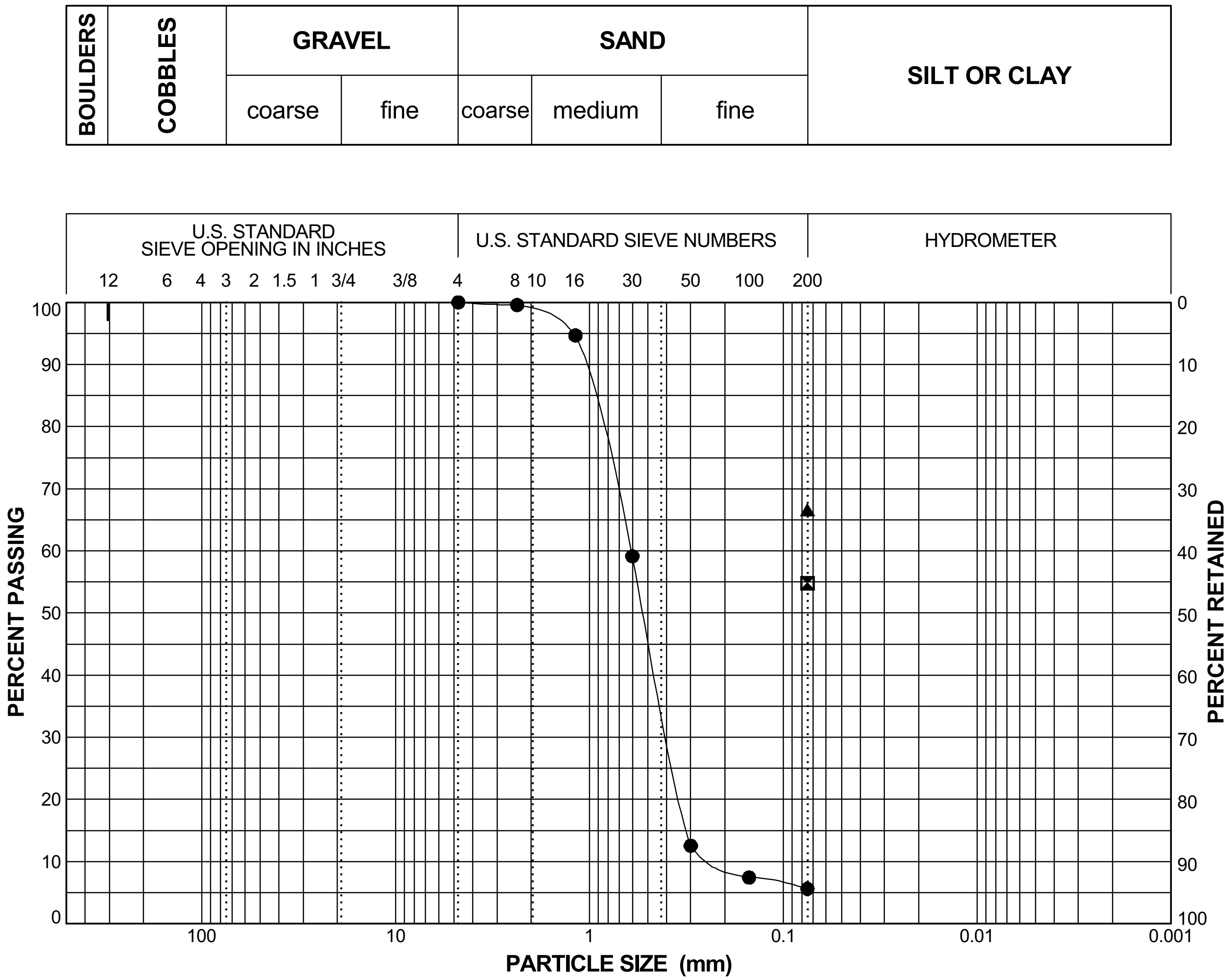


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_057B	13A	37	●	0	85	15	CLAYEY SAND (SC)
WR0017_057B	14A	40	⧗	0	90	10	Well-Graded SAND with Silt (SW-SM)
WR0017_057B	15A	42	▲	0	0	77	LEAN CLAY with Sand (CL)
WR0017_057B	24A	62	★	0	37	63	SANDY LEAN CLAY (CL)
WR0017_057B	30A	78	⊙	0	67	33	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

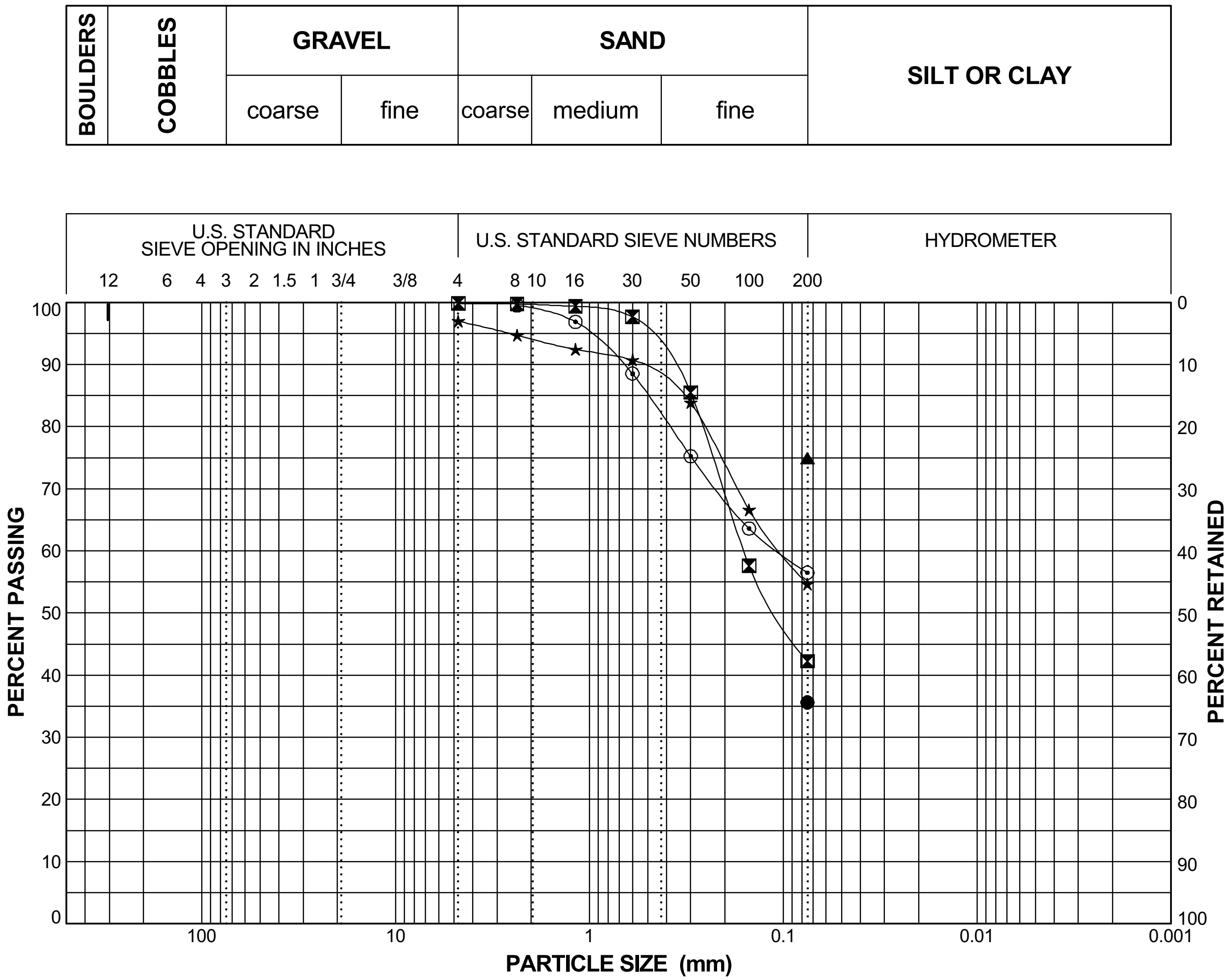


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_057B	33A	85.5	●	0	94	6	Poorly Graded SAND with Silt (SP-SM)
WR0017_057B	36A	92	⧗	0	0	55	SANDY SILT (ML)
WR0017_057B	38A	97	▲	0	0	67	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

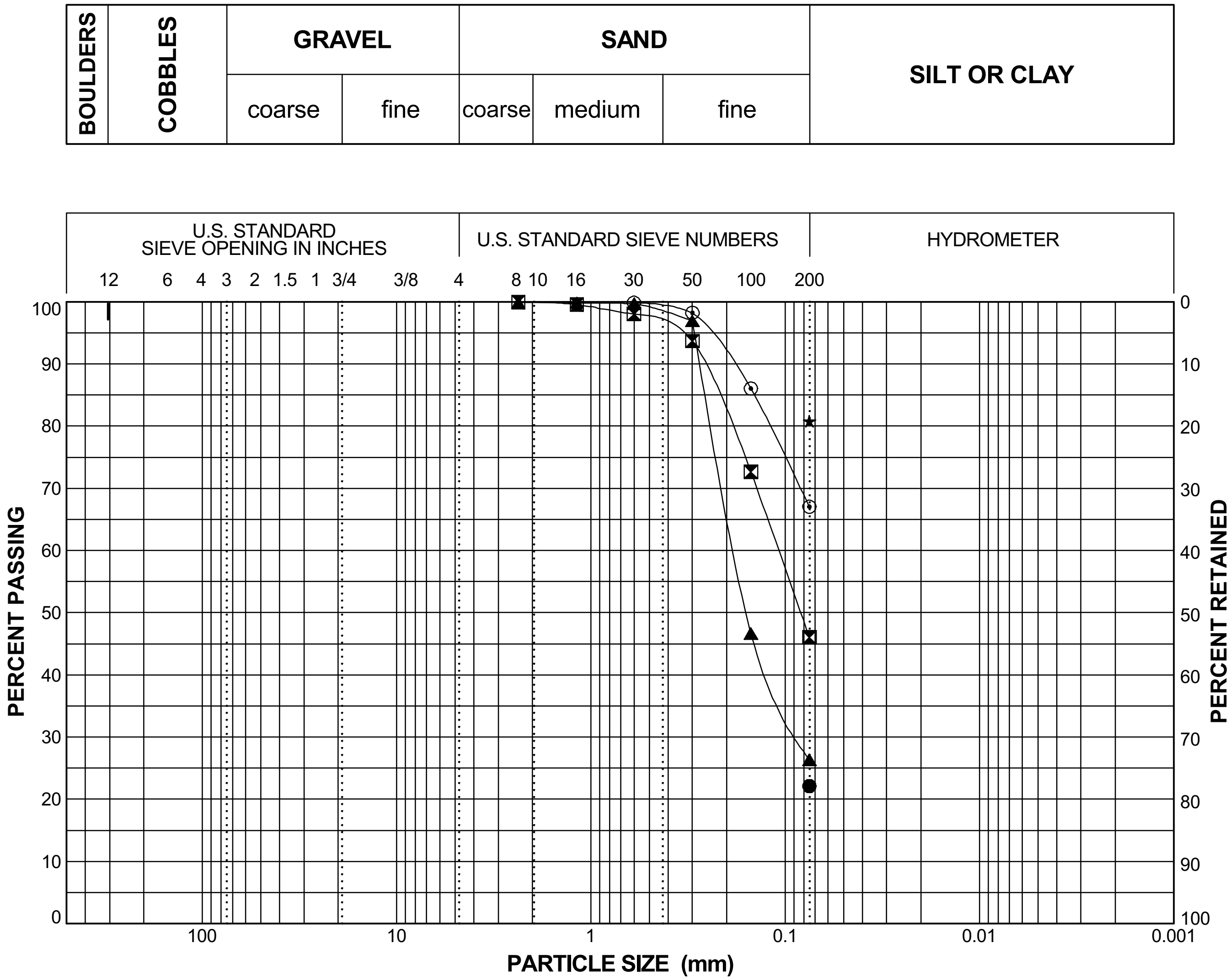


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_063B	3A	7.5	●	0	0	36	CLAYEY SAND (SC)
WR0017_063B	5A	13.5	⧗	0	58	42	CLAYEY SAND (SC)
WR0017_063B	6A	15.2	▲	0	0	75	LEAN CLAY with Sand (CL)
WR0017_063B	8A	20	★	0	42	55	SANDY LEAN CLAY (CL)
WR0017_063B	15A	40.5	⊙	0	43	56	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

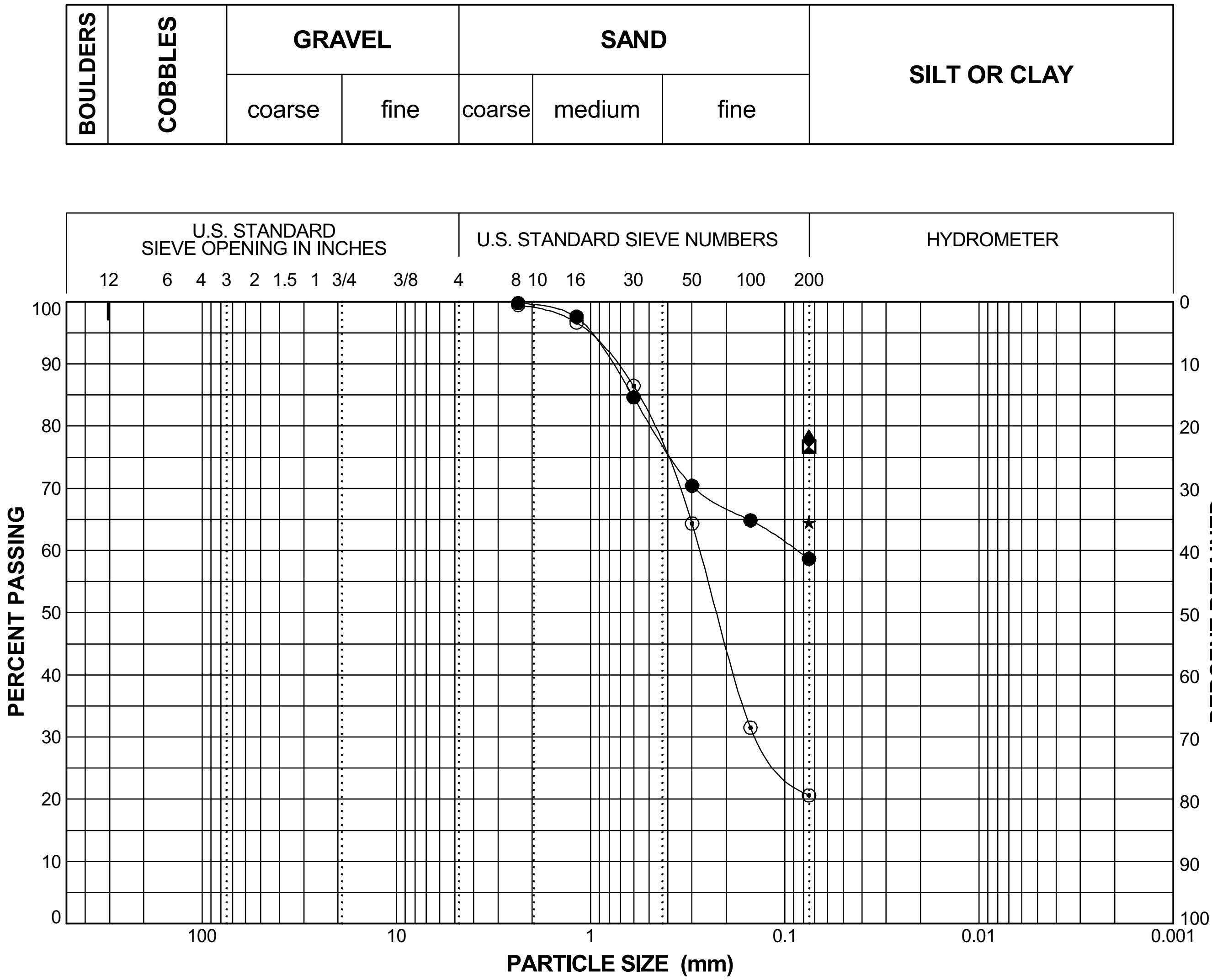


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_063B	18A	45	●	0	0	22	CLAYEY SAND (SC)
WR0017_063B	21A	51.5	⊠	0	54	46	CLAYEY SAND (SC)
WR0017_063B	23A	56.5	▲	0	74	26	CLAYEY SAND (SC)
WR0017_063B	27A	72.5	★	0	0	81	LEAN CLAY with Sand (CL)
WR0017_063B	30A	77	⊙	0	33	67	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



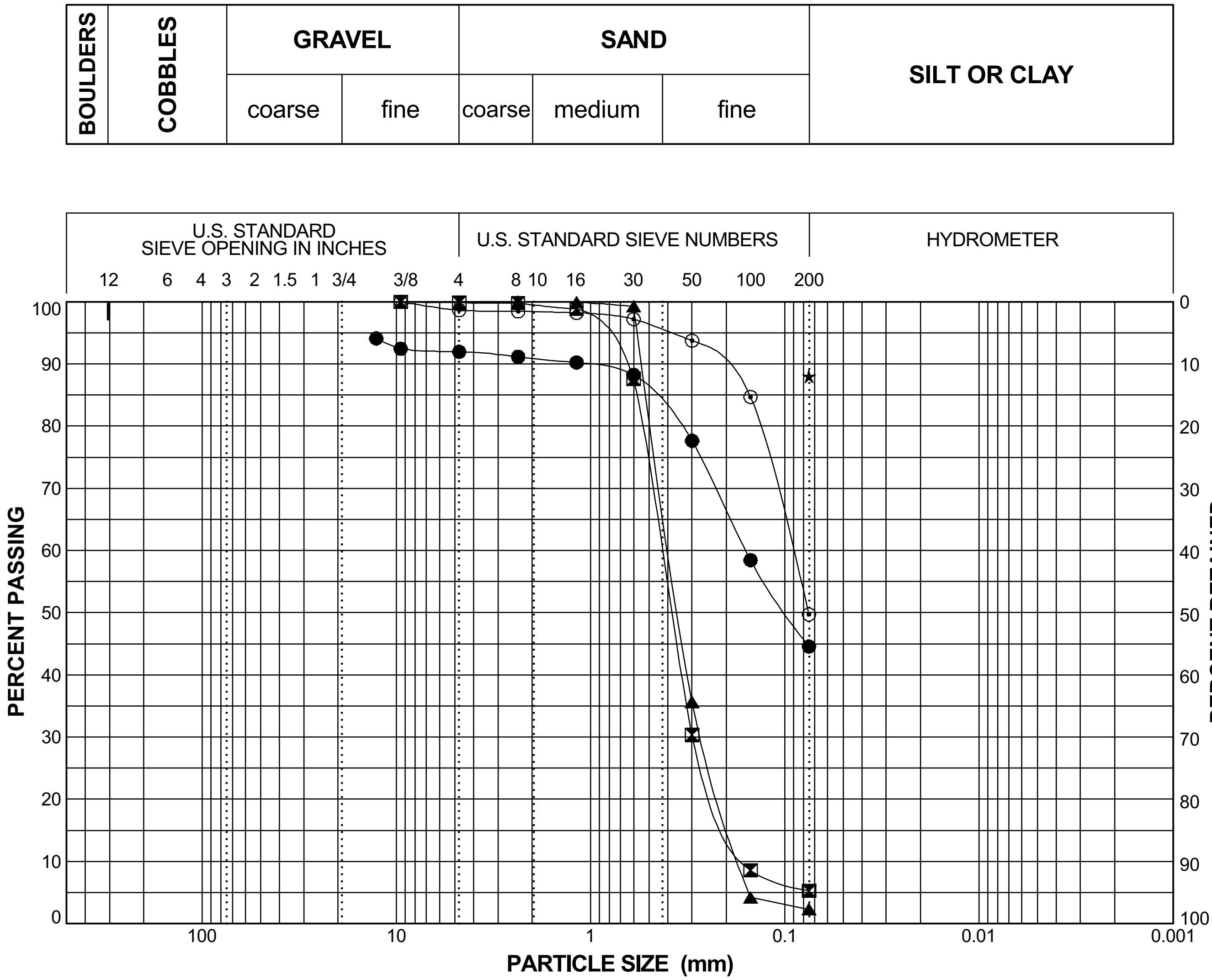
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_063B	32A	82	●	0	41	59	SANDY LEAN CLAY (CL)
WR0017_063B	38A	95	⧗	0	0	77	SILT with Sand (ML)
WR0017_063B	41A	102	▲	0	0	79	SILT with Sand (ML)
WR0017_063B	43A	108	★	0	0	65	SANDY SILT (ML)
WR0017_063B	46A	115	⊙	0	79	21	CLAYEY SAND (SC)

DWR SIEVE CURVES DWR052708.GPJ DWR TEST 81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

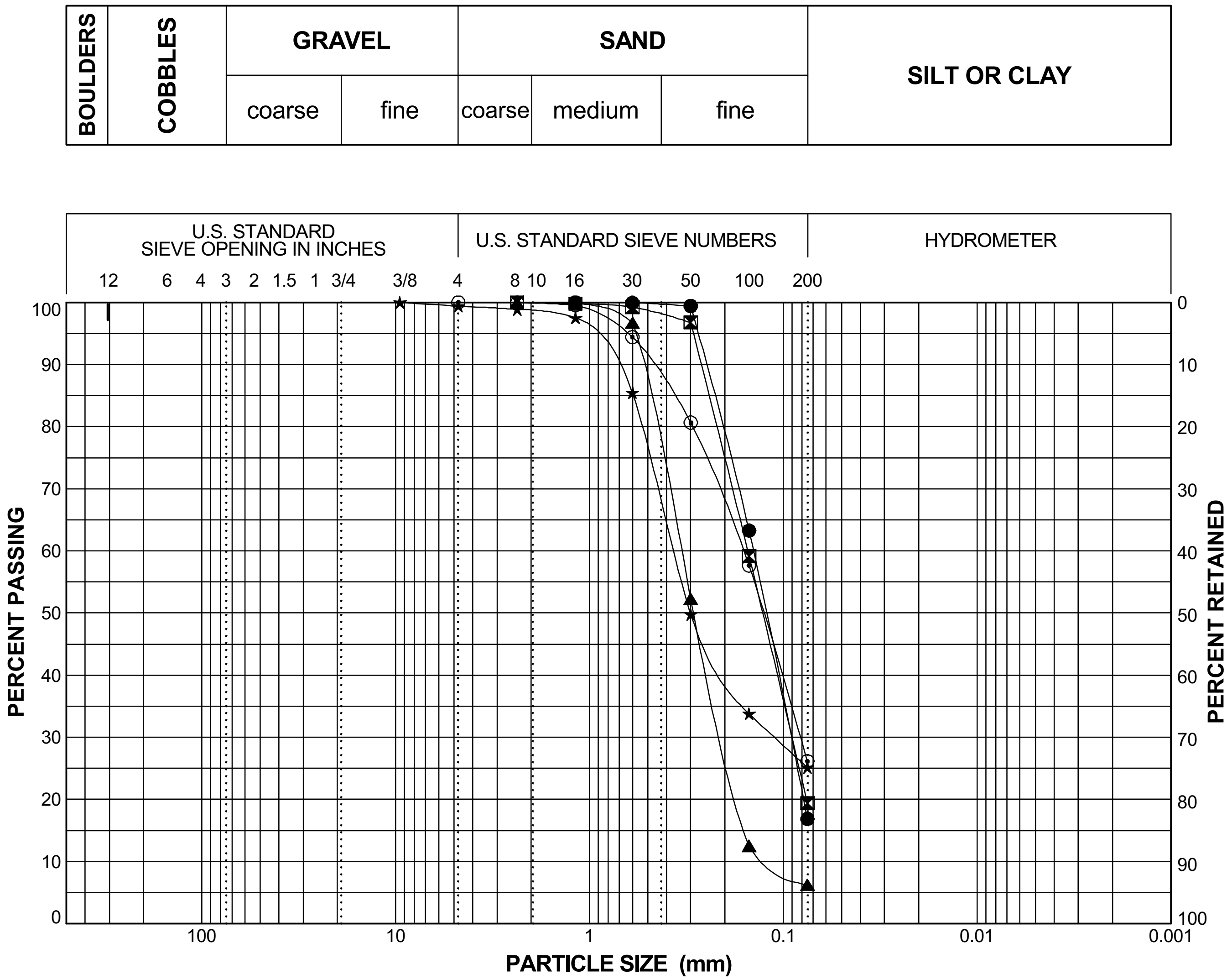


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_069B	2B	5.5	●	2	47	45	CLAYEY SAND (SC)
WR0017_069B	3A	7	⧗	0	95	5	Poorly Graded SAND with Silt (SP-SM)
WR0017_069B	4A	10.3	▲	0	98	2	Poorly Graded SAND (SP)
WR0017_069B	5A	12.5	★	0	0	88	LEAN CLAY (CL)
WR0017_069B	6A	15	⊙	1	49	50	SANDY SILT (ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



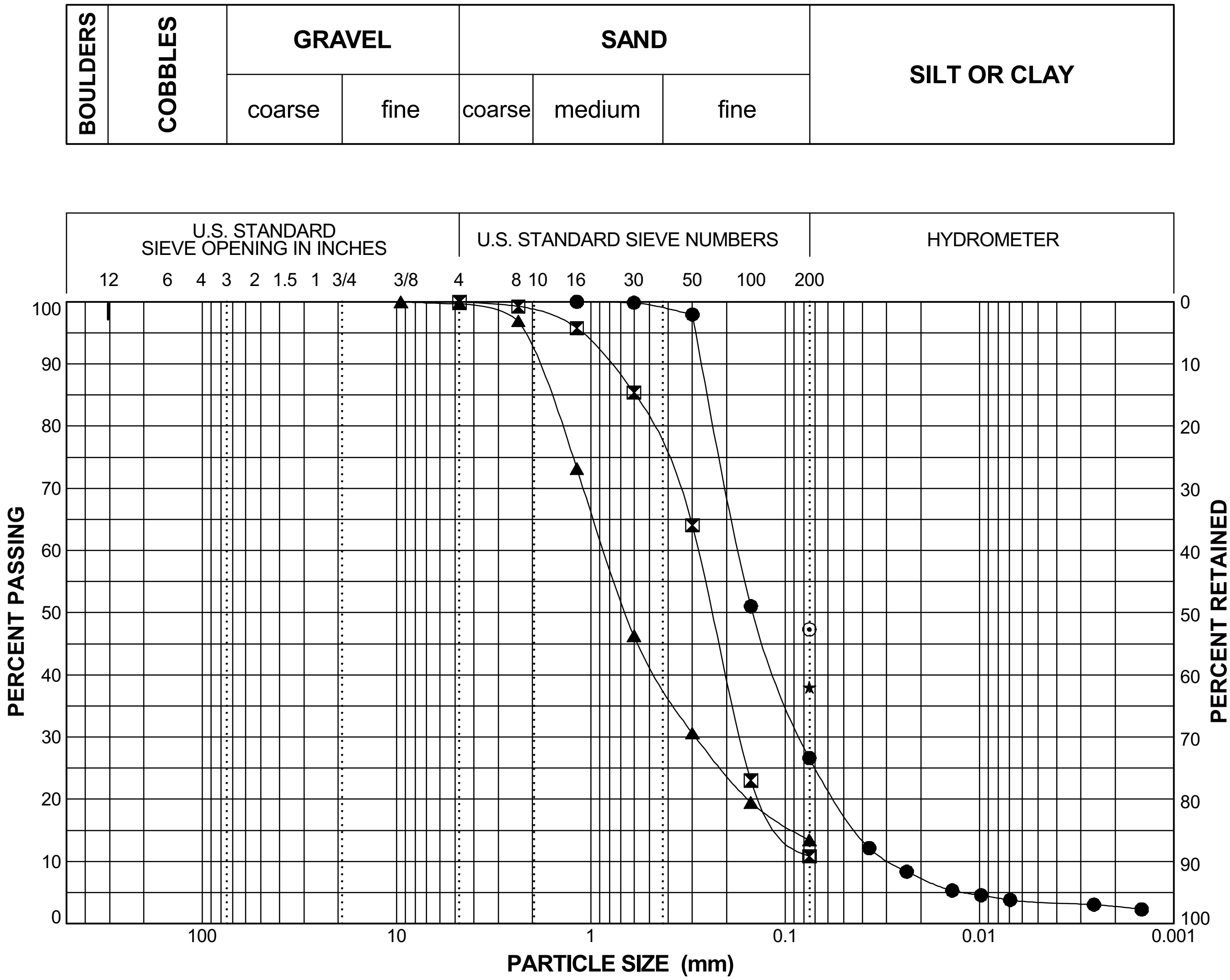
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_069B	7A	20	●	0	83	17	SILTY SAND (SM)
WR0017_069B	8A	21.5	⊠	0	81	19	SILTY SAND (SM)
WR0017_069B	9A	25	▲	0	94	6	Poorly Graded SAND (SP-SM)
WR0017_069B	18A	47.5	★	1	74	25	CLAYEY SAND (SC)
WR0017_069B	20A	52	⊙	0	74	26	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 6/9/08

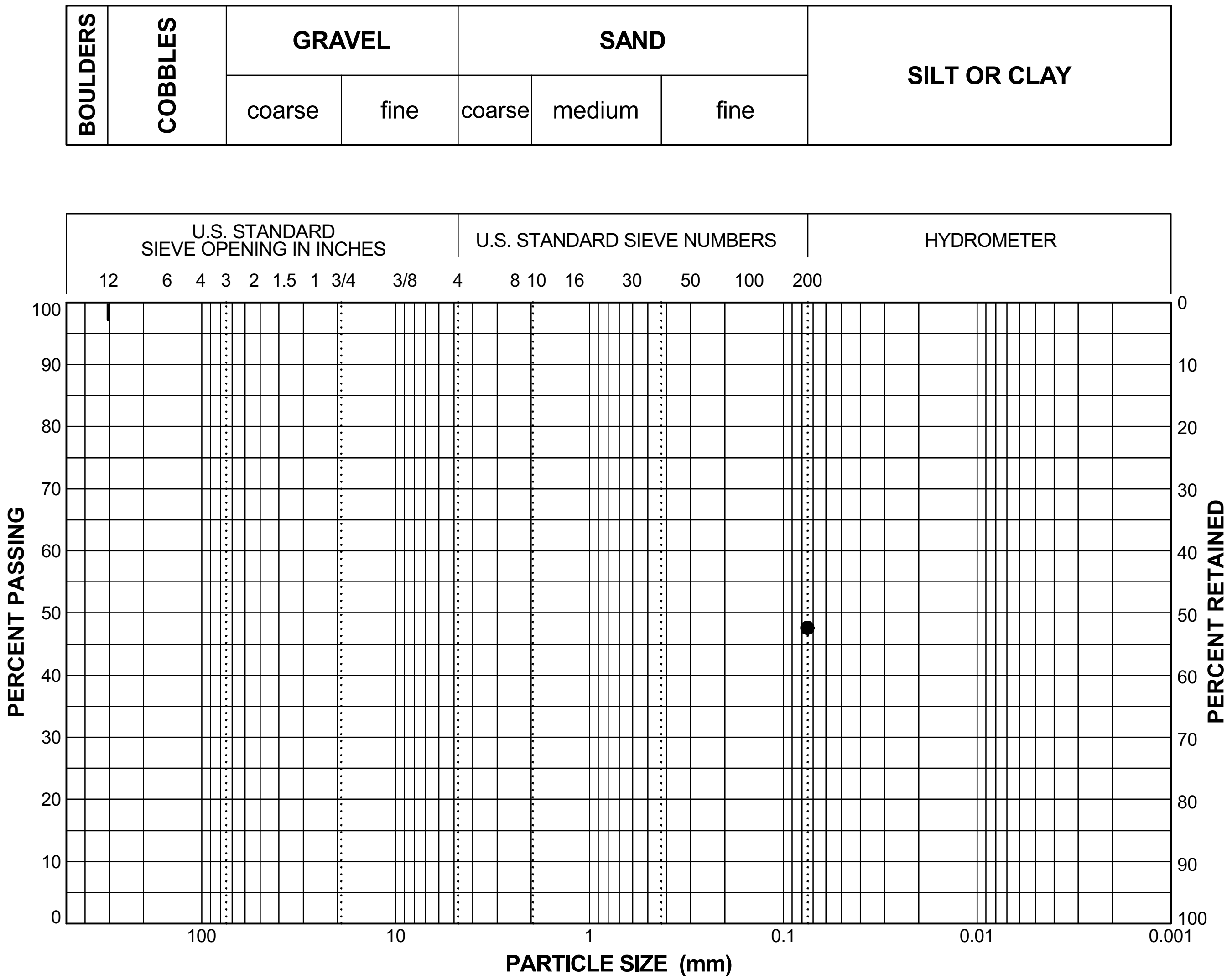


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_069B	22A	58.5	●	0	73	27	SILTY SAND (SM)
WR0017_069B	24A	61.5	⊠	0	89	11	Poorly Graded SAND with Silt (SP-SM)
WR0017_069B	28A	74	▲	0	86	13	SILTY SAND (SP)
WR0017_069B	33A	85	★	0	0	38	SILTY CLAYEY SAND (SC-SM)
WR0017_069B	35A	90.5	⊙	0	0	47	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



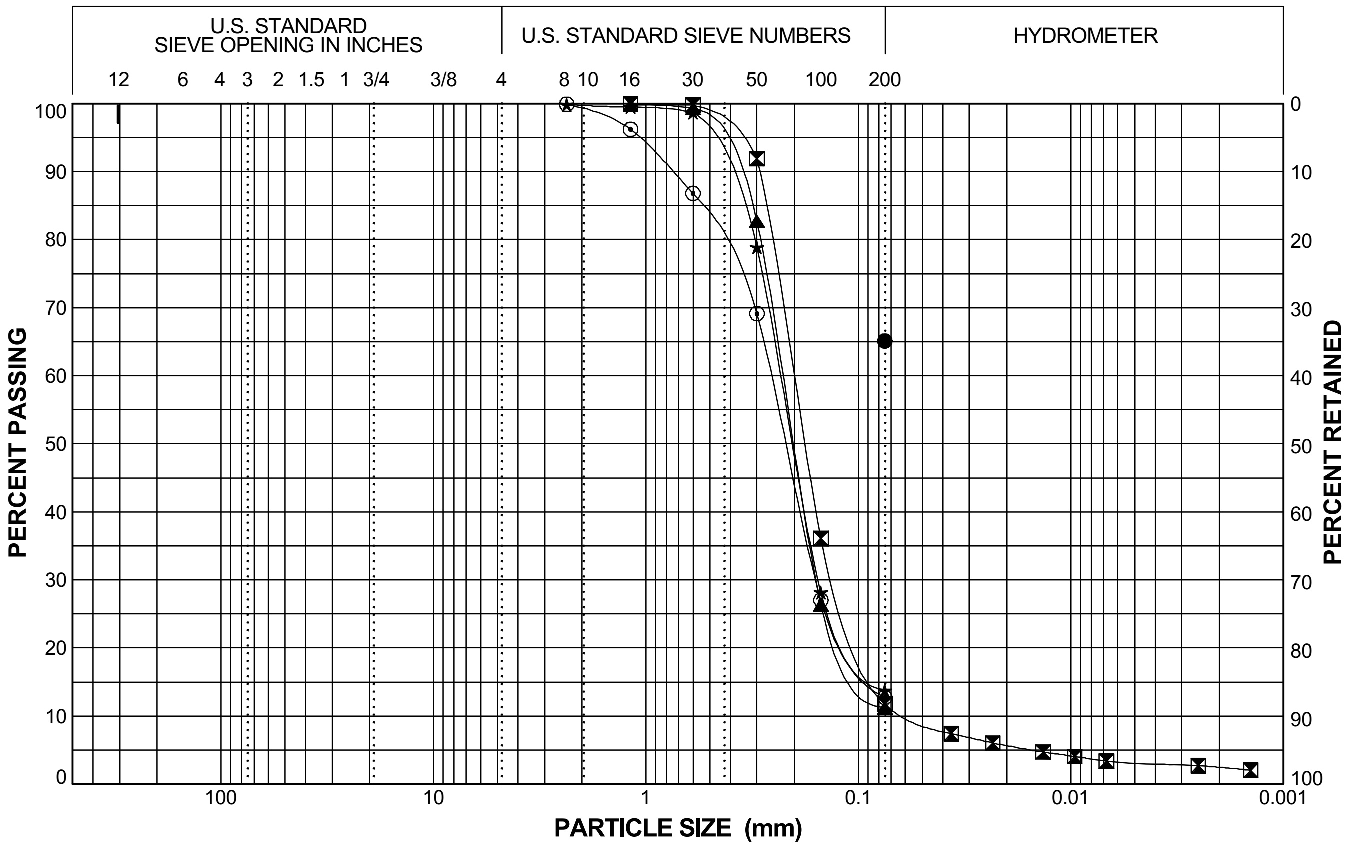
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_069B	38A	100	●	0	0	48	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

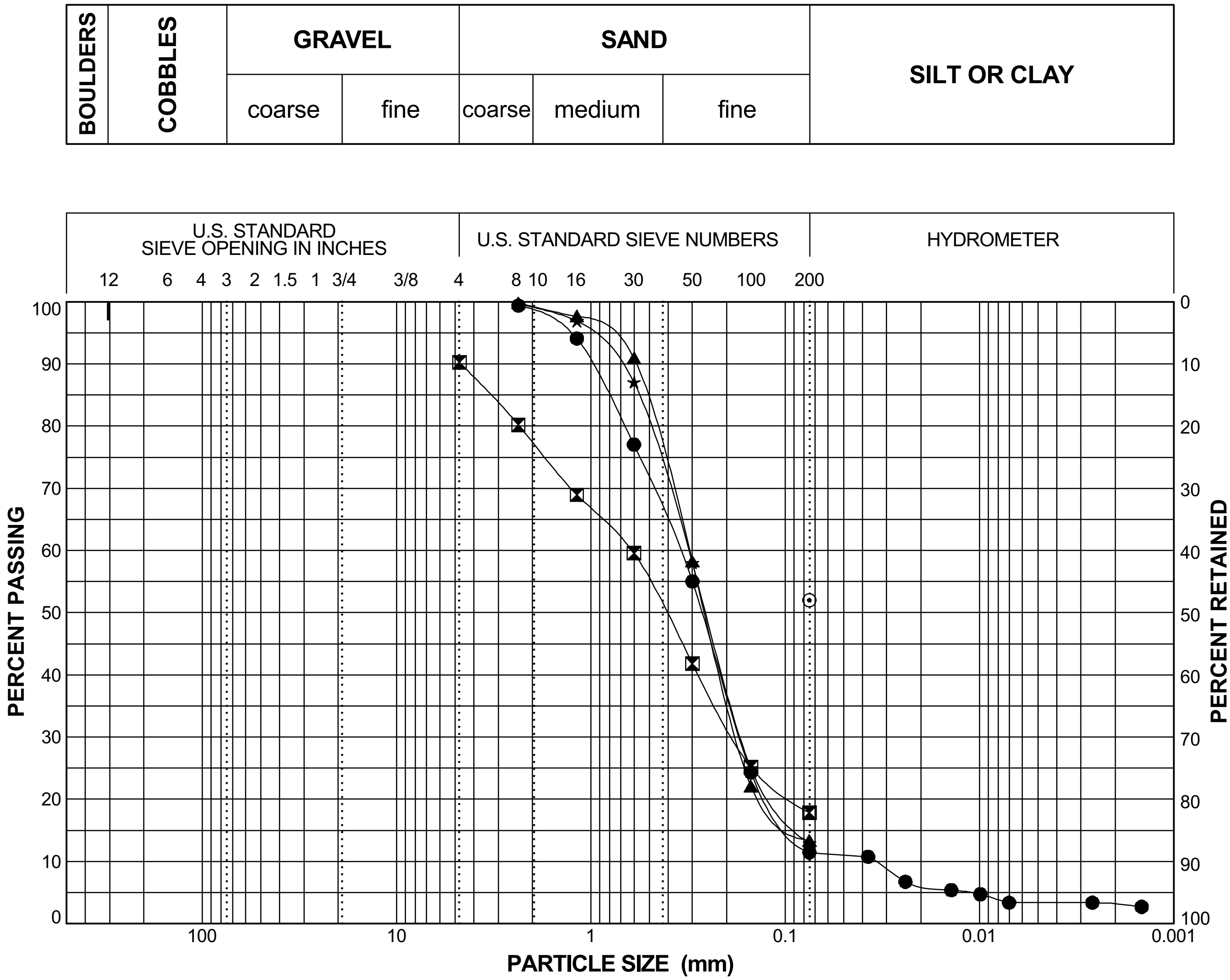


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_074B	3A	7.5	●	0	0	65	SANDY SILT (ML)
WR0017_074B	8A	21.5	⧗	0	88	12	Poorly Graded SAND with Silt (SP-SM)
WR0017_074B	9A	25.5	▲	0	89	11	Poorly Graded SAND with Silt (SP-SM)
WR0017_074B	13A	36	★	0	86	14	CLAYEY SAND (SC)
WR0017_074B	15A	43	⊙	0	87	13	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_074B	18A	48	●	0	88	11	Well-Graded SAND with Clay (SW-SC)
WR0017_074B	20A	51.5	⊠	0	72	18	CLAYEY SAND (SC)
WR0017_074B	21A	55.5	▲	0	86	13	CLAYEY SAND (SC)
WR0017_074B	24A	60	★	0	87	13	CLAYEY SAND (SC)
WR0017_074B	33A	82	⊙	0	0	52	SANDY LEAN CLAY (CL)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 6/9/08

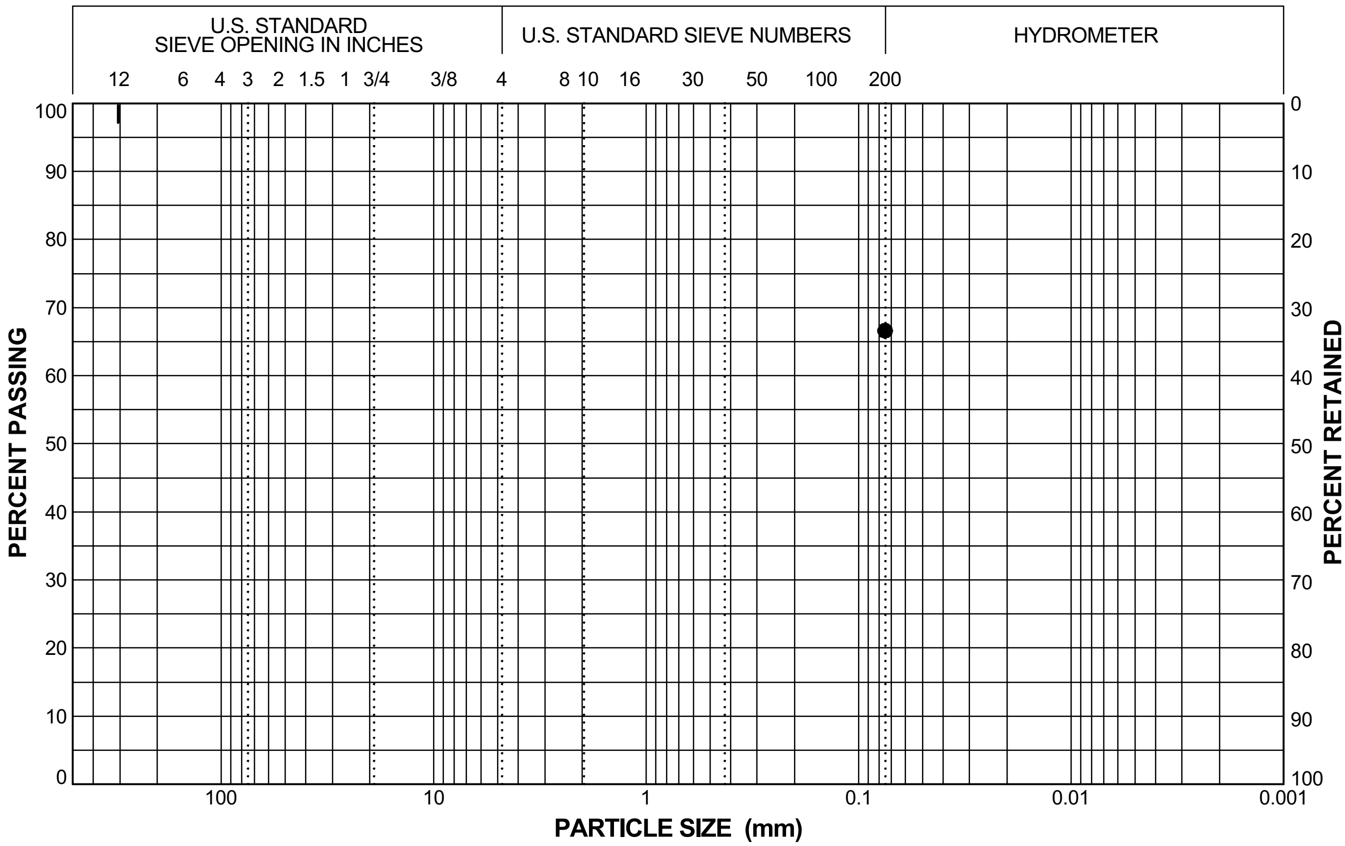
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



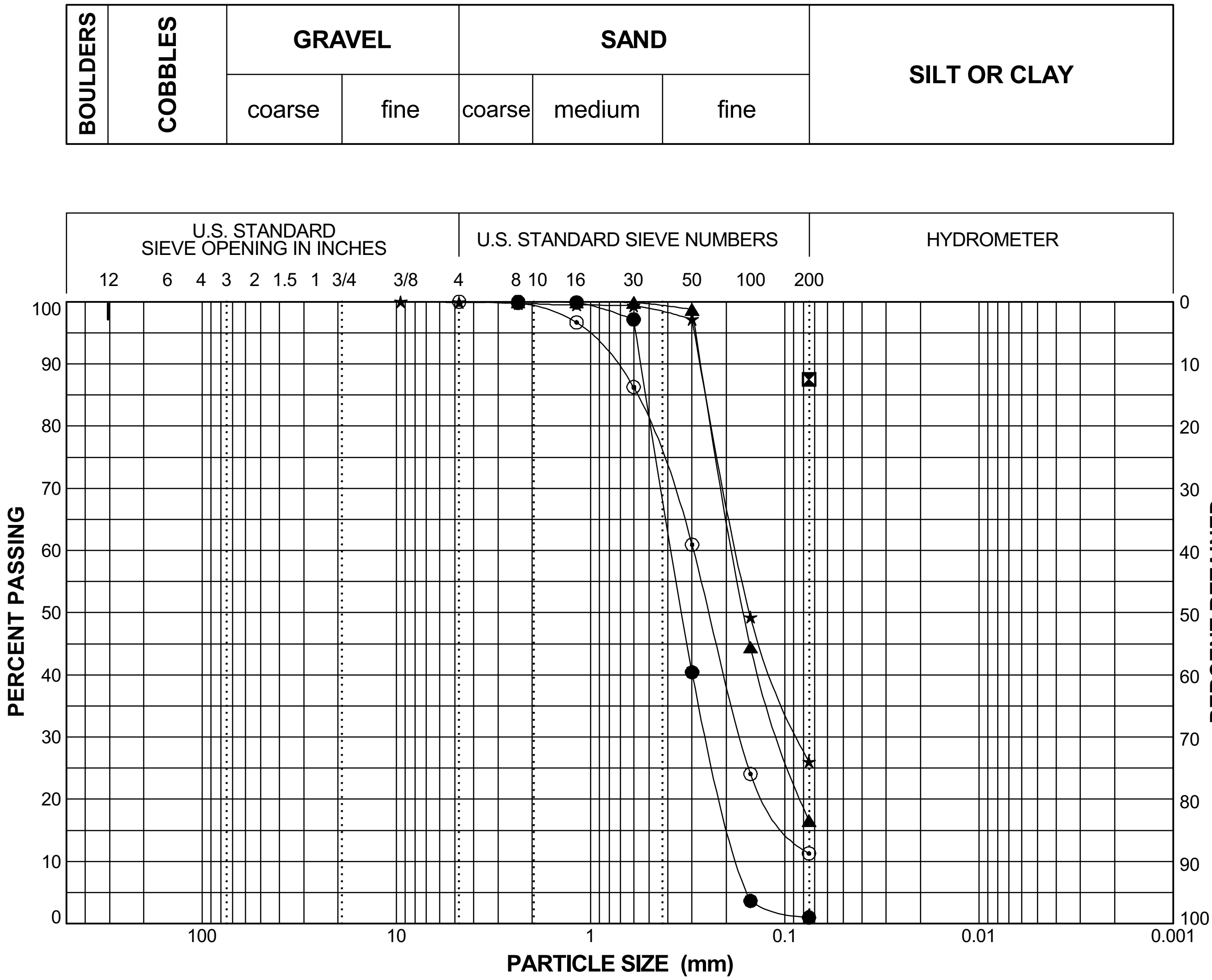
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_074B	38A	98	●	0	0	67	SANDY SILT (ML)

DWR SIEVE CURVES DWR052708.GPJ DWR TEST 81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



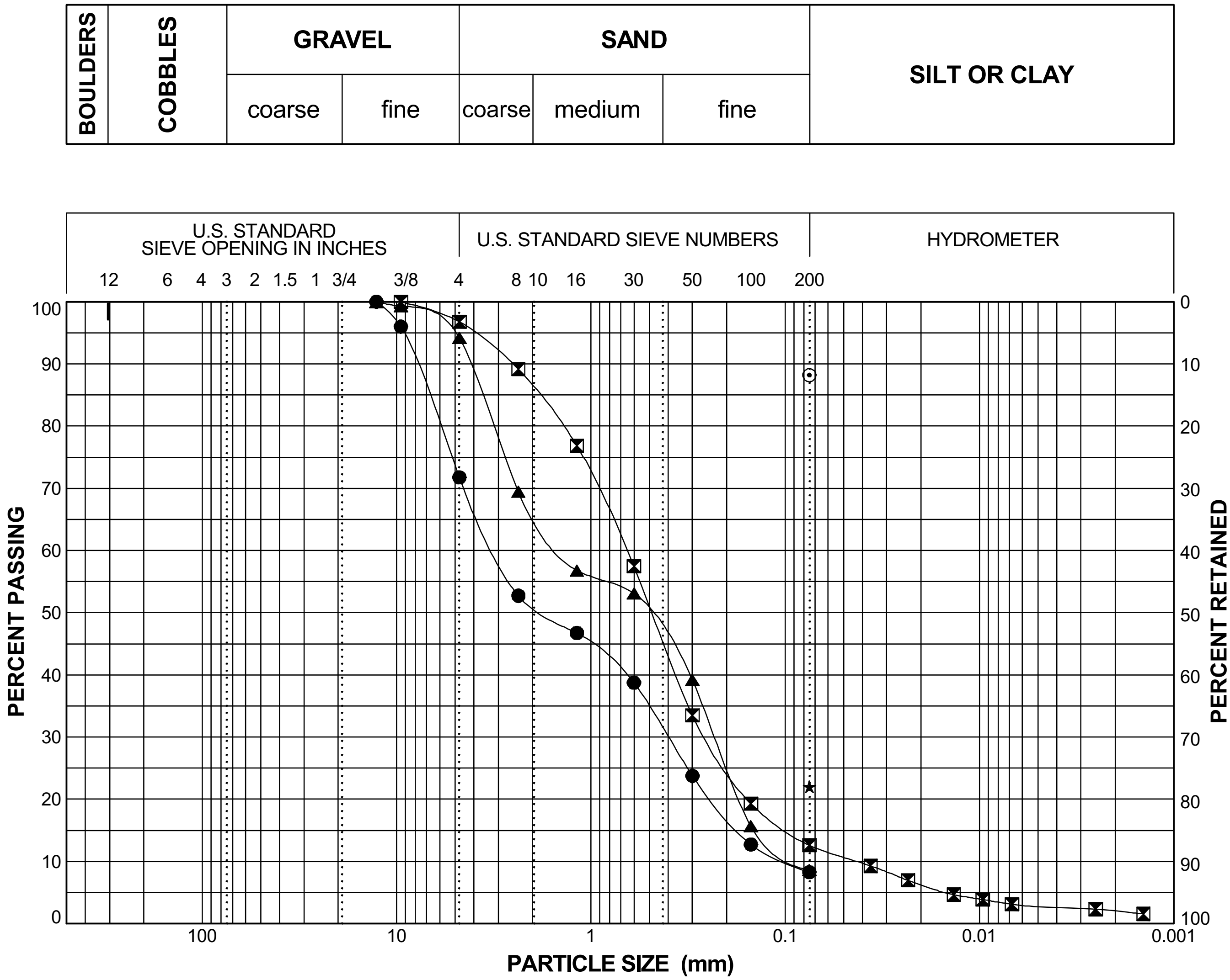
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_080B	2A	6	●	0	99	1	Poorly Graded SAND (SP)
WR0017_080B	6A	15	⊠	0	0	88	LEAN CLAY (CL)
WR0017_080B	9A	25	▲	0	83	17	SILTY SAND (SM)
WR0017_080B	11A	30	★	0	74	26	SILTY SAND (SM)
WR0017_080B	15A	40	⊙	0	89	11	Poorly Graded SAND with Silt (SP-SM)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



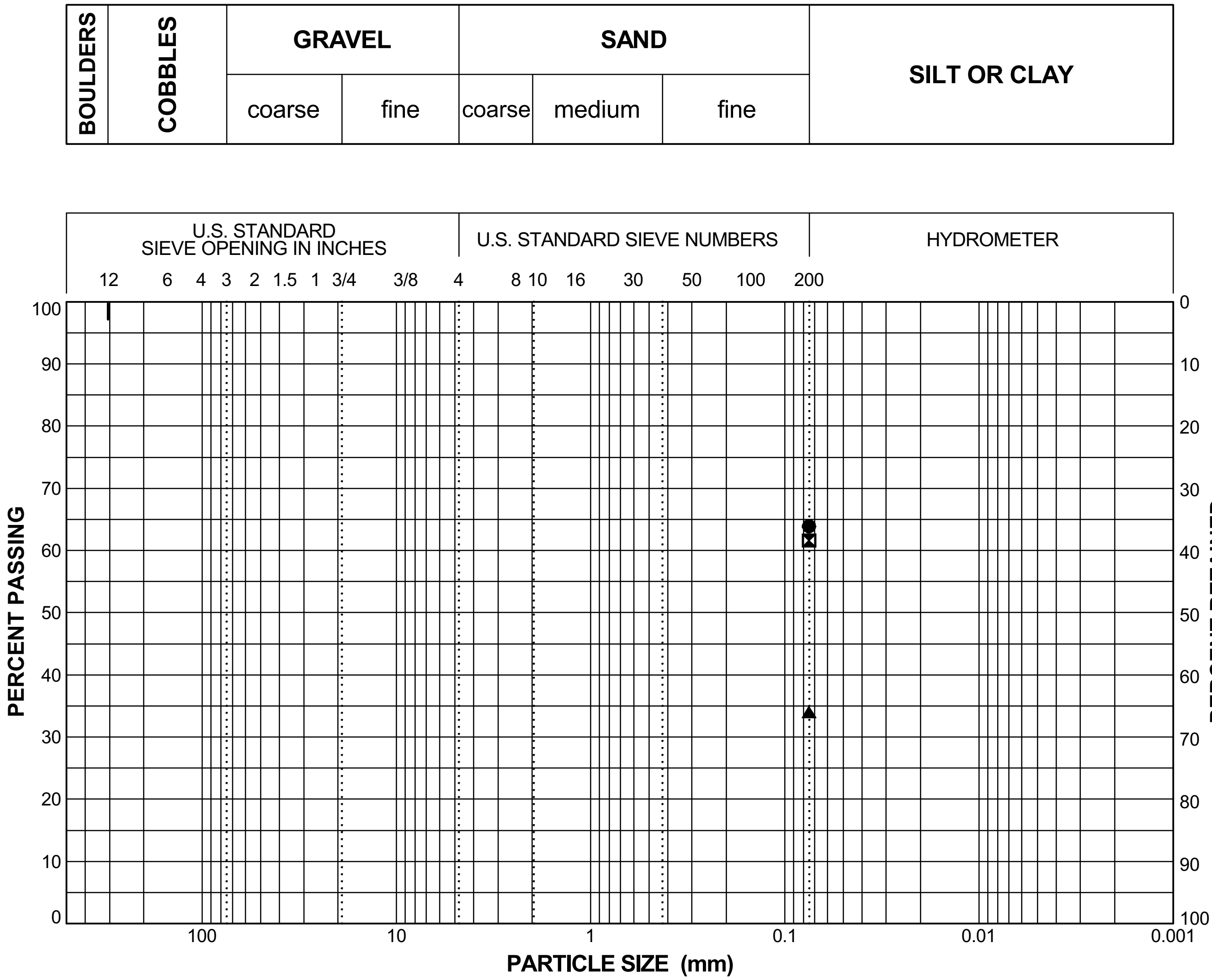
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_080B	19A	48	●	28	63	8	Well-Graded SAND with Gravel (SW)
WR0017_080B	21A	51.5	⊠	3	84	13	SILTY SAND (SM)
WR0017_080B	23A	56.5	▲	6	86	9	Well-Graded SAND with Silt (SW-SM)
WR0017_080B	27B	70	★	0	0	22	SILTY SAND (SM)
WR0017_080B	28A	73	⊙	0	0	88	FAT CLAY (CH)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

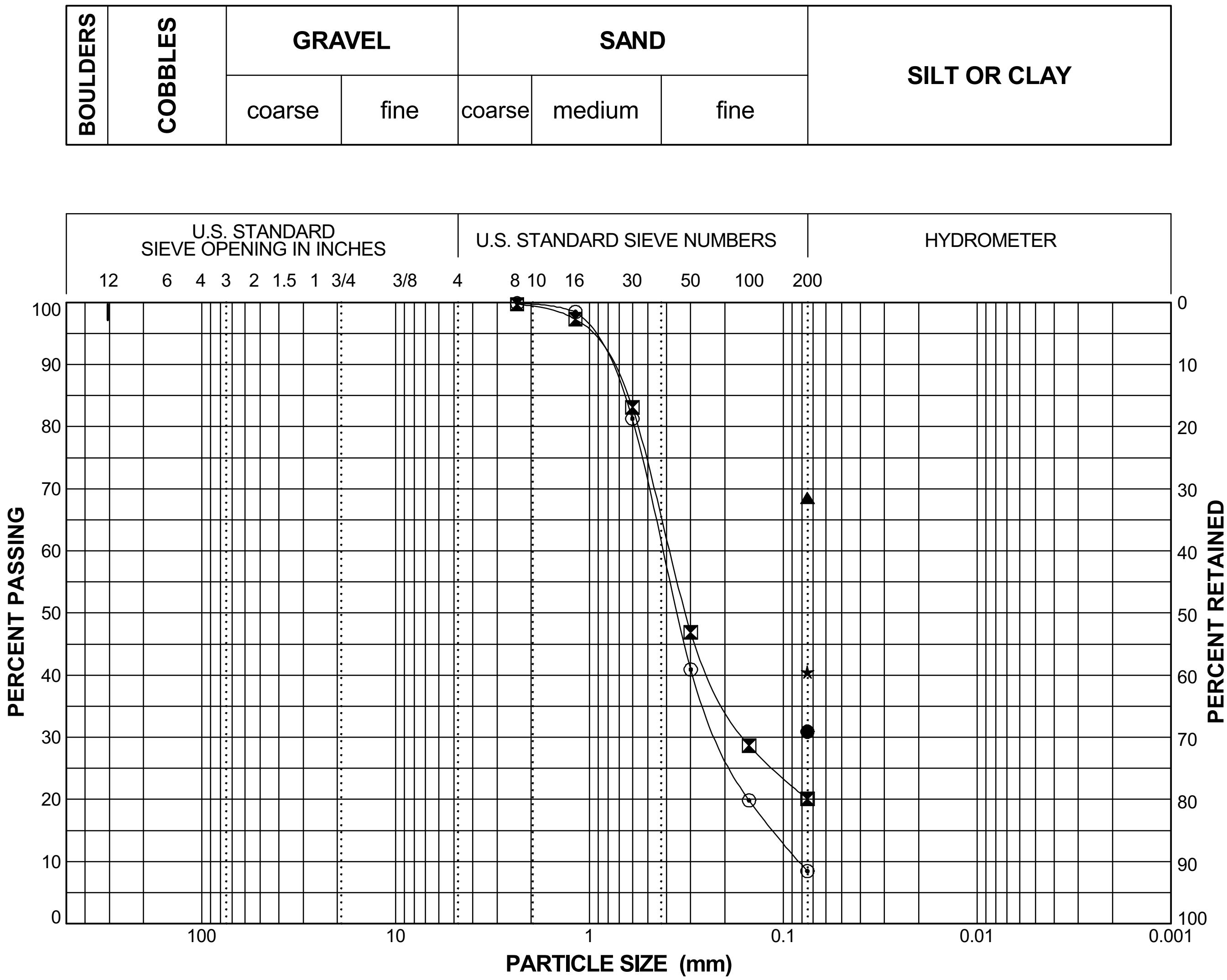


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_080B	36A	88	●	0	0	64	SANDY LEAN CLAY (CL)
WR0017_080B	37A	90	⊠	0	0	62	SANDY LEAN CLAY (CL)
WR0017_080B	41A	100	▲	0	0	34	SILTY CLAYEY SAND (SC-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

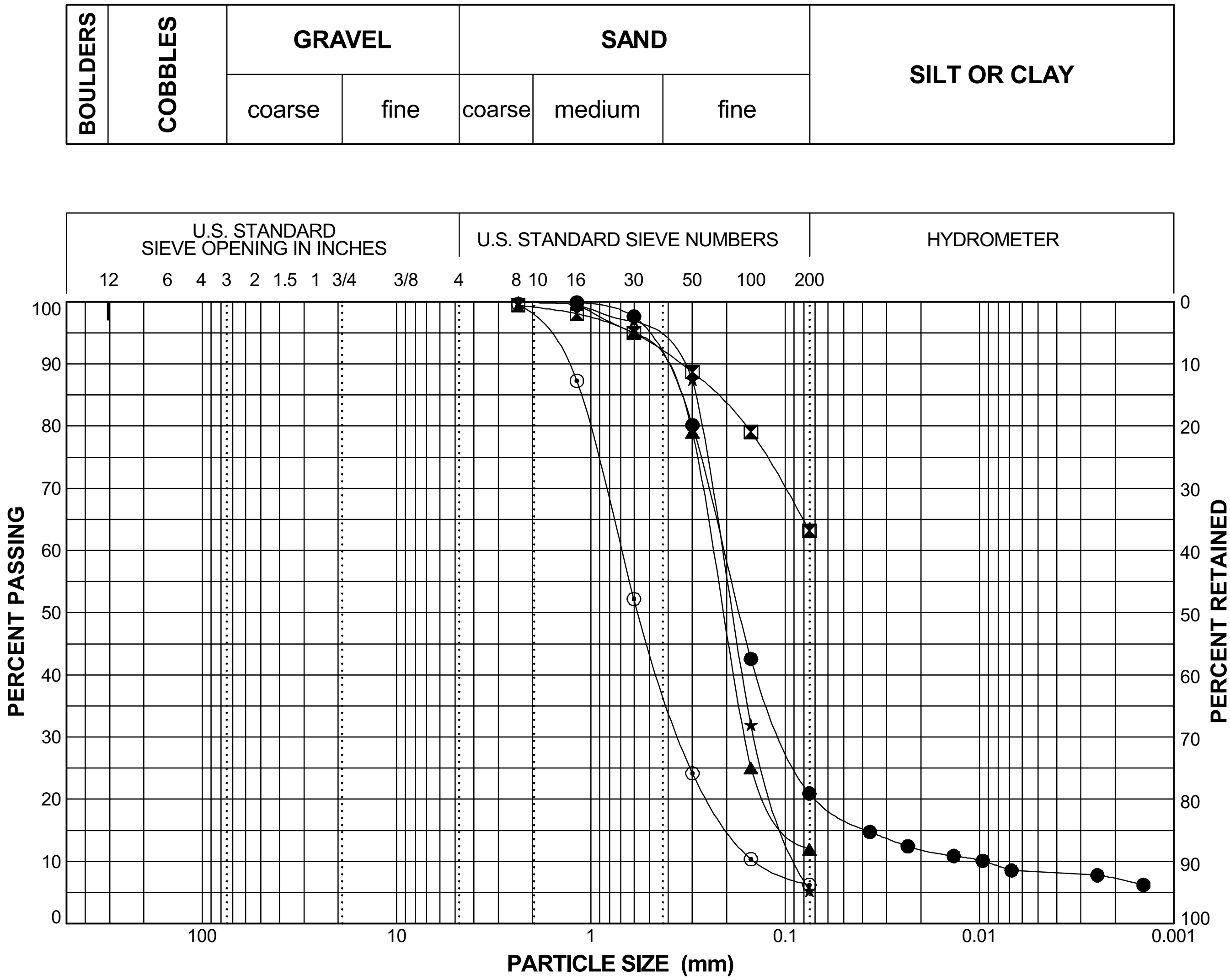


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_085B	3A	6.8	●	0	0	31	SILTY SAND (SM)
WR0017_085B	4A	10.5	⧗	0	80	20	CLAYEY SAND (SC)
WR0017_085B	5A	16	▲	0	0	69	SANDY LEAN CLAY (CL)
WR0017_085B	7B	20.5	★	0	0	41	SILTY SAND (SM)
WR0017_085B	8A	21.5	⊙	0	91	8	Poorly Graded SAND with Clay (SP-SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



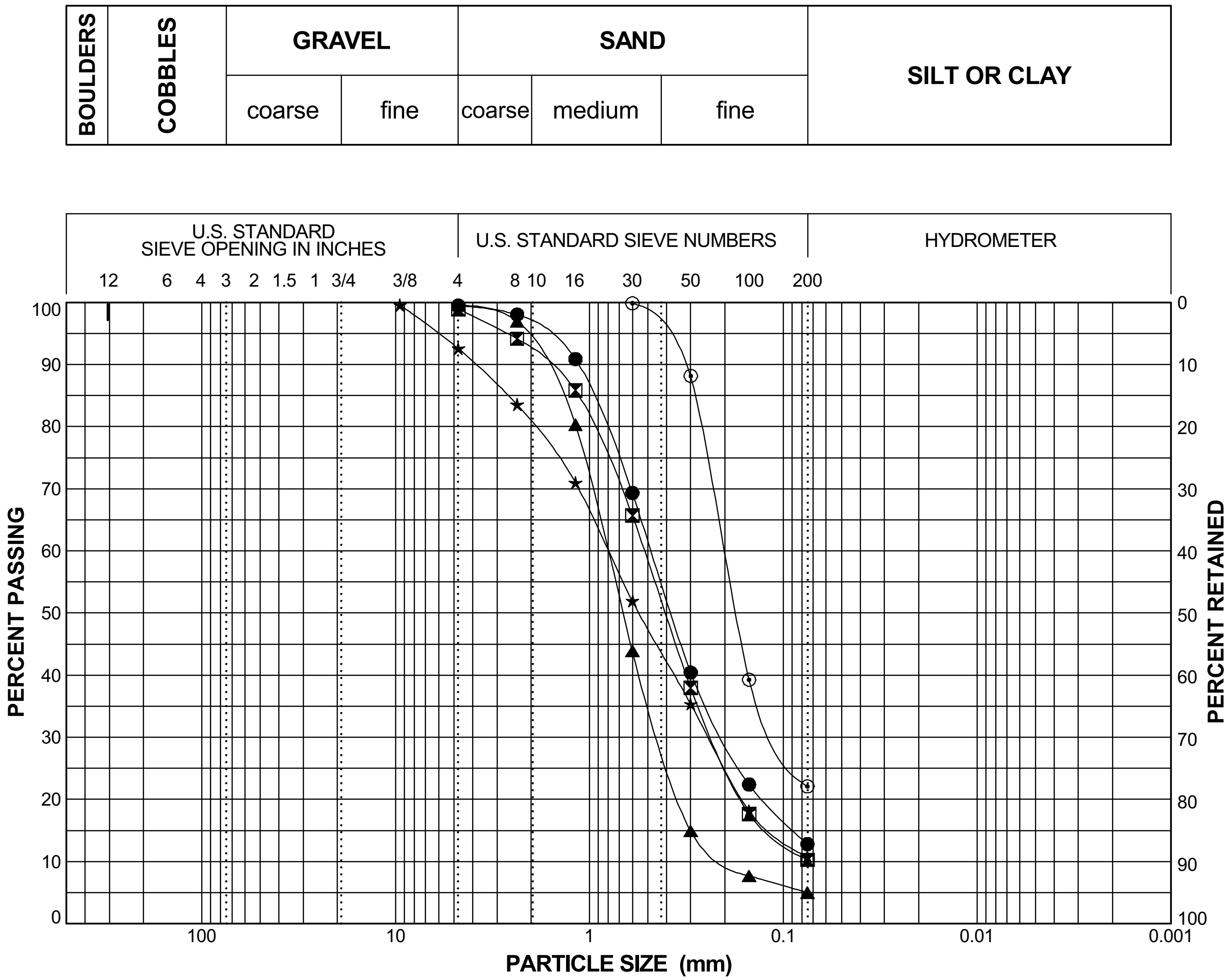
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_085B	9A	25	●	0	79	21	SILTY SAND (SM)
WR0017_085B	12A	31.5	⊠	0	36	63	SANDY SILT (ML)
WR0017_085B	14A	37.5	▲	0	88	12	Poorly Graded SAND with Silt (SP-SM)
WR0017_085B	15B	40.5	★	0	95	5	Poorly Graded SAND with Silt (SP-SM)
WR0017_085B	16A	42	⊙	0	93	6	Well-Graded SAND with Clay (SW-SC)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



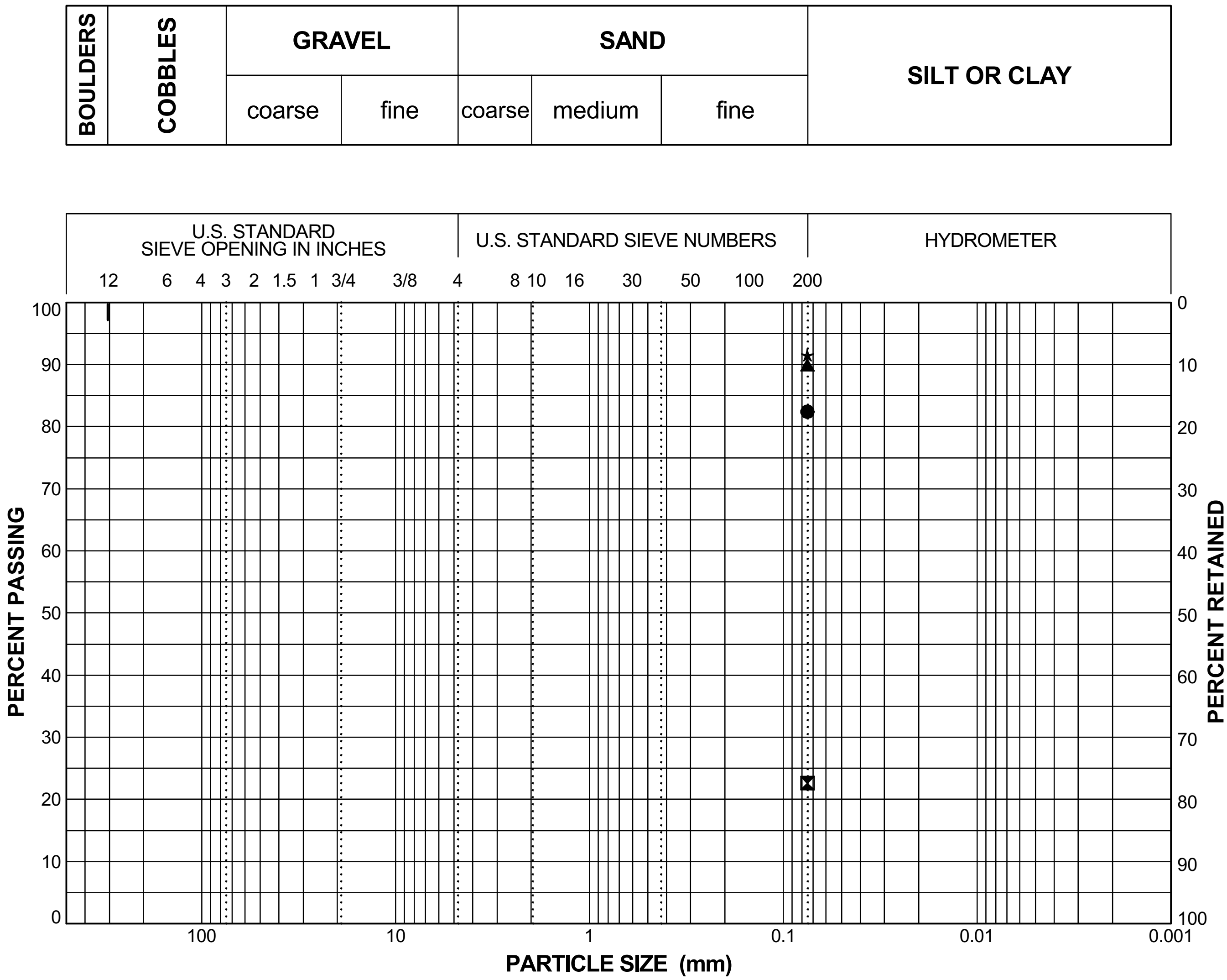
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_085B	21A	51.5	●	0	87	13	CLAYEY SAND (SC)
WR0017_085B	23A	58	⊠	0	89	10	Well-Graded SAND with Clay (SW-SC)
WR0017_085B	24A	60.5	▲	0	95	5	Poorly Graded SAND with Silt (SP-SM)
WR0017_085B	28A	67	★	7	82	11	Well-Graded SAND with Clay (SW-SC)
WR0017_085B	30A	72	⊙	0	78	22	SILTY SAND (SM)

DWR SIEVE CURVES DWR052708.GPJ DWR TEST 81507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

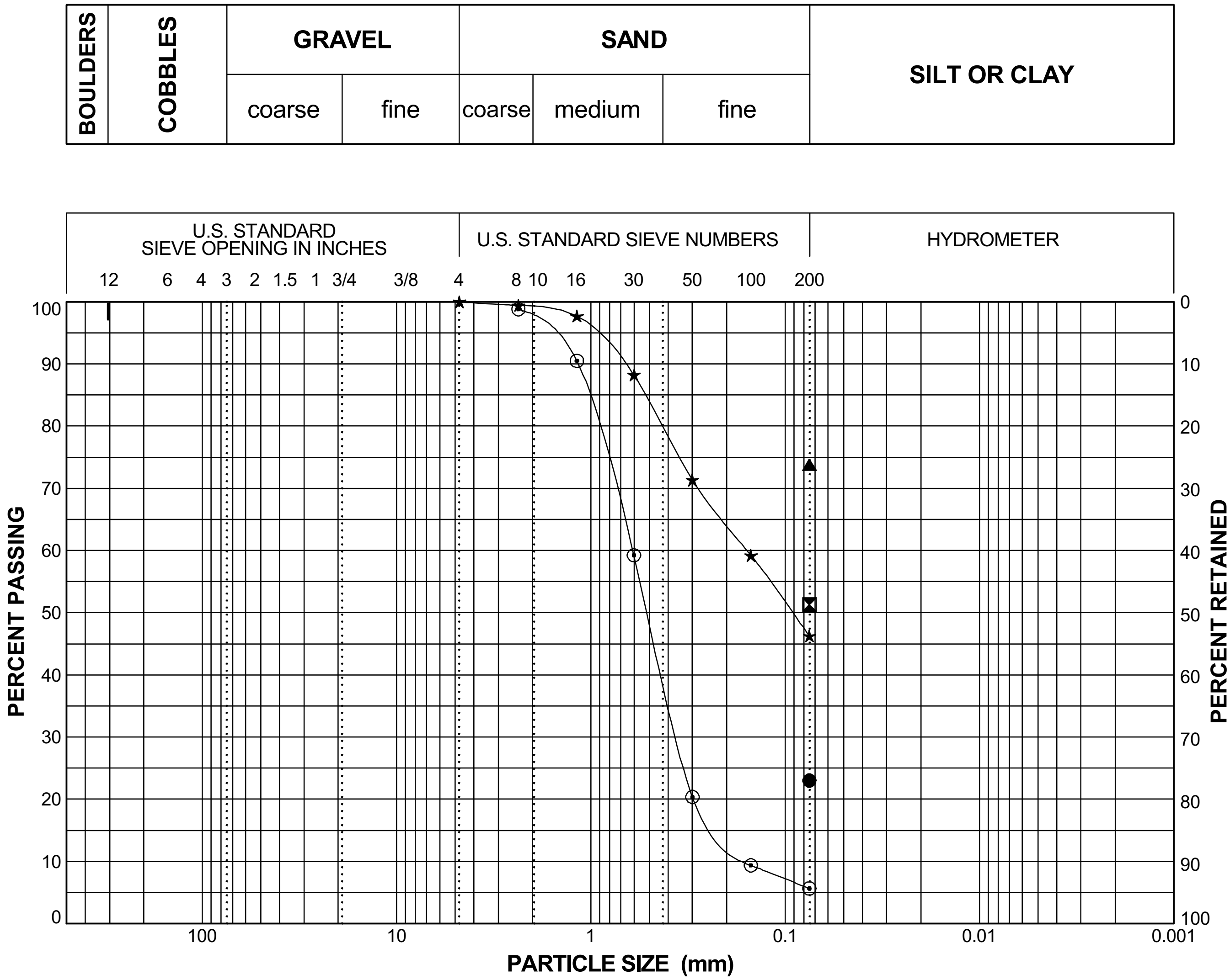


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_085B	34A	82	●	0	0	82	LEAN CLAY with Sand (CL)
WR0017_085B	36A	90	⧗	0	0	23	SILTY SAND (SM)
WR0017_085B	40A	100	▲	0	0	90	SILTY CLAY (CL-ML)
WR0017_085B	42A	105	★	0	0	92	LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations

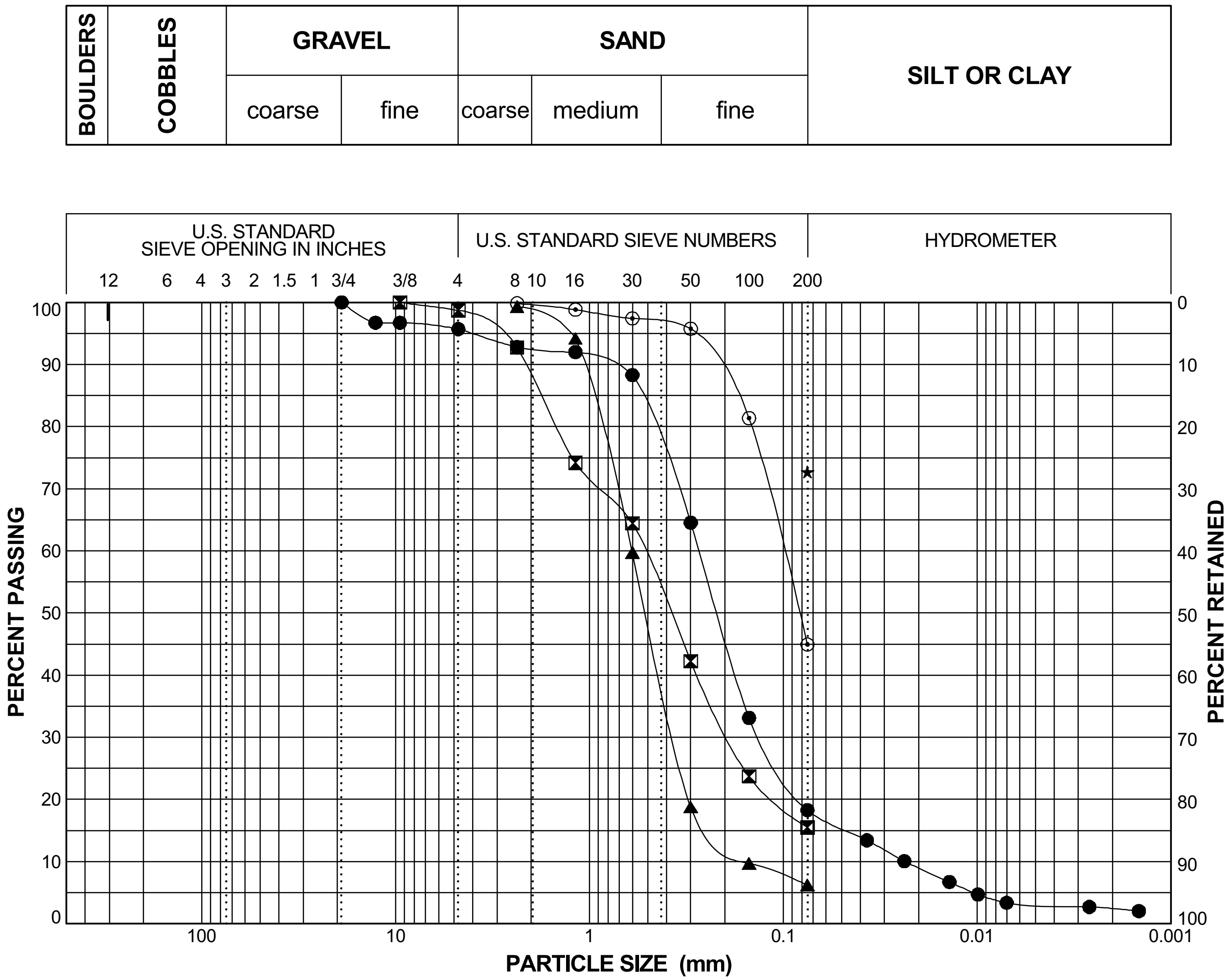
RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_090B	2A	6	●	0	0	23	SILTY SAND (SM)
WR0017_090B	3A	6.5	⊠	0	0	51	SANDY LEAN CLAY (CL)
WR0017_090B	9A	25	▲	0	0	74	SILT with Sand (ML)
WR0017_090B	12A	31	★	0	54	46	SILTY SAND (SM)
WR0017_090B	14A	36.5	⊙	0	93	6	Poorly Graded SAND with Clay (SP-SC)

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST_81507.GDT 6/9/08

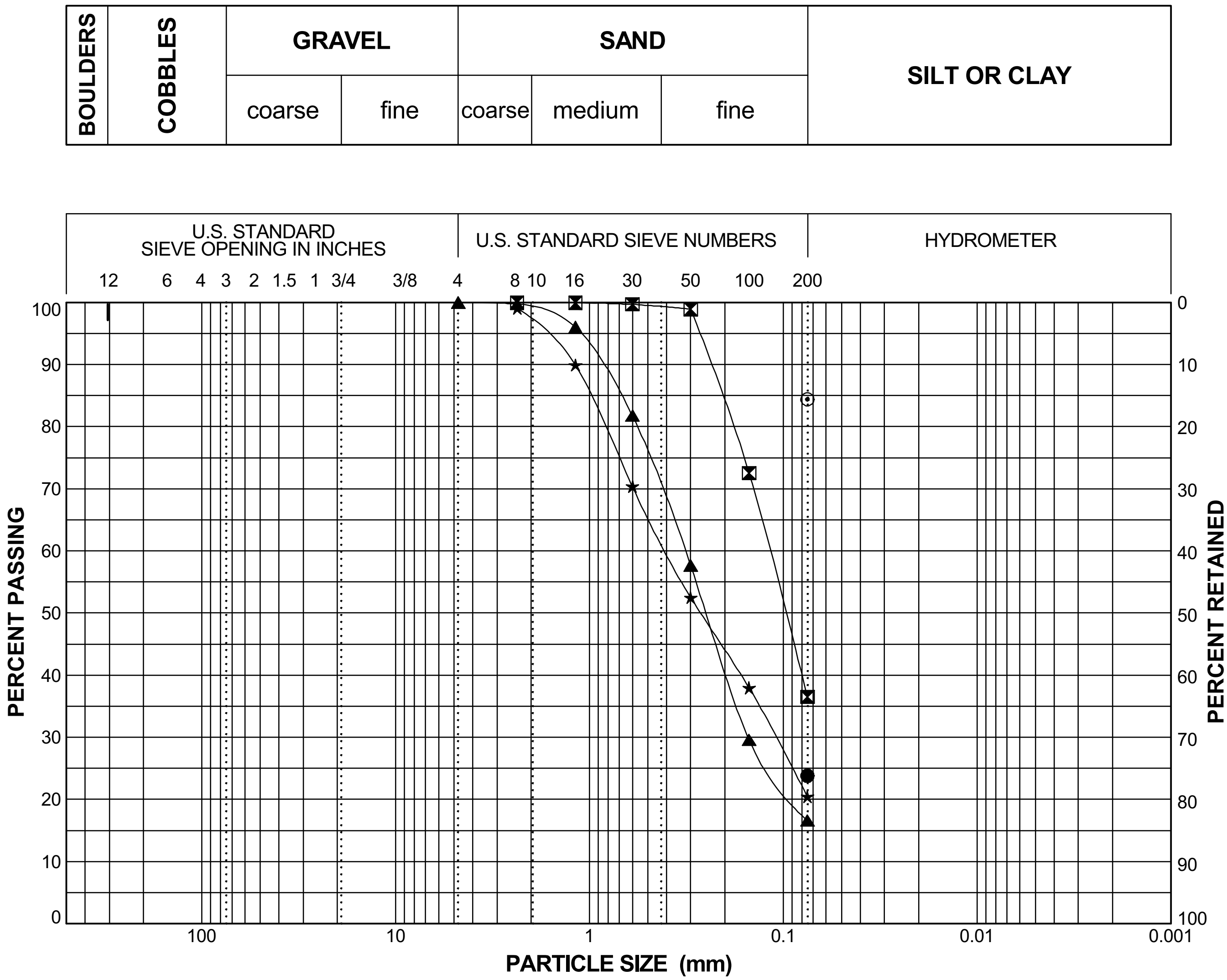


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_090B	16A	42	●	4	77	18	SILTY SAND (SM)
WR0017_090B	18A	47	⊠	1	83	15	SILTY SAND (SM)
WR0017_090B	22A	56.5	▲	0	93	6	Poorly Graded SAND with Silt (SP-SM)
WR0017_090B	26A	67	★	0	0	73	LEAN CLAY (CL)
WR0017_090B	30A	77.5	⊙	0	55	45	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

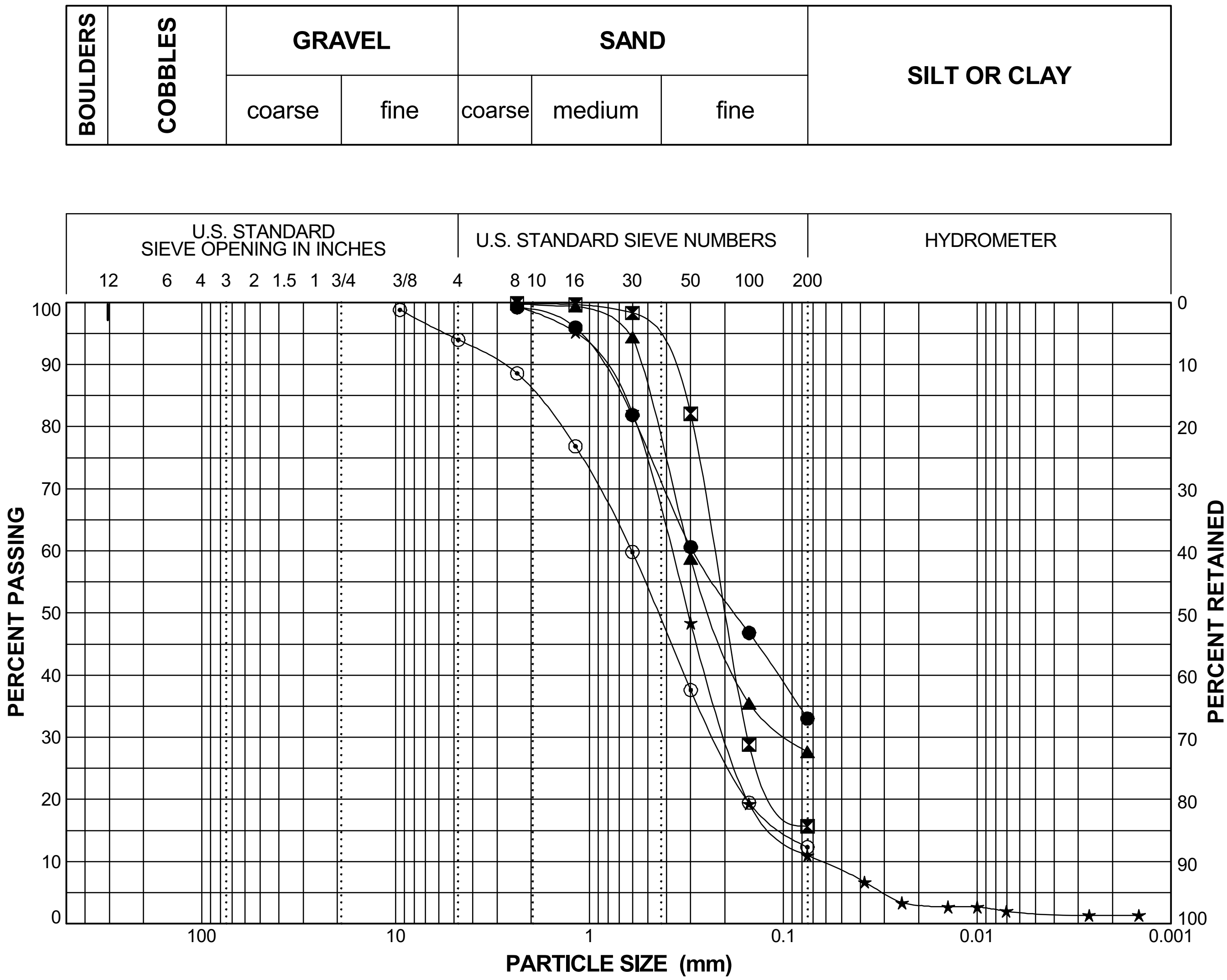


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_090B	34A	86	●	0	0	24	SILTY SAND (SM)
WR0017_090B	37A	92.5	⊠	0	64	36	SILTY SAND (SM)
WR0017_090B	40A	100	▲	0	83	17	SILTY SAND (SM)
WR0017_090B	44A	110	★	0	79	20	SILTY SAND (SM)
WR0017_090B	47A	116.5	⊙	0	0	84	SILT with Sand (ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



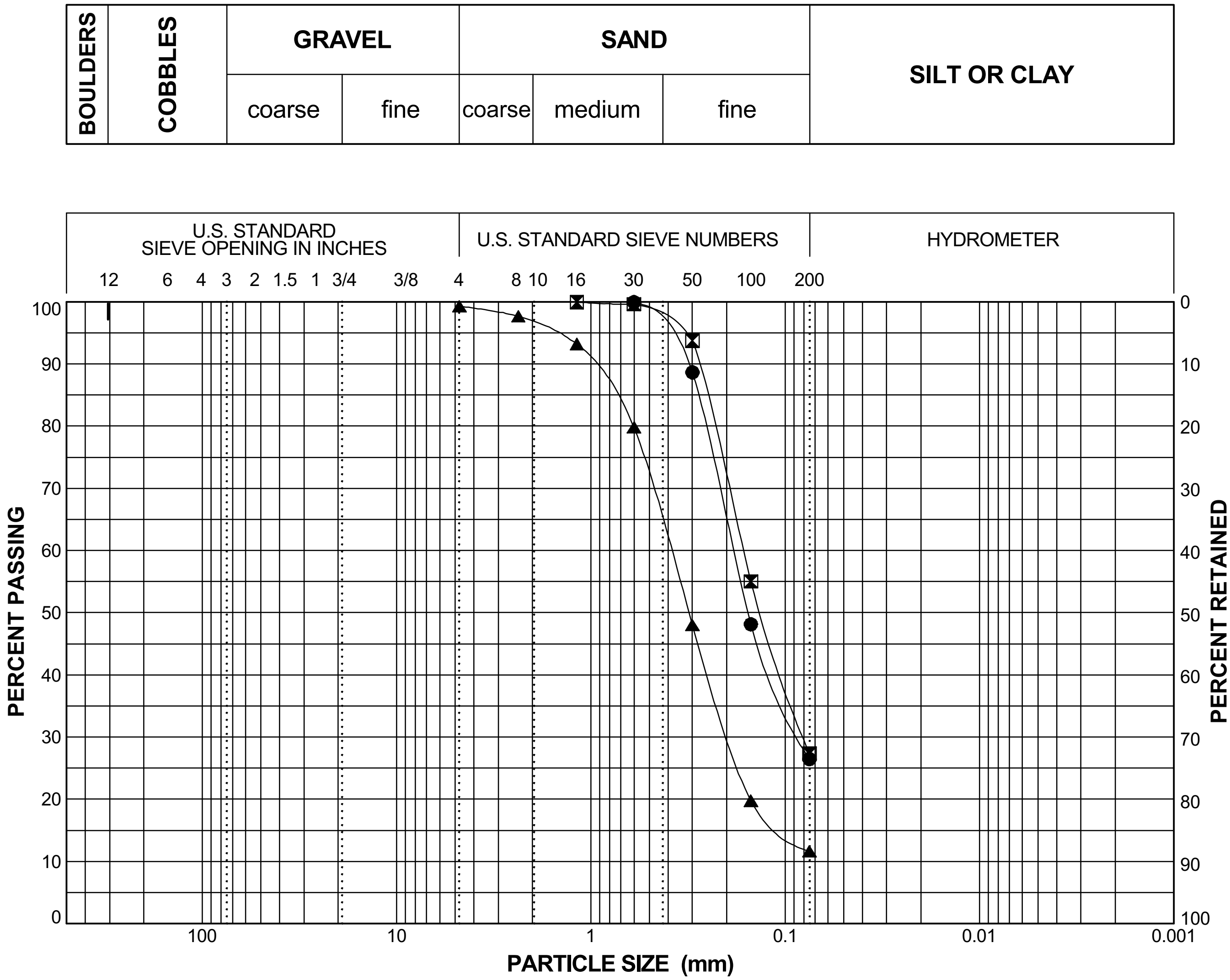
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_096B	4A	16	●	0	66	33	CLAYEY SAND (SC)
WR0017_096B	9A	30	⊠	0	84	16	CLAYEY SAND (SC)
WR0017_096B	13A	41.5	▲	0	72	28	CLAYEY SAND (SC)
WR0017_096B	16A	50	★	0	88	11	Poorly Graded SAND with Silt (SP-SM)
WR0017_096B	19A	57	⊙	5	82	12	Poorly Graded SAND with Silt (SW-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR SIEVE CURVES DWR052708.GPJ DWR_TEST 81507.GDT 6/9/08

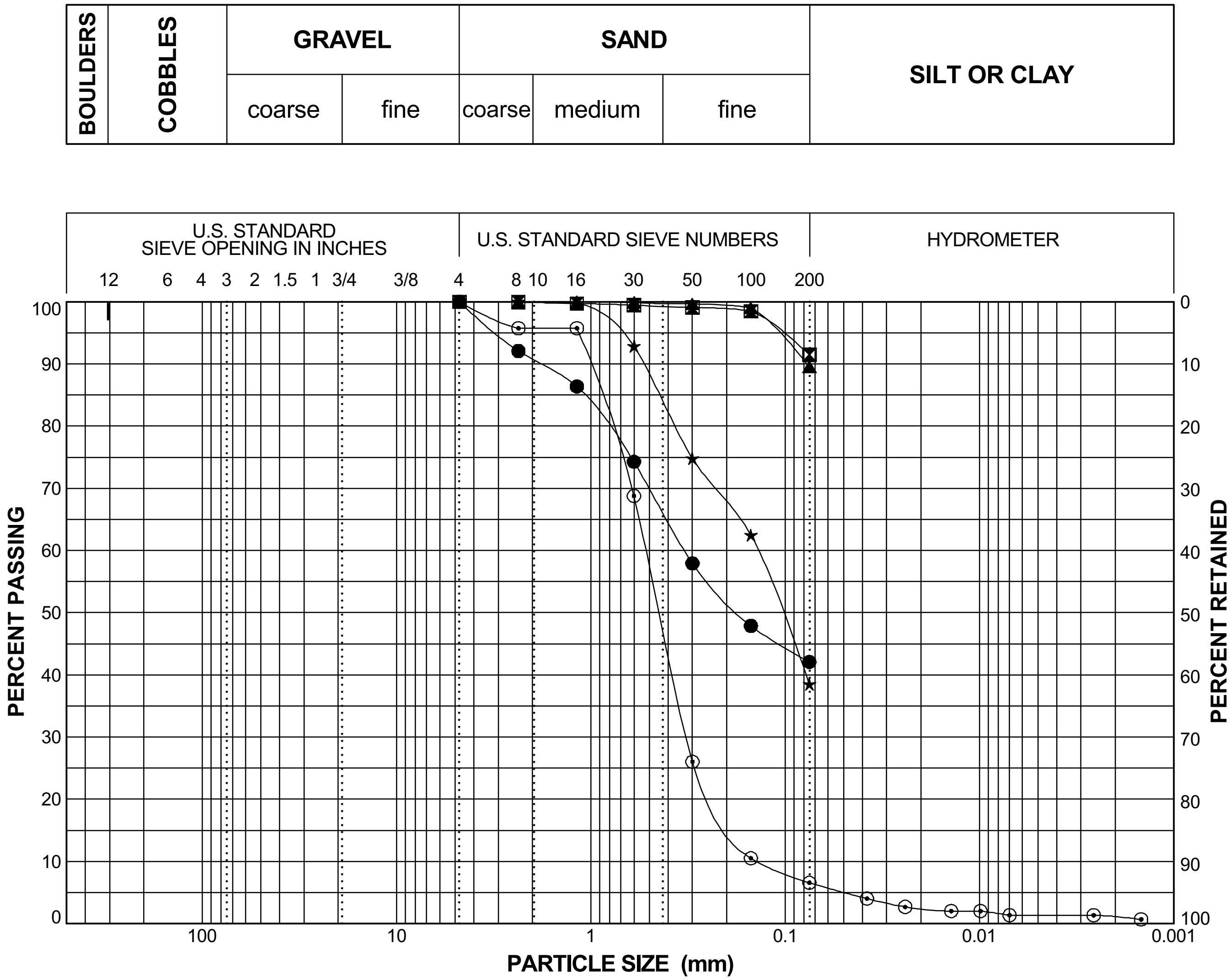


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_096B	26A	75	●	0	73	26	CLAYEY SAND (SC)
WR0017_096B	29A	80	⧗	0	73	27	SILTY SAND (SM)
WR0017_096B	33A	90	▲	0	88	12	Poorly Graded SAND with Clay (SP-SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

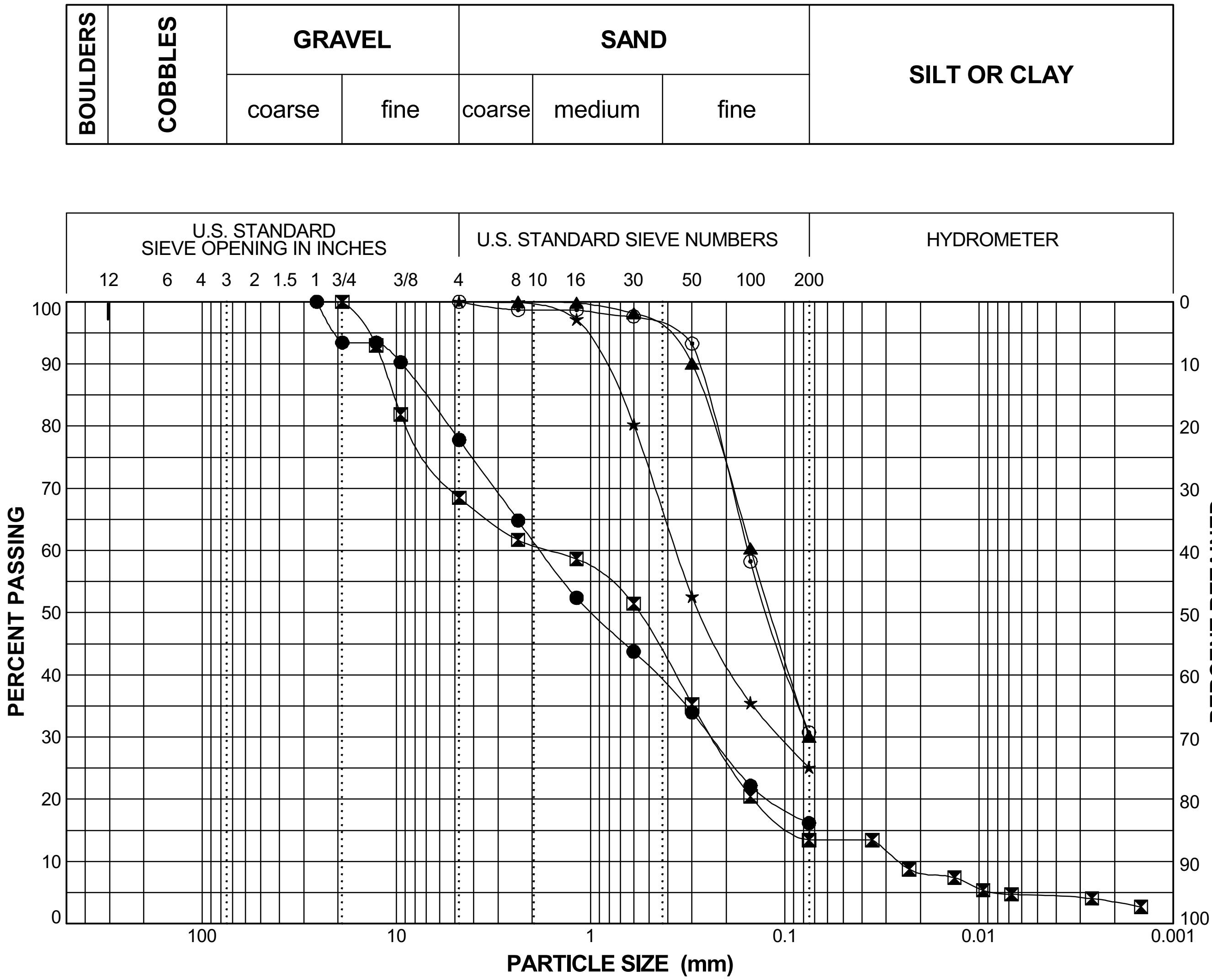


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_102B	2A	1.5	●	0	58	42	CLAYEY SAND (SC)
WR0017_102B	11A	33	⊠	0	9	91	LEAN CLAY (CL)
WR0017_102B	13A	35	▲	0	10	90	LEAN CLAY (CL)
WR0017_102B	14A	40.5	★	0	61	39	CLAYEY SAND (SC)
WR0017_102B	20A	55.7	⊙	0	93	7	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



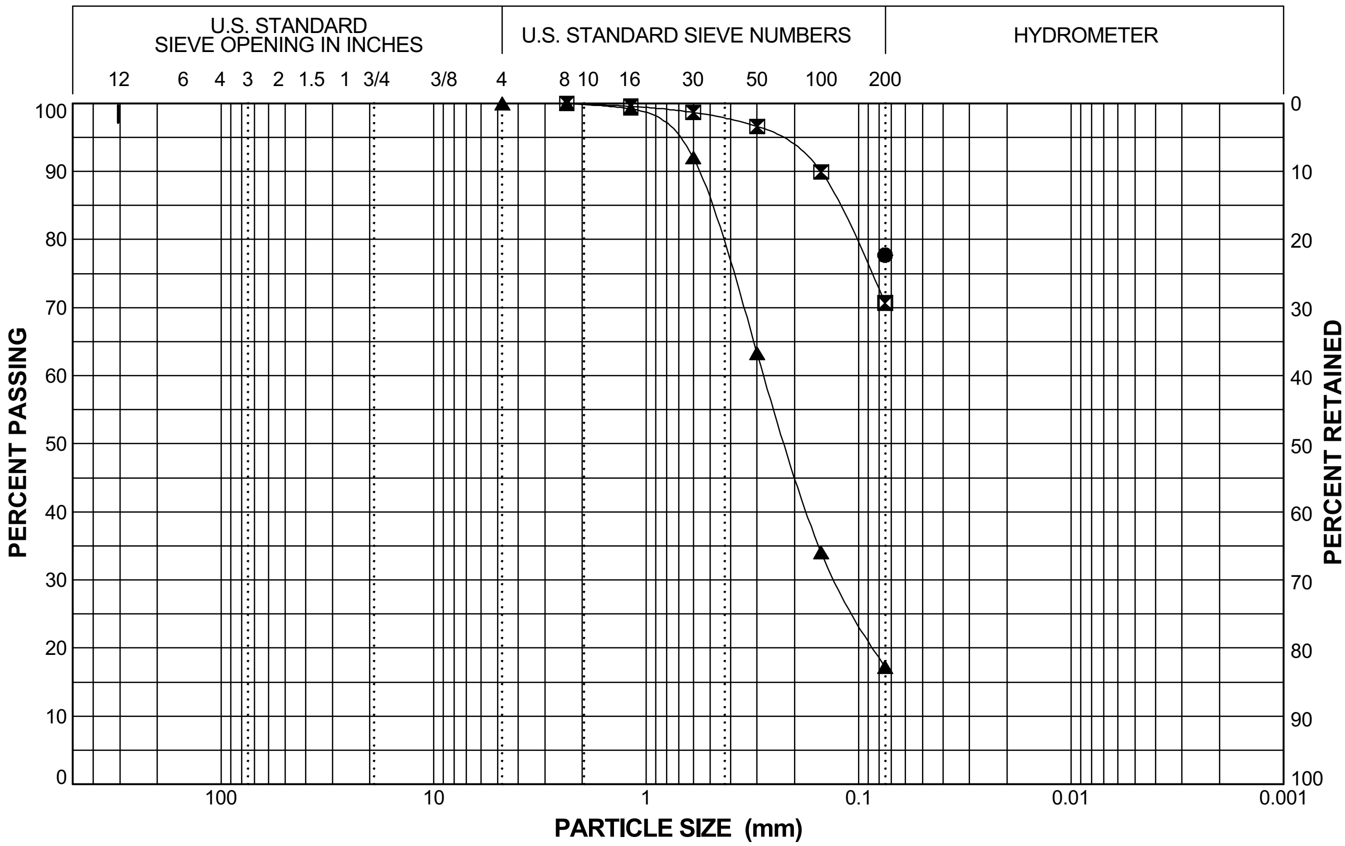
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_102B	27A	71.8	●	22	62	16	CLAYEY SAND (SC)
WR0017_102B	29A	76.5	⊠	32	55	13	SILTY SAND (SM)
WR0017_102B	35A	90.2	▲	0	70	30	SILTY SAND (SM)
WR0017_102B	36A	92	★	0	75	25	SILTY SAND (SM)
WR0017_102B	39A	100	⊙	0	69	31	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

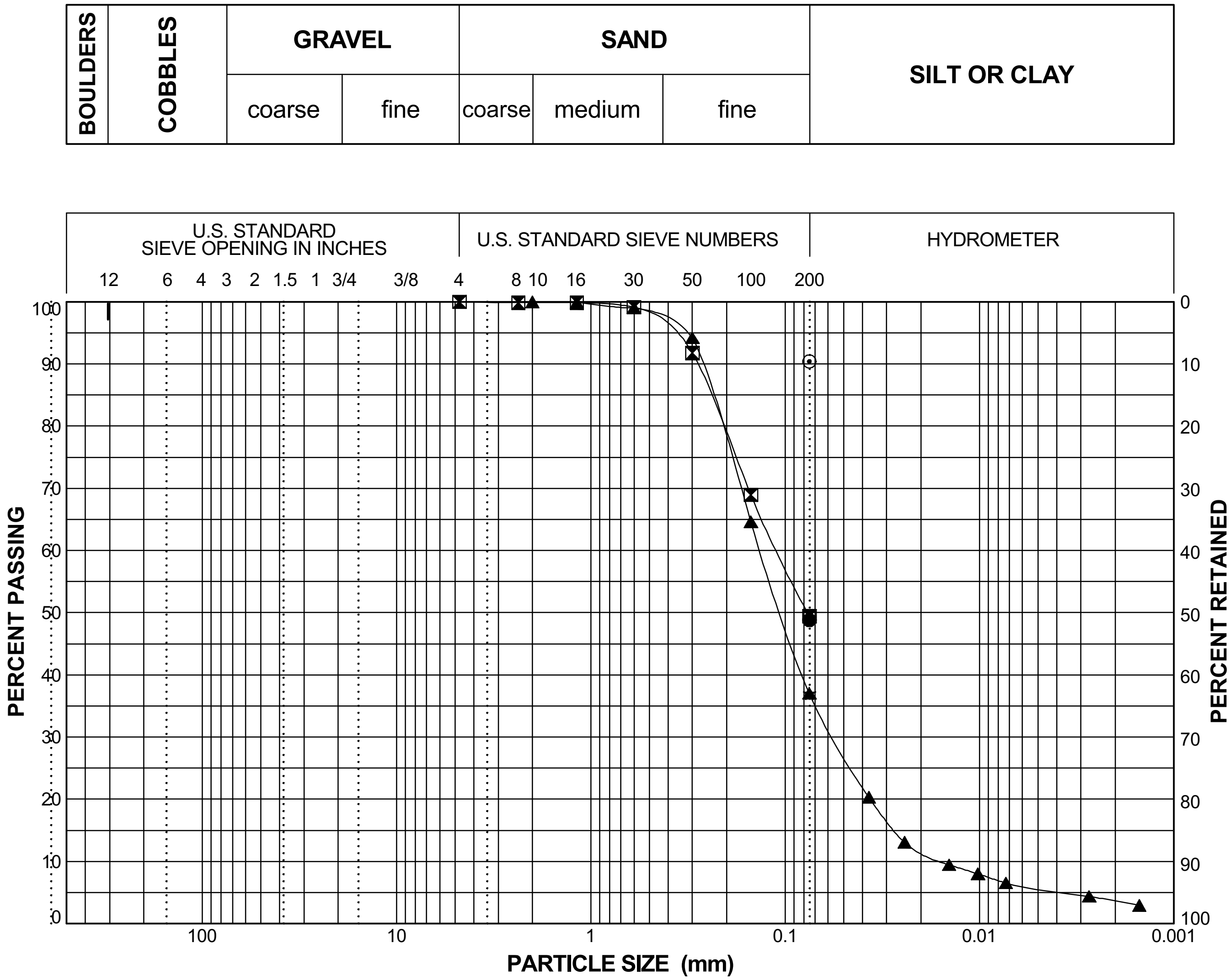


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_102B	42A	106.5	●	0	0	78	LEAN CLAY with Sand (CL)
WR0017_102B	45A	115.5	⊠	0	29	71	SILTY CLAY with Sand (CL-ML)
WR0017_102B	54A	136.5	▲	0	83	17	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



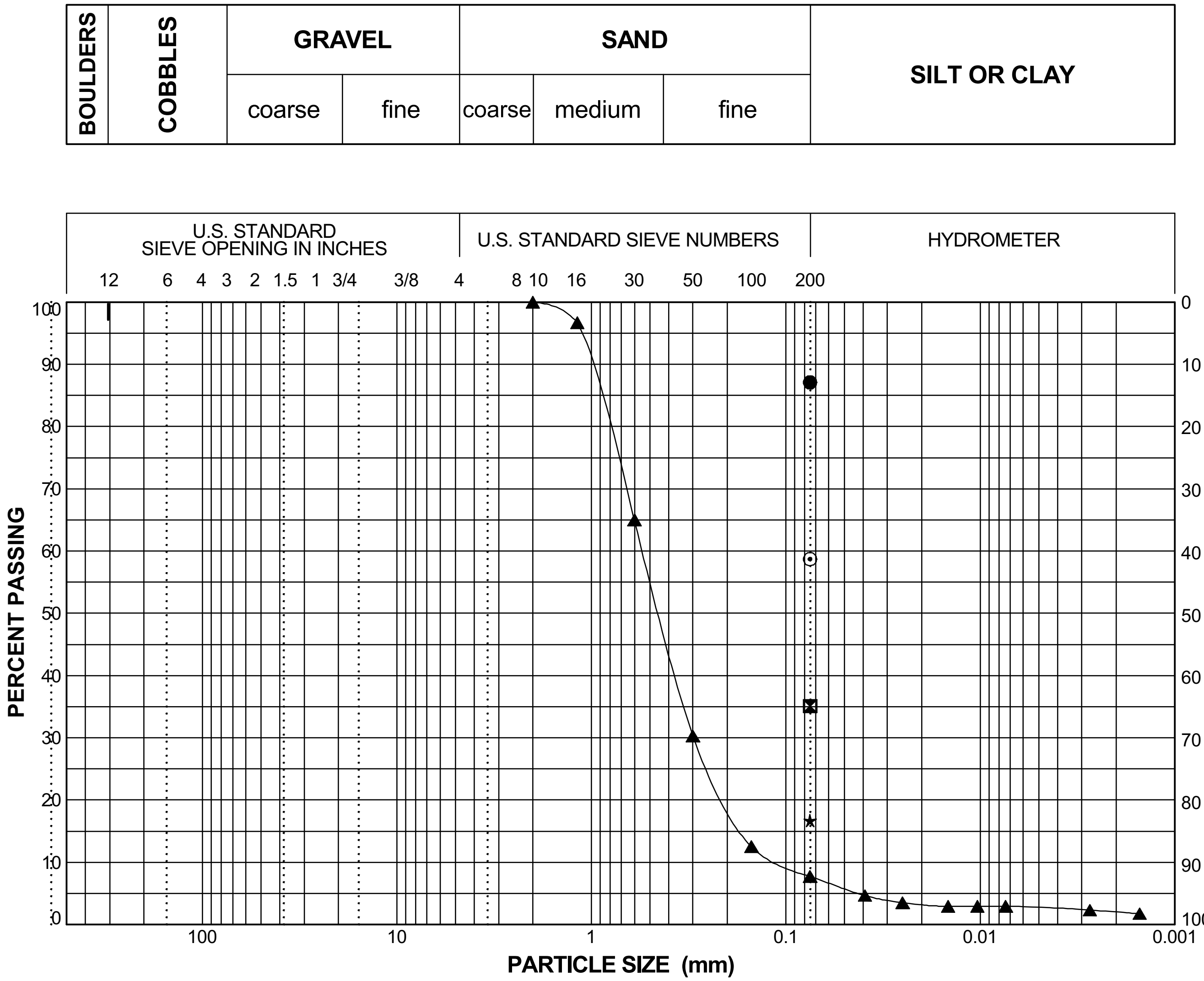
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_124B	2A	2.5	●	0.0	0.0	48.8	CLAYEY SAND (SC)
WR0017_124B	3A	3.5	⧗	0.0	50.6	49.4	CLAYEY SAND (SC)
WR0017_124B	6A	10	▲	0.0	63.0	37.0	SILTY SAND (SM)
WR0017_124B	8A	15.8	★	0.0	0.0	37.0	SILTY SAND (SM)
WR0017_124B	9A	18	⊙	0.0	0.0	90.4	LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10



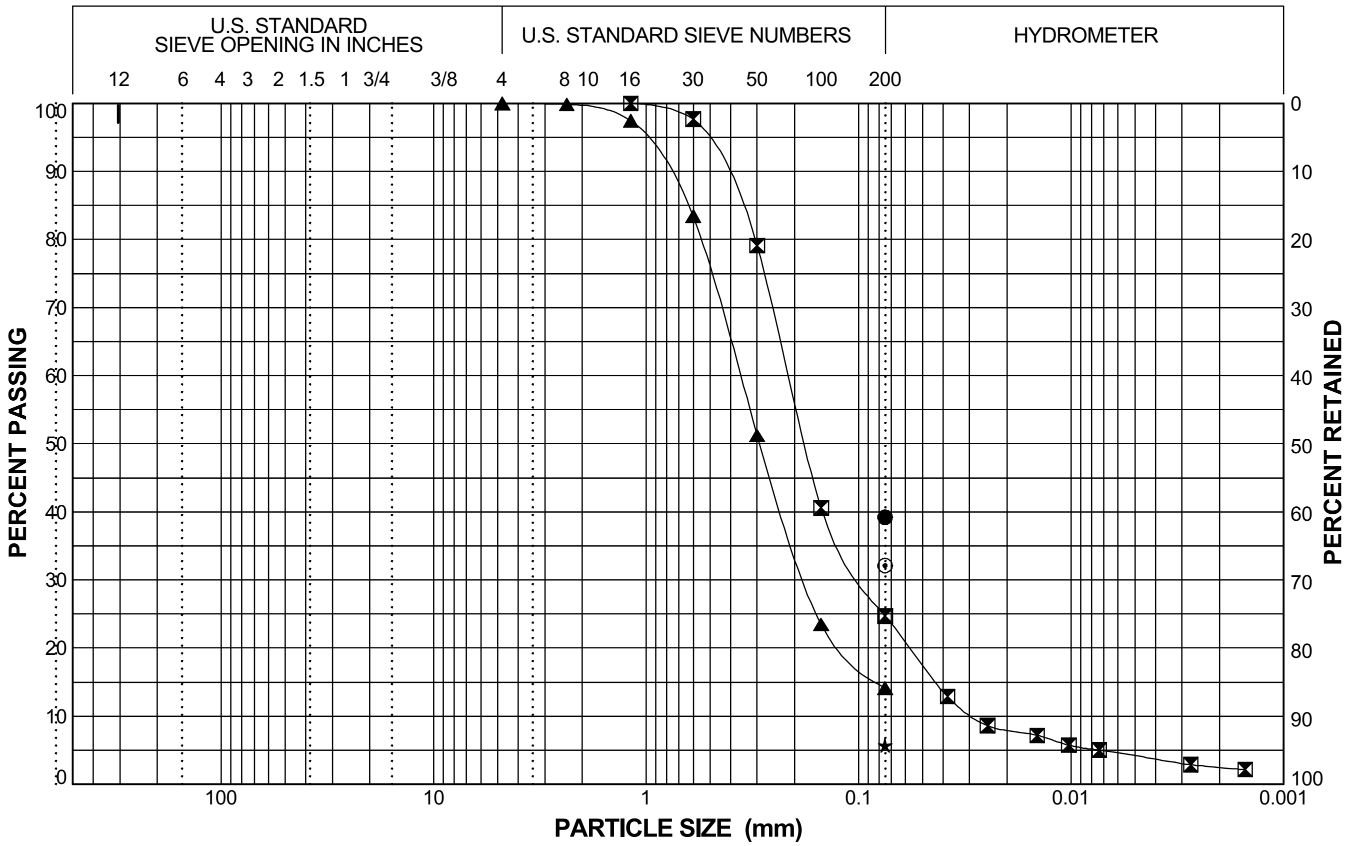
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_124B	10A	20	●	0.0	0.0	87.1	LEAN CLAY (CL)
WR0017_124B	13A	27.8	⊠	0.0	0.0	35.1	SILTY SAND (SM)
WR0017_124B	14A	30	▲	0.0	92.3	7.7	Poorly Graded SAND with Silt (SP-SM)
WR0017_124B	15A	31.51	★	0.0	0.0	16.7	SILTY SAND (SM)
WR0017_124B	16A	35	⊙	0.0	0.0	58.7	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



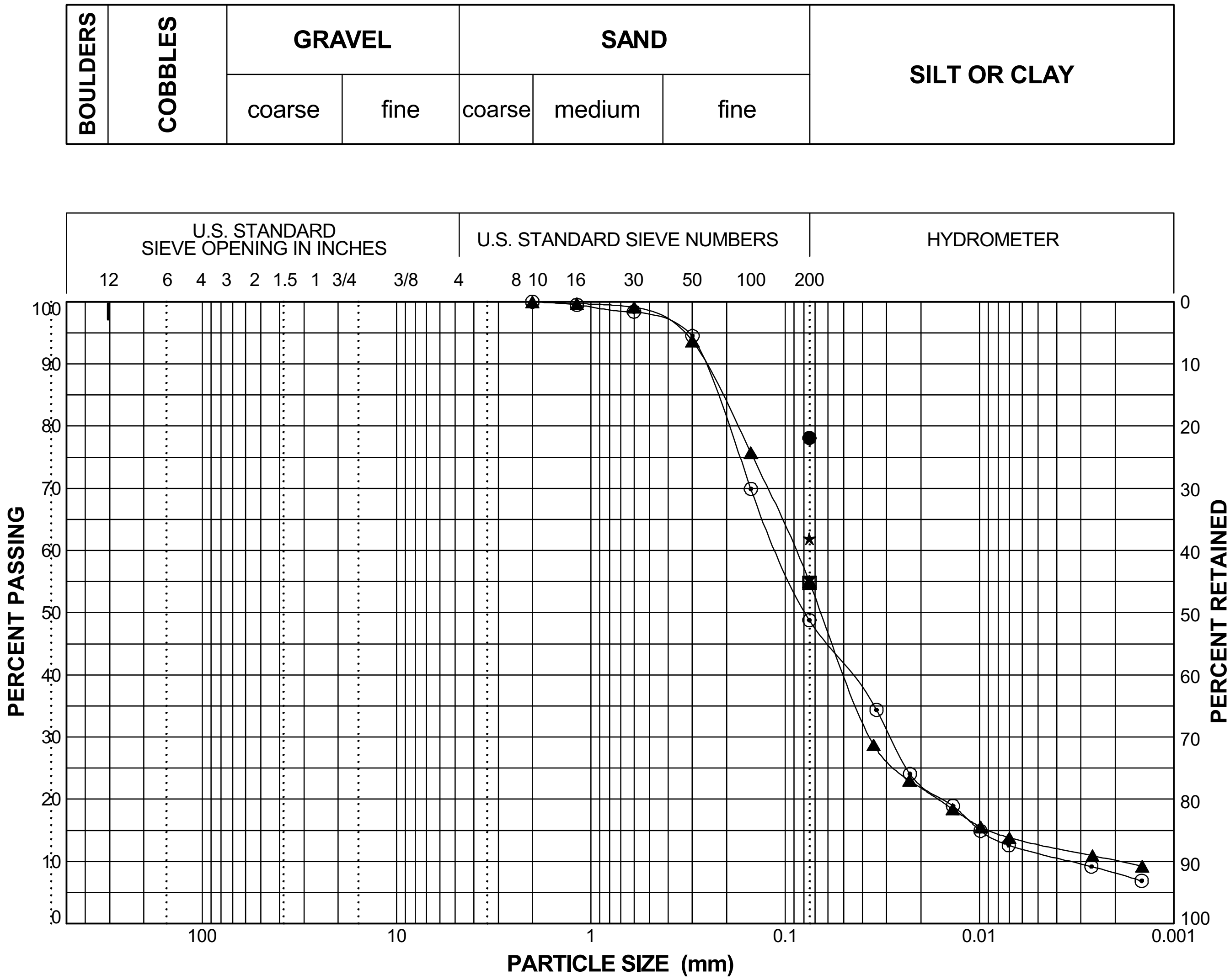
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_124B	17A	37	●	0.0	0.0	39.2	SILTY SAND (SM)
WR0017_124B	19A	42	⊠	0.0	75.3	24.7	SILTY SAND (SM)
WR0017_124B	21A	47	▲	0.0	85.9	14.1	SILTY SAND (SM)
WR0017_124B	22A	50	★	0.0	0.0	5.7	Poorly Graded SAND with Silt (SP-SM)
WR0017_124B	26A	60	⊙	0.0	0.0	32.1	CLAYEY SAND (SC)

DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

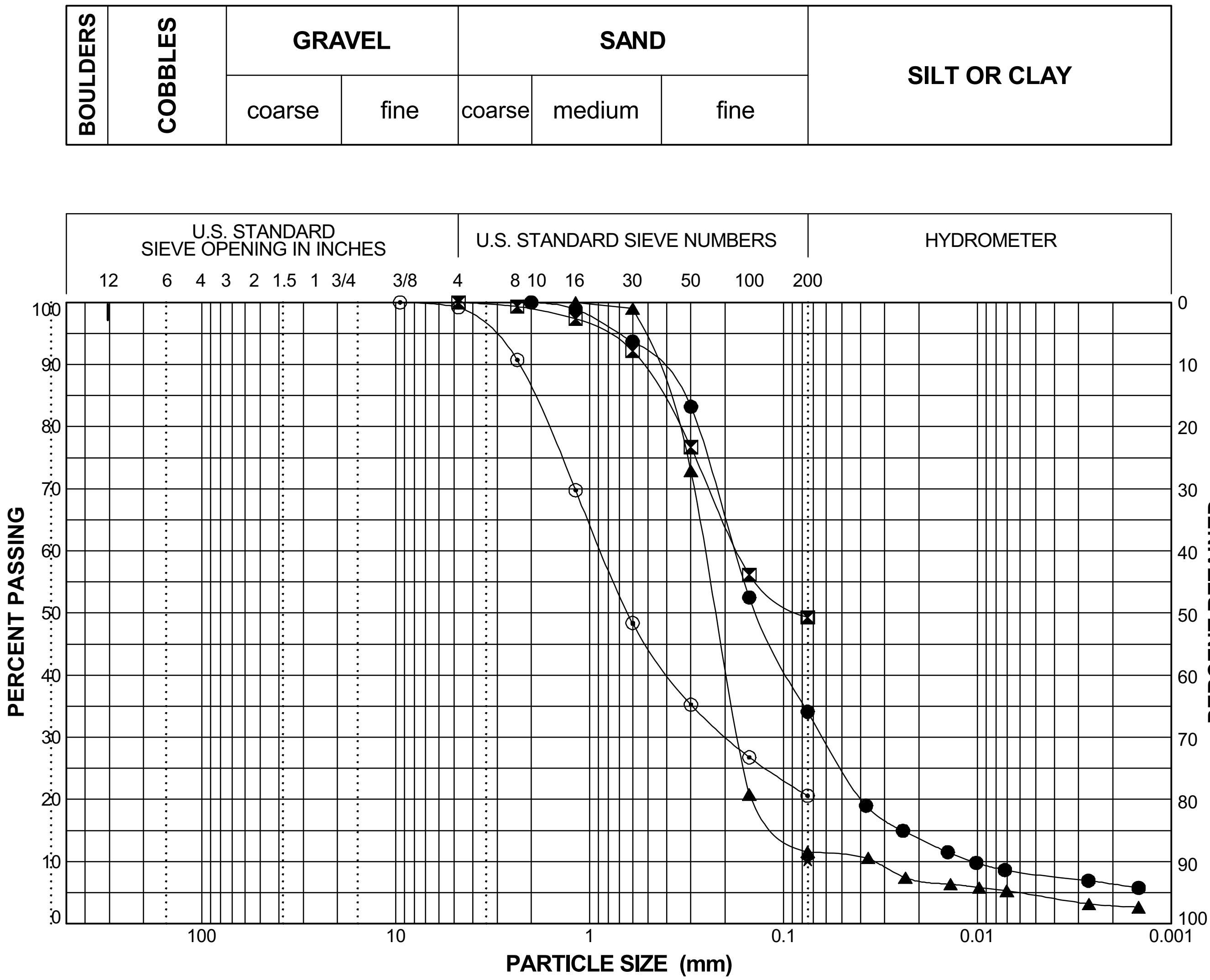


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_125B	1A	0.5	●	0.0	0.0	78.1	LEAN CLAY with SAND (CL)
WR0017_125B	2A	2	⊠	0.0	0.0	54.8	SANDY LEAN CLAY (CL)
WR0017_125B	4A	5	▲	0.0	45.0	55.0	SANDY SILT (ML)
WR0017_125B	5A	8.3	★	0.0	0.0	61.9	SANDY LEAN CLAY (CL)
WR0017_125B	6A	10	⊙	0.0	51.2	48.8	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

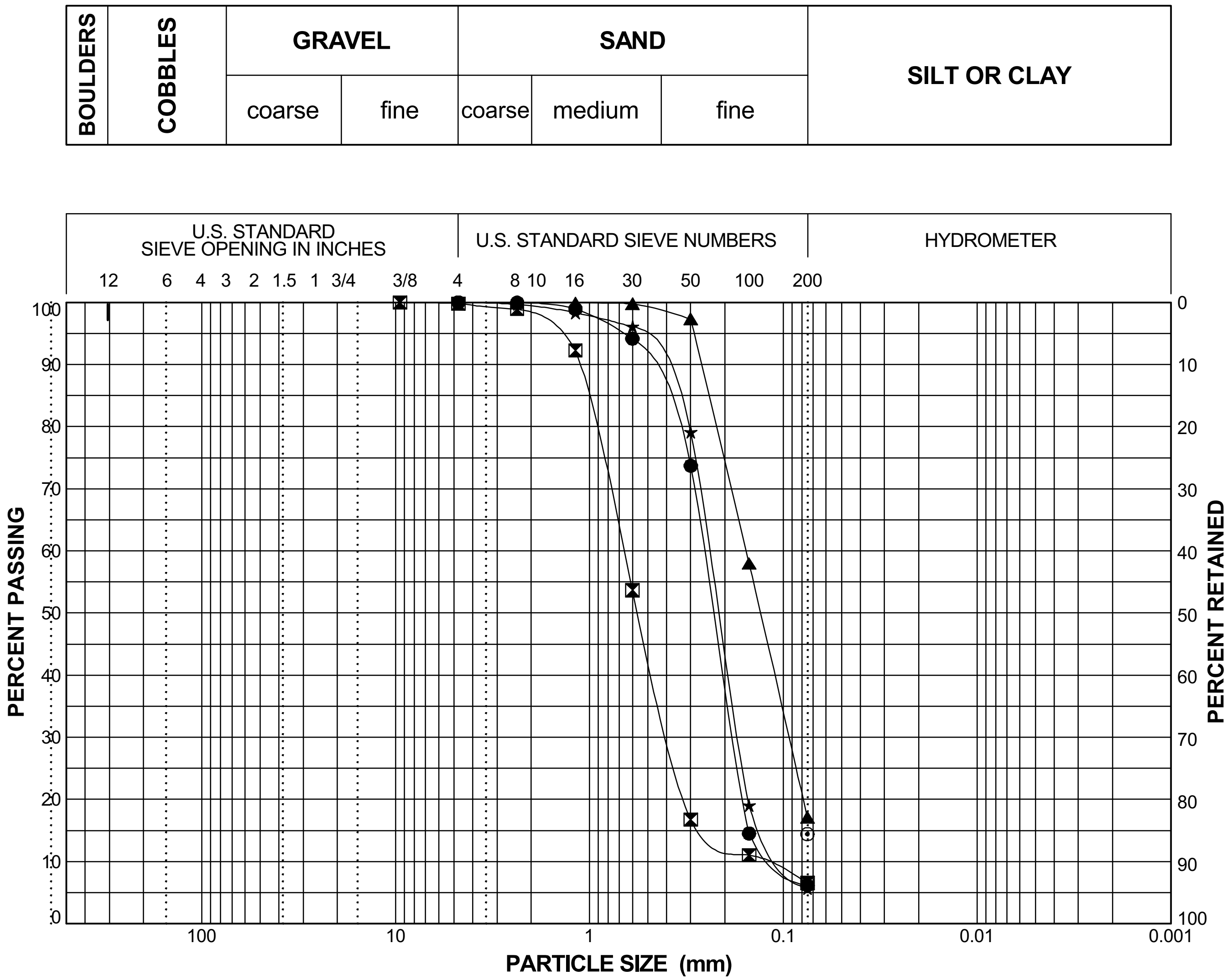


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_125B	7A	13.1	●	0.0	65.9	34.1	CLAYEY SAND (SC)
WR0017_125B	9B	16.51	⧗	0.0	50.7	49.3	CLAYEY SAND (SC)
WR0017_125B	9A	17.6	▲	0.0	88.5	11.5	Poorly Graded SAND with Clay (SP-SC)
WR0017_125B	10A	20	★	0.0	0.0	10.3	Poorly Graded SAND with Clay (SP-SC)
WR0017_125B	12A	25	⊙	0.8	78.6	20.6	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



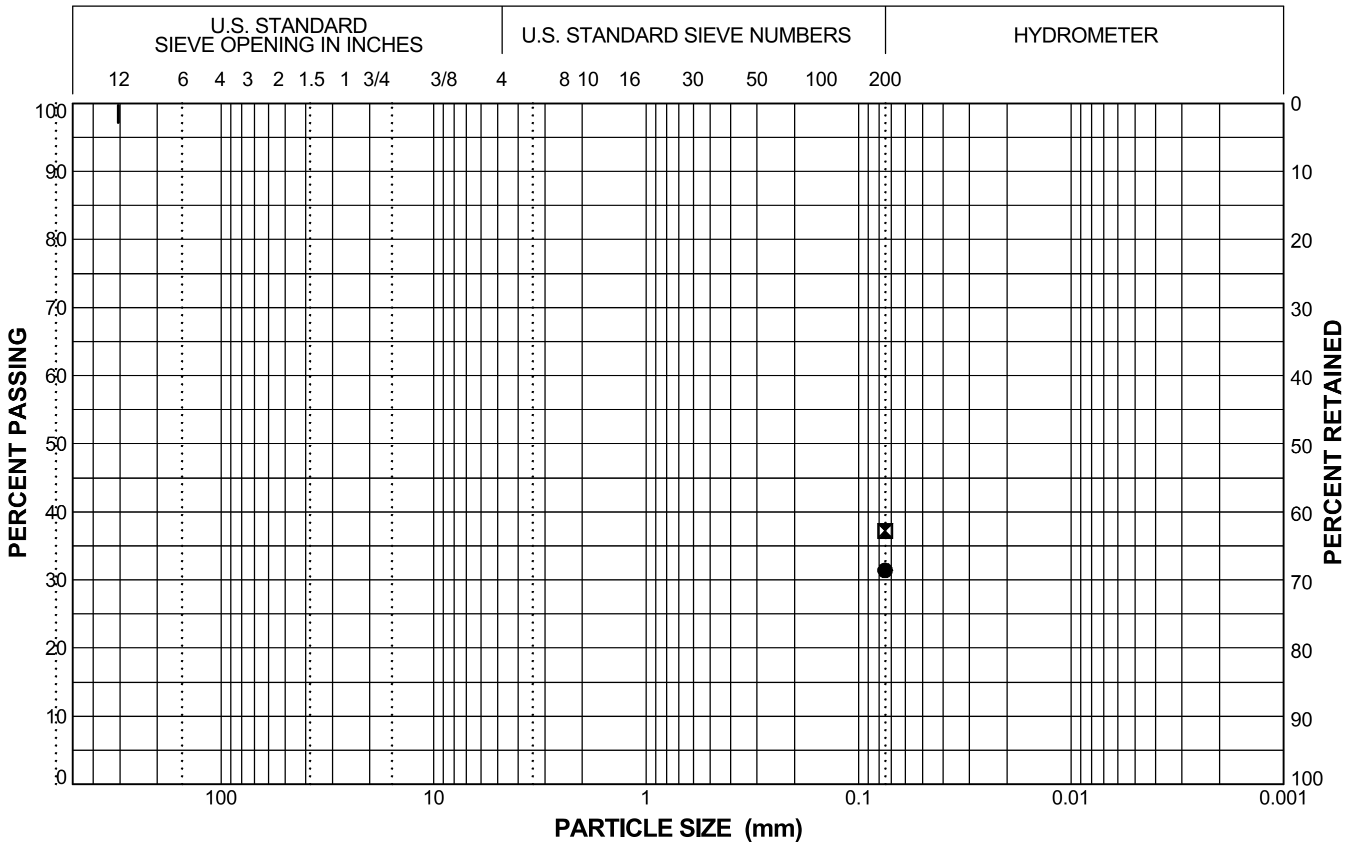
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_125B	14A	30	●	0.0	93.9	6.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_125B	16A	35	⊠	0.2	93.3	6.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_125B	19A	43	▲	0.0	82.9	17.1	SILTY SAND (SM)
WR0017_125B	20A	45	★	0.0	94.4	5.6	Poorly Graded SAND with Silt (SP-SM)
WR0017_125B	21A	47.8	⊙	0.0	0.0	14.4	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

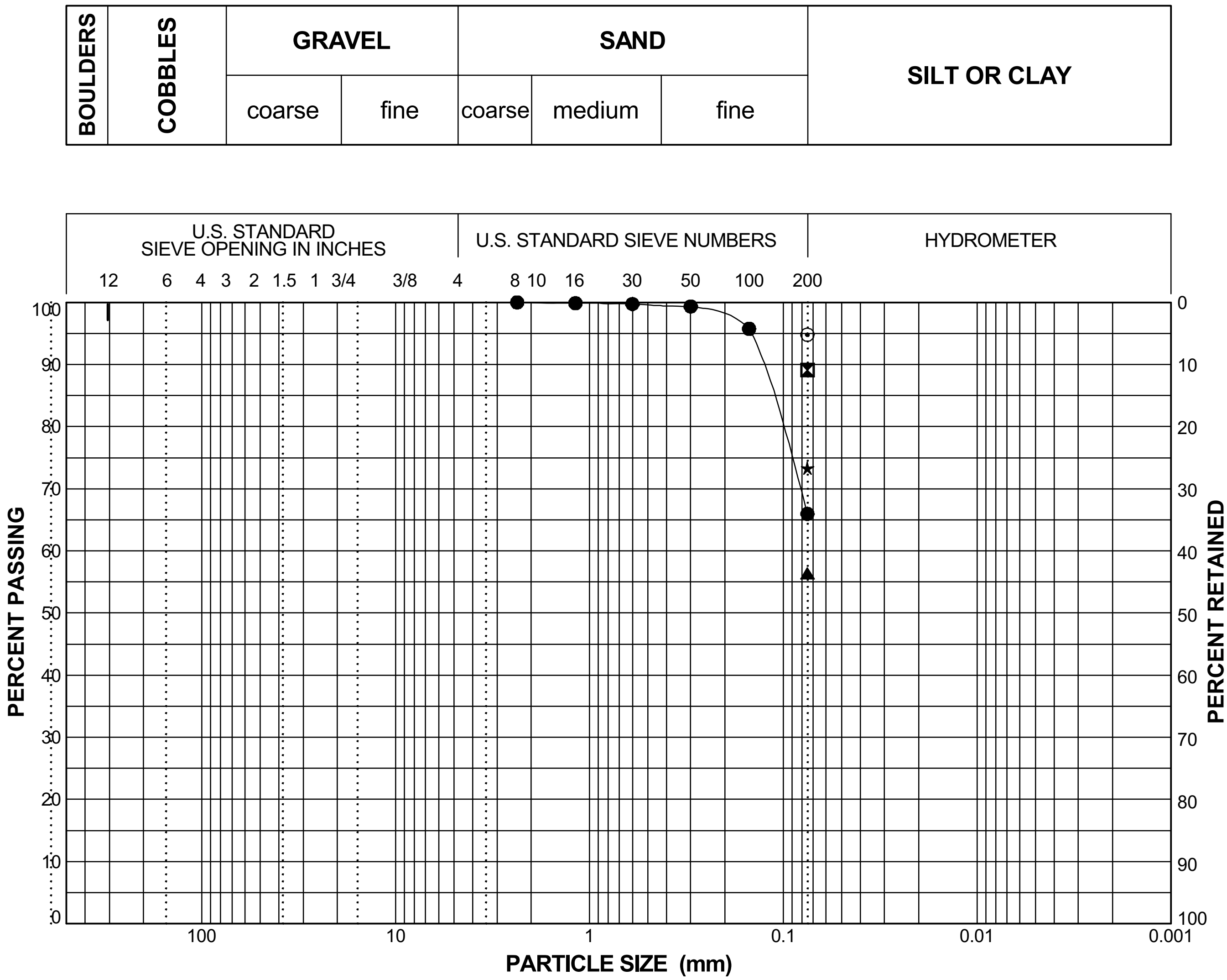


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_125B	25B	57	●	0.0	0.0	31.4	SILTY SAND (SM)
WR0017_125B	26A	60	⊠	0.0	0.0	37.2	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



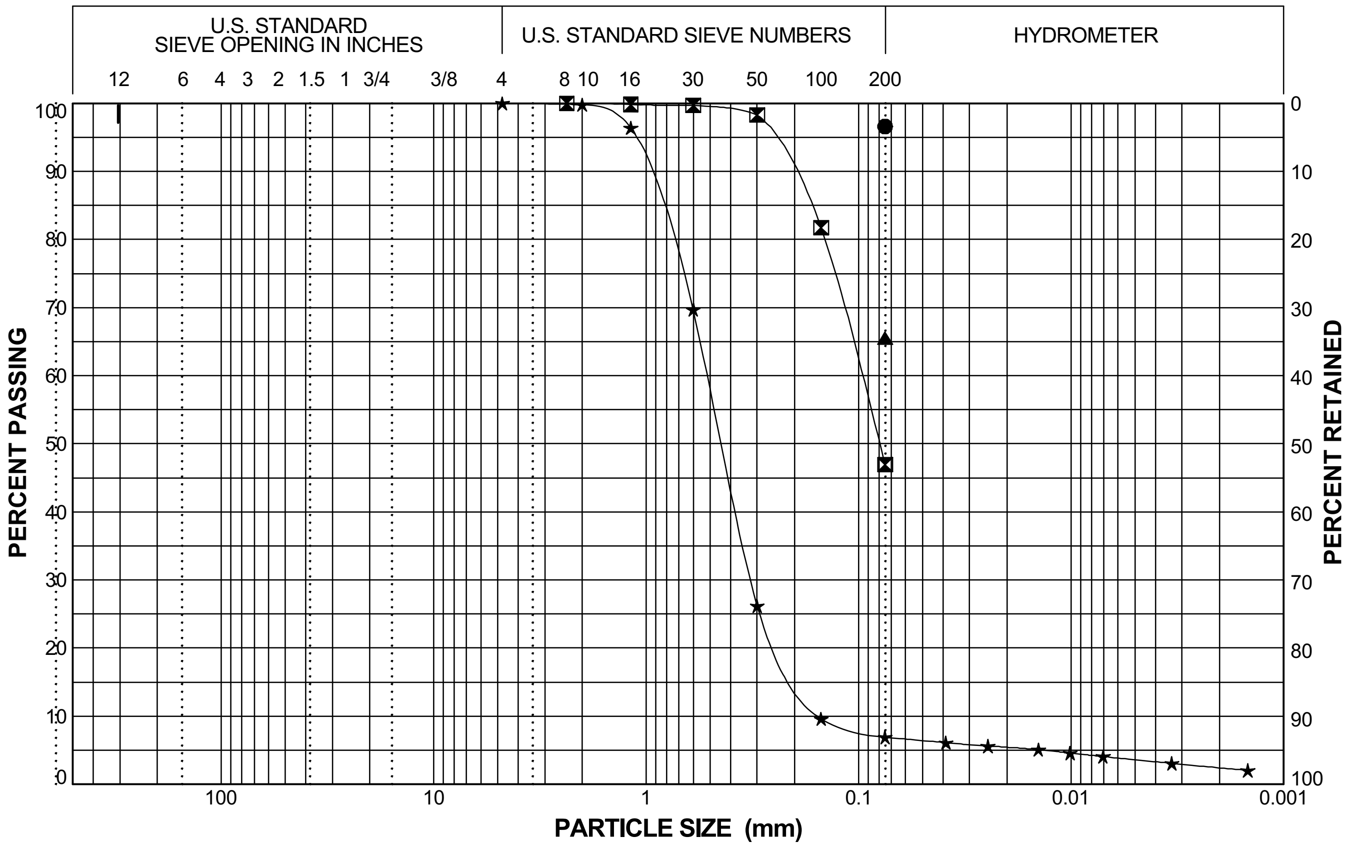
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_126B	1A	1	●	0.0	34.0	66.0	SANDY SILTY CLAY (CL-ML)
WR0017_126B	3A	3.6	⊠	0.0	0.0	89.1	LEAN CLAY (CL)
WR0017_126B	6A	8	▲	0.0	0.0	56.4	SANDY LEAN CLAY (CL)
WR0017_126B	7A	10	★	0.0	0.0	73.3	SILTY CLAY with SAND (CL-ML)
WR0017_126B	10A	16.51	⊙	0.0	0.0	94.8	LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

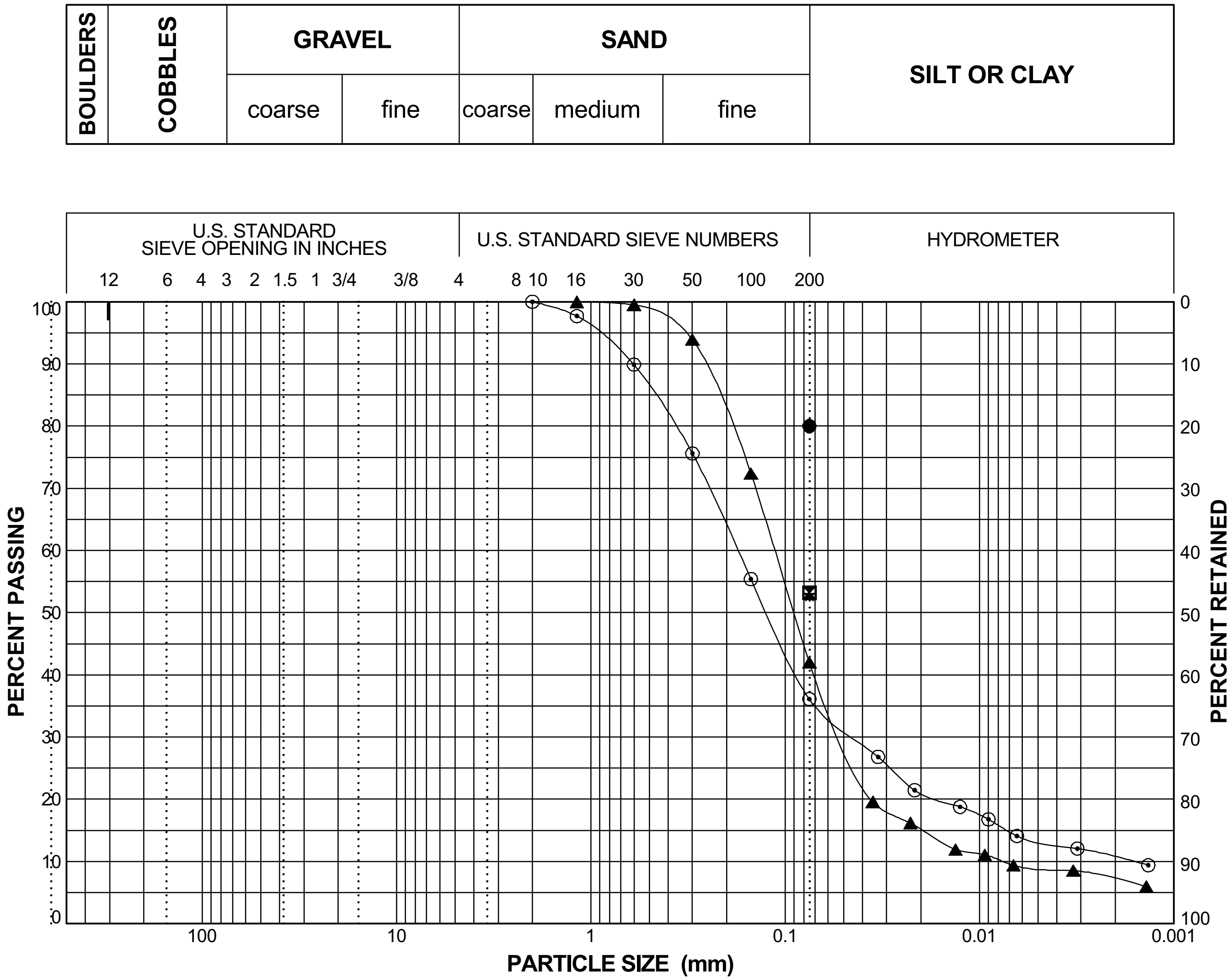


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_126B	15A	34	●	0.0	0.0	96.6	LEAN CLAY (CL)
WR0017_126B	18A	40.8	⧗	0.0	53.1	46.9	CLAYEY SAND (SC)
WR0017_126B	19A	42.6	▲	0.0	0.0	65.5	SANDY LEAN CLAY (CL)
WR0017_126B	21A	46.51	★	0.0	93.1	6.9	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

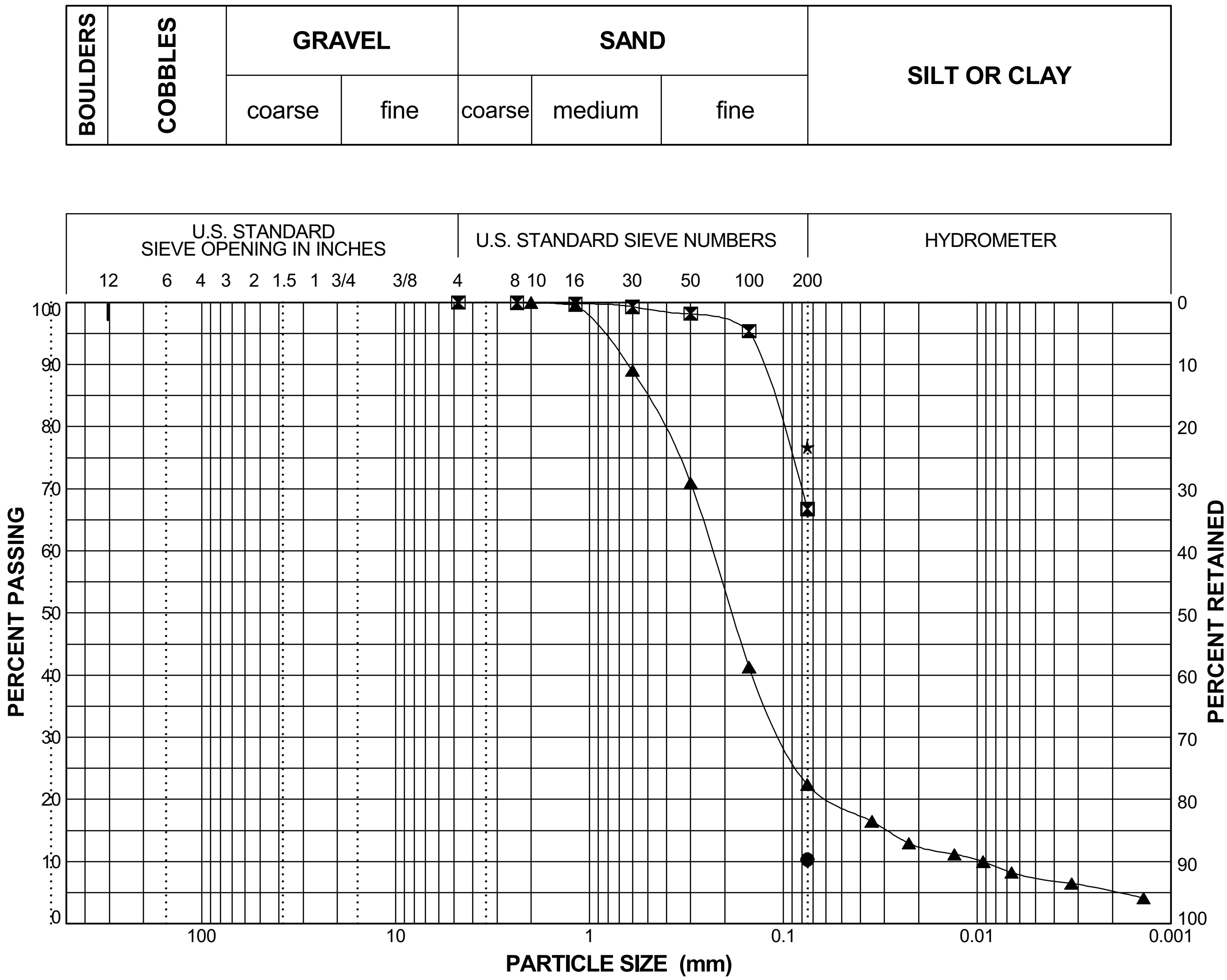


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_127B	1B	0.5	●	0.0	0.0	80.0	LEAN CLAY with SAND (CL)
WR0017_127B	2A	1.5	⊠	0.0	0.0	53.2	SANDY SILTY CLAY (CL-ML)
WR0017_127B	5A	8	▲	0.0	58.0	42.0	SILTY, CLAYEY SAND (SC-SM)
WR0017_127B	6A	10	★	0.0	0.0	52.9	SANDY SILT (ML)
WR0017_127B	10A	20	⊙	0.0	63.9	36.1	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

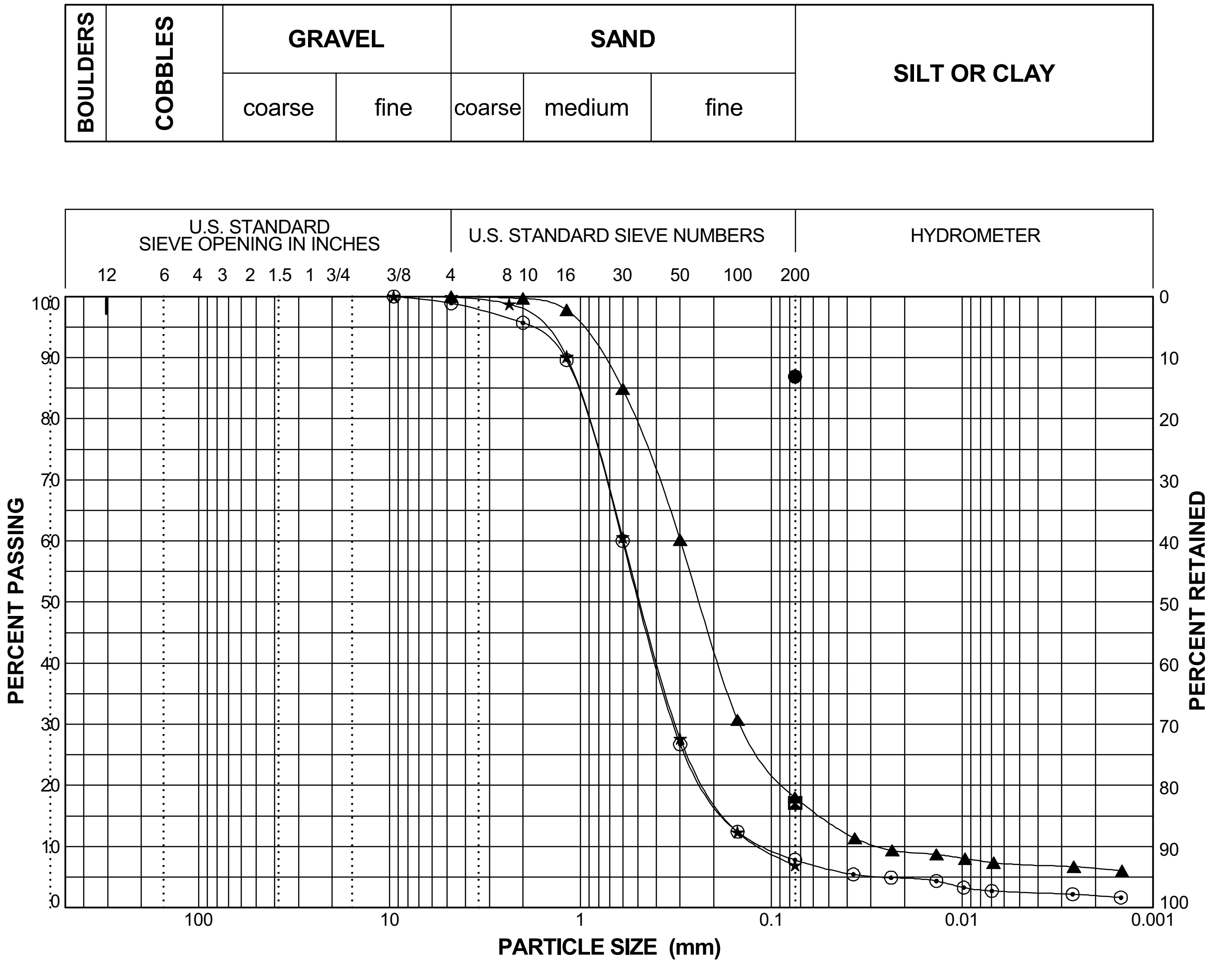


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_127B	12A	25.6	●	0.0	0.0	10.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_127B	16B	36.51	⧗	0.0	33.2	66.8	SANDY LEAN CLAY (CL)
WR0017_127B	18A	41.51	▲	0.0	77.6	22.4	SILTY SAND (SM)
WR0017_127B	21A	52.5	★	0.0	0.0	76.7	LEAN CLAY with SAND (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

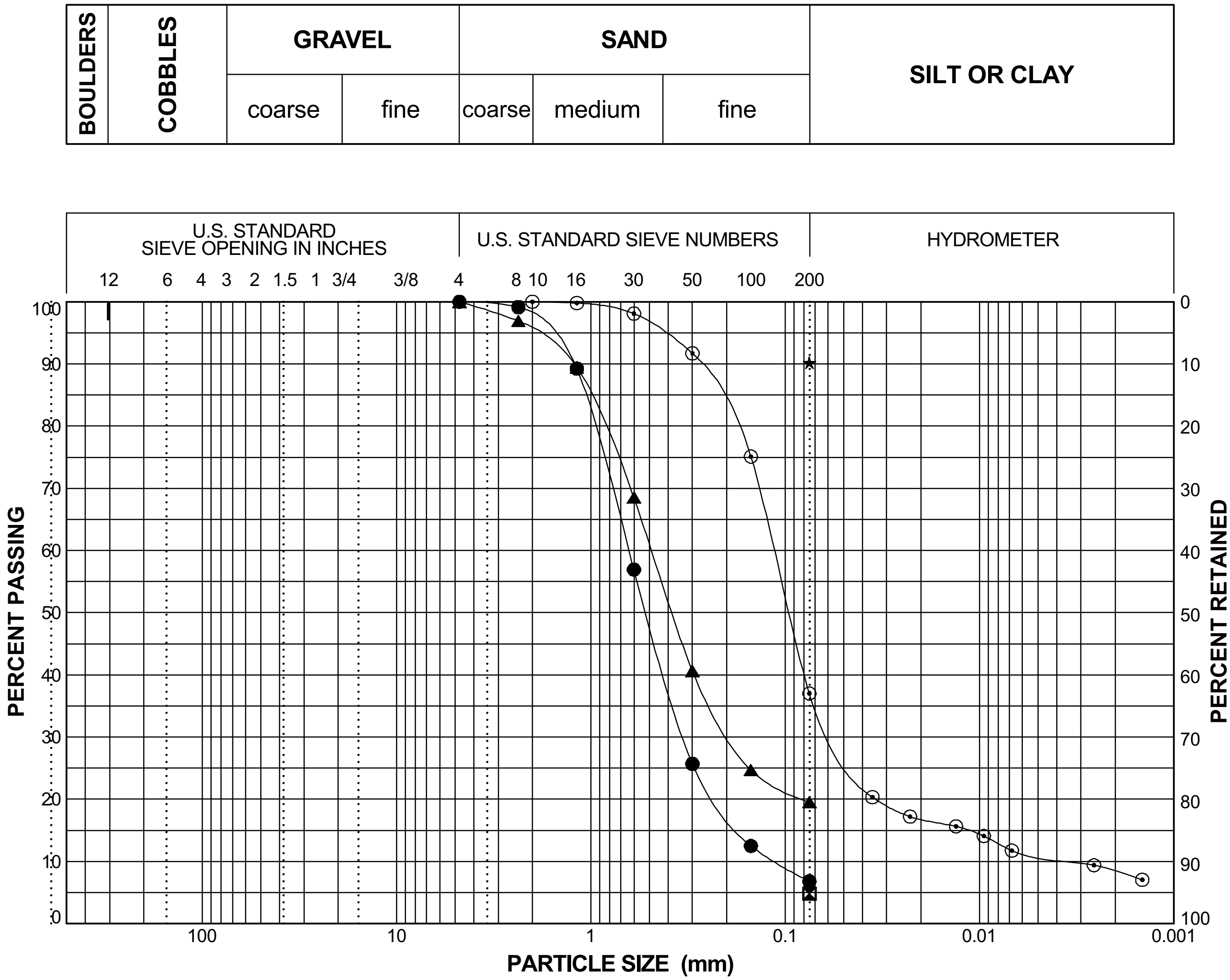


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_128B	1B	0.1	●	0.0	0.0	86.9	LEAN CLAY (CL)
WR0017_128B	2A	1.5	⧗	0.0	0.0	17.1	SILTY SAND (SM)
WR0017_128B	3A	3	▲	0.0	82.0	18.0	SILTY SAND (SM)
WR0017_128B	5A	10	★	0.1	93.0	6.9	Poorly Graded SAND with Silt (SP-SM)
WR0017_128B	7A	15	⊙	1.1	91.1	7.8	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

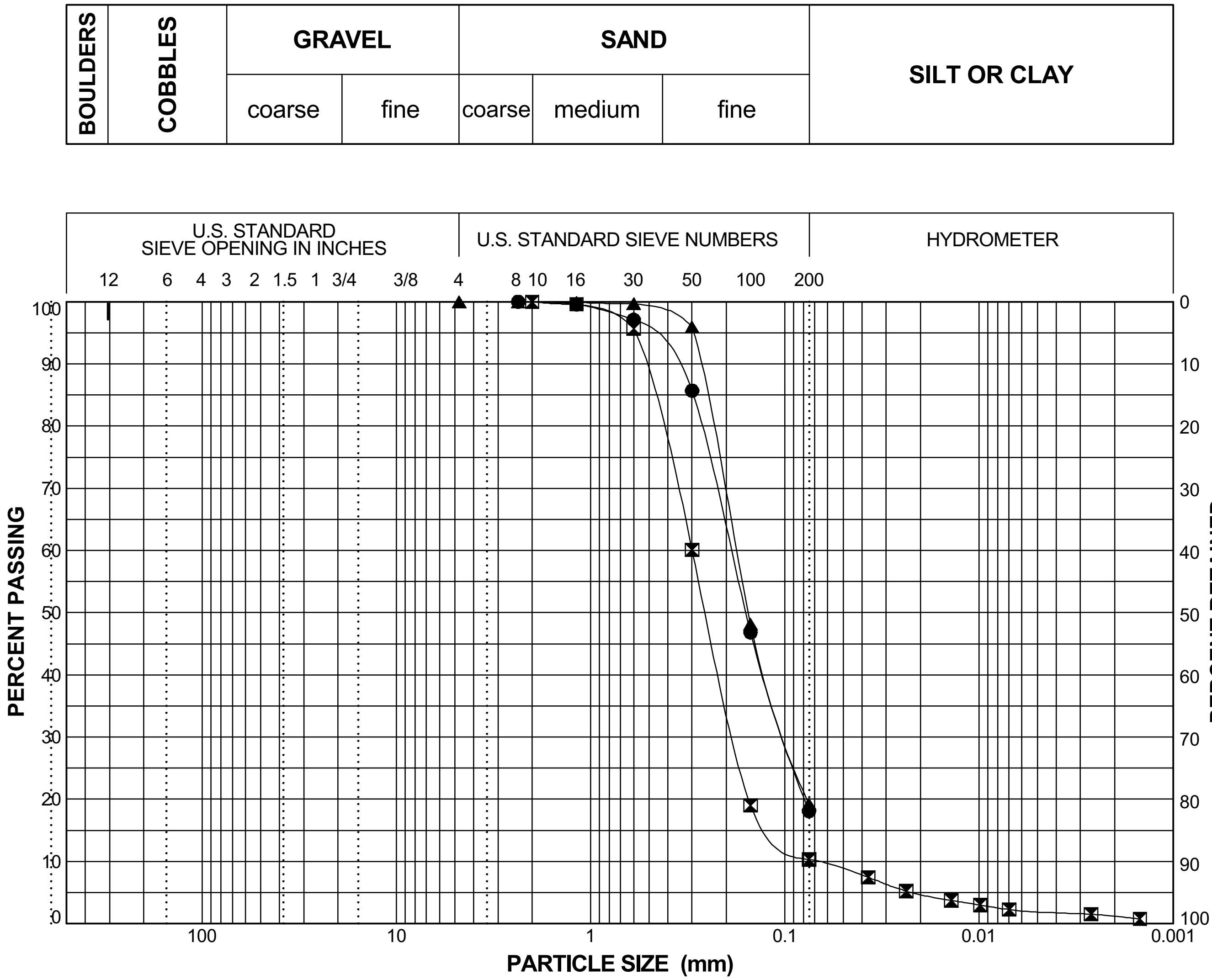


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_128B	10A	22	●	0.0	93.2	6.8	Poorly Graded SAND with Silt (SP-SM)
WR0017_128B	11A	25	⊠	0.0	0.0	4.8	Poorly Graded SAND with Silt (SP-SM)
WR0017_128B	13B	30	▲	0.0	80.5	19.5	CLAYEY SAND (SC)
WR0017_128B	16A	37	★	0.0	0.0	90.2	FAT CLAY (CH)
WR0017_128B	21A	50	⊙	0.0	63.0	37.0	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



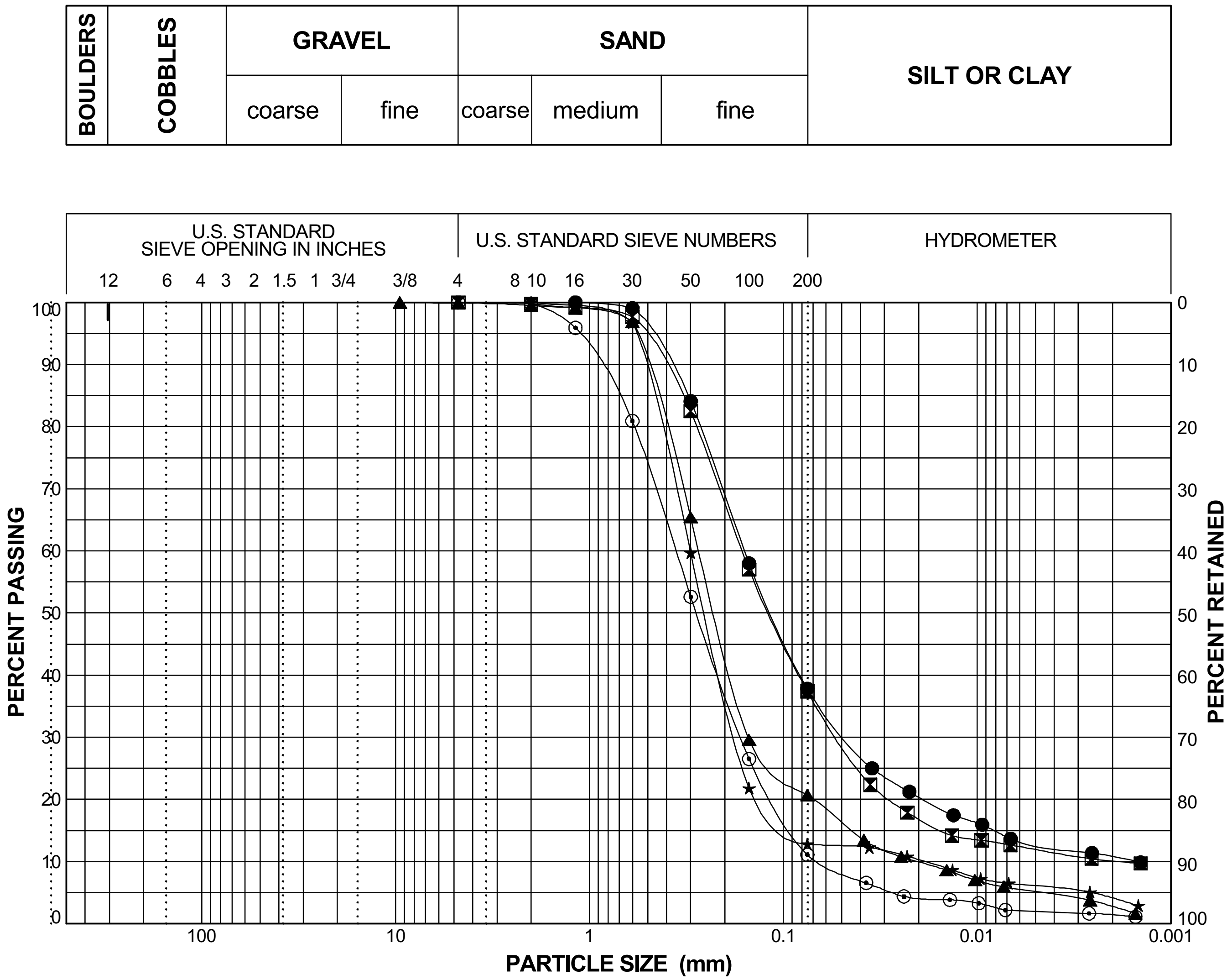
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_128B	22A	52	●	0.0	81.9	18.1	SILTY SAND (SM)
WR0017_128B	23A	55	⊠	0.0	89.7	10.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_128B	25A	60	▲	0.0	80.8	19.2	SILTY SAND (SM)

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



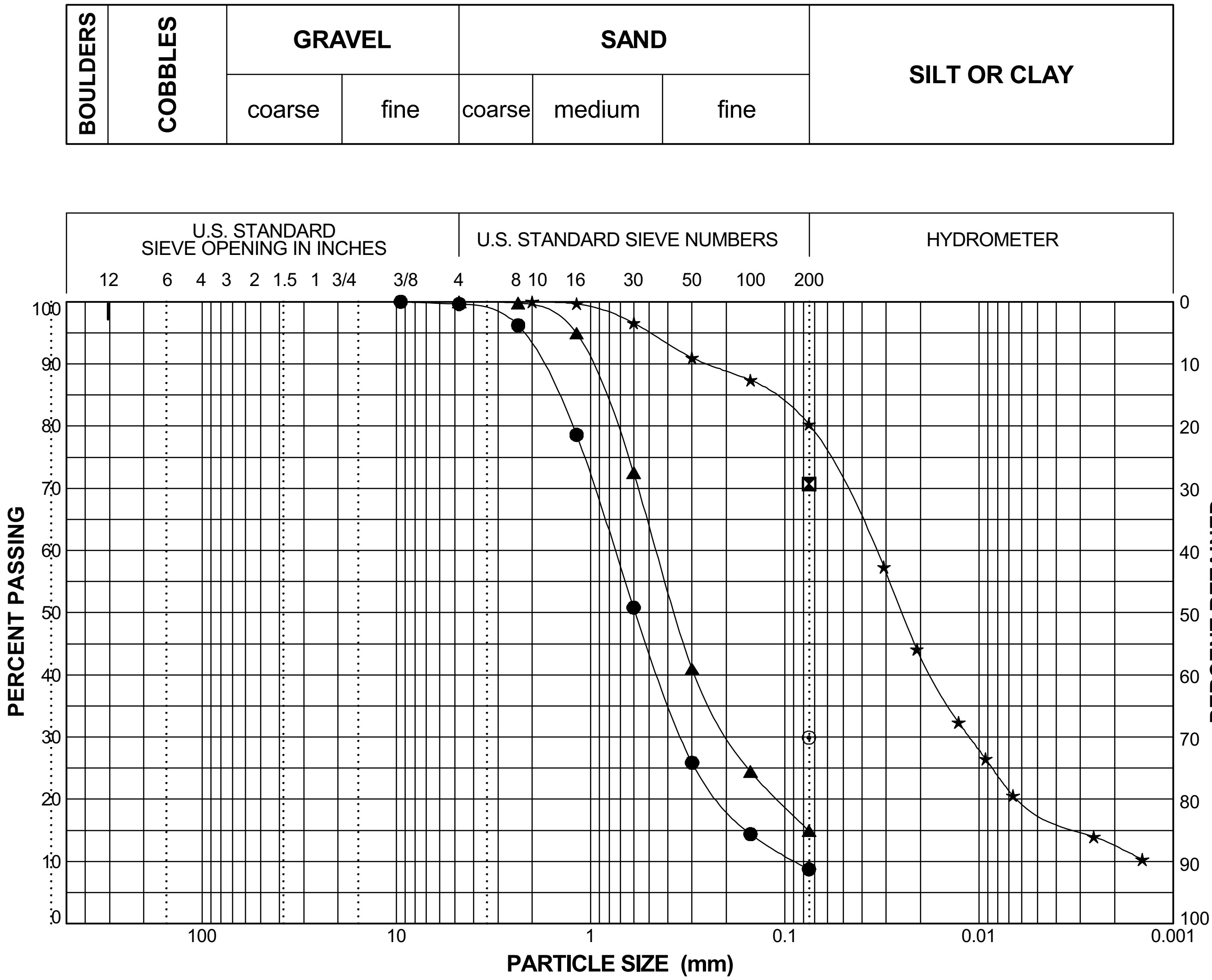
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_131B	2A	2.3	●	0.0	62.2	37.8	SILTY SAND (SM)
WR0017_131B	3A	5.9	⊠	0.0	62.6	37.4	SILTY SAND (SM)
WR0017_131B	5A	8	▲	0.1	79.2	20.7	SILTY SAND (SM)
WR0017_131B	6A	10	★	0.0	87.2	12.8	SILTY SAND (SM)
WR0017_131B	13A	27	⊙	0.0	88.9	11.1	Poorly Graded SAND with Silt (SP-SM)

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA

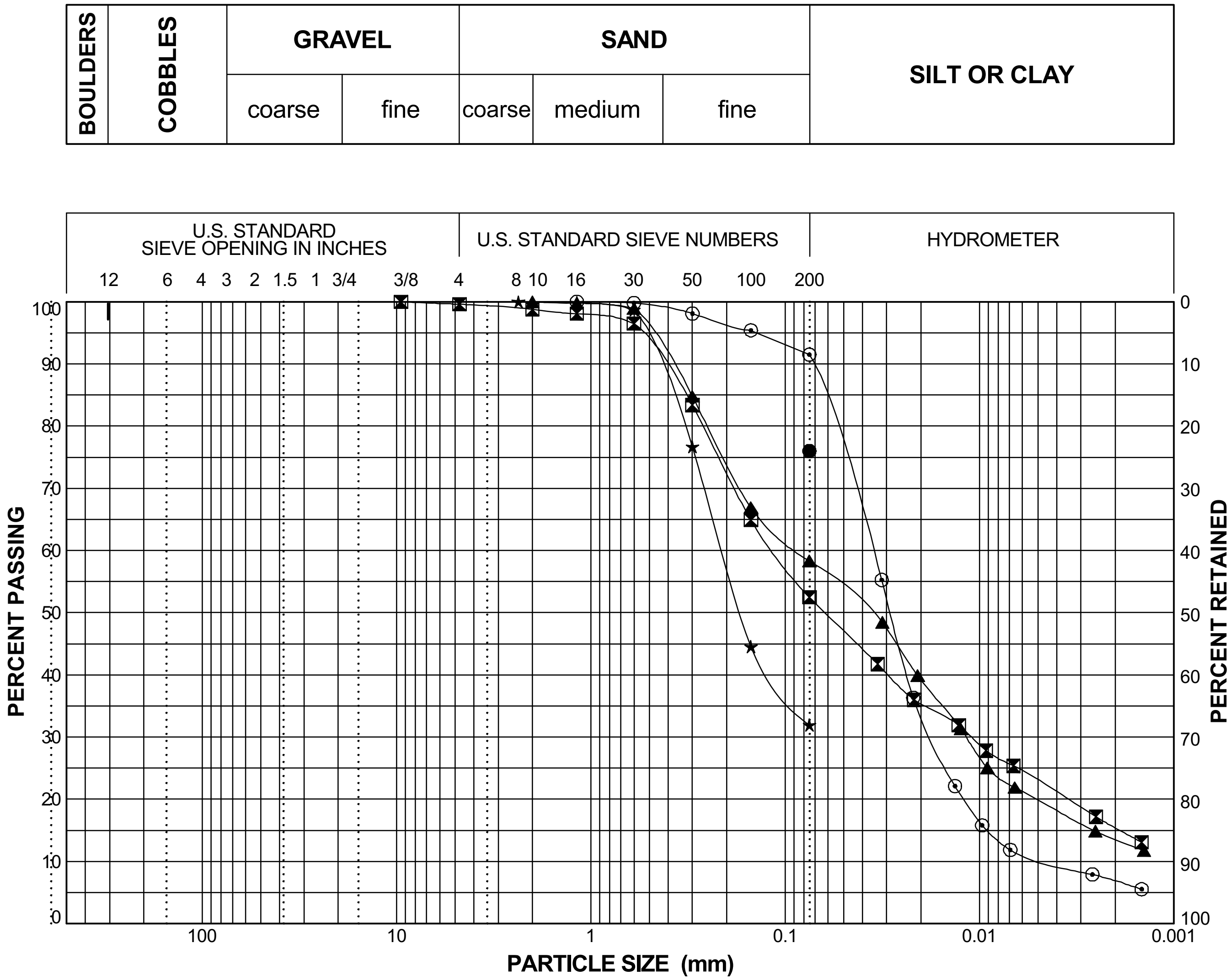
Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_131B	14A	30	●	0.4	90.9	8.7	Well-Graded SAND with Silt (SW-SM)
WR0017_131B	15A	31.51	⊠	0.0	0.0	70.7	LEAN CLAY with SAND (CL)
WR0017_131B	17D	37	▲	0.0	85.1	14.9	SILTY SAND (SM)
WR0017_131B	17C	38	★	0.0	19.7	80.3	SILT with Sand (ML)
WR0017_131B	25B	60.01	⊙	0.0	0.0	29.9	SILTY SAND (SM)

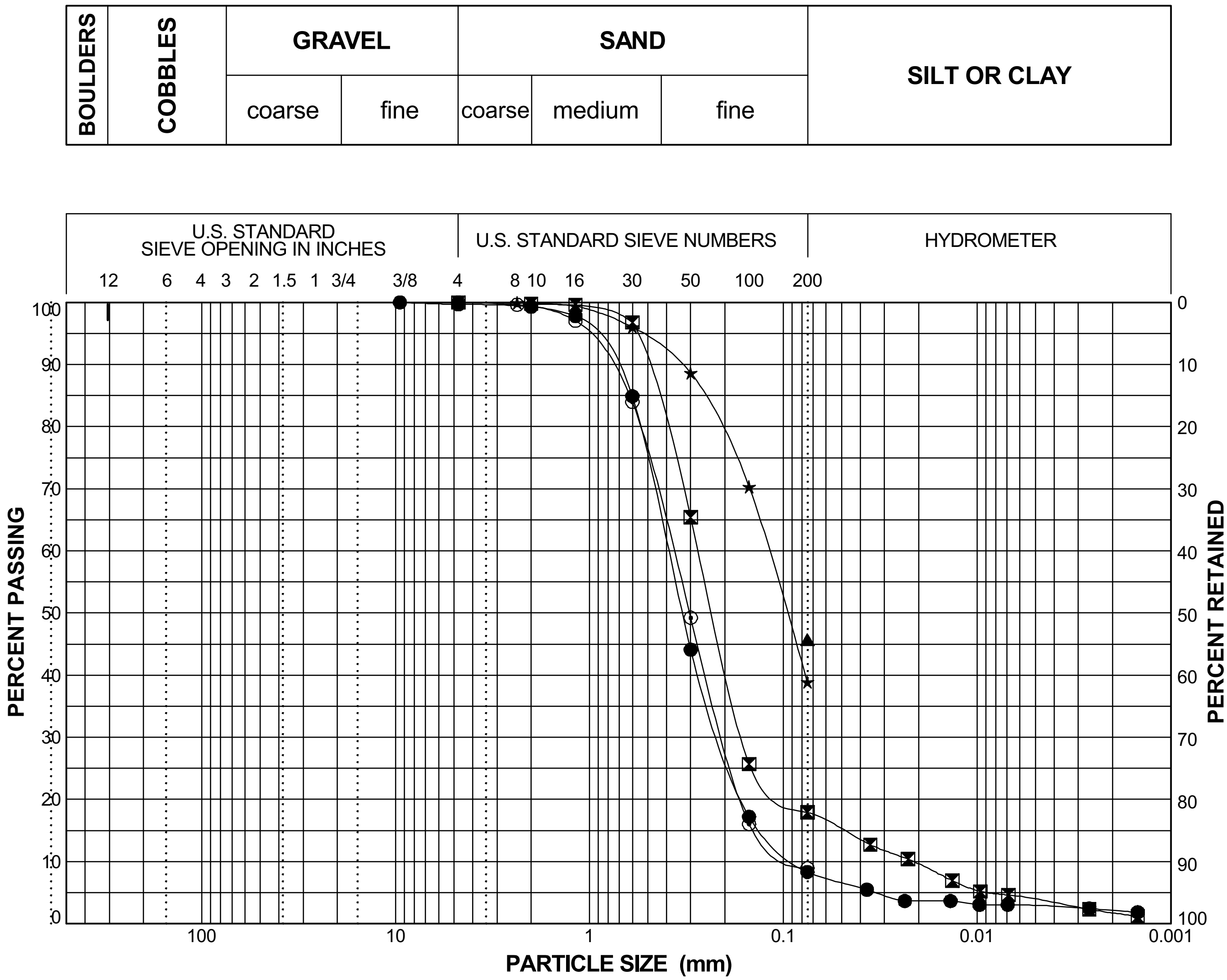


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_132B	1A	1	●	0.0	0.0	76.0	LEAN CLAY with SAND (CL)
WR0017_132B	3A	5	⧗	0.4	47.1	52.5	SANDY SILT (ML)
WR0017_132B	4B	8.5	▲	0.0	41.7	58.3	SANDY SILT (ML)
WR0017_132B	5B	10.01	★	0.0	68.1	31.9	SILTY SAND (SM)
WR0017_132B	5A	10.8	⊙	0.0	8.5	91.5	SILT (ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

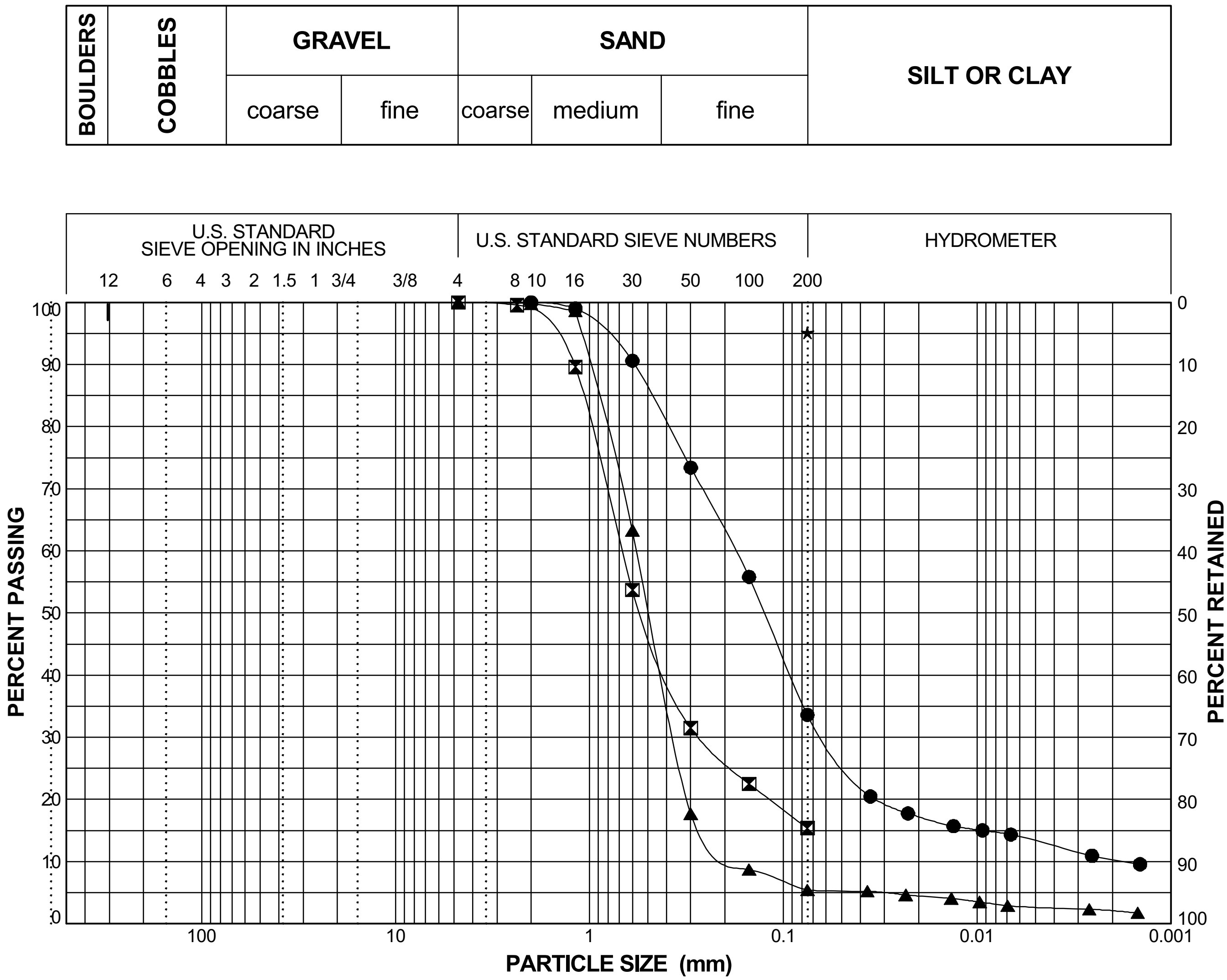


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_132B	6A	15	●	0.3	91.4	8.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_132B	8A	20	⧗	0.0	82.1	17.9	SILTY SAND (SM)
WR0017_132B	9A	25	▲	0.0	0.0	45.7	CLAYEY SAND (SC)
WR0017_132B	11A	30.2	★	0.0	61.1	38.9	CLAYEY SAND (SC)
WR0017_132B	12B	31.51	⊙	0.0	91.1	8.9	Poorly Graded SAND with Clay (SP-SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



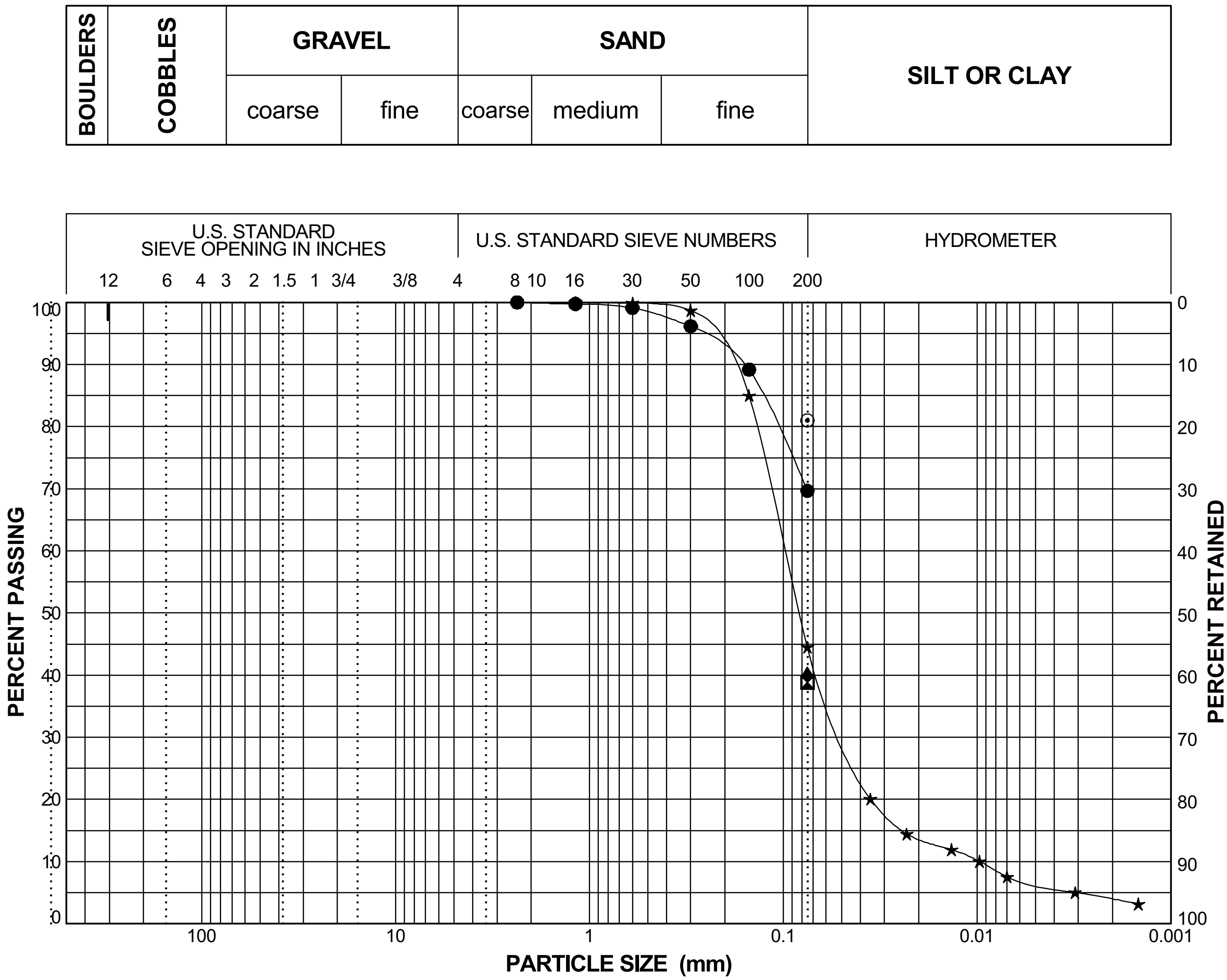
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_132B	12A	33.5	●	0.0	66.4	33.6	SILTY, CLAYEY SAND (SC-SM)
WR0017_132B	13A	35	⊠	0.0	84.6	15.4	SILTY SAND (SM)
WR0017_132B	15B	40.01	▲	0.0	94.6	5.4	Poorly Graded SAND with Silt (SP-SM)
WR0017_132B	19A	50	★	0.0	0.0	95.1	FAT CLAY (CH)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

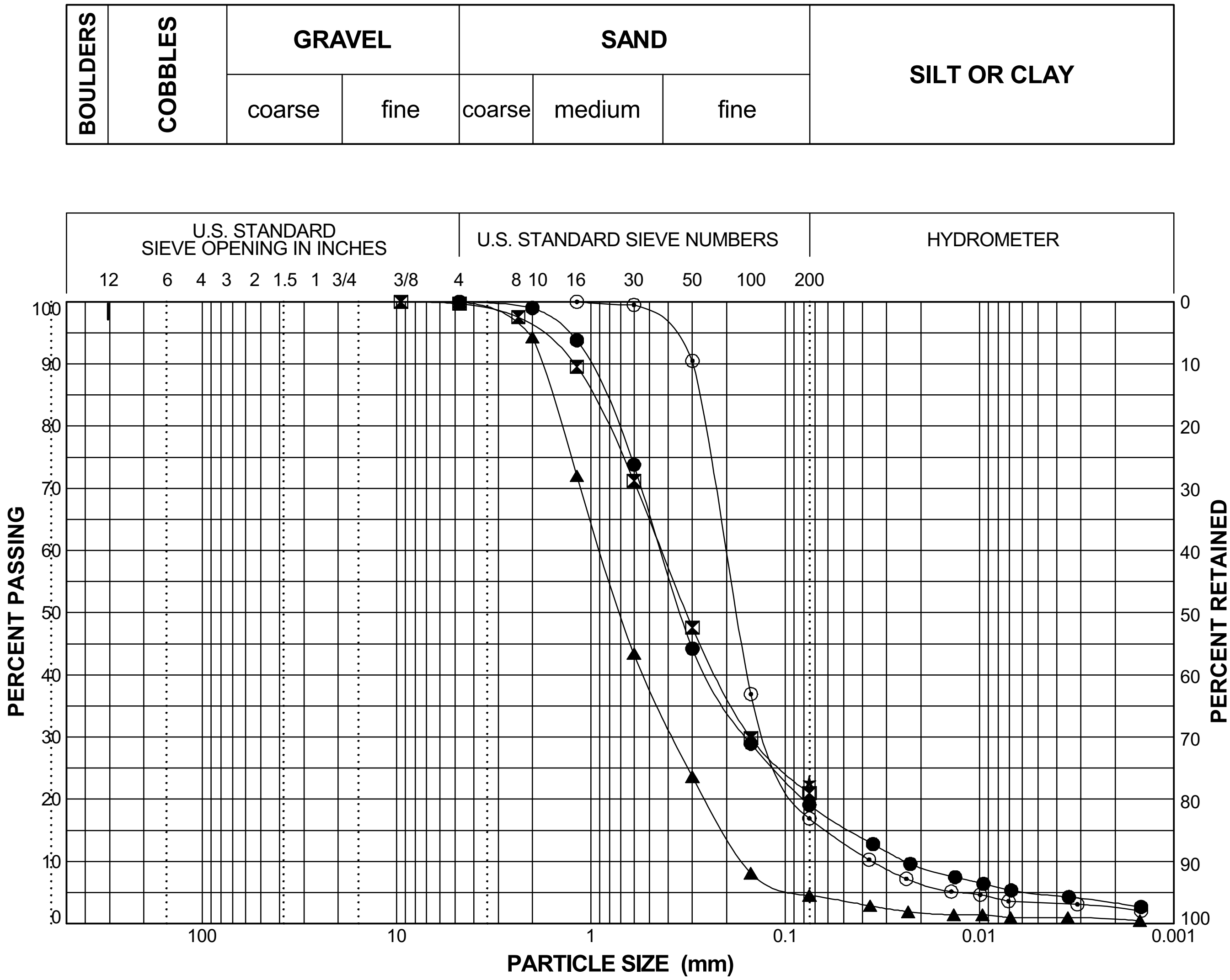


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_133B	1A	0	●	0.0	30.3	69.7	SANDY LEAN CLAY (CL)
WR0017_133B	4A	6.5	⊠	0.0	0.0	38.8	SILTY, CLAYEY SAND (SC-SM)
WR0017_133B	6A	10	▲	0.0	0.0	40.4	SILTY SAND (SM)
WR0017_133B	8A	14	★	0.0	55.5	44.5	SILTY SAND (SM)
WR0017_133B	9A	17	⊙	0.0	0.0	81.0	SILTY CLAY with SAND (CL-ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

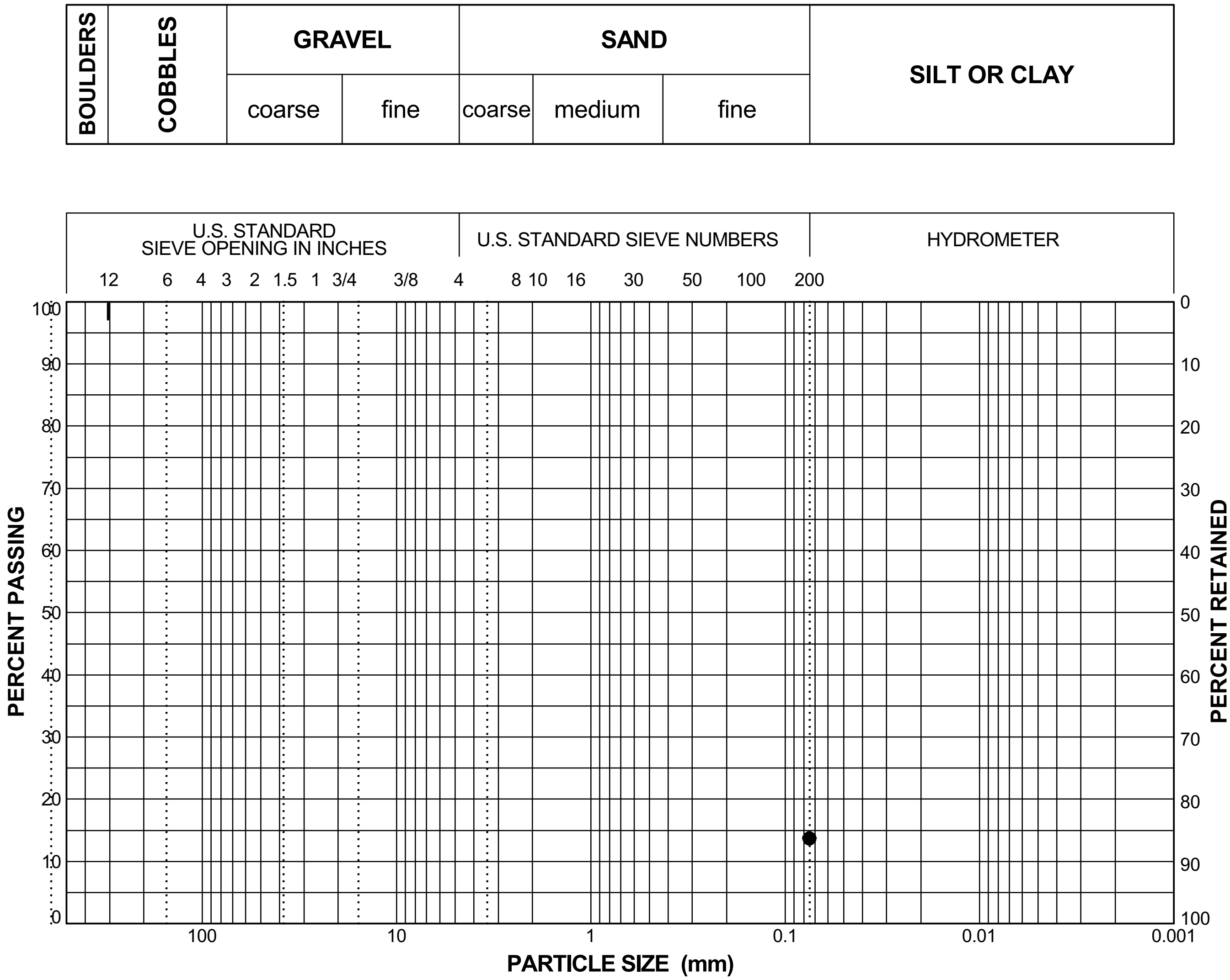


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_133B	12A	23.51	●	0.0	80.9	19.1	SILTY SAND (SM)
WR0017_133B	13A	27	⊠	0.3	78.7	21.0	CLAYEY SAND (SC)
WR0017_133B	17B	37.01	▲	0.0	95.5	4.5	POORLY GRADED SAND (SP)
WR0017_133B	18A	39.5	★	0.0	0.0	22.7	SILTY SAND (SM)
WR0017_133B	21A	47	⊙	0.0	83.1	16.9	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

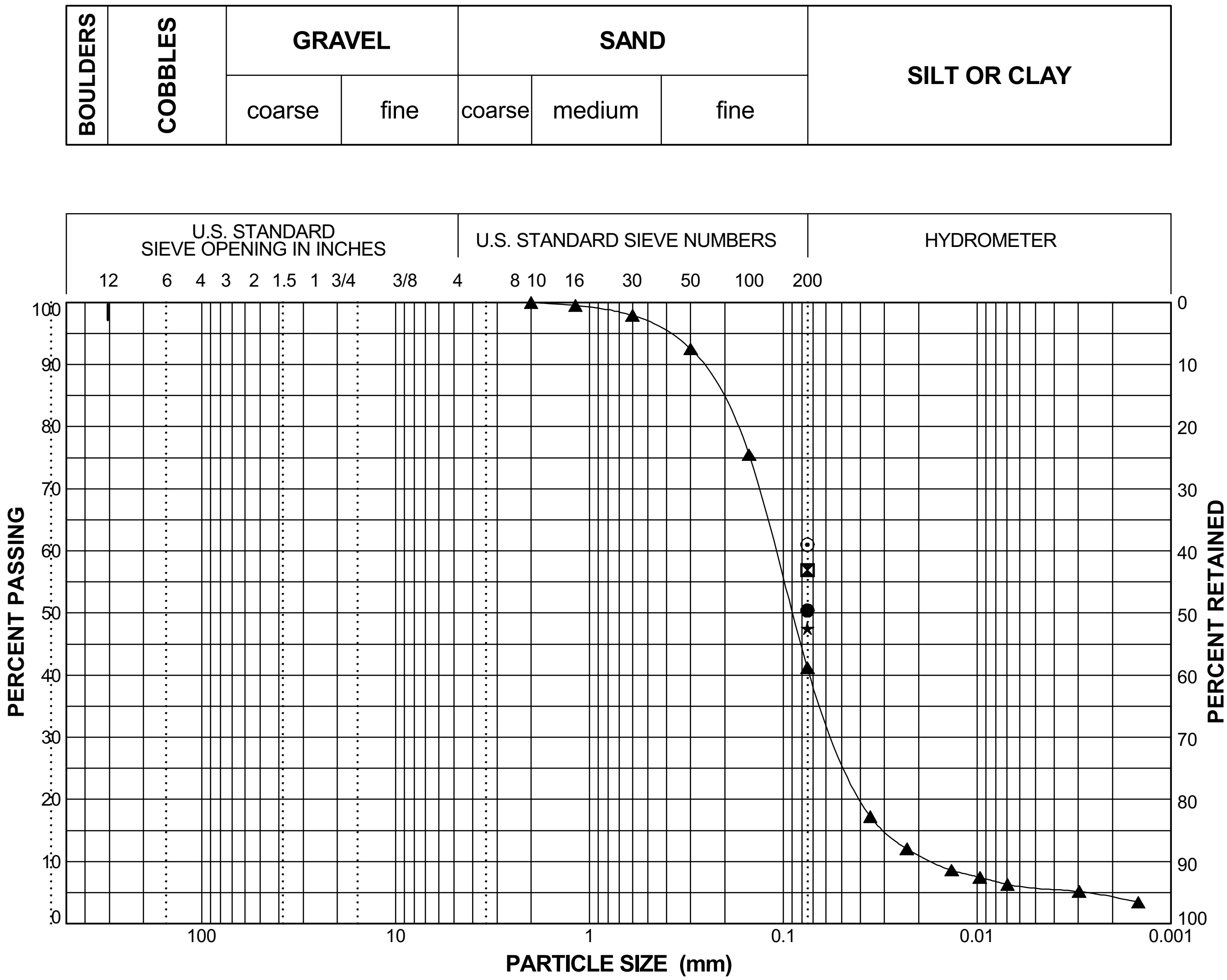


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_133B	26A	58.5	●	0.0	0.0	13.7	SILTY SAND (SM)

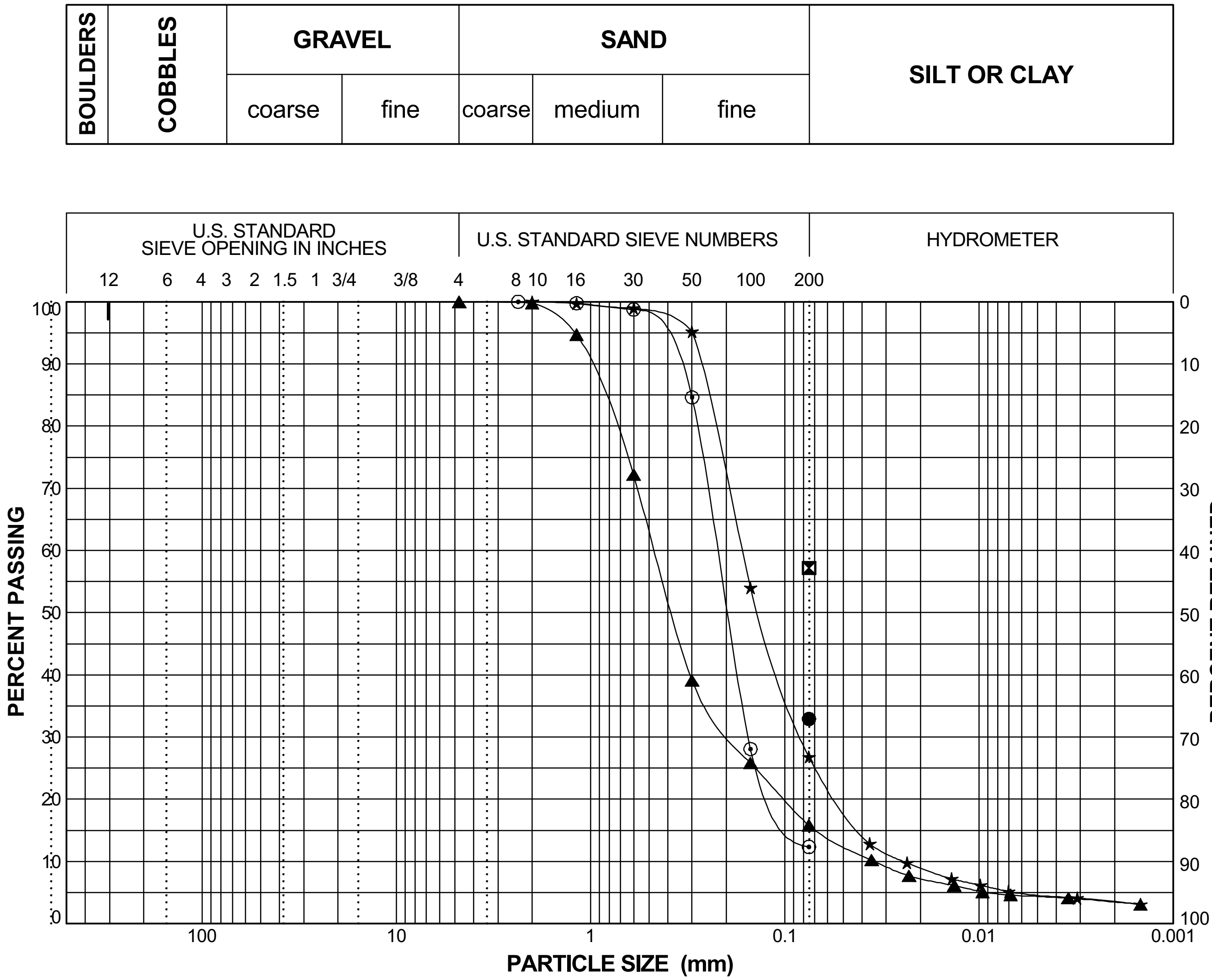
Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_134B	3A	3.5	●	0.0	0.0	50.4	SANDY LEAN CLAY (CL)
WR0017_134B	5A	7	⧗	0.0	0.0	56.9	SANDY LEAN CLAY (CL)
WR0017_134B	6A	10	▲	0.0	58.8	41.2	SILTY SAND (SM)
WR0017_134B	8A	15	★	0.0	0.0	47.5	SILTY SAND (SM)
WR0017_134B	9A	20	⊙	0.0	0.0	61.0	SANDY LEAN CLAY (CL)

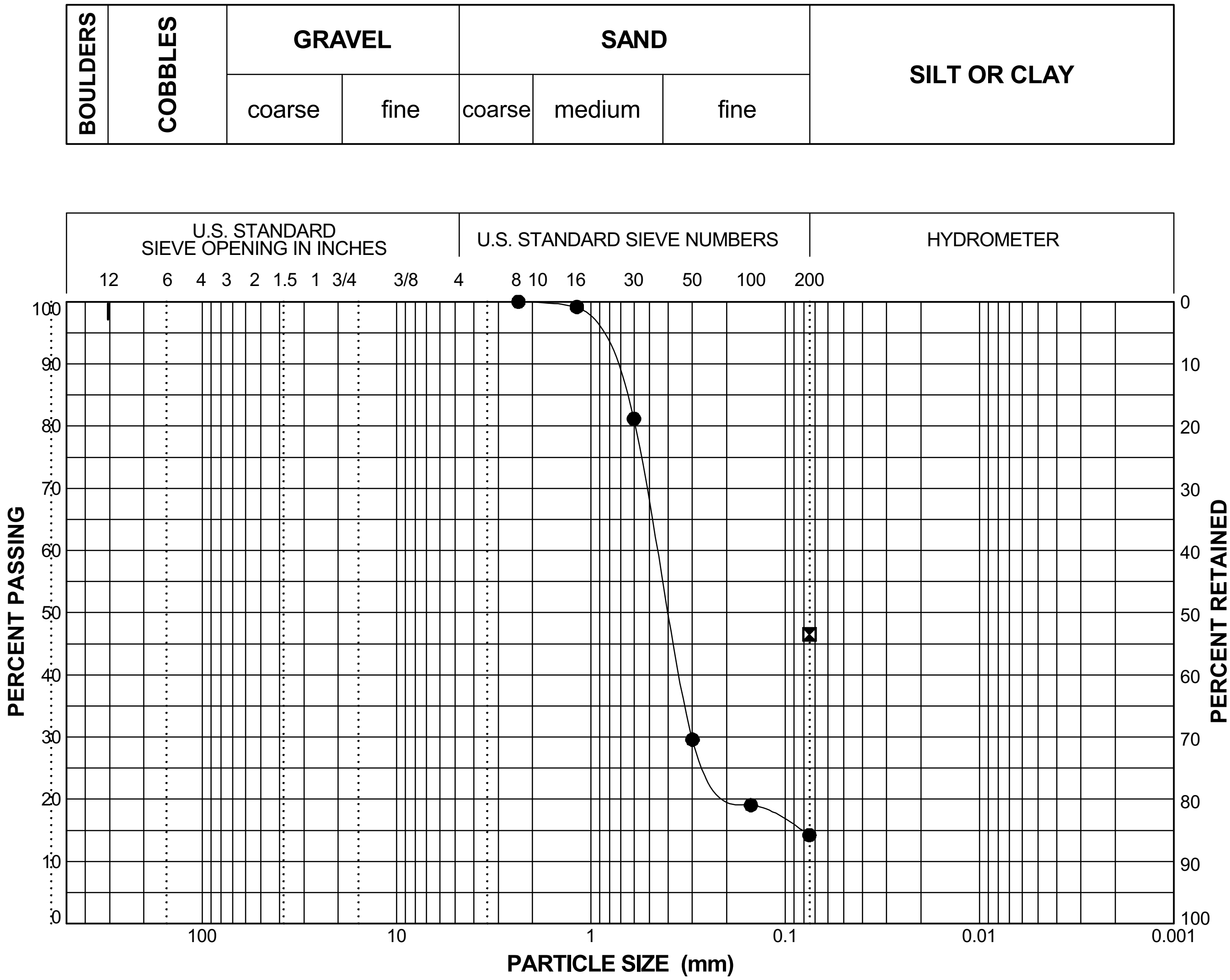


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_134B	11A	25	●	0.0	0.0	32.9	CLAYEY SAND (SC)
WR0017_134B	14A	33.9	⊠	0.0	0.0	57.2	SANDY SILTY CLAY (CL-ML)
WR0017_134B	15B	35	▲	0.0	84.2	15.8	SILTY SAND (SM)
WR0017_134B	16A	40	★	0.0	73.2	26.8	SILTY SAND (SM)
WR0017_134B	18A	45	⊙	0.0	87.7	12.3	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



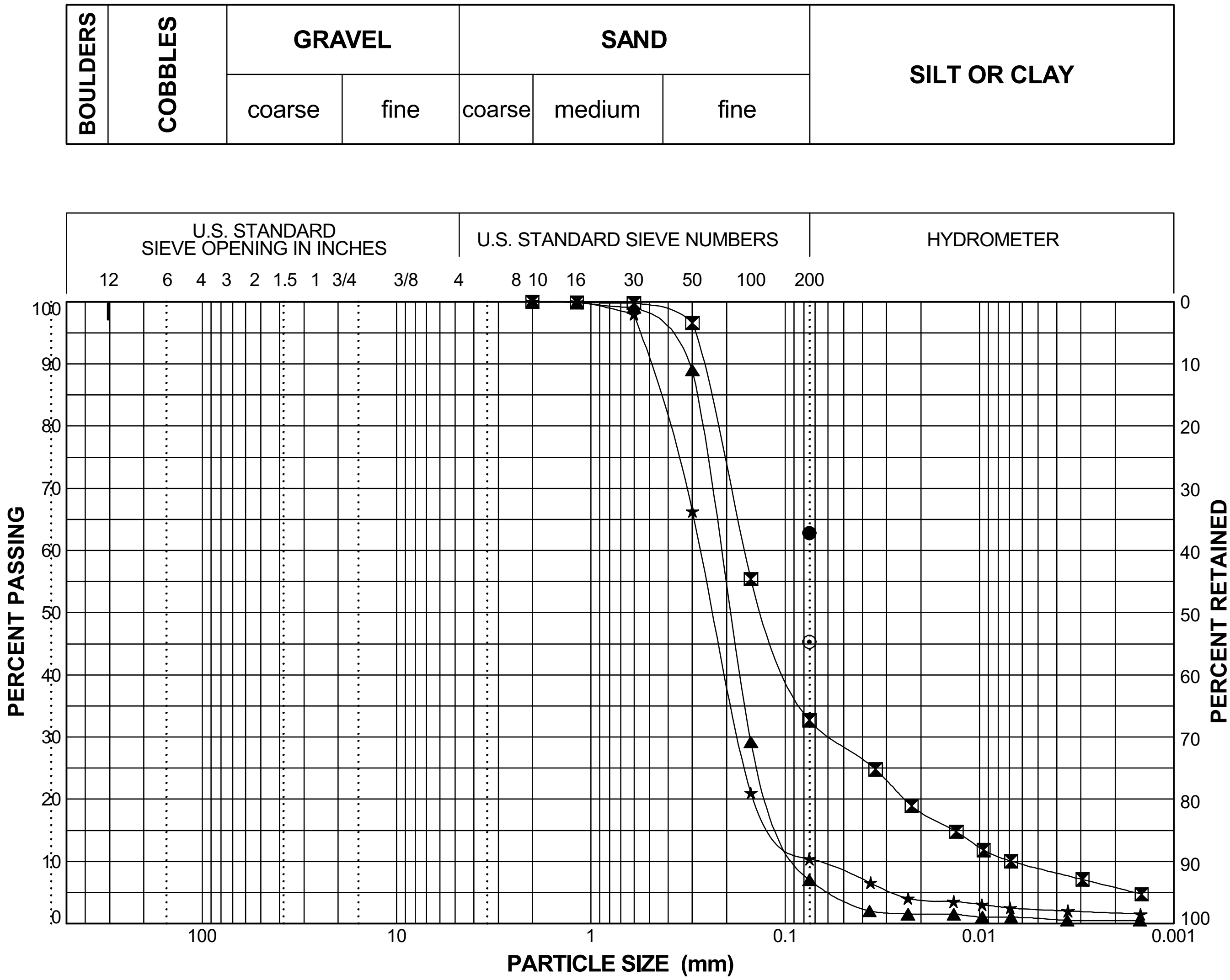
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_134B	22A	55	●	0.0	85.8	14.2	CLAYEY SAND (SC)
WR0017_134B	23A	56.51	⊠	0.0	0.0	46.5	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

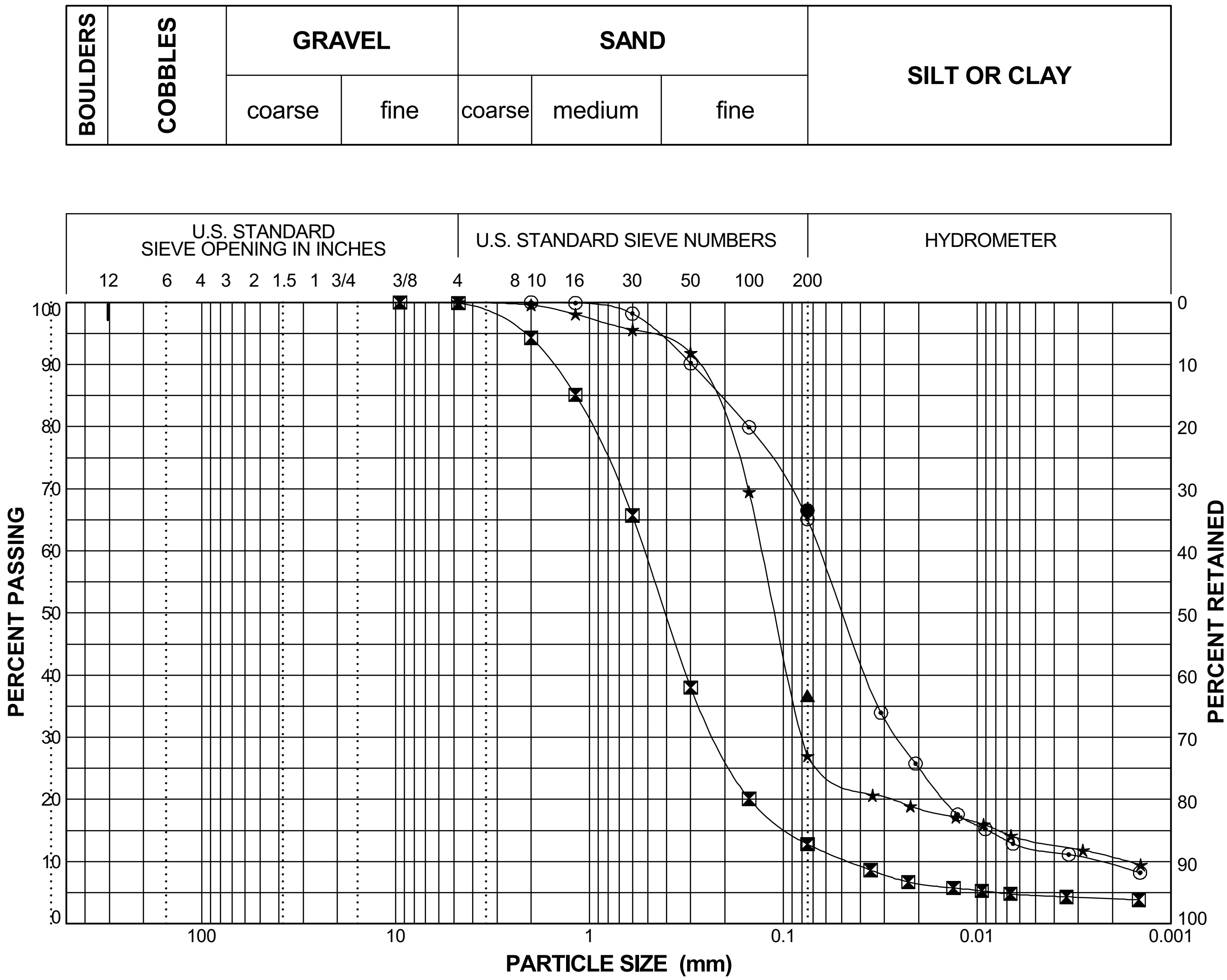


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_135B	5A	8	●	0.0	0.0	62.8	SANDY SILTY CLAY (CL-ML)
WR0017_135B	8A	15.7	⧗	0.0	67.3	32.7	SILTY SAND (SM)
WR0017_135B	9A	18	▲	0.0	93.0	7.0	Poorly Graded SAND with Silt (SP-SM)
WR0017_135B	10A	20	★	0.0	89.6	10.4	Poorly Graded SAND with Silt (SP-SM)
WR0017_135B	11B	25.5	⊙	0.0	0.0	45.3	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

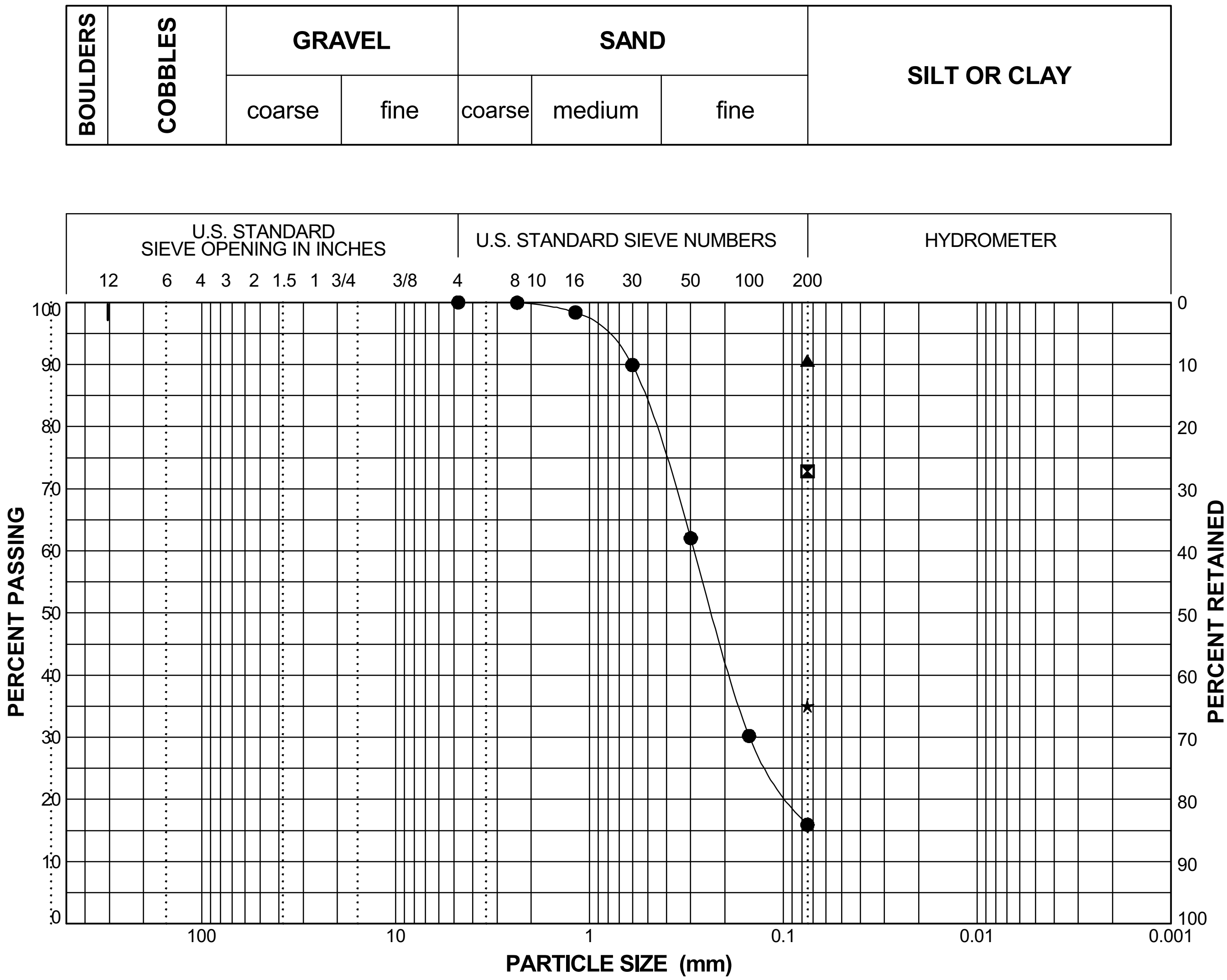


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_135B	12B	26.51	●	0.0	0.0	66.5	SANDY LEAN CLAY (CL)
WR0017_135B	12A	28.6	⧗	0.1	87.1	12.8	SILTY SAND (SM)
WR0017_135B	13A	30.75	▲	0.0	0.0	36.7	SILTY SAND (SM)
WR0017_135B	14B	31.51	★	0.0	73.0	27.0	SILTY SAND (SM)
WR0017_135B	14A	33.3	⊙	0.0	34.9	65.1	SANDY SILT (ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

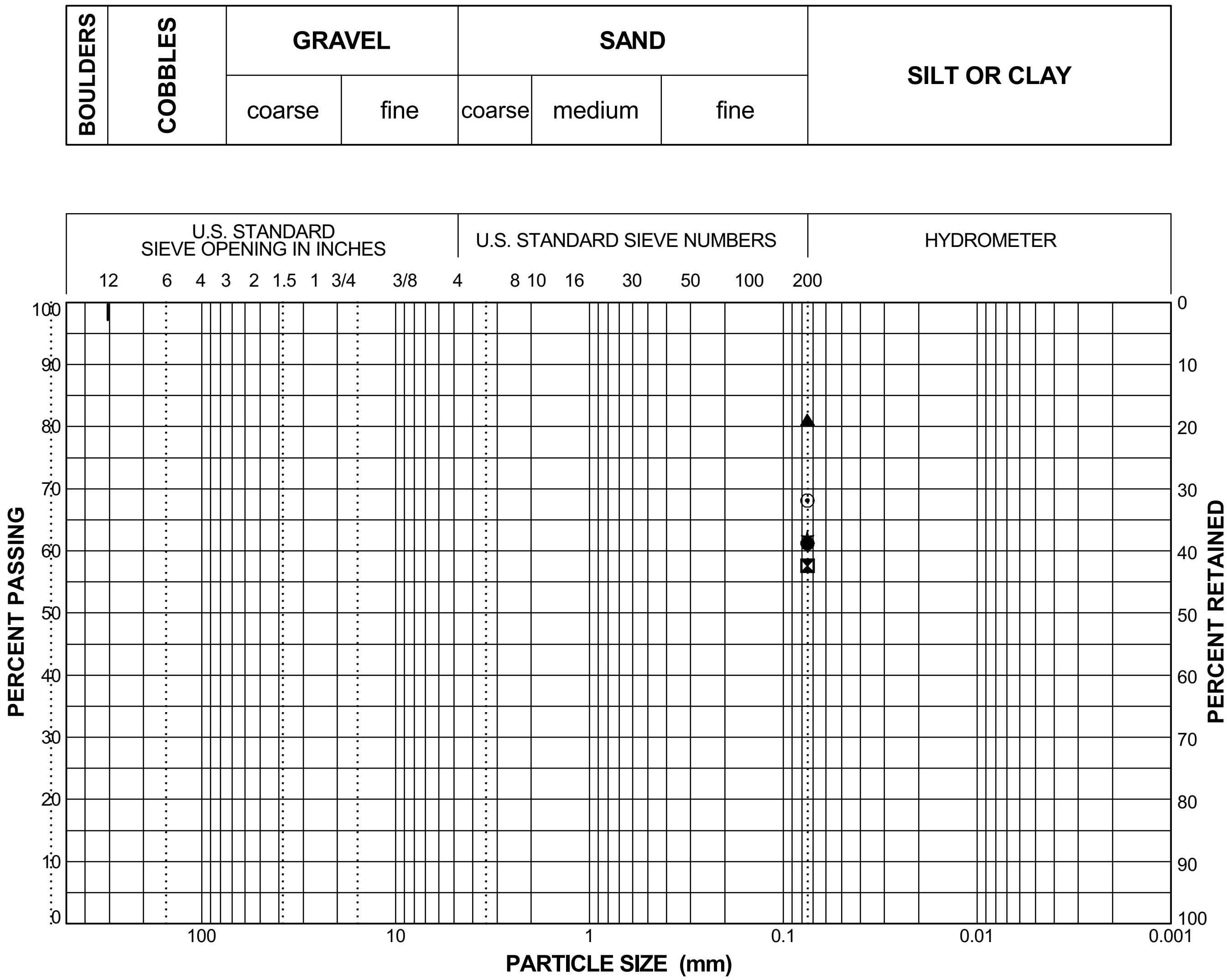


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_135B	16A	36.5	●	0.0	84.1	15.9	SILTY SAND (SM)
WR0017_135B	17A	40	⊠	0.0	0.0	72.8	LEAN CLAY with SAND (CL)
WR0017_135B	19A	45	▲	0.0	0.0	90.6	LEAN CLAY (CL)
WR0017_135B	23A	55.9	★	0.0	0.0	35.0	SILTY, CLAYEY SAND (SC-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

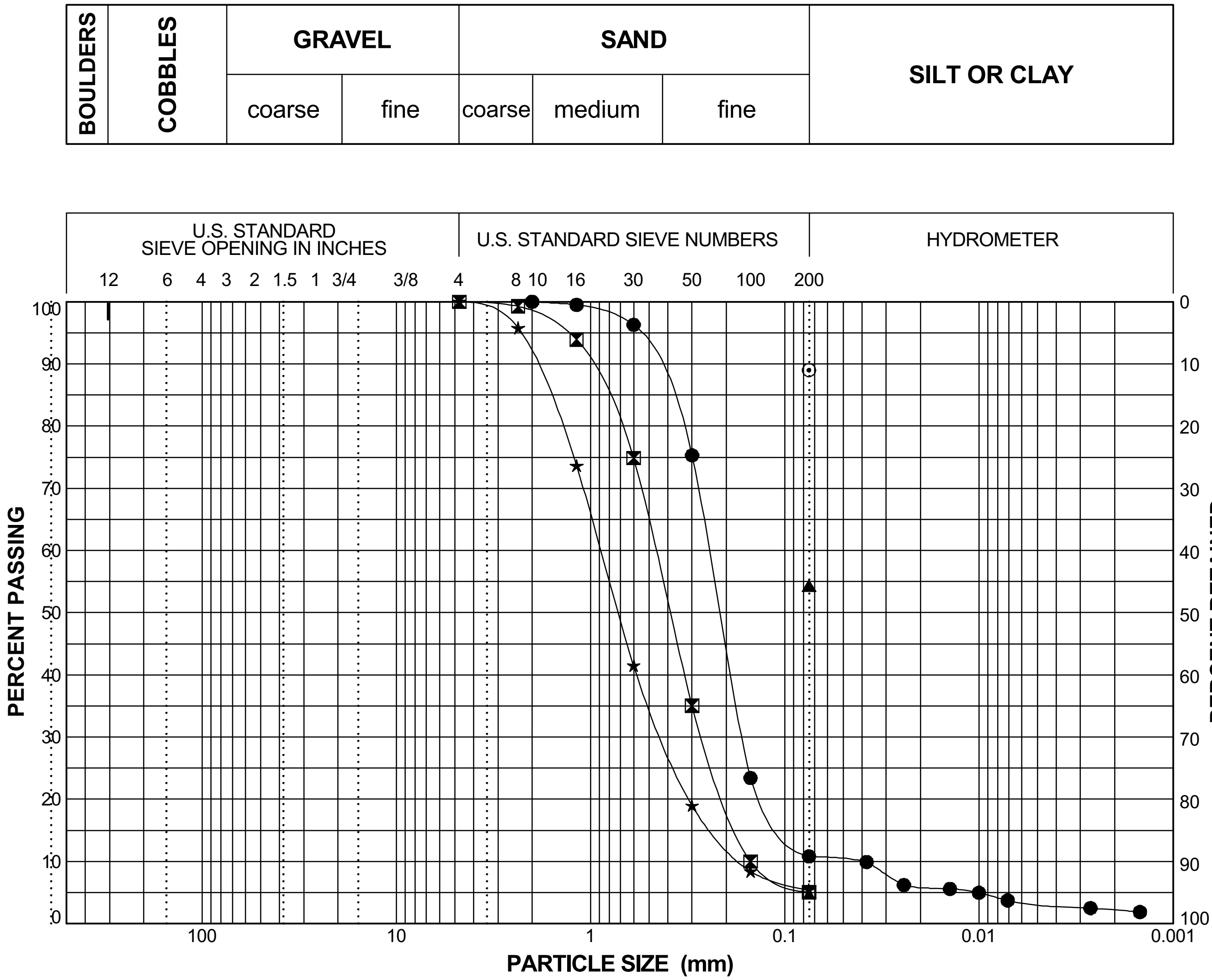


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_136B	1B	0.3	●	0.0	0.0	61.2	SANDY LEAN CLAY (CL)
WR0017_136B	4A	5	⊠	0.0	0.0	57.6	SANDY LEAN CLAY (CL)
WR0017_136B	7A	13.7	▲	0.0	0.0	81.1	LEAN CLAY with SAND (CL)
WR0017_136B	8B	15.01	★	0.0	0.0	62.2	SANDY LEAN CLAY (CL)
WR0017_136B	8A	15.5	⊙	0.0	0.0	68.1	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

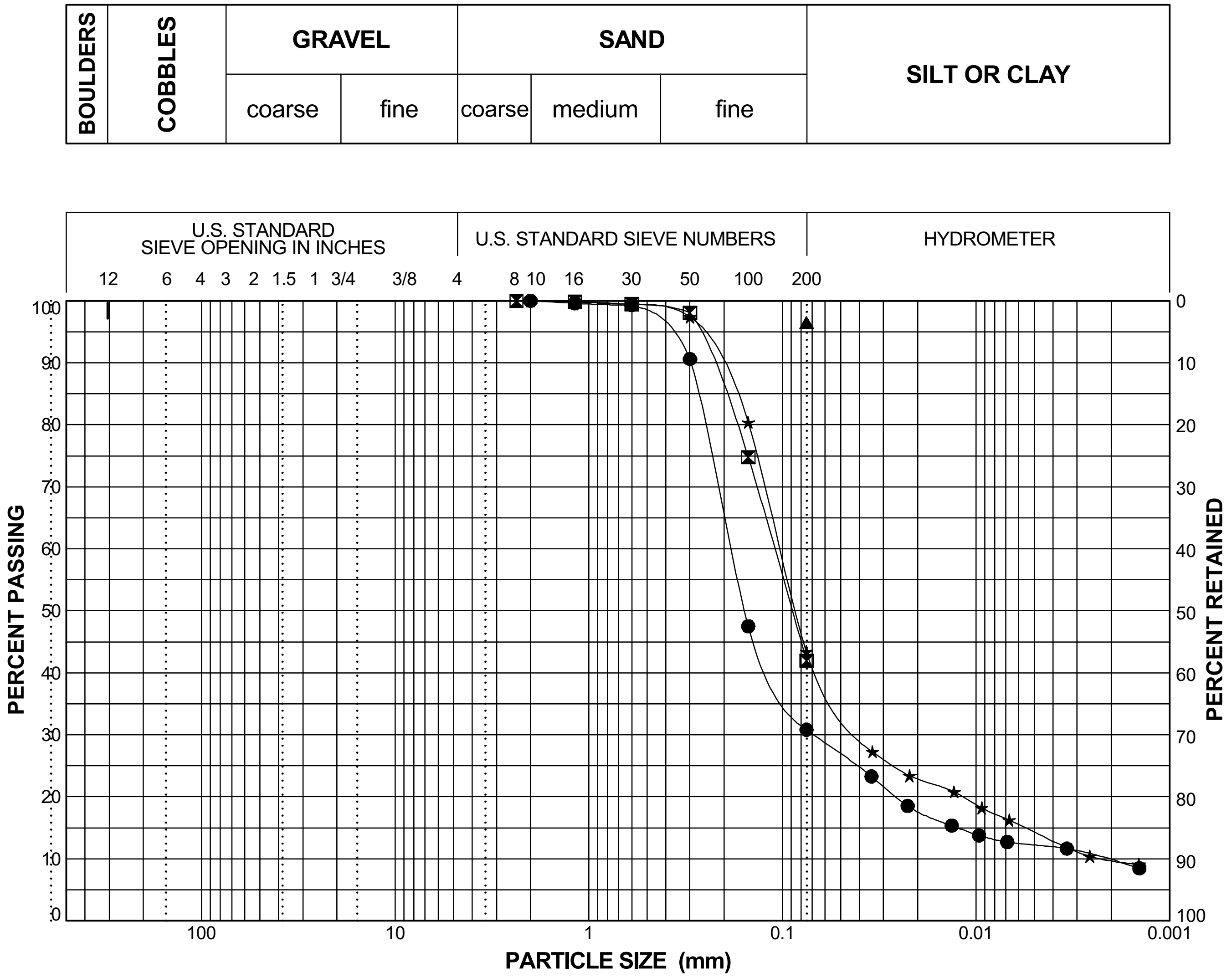


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_136B	9A	18	●	0.0	89.2	10.8	Well-Graded SAND with Silt (SW-SM)
WR0017_136B	10A	20	⧗	0.0	95.0	5.0	Poorly Graded SAND with Silt (SP-SM)
WR0017_136B	12A	25	▲	0.0	0.0	54.3	SANDY LEAN CLAY (CL)
WR0017_136B	17B	38	★	0.0	94.6	5.4	Poorly Graded SAND with Silt (SP-SM)
WR0017_136B	18A	40.8	⊙	0.0	0.0	89.0	LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

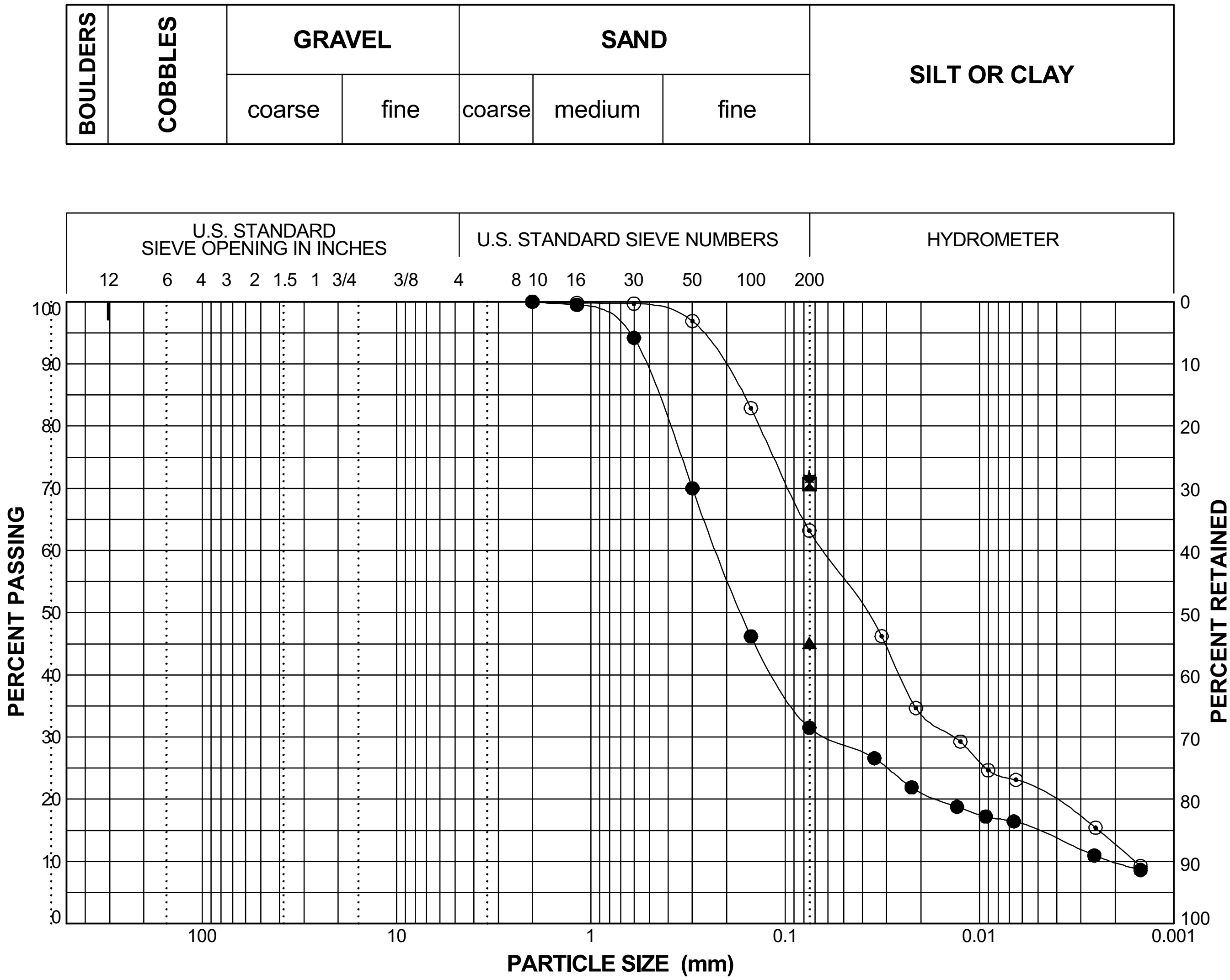


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_136B	22A	51.51	●	0.0	69.2	30.8	SILTY SAND (SM)
WR0017_136B	23A	55	⊠	0.0	58.0	42.0	SILTY SAND (SM)
WR0017_136B	24C	56.51	▲	0.0	0.0	96.5	LEAN CLAY (CL)
WR0017_136B	24B	58	★	0.0	56.6	43.4	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

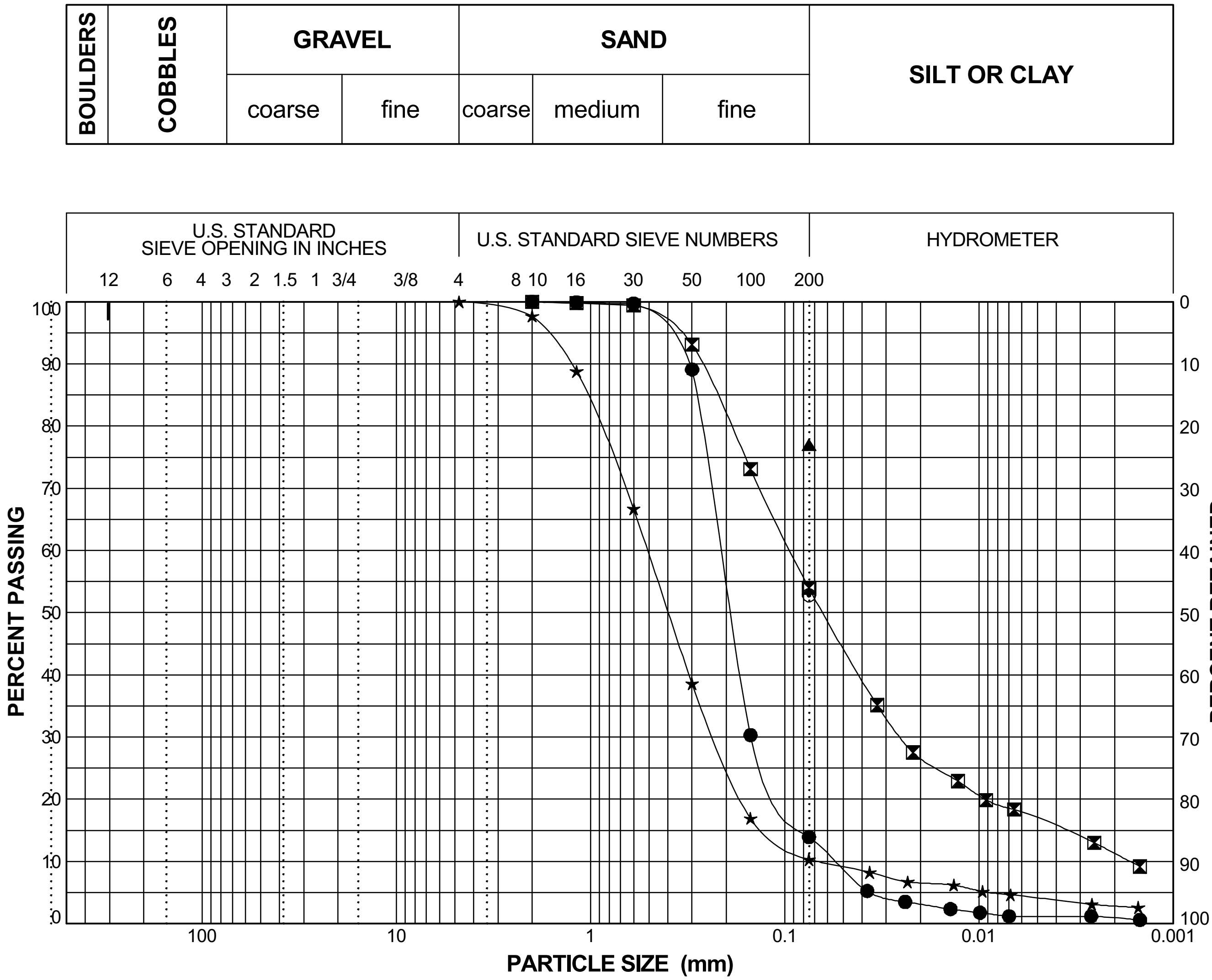


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_137B	1B	0.4	●	0.0	68.5	31.5	CLAYEY SAND (SC)
WR0017_137B	3A	3	⧗	0.0	0.0	70.7	LEAN CLAY with SAND (CL)
WR0017_137B	6A	8	▲	0.0	0.0	45.1	CLAYEY SAND (SC)
WR0017_137B	7A	10.8	★	0.0	0.0	71.9	LEAN CLAY with SAND (CL)
WR0017_137B	9A	15	⊙	0.0	36.8	63.2	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

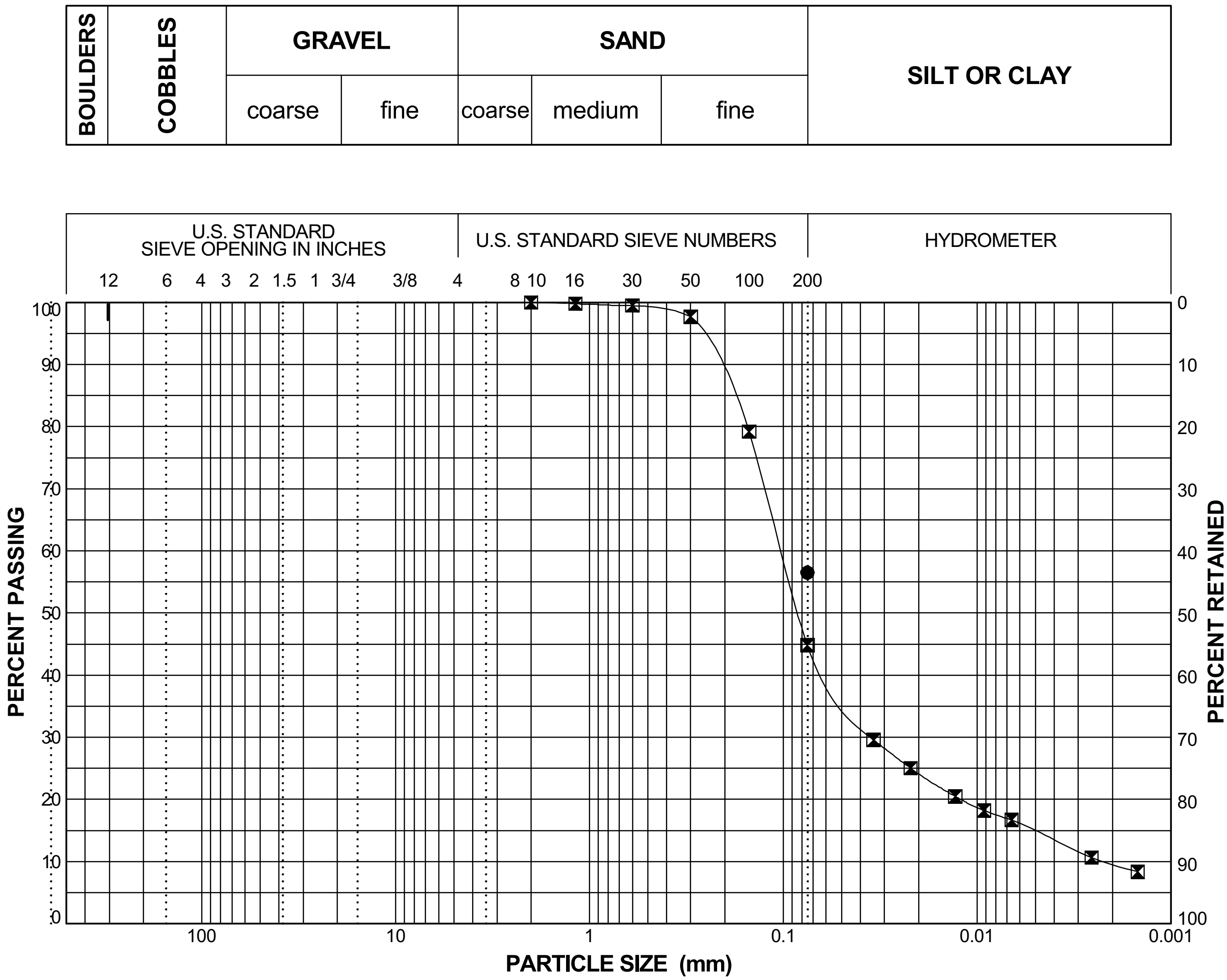


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_137B	11A	20	●	0.0	86.1	13.9	SILTY SAND (SM)
WR0017_137B	15A	30	⧗	0.0	46.0	54.0	SANDY LEAN CLAY (CL)
WR0017_137B	16B	31.51	▲	0.0	0.0	77.0	LEAN CLAY with SAND (CL)
WR0017_137B	17A	39	★	0.0	89.7	10.3	Well-Graded SAND with Silt (SW-SM)
WR0017_137B	21A	46.51	⊙	0.0	0.0	52.8	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_137B	22A	50	●	0.0	0.0	56.5	SANDY LEAN CLAY (CL)
WR0017_137B	23A	52.5	⧗	0.0	55.2	44.8	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

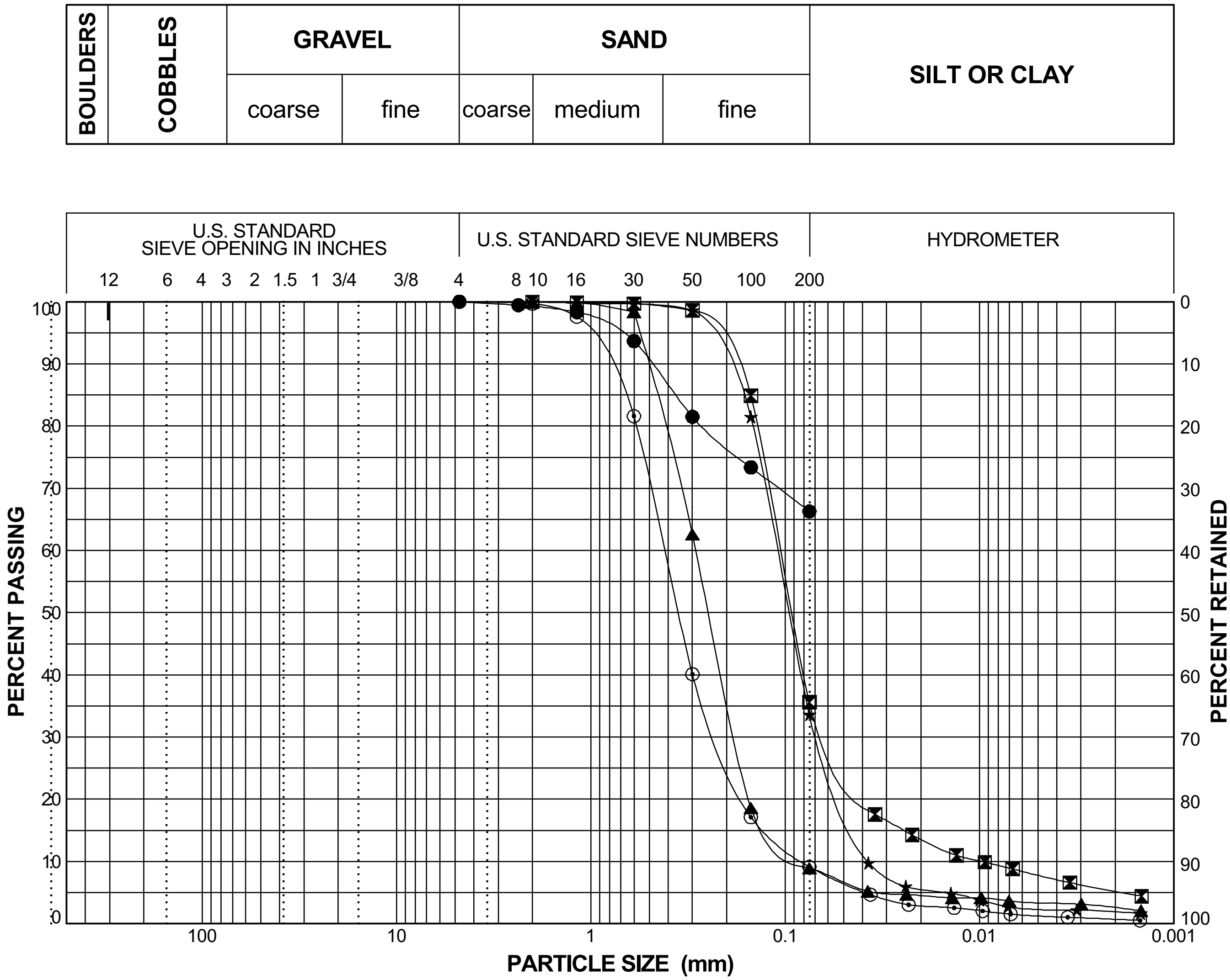
PARTICLE SIZE DISTRIBUTION CURVES

ASTM D-1140
PERCENT PASSING NO. 200 SIEVE REPORT

Method A
Specimens Soaked Overnight without Deflocculating Agent
Dry Mass Determined Directly

Client Name Fugro
Project Name DWR-Levee RD 17
Project Number 1310.022

Boring Number	WRO017-137B				
Sample Number	S03A				
Depth (ft)	3.0-5.0				
Percent of Soil Finer than No. 200 Sieve	70.7				
Visual Classification	Grayish brown sandy clay				
Date	02/16/08				
Weight of Dry Soil + Pan (before wash)	169.0				
Weight of Dry Soil + Pan (after wash)	80.2				
Weight of Pan	43.4				

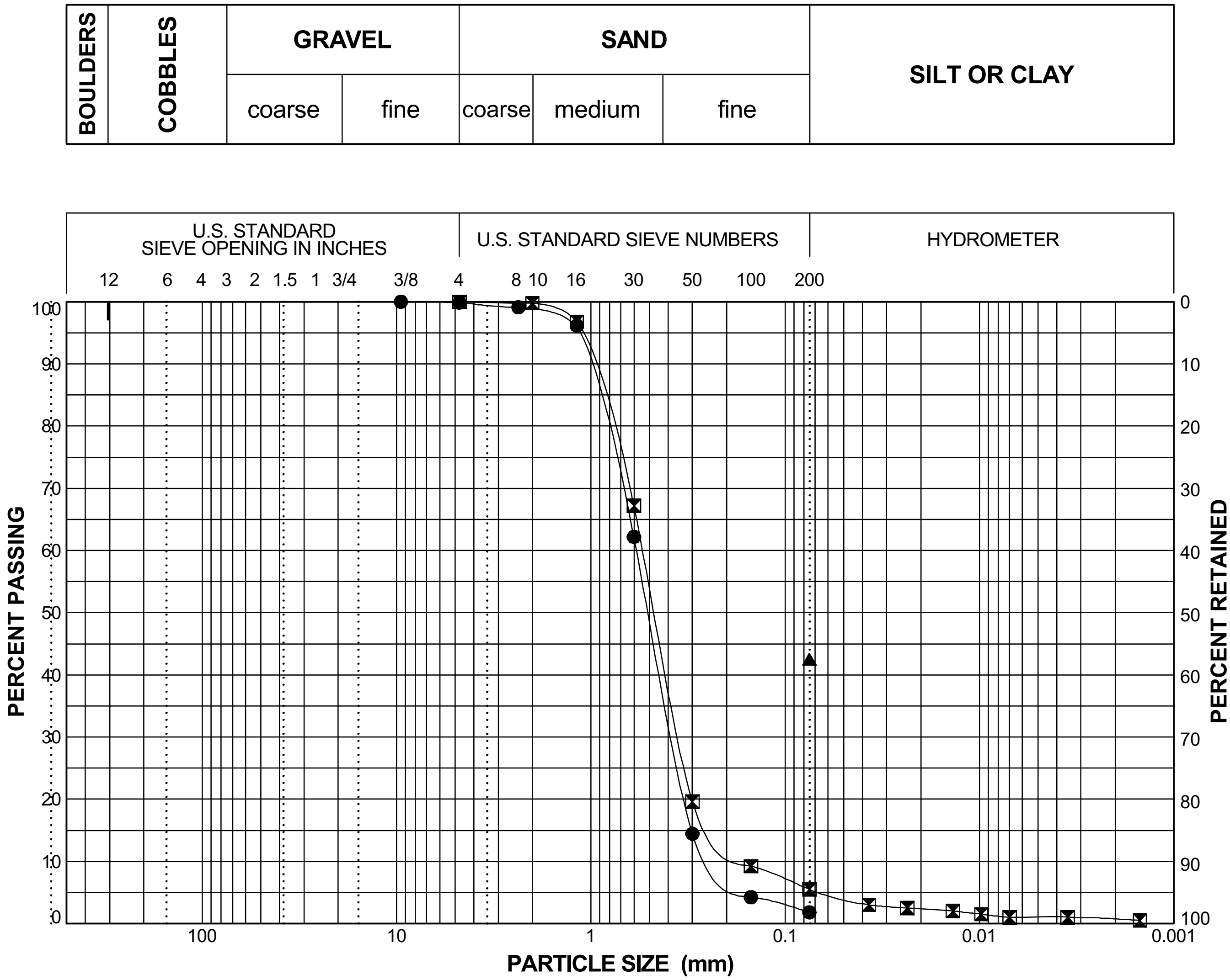


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_138B	1A	1.1	●	0.0	33.7	66.3	SANDY LEAN CLAY (CL)
WR0017_138B	3A	5	⧗	0.0	64.4	35.6	SILTY SAND (SM)
WR0017_138B	6B	15.01	▲	0.0	91.1	8.9	Poorly Graded SAND with Silt (SP-SM)
WR0017_138B	7A	20	★	0.0	66.4	33.6	SILTY SAND (SM)
WR0017_138B	10A	28.5	⊙	0.0	90.9	9.1	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

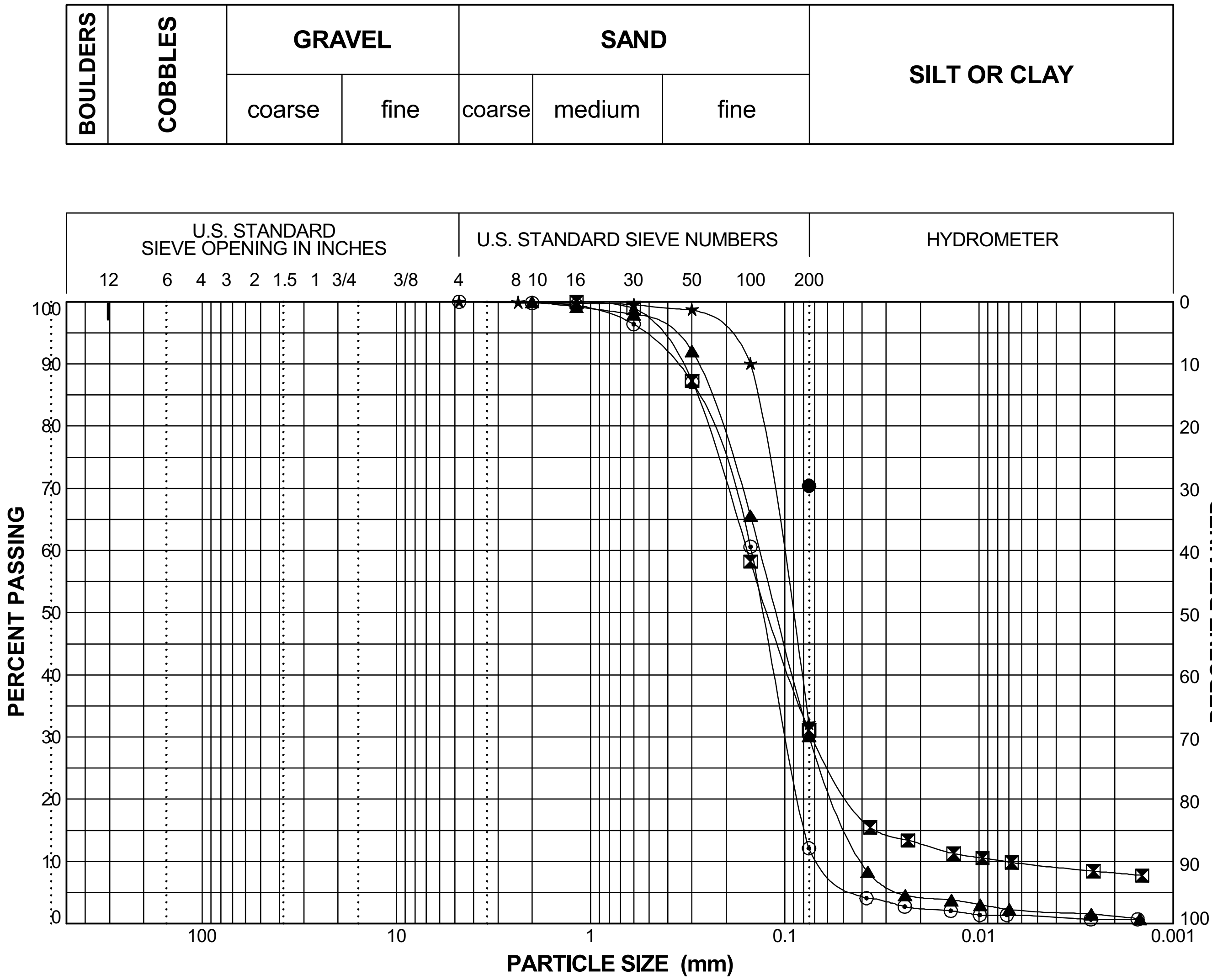


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_138B	12B	35	●	0.1	98.1	1.8	POORLY GRADED SAND (SP)
WR0017_138B	15A	45	⧗	0.0	94.5	5.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_138B	20A	58	▲	0.0	0.0	42.5	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

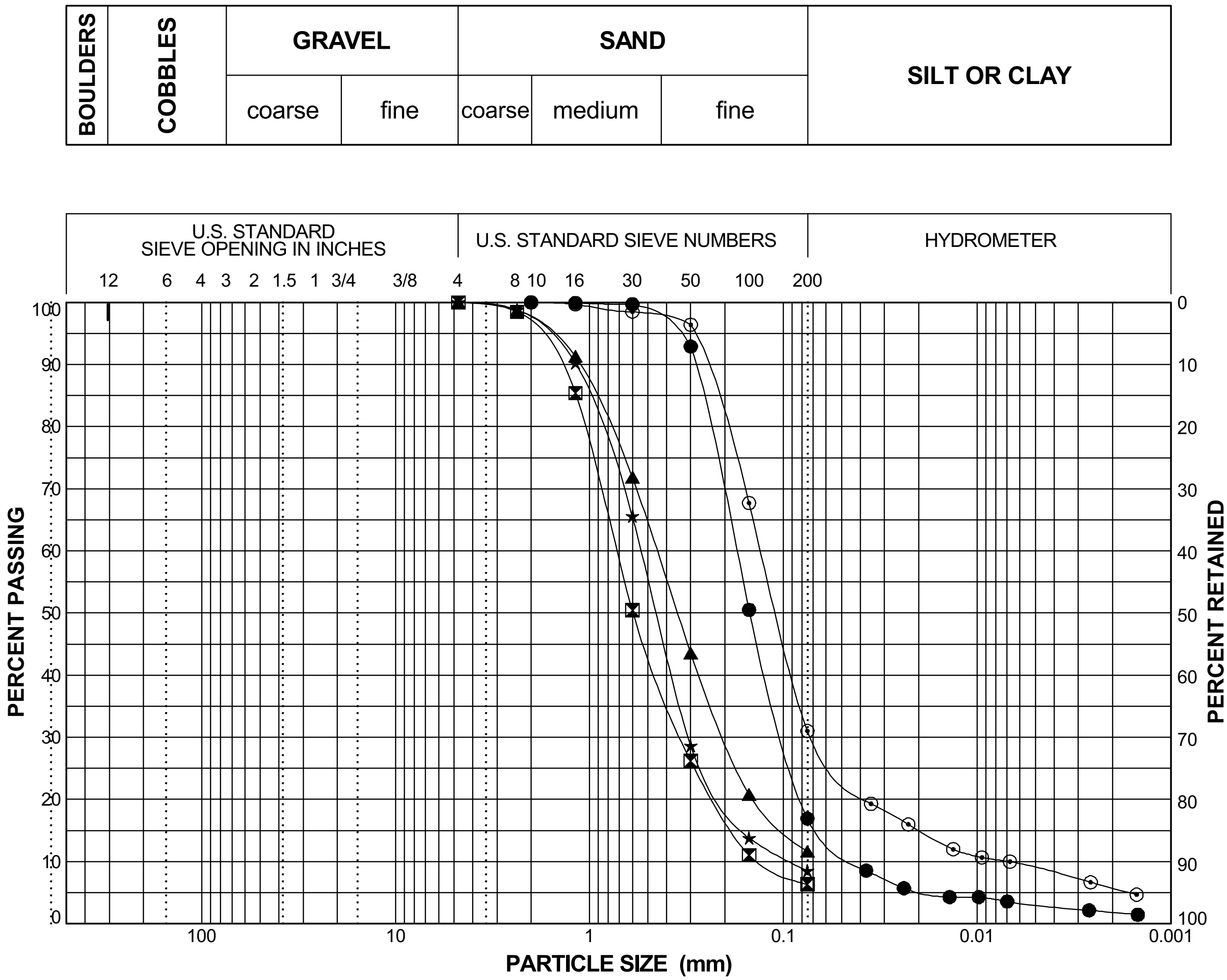


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_139B	2A	2	●	0.0	0.0	70.4	LEAN CLAY with SAND (CL)
WR0017_139B	3A	5.2	⧗	0.0	68.9	31.1	SILTY SAND (SM)
WR0017_139B	5A	10.2	▲	0.0	69.8	30.2	SILTY SAND (SM)
WR0017_139B	7A	15	★	0.0	67.8	32.2	SILTY SAND (SM)
WR0017_139B	9A	20	⊙	0.0	87.9	12.1	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

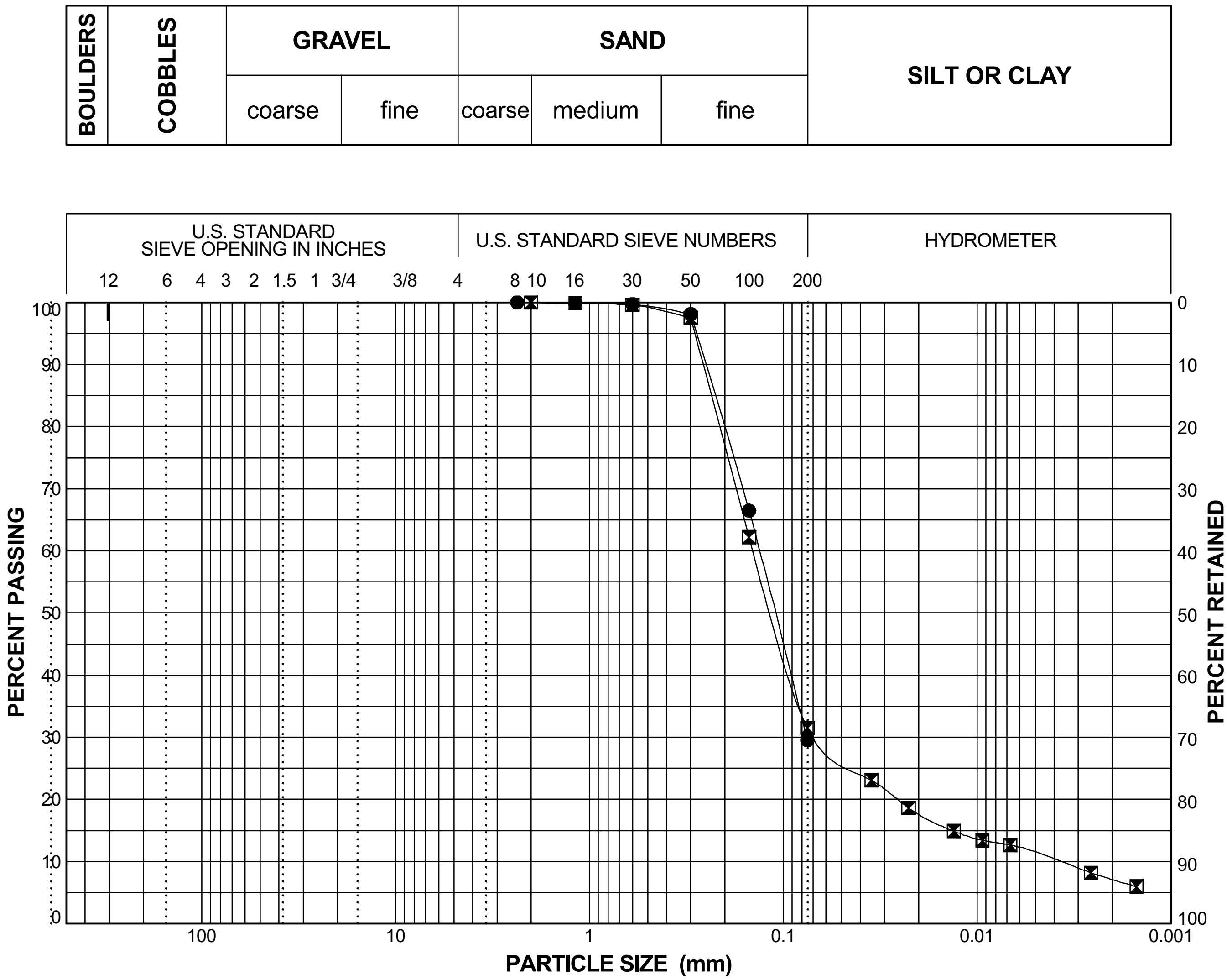


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_139B	11A	25	●	0.0	83.1	16.9	SILTY SAND (SM)
WR0017_139B	13A	30	⊠	0.0	93.7	6.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_139B	15A	35.8	▲	0.0	88.4	11.6	Poorly Graded SAND with Silt (SP-SM)
WR0017_139B	17A	40	★	0.0	91.5	8.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_139B	20A	46.8	⊙	0.0	69.0	31.0	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



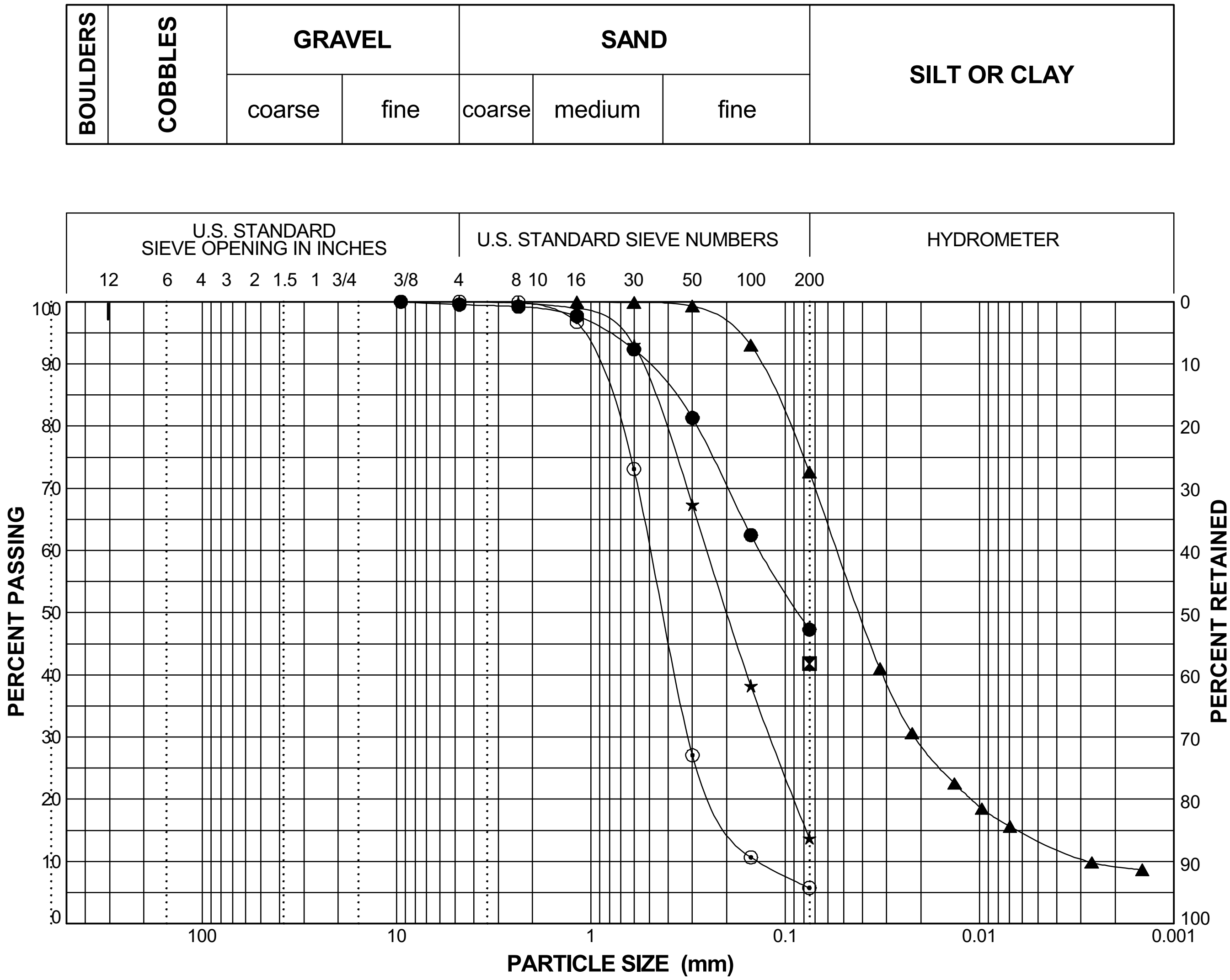
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_139B	21A	50	●	0.0	70.5	29.5	SILTY SAND (SM)
WR0017_139B	22B	51.51	⧗	0.0	68.5	31.5	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

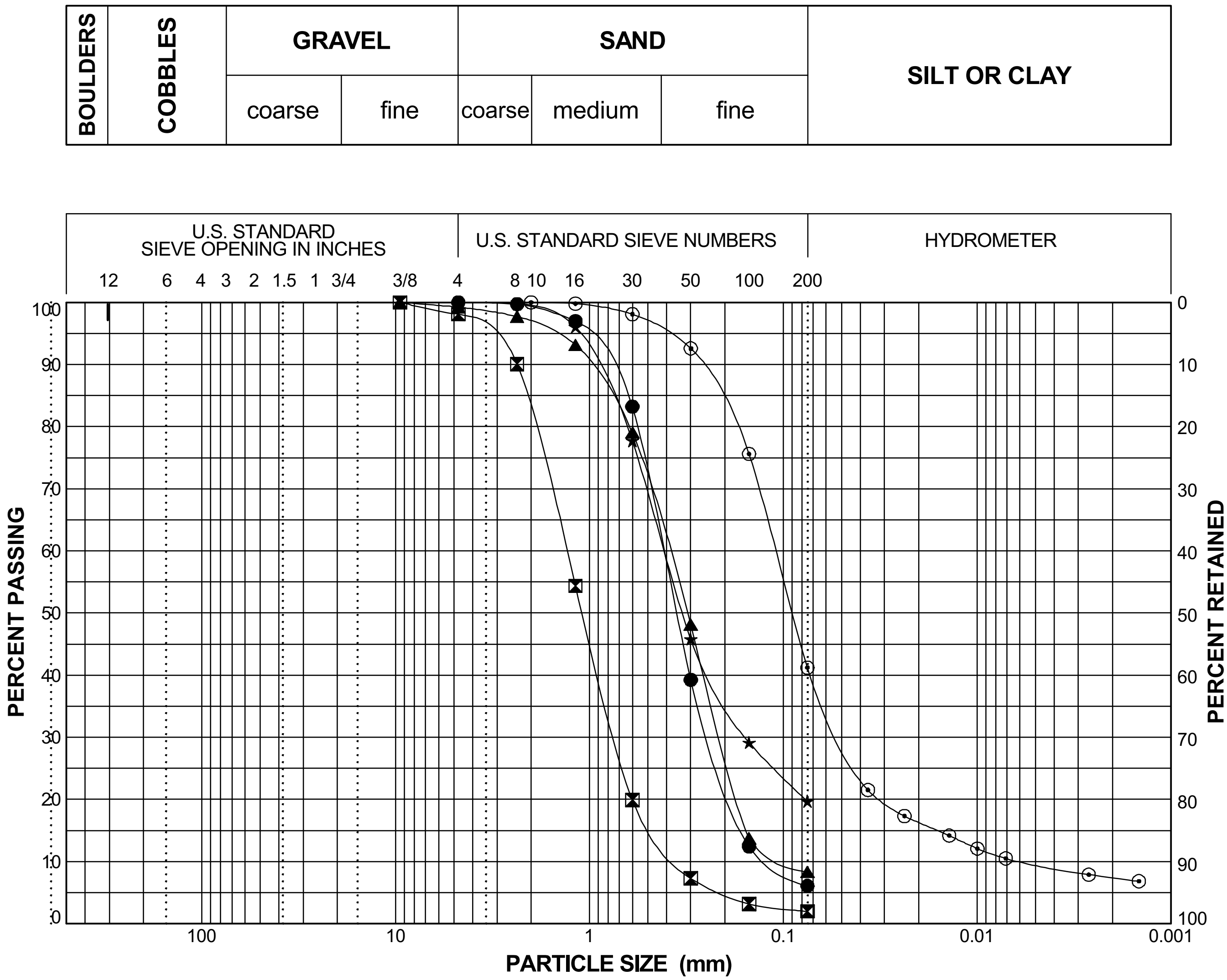


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_140B	5A	9	●	0.5	52.3	47.3	CLAYEY SAND (SC)
WR0017_140B	6A	10	⊠	0.0	0.0	41.8	CLAYEY SAND (SC)
WR0017_140B	7A	15	▲	0.0	27.4	72.6	SILT with Sand (ML)
WR0017_140B	10A	23	★	0.0	86.3	13.7	SILTY SAND (SM)
WR0017_140B	11A	29	⊙	0.0	94.3	5.7	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

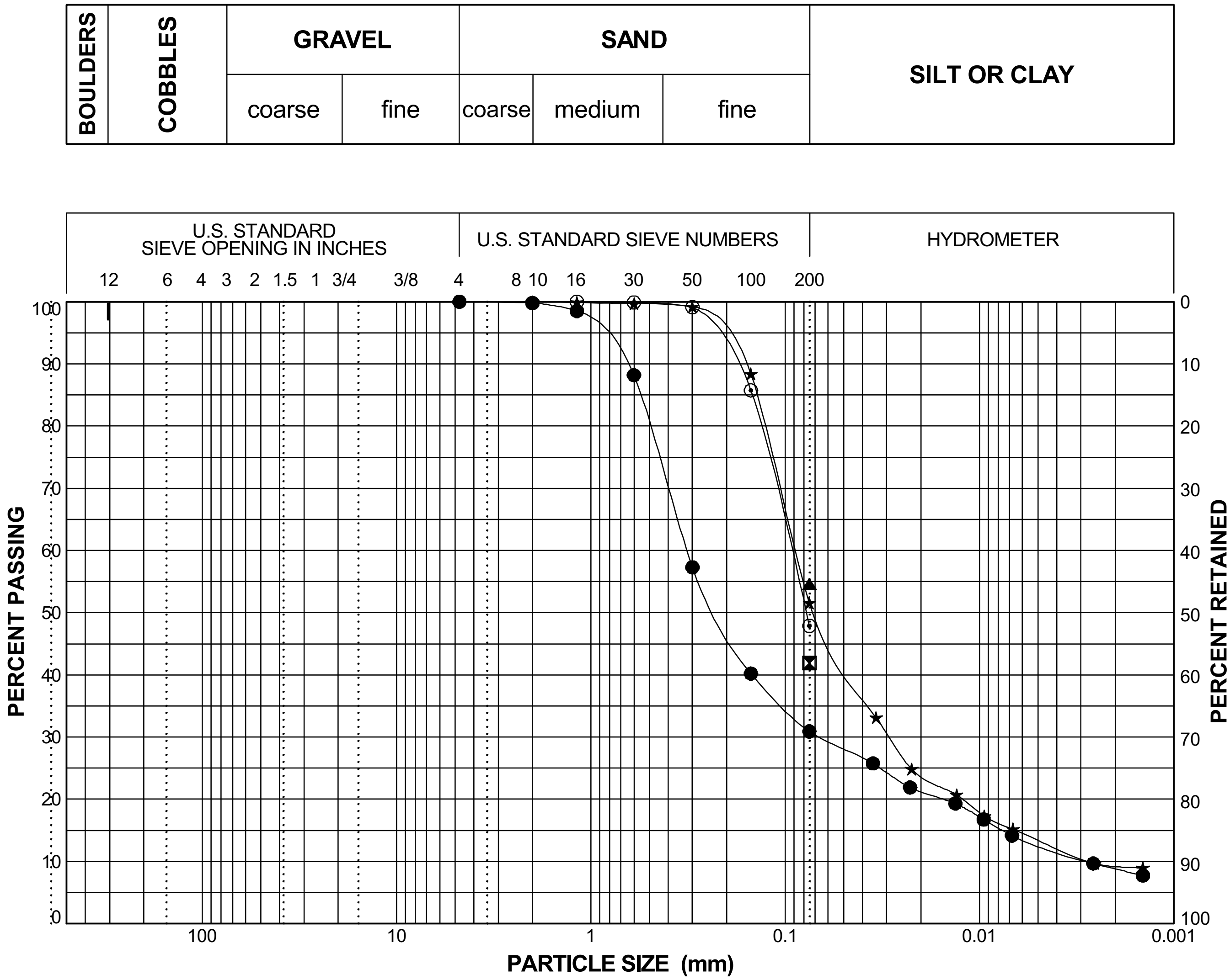


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_140B	12A	30	●	0.0	93.9	6.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_140B	15B	40	⊠	1.9	96.1	2.0	POORLY GRADED SAND (SP)
WR0017_140B	17A	45	▲	0.8	90.9	8.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_140B	18A	47	★	0.0	80.3	19.7	SILTY SAND (SM)
WR0017_140B	20B	53	⊙	0.0	58.8	41.2	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



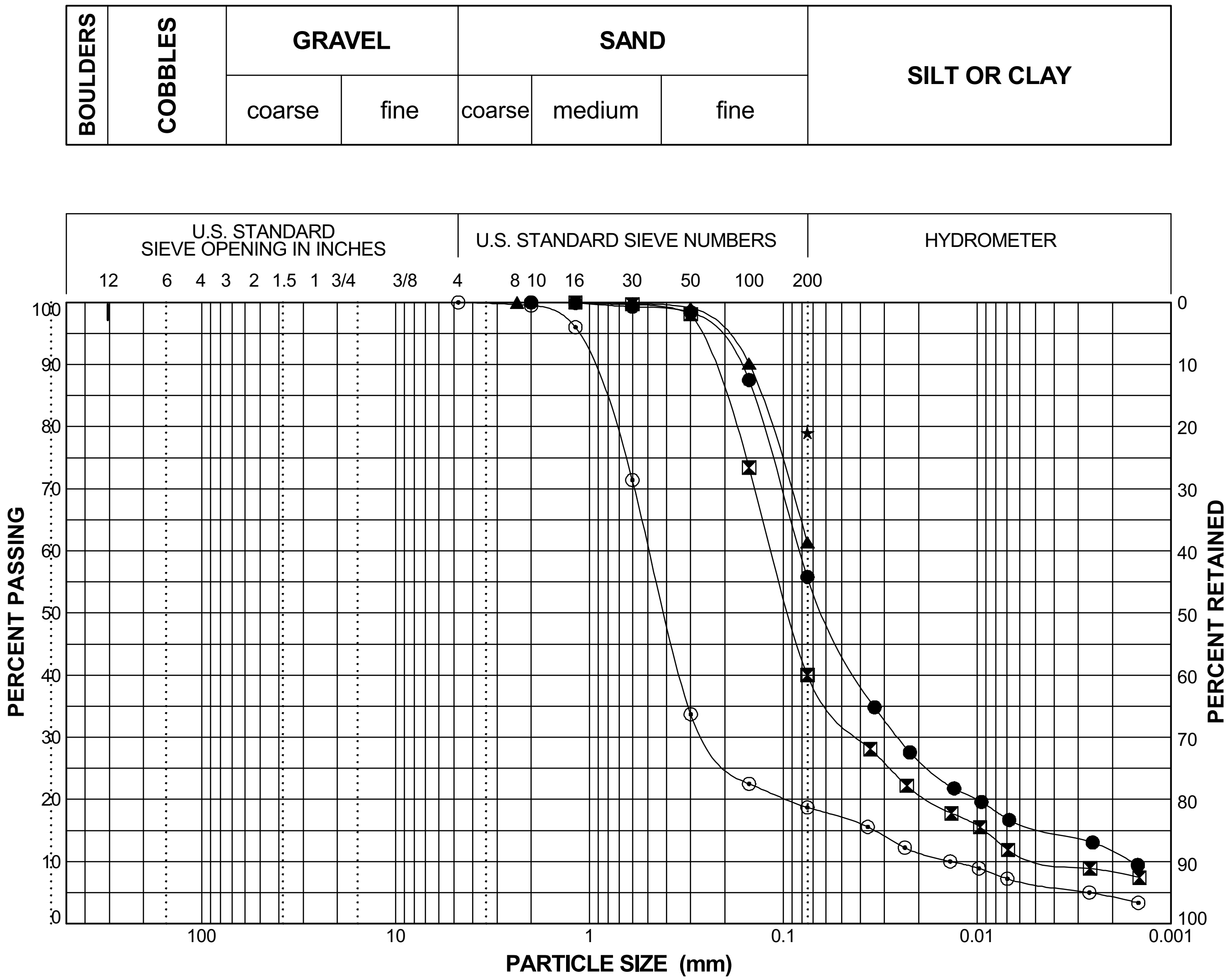
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_142B	1A	0.7	●	0.0	69.1	30.9	CLAYEY SAND (SC)
WR0017_142B	2A	1.5	⊠	0.0	0.0	41.9	CLAYEY SAND (SC)
WR0017_142B	3A	5.8	▲	0.0	0.0	54.6	SANDY LEAN CLAY (CL)
WR0017_142B	4A	6.5	★	0.0	48.4	51.6	SANDY SILT (ML)
WR0017_142B	5A	8.7	⊙	0.0	52.1	47.9	SILTY SAND (SM)

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

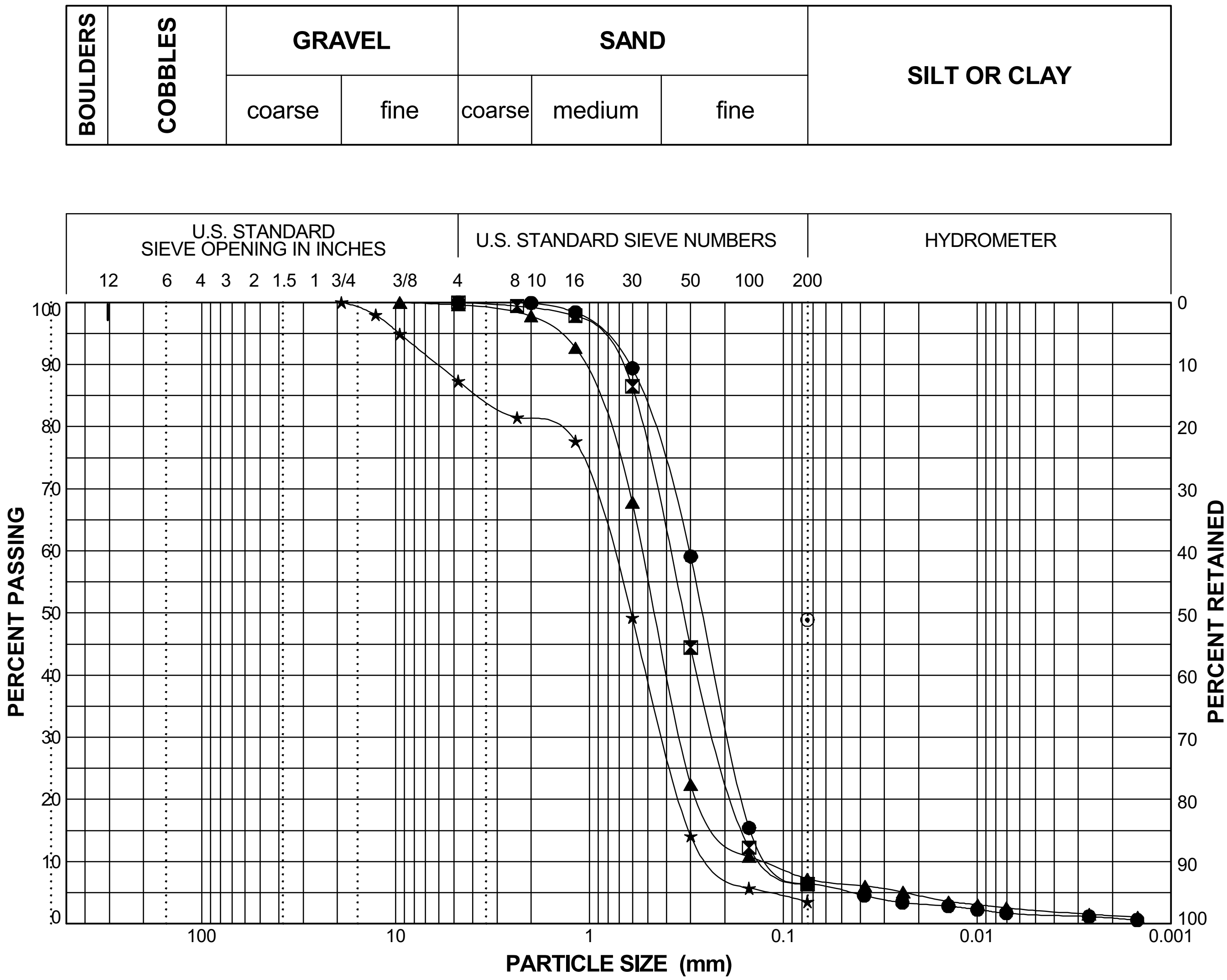


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_142B	6A	10	●	0.0	44.2	55.8	SANDY SILT (ML)
WR0017_142B	7A	15	⧗	0.0	60.0	40.0	SILTY SAND (SM)
WR0017_142B	9A	20	▲	0.0	38.6	61.4	SANDY LEAN CLAY (CL)
WR0017_142B	11A	25	★	0.0	0.0	79.0	LEAN CLAY with Sand (CL)
WR0017_142B	13A	30	⊙	0.0	81.3	18.7	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

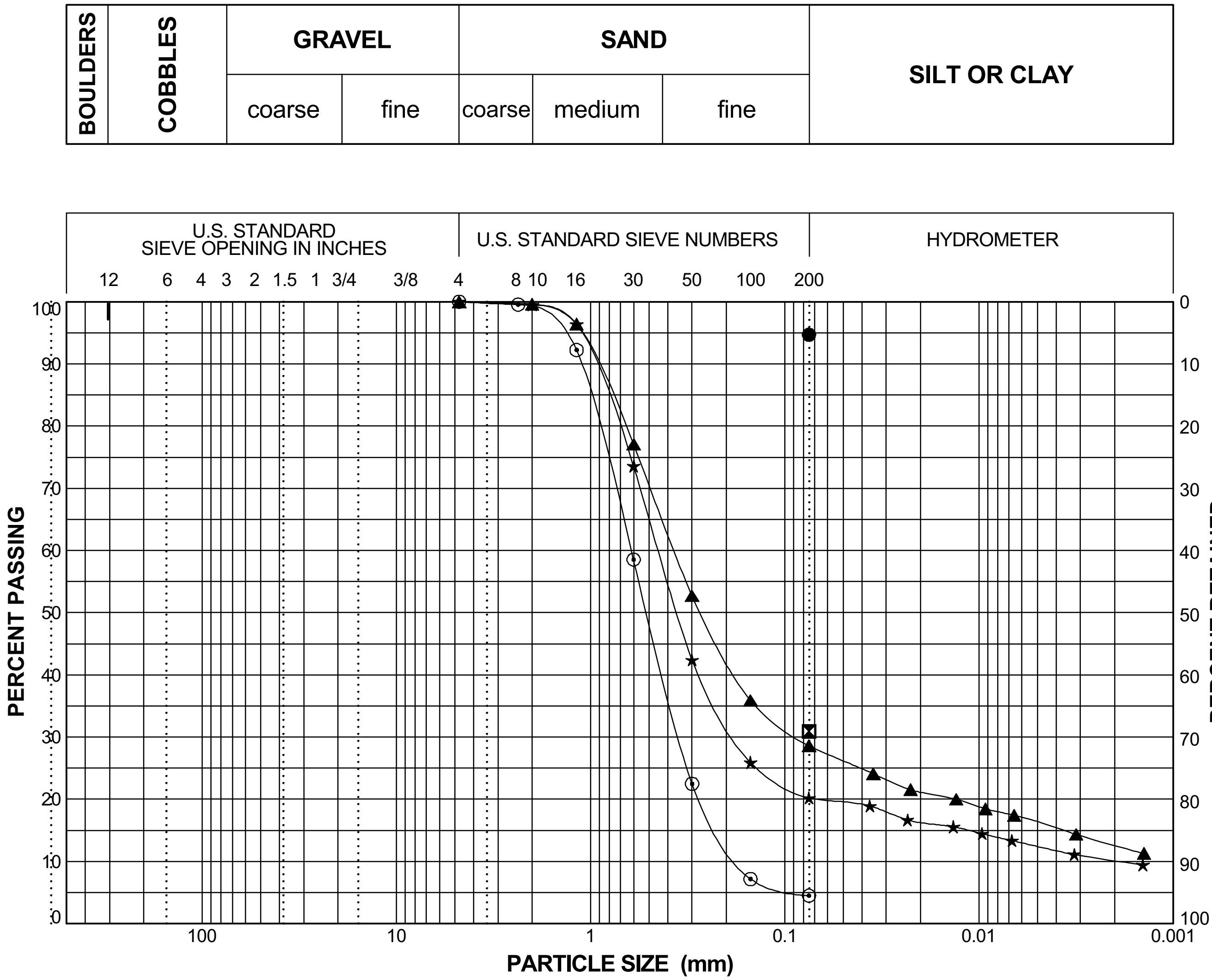


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_142B	15A	35	●	0.0	93.6	6.4	Poorly Graded SAND with Silt (SP-SM)
WR0017_142B	17A	40	⧗	0.0	93.6	6.4	Poorly Graded SAND with Silt (SP-SM)
WR0017_142B	18A	45.6	▲	0.4	92.4	7.2	Poorly Graded SAND with Silt (SP-SM)
WR0017_142B	20B	50.01	★	12.7	83.8	3.5	POORLY GRADED SAND (SP)
WR0017_142B	23A	56.51	⊙	0.0	0.0	48.9	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

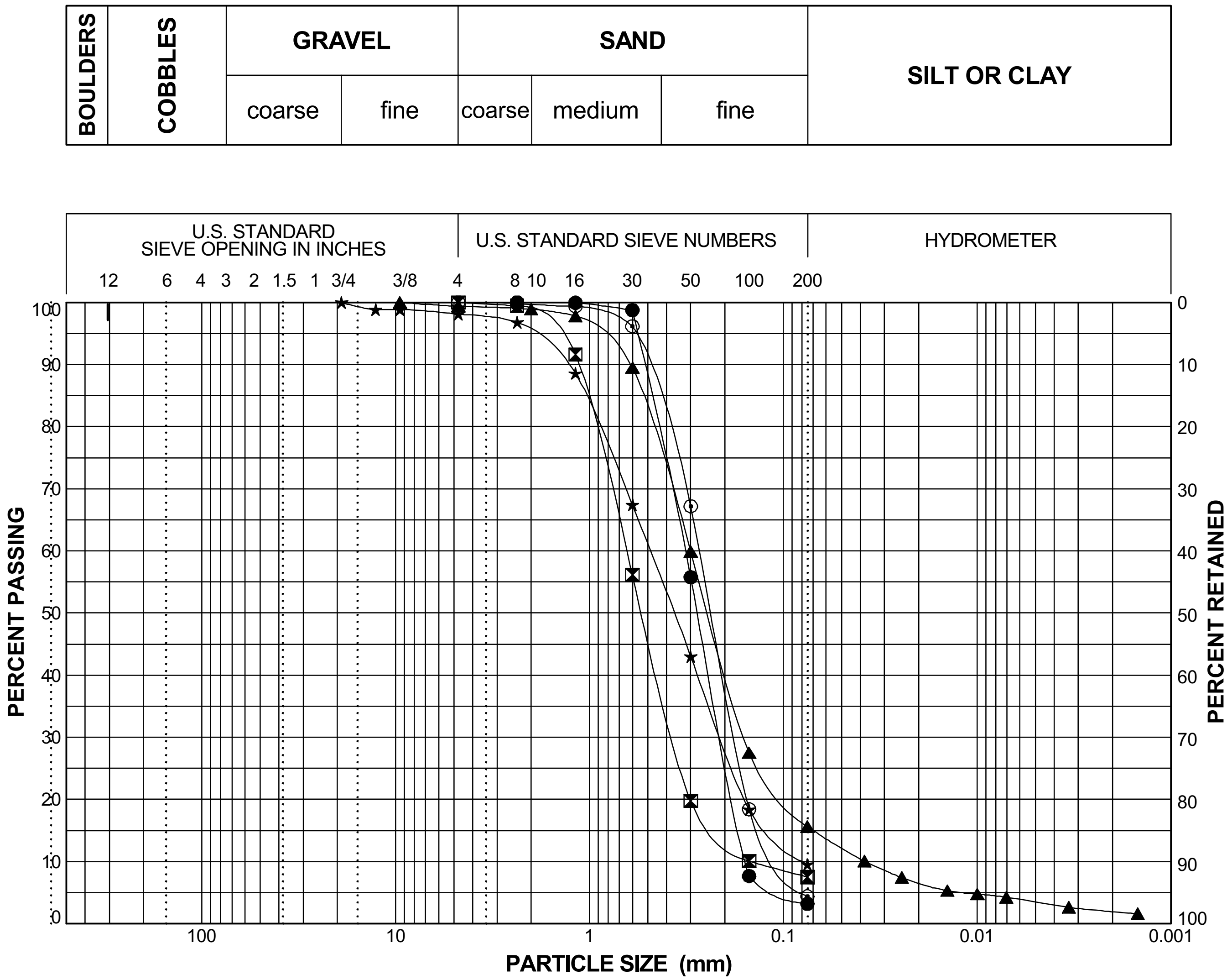


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_143B	3A	3	●	0.0	0.0	94.7	LEAN CLAY (CL)
WR0017_143B	5A	6.5	⊠	0.0	0.0	30.9	CLAYEY SAND (SC)
WR0017_143B	6A	8	▲	0.0	71.4	28.6	CLAYEY SAND (SC)
WR0017_143B	7A	10	★	0.0	79.8	20.2	SILTY SAND (SM)
WR0017_143B	9A	15	⊙	0.0	95.5	4.5	POORLY GRADED SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

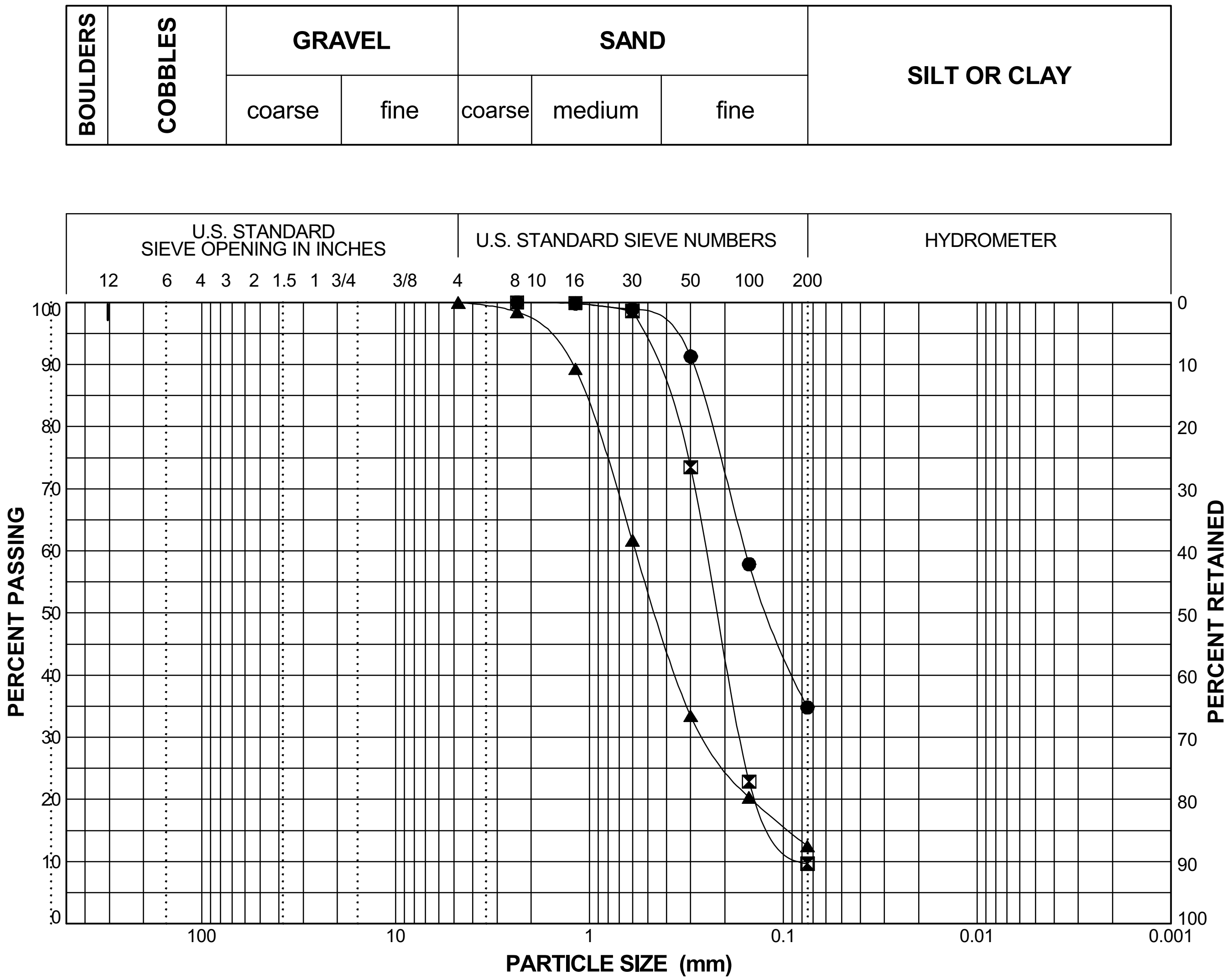


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_143B	10A	16.51	●	0.0	96.8	3.2	POORLY GRADED SAND (SP)
WR0017_143B	14A	26.51	⊠	0.0	92.5	7.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_143B	16A	31.51	▲	0.6	83.8	15.6	SILTY SAND (SM)
WR0017_143B	20A	41.51	★	1.9	88.6	9.5	Well-Graded SAND with Silt (SW-SM)
WR0017_143B	22B	46.6	⊙	0.0	95.6	4.4	POORLY GRADED SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

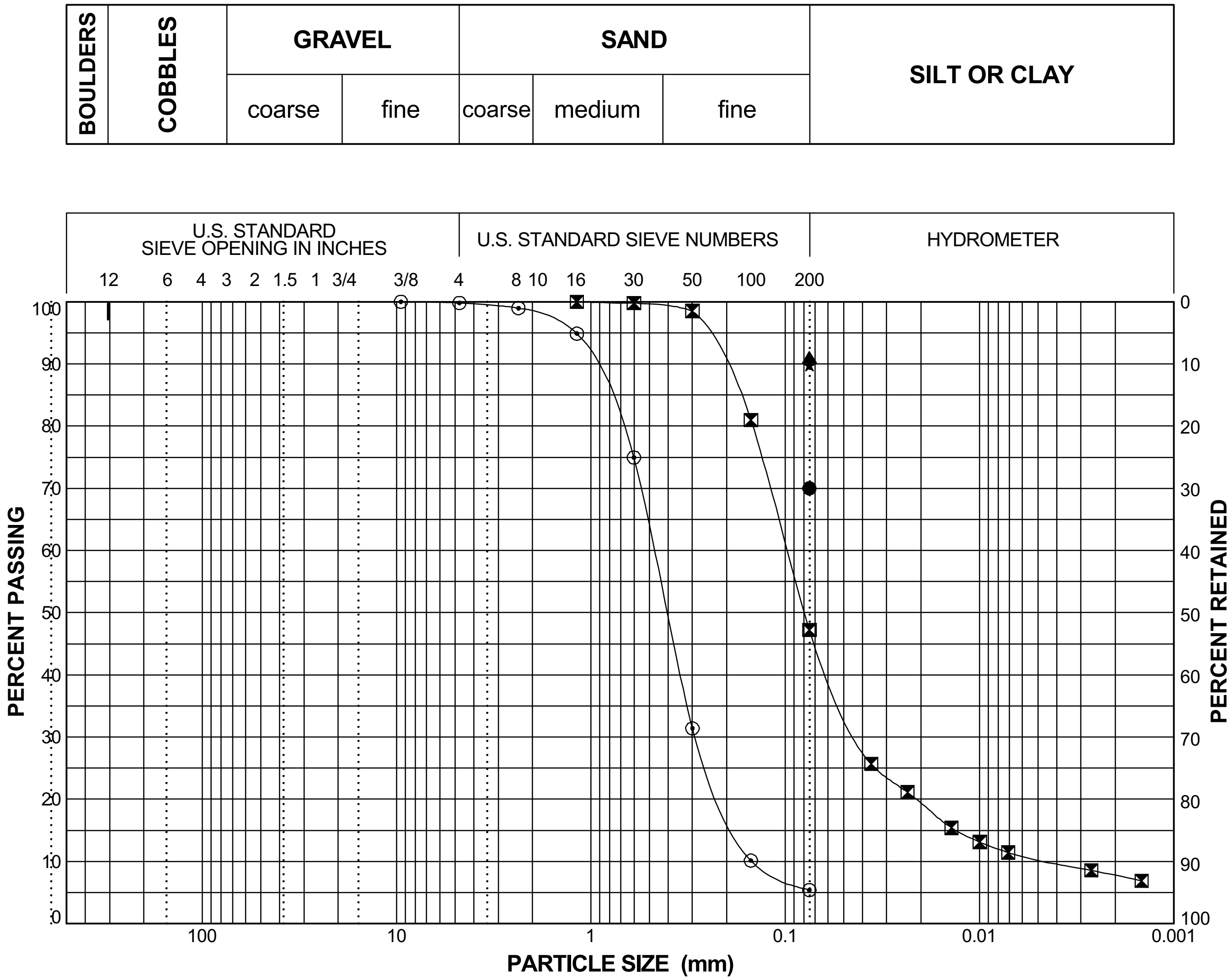


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_143B	22A	47.5	●	0.0	65.2	34.8	SILTY SAND (SM)
WR0017_143B	24A	52.5	⊠	0.0	90.3	9.7	Poorly Graded SAND with Silt (SP-SM)
WR0017_143B	27B	60	▲	0.0	87.5	12.5	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

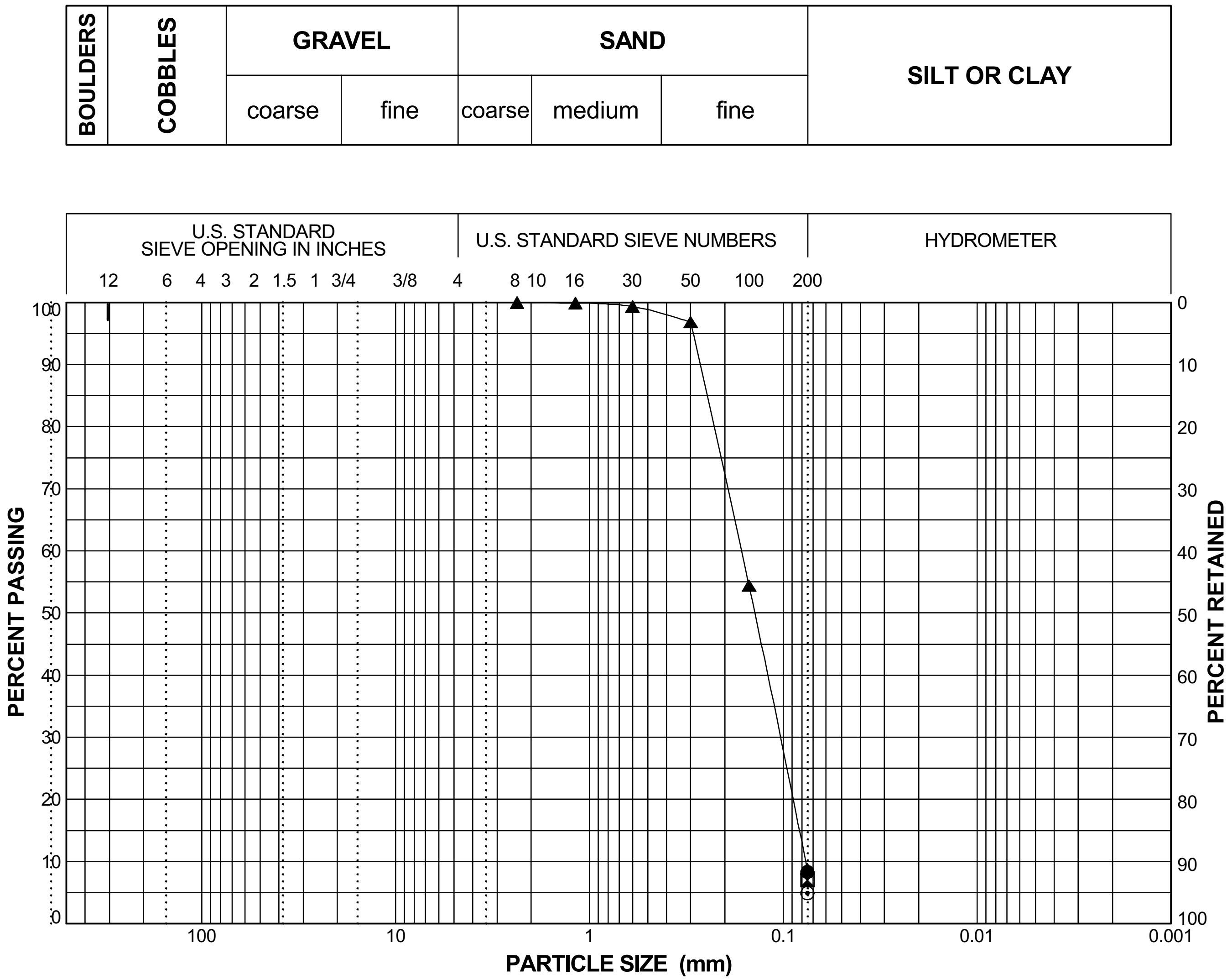


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_144B	2A	2	●	0.0	0.0	70.0	SANDY LEAN CLAY (CL)
WR0017_144B	7A	13	⊠	0.0	52.8	47.2	SILTY SAND (SM)
WR0017_144B	10A	25	▲	0.0	0.0	91.1	LEAN CLAY (CL)
WR0017_144B	13A	32	★	0.0	0.0	89.8	LEAN CLAY (CL)
WR0017_144B	14A	35.8	⊙	0.2	94.4	5.4	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

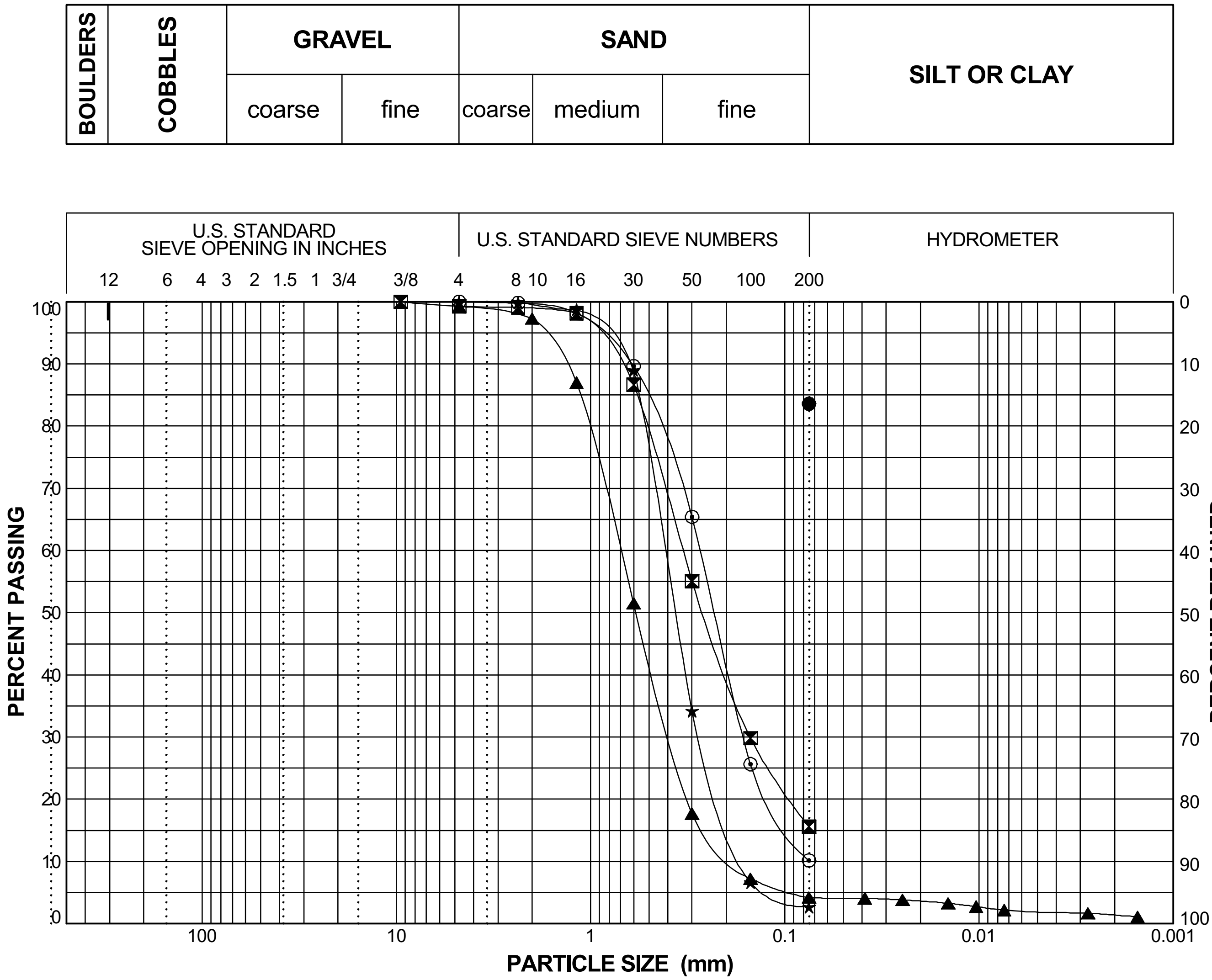


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_144B	16A	42	●	0.0	0.0	8.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_144B	17A	45	⧗	0.0	0.0	7.0	Poorly Graded SAND with Silt (SP-SM)
WR0017_144B	19A	54	▲	0.0	91.2	8.8	Poorly Graded SAND with Silt (SP-SM)
WR0017_144B	20A	56	★	0.0	0.0	8.4	Poorly Graded SAND with Silt (SP-SM)
WR0017_144B	21A	59	⊙	0.0	0.0	4.9	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



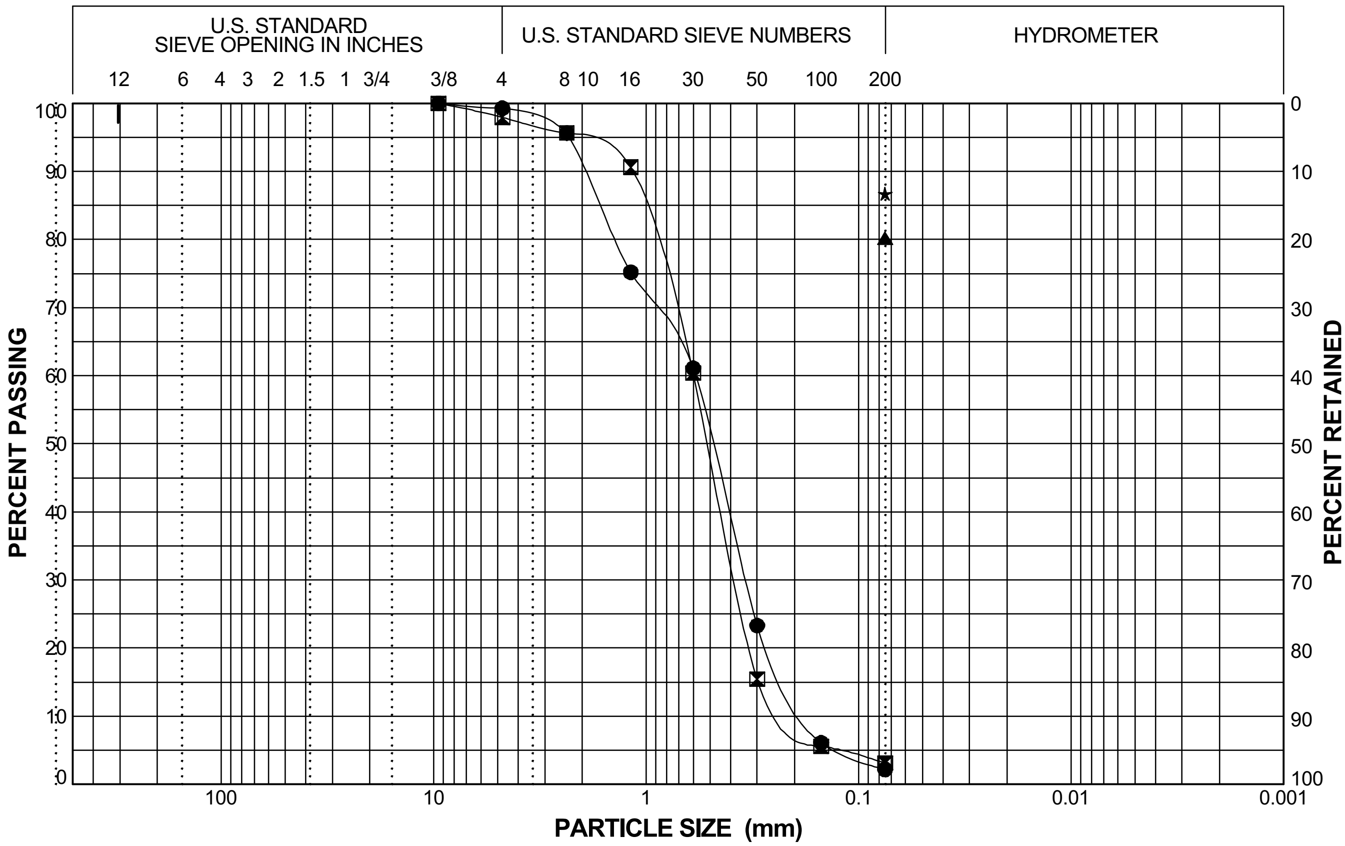
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_145B	3A	5	●	0.0	0.0	83.6	SILTY CLAY with SAND (CL-ML)
WR0017_145B	5A	8	⧗	0.7	83.7	15.6	SILTY SAND (SM)
WR0017_145B	9A	15	▲	0.0	95.0	4.2	POORLY GRADED SAND (SP)
WR0017_145B	11A	22	★	0.0	97.4	2.6	POORLY GRADED SAND (SP)
WR0017_145B	15A	32	⊙	0.0	89.8	10.2	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



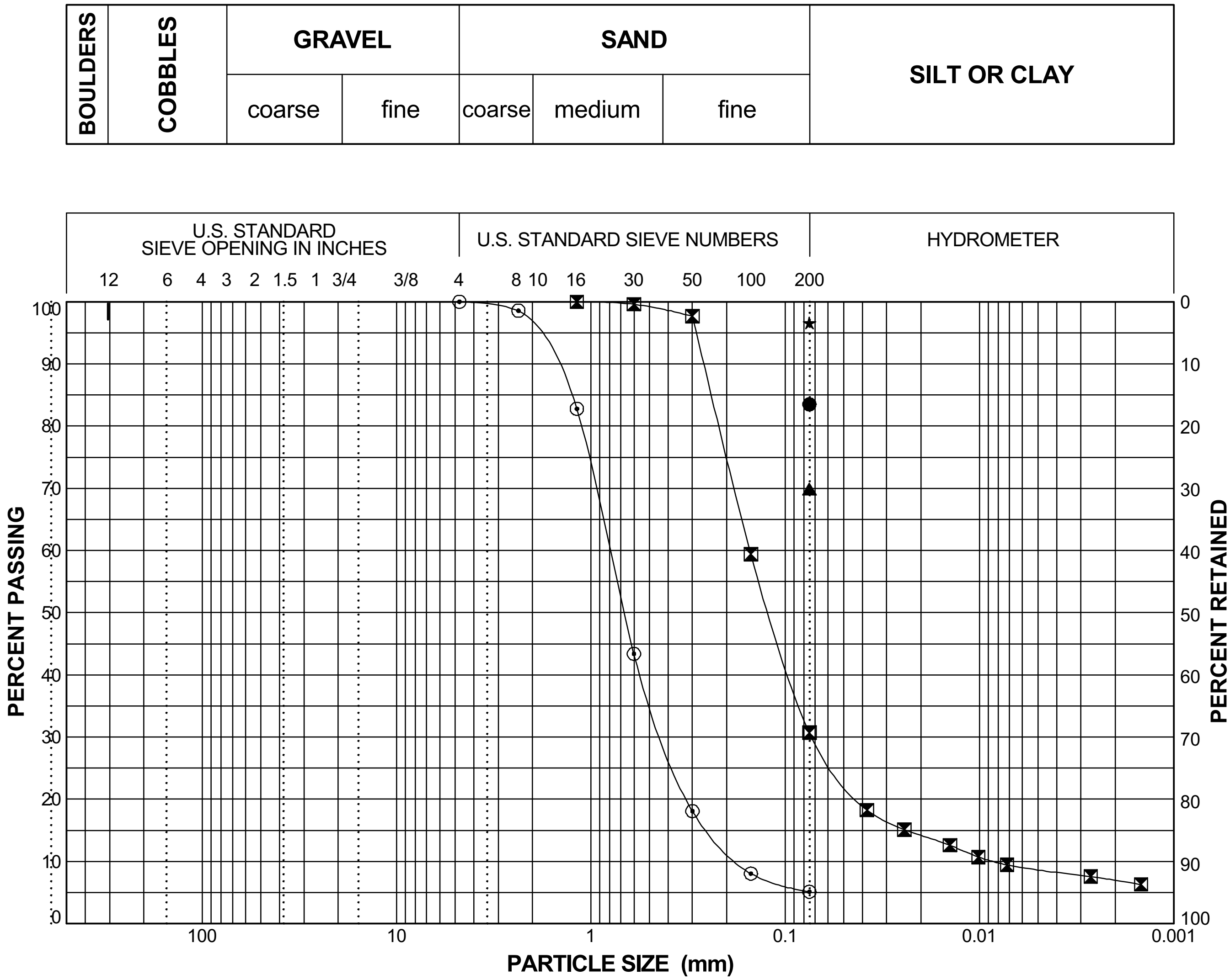
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_145B	16A	35	●	0.7	97.1	2.2	POORLY GRADED SAND (SP)
WR0017_145B	19A	45	⧗	2.1	94.9	3.1	POORLY GRADED SAND (SP)
WR0017_145B	24B	57	▲	0.0	0.0	80.2	LEAN CLAY with SAND (CL)
WR0017_145B	24A	59	★	0.0	0.0	86.7	LEAN CLAY (CL)

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

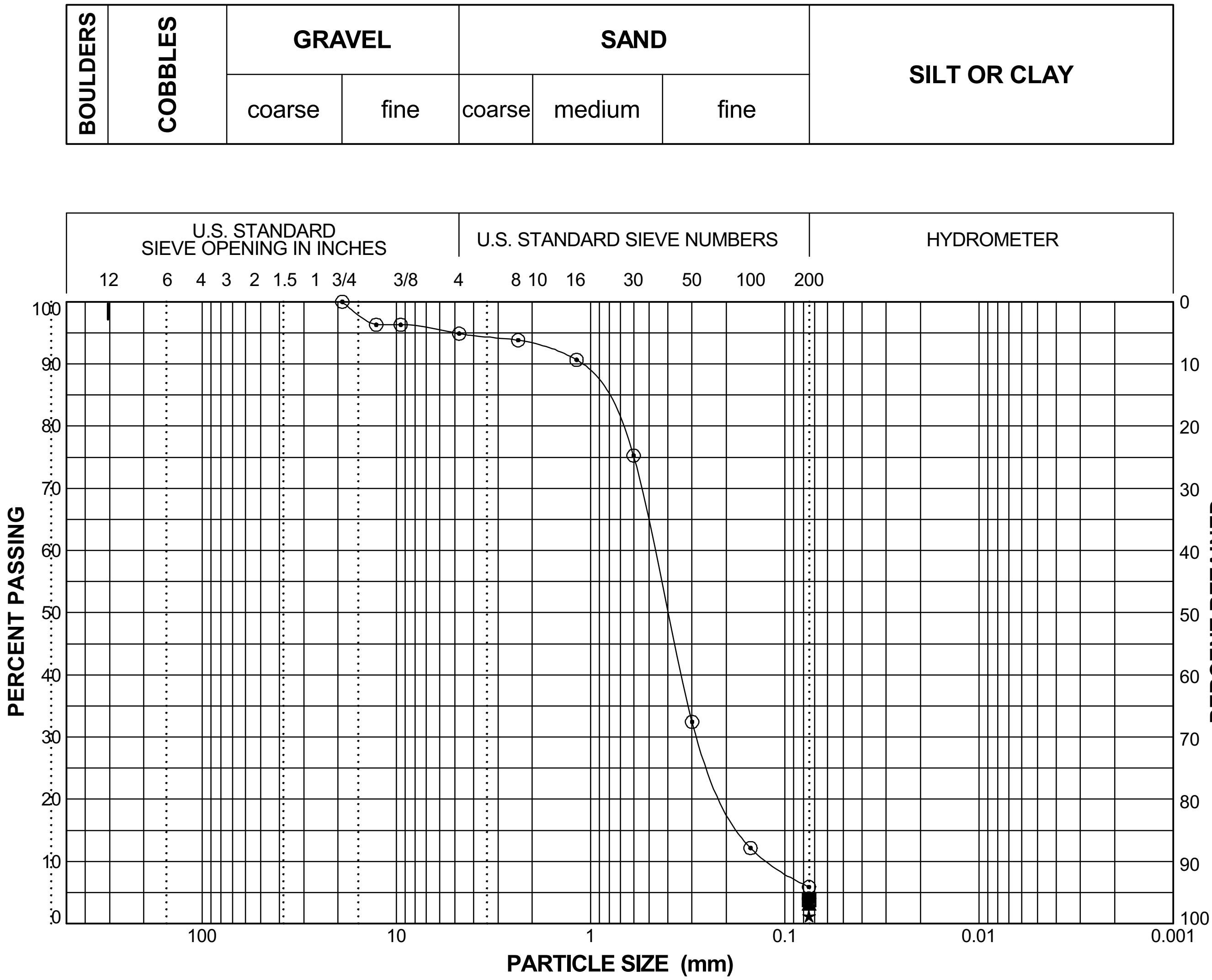


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_146B	1A	3.5	●	0.0	0.0	83.5	LEAN CLAY with SAND (CL)
WR0017_146B	2A	5	⧗	0.0	69.3	30.7	SILTY SAND (SM)
WR0017_146B	3A	6	▲	0.0	0.0	69.9	SANDY SILT (ML)
WR0017_146B	4A	9	★	0.0	0.0	96.6	LEAN CLAY (CL)
WR0017_146B	7A	15	⊙	0.0	94.9	5.1	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

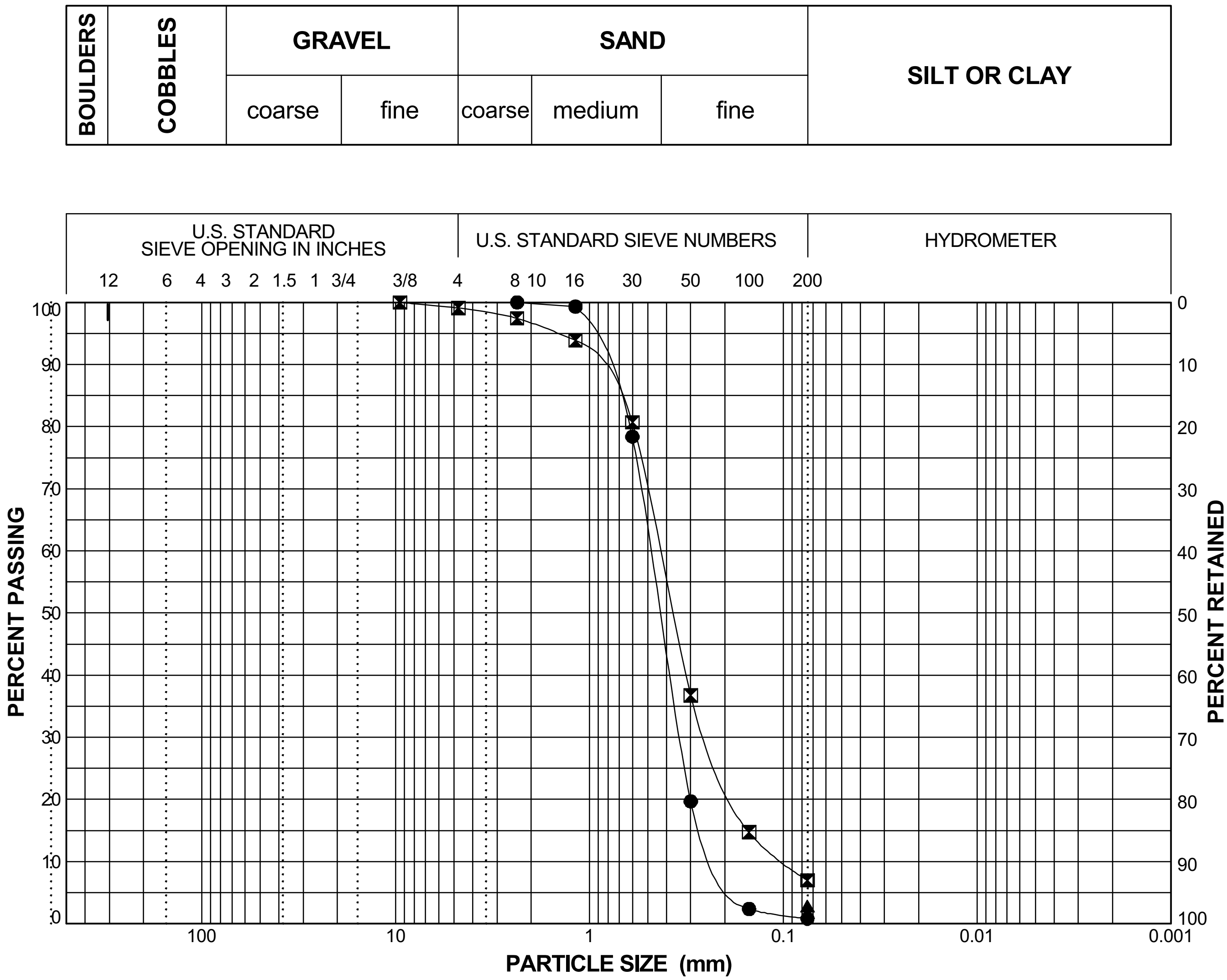


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_146B	9A	20	●	0.0	0.0	4.0	Poorly Graded SAND (SP)
WR0017_146B	10A	25	⊠	0.0	0.0	3.8	Poorly Graded SAND (SP)
WR0017_146B	13A	35	▲	0.0	0.0	3.1	Poorly Graded SAND (SP)
WR0017_146B	15B	40.1	★	0.0	0.0	1.2	Poorly Graded SAND (SP)
WR0017_146B	15A	40.7	⊙	5.1	89.0	5.9	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

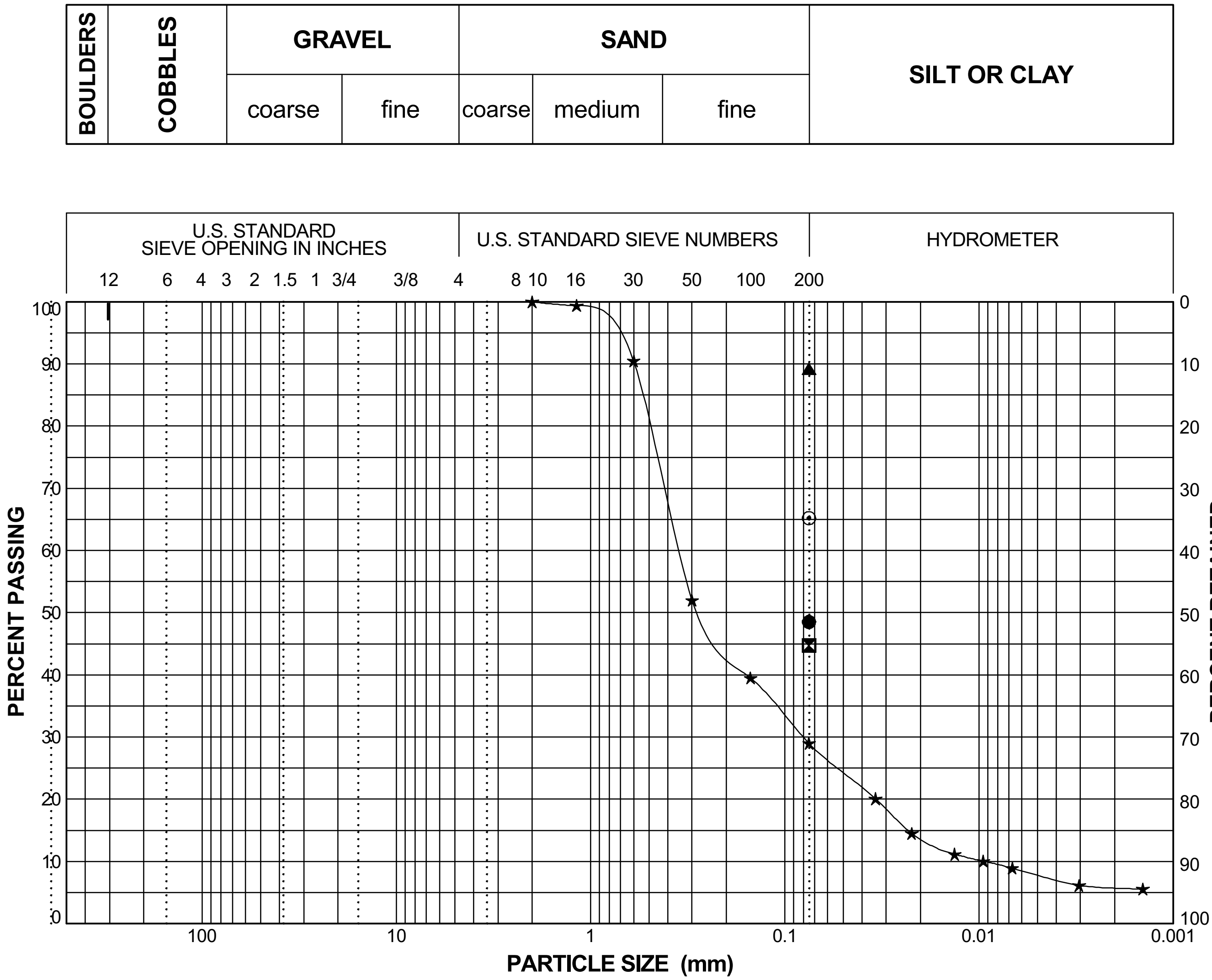


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_146B	16A	45	●	0.0	99.2	0.8	POORLY GRADED SAND (SP)
WR0017_146B	18A	52	⧗	0.9	92.1	7.0	Poorly Graded SAND with Silt (SP-SM)
WR0017_146B	19A	55	▲	0.0	0.0	2.8	Poorly Graded SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



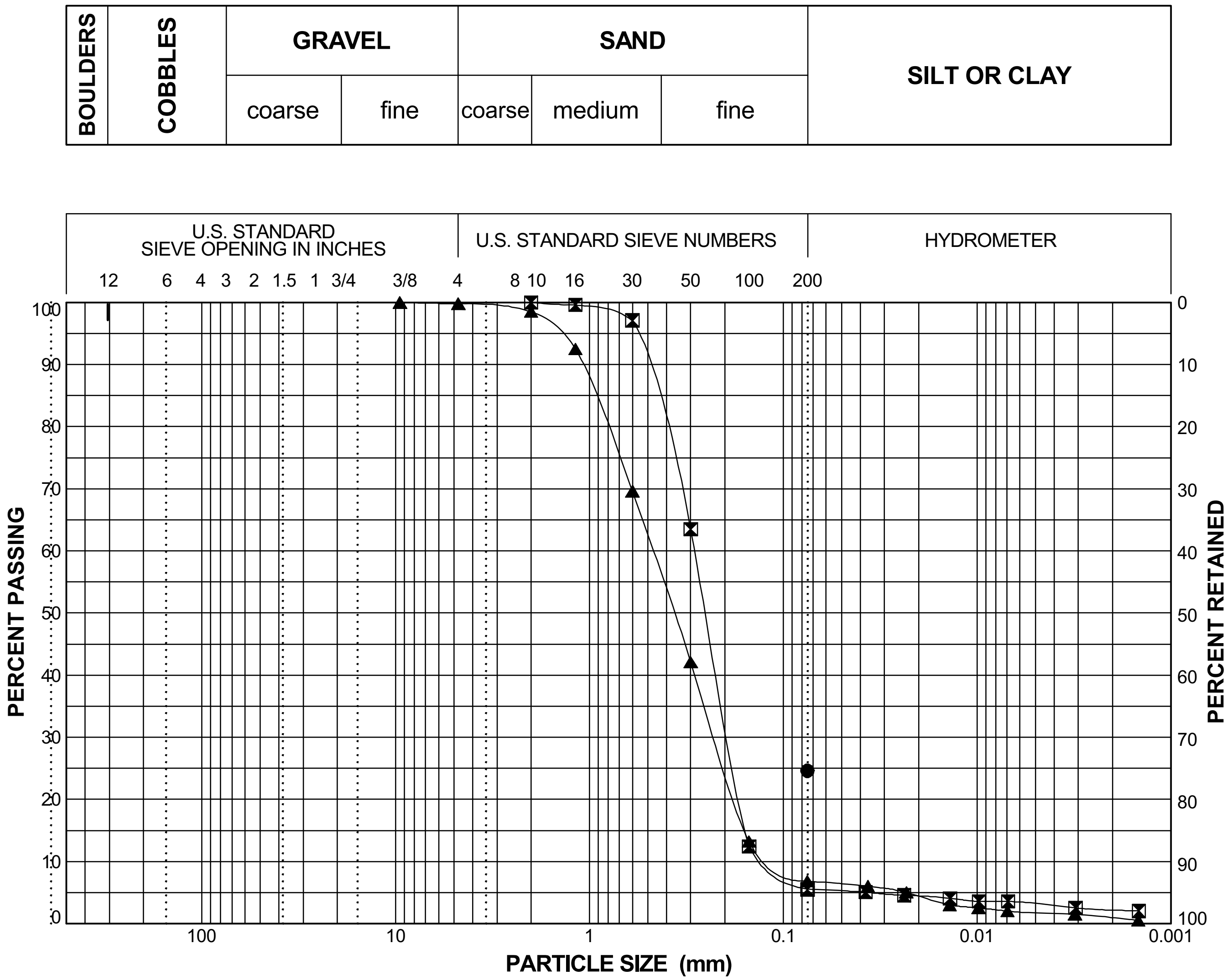
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_160B	4A	5	●	0.0	0.0	48.5	CLAYEY SAND (SC)
WR0017_160B	5A	7	⧗	0.0	0.0	44.7	SILTY SAND (SM)
WR0017_160B	10A	17	▲	0.0	0.0	89.2	LEAN CLAY (CL)
WR0017_160B	12A	20	★	0.0	71.0	29.0	SILTY SAND (SM)
WR0017_160B	16A	30	⊙	0.0	0.0	65.2	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

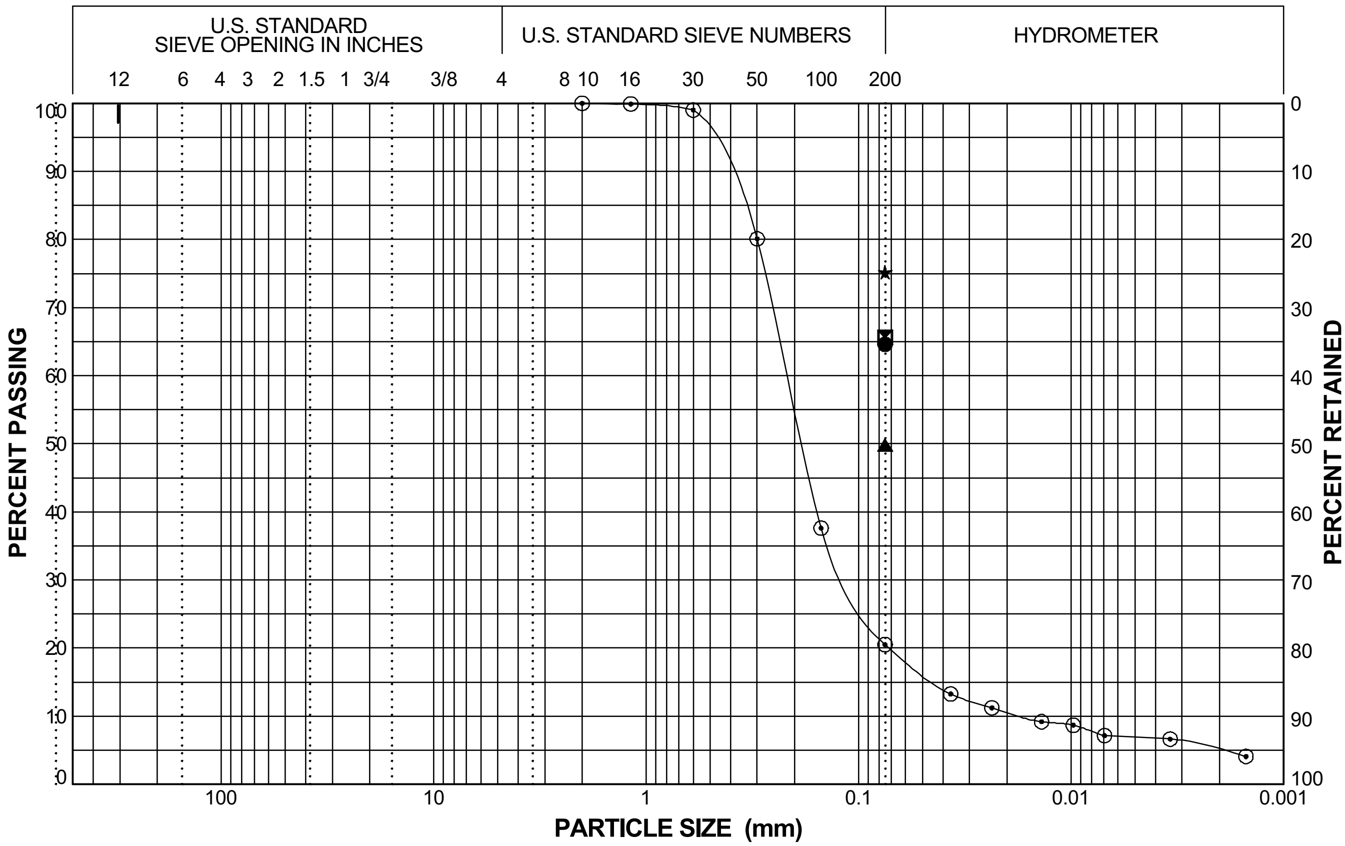
PARTICLE SIZE DISTRIBUTION CURVES

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_160B	20A	36.51	●	0.0	0.0	24.6	SILTY SAND (SM)
WR0017_160B	22A	42.5	⧗	0.0	94.5	5.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_160B	25A	50	▲	0.2	93.0	6.8	Poorly Graded SAND with Silt (SP-SM)

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

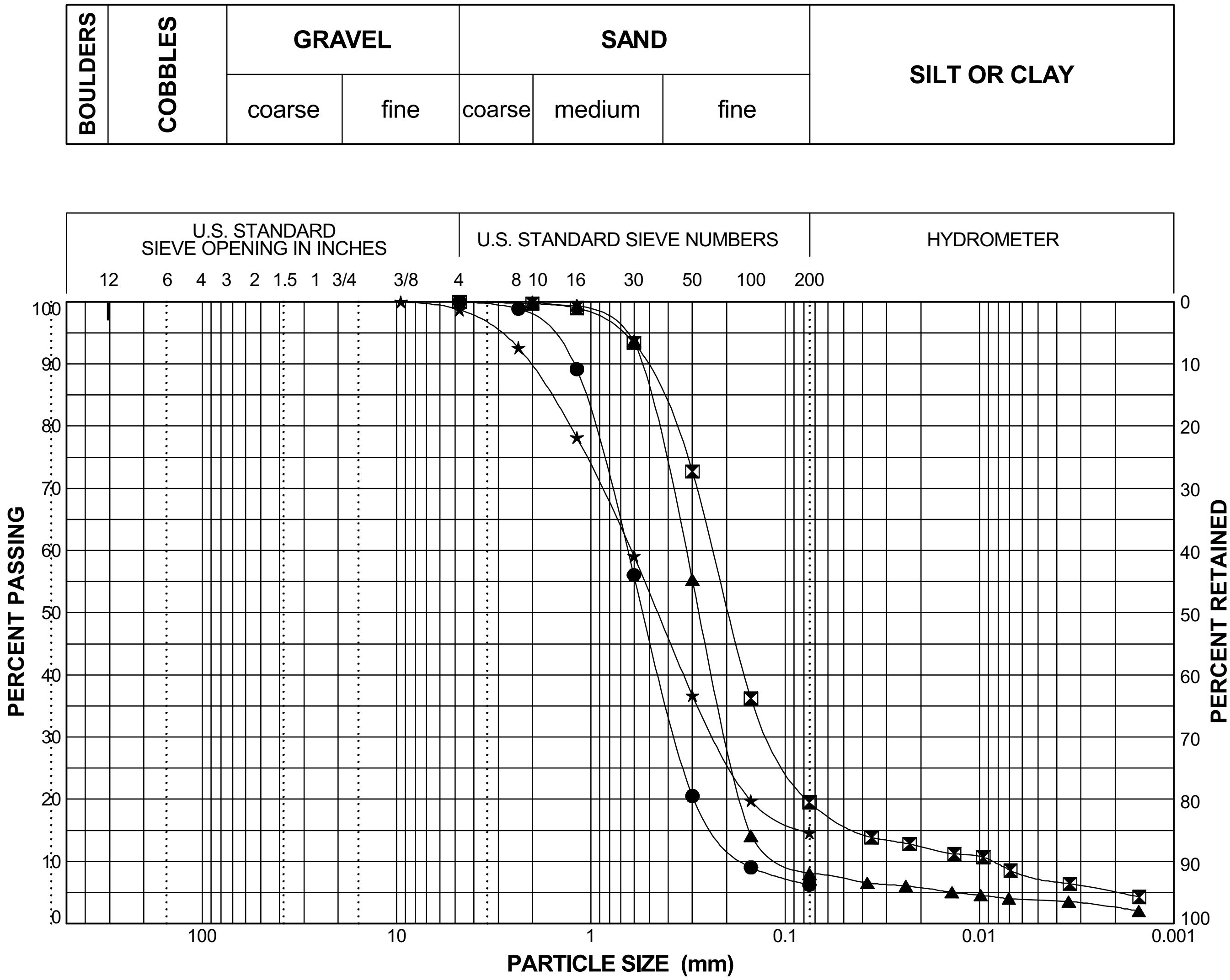


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_162B	1A	0	●	0.0	0.0	64.6	SANDY LEAN CLAY (CL)
WR0017_162B	3A	2	⊠	0.0	0.0	65.6	SANDY SILTY CLAY (CL-ML)
WR0017_162B	6A	6.5	▲	0.0	0.0	49.8	SILTY, CLAYEY SAND (SC-SM)
WR0017_162B	11A	17.01	★	0.0	0.0	75.2	LEAN CLAY with SAND (CL)
WR0017_162B	12A	19	⊙	0.0	79.5	20.5	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

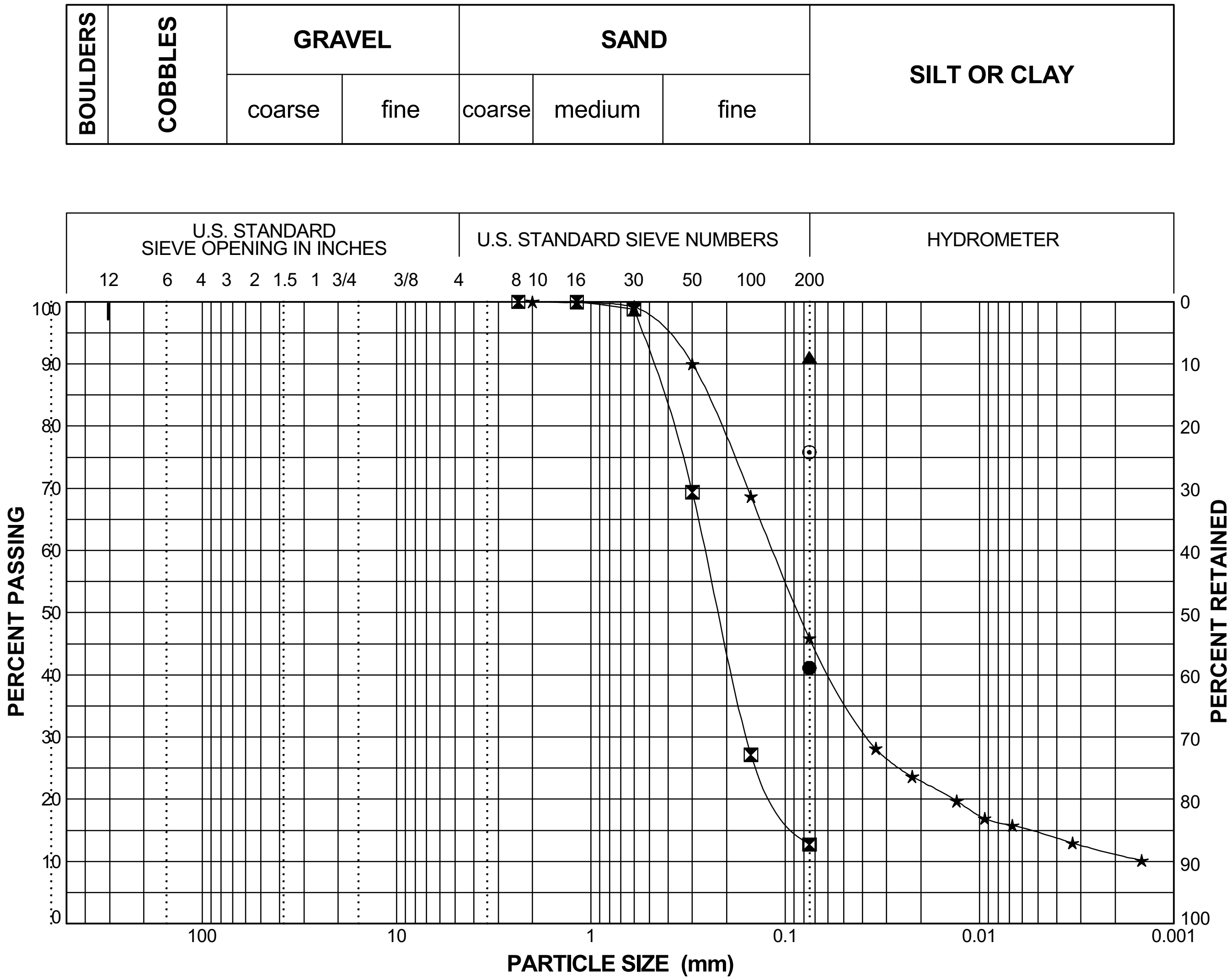


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_162B	16A	27	●	0.0	93.8	6.2	Poorly Graded SAND with Silt (SP-SM)
WR0017_162B	19A	33.51	⊠	0.0	80.5	19.5	SILTY SAND (SM)
WR0017_162B	20A	37	▲	0.0	92.0	8.0	Poorly Graded SAND with Silt (SP-SM)
WR0017_162B	27A	52	★	1.3	84.2	14.6	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

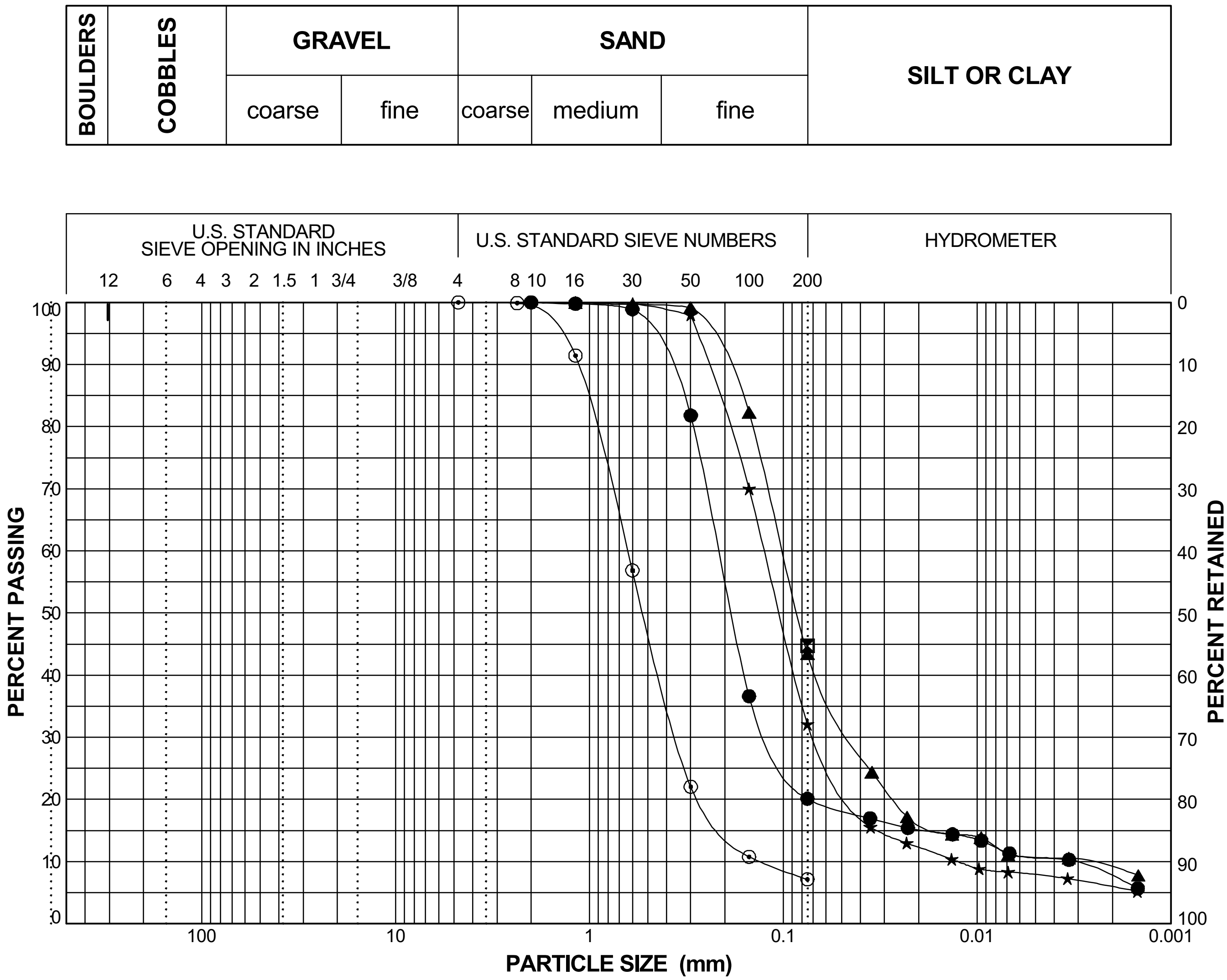


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_163B	2B	1	●	0.0	0.0	41.1	SILTY, CLAYEY SAND (SC-SM)
WR0017_163B	3A	2	⊠	0.0	87.3	12.7	SILTY SAND (SM)
WR0017_163B	4A	5	▲	0.0	0.0	91.1	LEAN CLAY (CL)
WR0017_163B	6A	10.5	★	0.0	54.1	45.9	SILTY, CLAYEY SAND (SC-SM)
WR0017_163B	9A	17.01	⊙	0.0	0.0	75.8	LEAN CLAY with SAND (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

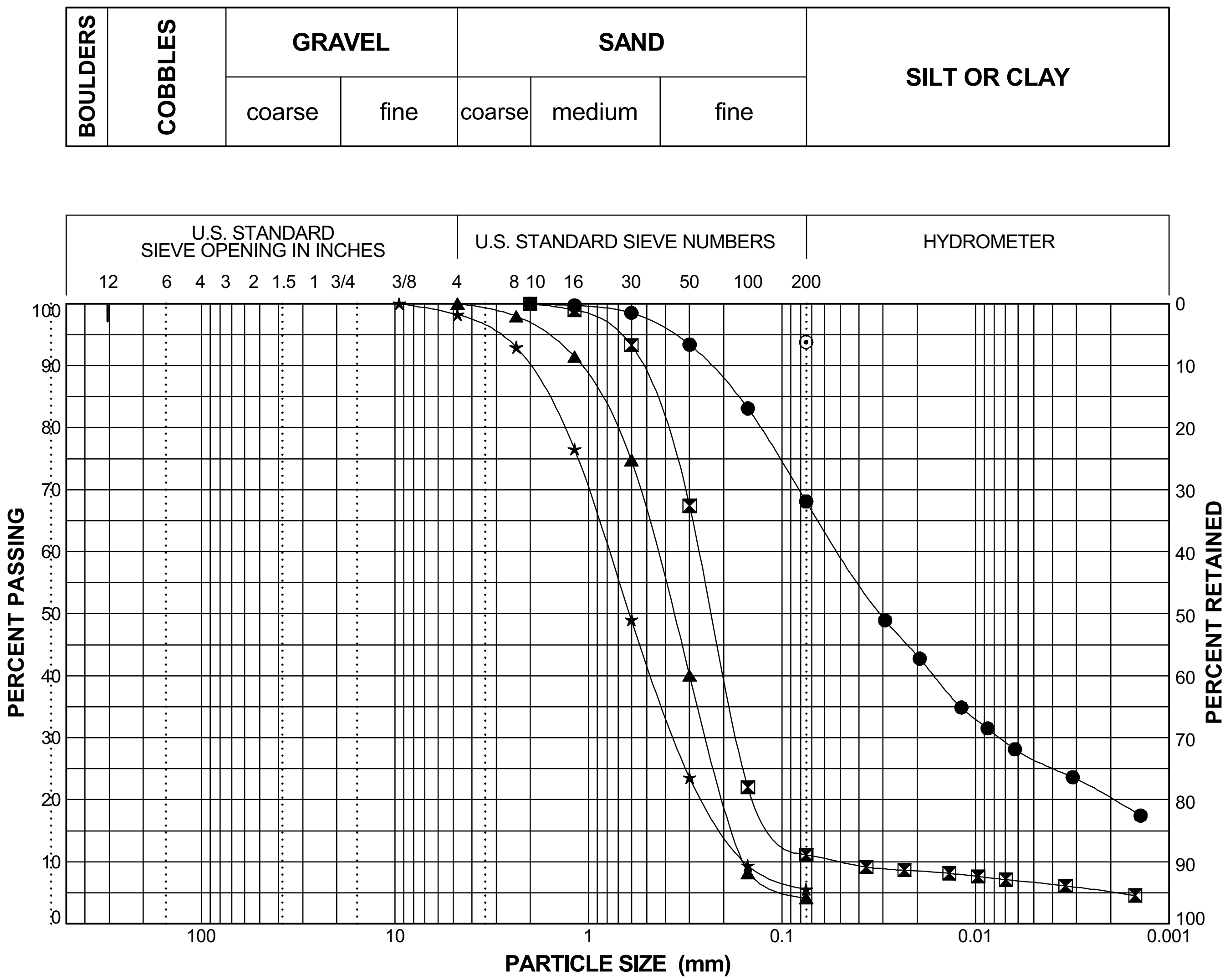


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_163B	10A	19	●	0.0	79.9	20.1	SILTY SAND (SM)
WR0017_163B	13A	23.8	⧗	0.0	0.0	44.7	CLAYEY SAND (SC)
WR0017_163B	17A	32	▲	0.0	56.6	43.4	SILTY, CLAYEY SAND (SC-SM)
WR0017_163B	19A	37	★	0.0	67.9	32.1	SILTY SAND (SM)
WR0017_163B	21A	42.6	⊙	0.0	92.9	7.1	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

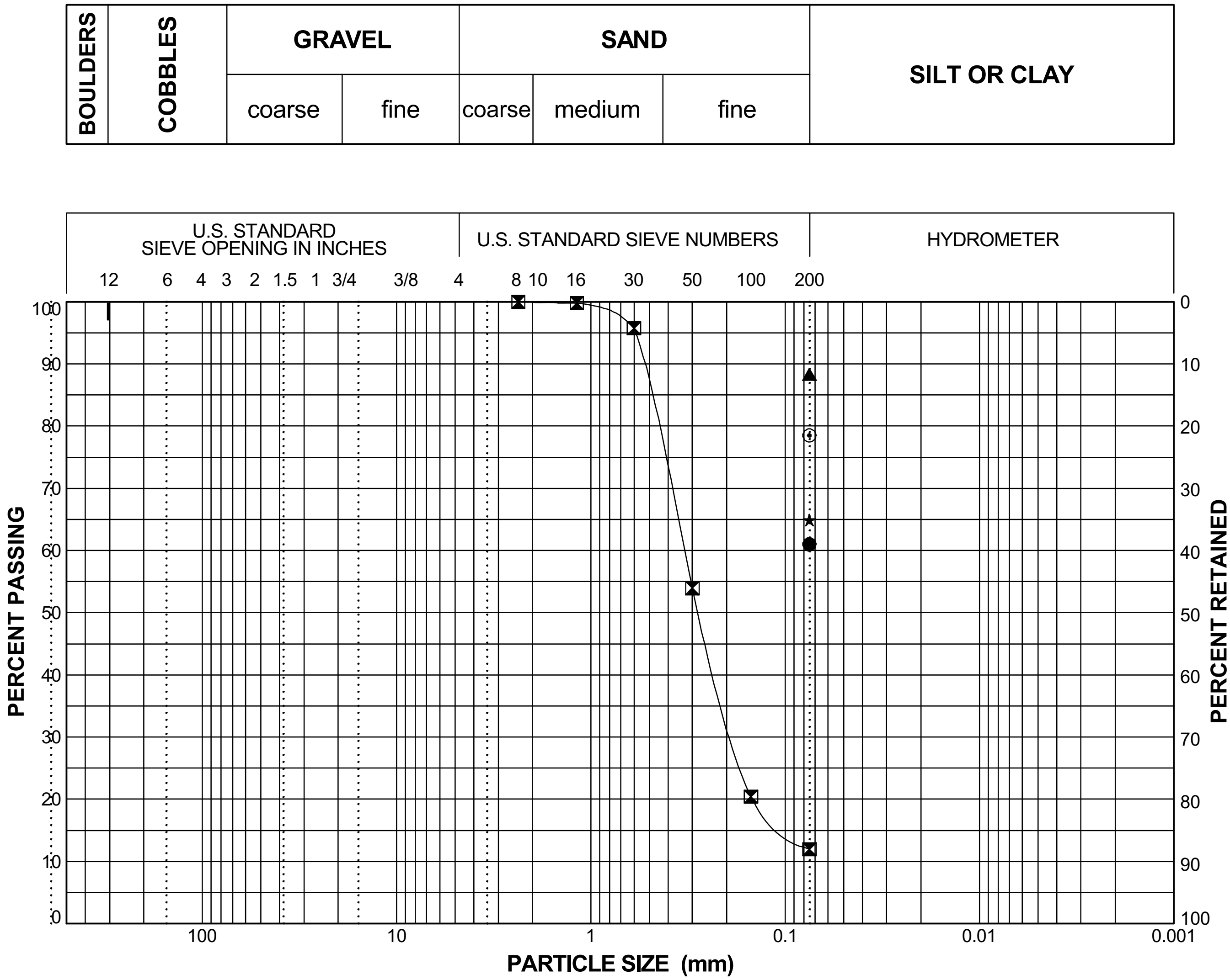


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_163B	22B	44.5	●	0.0	31.9	68.1	SANDY SILT (ML)
WR0017_163B	22A	45.5	⊠	0.0	88.9	11.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_163B	24A	49.5	▲	0.0	95.8	4.2	POORLY GRADED SAND (SP)
WR0017_163B	25A	52	★	1.8	92.7	5.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_163B	26A	53.51	⊙	0.0	0.0	93.8	FAT CLAY (CH)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

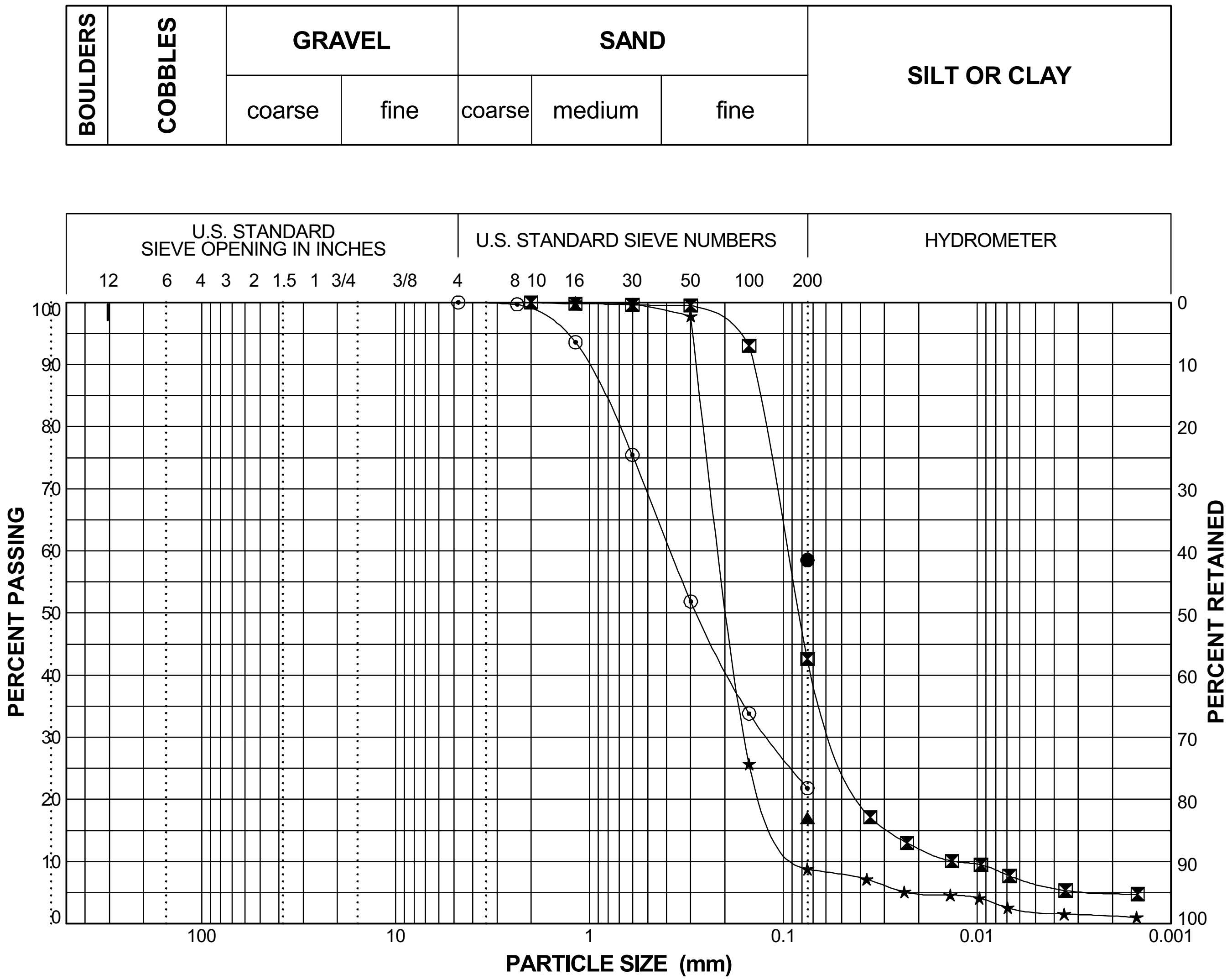


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_164B	2B	1	●	0.0	0.0	61.0	SANDY LEAN CLAY (CL)
WR0017_164B	3A	2	⧗	0.0	88.1	11.9	Poorly Graded SAND with Silt (SP-SM)
WR0017_164B	8A	12	▲	0.0	0.0	88.3	SILT (ML)
WR0017_164B	9A	14	★	0.0	0.0	64.9	SANDY SILTY CLAY (CL-ML)
WR0017_164B	11A	17	⊙	0.0	0.0	78.5	LEAN CLAY with SAND (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



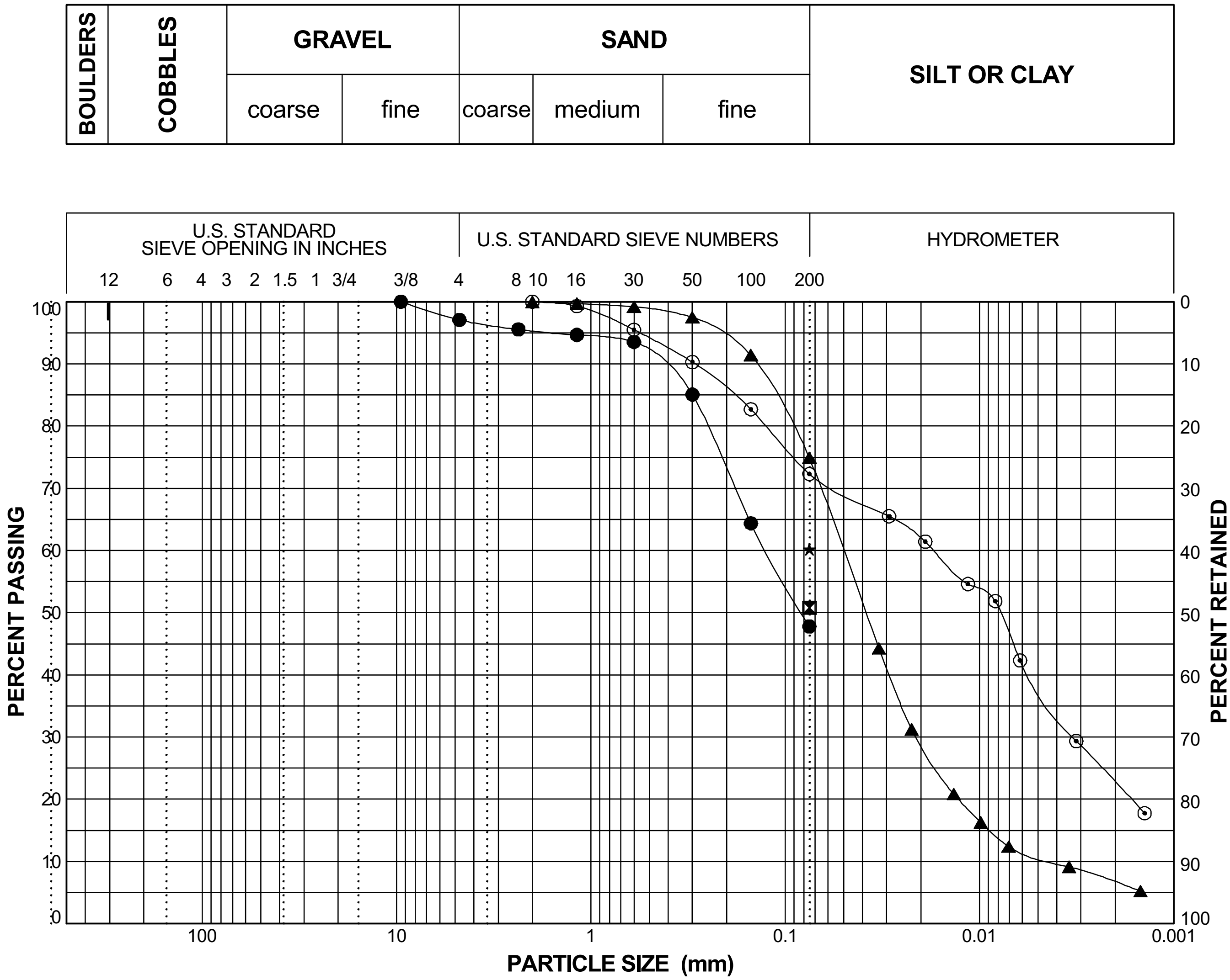
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_164B	14A	24	●	0.0	0.0	58.5	SANDY LEAN CLAY (CL)
WR0017_164B	17A	32	⧗	0.0	57.4	42.6	SILTY SAND (SM)
WR0017_164B	18A	34	▲	0.0	0.0	17.0	SILTY SAND (SM)
WR0017_164B	19A	37	★	0.0	91.2	8.8	Poorly Graded SAND with Silt (SP-SM)
WR0017_164B	20A	42	⊙	0.0	78.2	21.8	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10



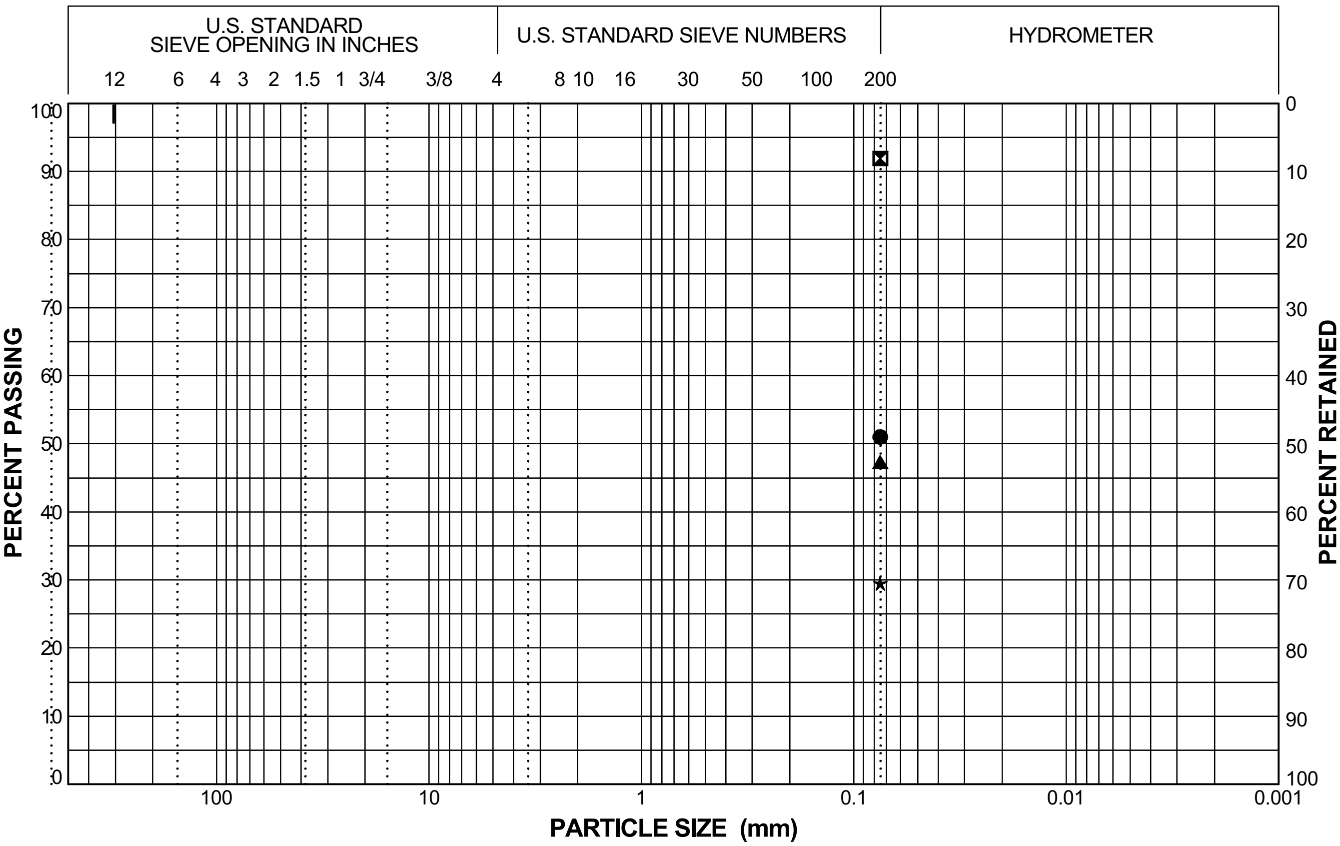
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_165B	1B	1.3	●	2.9	49.3	47.8	CLAYEY SAND (SC)
WR0017_165B	4A	6.5	⊠	0.0	0.0	50.8	SANDY LEAN CLAY (CL)
WR0017_165B	6A	10	▲	0.0	25.1	74.9	SILTY CLAY with SAND (CL-ML)
WR0017_165B	7A	13	★	0.0	0.0	60.2	SANDY LEAN CLAY (CL)
WR0017_165B	9A	18	⊙	0.0	27.7	72.3	LEAN CLAY with SAND (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

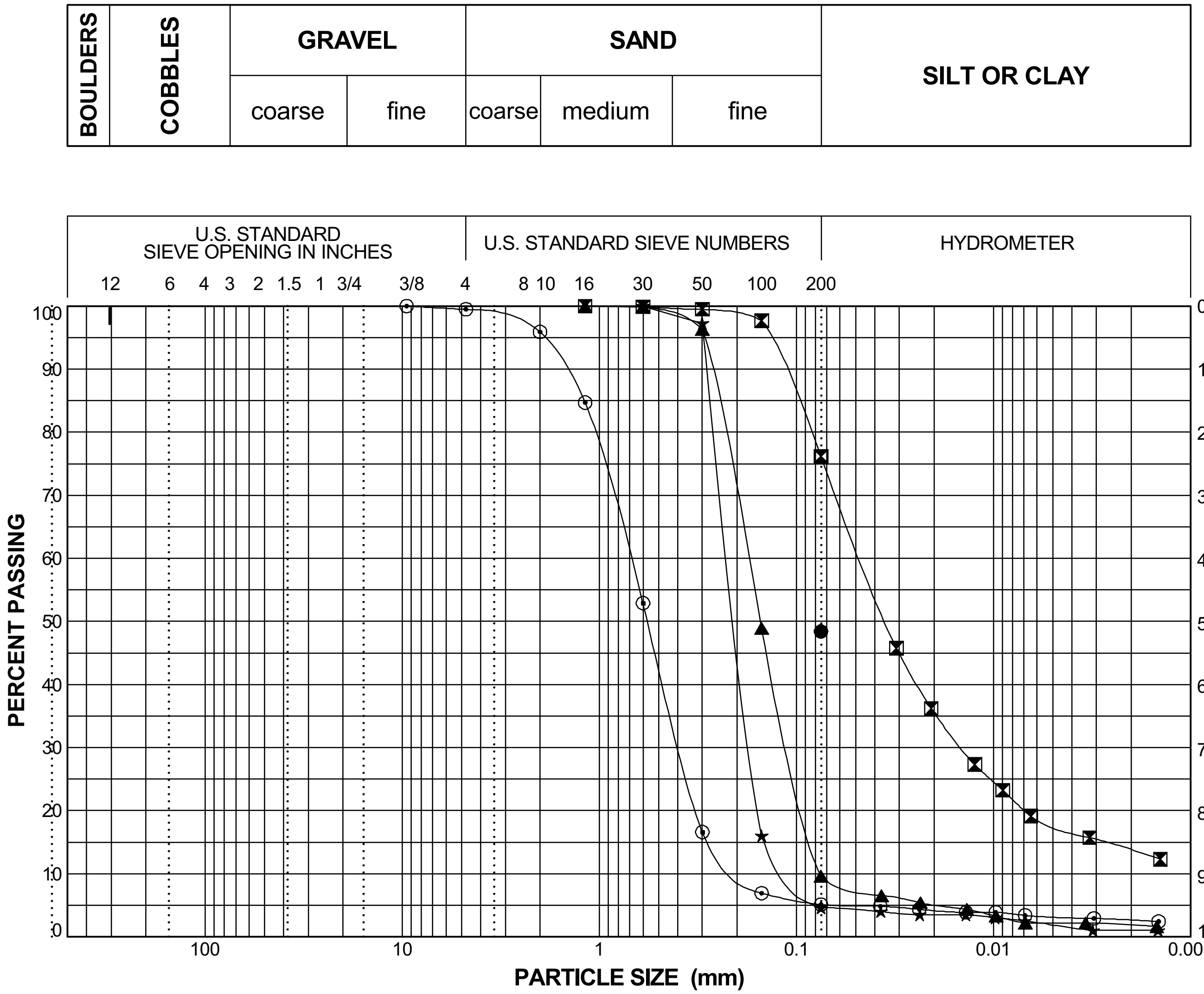


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_165B	11A	23	●	0.0	0.0	51.0	SANDY LEAN CLAY (CL)
WR0017_165B	13A	28	⌧	0.0	0.0	91.9	LEAN CLAY (CL)
WR0017_165B	16A	34.51	▲	0.0	0.0	47.3	SILTY SAND (SM)
WR0017_165B	18A	39.51	★	0.0	0.0	29.5	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



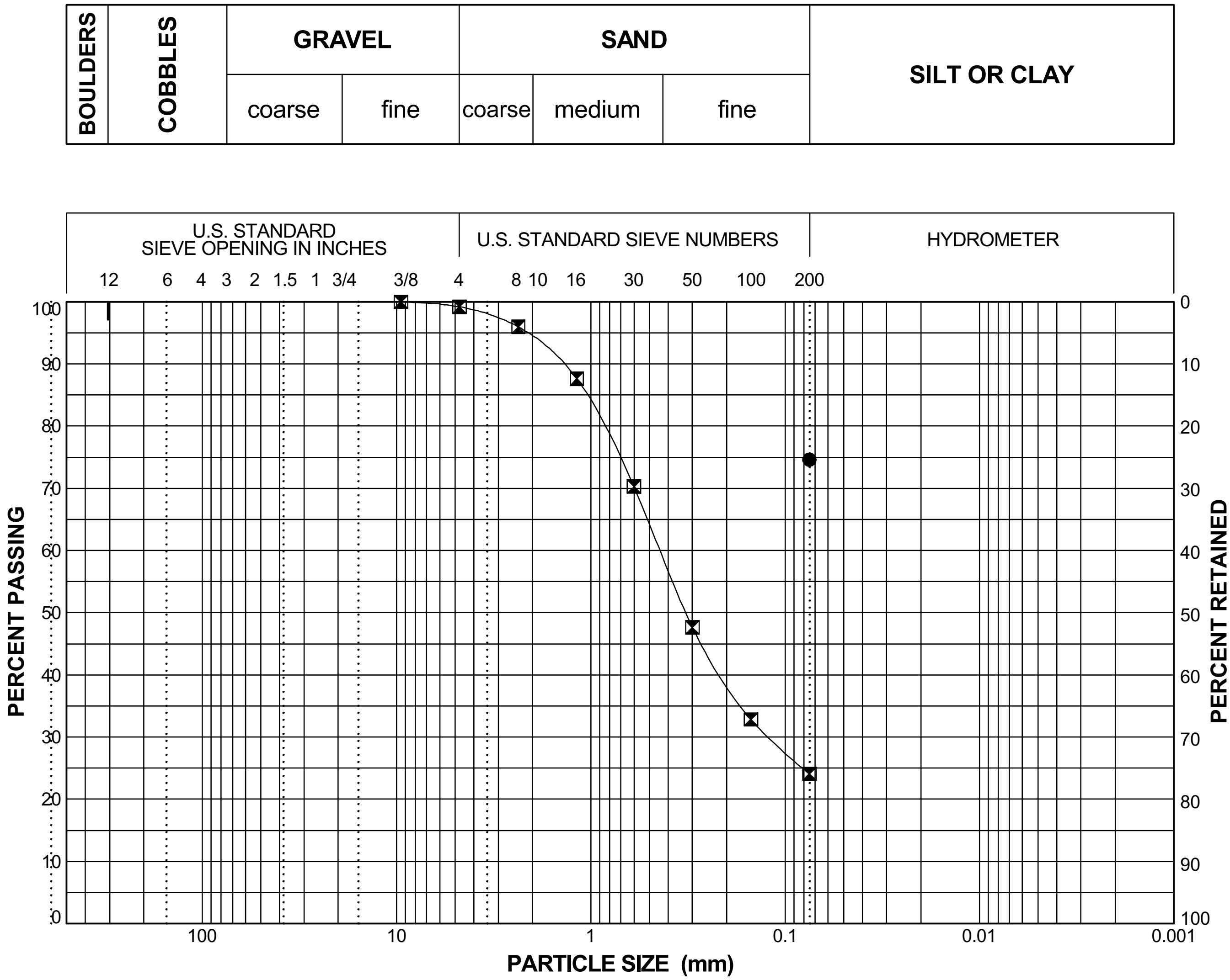
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_166B	1A	0.6	●	0.0	0.0	48.4	SILTY, CLAYEY SAND (SC-SM)
WR0017_166B	3A	3.5	⧗	0.0	23.8	76.2	LEAN CLAY with SAND (CL)
WR0017_166B	5A	6.5	▲	0.0	90.4	9.6	POORLY GRADED SAND with SILT (SP-SM)
WR0017_166B	9A	15	★	0.0	95.4	4.6	POORLY GRADED SAND (SP)
WR0017_166B	12A	21.51	⊙	0.5	94.4	5.1	Poorly Graded SAND with Silt (SP-SM)

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

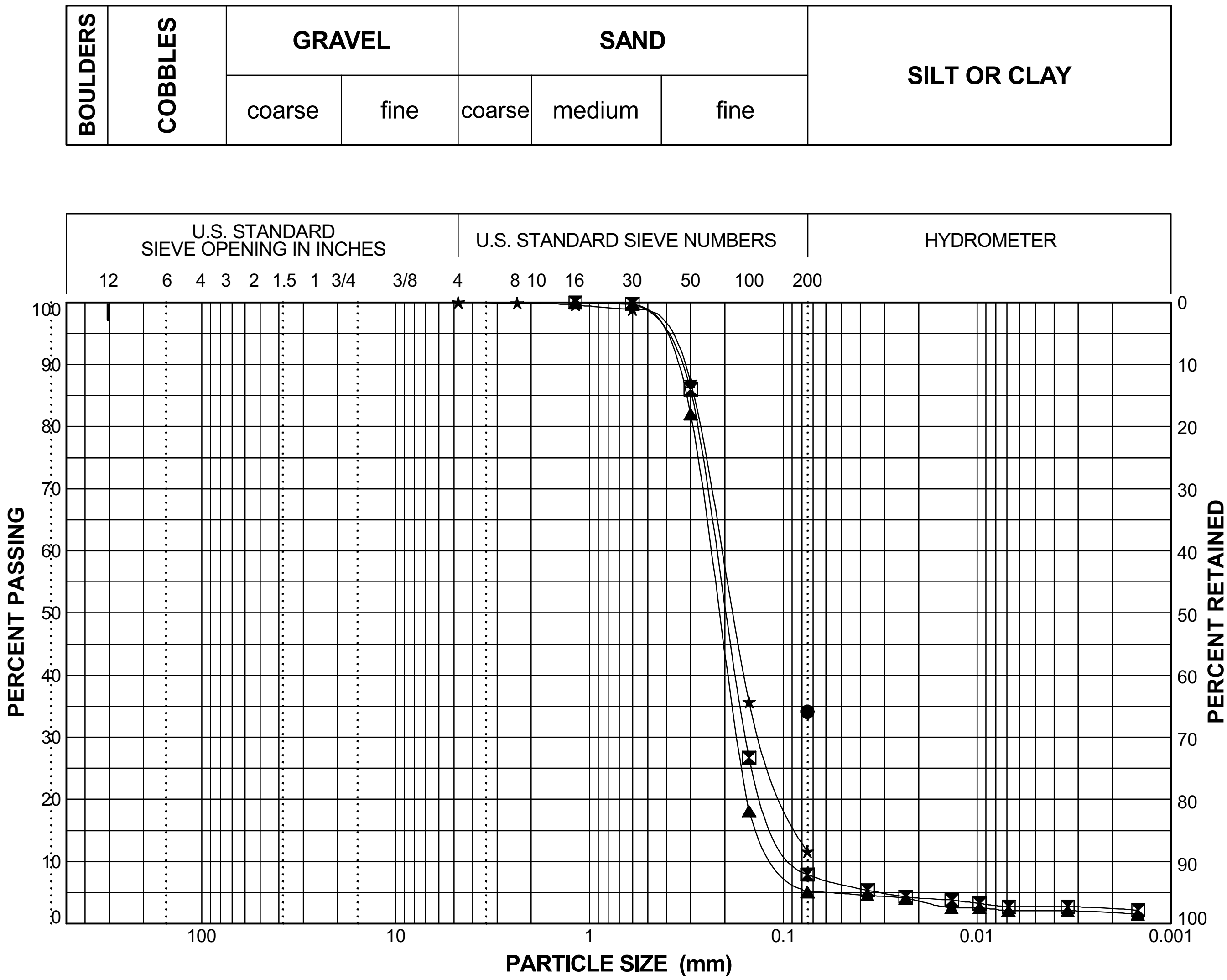


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_166B	14A	27.3	●	0.0	0.0	74.6	LEAN CLAY with SAND (CL)
WR0017_166B	16A	30.5	⧗	0.8	75.1	24.1	CLAYEY SAND (SC)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

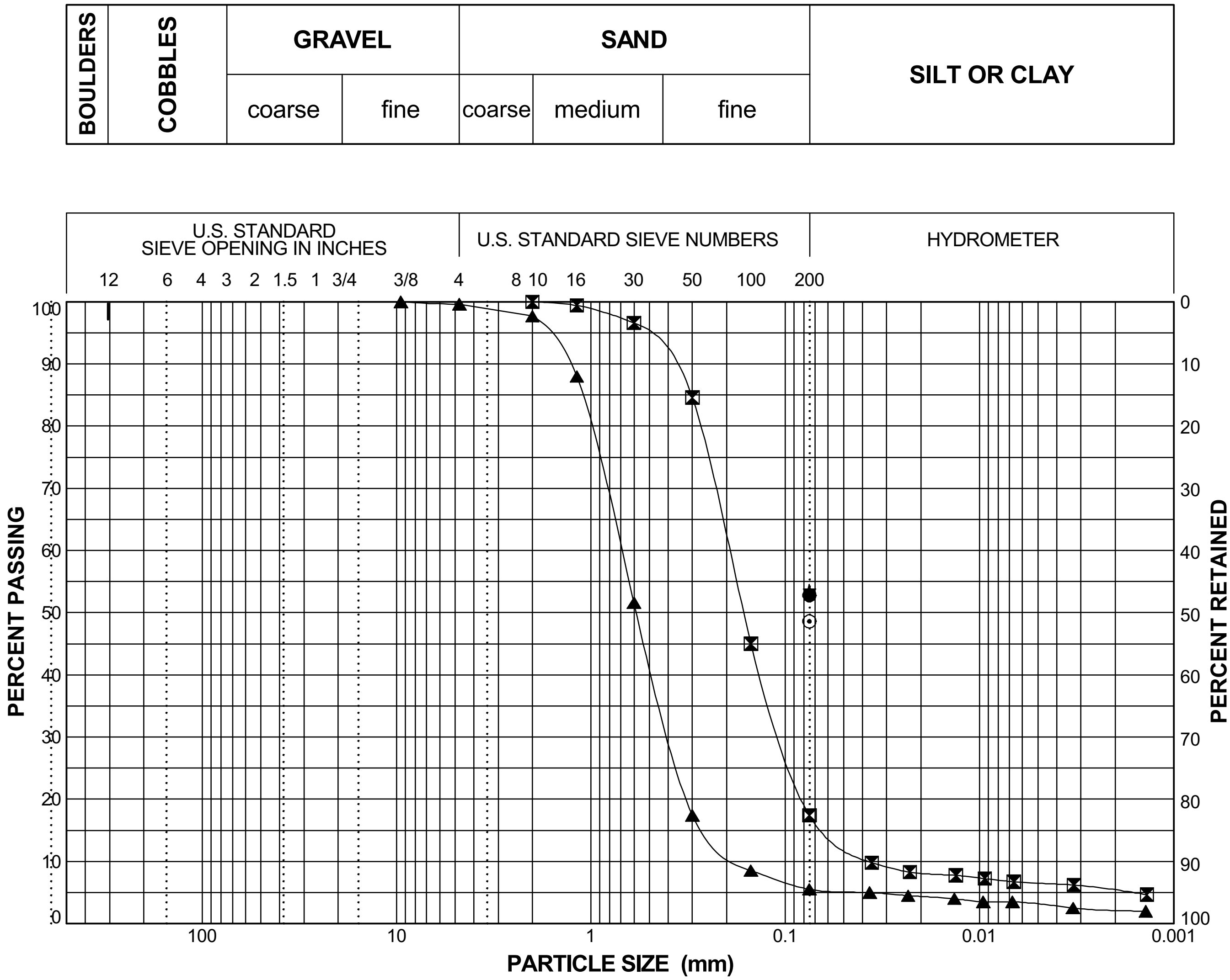


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_167B	1A	0.8	●	0.0	0.0	34.1	SILTY SAND (SM)
WR0017_167B	2A	1.5	⧗	0.0	92.1	7.9	Poorly Graded SAND with Silt (SP-SM)
WR0017_167B	8A	15	▲	0.0	94.9	5.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_167B	9A	17	★	0.0	88.4	11.6	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

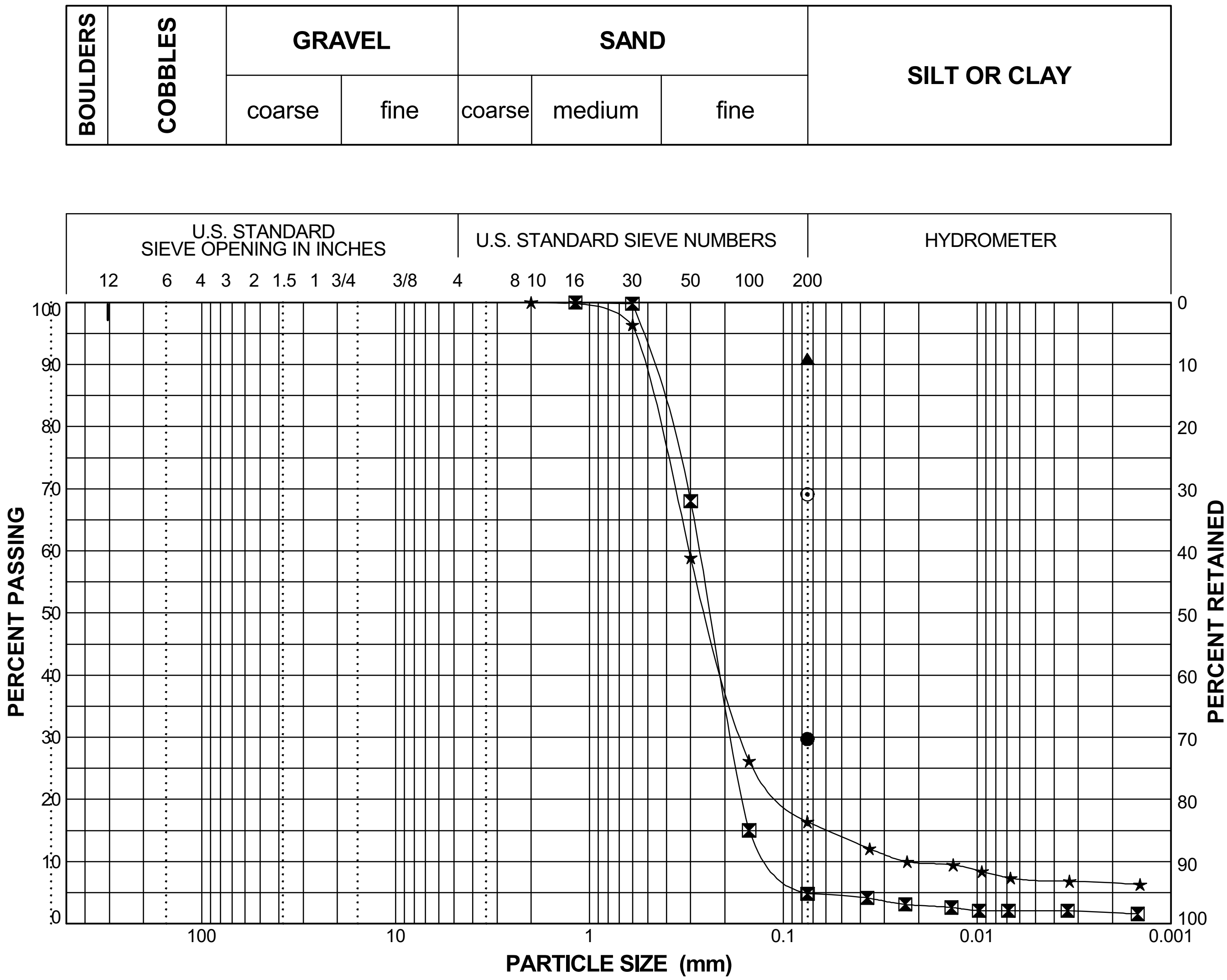


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_168B	1A	0.5	●	0.0	0.0	52.8	SANDY LEAN CLAY (CL)
WR0017_168B	5A	6.5	⧗	0.0	82.6	17.4	SILTY SAND (SM)
WR0017_168B	9A	16.33	▲	0.4	94.1	5.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_168B	12A	21.51	★	0.0	0.0	53.6	SANDY LEAN CLAY (CL)
WR0017_168B	22A	45	⊙	0.0	0.0	48.6	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

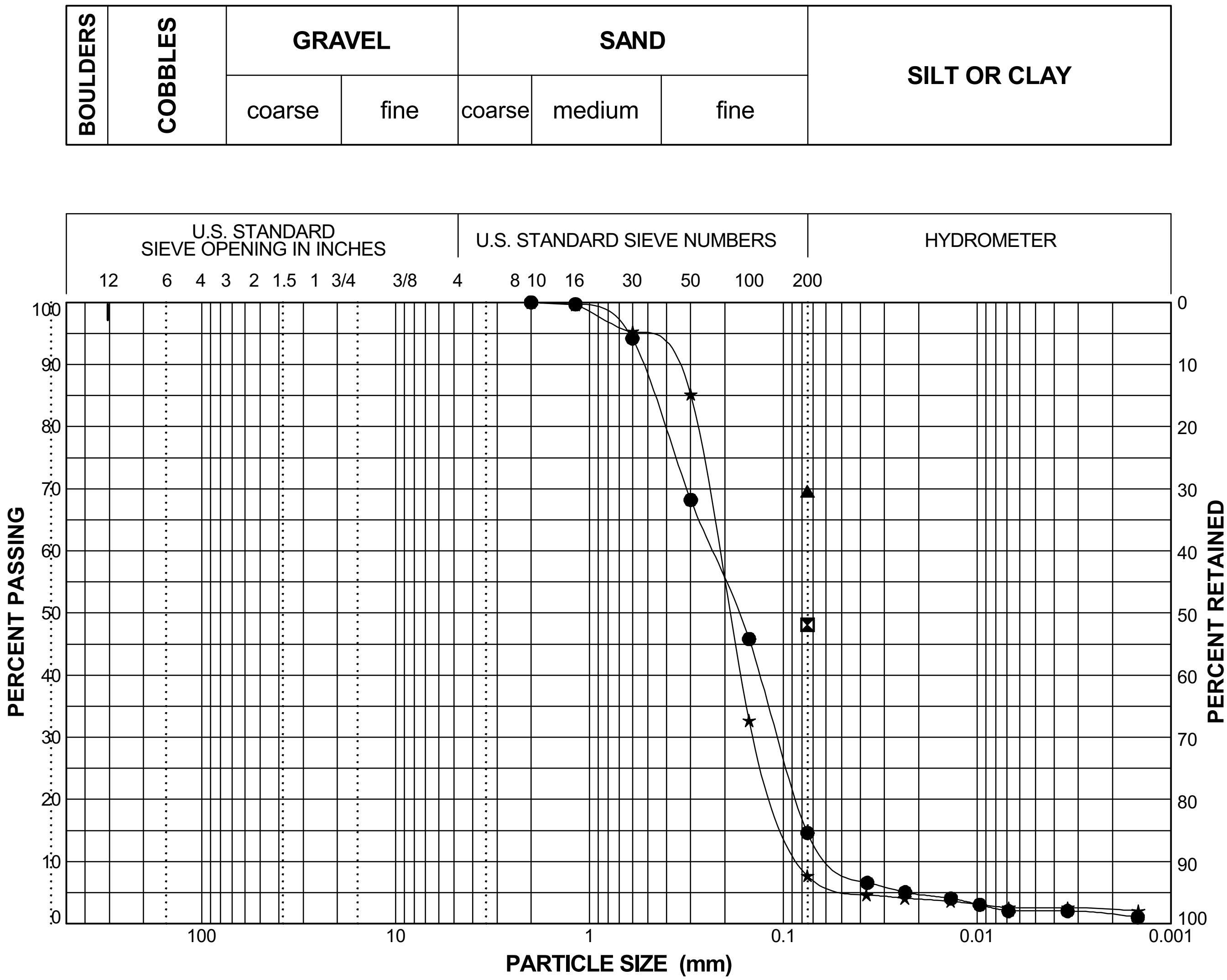


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_172B	1A	1	●	0.0	0.0	29.7	CLAYEY SAND (SC)
WR0017_172B	6A	10	⧗	0.0	95.2	4.8	POORLY GRADED SAND (SP)
WR0017_172B	8A	15.01	▲	0.0	0.0	90.9	LEAN CLAY (CL)
WR0017_172B	9A	17	★	0.0	83.6	16.4	SILTY SAND (SM)
WR0017_172B	10A	19.01	⊙	0.0	0.0	69.1	SANDY SILTY CLAY (CL-ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

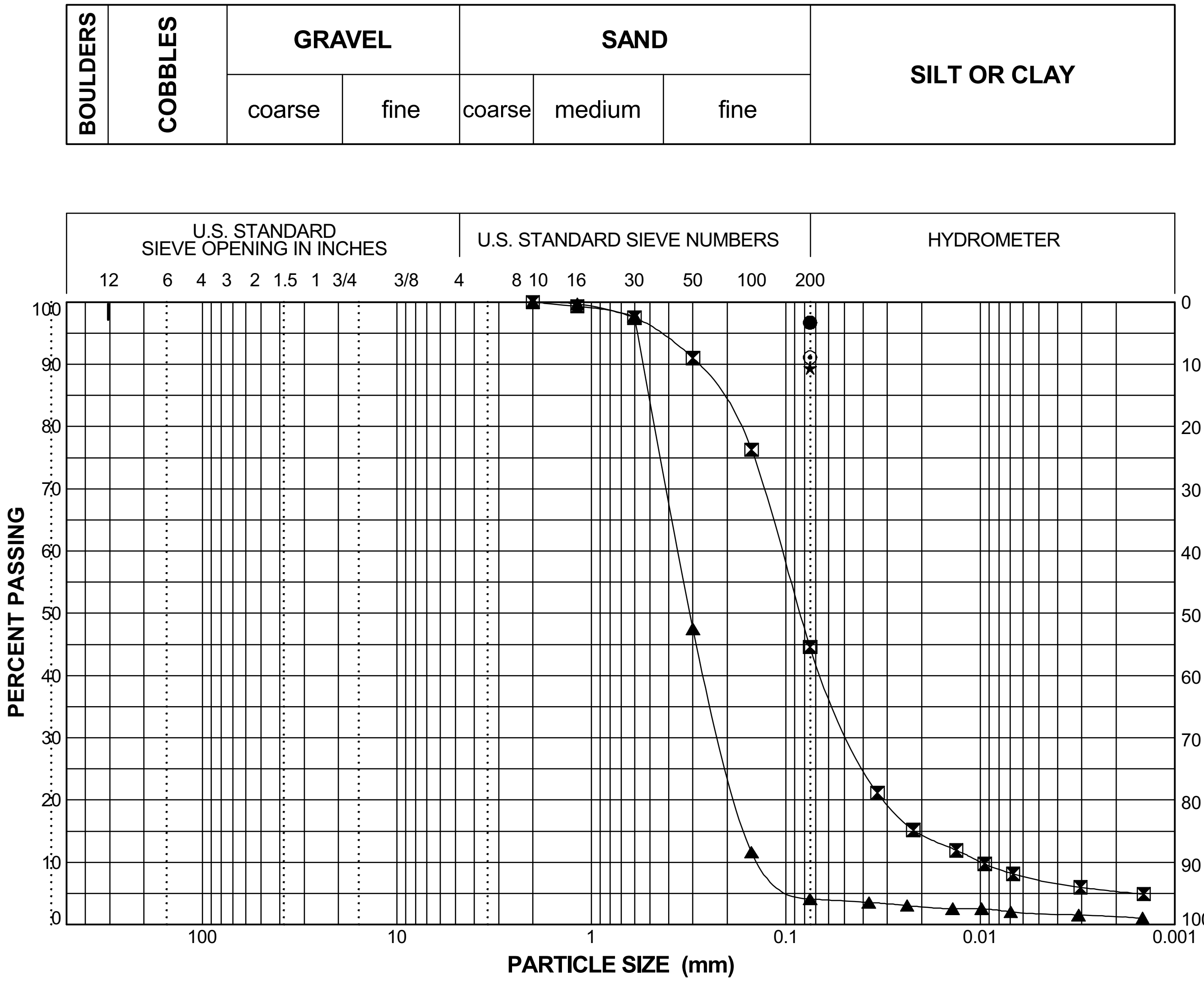


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_172B	11A	20.5	●	0.0	85.4	14.6	SILTY SAND (SM)
WR0017_172B	14A	30	⊠	0.0	0.0	48.1	CLAYEY SAND (SC)
WR0017_172B	17A	35	▲	0.0	0.0	69.6	SANDY LEAN CLAY (CL)
WR0017_172B	20A	43	★	0.0	92.3	7.7	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

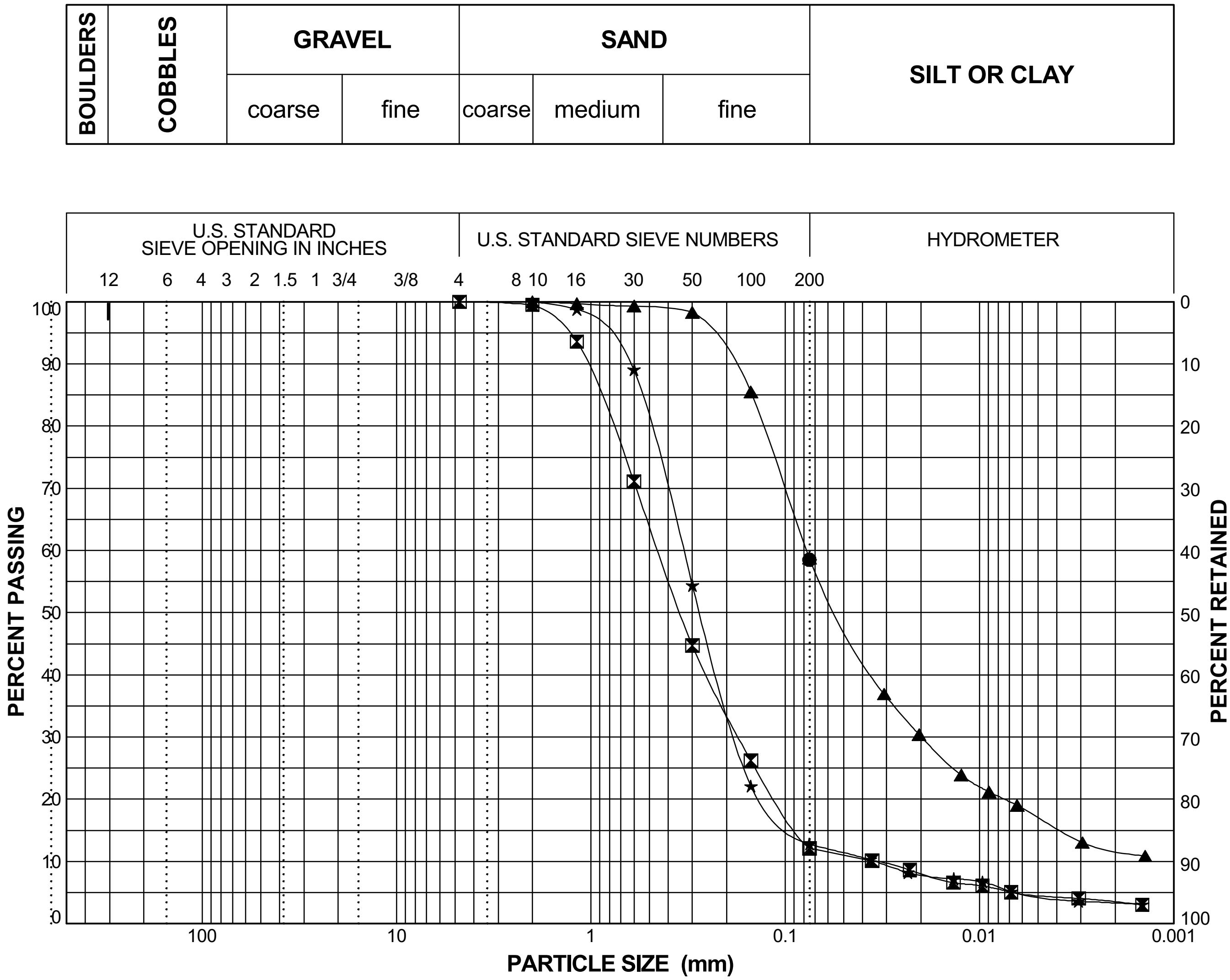


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_173B	1A	0.8	●	0.0	0.0	96.7	LEAN CLAY (CL)
WR0017_173B	5A	7	⧗	0.0	55.4	44.6	SILTY, CLAYEY SAND (SC-SM)
WR0017_173B	7A	10	▲	0.0	95.9	4.1	POORLY GRADED SAND (SP)
WR0017_173B	9A	17	★	0.0	0.0	89.4	LEAN CLAY (CL)
WR0017_173B	10A	20.01	⊙	0.0	0.0	91.1	LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

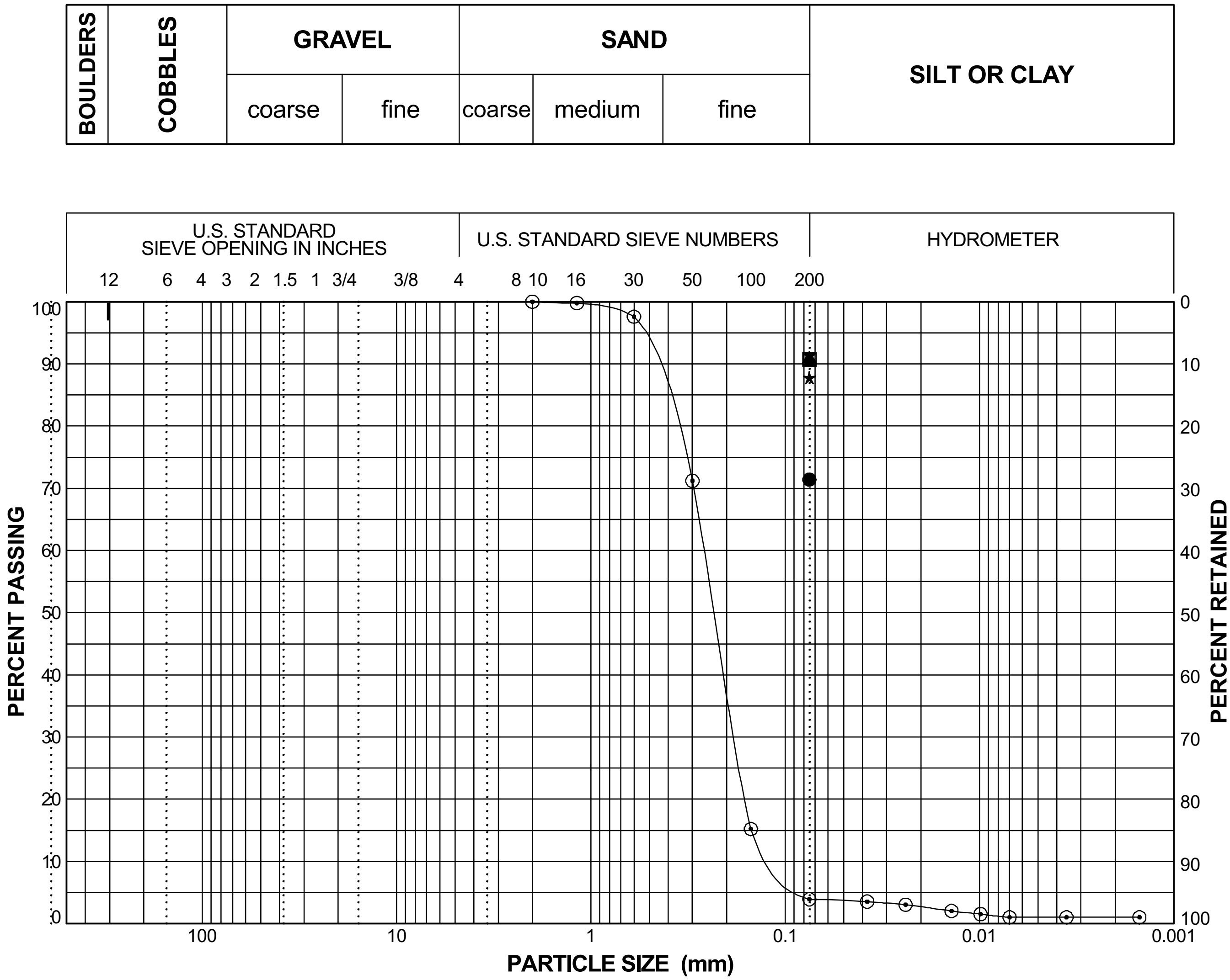


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_173B	13A	25	●	0.0	0.0	58.5	SANDY LEAN CLAY (CL)
WR0017_173B	15A	32	⊠	0.0	87.9	12.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_173B	17A	37	▲	0.0	41.2	58.8	SANDY SILTY CLAY (CL-ML)
WR0017_173B	21A	45	★	0.0	87.2	12.8	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

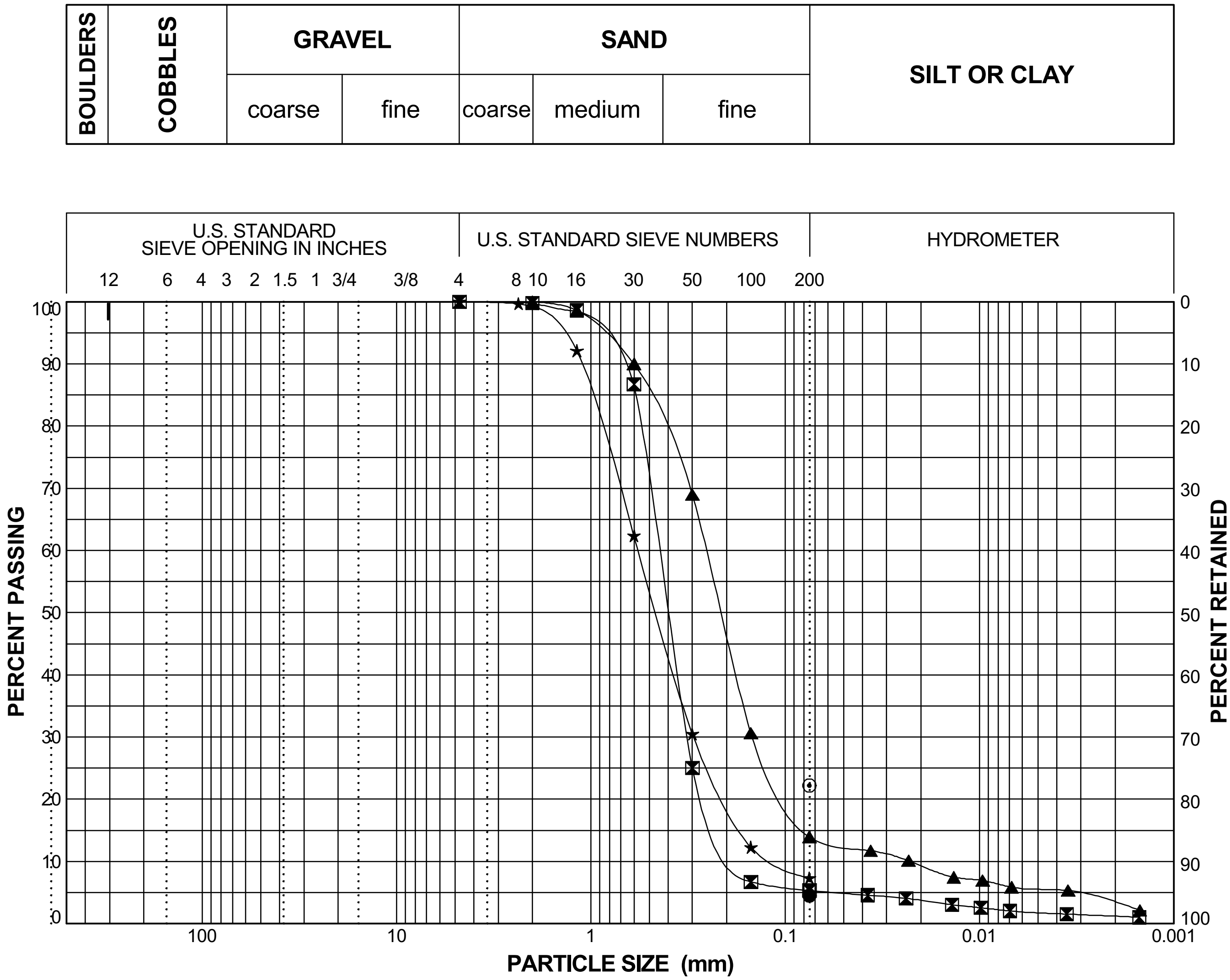


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_174B	8A	8.5	●	0.0	0.0	71.4	LEAN CLAY with SAND (CL)
WR0017_174B	9A	10	⊠	0.0	0.0	90.7	SILT (ML)
WR0017_174B	11A	13.1	▲	0.0	0.0	91.1	LEAN CLAY (CL)
WR0017_174B	12A	17	★	0.0	0.0	87.8	LEAN CLAY (CL)
WR0017_174B	13A	20.5	⊙	0.0	96.1	3.9	POORLY GRADED SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

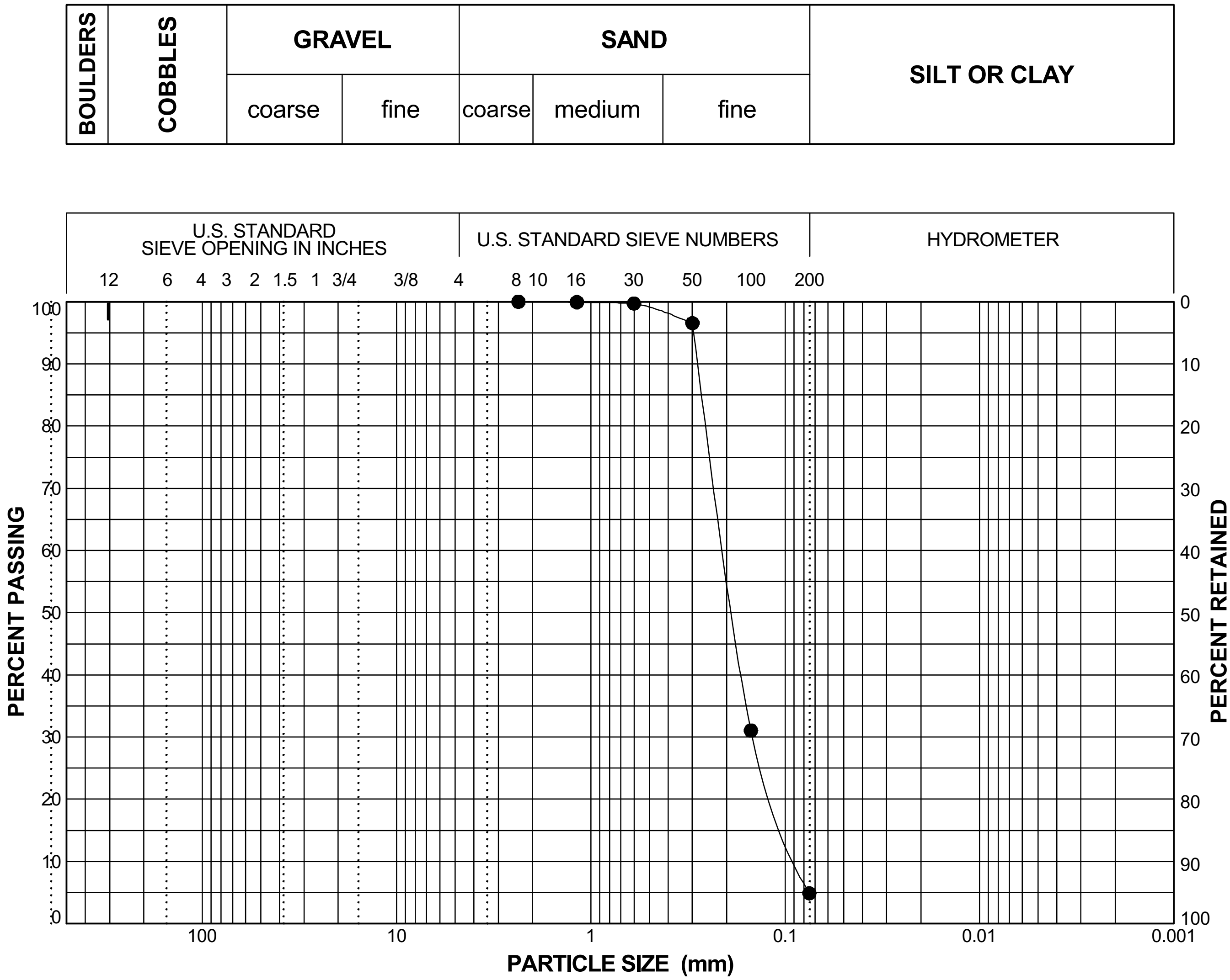


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_174B	14A	22	●	0.0	0.0	4.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_174B	16A	29	⧗	0.0	94.7	5.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_174B	20A	39	▲	0.0	86.1	13.9	SILTY SAND (SM)
WR0017_174B	22A	42	★	0.0	92.7	7.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_174B	24A	47	⊙	0.0	0.0	22.2	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

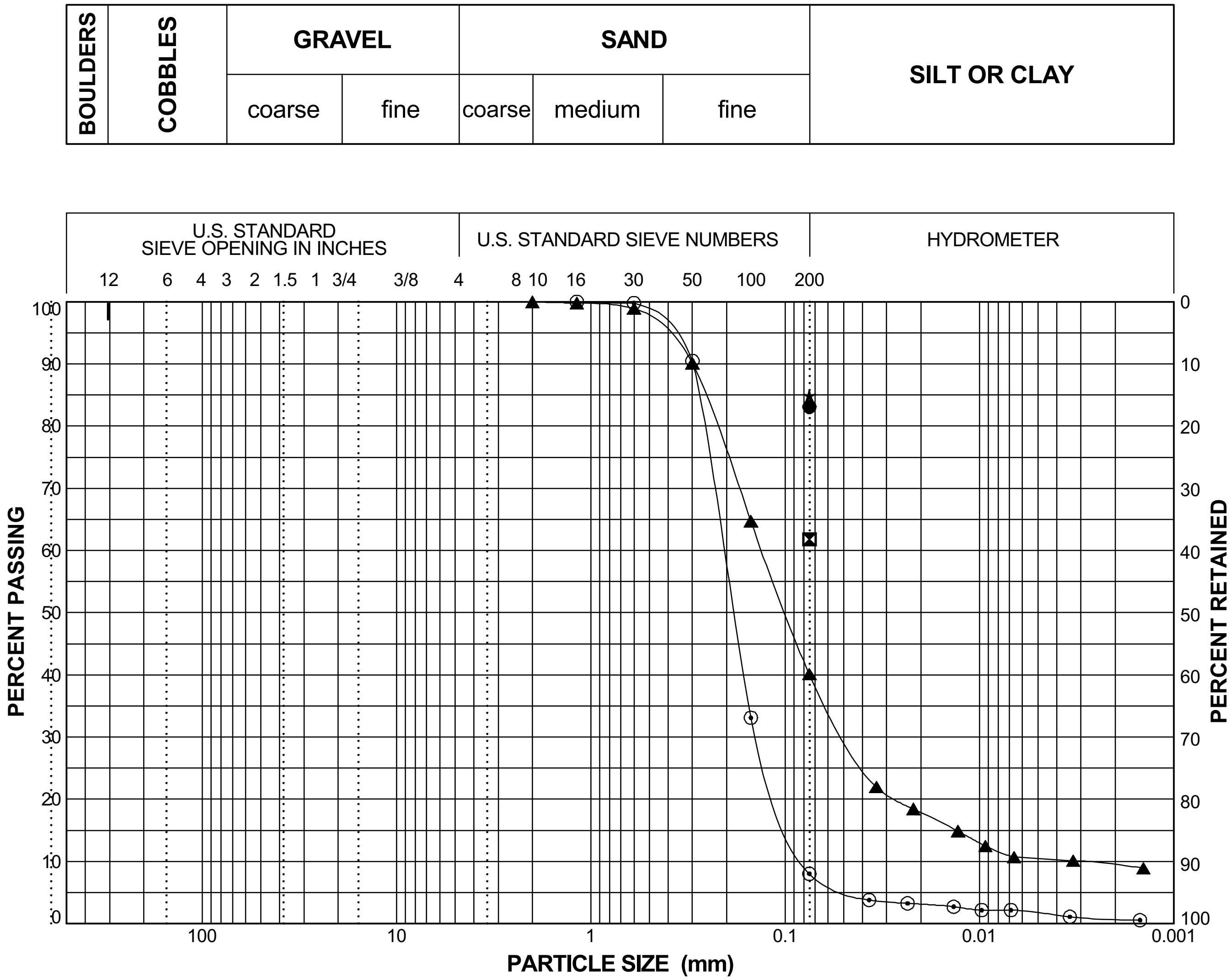


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_174B	29A	58.51	●	0.0	95.1	4.9	POORLY GRADED SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



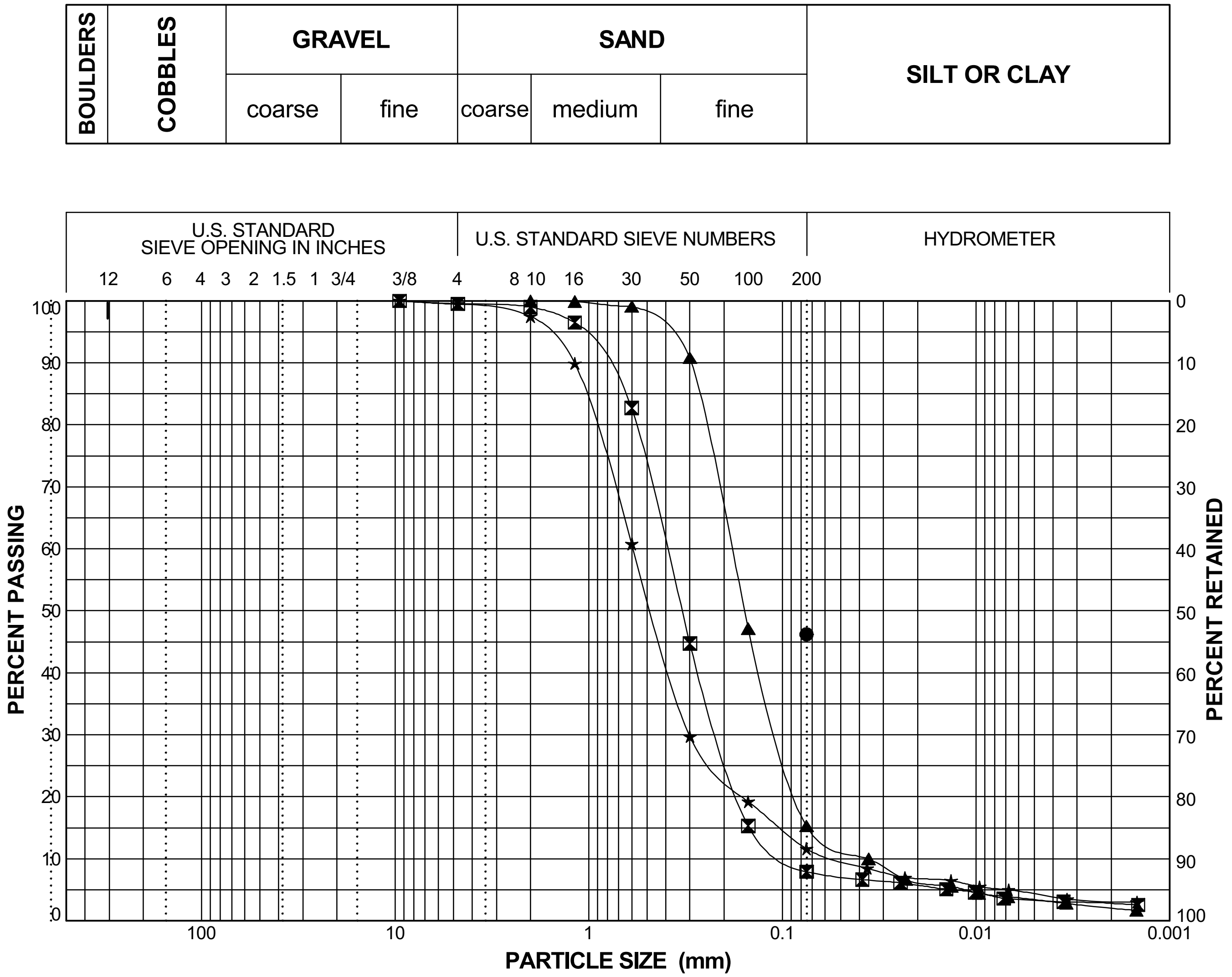
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_175B	1B	0	●	0.0	0.0	83.1	LEAN CLAY with SAND (CL)
WR0017_175B	3B	3.5	⊠	0.0	0.0	61.8	SANDY LEAN CLAY (CL)
WR0017_175B	6A	9	▲	0.0	59.9	40.1	SILTY, CLAYEY SAND (SC-SM)
WR0017_175B	8A	12.5	★	0.0	0.0	84.9	SILT with SAND (ML)
WR0017_175B	9A	15	⊙	0.0	92.0	8.0	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10



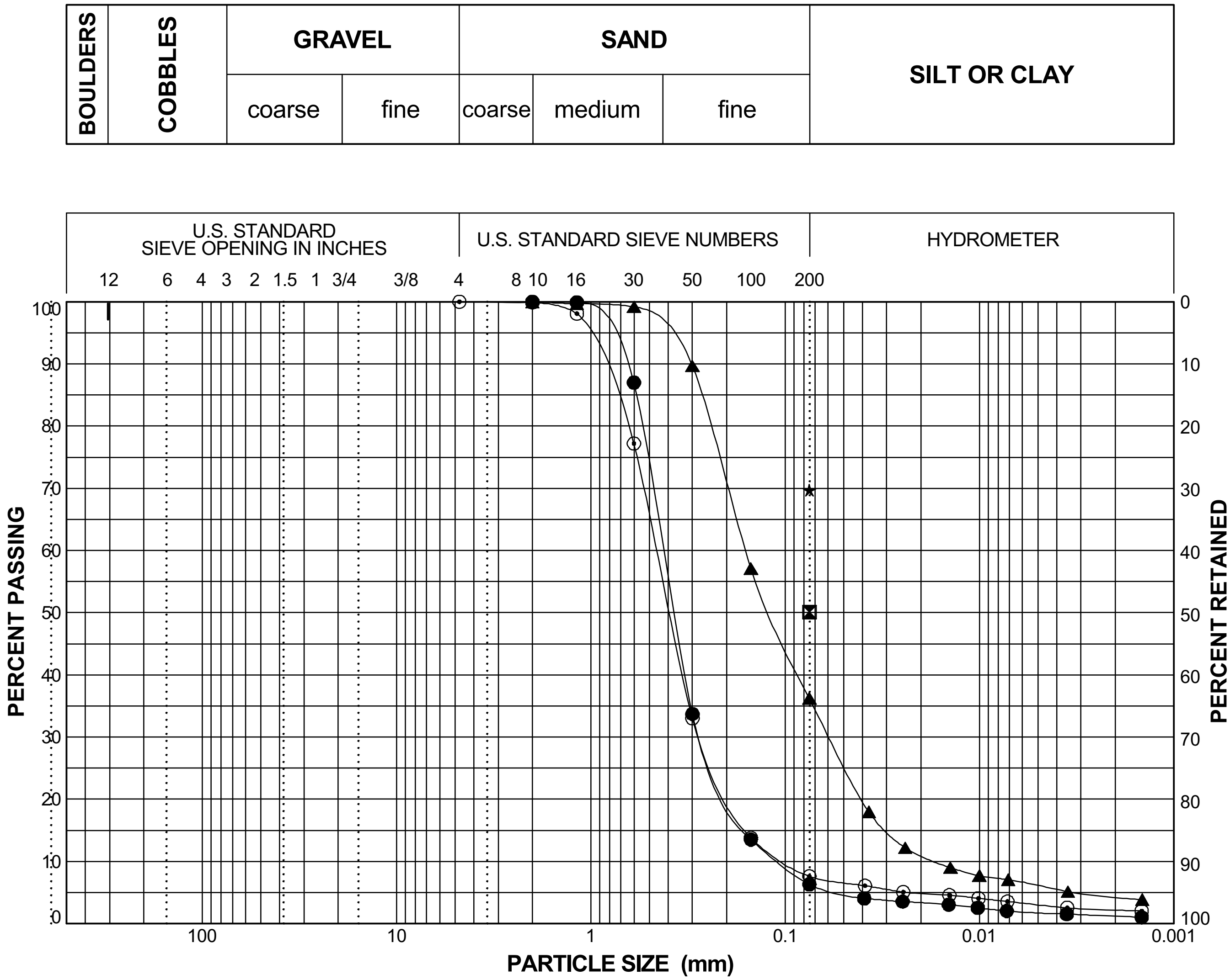
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_175B	11A	20.7	●	0.0	0.0	46.2	CLAYEY SAND (SC)
WR0017_175B	15A	30	⧗	0.5	91.6	7.9	Poorly Graded SAND with Silt (SP-SM)
WR0017_175B	19A	40	▲	0.0	84.7	15.3	SILTY SAND (SM)
WR0017_175B	21A	45	★	0.5	87.9	11.6	Well-Graded SAND with Silt (SW-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

DWR LEVEE U/NU SIEVE CURVES REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10



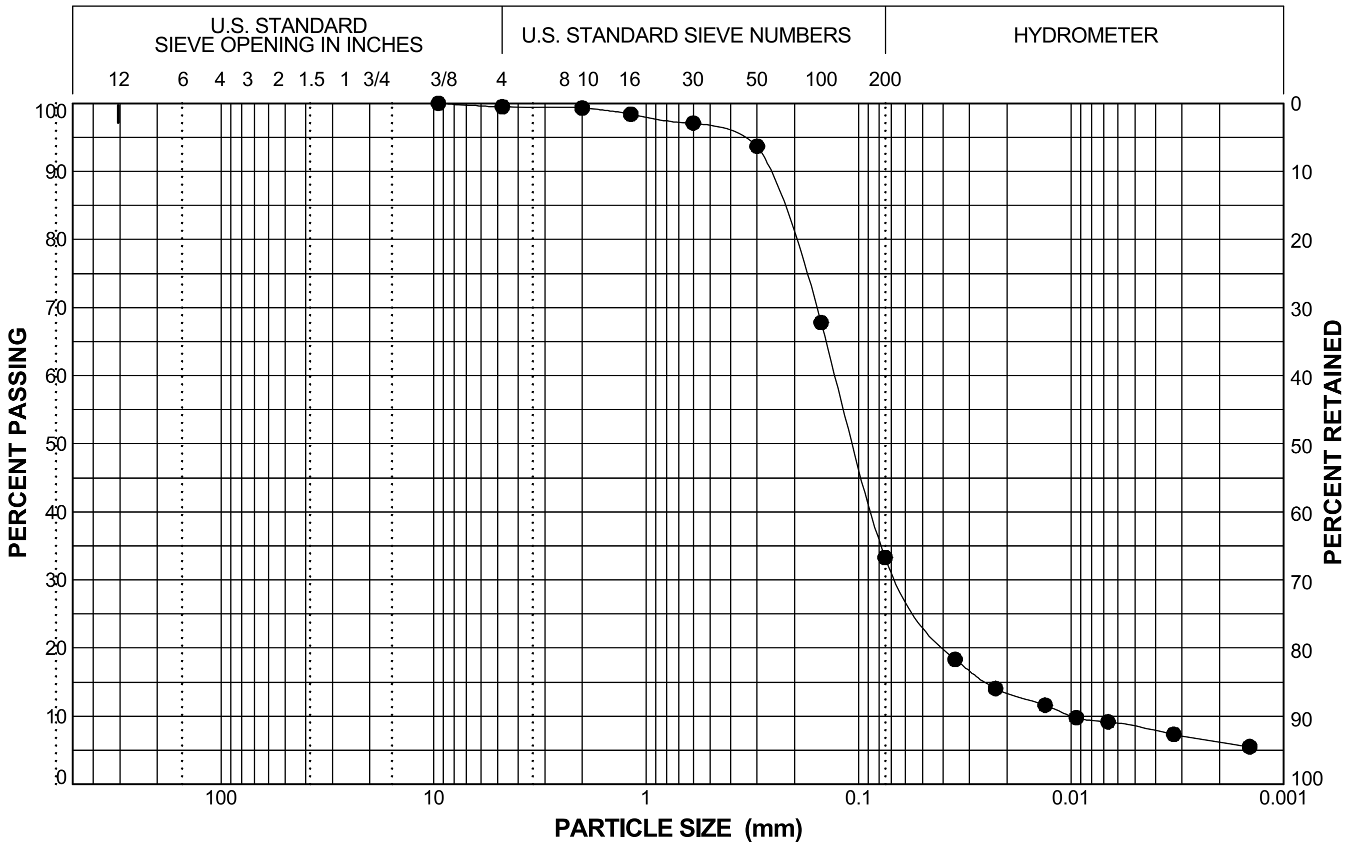
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_176B	3A	3.01	●	0.0	93.7	6.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_176B	6A	9	⊠	0.0	0.0	50.1	SANDY SILTY CLAY (CL-ML)
WR0017_176B	8A	13.51	▲	0.0	63.8	36.2	CLAYEY SAND (SC)
WR0017_176B	10A	18.5	★	0.0	0.0	69.7	SANDY LEAN CLAY (CL)
WR0017_176B	12A	24	⊙	0.0	92.4	7.6	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

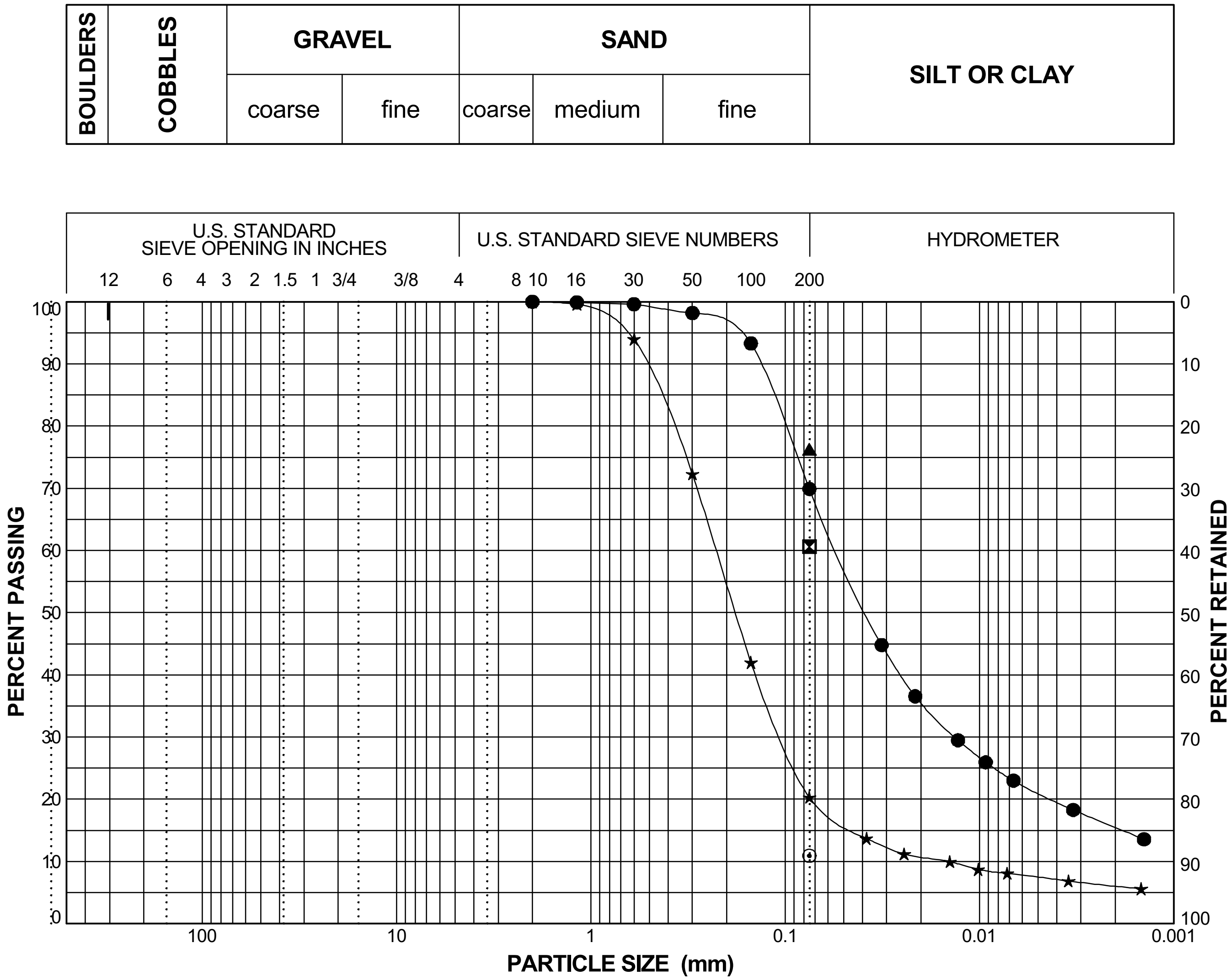


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_176B	16A	32.9	●	0.5	66.2	33.3	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

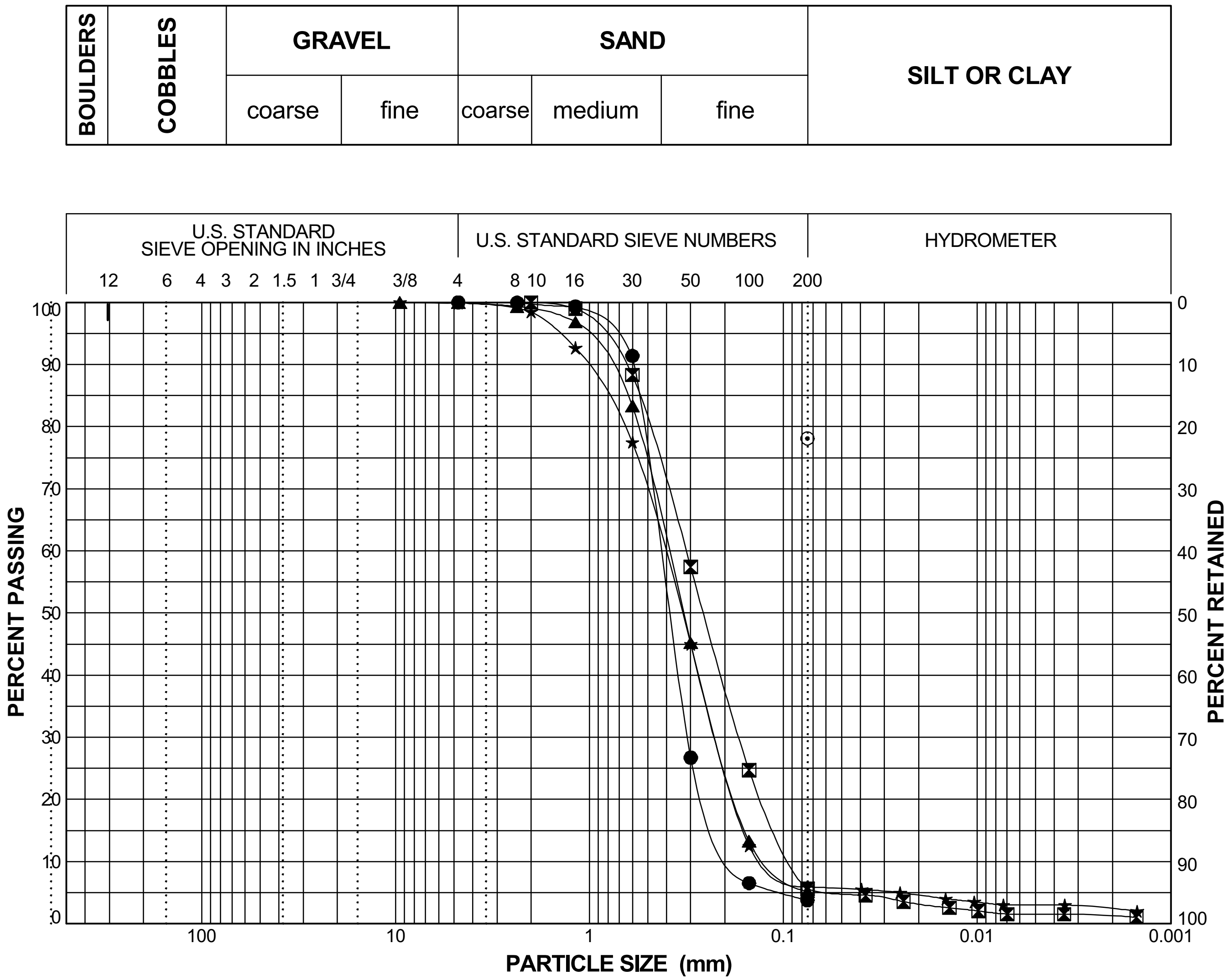


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_177B	2B	1.2	●	0.0	30.1	69.9	SANDY SILT (ML)
WR0017_177B	2A	2.3	⧗	0.0	0.0	60.6	SANDY LEAN CLAY (CL)
WR0017_177B	5B	7.6	▲	0.0	0.0	76.3	LEAN CLAY with SAND (CL)
WR0017_177B	6A	10	★	0.0	79.7	20.3	SILTY SAND (SM)
WR0017_177B	7A	13	⊙	0.0	0.0	10.9	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

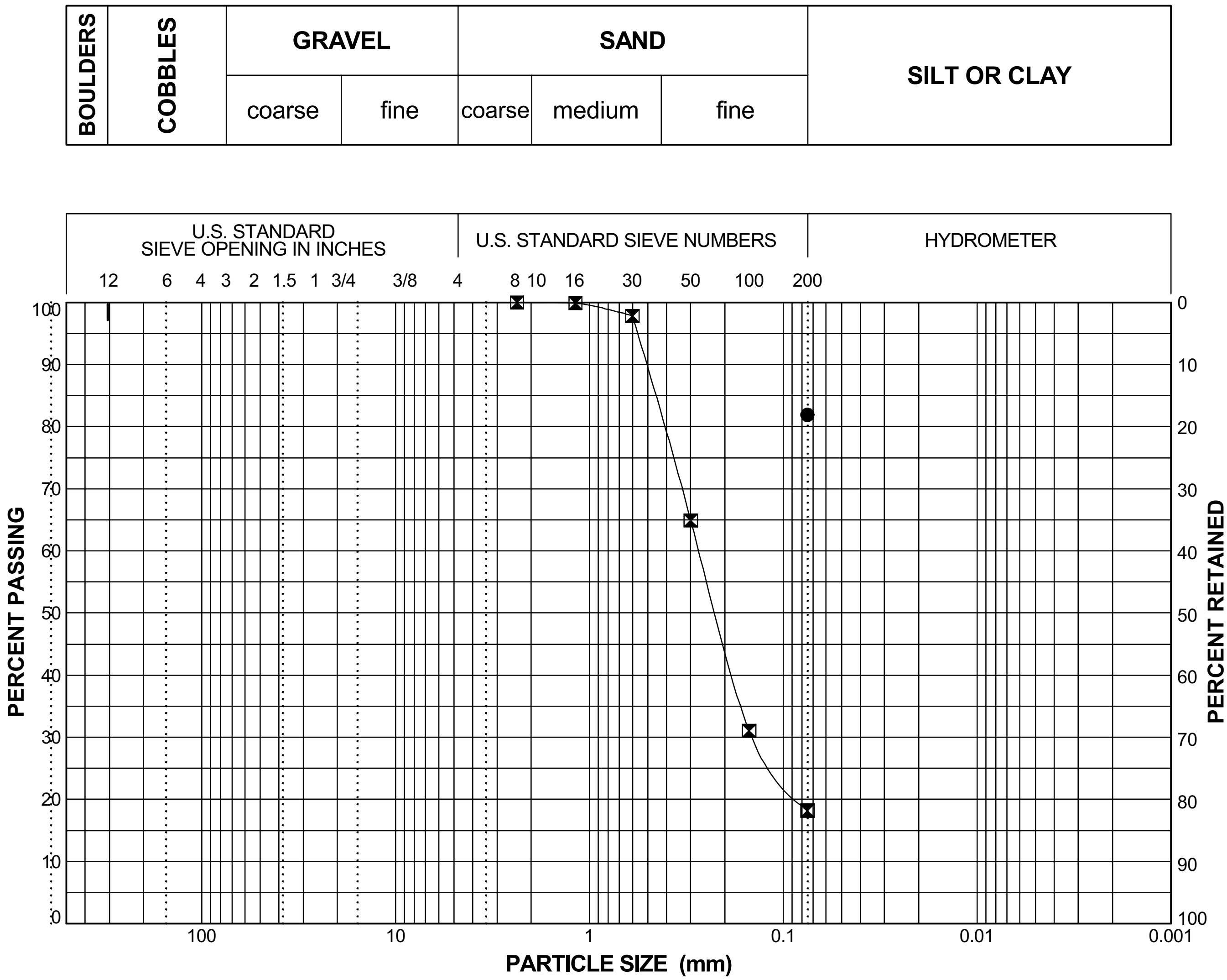


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_177B	9A	18	●	0.0	96.3	3.7	POORLY GRADED SAND (SP)
WR0017_177B	11A	23	⊠	0.0	94.4	5.6	Poorly Graded SAND with Silt (SP-SM)
WR0017_177B	15A	33	▲	0.1	94.8	5.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_177B	18A	39.51	★	0.1	94.0	5.9	Poorly Graded SAND with Silt (SP-SM)
WR0017_177B	20A	46.5	⊙	0.0	0.0	78.1	LEAN CLAY with Sand (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

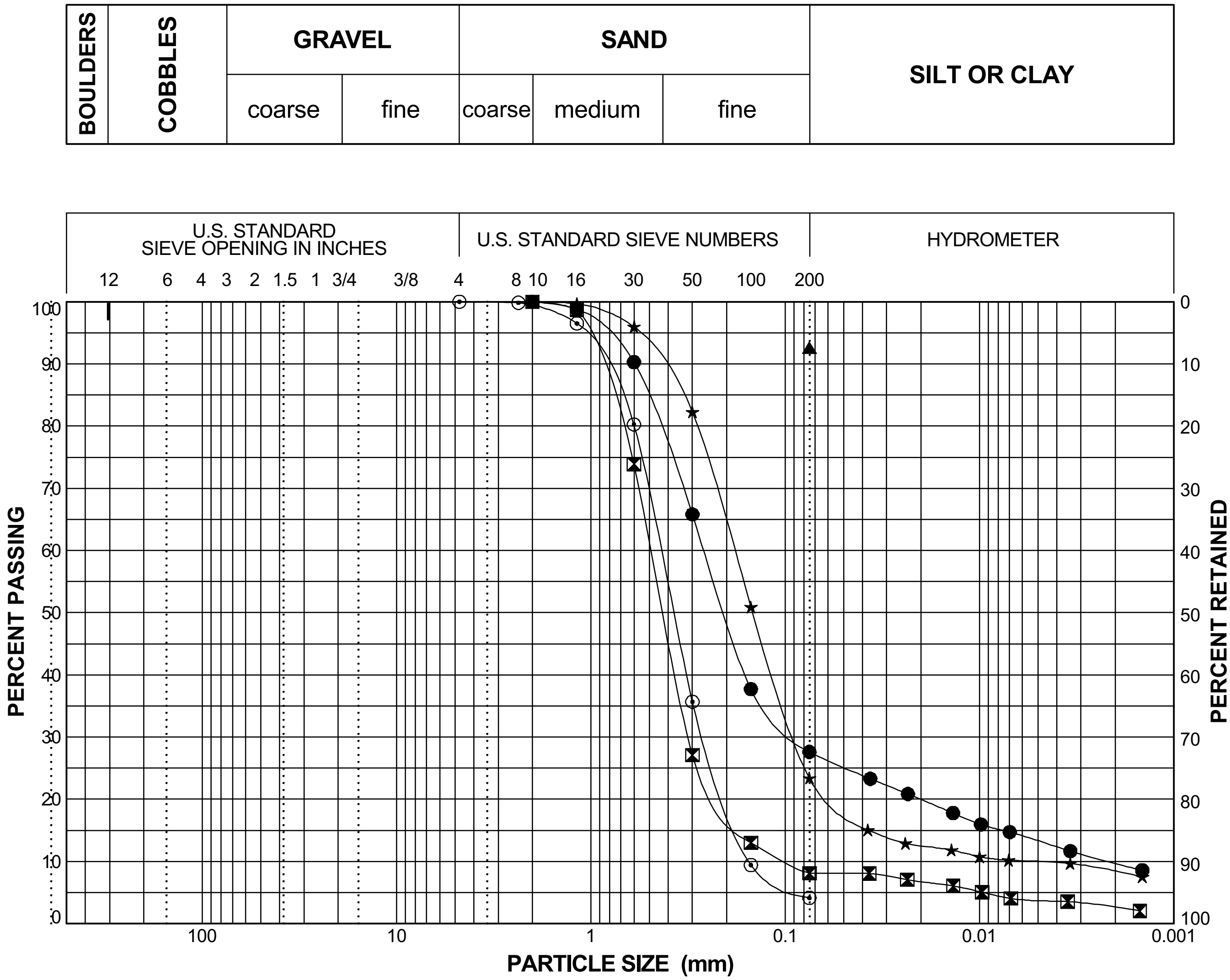


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_177B	22A	50	●	0.0	0.0	81.9	LEAN CLAY with SAND (CL)
WR0017_177B	24A	55	⧗	0.0	81.8	18.2	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

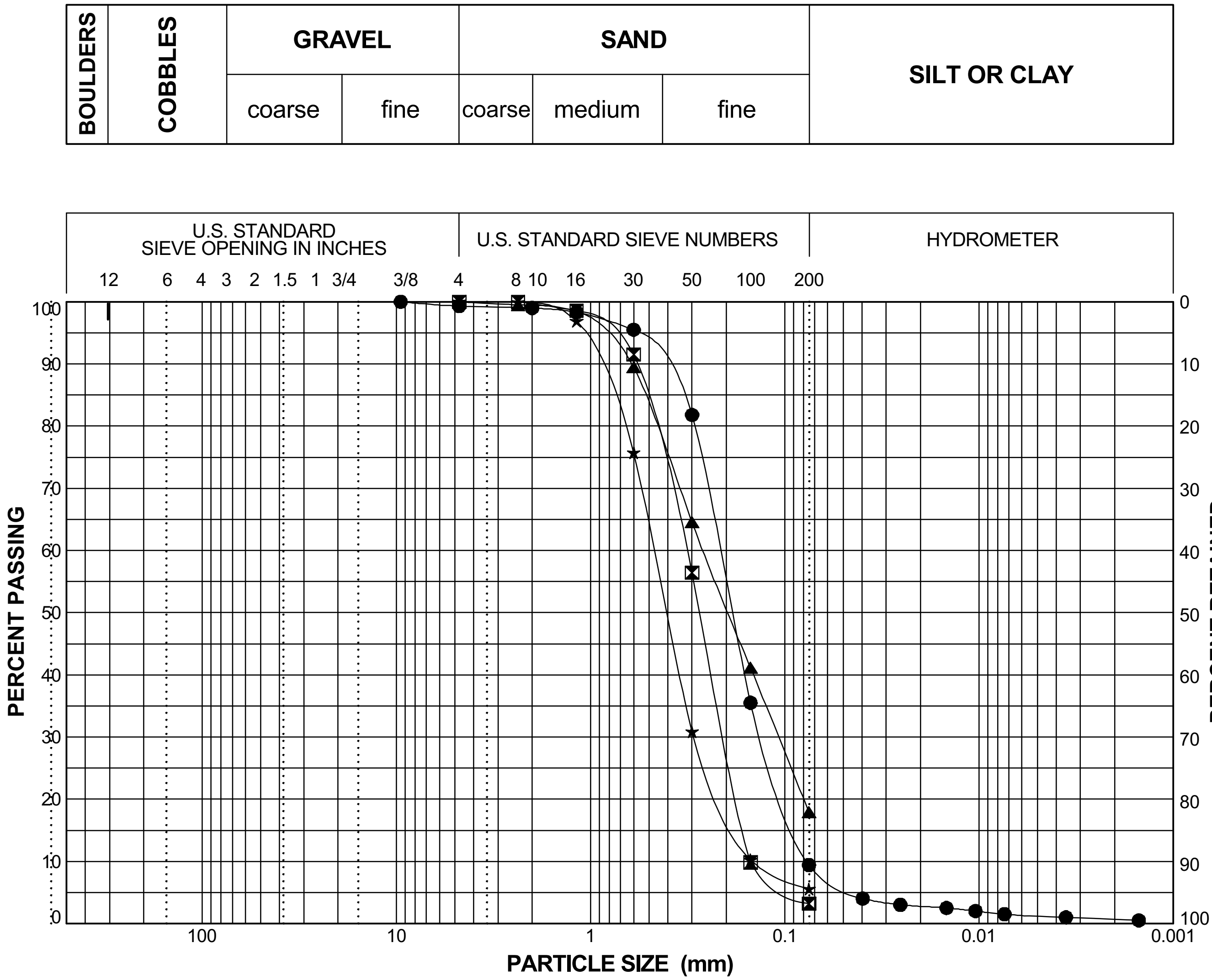


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_178B	1B	0.5	●	0.0	72.4	27.6	SILTY SAND (SM)
WR0017_178B	3A	3	⧗	0.0	91.9	8.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_178B	5A	6.5	▲	0.0	0.0	92.6	LEAN CLAY (CL)
WR0017_178B	8A	12	★	0.0	76.6	23.4	SILTY SAND (SM)
WR0017_178B	12A	22	⊙	0.0	95.9	4.1	POORLY GRADED SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

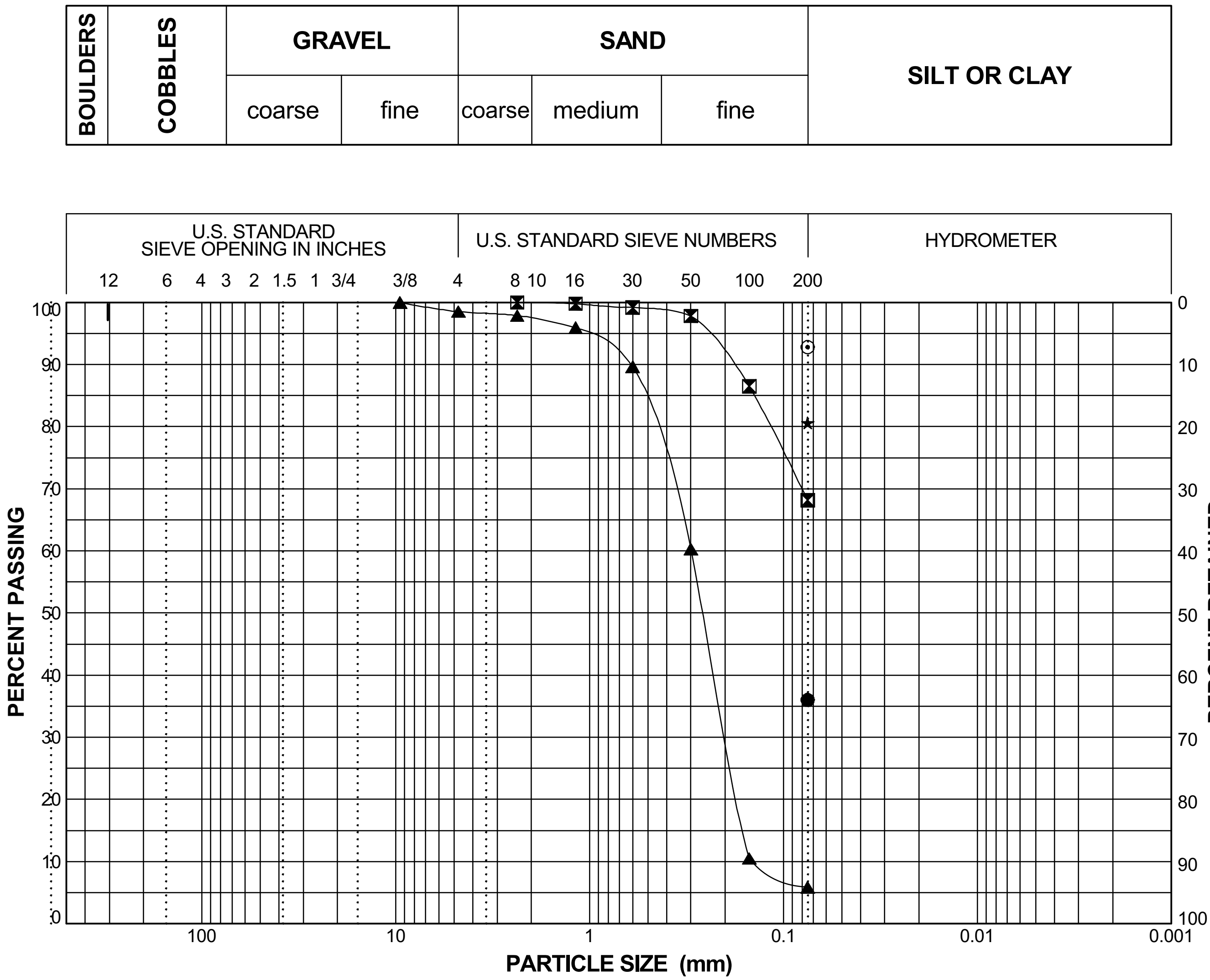


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_178B	15A	29	●	0.7	89.9	9.4	Poorly Graded SAND with Silt (SP-SM)
WR0017_178B	21A	44.5	⊠	0.0	96.8	3.2	POORLY GRADED SAND (SP)
WR0017_178B	22A	47.5	▲	0.0	82.1	17.9	SILTY SAND (SM)
WR0017_178B	24A	52	★	0.0	94.4	5.6	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

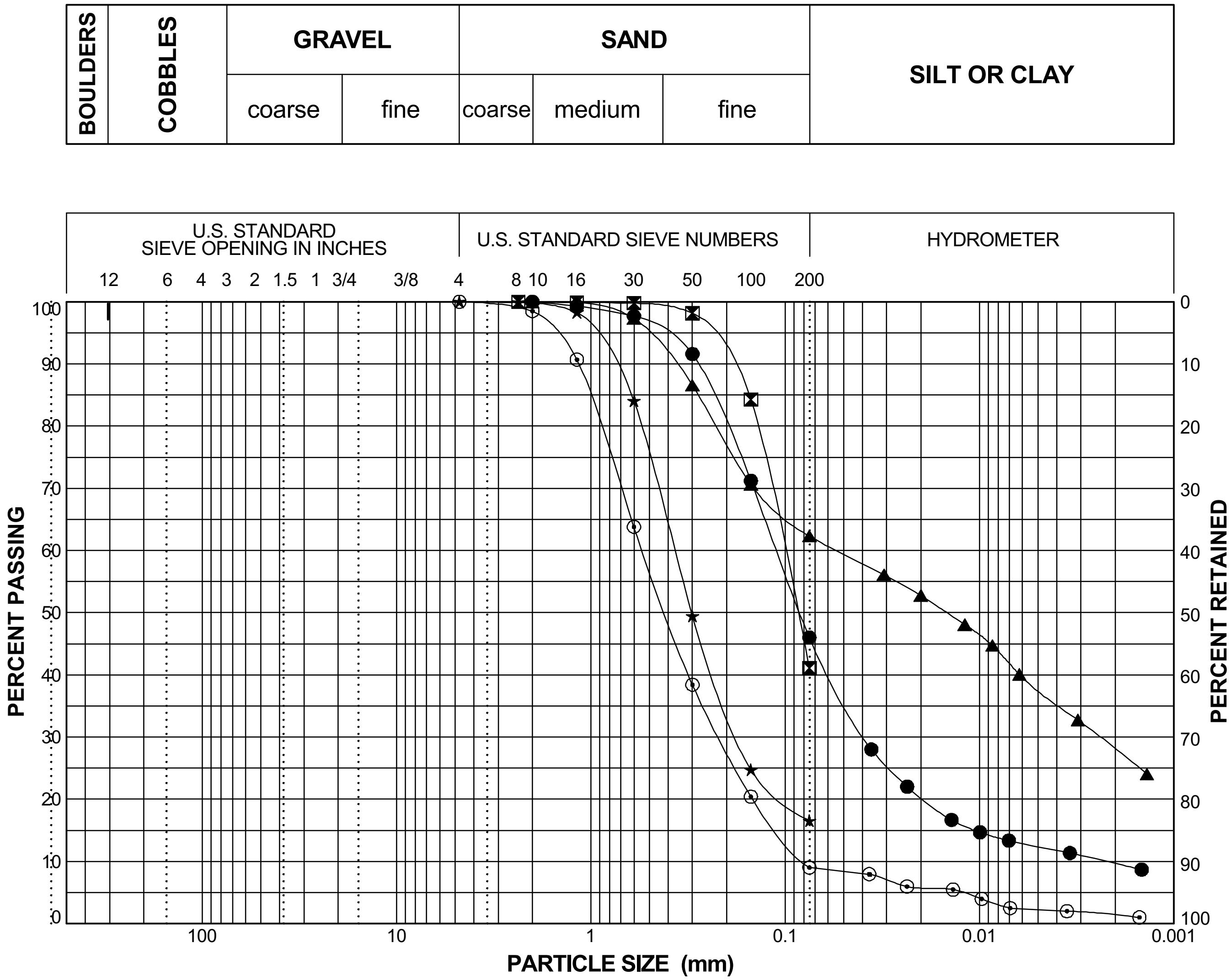


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_179B	6A	9.3	●	0.0	0.0	36.0	SILTY SAND (SM)
WR0017_179B	7B	10	⊠	0.0	31.8	68.2	SANDY SILT (ML)
WR0017_179B	8A	11.5	▲	1.5	92.7	5.8	Poorly Graded SAND with Silt (SP-SM)
WR0017_179B	10A	15	★	0.0	0.0	80.6	LEAN CLAY with SAND (CL)
WR0017_179B	13A	22	⊙	0.0	0.0	92.8	FAT CLAY (CH)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

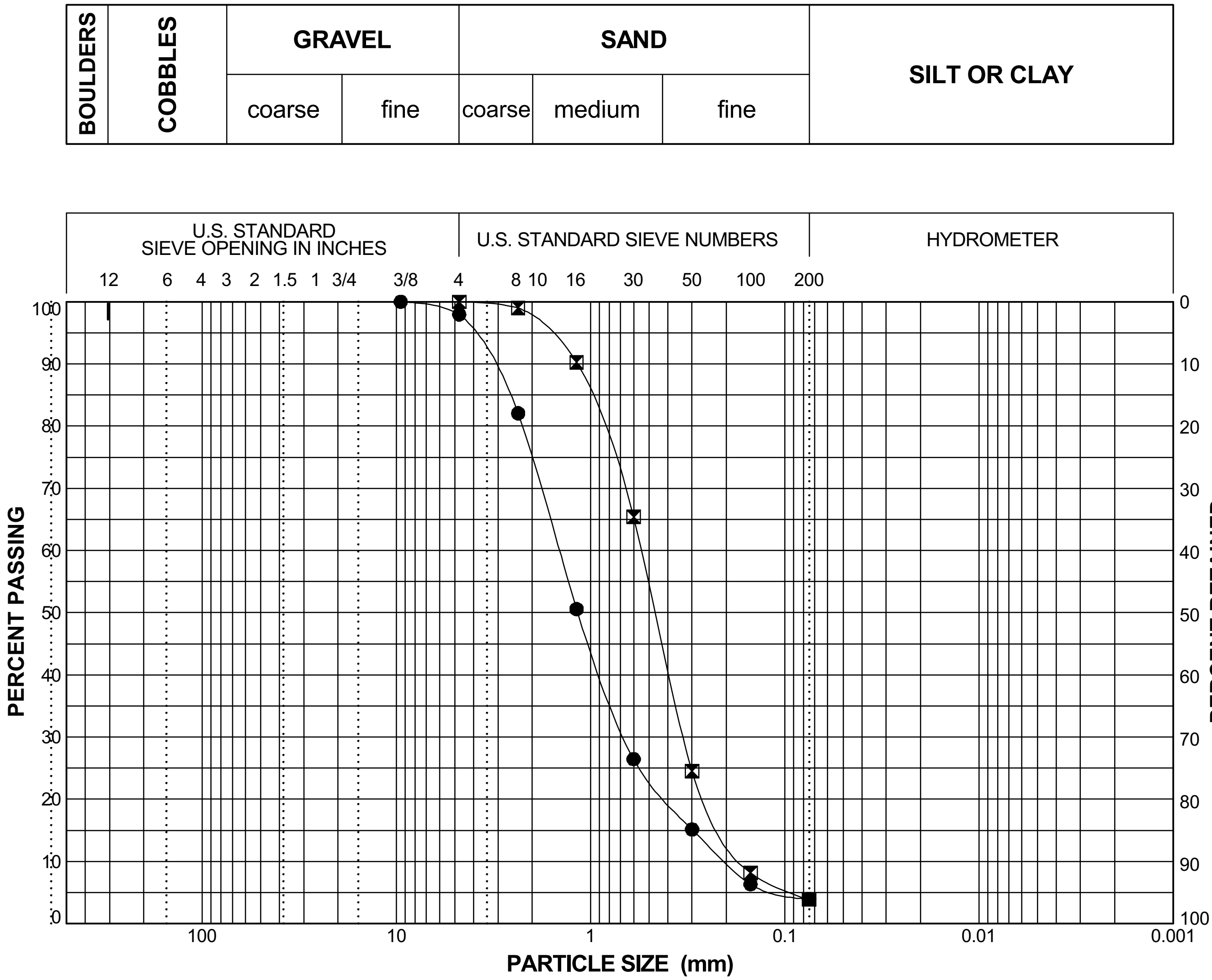


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_179B	15A	29	●	0.0	54.0	46.0	SILTY, CLAYEY SAND (SC-SM)
WR0017_179B	17A	32	⊠	0.0	58.9	41.1	SILTY SAND (SM)
WR0017_179B	19A	37	▲	0.0	37.7	62.3	SANDY LEAN CLAY (CL)
WR0017_179B	20A	39	★	0.0	83.5	16.5	SILTY SAND (SM)
WR0017_179B	22A	43.5	⊙	0.0	91.0	9.0	Well-Graded SAND with Silt (SW-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

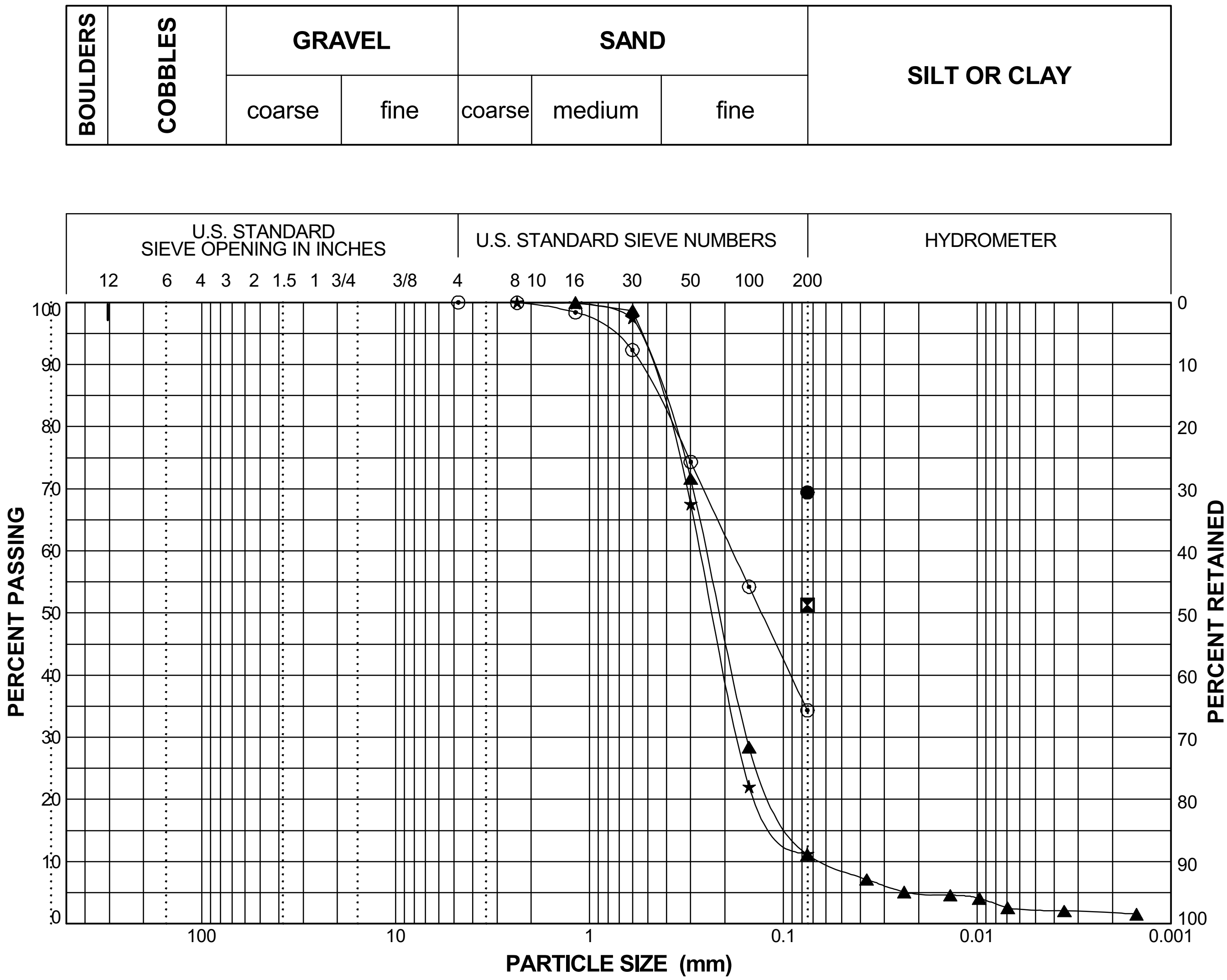


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_179B	23B	47.01	●	2.0	94.0	4.0	WELL-GRADED SAND (SW)
WR0017_179B	24A	49	⧗	0.0	96.1	3.9	POORLY GRADED SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

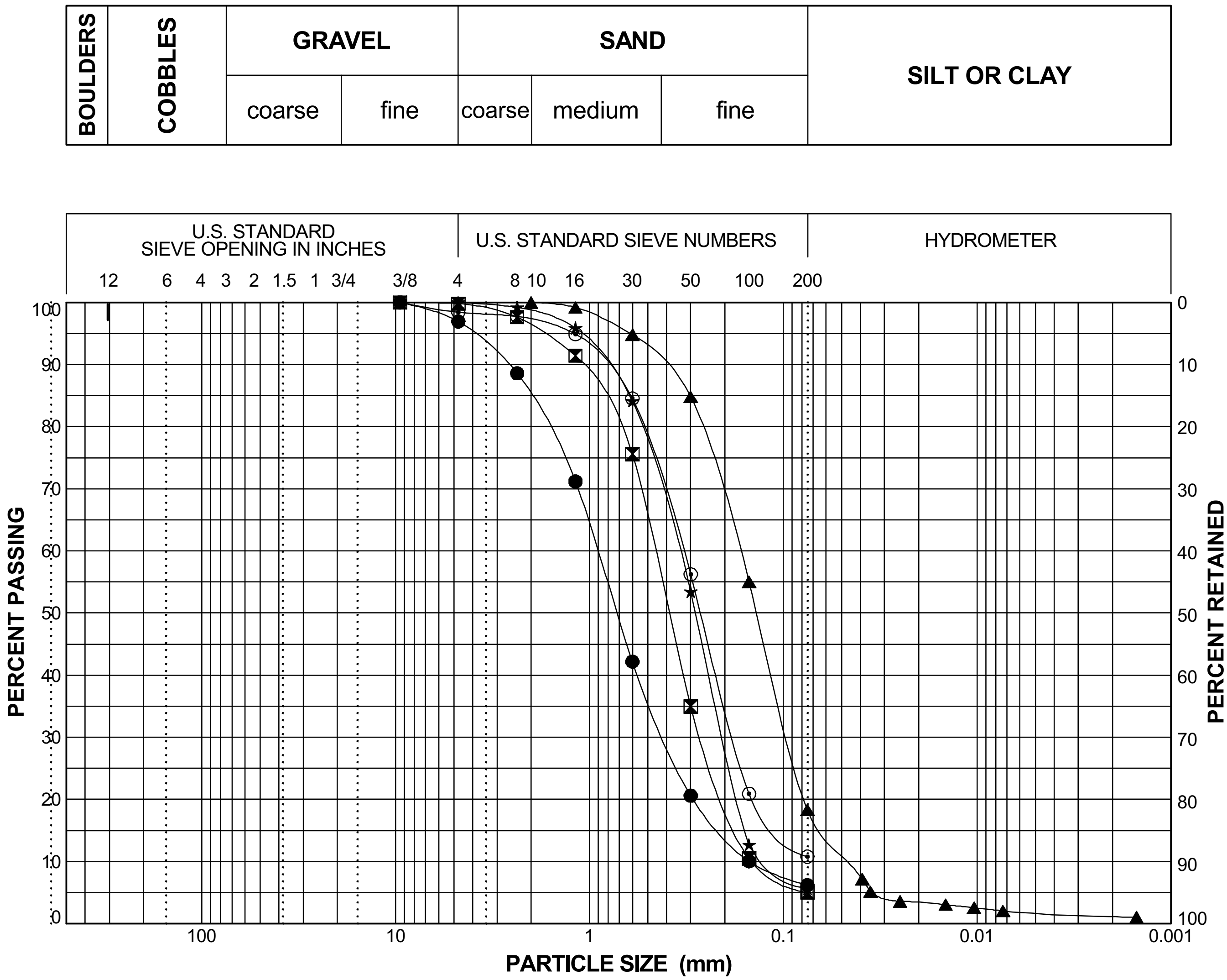


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_180B	2A	0.5	●	0.0	0.0	69.4	SANDY LEAN CLAY (CL)
WR0017_180B	6A	8.5	⊠	0.0	0.0	51.3	SANDY LEAN CLAY (CL)
WR0017_180B	9A	17	▲	0.0	88.9	11.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_180B	11A	22	★	0.0	88.8	11.2	Poorly Graded SAND with Silt (SP-SM)
WR0017_180B	12A	25.2	⊙	0.0	65.7	34.3	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

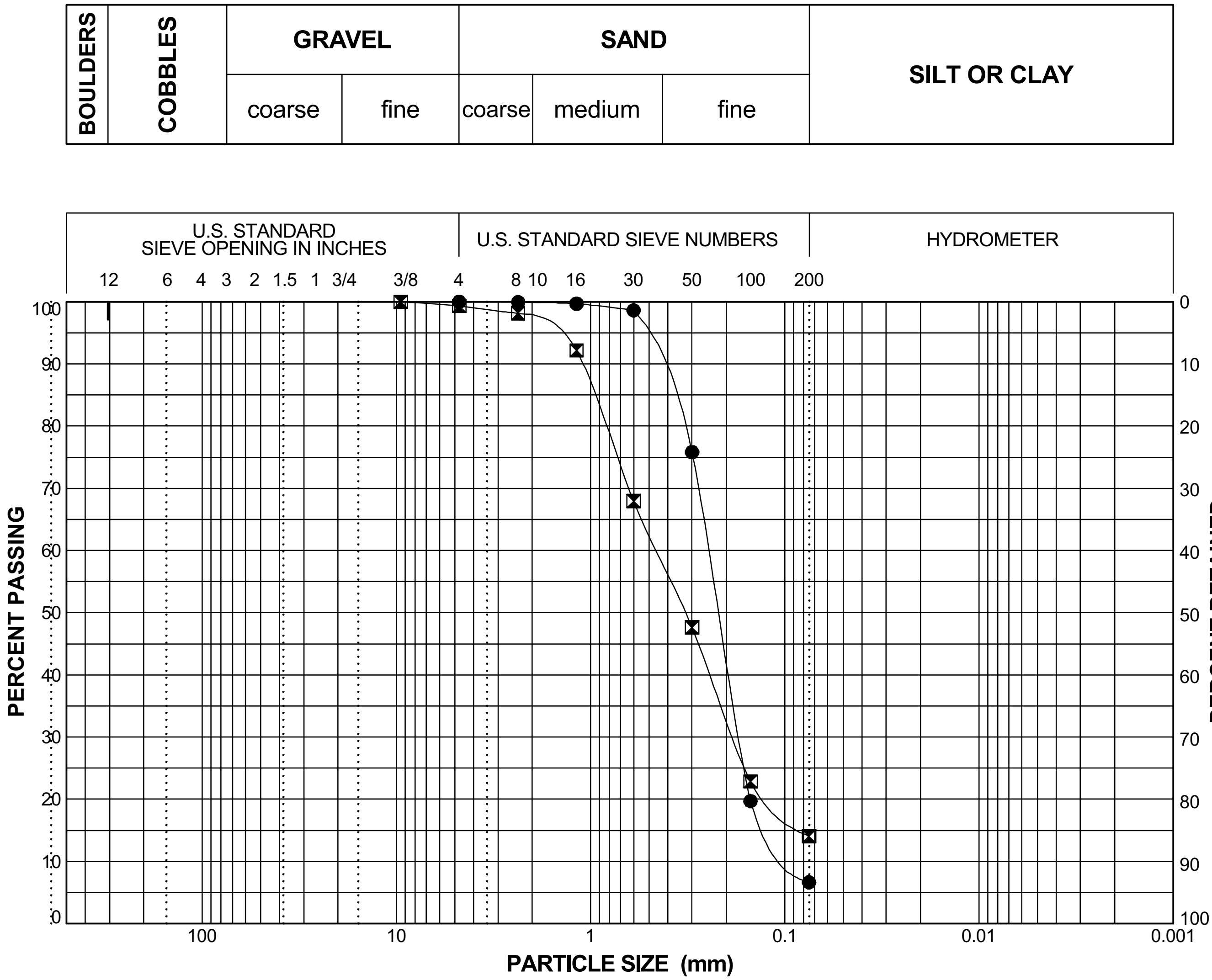


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_180B	13A	27	●	3.1	90.7	6.2	Well-Graded SAND with Silt (SW-SM)
WR0017_180B	15A	32	⊠	0.2	94.8	5.0	POORLY GRADED SAND (SP)
WR0017_180B	17A	37	▲	0.0	81.7	18.3	SILTY SAND (SM)
WR0017_180B	18A	42	★	0.0	94.4	5.6	Poorly Graded SAND with Silt (SP-SM)
WR0017_180B	19A	43.8	⊙	1.6	87.6	10.8	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

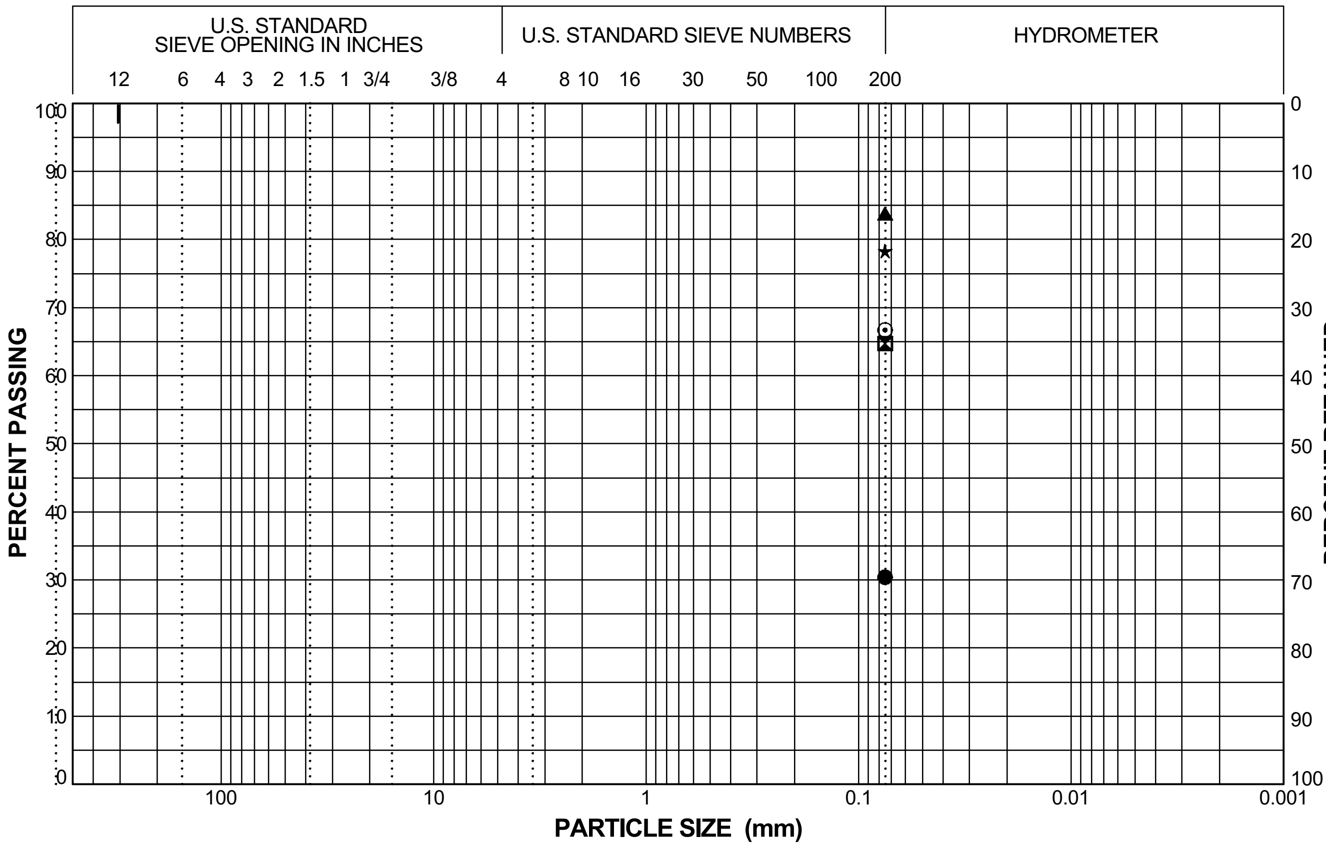
RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_180B	21A	52	●	0.0	93.4	6.6	Poorly Graded SAND with Silt (SP-SM)
WR0017_180B	23A	57	⧗	0.7	85.3	14.1	SILTY SAND (SM)

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

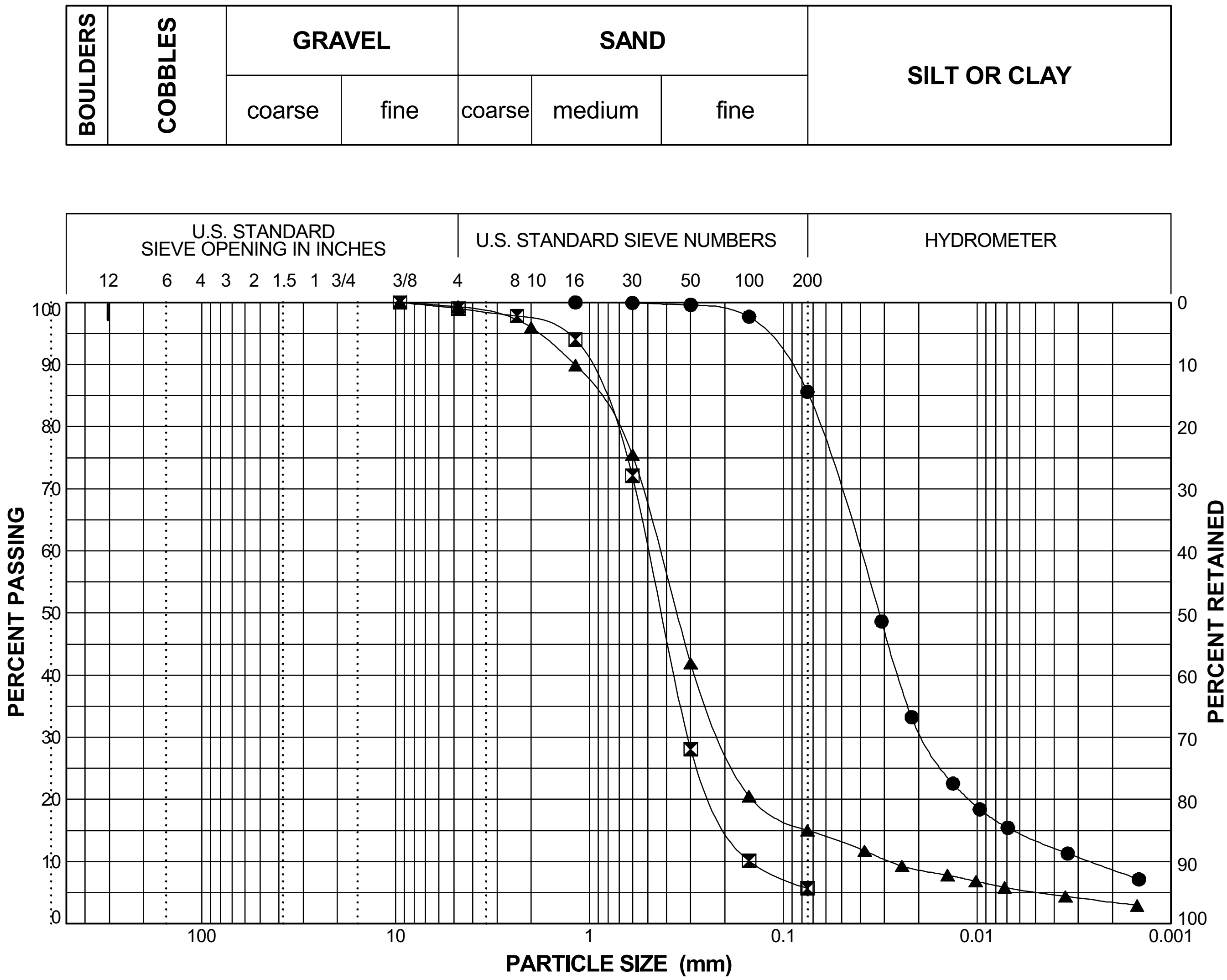


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_182B	1A	0	●	0.0	0.0	30.4	SILTY SAND (SM)
WR0017_182B	8A	12	⊠	0.0	0.0	64.7	SANDY SILTY CLAY (CL-ML)
WR0017_182B	10A	17	▲	0.0	0.0	83.8	LEAN CLAY with SAND (CL)
WR0017_182B	12A	22	★	0.0	0.0	78.3	LEAN CLAY with SAND (CL)
WR0017_182B	14A	27	⊙	0.0	0.0	66.7	SANDY SILT (ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

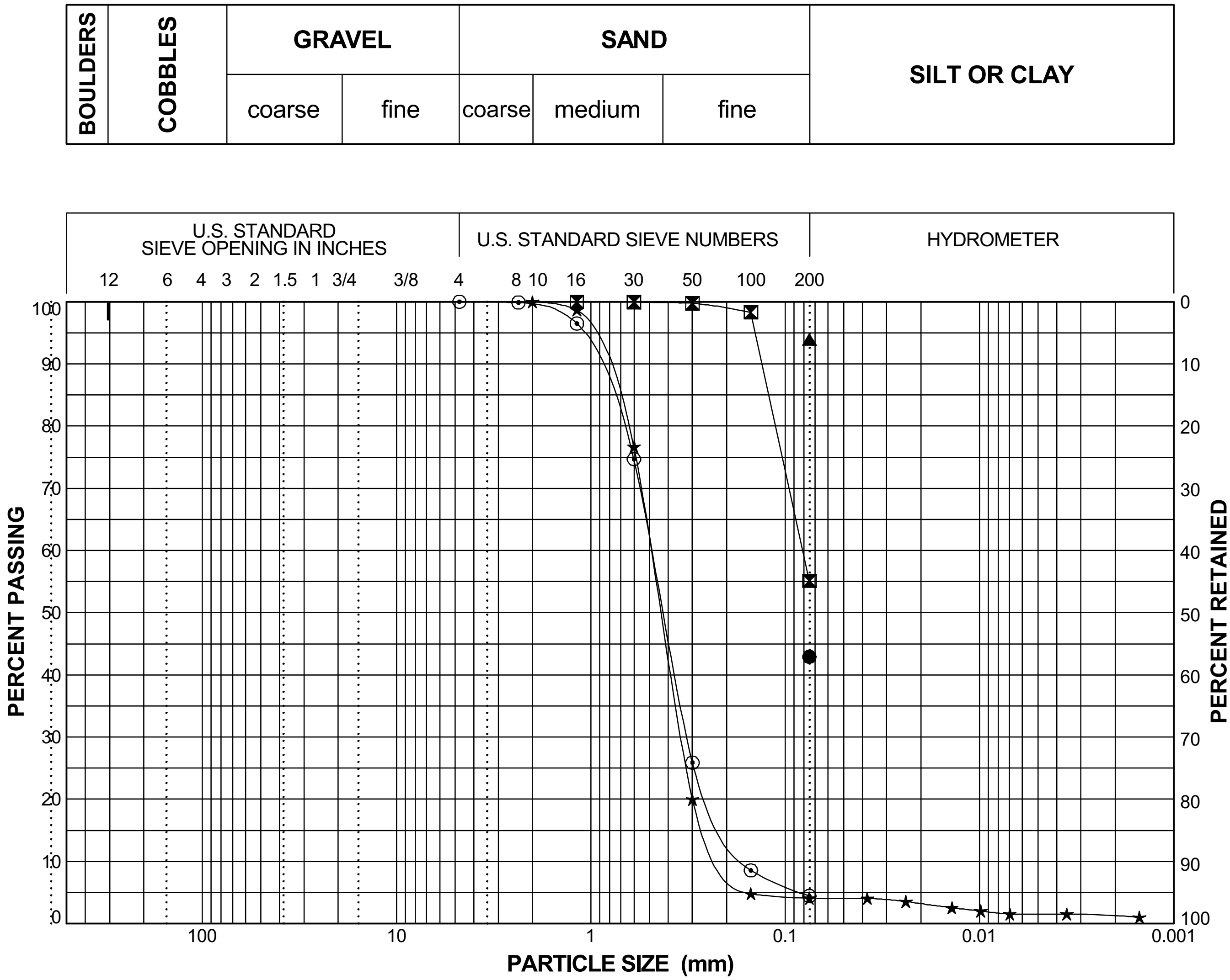


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_182B	16A	32	●	0.0	14.4	85.6	SILT (ML)
WR0017_182B	17A	37	⊠	1.0	93.3	5.7	Poorly Graded SAND with Silt (SP-SM)
WR0017_182B	20A	44.8	▲	0.7	84.3	15.0	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

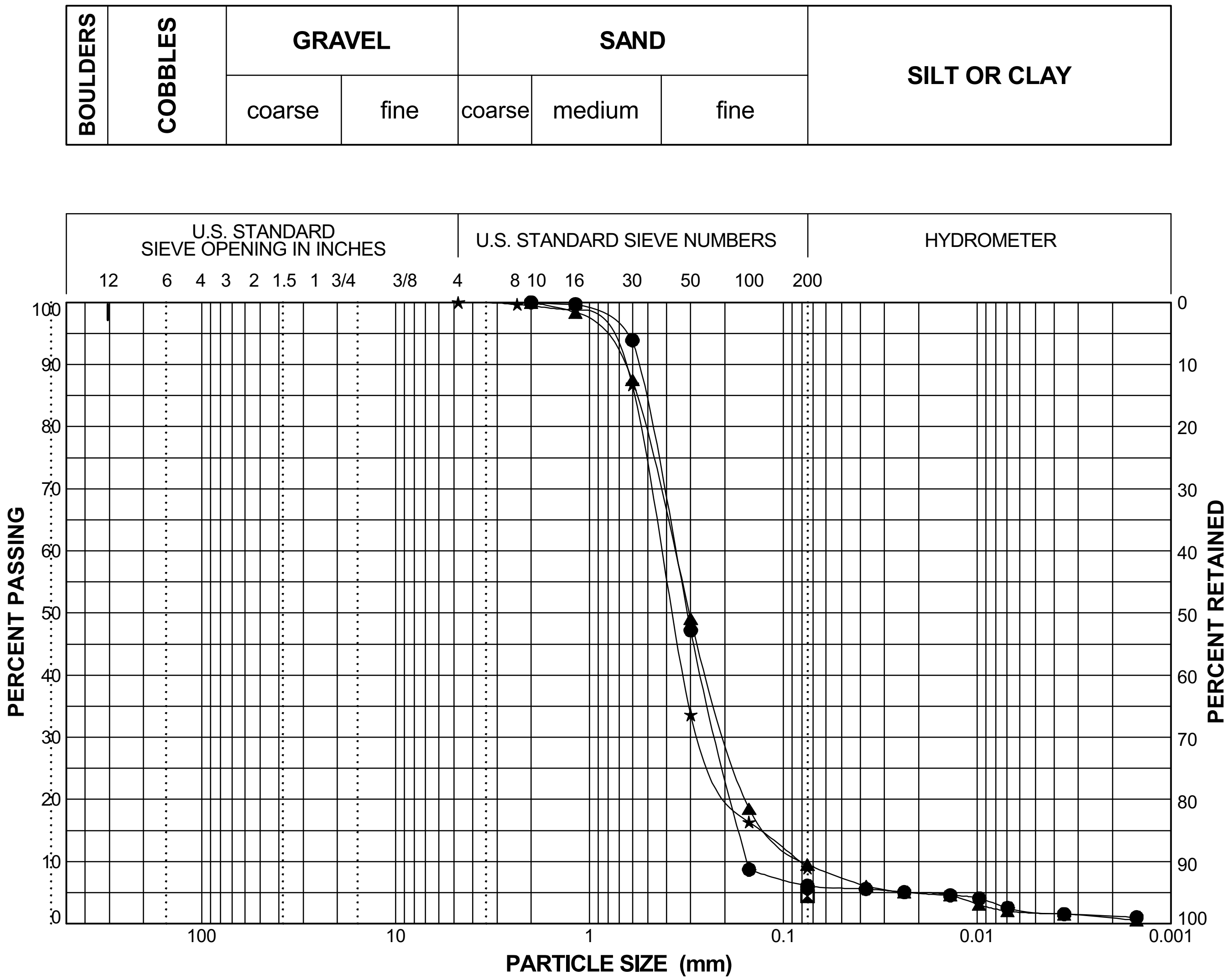


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_187B	1A	0	●	0.0	0.0	42.9	CLAYEY SAND (SC)
WR0017_187B	2A	1.9	⧗	0.0	44.9	55.1	SANDY SILT (ML)
WR0017_187B	3A	2.5	▲	0.0	0.0	93.9	LEAN CLAY (CL)
WR0017_187B	5A	7.5	★	0.0	95.9	4.1	POORLY GRADED SAND (SP)
WR0017_187B	9A	15	⊙	0.0	95.6	4.4	POORLY GRADED SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

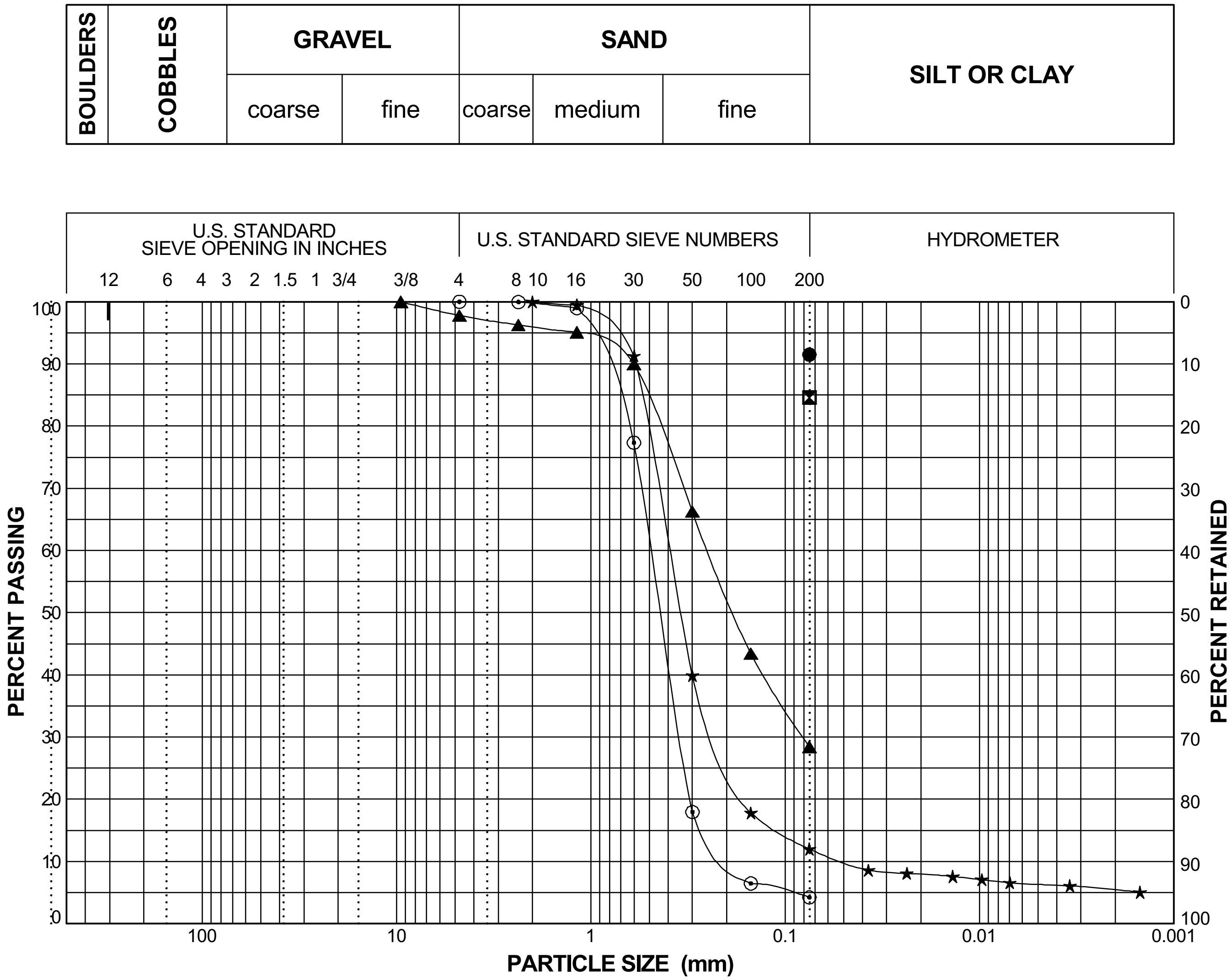


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_187B	14A	24.51	●	0.0	93.9	6.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_187B	15A	28	⊠	0.0	0.0	4.4	Poorly Graded SAND (SP)
WR0017_187B	18A	38	▲	0.0	90.5	9.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_187B	21A	44.51	★	0.0	91.0	9.0	Poorly Graded SAND with Silt (SP-SM)
WR0017_187B	23A	53	⊙	0.0	0.0	5.7	Poorly Graded SAND with Silt (SP-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

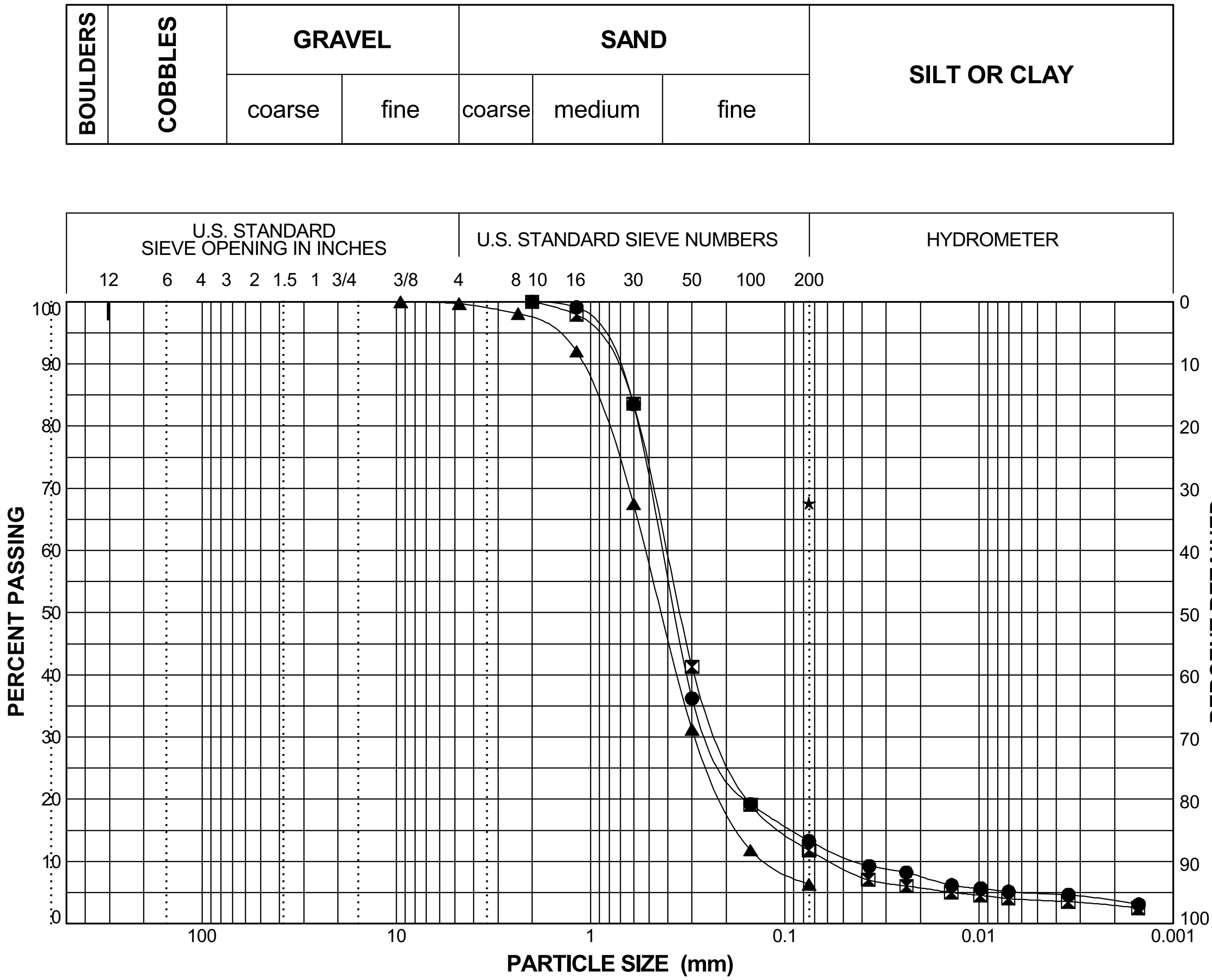


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_188B	2B	1.3	●	0.0	0.0	91.5	LEAN CLAY (CL)
WR0017_188B	3A	2.5	⊠	0.0	0.0	84.6	LEAN CLAY with SAND (CL)
WR0017_188B	6A	12	▲	2.2	69.4	28.4	SILTY, CLAYEY SAND (SC-SM)
WR0017_188B	8A	15	★	0.0	88.0	12.0	Well-Graded SAND with Silt (SW-SM)
WR0017_188B	13A	25.5	⊙	0.0	95.8	4.2	POORLY GRADED SAND (SP)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



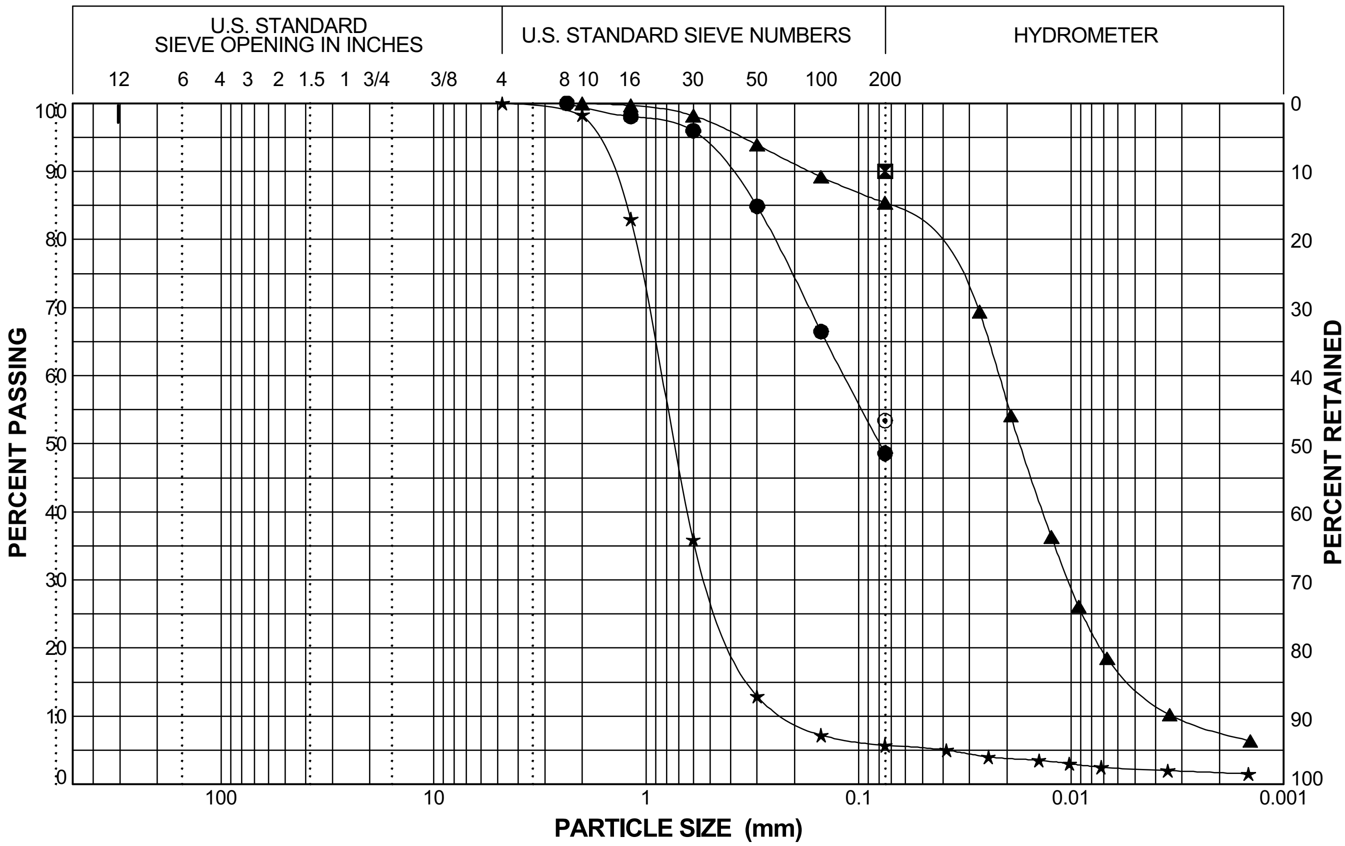
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_188B	15A	29.8	●	0.0	86.7	13.3	SILTY SAND (SM)
WR0017_188B	18A	39.51	⧗	0.0	88.2	11.8	Well-Graded SAND with Silt (SW-SM)
WR0017_188B	23A	53	▲	0.3	93.4	6.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_188B	25A	59.51	★	0.0	0.0	67.6	SANDY SILT (ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

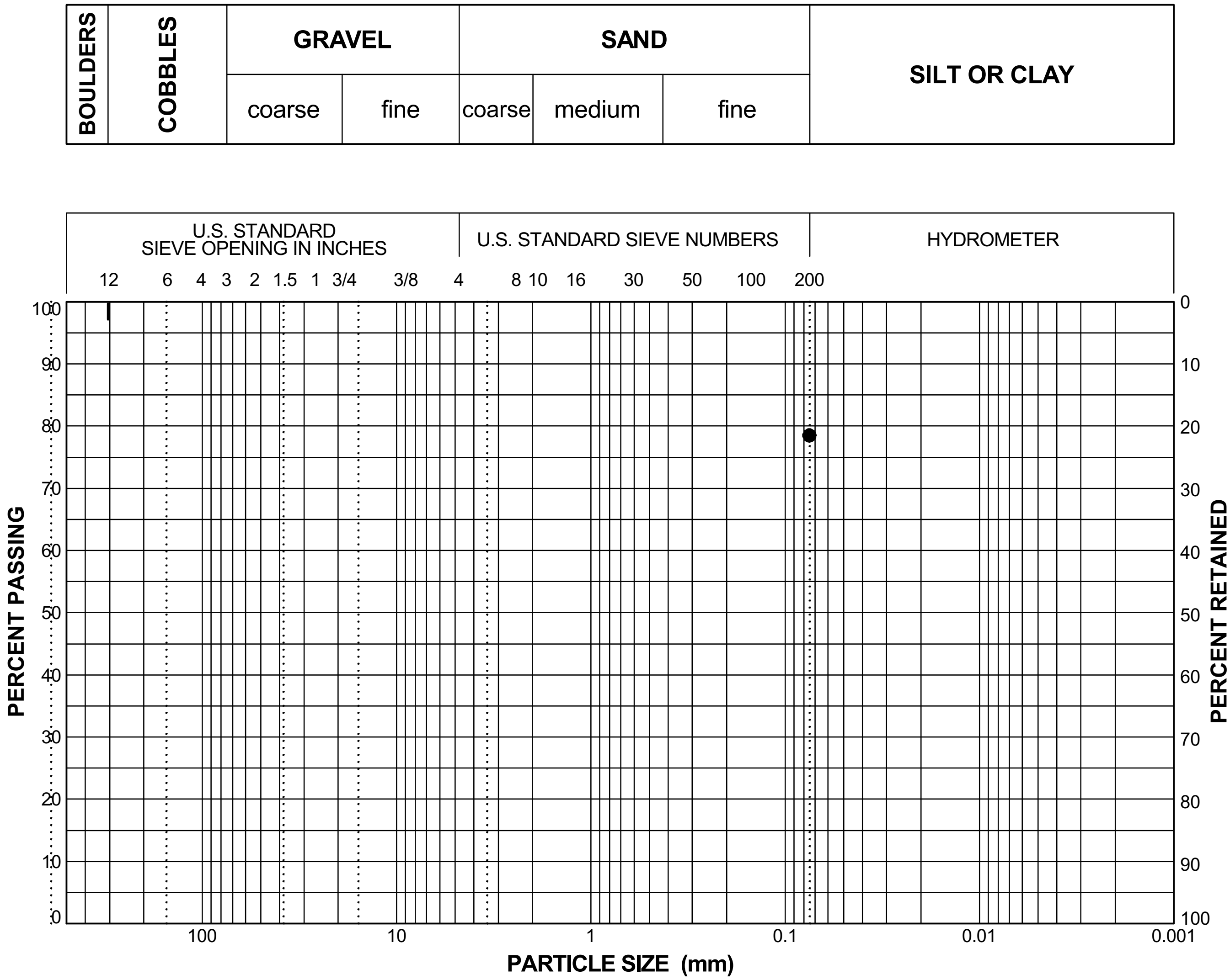


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_193B	5A	7.5	●	0.0	51.4	48.6	SILTY, CLAYEY SAND (SC-SM)
WR0017_193B	7A	12	⊠	0.0	0.0	90.0	LEAN CLAY (CL)
WR0017_193B	8A	15.01	▲	0.0	14.6	85.4	LEAN CLAY with Sand (CL)
WR0017_193B	10A	18.5	★	0.0	94.3	5.7	Poorly Graded SAND with Silt (SP-SM)
WR0017_193B	18A	35	⊙	0.0	0.0	53.4	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

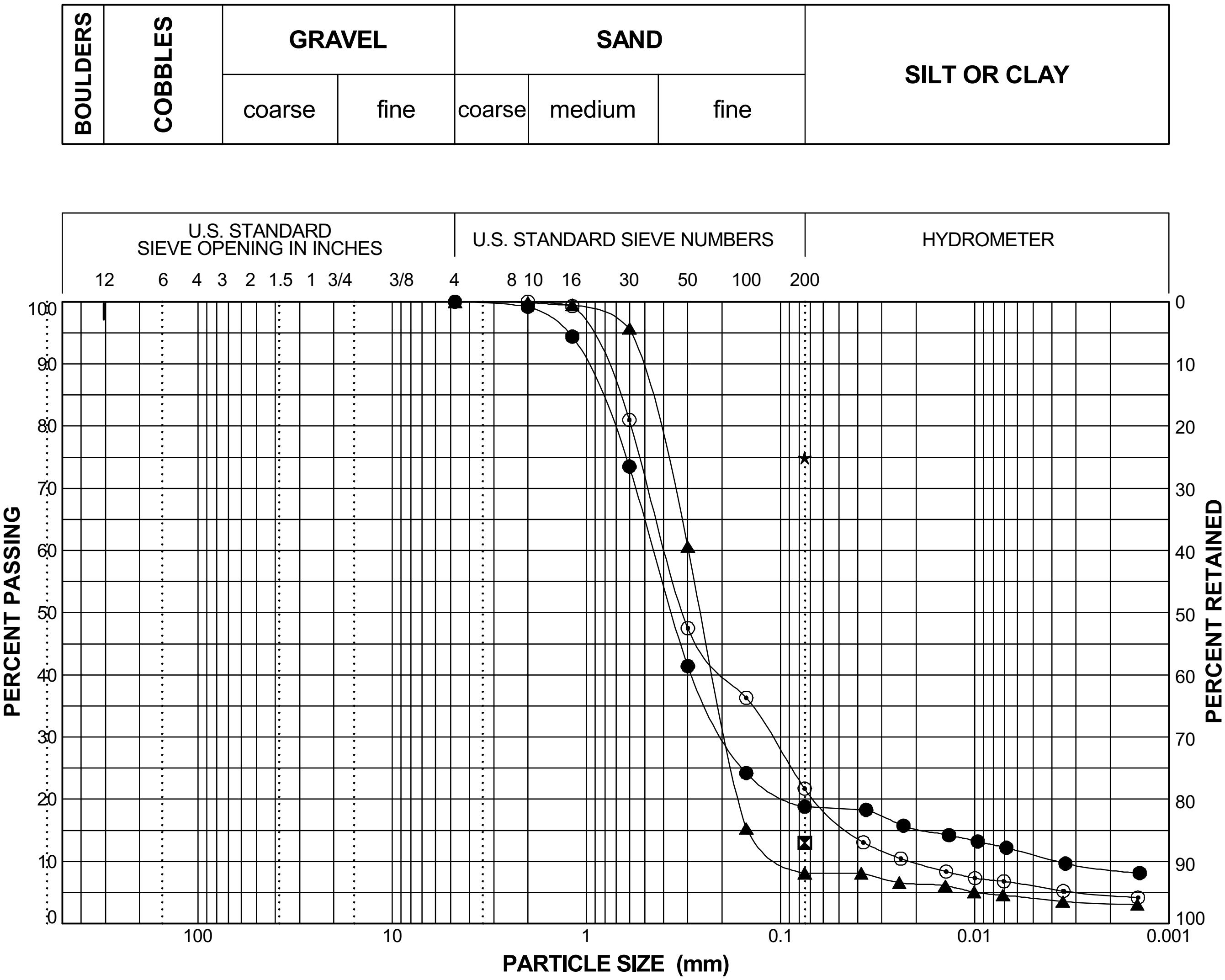


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_193B	20A	40.6	●	0.0	0.0	78.5	LEAN CLAY with SAND (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

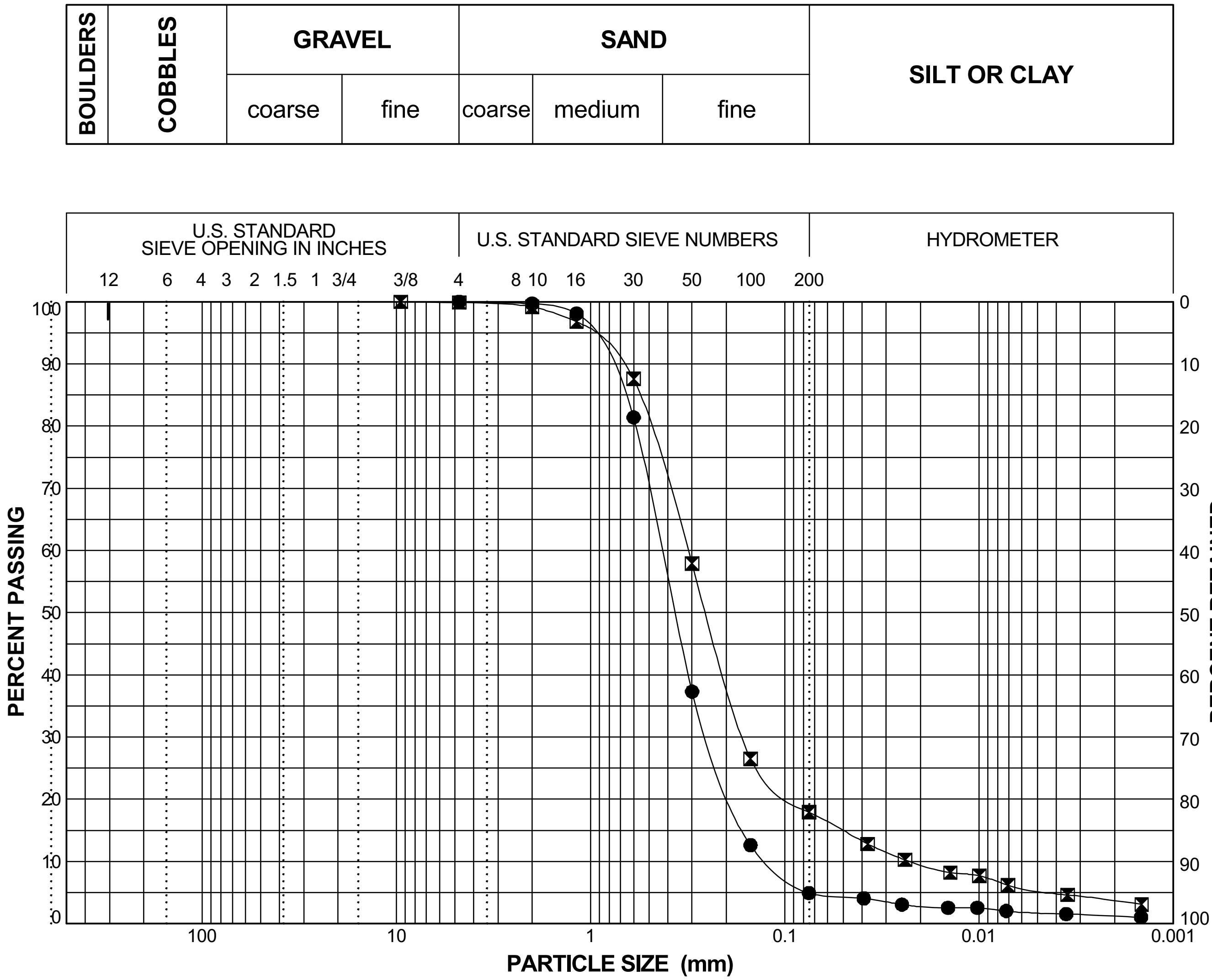


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_196B	1A	0.5	●	0.0	81.2	18.8	CLAYEY SAND (SC)
WR0017_196B	4A	5	⊠	0.0	0.0	13.0	SILTY SAND (SM)
WR0017_196B	5A	7	▲	0.0	91.9	8.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_196B	9A	15	★	0.0	0.0	74.9	LEAN CLAY with SAND (CL)
WR0017_196B	10A	18.5	⊙	0.0	78.3	21.7	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

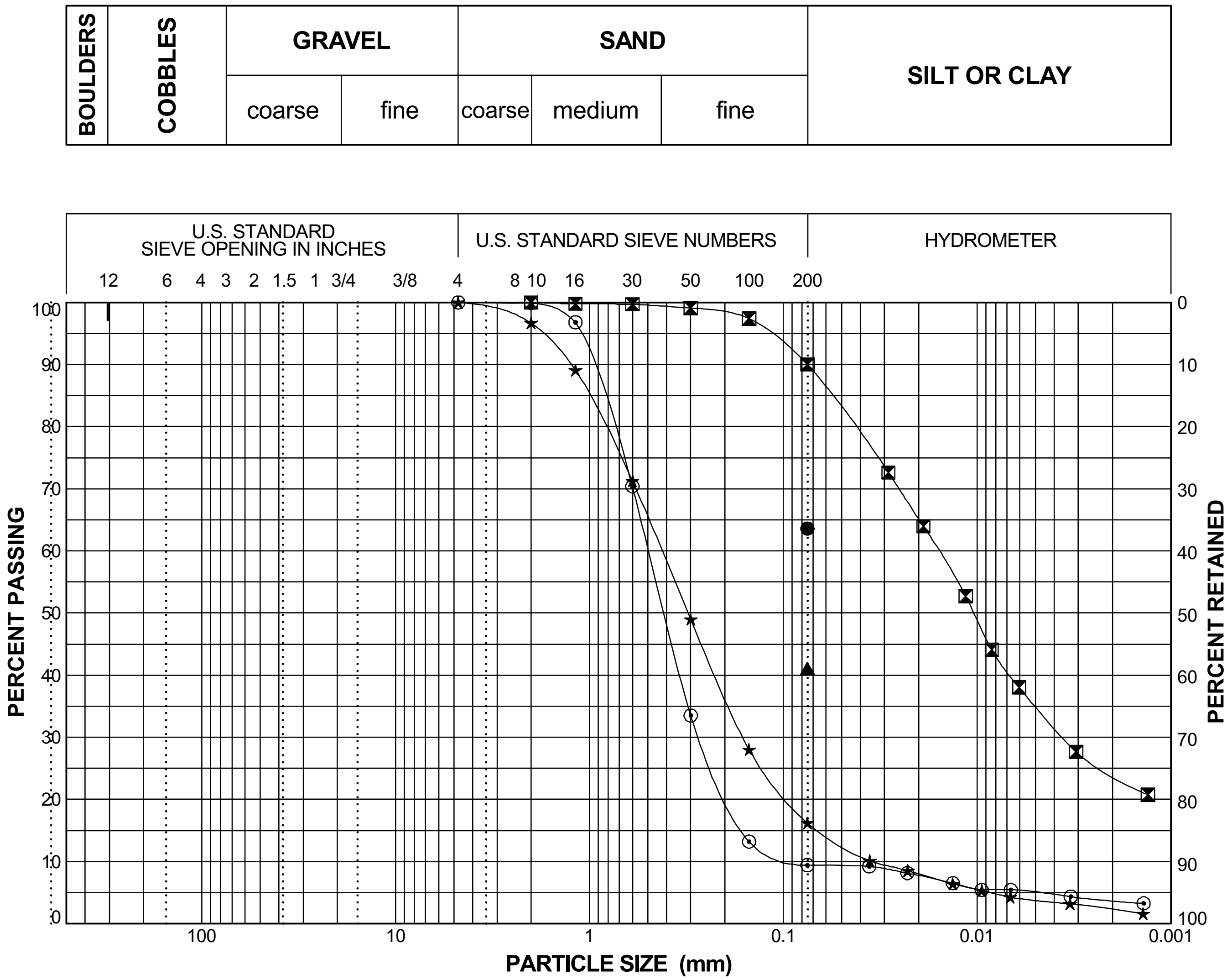


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_196B	15A	30	●	0.0	95.1	4.9	POORLY GRADED SAND (SP)
WR0017_196B	20A	41.51	⧗	0.1	82.0	17.9	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

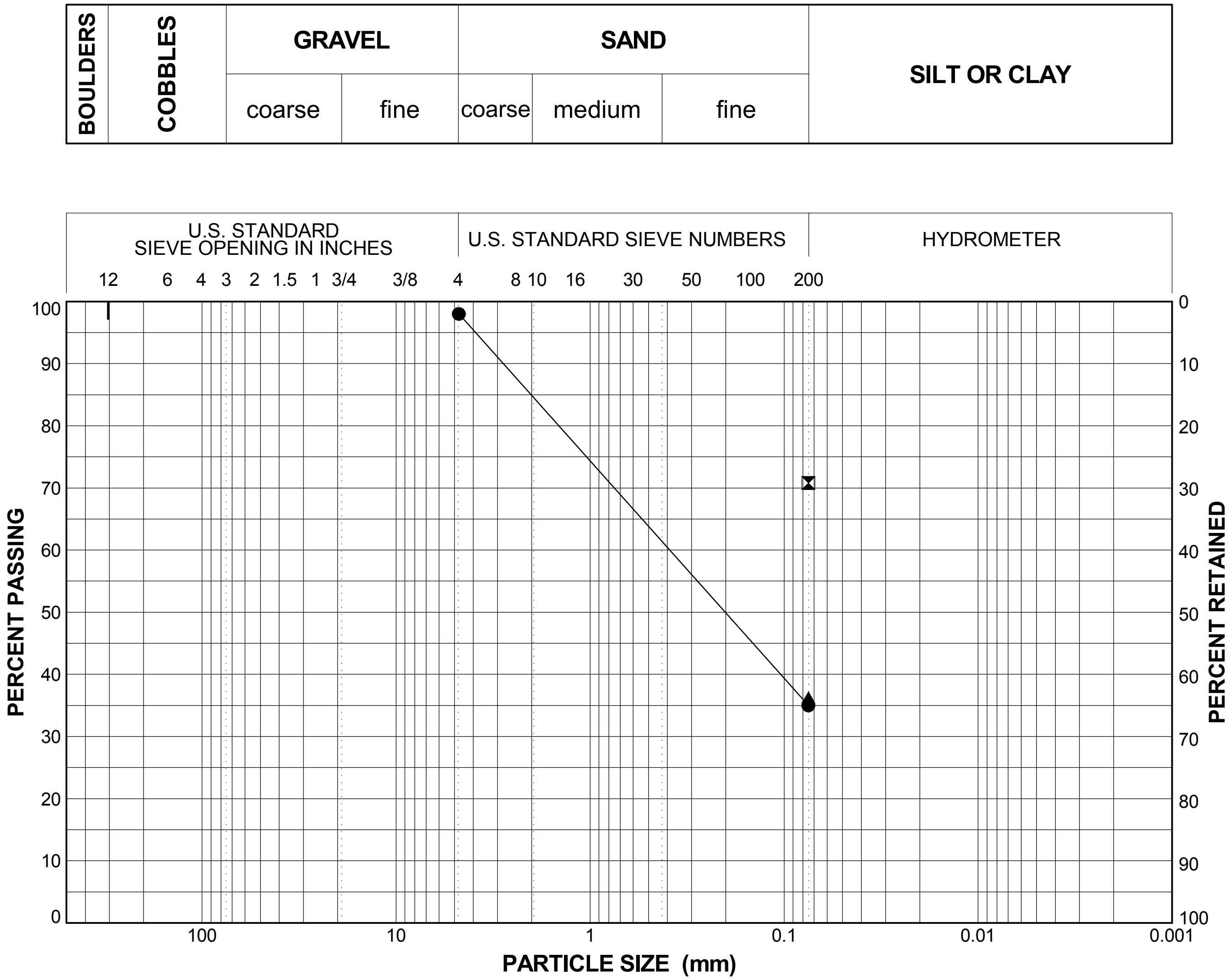


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_200B	2A	2	●	0.0	0.0	63.6	SANDY SILT (ML)
WR0017_200B	6A	5.8	⌧	0.0	10.0	90.0	LEAN CLAY (CL)
WR0017_200B	9B	10.01	▲	0.0	0.0	41.1	SILTY SAND (SM)
WR0017_200B	12A	26.51	★	0.0	83.8	16.2	SILTY SAND (SM)
WR0017_200B	15A	35	⊙	0.0	90.6	9.4	Poorly Graded SAND with Silt (SP-SM)

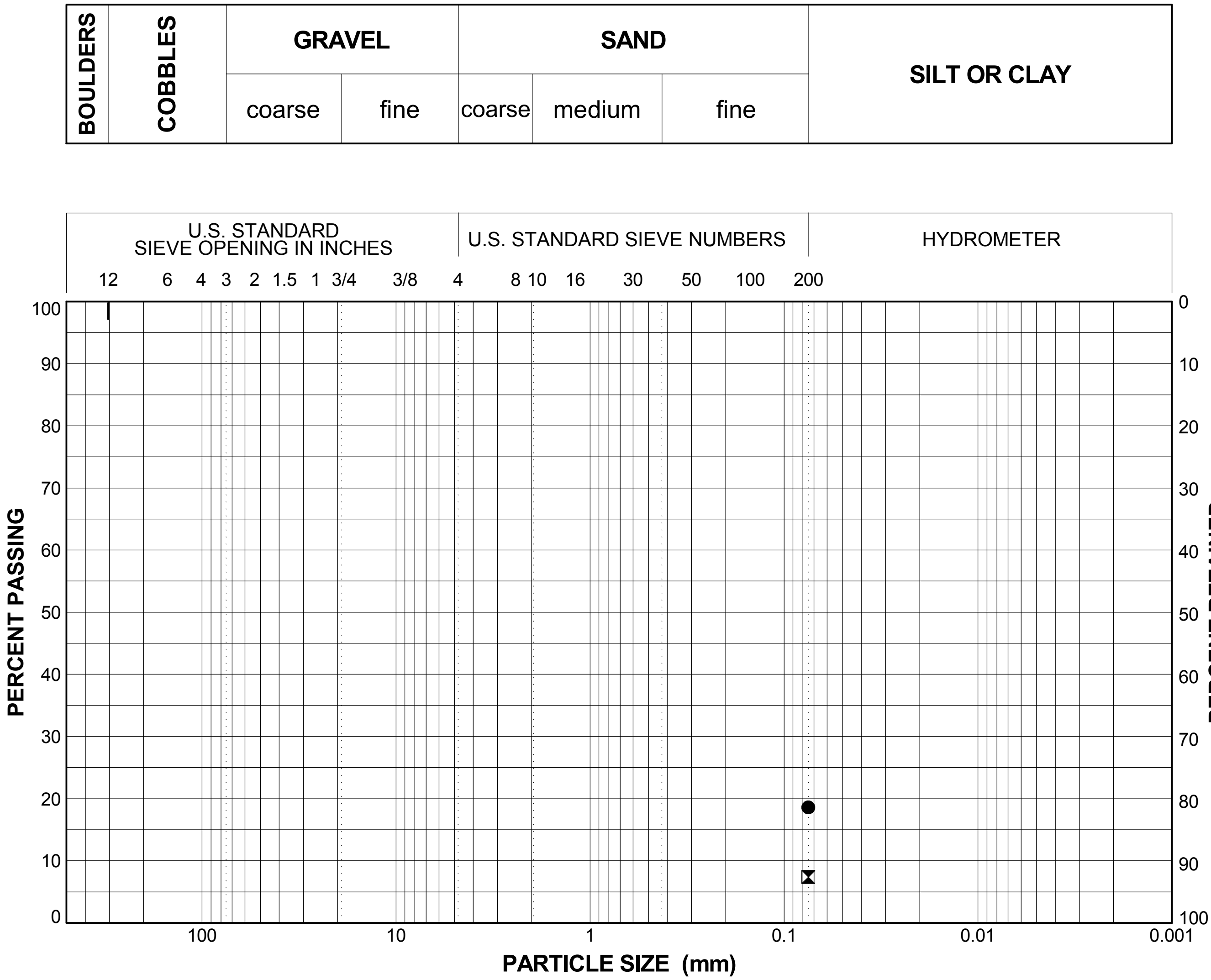
Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

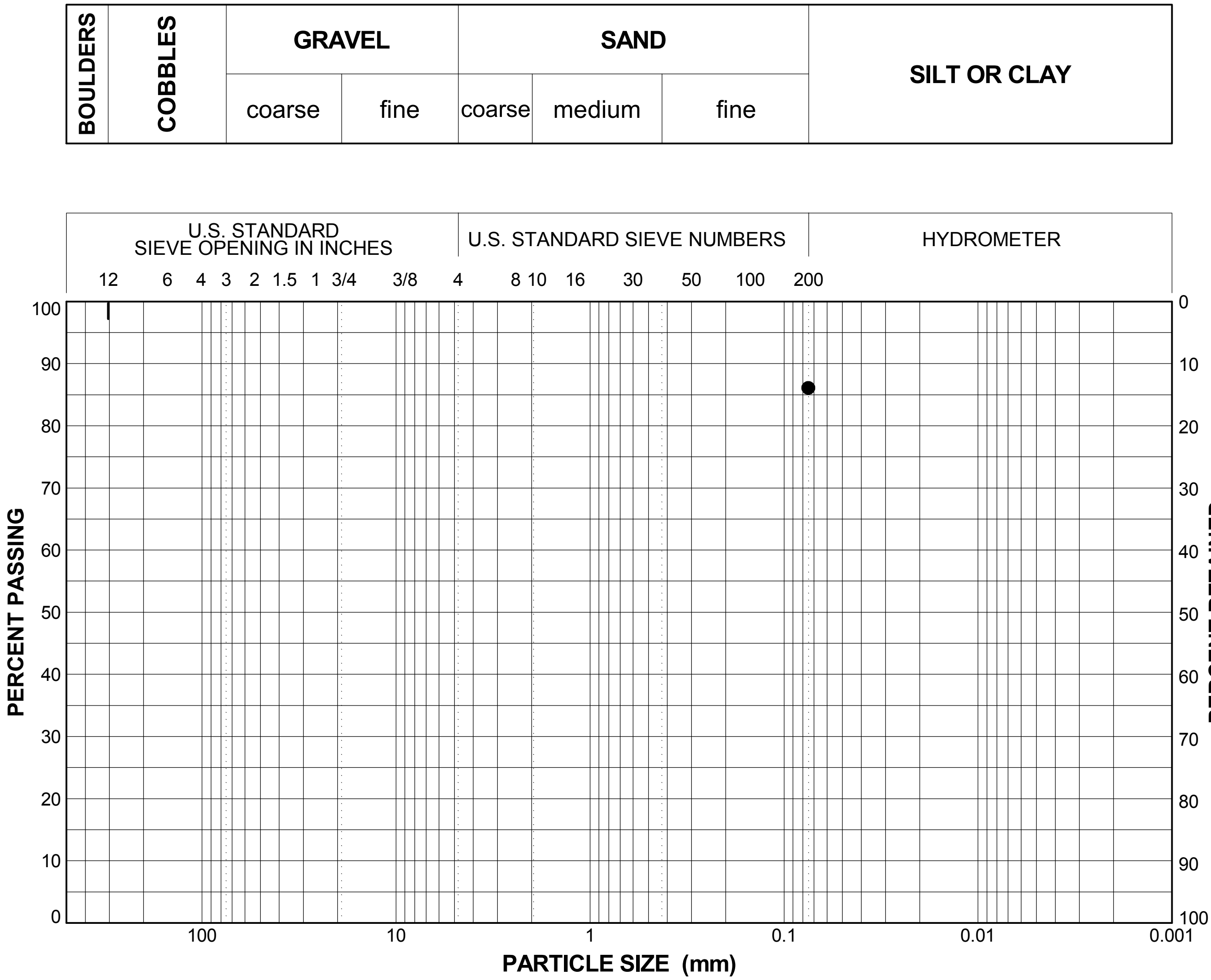
PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_205B	S04A_012_014S	13	●	0.0	63.0	35.0	SILTY SAND (SM)
WR0017_205B	S05A_015_017C	15	⧗	0.0	0.0	70.8	LEAN CLAY with SAND (CL)
WR0017_205B	S05A_015_017C	16	▲	0.0	0.0	36.3	SANDY LEAN CLAY (CL)



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_206B	S10A_031_033S	31	●	0.0	0.0	18.6	SILTY SAND (SM)
WR0017_206B	S13A_039_040S	38.5	⧗	0.0	0.0	7.4	Well-Graded SAND with Silt (SW-SM)

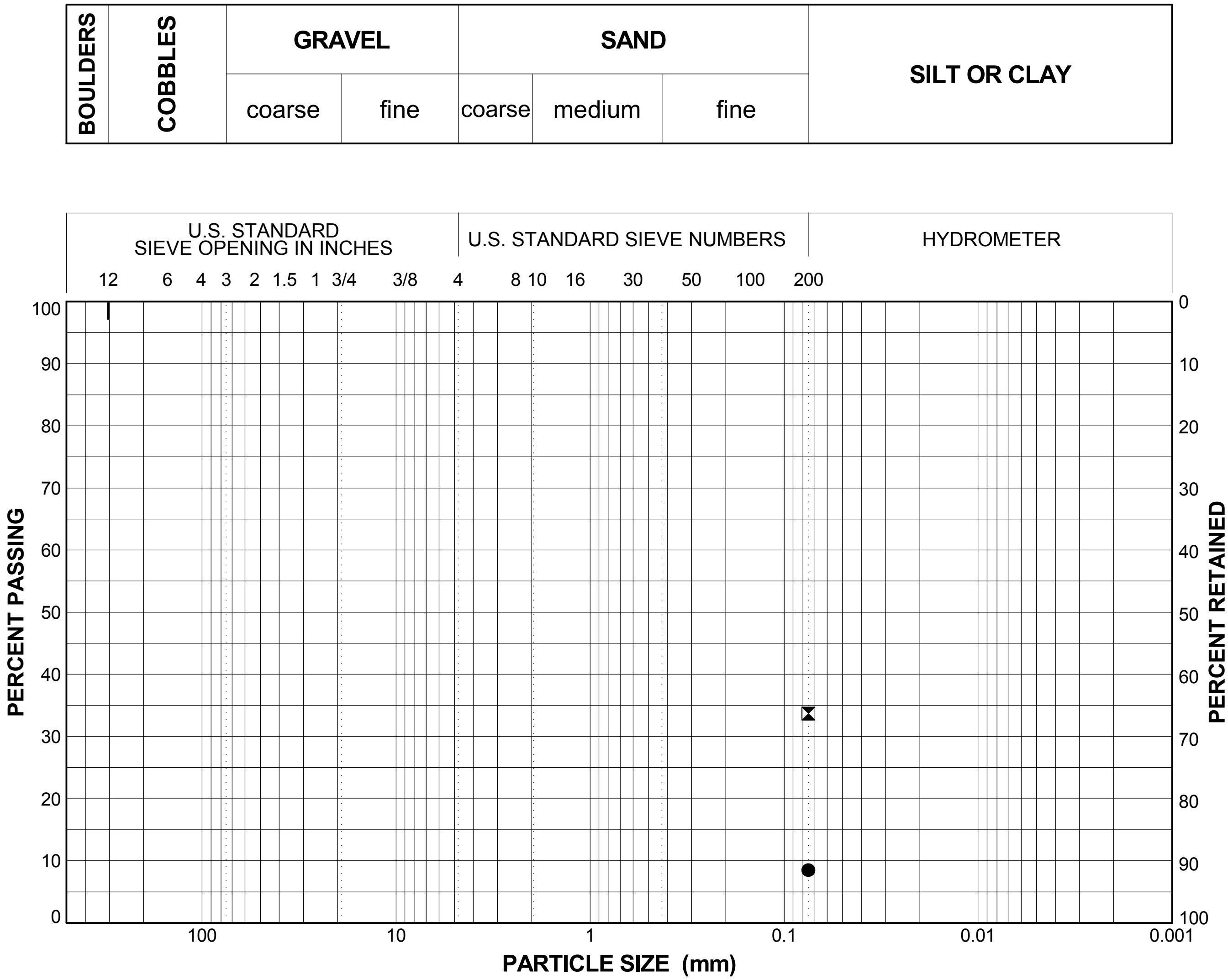


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_207B	S10A_026_029T	27	●	0.0	0.0	86.1	LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

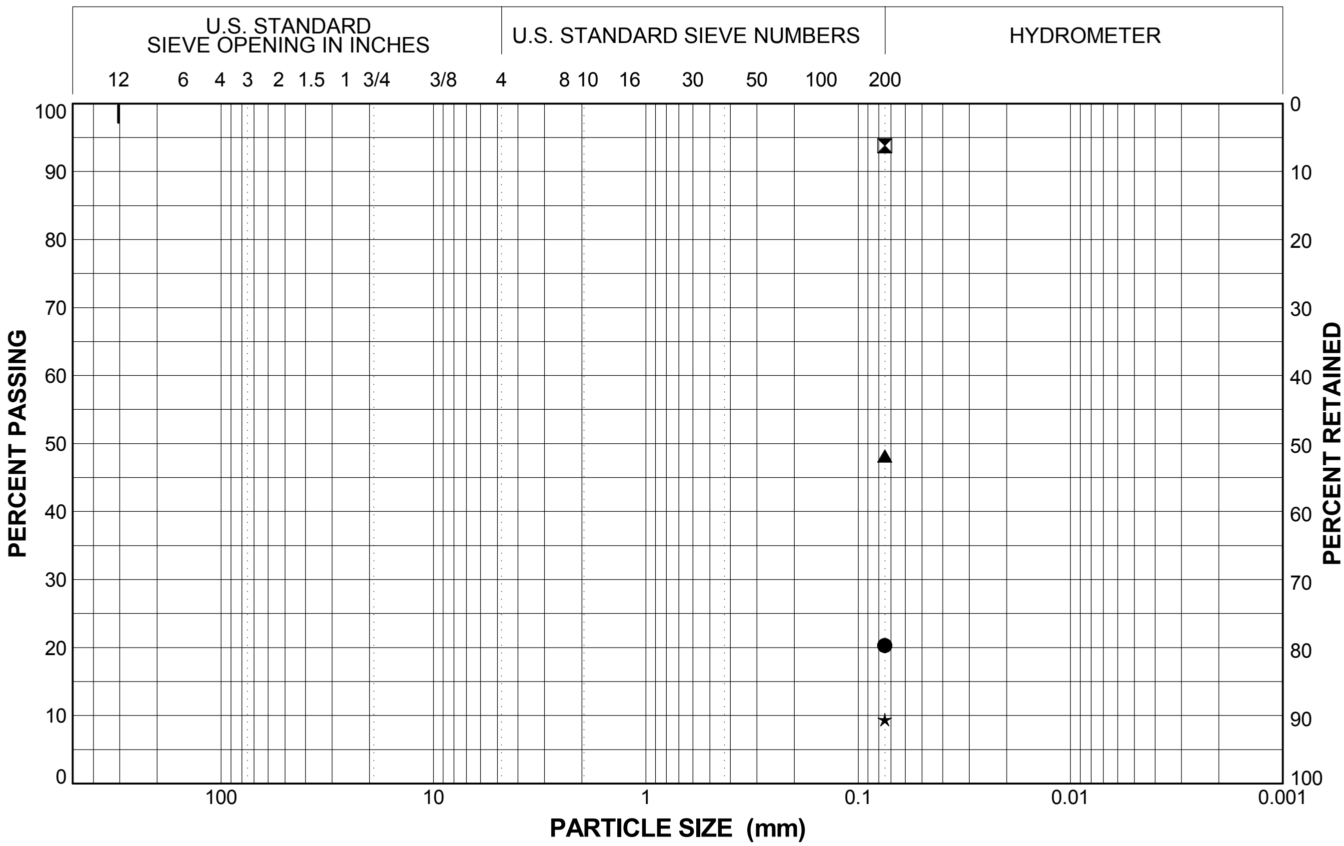
RD 17

PARTICLE SIZE DISTRIBUTION CURVES

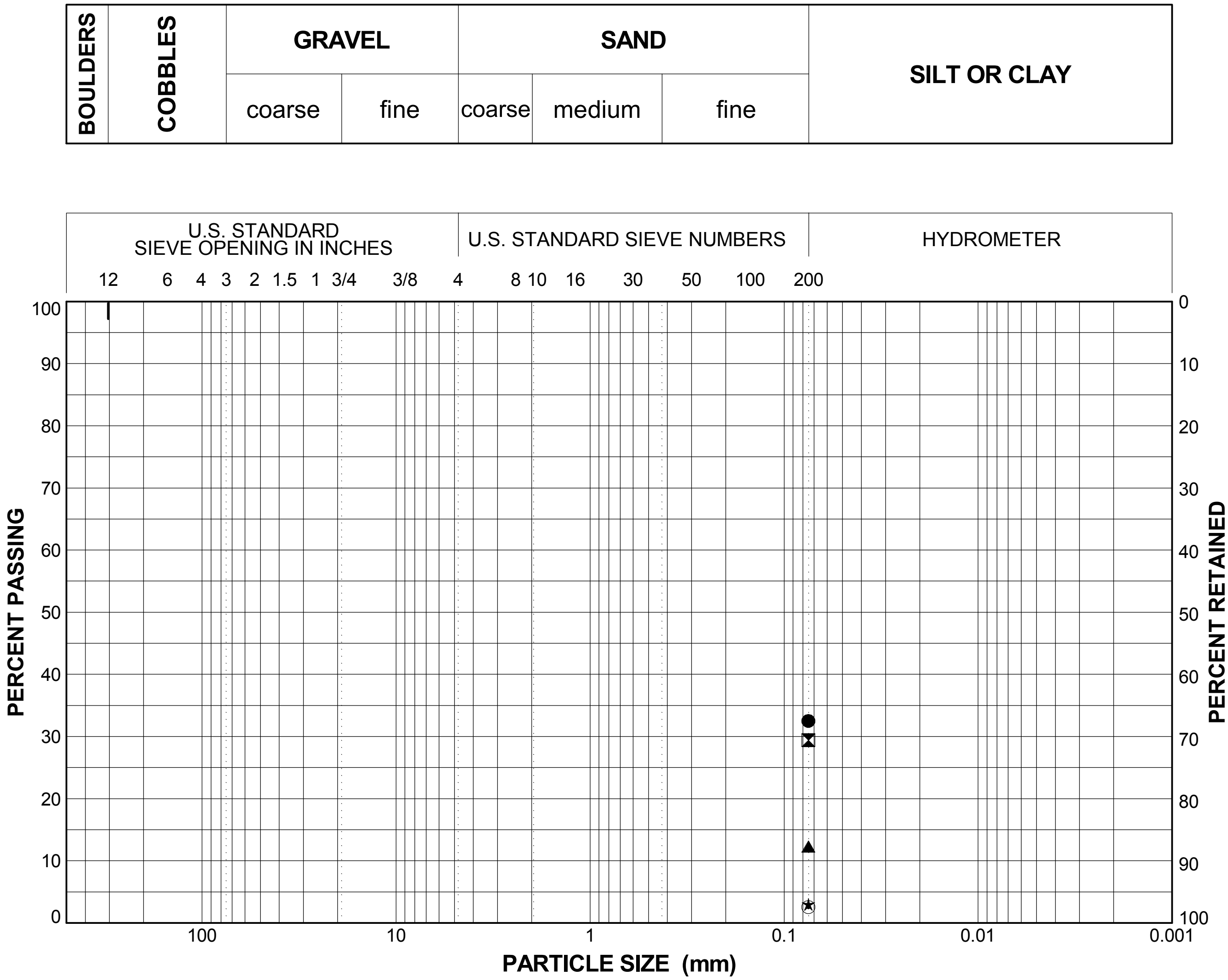


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_208B	S03A_008_010C	9	●	0.0	0.0	8.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_208B	S06A_018_019T	17.5	⧗	0.0	0.0	33.7	SILTY SAND (SM)

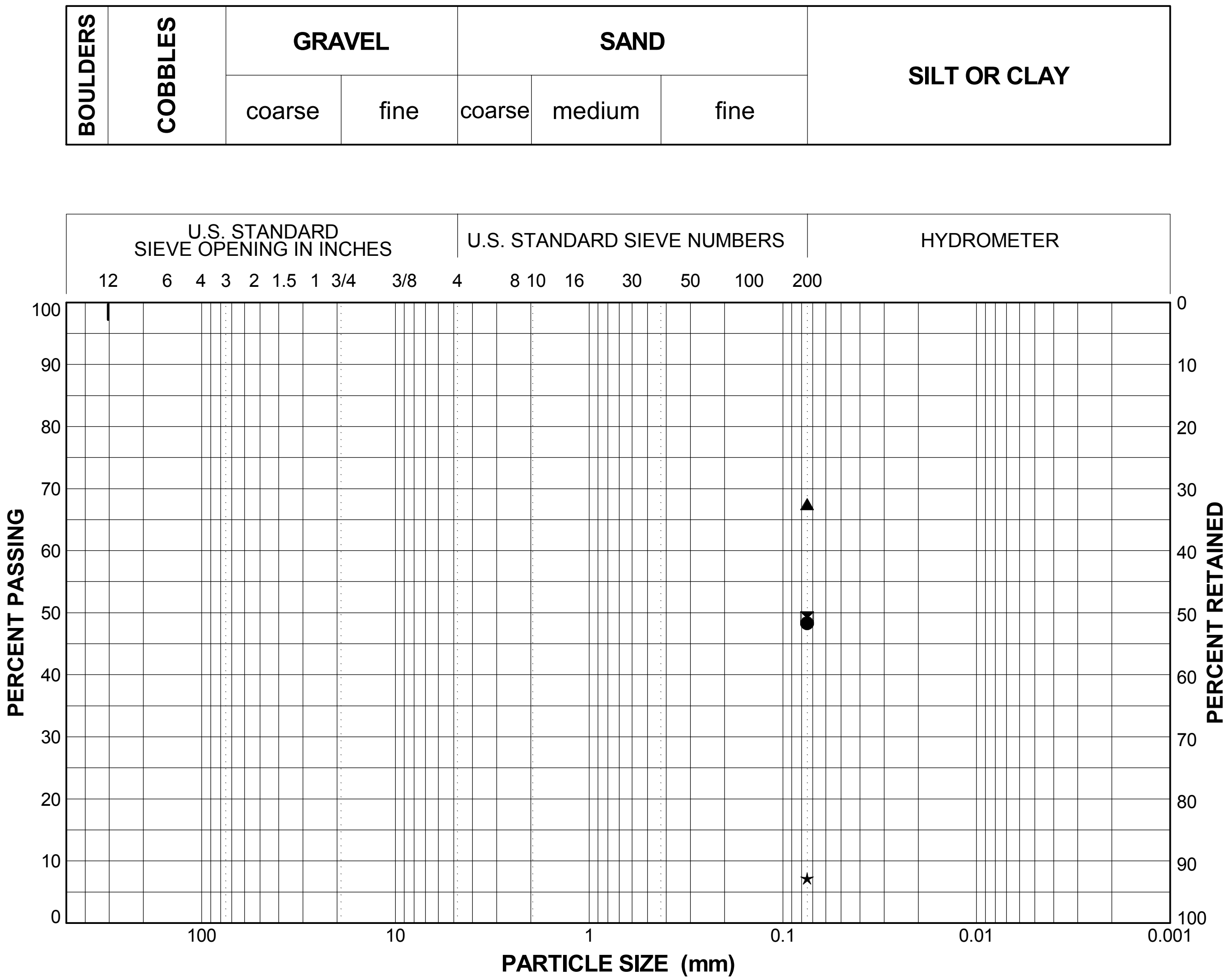
BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_209B	S02A_007_008C	7	●	0.0	0.0	20.3	SILTY SAND (SM)
WR0017_209B	S08A_025_027T	25.5	⧗	0.0	0.0	93.8	SILT (ML)
WR0017_209B	S09A_028_030T	29.05	▲	0.0	0.0	48.2	SILTY SAND (SM)
WR0017_209B	S17A_051_052C	51	★	0.0	0.0	9.4	Poorly Graded SAND with Silt (SP-SM)



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_210B	S08A_023_025S	23	●	0.0	0.0	32.5	SILTY SAND (SM)
WR0017_210B	S12A_034_037T	35.5	⧗	0.0	0.0	29.4	SILTY SAND (SM)
WR0017_210B	S13A_037_040T	37	▲	0.0	0.0	12.3	SILTY SAND (SM)
WR0017_210B	S20A_058_061T	60	★	0.0	0.0	3.0	Well-Graded SAND (GW)
WR0017_210B	S20A_058_061T	60.3	☉	0.0	0.0	2.6	Well-Graded SAND (GW)

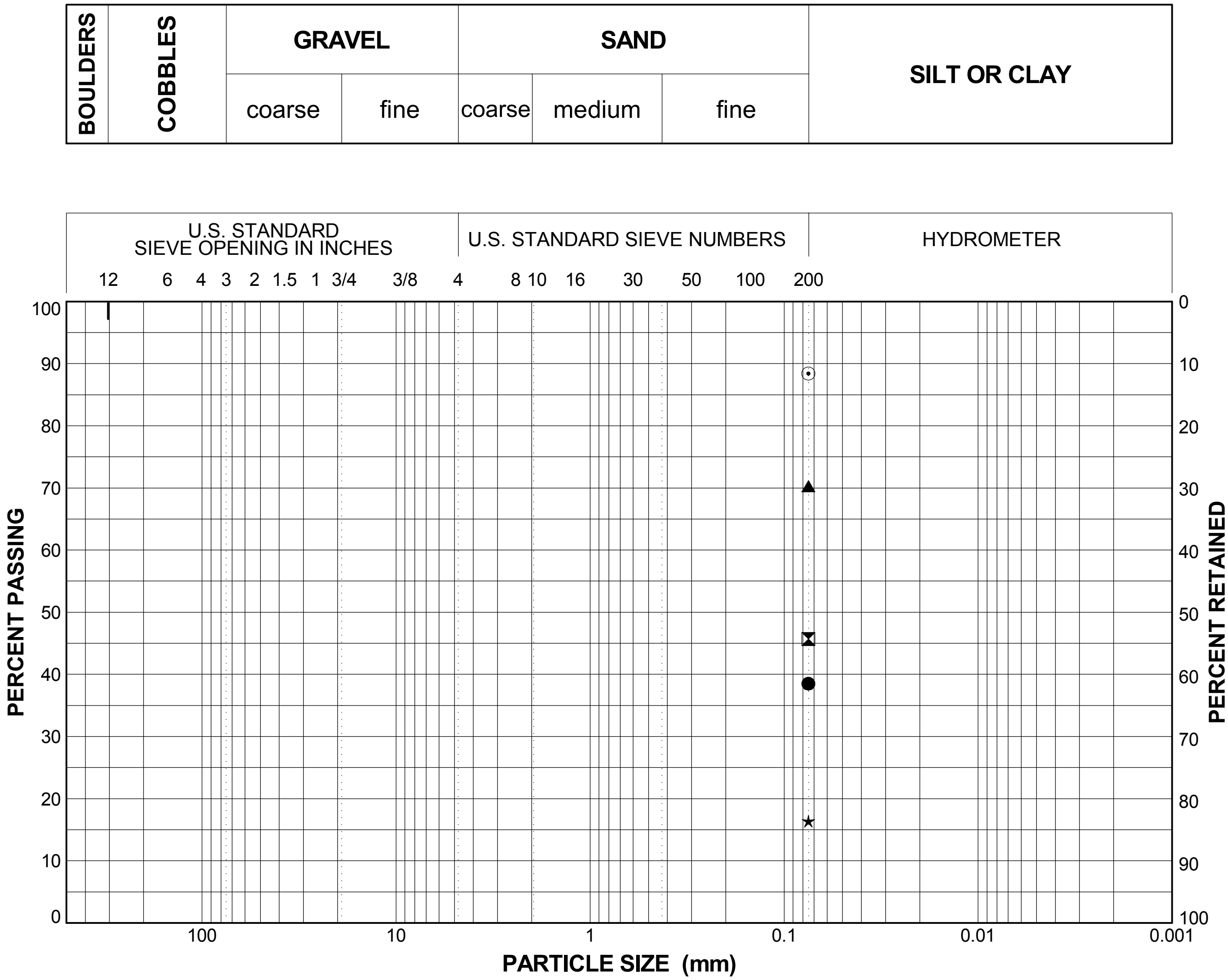


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_211B	S01A_002_004S	2	●	0.0	0.0	48.3	CLAYEY SAND (SC)
WR0017_211B	S08A_018_020T	19.5	⧗	0.0	0.0	49.1	CLAYEY SAND (SC)
WR0017_211B	S14A_038_039C	38	▲	0.0	0.0	67.5	SANDY LEAN CLAY (CL)
WR0017_211B	S21A_054_055C	54	★	0.0	0.0	7.2	Poorly Graded SAND with Silt (SP-SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

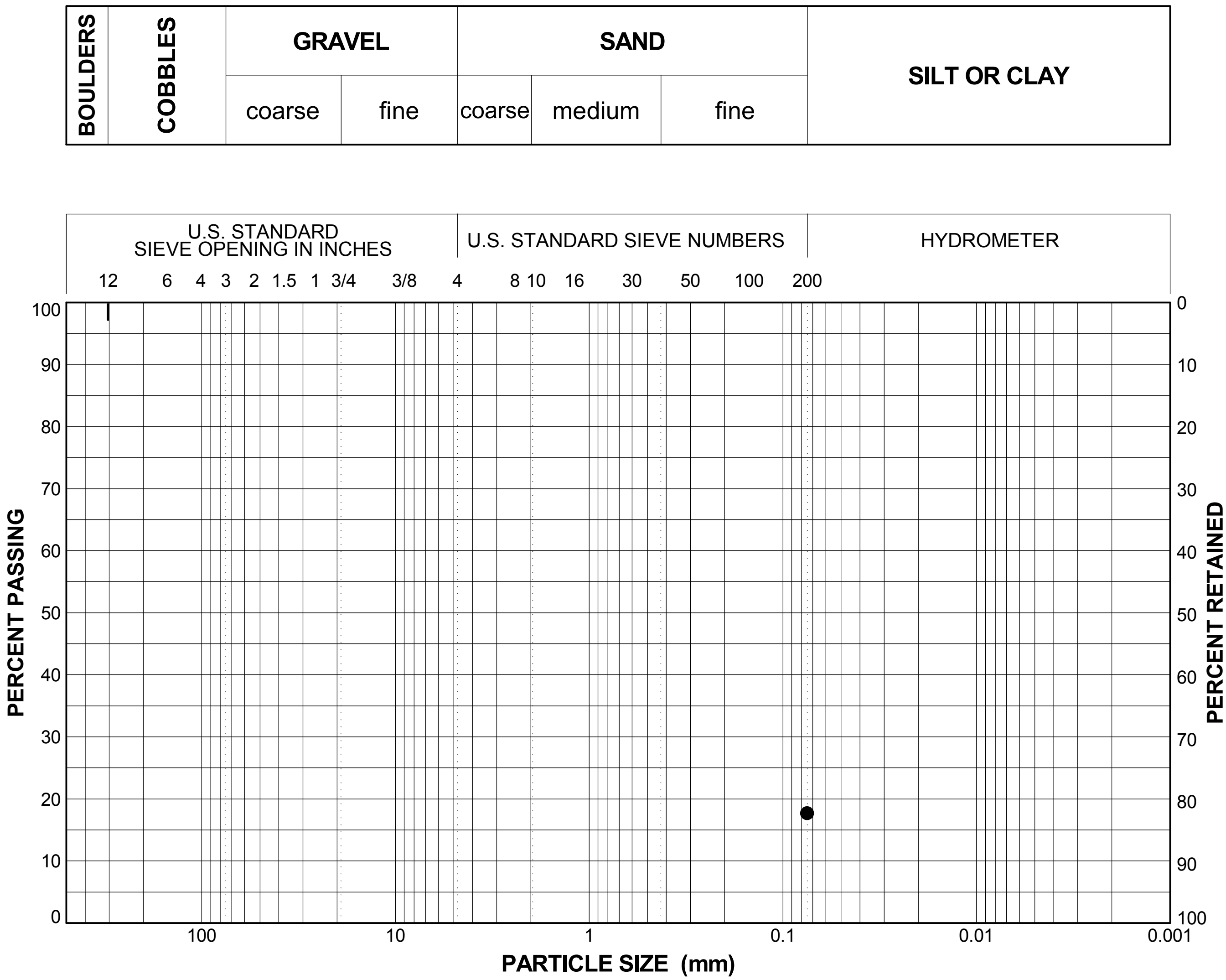


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_212B	S03A_008_009C	8.5	●	0.0	0.0	38.5	SILTY, CLAYEY SAND (SC-SM)
WR0017_212B	S04A_010_013T	10.65	⧗	0.0	0.0	45.7	SILTY, CLAYEY SAND (SC-SM)
WR0017_212B	S07B_019_021C	19.5	▲	0.0	0.0	70.3	SILT with Sand (ML)
WR0017_212B	S08A_022_025T	23.5	★	0.0	0.0	16.4	SILTY SAND (SM)
WR0017_212B	S11A_031_033C	32	⊙	0.0	0.0	88.4	SILT (ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



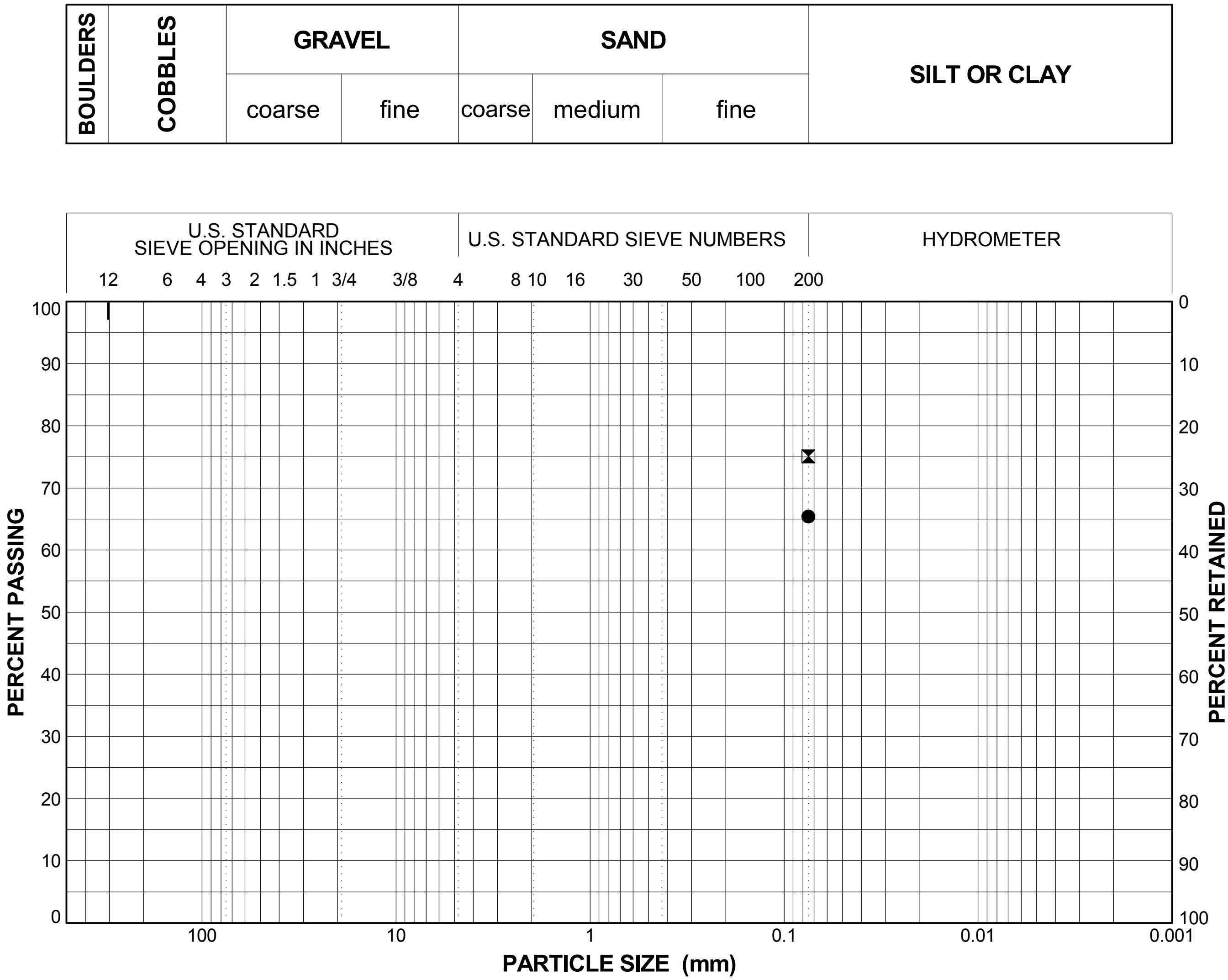
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_212B	S12A_034_037T	34.3	●	0.0	0.0	17.7	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

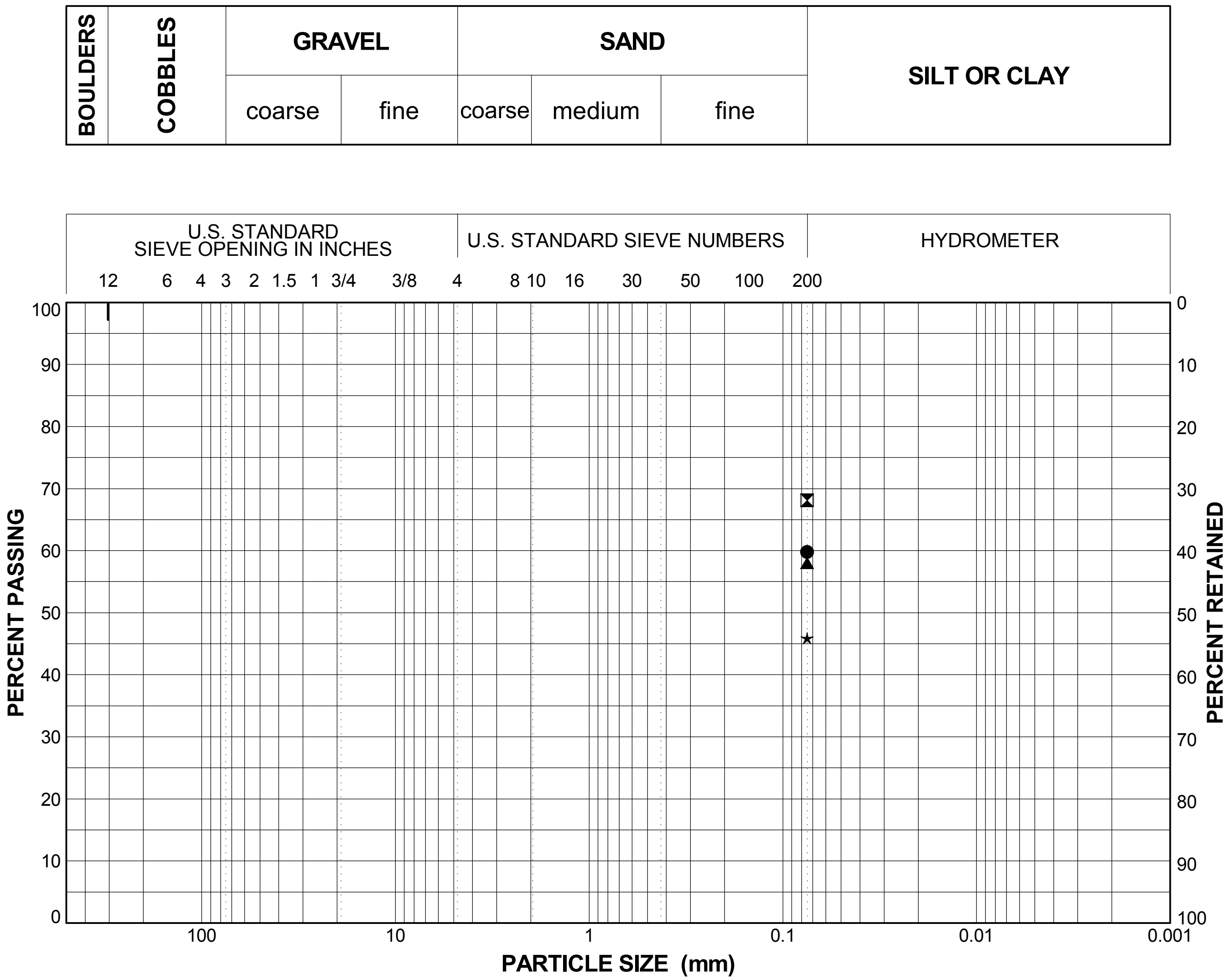
RD 17

PARTICLE SIZE DISTRIBUTION CURVES

Sheet 10 of 96



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_214B	S04A_015_017T	15.65	●	0.0	0.0	65.4	SANDY LEAN CLAY (CL)
WR0017_214B	S05A_019_022T	19	⧗	0.0	0.0	75.1	LEAN CLAY with SAND (CL)



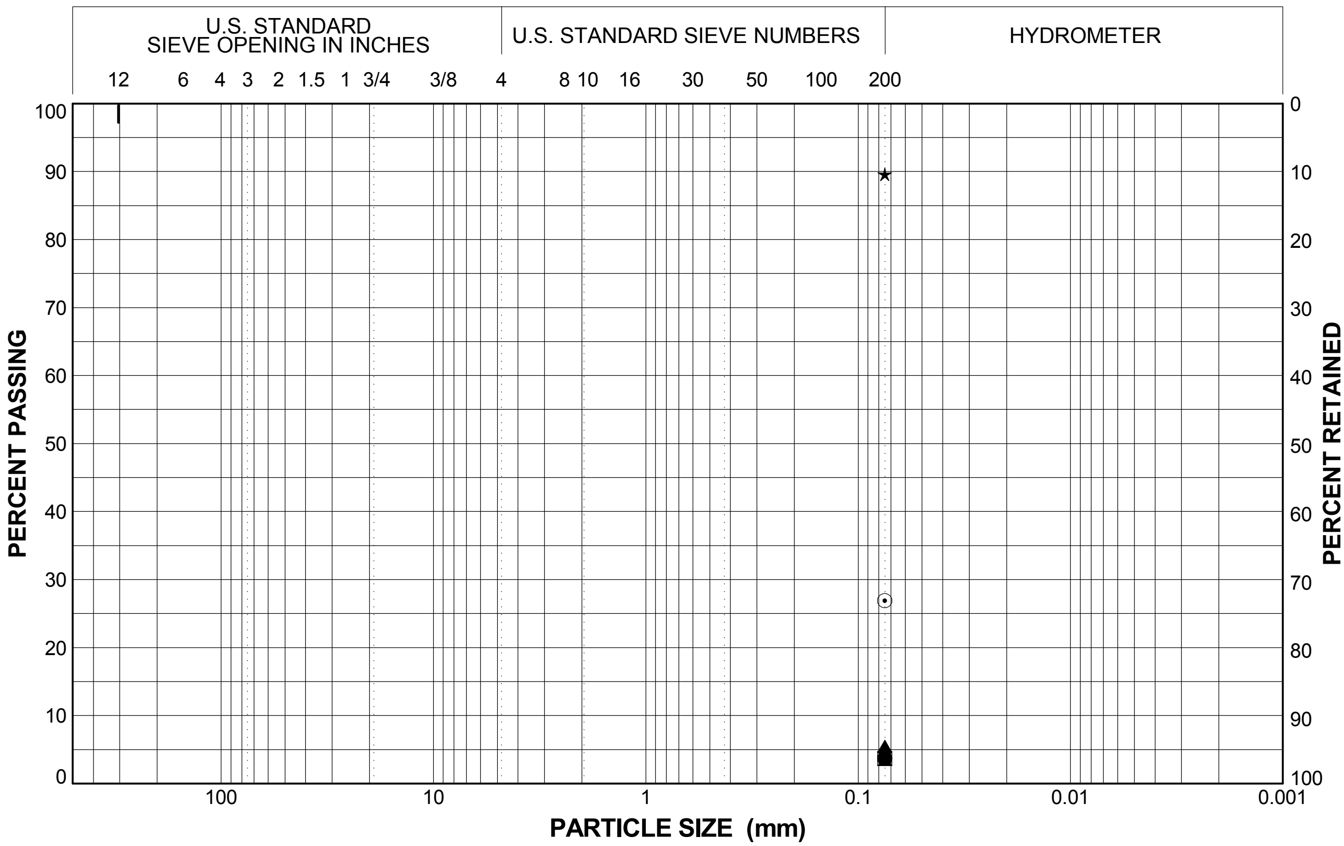
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_215B	S03A_008_010S	8.5	●	0.0	0.0	59.8	SANDY SILT (ML)
WR0017_215B	S05A_014_016T	15	⧗	0.0	0.0	68.1	SANDY LEAN CLAY (CL)
WR0017_215B	S05A_014_016T	15.25	▲	0.0	0.0	58.0	SANDY LEAN CLAY (CL)
WR0017_215B	S06A_017_020T	19.5	★	0.0	0.0	45.9	CLAYEY SAND (SC)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

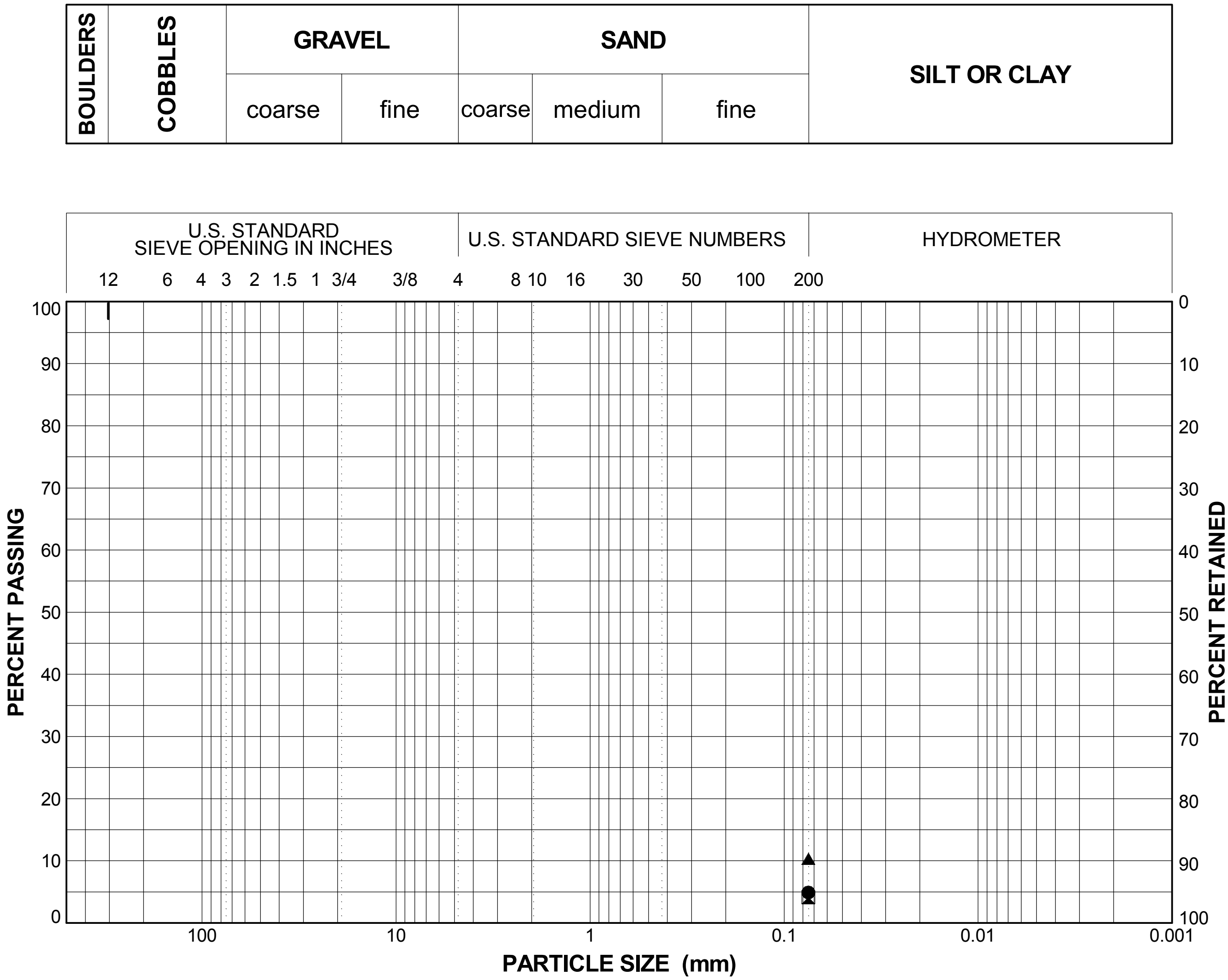


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_216B	S03A_008_009T	7.85	●	0.0	0.0	3.7	Poorly Graded SAND (SP)
WR0017_216B	S04A_010_012T	10	⧗	0.0	0.0	3.7	Poorly Graded SAND (SP)
WR0017_216B	S05A_013_014T	13.5	▲	0.0	0.0	5.5	Poorly Graded SAND with Silt (SP-SM)
WR0017_216B	S06A_016_019T	18.25	★	0.0	0.0	89.6	LEAN CLAY (CL)
WR0017_216B	S10A_028_029S	27.5	⊙	0.0	0.0	26.9	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

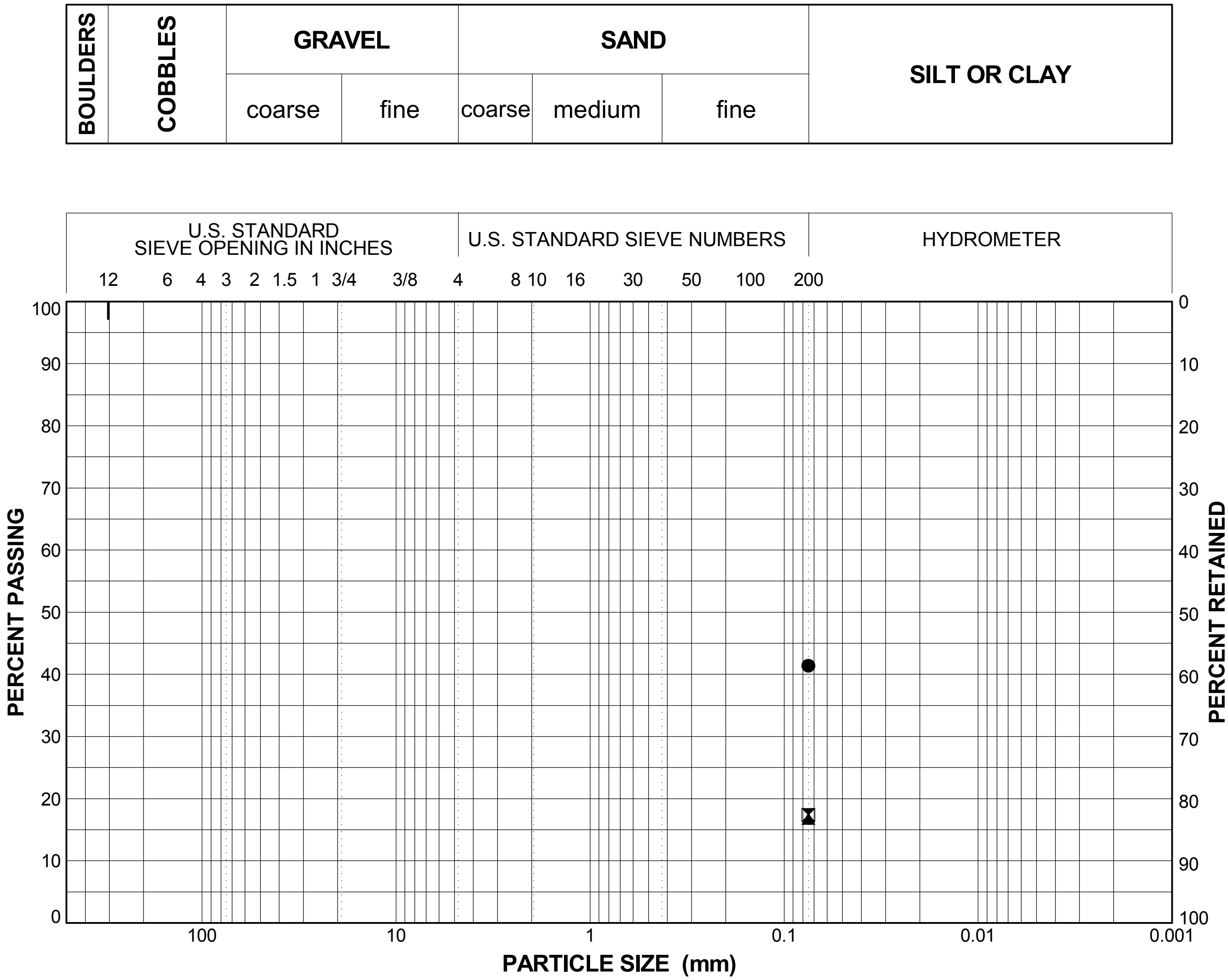


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_216B	S12A_034_035C	34.5	●	0.0	0.0	4.9	Well-Graded SAND (SW)
WR0017_216B	S15B_044_045C	44.5	⧗	0.0	0.0	4.1	Well-Graded SAND (SW)
WR0017_216B	S21A_062_064C	63	▲	0.0	0.0	10.3	Poorly Graded SAND with Silt (SP-SM)

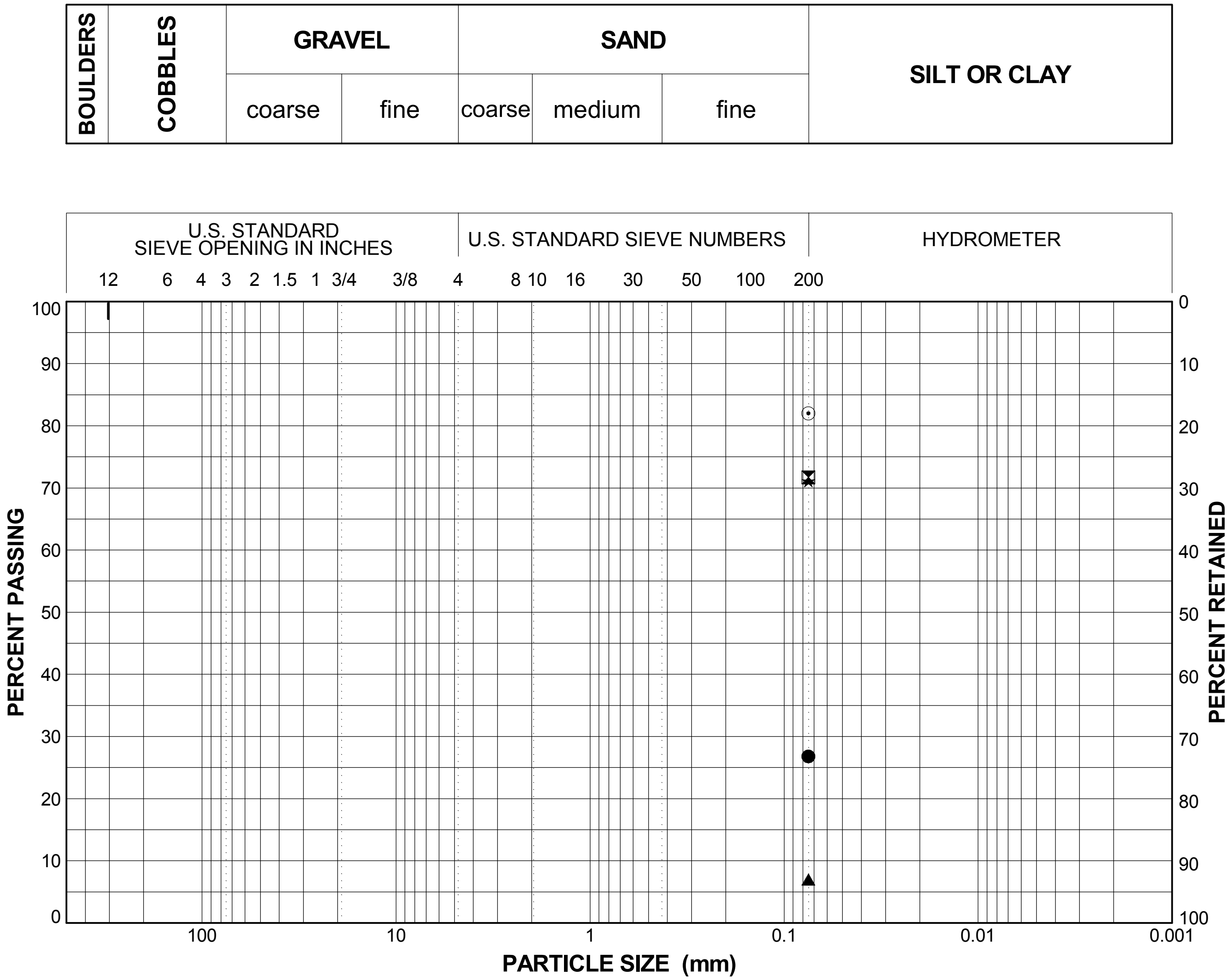
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_217B	S02A_006_007C	6	●	0.0	0.0	41.4	SILTY SAND (SM)
WR0017_217B	S07A_019_021T	19.5	⧗	0.0	0.0	17.4	SILTY SAND (SM)
WR0017_217B	S08A_022_024T	23.5	▲	0.0	0.0	16.8	SILTY SAND (SM)

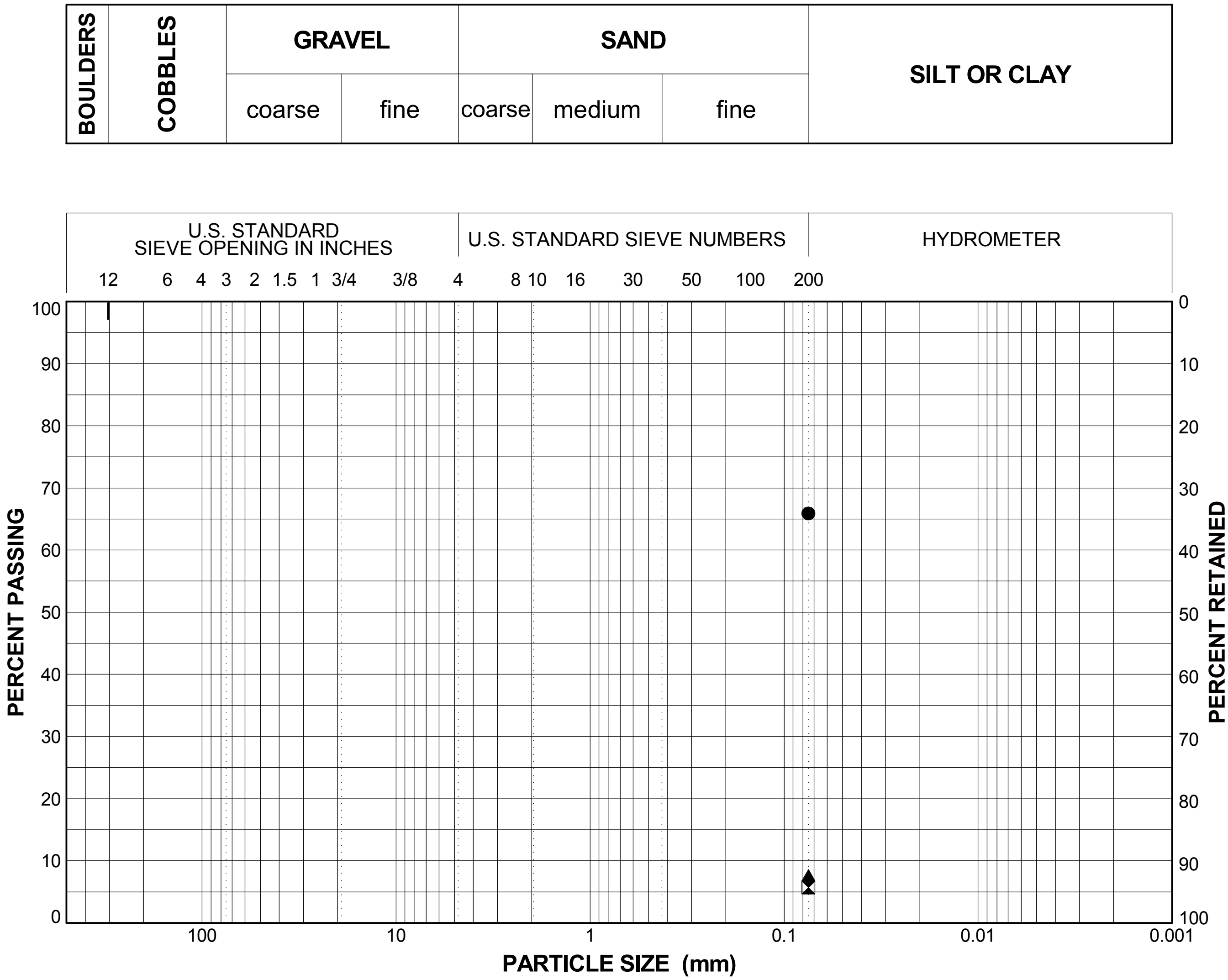


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_218B	S03A_008_010C	9	●	0.0	0.0	26.8	SILTY SAND (SM)
WR0017_218B	S05A_013_015T	13.75	⧗	0.0	0.0	71.7	LEAN CLAY with SAND (CL)
WR0017_218B	S05A_013_015T	14	▲	0.0	0.0	7.0	LEAN CLAY with Sand (CL)
WR0017_218B	S11B_030_032C	31	★	0.0	0.0	71.1	LEAN CLAY with SAND (CL)
WR0017_218B	S13A_035_036C	35.5	⊙	0.0	0.0	82.0	LEAN CLAY with SAND (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_218B	S13A_035_036C	35.75	●	0.0	0.0	65.9	SANDY LEAN CLAY (CL)
WR0017_218B	S16A_044_045C	44.5	⧗	0.0	0.0	5.7	Well-Graded SAND with Silt (SW)
WR0017_218B	S22A_061_063C	61.5	▲	0.0	0.0	7.7	Poorly Graded SAND with Silt (SP-SM)

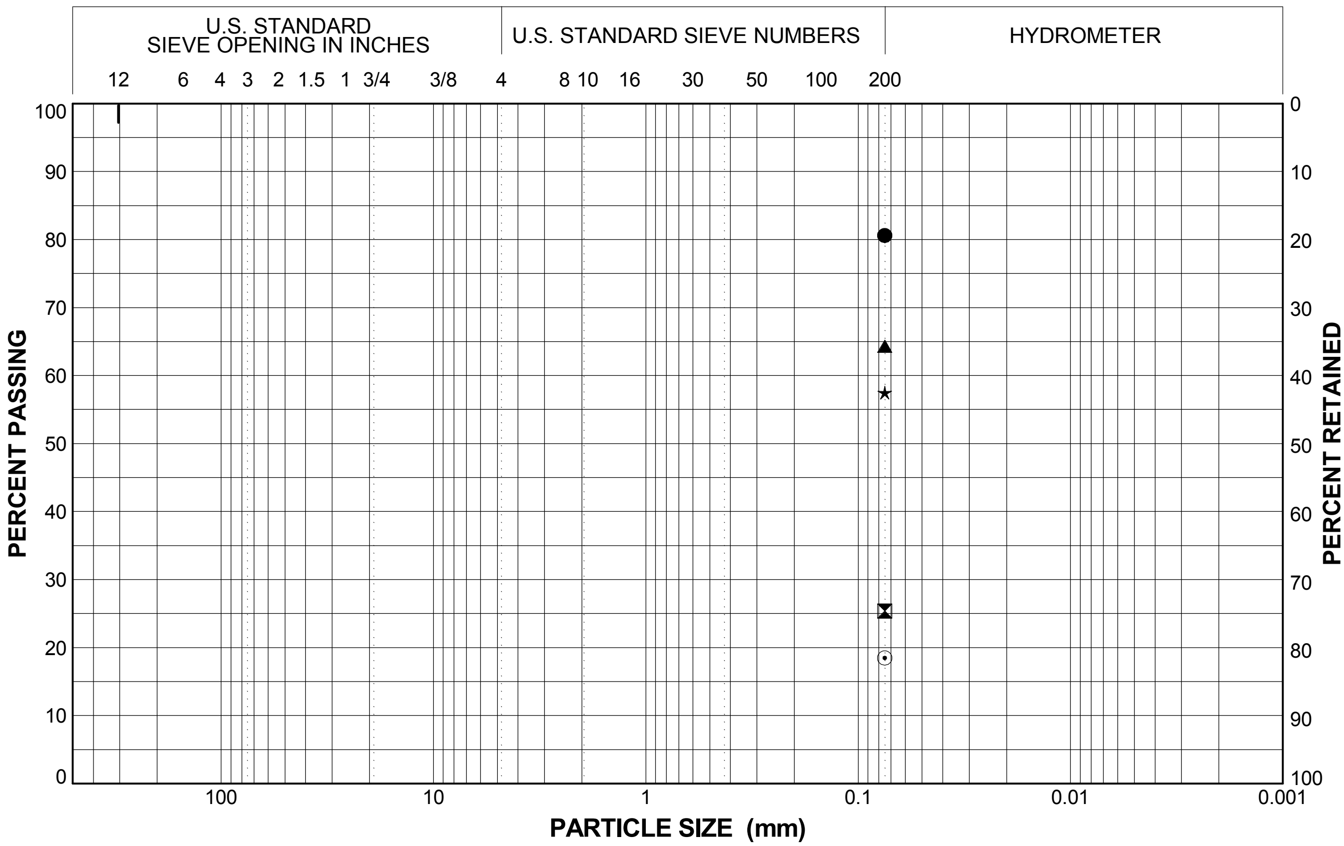
DWR LEVEE U/NU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_219B	S02B_005_006C	6	●	0.0	0.0	80.6	FAT CLAY with SAND (CH)
WR0017_219B	S04A_010_012T	11.25	⧗	0.0	0.0	25.4	SILTY SAND (SM)
WR0017_219B	S04A_010_012T	11.5	▲	0.0	0.0	64.3	SANDY LEAN CLAY (CL)
WR0017_219B	S06A_017_019T	18	★	0.0	0.0	57.5	SANDY SILT (ML)
WR0017_219B	S08A_023_025T	23.95	⊙	0.0	0.0	18.5	SILTY SAND (SM)

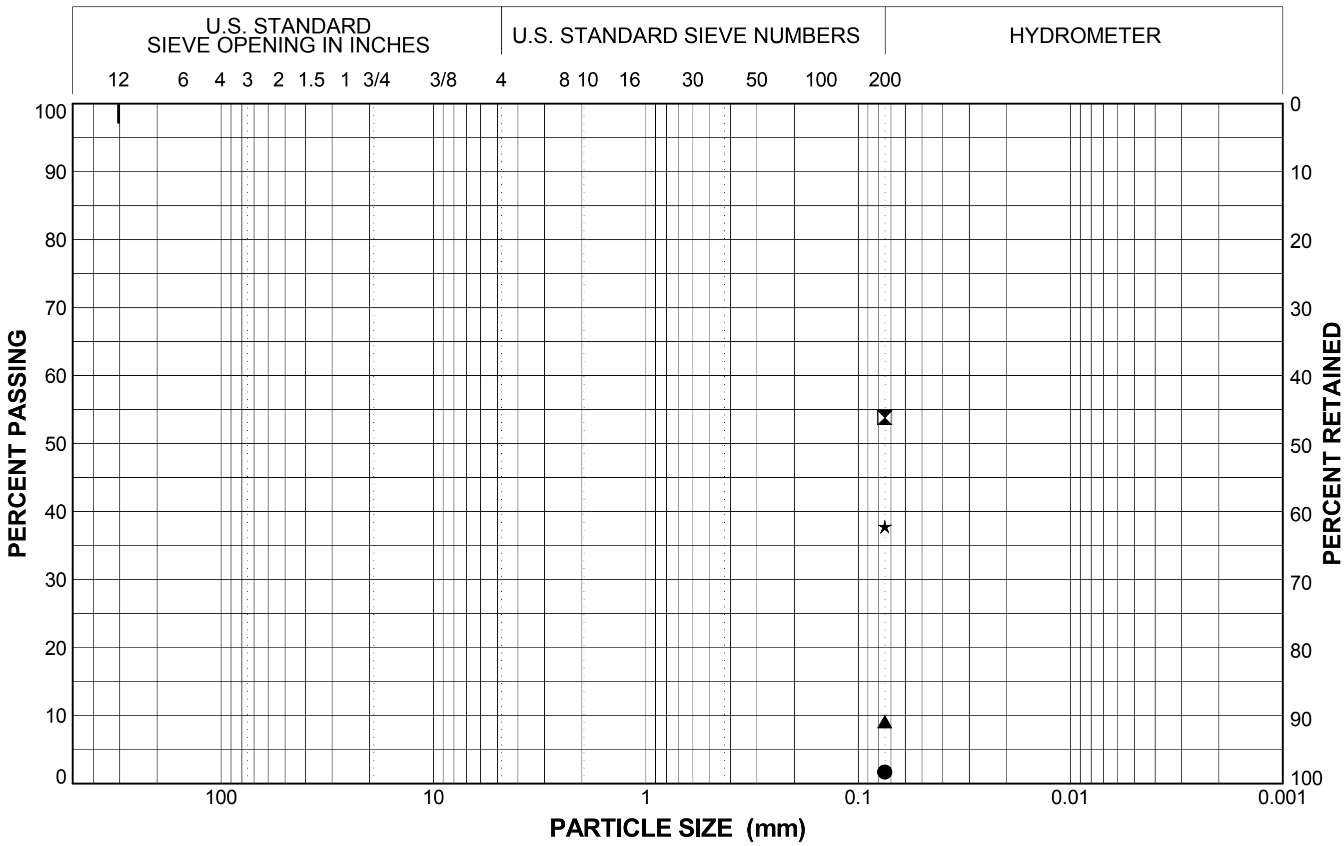
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

Sheet 18 of 96

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



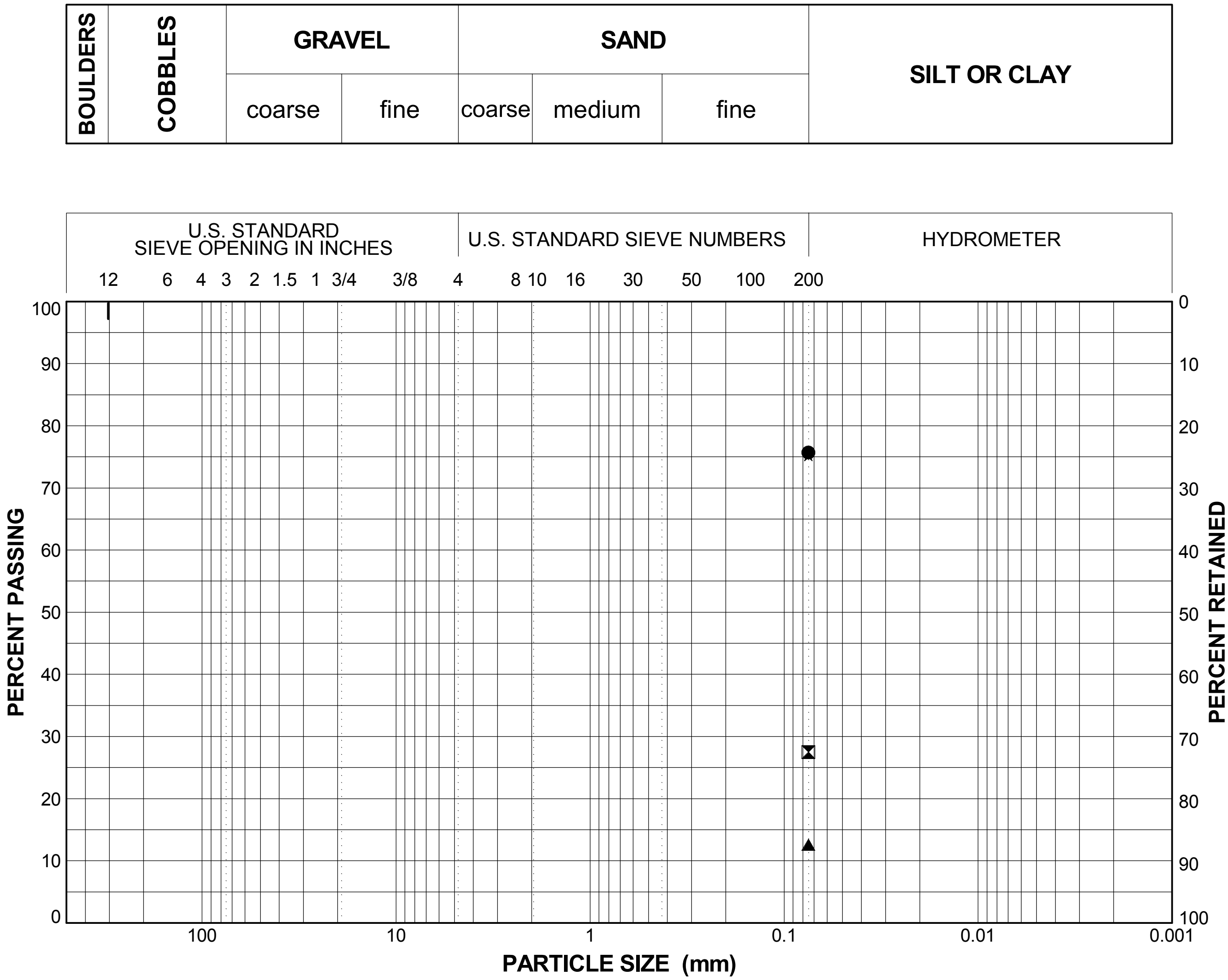
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_219B	S10A_030_033T	32	●	0.0	0.0	1.7	Poorly Graded SAND (SP)
WR0017_219B	S14A_041_044T	43	⧗	0.0	0.0	53.8	SANDY LEAN CLAY (CL)
WR0017_219B	S17A_051_054T	53.75	▲	0.0	0.0	9.1	SANDY LEAN CLAY (CL)
WR0017_219B	S19A_058_060T	59.5	★	0.0	0.0	37.8	CLAYEY SAND (SC)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

Sheet 19 of 96

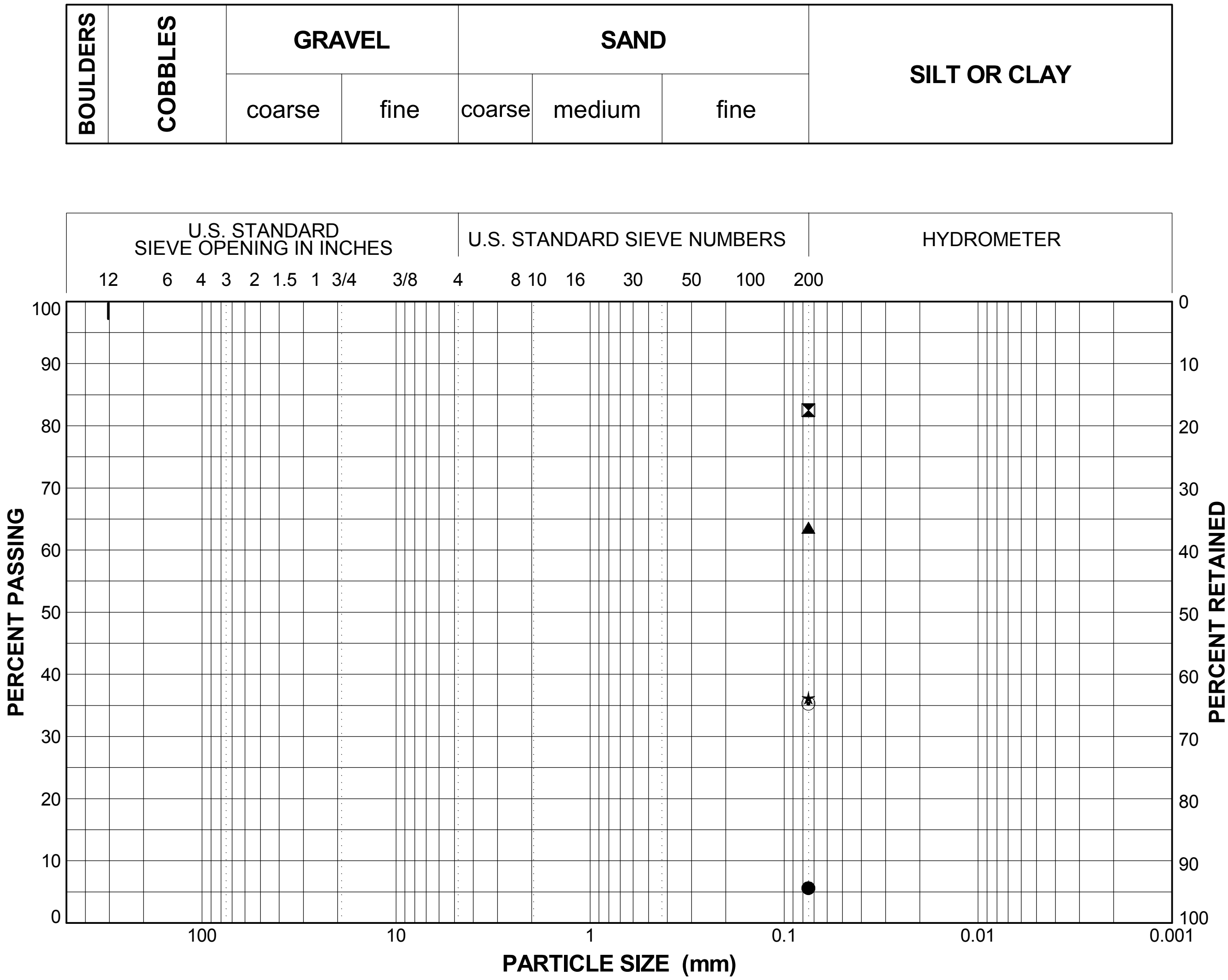


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_220B	S03B_008_010C	9	●	0.0	0.0	75.7	CLAYEY SAND (SC)
WR0017_220B	S03B_008_010C	9.1	⧗	0.0	0.0	27.5	CLAYEY SAND (SC)
WR0017_220B	S04A_011_012T	11	▲	0.0	0.0	12.6	SILTY SAND (SM)
WR0017_220B	S04A_011_012T	11.5	★	0.0	0.0	75.3	SILT with SAND (ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



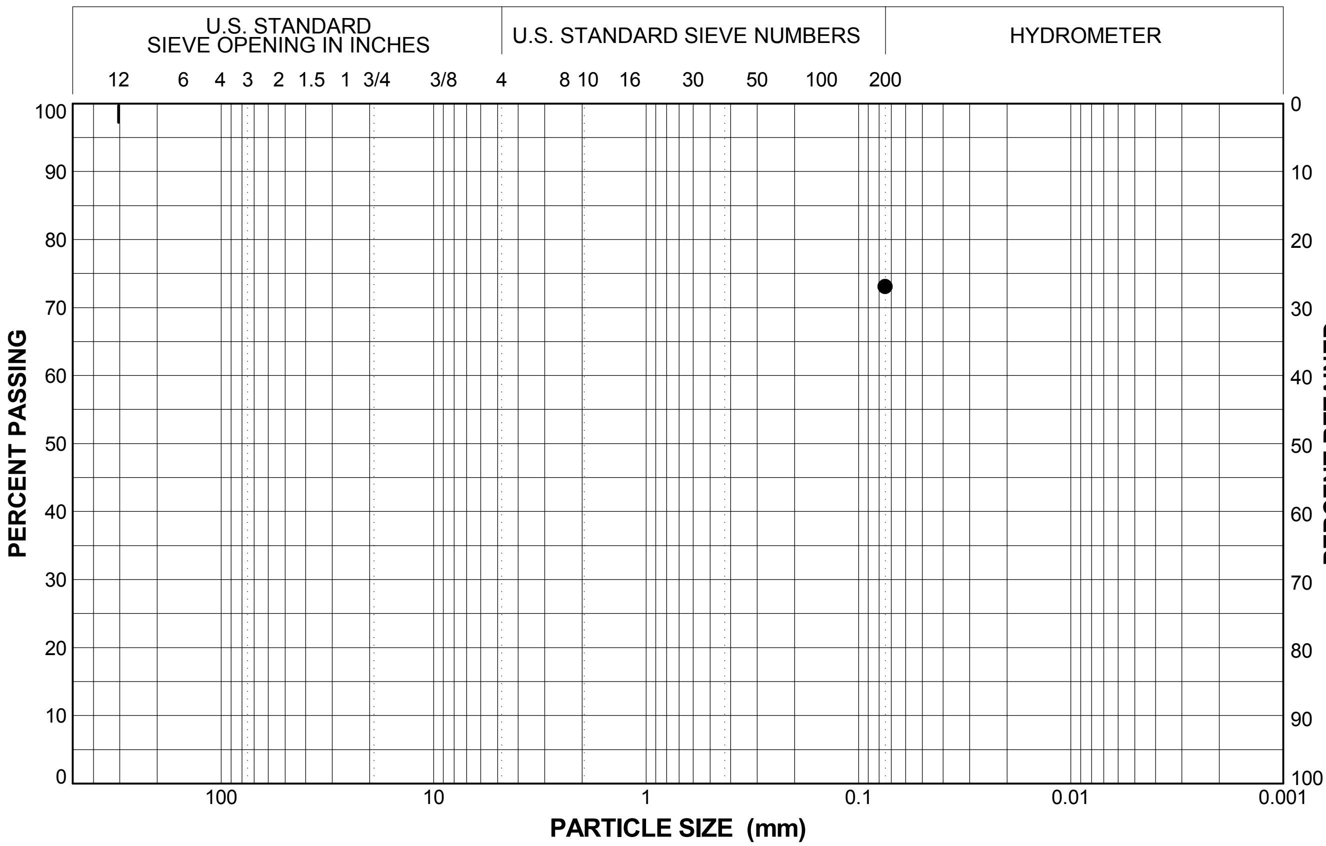
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_221B	S02A_006_007C	6	●	0.0	0.0	5.6	Poorly Graded SAND with Silt (SP-SM)
WR0017_221B	S04A_011_014T	11	⧗	0.0	0.0	82.5	LEAN CLAY with SAND (CL)
WR0017_221B	S05A_014_016T	14	▲	0.0	0.0	63.6	SANDY SILT (ML)
WR0017_221B	S08A_024_026T	24.5	★	0.0	0.0	36.2	SILTY SAND (SM)
WR0017_221B	S09A_028_031T	30.1	⊙	0.0	0.0	35.3	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

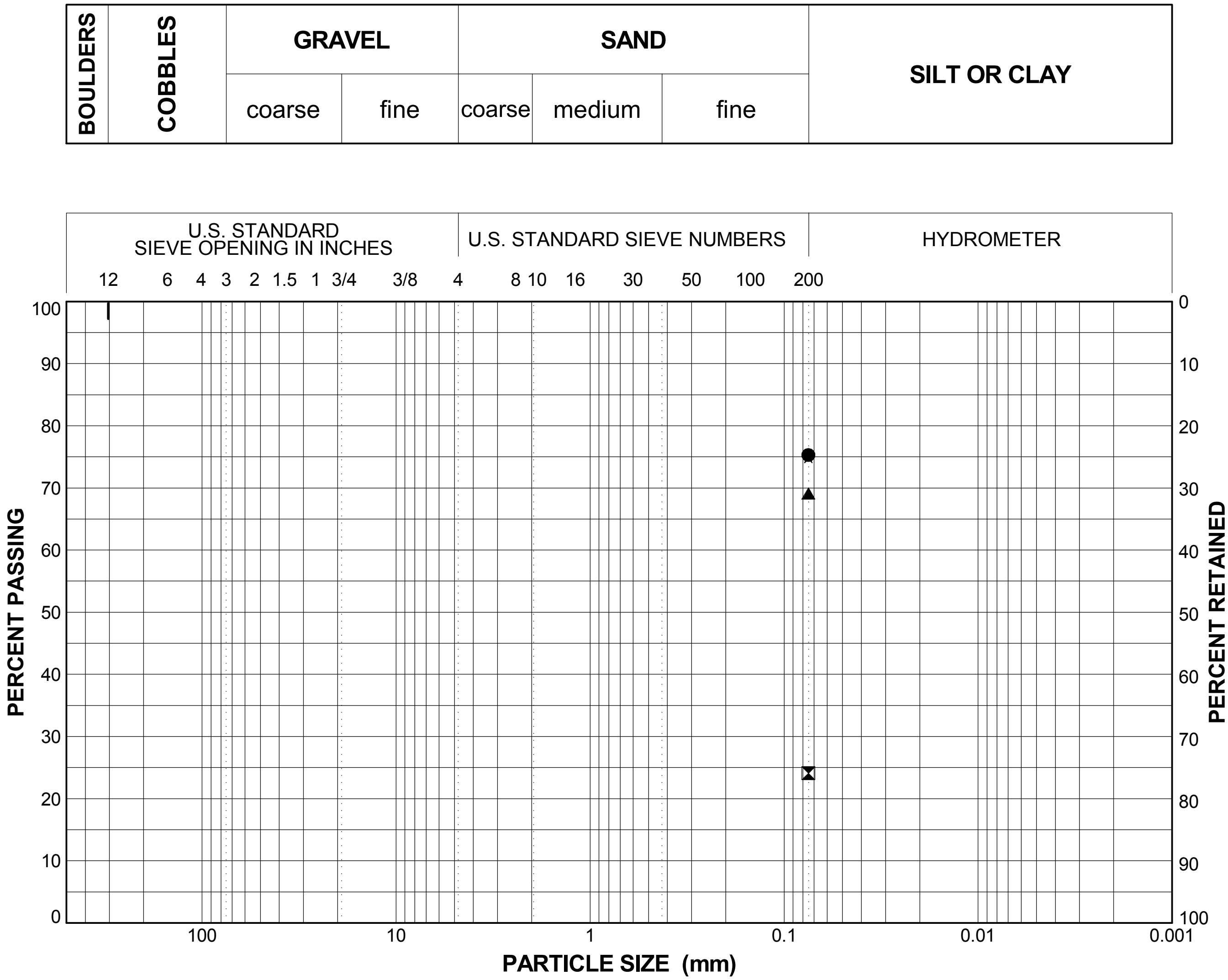
RD 17

PARTICLE SIZE DISTRIBUTION CURVES

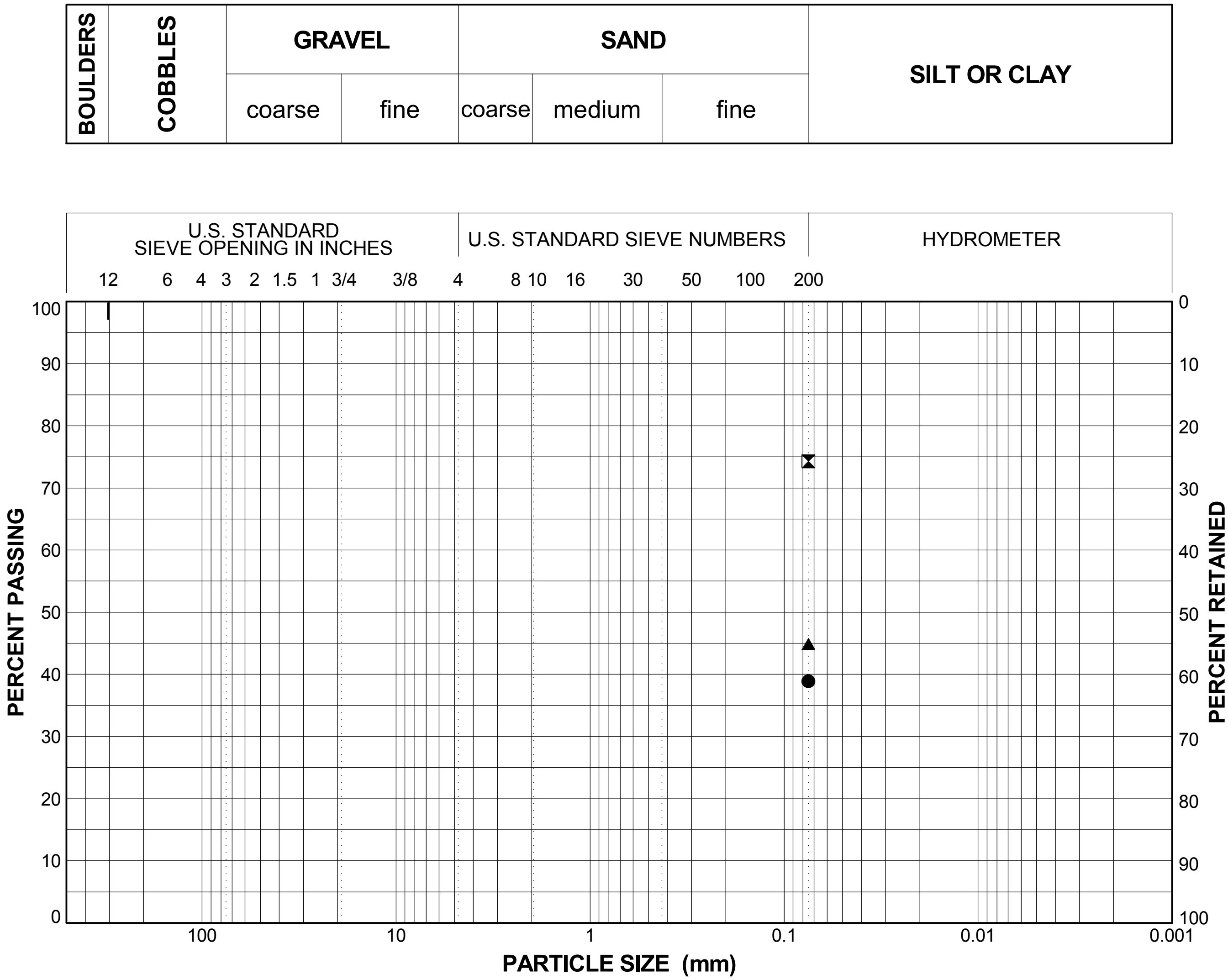
BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



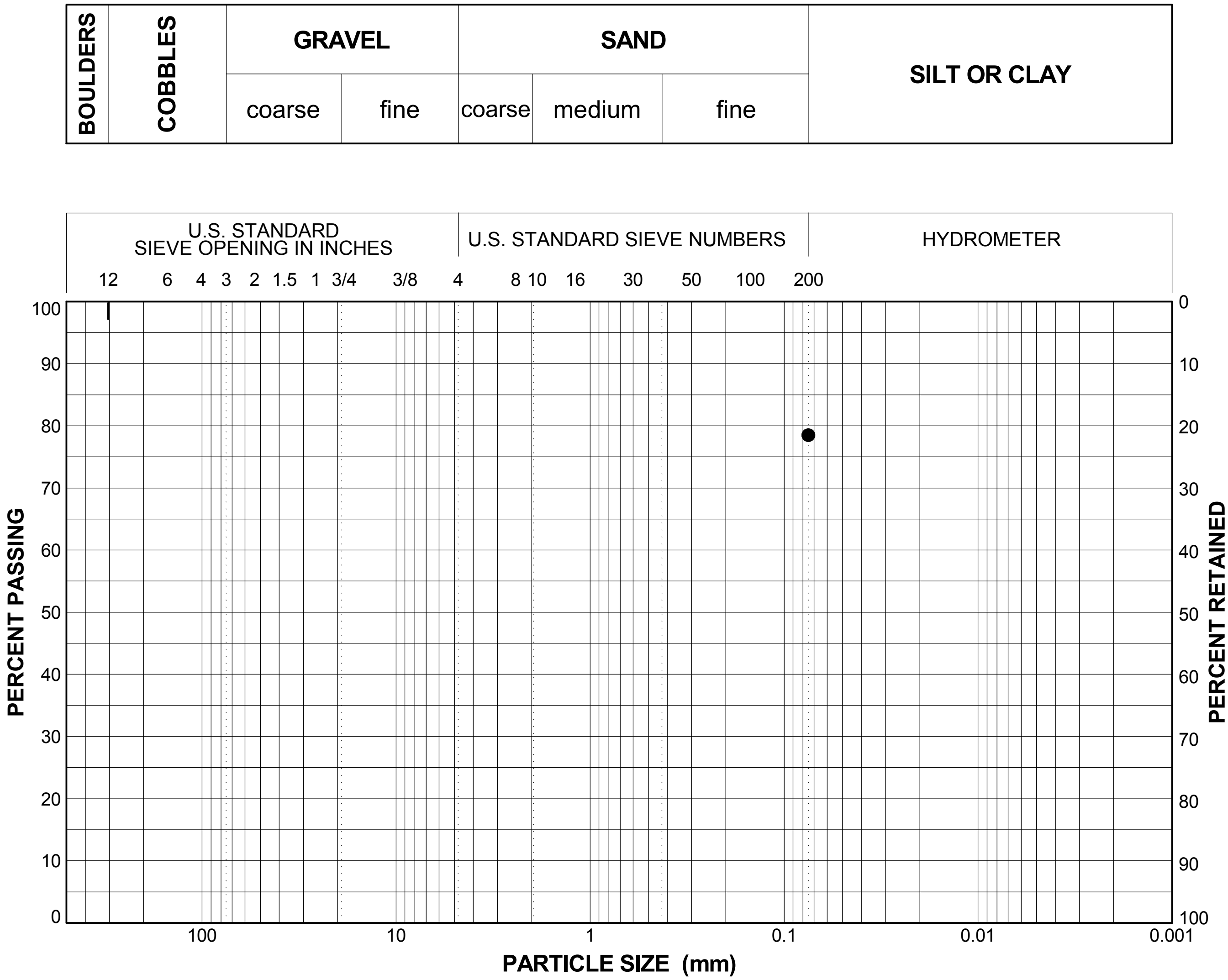
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_221B	S13A_039_042T	41.25	●	0.0	0.0	73.1	SANDY SILT (ML)



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_223B	S03A_011_013T	11	●	0.0	0.0	75.3	SANDY SILT (ML)
WR0017_223B	S04A_015_08T	16.45	⧗	0.0	0.0	24.1	SILTY SAND (SM)
WR0017_223B	S05A_020_022T	21.3	▲	0.0	0.0	69.1	SANDY LEAN CLAY (CL)
WR0017_223B	S10A_040_042S	40.5	★	0.0	0.0	75.0	SILT with Sand (ML)



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_224B	S05A_012_015T	12	●	0.0	0.0	38.9	SILTY SAND (SM)
WR0017_224B	S08A_024_026T	24	⧗	0.0	0.0	74.3	SILTY CLAY with SAND (CL-ML)
WR0017_224B	S18A_054_057T	54	▲	0.0	0.0	44.9	SILTY SAND (SM)

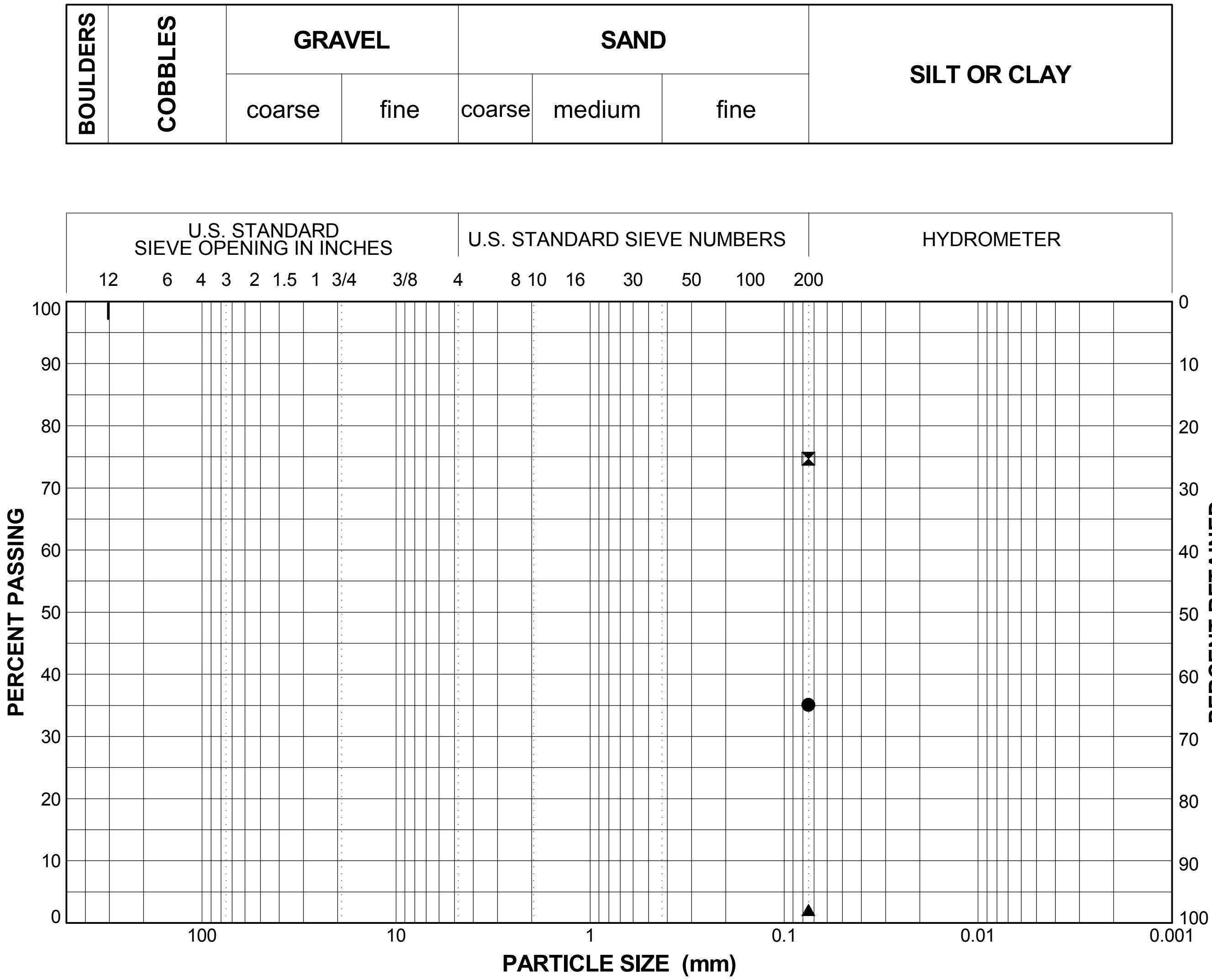


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_225B	S02A_007_008C	7	●	0.0	0.0	78.5	LEAN CLAY with SAND (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

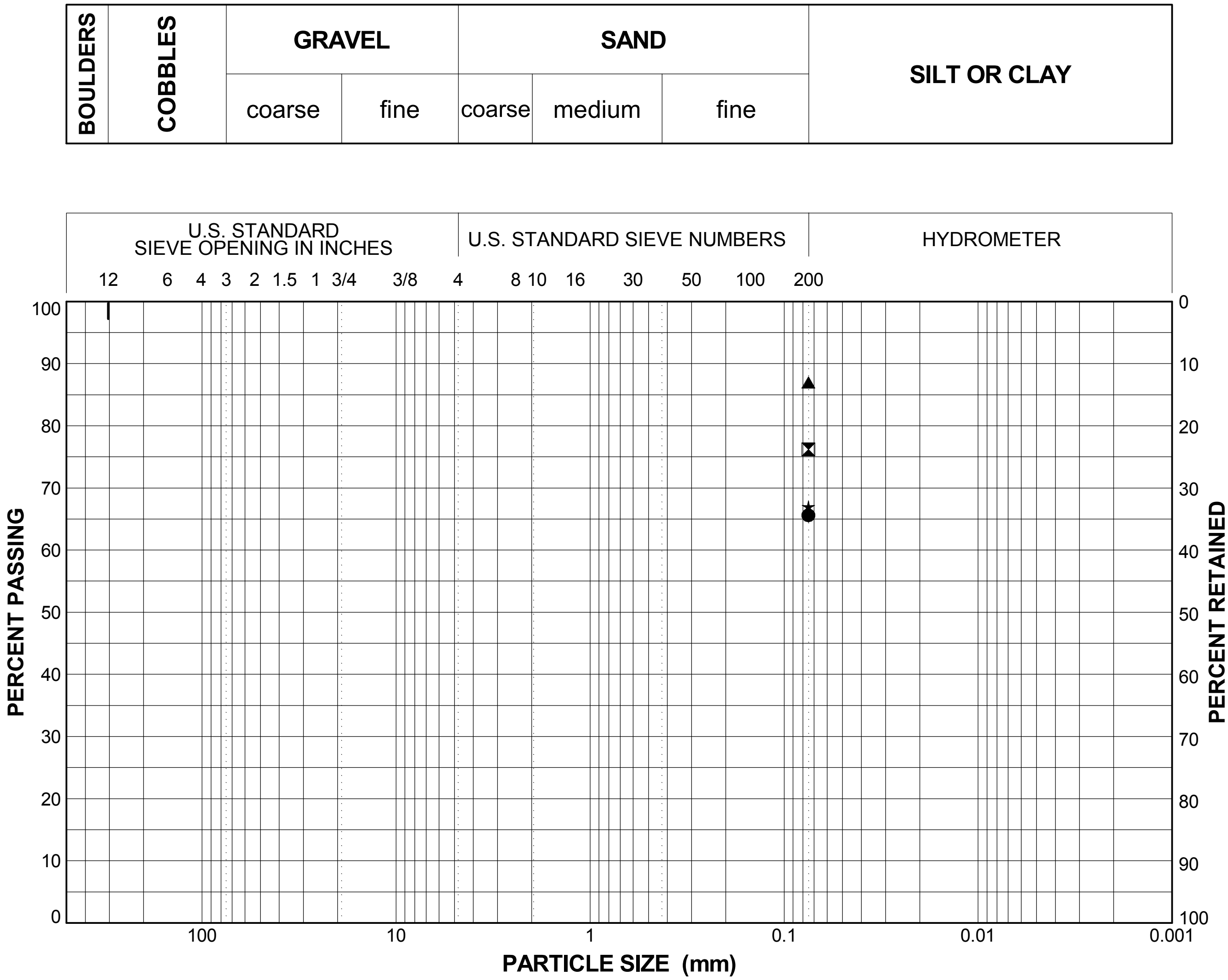


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_226B	S02A_025_027S	25	●	0.0	0.0	35.1	SILTY SAND with Gravel (SM)
WR0017_226B	S03A_030_032T	31.1	⧗	0.0	0.0	74.7	LEAN CLAY with SAND (CL)
WR0017_226B	S06A_045_048T	44.9	▲	0.0	0.0	2.1	Well-Graded SAND (SW)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



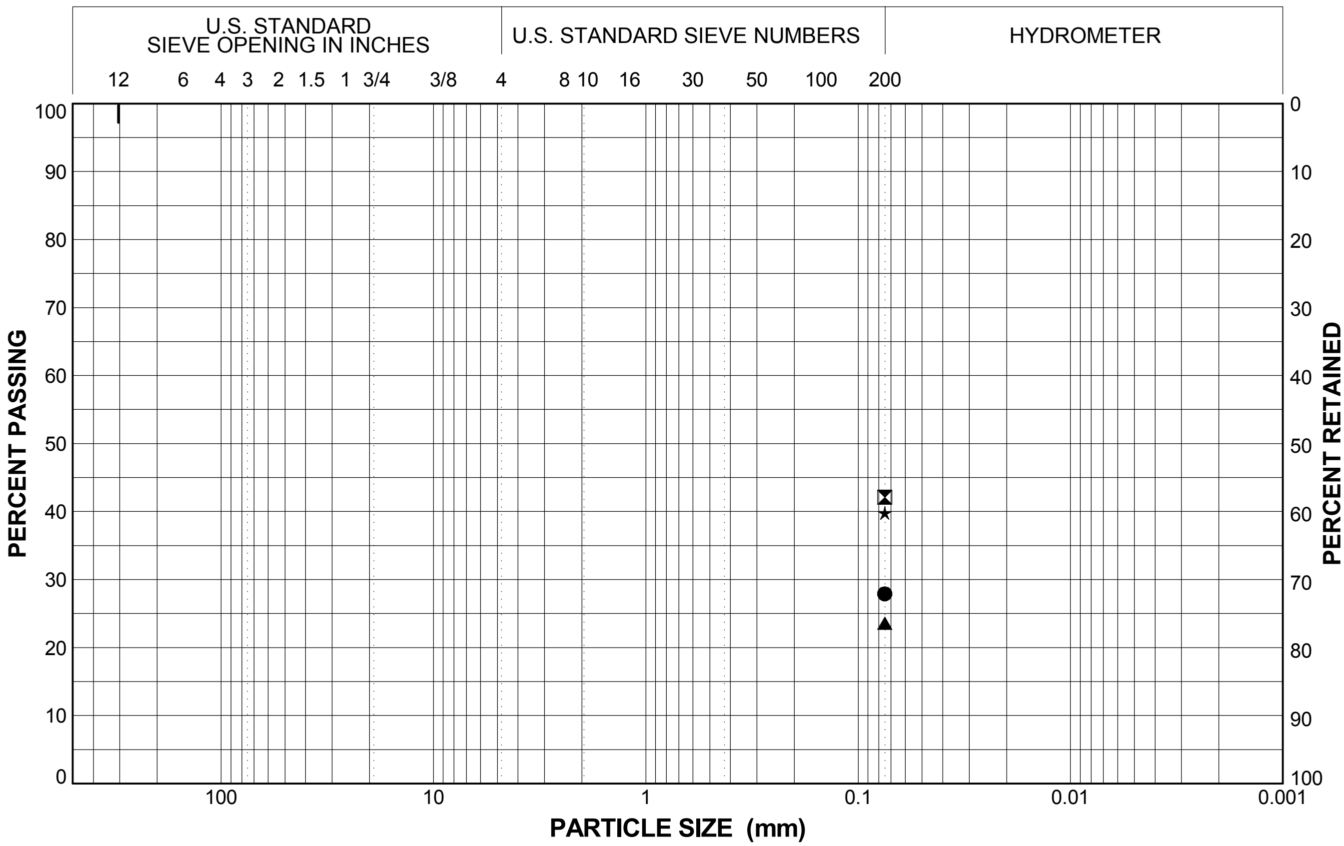
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_227B	S01A_002_004S	2	●	0.0	0.0	65.6	SANDY SILT (ML)
WR0017_227B	S03A_010_013T	10.5	⧗	0.0	0.0	76.2	SILTY CLAY with SAND (CL-ML)
WR0017_227B	S04A_016_018T	16.2	▲	0.0	0.0	87.0	SILTY CLAY (CL-ML)
WR0017_227B	S04A_016_018T	16.5	★	0.0	0.0	67.0	SANDY SILTY CLAY (CL-ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

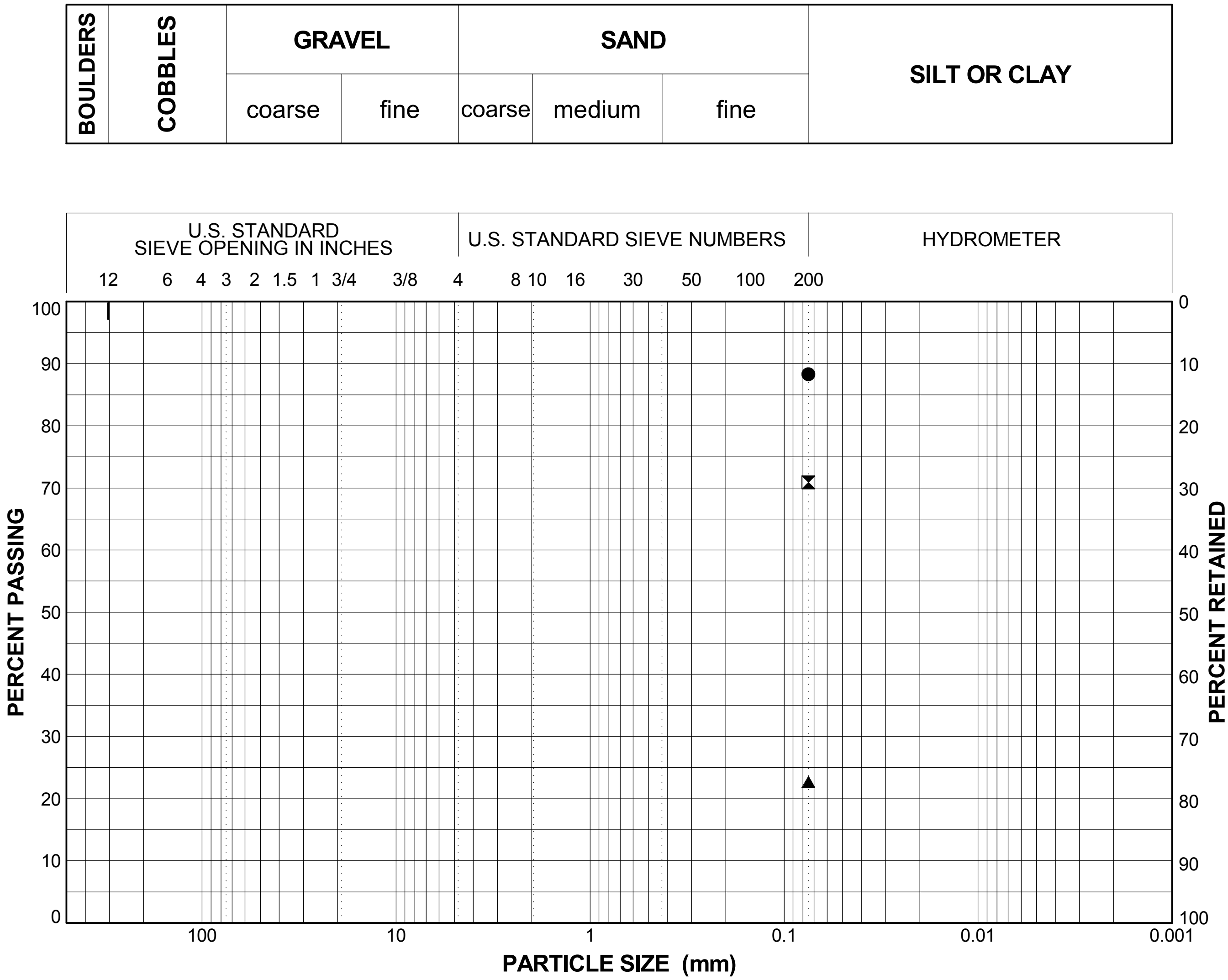


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_228B	S02A_005_007S	5	●	0.0	0.0	27.9	SILTY SAND (SM)
WR0017_228B	S03A_009_011C	10.3	⧗	0.0	0.0	42.1	SILTY, CLAYEY SAND (SC-SM)
WR0017_228B	S08A_030_032T	30.4	▲	0.0	0.0	23.6	SILTY SAND (SM)
WR0017_228B	S12A_045_047C	47.3	★	0.0	0.0	39.8	CLAYEY SAND (SC)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

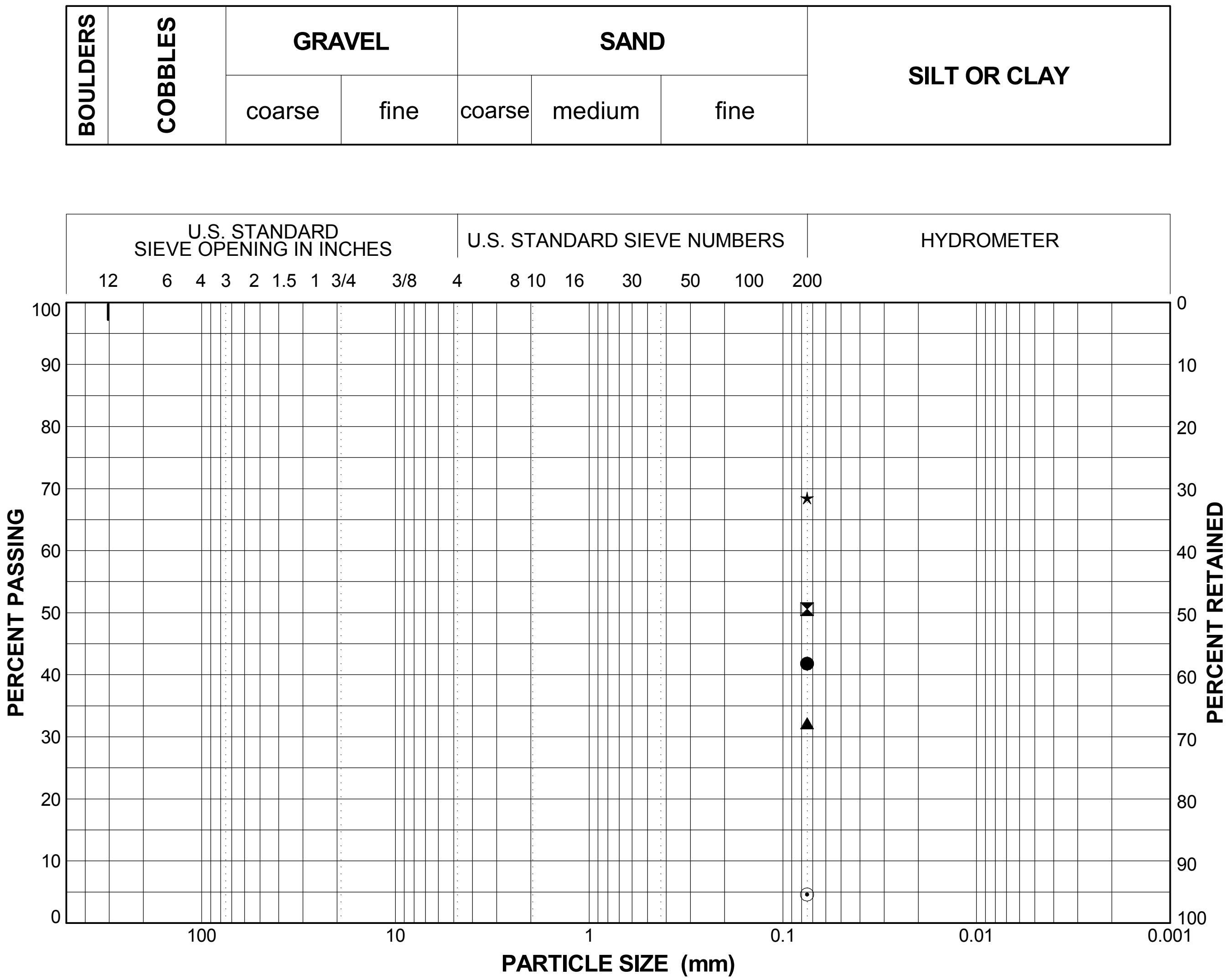


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_229B	S06A_025_028T	26	●	0.0	0.0	88.3	SILTY CLAY (CL-ML)
WR0017_229B	S08A_035_037S	35	⧗	0.0	0.0	70.9	SILT with Sand (ML)
WR0017_229B	S12A_051_053S	51.5	▲	0.0	0.0	22.7	SILTY SAND (SM)

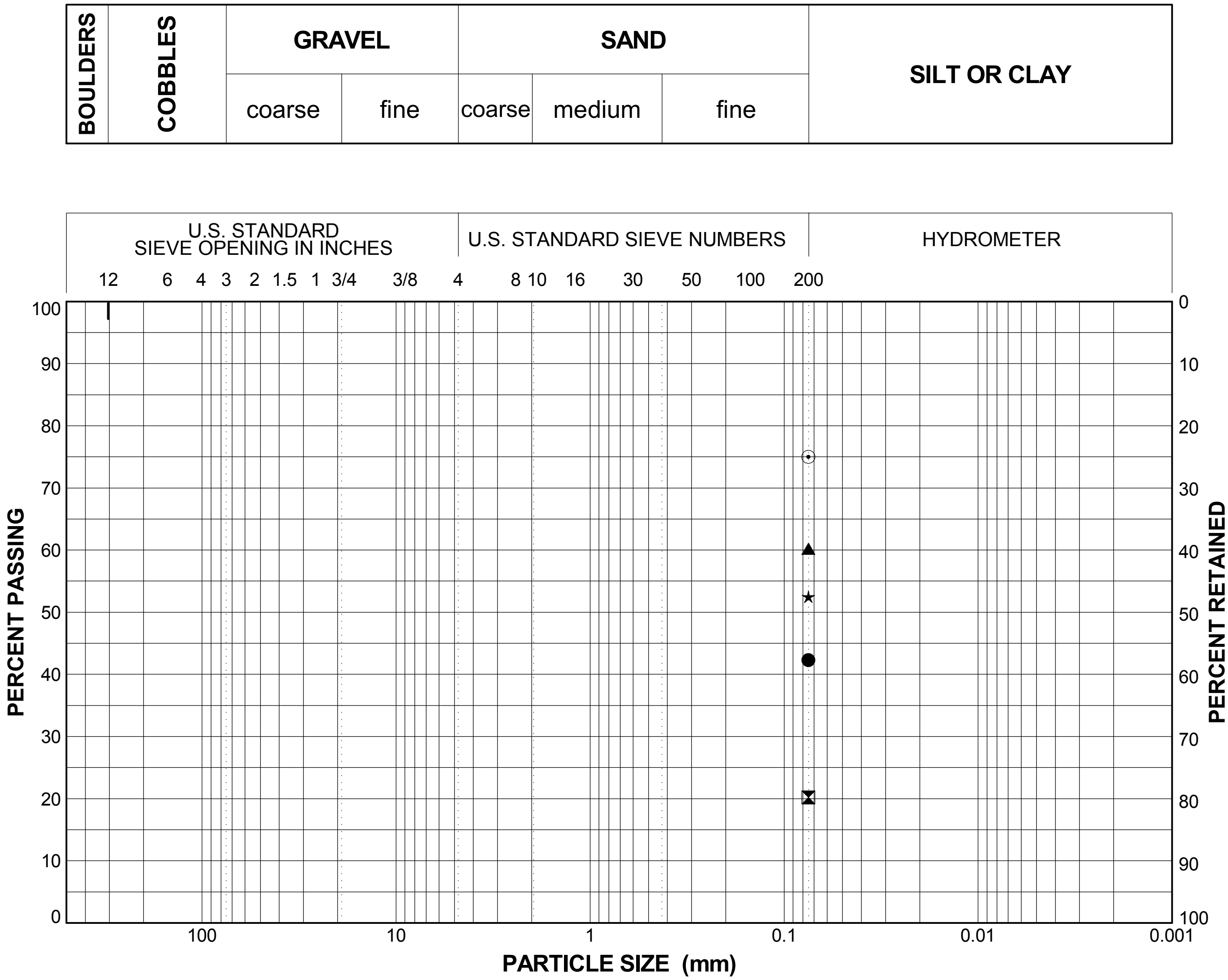
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_230B	S02A_005_007S	5	●	0.0	0.0	41.8	SILTY SAND (SM)
WR0017_230B	S04B_010_011C	10.5	⧗	0.0	0.0	50.6	SANDY LEAN CLAY (CL)
WR0017_230B	S06A_015_016T	14.5	▲	0.0	0.0	32.2	SILTY SAND (SM)
WR0017_230B	S10A_031_033S	31	★	0.0	0.0	68.5	SANDY SILT (ML)
WR0017_230B	S12B_039_040C	39.3	⊙	0.0	0.0	4.6	Poorly Graded SAND (SP)



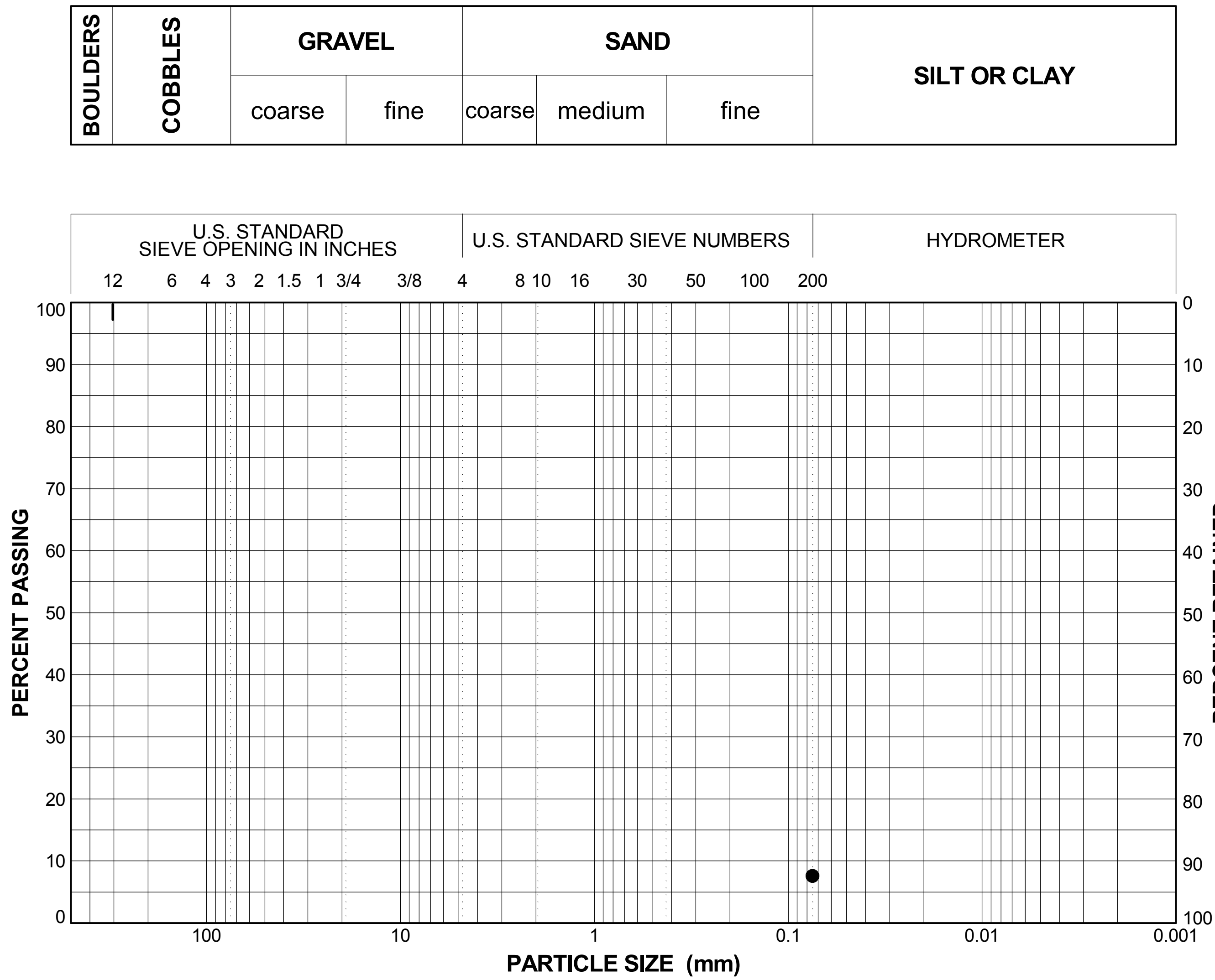
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_230B	S12A_039_040S	39.8	●	0.0	0.0	42.3	CLAYEY SAND (SC)
WR0017_230B	S13B_042_043S	42	⧗	0.0	0.0	20.2	SILTY SAND (SM)
WR0017_230B	S13A_043_044S	43	▲	0.0	0.0	60.2	SANDY LEAN CLAY (CL)
WR0017_230B	S14B_046_047S	46	★	0.0	0.0	52.5	SANDY LEAN CLAY (CL)
WR0017_230B	S14A_047_048S	47.3	⊙	0.0	0.0	75.0	LEAN CLAY (CL)

DWR LEVEE U/NU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

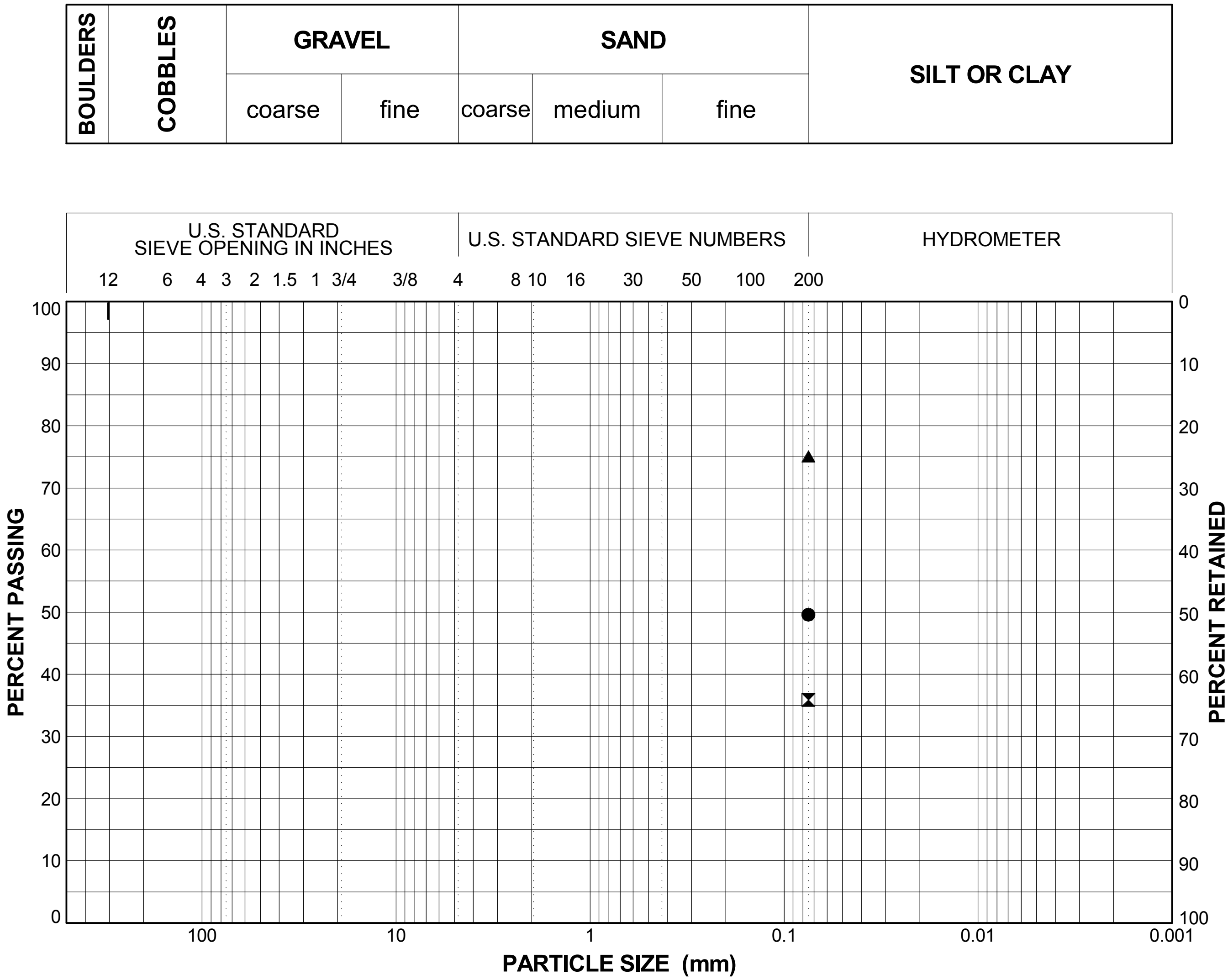


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_230B	S16A_052_054T	52.75	●	0.0	0.0	7.6	Poorly Graded SAND with Silt (SP-SM)

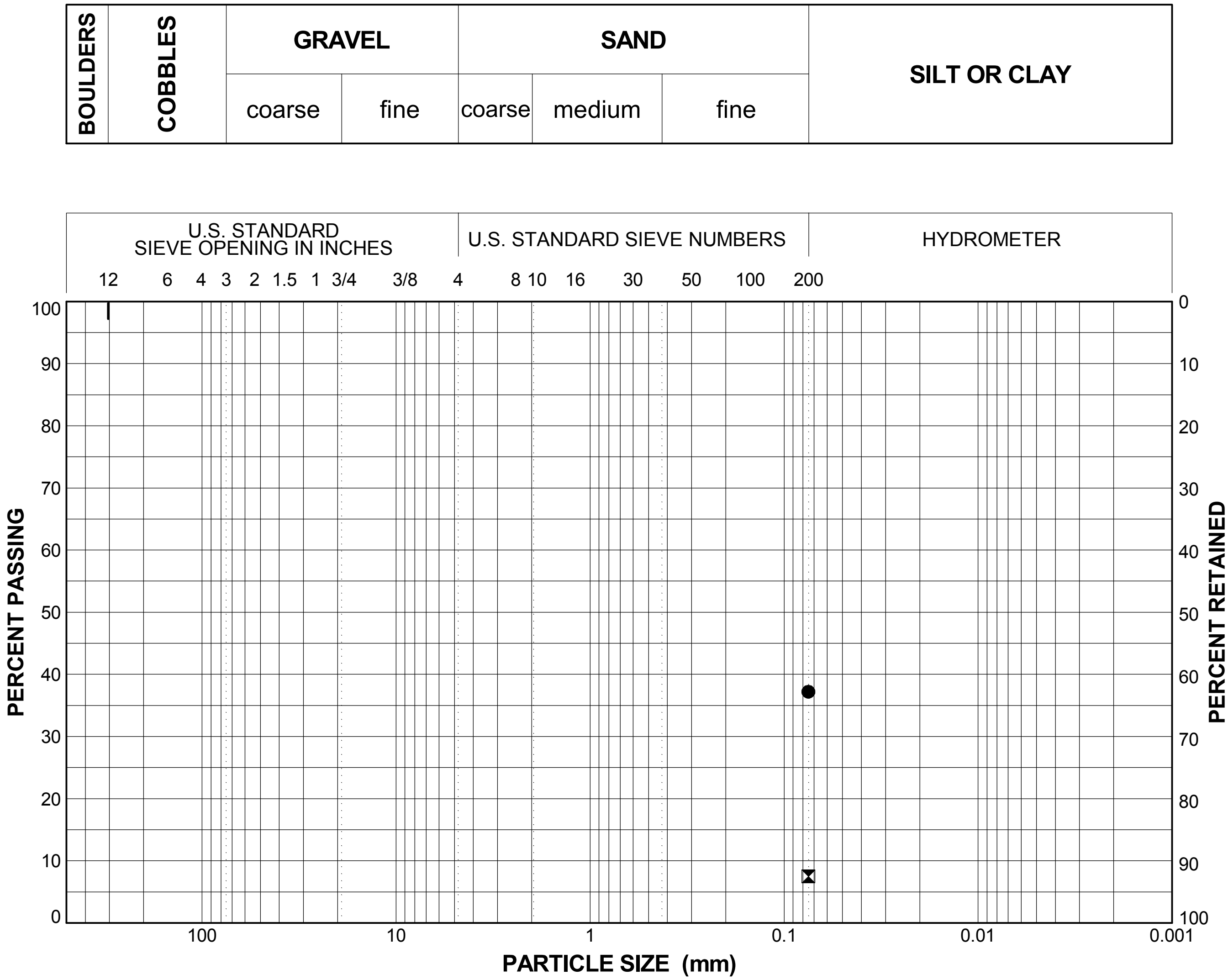
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

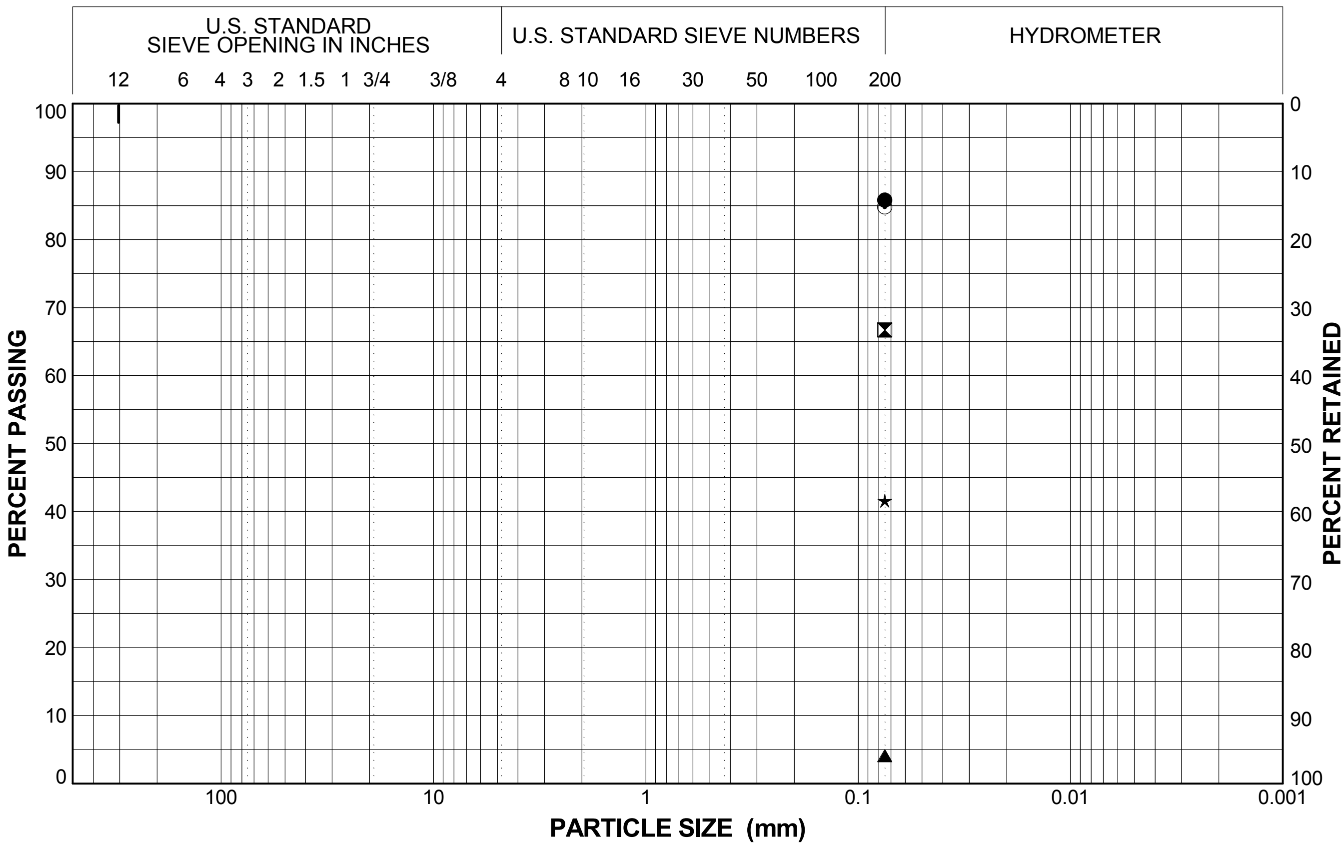


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_231B	S03A_010_012S	10	●	0.0	0.0	49.6	SILTY SAND (SM)
WR0017_231B	S06A_022_024S	22.5	⧗	0.0	0.0	35.9	SILTY SAND (SM)
WR0017_231B	S08A_032_034T	32	▲	0.0	0.0	75.1	SILT with Sand (ML)

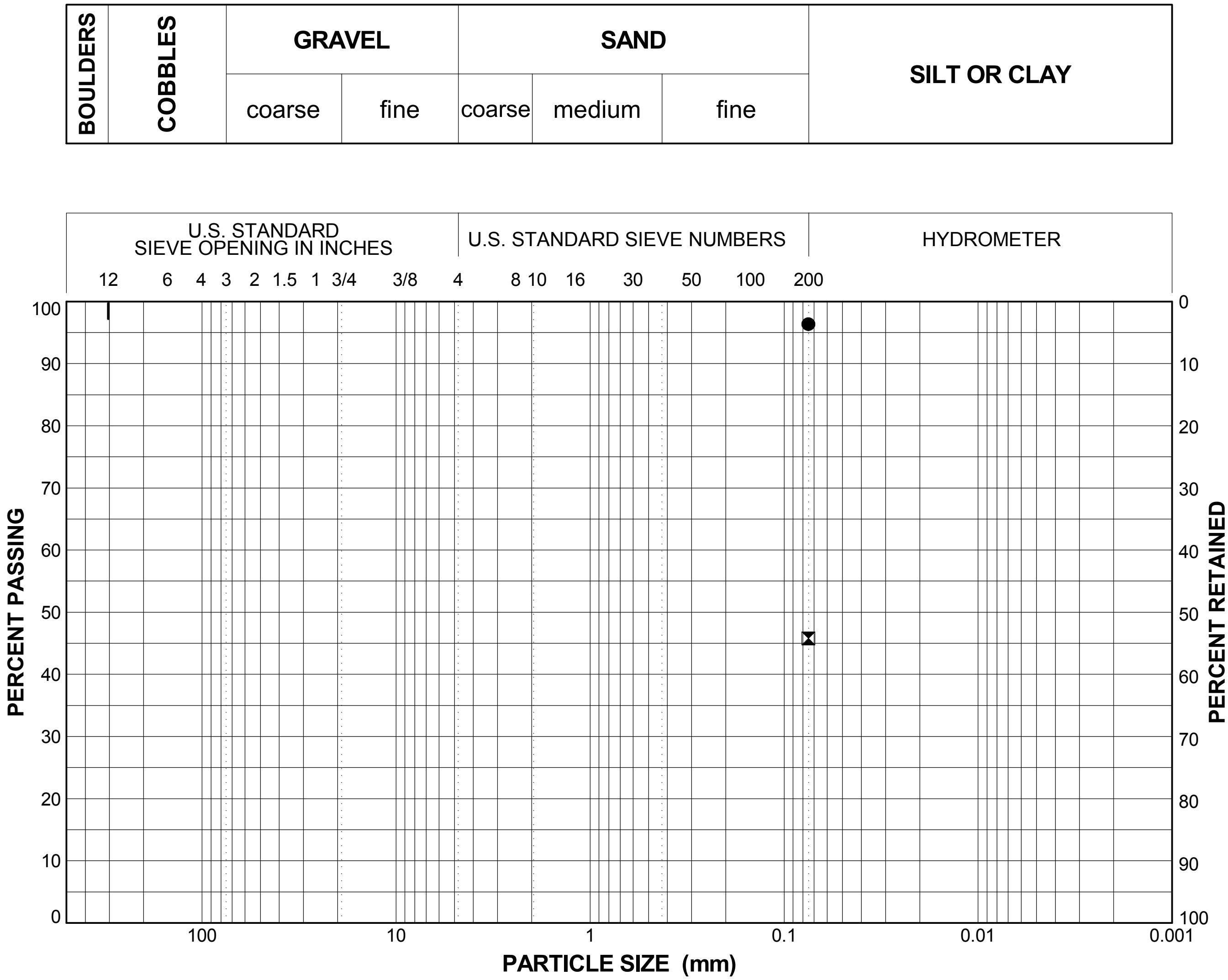


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_232B	S06A_019_020T	19.65	●	0.0	0.0	37.2	CLAYEY SAND (SC)
WR0017_232B	S11A_035_036S	34.5	⧗	0.0	0.0	7.5	Poorly Graded SAND with Silt (SP-SM)

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_233B	S02A_008_009C	8	●	0.0	0.0	85.8	SILT with Sand (ML)
WR0017_233B	S02A_008_009C	8.25	⧗	0.0	0.0	66.7	SILT with Sand (ML)
WR0017_233B	S03B_012_013S	12	▲	0.0	0.0	4.1	Poorly Graded SAND (SP)
WR0017_233B	S04A_015_018T	16.2	★	0.0	0.0	41.6	SILTY SAND (SM)
WR0017_233B	S04A_015_018T	17.5	☉	0.0	0.0	84.8	SILT with Sand (ML)

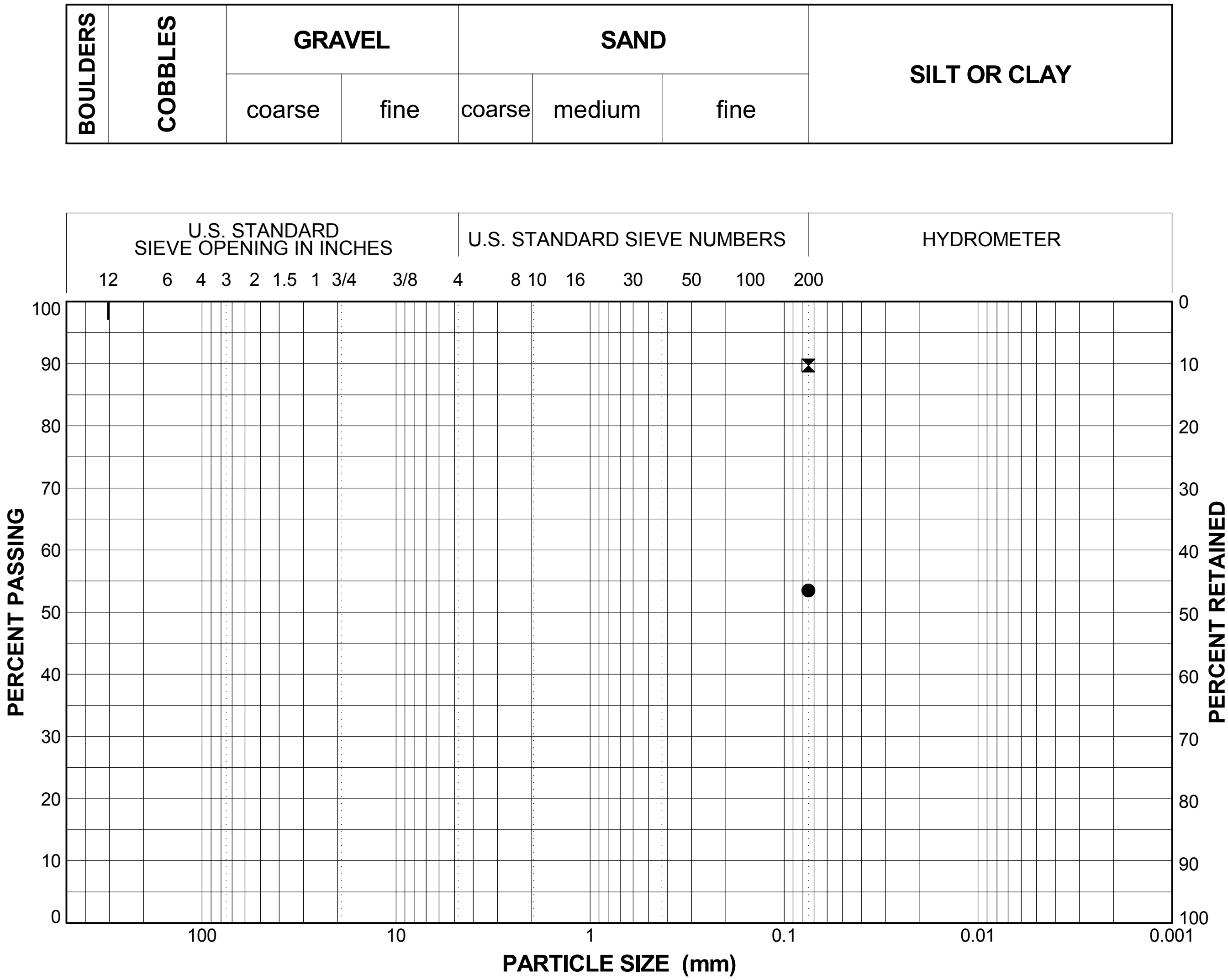


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_233B	S07A_030_032T	31.2	●	0.0	0.0	96.4	LEAN CLAY (CL)
WR0017_233B	S08A_035_036T	35	⧗	0.0	0.0	45.8	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

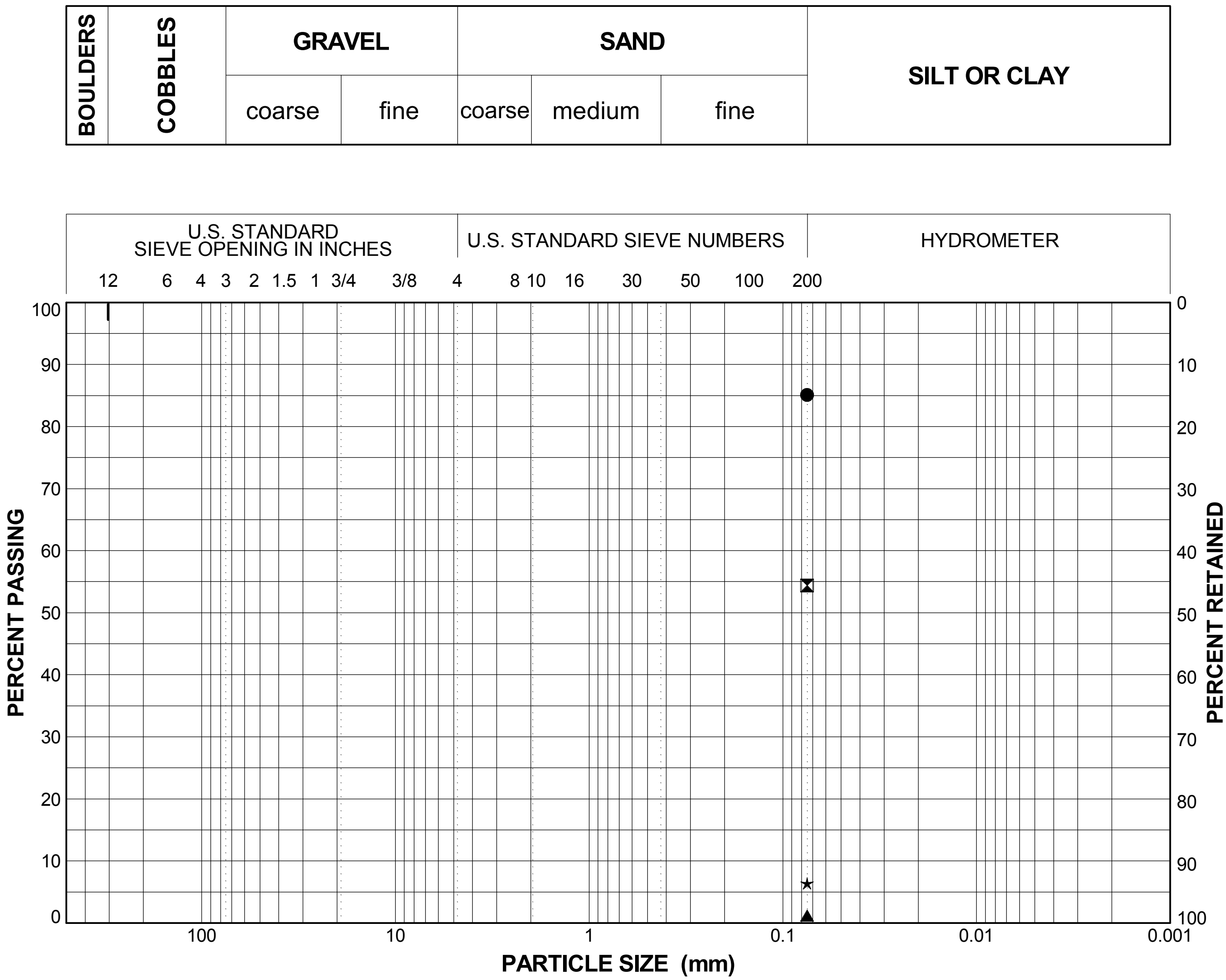


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_234B	S02A_005_007S	5	●	0.0	0.0	53.5	SANDY LEAN CLAY (CL)
WR0017_234B	S05A_012_014S	12	⧗	0.0	0.0	89.7	LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_235B	S03A_013_014C	13.5	●	0.0	0.0	85.1	SANDY SILT (ML)
WR0017_235B	S07A_032_034S	32	⧗	0.0	0.0	54.4	SANDY SILT (ML)
WR0017_235B	S08A_037_039T	38.15	▲	0.0	0.0	1.2	Poorly Graded SAND (SP)
WR0017_235B	S09A_042_044S	42	★	0.0	0.0	6.4	Poorly Graded SAND (SP)

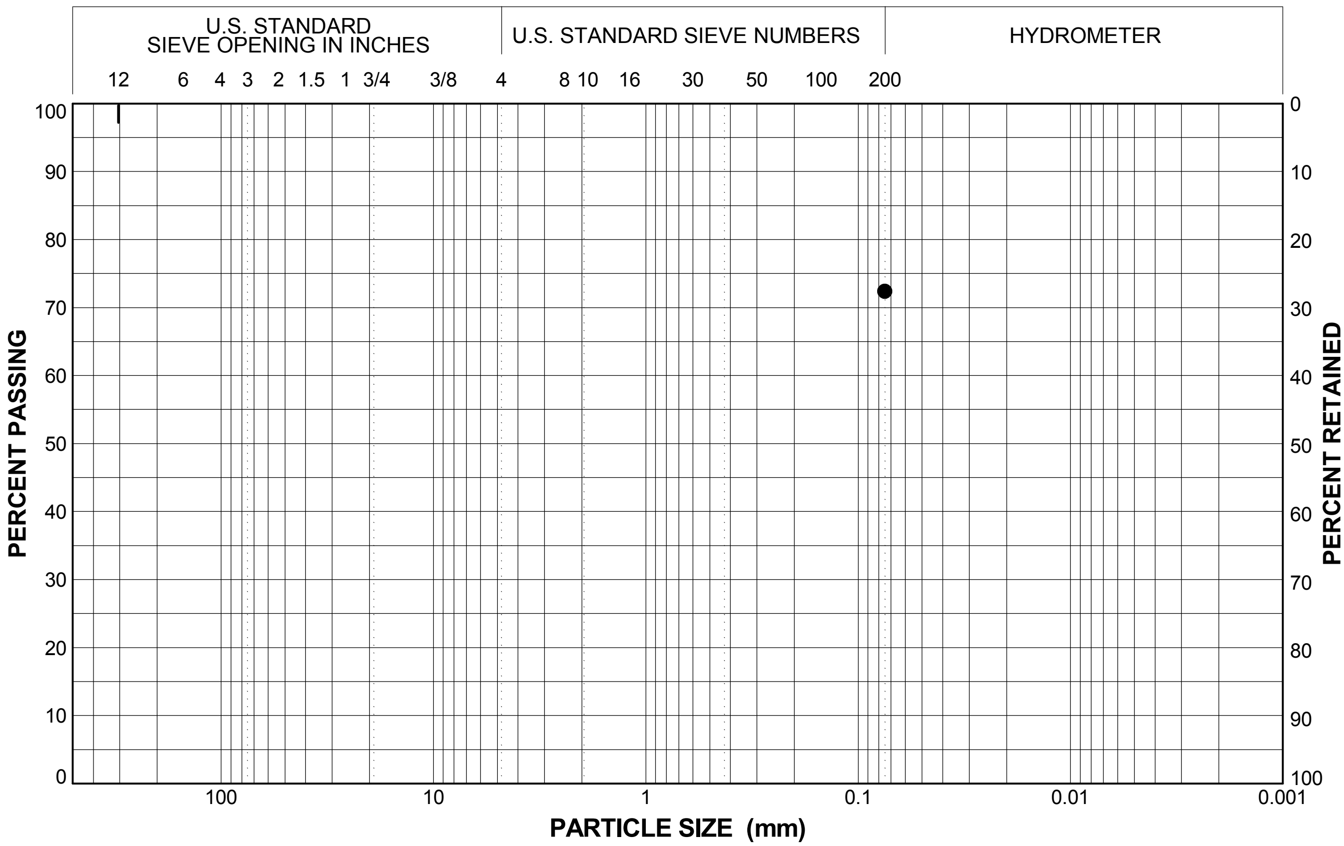
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

Sheet 38 of 96

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

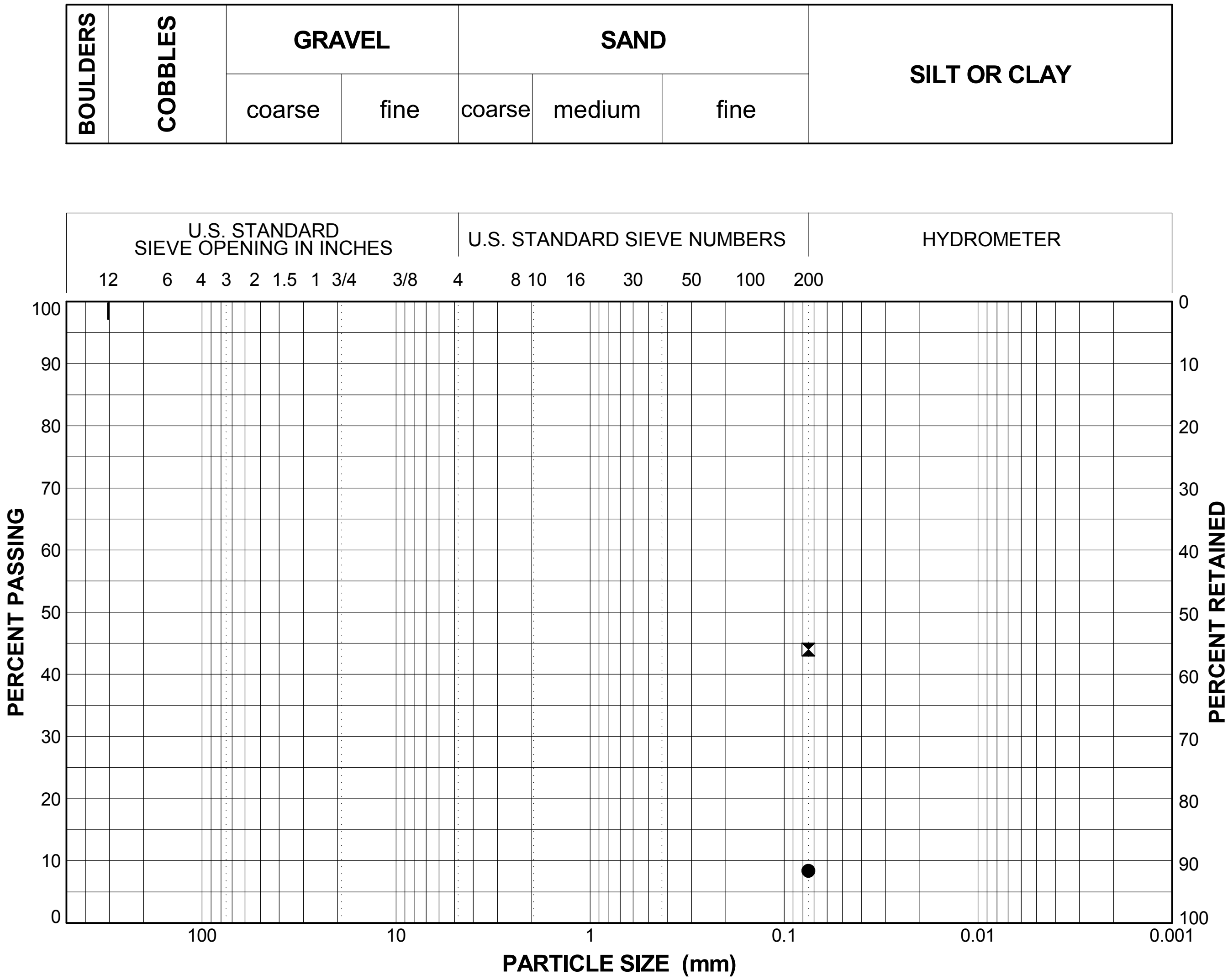


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_236B	S02A_005_007S	5	●	0.0	0.0	72.4	SILT with Sand (ML)

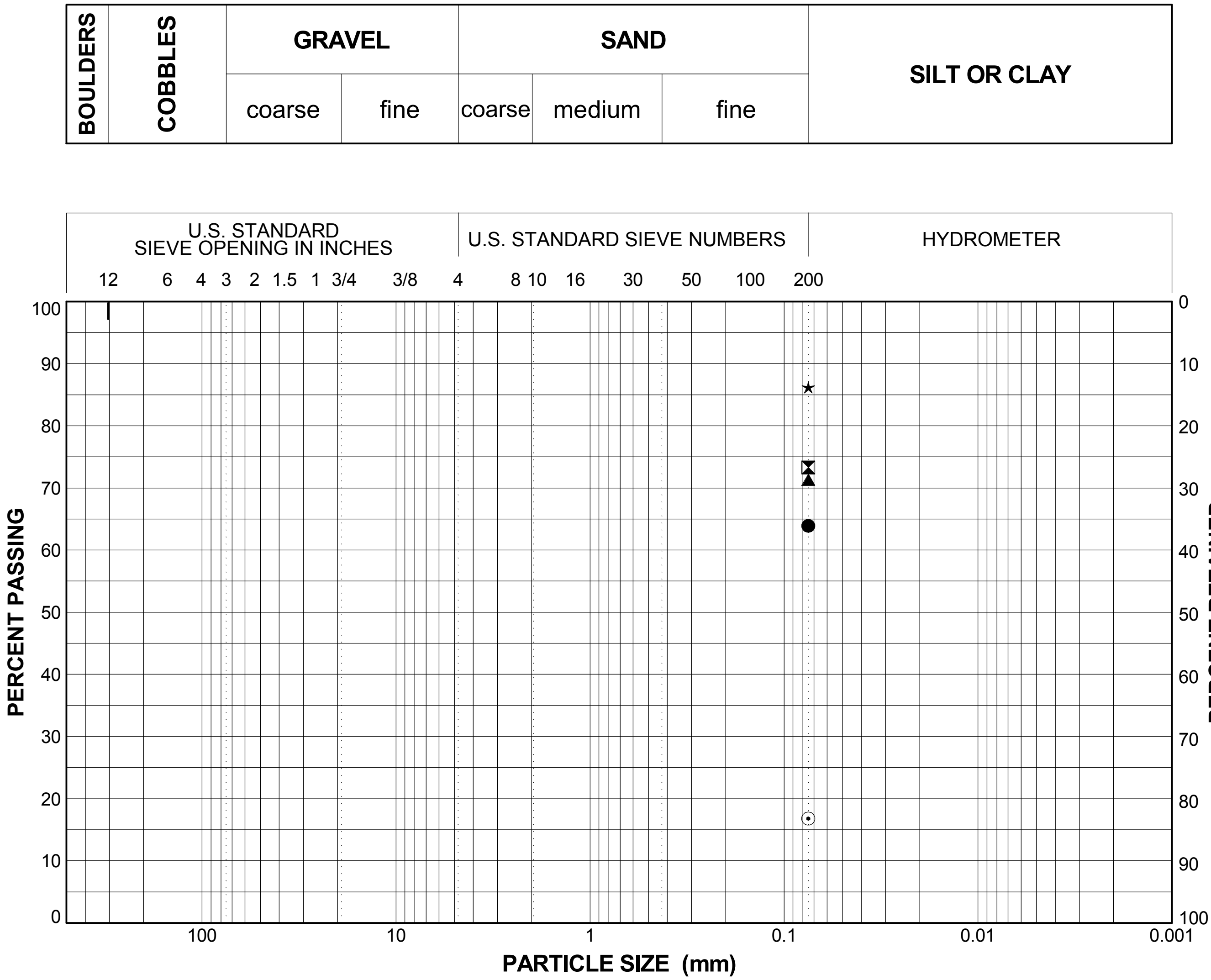
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_237B	S02A_007_009S	7	●	0.0	0.0	8.4	Poorly Graded SAND with Silt (SP-SM)
WR0017_237B	S08A_035_037S	35	⧗	0.0	0.0	44.0	SILTY SAND (SM)

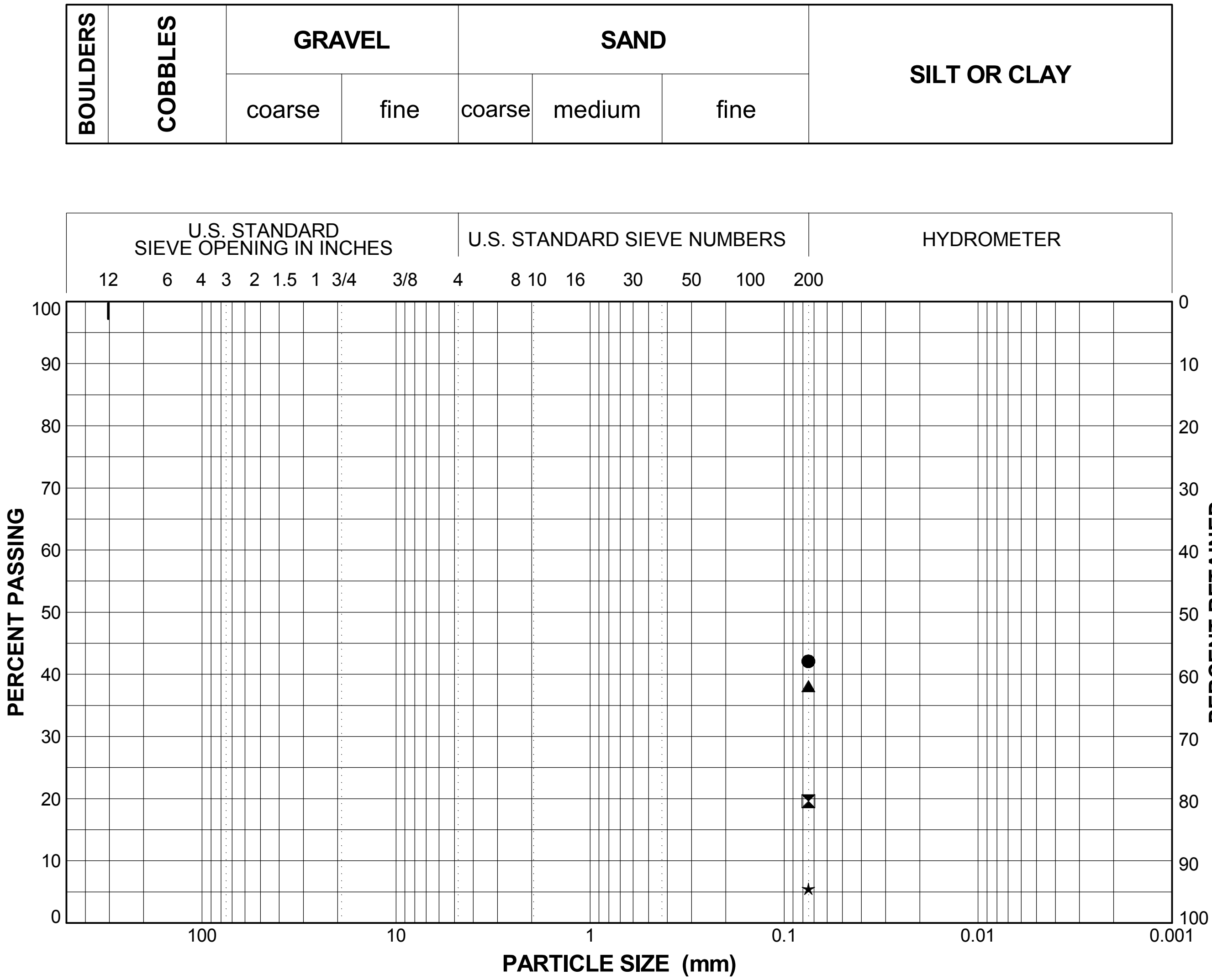


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_238B	S02A_006_007S	6	●	0.0	0.0	63.9	SANDY LEAN CLAY (CL)
WR0017_238B	S03B_008_010C	8.5	⧗	0.0	0.0	73.3	LEAN CLAY with SAND (CL)
WR0017_238B	S05A_014_016S	14.5	▲	0.0	0.0	71.3	LEAN CLAY with SAND (CL)
WR0017_238B	S06B_017_018C	17.5	★	0.0	0.0	86.2	FAT CLAY (CH)
WR0017_238B	S11A_036_038T	36	⊙	0.0	0.0	16.8	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_239B	S02A_005_007S	5	●	0.0	0.0	42.1	CLAYEY SAND (SC)
WR0017_239B	S03A_008_010T	9.5	⧗	0.0	0.0	19.6	SILTY SAND (SM)
WR0017_239B	S04A_011_013S	11.5	▲	0.0	0.0	38.1	SILTY SAND (SM)
WR0017_239B	S13A_042_043S	41.5	★	0.0	0.0	5.5	Poorly Graded SAND with Silt (SP-SM)

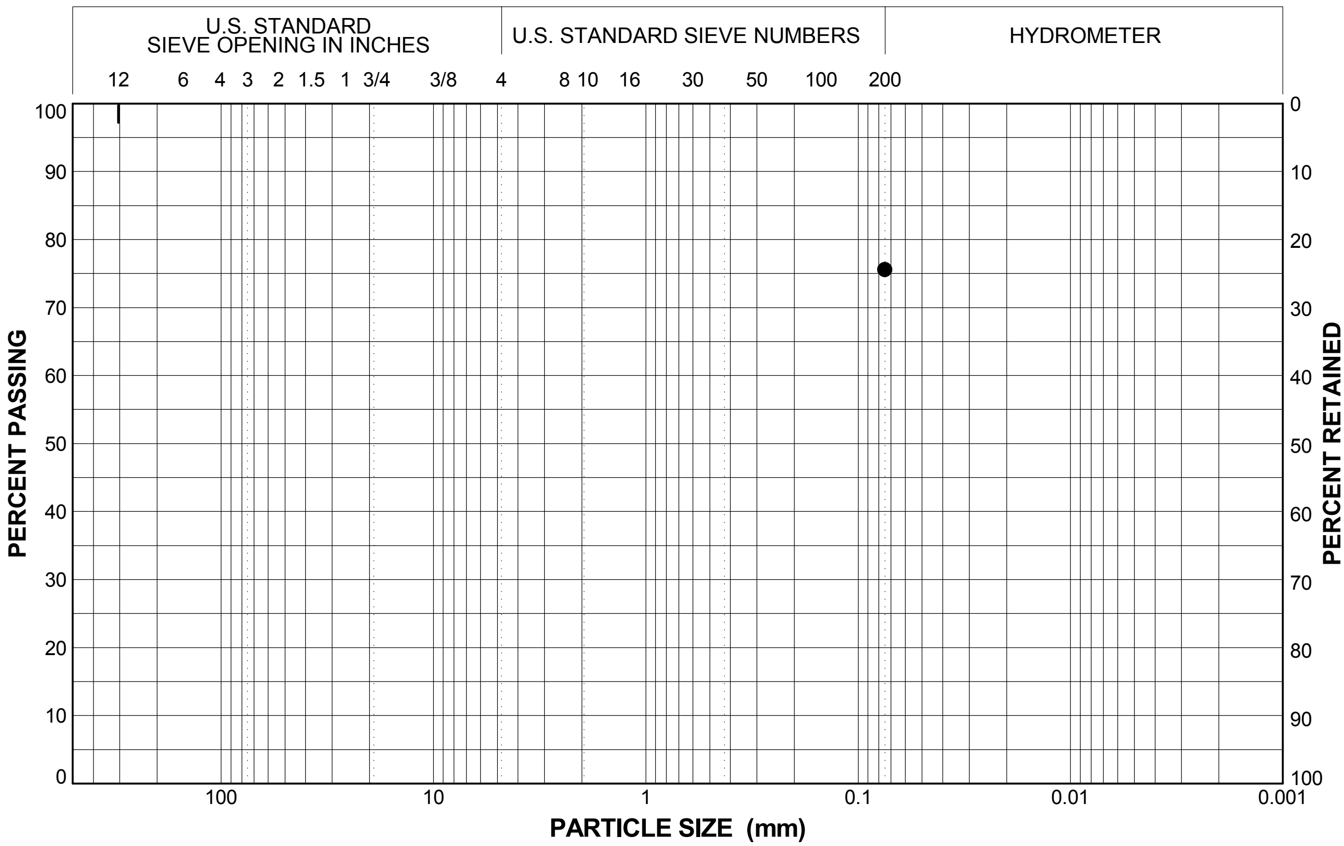
DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

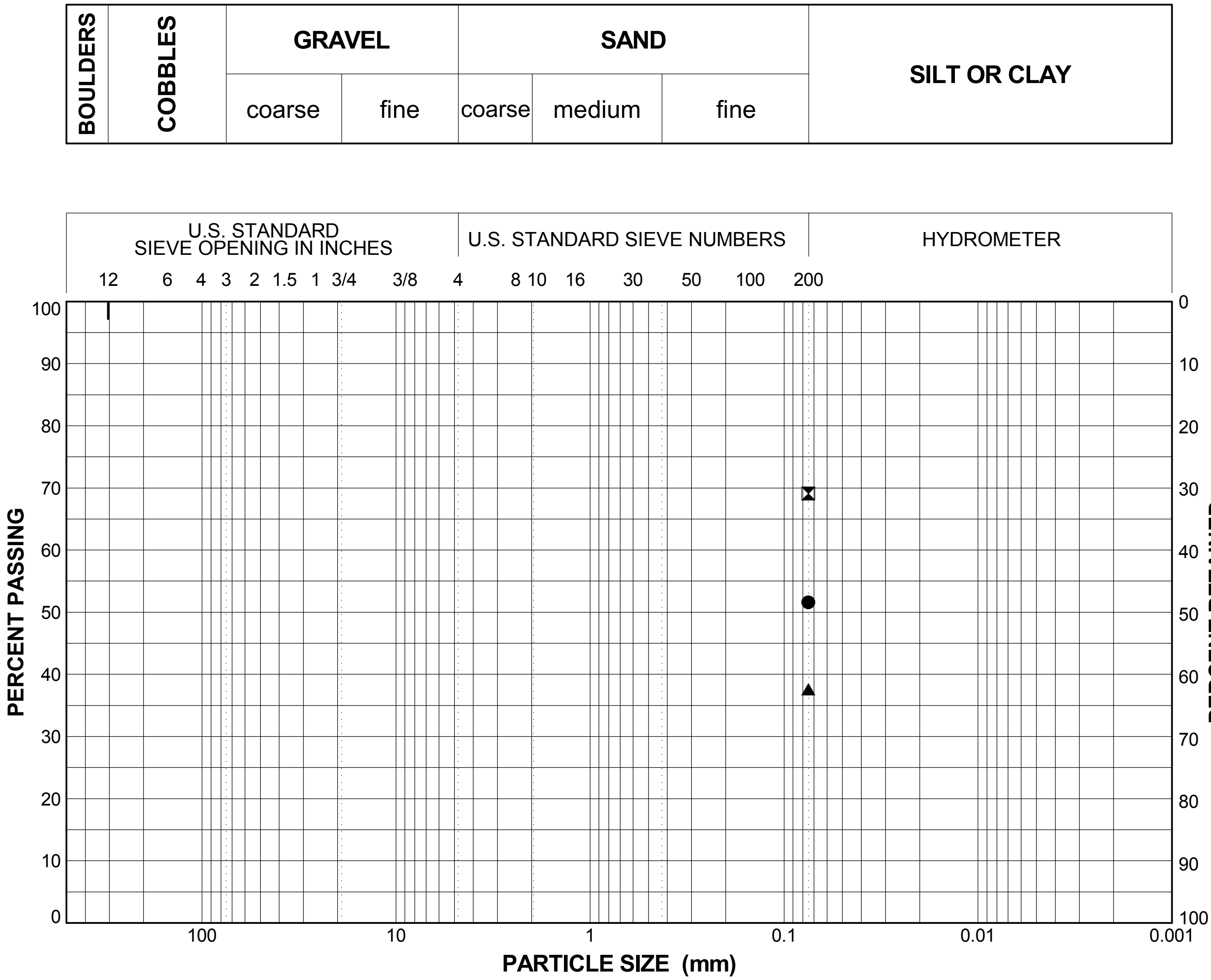


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_240B	S02B_007_009C	7.5	●	0.0	0.0	75.6	LEAN CLAY with SAND (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

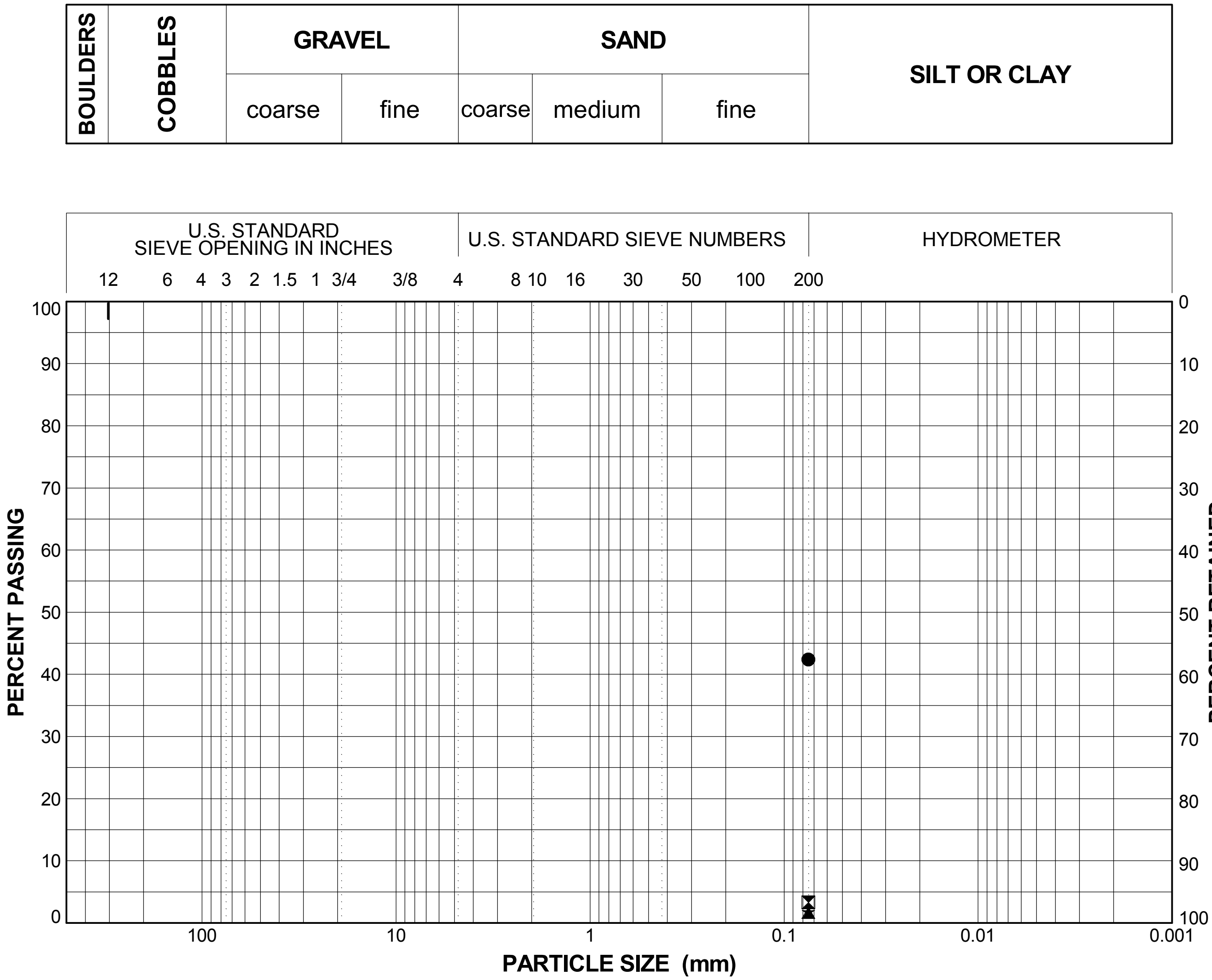


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_241B	S02A_002_004S	2.5	●	0.0	0.0	51.6	SANDY LEAN CLAY (CL)
WR0017_241B	S04A_007_009S	7	⧗	0.0	0.0	69.1	SANDY SILT (ML)
WR0017_241B	S12A_026_028T	27	▲	0.0	0.0	37.6	CLAYEY SAND (SC)

Levee Evaluations
Engineering Support Services

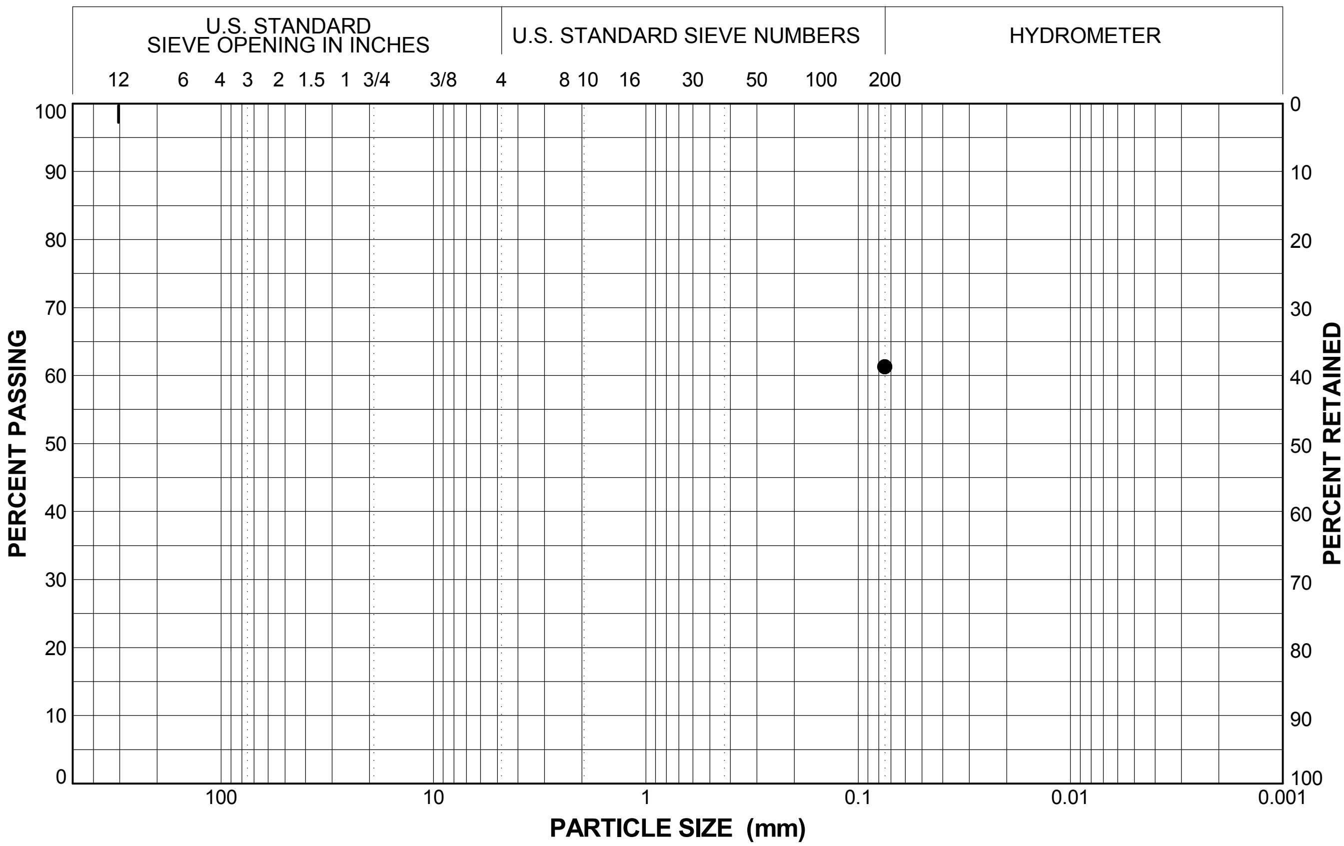
RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_243B	S03A_008_010T	9.45	●	0.0	0.0	42.4	SILTY, CLAYEY SAND (SC-SM)
WR0017_243B	S06A_019_021T	19.5	⧗	0.0	0.0	3.3	Poorly Graded SAND (SP)
WR0017_243B	S06A_019_021T	20	▲	0.0	0.0	1.6	Poorly Graded SAND (SP)
WR0017_243B	S08A_023_025T	23.65	★	0.0	0.0	1.8	Poorly Graded SAND (SP)

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_245B	S05A_012_014S	12	●	0.0	0.0	61.3	SANDY SILTY CLAY (CL-ML)

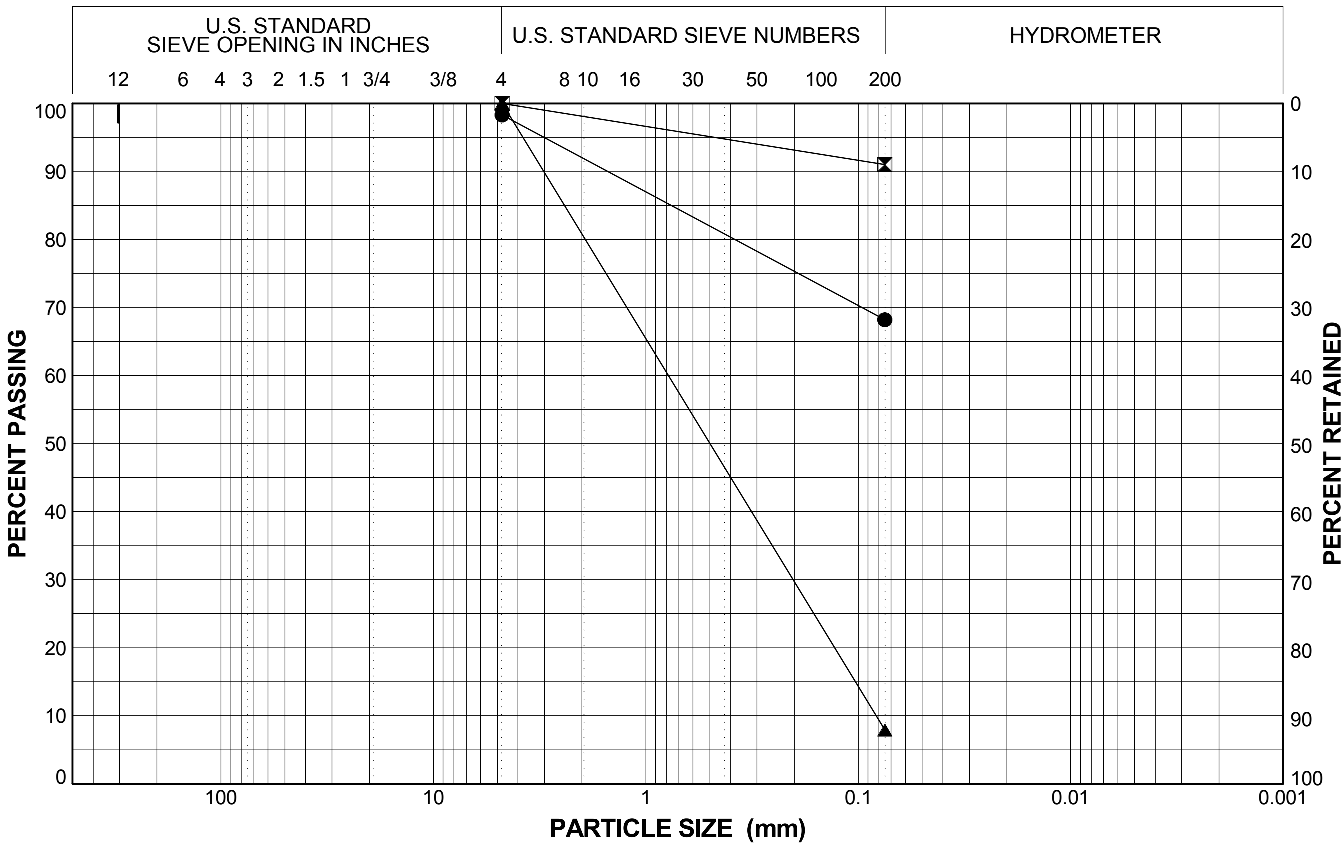
DWR LEVEE UNU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

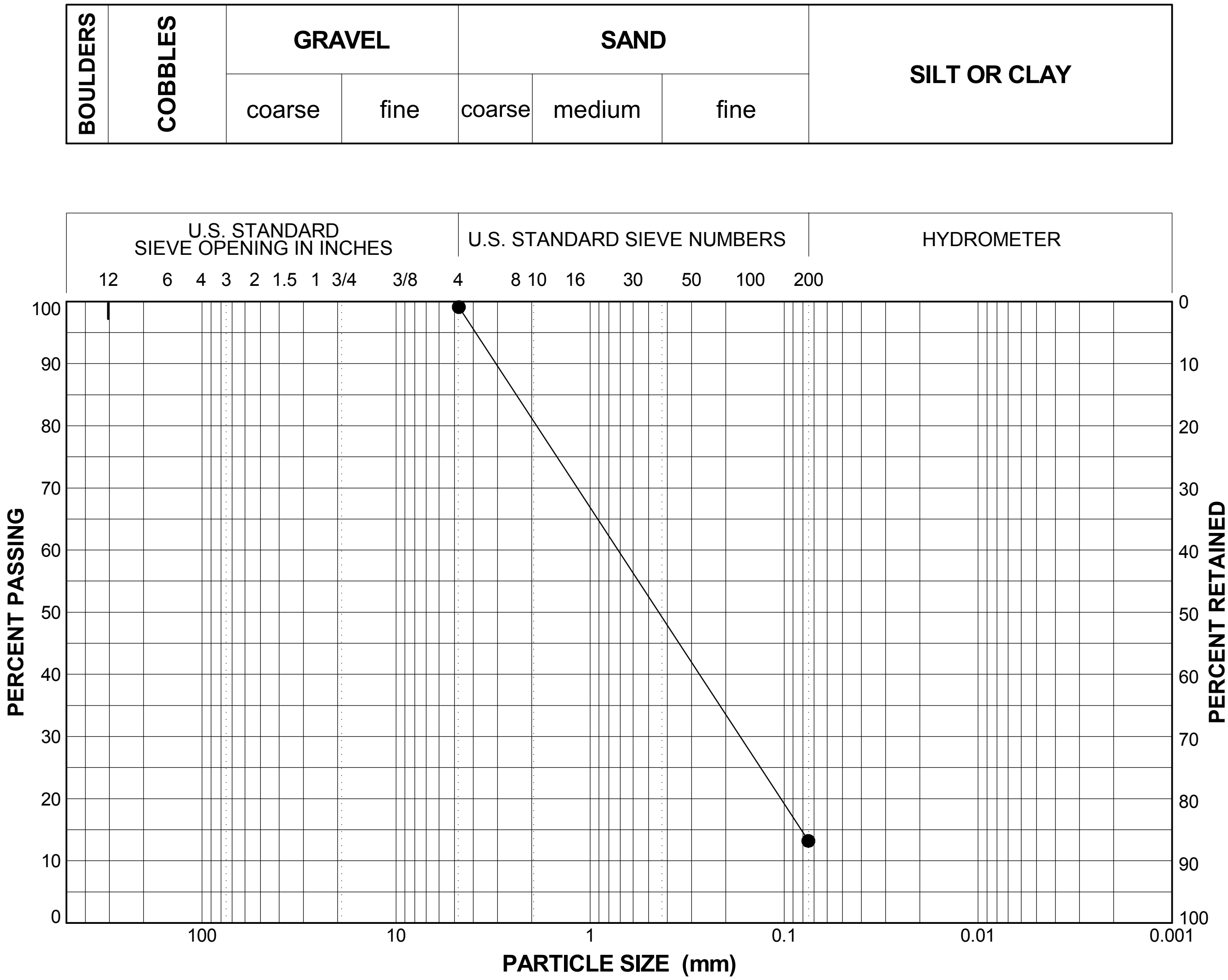


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_246B	S01A_003_004B	3	●	0.0	30.1	68.2	SANDY LEAN CLAY (CL)
WR0017_246B	S03A_007_009S	8	⧗	0.0	9.0	91.0	Poorly Graded SAND (SP)
WR0017_246B	S05A_012_014S	12.5	▲	0.0	92.1	7.9	Poorly Graded SAND with Silt (SP-SM)

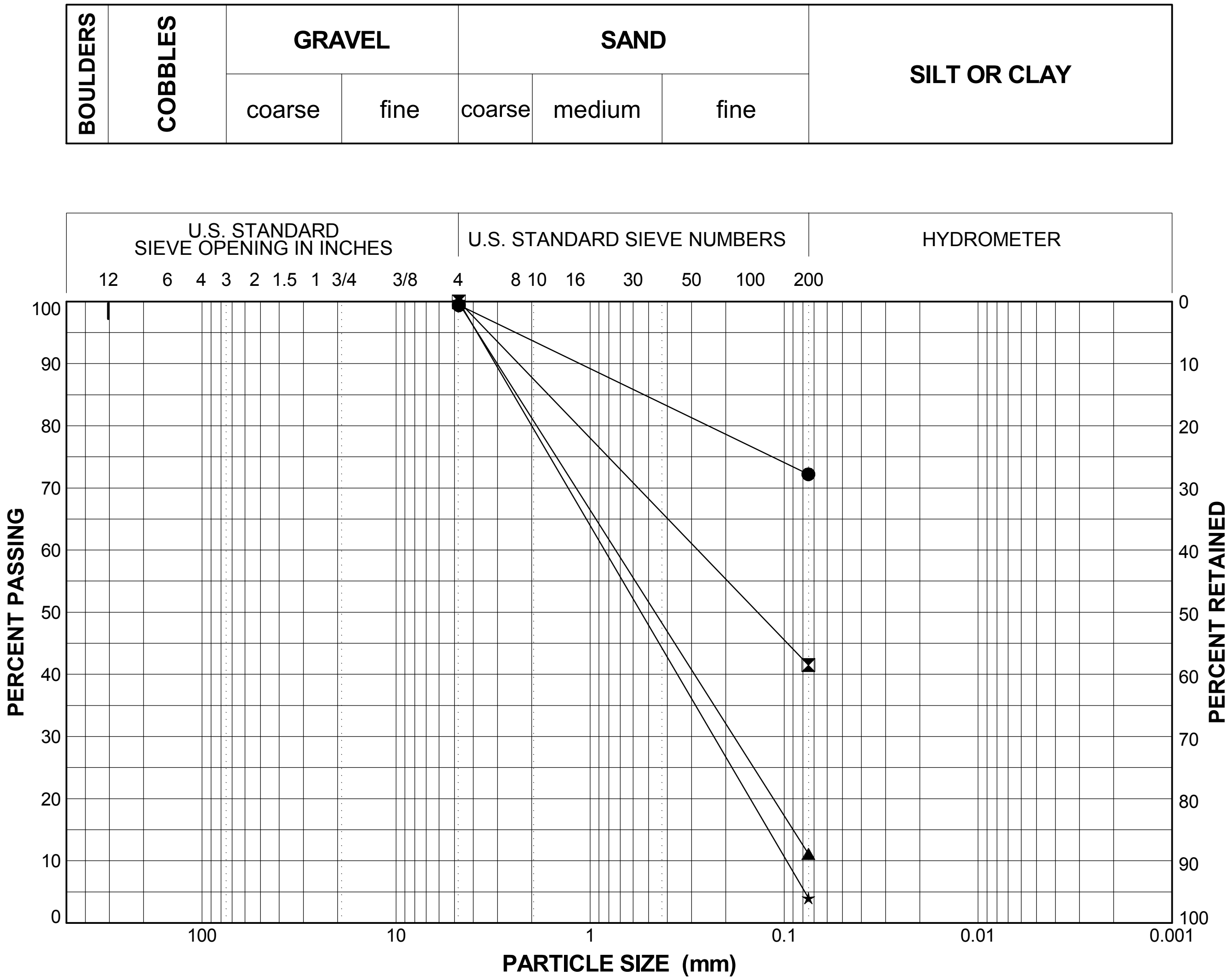
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_247B	S08A_017_018S	17.5	●	0.0	85.9	13.2	SILTY SAND (SM)

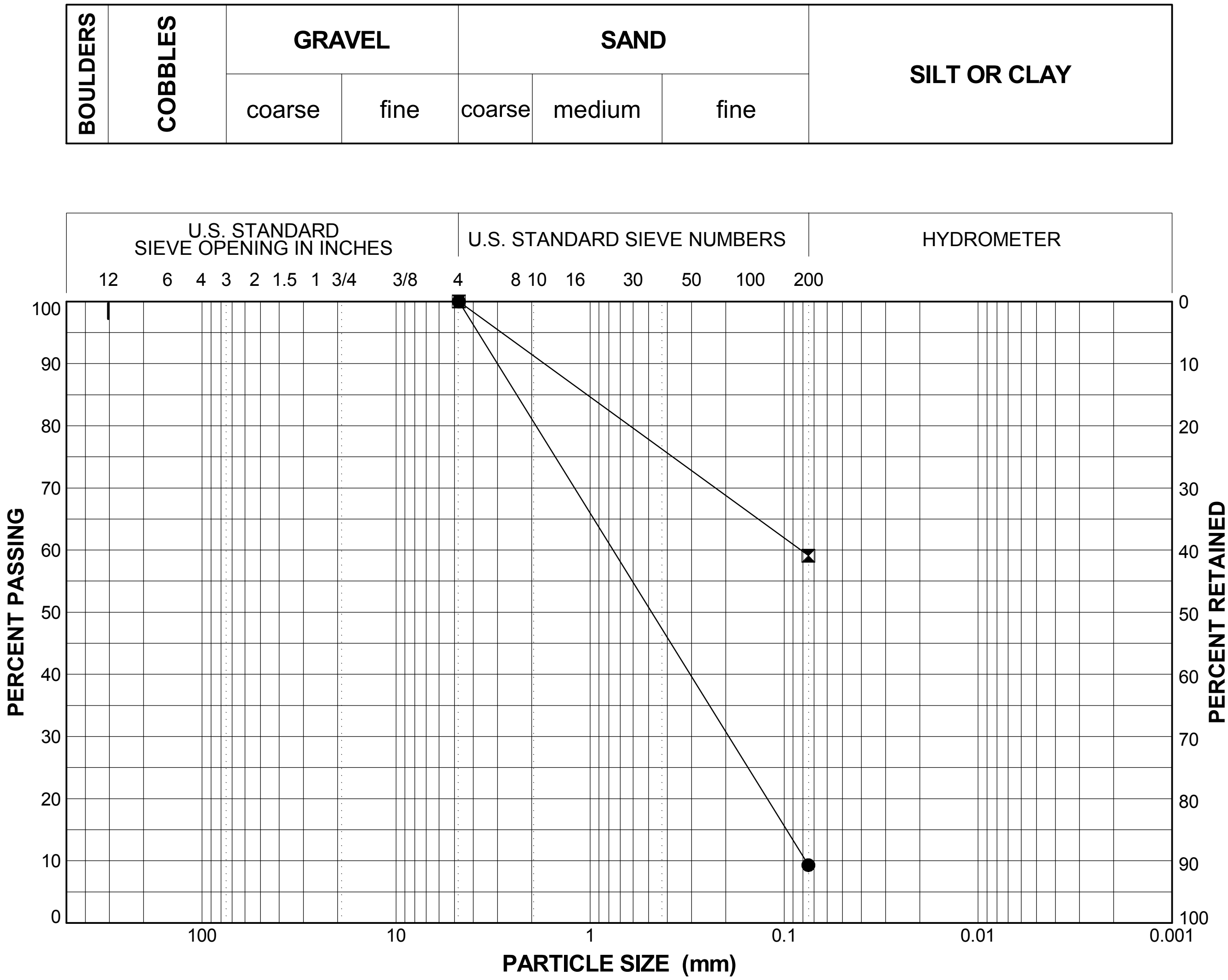


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_248B	S01A_004_005B	4	●	0.0	27.2	72.2	LEAN CLAY with SAND (CL)
WR0017_248B	S02A_007_009S	8	⧗	0.0	58.5	41.5	CLAYEY SAND (SC)
WR0017_248B	S04A_012_014S	13	▲	0.0	88.6	11.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_248B	S06A_022_024S	18	★	0.0	96.0	4.0	POORLY GRADED SAND (SP)

Levee Evaluations
Engineering Support Services

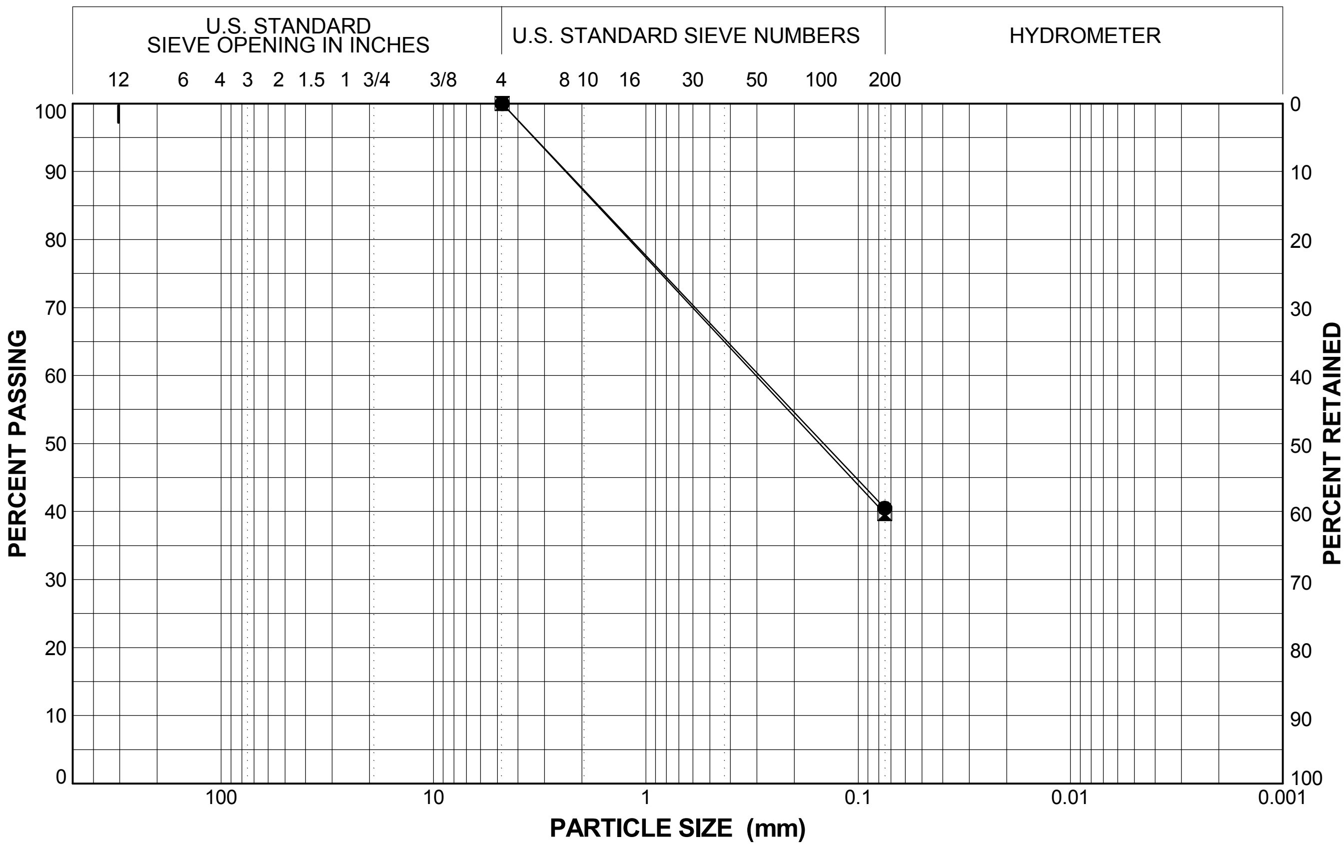
RD 17

PARTICLE SIZE DISTRIBUTION CURVES

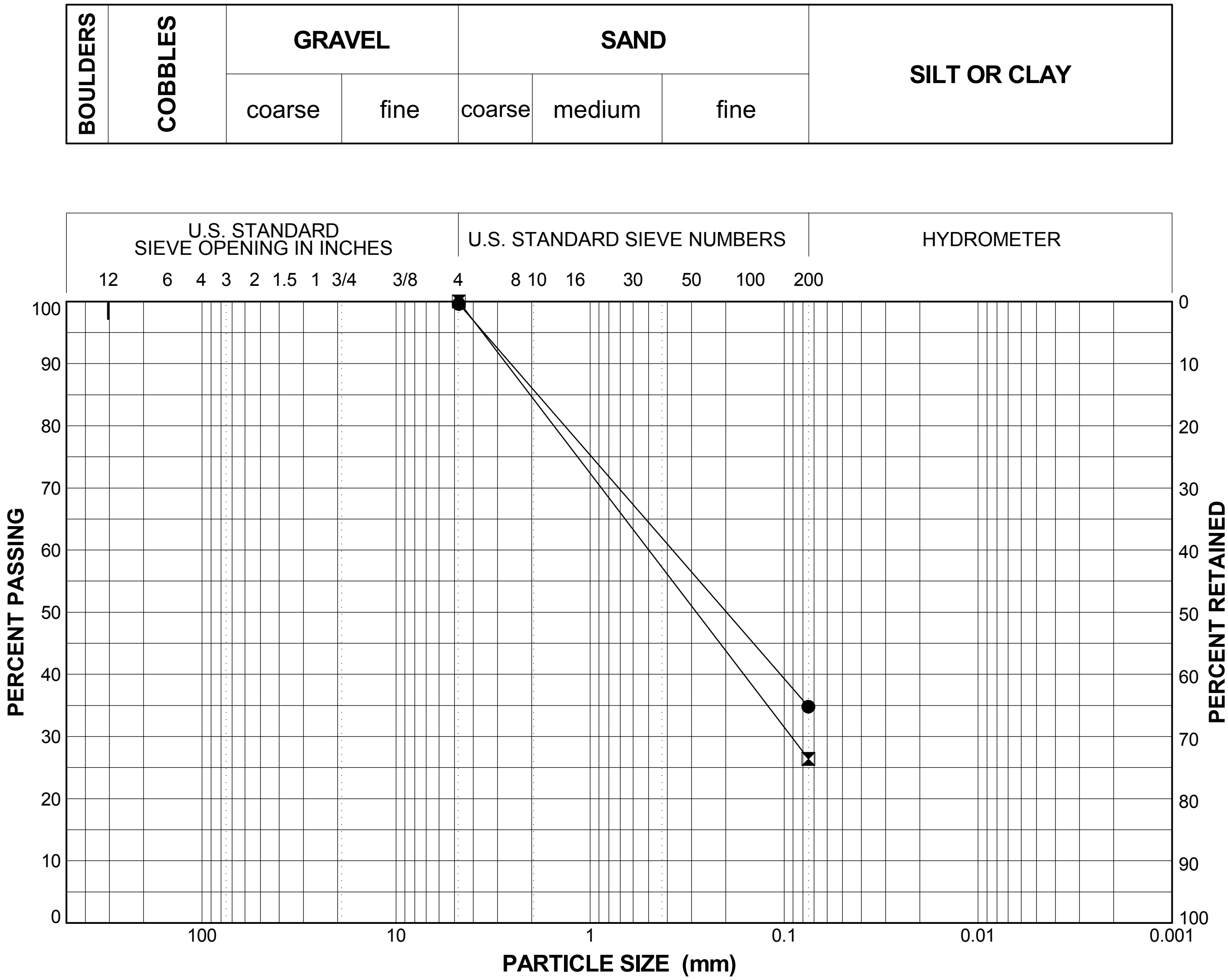


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_249B	S07A_012_013S	12.5	●	0.0	90.7	9.3	Poorly Graded SAND with Silt (SP-SM)
WR0017_249B	S09A_017_018S	17.5	⧗	0.0	40.9	59.1	SANDY SILT (ML)

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_250B	S02A_004_006C	5	●	0.0	59.5	40.5	SILTY SAND (SM)
WR0017_250B	S08A_017_019S	18	⧗	0.0	60.3	39.7	SILTY CLAYEY SAND (SC)

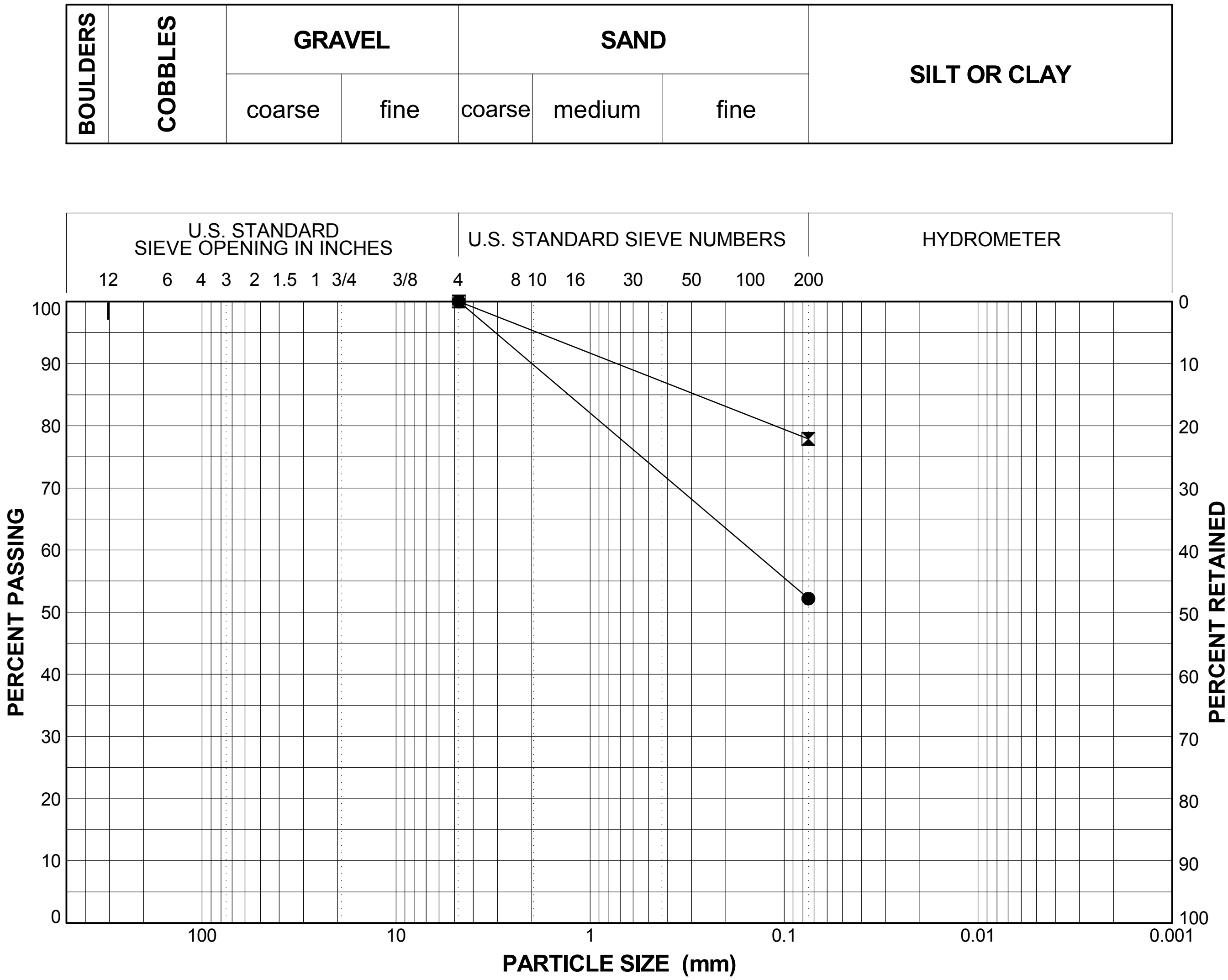


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_251B	S04A_006_007S	5.8	●	0.0	64.8	34.8	SILTY SAND (SM)
WR0017_251B	S09A_017_019S	18	⧗	0.0	73.6	26.4	SILTY SAND (SM)

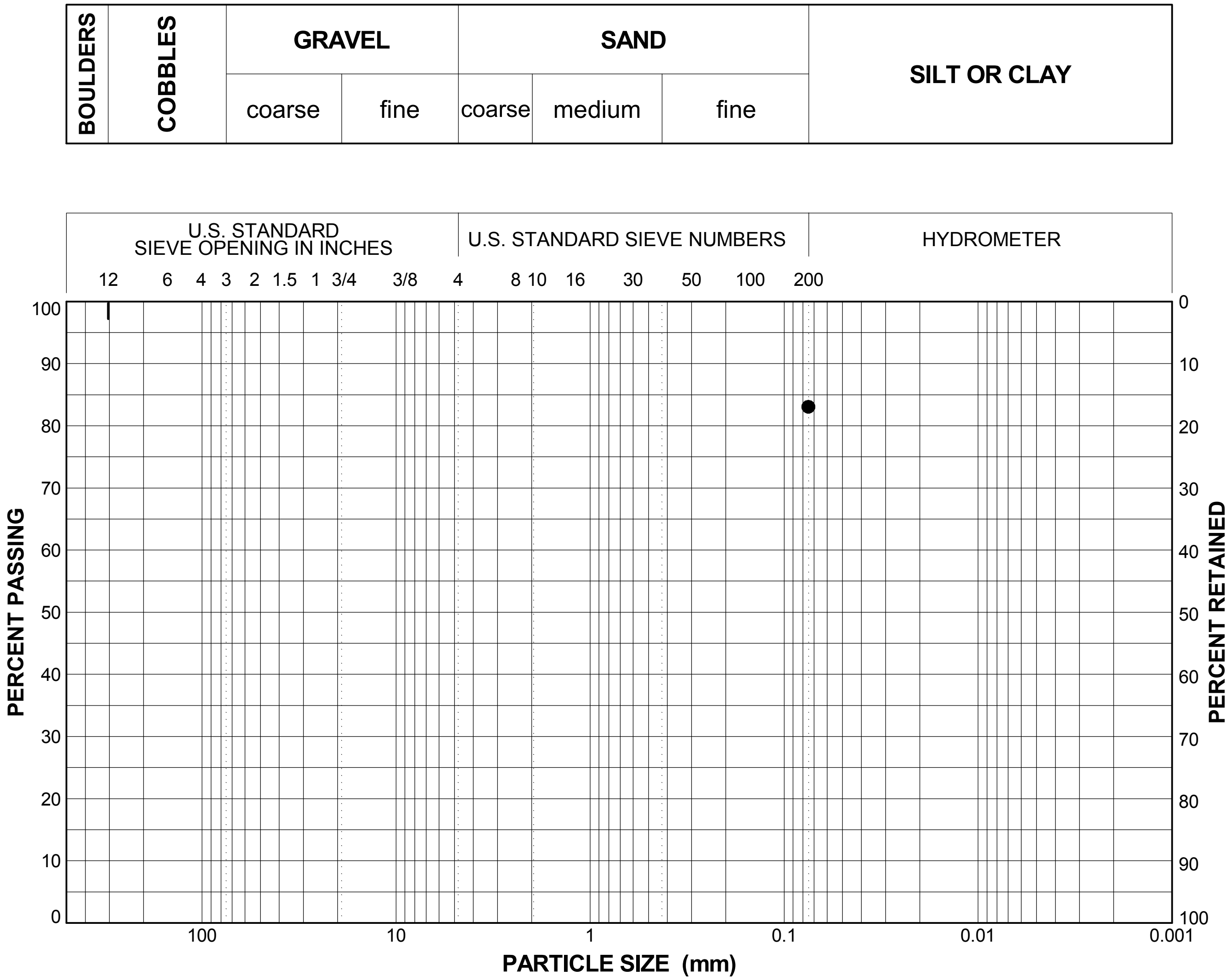
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_252B	S01A_002_003B	2	●	0.0	47.8	52.2	SANDY LEAN CLAY (CL)
WR0017_252B	S03A_007_009S	8	⧗	0.0	22.1	77.9	LEAN CLAY with Sand (CL)

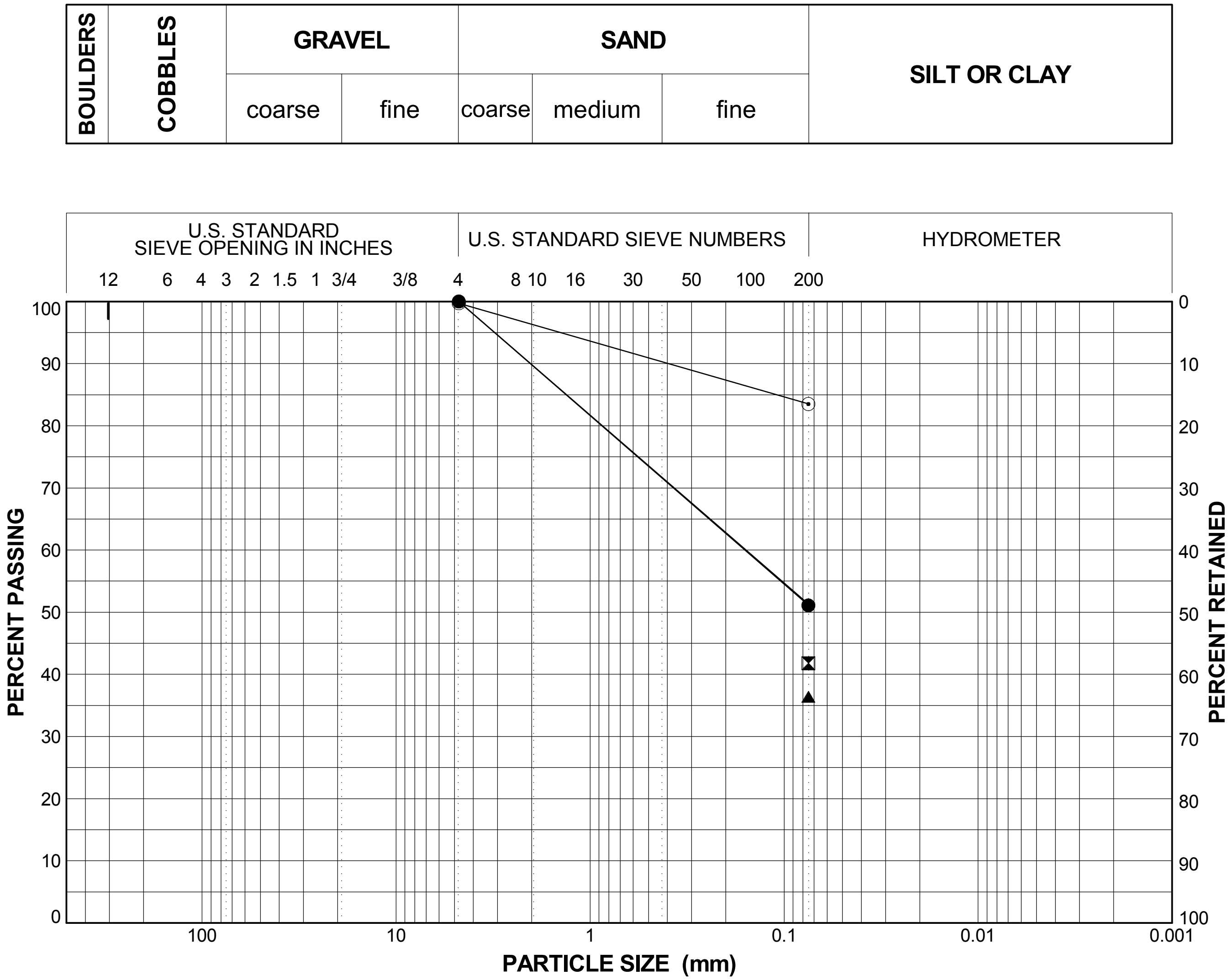


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_253B	S07A_028_030T	29.2	●	0.0	0.0	83.1	SILTY CLAY with SAND (CL-ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

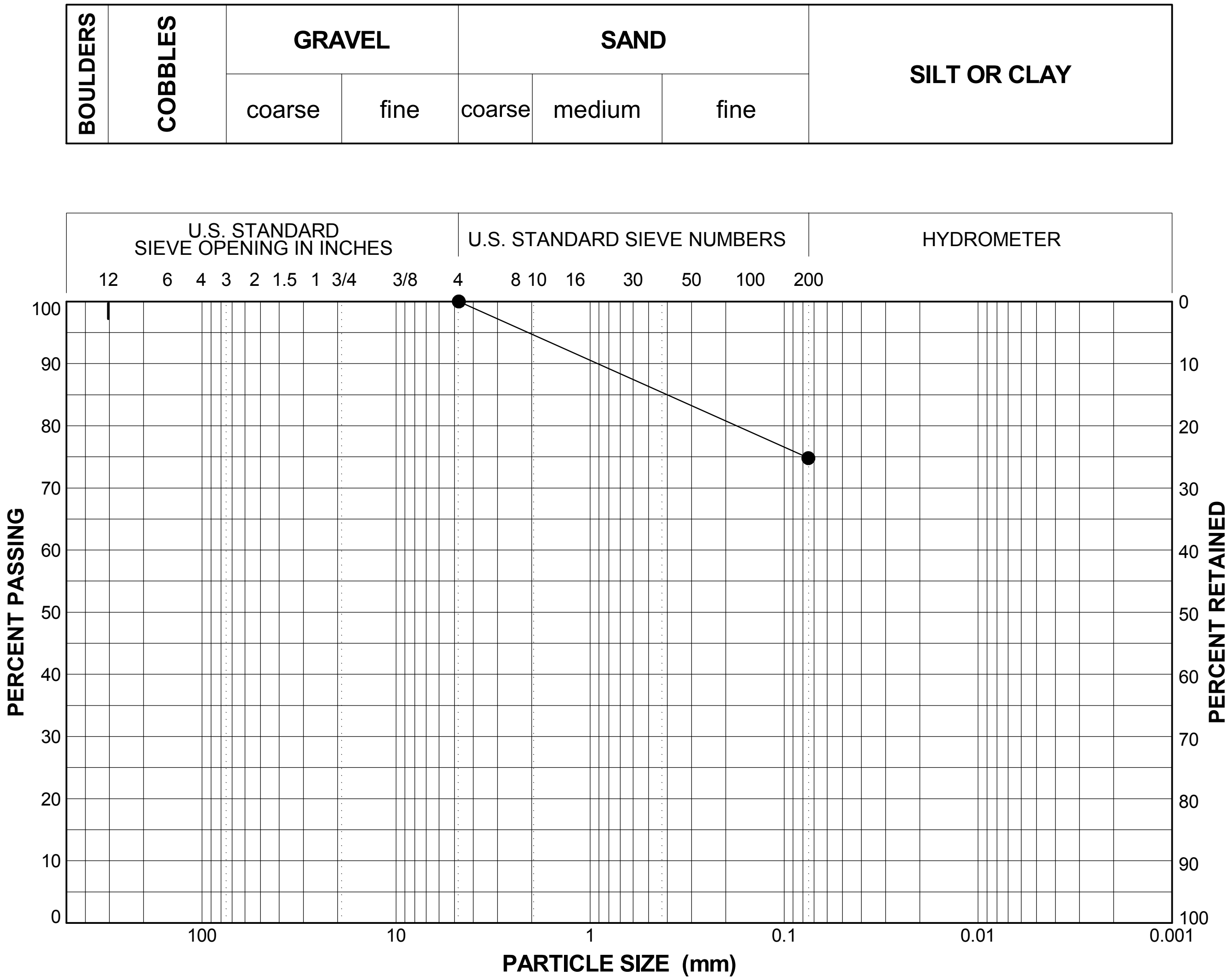


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_254B	S01A_002_003B	2	●	0.0	48.9	51.1	SANDY LEAN CLAY (CL)
WR0017_254B	S03A_007_009S	7.5	⧗	0.0	0.0	41.8	CLAYEY SAND (SC)
WR0017_254B	S04A_009_010P	9	▲	0.0	0.0	36.4	CLAYEY SAND (SC)
WR0017_254B	S05A_012_014S	13	★	0.0	48.7	51.3	SANDY SILTY CLAY (CL-ML)
WR0017_254B	S07A_017_019S	18	⊙	0.0	16.2	83.5	SILT with SAND (ML)

Levee Evaluations
Engineering Support Services

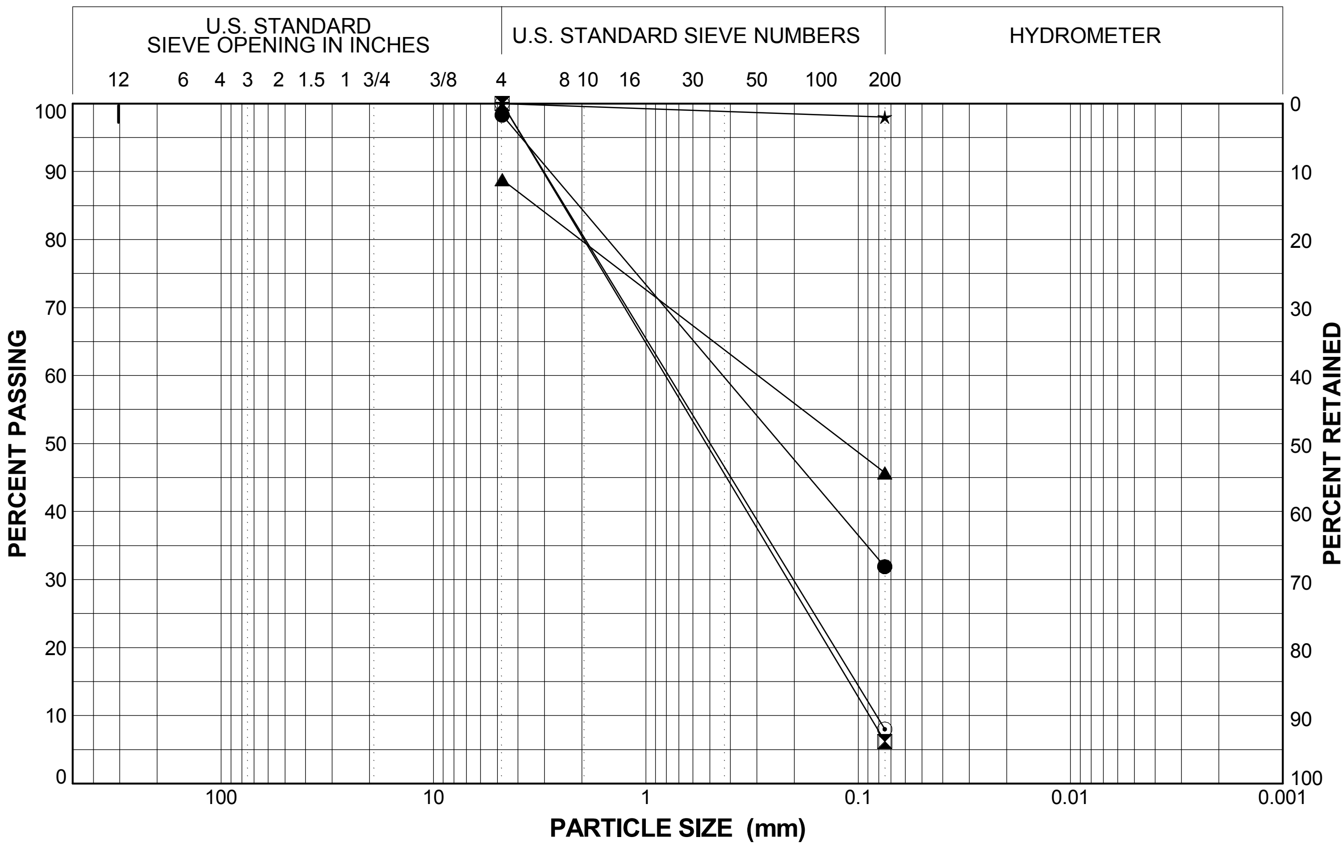
RD 17

PARTICLE SIZE DISTRIBUTION CURVES



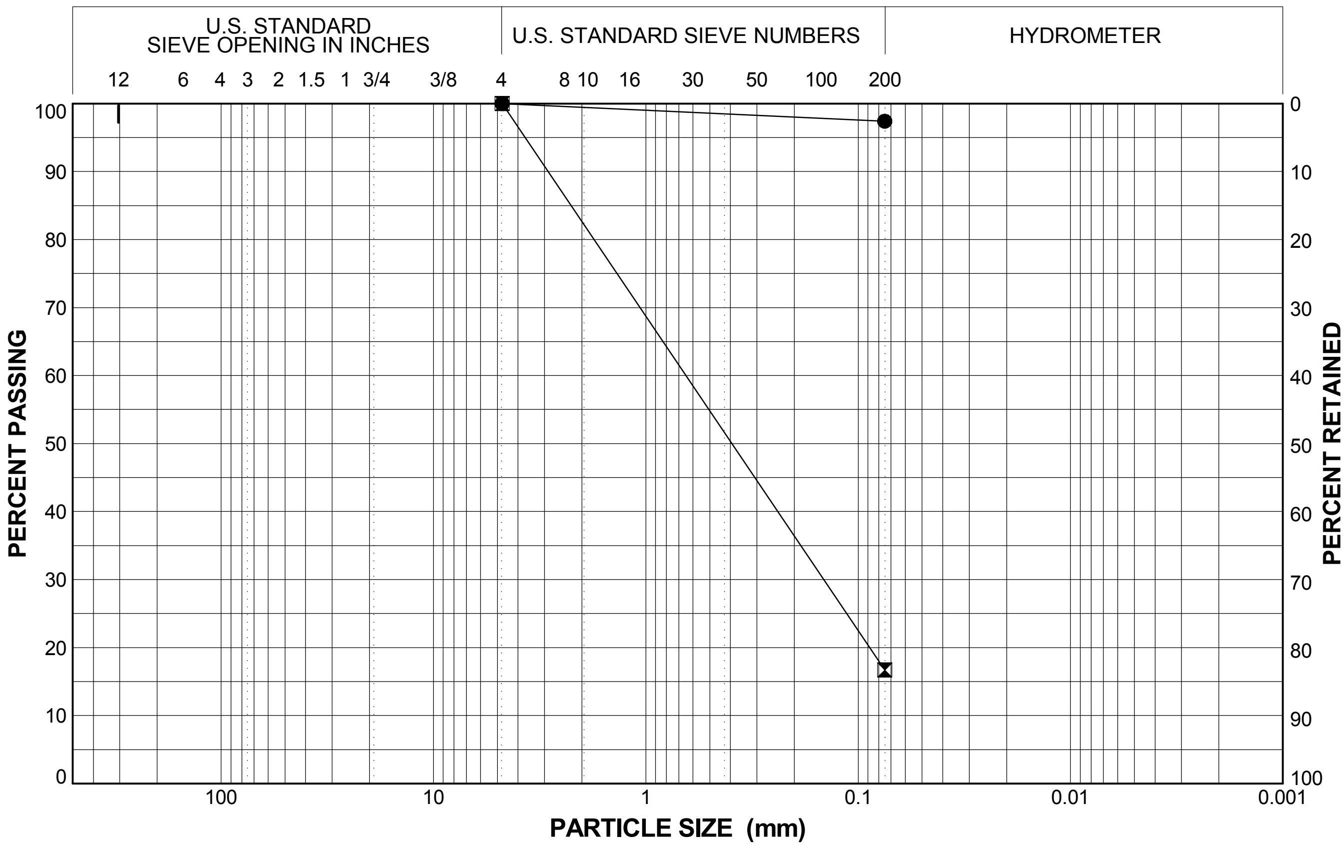
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_255B	S05A_008_010S	9.5	●	0.0	25.2	74.8	SILT with Sand (ML)

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



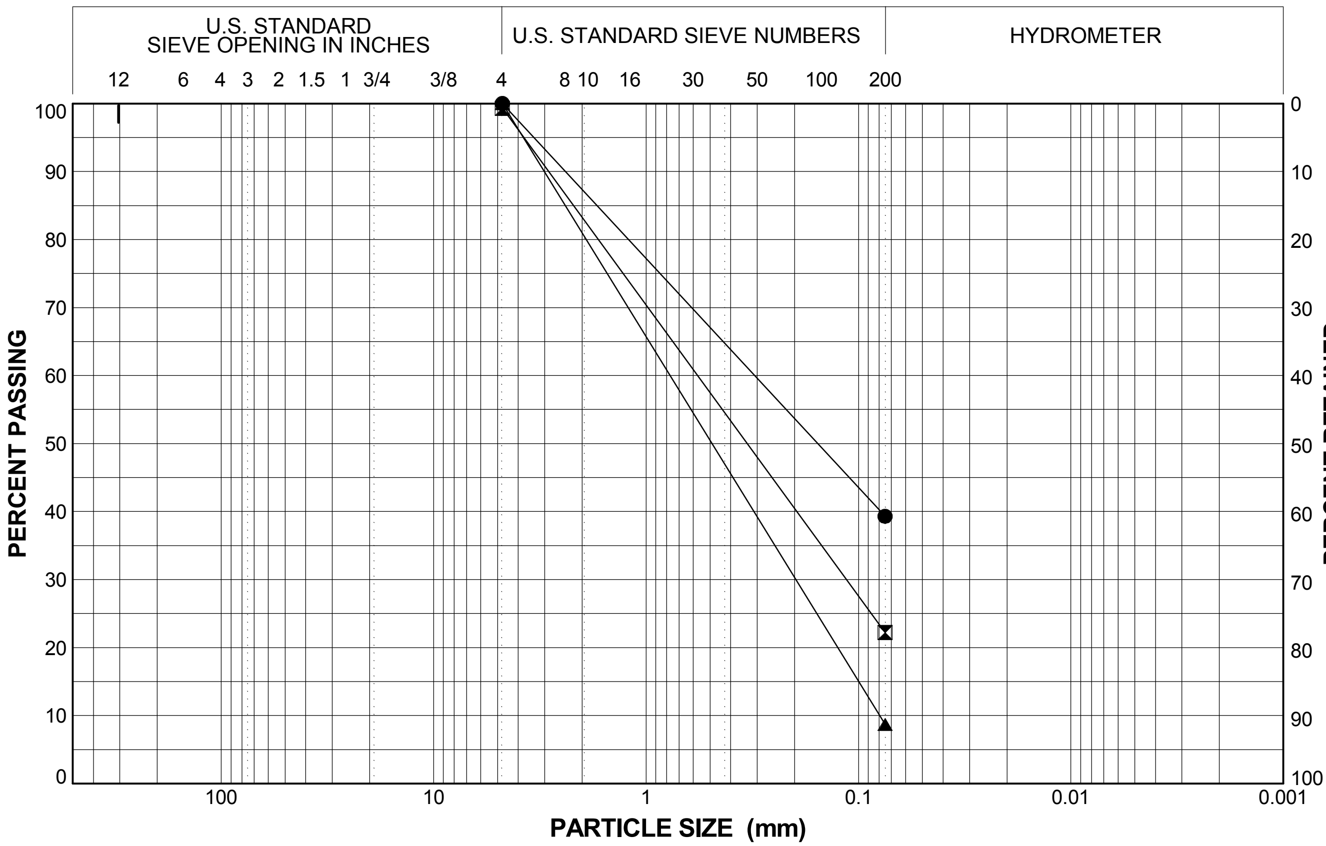
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_256B	S02A_003_005P	4.5	●	0.0	66.4	31.9	CLAYEY SAND (SC)
WR0017_256B	S05A_010_012S	11	⧗	0.0	93.8	6.2	Poorly Graded SAND with Silt (SP-SM)
WR0017_256B	S09A_016_017S	16	▲	0.0	43.1	45.7	SILTY SAND (SM)
WR0017_256B	S10A_018_019P	18.5	★	0.0	2.0	98.0	LEAN CLAY (CL)
WR0017_256B	S11A_021_022S	21	⊙	0.0	92.0	8.0	Poorly Graded SAND with Silt (SP-SM)

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

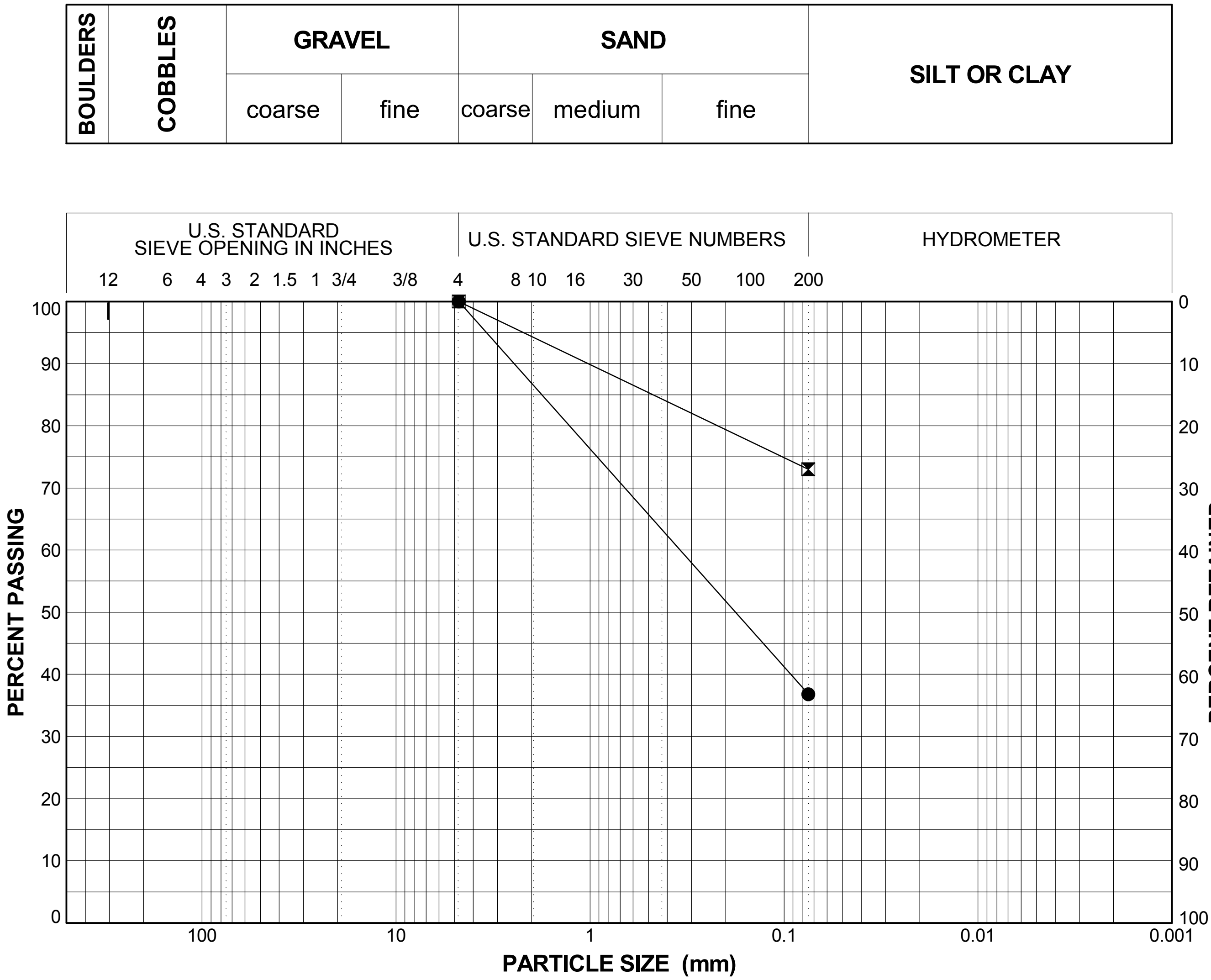


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_256B	S12B_022_023S	22.5	●	0.0	2.6	97.4	LEAN CLAY (CL)
WR0017_256B	S12A_023_024S	23	⧗	0.0	83.3	16.7	SILTY SAND (SM)

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_257B	S01A_002_003S	2	●	0.0	60.7	39.3	CLAYEY SAND (SC)
WR0017_257B	S05A_008_009S	8	⧗	0.0	77.1	22.2	SILTY SAND (SM)
WR0017_257B	S11A_017_019S	18	▲	0.0	91.3	8.7	Poorly Graded SAND with Silt (SP-SM)

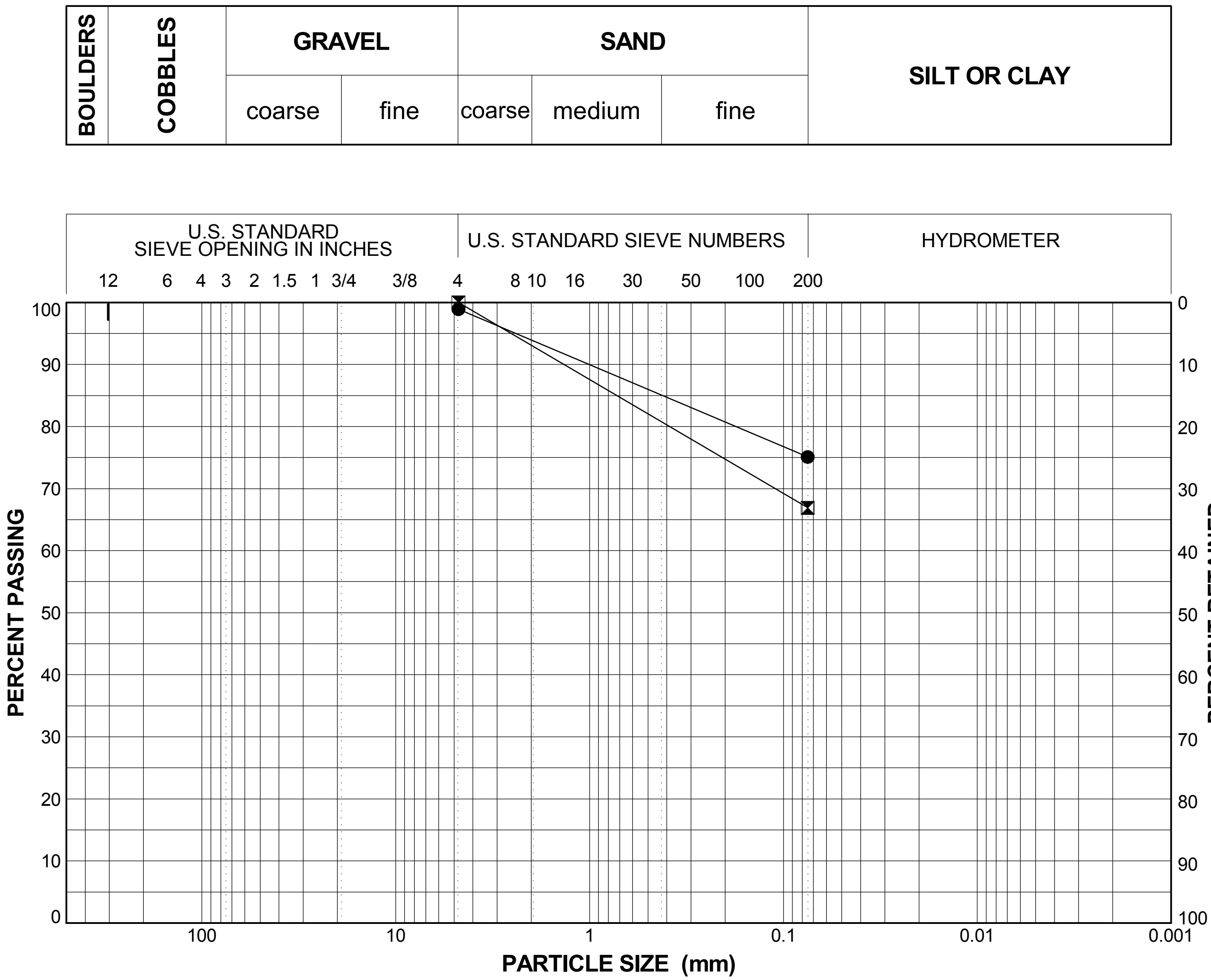


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_258B	S03B_004_004P	5.5	●	0.0	63.2	36.8	CLAYEY SAND (SC)
WR0017_258B	S06A_012_014S	13	⧗	0.0	27.0	73.0	LEAN CLAY with SAND (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

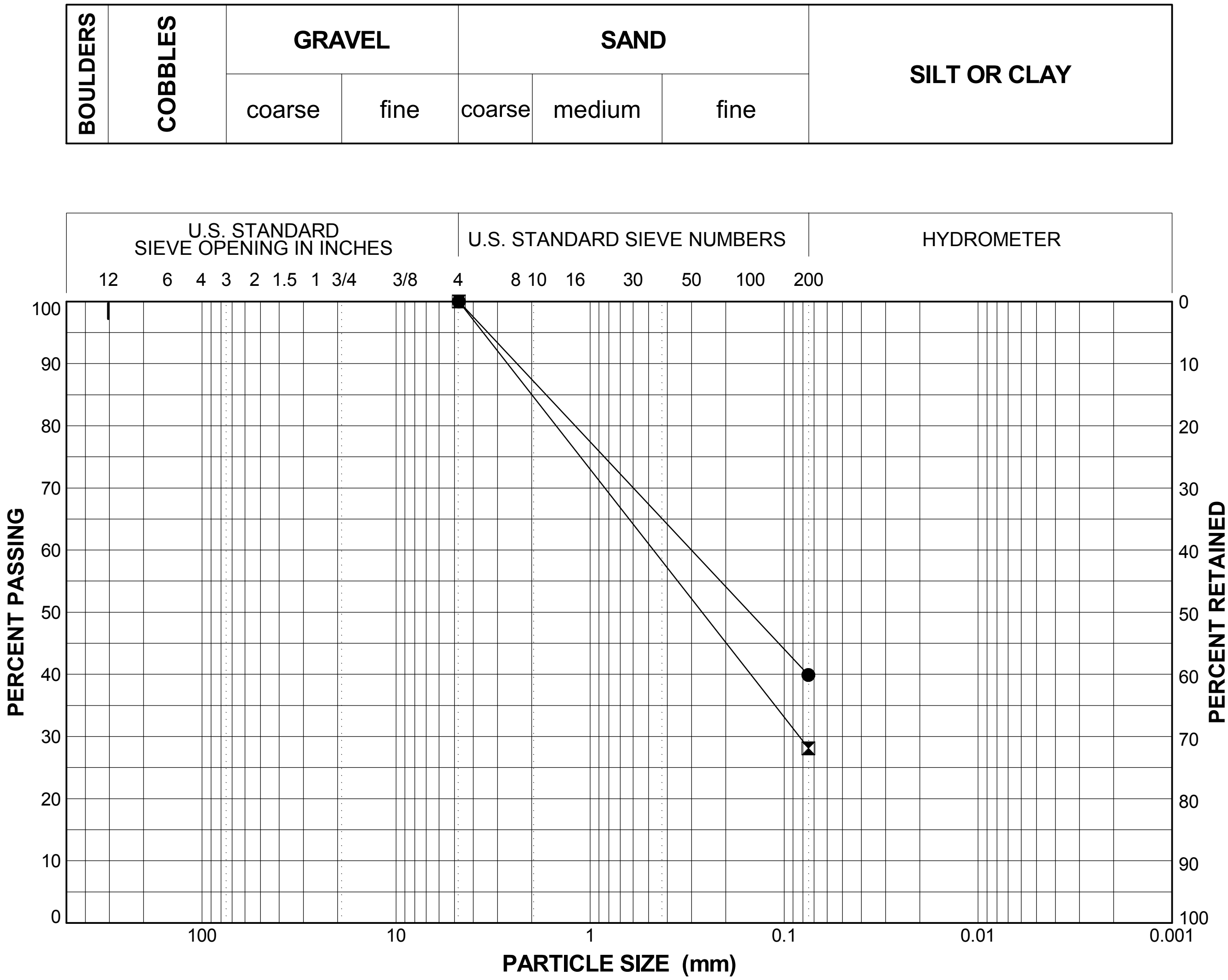


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_259B	S01A_001_003B	2	●	0.0	23.8	75.1	LEAN CLAY with SAND (CL)
WR0017_259B	S03A_005_007S	6	⧗	0.0	33.1	66.9	SANDY LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_260B	S02A_003_005B	3	●	0.0	60.1	39.9	CLAYEY SAND (SC)
WR0017_260B	S03A_005_007S	6	⧗	0.0	71.9	28.1	CLAYEY SAND (SC)

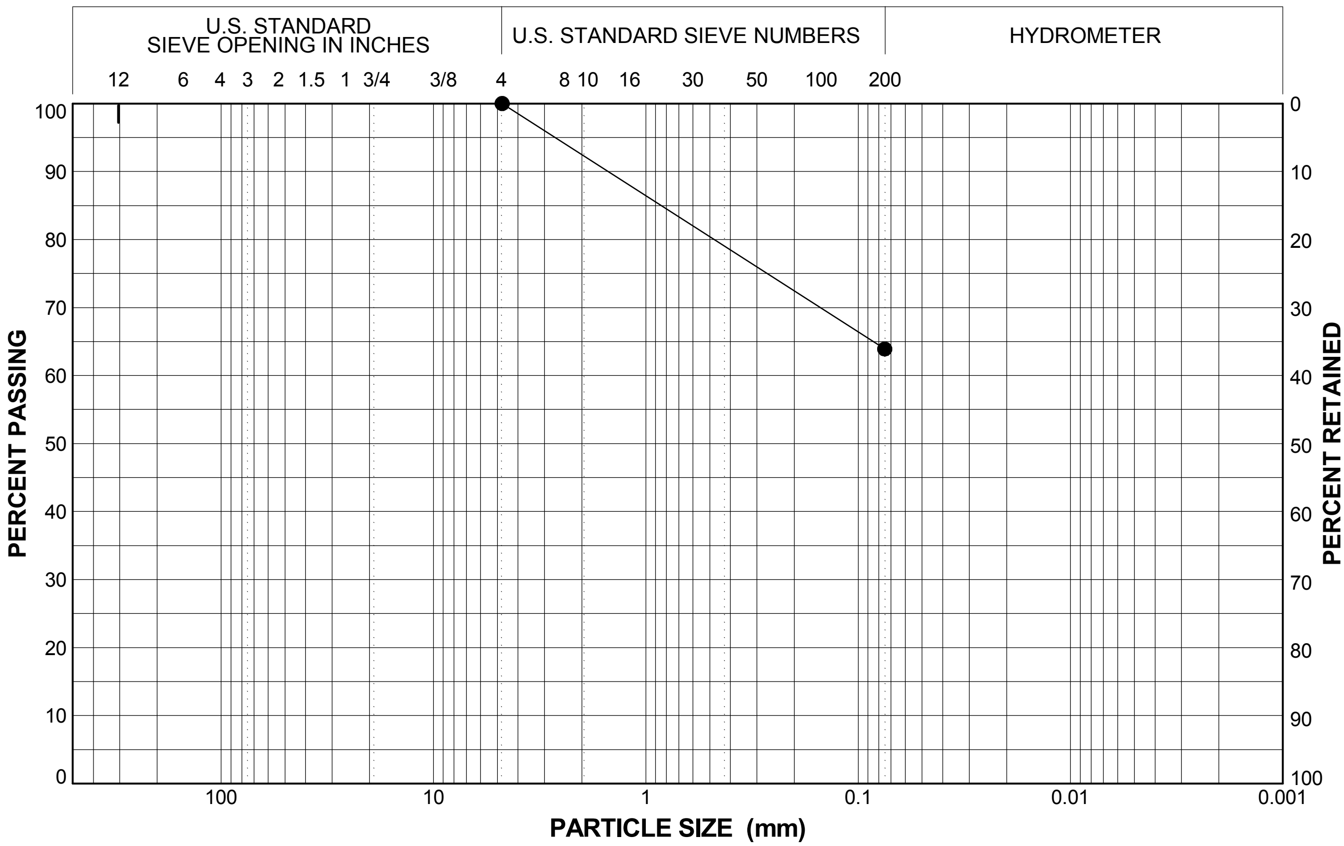
Levee Evaluations
Engineering Support Services

RD 17

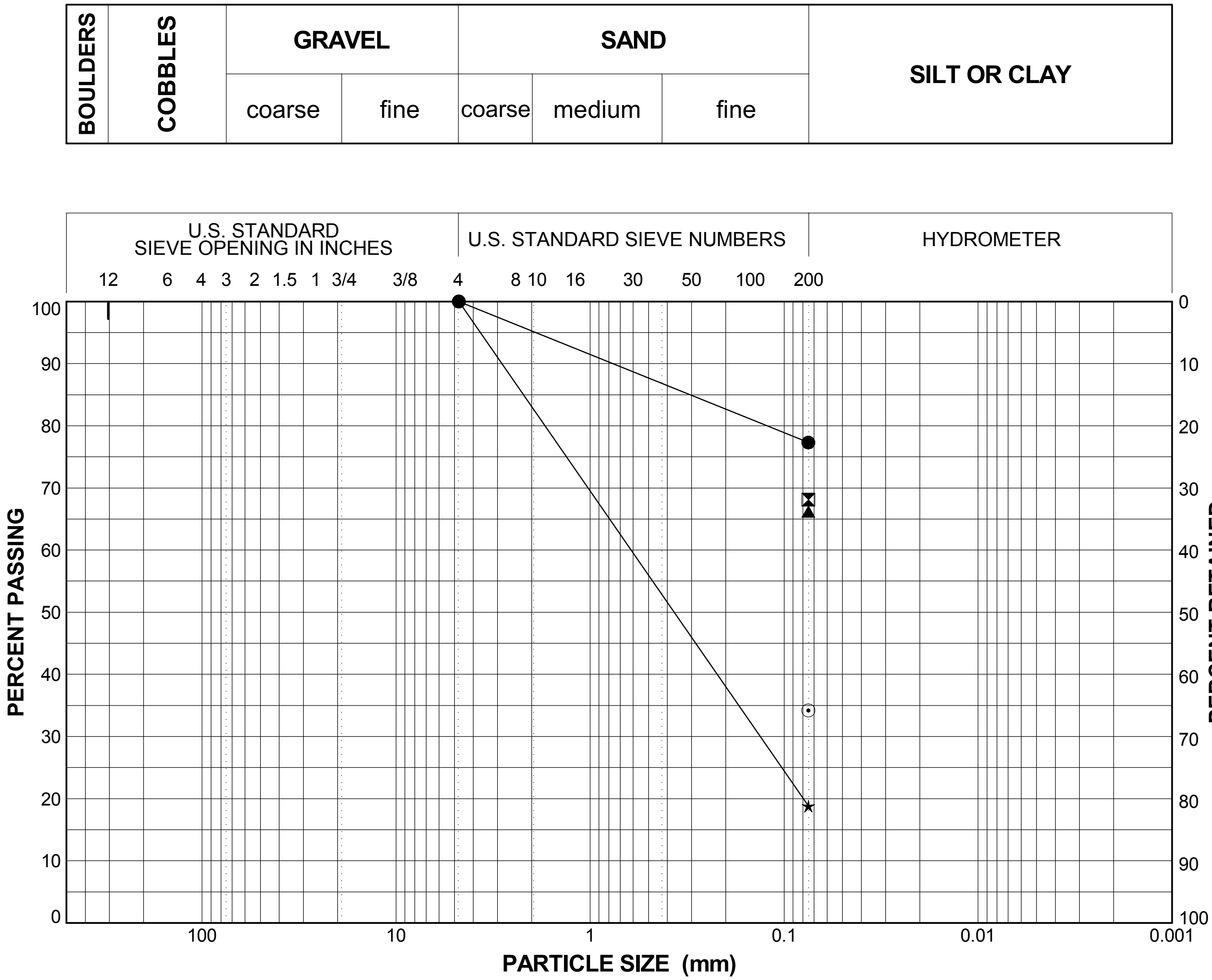
PARTICLE SIZE DISTRIBUTION CURVES

Sheet 62 of 96

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_261B	S04B_009_010P	9.5	●	0.0	36.1	63.9	SANDY LEAN CLAY (CL)

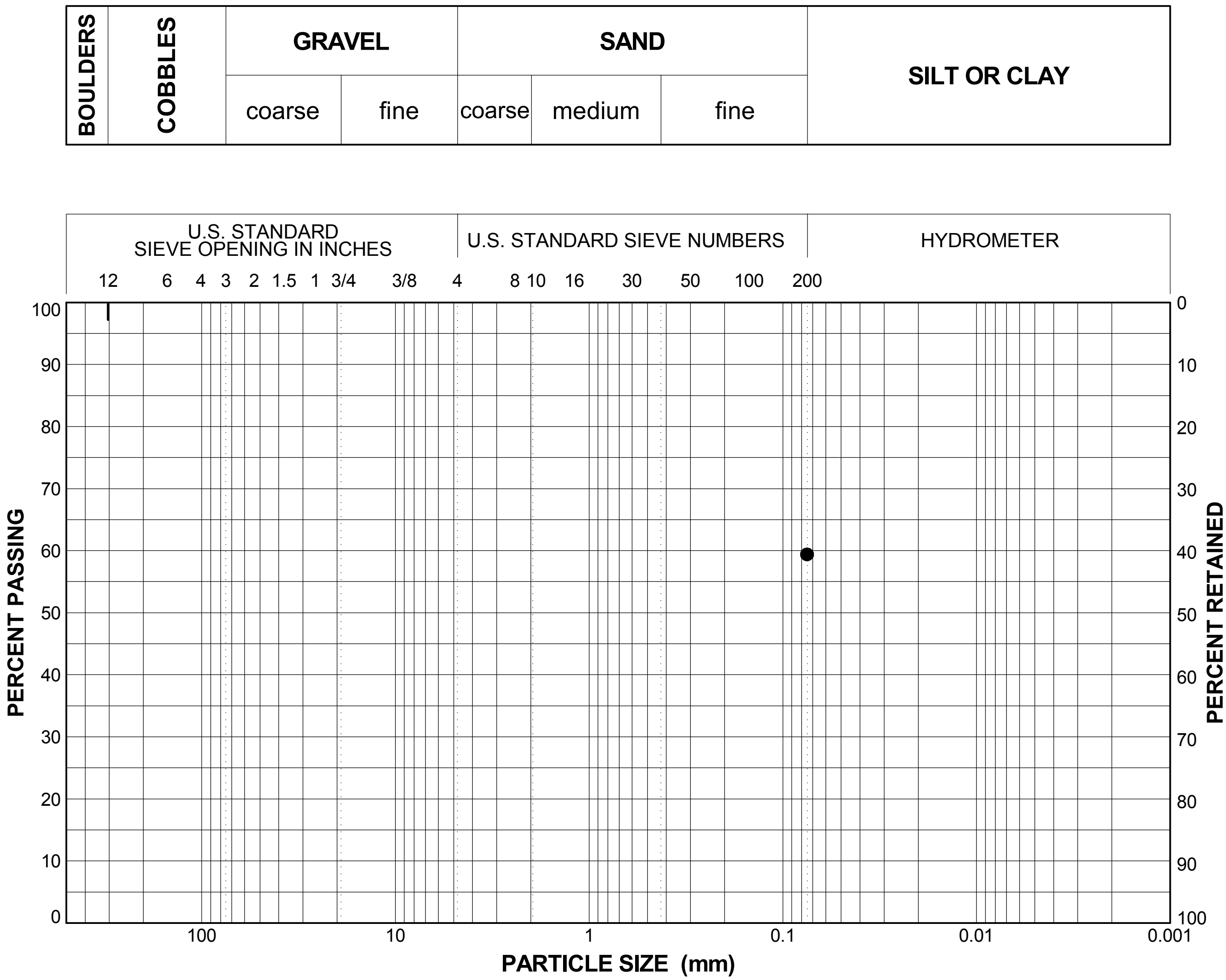


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_262B	S04A_010_012S	11	●	0.0	22.7	77.3	LEAN CLAY with SAND (CL)
WR0017_262B	S05A_012_014S	13	⧗	0.0	0.0	68.1	SANDY LEAN CLAY (CL)
WR0017_262B	S06A_015_016P	14.5	▲	0.0	0.0	66.2	SANDY SILT (ML)
WR0017_262B	S07A_018_019S	18	★	0.0	81.2	18.8	SILTY SAND (SM)
WR0017_262B	S08A_019_020P	19	⊙	0.0	0.0	34.2	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

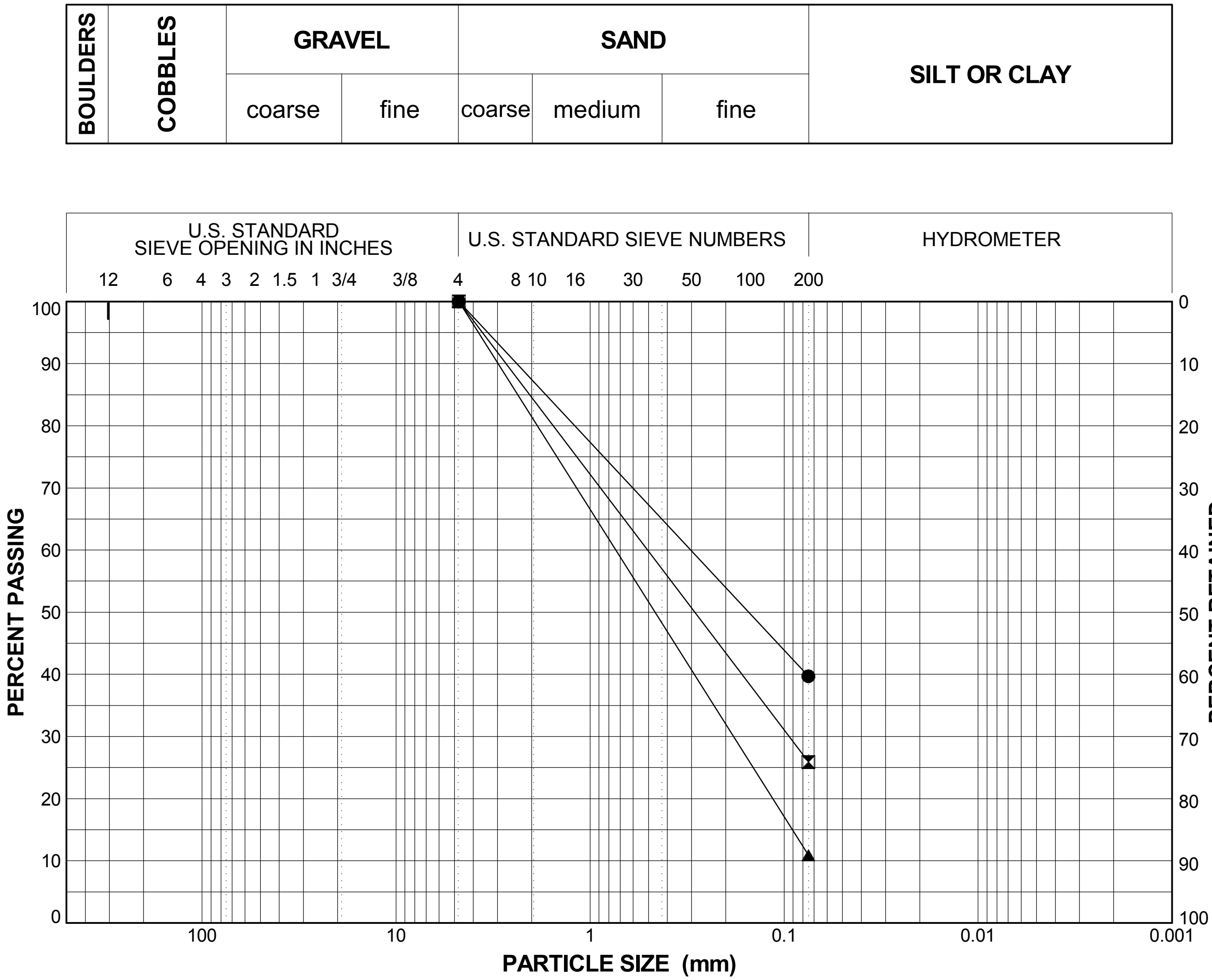


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_262B	S09A_022_024S	23	●	0.0	0.0	59.4	SANDY LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



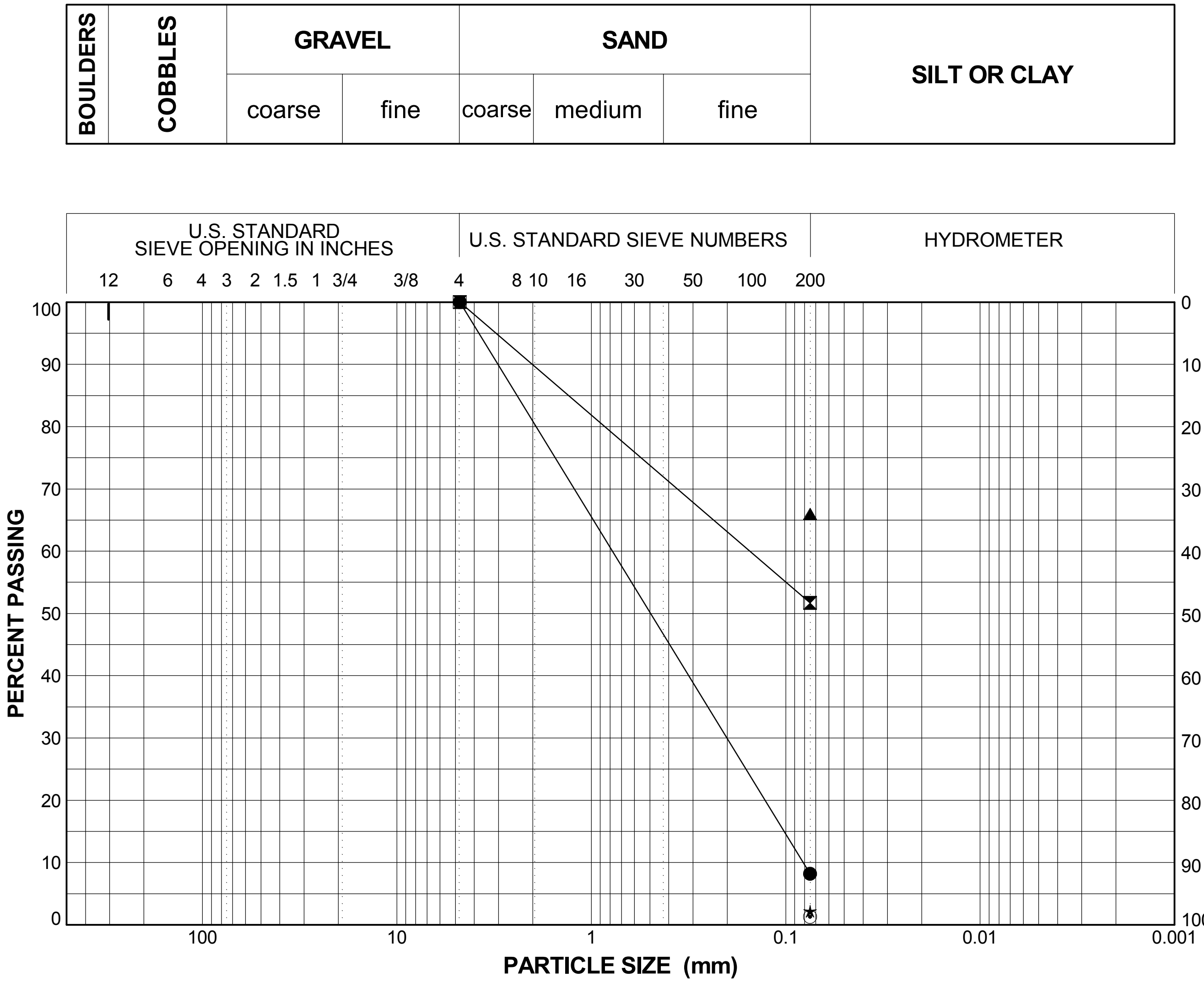
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_263B	S01A_002_002B	1.5	●	0.0	60.3	39.7	CLAYEY SAND (SC)
WR0017_263B	S04B_009_010P	9.5	⧗	0.0	74.1	25.9	SILTY SAND (SM)
WR0017_263B	S05A_012_014S	13	▲	0.0	89.1	10.9	Poorly Graded SAND with Silt (SP-SM)

DWR LEVEE U/NU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

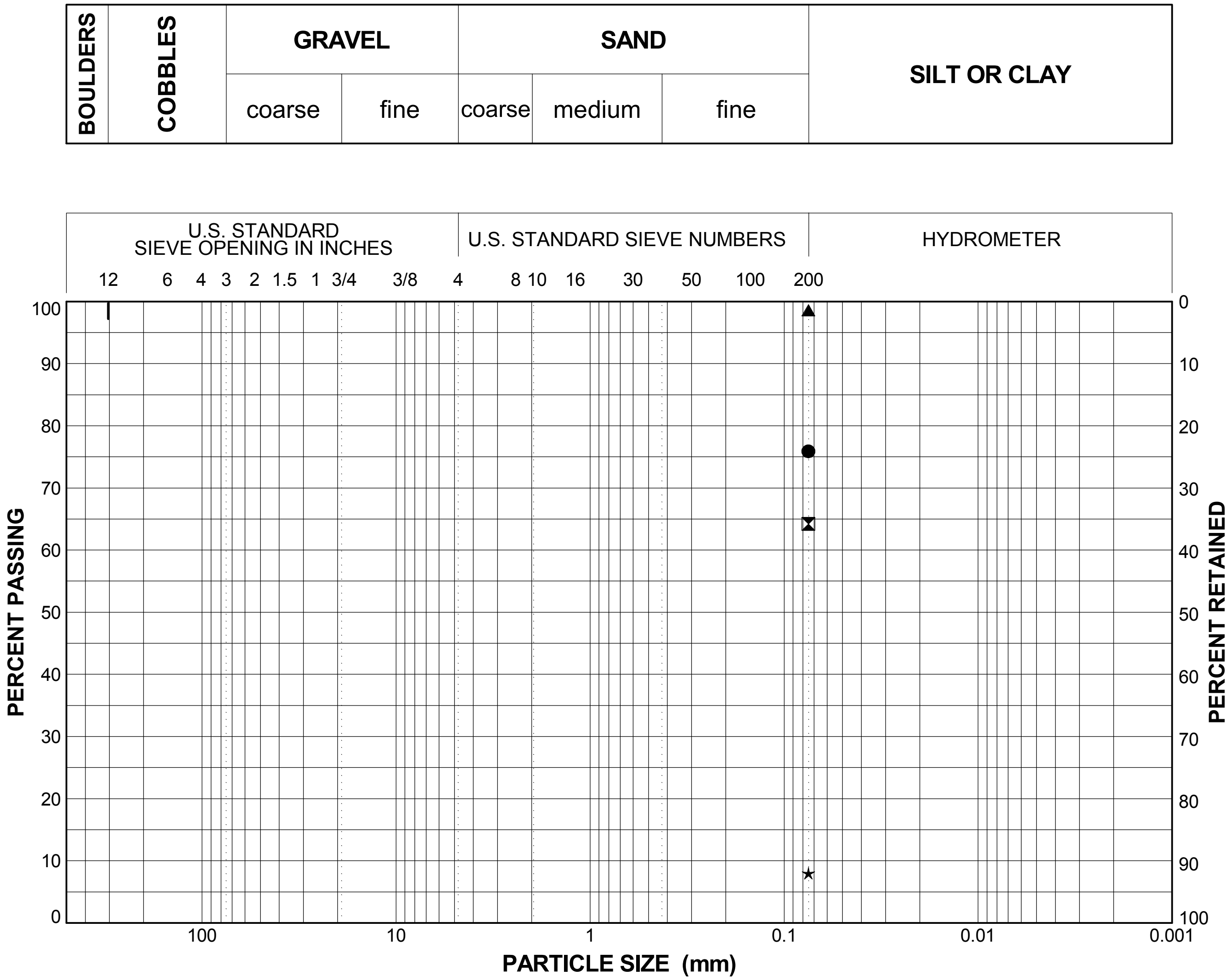


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_264B	S04B_008_009M	8.5	●	0.0	91.8	8.2	Poorly Graded SAND with Silt (SP-SM)
WR0017_264B	S06A_015_015M	14.5	⧗	0.0	48.3	51.7	SANDY LEAN CLAY (CL)
WR0017_264B	S07A_017_018T	17.5	▲	0.0	0.0	66.0	SANDY SILTY CLAY (CL-ML)
WR0017_264B	S09A_025_027T	26	★	0.0	0.0	2.2	Poorly Graded SAND (SP)
WR0017_264B	S11A_035_037T	36.1	⊙	0.0	0.0	1.3	Poorly Graded SAND (SP)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

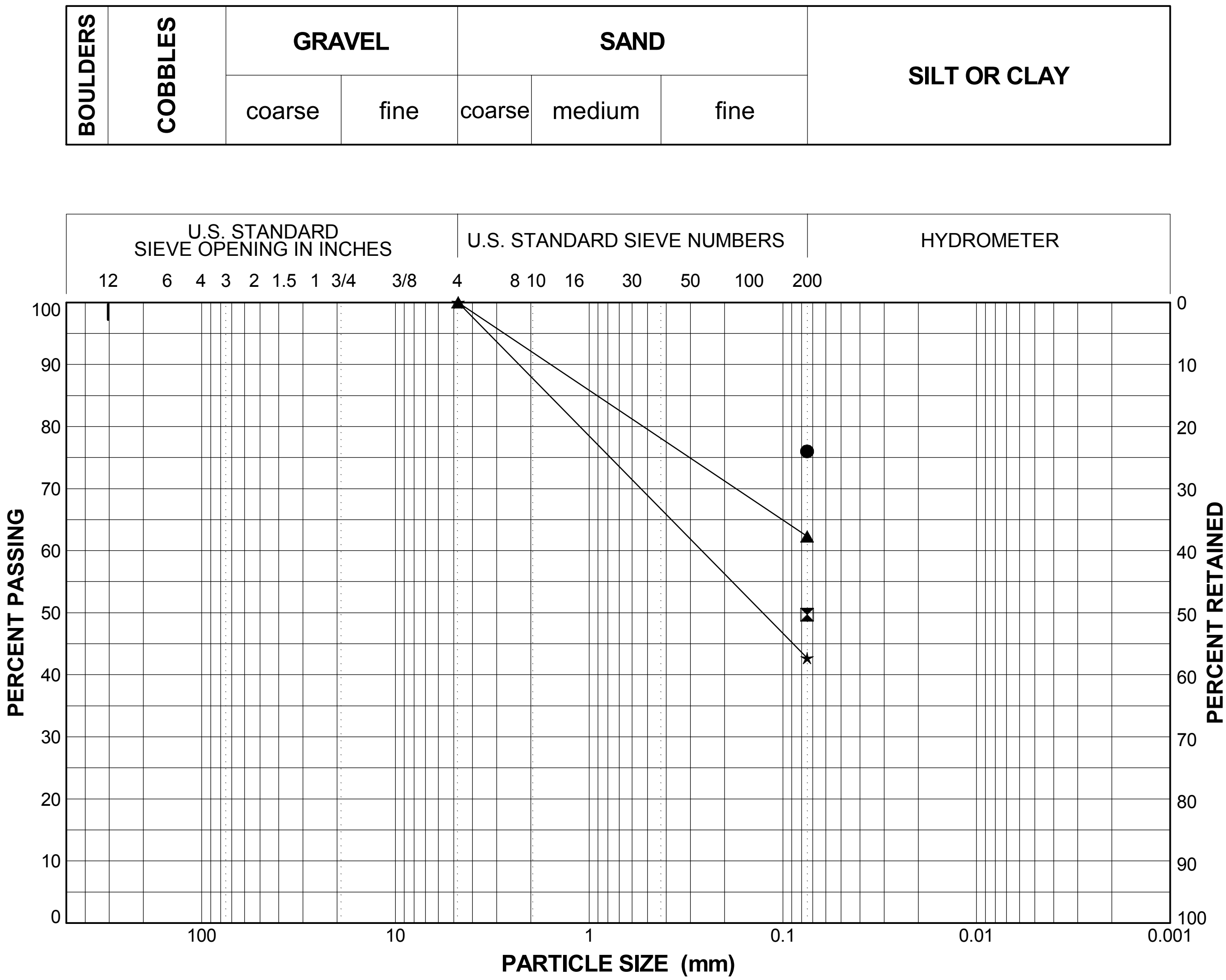


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_265B	S02A_006_008T	7.4	●	0.0	0.0	75.9	FAT CLAY with SAND (CH)
WR0017_265B	S06A_021_023T	21.5	⧗	0.0	0.0	64.2	SANDY LEAN CLAY (CL)
WR0017_265B	S08A_029_030T	29.5	▲	0.0	0.0	98.6	LEAN CLAY (CL)
WR0017_265B	S13A_050_052S	51	★	0.0	0.0	8.0	Poorly Graded SAND with Silt (SP-SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



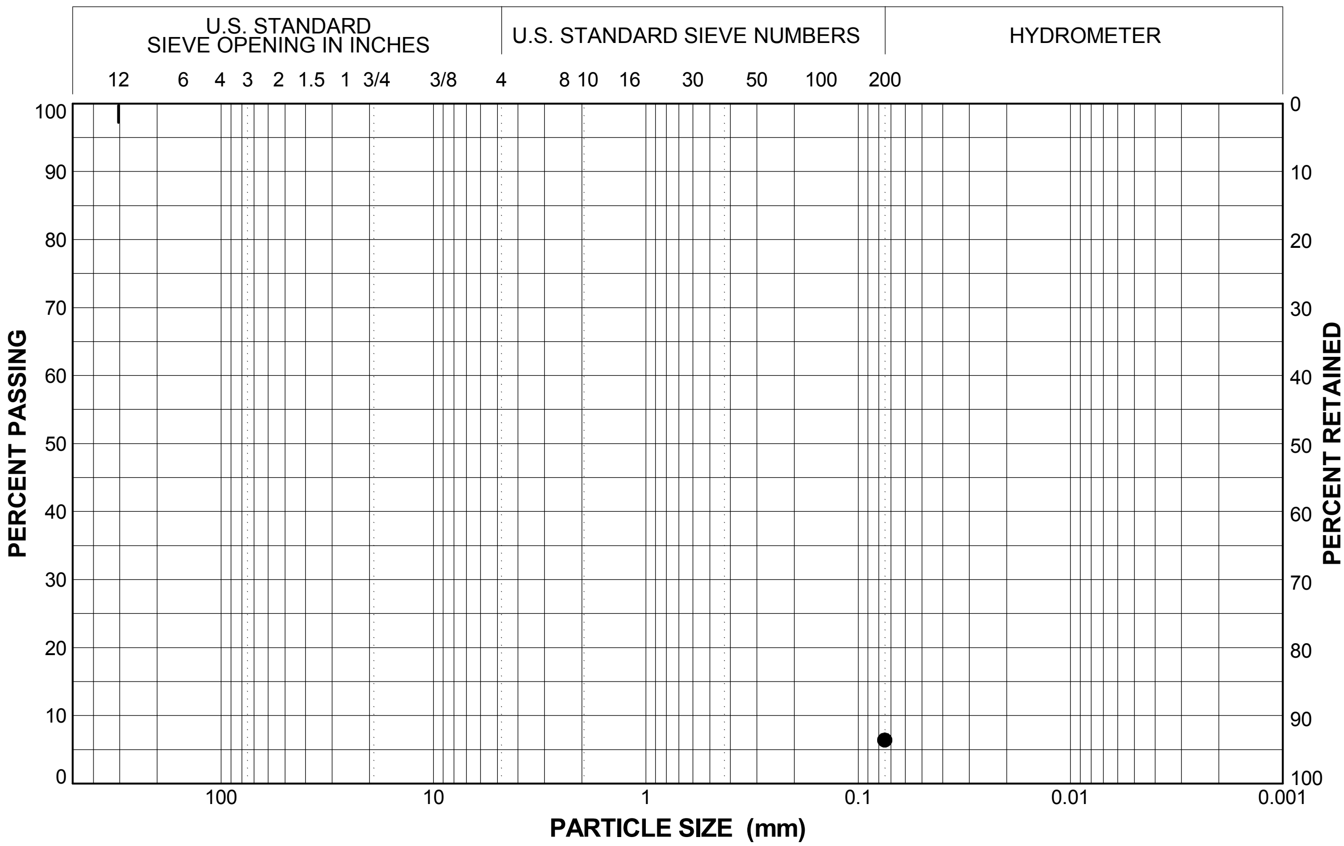
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_266B	S01A_000_001B	0.5	●	0.0	0.0	76.0	LEAN CLAY with SAND (CL)
WR0017_266B	S02A_001_002B	1	⧗	0.0	0.0	49.7	SILTY SAND (SM)
WR0017_266B	S03A_002_003B	2.5	▲	0.0	37.7	62.3	SANDY LEAN CLAY (CL)
WR0017_266B	S08A_012_014S	13	★	0.0	57.3	42.7	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



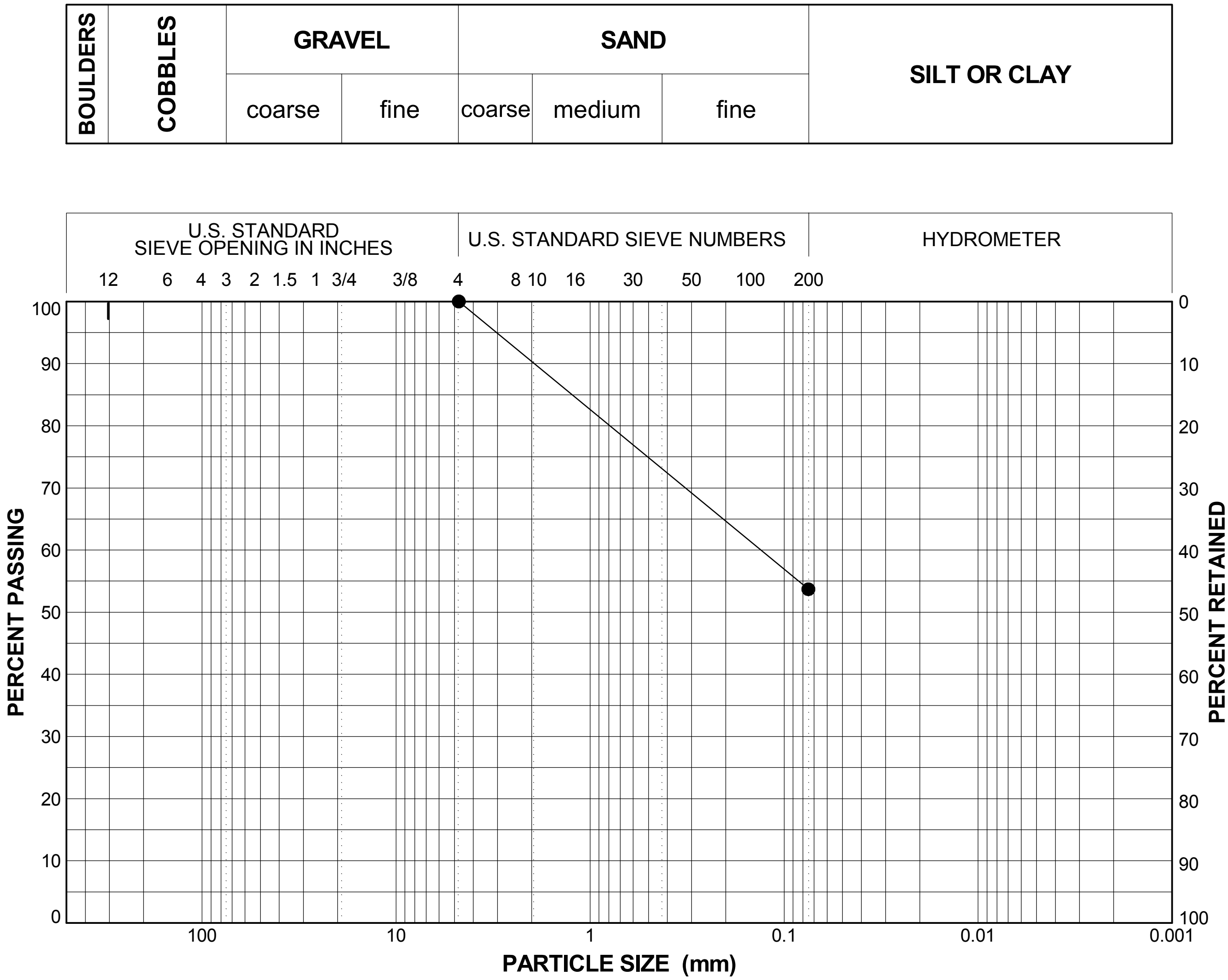
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_267B	S06A_011_012P	11	●	0.0	0.0	6.4	Poorly Graded SAND with Silt (SP-SM)

DWR LEVEE U/NU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

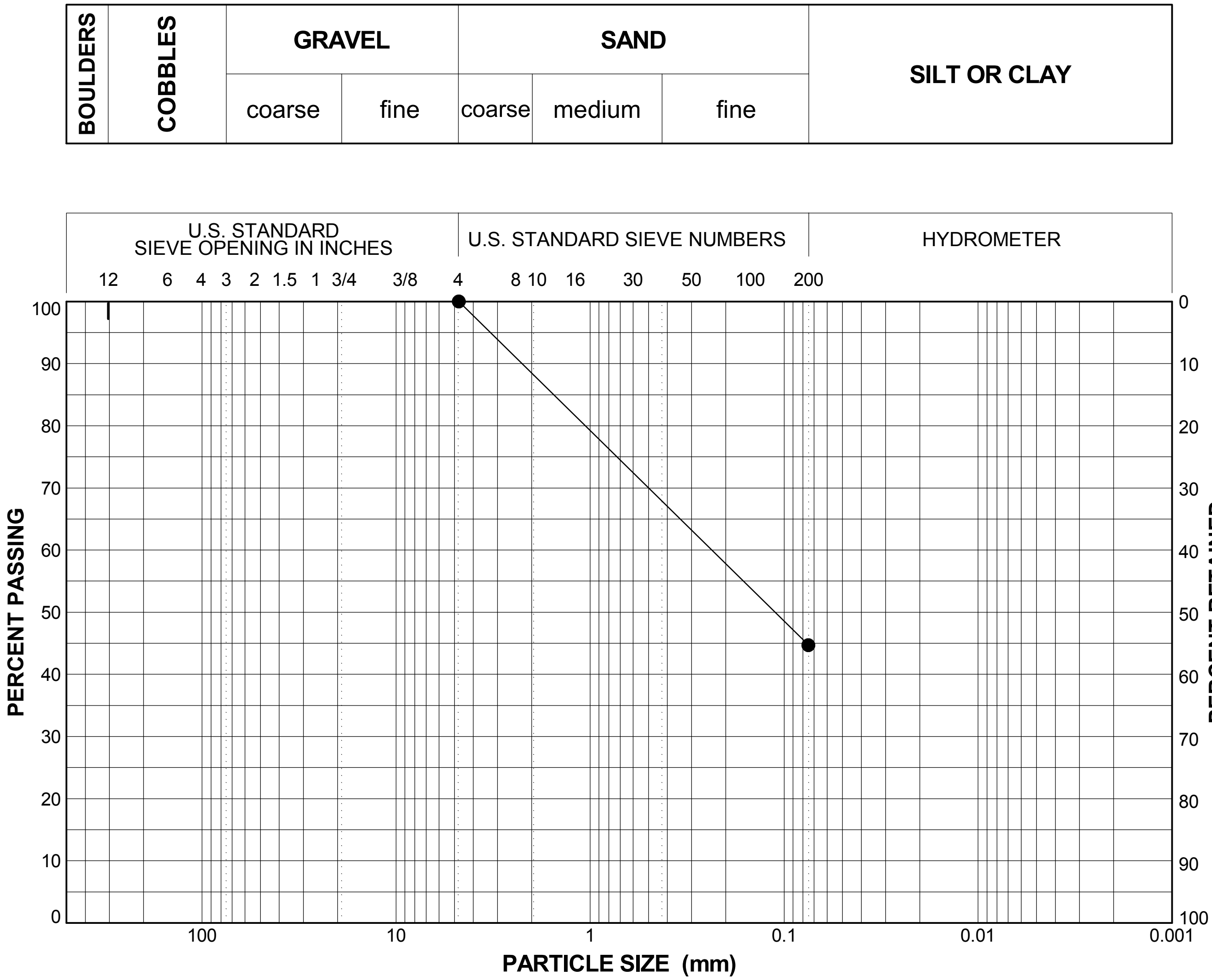


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_268B	S03A_007_009S	8	●	0.0	46.3	53.7	SANDY SILTY CLAY (CL-ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

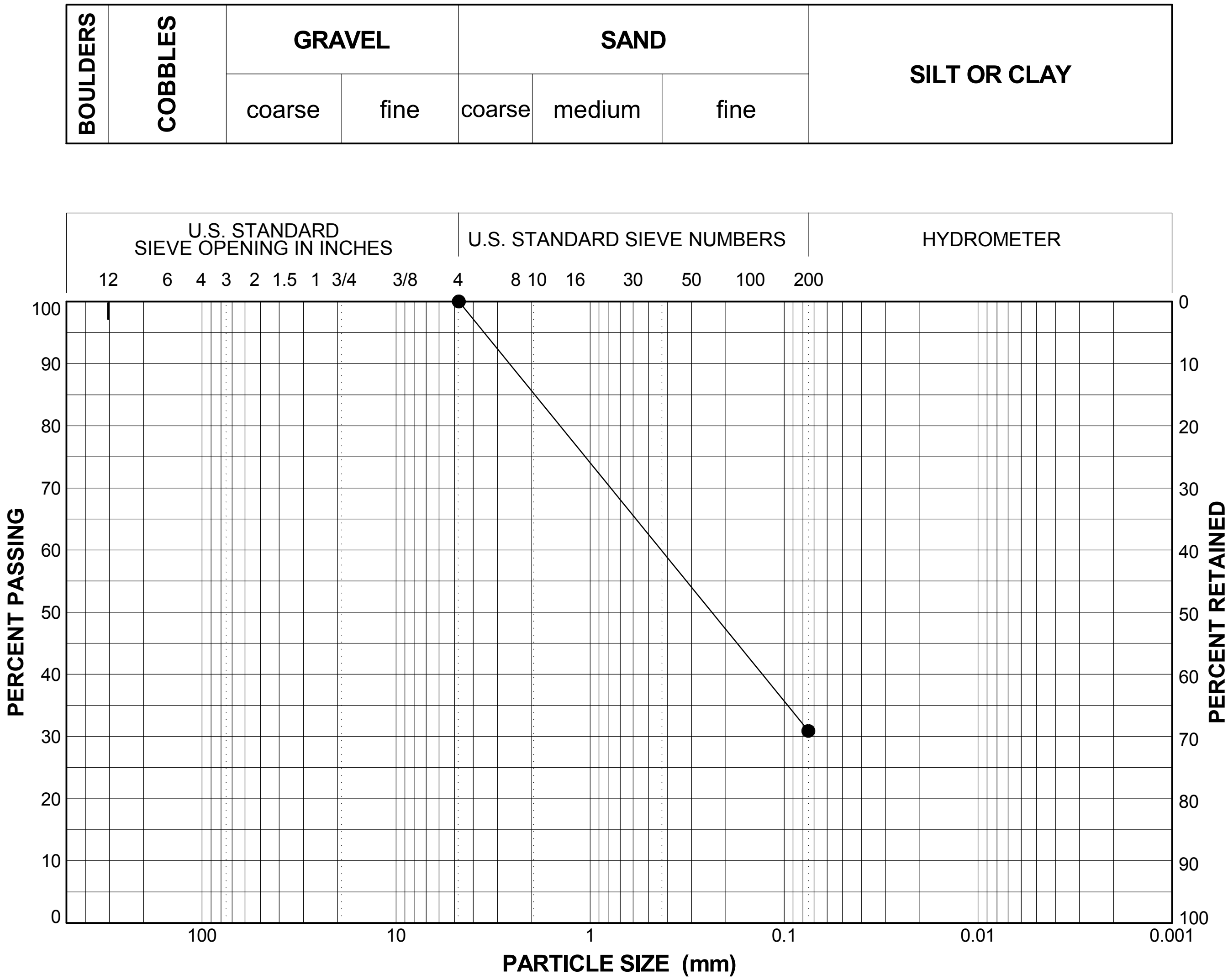


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_269B	S03A_007_009S	8	●	0.0	55.3	44.7	SILTY, CLAYEY SAND (SC-SM)

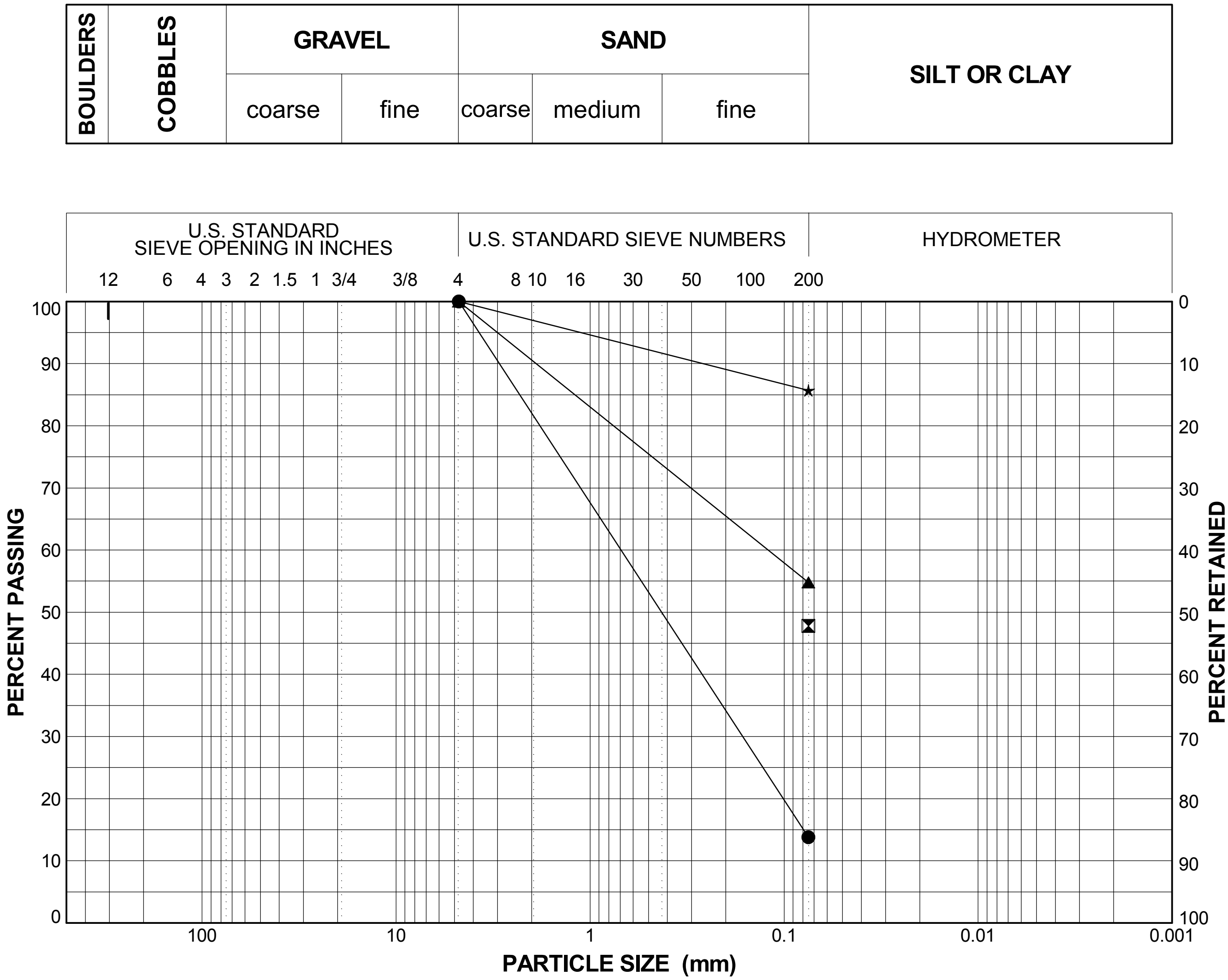
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_270B	S06A_012_014S	13	●	0.0	69.1	30.9	SILTY SAND (SM)



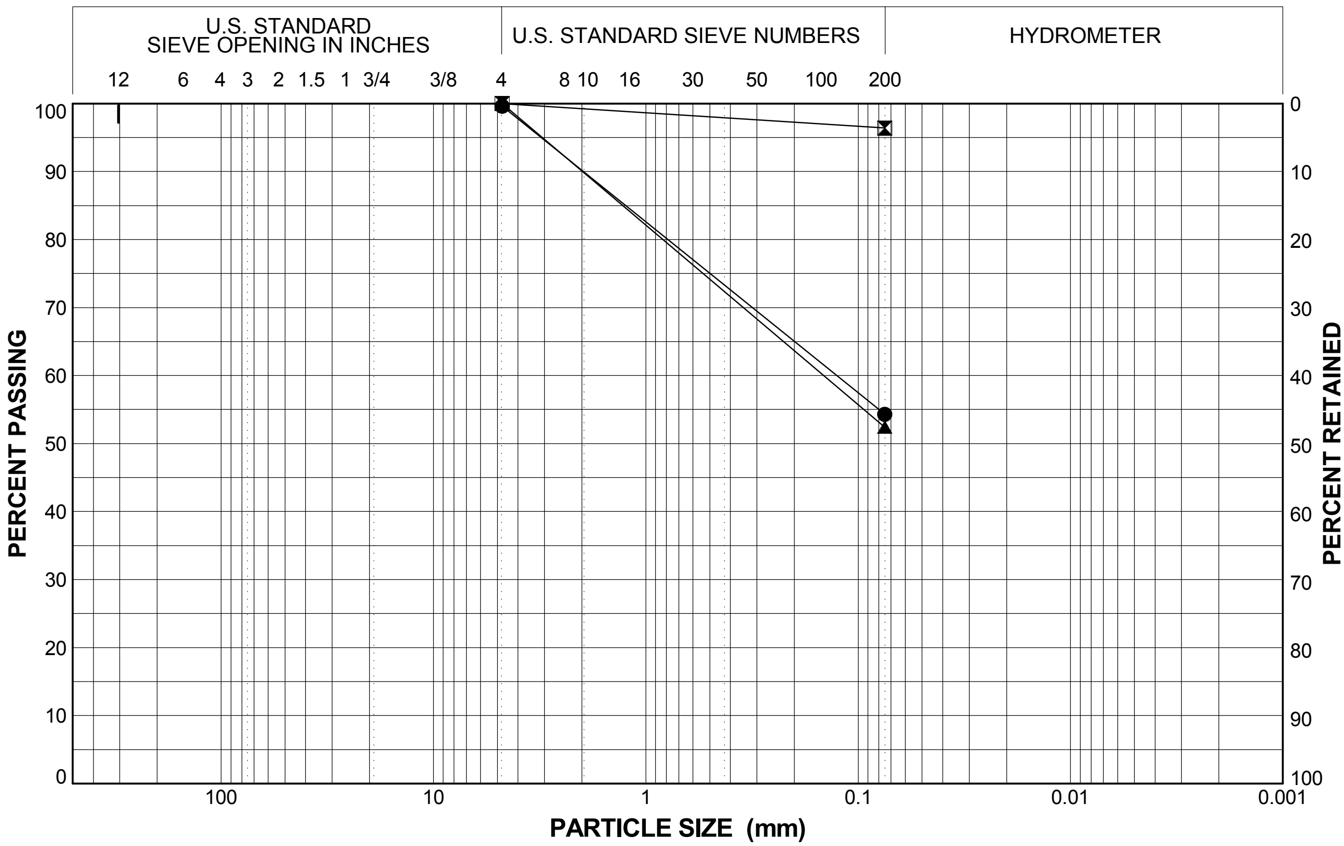
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_271B	S10B_019_020P	19.5	●	0.0	86.2	13.8	SILTY SAND (SM)
WR0017_271B	S12A_024_025P	24	⧗	0.0	0.0	47.8	CLAYEY SAND (SC)
WR0017_271B	S13A_027_029S	28	▲	0.0	45.2	54.8	SANDY LEAN CLAY (CL)
WR0017_271B	S16B_035_036P	35	★	0.0	14.3	85.7	LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

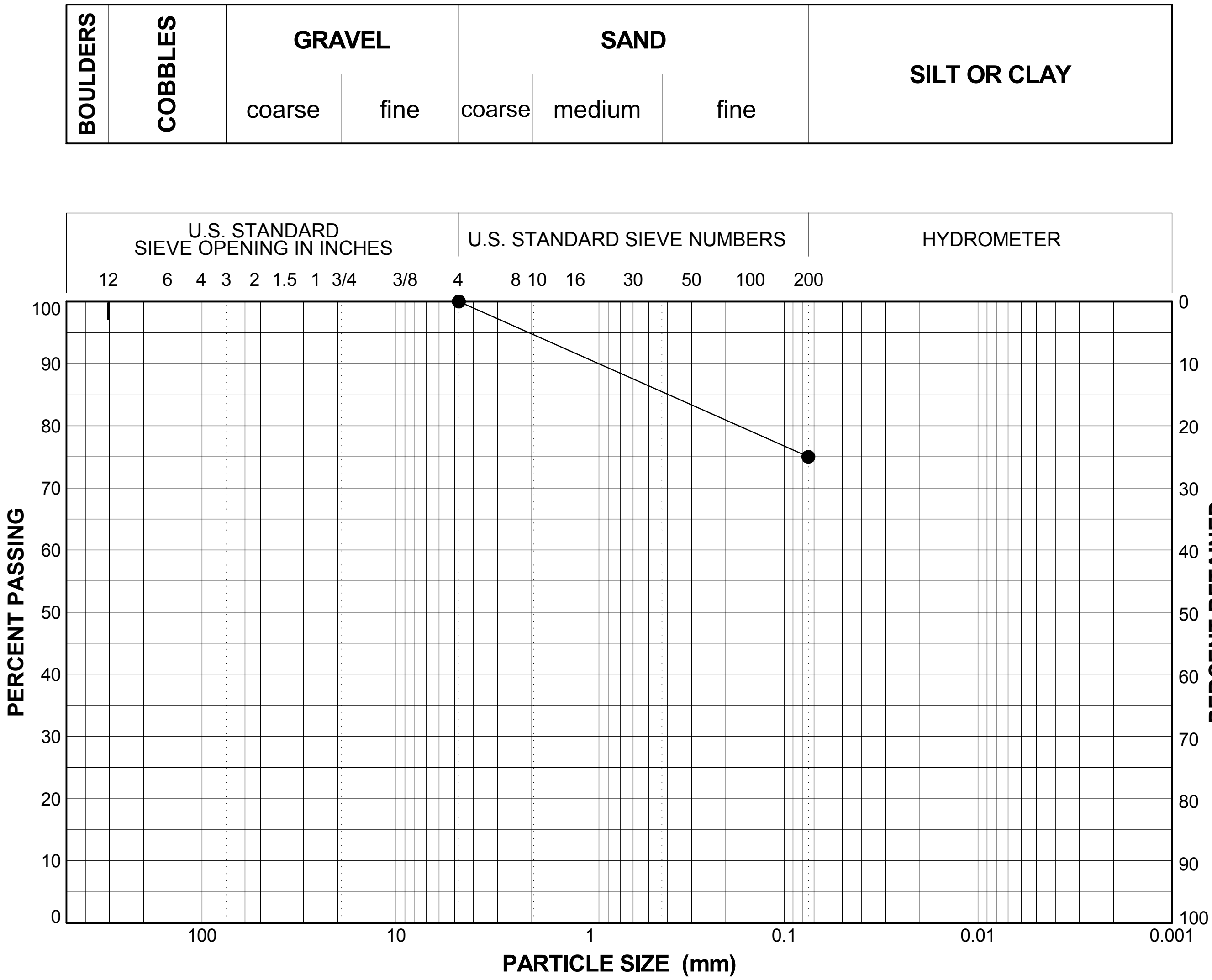
RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

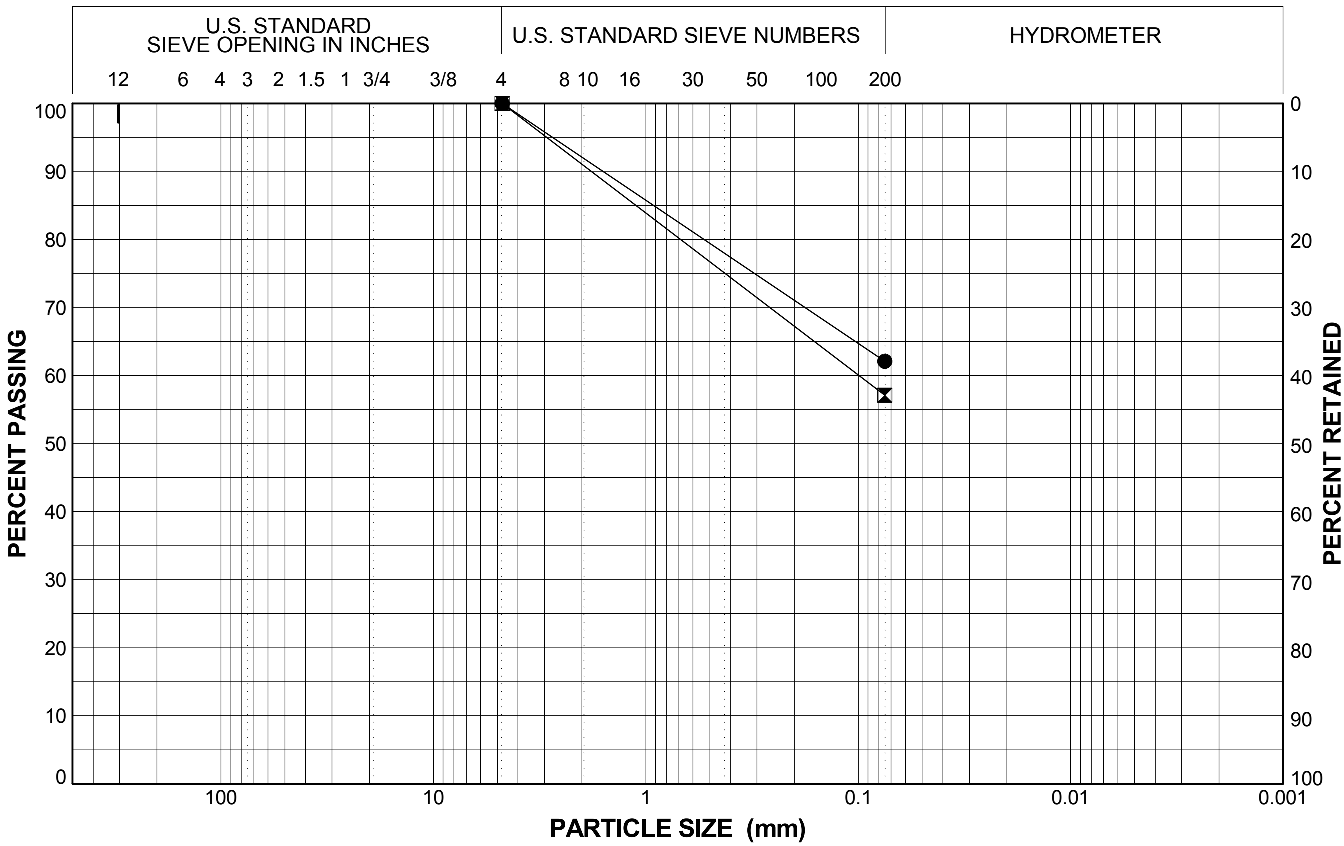


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_272B	S04A_005_007S	6	●	0.0	45.3	54.3	SANDY SILT (ML)
WR0017_272B	S05B_007_008S	7.5	⧗	0.0	3.6	96.4	LEAN CLAY (CL)
WR0017_272B	S10B_019_020P	19	▲	0.0	47.6	52.4	SANDY SILTY CLAY (CL-ML)

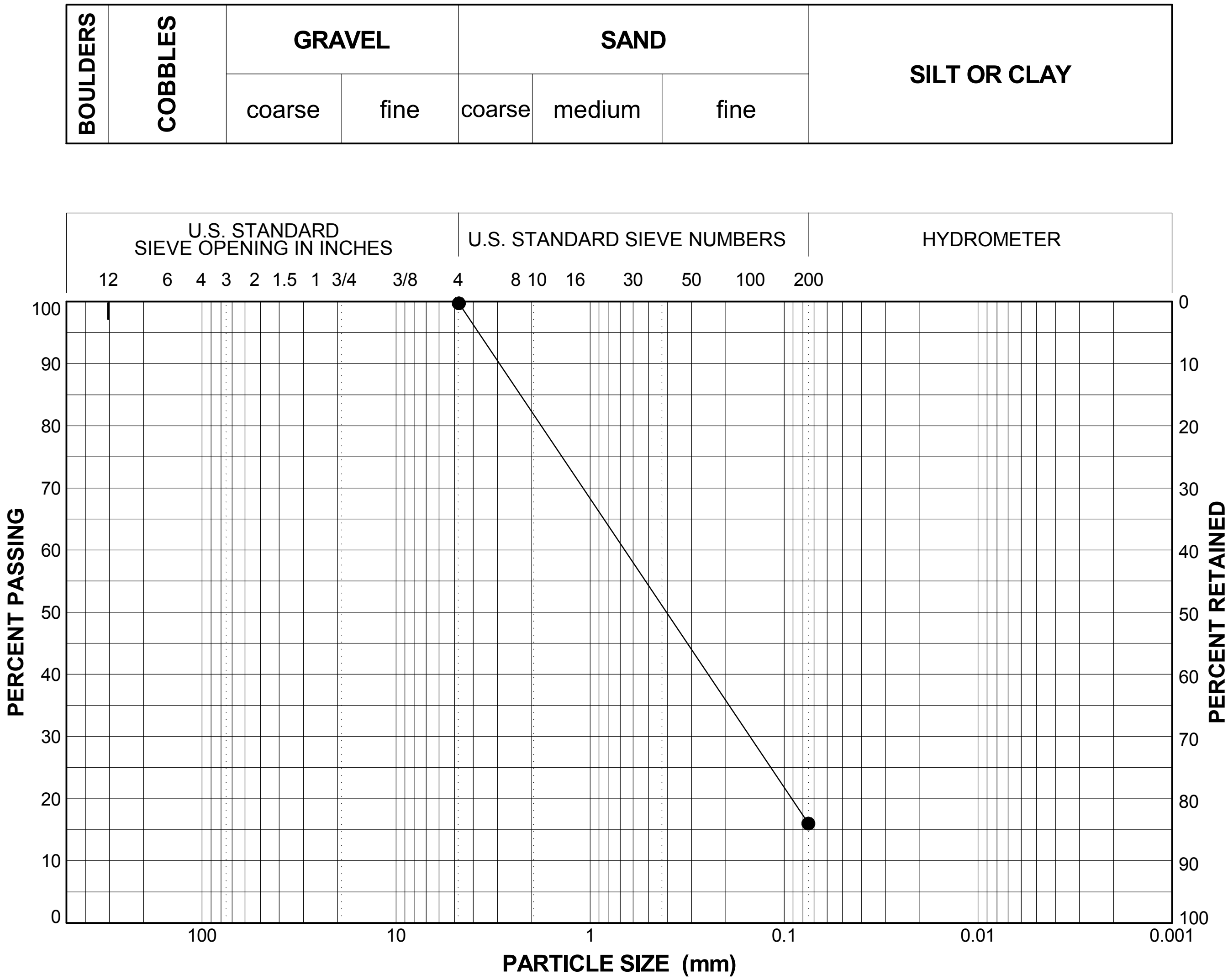


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_273B	S05A_012_014S	13	●	0.0	25.0	75.0	SILTY CLAY with SAND (CL-ML)

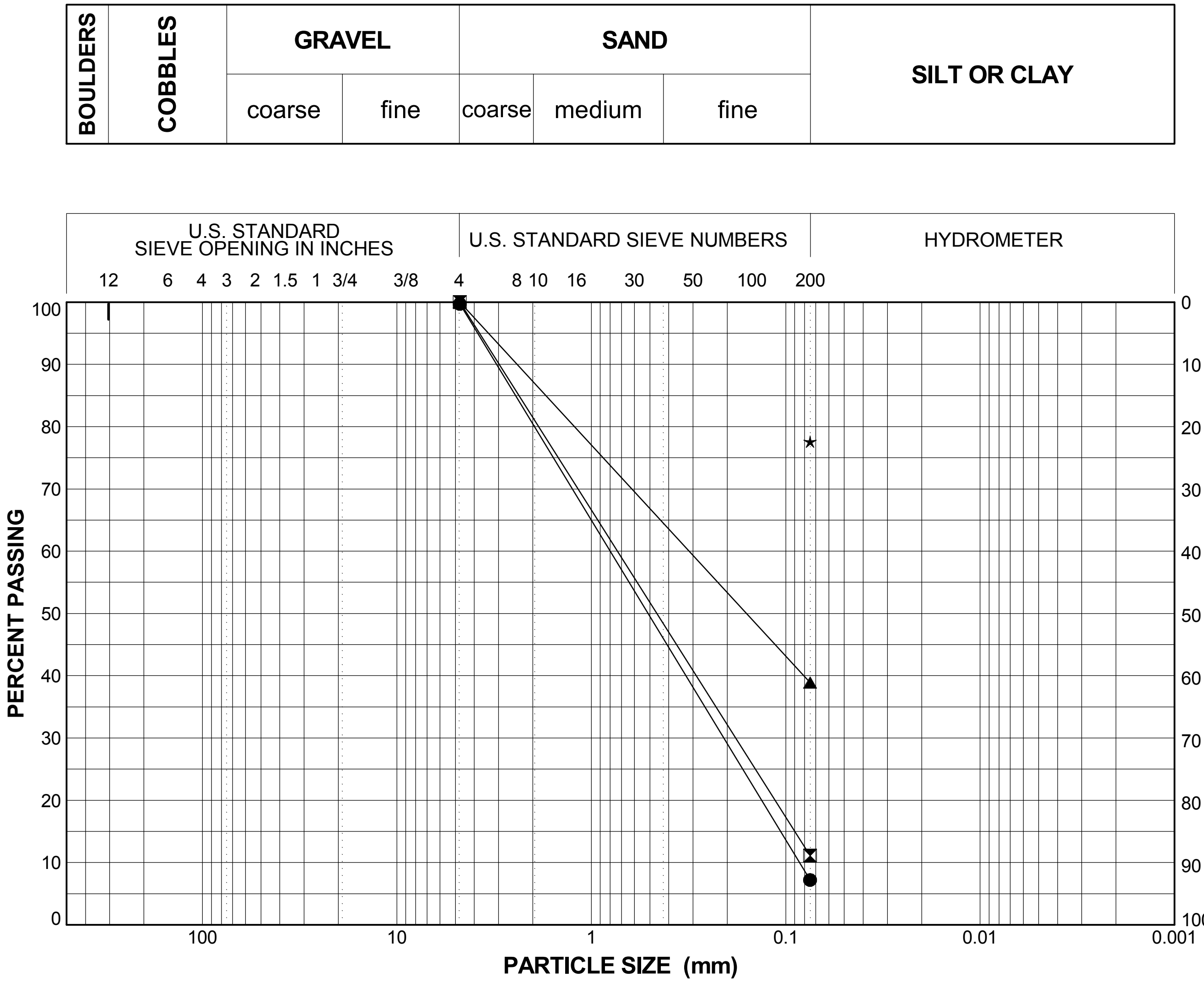
BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_274B	S01A_002_004S	3	●	0.0	37.9	62.1	SANDY LEAN CLAY (CL)
WR0017_274B	S03A_010_011P	11.5	⧗	0.0	42.9	57.1	SANDY LEAN CLAY (CL)



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_275B	S06A_009_010P	9.5	●	0.0	83.7	16.0	SILTY SAND (SM)

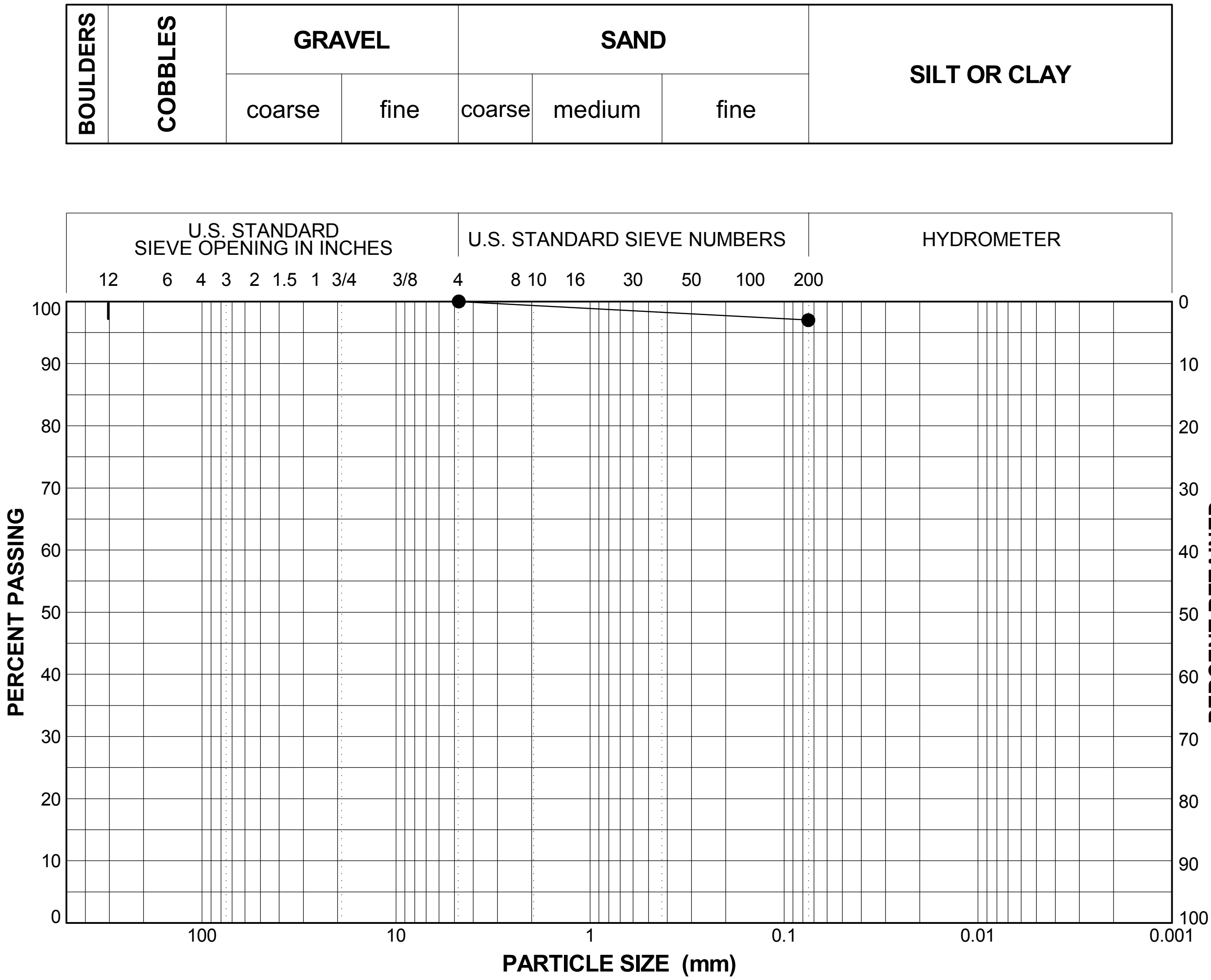


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_276B	S01A_000_002B	1.5	●	0.0	92.5	7.2	Poorly Graded SAND with Silt (SP-SM)
WR0017_276B	S04A_006_008S	7	⧗	0.0	88.9	11.1	Poorly Graded SAND with Silt (SP-SM)
WR0017_276B	S06A_012_014S	13	▲	0.0	61.1	38.9	CLAYEY SAND (SC)
WR0017_276B	S08A_017_019S	18	★	0.0	0.0	77.6	LEAN CLAY with SAND (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

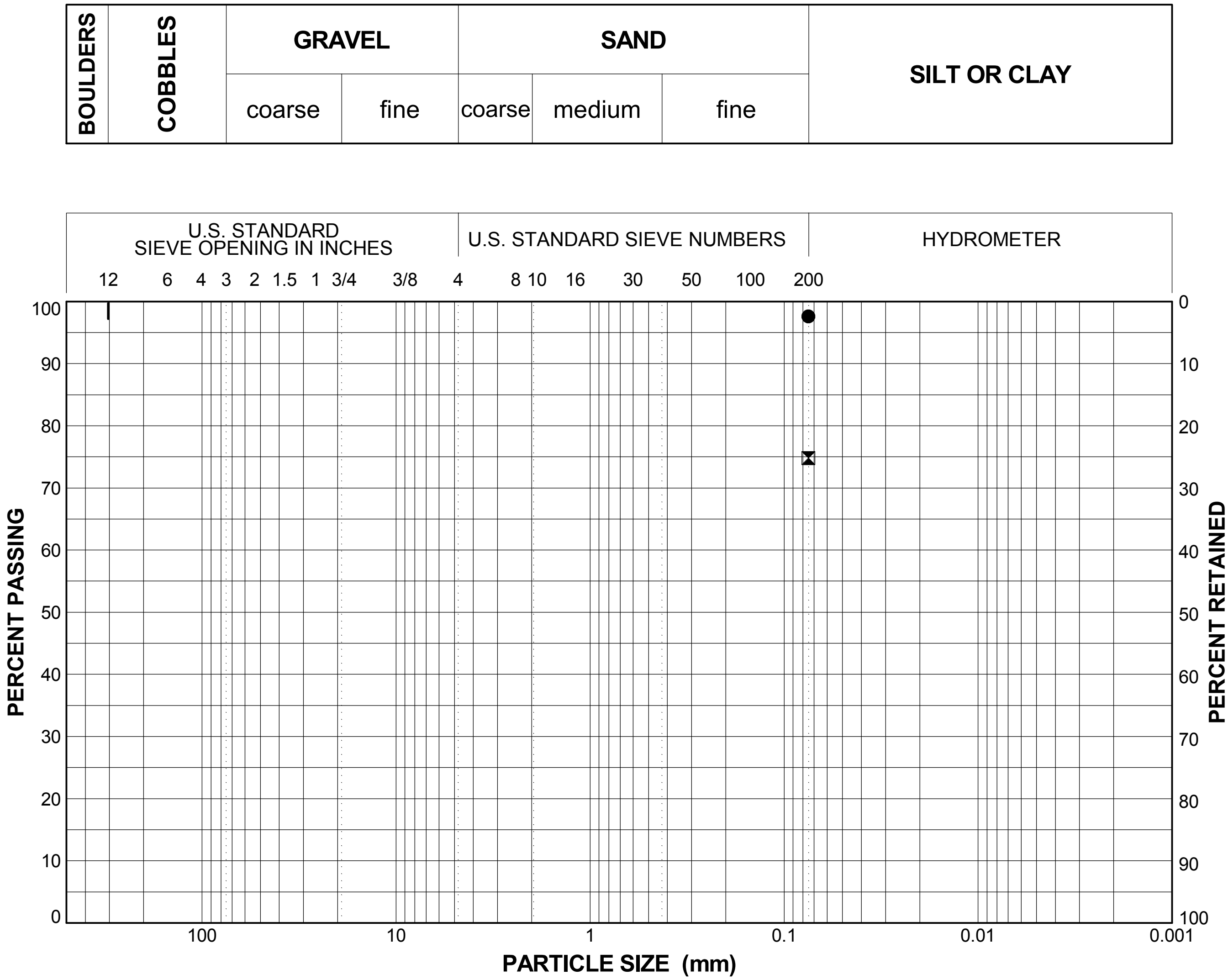


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_277B	S02A_005_007S	5.8	●	0.0	3.0	97.0	LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



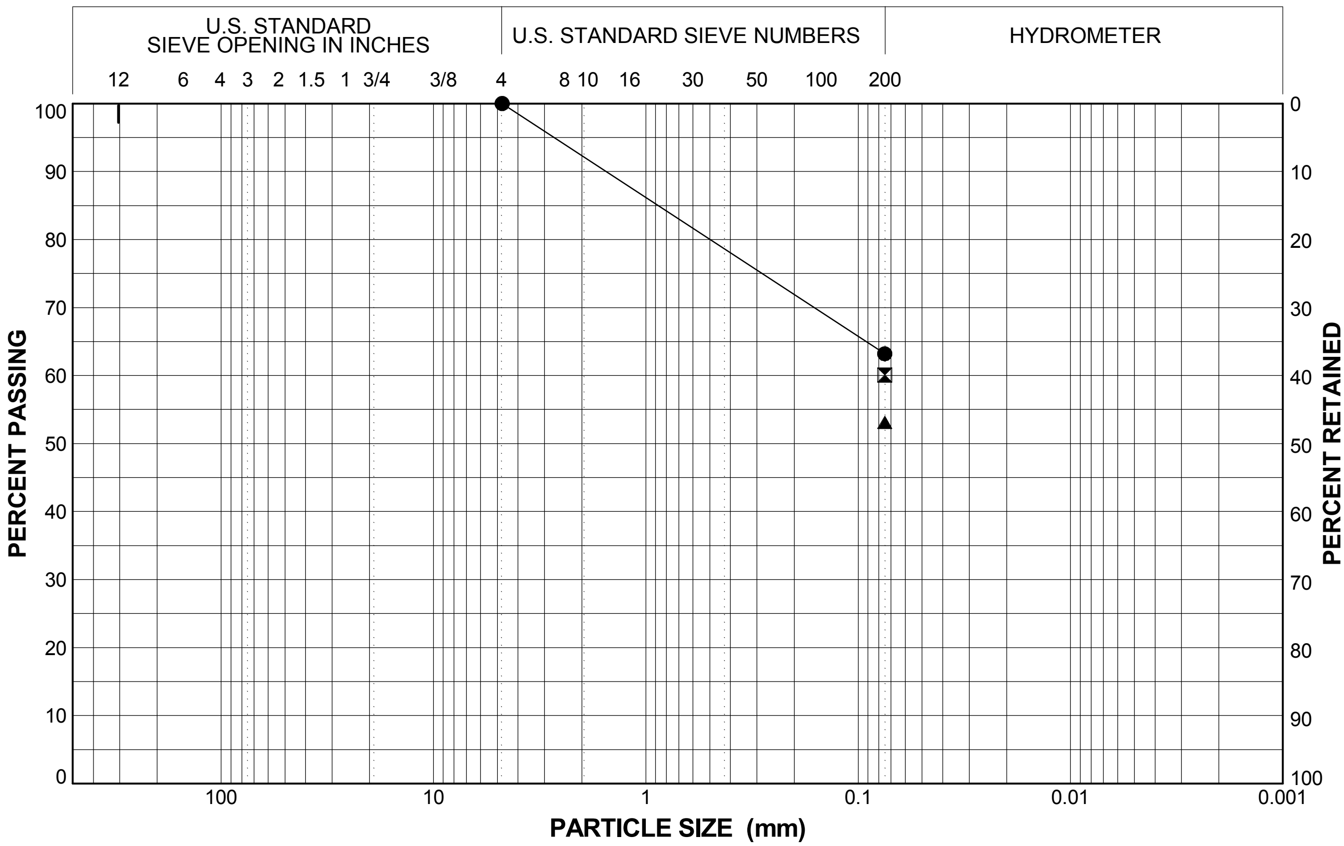
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_278B	S05A_009_011S	10	●	0.0	0.0	97.6	FAT CLAY (CH)
WR0017_278B	S07A_017_019T	17.75	⧗	0.0	0.0	74.8	SILT with SAND (ML)

Levee Evaluations
Engineering Support Services

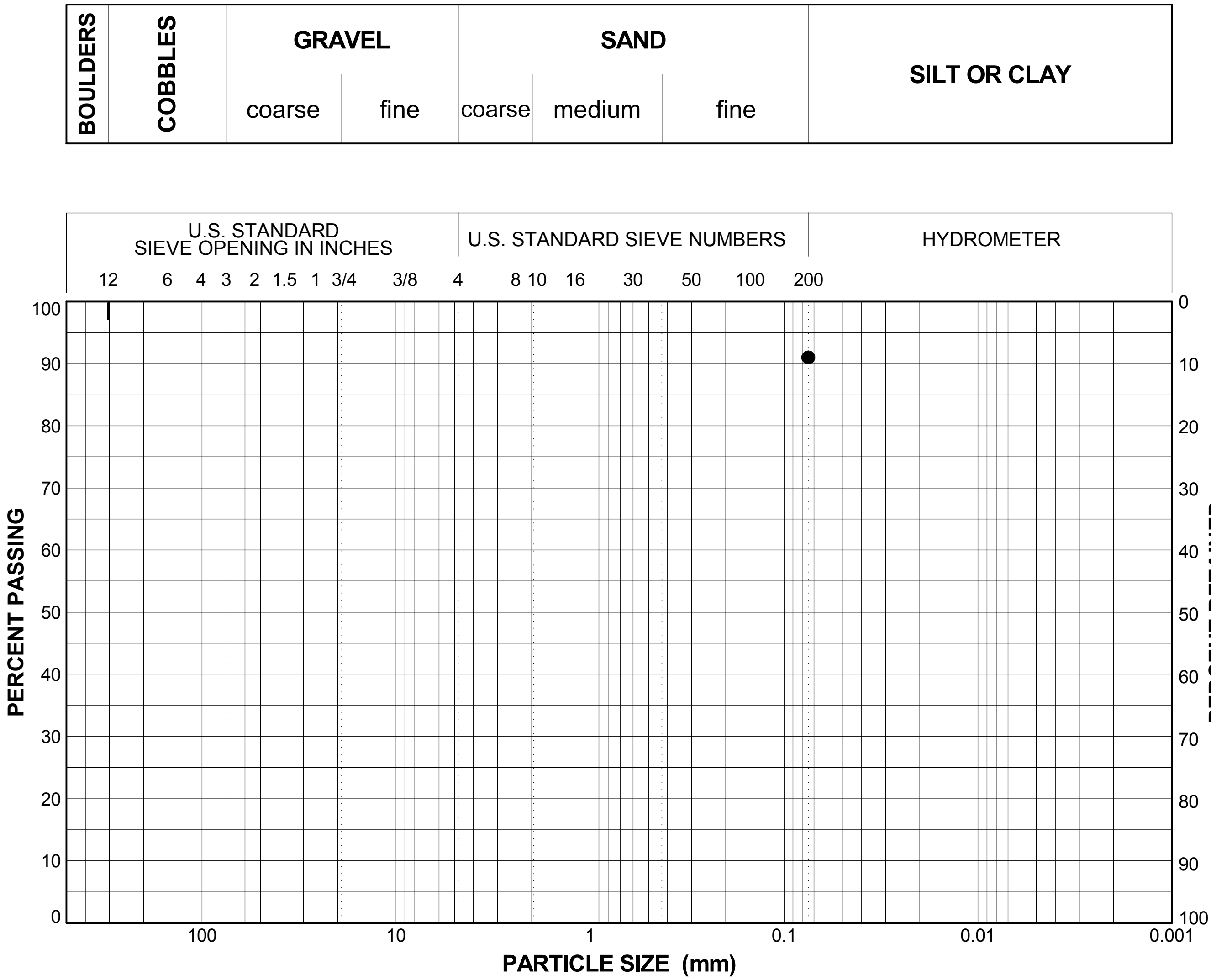
RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_279B	S06A_015_017B	15.5	●	0.0	36.8	63.2	SANDY SILTY CLAY (CL-ML)
WR0017_279B	S06A_015_017B	16	⧗	0.0	0.0	60.1	SANDY SILTY CLAY (CL-ML)
WR0017_279B	S09A_025_027T	25.85	▲	0.0	0.0	53.1	SANDY SILT (ML)

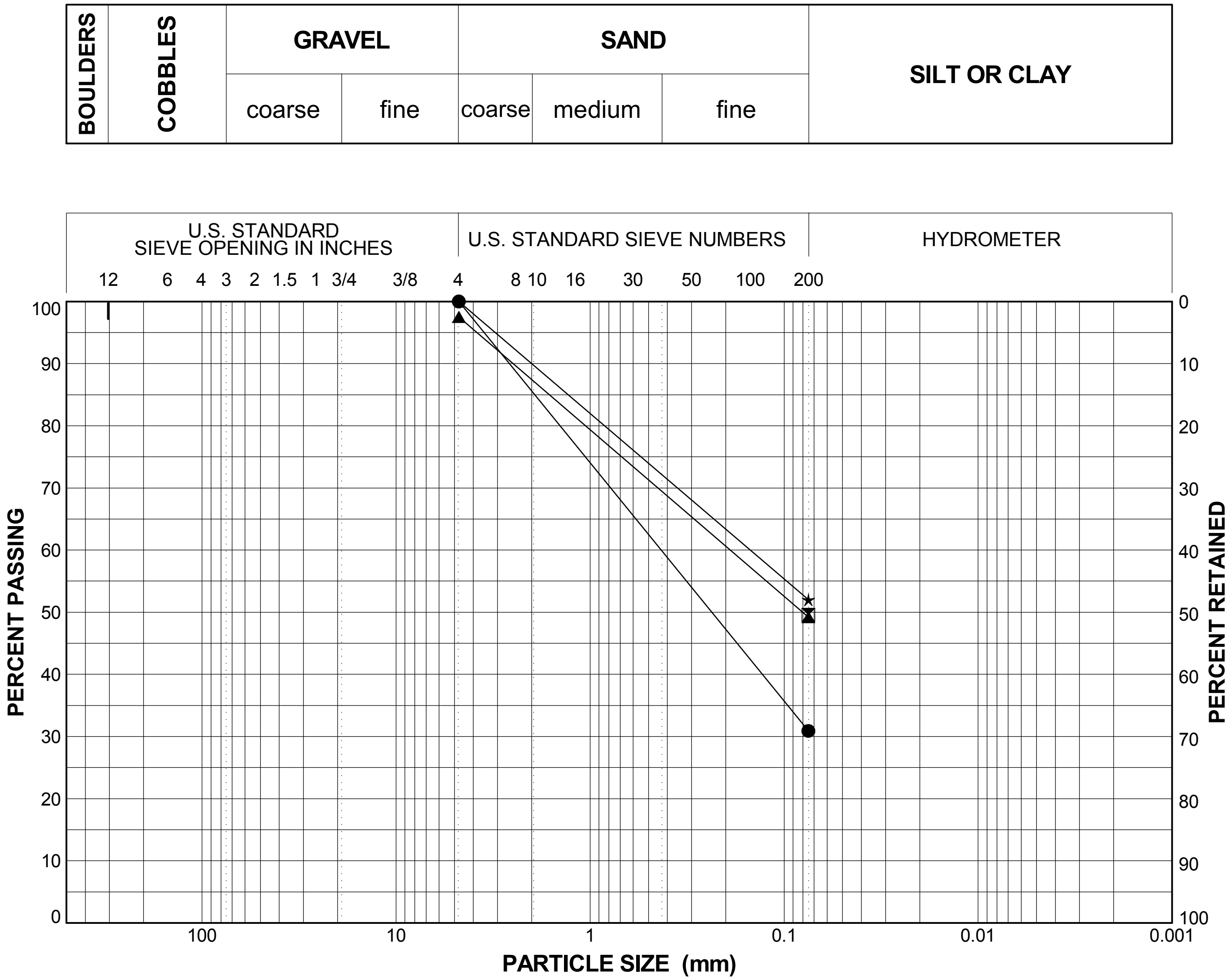


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_280B	S07B_015_016P	15	●	0.0	0.0	91.0	SILT (ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

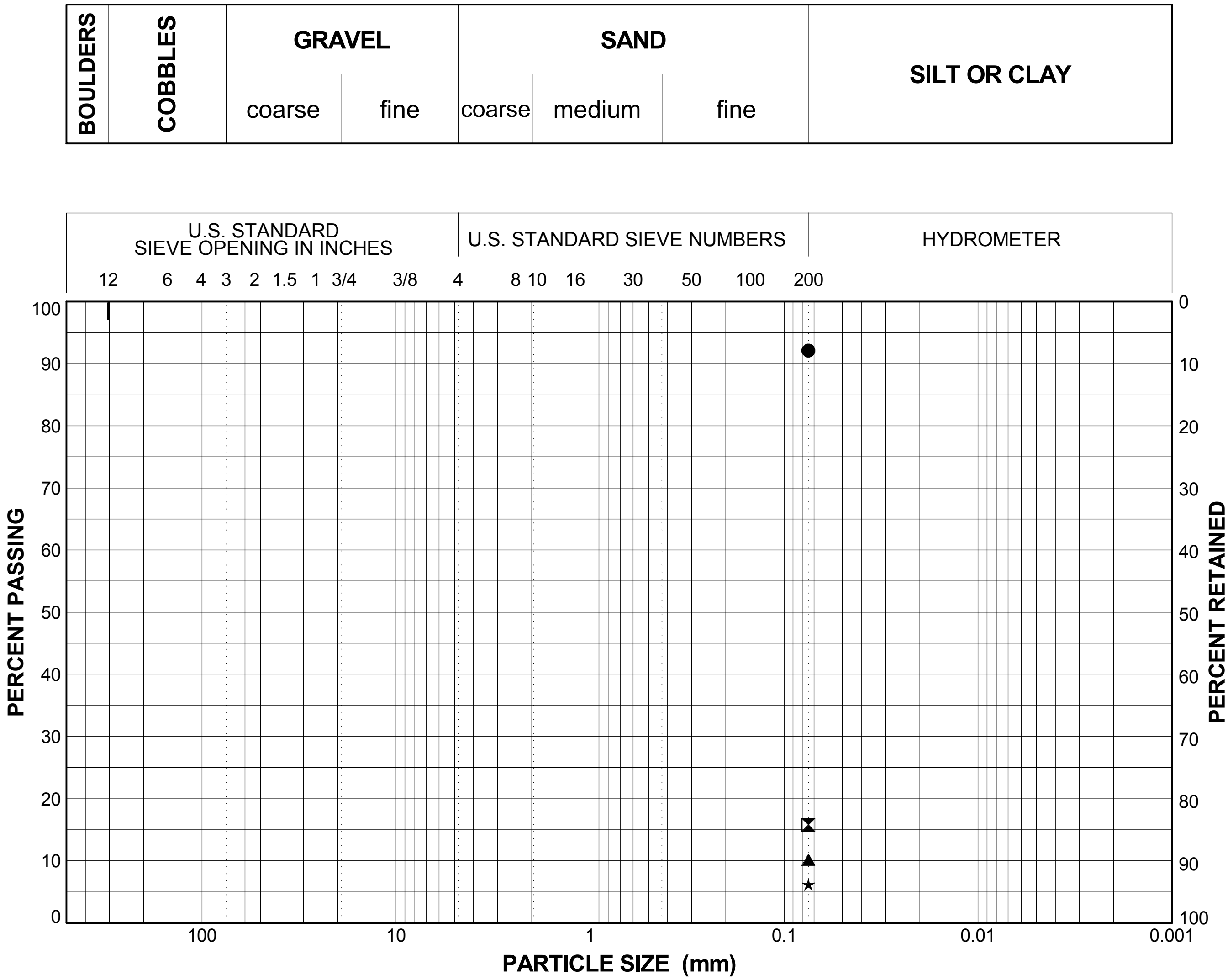


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_281B	S03A_004_005B	4	●	0.0	69.1	30.9	SILTY SAND (SM)
WR0017_281B	S05A_008_009P	8	⧗	0.0	0.0	49.6	CLAYEY SAND (SC)
WR0017_281B	S06A_010_011S	10.5	▲	0.0	48.3	49.2	SILTY SAND (SM)
WR0017_281B	S08A_012_013S	13	★	0.0	48.0	52.0	SANDY SILT (ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



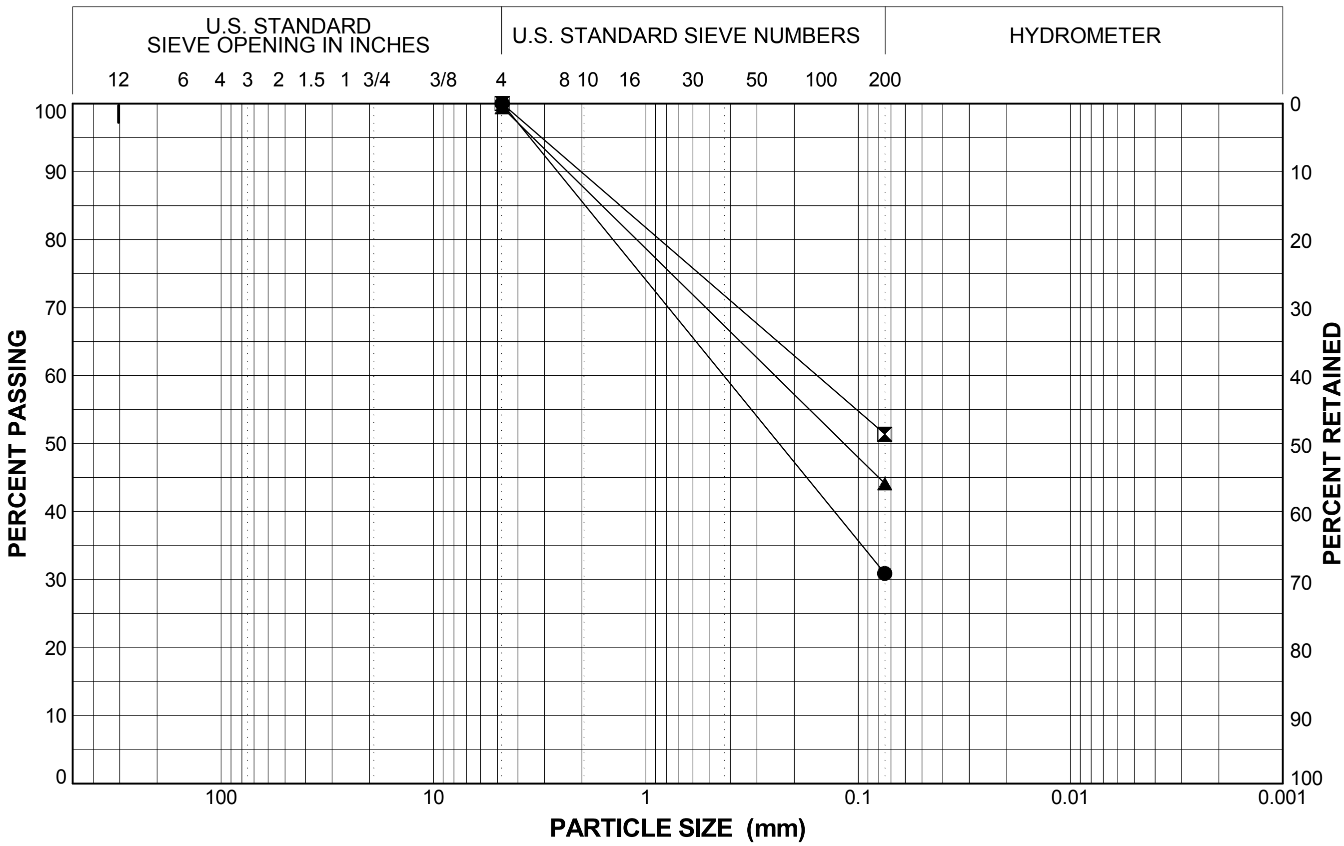
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_282B	S04A_006_008T	6.8	●	0.0	0.0	92.1	SILT (ML)
WR0017_282B	S07A_017_019T	17.3	⧗	0.0	0.0	15.8	SILTY SAND (SM)
WR0017_282B	S07A_017_019T	17.4	▲	0.0	0.0	10.2	SILTY SAND (SM)
WR0017_282B	S07A_017_019T	17.9	★	0.0	0.0	6.2	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



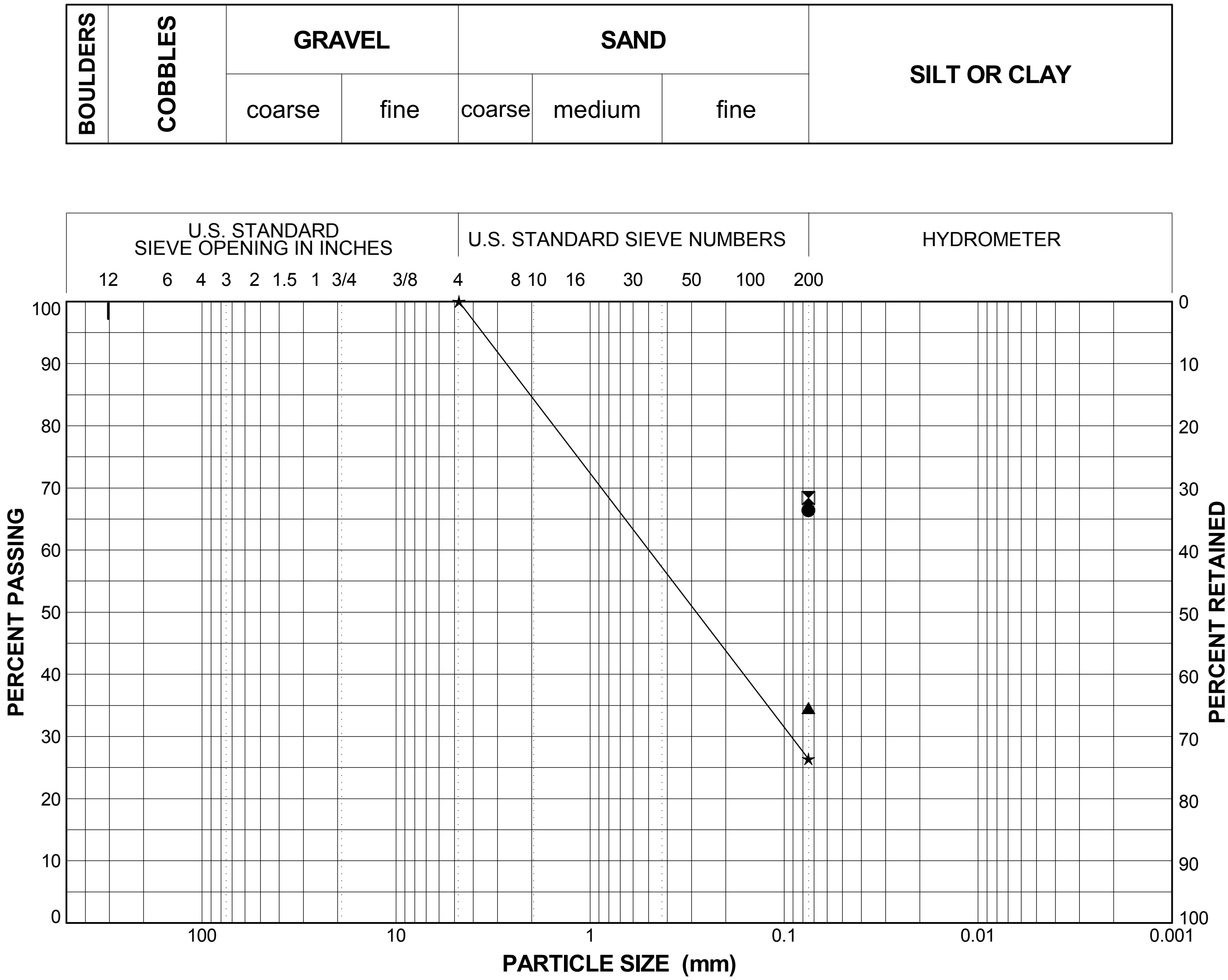
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_283B	S03A_007_010P	9.5	●	0.0	69.1	30.9	SILTY SAND (SM)
WR0017_283B	S06A_016_017S	16	⧗	0.0	48.6	51.4	SANDY LEAN CLAY (CL)
WR0017_283B	S11A_028_029S	28	▲	0.0	55.3	44.1	SILTY SAND (SM)

DWR LEVEE UNU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

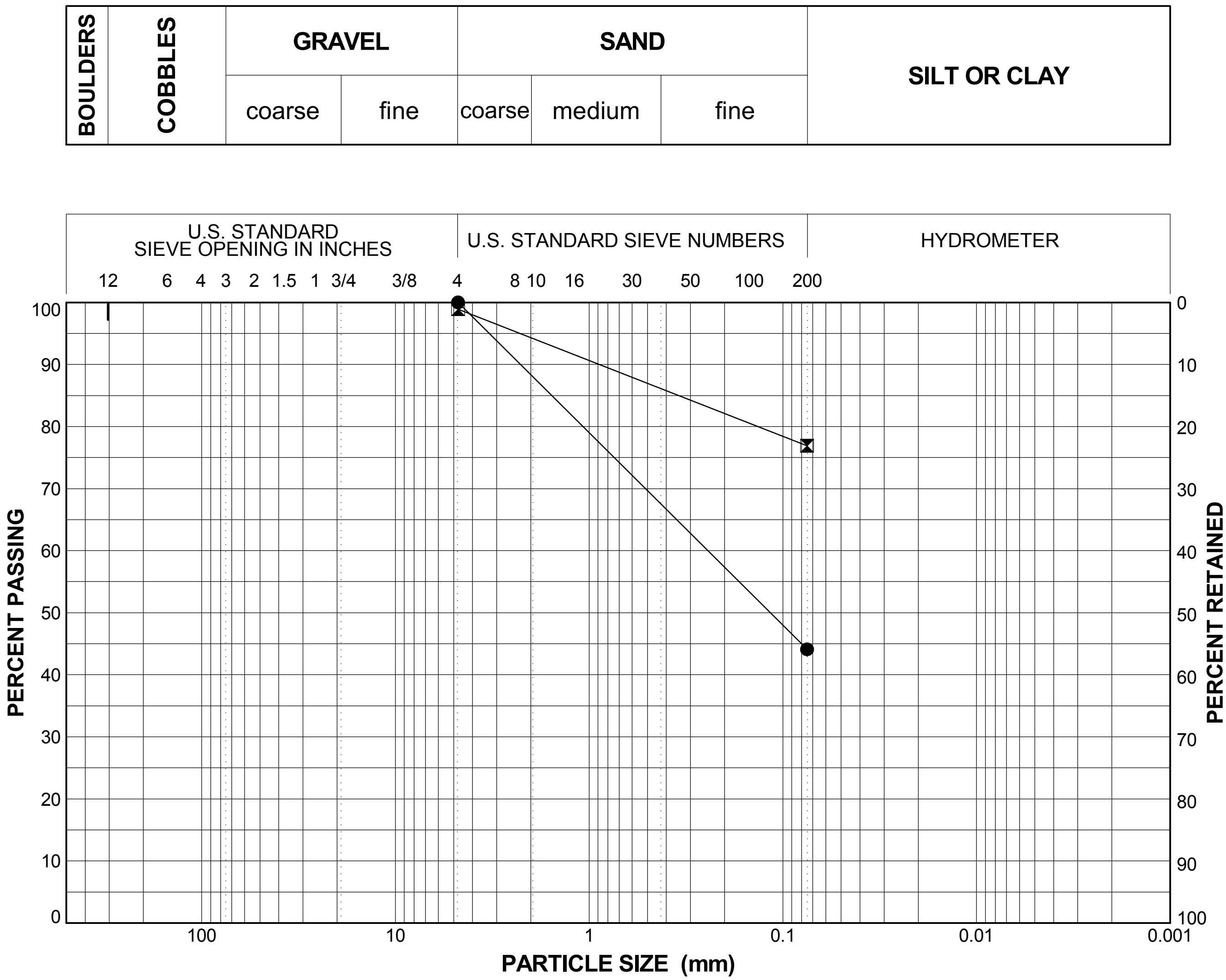
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_284B	S01A_000_001B	0	●	0.0	0.0	66.4	SANDY LEAN CLAY (CL)
WR0017_284B	S02A_001_002B	1	⧗	0.0	0.0	68.4	SANDY LEAN CLAY (CL)
WR0017_284B	S03A_003_004C	3	▲	0.0	0.0	34.6	SILTY SAND (SM)
WR0017_284B	S08A_018_020S	19	★	0.0	73.6	26.4	SILTY SAND (SM)

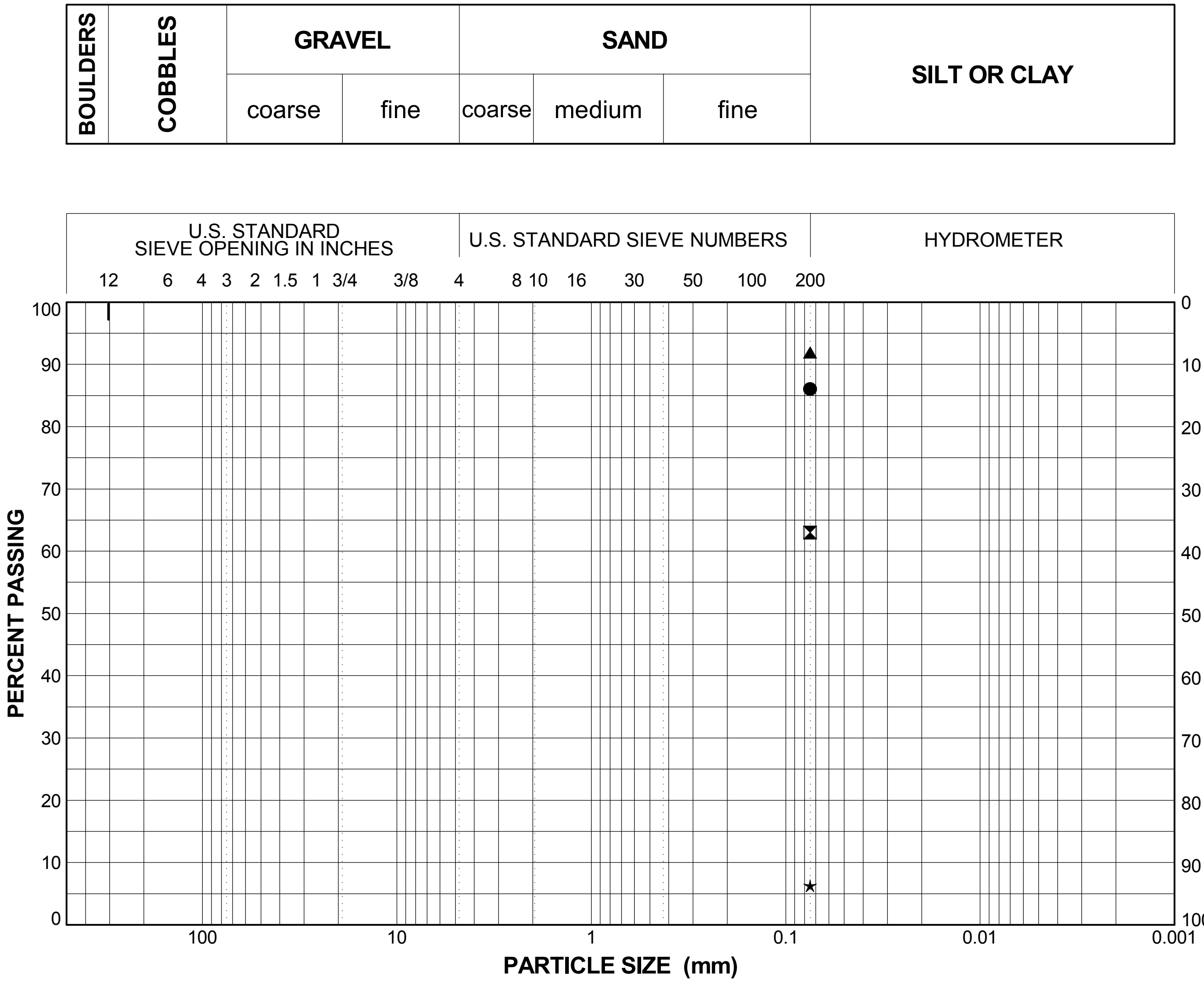


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_285B	S06A_010_012T	11	●	0.0	55.9	44.1	SILTY, CLAYEY SAND (SC-SM)
WR0017_285B	S08A_015_017S	16	⧗	0.0	22.0	76.9	SILT with Sand (ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



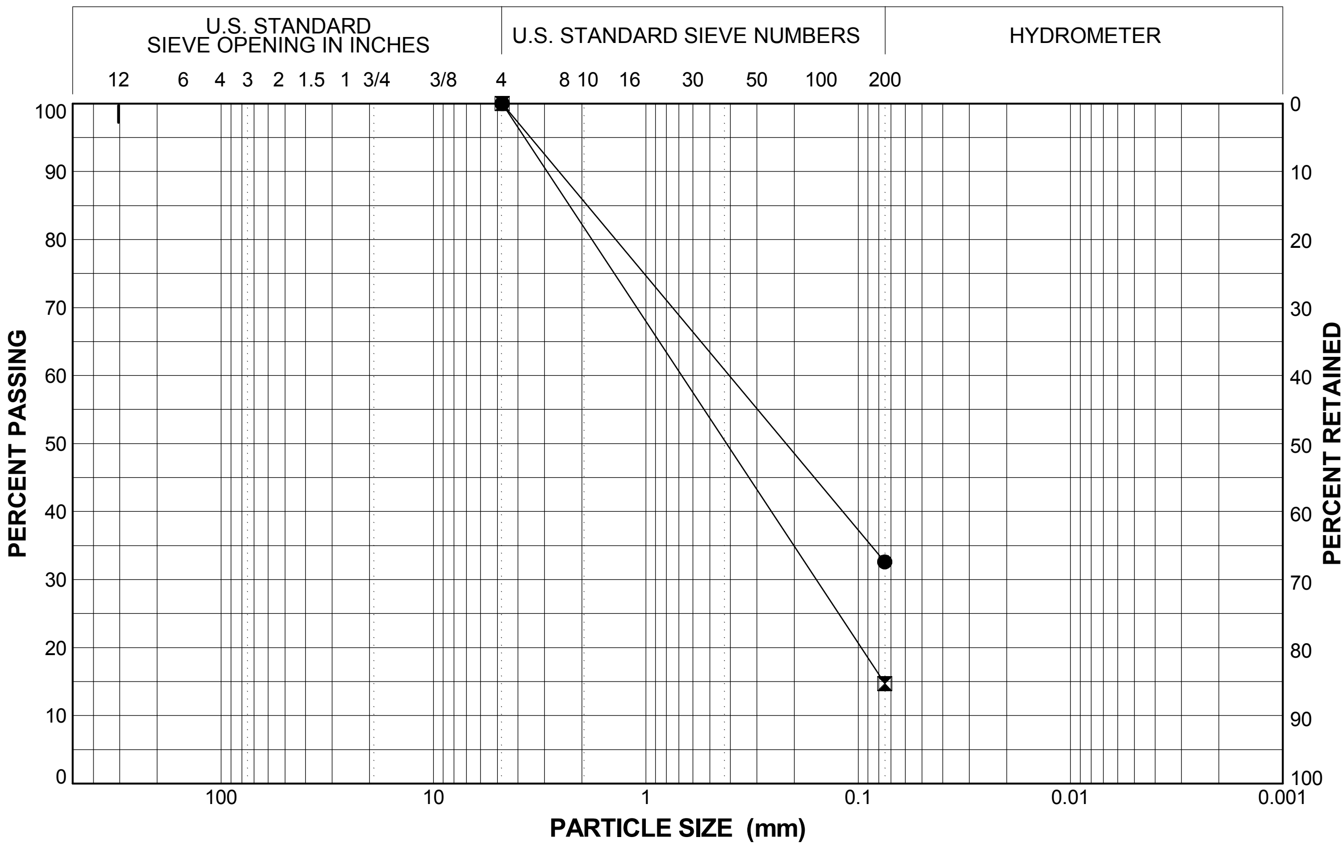
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_286B	S03A_005_007T	6	●	0.0	0.0	86.1	LEAN CLAY (CL)
WR0017_286B	S05A_010_012T	10.5	⧗	0.0	0.0	63.0	SANDY LEAN CLAY (CL)
WR0017_286B	S07A_015_017T	16.2	▲	0.0	0.0	91.9	LEAN CLAY (CL)
WR0017_286B	S10A_025_027T	25.5	★	0.0	0.0	6.3	Poorly Graded SAND with Silt (SP-SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



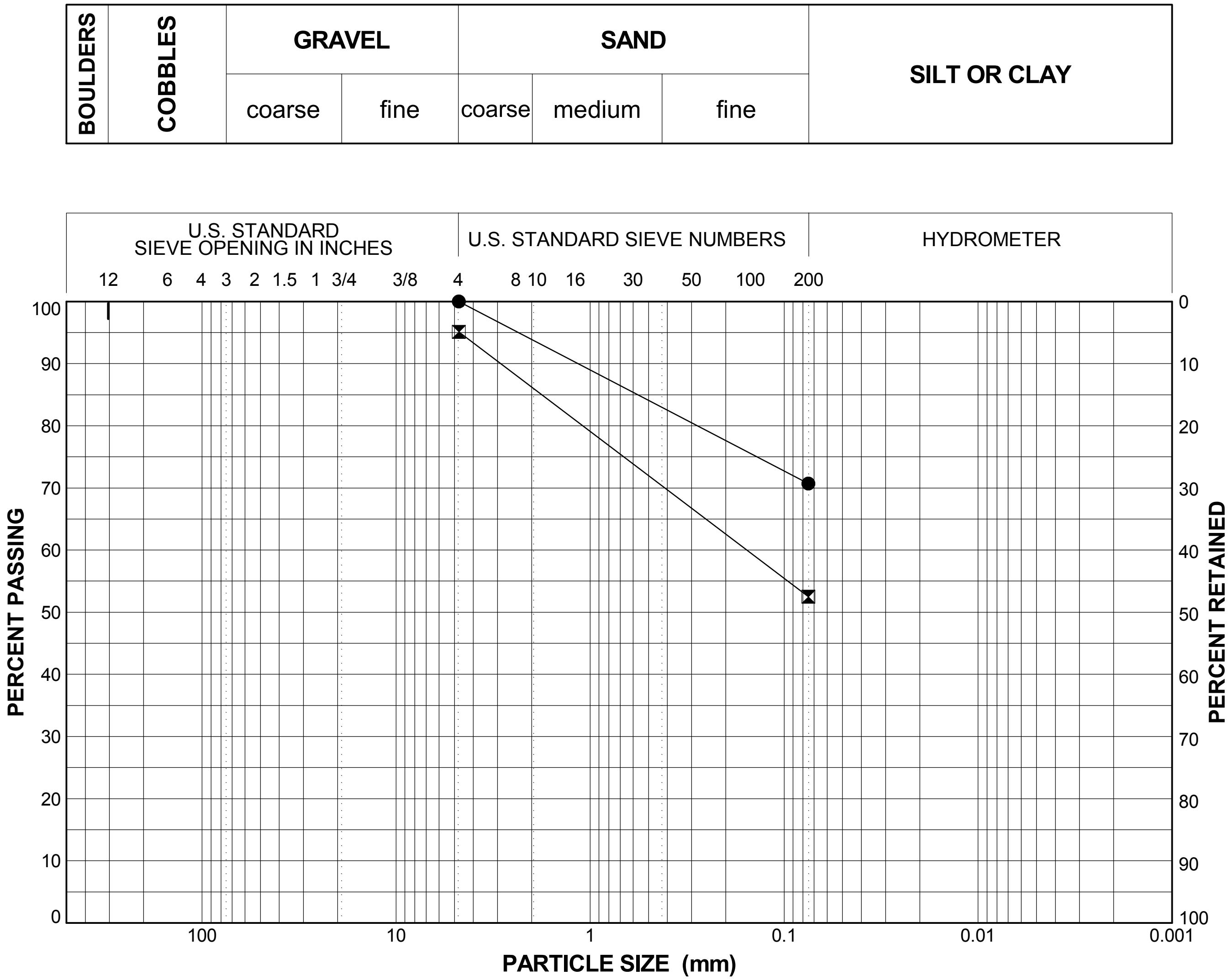
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_287B	S05B_007_008P	7.5	●	0.0	67.4	32.6	SILTY SAND (SM)
WR0017_287B	S10A_022_024S	23	⧗	0.0	85.3	14.7	SILTY SAND (SM)

DWR LEVEE U/NU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES



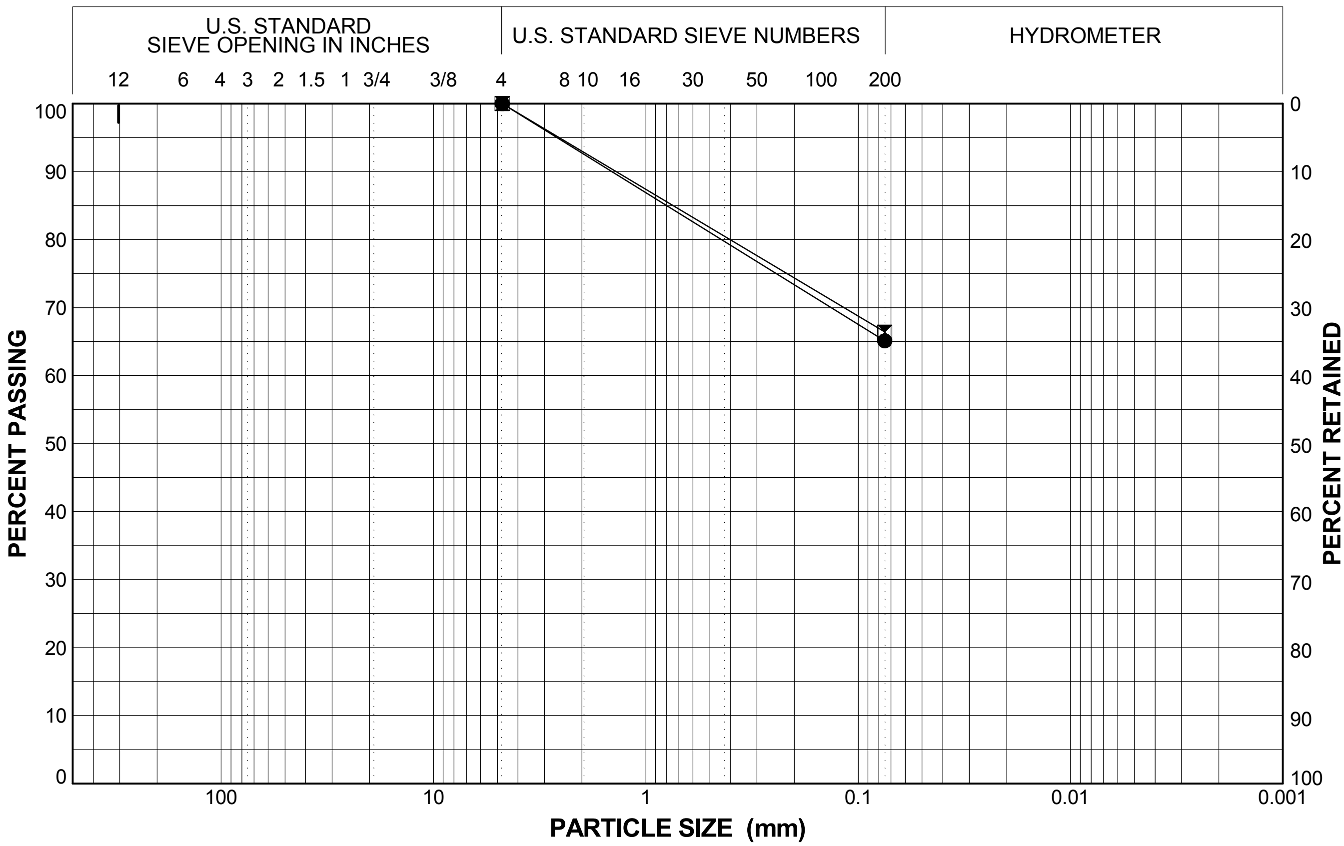
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_288B	S05A_012_014S	13	●	0.0	29.3	70.7	LEAN CLAY with SAND (CL)
WR0017_288B	S11A_027_029S	28	⧗	0.0	42.6	52.5	SANDY SILT (ML)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_289B	S03A_002_004S	3	●	0.0	34.9	65.1	SANDY LEAN CLAY (CL)
WR0017_289B	S05A_005_007S	6	⧗	0.0	33.6	66.4	SANDY SILTY CLAY (CL-ML)

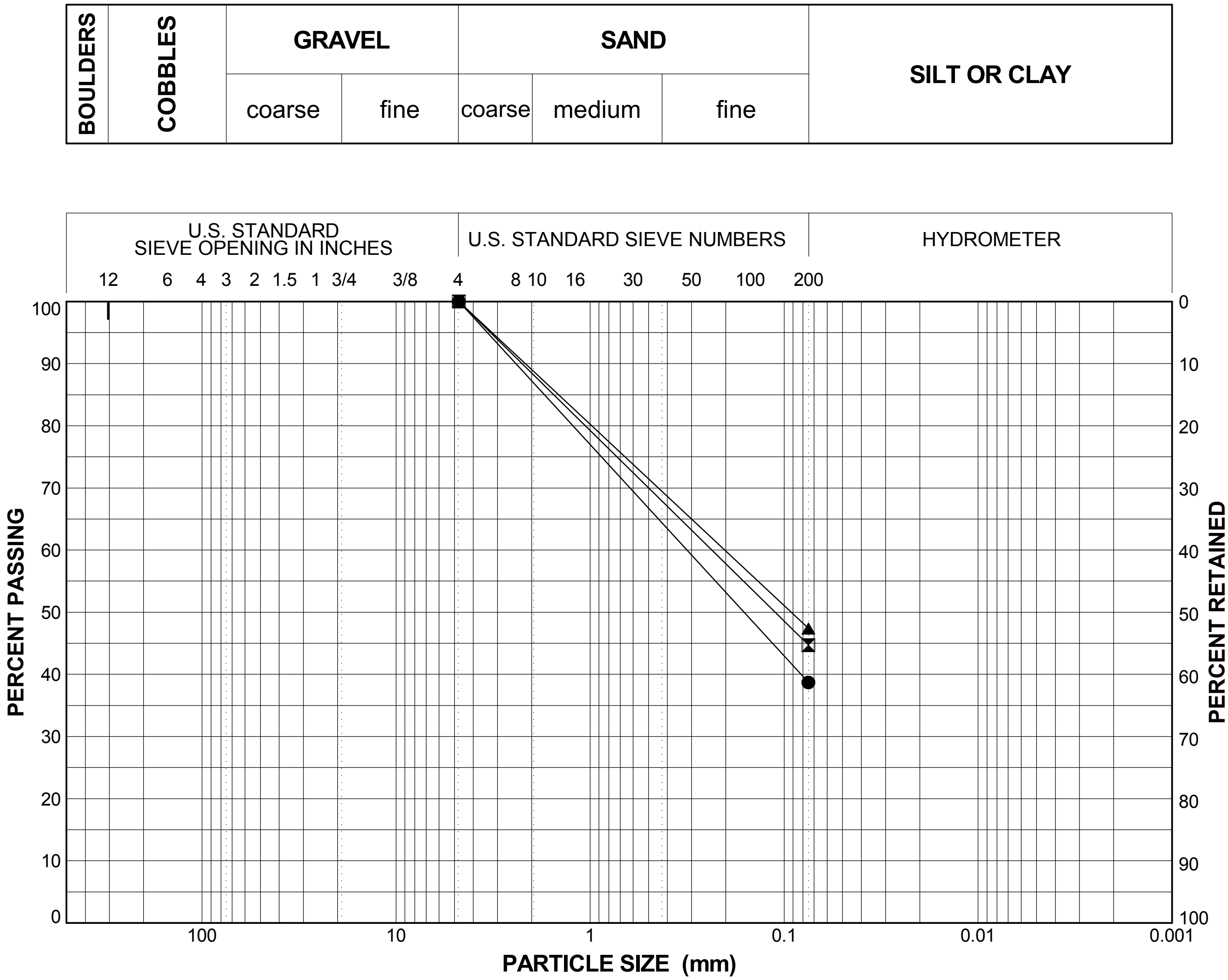
DWR LEVEE U/NU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

Sheet 92 of 96



Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_290B	S30B_002_003S	2.5	●	0.0	61.3	38.7	SILTY SAND (SM)
WR0017_290B	S06B_009_010P	9.5	⧗	0.0	55.3	44.7	SILTY SAND (SM)
WR0017_290B	S08B_013_014P	15	▲	0.0	52.6	47.4	SILTY SAND (SM)

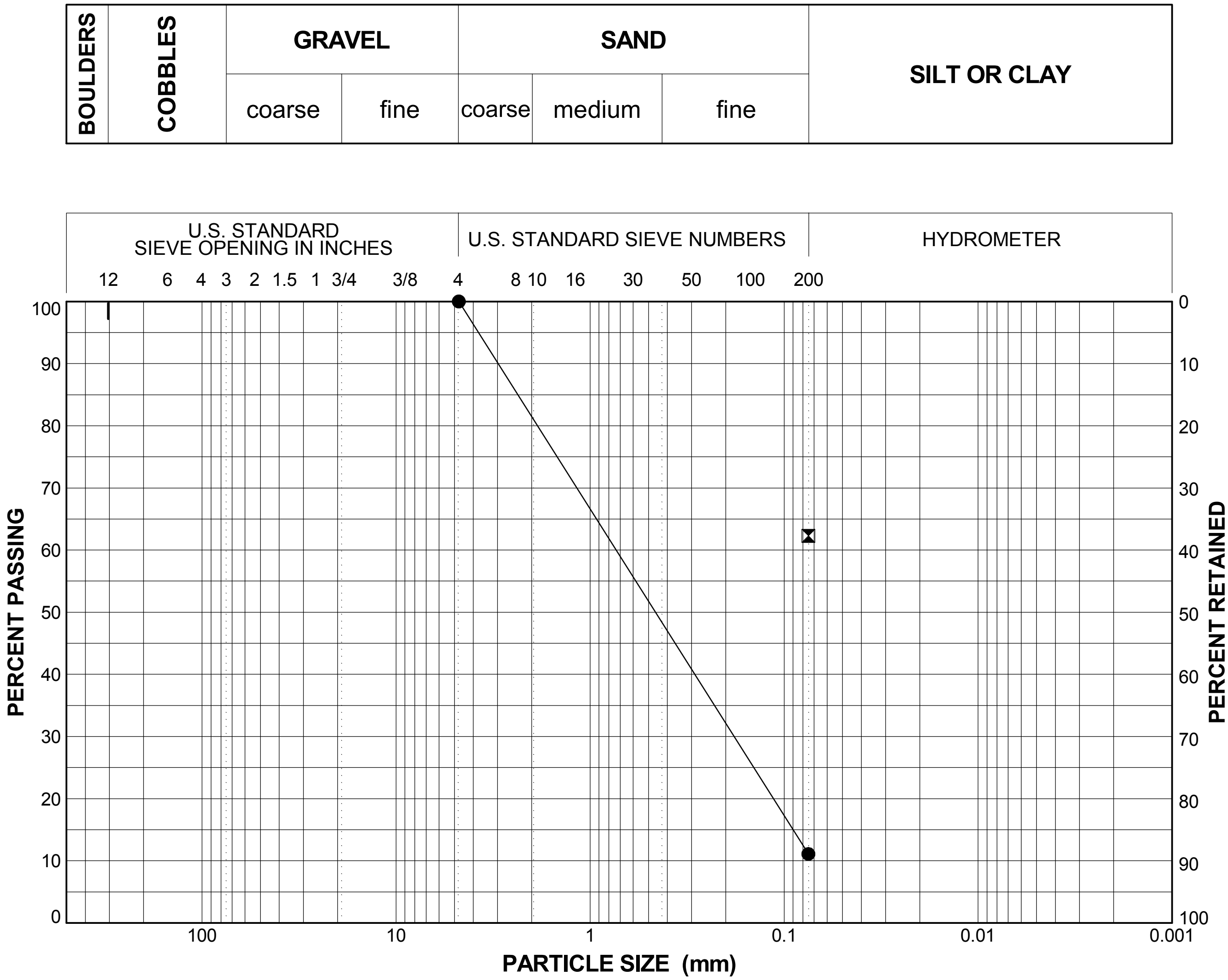
Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

Sheet 93 of 96

DWR LEVEE U/NU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13



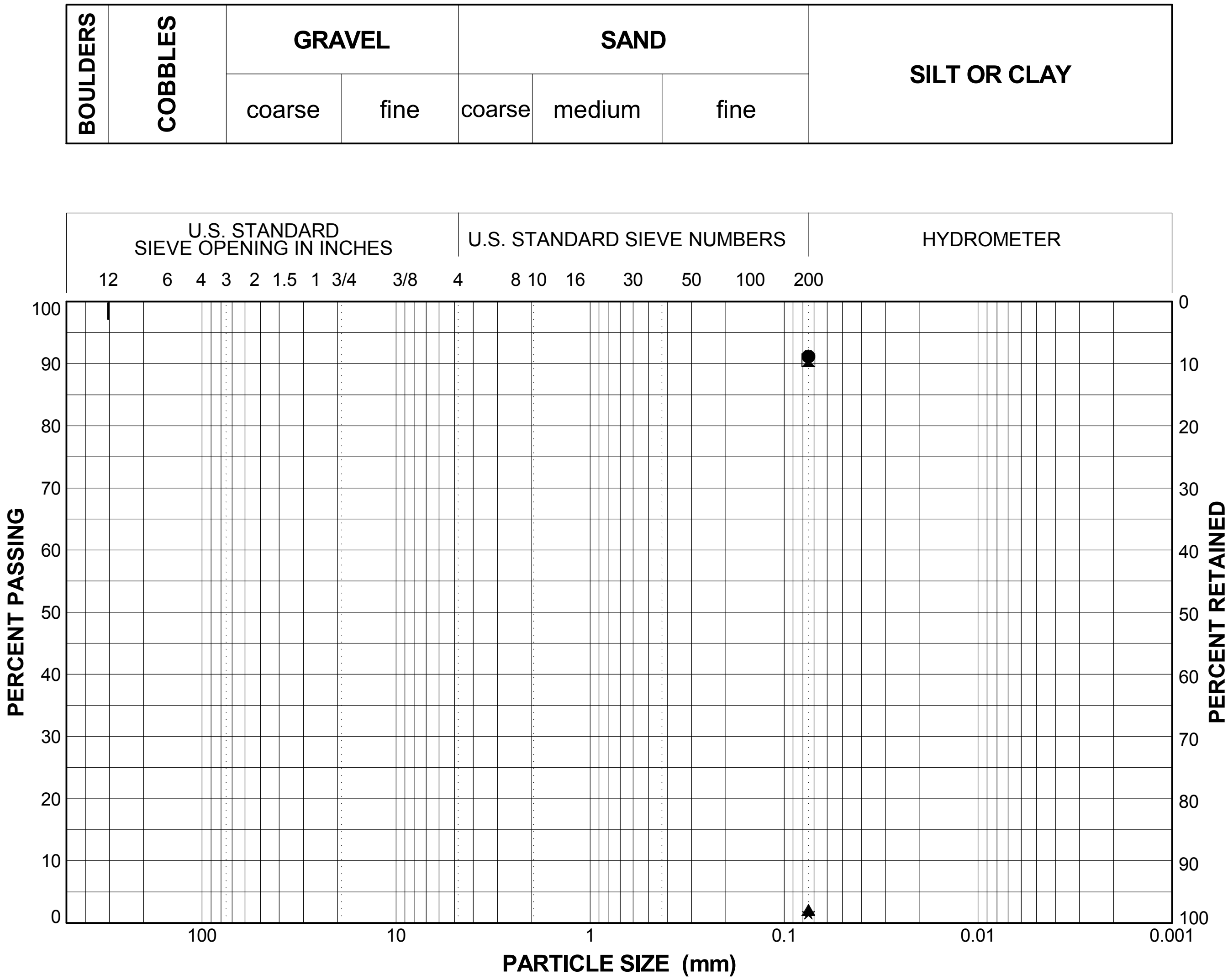
Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_292B	S01B_002_003M	2.5	●	0.0	88.9	11.1	POORLY GRADED SAND with SILT (SP-SM)
WR0017_292B	S07A_015_017T	16.25	⧗	0.0	0.0	62.3	SANDY elastic SILT (MH)

DWR LEVEE UNU SIEVE CURVES #200 REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

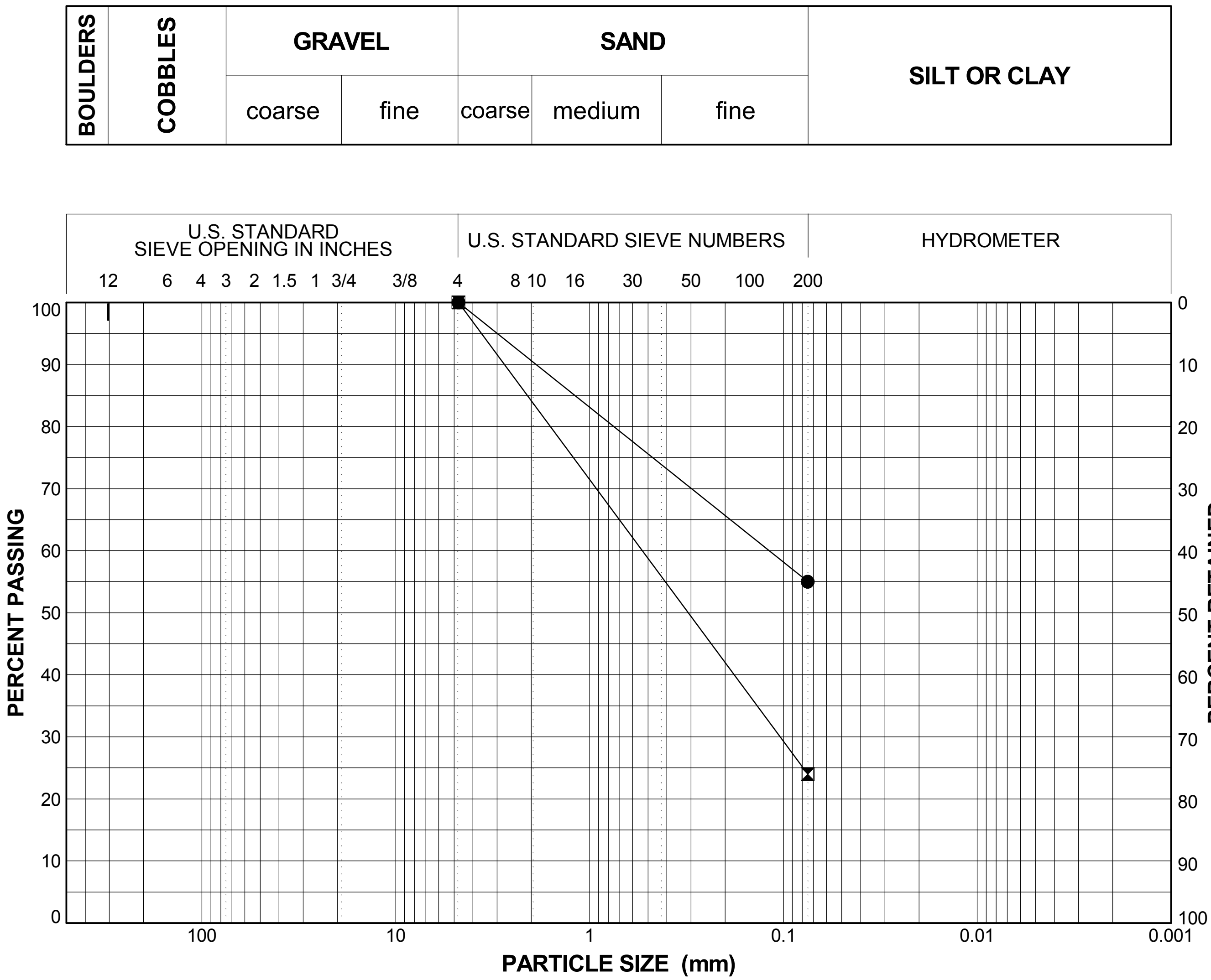


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_293B	S08A_013_014T	13.5	●	0.0	0.0	91.2	SILT (ML)
WR0017_293B	S08A_013_014T	13.75	⧗	0.0	0.0	90.5	SILT (ML)
WR0017_293B	S12A_025_027T	26	▲	0.0	0.0	2.1	Poorly Graded SAND (SP)
WR0017_293B	S13A_030_032T	31.45	★	0.0	0.0	1.6	Poorly Graded SAND (SP)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

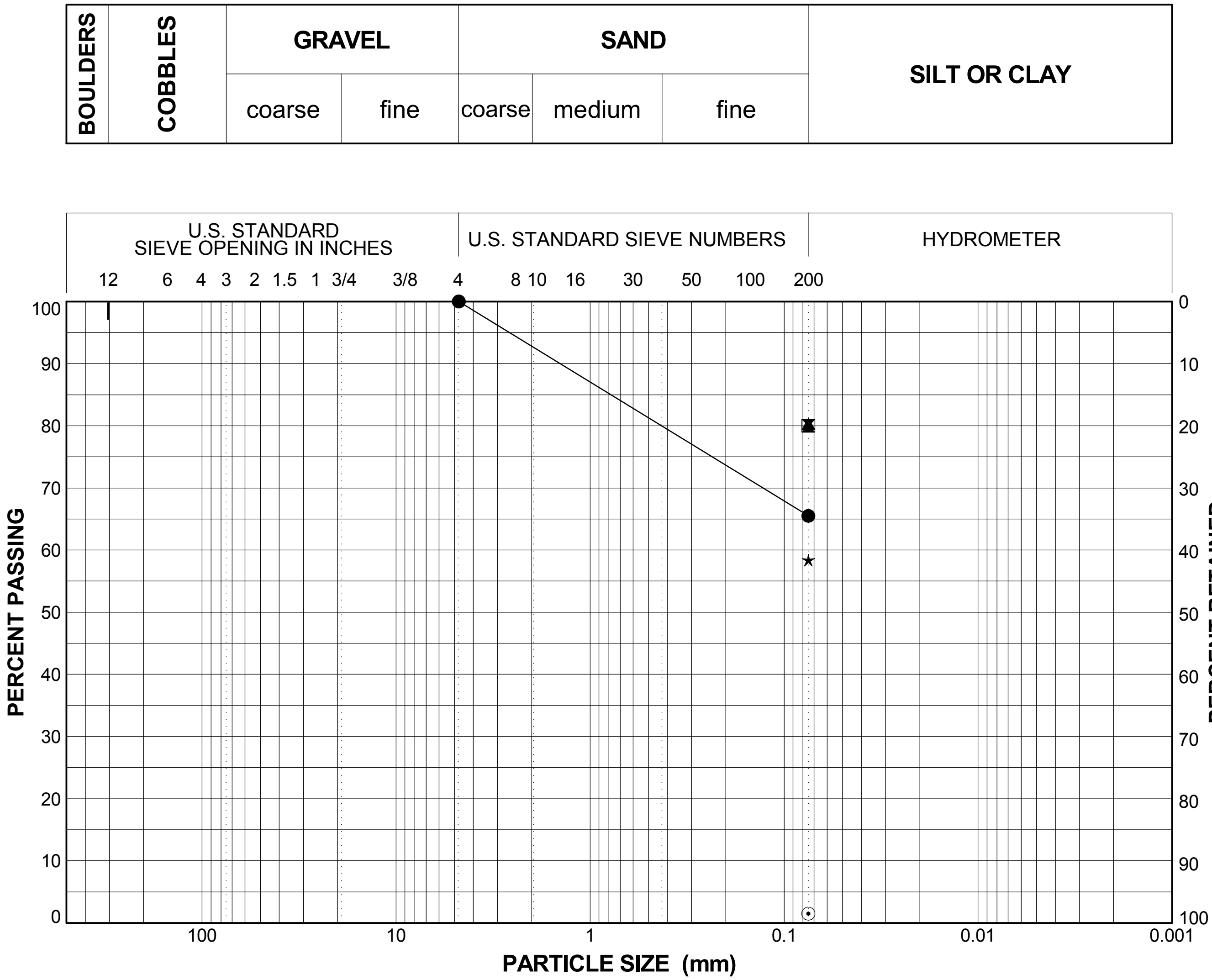


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_294B	S04A_006_007S	6	●	0.0	45.0	55.0	SANDY SILTY CLAY (CL-ML)
WR0017_294B	S08A_017_019S	18	⧗	0.0	76.0	24.0	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

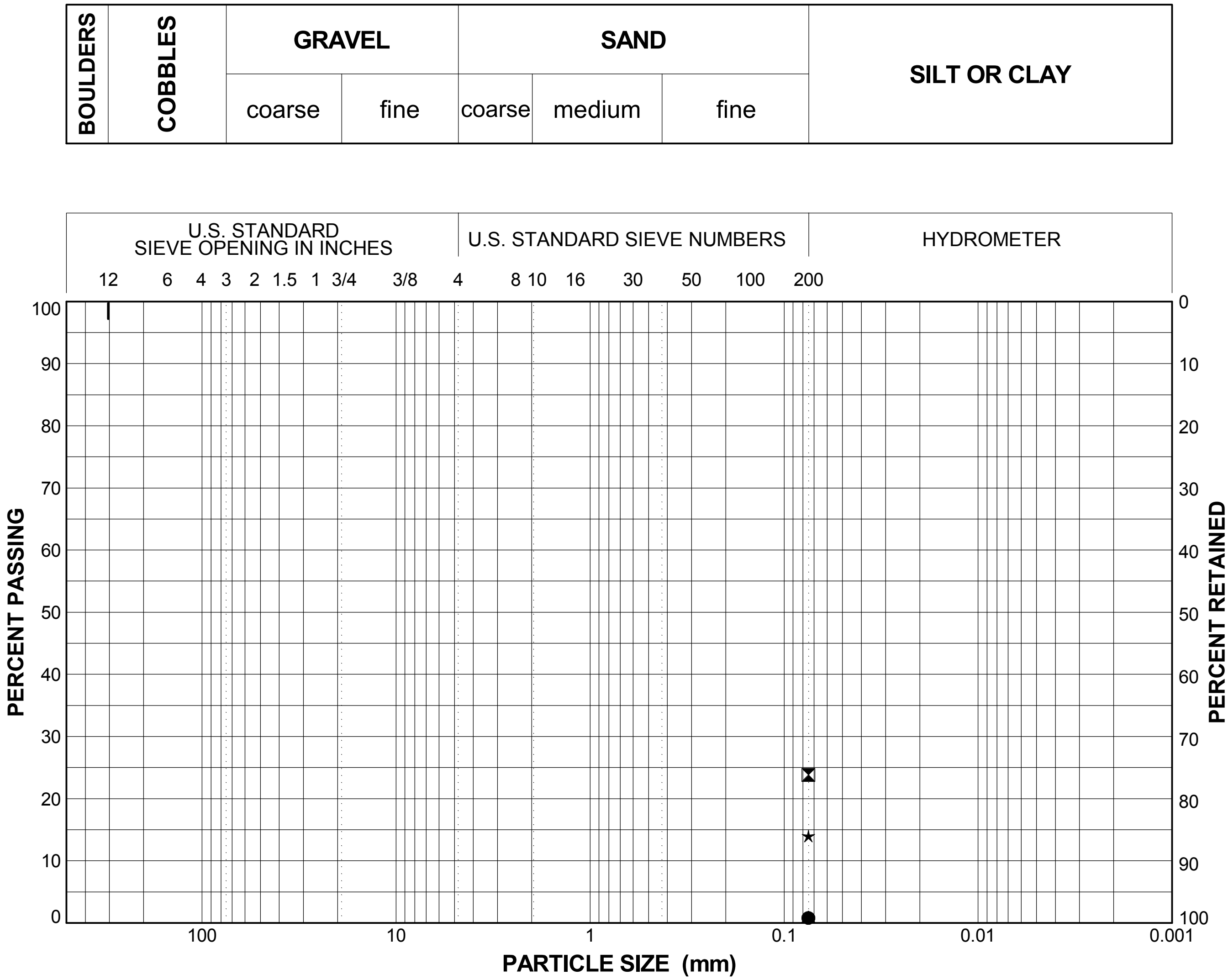


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_295B	S01A_001_002B	1.5	●	0.0	34.5	65.5	SANDY LEAN CLAY (CL)
WR0017_295B	S02A_002_003T	2.4	⧗	0.0	0.0	80.0	LEAN CLAY with SAND (CL)
WR0017_295B	S03A_003_005S	4	▲	0.0	0.0	80.3	LEAN CLAY with SAND (CL)
WR0017_295B	S04A_005_006T	6	★	0.0	0.0	58.4	Poorly Graded SAND (SP)
WR0017_295B	S11A_025_028T	26.5	⊙	0.0	0.0	1.5	Poorly Graded SAND (SP)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

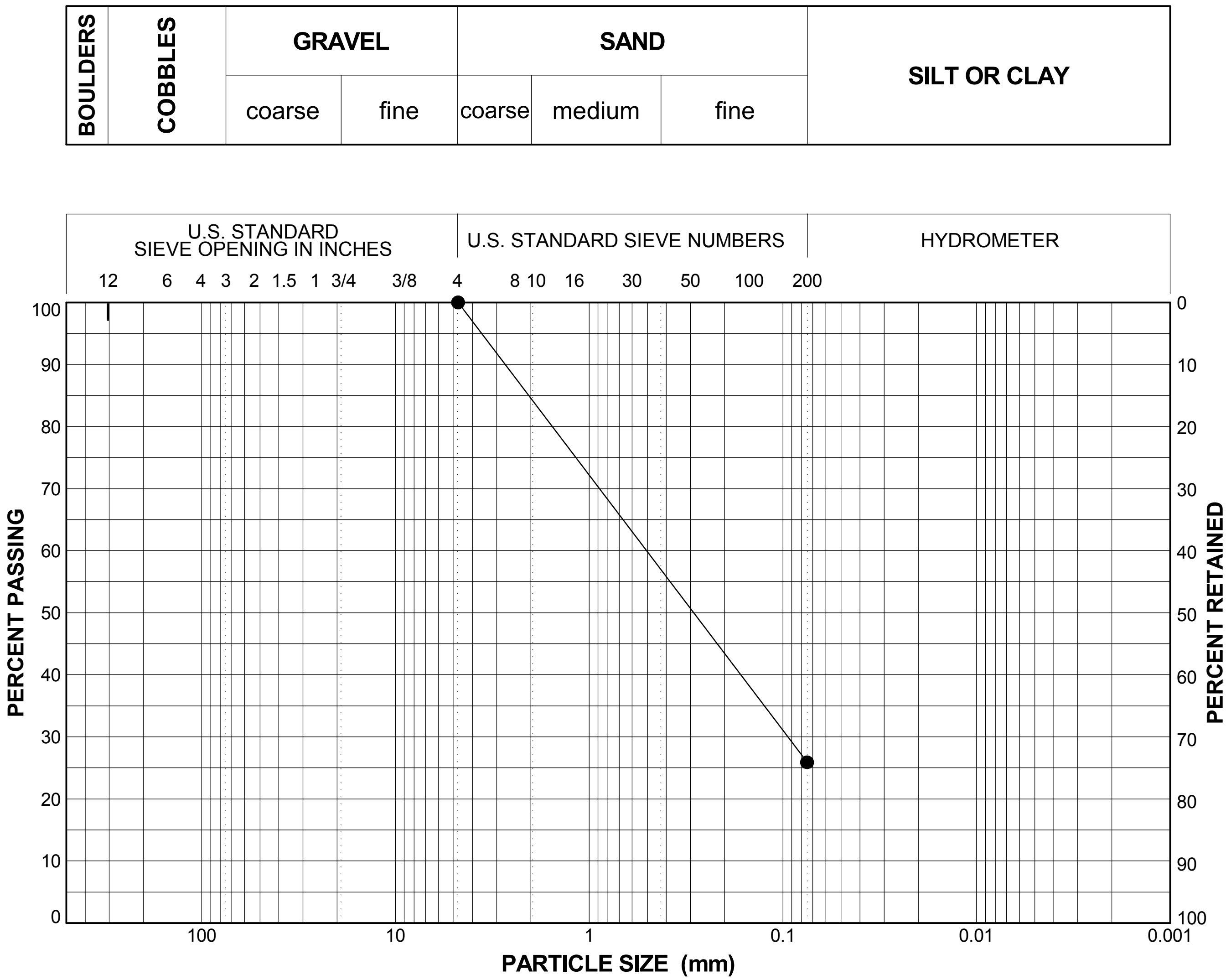


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_296B	S12A_020_022T	21	●	0.0	0.0	0.8	Poorly Graded SAND (SP)
WR0017_296B	S14A_030_032T	30.5	⧗	0.0	0.0	23.8	SILTY SAND (SM)
WR0017_296B	S16A_040_042T	41.1	▲	0.0	0.0	1.0	Poorly Graded SAND (SP)
WR0017_296B	S18A_050_052T	51	★	0.0	0.0	14.0	CLAYEY SAND (SC)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

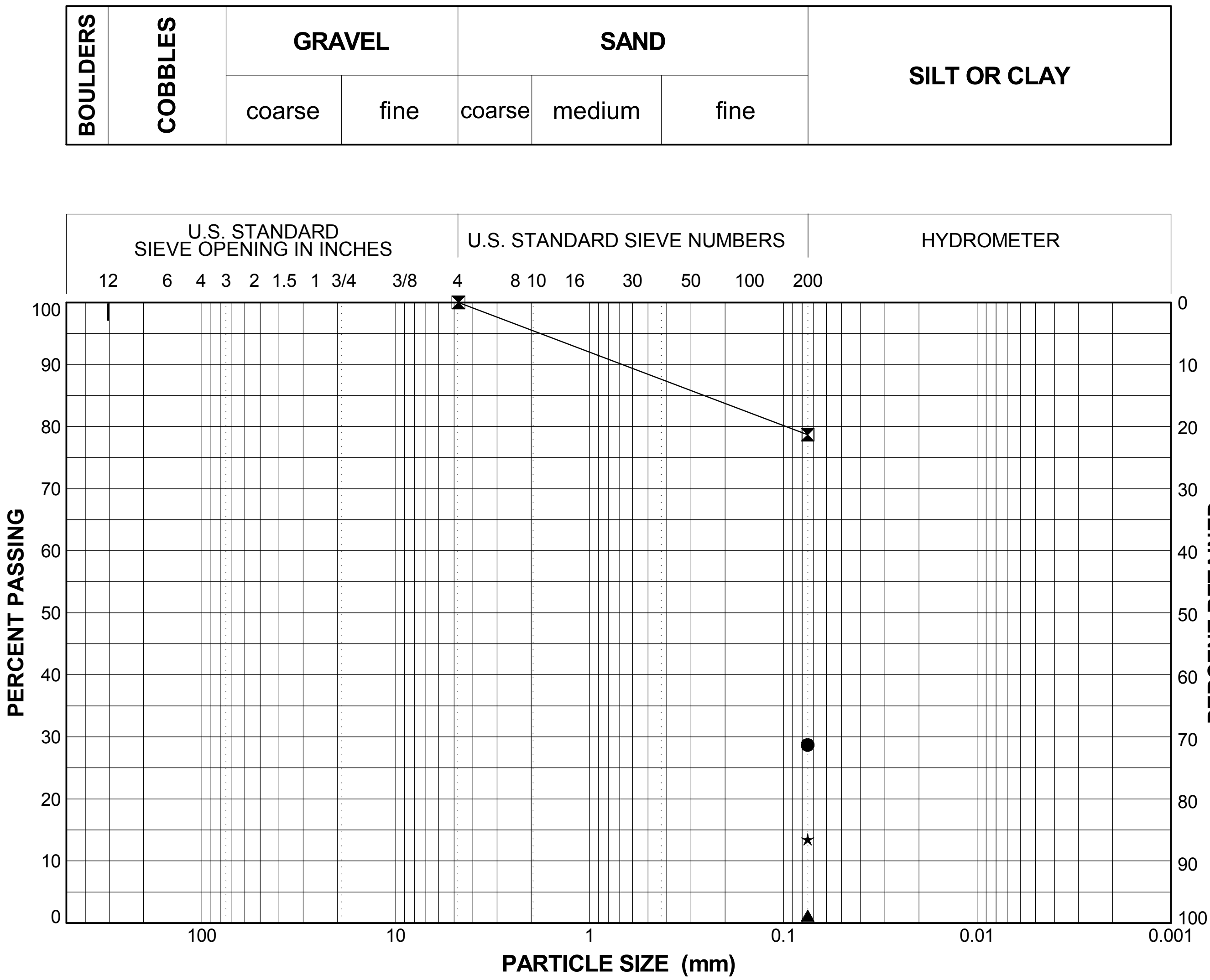


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_297B	S09B_017_018S	17.5	●	0.0	74.1	25.9	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

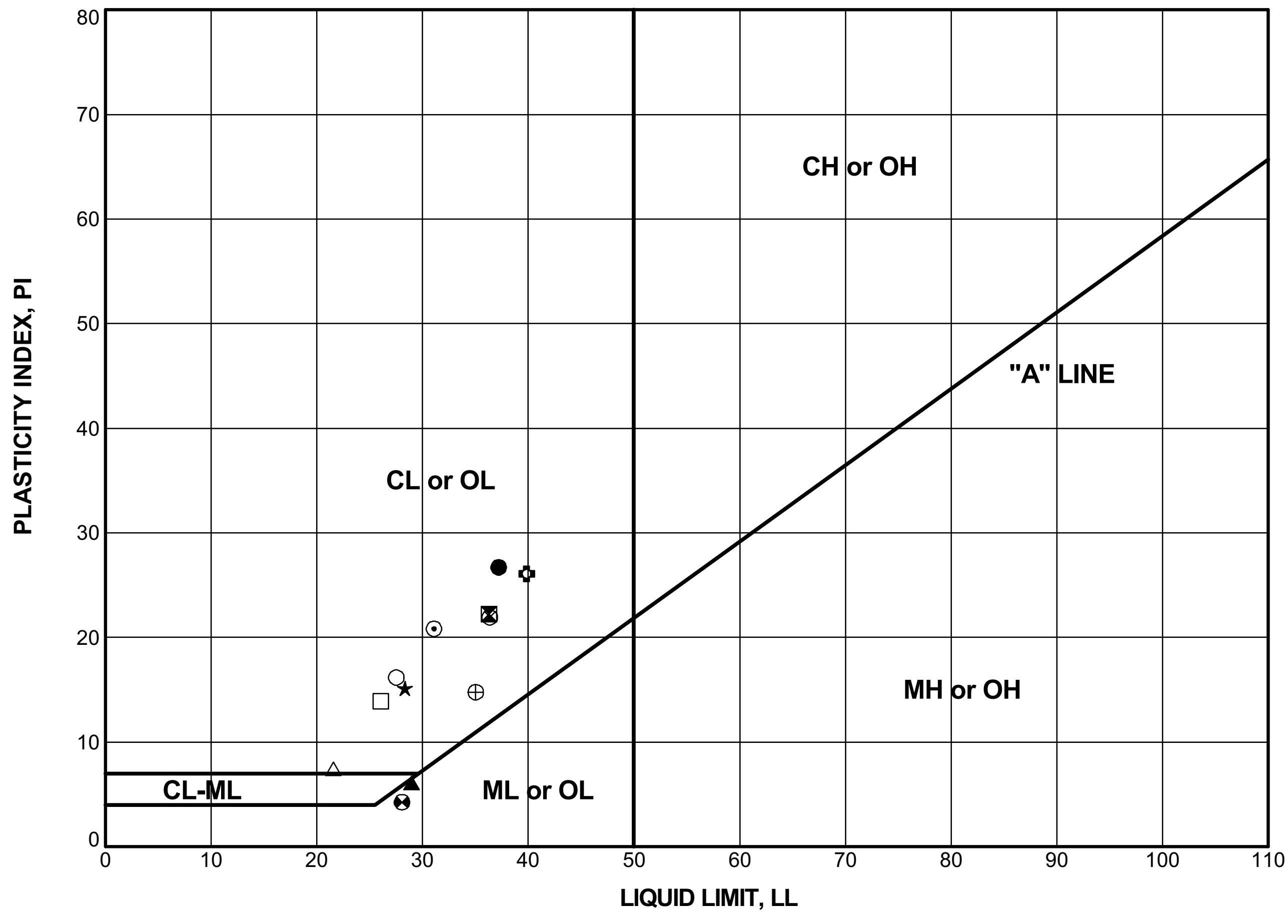


Boring Number	Sample Number	Depth (feet)	Symbol	%G	%S	%F	Classification
WR0017_298B	S03B_004_004C	3.7	●	0.0	0.0	28.7	SILTY SAND (SM)
WR0017_298B	S03A_004_005C	4	⧗	0.0	21.3	78.7	SILT with Sand (ML)
WR0017_298B	S04A_006_007C	6.3	▲	0.0	0.0	1.2	SILTY SAND (SM)
WR0017_298B	S07A_013_014S	13	★	0.0	0.0	13.5	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PARTICLE SIZE DISTRIBUTION CURVES

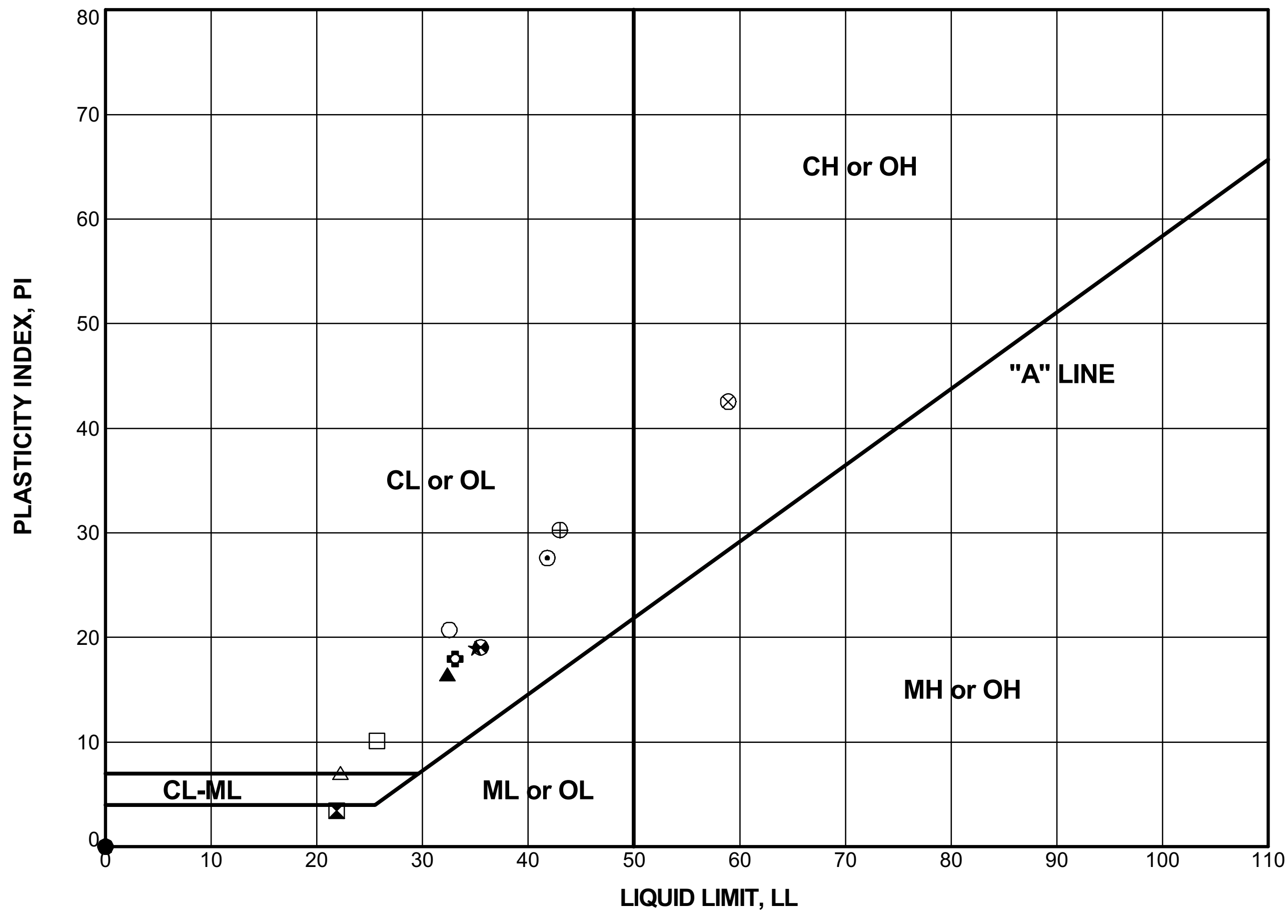


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_029B	29A	58	●	18.5	37	10	27	LEAN CLAY with Sand (CL)
WR0017_036B	3A	5	⊠	21.3	36	14	22	LEAN CLAY with Sand (CL)
WR0017_036B	7A	14	▲	25.2	29	23	6	SILT with Sand (ML)
WR0017_036B	17A	35	★	20.2	28	13	15	LEAN CLAY (CL)
WR0017_036B	19A	40	⊙	19.8	31	10	21	LEAN CLAY (CL)
WR0017_036B	38A	90	✤	26.9	40	14	26	LEAN CLAY with Sand (CL)
WR0017_036B	52A	125	○	19.0	28	11	17	LEAN CLAY with Sand (CL)
WR0017_041B	17A	36.5	△	19.2	22	14	8	SANDY LEAN CLAY (CL)
WR0017_041B	22B	50.5	⊗	27.6	36	14	22	SANDY LEAN CLAY (CL)
WR0017_041B	42A	93	⊕	30.9	35	20	15	LEAN CLAY with Sand (CL)
WR0017_041B	60A	139	□	15.7	26	12	14	SANDY LEAN CLAY (CL)
WR0017_047B	5A	15	⦻	18.3	28	24	4	SANDY SILT (ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PLASTICITY CHART



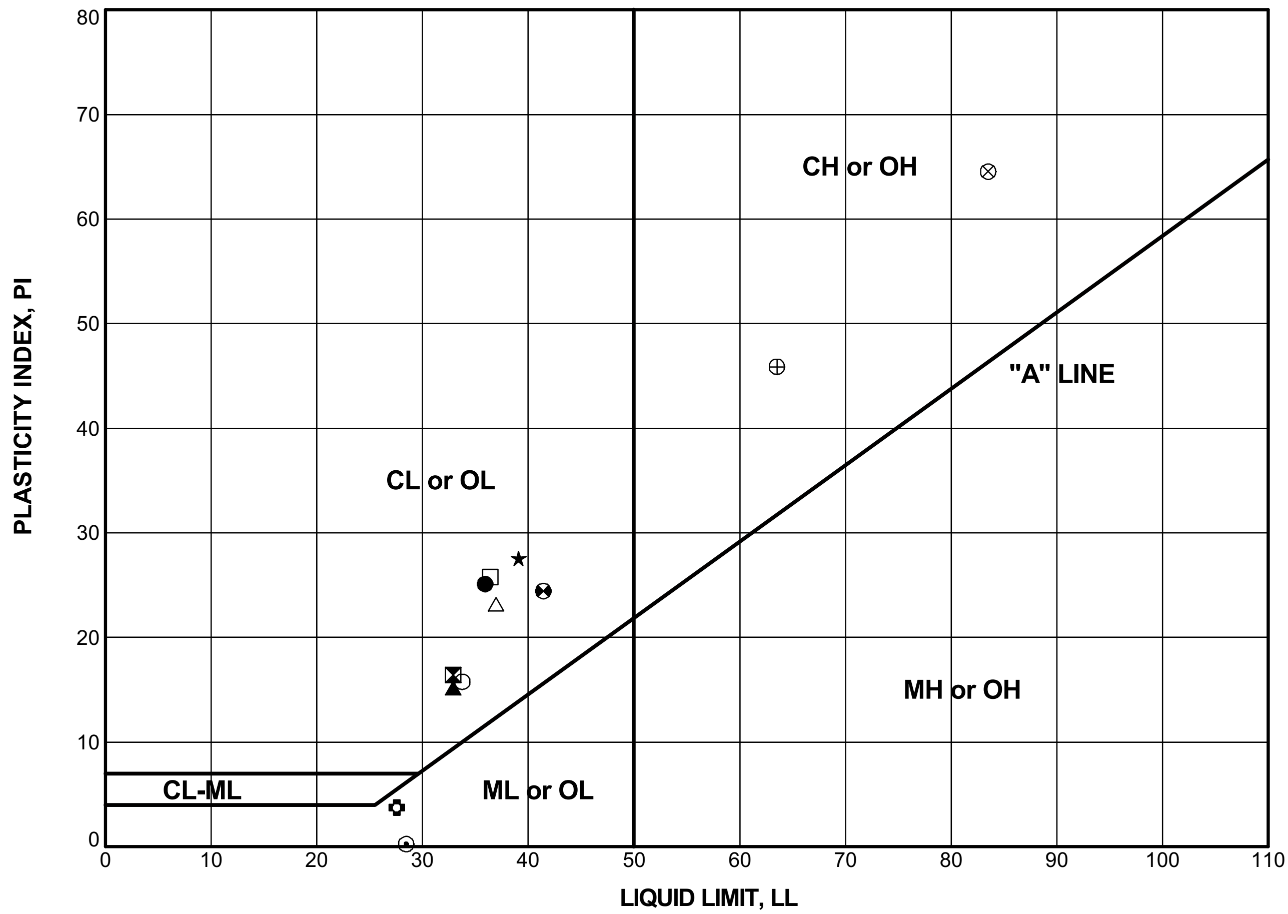
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_047B	7A	17.5	●		NP	NP	NP	SILT (ML)
WR0017_047B	10A	25.5	⧗	21.9	22	18	4	SILTY SAND (SM)
WR0017_047B	23A	60	▲	29.7	32	16	16	LEAN CLAY with Sand (CL)
WR0017_047B	29A	73	★	25.3	35	16	19	LEAN CLAY with Sand (CL)
WR0017_047B	30A	75	⊙	30.8	42	14	28	LEAN CLAY with Sand (CL)
WR0017_047B	32A	80	✿	27.9	33	15	18	LEAN CLAY with Sand (CL)
WR0017_047B	38A	95	○	21.0	33	12	21	SANDY LEAN CLAY (CL)
WR0017_047B	39A	98	△	21.4	22	15	7	SILTY CLAYEY SAND (SC-SM)
WR0017_047B	41A	101.5	⊗	26.5	59	16	43	FAT CLAY with Sand (CH)
WR0017_047B	44A	108	⊕	21.0	43	13	30	LEAN CLAY with Sand (CL)
WR0017_052B	15A	38	□	25.4	26	16	10	SANDY LEAN CLAY (CL)
WR0017_052B	16A	40	⊛	29.6	35	16	19	SANDY LEAN CLAY (CL)

DWR ATTERBERG PLOT DWR052708.GPJ DWR_LEVEES_111507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

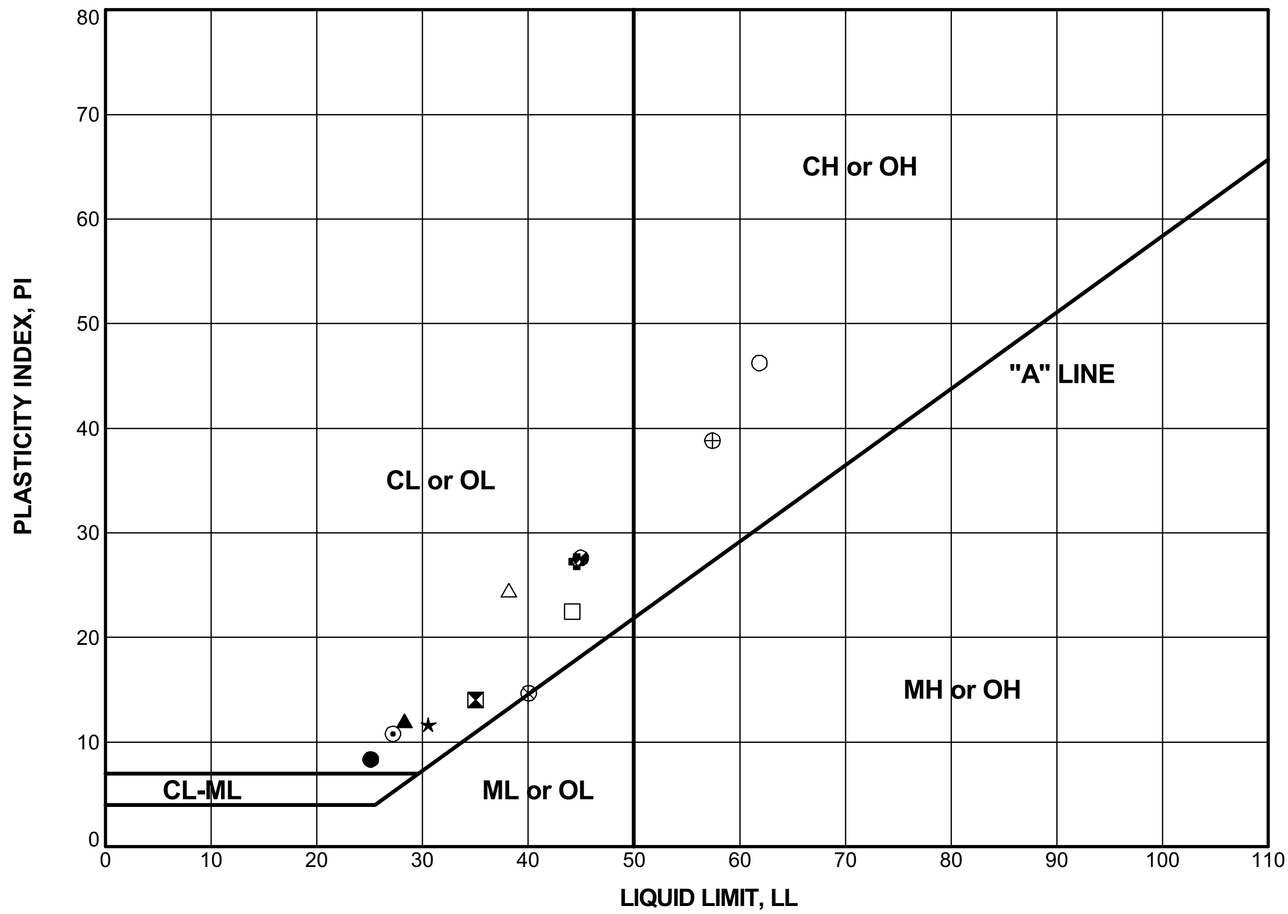
PLASTICITY CHART



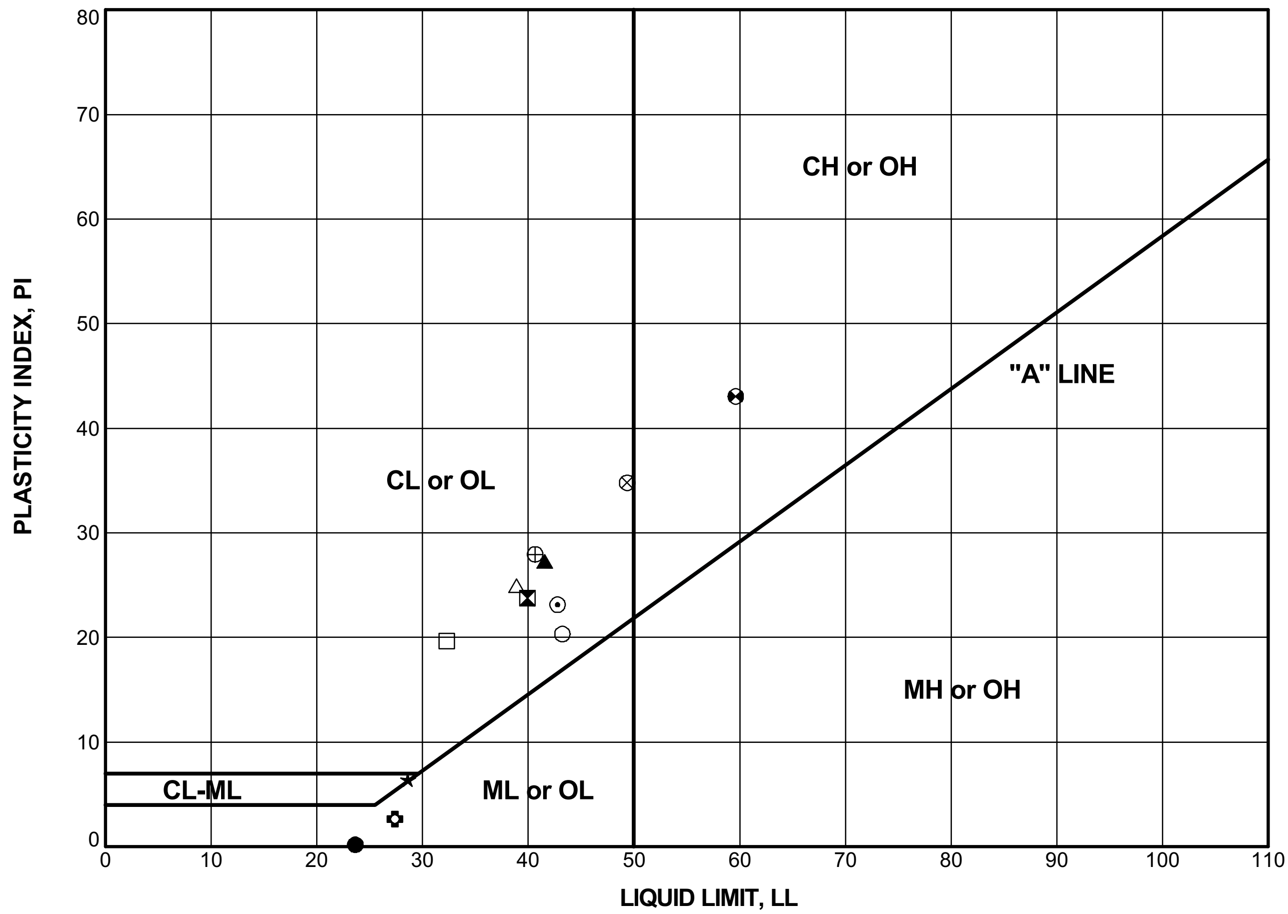
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_052B	17A	44	●	22.6	36	11	25	CLAYEY SAND (SC)
WR0017_052B	19A	47	⊠	27.4	33	16	17	LEAN CLAY (CL)
WR0017_052B	25A	62	▲	31.3	33	18	15	LEAN CLAY with Sand (CL)
WR0017_052B	45A	108	★	18.5	39	12	27	LEAN CLAY with Sand (CL)
WR0017_057B	4A	12.5	⊙	19.1	28	28	NP	SILT (ML)
WR0017_057B	5A	15	✪	18.4	28	24	4	SILTY SAND (SM)
WR0017_057B	15A	42	○	29.9	34	18	16	LEAN CLAY with Sand (CL)
WR0017_057B	16A	45	△	30.7	37	14	23	SANDY LEAN CLAY (CL)
WR0017_057B	18B	50.5	⊗	38.6	84	19	65	FAT CLAY with Sand (CH)
WR0017_057B	21A	55	⊕	37.5	64	18	46	FAT CLAY (CH)
WR0017_057B	24A	62	□	21.3	36	11	25	SANDY LEAN CLAY (CL)
WR0017_057B	26A	70.5	⊗	31.0	41	17	24	LEAN CLAY with Sand (CL)

Engineering Support Services Urban Levee Geotechnical Evaluations RD 17	**PLASTICITY CHART**

DWR ATTERBERG PLOT DWR052708.GPJ DWR_LEVEES_111507.GDT 6/9/08



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_057B	38A	97	●	20.0	25	17	8	SANDY LEAN CLAY (CL)
WR0017_057B	41B	105.5	⊠	26.3	35	21	14	SANDY LEAN CLAY (CL)
WR0017_063B	3A	7.5	▲	18.5	28	16	12	CLAYEY SAND (SC)
WR0017_063B	6A	15.2	★	22.6	31	19	12	LEAN CLAY with Sand (CL)
WR0017_063B	8A	20	⊙	18.9	27	16	11	SANDY LEAN CLAY (CL)
WR0017_063B	11A	30	✿	30.3	45	17	28	LEAN CLAY with Sand (CL)
WR0017_063B	25A	65	○	31.3	62	16	46	FAT CLAY with Sand (CH)
WR0017_063B	27A	72.5	△	30.7	38	14	24	LEAN CLAY with Sand (CL)
WR0017_063B	32A	82	⊗	27.6	40	25	15	SANDY LEAN CLAY (CL)
WR0017_063B	34A	87	⊕	37.5	57	19	38	SANDY FAT CLAY (CH)
WR0017_069B	5A	12.5	□	29.5	44	22	22	LEAN CLAY (CL)
WR0017_069B	13A	37	⊛	29.3	45	17	28	LEAN CLAY with Sand (CL)



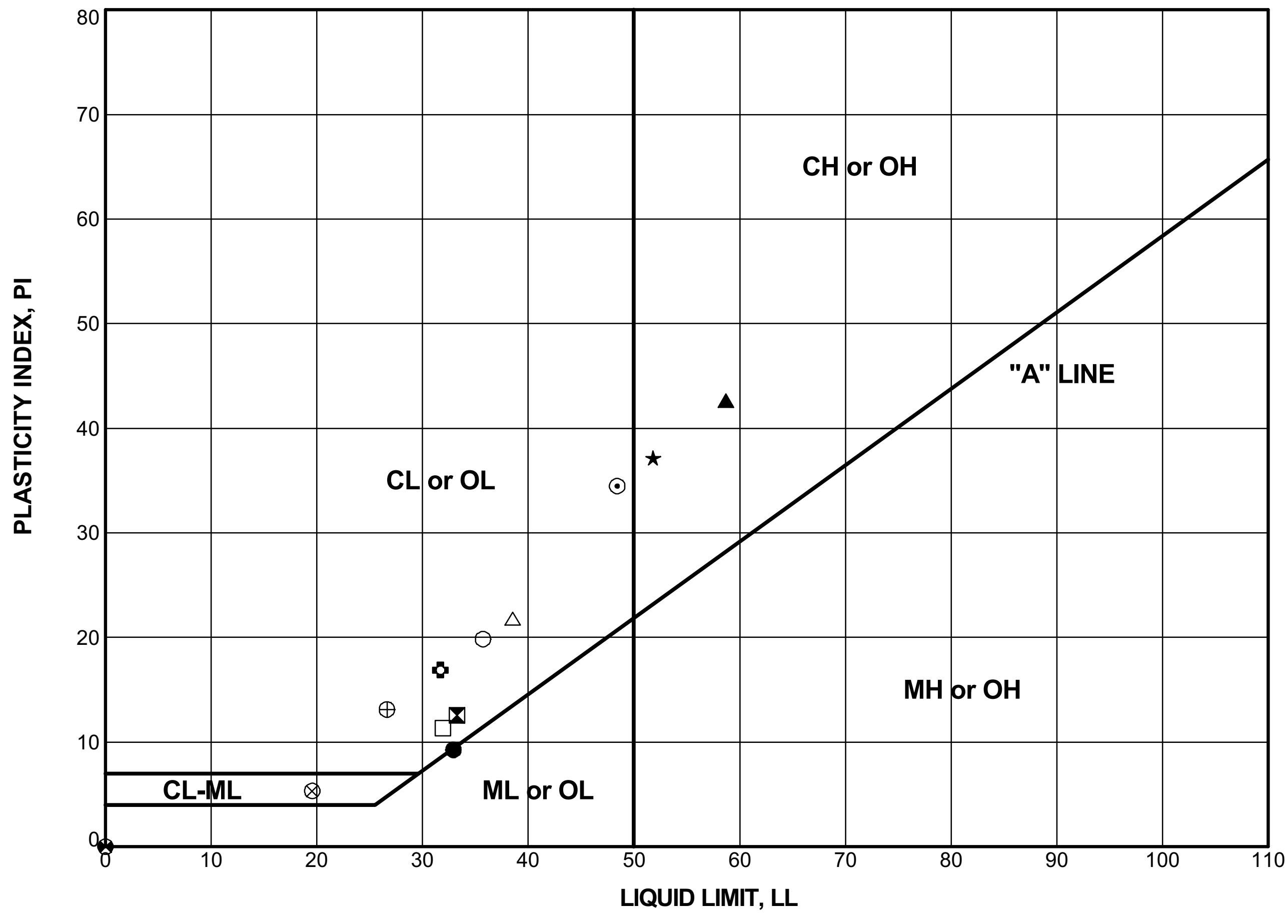
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_069B	14A	40	●	28.5	24	23	1	SANDY SILT (ML)
WR0017_069B	25A	67.5	⊠	31.4	40	16	24	LEAN CLAY (CL)
WR0017_069B	31A	80	▲	25.9	42	14	28	LEAN CLAY with Sand (CL)
WR0017_069B	33A	85	★	25.9	29	22	7	SILTY CLAYEY SAND (SC-SM)
WR0017_069B	37A	96.5	⊙	37.9	43	20	23	LEAN CLAY with Sand (CL)
WR0017_074B	3A	7.5	✪	18.5	27	25	2	SANDY SILT (ML)
WR0017_074B	5A	12.5	○	32.3	43	23	20	LEAN CLAY with Sand (CL)
WR0017_074B	25A	65.3	△	28.1	39	14	25	LEAN CLAY with Sand (CL)
WR0017_074B	28A	74	⊗	26.8	49	15	34	LEAN CLAY with Sand (CL)
WR0017_074B	30A	77.5	⊕	26.3	41	13	28	LEAN CLAY (CL)
WR0017_074B	33A	82	□	25.5	32	13	19	SANDY LEAN CLAY (CL)
WR0017_074B	35A	90	⊗	30.2	60	17	43	FAT CLAY (CH)

DWR ATTERBERG PLOT DWR052708.GPJ DWR_LEVEES_111507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_074B	38A	98	●	30.1	33	24	9	SANDY SILT (ML)
WR0017_080B	6A	15	⧗	27.7	33	21	12	LEAN CLAY (CL)
WR0017_080B	25A	65	▲	30.4	59	16	43	FAT CLAY (CH)
WR0017_080B	28A	73	★	29.1	52	15	37	FAT CLAY (CH)
WR0017_080B	32A	80	⊙	25.2	48	14	34	LEAN CLAY (CL)
WR0017_080B	36A	88	✿	28.1	32	15	17	SANDY LEAN CLAY (CL)
WR0017_080B	37A	90	○	21.6	36	16	20	SANDY LEAN CLAY (CL)
WR0017_080B	39A	95	△	31.5	39	17	22	SANDY LEAN CLAY (CL)
WR0017_080B	41A	100	⊗	18.8	20	14	6	SILTY CLAYEY SAND (SC-SM)
WR0017_085B	2A	6	⊕	14.7	27	13	14	LEAN CLAY (CL)
WR0017_085B	5A	16	□	21.1	32	21	11	SANDY LEAN CLAY (CL)
WR0017_085B	7B	20.5	⊗	21.1	NP	NP	NP	SILTY SAND (SM)

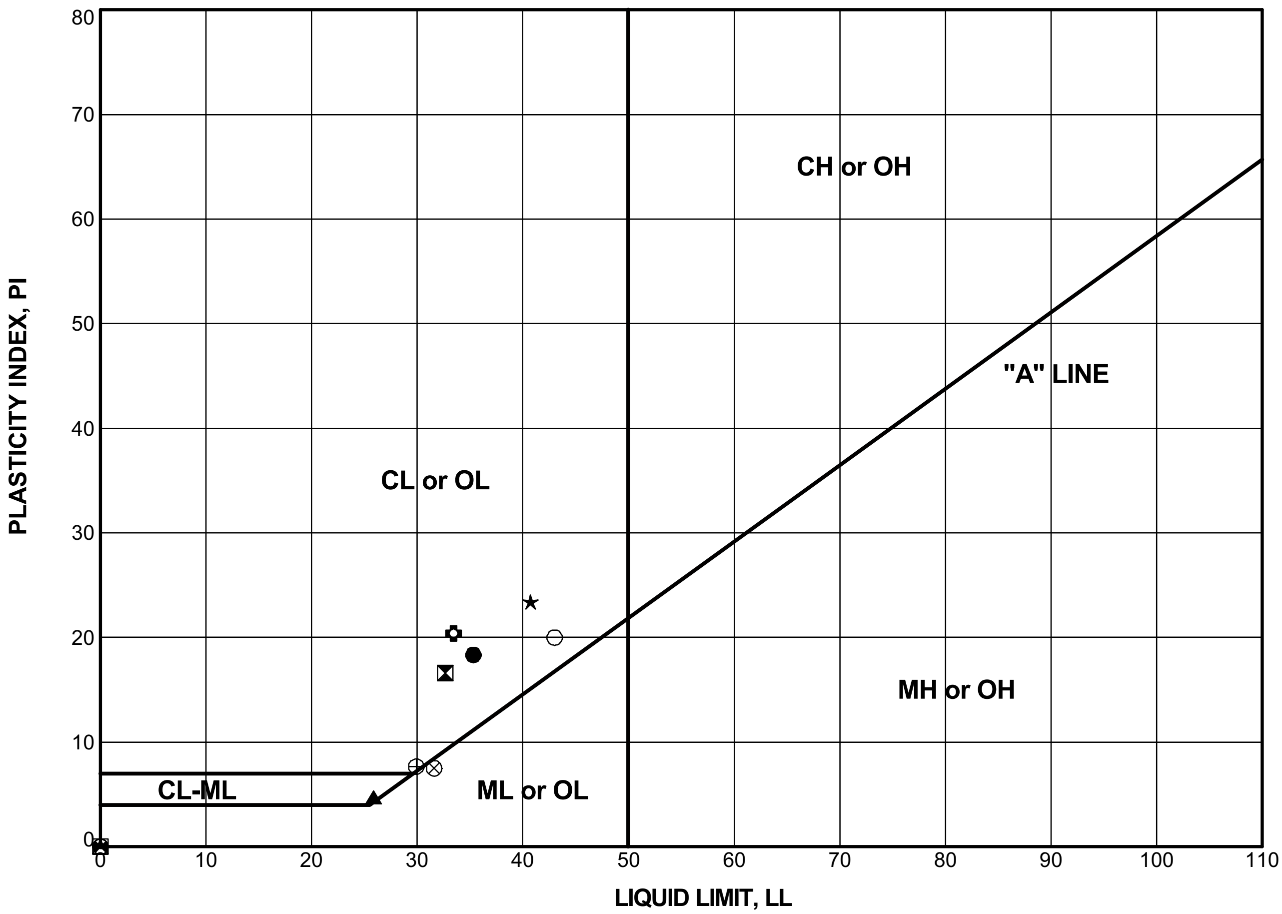
DWR ATTERBERG PLOT DWR052708.GPJ DWR_LEVEES_111507.GDT 6/9/08

DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_085B	32A	77	●	24.5	35	17	18	LEAN CLAY (CL)
WR0017_085B	34A	82	⧗	29.8	33	16	17	LEAN CLAY with Sand (CL)
WR0017_085B	40A	100	▲	32.9	26	21	5	SILTY CLAY (CL-ML)
WR0017_085B	42A	105	★	28.3	41	17	24	LEAN CLAY (CL)
WR0017_090B	2A	6	⊙	7.0	NP	NP	NP	SILTY SAND (SM)
WR0017_090B	5A	12.5	✿	16.5	33	13	20	LEAN CLAY (CL)
WR0017_090B	7A	20	○		43	23	20	LEAN CLAY (CL)
WR0017_090B	9A	25	△	22.5	NP	NP	NP	SILT with Sand (ML)
WR0017_090B	10A	26.5	⊗	32.7	32	24	8	SILT with Sand (ML)
WR0017_090B	26A	67	⊕	32.5	30	22	8	LEAN CLAY (CL)
WR0017_090B	29A	75	□	23.6	NP	NP	NP	SILT with Sand (ML)
WR0017_090B	30A	77.5	⊗	24.2	NP	NP	NP	SILTY SAND (SM)

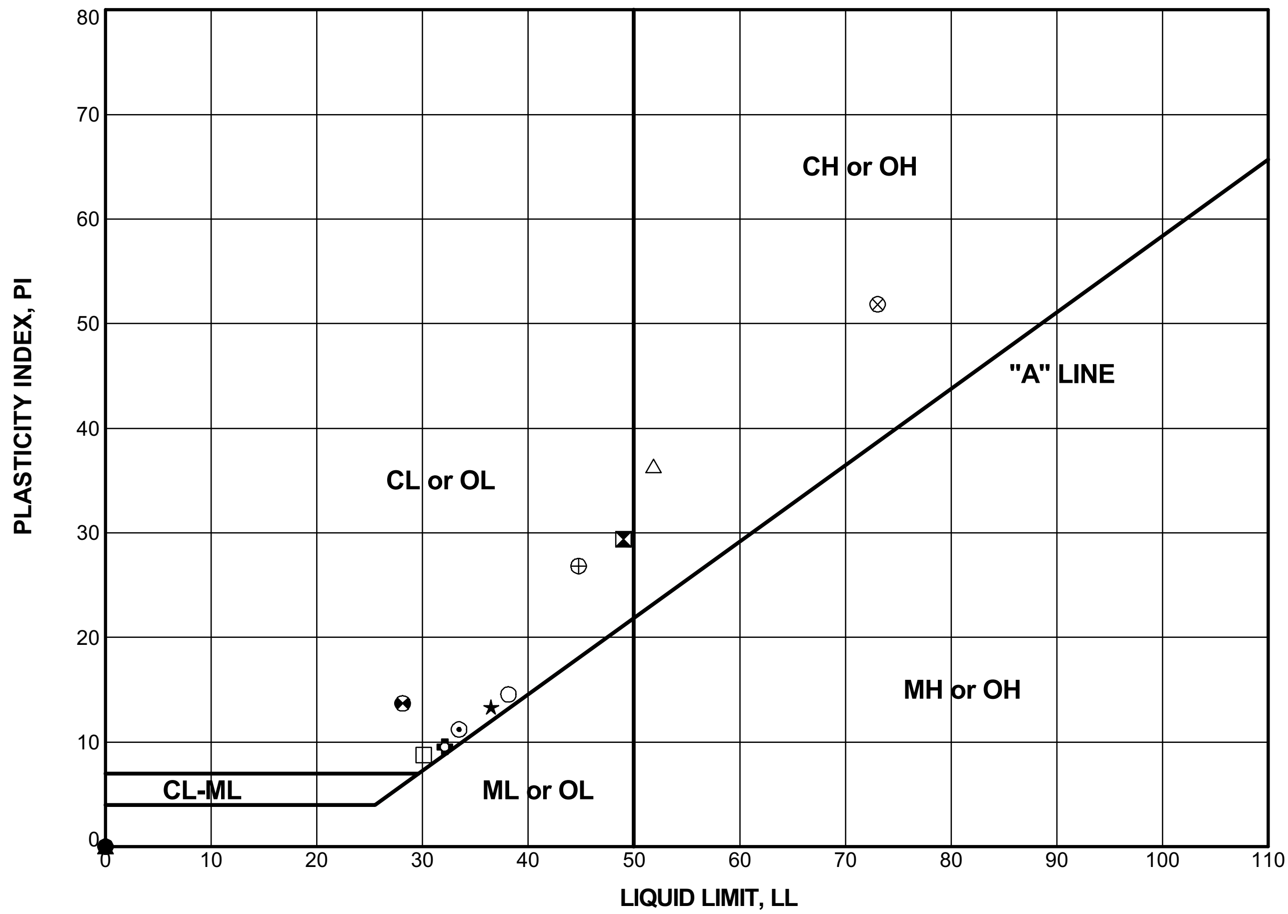
DWR ATTERBERG PLOT DWR052708.GPJ DWR_LEVEES_111507.GDT 6/9/08

DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PLASTICITY CHART



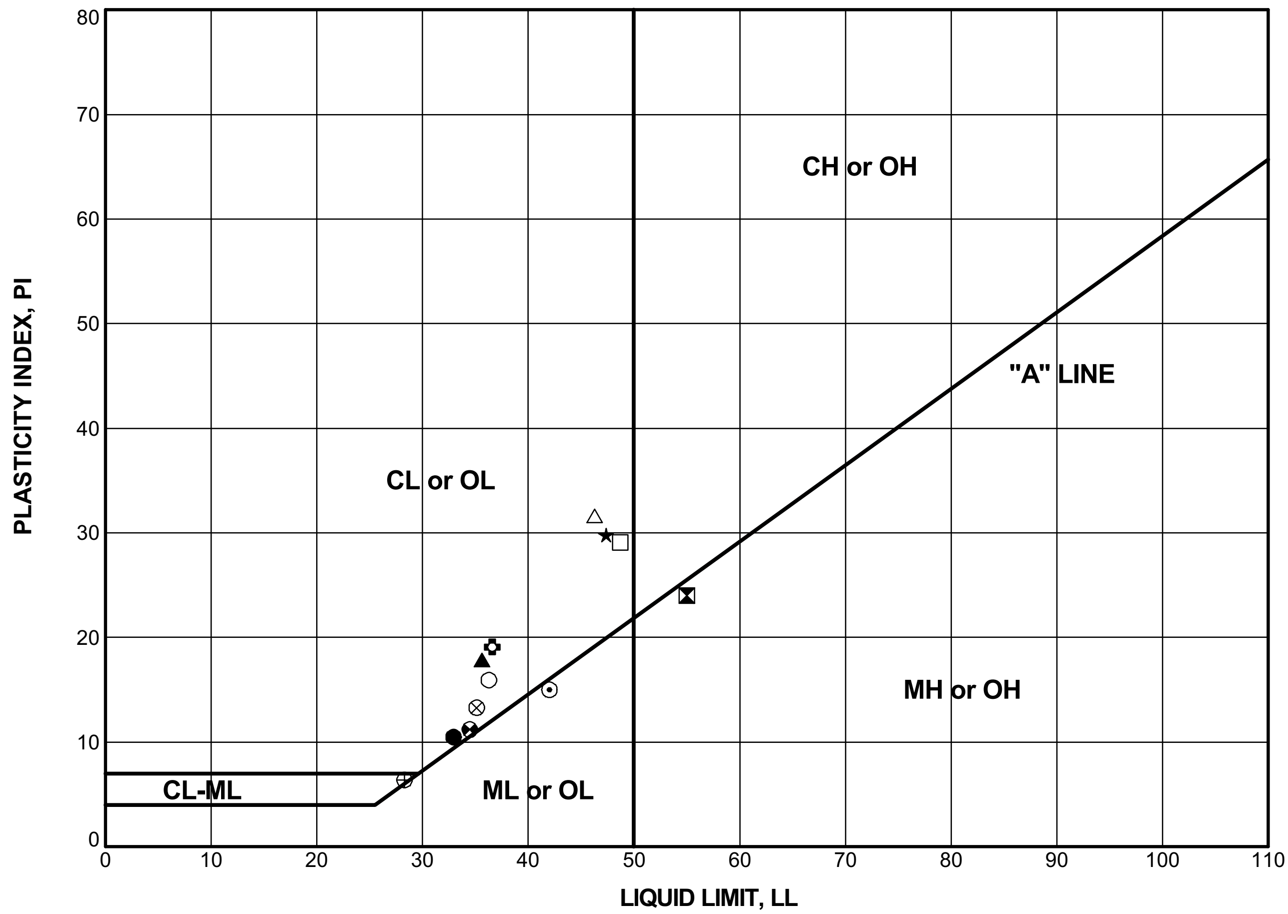
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_090B	37A	92.5	●	23.1	NP	NP	NP	SILTY SAND (SM)
WR0017_090B	42A	105	⧗	32.1	49	20	29	LEAN CLAY (CL)
WR0017_090B	47A	116.5	▲	25.6	NP	NP	NP	SILT with Sand (ML)
WR0017_090B	48A	120	★	28.4	36	23	13	LEAN CLAY (CL)
WR0017_096B	5A	20	⊙	32.0	33	22	11	SANDY LEAN CLAY (CL)
WR0017_096B	6A	22.5	✪	30.8	32	23	9	SANDY LEAN CLAY (CL)
WR0017_096B	7A	25.5	○		38	24	14	SANDY LEAN CLAY (CL)
WR0017_096B	23A	67	△	33.2	52	15	37	FAT CLAY (CH)
WR0017_096B	34A	92.5	⊗	43.9	73	21	52	FAT CLAY (CH)
WR0017_096B	36A	98	⊕	32.1	45	18	27	LEAN CLAY (CL)
WR0017_096B	38A	102	□	26.5	30	21	9	LEAN CLAY (CL)
WR0017_102B	2A	1.5	❂	10.6	28	14	14	CLAYEY SAND (SC)

DWR ATTERBERG PLOT DWR052708.GPJ DWR_LEVEES_111507.GDT 6/9/08

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_102B	4A	11	●	20.9	33	22	11	SANDY LEAN CLAY (CL)
WR0017_102B	5A	15	⧗		55	31	24	ELASTIC SILT (MH)
WR0017_102B	6A	18.5	▲	25.9	36	18	18	SANDY LEAN CLAY (CL)
WR0017_102B	7A	20	★	24.6	47	18	29	SANDY LEAN CLAY (CL)
WR0017_102B	10A	30	⊙	32.2	42	27	15	SILT (ML)
WR0017_102B	11A	33	✿		37	17	20	LEAN CLAY (CL)
WR0017_102B	13A	35	○	34.6	36	20	16	LEAN CLAY (CL)
WR0017_102B	31A	82.5	△	27.4	46	15	31	LEAN CLAY with Sand (CL)
WR0017_102B	42A	106.5	⊗	30.5	35	22	13	LEAN CLAY with Sand (CL)
WR0017_102B	45A	115.5	⊕	24.5	28	22	6	SILTY CLAY with Sand (CL-ML)
WR0017_102B	46A	118.2	□	32.1	49	20	29	LEAN CLAY (CL)
WR0017_102B	50A	127	⊛	32.7	34	23	11	LEAN CLAY with Sand (CL)

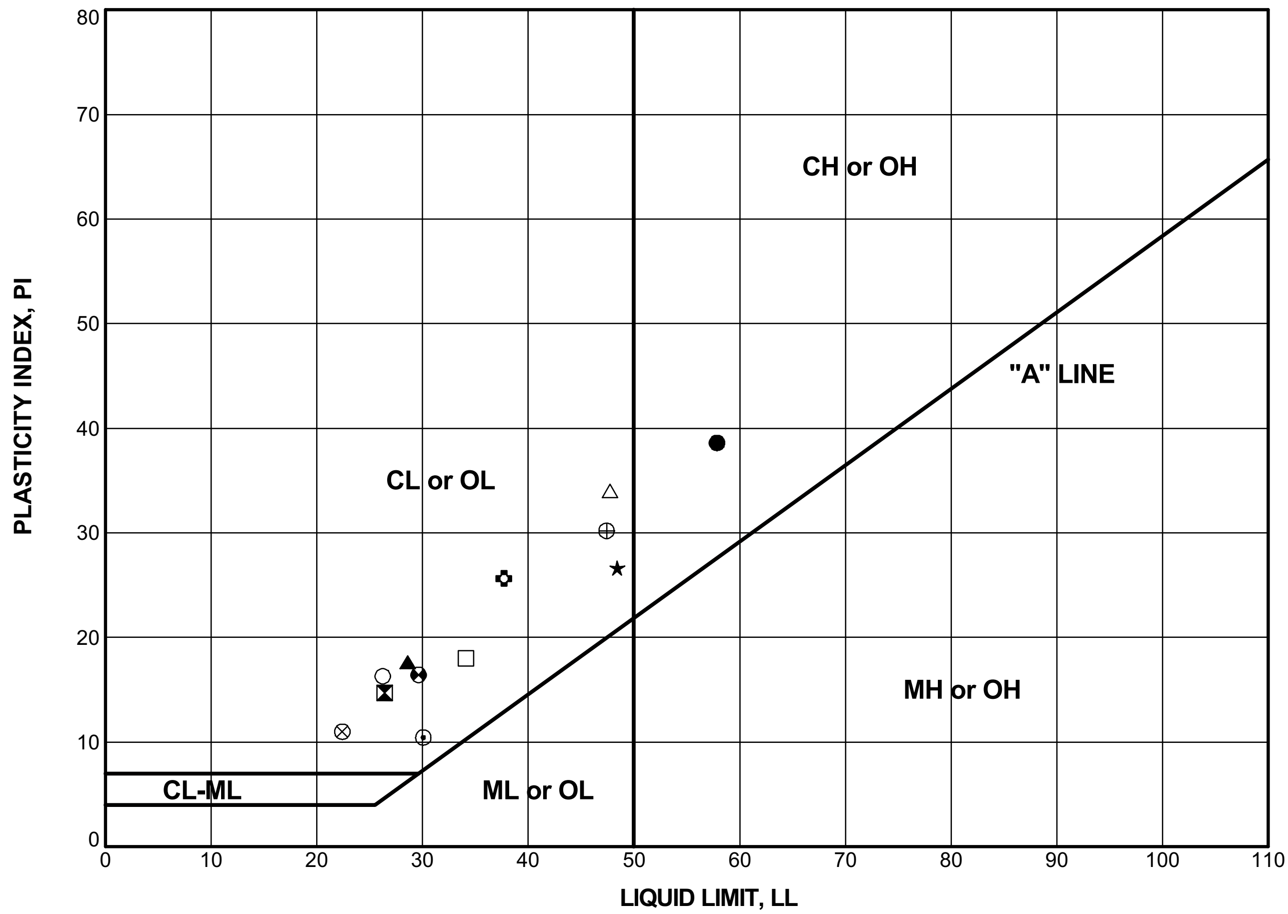
DWR ATTERBERG PLOT DWR052708.GPJ DWR_LEVEES_111507.GDT 6/9/08

DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA

Engineering Support Services
Urban Levee Geotechnical Evaluations

RD 17

PLASTICITY CHART

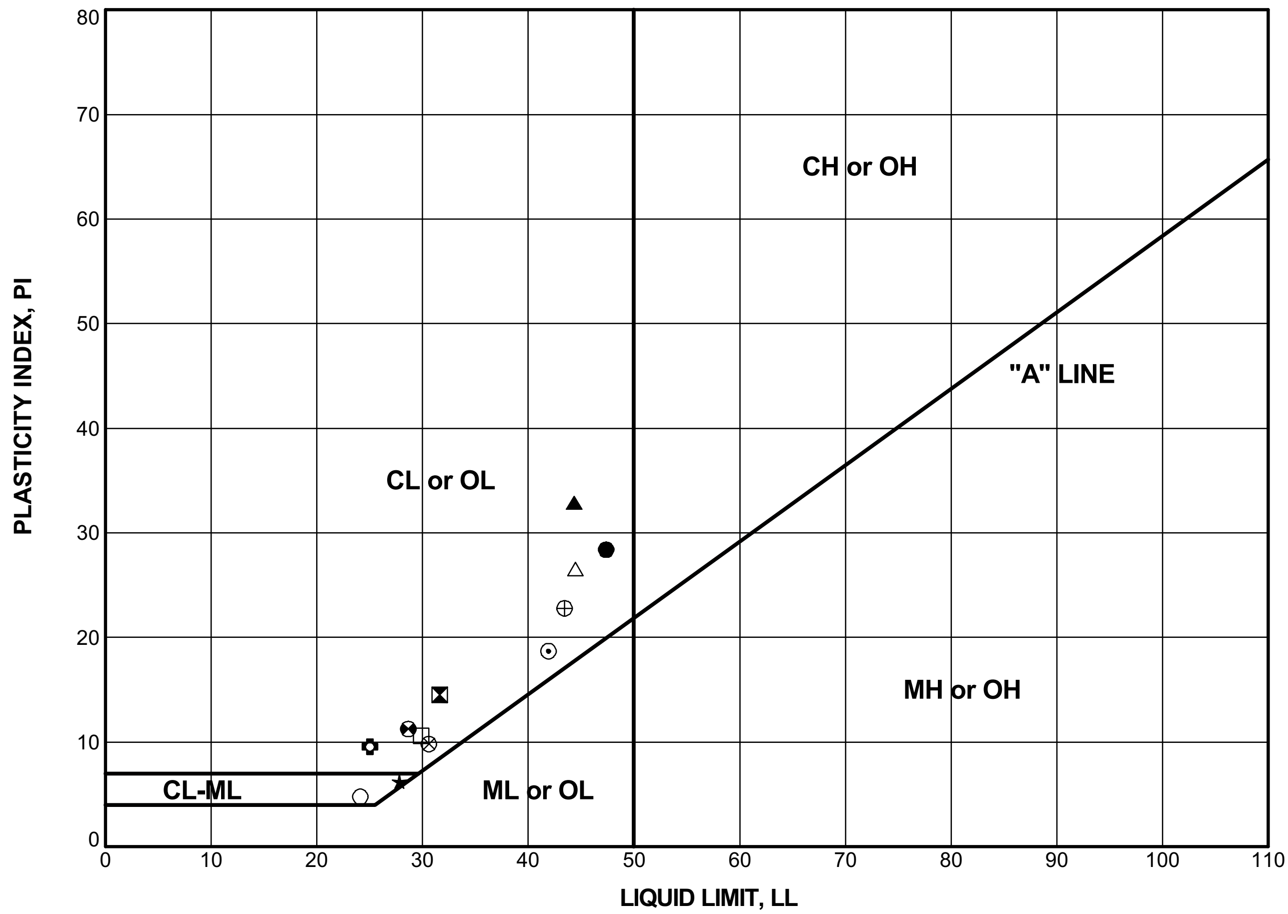


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_124B	1A	0.5	●	25.6	58	19	39	FAT CLAY (CH)
WR0017_124B	2A	2.5	⧗	17.7	26	12	14	CLAYEY SAND (SC)
WR0017_124B	3A	3.5	▲	22.5	29	11	18	CLAYEY SAND (SC)
WR0017_124B	5A	7	★	42.4	48	22	26	LEAN CLAY (CL)
WR0017_124B	9A	18	⊙	29.9	30	20	10	LEAN CLAY (CL)
WR0017_124B	10A	20	✪		38	12	26	LEAN CLAY (CL)
WR0017_124B	16A	35	○	21.8	26	10	16	SANDY LEAN CLAY (CL)
WR0017_124B	24A	55	△	27.1	48	14	34	LEAN CLAY (CL)
WR0017_124B	26A	60	⊗		22	11	11	CLAYEY SAND (SC)
WR0017_125B	1A	0.5	⊕		47	17	30	LEAN CLAY with SAND (CL)
WR0017_125B	2A	2	□	19.6	34	16	18	SANDY LEAN CLAY (CL)
WR0017_125B	5A	8.3	⊗	27.3	30	13	17	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

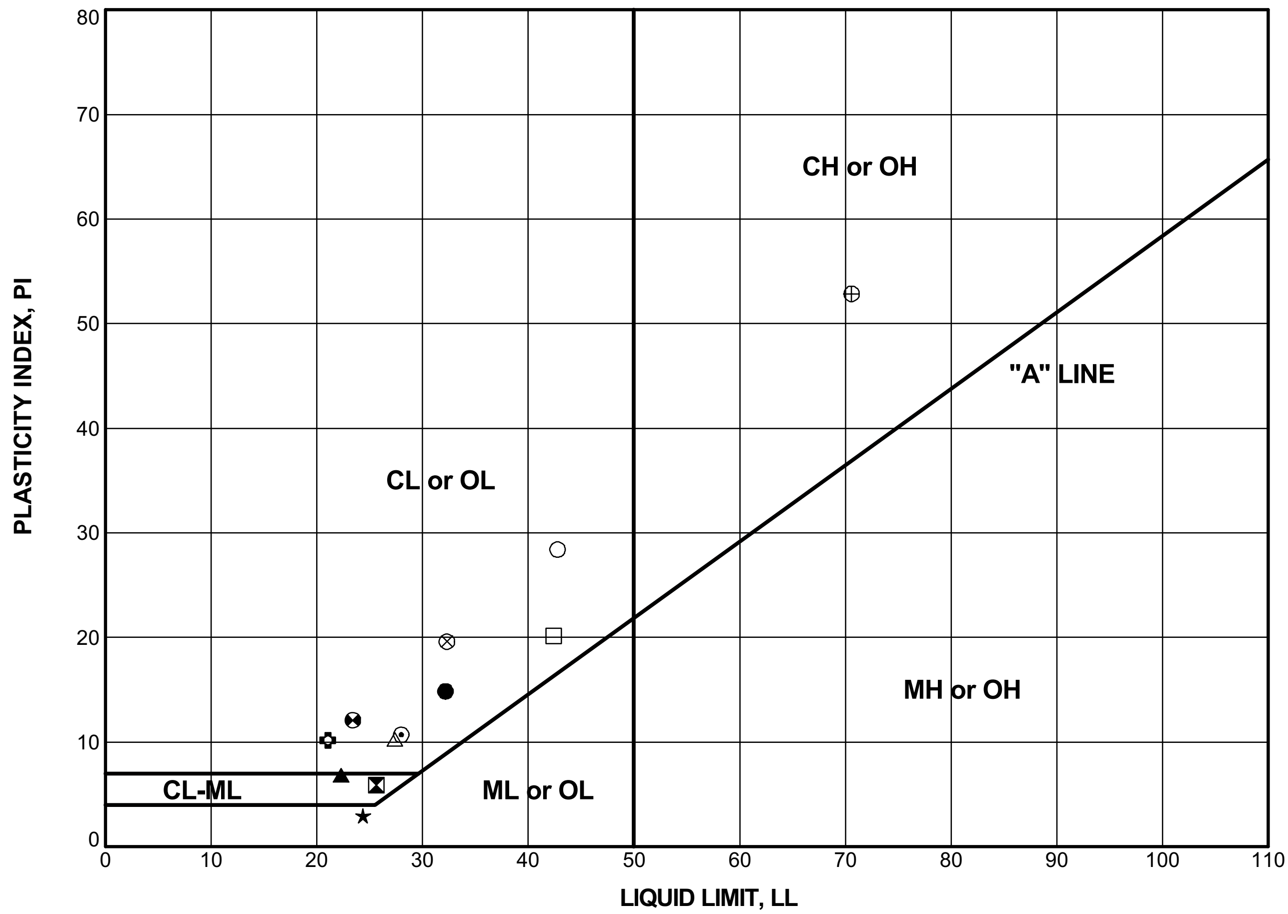


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_125B	7B	11.51	●	29.3	47	19	28	LEAN CLAY (CL)
WR0017_125B	17A	38	⧗	29.4	32	17	15	LEAN CLAY (CL)
WR0017_125B	23A	52.5	▲	22.5	44	11	33	LEAN CLAY (CL)
WR0017_126B	1A	1	★	6.8	28	22	6	SANDY SILTY CLAY (CL-ML)
WR0017_126B	3A	3.6	⊙	19.3	42	23	19	LEAN CLAY (CL)
WR0017_126B	6A	8	✪	27.2	25	15	10	SANDY LEAN CLAY (CL)
WR0017_126B	7A	10	○	30.7	24	19	5	SILTY CLAY with SAND (CL-ML)
WR0017_126B	9B	15	△	31.5	44	18	26	LEAN CLAY (CL)
WR0017_126B	10A	16.51	⊗	31.7	31	21	10	LEAN CLAY (CL)
WR0017_126B	13A	25	⊕	35.7	43	21	22	LEAN CLAY (CL)
WR0017_126B	18A	40.8	□	25.3	30	19	11	CLAYEY SAND (SC)
WR0017_126B	19A	42.6	⊛	21.7	29	17	12	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_127B	1B	0.5	●	11.2	32	17	15	LEAN CLAY with SAND (CL)
WR0017_127B	2A	1.5	⧗	8.0	26	20	6	SANDY SILTY CLAY (CL-ML)
WR0017_127B	5A	8	▲	24.3	22	15	7	SILTY, CLAYEY SAND (SC-SM)
WR0017_127B	6A	10	★	28.5	24	21	3	SANDY SILT (ML)
WR0017_127B	7A	12.5	⊙	29.7	28	17	11	LEAN CLAY (CL)
WR0017_127B	10A	20	✪	21.5	21	11	10	CLAYEY SAND (SC)
WR0017_127B	14A	30	○	25.3	43	14	29	LEAN CLAY (CL)
WR0017_127B	16B	36.51	△	26.6	27	17	10	SANDY LEAN CLAY (CL)
WR0017_127B	21A	52.5	⊗	20.3	32	13	19	LEAN CLAY with SAND (CL)
WR0017_127B	23A	57.3	⊕	37.0	71	18	53	FAT CLAY (CH)
WR0017_128B	1B	0.1	□	10.0	42	22	20	LEAN CLAY (CL)
WR0017_128B	13B	30	⊗	17.6	23	11	12	CLAYEY SAND (SC)

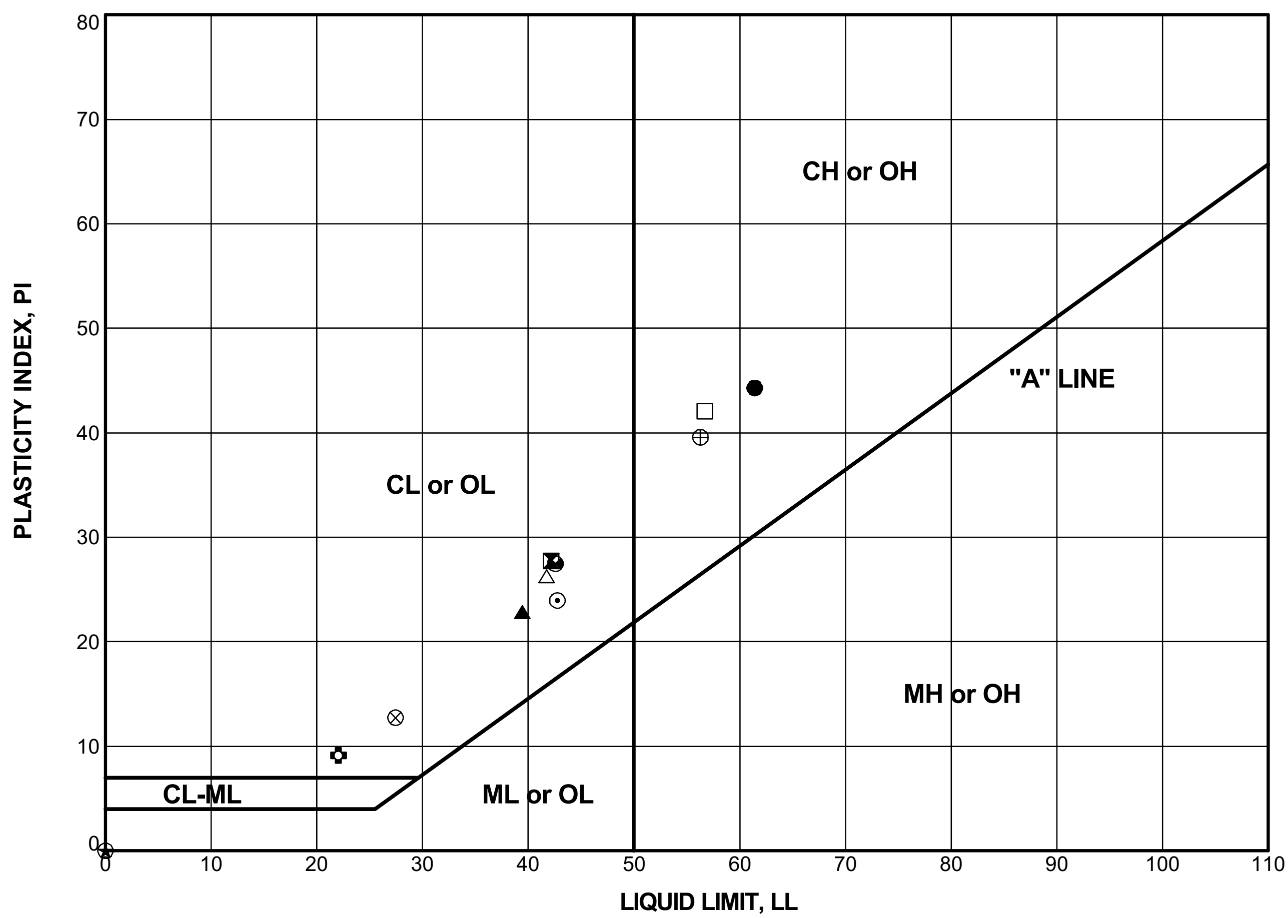
DWR LEVEE U/N/U ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



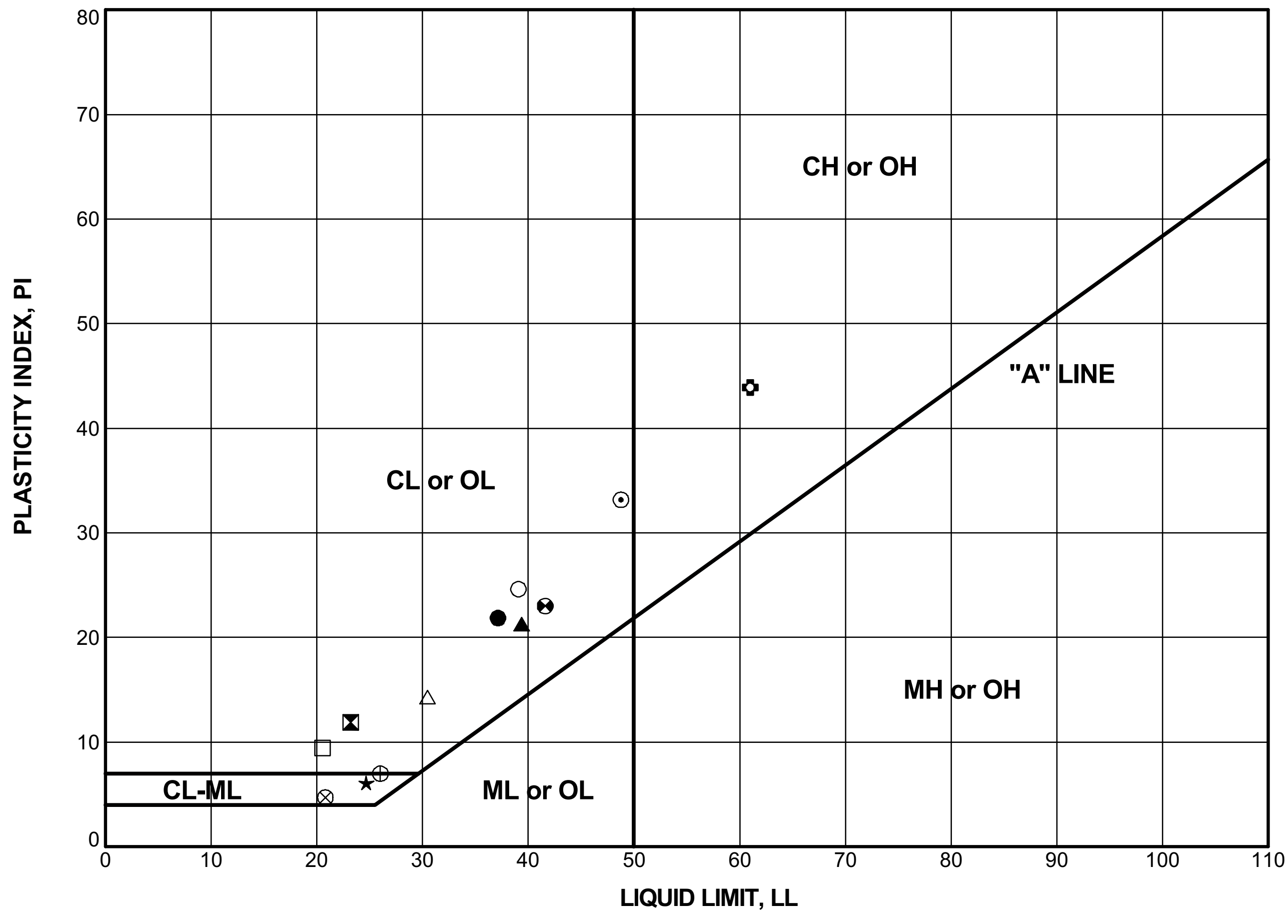
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_128B	16A	37	●	30.0	61	17	44	FAT CLAY (CH)
WR0017_128B	18A	42.5	⧗	25.7	42	14	28	LEAN CLAY (CL)
WR0017_128B	19A	45	▲	31.3	39	17	22	LEAN CLAY (CL)
WR0017_128B	22A	52	★	24.6	NP	NP	NP	SILTY SAND (SM)
WR0017_131B	1A	0.9	⊙	17.5	43	19	24	LEAN CLAY (CL)
WR0017_131B	3B	5.2	✿	15.7	22	13	9	LEAN CLAY (CL)
WR0017_131B	5A	8	○	21.5	NP	NP	NP	SILTY SAND (SM)
WR0017_131B	7A	13	△	23.0	42	15	27	LEAN CLAY (CL)
WR0017_131B	15A	31.51	⊗	19.2	27	15	12	LEAN CLAY with SAND (CL)
WR0017_131B	18A	40	⊕	32.1	56	17	39	FAT CLAY (CH)
WR0017_131B	21A	50	□	35.4	57	15	42	FAT CLAY (CH)
WR0017_131B	25A	60.8	⊛	28.7	43	15	28	LEAN CLAY with Sand (CL)

DWR LEVEE U/N/U ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

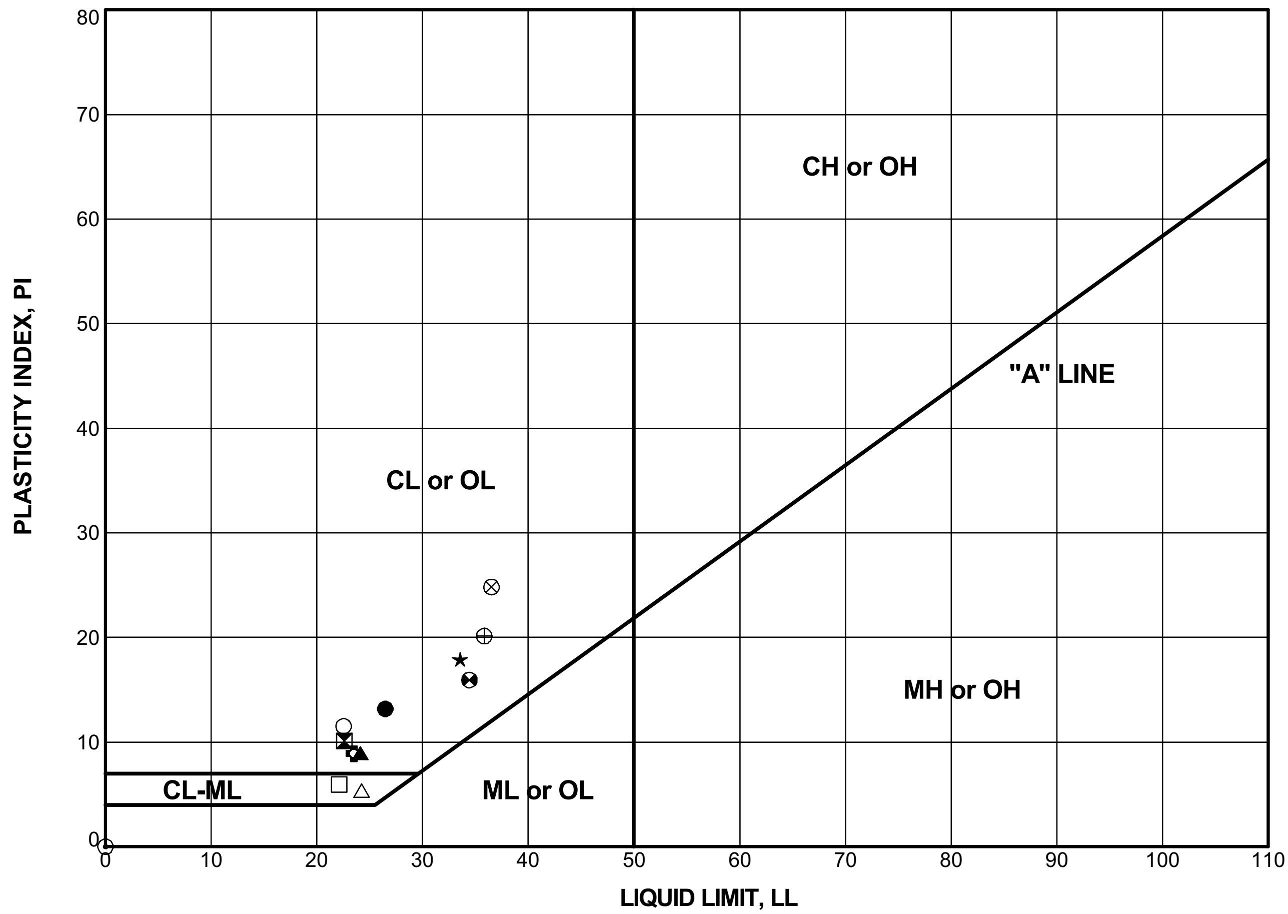


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_132B	1A	1	●	14.9	37	15	22	LEAN CLAY with SAND (CL)
WR0017_132B	9A	25	⊠	20.7	23	11	12	CLAYEY SAND (SC)
WR0017_132B	10A	28	▲	26.6	39	18	21	LEAN CLAY (CL)
WR0017_132B	12A	33.5	★	24.3	25	19	6	SILTY, CLAYEY SAND (SC-SM)
WR0017_132B	16A	41.51	⊙	28.2	49	16	33	LEAN CLAY (CL)
WR0017_132B	19A	50	✪	29.5	61	17	44	FAT CLAY (CH)
WR0017_132B	21A	55	○	32.4	39	14	25	LEAN CLAY (CL)
WR0017_133B	1A	0	△	6.7	30	16	14	SANDY LEAN CLAY (CL)
WR0017_133B	4A	6.5	⊗	12.7	21	16	5	SILTY, CLAYEY SAND (SC-SM)
WR0017_133B	9A	17	⊕	33.5	26	19	7	SILTY CLAY with SAND (CL-ML)
WR0017_133B	13A	27	□	17.4	21	11	10	CLAYEY SAND (SC)
WR0017_133B	14A	30.5	⊗	30.9	42	19	23	LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



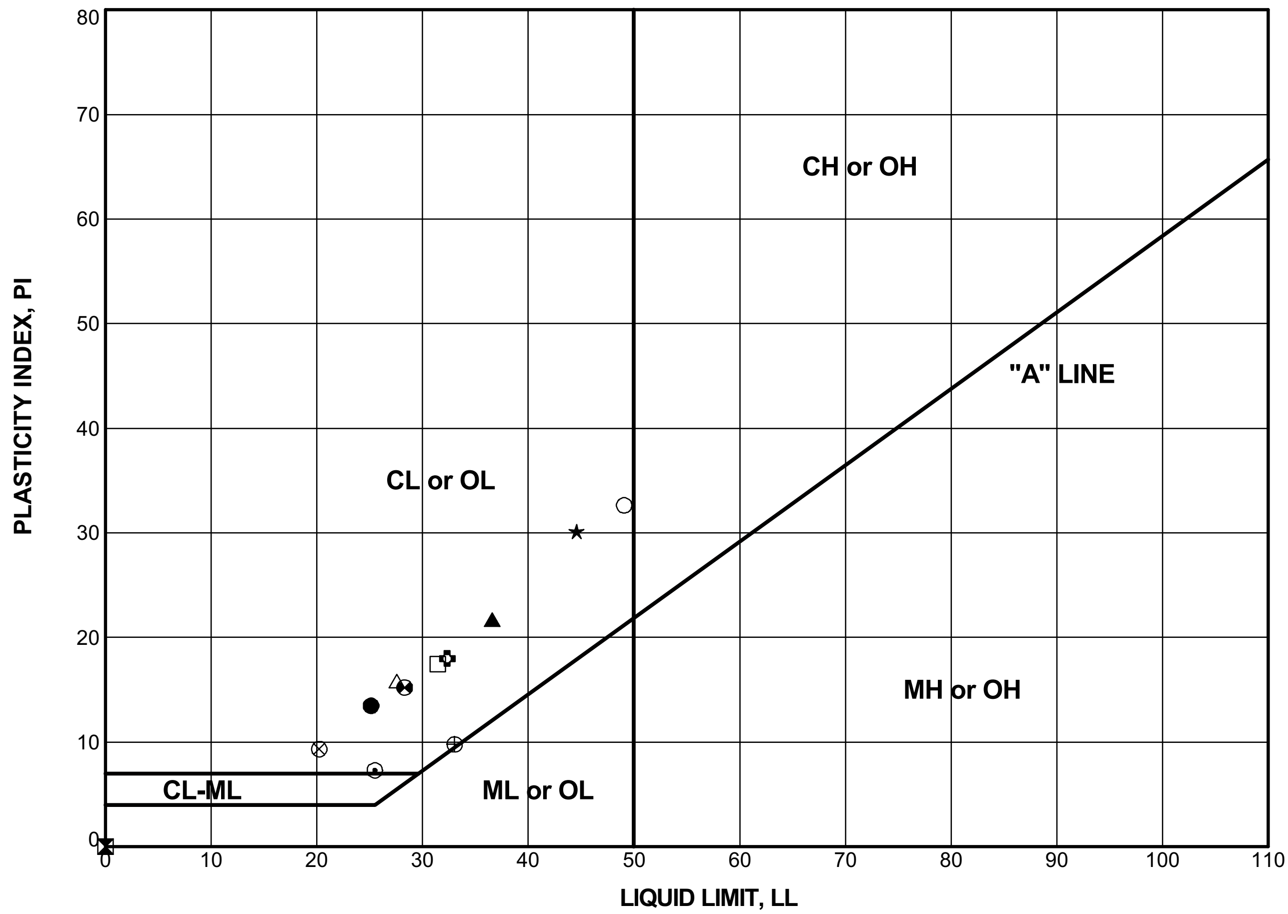
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_134B	1B	0.5	●	9.3	26	13	13	LEAN CLAY (CL)
WR0017_134B	3A	3.5	⊠	13.9	23	13	10	SANDY LEAN CLAY (CL)
WR0017_134B	5A	7	▲	19.4	24	15	9	SANDY LEAN CLAY (CL)
WR0017_134B	7B	11.51	★	26.4	34	16	18	LEAN CLAY (CL)
WR0017_134B	8A	15	⊙	30.4	NP	NP	NP	SILTY SAND (SM)
WR0017_134B	9A	20	✪	24.5	23	15	8	SANDY LEAN CLAY (CL)
WR0017_134B	11A	25	○	16.9	23	11	12	CLAYEY SAND (SC)
WR0017_134B	14A	33.9	△	27.1	24	19	5	SANDY SILTY CLAY (CL-ML)
WR0017_134B	20A	50	⊗	24.3	37	12	25	LEAN CLAY (CL)
WR0017_135B	1A	0	⊕	12.7	36	16	20	LEAN CLAY (CL)
WR0017_135B	5A	8	□	22.5	22	16	6	SANDY SILTY CLAY (CL-ML)
WR0017_135B	6A	10	⊛	33.3	34	18	16	LEAN CLAY (CL)

DWR LEVEE U/NU ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



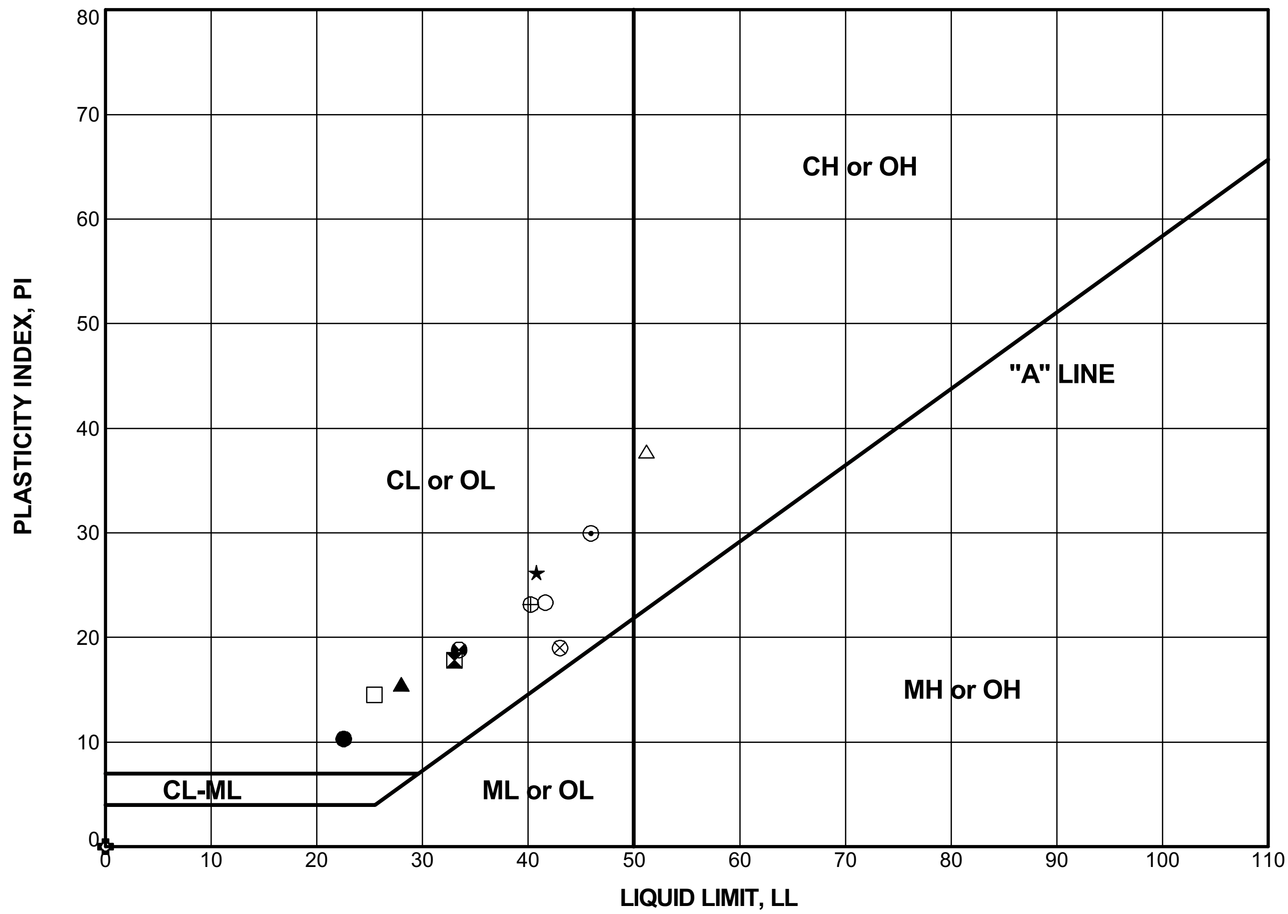
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_135B	11B	25.5	●	16.3	25	12	13	CLAYEY SAND (SC)
WR0017_135B	12A	28.6	⊠	16.1	NP	NP	NP	SILTY SAND (SM)
WR0017_135B	17A	40	▲	29.3	37	15	22	LEAN CLAY with SAND (CL)
WR0017_135B	19A	45	★	32.8	45	14	31	LEAN CLAY (CL)
WR0017_135B	23A	55.9	⊙	25.9	25	18	7	SILTY, CLAYEY SAND (SC-SM)
WR0017_136B	1B	0.3	✿	10.2	32	14	18	SANDY LEAN CLAY (CL)
WR0017_136B	3A	3	○	37.0	49	16	33	SANDY LEAN CLAY (CL)
WR0017_136B	4A	5	△	21.3	28	12	16	SANDY LEAN CLAY (CL)
WR0017_136B	5A	9.5	⊗	23.1	20	11	9	SANDY LEAN CLAY (CL)
WR0017_136B	7B	11.51	⊕	31.5	33	23	10	LEAN CLAY (CL)
WR0017_136B	7A	13.7	□	28.6	31	14	17	LEAN CLAY with SAND (CL)
WR0017_136B	8B	15.01	⊗	21.7	28	13	15	SANDY LEAN CLAY (CL)

DWR LEVEE U/N/U ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

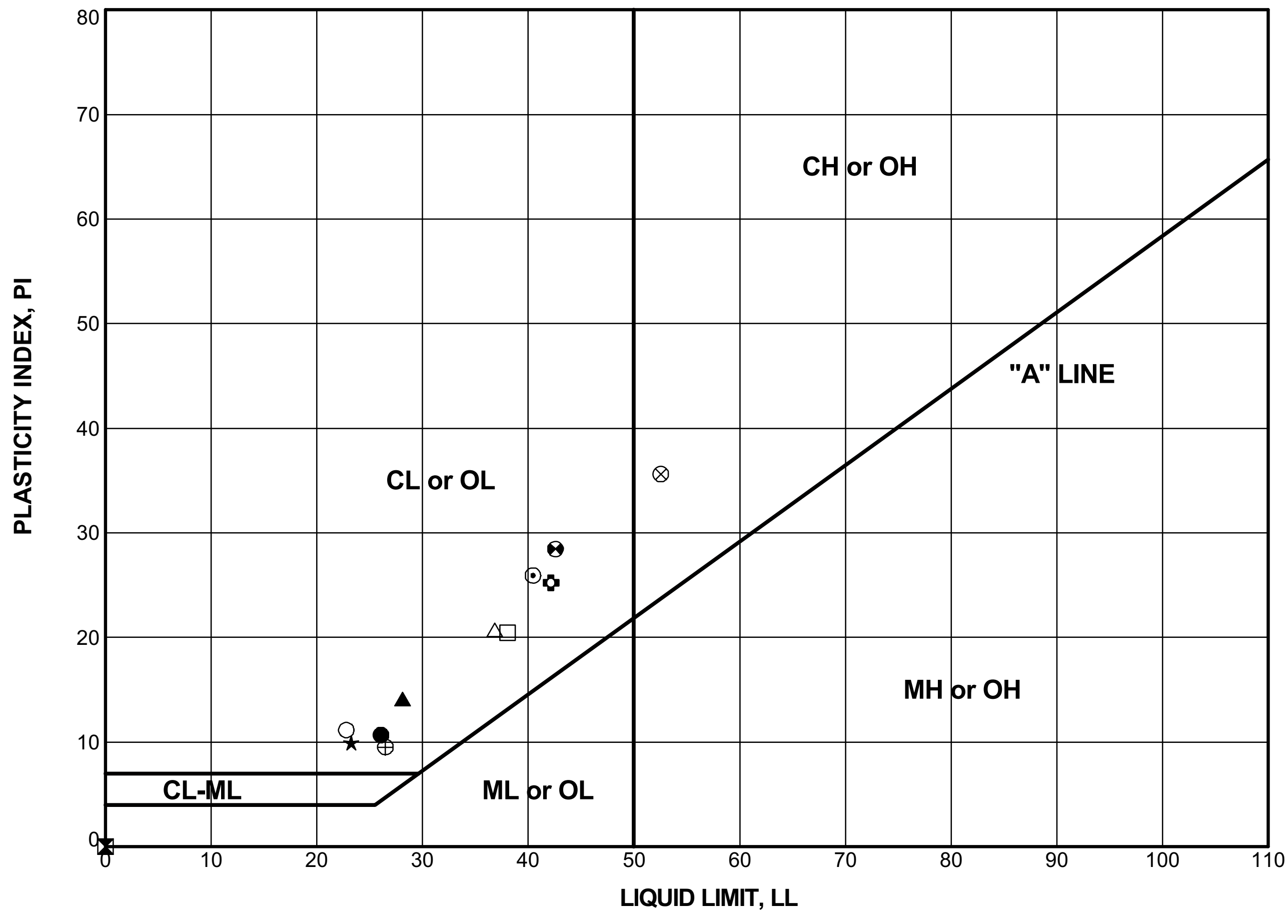


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_136B	12A	25	●	15.6	23	12	11	SANDY LEAN CLAY (CL)
WR0017_136B	13A	28.5	⧗	26.4	33	15	18	LEAN CLAY with Sand (CL)
WR0017_136B	18B	40.01	▲	26.4	28	12	16	LEAN CLAY with Sand (CL)
WR0017_136B	18A	40.8	★	27.4	41	15	26	LEAN CLAY (CL)
WR0017_136B	20A	45	⊙	28.8	46	16	30	LEAN CLAY (CL)
WR0017_136B	22A	51.51	✿	21.3	NP	NP	NP	SILTY SAND (SM)
WR0017_136B	24C	56.51	○	31.5	42	18	24	LEAN CLAY (CL)
WR0017_136B	25A	60	△	24.5	51	13	38	FAT CLAY (CH)
WR0017_137B	3A	3	⊗		43	24	19	LEAN CLAY with SAND (CL)
WR0017_137B	4A	5.7	⊕	31.0	40	17	23	LEAN CLAY with Sand (CL)
WR0017_137B	6A	8	□	19.5	25	11	14	CLAYEY SAND (SC)
WR0017_137B	7A	10.8	◍	27.3	33	15	18	LEAN CLAY with SAND (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



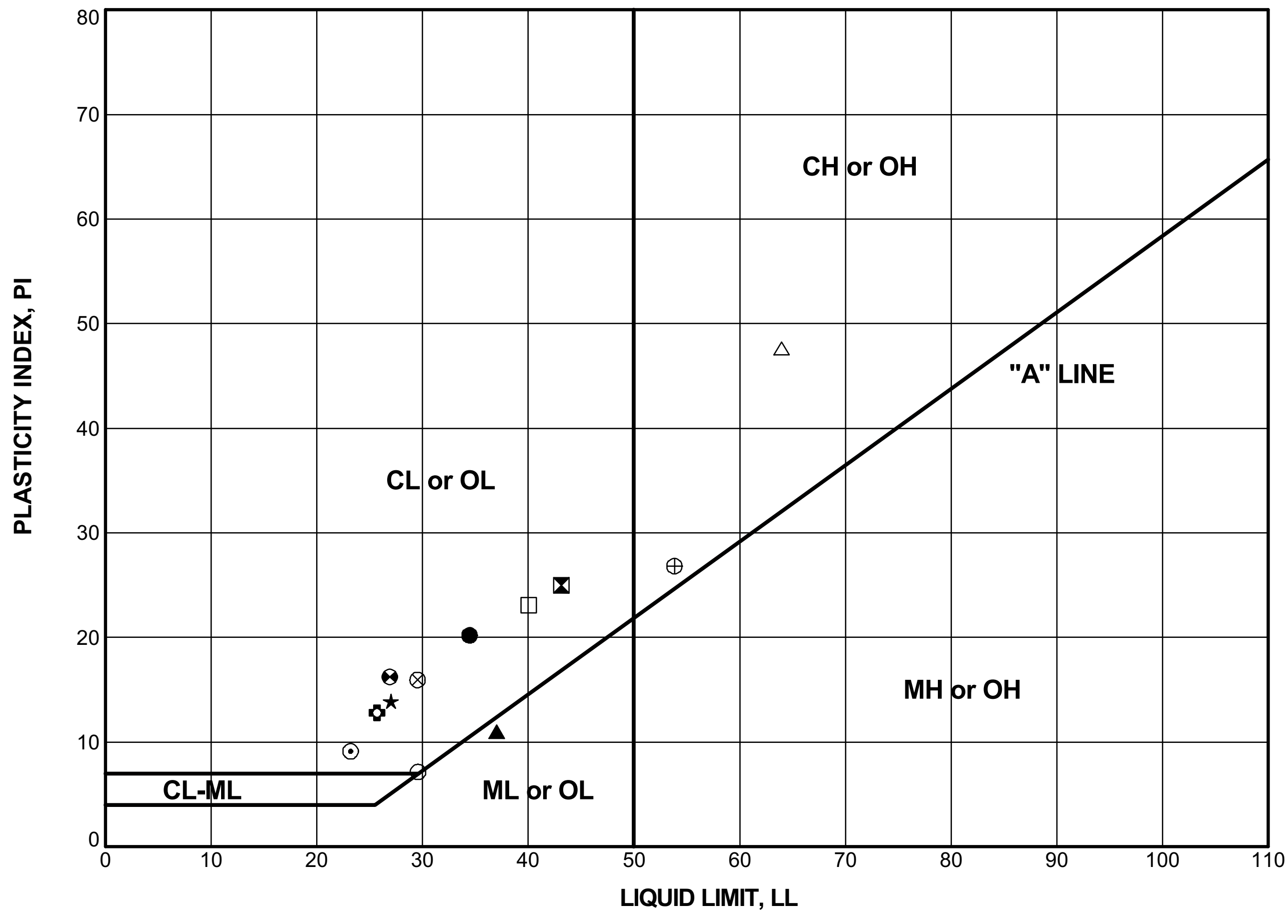
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_137B	9A	15	●	22.3	26	15	11	SANDY LEAN CLAY (CL)
WR0017_137B	10A	18.5	⊠	23.5	NP	NP	NP	SILTY SAND (SM)
WR0017_137B	13A	25	▲	21.3	28	14	14	LEAN CLAY (CL)
WR0017_137B	15A	30	★	18.8	23	13	10	SANDY LEAN CLAY (CL)
WR0017_137B	16B	31.51	⊙	27.2	40	15	25	LEAN CLAY with SAND (CL)
WR0017_137B	20A	45	✪	28.9	42	17	25	LEAN CLAY (CL)
WR0017_137B	21A	46.51	○	19.0	23	12	11	SANDY LEAN CLAY (CL)
WR0017_137B	22A	50	△	24.4	37	16	21	SANDY LEAN CLAY (CL)
WR0017_138B	17A	50.5	⊗	27.7	53	17	36	FAT CLAY (CH)
WR0017_138B	20A	58	⊕	26.9	26	17	9	CLAYEY SAND (SC)
WR0017_139B	2A	2	□	28.9	38	18	20	LEAN CLAY with SAND (CL)
WR0017_139B	19A	45	⊛	26.0	43	14	29	LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

DWR LEVEE U/NU ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10



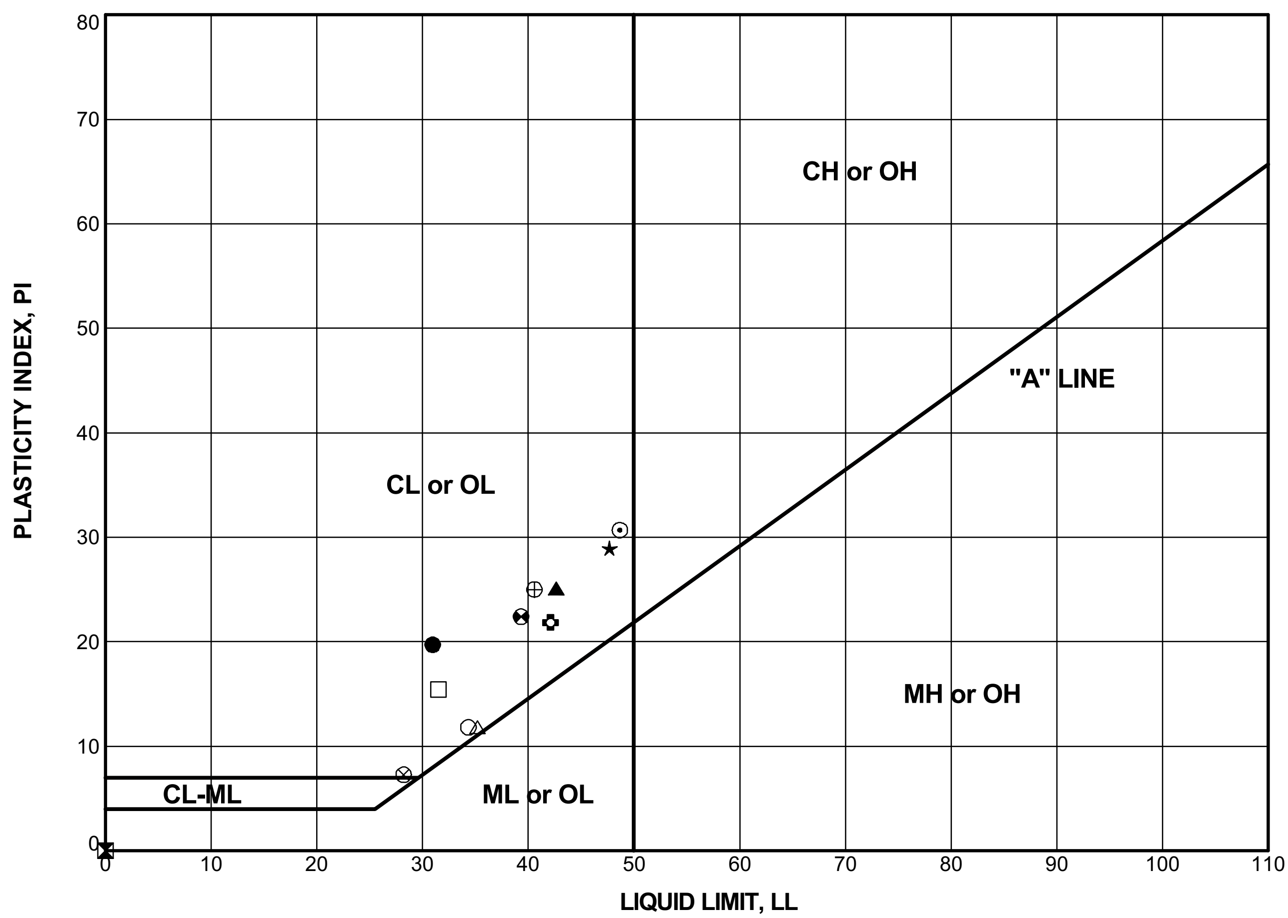
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_139B	23A	55	●	25.3	34	14	20	LEAN CLAY (CL)
WR0017_140B	2A	1.5	⧗	17.1	43	18	25	LEAN CLAY (CL)
WR0017_140B	3A	3	▲		37	26	11	LEAN CLAY (CL)
WR0017_140B	5A	9	★	22.5	27	13	14	CLAYEY SAND (SC)
WR0017_142B	2A	1.5	⊙	5.8	23	14	9	CLAYEY SAND (SC)
WR0017_142B	3A	5.8	✪	6.0	26	13	13	SANDY LEAN CLAY (CL)
WR0017_142B	9A	20	○	38.6	30	22	8	SANDY LEAN CLAY (CL)
WR0017_142B	21A	52.5	△	31.3	64	16	48	FAT CLAY (CH)
WR0017_142B	23A	56.51	⊗	22.1	30	14	16	CLAYEY SAND (SC)
WR0017_143B	1A	1	⊕	14.6	54	27	27	FAT CLAY (CH)
WR0017_143B	3A	3	□	14.1	40	17	23	LEAN CLAY (CL)
WR0017_143B	5A	6.5	❂	8.3	27	11	16	CLAYEY SAND (SC)

DWR LEVEE U/NU ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

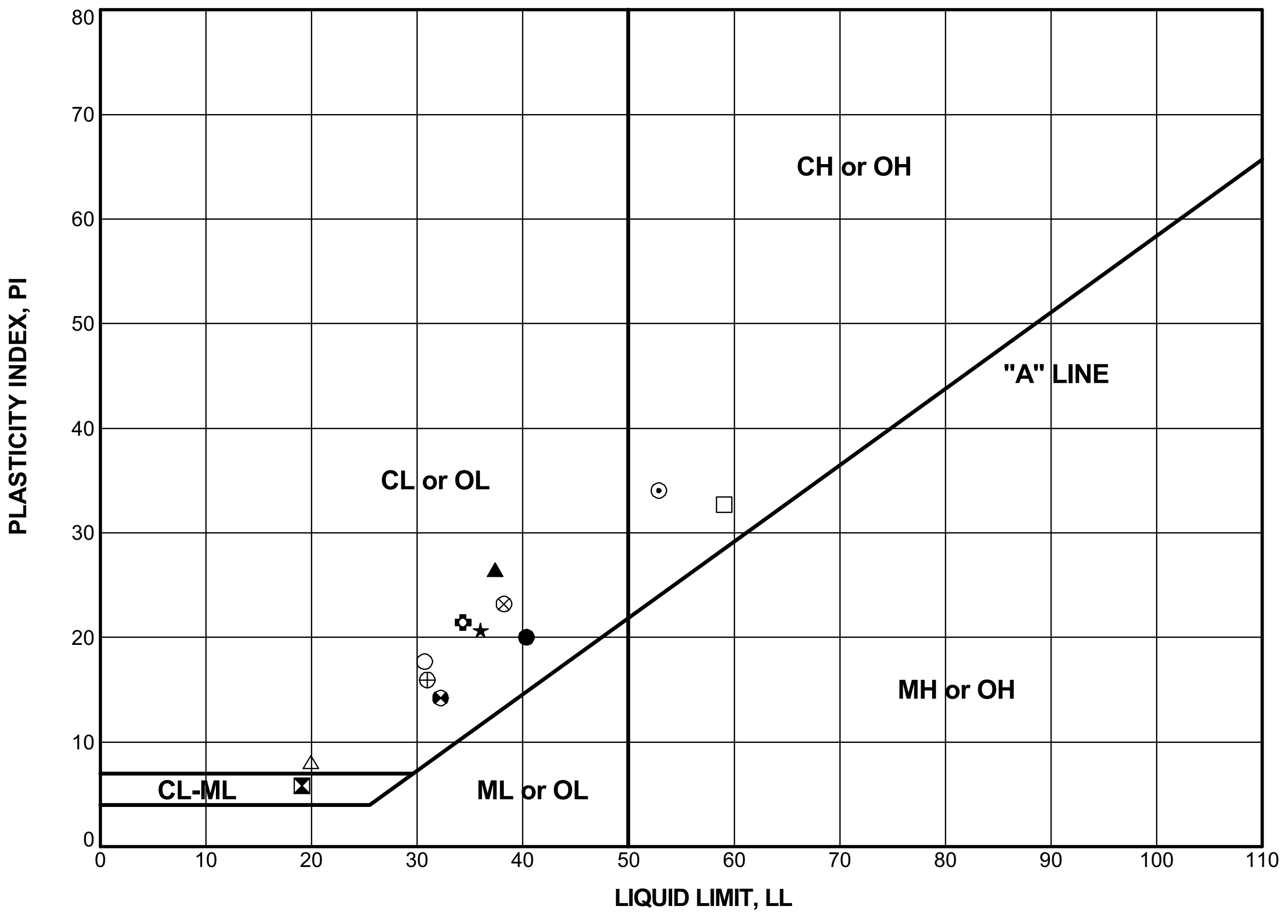
Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_143B	6A	8	●	37.5	31	11	20	CLAYEY SAND (SC)
WR0017_143B	22A	47.5	⊠	17.6	NP	NP	NP	SILTY SAND (SM)
WR0017_144B	2A	2	▲	16.7	43	18	25	SANDY LEAN CLAY (CL)
WR0017_144B	3B	4.5	★	26.5	48	19	29	LEAN CLAY (CL)
WR0017_144B	6A	9.01	⊙	43.8	49	18	31	LEAN CLAY (CL)
WR0017_144B	8A	18	✿	36.2	42	20	22	ORGANIC LEAN CLAY (OL)
WR0017_144B	10A	25	○	44.2	34	23	11	LEAN CLAY (CL)
WR0017_144B	13A	32	△	32.0	35	23	12	LEAN CLAY (CL)
WR0017_145B	3A	5	⊗		28	21	7	SILTY CLAY with SAND (CL-ML)
WR0017_145B	23A	56	⊕	25.9	41	16	25	LEAN CLAY with Sand (CL)
WR0017_145B	24B	57	□		32	16	16	LEAN CLAY with SAND (CL)
WR0017_146B	1A	3.5	⨂	16.6	39	17	22	LEAN CLAY with SAND (CL)



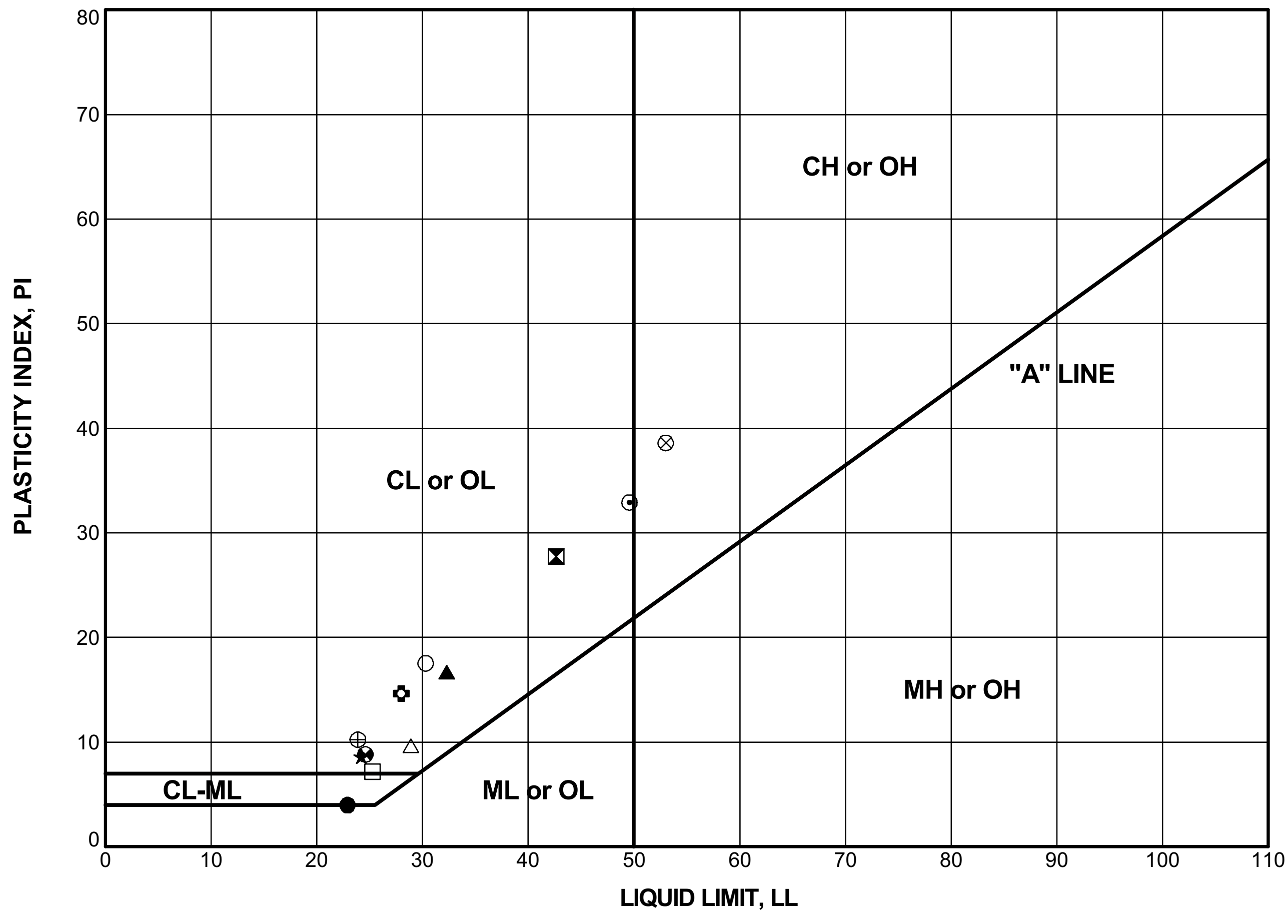
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_146B	4A	9	●	5.6	40	20	20	LEAN CLAY (CL)
WR0017_148B	2A	1.5	⧗	11.4	19	13	6	SILTY, CLAYEY SAND (SC-SM)
WR0017_148B	4A	6	▲	16.4	37	11	26	LEAN CLAY with Sand (CL)
WR0017_148B	9A	15	★	29.7	36	15	21	LEAN CLAY with Sand (CL)
WR0017_148B	12A	20	⊙	37.7	53	19	34	FAT CLAY (CH)
WR0017_148B	17B	32	✪	27.8	34	13	21	LEAN CLAY (CL)
WR0017_148B	17A	33.5	○	33.1	31	13	18	LEAN CLAY (CL)
WR0017_149B	1A	0.2	△	8.2	20	12	8	CLAYEY SAND (SC)
WR0017_149B	10A	17	⊗	27.6	38	15	23	LEAN CLAY (CL)
WR0017_152B	2A	1	⊕	20.7	31	15	16	SANDY LEAN CLAY (CL)
WR0017_152B	5A	5.5	□	41.1	59	26	33	FAT CLAY (CH)
WR0017_152B	9A	14.5	◉	26.7	32	18	14	LEAN CLAY (CL)

DWR LEVEE U/N/U ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



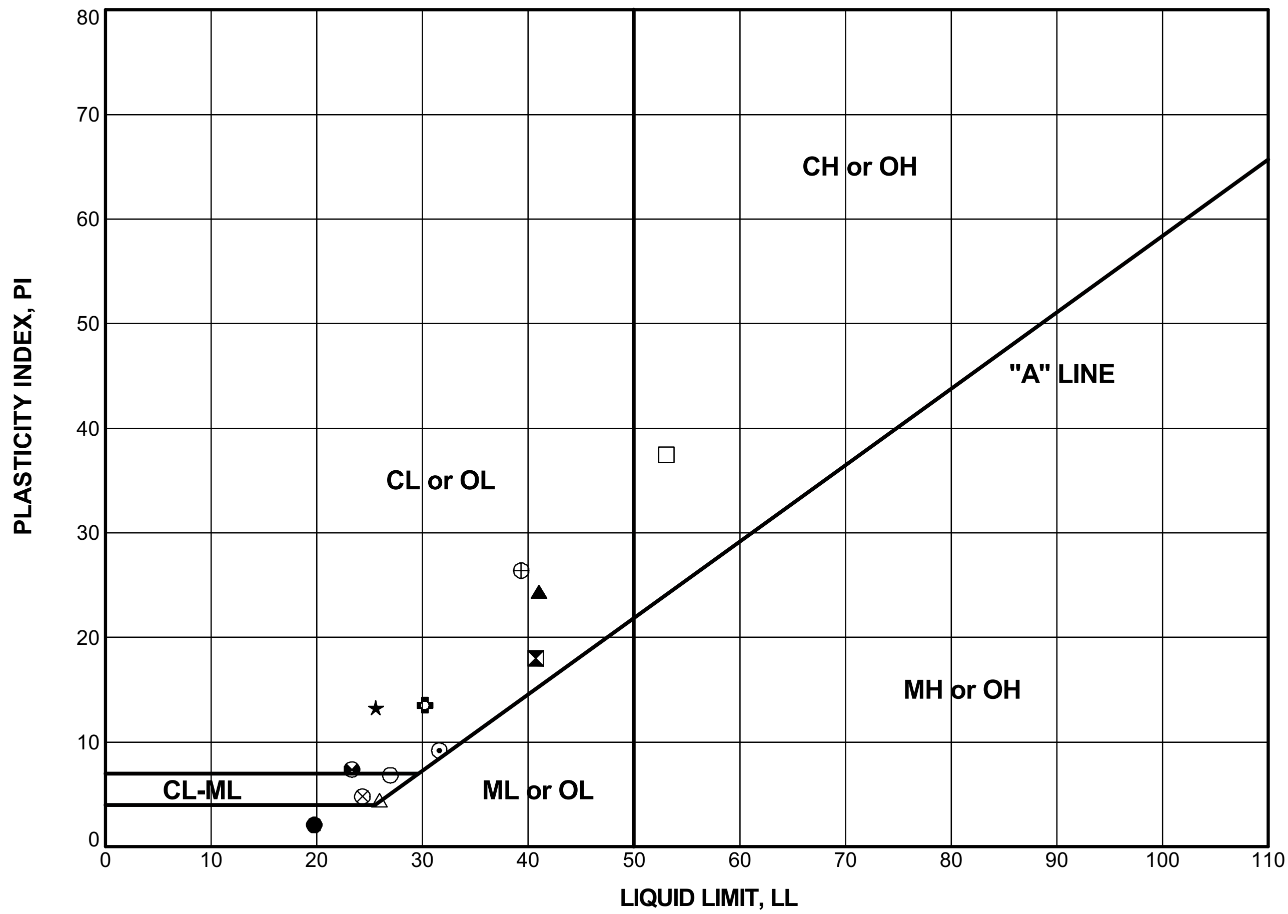
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_152B	11A	19	●	37.8	23	19	4	SANDY SILTY CLAY (CL-ML)
WR0017_152B	13A	24.5	⧗	23.6	43	15	28	LEAN CLAY (CL)
WR0017_152B	15A	28.8	▲	27.0	32	16	16	SANDY LEAN CLAY (CL)
WR0017_152B	19A	37	★	21.9	24	16	8	SANDY LEAN CLAY (CL)
WR0017_152B	20A	42.5	⊙	27.9	50	17	33	FAT CLAY (CH)
WR0017_158B	1A	0.5	✿	14.3	28	13	15	SANDY LEAN CLAY (CL)
WR0017_158B	4A	5	○	25.7	30	13	17	SANDY LEAN CLAY (CL)
WR0017_158B	10A	16	△	27.7	29	19	10	LEAN CLAY (CL)
WR0017_158B	12A	20	⊗	25.8	53	14	39	FAT CLAY (CH)
WR0017_158B	14A	25	⊕	17.8	24	14	10	CLAYEY SAND (SC)
WR0017_158B	20A	38.5	□	29.0	25	18	7	SANDY SILTY CLAY (CL-ML)
WR0017_160B	4A	5	⊗	22.9	25	16	9	CLAYEY SAND (SC)

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



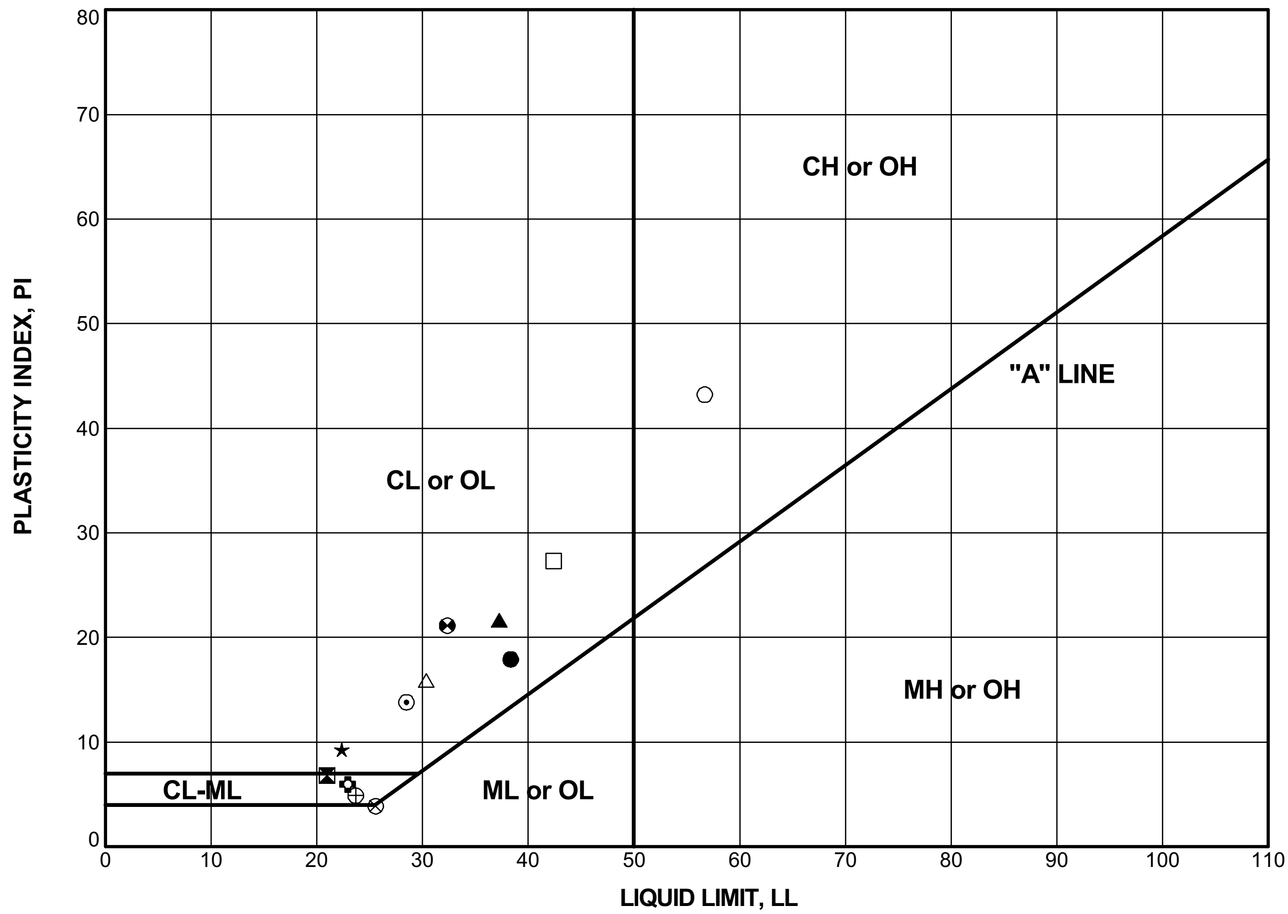
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_160B	5A	7	●	24.5	20	18	2	SILTY SAND (SM)
WR0017_160B	9A	15	⧗	34.2	41	23	18	LEAN CLAY (CL)
WR0017_160B	10A	17	▲	30.5	41	17	24	LEAN CLAY (CL)
WR0017_160B	13A	22.01	★	21.9	26	12	14	LEAN CLAY (CL)
WR0017_160B	16A	30	⊙	28.7	32	22	10	SANDY LEAN CLAY (CL)
WR0017_162B	1A	0	✪	25.7	30	17	13	SANDY LEAN CLAY (CL)
WR0017_162B	3A	2	○	30.2	27	20	7	SANDY SILTY CLAY (CL-ML)
WR0017_162B	6A	6.5	△	32.7	26	21	5	SILTY, CLAYEY SAND (SC-SM)
WR0017_162B	7A	10	⊗	27.0	24	20	4	SANDY SILTY CLAY (CL-ML)
WR0017_162B	11A	17.01	⊕	26.5	39	13	26	LEAN CLAY with SAND (CL)
WR0017_162B	23A	44	□	31.0	53	16	37	FAT CLAY (CH)
WR0017_163B	2B	1	⊛	16.1	23	16	7	SILTY, CLAYEY SAND (SC-SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

DWR LEVEE U/NU ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10



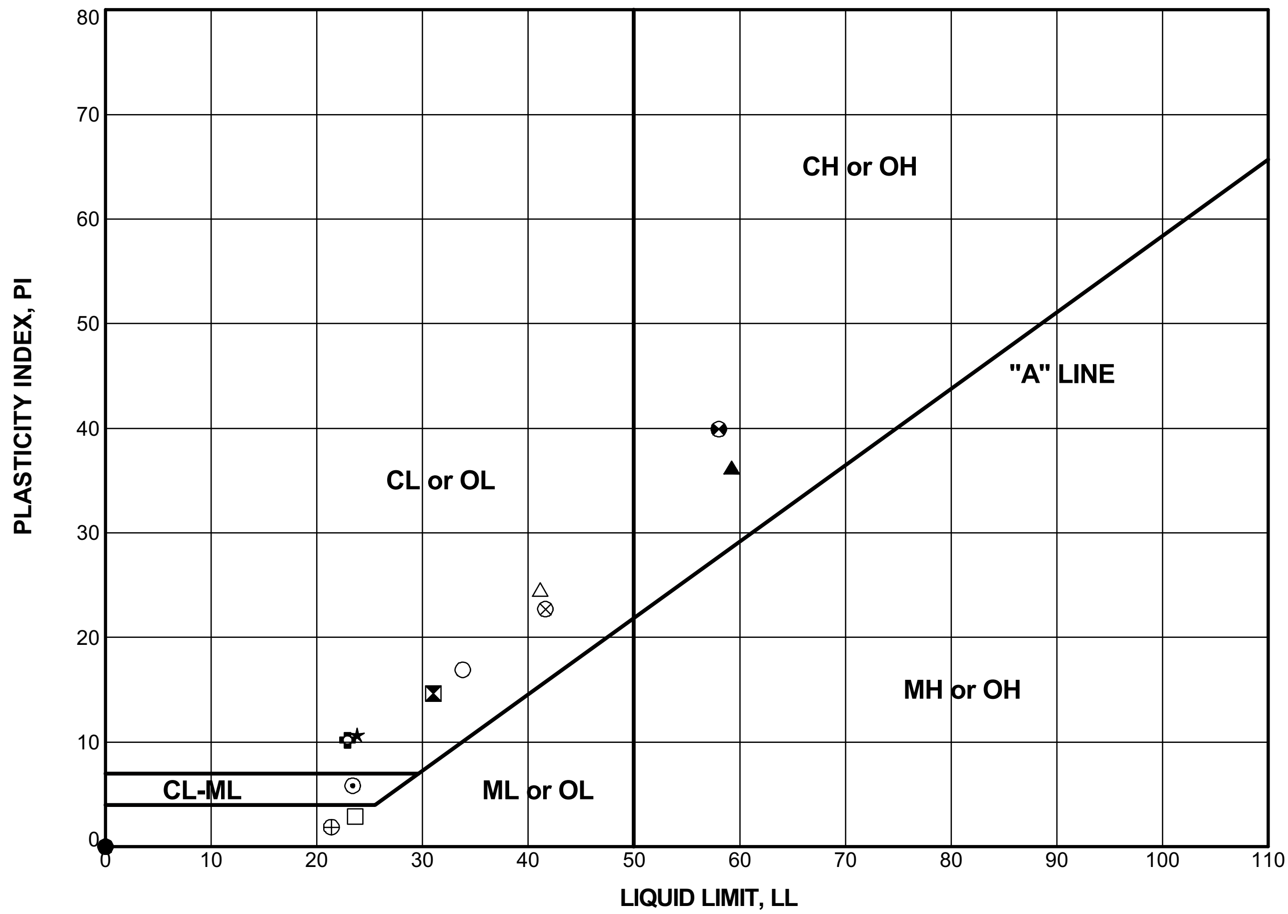
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_163B	4A	5	●	34.0	38	20	18	LEAN CLAY (CL)
WR0017_163B	6A	10.5	⧗	24.3	21	14	7	SILTY, CLAYEY SAND (SC-SM)
WR0017_163B	9A	17.01	▲	31.8	37	16	21	LEAN CLAY with SAND (CL)
WR0017_163B	13A	23.8	★	17.3	22	13	9	CLAYEY SAND (SC)
WR0017_163B	16A	29.5	⊙	23.0	28	15	13	LEAN CLAY (CL)
WR0017_163B	17A	32	✪	23.3	23	17	6	SILTY, CLAYEY SAND (SC-SM)
WR0017_163B	26A	53.51	○	26.1	57	13	44	FAT CLAY (CH)
WR0017_164B	2B	1	△	21.1	30	14	16	SANDY LEAN CLAY (CL)
WR0017_164B	8A	12	⊗	27.5	26	22	4	SILT (ML)
WR0017_164B	9A	14	⊕	26.6	24	19	5	SANDY SILTY CLAY (CL-ML)
WR0017_164B	11A	17	□	29.2	42	15	27	LEAN CLAY with SAND (CL)
WR0017_164B	14A	24	⊛	21.7	32	11	21	SANDY LEAN CLAY (CL)

DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA

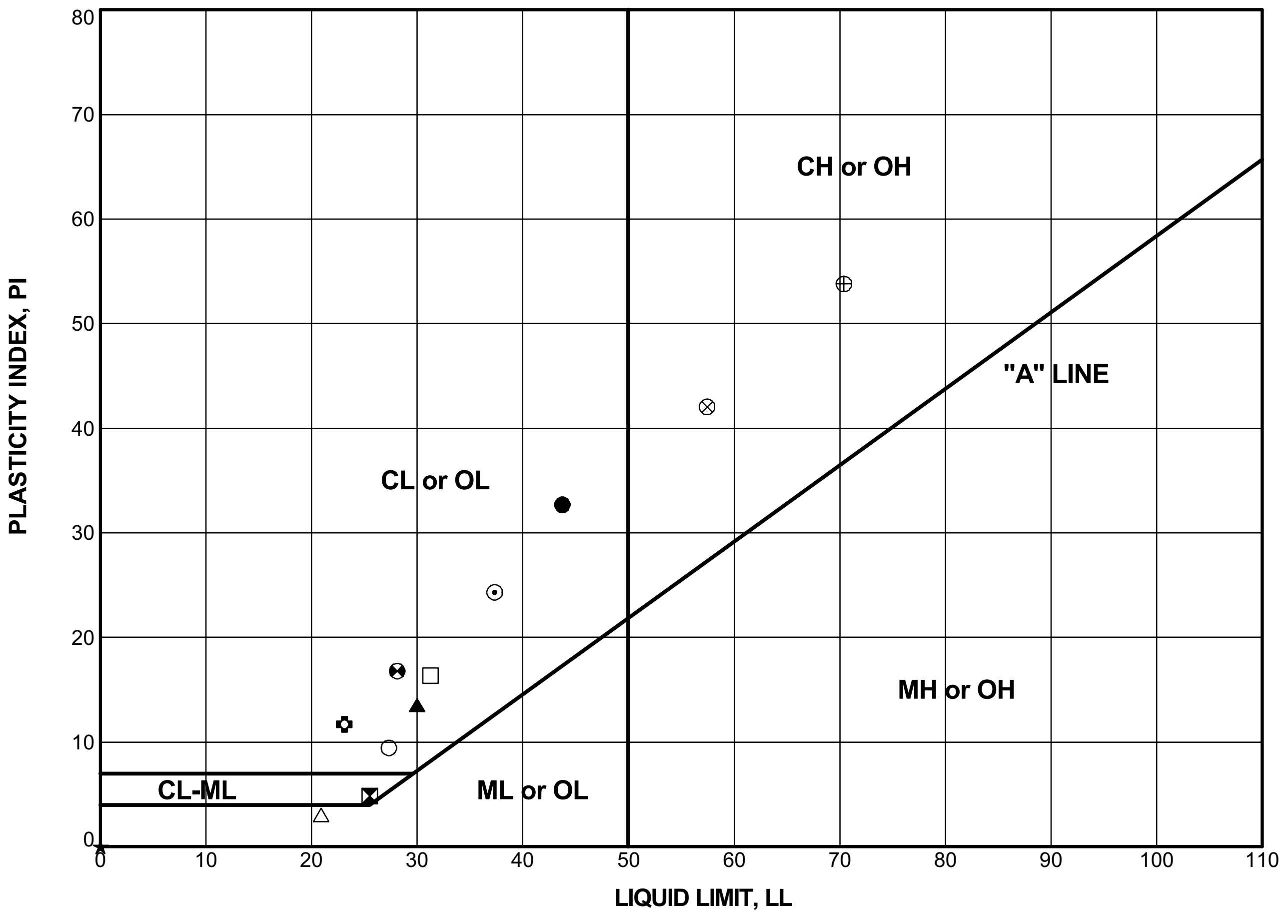
Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_164B	18A	34	●	34.5	NP	NP	NP	SILTY SAND (SM)
WR0017_165B	1B	1.3	⧗	15.4	31	16	15	CLAYEY SAND (SC)
WR0017_165B	2A	2.5	▲	39.4	59	23	36	FAT CLAY (CH)
WR0017_165B	4A	6.5	★	19.9	24	13	11	SANDY LEAN CLAY (CL)
WR0017_165B	6A	10	⊙	27.6	23	18	5	SILTY CLAY with SAND (CL-ML)
WR0017_165B	7A	13	✿	19.1	23	13	10	SANDY LEAN CLAY (CL)
WR0017_165B	9A	18	○	35.2	34	17	17	LEAN CLAY with SAND (CL)
WR0017_165B	11A	23	△	28.5	41	17	24	SANDY LEAN CLAY (CL)
WR0017_165B	13A	28	⊗	26.4	42	19	23	LEAN CLAY (CL)
WR0017_165B	16A	34.51	⊕	24.6	21	19	2	SILTY SAND (SM)
WR0017_165B	18A	39.51	□	23.2	24	21	3	SILTY SAND (SM)
WR0017_165B	20A	46	⨂	27.1	58	18	40	FAT CLAY (CH)

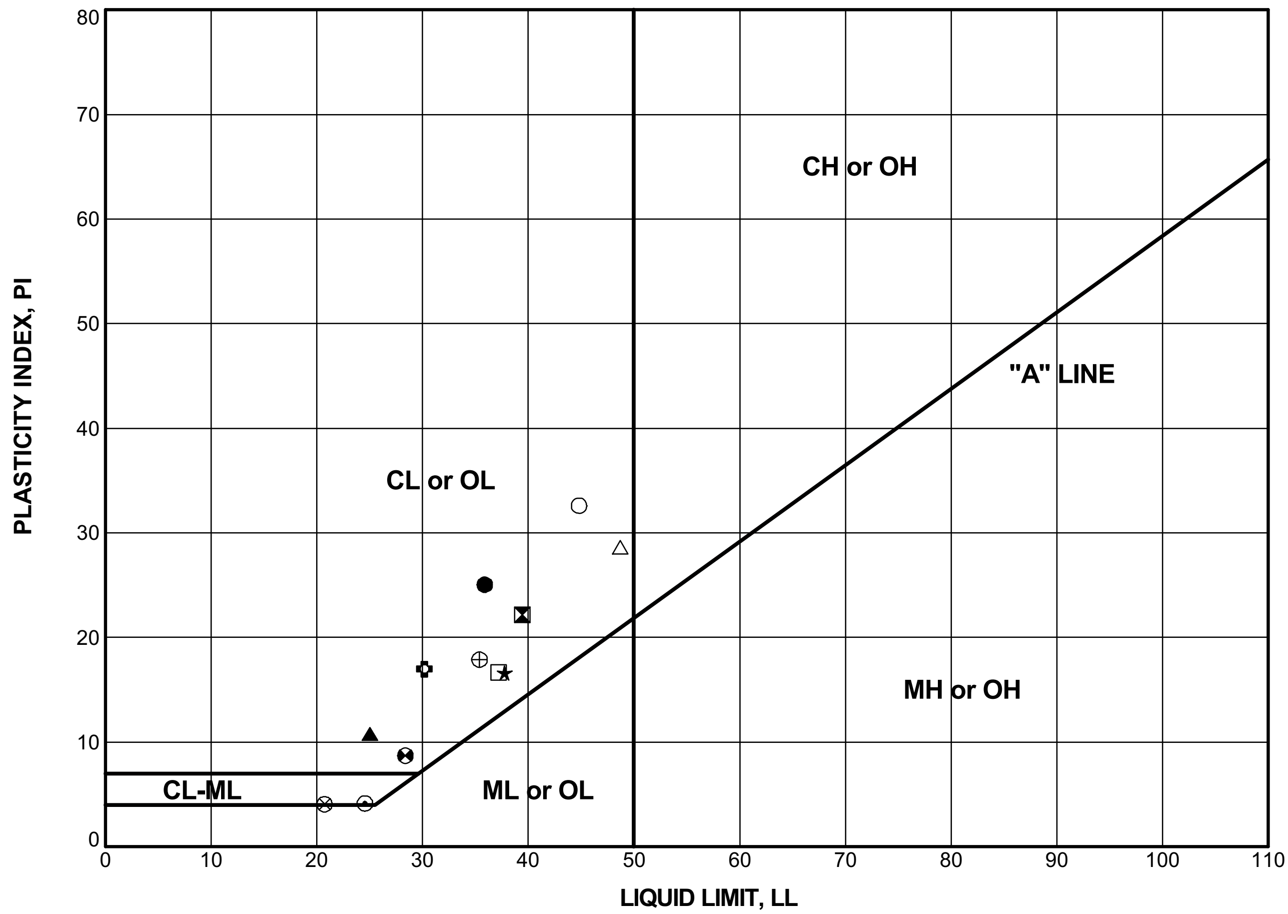


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_165B	24A	53	●	20.5	44	11	33	LEAN CLAY (CL)
WR0017_166B	1A	0.6	⧗	14.9	26	21	5	SILTY, CLAYEY SAND (SC-SM)
WR0017_166B	3A	3.5	▲	15.1	30	16	14	LEAN CLAY with SAND (CL)
WR0017_166B	5A	6.5	★	6.3	NP	NP	NP	POORLY GRADED SAND with SILT (SP-SM)
WR0017_166B	14A	27.3	⊙	21.2	37	13	24	LEAN CLAY with SAND (CL)
WR0017_166B	16A	30.5	✪	15.3	23	11	12	CLAYEY SAND (SC)
WR0017_166B	19A	36.51	○	24.2	27	18	9	LEAN CLAY with Sand (CL)
WR0017_167B	1A	0.8	△	6.0	21	18	3	SILTY SAND (SM)
WR0017_167B	16A	35	⊗	33.3	57	15	42	FAT CLAY with Sand (CH)
WR0017_167B	19A	40	⊕	33.4	70	17	53	FAT CLAY (CH)
WR0017_168B	2A	1.5	□	22.3	31	15	16	LEAN CLAY (CL)
WR0017_168B	12A	21.51	⊛	16.6	28	11	17	SANDY LEAN CLAY (CL)

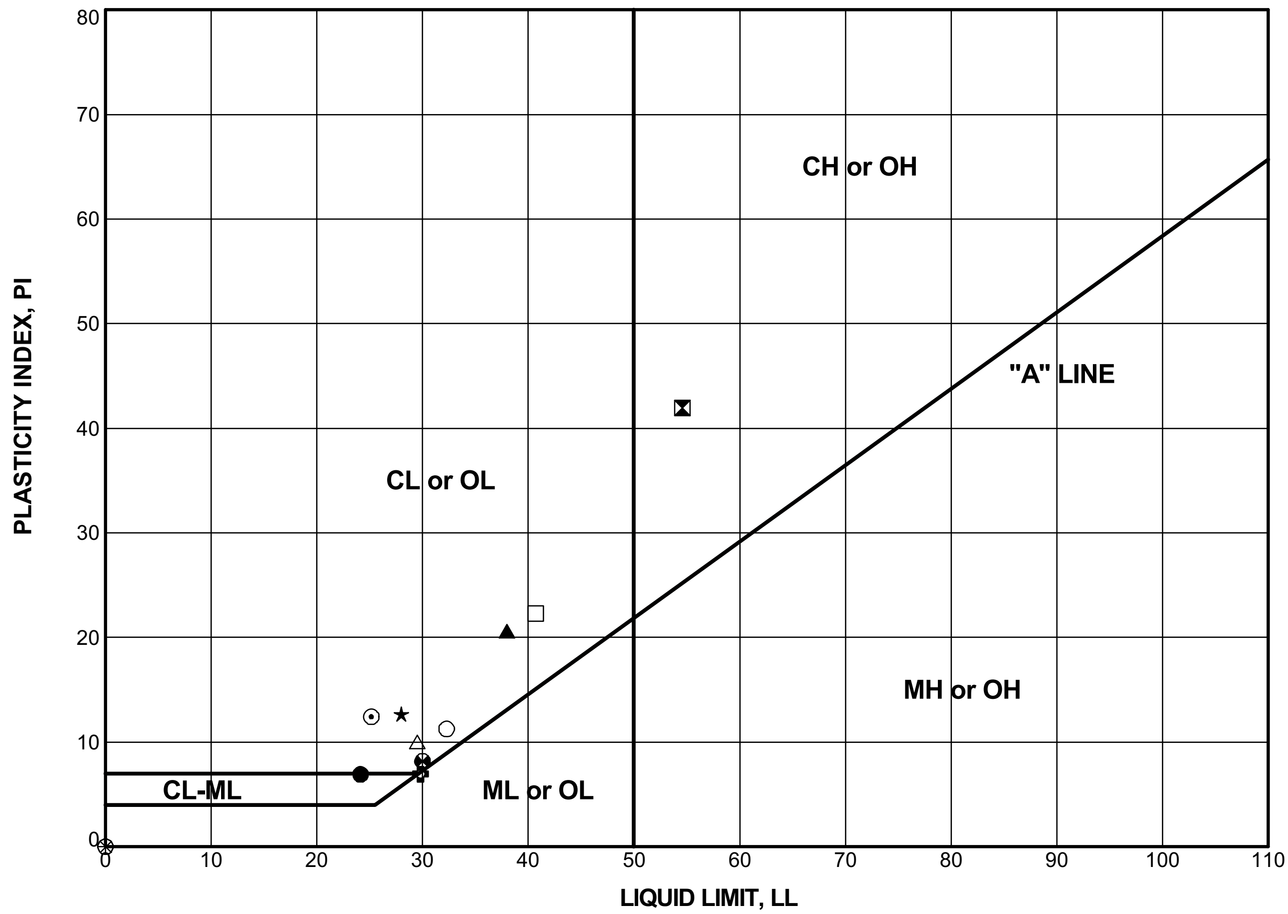
Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_168B	16A	30	●	19.1	36	11	25	LEAN CLAY (CL)
WR0017_168B	24A	50	⊠	34.2	39	17	22	LEAN CLAY (CL)
WR0017_172B	1A	1	▲	5.3	25	14	11	CLAYEY SAND (SC)
WR0017_172B	8A	15.01	★	31.9	38	21	17	LEAN CLAY (CL)
WR0017_172B	10A	19.01	⊙	28.5	25	20	5	SANDY SILTY CLAY (CL-ML)
WR0017_172B	14A	30	✿	19.0	30	13	17	CLAYEY SAND (SC)
WR0017_172B	17A	35	○	22.5	45	12	33	SANDY LEAN CLAY (CL)
WR0017_173B	1A	0.8	△	26.3	49	20	29	LEAN CLAY (CL)
WR0017_173B	5A	7	⊗	21.7	21	17	4	SILTY, CLAYEY SAND (SC-SM)
WR0017_173B	9A	17	⊕	22.8	35	17	18	LEAN CLAY (CL)
WR0017_173B	10A	20.01	□	27.0	37	20	17	LEAN CLAY (CL)
WR0017_173B	13A	25	⊗	22.5	28	20	8	SANDY LEAN CLAY (CL)

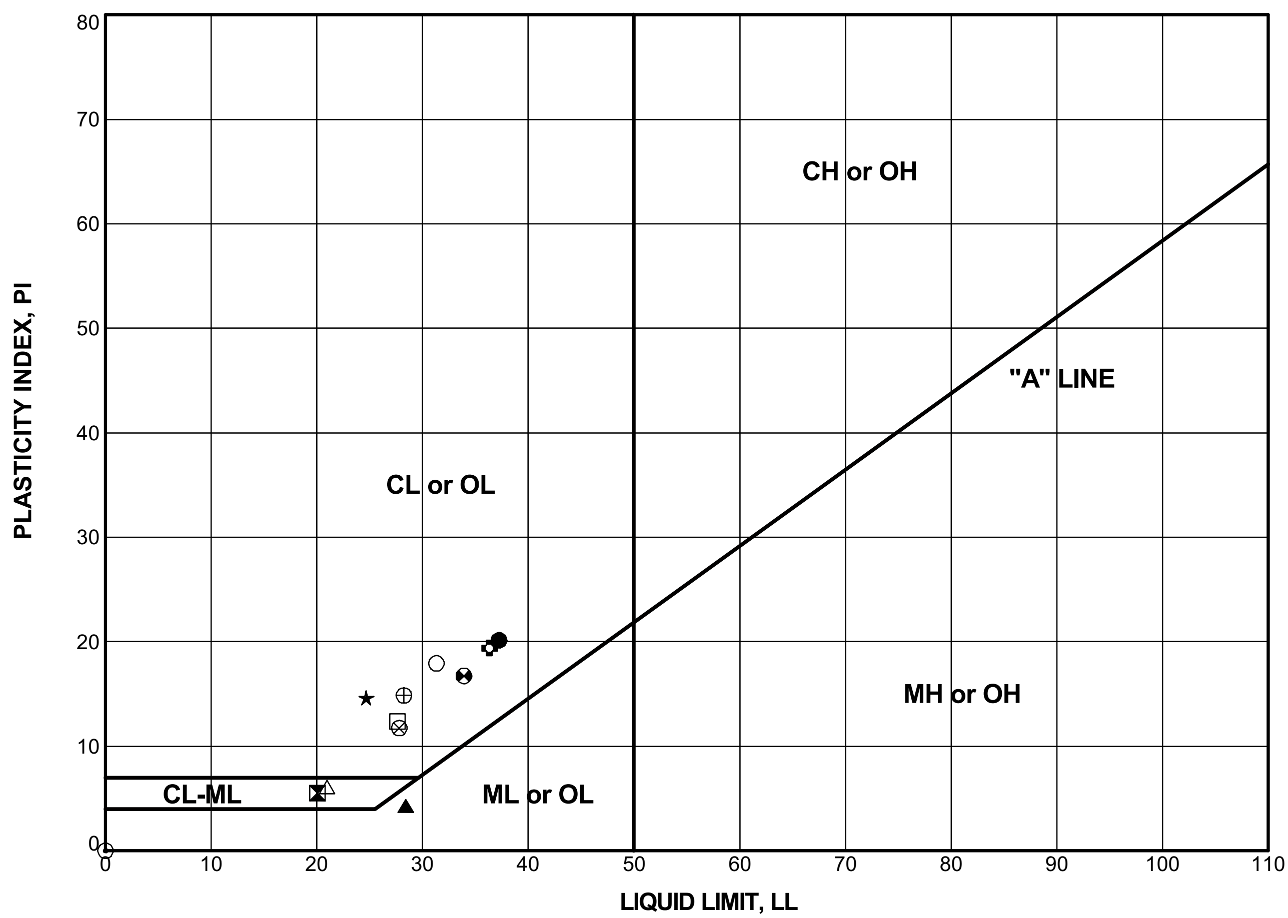


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_173B	17A	37	●	29.4	24	17	7	SANDY SILTY CLAY (CL-ML)
WR0017_173B	18A	40	⊠	33.5	55	13	42	FAT CLAY (CH)
WR0017_174B	1A	0	▲	22.8	38	17	21	LEAN CLAY (CL)
WR0017_174B	6B	5.5	★	22.5	28	15	13	LEAN CLAY with Sand (CL)
WR0017_174B	8A	8.5	⊙	29.5	25	13	12	LEAN CLAY with SAND (CL)
WR0017_174B	9A	10	✪	29.9	30	23	7	SILT (ML)
WR0017_174B	11A	13.1	○	29.3	32	21	11	LEAN CLAY (CL)
WR0017_174B	12A	17	△	26.1	30	20	10	LEAN CLAY (CL)
WR0017_174B	19A	37	⊗	29.4	NP	NP	NP	SILTY SAND (SM)
WR0017_174B	24A	47	⊕	23.3	NP	NP	NP	SILTY SAND (SM)
WR0017_175B	1B	0	□	22.6	41	18	23	LEAN CLAY with SAND (CL)
WR0017_175B	3B	3.5	⊗	12.2	30	22	8	SANDY LEAN CLAY (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

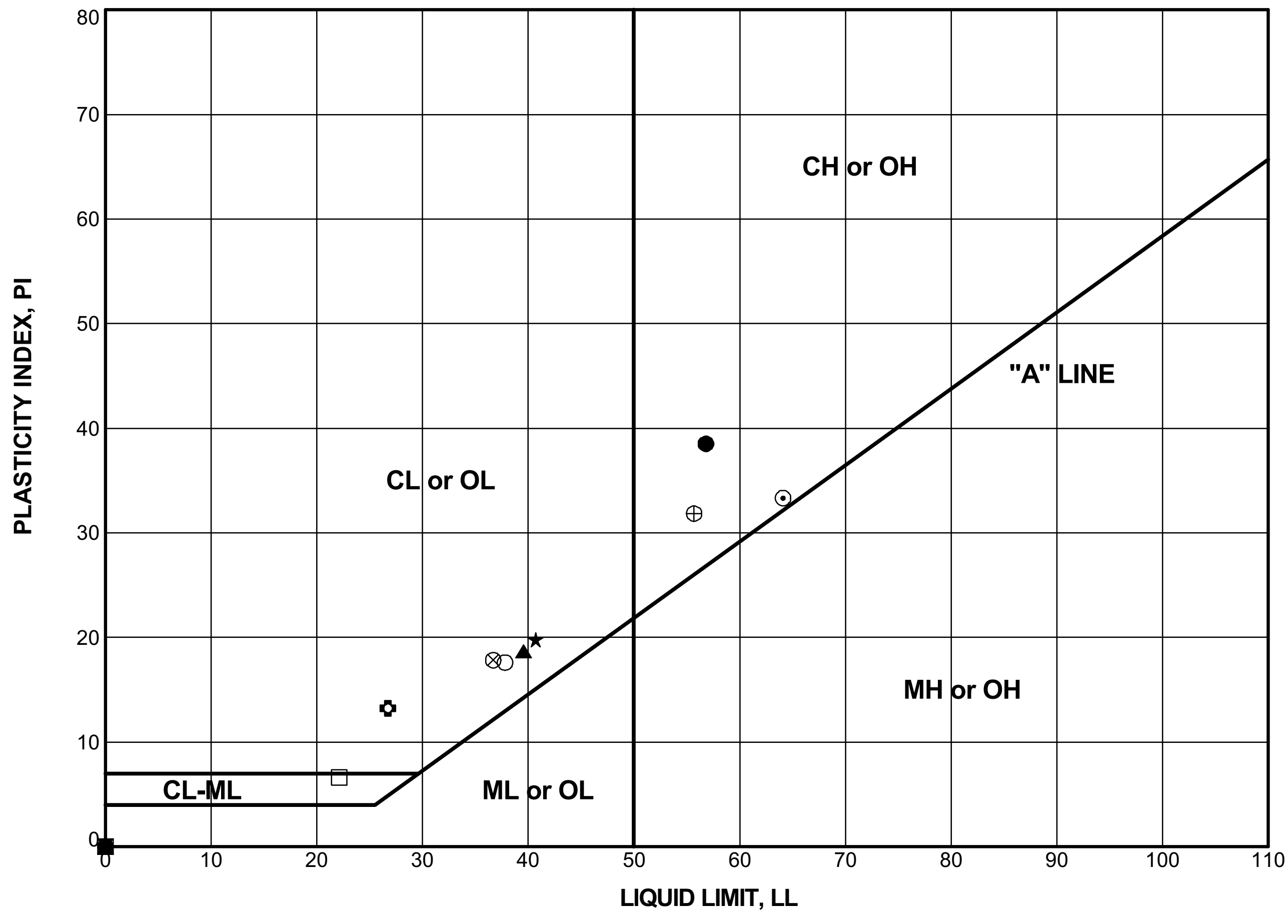


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_175B	4A	5	●	22.1	37	17	20	LEAN CLAY (CL)
WR0017_175B	6A	9	⧗	22.6	20	15	5	SILTY, CLAYEY SAND (SC-SM)
WR0017_175B	8A	12.5	▲	37.0	28	24	4	SILT with SAND (ML)
WR0017_175B	11A	20.7	★	16.9	25	10	15	CLAYEY SAND (SC)
WR0017_175B	19A	40	⊙	23.5	NP	NP	NP	SILTY SAND (SM)
WR0017_176B	1A	0.5	✿	21.6	36	17	19	LEAN CLAY with Sand (CL)
WR0017_176B	5A	6.5	○	22.0	31	13	18	LEAN CLAY (CL)
WR0017_176B	6A	9	△	26.0	21	15	6	SANDY SILTY CLAY (CL-ML)
WR0017_176B	7A	12	⊗	23.6	28	16	12	CLAYEY SAND (SC)
WR0017_176B	10A	18.5	⊕	19.2	28	13	15	SANDY LEAN CLAY (CL)
WR0017_177B	2A	2.3	□	18.4	28	15	13	SANDY LEAN CLAY (CL)
WR0017_177B	5B	7.6	⊛	34.7	34	17	17	LEAN CLAY with SAND (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

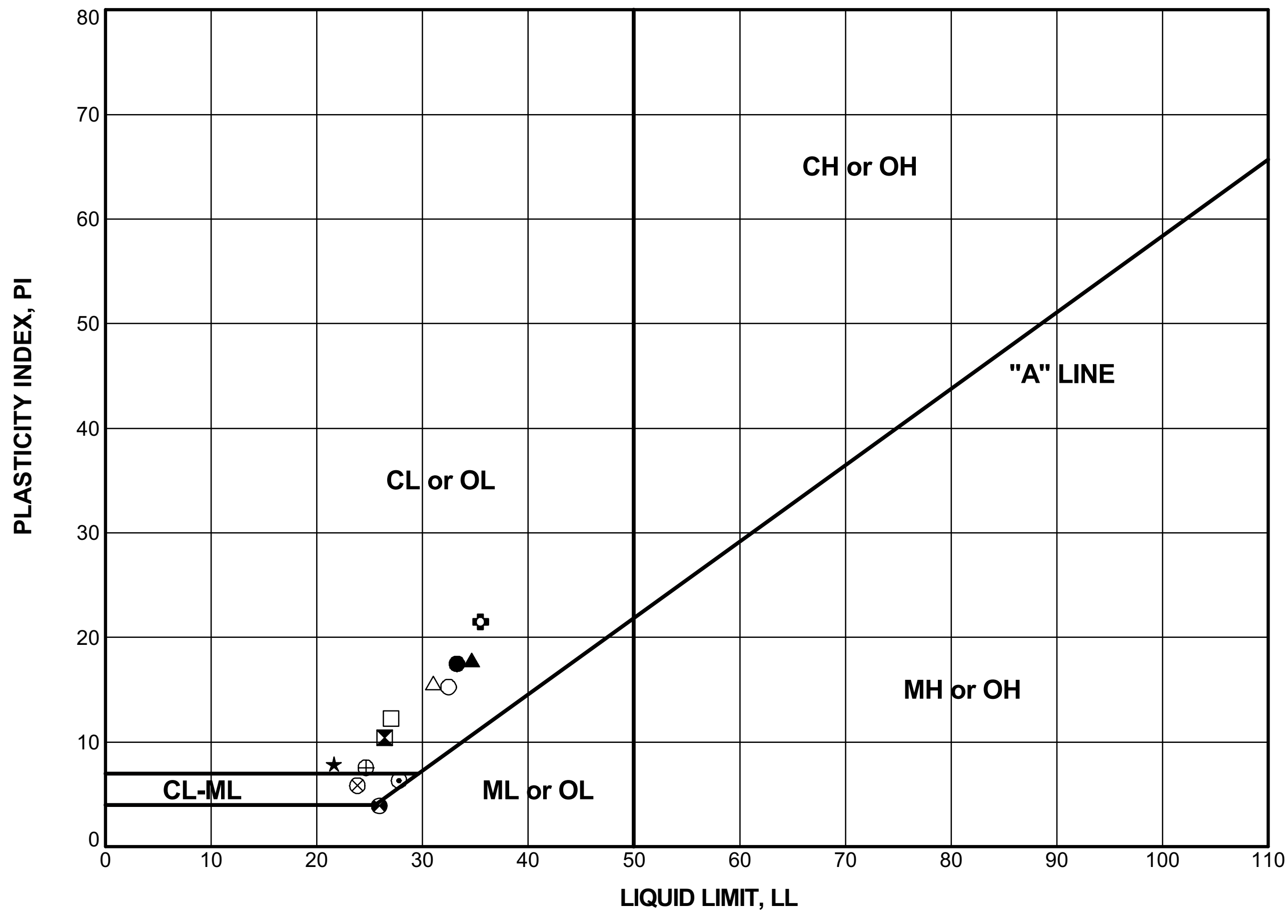


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_177B	5A	9	●	52.6	57	18	39	FAT CLAY (CH)
WR0017_177B	6A	10	⧗	23.5	NP	NP	NP	SILTY SAND (SM)
WR0017_177B	22A	50	▲	33.6	40	21	19	LEAN CLAY with SAND (CL)
WR0017_178B	5A	6.5	★	37.2	41	21	20	LEAN CLAY (CL)
WR0017_178B	6A	8.9	⊙	56.5	64	31	33	FAT CLAY (CH)
WR0017_179B	3A	2	✿	12.4	27	13	14	LEAN CLAY with Sand (CL)
WR0017_179B	4A	5	○	26.4	38	20	18	LEAN CLAY with Sand (CL)
WR0017_179B	6A	9.3	△	13.8	NP	NP	NP	SILTY SAND (SM)
WR0017_179B	10A	15	⊗	28.9	37	19	18	LEAN CLAY with SAND (CL)
WR0017_179B	13A	22	⊕	42.1	56	24	32	FAT CLAY (CH)
WR0017_179B	15A	29	□	24.0	22	15	7	SILTY, CLAYEY SAND (SC-SM)
WR0017_179B	17A	32	❂	28.2	NP	NP	NP	SILTY SAND (SM)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

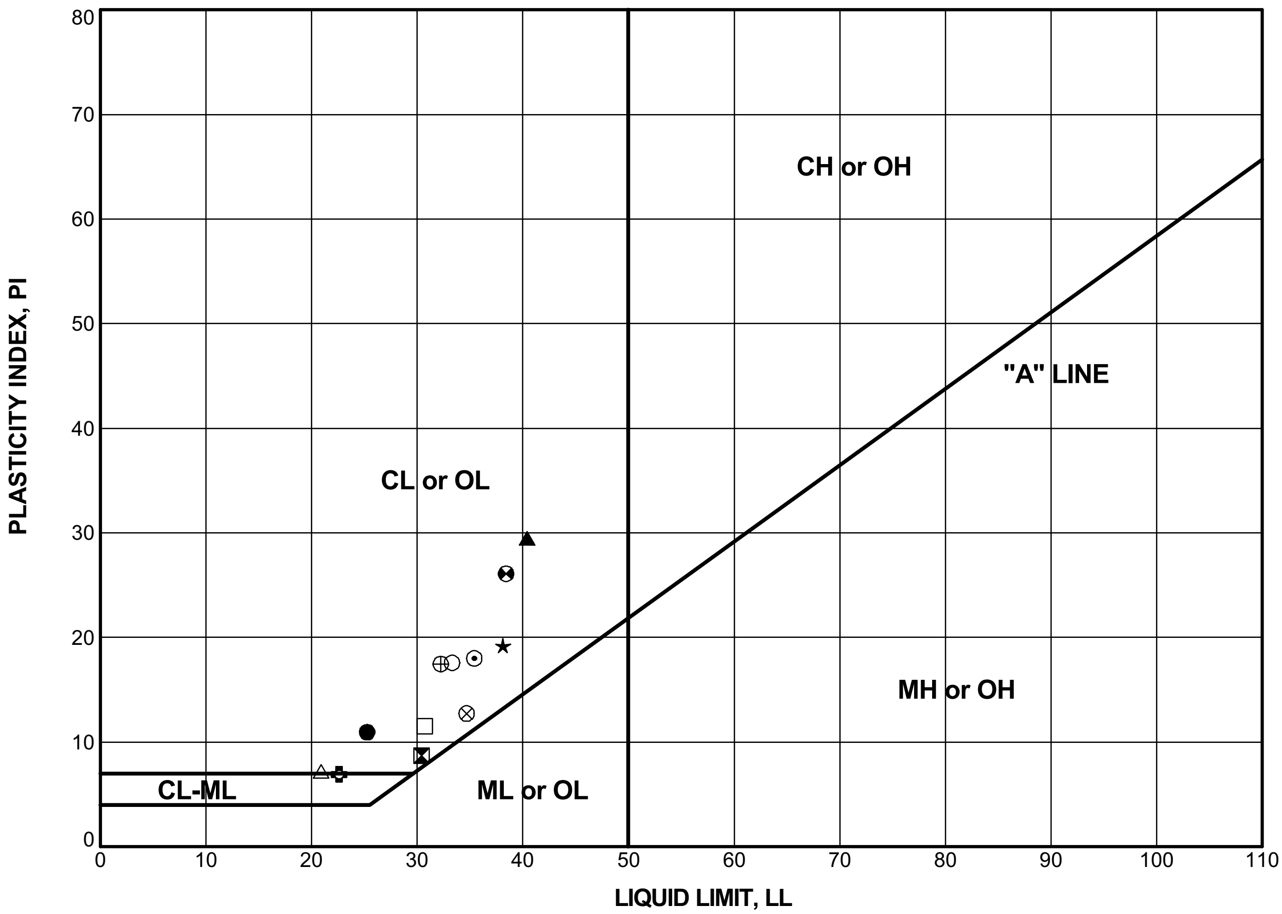


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_179B	19A	37	●	23.1	33	16	17	SANDY LEAN CLAY (CL)
WR0017_179B	31B	69	⊠	28.4	26	16	10	LEAN CLAY (CL)
WR0017_180B	2A	0.5	▲	21.3	35	17	18	SANDY LEAN CLAY (CL)
WR0017_180B	6A	8.5	★	20.0	22	14	8	SANDY LEAN CLAY (CL)
WR0017_180B	7A	12	⊙	32.9	28	21	7	SANDY SILTY CLAY (CL-ML)
WR0017_180B	12B	24	✪	26.0	35	14	21	LEAN CLAY with Sand (CL)
WR0017_182B	3A	2.5	○	20.6	32	17	15	LEAN CLAY (CL)
WR0017_182B	7A	10.01	△	29.7	31	15	16	LEAN CLAY (CL)
WR0017_182B	8A	12	⊗	24.6	24	18	6	SANDY SILTY CLAY (CL-ML)
WR0017_182B	10A	17	⊕	31.0	25	17	8	LEAN CLAY with SAND (CL)
WR0017_182B	12A	22	□	25.8	27	15	12	LEAN CLAY with SAND (CL)
WR0017_182B	14A	27	⊗	29.4	26	22	4	SANDY SILT (ML)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART

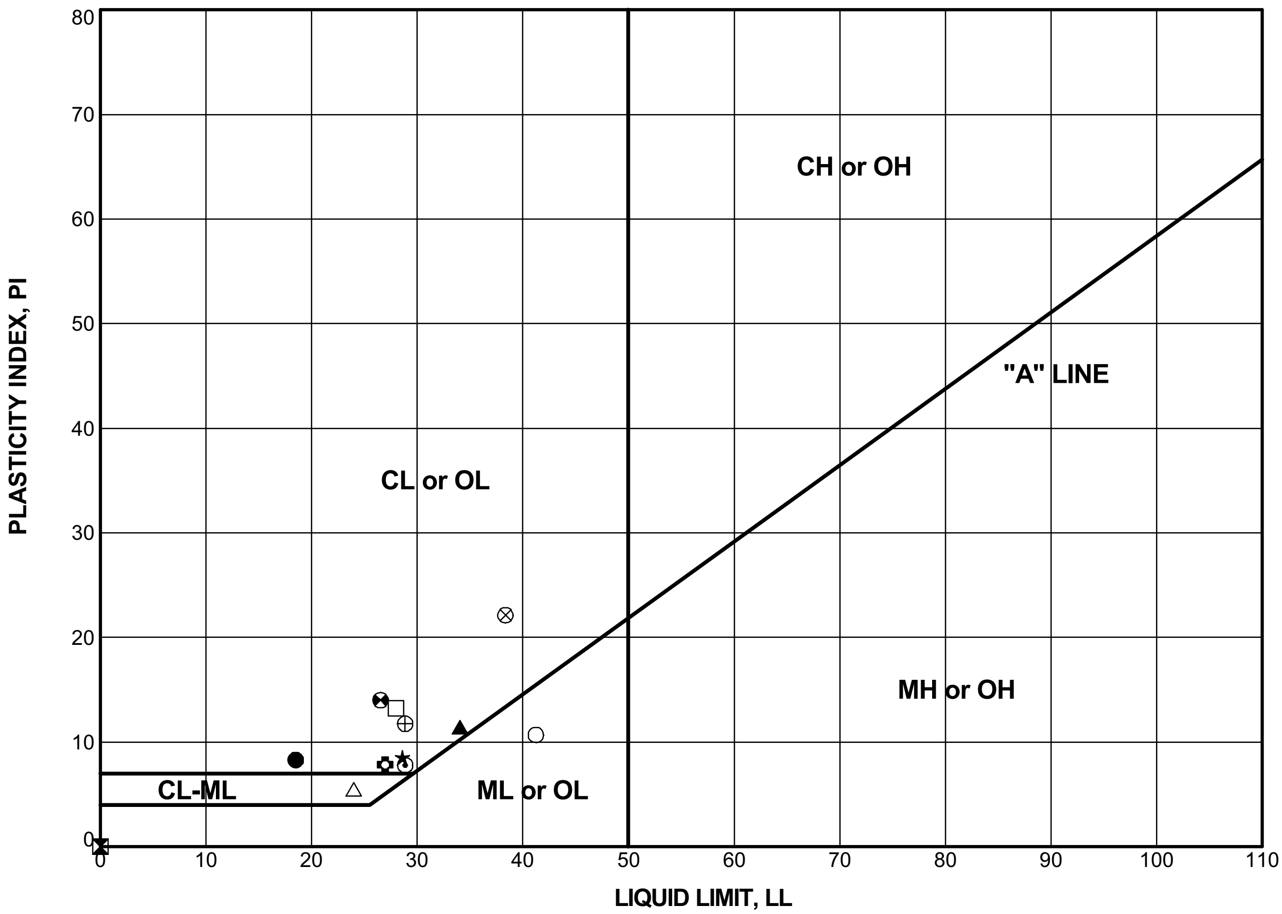


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_187B	1A	0	●	14.7	25	14	11	CLAYEY SAND (SC)
WR0017_187B	3A	2.5	⧗	7.0	30	22	8	LEAN CLAY (CL)
WR0017_187B	24A	54.51	▲	24.6	40	11	29	LEAN CLAY (CL)
WR0017_188B	2B	1.3	★	28.8	38	19	19	LEAN CLAY (CL)
WR0017_188B	3A	2.5	⊙	23.5	35	17	18	LEAN CLAY with SAND (CL)
WR0017_188B	6A	12	✿	16.9	23	16	7	SILTY, CLAYEY SAND (SC-SM)
WR0017_193B	1A	0.5	○	18.0	33	16	17	LEAN CLAY with Sand (CL)
WR0017_193B	5A	7.5	△	24.1	21	14	7	SILTY, CLAYEY SAND (SC-SM)
WR0017_193B	7A	12	⊗	36.2	35	22	13	LEAN CLAY (CL)
WR0017_193B	16A	32	⊕	26.0	32	15	17	SANDY LEAN CLAY (CL)
WR0017_193B	18A	35	□	28.9	31	19	12	SANDY LEAN CLAY (CL)
WR0017_193B	20A	40.6	⊛	25.0	38	12	26	LEAN CLAY with SAND (CL)

Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



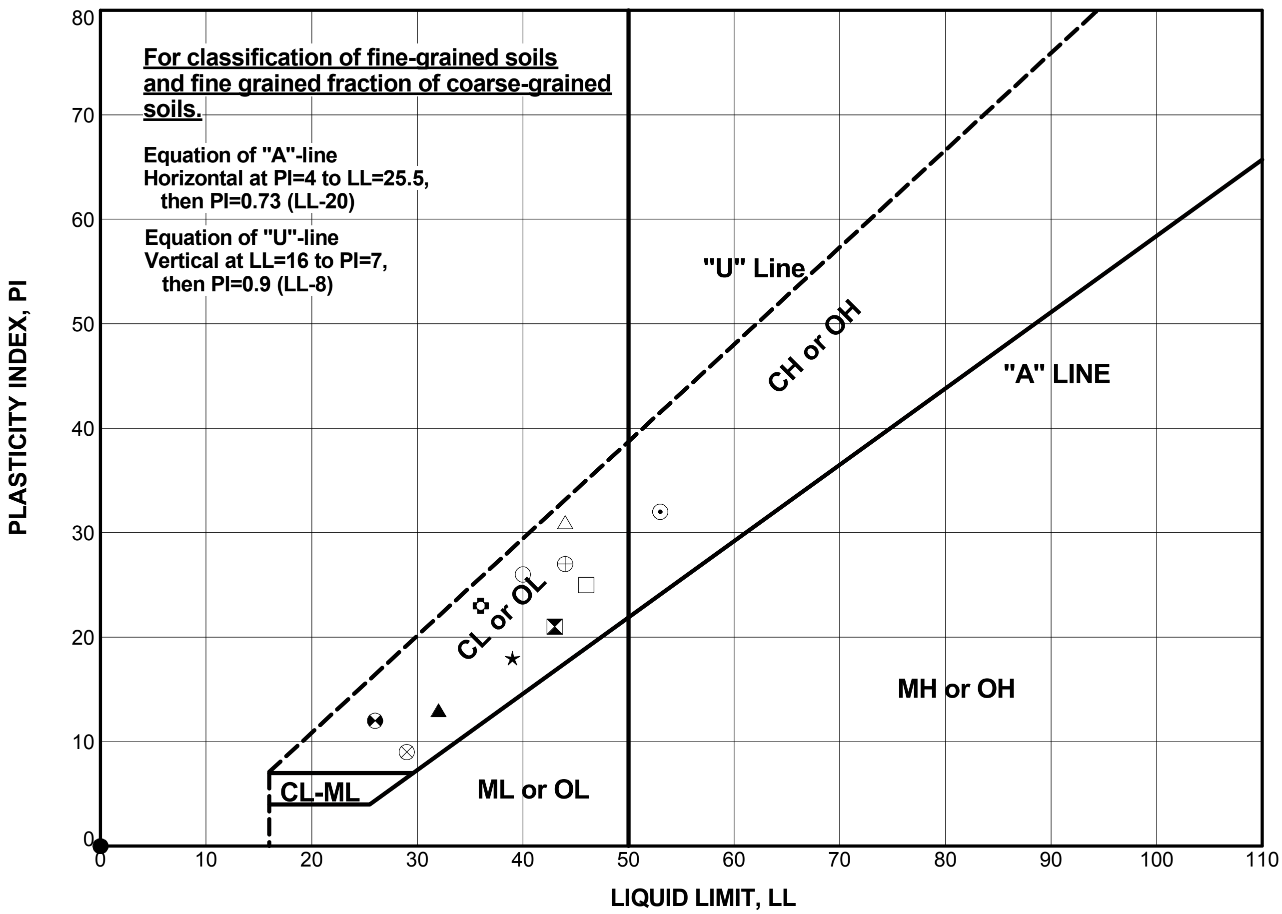
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_196B	1A	0.5	●	6.4	18	10	8	CLAYEY SAND (SC)
WR0017_196B	4A	5	⧗	6.3	NP	NP	NP	SILTY SAND (SM)
WR0017_196B	9A	15	▲	38.1	34	23	11	LEAN CLAY with SAND (CL)
WR0017_199B	7A	8.5	★	13.0	29	20	9	SANDY LEAN CLAY (CL)
WR0017_199B	9A	11.5	⊙	19.7	29	21	8	SANDY LEAN CLAY (CL)
WR0017_199B	16A	24	✪	35.7	27	19	8	LEAN CLAY (CL)
WR0017_200B	2A	2	○	30.8	41	31	10	SANDY SILT (ML)
WR0017_TP-01	2A	0.5	△	18.1	24	18	6	SANDY SILTY CLAY (CL-ML)
WR0017_TP-05	4A	3.8	⊗	19.9	38	16	22	LEAN CLAY with SAND (CL)
WR0017_TP-09	5A	4.3	⊕	17.4	29	17	12	SANDY LEAN CLAY (CL)
WR0017_TP-11	2A	0.5	□	14.5	28	15	13	SANDY LEAN CLAY (CL)
WR0017_TP-11	4A	5	⊗	14.5	27	13	14	CLAYEY SAND (SC)

DWR LEVEE U/N/U ATT PLOT REV1; 20100618_RD17_P2.GPJ; DWR OFFICIAL LIBRARY 042110.GLB; 6/18/10

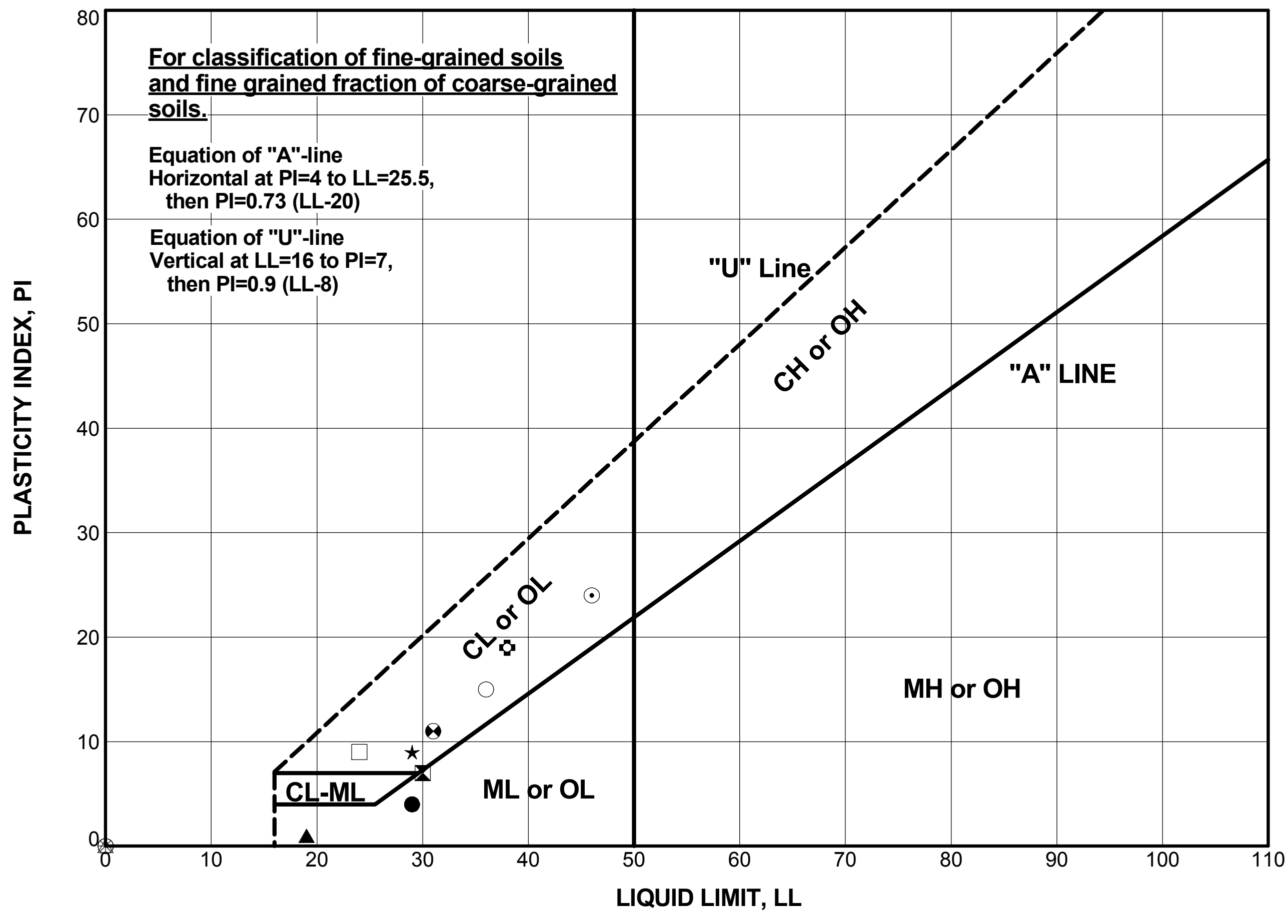
Engineering Support Services
Urban Levee Geotechnical Evaluations Program

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_204B	S05A_019_022T	20.5	●	7.4	NP	NP	NP	SILTY SAND (SM)
WR0017_204B	S07A_028_030T	29	⧗	33.6	43	22	21	LEAN CLAY (CL)
WR0017_205B	S05A_015_017C	15	▲	14.2	32	19	13	LEAN CLAY with SAND (CL)
WR0017_206B	S06A_018_021T	18	★	29.9	39	21	18	LEAN CLAY (CL)
WR0017_207B	S05A_013_014T	13.7	⊙	32.8	53	21	32	FAT CLAY (CH)
WR0017_207B	S07A_019_021T	19.25	✪	19.6	36	13	23	SANDY LEAN CLAY (CL)
WR0017_207B	S07A_019_021T	19.5	○	20.7	40	14	26	SANDY LEAN CLAY (CL)
WR0017_207B	S10A_026_029T	27.5	△	24.9	44	13	31	LEAN CLAY (CL)
WR0017_207B	S10A_026_029T	28	⊗		29	20	9	LEAN CLAY (CL)
WR0017_207B	S14A_038_040T	39	⊕		44	17	27	LEAN CLAY (CL)
WR0017_209B	S06A_017_019T	18.35	□	30.4	46	21	25	SANDY LEAN CLAY (CL)
WR0017_209B	S07A_020_023T	22.5	◉	16.9	26	14	12	CLAYEY SAND (SC)

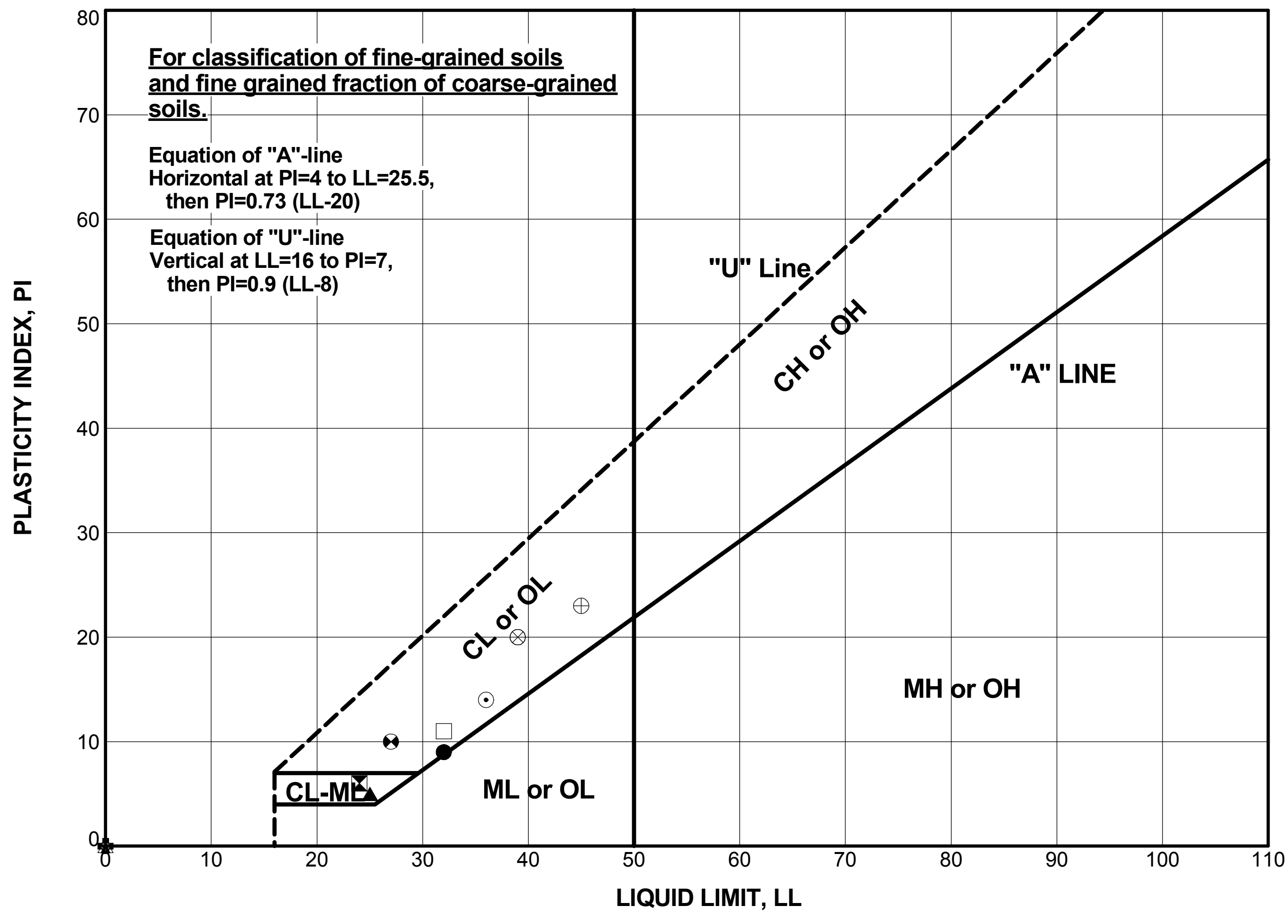


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_209B	S08A_025_027T	25.5	●	27.9	29	25	4	SILT (ML)
WR0017_209B	S08A_025_027T	26	⧗	28.6	30	23	7	SILT (ML)
WR0017_209B	S09A_028_030T	29.05	▲	23.5	19	18	1	SILTY SAND (SM)
WR0017_210B	S03B_008_010C	8.5	★	19.3	29	20	9	CLAYEY SAND (SC)
WR0017_210B	S07A_020_021T	20.45	⊙	28.7	46	22	24	LEAN CLAY (CL)
WR0017_210B	S07A_020_021T	20.5	✪	26.7	38	19	19	LEAN CLAY (CL)
WR0017_210B	S11A_031_033S	31	○	24.2	36	21	15	LEAN CLAY (CL)
WR0017_210B	S12A_034_037T	35.5	△	29.3	NP	NP	NP	SILTY SAND (SM)
WR0017_210B	S20A_058_061T	60	⊗	17.7	NP	NP	NP	Well-Graded SAND (GW)
WR0017_210B	S20A_058_061T	60.3	⊕	17.8	NP	NP	NP	Well-Graded SAND (GW)
WR0017_211B	S01A_002_004S	2	□	8.5	24	15	9	CLAYEY SAND (SC)
WR0017_211B	S08A_018_020T	19.5	⧓	18.5	31	20	11	CLAYEY SAND (SC)

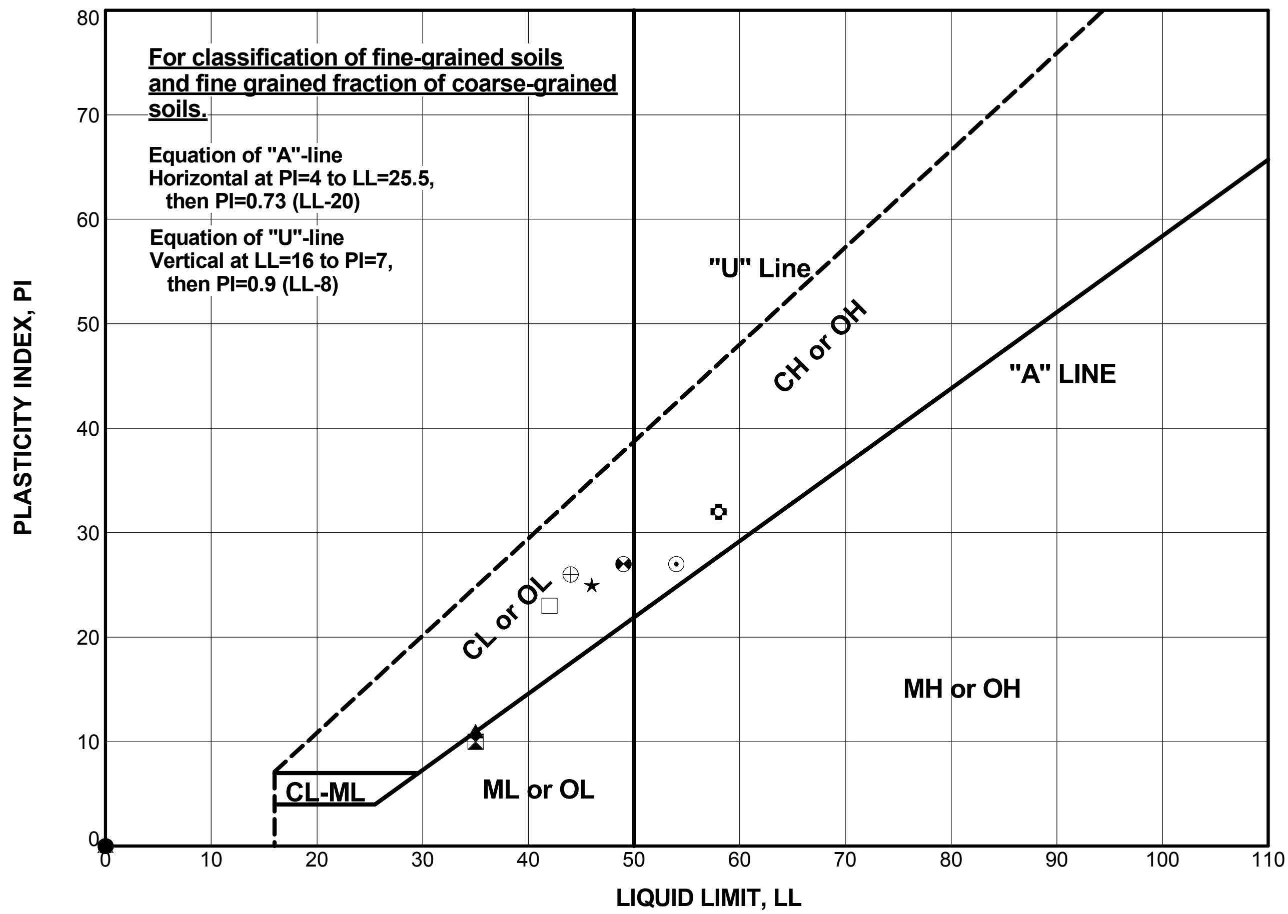
Levee Evaluations
Engineering Support Services

RD 17

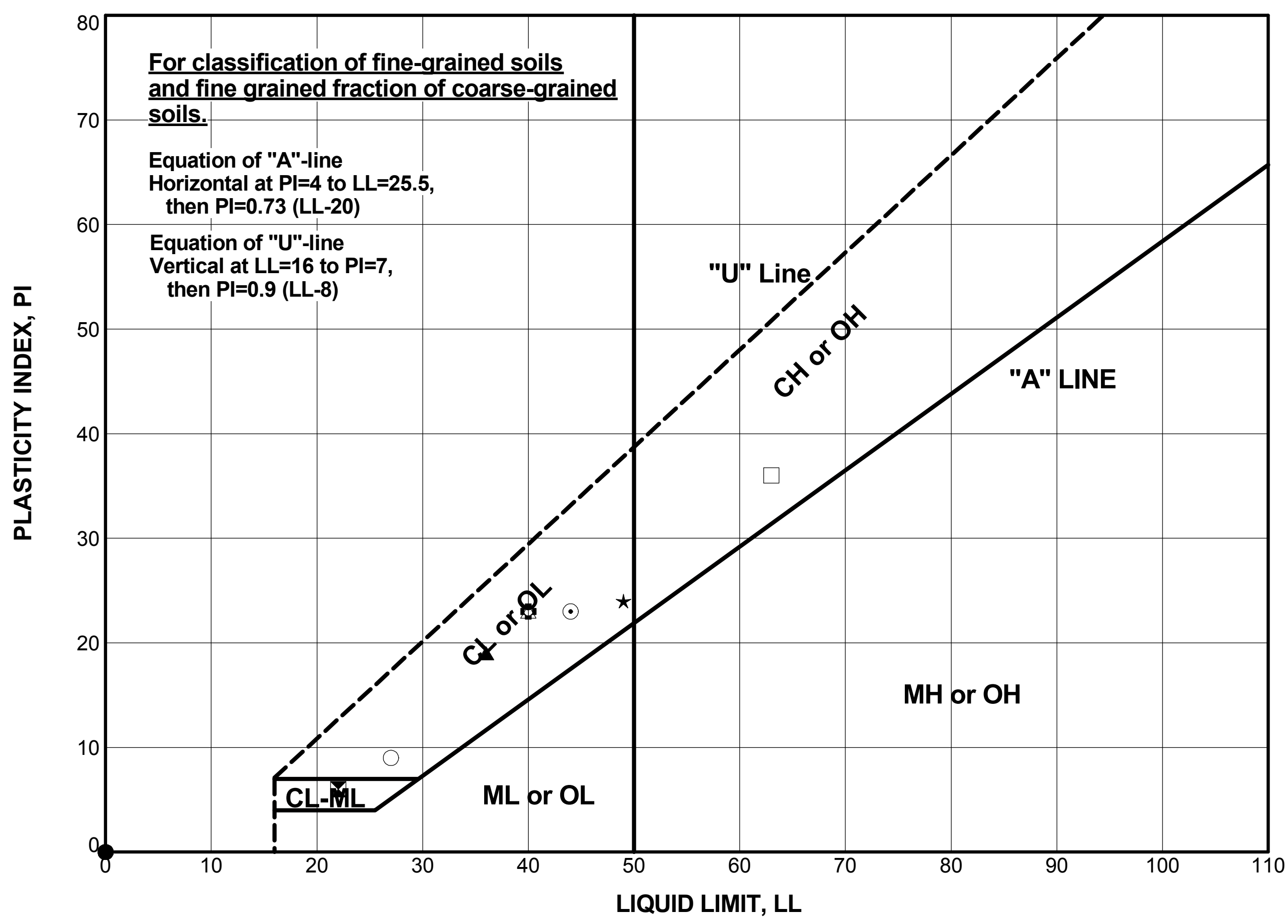
PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_211B	S14A_038_039C	38	●	26.8	32	23	9	SANDY LEAN CLAY (CL)
WR0017_212B	S03A_008_009C	8.5	⧗	11.9	24	18	6	SILTY, CLAYEY SAND (SC-SM)
WR0017_212B	S04A_010_013T	10.65	▲	10.2	25	20	5	SILTY, CLAYEY SAND (SC-SM)
WR0017_212B	S08A_022_025T	23.5	★	15.9	NP	NP	NP	SILTY SAND (SM)
WR0017_212B	S07A_019_021C	31	⊙	33.0	36	22	14	Poorly Graded SAND with Silt (SP-SM)
WR0017_212B	S12A_034_037T	34.3	✪	21.1	NP	NP	NP	SILTY SAND (SM)
WR0017_214B	S04A_015_017T	15.65	○	14.9	39	19	20	SANDY LEAN CLAY (CL)
WR0017_214B	S04A_015_017T	16	△		NP	NP	NP	SANDY LEAN CLAY (CL)
WR0017_214B	S05A_019_022T	19	⊗	20.2	39	19	20	LEAN CLAY with SAND (CL)
WR0017_214B	S07A_030_033T	32.6	⊕	29.8	45	22	23	SANDY LEAN CLAY (CL)
WR0017_215B	S05A_014_016T	15	□		32	21	11	SANDY LEAN CLAY (CL)
WR0017_215B	S06A_017_020T	19.5	⧓	19.1	27	17	10	CLAYEY SAND (SC)



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_216B	S05A_013_014T	13.5	●	3.9	NP	NP	NP	Poorly Graded SAND with Silt (SP-SM)
WR0017_216B	S06A_016_019T	18	⧗	27.0	35	25	10	SILTY CLAY (CL-ML)
WR0017_216B	S06A_016_019T	18.25	▲	25.6	35	24	11	LEAN CLAY (CL)
WR0017_216B	S07A_020_022T	20	★	32.5	46	21	25	LEAN CLAY (CL)
WR0017_216B	S08A_023_024T	23	⊙	41.9	54	27	27	FAT CLAY (CH)
WR0017_216B	S08A_023_024T	23.75	✪	47.1	58	26	32	FAT CLAY (CH)
WR0017_216B	S10A_028_029S	27.5	○		NP	NP	NP	SILTY SAND (SM)
WR0017_216B	S15B_044_045C	44.5	△	20.1	NP	NP	NP	Well-Graded SAND (SW)
WR0017_216B	S21A_062_064C	63	⊗	21.9	NP	NP	NP	Poorly Graded SAND with Silt (SP-SM)
WR0017_217B	S06A_017_019T	17.5	⊕	24.3	44	18	26	CLAYEY SAND (SC)
WR0017_217B	S06A_017_019T	17.75	□	24.7	42	19	23	CLAYEY SAND (SC)
WR0017_217B	S06A_017_019T	18	⊛	33.5	49	22	27	CLAYEY SAND (SC)

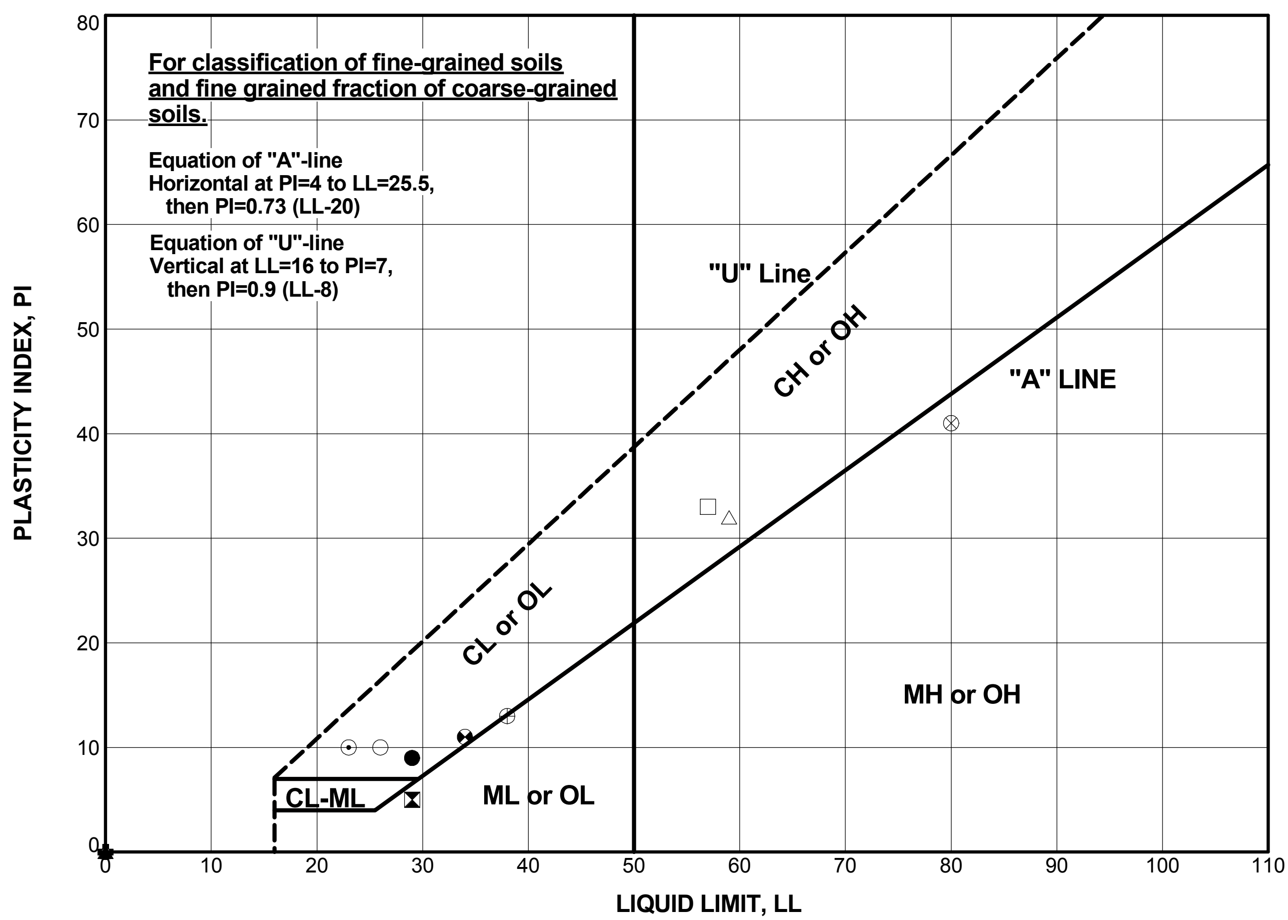


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_217B	S08A_022_024T	23.5	●	14.6	NP	NP	NP	SILTY SAND (SM)
WR0017_217B	S15A_042_045T	42	⧗	14.3	22	16	6	SILTY CLAY (CL-ML)
WR0017_218B	S05A_013_015T	13.75	▲	20.5	36	17	19	LEAN CLAY with SAND (CL)
WR0017_218B	S07A_020_022T	21	★	33.1	49	25	24	LEAN CLAY (CL)
WR0017_218B	S07A_020_022T	21.05	⊙	31.7	44	21	23	LEAN CLAY (CL)
WR0017_218B	S09A_026_028T	26.5	✪	34.1	40	17	23	LEAN CLAY (CL)
WR0017_218B	S11B_030_032C	31	○	26.9	27	18	9	LEAN CLAY with SAND (CL)
WR0017_218B	S13A_035_036C	35.5	△	22.7	40	17	23	LEAN CLAY with SAND (CL)
WR0017_218B	S14A_038_041T	39.75	⊗	28.5	NP	NP	NP	SANDY SILT (ML)
WR0017_218B	S22A_061_063C	61.5	⊕	26.1	NP	NP	NP	Poorly Graded SAND with Silt (SP-SM)
WR0017_219B	S02B_005_006C	6	□	28.9	63	27	36	FAT CLAY with SAND (CH)
WR0017_219B	S04A_010_012T	11.25	⊛	7.0	NP	NP	NP	SILTY SAND (SM)

Levee Evaluations
Engineering Support Services

RD 17

PLASTICITY CHART



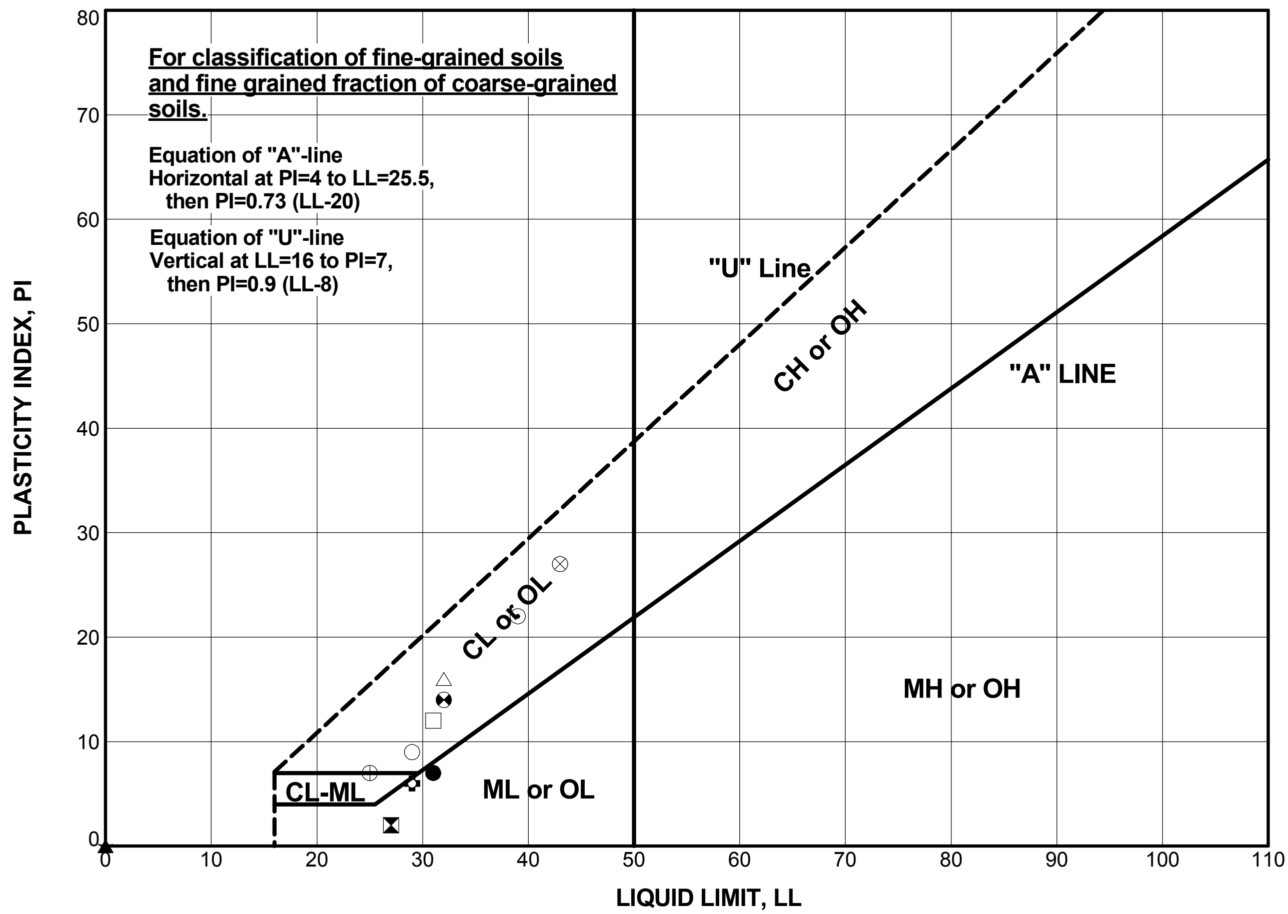
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_219B	S04A_010_012T	11.5	●	18.9	29	20	9	SANDY LEAN CLAY (CL)
WR0017_219B	S06A_017_019T	18	⧗	30.6	29	24	5	SANDY SILT (ML)
WR0017_219B	S08A_023_025T	23.95	▲	27.4	NP	NP	NP	SILTY SAND (SM)
WR0017_219B	S10A_030_033T	32	★	21.5	NP	NP	NP	Poorly Graded SAND (SP)
WR0017_219B	S14A_041_044T	43	⊙	15.9	23	13	10	SANDY LEAN CLAY (CL)
WR0017_219B	S17A_051_054T	53.75	✪	28.2	NP	NP	NP	SANDY LEAN CLAY (CL)
WR0017_219B	S19A_058_060T	59.5	○	28.9	26	16	10	CLAYEY SAND (SC)
WR0017_220B	S03B_008_010C	9.1	△	17.9	59	27	32	CLAYEY SAND (SC)
WR0017_220B	S04A_011_012T	11	⊗	25.5	80	39	41	SILTY SAND (SM)
WR0017_220B	S04A_011_012T	11.5	⊕	21.7	38	25	13	SILT with SAND (ML)
WR0017_220B	S06A_019_022T	18.5	□	29.2	57	24	33	FAT CLAY (CH)
WR0017_221B	S04A_011_014T	11	⊛	19.1	34	23	11	LEAN CLAY with SAND (CL)

Levee Evaluations
Engineering Support Services

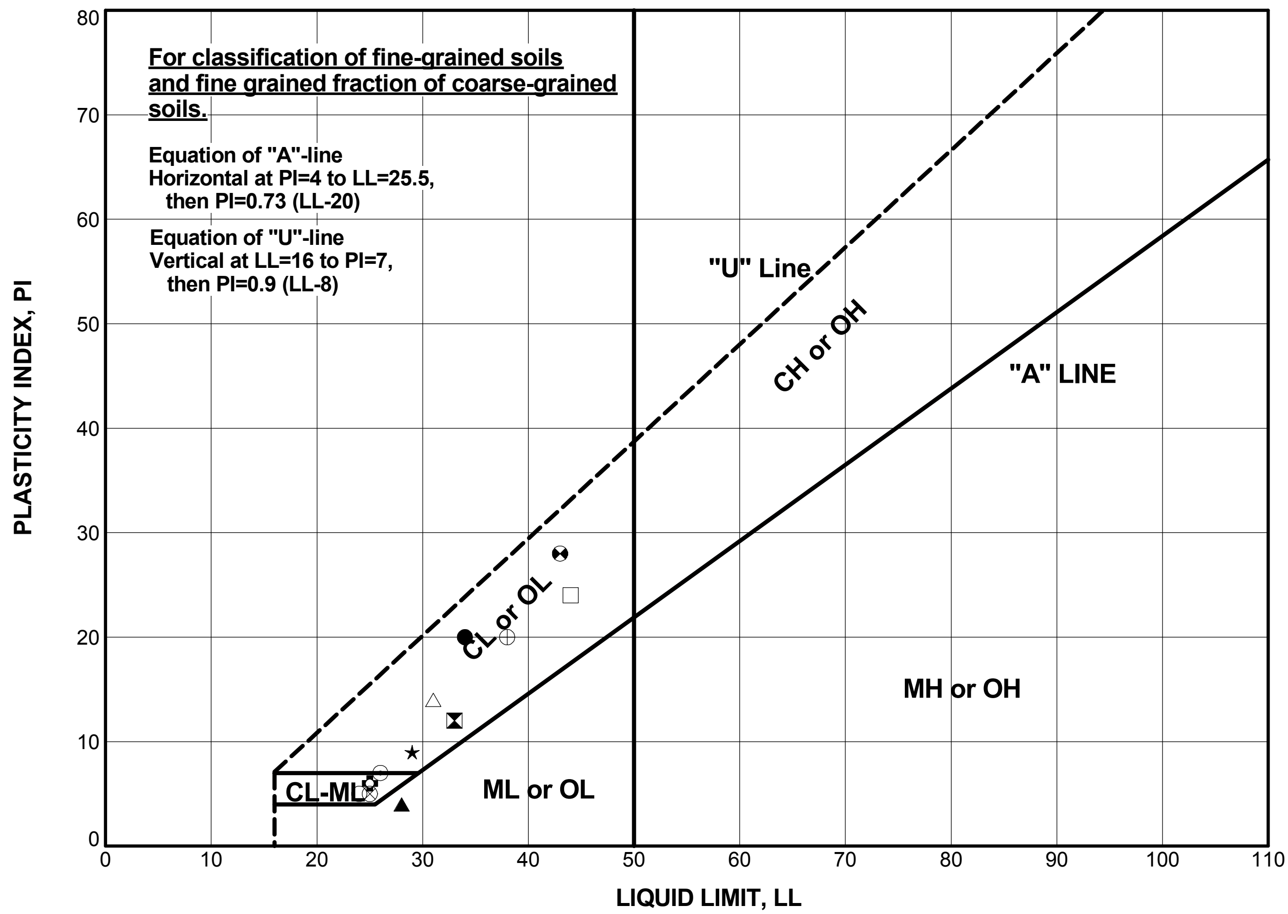
RD 17

PLASTICITY CHART

Sheet 6 of 24



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_221B	S05A_014_016T	14	●	18.6	31	24	7	SANDY SILT (ML)
WR0017_221B	S09A_028_031T	30.1	⧗	28.6	27	25	2	SILTY SAND (SM)
WR0017_221B	S13A_039_042T	40.5	▲	27.3	NP	NP	NP	SANDY SILT (ML)
WR0017_223B	S04A_015_08T	16.45	★	15.7	NP	NP	NP	SILTY SAND (SM)
WR0017_223B	S05A_020_022T	21.3	⊙	38.9	39	17	22	SANDY LEAN CLAY (CL)
WR0017_223B	S08A_035_037T	35.95	✿	28.8	29	23	6	SANDY LEAN CLAY (CL)
WR0017_223B	S08A_035_037T	36	○	26.3	29	20	9	SANDY LEAN CLAY (CL)
WR0017_223B	S14A_060_061C	60.5	△	20.4	32	16	16	LEAN CLAY (CL)
WR0017_224B	S07A_020_023T	21.5	⊗	36.9	43	16	27	LEAN CLAY (CL)
WR0017_224B	S08A_024_026T	24	⊕	24.3	25	18	7	SILTY CLAY with SAND (CL-ML)
WR0017_224B	S14A_044_047T	45.5	□	23.5	31	19	12	LEAN CLAY (CL)
WR0017_225B	S02A_007_008C	7	◕	21.5	32	18	14	LEAN CLAY with SAND (CL)

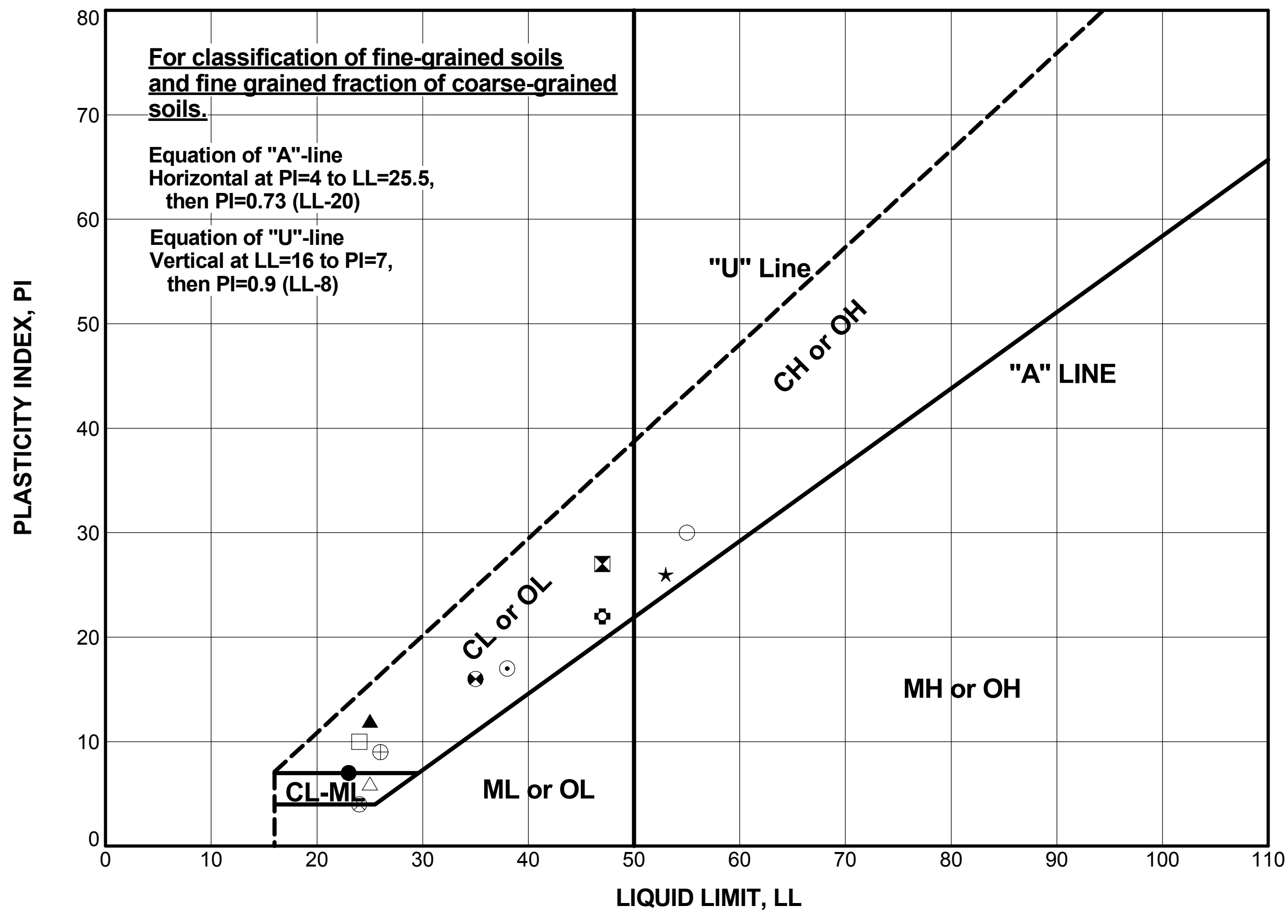


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_225B	S03A_010_012T	11.65	●	14.5	34	14	20	LEAN CLAY with Sand (CL)
WR0017_225B	S04A_015_018T	17	⧗	32.7	33	21	12	LEAN CLAY with Sand (CL)
WR0017_225B	S06A_026_028T	27	▲	23.7	28	24	4	SILTY SAND (SM)
WR0017_226B	S03A_030_032T	31.1	★	35.4	29	20	9	LEAN CLAY with SAND (CL)
WR0017_227B	S03A_010_013T	10.5	⊙	23.4	26	19	7	SILTY CLAY with SAND (CL-ML)
WR0017_227B	S04A_016_018T	16.2	✪	24.0	25	19	6	SILTY CLAY (CL-ML)
WR0017_227B	S04A_016_018T	16.5	○	25.4	24	19	5	SANDY SILTY CLAY (CL-ML)
WR0017_227B	S04A_016_018T	17	△	26.6	31	17	14	SANDY LEAN CLAY (CL)
WR0017_227B	S04A_016_018T	17.2	⊗	27.3	25	20	5	SANDY LEAN CLAY (CL)
WR0017_227B	S07A_026_028T	27.1	⊕	34.2	38	18	20	LEAN CLAY (CL)
WR0017_227B	S07A_026_028T	27.2	□	37.9	44	20	24	LEAN CLAY (CL)
WR0017_227B	S07A_026_028T	27.5	⊛	28.3	43	15	28	LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

RD 17

PLASTICITY CHART

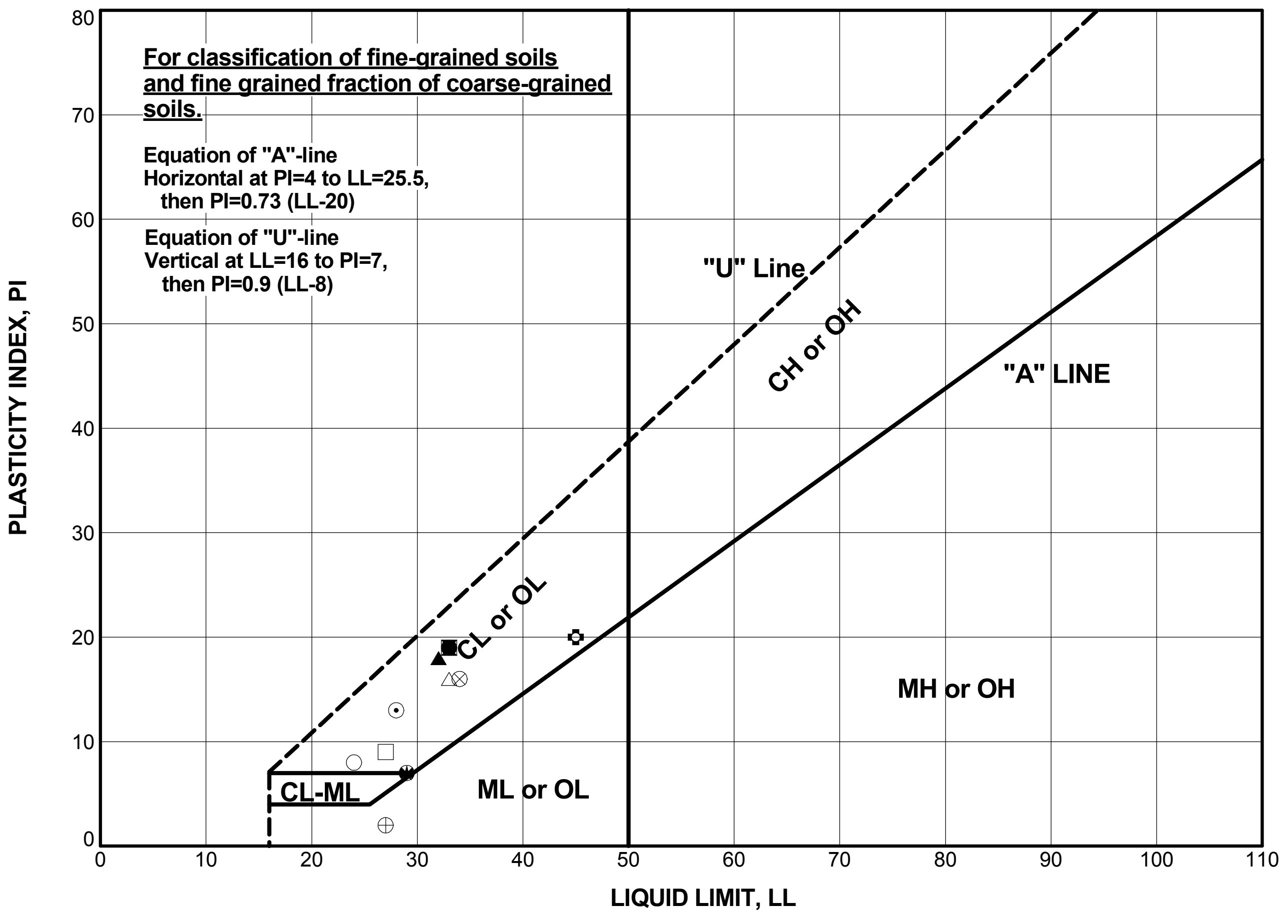


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_228B	S03A_009_011C	10.3	●	11.7	23	16	7	SILTY, CLAYEY SAND (SC-SM)
WR0017_228B	S07A_025_027T	25.95	⧗	33.5	47	20	27	LEAN CLAY (CL)
WR0017_228B	S12A_045_047C	47.3	▲	17.0	25	13	12	CLAYEY SAND (SC)
WR0017_229B	S04A_015_018T	16	★	41.7	53	27	26	LEAN to FAT CLAY (CL)
WR0017_229B	S04A_015_018T	16.35	⊙	29.1	38	21	17	LEAN to FAT CLAY (CL)
WR0017_229B	S04A_015_018T	16.4	✿	38.8	47	25	22	LEAN to FAT CLAY (CL)
WR0017_229B	S04A_015_018T	17	○	41.4	55	25	30	FAT CLAY (CH)
WR0017_229B	S06A_025_028T	26	△	27.8	25	19	6	SILTY CLAY (CL-ML)
WR0017_229B	S06A_025_028T	26.5	⊗	29.1	24	20	4	SILTY CLAY (CL-ML)
WR0017_229B	S06A_025_028T	26.7	⊕	27.8	26	17	9	SILTY CLAY (CL-ML)
WR0017_230B	S04B_010_011C	10.5	□	13.9	24	14	10	SANDY LEAN CLAY (CL)
WR0017_230B	S09A_027_029T	27.2	⊛	20.4	35	19	16	LEAN CLAY (CL)

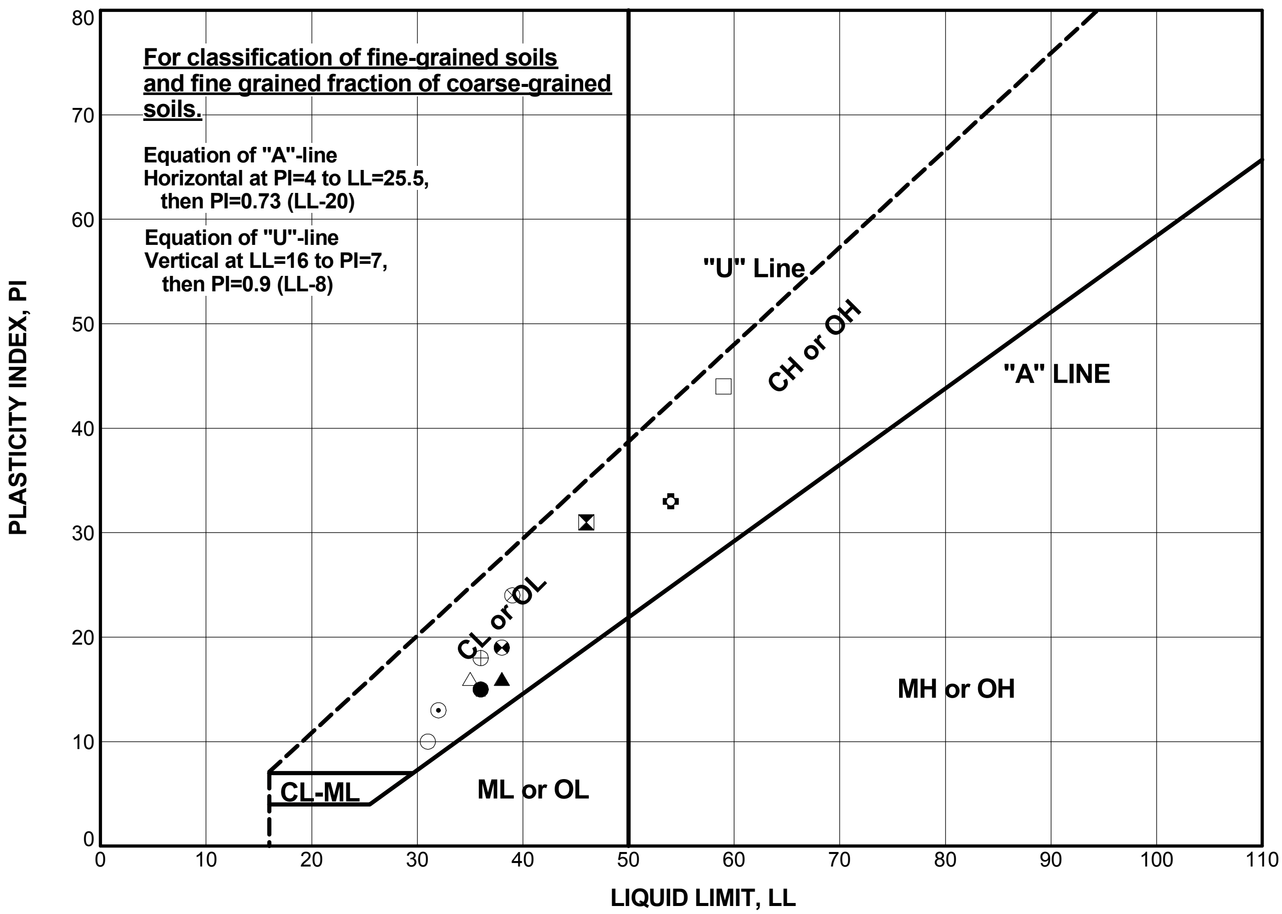
Levee Evaluations
Engineering Support Services

RD 17

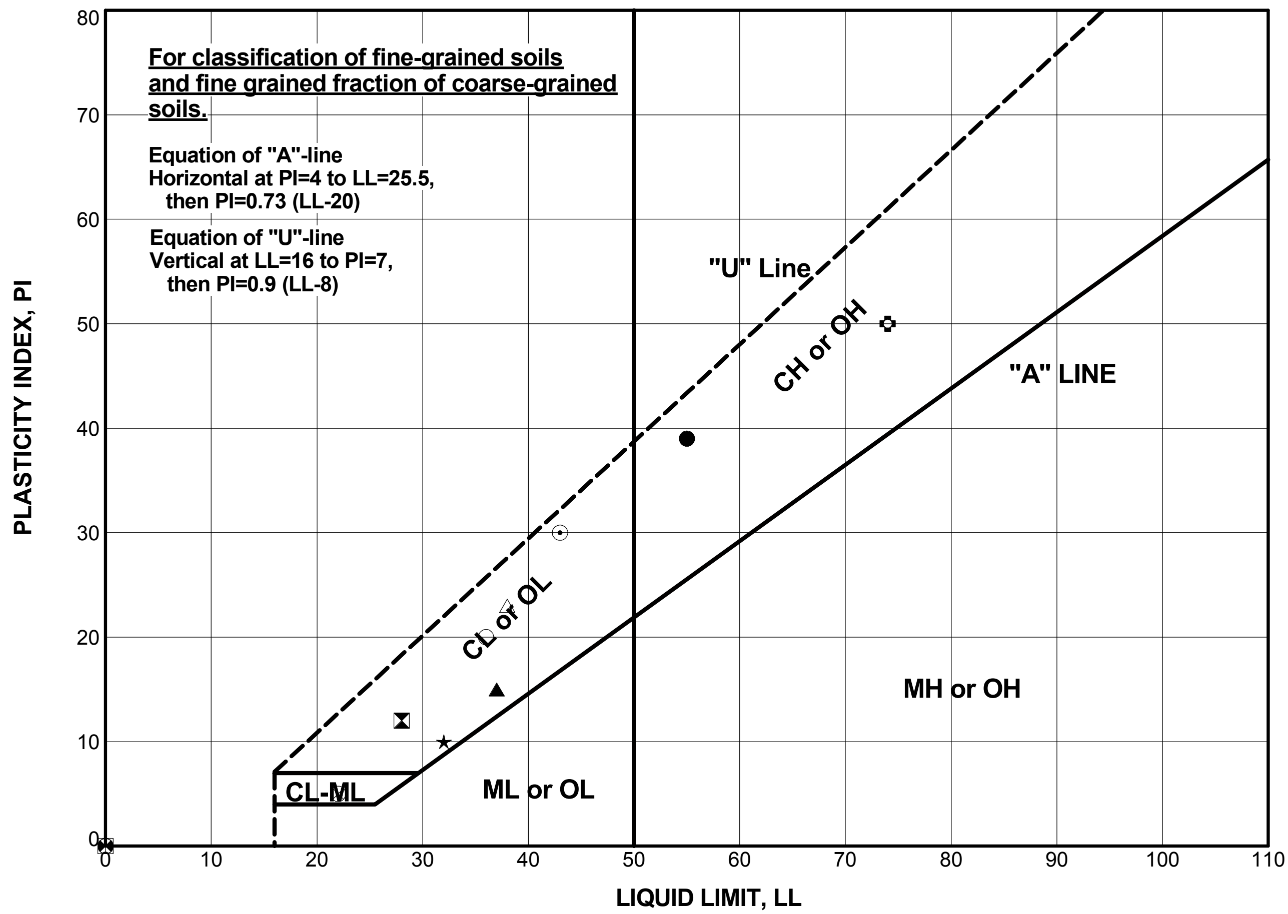
PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_230B	S12A_039_040S	39.8	●	23.1	33	14	19	CLAYEY SAND (SC)
WR0017_230B	S13A_043_044S	43	⧗		33	14	19	SANDY LEAN CLAY (CL)
WR0017_230B	S14B_046_047S	46	▲		32	14	18	SANDY LEAN CLAY (CL)
WR0017_230B	S16A_052_054T	52.75	★	29.4	29	22	7	Poorly Graded SAND with Silt (SP-SM)
WR0017_231B	S02A_006_008T	7.35	⊙	10.8	28	15	13	LEAN CLAY (CL)
WR0017_231B	S05A_018_020T	19	✪	37.3	45	25	20	LEAN CLAY (CL)
WR0017_232B	S06A_019_020T	19.65	○	23.6	24	16	8	CLAYEY SAND (SC)
WR0017_232B	S07A_022_024C	23	△	24.0	33	17	16	LEAN CLAY (CL)
WR0017_233B	S03A_013_014S	13	⊗		34	18	16	SANDY LEAN CLAY (CL)
WR0017_233B	S04A_015_018T	17.65	⊕	28.2	27	25	2	SILT with Sand (ML)
WR0017_233B	S06A_025_028T	27.5	□	26.4	27	18	9	SANDY LEAN CLAY (CL)
WR0017_233B	S07A_030_032T	31	⊕	27.6	29	22	7	LEAN CLAY (CL)



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_233B	S07A_030_032T	31.2	●	27.8	36	21	15	LEAN CLAY (CL)
WR0017_233B	S13A_059_061T	59.5	⧗	22.8	46	15	31	LEAN CLAY with Sand (CL)
WR0017_234B	S05A_012_014S	12	▲	18.7	38	22	16	LEAN CLAY (CL)
WR0017_234B	S06A_016_017T	16.5	★	25.8	36	21	15	CLAYEY SAND (SC)
WR0017_235B	S04A_017_019T	18.55	⊙	21.8	32	19	13	LEAN CLAY (CL)
WR0017_235B	S05A_022_024T	22.5	✪	28.0	54	21	33	FAT CLAY (CH)
WR0017_236B	S03A_010_012S	10	○	10.4	31	21	10	LEAN CLAY (CL)
WR0017_236B	S07A_030_032C	31	△	28.7	35	19	16	SANDY LEAN CLAY (CL)
WR0017_238B	S03B_008_010C	8.5	⊗	22.1	39	15	24	LEAN CLAY with SAND (CL)
WR0017_238B	S05A_014_016S	14.5	⊕	21.6	36	18	18	LEAN CLAY with SAND (CL)
WR0017_238B	S06B_017_018C	17.5	□	8.6	59	15	44	FAT CLAY (CH)
WR0017_238B	S08A_024_026T	25	⊛	34.6	38	19	19	LEAN CLAY with Sand (CL)



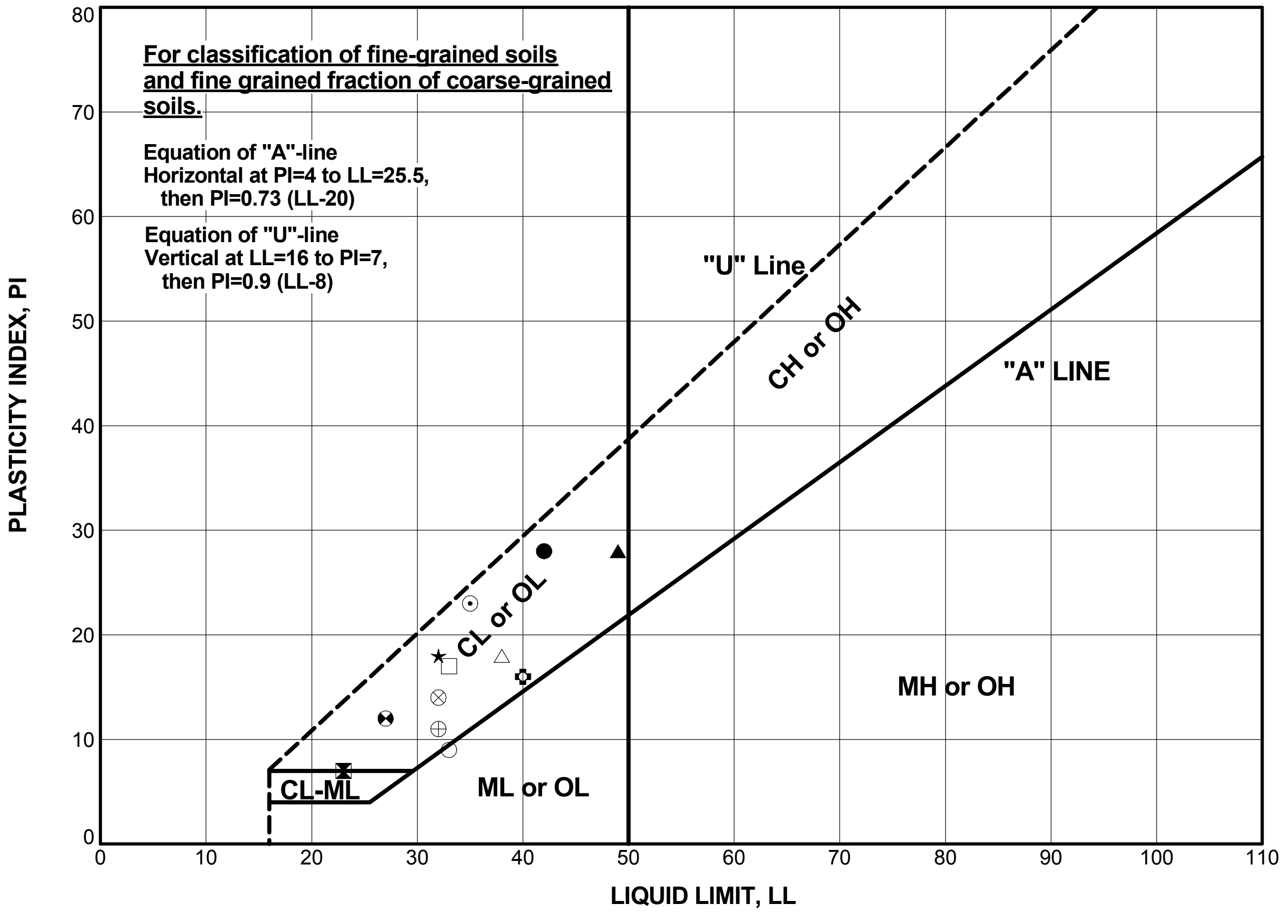
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_238B	S12A_039_040S	38.5	●	23.9	55	16	39	SILTY SAND (SM)
WR0017_239B	S02A_005_007S	5	⧗		28	16	12	CLAYEY SAND (SC)
WR0017_239B	S06A_018_020S	18	▲	23.5	37	22	15	SANDY LEAN CLAY (CL)
WR0017_239B	S09A_027_029T	28	★	34.4	32	22	10	SILTY SAND (SM)
WR0017_240B	S02B_007_009C	7.5	⊙	30.8	43	13	30	LEAN CLAY with SAND (CL)
WR0017_241B	S05A_009_010T	10.5	✪	44.7	74	24	50	FAT CLAY with Sand (CH)
WR0017_241B	S06A_012_013C	12.5	○	24.4	36	16	20	LEAN CLAY with Sand (CL)
WR0017_241B	S12A_026_028T	27	△	20.4	38	15	23	CLAYEY SAND (SC)
WR0017_243B	S03A_008_010T	9.45	⊗	20.3	22	17	5	SILTY, CLAYEY SAND (SC-SM)
WR0017_243B	S06A_019_021T	19.5	⊕	27.8	NP	NP	NP	Poorly Graded SAND (SP)
WR0017_243B	S06A_019_021T	20	□	24.0	NP	NP	NP	Poorly Graded SAND (SP)
WR0017_243B	S08A_023_025T	23.65	◍	10.1	NP	NP	NP	Poorly Graded SAND (SP)

Levee Evaluations
Engineering Support Services

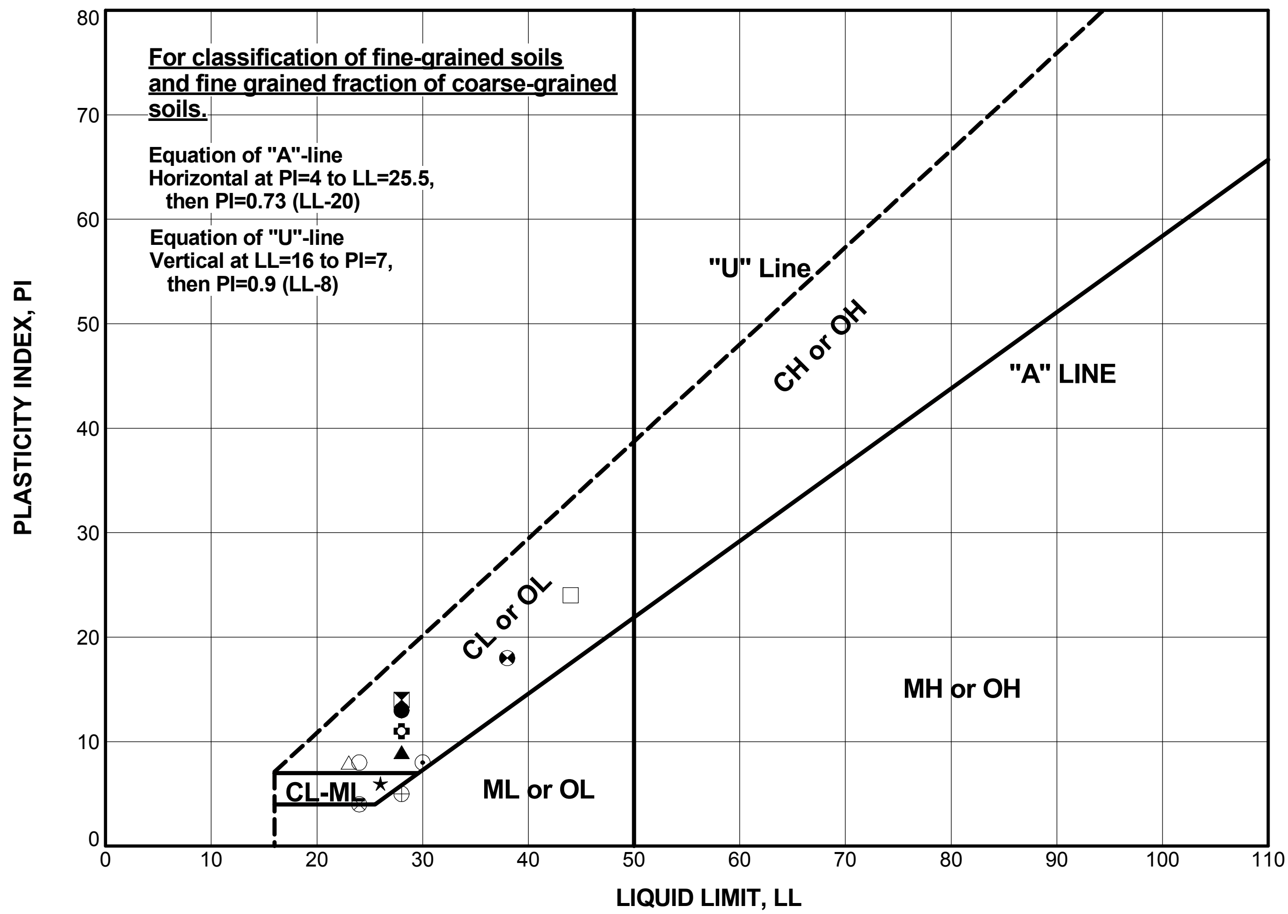
RD 17

PLASTICITY CHART

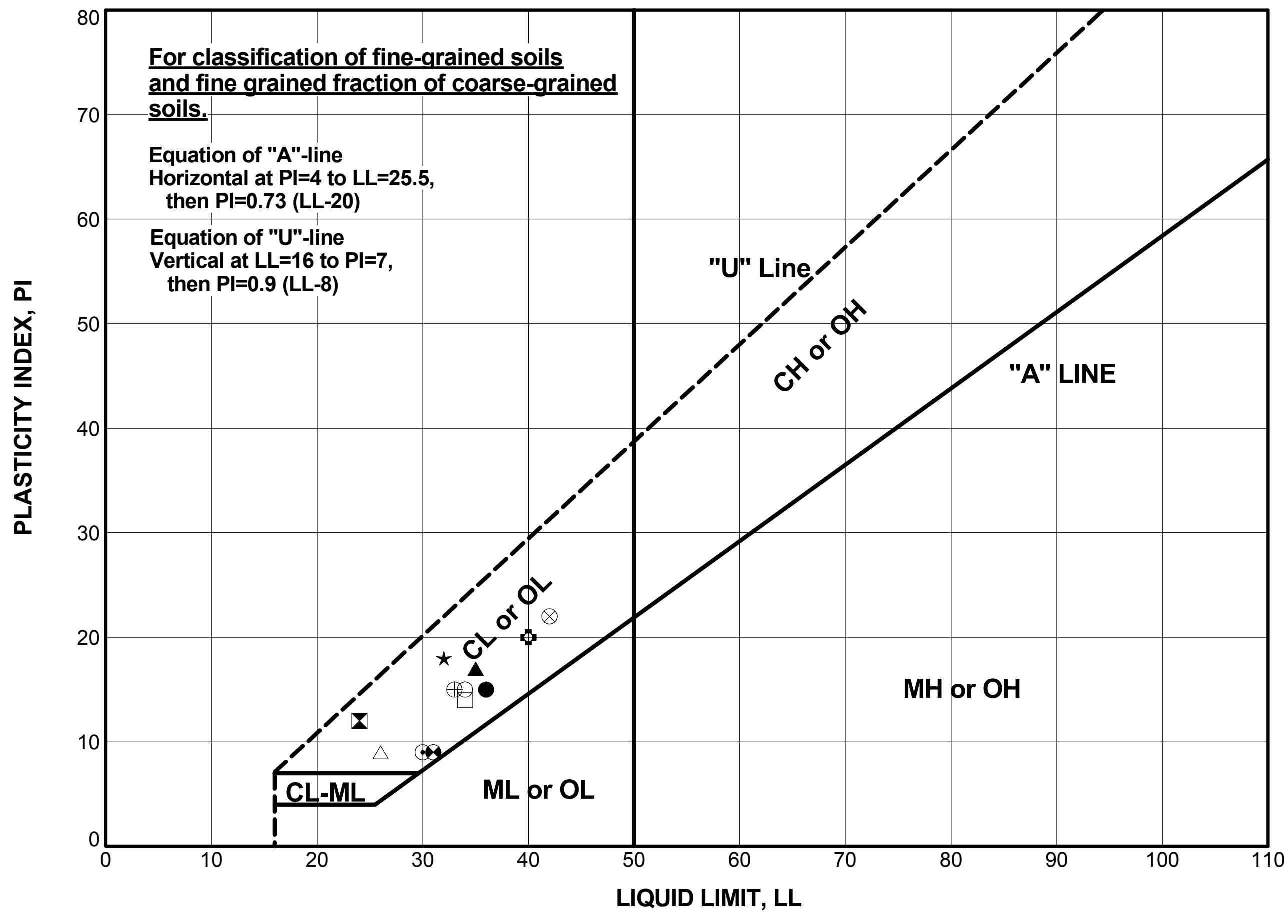
Sheet 12 of 24



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_243B	S08A_023_025T	24.45	●	23.5	42	14	28	LEAN CLAY with Sand (CL)
WR0017_245B	S05A_012_014S	12	⧗	20.0	23	16	7	SANDY SILTY CLAY (CL-ML)
WR0017_247B	S04A_008_010S	9	▲	34.6	49	21	28	LEAN CLAY with Sand (CL)
WR0017_248B	S01A_004_005B	4	★	9.7	32	14	18	LEAN CLAY with SAND (CL)
WR0017_248B	S02A_007_009S	8	⊙	13.4	35	12	23	CLAYEY SAND (SC)
WR0017_249B	S03A_006_007C	6	✪	33.6	40	24	16	SANDY LEAN CLAY (CL)
WR0017_249B	S09A_017_018S	17	○	26.7	33	24	9	SANDY SILT (ML)
WR0017_250B	S05A_010_012C	11	△	29.2	38	20	18	LEAN CLAY (CL)
WR0017_252B	S01A_002_003B	2	⊗		32	18	14	SANDY LEAN CLAY (CL)
WR0017_252B	S02A_004_006C	5	⊕	15.5	32	21	11	LEAN CLAY with Sand (CL)
WR0017_253B	S03B_010_011C	11	□		33	16	17	SANDY LEAN CLAY (CL)
WR0017_253B	S04A_015_017T	15.45	⊛	17.2	27	15	12	SANDY LEAN CLAY (CL)



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_253B	S04A_015_017T	15.5	●	16.4	28	15	13	SANDY LEAN CLAY (CL)
WR0017_253B	S04A_015_017T	15.65	⧗	17.7	28	14	14	SANDY LEAN CLAY (CL)
WR0017_253B	S06A_023_026T	25	▲	18.5	28	19	9	SANDY LEAN CLAY (CL)
WR0017_253B	S07A_028_030T	29.2	★	26.8	26	20	6	SILTY CLAY with SAND (CL-ML)
WR0017_253B	S08A_033_035T	34	⊙	27.7	30	22	8	SANDY SILT (ML)
WR0017_254B	S01A_002_003B	2	✿	16.5	28	17	11	SANDY LEAN CLAY (CL)
WR0017_254B	S03A_007_009S	7.5	○	24.0	24	16	8	CLAYEY SAND (SC)
WR0017_254B	S04A_009_010P	9	△	22.2	23	15	8	CLAYEY SAND (SC)
WR0017_254B	S05A_012_014S	12.5	⊗	21.8	24	20	4	SANDY SILTY CLAY (CL-ML)
WR0017_254B	S07A_017_019S	18	⊕	29.8	28	23	5	SILT with SAND (ML)
WR0017_255B	S09A_017_019S	18	□	37.7	44	20	24	LEAN CLAY (CL)
WR0017_256B	S10A_018_019P	18.5	⧓	31.2	38	20	18	LEAN CLAY (CL)



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_256B	S12B_022_023S	22.5	●	28.7	36	21	15	LEAN CLAY (CL)
WR0017_257B	S01A_002_003S	2	⧗	10.6	24	12	12	CLAYEY SAND (SC)
WR0017_257B	S04A_005_007P	6.5	▲	26.0	35	18	17	SANDY LEAN CLAY (CL)
WR0017_258B	S03B_004_004P	5.5	★		32	14	18	CLAYEY SAND (SC)
WR0017_258B	S06A_012_014S	13	⊙	23.6	30	21	9	LEAN CLAY with SAND (CL)
WR0017_259B	S01A_001_003B	2	✪		40	20	20	LEAN CLAY with SAND (CL)
WR0017_259B	S03A_005_007S	6	○	16.7	34	19	15	SANDY LEAN CLAY (CL)
WR0017_260B	S02A_003_005B	3	△	8.7	26	17	9	CLAYEY SAND (SC)
WR0017_261B	S04B_009_010P	9.5	⊗		42	20	22	SANDY LEAN CLAY (CL)
WR0017_262B	S02A_005_007S	6	⊕	17.6	33	18	15	SANDY LEAN CLAY (CL)
WR0017_262B	S04A_010_012S	11	□	21.8	34	20	14	LEAN CLAY with SAND (CL)
WR0017_262B	S05A_012_014S	13	⊛	26.3	31	22	9	SANDY LEAN CLAY (CL)

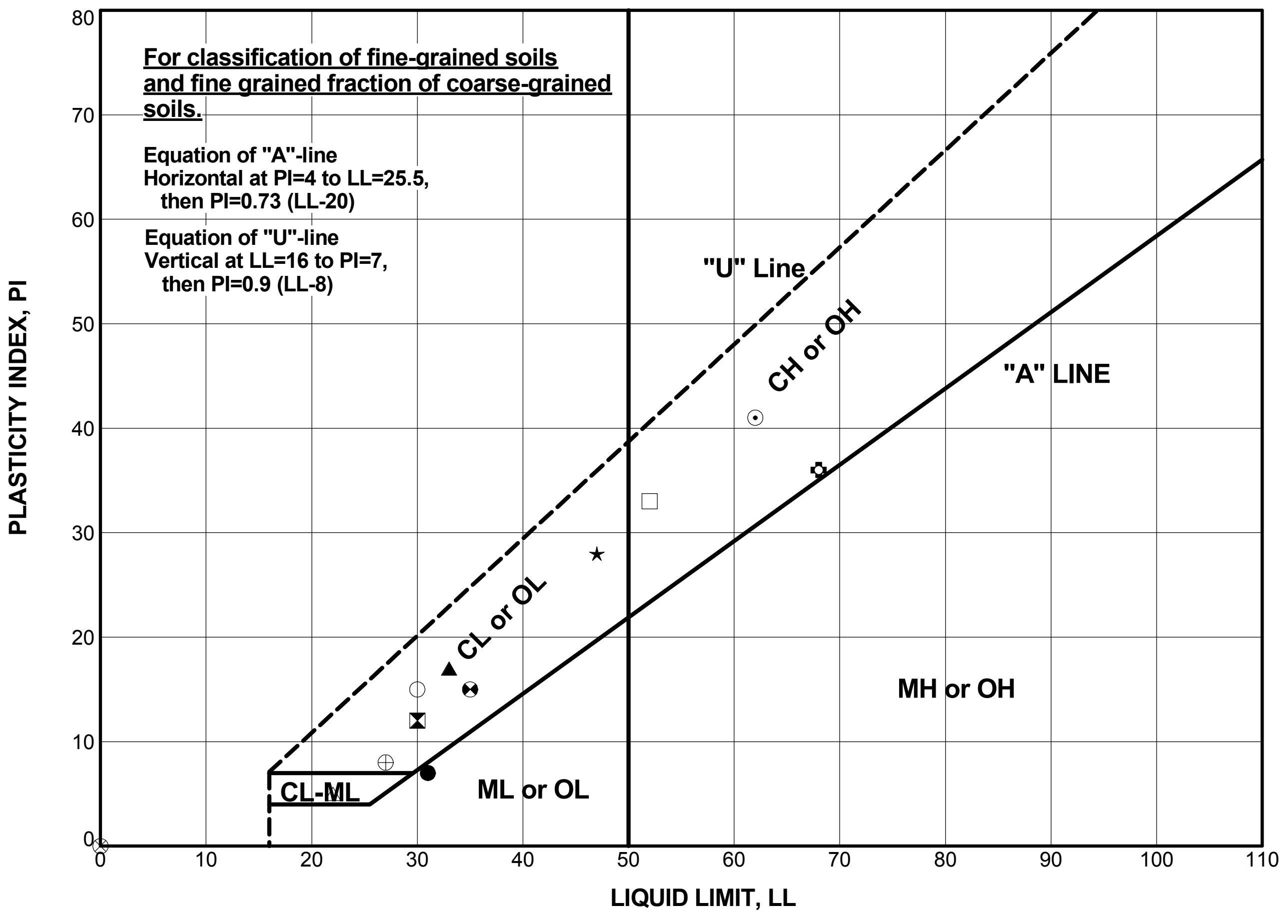
DWR LEVEE U/NU ATT. PLOT (U LINE) REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA

Levee Evaluations
Engineering Support Services

RD 17

PLASTICITY CHART

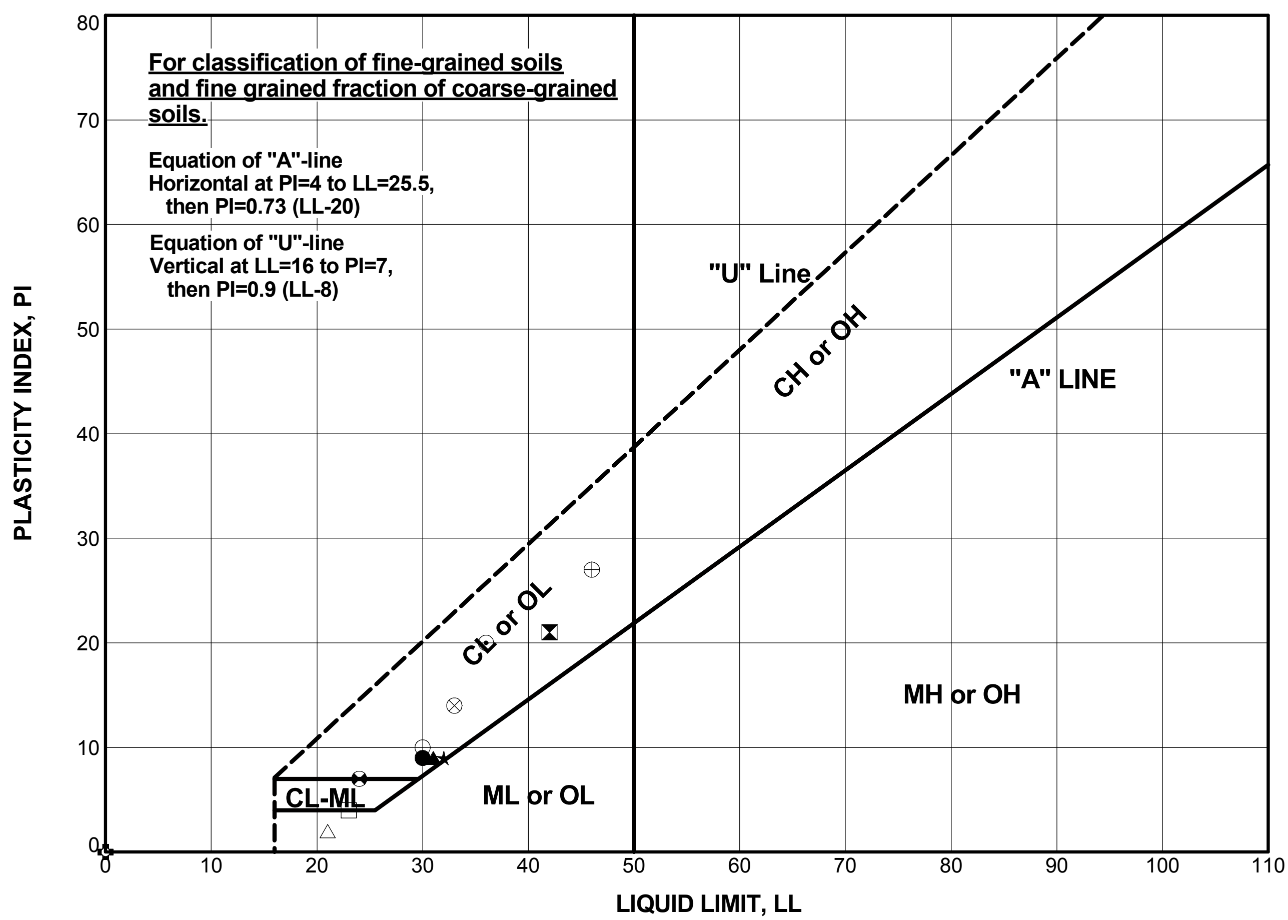


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_262B	S06A_015_016P	14.5	●	30.5	31	24	7	SANDY SILT (ML)
WR0017_262B	S09A_022_024S	23	⧗		30	18	12	SANDY LEAN CLAY (CL)
WR0017_263B	S01A_002_002B	1.5	▲		33	16	17	CLAYEY SAND (SC)
WR0017_263B	S04C_007_008P	7.5	★	28.2	47	19	28	SILTY SAND (SM)
WR0017_264B	S05A_010_012T	11	⊙	34.0	62	21	41	FAT CLAY (CH)
WR0017_264B	S05A_010_012T	11.2	✪	51.6	68	32	36	FAT CLAY (CH)
WR0017_264B	S06A_015_015M	14.75	○	17.2	30	15	15	SANDY LEAN CLAY (CL)
WR0017_264B	S07A_017_018T	17.5	△	22.2	22	17	5	SANDY SILTY CLAY (CL-ML)
WR0017_264B	S09A_025_027T	26	⊗	23.0	NP	NP	NP	Poorly Graded SAND (SP)
WR0017_265B	S02A_006_008T	7	⊕	31.7	27	19	8	LEAN to FAT CLAY with Sand (CL)
WR0017_265B	S02A_006_008T	7.4	□	14.8	52	19	33	FAT CLAY with SAND (CH)
WR0017_265B	S06A_021_023T	21.5	⊛	24.6	35	20	15	SANDY LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

RD 17

PLASTICITY CHART

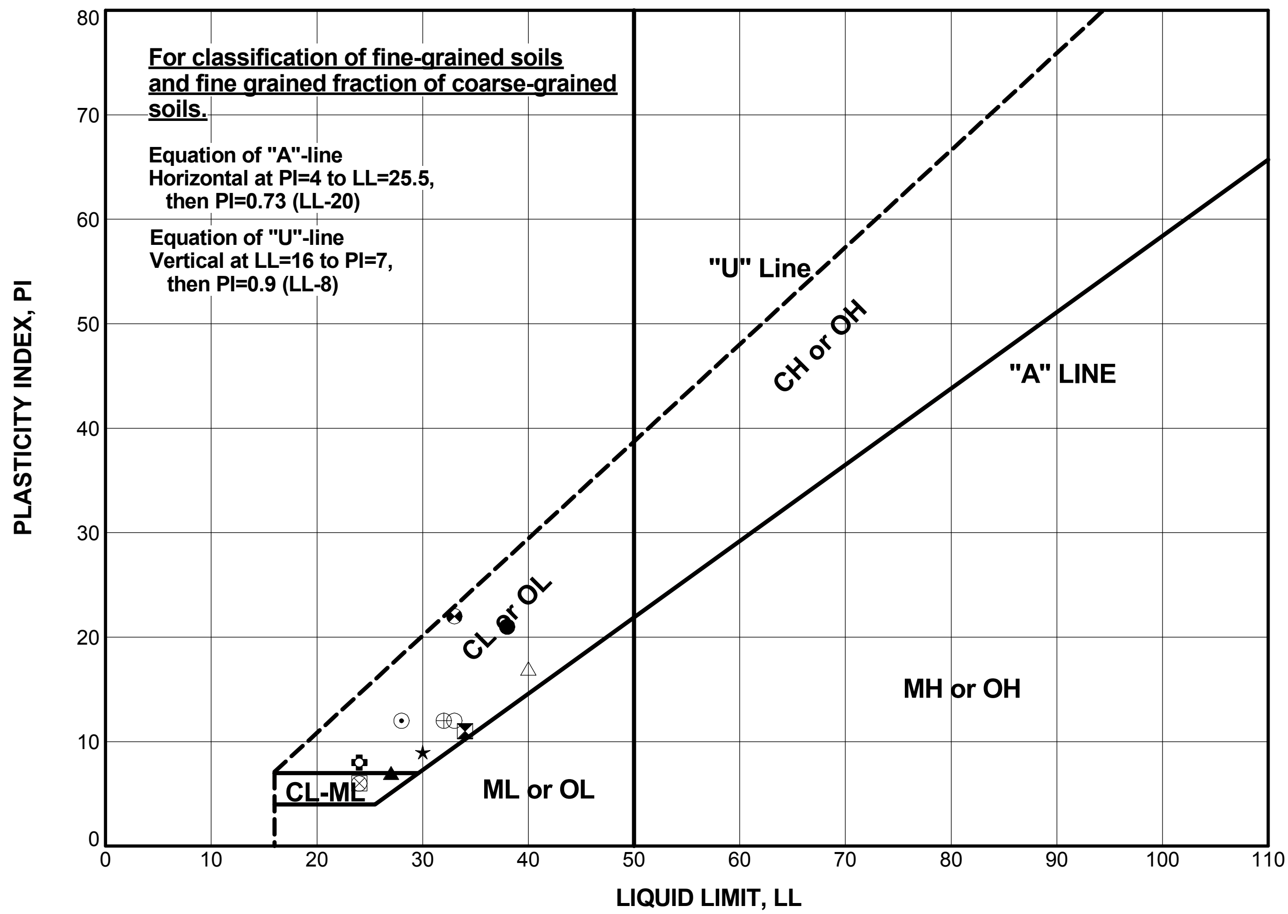


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_265B	S06A_021_023T	21.6	●	18.0	30	21	9	SANDY LEAN CLAY (CL)
WR0017_265B	S06A_021_023T	22	⧗	23.9	42	21	21	SANDY LEAN CLAY (CL)
WR0017_265B	S08A_029_030T	29	▲	28.8	31	22	9	LEAN CLAY (CL)
WR0017_265B	S08A_029_030T	29.5	★	28.2	32	23	9	LEAN CLAY (CL)
WR0017_266B	S01A_000_001B	0.5	⊙	17.6	36	16	20	LEAN CLAY with SAND (CL)
WR0017_266B	S02A_001_002B	1	✪	8.1	NP	NP	NP	SILTY SAND (SM)
WR0017_266B	S03A_002_003B	2.5	○	12.1	30	20	10	SANDY LEAN CLAY (CL)
WR0017_266B	S08A_012_014S	13	△	28.9	21	19	2	SILTY SAND (SM)
WR0017_267B	S03A_003_005S	4	⊗	9.4	33	19	14	SANDY LEAN CLAY (CL)
WR0017_268B	S01A_001_003S	2	⊕	17.9	46	19	27	LEAN CLAY with Sand (CL)
WR0017_268B	S03A_007_009S	8	□	21.9	23	19	4	SANDY SILTY CLAY (CL-ML)
WR0017_269B	S03A_007_009S	8	◍	16.5	24	17	7	SILTY, CLAYEY SAND (SC-SM)

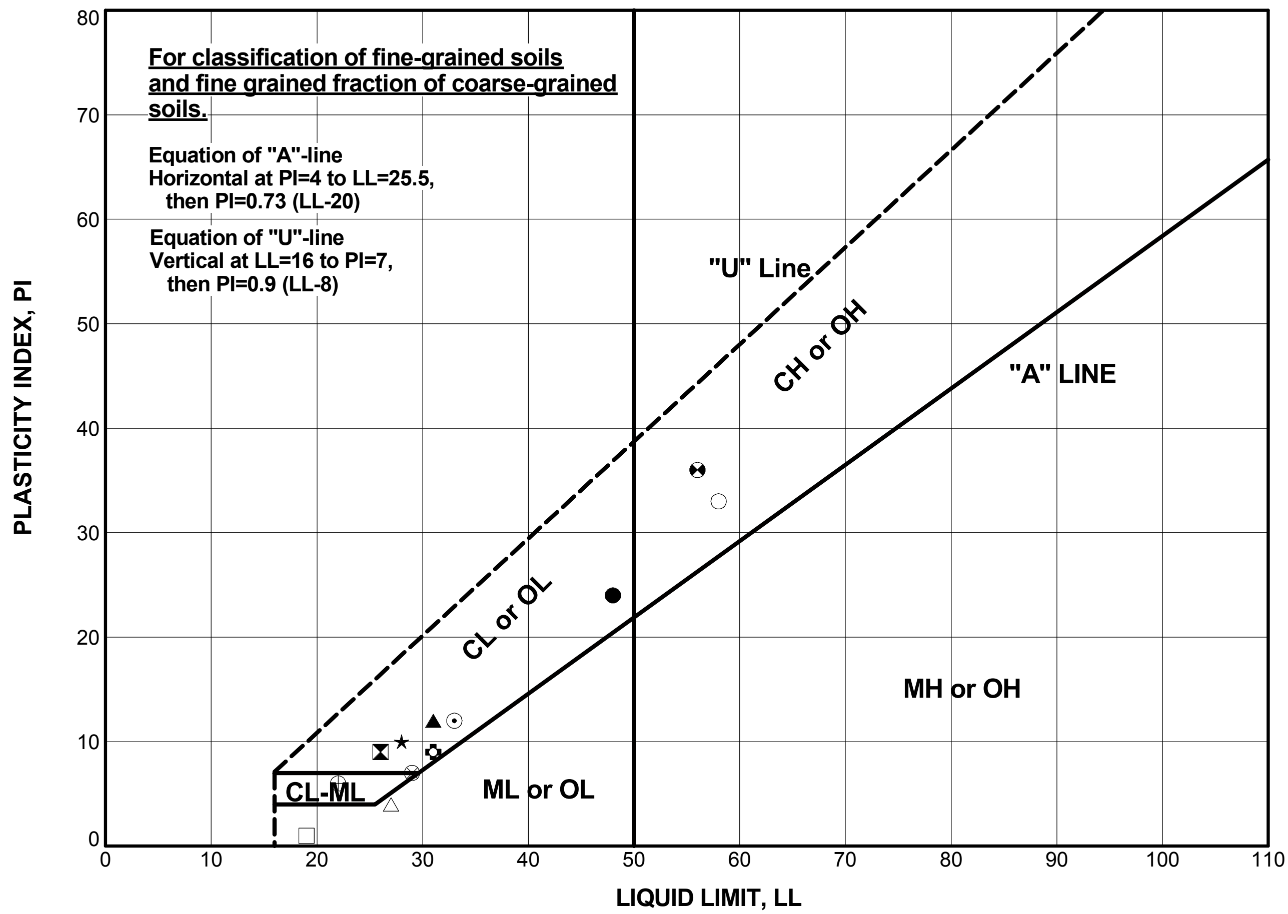
Levee Evaluations
Engineering Support Services

RD 17

PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_270B	S01A_000_002S	1	●	5.5	38	17	21	LEAN CLAY (CL)
WR0017_270B	S04A_006_007S	6	⧗	22.8	34	23	11	LEAN CLAY with Sand (CL)
WR0017_271B	S04A_005_007S	6	▲	16.2	27	20	7	SILTY CLAY (CL-ML)
WR0017_271B	S07A_014_014C	13.5	★	17.4	30	21	9	LEAN CLAY (CL)
WR0017_271B	S12A_024_025P	24	⊙	23.7	28	16	12	CLAYEY SAND (SC)
WR0017_271B	S13A_027_029S	28	✿	20.1	24	16	8	SANDY LEAN CLAY (CL)
WR0017_271B	S16B_035_036P	35	○		33	21	12	LEAN CLAY (CL)
WR0017_272B	S05B_007_008S	7.5	△	39.3	40	23	17	LEAN CLAY (CL)
WR0017_272B	S10B_019_020P	19	⊗	25.8	24	18	6	SANDY SILTY CLAY (CL-ML)
WR0017_273B	S02A_004_005S	4.5	⊕	11.8	32	20	12	SANDY LEAN CLAY (CL)
WR0017_273B	S05A_012_014S	13	□	27.0	24	18	6	SILTY CLAY with SAND (CL-ML)
WR0017_274B	S01A_002_004S	3.25	◓	12.1	33	11	22	SANDY LEAN CLAY (CL)

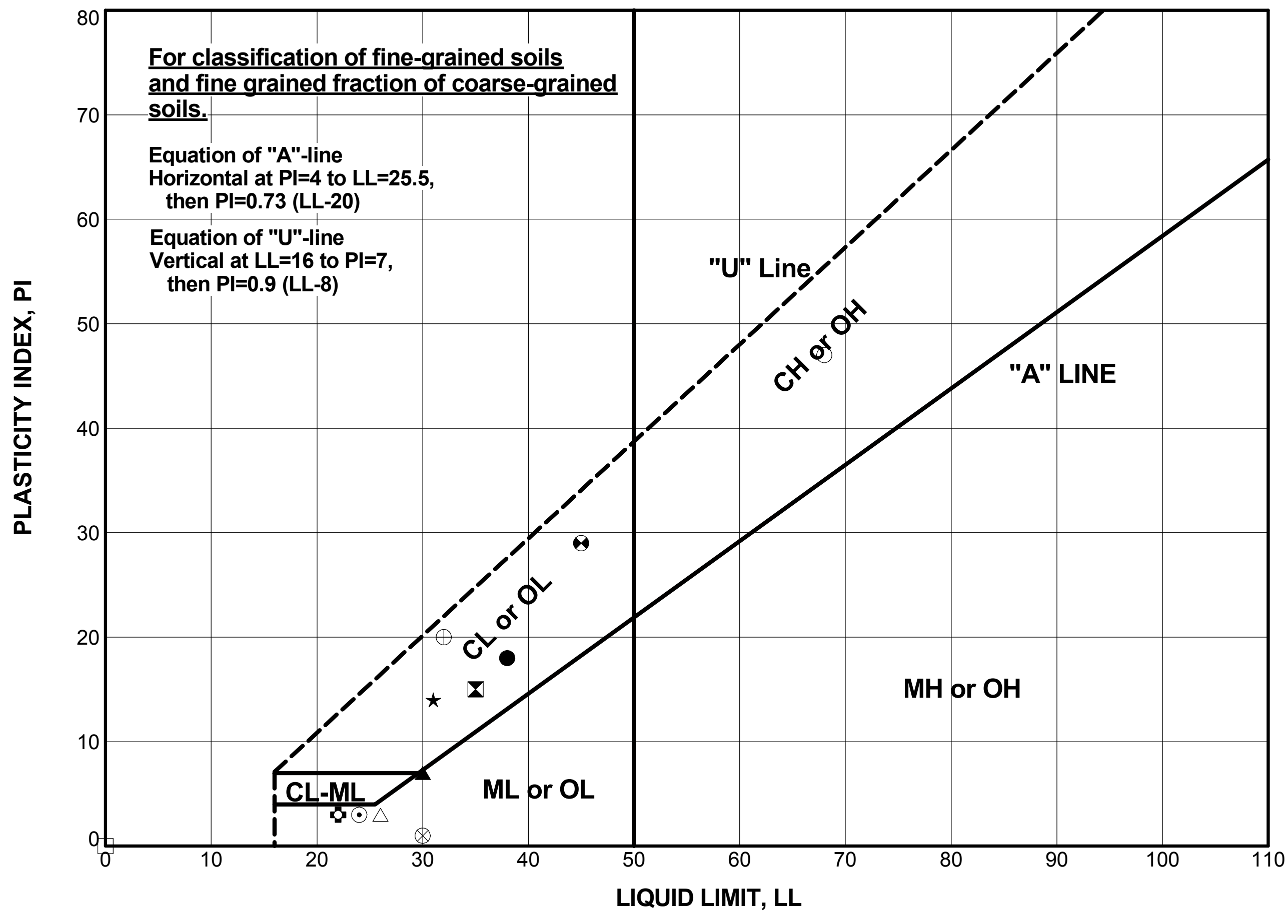


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_274B	S02A_005_007S	6	●	25.7	48	24	24	LEAN CLAY with Sand (CL)
WR0017_274B	S03A_010_011P	9.5	⧗	24.1	26	17	9	SANDY LEAN CLAY (CL)
WR0017_275B	S02A_001_002B	1.5	▲	11.5	31	19	12	SANDY LEAN CLAY (CL)
WR0017_276B	S06A_012_014S	13	★	24.2	28	18	10	CLAYEY SAND (SC)
WR0017_276B	S08A_017_019S	18	⊙	30.7	33	21	12	LEAN CLAY with SAND (CL)
WR0017_277B	S02A_005_007S	5.8	✪	22.2	31	22	9	LEAN CLAY (CL)
WR0017_278B	S05A_009_011S	10	○	43.9	58	25	33	FAT CLAY (CH)
WR0017_278B	S07A_017_019T	17.75	△		27	23	4	SILT with SAND (ML)
WR0017_279B	S06A_015_017B	16	⊗	17.4	29	22	7	SANDY SILTY CLAY (CL-ML)
WR0017_279B	S08A_020_022T	21	⊕	20.3	22	16	6	SILTY CLAYEY SAND (SC-SM)
WR0017_279B	S09A_025_027T	25.85	□	26.7	19	18	1	SANDY SILT (ML)
WR0017_279B	S19A_053_055T	54.5	⧓	29.7	56	20	36	FAT CLAY (CH)

Levee Evaluations
Engineering Support Services

RD 17

PLASTICITY CHART

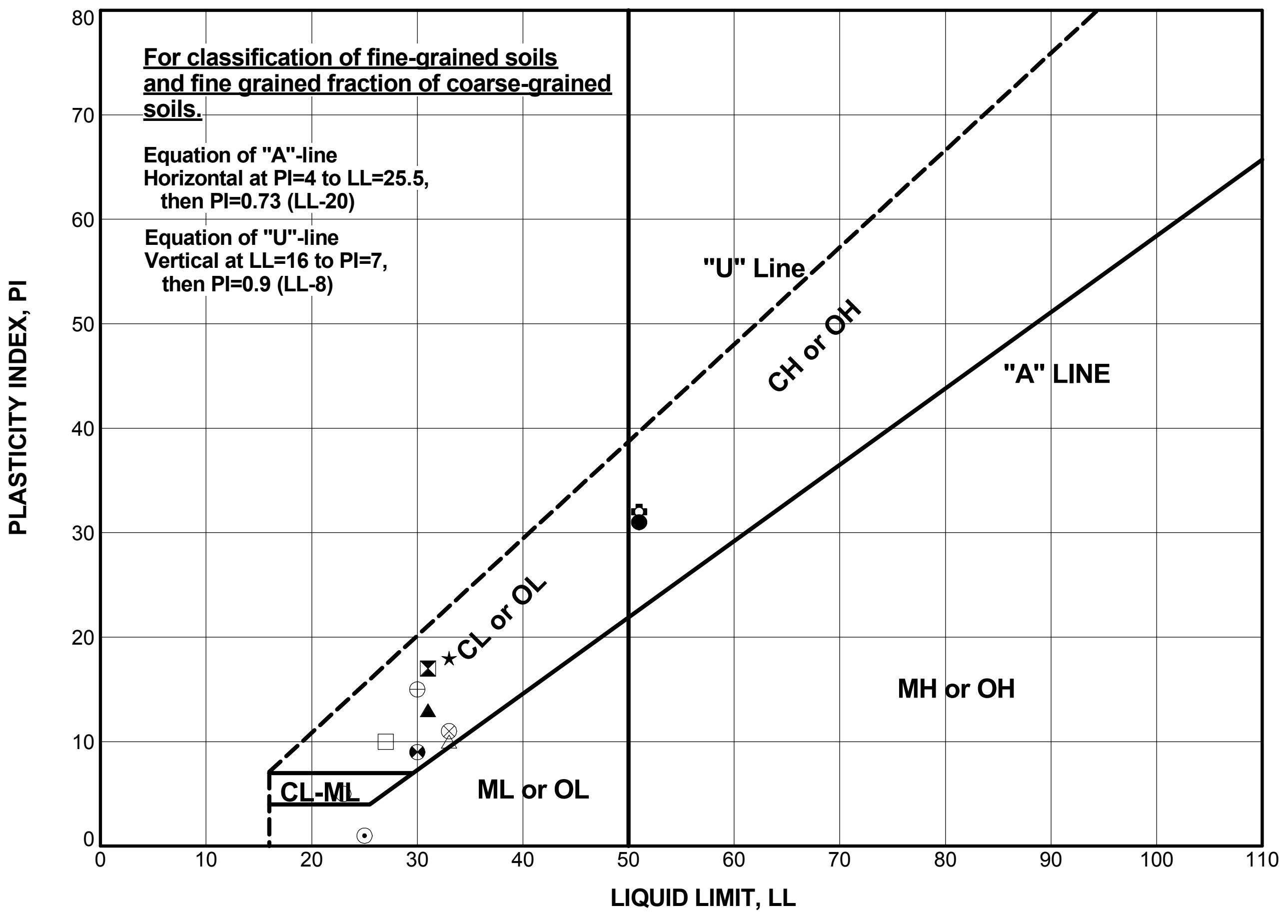


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_280B	S04A_005_007S	6	●	20.9	38	20	18	LEAN CLAY (CL)
WR0017_280B	S05A_010_011P	10.5	⧗	33.0	35	20	15	LEAN CLAY (CL)
WR0017_280B	S07B_015_016P	15	▲	30.1	30	23	7	SILT (ML)
WR0017_281B	S05A_008_009P	8	★	27.0	31	17	14	CLAYEY SAND (SC)
WR0017_281B	S06A_010_011S	10.5	⊙	24.4	24	21	3	SILTY SAND (SM)
WR0017_281B	S08A_012_013S	13	✿	22.7	22	19	3	SANDY SILT (ML)
WR0017_281B	S10A_015_016S	15.5	○	38.9	68	21	47	FAT CLAY (CH)
WR0017_282B	S04A_006_008T	6.8	△	30.7	26	23	3	SILT (ML)
WR0017_282B	S04A_006_008T	7.2	⊗	32.9	30	29	1	SILT (ML)
WR0017_282B	S07A_017_019T	17.4	⊕		32	12	20	SILTY SAND (SM)
WR0017_282B	S07A_017_019T	17.9	□	16.9	NP	NP	NP	SILTY SAND (SM)
WR0017_282B	S07A_017_019T	18.3	◉	23.6	45	16	29	LEAN CLAY (CL)

Levee Evaluations
Engineering Support Services

RD 17

PLASTICITY CHART



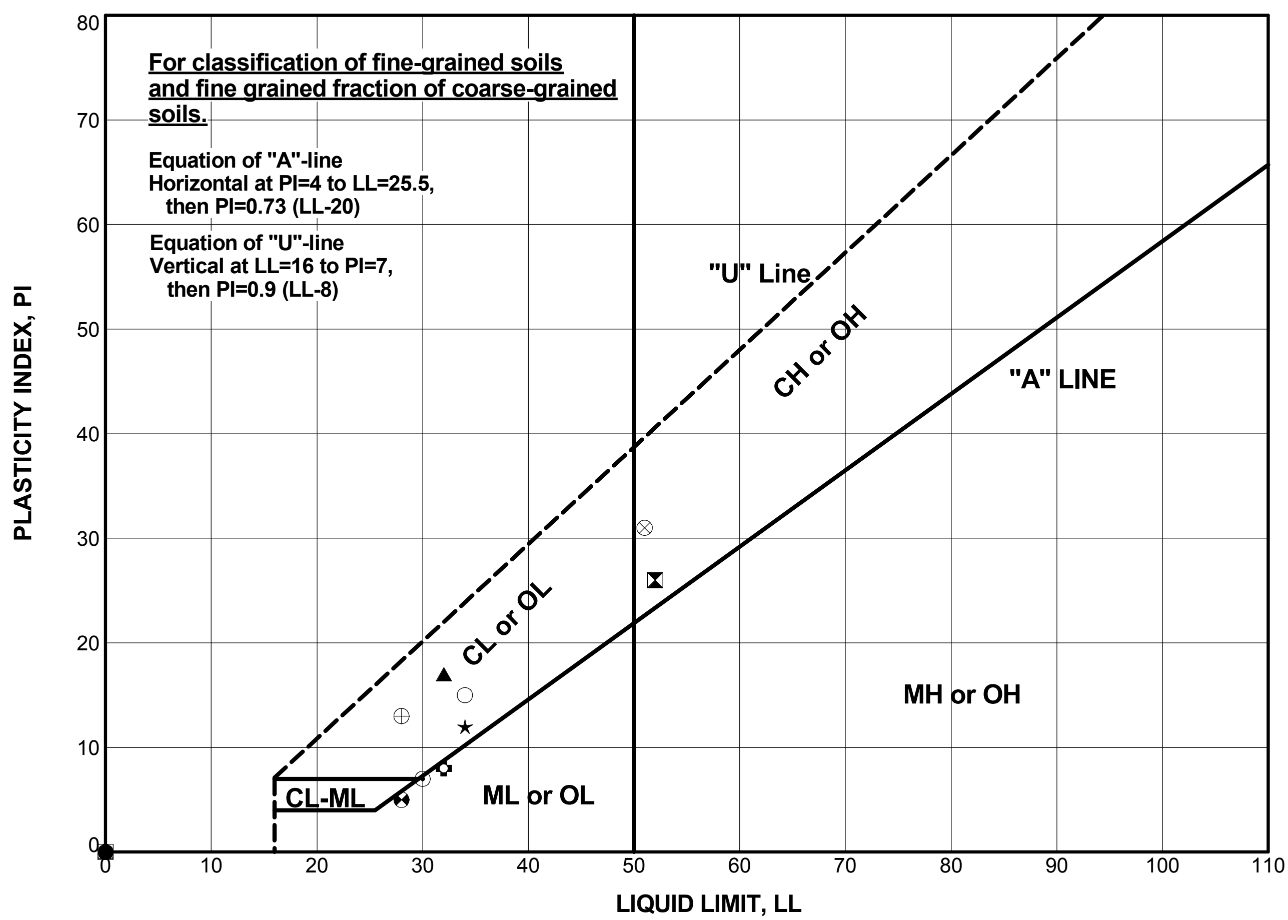
Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_282B	S11A_037_039T	37.8	●	27.8	51	20	31	FAT CLAY (CH)
WR0017_283B	S06A_016_017S	16	⧗	14.2	31	14	17	SANDY LEAN CLAY (CL)
WR0017_284B	S01A_000_001B	0	▲	9.0	31	18	13	SANDY LEAN CLAY (CL)
WR0017_284B	S02A_001_002B	1	★		33	15	18	SANDY LEAN CLAY (CL)
WR0017_284B	S03A_003_004C	3	⊙	16.2	25	24	1	SILTY SAND (SM)
WR0017_284B	S05A_005_007T	6	✪	30.2	51	19	32	SILTY SAND (SM)
WR0017_285B	S06A_010_012T	11	○	23.1	23	18	5	SILTY, CLAYEY SAND (SC-SM)
WR0017_285B	S07A_012_014T	13.5	△	28.2	33	23	10	SANDY LEAN CLAY (CL)
WR0017_286B	S03A_005_007T	6	⊗	27.0	33	22	11	LEAN CLAY (CL)
WR0017_286B	S05A_010_012T	10.5	⊕	20.4	30	15	15	SANDY LEAN CLAY (CL)
WR0017_286B	S05A_010_012T	11	□	22.6	27	17	10	SANDY LEAN CLAY (CL)
WR0017_286B	S07A_015_017T	16.2	⊗	27.1	30	21	9	LEAN CLAY (CL)

DWR LEVEE U/NU ATT. PLOT (U LINE) REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 05312013.GLB; 6/13/13

Levee Evaluations
Engineering Support Services

RD 17

PLASTICITY CHART

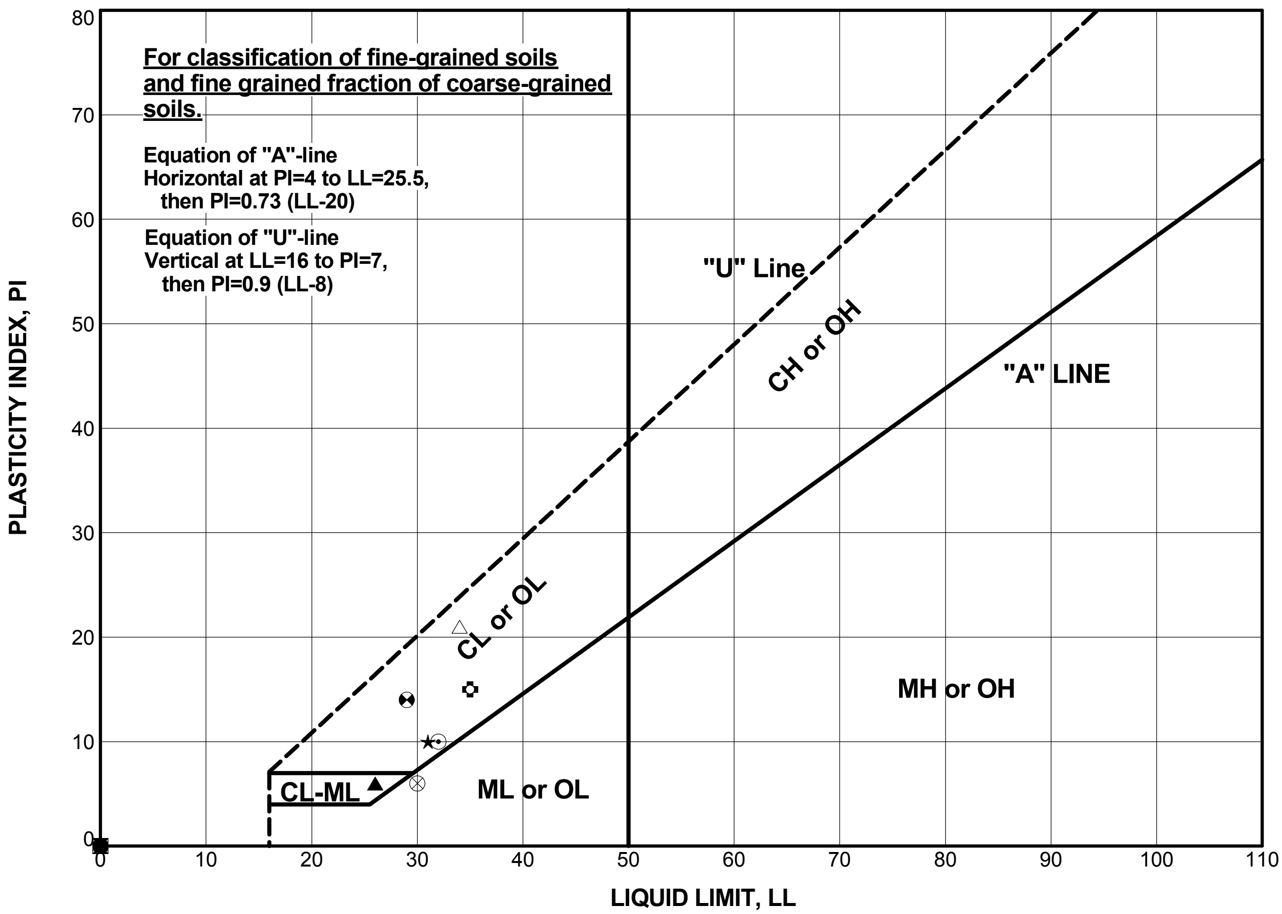


Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_286B	S10A_025_027T	25.5	●	24.4	NP	NP	NP	Poorly Graded SAND with Silt (SP-SM)
WR0017_288B	S03A_007_009S	8	⧗	51.1	52	26	26	FAT CLAY with Sand (CH)
WR0017_288B	S05A_012_014S	13	▲	25.1	32	15	17	LEAN CLAY with SAND (CL)
WR0017_289B	S03A_002_004S	3	★	8.4	34	22	12	SANDY LEAN CLAY (CL)
WR0017_289B	S05A_005_007S	6.25	⊙	21.0	30	23	7	SANDY SILTY CLAY (CL-ML)
WR0017_290B	S02A_001_002B	1.5	✿	5.4	32	24	8	SILT with Sand (ML)
WR0017_290B	S05B_005_006S	5.5	○	32.0	34	19	15	SANDY SILT (ML)
WR0017_292B	S01B_002_003M	2.5	△		NP	NP	NP	POORLY GRADED SAND with SILT (SP-SM)
WR0017_292B	S06A_013_015T	14	⊗	36.1	51	20	31	SANDY FAT CLAY (CH)
WR0017_293B	S06A_008_010T	8.45	⊕	20.9	28	15	13	LEAN CLAY with Sand (CL)
WR0017_293B	S08A_013_014T	13.5	□	32.5	NP	NP	NP	SILT (ML)
WR0017_293B	S08A_013_014T	13.75	◒	31.6	28	23	5	SILT (ML)

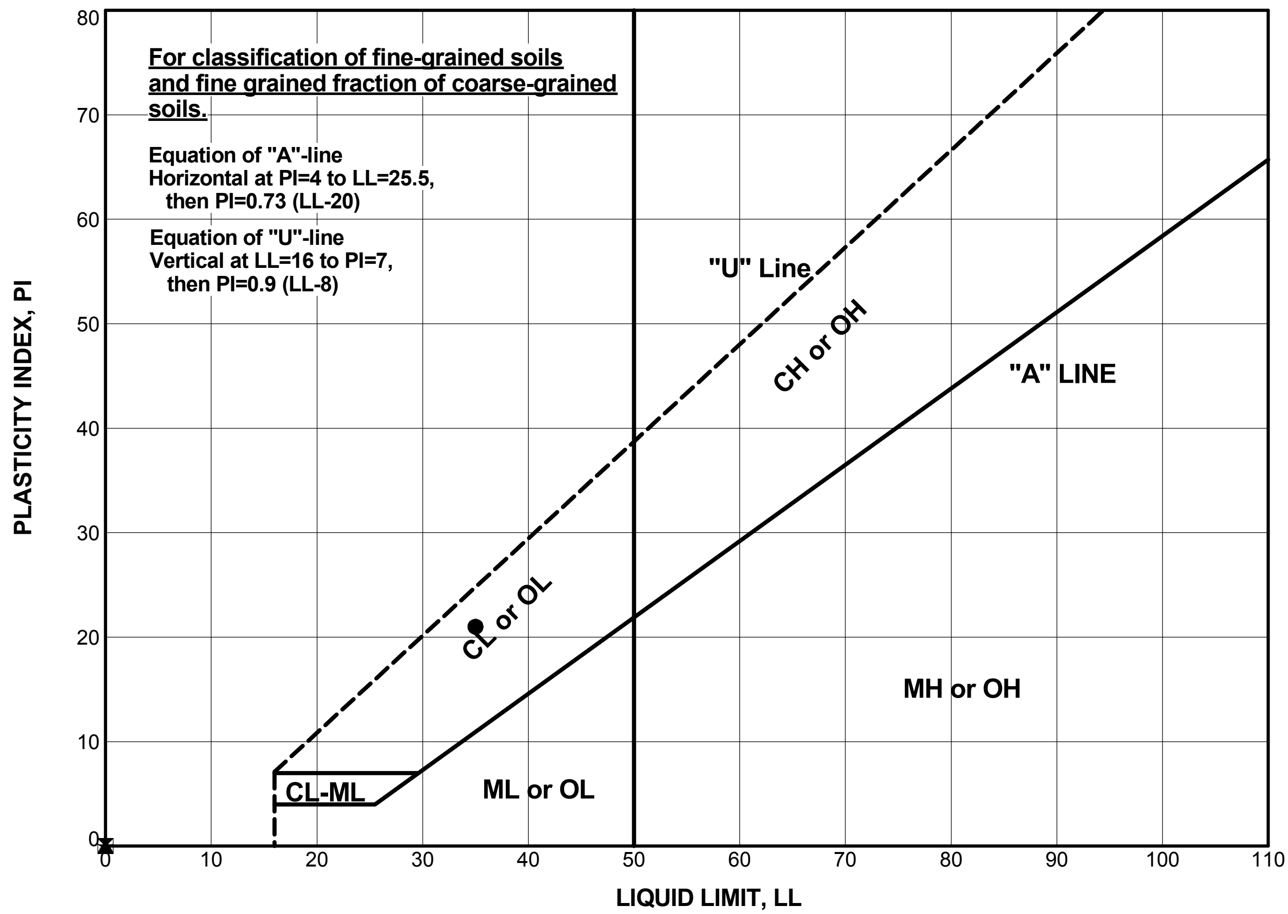
Levee Evaluations
Engineering Support Services

RD 17

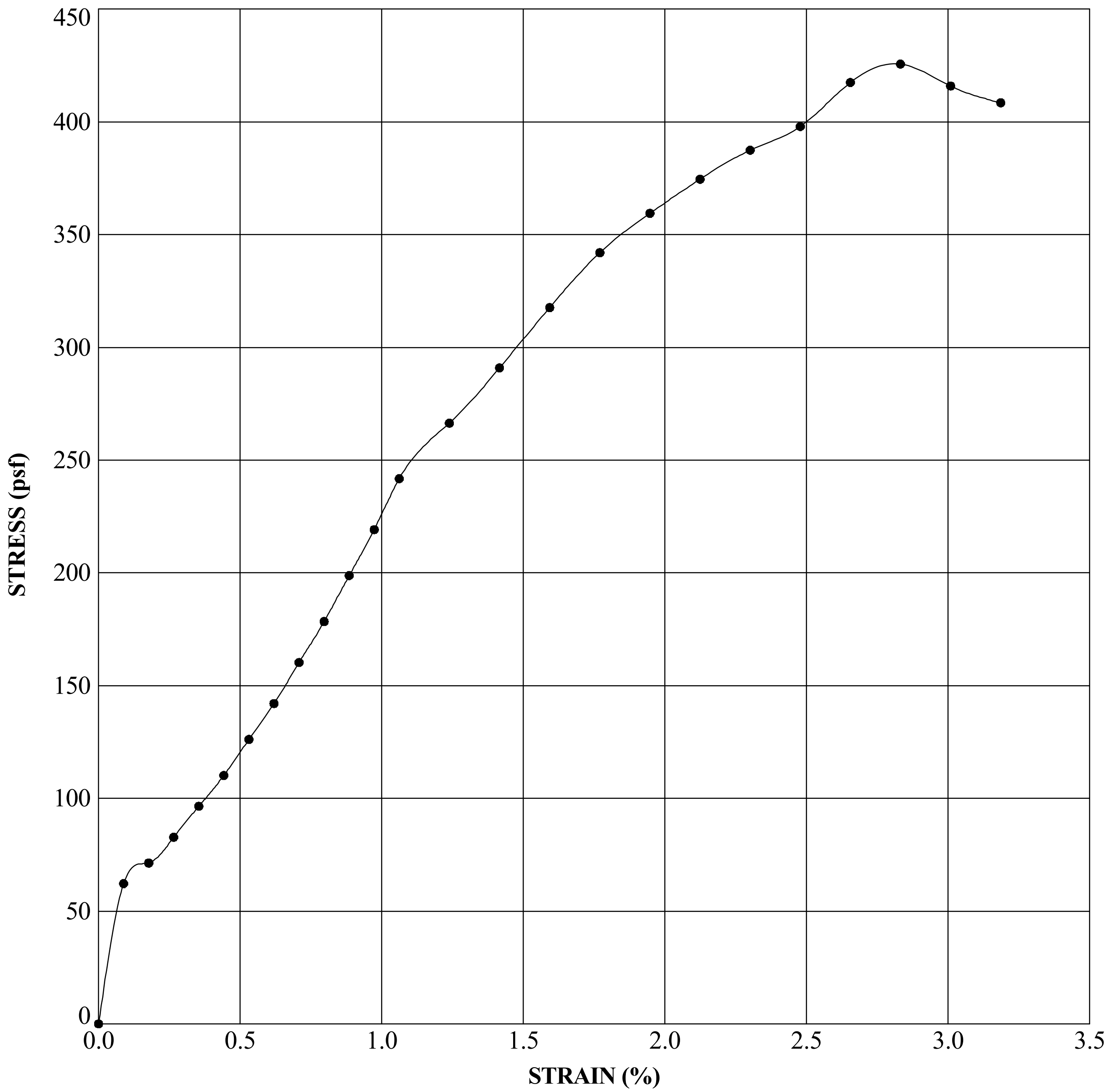
PLASTICITY CHART



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_293B	S12A_025_027T	26	●	19.9	NP	NP	NP	Poorly Graded SAND (SP)
WR0017_293B	S13A_030_032T	31.45	⧗	21.1	NP	NP	NP	Poorly Graded SAND (SP)
WR0017_294B	S04A_006_007S	6.25	▲	12.0	26	20	6	SANDY SILTY CLAY (CL-ML)
WR0017_295B	S01A_001_002B	1.5	★	10.3	31	21	10	SANDY LEAN CLAY (CL)
WR0017_295B	S02A_002_003T	2.4	⊙	17.2	32	22	10	LEAN CLAY with SAND (CL)
WR0017_295B	S03A_003_005S	4	✪	18.5	35	20	15	LEAN CLAY with SAND (CL)
WR0017_295B	S11A_025_028T	26.5	○	10.3	NP	NP	NP	Poorly Graded SAND (SP)
WR0017_296B	S07A_009_011T	10	△	32.1	34	13	21	SANDY SILT (ML)
WR0017_296B	S07A_009_011T	10.2	⊗	30.2	30	24	6	SANDY SILT (ML)
WR0017_296B	S12A_020_022T	21	⊕	16.9	NP	NP	NP	Poorly Graded SAND (SP)
WR0017_296B	S14A_030_032T	30.5	□	30.0	NP	NP	NP	SILTY SAND (SM)
WR0017_296B	S18A_050_052T	51	⊛	27.5	29	15	14	CLAYEY SAND (SC)



Boring Number	Sample Number	Depth (feet)	Test Symbol	WC (%)	LL	PL	PI	Classification
WR0017_297B	S04A_005_007S	6	●	25.9	35	14	21	LEAN CLAY (CL)
WR0017_298B	S03B_004_004C	3.5	⌛	10.3	NP	NP	NP	SILTY SAND (SM)
WR0017_298B	S04A_006_007C	6.3	▲	17.0	NP	NP	NP	SILTY SAND (SM)
WR0017_298B	S07A_013_014S	13	★	23.1	NP	NP	NP	SILTY SAND (SM)



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Unconfined Strength (psf)	Strain (%)
●	047B	15.0	Brown sandy SILT (ML)	91.4	19.9	426	2.8

TEST DATE 04/10/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/10/07

DWG FILE:

UNCONSOLIDATED UNDRAINED TRIAXIAL

DWR LEVEES - RECLAMATION DISTRICT 17

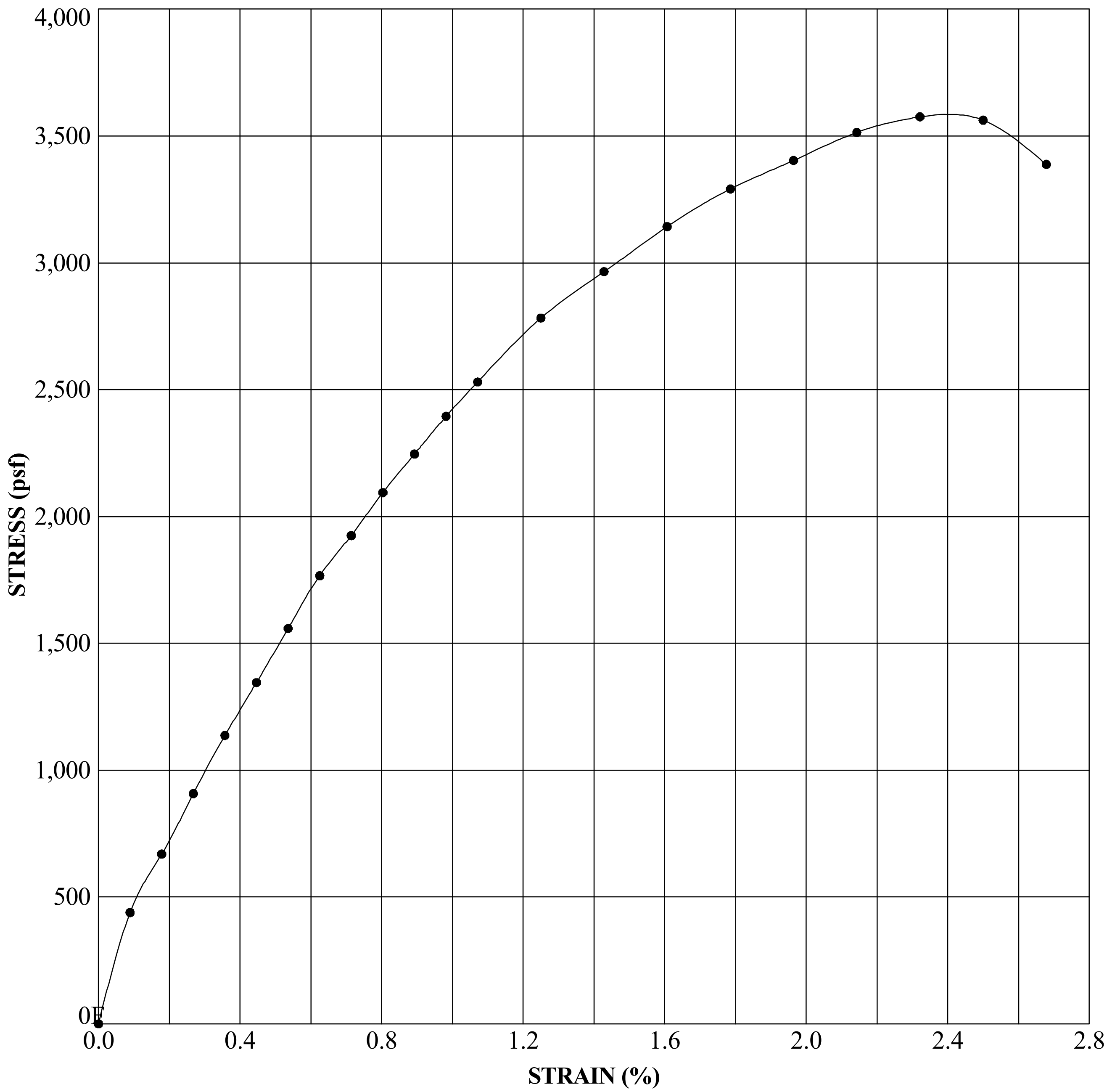
San Joaquin County, California

FIGURE

E-3e

PROJECT No.

1310.013

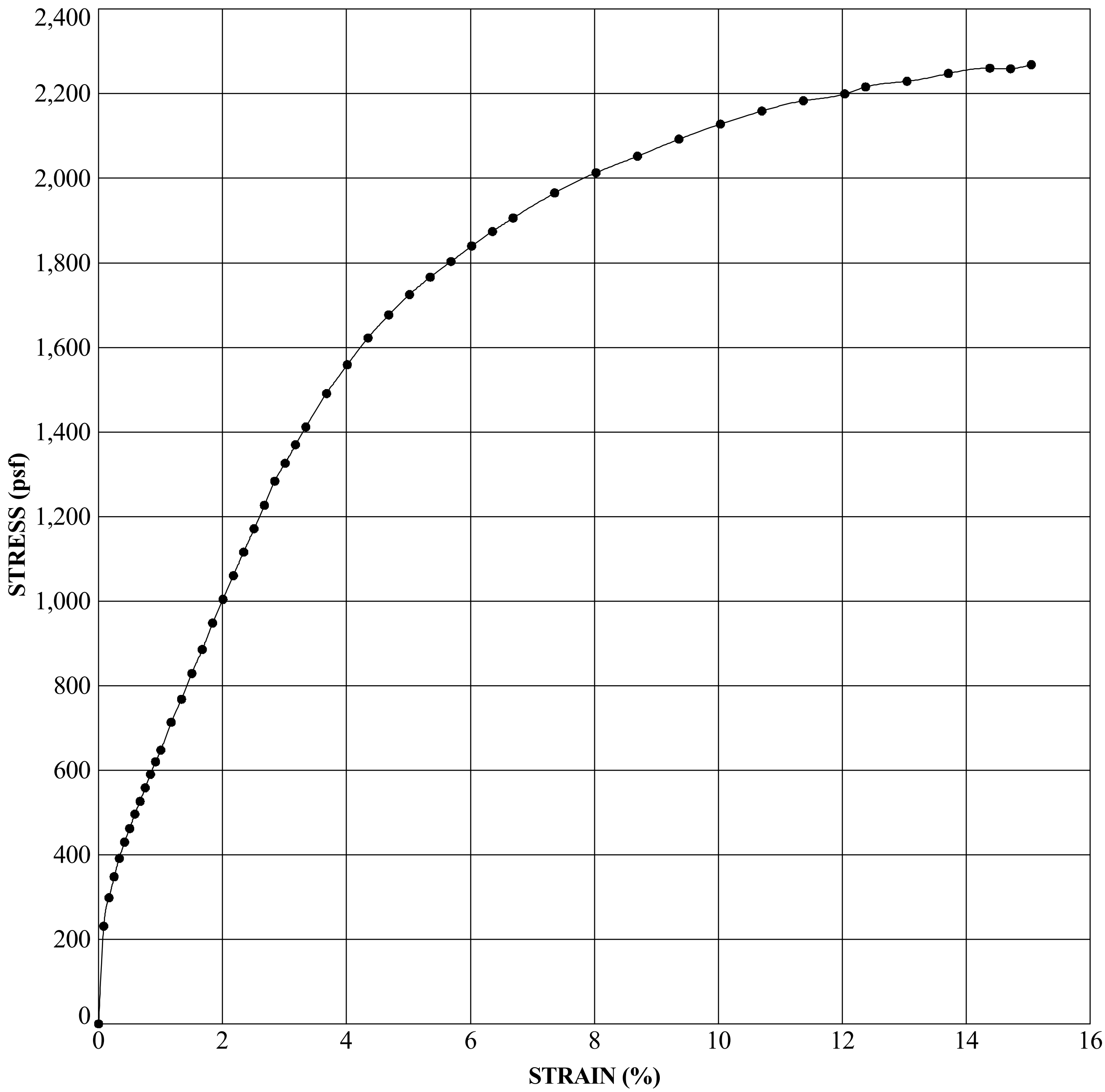


Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Unconfined Strength (psf)	Strain (%)
●	063B	7.5	Dark brown clayey sand (SC)	97.9	22.4	3,575	2.3

TEST DATE 04/10/07

FUGRO

PREP'D BY:	UNCONSOLIDATED UNDRAINED TRIAXIAL	FIGURE
APP'D BY: L.Sansone		E-3f
DATE: 04/10/07	DWR LEVEES - RECLAMATION DISTRICT 17 San Joaquin County, California	PROJECT No.
DWG FILE:		1310.013



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Unconfined Strength (psf)	Strain (%)
●	063B	17.5	Brown sandy CLAY (CL)	83.6	34.5	2,269	15.0

TEST DATE 04/10/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/10/07

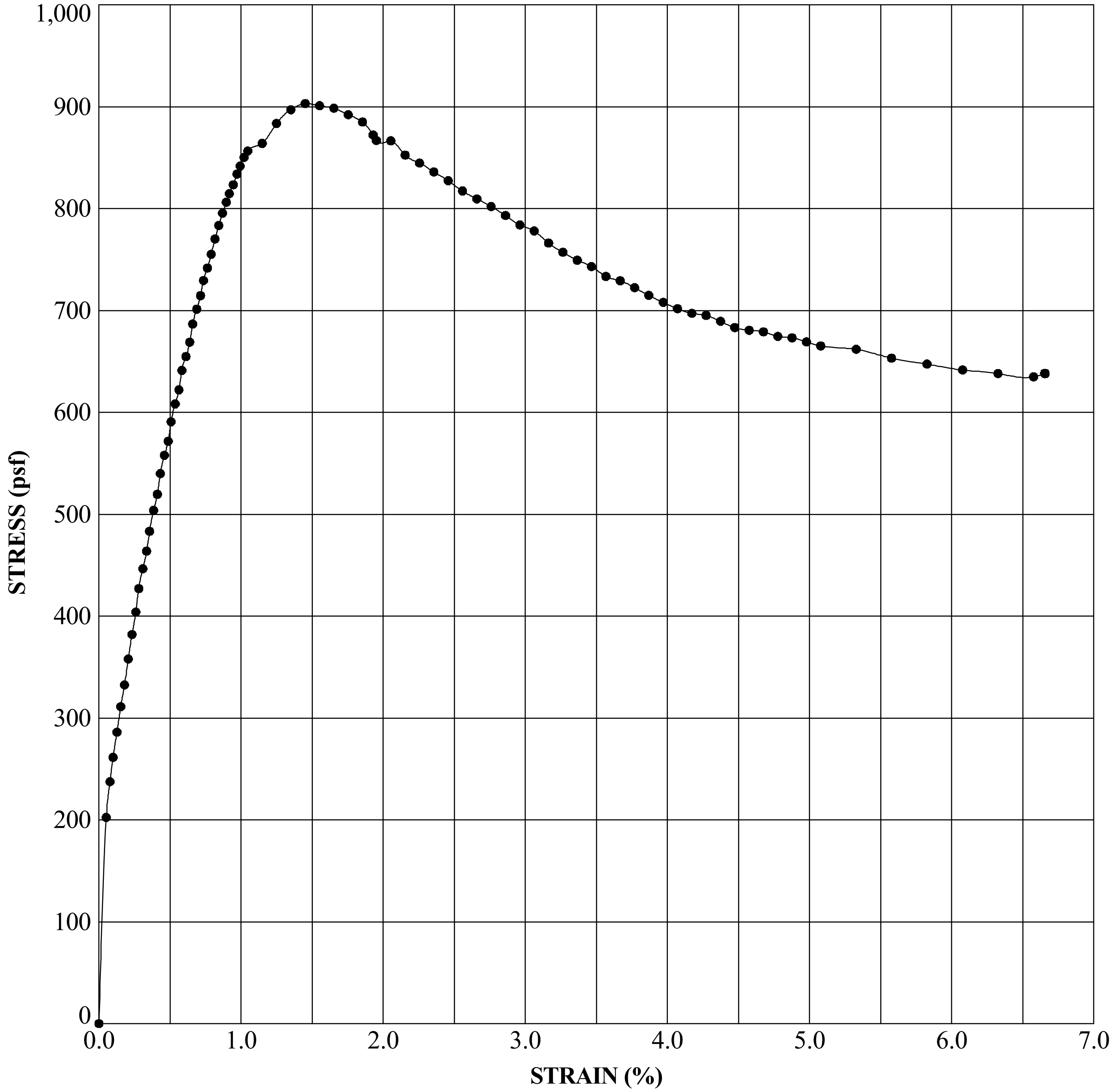
DWG FILE:

UNCONSOLIDATED UNDRAINED TRIAXIAL

DWR LEVEES - RECLAMATION DISTRICT 17
San Joaquin County, California

FIGURE **E-3g**

PROJECT No. 1310.013



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Unconfined Strength (psf)	Strain (%)
●	080B	12.5	Brown silty CLAY (CL)	73.6	29.7	903	1.5

TEST DATE 04/24/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/24/07

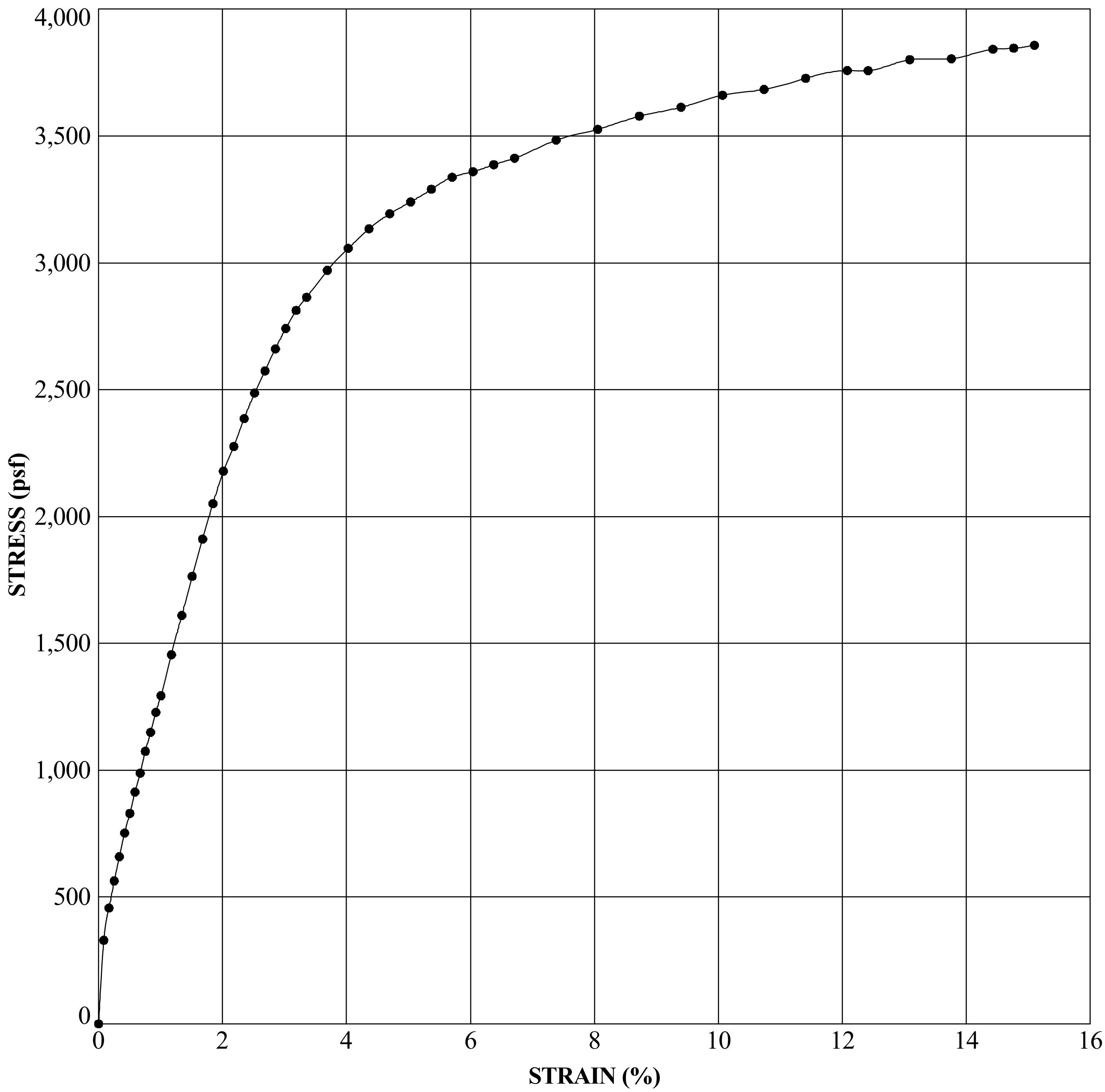
DWG FILE:

UNCONSOLIDATED UNDRAINED TRIAXIAL

DWR LEVEES - RECLAMATION DISTRICT 17
San Joaquin County, California

FIGURE **E-3i**

PROJECT No. 1310.013



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Unconfined Strength (psf)	Strain (%)
●	090B	12.5	Lean CLAY (CL)	75.9	43.2	3,857	15.0

TEST DATE 04/10/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/10/07

DWG FILE:

UNCONSOLIDATED UNDRAINED TRIAXIAL

DWR LEVEES - RECLAMATION DISTRICT 17

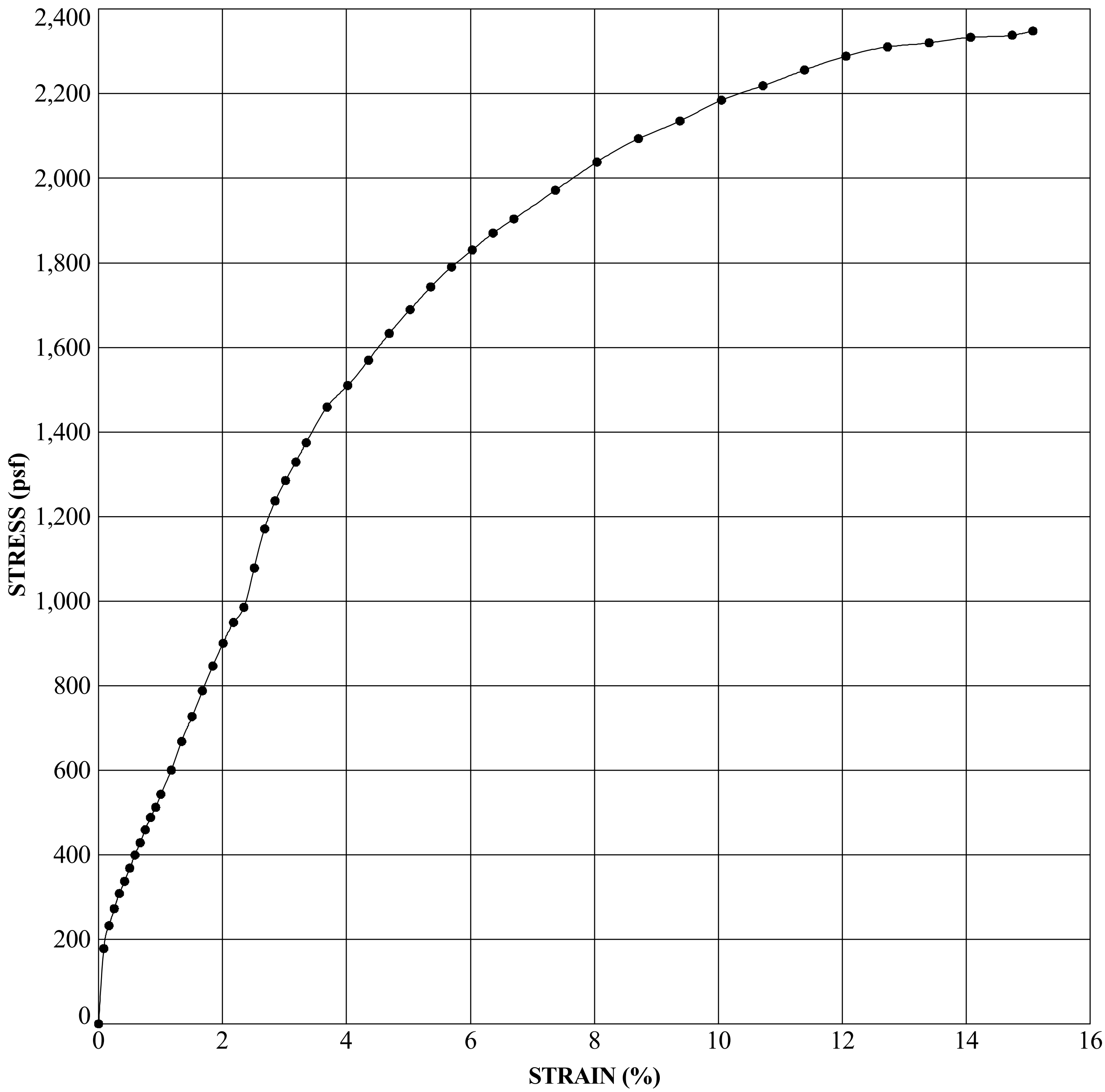
San Joaquin County, California

FIGURE

E-3j

PROJECT No.

1310.013



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Unconfined Strength (psf)	Strain (%)
●	096B	25.5	Brown sandy CLAY (CL)	83.5	38.5	2,348	15.0

TEST DATE 04/10/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/10/07

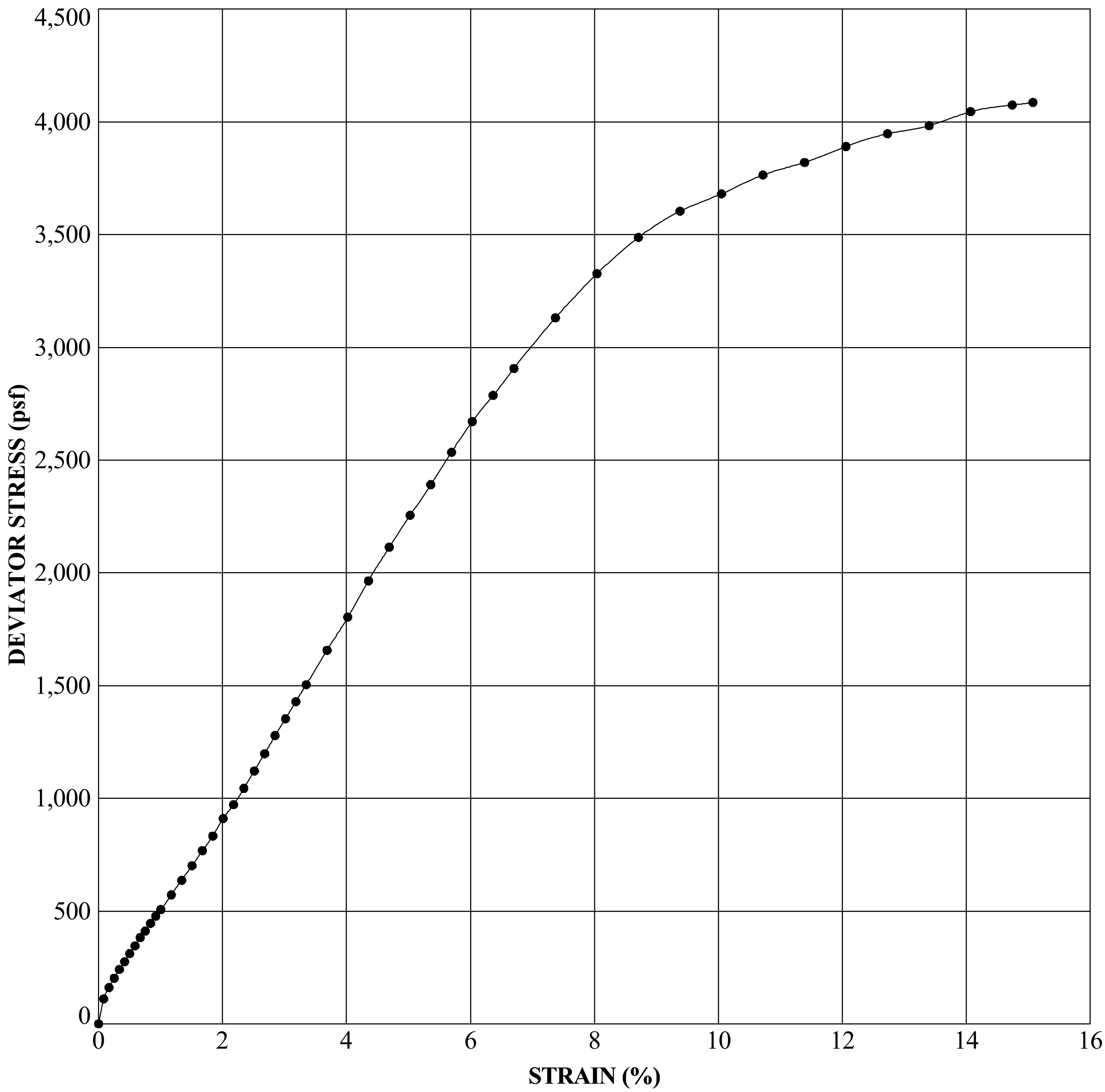
DWG FILE:

UNCONSOLIDATED UNDRAINED TRIAXIAL

DWR LEVEES - RECLAMATION DISTRICT 17
San Joaquin County, California

FIGURE **E-3k**

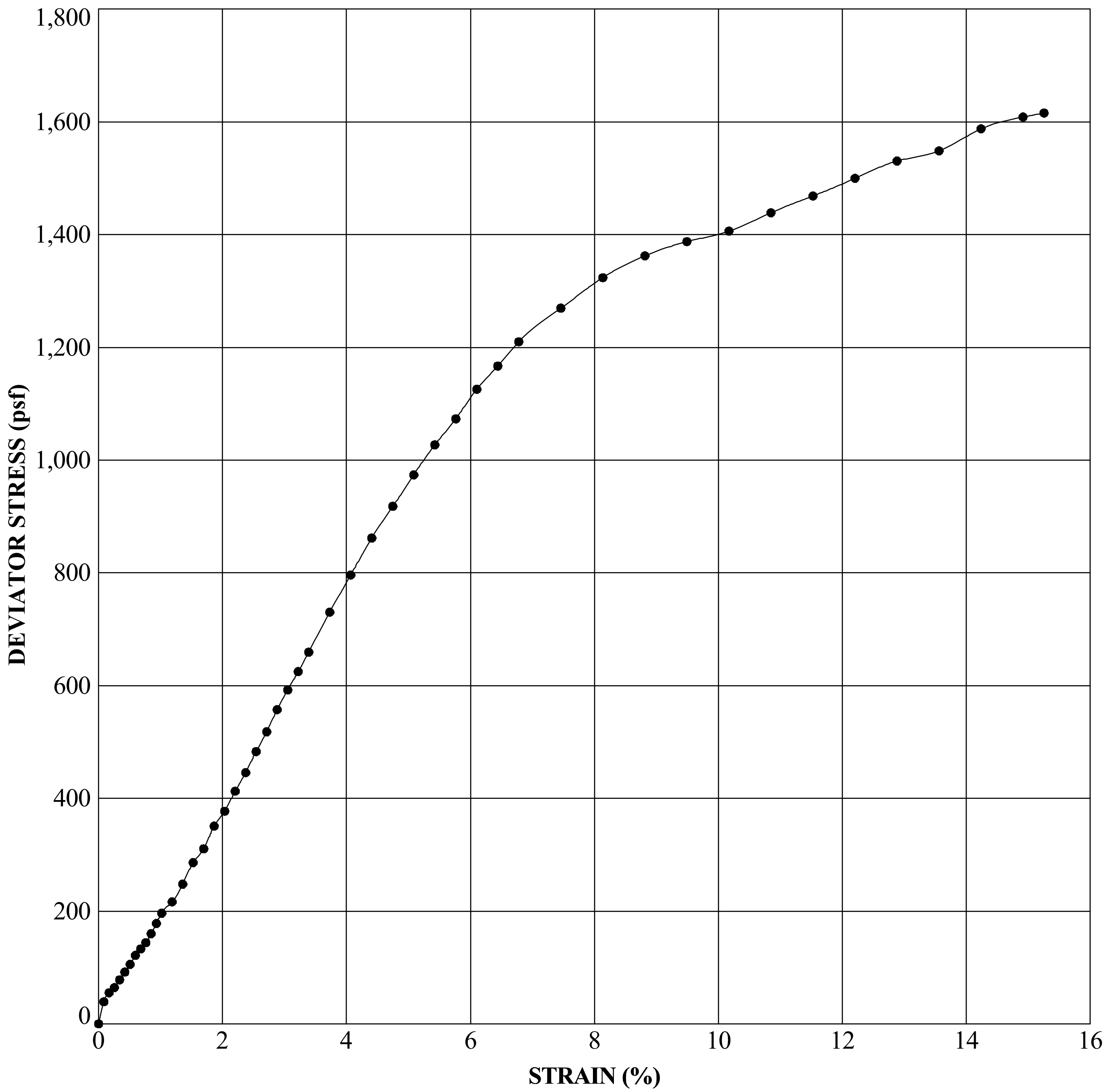
PROJECT No. 1310.013



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Peak Deviator Stress (psf)	Strain (%)
●	134B	7.0	SANDY LEAN CLAY (CL)	108.4	19.4	4,086	15.0

Atterberg Limits: LL=24 , PL=15 , PI=9

FUGRO	PREP'D BY:	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS	FIGURE
	APP'D BY:		D-2
	DATE: 3/12/08	**RECLAMATION DISTRICT 17** **Stockton & Lathrop, California**	PROJECT No.
	DWG FILE:		1310.022



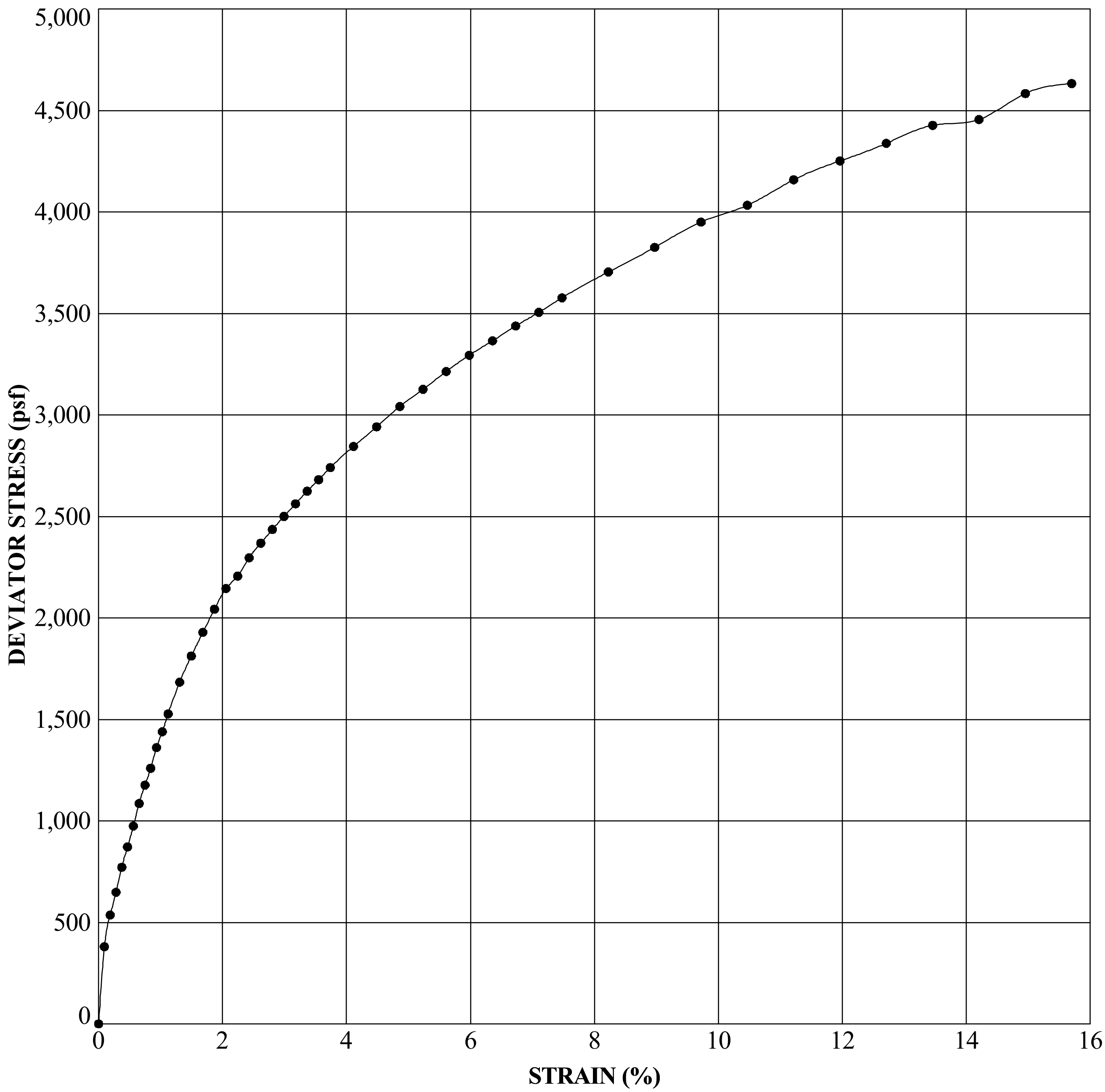
Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Peak Deviator Stress (psf)	Strain (%)
●	135B	8.0	SANDY SILTY CLAY (CL-ML)	109.2	22.5	1,616	15.0

Atterberg Limits: LL=22 , PL=16 , PI=6

PREP'D BY:	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS	FIGURE
APP'D BY:		D-3
DATE: 3/12/08	**RECLAMATION DISTRICT 17** **Stockton & Lathrop, California**	PROJECT No.
DWG FILE:		1310.022

FUGRO

TRIAXIAL 1310 022 V012505-051508.GPJ STD.GDT 10/1/08



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Peak Deviator Stress (psf)	Strain (%)
●	137B	8.0	CLAYEY SAND (SC)	113.4	18.8	4,633	15.0

Atterberg Limits: LL=25 , PL=11 , PI=14

TRIAXIAL 1310 022 V012505-051508.GPJ STD.GDT 10/1/08

FUGRO

PREP'D BY:

APP'D BY:

DATE: 2/18/08

DWG FILE:

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

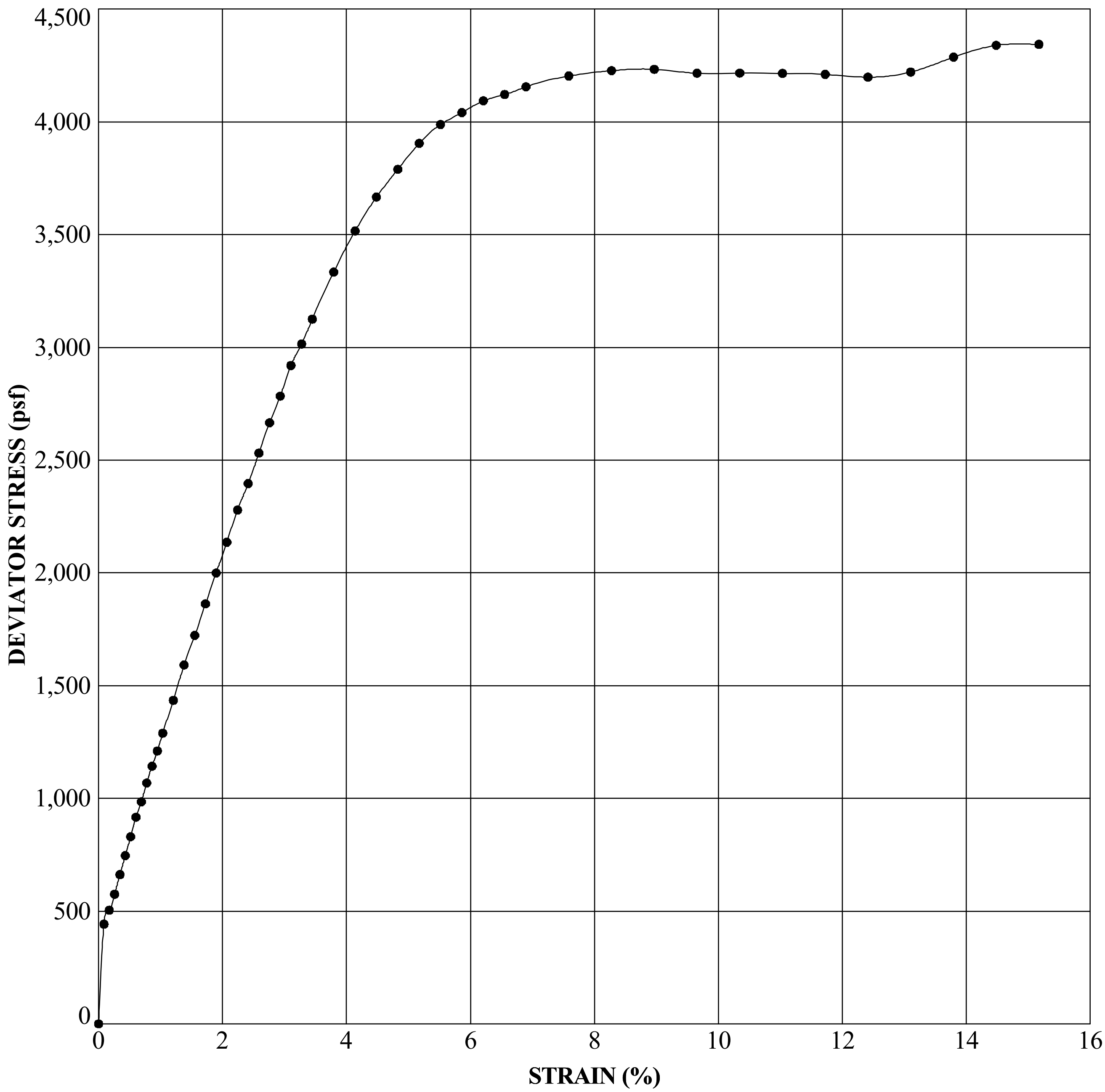
RECLAMATION DISTRICT 17
Stockton & Lathrop, California

FIGURE

D-4

PROJECT No.

1310.022



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Peak Deviator Stress (psf)	Strain (%)
●	139B	2.0	SANDY LEAN CLAY (CL)	91.2	28.9	4,344	15.0

Atterberg Limits: LL=38 , PL=18 , PI=20

FUGRO

PREP'D BY:

APP'D BY:

DATE:
2/14/08

DWG FILE:

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

RECLAMATION DISTRICT 17
Stockton & Lathrop, California

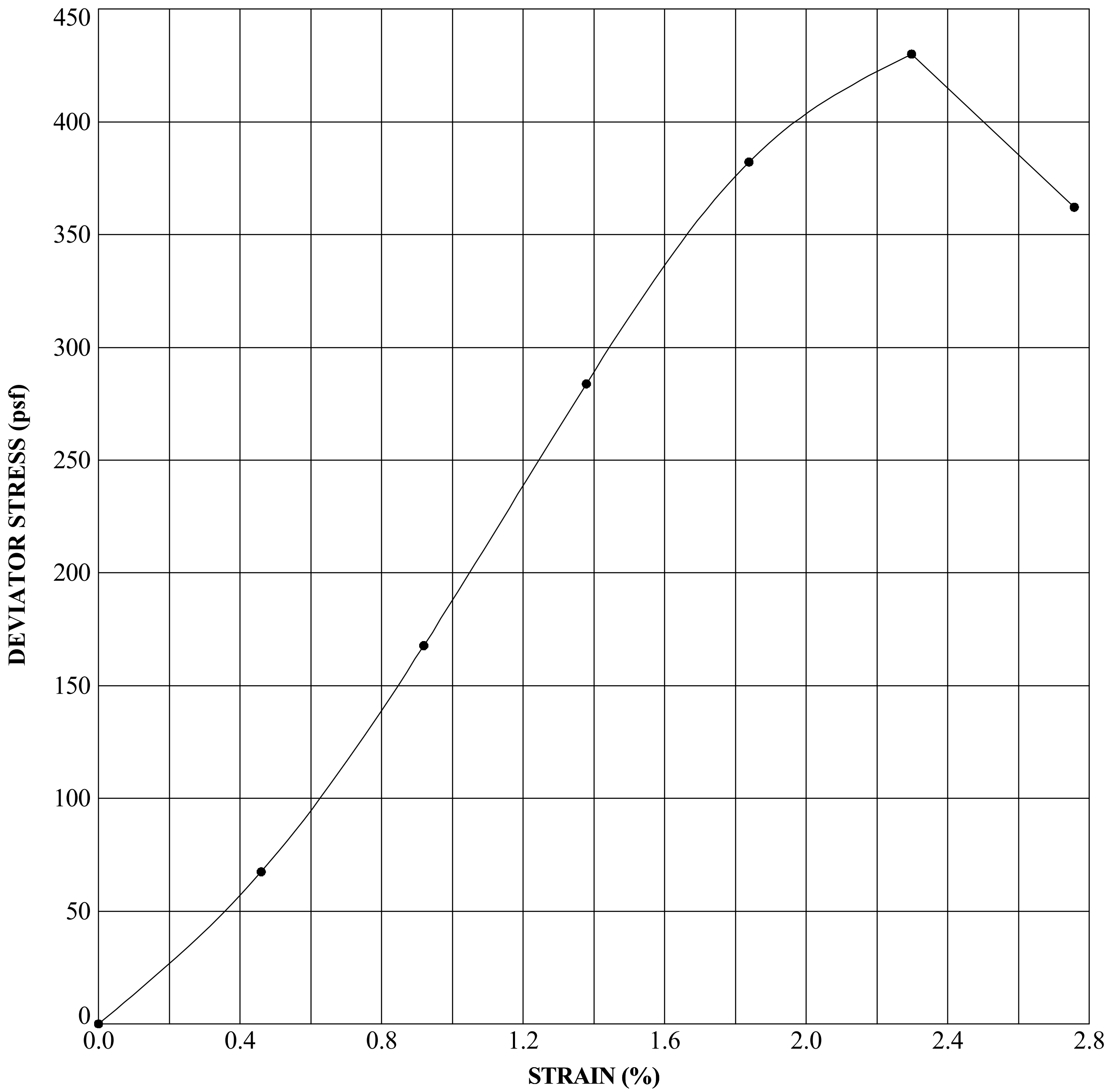
FIGURE

D-5

PROJECT No.

1310.022

TRIAXIAL 1310 022 V012505-051508.GPJ STD.GDT 10/1/08



Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Peak Deviator Stress (psf)	Strain (%)
●	165B	2.5	FAT CLAY (CH)	66.8	39.4	430	2.3

Atterberg Limits: LL=59, PL=23, PI=36

FUGRO

PREP'D BY:

APP'D BY:

DATE: 4/9/08

DWG FILE:

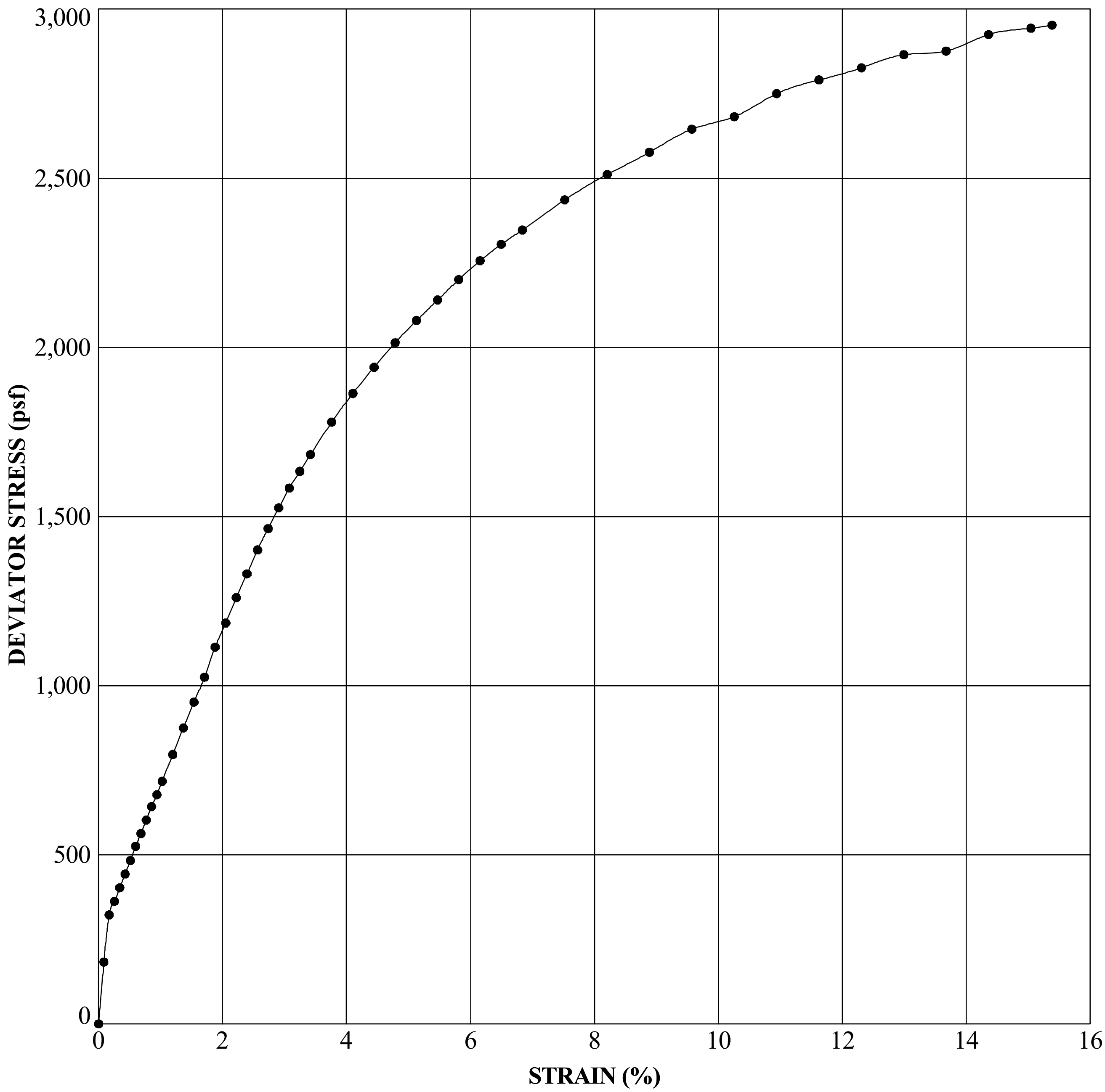
UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

RECLAMATION DISTRICT 17
Stockton & Lathrop, California

FIGURE **D-6**

PROJECT No. 1310.022

TRIAXIAL 1310 022 V012505-051508.GPJ STD.GDT 10/1/08

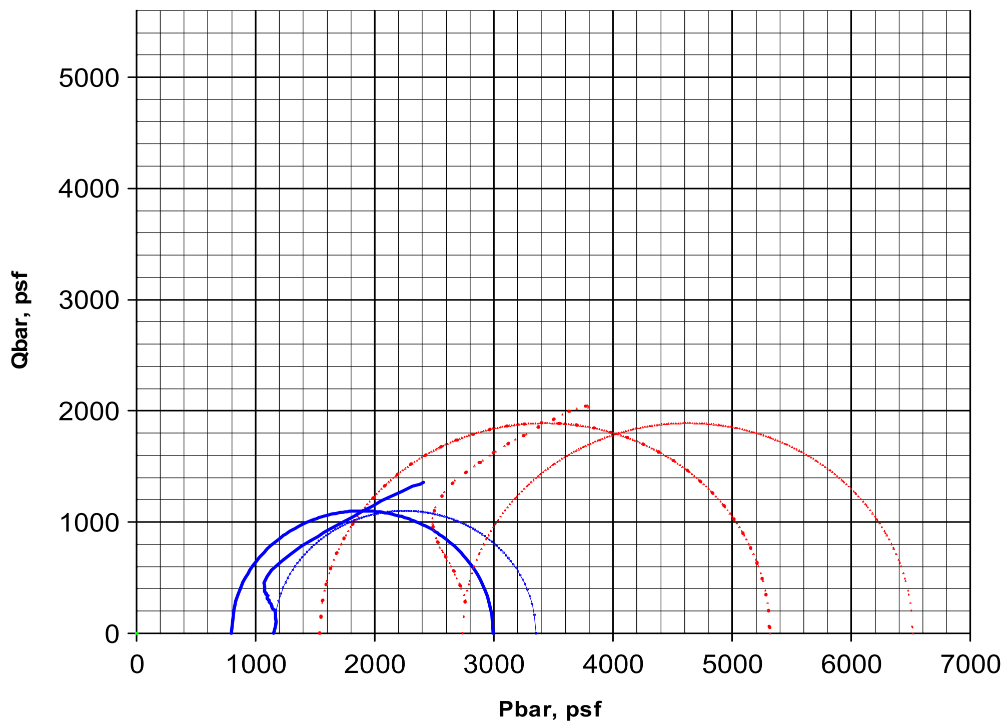


Key Symbol	Boring	Depth (Feet)	Sample Description (USCS)	Dry Density (pcf)	Water Content (%)	Peak Deviator Stress (psf)	Strain (%)
●	176B	6.5	LEAN CLAY (CL)	105.6	22.0	2,953	15.0

Atterberg Limits: LL=31 , PL=13 , PI=18

FUGRO

PREP'D BY:	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS	FIGURE
APP'D BY:		D-7
DATE: 5/9/08	RECLAMATION DISTRICT 17 Stockton & Lathrop, California	PROJECT No.
DWG FILE:		1310.022



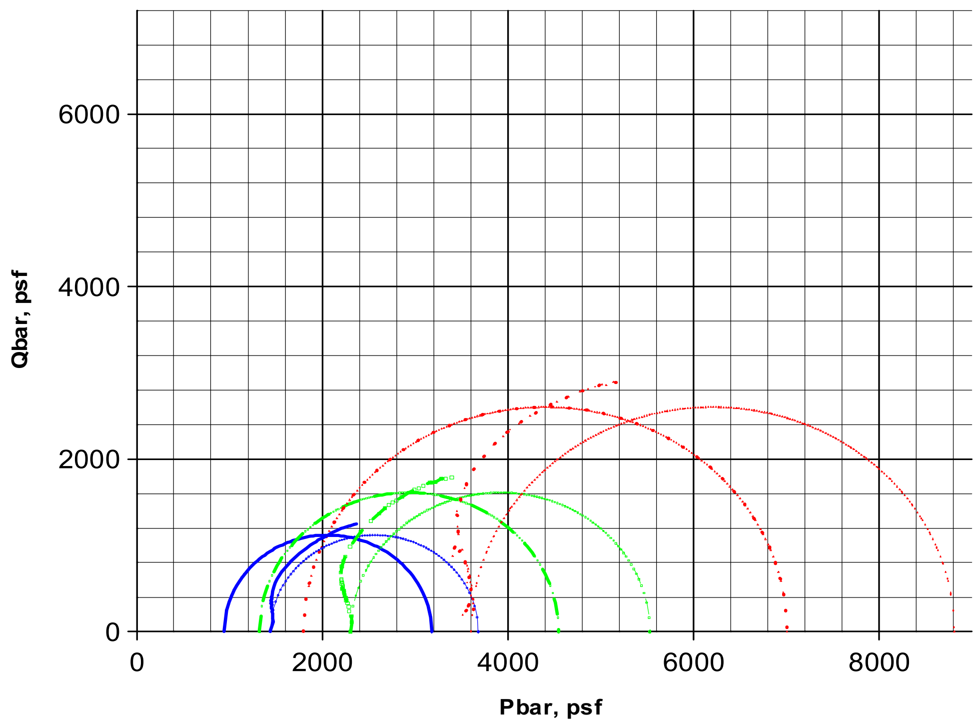
Line type	SigC psf	Peak Deviator str., psf	Strain @ fail. %	PWP psf	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio			Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Strain Rate %/hr.
solid	1152	2202	8.0	358	30.5	90.3	95	0.866			32.2	91.1	102	0.850	1.0
dash															
dot	2736	3781	10.5	1198	32.1	90.9	101.6	0.9			30.9	93.7	105	0.8	1.0

Client: **Fugro**		Boring #: **47B**	Sample #: **S07A**
Project: **DWR Levee Geotechnical Evaluation - RD 17**		Depth (ft): **17.5-20**	
Project #: **1310.013**		Soil: **LEAN CLAY (CL)**	

TEST REPORT: Isotropically Consolidated Undrained Triaxial Compression Test

Signet Testing Labs, Inc.

Figure E-4a



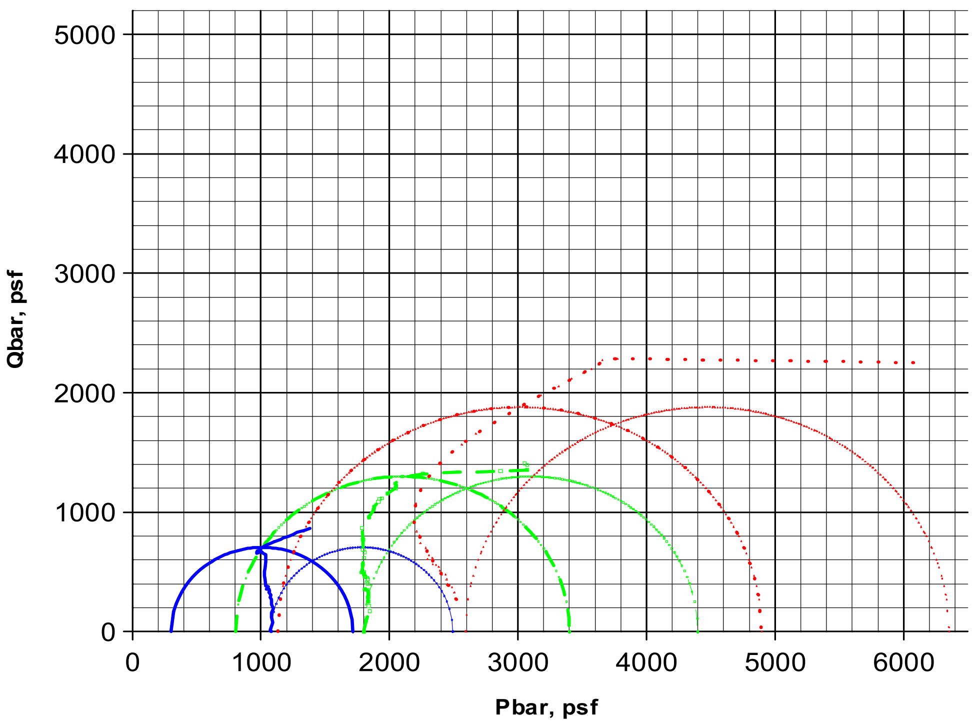
Line type	SigC psf	Peak Deviator str., psf	Strain @ fail. %	PWP psf	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio			Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Strain Rate %/hr.
solid	1440	2240	6.8	501	33.4	86.6	95	0.946			34.7	88.1	103	0.913	1.0
dash	2304	3226	6.8	983	40.8	78.8	96.8	1.1			42.4	81.3	107	1.1	1.0
dot	3600	5210	6.8	1802	48.5	70.4	94.0	1.4			47.4	73.9	100	1.3	1.0

Client:	**Fugro**	Boring #: **90B**	Sample #: **S07A**
Project:	**DWR Levee Geotechnical Evaluation - RD 17**	Depth (ft): **20-22.5**	
Project #:	**1310.013**	Soil: **LEAN CLAY (CL)**	

TEST REPORT: Isotropically Consolidated Undrained Triaxial Compression Test

Signet Testing Labs, Inc.

Figure E-4b



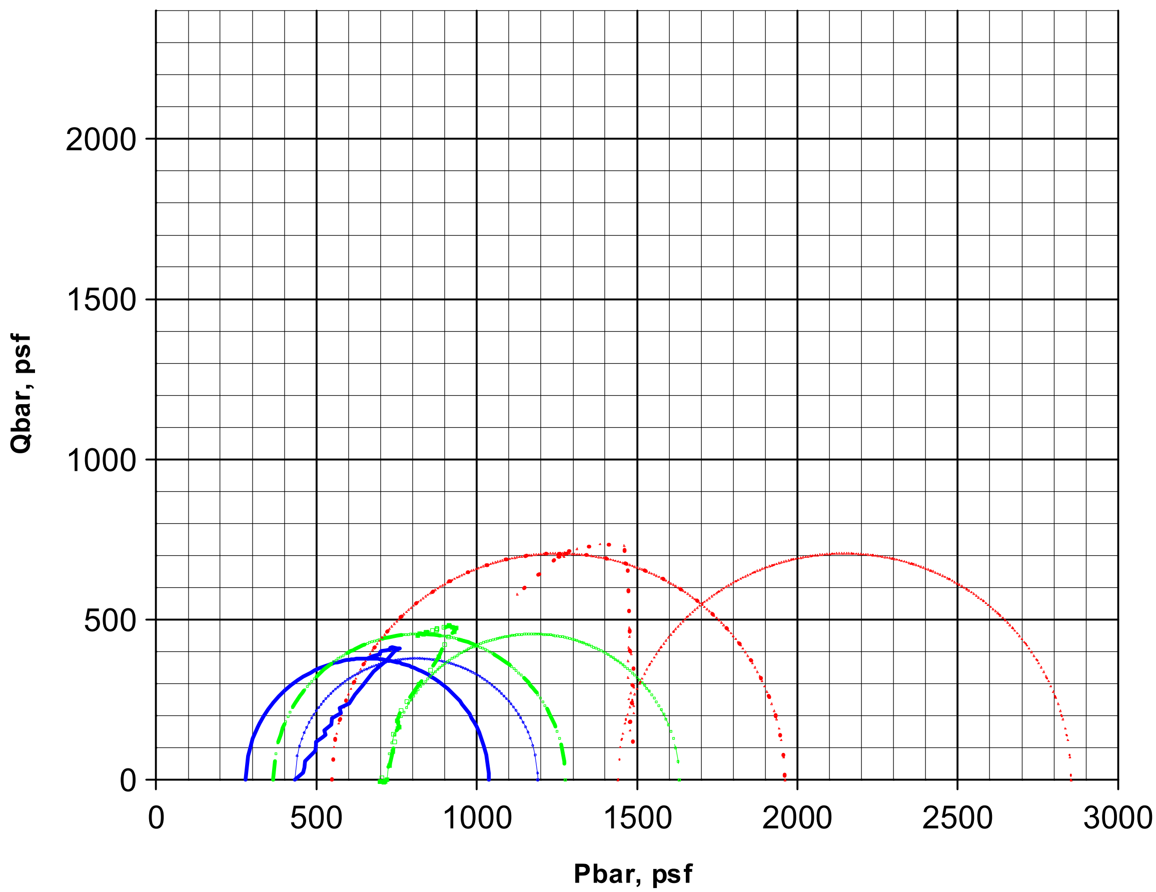
Line type	SigC psf	Peak Deviator str., psf	Strain @ fail. %	PWP psf	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio			Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Strain Rate %/hr.
solid	1080	1413	5.5	777	29.8	85.9	84	0.961			36.5	86.6	104	0.945	1.0
dash	1800	2598	10.5	997	31.0	85.4	86.1	1.0			34.2	87.9	101	0.9	1.0
dot	2592	3762	6.8	1459	29.8	92.2	97.2	0.8			30.8	92.6	102	0.8	1.0

Client:	**Fugro**	Boring #:	**102B**	Sample #:	**05A**
Project:	**DWR Levee Geotechnical Evaluation - RD 17**	Depth (ft):	**15-17.5**		
Project #:	**1310.013**	Soil:	**ELASTIC SILT (MH)**		

TEST REPORT: Isotropically Consolidated Undrained Triaxial Compression Test

Signet Testing Labs, Inc.

Figure E-4c

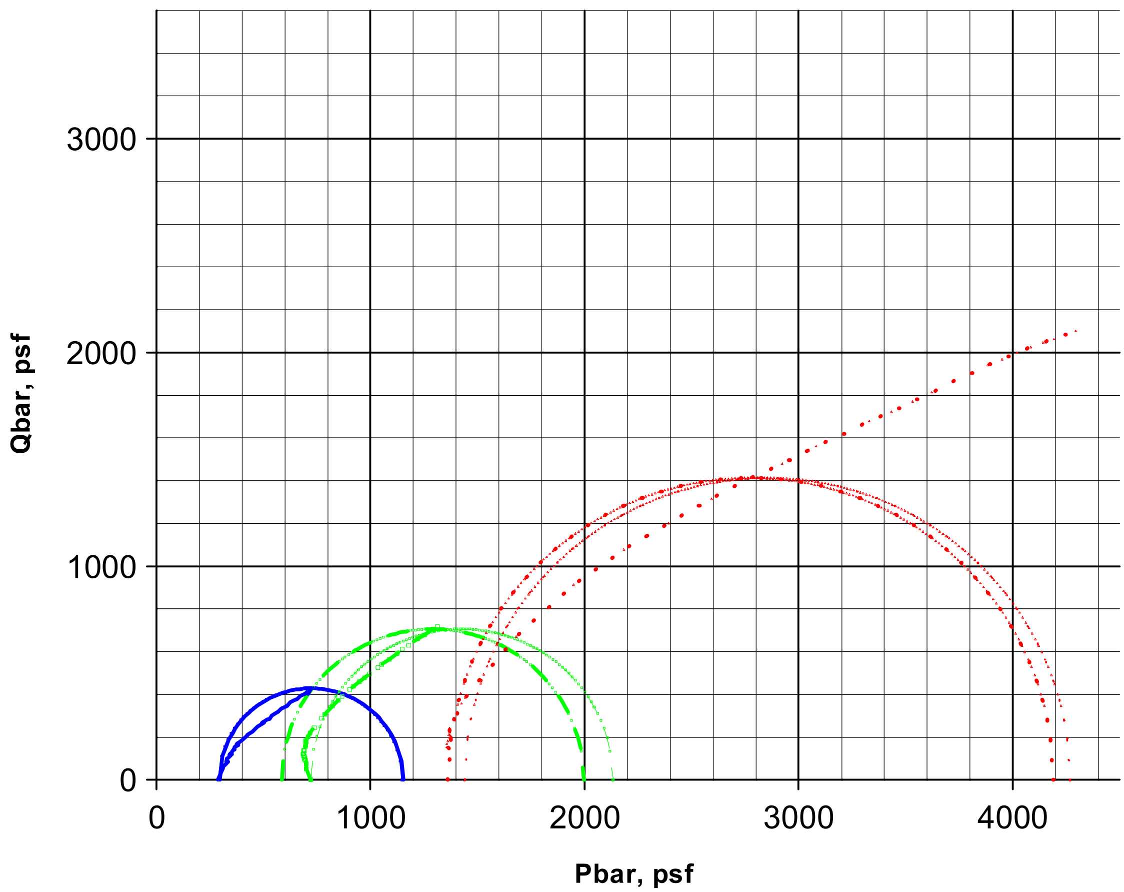


Line type	SigC psf	Peak Deviator str., psf	Strain @ fail. %	PWP psf	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio			Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Strain Rate %/hr.
solid	432	758	2.7	153	26.1	88.7	78	0.898			31.8	88.9	96	0.896	1.0
dash	720	911	3.8	354											1.0
dot	1440	1414	10.4	892											1.0

Client: **Fugro**	Boring #: **WR0017_137B** Sample #: **S03A**
Project: **DWR Levee RD 17**	Depth (ft): **3-5**
Project #: **1310.022**	Soil: **LEAN CLAY with sand (CL)**

TEST REPORT: STAGED Consolidated Undrained Triaxial Compression Test

Signet Testing Labs, Inc.

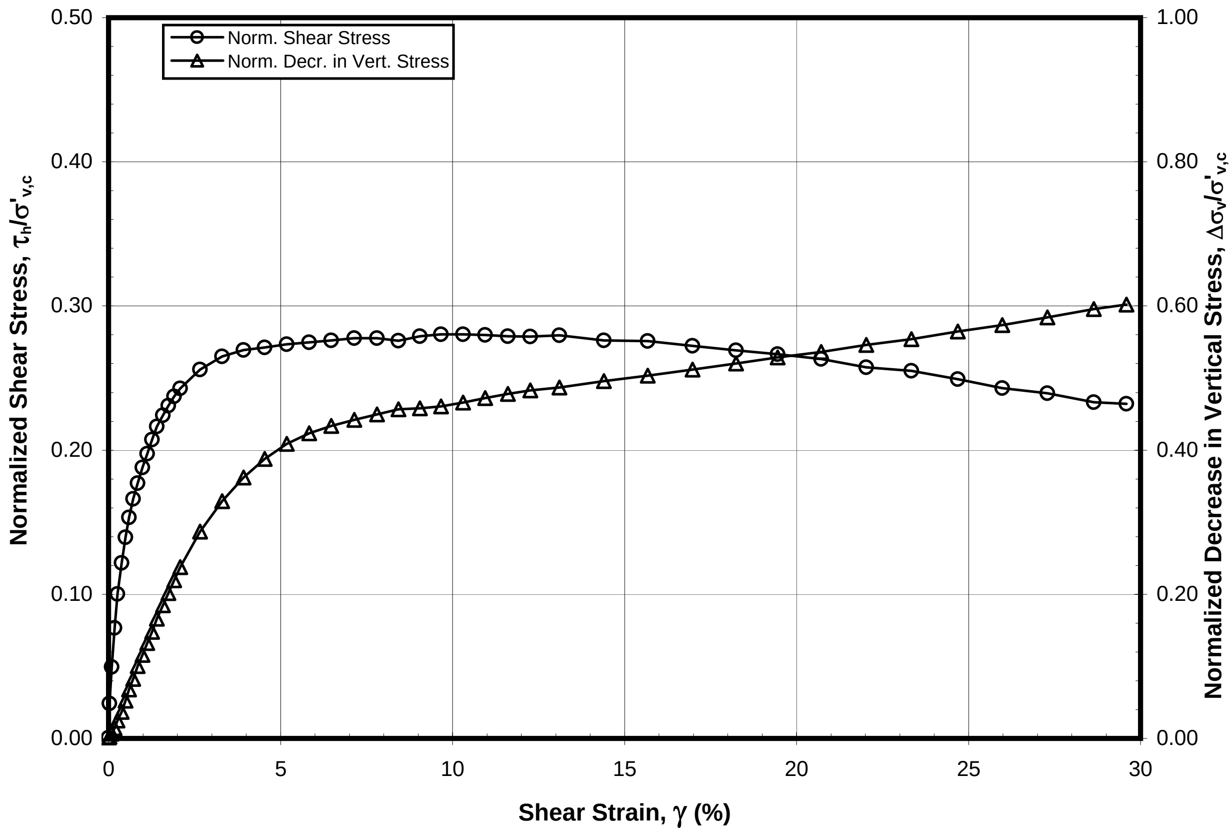


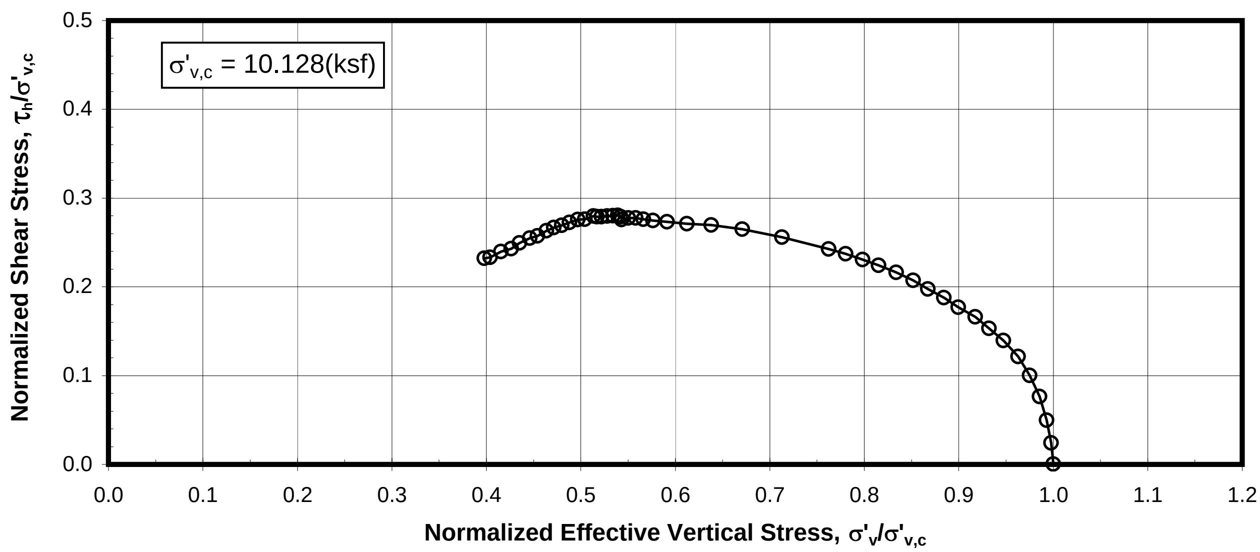
Line type	SigC psf	Peak Deviator str., psf	Strain @ fail. %	PWP psf	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio			Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Strain Rate %/hr.
solid	288	858	3.9	-7	24.5	93.0	82	0.812			28.8	93.1	96	0.809	1.0
dash	720	1413	3.7	135											1.0
dot	1440	2828	5.4	78											1.0

Client:	**Fugro**	Boring #:	**WR0017_140B** Sample #: **S03A**
Project:	**DWR-Stockton & Lathrop Levee Road 17**	Depth (ft):	**3'-5'**
Project #:	**1310.022 T.O. 27**	Soil:	**LEAN CLAY (CL)**

TEST REPORT: **STAGED Consolidated Undrained Triaxial Compression Test**

Signet Testing Labs, Inc.



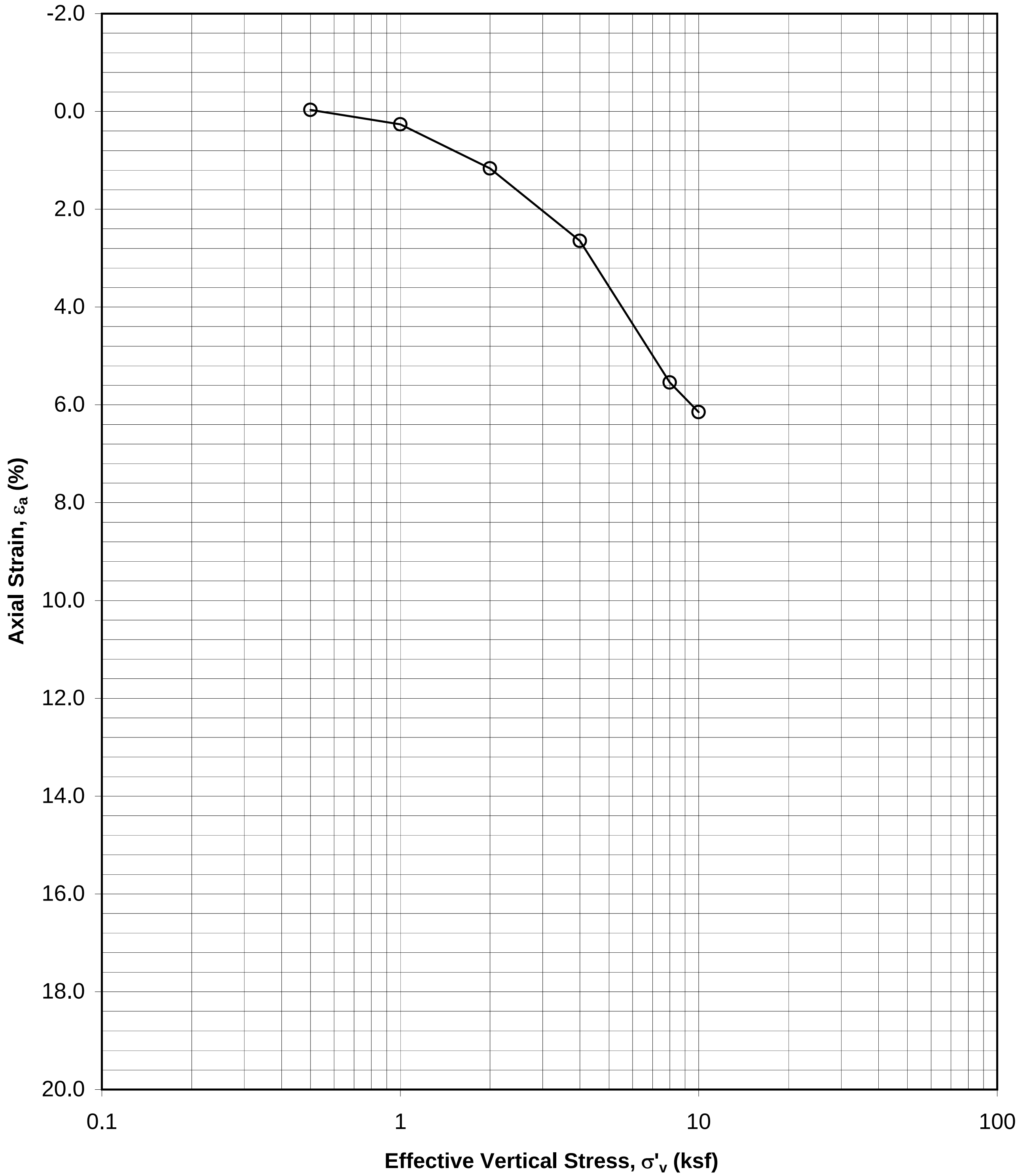


STATIC DSS TEST

K_o Consolidation - OCR = 1

Sample: S07Ac - Depth: 19.45 ft

Boring WR0017-207B



DSS INCREMENTAL CONSOLIDATION

Sample: S07Ac - Depth 19.45 ft

Boring No. WR0017-207B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: SDSS | Sta. No.: DSS-S05 | File Name: 0017-207B_S07

Task No.: | Assign, $\sigma'_{v,c}$ = 10.00 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: | Induced OCR = 1.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.750 | [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-207B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 19.45	Specimen No.: c	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[X] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental [ ] CRS	; [ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ [ ] 90° Stress Path	[X] Used Automated System Remarks:	
Loading Conditions:	[X] Static [ ] Rapid	[X] Strain [ ] Stress	[X] Creep [ ] Post Cyclic	[X] Const, Vol./Ht [ ] Drained	[X] Without - Water [ ] With - Bath	[ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Strain [ ] Stress 1; Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	4096	6087	6182	6133
Mass Moist Soil + Cont. (g)	71.09	97.29	109.73	65.44
Mass Dry Soil + Container (g)	65.22	86.29	96.92	59.62
Mass Container (g)	30.58	30.81	29.84	30.98
WATER CONTENT (%)	16.95	19.83	19.10	20.32
Avg. Initial WC, $W_{o,avg}$ (%)	18.62	Final W_{at}:	[X] Slice ; [ ]	Whole Spec.

[ ] See attached data sheet(s) for additional water contents

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	220.20	72.84
Mass Tare (g)	151.02	3.76
Mass Moist Soil, $M_{t,o}$ $Mt_{,at}$ (g)	69.18	69.08

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

[X] Trimming Ring for Fugro Apparatus		Large-ring ID #	
[ ] Trimming Ring for NGI Apparatus	FS1	Small-ring ID #	
$H_{s,t}$ (mm):	18.81	$A_{s,t}$ (cm²):	17.93
$D_{s,t}$ (mm) :	47.79	$V_{s,t}$ (cm³):	33.73

Remarks:

[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})	Diameter (D_o)		Remarks:	
1	18.850	1-T	NA		
2	18.790	2-M	NA		
3	18.780	3-B	NA		
4	18.800	1'-T	NA	For Free Standing	
5	18.810	2'-M	NA	or Reconstituted Spec.:	
	Avg.	3'-B	NA	A_{tr} (cm²):	NA
=	18.806	Avg	NA	V_{tr} (cm³):	NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)= 128.05 | Dry, $\gamma_{d,o}$ (lb/ft³)= 107.95

Specimen Lateral Confinement by:

[ ] **Wire Reinforced, Model:** Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

[X] **Regular Membrane with Ring Set No.** 5S | ID, Rings (mm)

Thickness (mm): Top: 0.71 , | = 48.33

[ ] Single Bottom: 0.76 , | Corr. for mem.

[X] Double Membr. Thick. = 0.37 | = 47.595

Area Ring with mem., A_o: (cm²)= 17.79 ; (in²)= 2.758

Mass Top Cap, etc., M_{tc} = 265.1 g, 0.58 lbf

Data corr. for M_{tc}: [X] Yes; [ ] No Plattens with Pins: [ ] Yes; [X] No

Note: NA indicates not applicable. | Top Cap No. 5S

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus.

Sketch of Specimen

Final Visual Description: Clay brown, with small Gravel and Sand pockets

Other Remarks :

Trim./ Recon. By:	PL	Setup By:	JTG	Take Down By:	PL
Date:	2/19/2013	Date:	2/20/2013	Date:	2/28/2013
Prelim. Calc. By:	JTG	Final Calc. By:	JJ	Reviewed By:	TP

Specimen Take Down: [X] Spec. removed right after shearing | Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: DSS-S05 File Name: 0017-207B_S07Ac

Task Number: ______ Specific Gravity: 2.750 [ ] Measured; [X] Assumed

Type Test: SDSS Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary							
Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X	Static Strain Rate = Value ? (%/hr or)		
Nominal Vertical Stress, σ'_v (ksf)	NA	10	NA		Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =		
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA		During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	NA	0	NA		Change in Height, $\Delta H_{L,n}$ (mm)	NA	NA
Nominal OCR	NA	1	NA		Change in Vol., $\Delta V_{L,n}$ (cm^3)	A	NA
t_c,(ON,days,hrs)	NA	2.06days	NA		Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):						
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	16.95	19.83	19.10	18.62	18.62	20.50
S_o	82.5	90.3	88.4	87.2	87.2	92.0
Measured final mass of moist soil, $M_{t,at}$ (g)						69.08
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						69.08

Calculated Mass of Dry Soil (g)	
Initial Selected Water Content (%)	18.62
Initial , $M_{d,o}$	58.32
Final, $M_{d,at}$	57.41
Selected, M_d	57.87

Initial Back Cal. Specific Gravity (TS):	
Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary			
Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	10.000	NA	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	1.170		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	1.170		
ΔV_n using A_o - spec. (cm^3)	2.10		
ΔV_n using $A_{c,n}$ - app. (cm^3)	2.08		
ΔV_n using burette meas.(cm^3)	-0.80		
Selected ΔV_n (cm^3)	2.08	NA	NA = ΔV_{uL}
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures			
By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	2.08	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	0.10
ΔV_c (cm^3)	2.08	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	2.10	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below	
Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	17.76
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	NA

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	2.35	ΔH_c (mm) =	1.170	$\varepsilon_{a,c}$ (%) =	6.22	$\Delta V_{c,max}$ (cm^3) =	NA
V_c (cm^3) =	31.38	H_c (mm) =	17.636	$\varepsilon_{v,c}$ (%) =	6.97	$\varepsilon_{ac,max}$ (%)=	NA
A_c (cm^2) =	17.79	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:							
Specific Gravity: G_s = 2.750 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	18.806	33.73	17.93	19.6	128.0	107.1	89.6
After Consol.: to $\sigma'_{v,c}$	17.636	31.38	17.79	17.8	135.6	115.1	100.0
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.

& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable

3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ

Reviewed By: TP

Remarks: ______

Project Number: 04.11120056 Test Type: SDSS Test Sta. No.: DSS-S05 File Name: 0017-207B_S07

Project Name: Task No.: Test No.: NA Test Series for: NA

X	Tube		Field Extruded		Liner		Remolded
	Boring No.: WR0017-207B				LPC Core		
	Sample No.: S07A		Compostite No.:				
	Depth (ft): 19.45		Specimen No.: c				
X	Spec. Selection by X-ray;				Geomarine Sample		

	Tamping		Constant Effort: Blows/Tamps per Layer =
	Impact/Rammer		Rammer Wgt.(lbf)= No. Layers =
	Pluviated:		Tamper Force (lbf)= Drop (in.) =
	Kneading		Undercompaction: U_{ni} (%) = Dia. (in.) =
			Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X	K_o at:	X	Incremental		Anisotropic at:		Inclined Stress Path, $K_{c,DSS}$	X	Used Automated System			
				CRS				90° Stress Path		Remarks:			
Loading	X	Static	X	Strain	X	Creep	X	Const, Vol./Ht	X	Without - Water		Cyclic (Hz)	Strain / Stress
Conditions:		Dynamic		Stress		Post Cyclic		Drained		With - Bath		Rate: 0.1;	1; Other:

Summary of Specimen Physical Properties										
Specific Gravity: G_s = 2.750	Height	Volume	Area	Water Content	Unit Weight Total	Unit Weight Dry	Saturation	LL PL PI		
Condition:	(mm)	(cm^3)	(cm^2)	(%)	(pcf)	(pcf)	(%)			
Initial	18.81	33.73	17.93	19.55	128.0	107.1	89.6			
After Consol. to $\sigma'_{v,c}$	17.64	31.38	17.79	17.76	135.6	115.1	100.0			
to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA			

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	NA	10.128	NA
Induced OCR:	-	NA	1.00	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	NA	6.22	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 4.7 %/hr.

Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	A	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.58

Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No

Wire Reinforced Membrane, Model: Data corr. for Membr. strength

X Regular Membrane with Rings Yes X No

Data Normalization: X Yes No Value: 10.128 (ksf)

Using Effective Vertical Stress:

X Pre-Shear Conditions Post-Cyclic Conditions

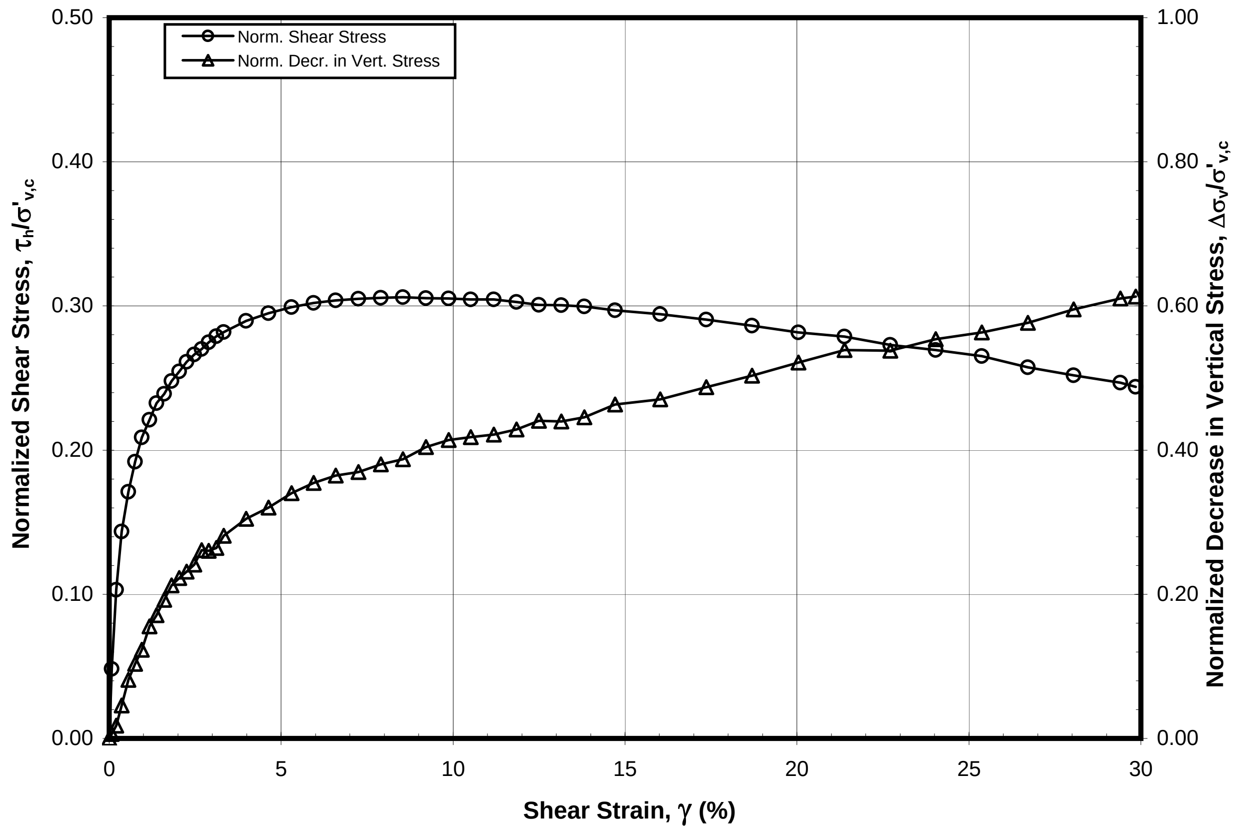
Maximum Stress during Consol.

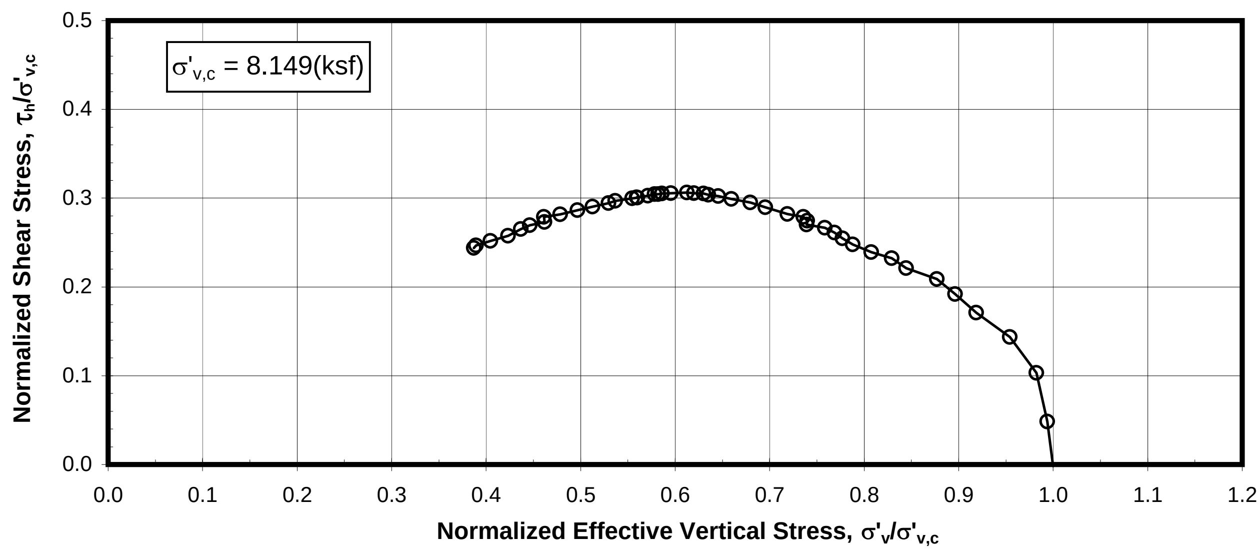
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

NA - Not Applicable

Final Visual Description and Remarks: Clay brown, with small Gravel and Sand pockets

Loading Summary	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	2.839	9.67	5.460	0.520	0.461	0.280
at Maximum Strain	2.351	29.59	4.030	0.583	0.602	-



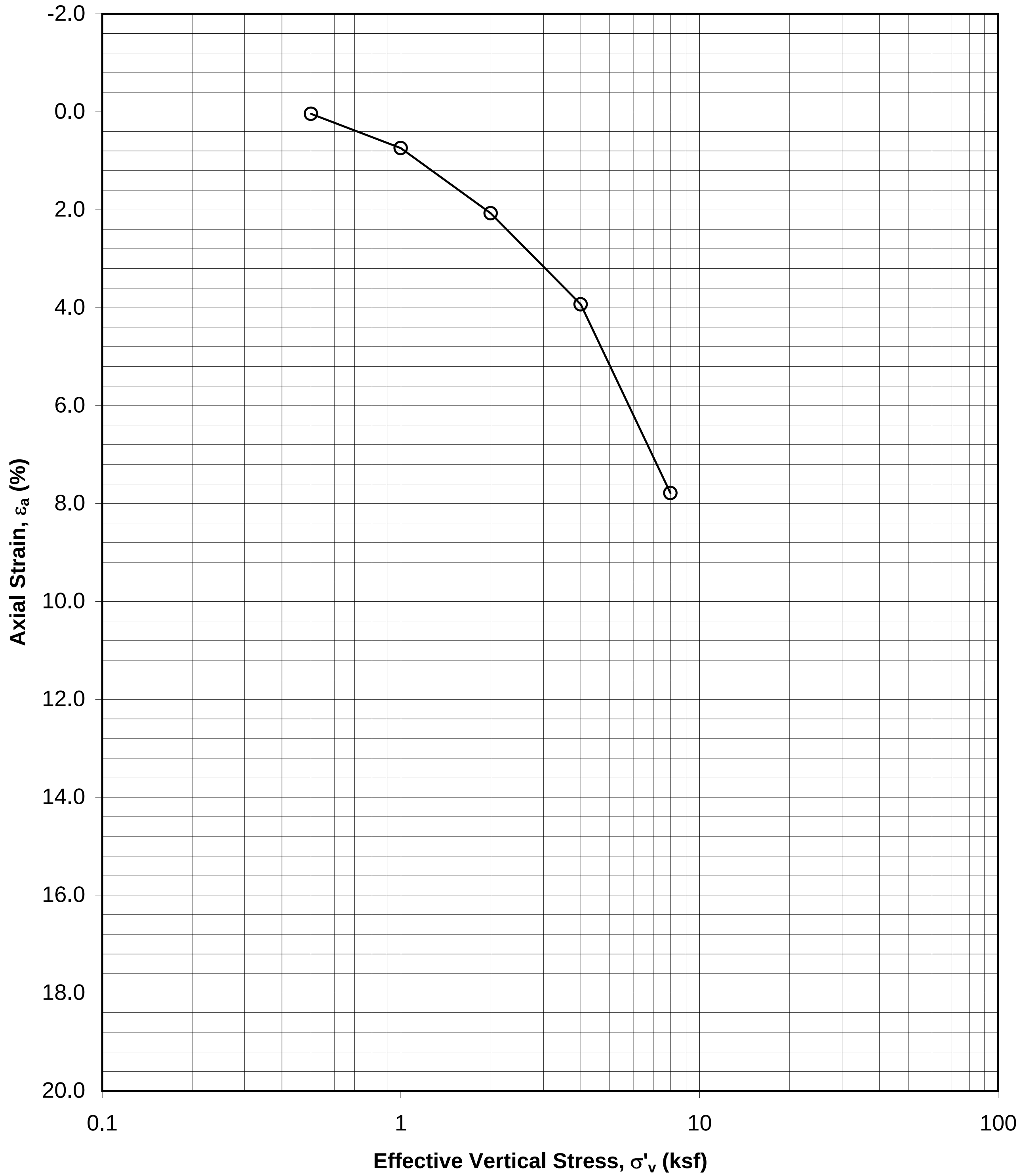


STATIC DSS TEST

K_o Consolidation - OCR = 1

Sample: S08Aa - Depth: 23.45 ft

Boring WR0017-216B



DSS INCREMENTAL CONSOLIDATION

Sample: S08Aa - Depth 23.45 ft

Boring No. WR0017-216B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: SDSS Sta. No.: DSS-S12 File Name: 0017-216B_S08

Task No.: Assign, $\sigma'_{v,c}$ = 8.00 ksf $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: Induced OCR = 1.00 $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: Specific Gravity: 2.720 [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-216B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S08A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 23.45	Specimen No.: a	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[ ] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental [ ] CRS	; [ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ [ ] 90° Stress Path	[X] Used Automated System	Remarks:
Loading Conditions:	[X] Static [ ] Rapid	[X] Strain [ ] Stress	[ ] Creep [ ] Post Cyclic	[X] Const, Vol./Ht [ ] Drained	[X] Without - Water [ ] With - Bath	[ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Strain [ ] Stress [ ] 1; Other:

Water Content (WC);	Initial - Trimming Location: Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	4107		6030	6133
Mass Moist Soil + Cont. (g)	68.39		72.86	61.23
Mass Dry Soil + Container (g)	56.98		60.66	53.01
Mass Container (g)	30.03		31.68	30.97
WATER CONTENT (%)	42.34		42.10	37.30
Avg. Initial WC, $W_{o,avg}$ (%)	42.22	Final W_{at}:	[X] Slice ;	[ ] Whole Spec.

[ ] See attached data sheet(s) for additional water contents

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	210.90	61.68
Mass Tare (g)	151.02	3.61
Mass Moist Soil, $M_{t,o}$ $M_{t,at}$ (g)	59.88	58.07

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

[X] Trimming Ring for Fugro Apparatus		Large-ring ID #	
[ ] Trimming Ring for NGI Apparatus	FS1	Small-ring ID #	
$H_{s,t}$ (mm): 18.83		$A_{s,t}$ (cm²): 17.93	
$D_{s,t}$ (mm) : 47.79		$V_{s,t}$ (cm³): 33.77	

Remarks:

[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})		Diameter (D_o)	Remarks:
1	18.810	1-T	NA	
2	18.840	2-M	NA	
3	18.870	3-B	NA	
4	18.820	1'-T	NA	For Free Standing
5	18.810	2'-M	NA	or Reconstituted Spec.:
	Avg.	3'-B	NA	A_{tr} (cm²): NA
=	18.830	Avg	NA	V_{tr} (cm³): NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)= 110.69 Dry, $\gamma_{d,o}$ (lb/ft³)= 77.83

Specimen Lateral Confinement by:

[ ] **Wire Reinforced, Model:** Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

[x] **Regular Membrane with Ring Set No.** 8S ID, Rings (mm)

Thickness (mm): Top: 0.77 , = 48.32

[ ] Single Bottom: 0.74 , Corr. for mem.

[x] Double Membr. Thick. = 0.38 = 47.565

Area Ring with mem., A_o: (cm²)= 17.77 ; (in²)= 2.754

Note: NA indicates not applicable. Top Cap No. 8S Mass Top Cap, etc., M_{tc} = 268.2 g, 0.59 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus. Data corr. for M_{tc}: [X] Yes; [ ] No Plattens with Pins: [ ] Yes; [X] No

Sketch of Specimen

Final Visual Description: Sil;ty Clay, brown, with Ferrous Stains, and Traces of Organic Matters

Other Remarks :

Trim./ Recon. By: PL Setup By: JTG Take Down By: PL

Date: 2/20/2013 Date: 2/20/2013 Date: 2/26/2013

Prelim. Calc. By: JTG Final Calc. By: JJ Reviewed By: TP

Specimen Take Down: [X] Spec. removed right after shearing Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 | Test Station No.: DSS-S12 | File Name: 0017-216B_S08Aa

Task Number: | Specific Gravity: 2.720 | [ ] Measured; [X] Assumed

Type Test: SDSS | Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary							
Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X	Static Strain Rate = Value ? (%/hr or)		
Nominal Vertical Stress, σ'_v (ksf)	NA	8	NA		Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =		
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA		During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	NA	0	NA		Change in Height, $\Delta H_{L,n}$ (mm)	Value ?	NA
Nominal OCR	NA	1	NA		Change in Vol., $\Delta V_{L,n}$ (cm^3)	Value ?	NA
t_c,(ON,days,hrs)	NA	3.84days	NA		Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

	Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):					
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	42.34		42.10	42.22	42.22	41.58
S_o	97.6		97.4	97.5	97.5	96.8
Measured final mass of moist soil, $M_{t,at}$ (g)						58.07
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						58.07

Calculated Mass of Dry Soil (g)	
Initial Selected Water Content (%)	42.22
Initial , $M_{d,o}$	42.10
Final, $M_{d,at}$	42.30
Selected, M_d	42.20

Initial Back Cal. Specific Gravity (TS):	
Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary			
Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	8.000	NA	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	1.540		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	1.540		
ΔV_n using A_o - spec. (cm^3)	2.76		
ΔV_n using $A_{c,n}$ - app. (cm^3)	2.74		
ΔV_n using burette meas.(cm^3)	1.35		
Selected ΔV_n (cm^3)	2.74	NA	NA = ΔV_{uL}
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures			
By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	2.74	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	1.81
ΔV_c (cm^3)	2.74	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	2.76	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below	
Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	35.91
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	NA

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	3.05	ΔH_c (mm) =	1.540	$\varepsilon_{a,c}$ (%) =	8.18	$\Delta V_{c,max}$ (cm^3) =	NA
V_c (cm^3) =	30.72	H_c (mm) =	17.290	$\varepsilon_{v,c}$ (%) =	9.03	$\varepsilon_{ac,max}$ (%)=	NA
A_c (cm^2) =	17.77	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:							
Specific Gravity: G_s = 2.720 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	18.830	33.77	17.93	41.9	110.7	78.0	97.2
After Consol.: to $\sigma'_{v,c}$	17.290	30.72	17.77	35.9	116.5	85.7	100.0
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume. Calculated By: JJ

& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable Reviewed By: TP

3 - Uses measured value at appropriate stress level (NA for rings).

Remarks:

Project Number: 04.11120056 | Test Type: SDSS | Test Sta. No.: DSS-S12 | File Name: 0017-216B_S08

Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-216B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S08A		Compostite No.:		Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 23.45		Specimen No.: a		Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental / CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ / 90° Stress Path	X Used Automated System	Remarks:
Loading Conditions:	X Static / Dynamic	X Strain / Stress	Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1; Strain 1; Stress Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.720	Height	Volume	Area	Water Content	Unit Weight Total	Unit Weight Dry	Saturation	LL / PL / PI		
Condition:	(mm)	(cm^3)	(cm^2)	(%)	(pcf)	(pcf)	(%)			
Initial	18.83	33.77	17.93	41.90	110.7	78.0	97.2			
After Consol.: to $\sigma'_{v,c}$	17.29	30.72	17.77	35.91	116.5	85.7	100.0			
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA			

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	NA	8.149	NA
Induced OCR:	-	NA	1.00	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	NA	8.18	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 4.9 %/hr.

Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	Value ?	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	Value ?	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.59		Data Normalization: X Yes / No Value: 8.149 (ksf)
Data corr. for M_{tc}: X Yes; No	Plattens with Pins: Yes; X No	Using Effective Vertical Stress:
Wire Reinforced Membrane, Model:	Data corr. for Membr. strength	X Pre-Shear Conditions / Post-Cyclic Conditions
x Regular Membrane with Rings	Yes / X No	Maximum Stress during Consol.

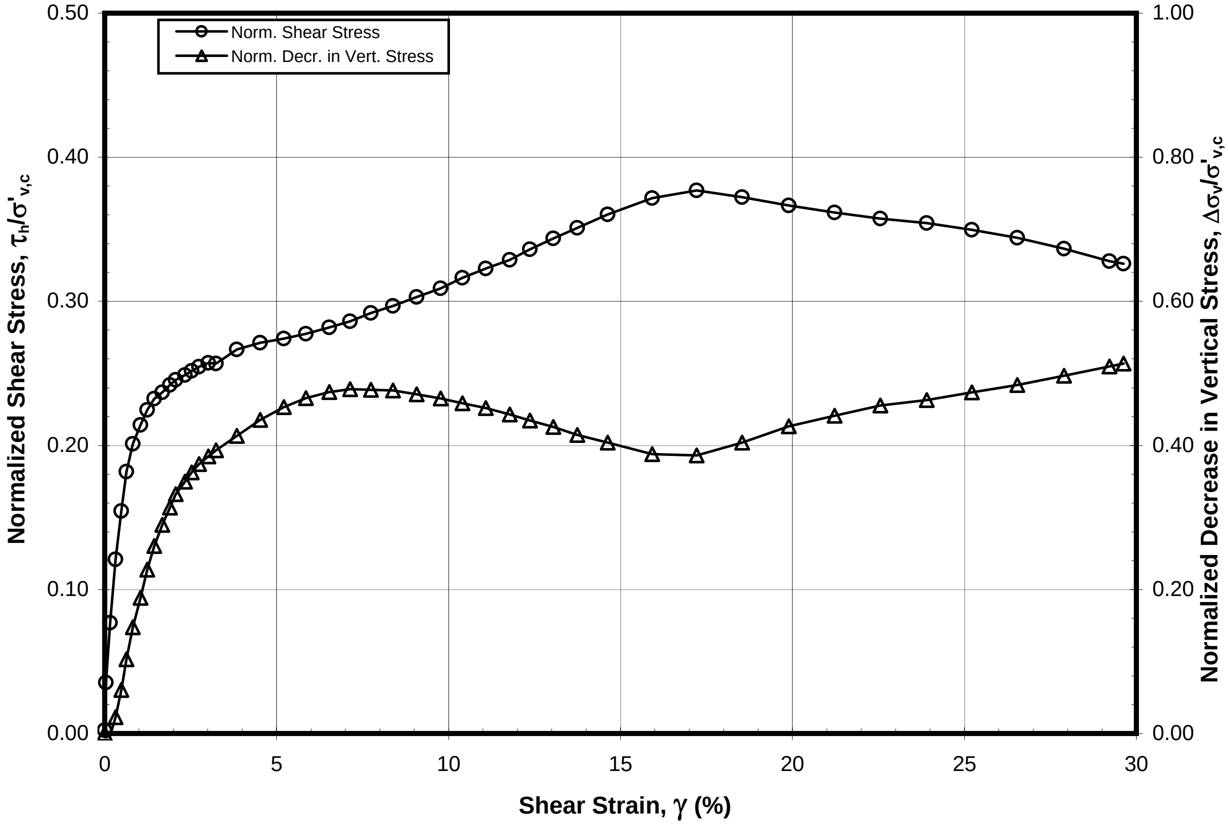
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

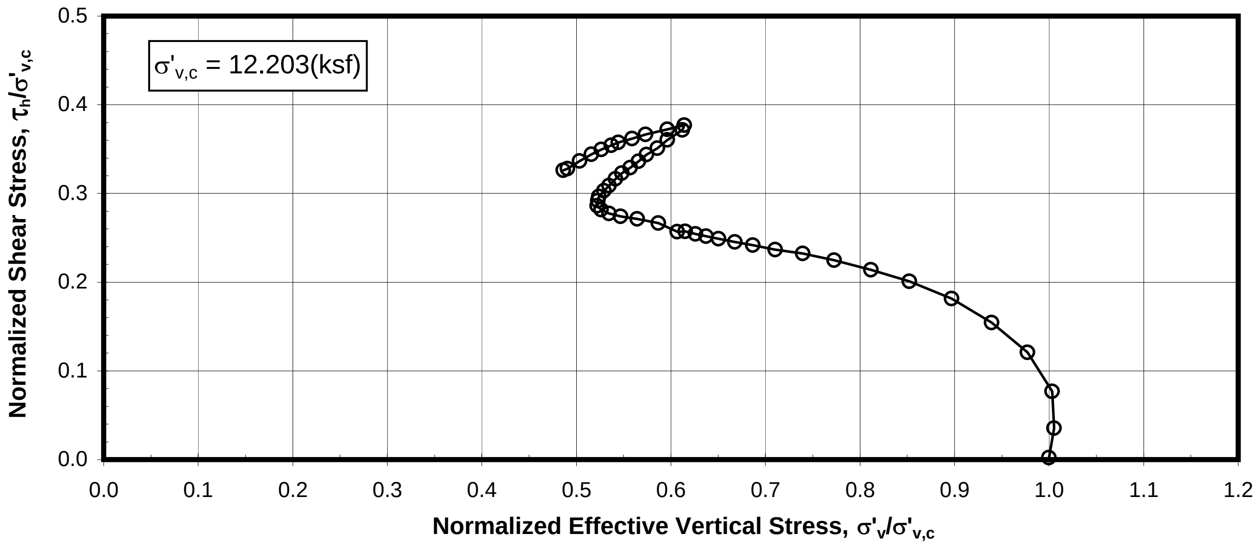
NA - Not Applicable

Final Visual Description and Remarks: Sil;ty Clay, brown, with Ferrous Stains, and Traces of Organic Matters

Loading Summary

	τ_h	γ	σ'_v	τ_h/σ'_v	$\Delta\sigma'_v/\sigma'_{v,c}$	$c_u/\sigma'_{v,c}$
	(ksf)	(%)	(ksf)	-	-	-
at Peak Shear Stress	2.494	8.54	4.991	0.500	0.388	0.306
at Maximum Strain	1.987	29.85	3.153	0.630	0.613	-



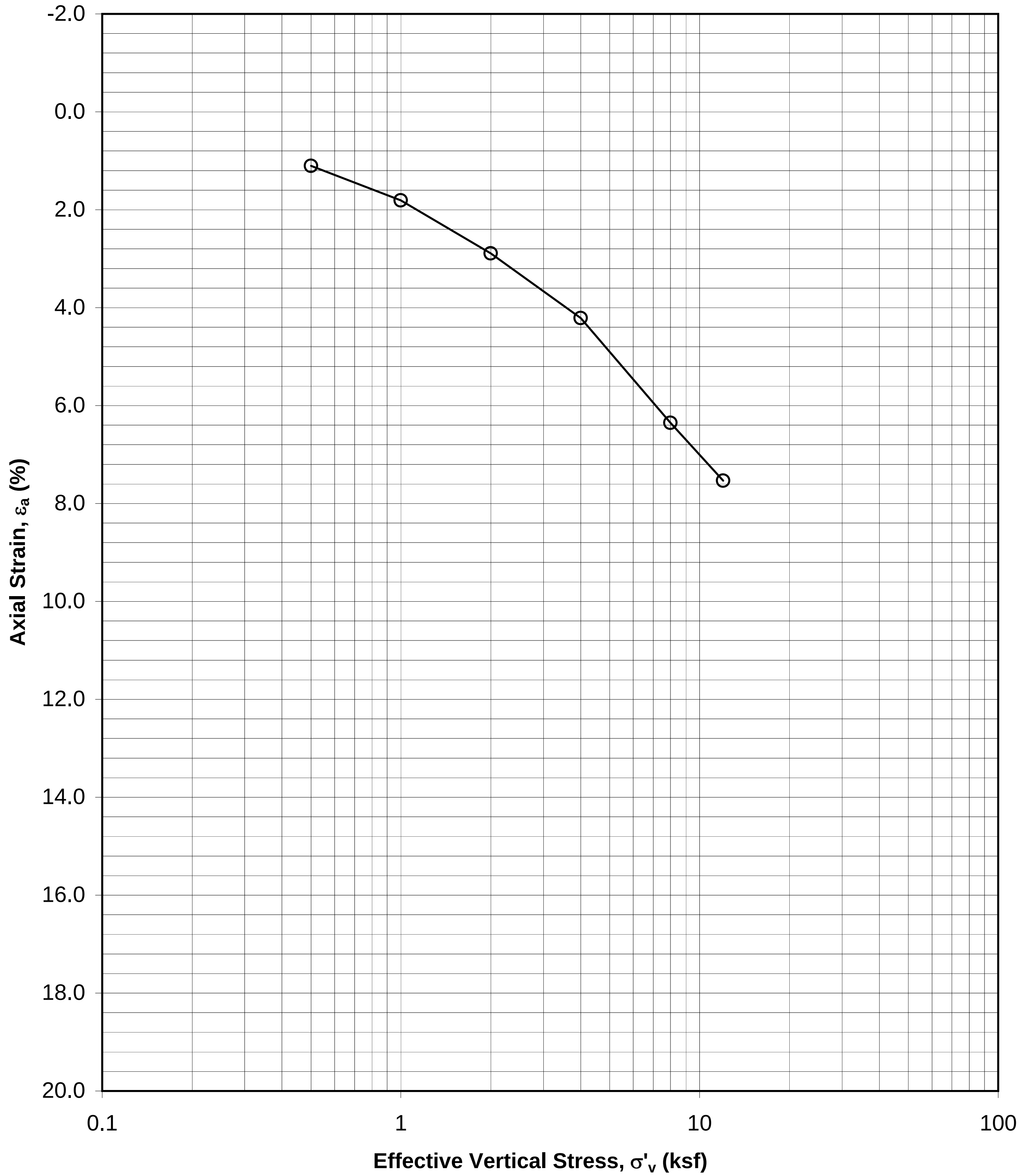


STATIC DSS TEST

K_o Consolidation - OCR = 1

Sample: S04Af - Depth: 16.60 ft

Boring WR0017-227B



DSS INCREMENTAL CONSOLIDATION

Sample: S04Af - Depth 16.60 ft

Boring No. WR0017-227B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: SDSS Sta. No.: DSS-S13 File Name: WR0017-227B

Task No.: Assign, $\sigma'_{v,c}$ = 12.00 ksf $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: Induced OCR = 1.00 $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: Specific Gravity: 2.700 [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-227B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S04A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 16.60	Specimen No.: f	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) =	Dia. (in.) =
[X] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental CRS	; [ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ 90^o Stress Path	[X] Used Automated System Remarks:	
Loading Conditions:	[X] Static [ ] Rapid	[X] Strain [ ] Stress	[ ] Creep [ ] Post Cyclic	[X] Const, Vol./Ht [ ] Drained	[X] Without - Water [ ] With - Bath	[ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Strain 1; [ ] Stress Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	5007		6442	6030
Mass Moist Soil + Cont. (g)	71.40		89.37	69.65
Mass Dry Soil + Container (g)	63.01		76.68	62.26
Mass Container (g)	31.12		30.13	31.65
WATER CONTENT (%)	26.31		27.26	24.14
Avg. Initial WC, $W_{o,avg}$ (%)	26.79	Final W_{at}:	[X] Slice ;	[ ] Whole Spec.
[ ] See attached data sheet(s) for additional water contents				

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	217.89	68.62
Mass Tare (g)	151.03	3.63
Mass Moist Soil, $M_{t,o}$ $Mt_{,at}$ (g)	66.86	64.99
Excess Dry Soil (soil not included in final mass above)		
Container No.		
Mass Dry Soil + Container (g)		
Mass Container (g)		
Mass Excess Dry Soil (g)		0.00

Specimen Trimming:

[X] Trimming Ring for Fugro Apparatus			Large-ring ID #
[ ] Trimming Ring for NGI Apparatus		FS1	Small-ring ID #
$H_{s,t}$ (mm):	18.72	$A_{s,t}$ (cm^2):	17.93
$D_{s,t}$ (mm) :	47.79	$V_{s,t}$ (cm^3):	33.57

Remarks:

[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})	Diameter (D_o)		Remarks:	
1	18.740	1-T	NA		
2	18.700	2-M	NA		
3	18.750	3-B	NA		
4	18.680	1'-T	NA	For Free Standing	
5	18.710	2'-M	NA	or Reconstituted Spec.:	
Avg.		3'-B	NA	A_{tr} (cm^2):	NA
=	18.716	Avg	NA	V_{tr} (cm^3):	NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft^3)=	124.35	Dry, $\gamma_{d,o}$ (lb/ft^3)=	98.08

Specimen Lateral Confinement by:

[ ] **Wire Reinforced, Model:** Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm^2)	(in^2)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

[X] **Regular Membrane with Ring Set No.** 7S ID, Rings (mm)

Thickness (mm): Top: 0.83 , = 48.32

[ ] Single Bottom: 0.79 , Corr. for mem.

[X] Double Membr. Thick. = 0.41 = 47.510

Area Ring with mem., A_o: (cm^2)= 17.73 ; (in^2)= 2.748

Note: NA indicates not applicable. Top Cap No. 7S

Mass Top Cap, etc., M_{tc} = 267.9 g, 0.59 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus.

Data corr. for M_{tc}: [X] Yes; [ ] No Plattens with Pins: [ ] Yes; [X] No

Sketch of Specimen

Final Visual Description:

silt/silty clay with some fine sand, gray / olive gray, with small Stones

Other Remarks :

Trim./ Recon. By: PL Setup By: JTG Take Down By: PL

Date: 2/22/2013 Date: 2/22/2013 Date: 2/28/2013

Prelim. Calc. By: Final Calc. By: JJ Reviewed By: RJ

Specimen Take Down: [X] Spec. removed right after shearing Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 | Test Station No.: DSS-S13 | File Name: WR0017-227B_S04Af

Task Number: | Specific Gravity: 2.700 | [ ] Measured; [X] Assumed

Type Test: SDSS | Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary						
Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X	Static Strain Rate = Value ? (%/hr or)	
Nominal Vertical Stress, σ'_v (ksf)	NA	12	NA		Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =	
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	NA	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)	Value ?	NA
Nominal OCR	NA	1	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	Value ?	NA
t_c,(ON,days,hrs)	NA	1.07 days	NA	Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	26.31		27.26	26.79	26.79	27.71
S_o	100.2		102.0	101.1	101.1	102.8
Measured final mass of moist soil, $M_{t,at}$ (g)						64.99
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						64.99

Calculated Mass of Dry Soil (g)	
Initial Selected Water Content (%)	26.79
Initial , $M_{d,o}$	52.73
Final, $M_{d,at}$	52.35
Selected, M_d	52.54

Initial Back Cal. Specific Gravity (TS):	
Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary			
Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	12.000	NA	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	1.410		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	1.410		
ΔV_n using A_o - spec. (cm^3)	2.53		
ΔV_n using $A_{c,n}$ - app. (cm^3)	2.50		
ΔV_n using burette meas.(cm^3)	-0.45		
Selected ΔV_n (cm^3)	2.50	NA	NA = ΔV_{uL}
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures			
By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	2.50	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	1.87
ΔV_c (cm^3)	2.50	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	2.53	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below	
Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	21.25
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	NA

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	2.89	ΔH_c (mm) =	1.410	$\varepsilon_{a,c}$ (%) =	7.53	$\Delta V_{c,max}$ (cm^3) =	NA
V_c (cm^3) =	30.68	H_c (mm) =	17.306	$\varepsilon_{v,c}$ (%) =	8.60	$\varepsilon_{ac,max}$ (%)=	NA
A_c (cm^2) =	17.73	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:							
Specific Gravity: G_s = 2.700 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	18.716	33.57	17.93	27.2	124.3	97.7	101.9
After Consol.: to $\sigma'_{v,c}$	17.306	30.68	17.73	21.2	129.6	106.9	100.0
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.
& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable
3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ
Reviewed By: RJ

Remarks:

Project Number:	04.11120056	Test Type:	SDSS	Test Sta. No.: DSS-S13	File Name: WR0017-227B
Project Name:		Task No.:		Test No.: NA	Test Series for: NA

X Tube / Field Extruded	Liner / Remolded	Tamping	Constant Effort: / Blows/Tamps per Layer =
Boring No.: WR0017-227B	LPC Core	Impact/Rammer	Rammer Wgt.(lbf)= / No. Layers =
Sample No.: S04A	Compostite No.:	Pluviated:	Tamper Force (lbf)= / Drop (in.) =
Depth (ft): 16.6	Specimen No.: f	Kneading	Undercompaction: U_{ni} (%) = / Dia. (in.) =
X Spec. Selection by X-ray;	Geomarine Sample		Ref. Effort= / % Comp. = / ± Opt.=

Type Consolidation:	X K_o at:	X Incremental / CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ / 90° Stress Path	X Used Automated System / Remarks:	
Loading Conditions:	X Static / Dynamic	X Strain / 0 Stress	Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - Water / With - Bath	Cyclic (Hz) Rate: 0.1; / Strain 1; / Stress Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.700 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL / PL / PI		
Initial	18.72	33.57	17.93	27.25	124.3	97.7	101.9			
After Consol. to $\sigma'_{v,c}$	17.31	30.68	17.73	21.25	129.6	106.9	100.0			
After Consol. to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA			

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	NA	12.203	NA
Induced OCR:	-	NA	1.00	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	NA	7.53	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 4.9 %/hr.
Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	Value ?	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	Value ?	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA
$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %
at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

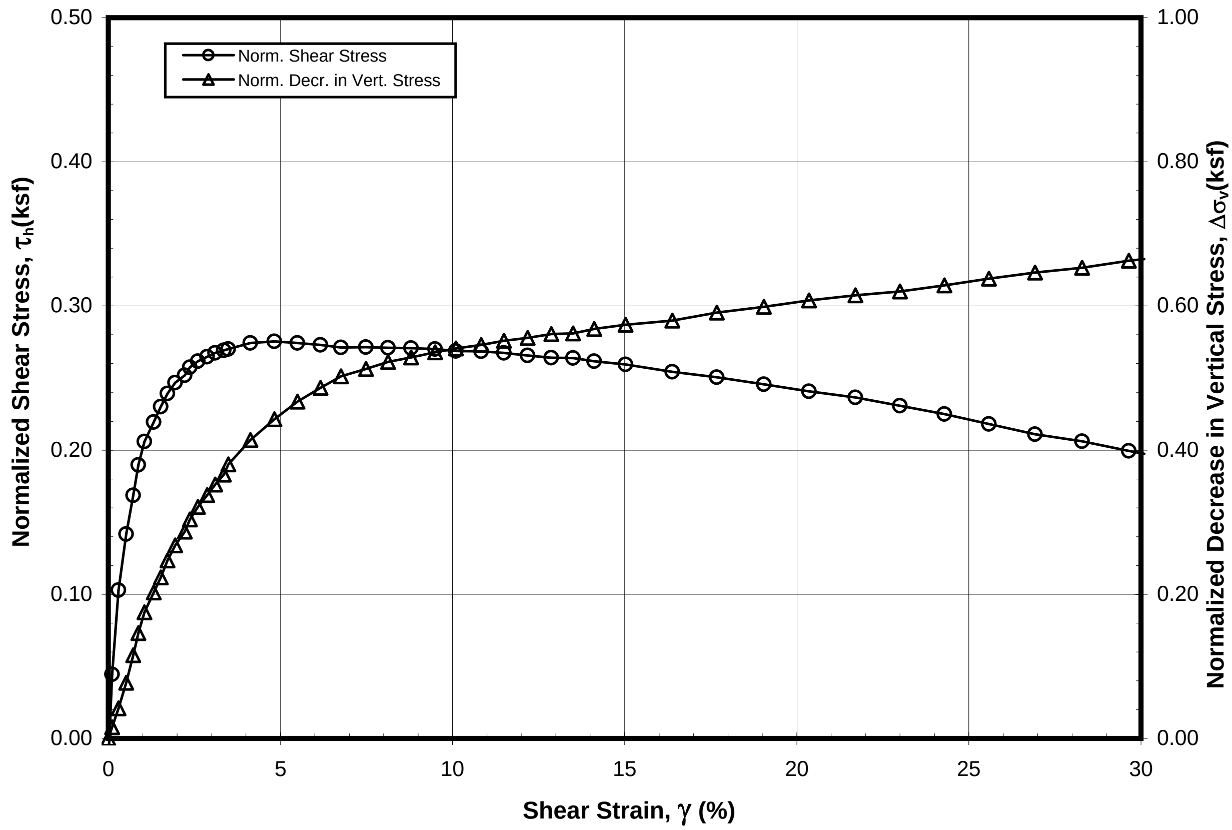
Weight Top Cap, etc., M_{tc} (lbf): 0.59	Data Normalization: X Yes / No Value: 12.203 (ksf)
Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No	Using Effective Vertical Stress:
Wire Reinforced Membrane, Model: / Data corr. for Membr. strength	X Pre-Shear Conditions / Post-Cyclic Conditions
X Regular Membrane with Rings / Yes X No	Maximum Stress during Consol.

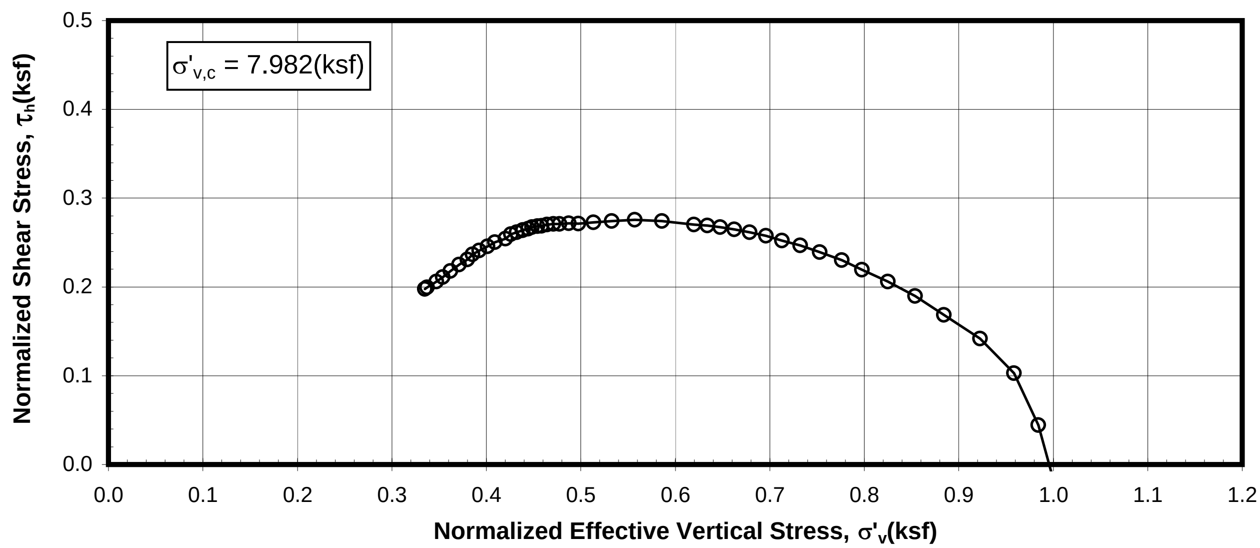
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.
NA - Not Applicable

Final Visual Description and Remarks: silt/silty clay with some fine sand, gray / olive gray, with small Stones

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	4.600	17.21	7.494	0.614	0.386	0.377
at Maximum Strain	3.978	29.63	5.934	0.670	0.514	-



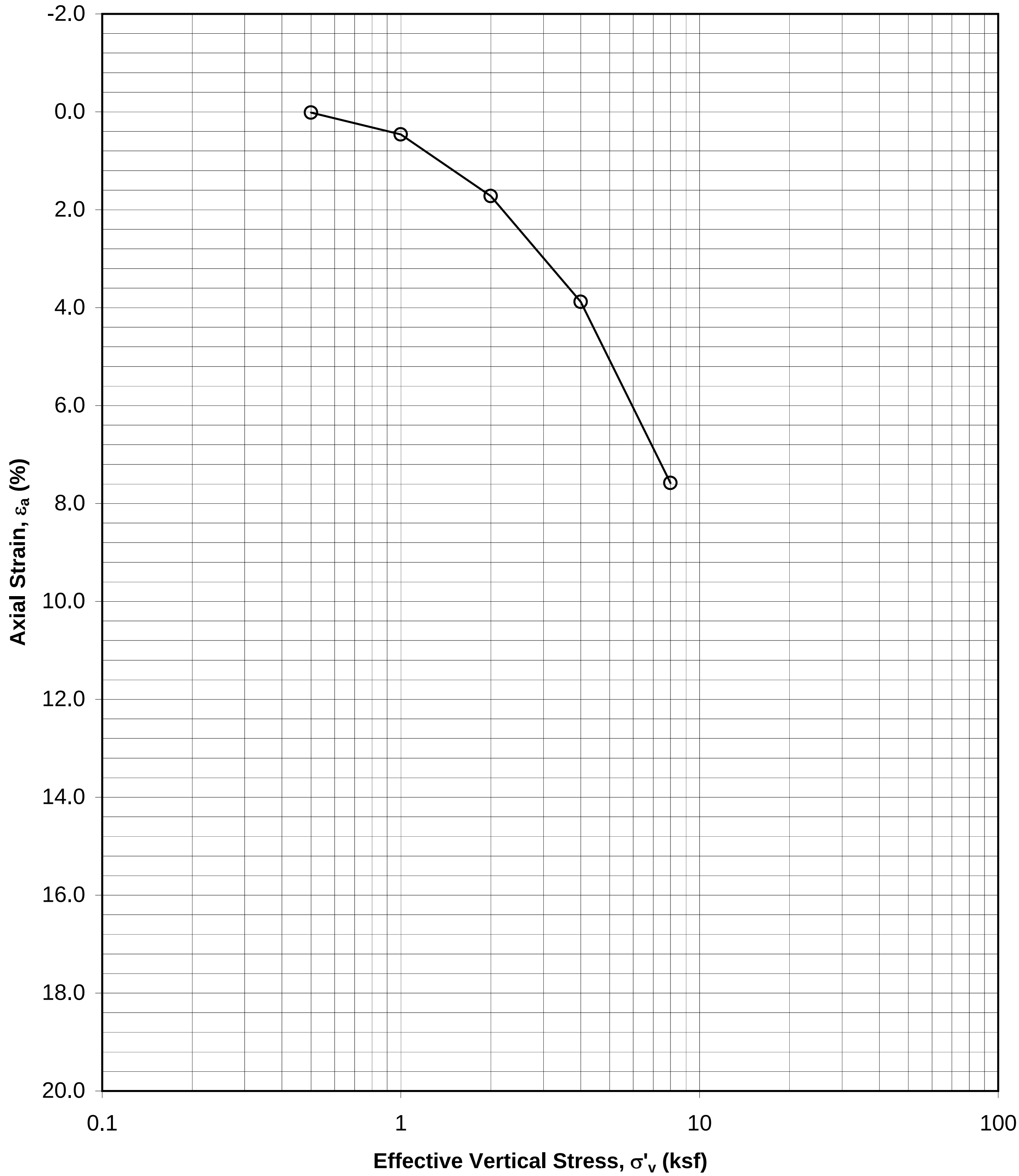


STATIC DSS TEST

K_o Consolidation - OCR = 1

Sample: S07Ac - Depth: 27.45 ft

Boring WR0017-227B



DSS INCREMENTAL CONSOLIDATION

Sample: S07Ac - Depth 27.45 ft

Boring No. WR0017-227B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: SDSS | Sta. No.: DSS-S13 | File Name: 0017-227B_S0

Task No.: | Assign, $\sigma'_{v,c}$ = 8.00 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: | Induced OCR = 1.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.720 | Meas.; | X Assumed

X Tube / Field Extruded	Liner / Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-227B	LPC Core	Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A	Compostite No.:	Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 27.45	Specimen No.: c	Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;	Geomarine Sample		Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental / CRS	; Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ / 90° Stress Path	X Used Automated System / Remarks:
Loading Conditions:	X Static / Rapid	X Strain / Stress	Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - Water / With - Bath; Cyclic (Hz) Rate: 0.1; Strain / Stress 1; Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	4025	6066	6133	6030
Mass Moist Soil + Cont. (g)	69.48	65.77	80.33	57.63
Mass Dry Soil + Container (g)	58.83	56.76	66.76	50.53
Mass Container (g)	30.03	30.86	30.98	31.66
WATER CONTENT (%)	36.98	34.79	37.93	37.63
Avg. Initial WC, $W_{o,avg}$ (%)	36.56	Final W_{at}:	X Slice ;	Whole Spec.
See attached data sheet(s) for additional water contents				

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	211.87	63.30
Mass Tare (g)	151.02	3.16
Mass Moist Soil, $M_{t,o}$ $M_{t,at}$ (g)	60.85	60.14

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

X Trimming Ring for Fugro Apparatus		Large-ring ID #	
Trimming Ring for NGI Apparatus	FS1	Small-ring ID #	
$H_{s,t}$ (mm):	18.87	$A_{s,t}$ (cm²):	17.93
$D_{s,t}$ (mm) :	47.79	$V_{s,t}$ (cm³):	33.84

Remarks:

Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

Height (H_{tr})		Diameter (D_o)		Remarks:
1	18.900	1-T	NA	
2	18.850	2-M	NA	
3	18.820	3-B	NA	
4	18.900	1'-T	NA	For Free Standing
5	18.880	2'-M	NA	or Reconstituted Spec.:
Avg.		3'-B	NA	A_{tr} (cm²): NA
=	18.870	Avg	NA	V_{tr} (cm³): NA

Note: NA indicates not applicable. | Top Cap No. 6S

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus.

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)=	112.25	Dry, $\gamma_{d,o}$ (lb/ft³)=	82.19

Specimen Lateral Confinement by:

Wire Reinforced, Model: Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

X **Regular Membrane with Ring Set No.** 6S | ID, Rings (mm)

Thickness (mm): Top: 0.70 , | = 48.32

Single Bottom: 0.73 , | Corr. for mem.

X Double Membr. Thick. = 0.36 | = 47.603

Area Ring with mem., A_o: (cm²)= 17.80 ; (in²)= 2.759

Mass Top Cap, etc., M_{tc} = 264.2 g, 0.58 lbf

Data corr. for M_{tc}: X Yes; No | Plattens with Pins: Yes; X No

Sketch of Specimen

Final Visual Description:

Silty Clay, brown, with a few carbonate nodules

Other Remarks :

Trim./ Recon. By: PL | Setup By: JTG | Take Down By: PL

Date: 2/19/2013 | Date: 2/19/2013 | Date: 2/22/2013

Prelim. Calc. By: JTG | Final Calc. By: JJ | Reviewed By: TP

Specimen Take Down: X Spec. removed right after shearing | Remarks:

Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: DSS-S13 File Name: 0017-227B_S07Ac

Task Number: Specific Gravity: 2.720 [ ] Measured; [X] Assumed

Type Test: SDSS Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary						
Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X	Static Strain Rate = 5 (%/hr or)	
Nominal Vertical Stress, σ'_v (ksf)	NA	8	NA		Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =	
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	NA	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)	Value ?	NA
Nominal OCR	NA	1	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	Value ?	NA
t_c,(ON,days,hrs)	NA	1.35 days	NA	Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):						
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	36.98	34.79	37.93	36.56	36.56	39.25
S_o	94.1	91.4	95.3	93.6	93.6	96.8
Measured final mass of moist soil, $M_{t,at}$ (g)						60.14
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						60.14

Calculated Mass of Dry Soil (g)	
Initial Selected Water Content (%)	36.56
Initial , $M_{d,o}$	44.56
Final, $M_{d,at}$	43.70
Selected, M_d	44.13

Initial Back Cal. Specific Gravity (TS):	
Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary			
Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	8.000	NA	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	1.450		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	1.450		
ΔV_n using A_o - spec. (cm^3)	2.60		
ΔV_n using $A_{c,n}$ - app. (cm^3)	2.58		
ΔV_n using burette meas.(cm^3)	-0.75		
Selected ΔV_n (cm^3)	2.58	NA	NA $= \Delta V_{uL}$
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures			
By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	2.58	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	0.71
ΔV_c (cm^3)	2.58	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	2.60	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below	
Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	33.37
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	NA

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	2.84	ΔH_c (mm) =	1.450	$\varepsilon_{a,c}$ (%) =	7.68	$\Delta V_{c,max}$ (cm^3) =	NA
V_c (cm^3) =	31.00	H_c (mm) =	17.420	$\varepsilon_{v,c}$ (%) =	8.39	$\varepsilon_{ac,max}$ (%)=	NA
A_c (cm^2) =	17.80	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:								
Specific Gravity: G_s = 2.720 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	
Initial (as trimmed)	18.870	33.84	17.93	37.9	112.2	81.4	95.2	
After Consol.: to $\sigma'_{v,c}$	17.420	31.00	17.80	33.4	118.5	88.9	100.0	
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA	

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.

& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable

3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ

Reviewed By: TP

Remarks:

FUGRO

Project Number:	04.11120056	Test Type:	SDSS	Test Sta. No.:	DSS-S13	File Name:	0017-227B_S0
Project Name:		Task No.:		Test No.:	NA	Test Series for:	NA

X Tube ☐ Field Extruded	☐ Liner ☐ Remolded	☐ Tamping	☐ Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-227B	☐ LPC Core	☐ Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A	Compostite No.:	☐ Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 27.45	Specimen No.: c	☐ Kneading	☐ Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;	☐ Geomarine Sample	☐	Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	☐ Anisotropic at:	☐ Inclined Stress Path, $K_{c,DSS}$ ☐ 90° Stress Path	X Used Automated System Remarks:	
Loading Conditions:	X Static ☐ Dynamic	X Strain ☐ Stress	☐ Creep ☐ Post Cyclic	X Const, Vol./Ht ☐ Drained	X Without - ☐ With - Water Bath	☐ Cyclic (Hz) Rate: ☐ 0.1; ☐ 1; ☐ Strain ☐ Stress Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.720 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI		
Initial	18.87	33.84	17.93	37.89	112.2	81.4	95.2			
After Consol.: to $\sigma'_{v,c}$	17.42	31.00	17.80	33.37	118.5	88.9	100.0			
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA			

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	NA	7.982	NA
Induced OCR:	-	NA	1.00	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	NA	7.68	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 5.0 %/hr.

☐ Cyclic Rate (Hz): ☐ 0.1; ☐ 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	Value ?	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	Value ?	NA
Post Cy.Displ. Reset to Null Pos.:	☐ Yes;	☐ No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.58	Data Normalization: X Yes ☐ No Value: 7.982 (ksf)
Data corr. for M_{tc}: X Yes; ☐ No Plattens with Pins: ☐ Yes; X No	Using Effective Vertical Stress:
☐ Wire Reinforced Membrane, Model: Data corr. for Membr. strength	X Pre-Shear Conditions ☐ Post-Cyclic Conditions
X Regular Membrane with Rings ☐ Yes X No	☐ Maximum Stress during Consol. ☐

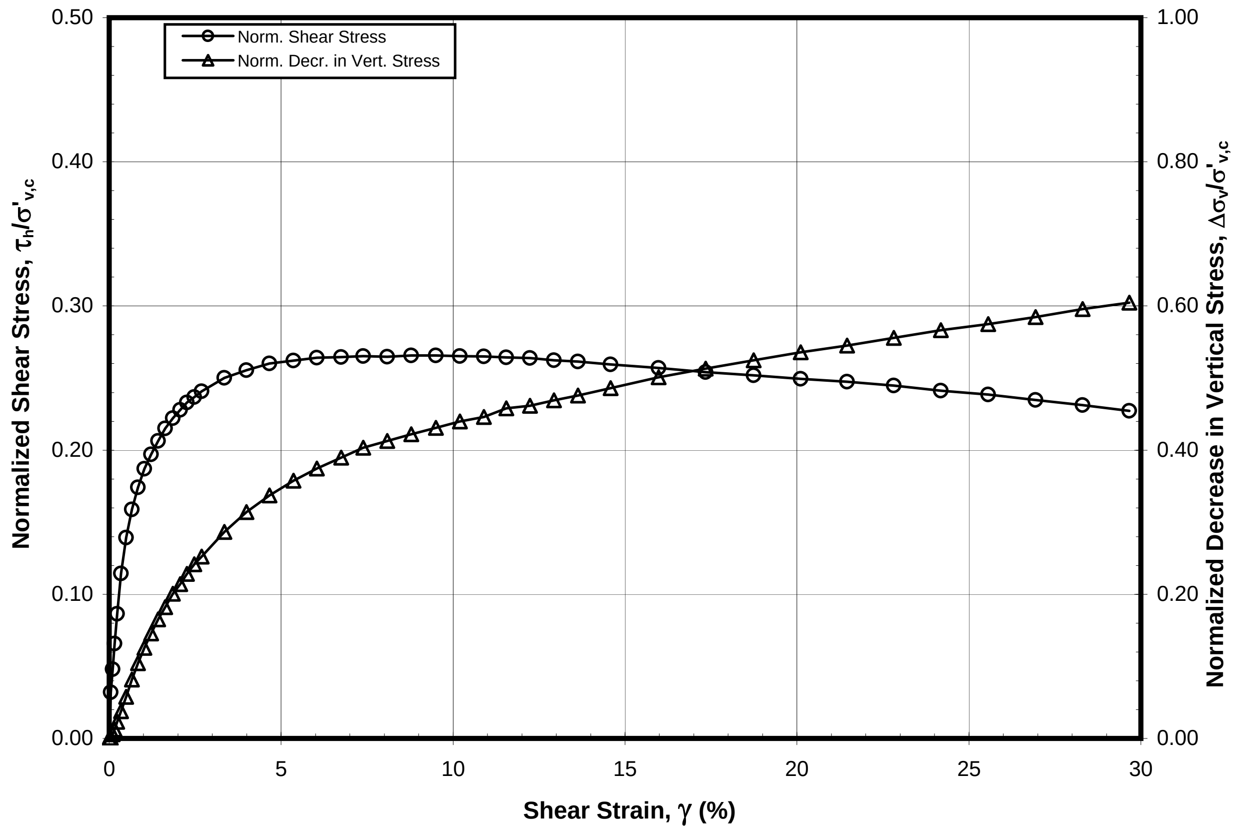
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

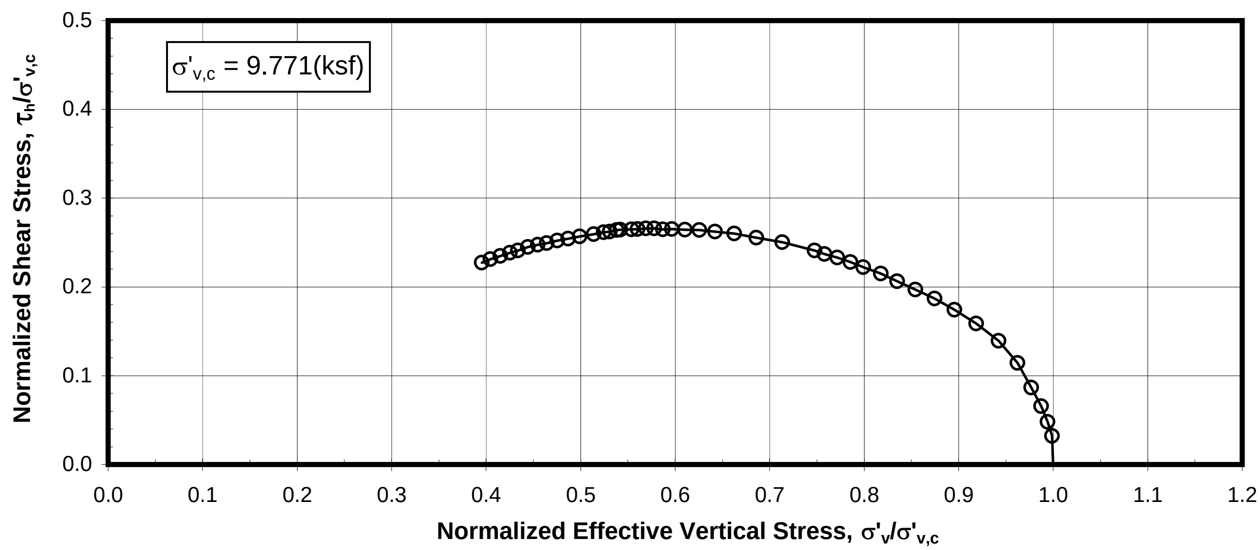
NA - Not Applicable

Final Visual Description and Remarks: Silty Clay, brown, with a few carbonate nodules

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	2.199	4.82	4.446	0.495	0.443	0.275
at Maximum Strain	1.577	30.09	2.673	0.590	0.665	-



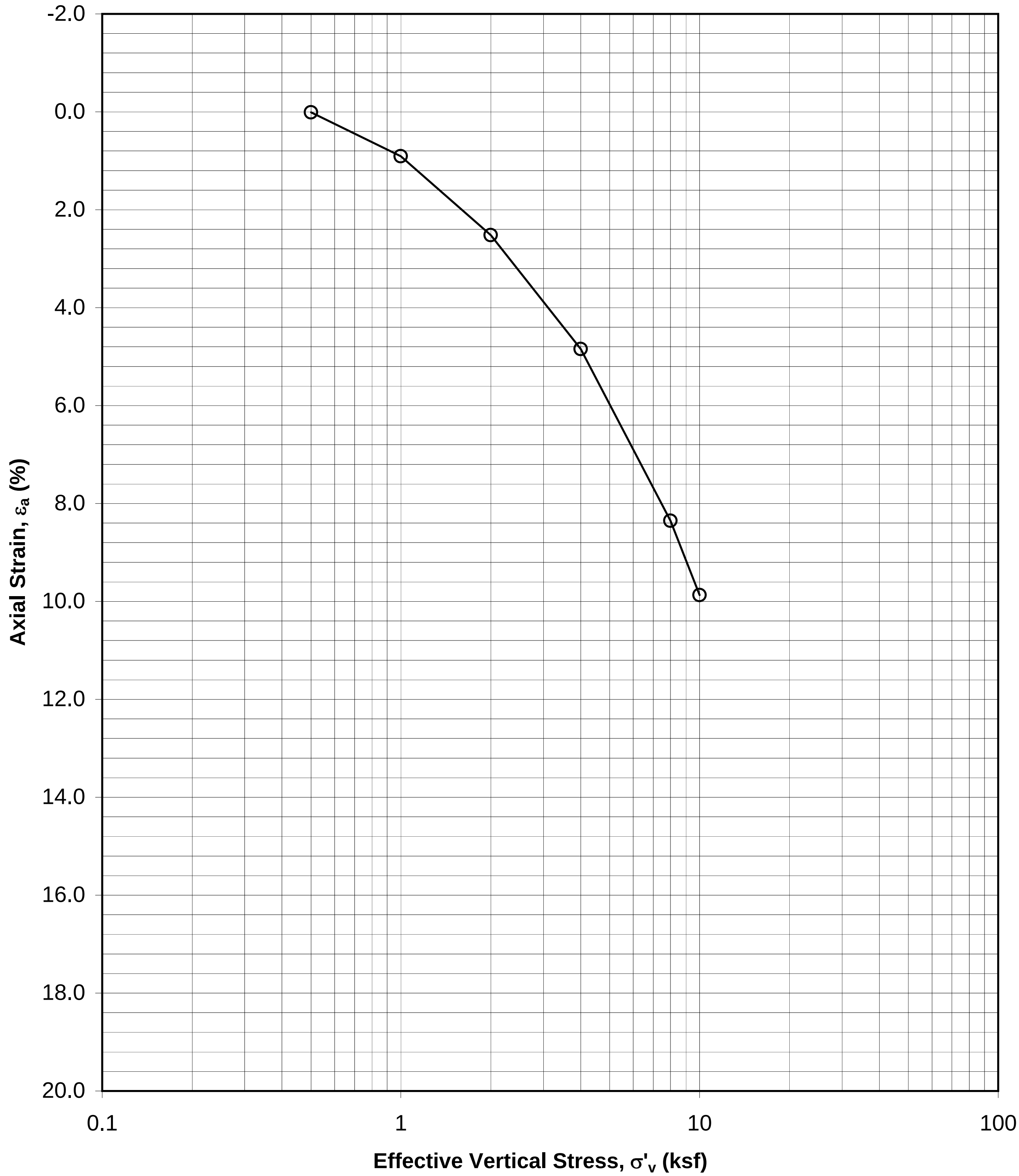


STATIC DSS TEST

K_o Consolidation - OCR = 1

Sample: S04Adrt - Depth: 16.00 ft

Boring WR0017-229B



DSS INCREMENTAL CONSOLIDATION

Sample: S04Ad - Depth 16.00 ft

Boring No. WR0017-229B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: SDSS | Sta. No.: DSS-S07 | File Name: 017-229B_S04

Task No.: | Assign, $\sigma'_{v,c}$ = 10.00 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: | Induced OCR = 1.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.720 | Meas.; | X Assumed

X Tube; Field Extruded	Liner; Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-229B	LPC Core	Impact/Rammer	Rammer Wgt.(lbf)= ; No. Layers =
Sample No.: S04A	Compostite No.:	Pluviated:	Tamper Force (lbf)= ; Drop (in.) =
Depth (ft): 16.00	Specimen No.: dRt	Kneading	Undercompaction: U_{ni} (%) = ; Dia. (in.) =
X Spec. Selection by X-ray;	Geomarine Sample		Ref. Effort= ; % Comp. = ; ± Opt.=

Type Consolidation:	X K_o at:	X Incremental; CRS	; Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$; 90^o Stress Path	X Used Automated System; Remarks:	
Loading Conditions:	X Static; Rapid	X Strain; Stress	Creep; Post Cyclic	X Const, Vol./Ht; Drained	X Without - Water; With - Bath	Cyclic (Hz) Rate: 0.1; Strain 1; Stress Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	802	4097	6316	65.26
Mass Moist Soil + Cont. (g)	87.88	79.84	74.95	64.66
Mass Dry Soil + Container (g)	72.19	65.48	62.55	55.16
Mass Container (g)	32.01	30.52	29.84	30.11
WATER CONTENT (%)	39.05	41.08	37.91	37.92
Avg. Initial WC, $W_{o,avg}$ (%)	39.34	Final W_{at}:	X Slice ;	Whole Spec.

See attached data sheet(s) for additional water contents

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	300.22	112.95
Mass Tare (g)	186.56	4.16
Mass Moist Soil, $M_{t,o}$ $Mt_{,at}$ (g)	113.66	108.79

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

Trimming Ring for Fugro Apparatus	NL3	Large-ring ID #	
X Trimming Ring for NGI Apparatus		Small-ring ID #	
$H_{s,t}$ (mm):	18.62	$A_{s,t}$ (cm^2):	34.78
$D_{s,t}$ (mm) :	66.55	$V_{s,t}$ (cm^3):	64.76

Remarks:

Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})	Diameter (D_o)		Remarks:	
1	18.650	1-T	NA		
2	18.580	2-M	NA		
3	18.620	3-B	NA		
4	18.610	1'-T	NA	For Free Standing	
5	18.630	2'-M	NA	or Reconstituted Spec.:	
	Avg.	3'-B	NA	A_{tr} (cm^2):	NA
=	18.618	Avg	NA	V_{tr} (cm^3):	NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft^3)= 109.57 | Dry, $\gamma_{d,o}$ (lb/ft^3)= 78.63

Specimen Lateral Confinement by:

Wire Reinforced, Model: | Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm^2)	(in^2)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

X **Regular Membrane with Ring Set No.** 7 | ID, Rings (mm)

Thickness (mm): Top: 0.55 , | = 67.21

Single; Bottom: 0.60 , | Corr. for mem.

X Double; Membr. Thick. = 0.29 | = 66.635

Area Ring with mem., $A_{o:}$ (cm^2)= 34.87 ; (in^2)= 5.405

Note: NA indicates not applicable. | Top Cap No. 7 | Mass Top Cap, etc., M_{tc} = 526.9 g, 1.16 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus. | Data corr. for M_{tc}: X Yes; No | Plattens with Pins: Yes; X No

Sketch of Specimen

Final Visual Description:

Silty Clay brown, with Ferrous Stains, and Traces of Organic Matters

Other Remarks :

Trim./ Recon. By:	PL	Setup By:	JTG	Take Down By:	PL
Date:	2/19/2013	Date:	2/19/2013	Date:	2/26/2013
Prelim. Calc. By:	JTG	Final Calc. By:	JJ	Reviewed By:	TP

Specimen Take Down: X Spec. removed right after shearing | Remarks:

Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 — Test Station No.: DSS-S07 — File Name: 017-229B_S04AdRt

Task Number: — Specific Gravity: 2.720 [ ] Measured; [X] Assumed

Type Test: SDSS — Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ____ ppm

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Pre-Shear	Post Cyclic
Nominal Vertical Stress, σ'_v (ksf)	NA	10	NA
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA
Horizontal Force, $P_{hr,n}$ (lbf)	NA	0	NA
Nominal OCR	NA	1	NA
t_c,(ON,days,hrs)	NA	3.7	NA

[X] Static Strain Rate = Value ? (%/hr or)

[ ] Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm)	Value ?	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	Value ?	NA
Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	39.05	41.08	37.91	39.34	39.34	44.10
S_o	92.3	94.5	91.0	92.6	92.6	97.6
Measured final mass of moist soil, $M_{t,at}$ (g)						108.79
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						108.79

Calculated Mass of Dry Soil (g)

Initial Selected Water Content (%)	39.34
Initial , $M_{d,o}$	81.57
Final, $M_{d,at}$	78.88
Selected, M_d	80.22

Initial Back Cal. Specific Gravity (TS):

Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary

Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	10.000	NA	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	1.890		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	1.890		
ΔV_n using A_o - spec. (cm^3)	6.57		
ΔV_n using $A_{c,n}$ - app. (cm^3)	6.59		
ΔV_n using burette meas.(cm^3)	3.35		
Selected ΔV_n (cm^3)	6.59	NA	NA = ΔV_{uL}
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures

By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	6.59	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	4.87
ΔV_c (cm^3)	6.59	**By Saturation = 100% and**	
By Cal. Ht. & Init. Spec. Area		**Spec. Unloaded to 0 Stress**	
ΔV_c (cm^3)	6.57	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. -
Based on the Consolidation Conclusions Given Below

Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	35.82
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	NA

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	6.42	ΔH_c (mm) =	1.890	$\varepsilon_{a,c}$ (%) =	10.15	$\Delta V_{c,max}$ (cm^3) =	NA
V_c (cm^3) =	58.34	H_c (mm) =	16.728	$\varepsilon_{v,c}$ (%) =	9.92	$\varepsilon_{ac,max}$ (%)=	NA
A_c (cm^2) =	34.87	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:

Specific Gravity: G_s = 2.720 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	18.618	64.76	34.78	41.7	109.6	77.3	95.1
After Consol.: to $\sigma'_{v,c}$	16.728	58.34	34.87	35.8	116.6	85.9	100.0
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.
& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable
3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ
Reviewed By: TP

Remarks:

Project Number: 04.11120056 | Test Type: SDSS | Test Sta. No.: DSS-S07 | File Name: 017-229B_S04A
Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube / Field Extruded / Liner / Remolded	Tamping	Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-229B / LPC Core	Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S04A / Compostite No.:	Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 16 / Specimen No.: dRt	Kneading	Undercompaction: U_{ni} (%) =	Dia. (in.) =
X Spec. Selection by X-ray; / Geomarine Sample		Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	X K_o at:	X Incremental / CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ / 90° Stress Path	X Used Automated System / Remarks:		
Loading Conditions:	X Static / Dynamic	X Strain / Stress	Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1;	Strain / Stress 1; Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.720 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI		
Initial	18.62	64.76	34.78	41.68	109.6	77.3	95.1			
After Consol. to $\sigma'_{v,c}$	16.73	58.34	34.87	35.82	116.6	85.9	100.0			
After Consol. to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA			

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	NA	9.771	NA
Induced OCR:	-	NA	1.00	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	NA	10.15	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 4.8 %/hr.
Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	Value ?	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	Value ?	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

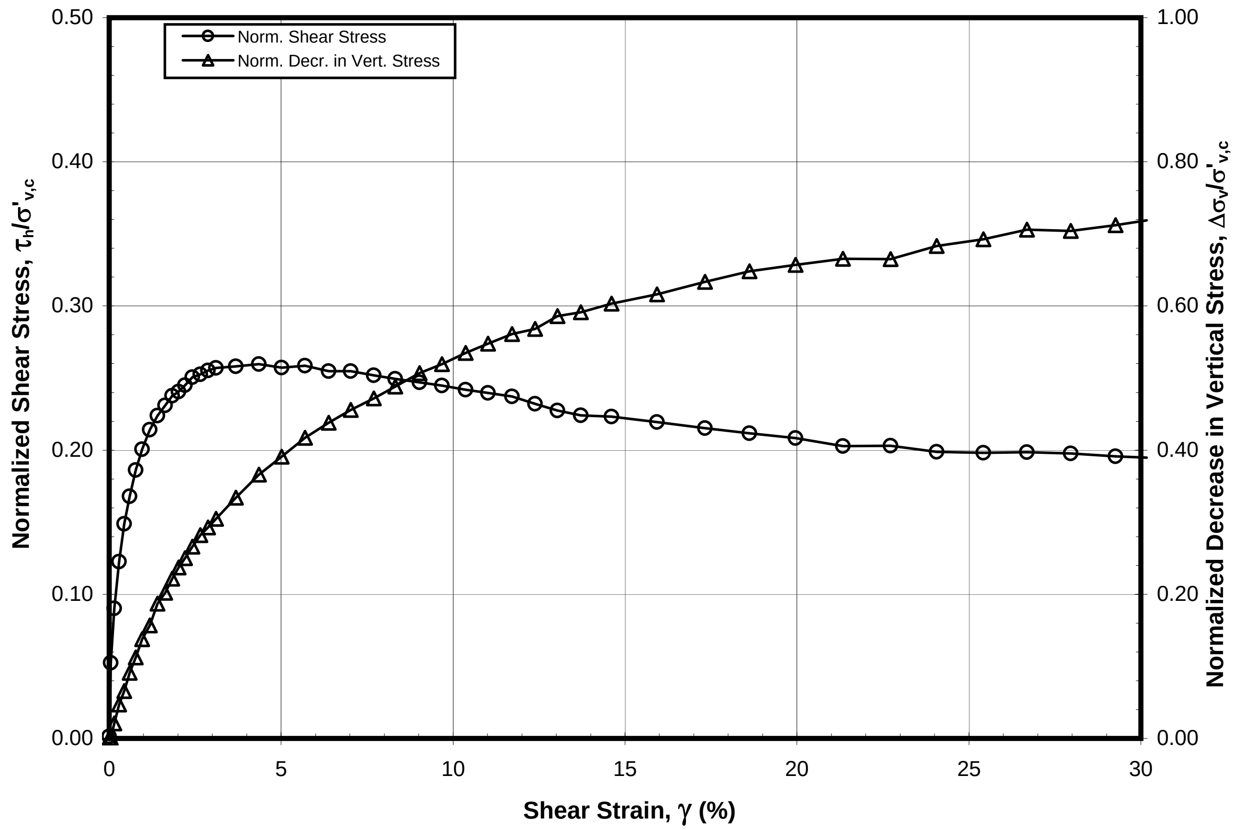
Number of Loading Cycles, N = NA
$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %
at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

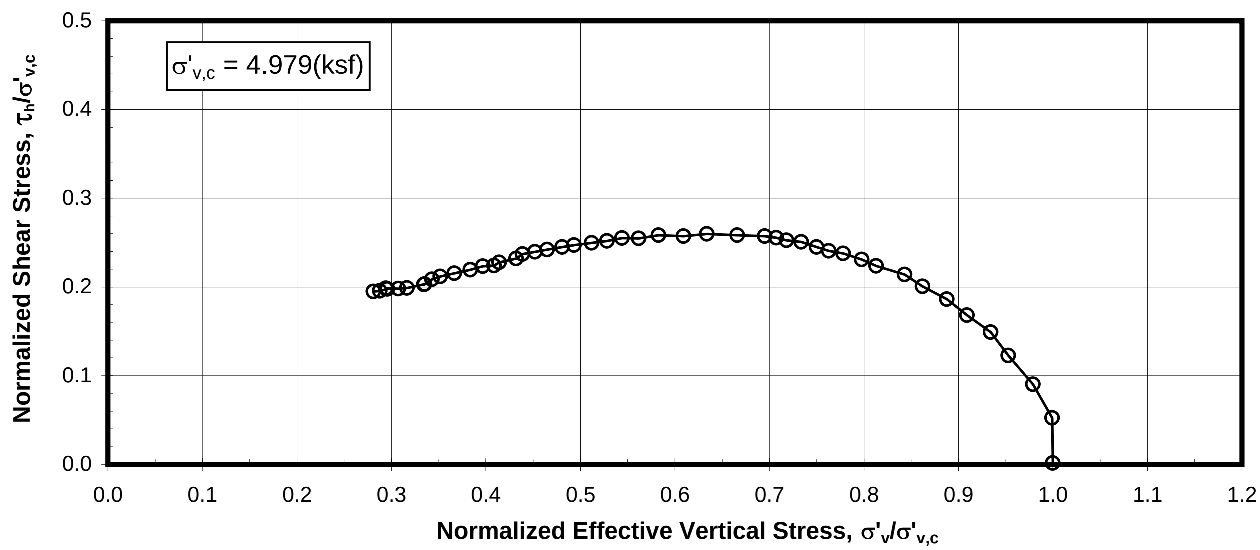
Weight Top Cap, etc., M_{tc} (lbf): 1.16	Data Normalization: X Yes / No Value: 9.771 (ksf)
Data corr. for M_{tc}: X Yes; / No Plattens with Pins: Yes; / X No	Using Effective Vertical Stress:
Wire Reinforced Membrane, Model: / Data corr. for Membr. strength	X Pre-Shear Conditions / Post-Cyclic Conditions
X Regular Membrane with Rings / Yes / X No	Maximum Stress during Consol.

Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.
NA - Not Applicable
Final Visual Description and Remarks: Silty Clay brown, with Ferrous Stains, and Traces of Organic Matters

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	2.597	8.78	5.649	0.460	0.422	0.266
at Maximum Strain	2.220	29.67	3.863	0.575	0.605	-



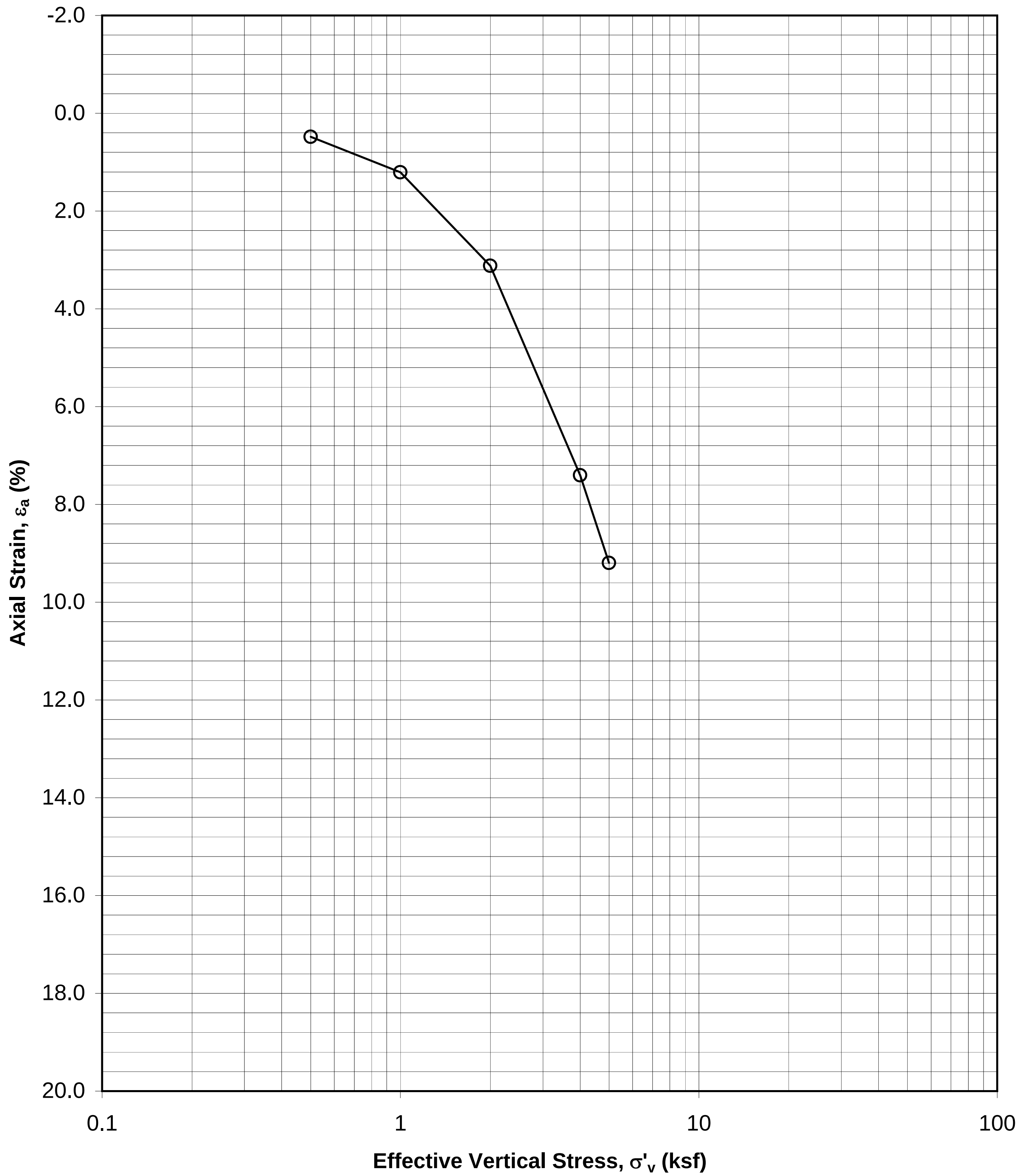


STATIC DSS TEST

K_o Consolidation - OCR = 1

Sample: S05Aa - Depth: 10.65 ft

Boring WR0017-264B



DSS INCREMENTAL CONSOLIDATION

Sample: S05Aa - Depth 10.65 ft

Boring No. WR0017-264B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: SDSS Sta. No.: DSS-S06 File Name: 0017-264B_S05

Task No.: Assign, $\sigma'_{v,c}$ = 5.00 ksf $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: Induced OCR = 1.00 $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: Specific Gravity: 2.720 [ ] Meas.; [X] Assumed

X Tube; Field Extruded	Liner; Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-264B	LPC Core	Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S05A	Compostite No.:	Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 10.65	Specimen No.: a	Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;	Geomarine Sample		Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental; CRS	; Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$; 90° Stress Path	X Used Automated System; Remarks:
Loading Conditions:	X Static; Rapid	X Strain; Stress	Creep; Post Cyclic	X Const, Vol./Ht; Drained	X Without - Water; With - Bath; Cyclic (Hz) Rate: 0.1; Strain; Stress 1; Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	5007		6030	6071
Mass Moist Soil + Cont. (g)	45.14		63.80	43.19
Mass Dry Soil + Container (g)	40.47		53.18	38.98
Mass Container (g)	31.11		31.65	31.59
WATER CONTENT (%)	49.89		49.33	56.97
Avg. Initial WC, $W_{o,avg}$ (%)	49.61	Final W_{at}:	X Slice ;	Whole Spec.
See attached data sheet(s) for additional water contents				

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	201.55	55.09
Mass Tare (g)	151.03	3.44
Mass Moist Soil, $M_{t,o}$ $M_{t,at}$ (g)	50.52	51.65

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

X Trimming Ring for Fugro Apparatus		Large-ring ID #	
Trimming Ring for NGI Apparatus	FS1	Small-ring ID #	
$H_{s,t}$ (mm):	18.99	$A_{s,t}$ (cm²):	17.93
$D_{s,t}$ (mm) :	47.79	$V_{s,t}$ (cm³):	34.06
Remarks:			
Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)			

	Height (H_{tr})	Diameter (D_o)		Remarks:	
1	18.990	1-T	NA		
2	18.890	2-M	NA		
3	18.990	3-B	NA		
4	19.040	1'-T	NA	For Free Standing	
5	19.050	2'-M	NA	or Reconstituted Spec.:	
Avg.		3'-B	NA	A_{tr} (cm²):	NA
=	18.992	Avg	NA	V_{tr} (cm³):	NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)= 92.59 Dry, $\gamma_{d,o}$ (lb/ft³)= 61.89

Specimen Lateral Confinement by:

Wire Reinforced, Model: Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

X **Regular Membrane with Ring Set No.** 7S ID, Rings (mm)

Thickness (mm): Top: 0.81 , = 48.32

Single Bottom: 0.85 , Corr. for mem.

X Double Membr. Thick. = 0.42 = 47.490

Area Ring with mem., A_o: (cm²)= 17.71 ; (in²)= 2.746

Note: NA indicates not applicable. Top Cap No. 7S

Mass Top Cap, etc., M_{tc} = 267.9 g, 0.59 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus.

Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No

Sketch of Specimen

Final Visual Description:

Silty Clay, Olive gray

Other Remarks :

Trim./ Recon. By: PL Setup By: JTG Take Down By: PL

Date: 2/15/2013 Date: 2/16/2013 Date: 2/21/2013

Prelim. Calc. By: JTG Final Calc. By: JJ Reviewed By: TP

Specimen Take Down: X Spec. removed right after shearing Remarks:

Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: DSS-S06 File Name: 0017-264B_S05Aa

Task Number: Specific Gravity: 2.720 [ ] Measured; [X] Assumed

Type Test: SDSS Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ppm

Consolidation Stress Summary and Loading Summary						
Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X Static Strain Rate = Value ? (%/hr or)		
Nominal Vertical Stress, σ'_v (ksf)	NA	5	NA	Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =		
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	NA	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)	Value ?	NA
Nominal OCR	NA	1	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	Value ?	NA
t_c,(ON,days,hrs)	NA	2.0 days	NA	Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):						
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	49.89		49.33	49.61	49.61	53.53
S_o	77.8		77.4	77.6	77.6	80.4
Measured final mass of moist soil, $M_{t,at}$ (g)						51.65
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						51.65

Calculated Mass of Dry Soil (g)	
Initial Selected Water Content (%)	49.61
Initial , $M_{d,o}$	33.77
Final, $M_{d,at}$	32.90
Selected, M_d	33.34

Initial Back Cal. Specific Gravity (TS):	
Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary			
Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	5.000	NA	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	1.750		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	1.750		
ΔV_n using A_o - spec. (cm^3)	3.14		
ΔV_n using $A_{c,n}$ - app. (cm^3)	3.10		
ΔV_n using burette meas.(cm^3)	0.70		
Selected ΔV_n (cm^3)	3.10	NA	NA $= \Delta V_{uL}$
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures			
By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	3.10	$\sim M_{t,o} - (M_{tat,c} + \Delta V_L + \Delta V_{uL})$	
By Cal. Height & App. Area		ΔV_c (cm^3)	-1.13
ΔV_c (cm^3)	3.10	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	3.14	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below	
Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	54.69
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	NA

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	3.52	ΔH_c (mm) =	1.750	$\varepsilon_{a,c}$ (%) =	9.21	$\Delta V_{c,max}$ (cm^3) =	NA
V_c (cm^3) =	30.54	H_c (mm) =	17.242	$\varepsilon_{v,c}$ (%) =	10.34	$\varepsilon_{ac,max}$ (%)=	NA
A_c (cm^2) =	17.71	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:							
Specific Gravity: G_s = 2.720 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	18.992	34.06	17.93	51.5	92.6	61.1	79.0
After Consol.: to $\sigma'_{v,c}$	17.242	30.54	17.71	54.7	105.4	68.1	100.0
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume. Calculated By: JJ

& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable Reviewed By: TP

3 - Uses measured value at appropriate stress level (NA for rings).

Remarks:

Project Number: 04.11120056 | Test Type: SDSS | Test Sta. No.: DSS-S06 | File Name: 0017-264B_S0

Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube / Field Extruded	Liner / Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-264B	LPC Core	Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S05A	Compostite No.:	Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 10.65	Specimen No.: a	Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;	0 Geomarine Sample		Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental / CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ / 90° Stress Path		X Used Automated System / Remarks:	
Loading Conditions:	X Static / Dynamic	X Strain / Stress	Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - Water / With - Bath	Cyclic (Hz) Rate: 0.1;	Strain / Stress 1; Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.720 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI		
Initial	18.99	34.06	17.93	51.55	92.6	61.1	79.0			
After Consol.: to $\sigma'_{v,c}$	17.24	30.54	17.71	54.69	105.4	68.1	100.0			
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA			

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	NA	4.979	NA
Induced OCR:	-	NA	1.00	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	NA	9.21	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 4.9 %/hr.

Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	Value ?	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	Value ?	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.59

Data corr. for M_{tc}: X Yes; No | Plattens with Pins: Yes; X No

Wire Reinforced Membrane, Model: | Data corr. for Membr. strength

X Regular Membrane with Rings | Yes X No

Data Normalization: X Yes No Value: 4.979 (ksf)

Using Effective Vertical Stress:

X Pre-Shear Conditions | Post-Cyclic Conditions

Maximum Stress during Consol.

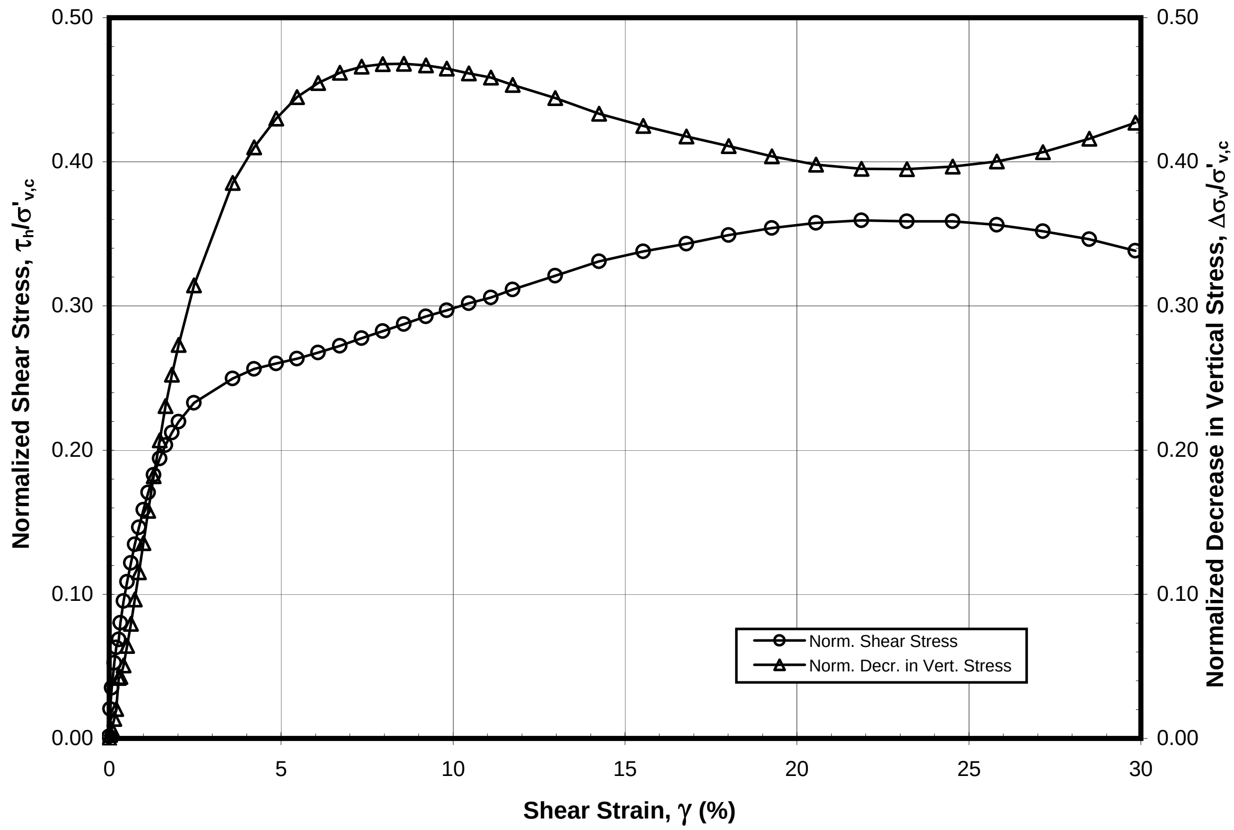
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

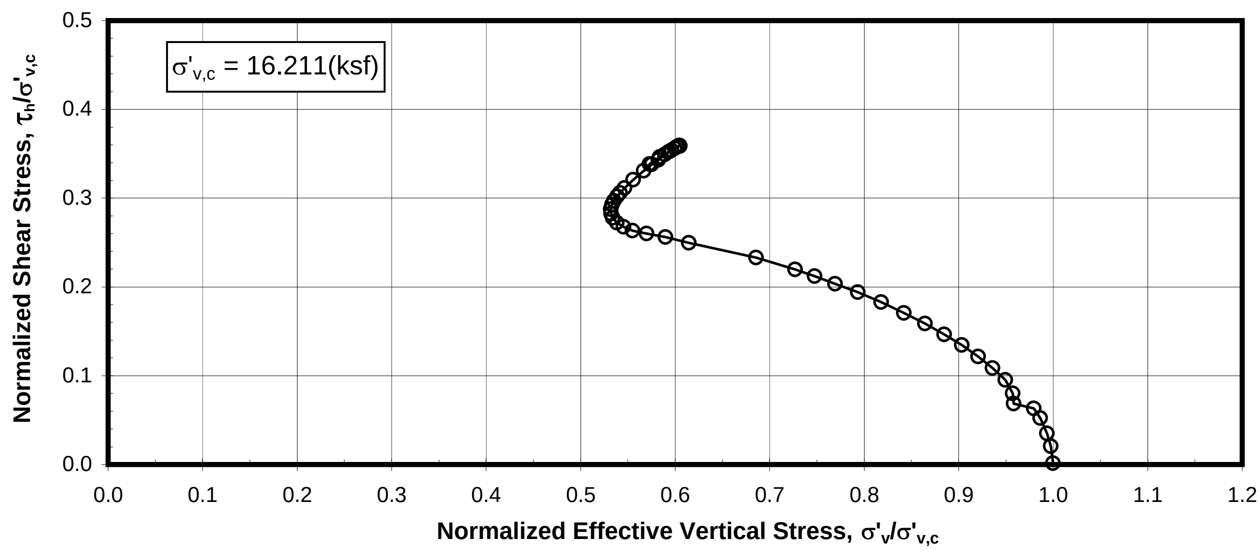
NA - Not Applicable

Final Visual Description and Remarks: Silty Clay, Olive gray

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	1.293	4.36	3.156	0.410	0.366	0.260
at Maximum Strain	0.970	30.17	1.399	0.693	0.719	-



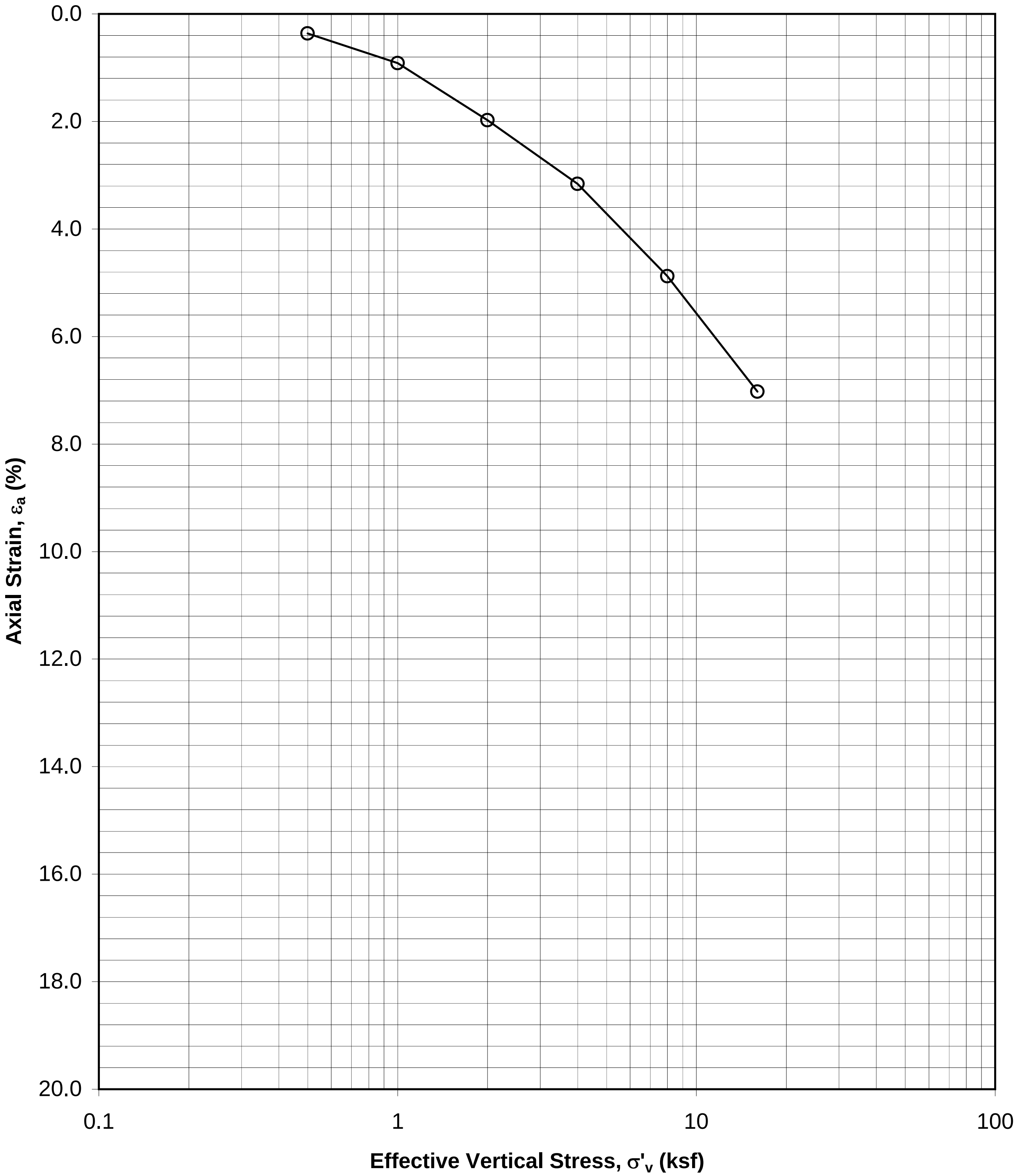


STATIC DSS TEST

K_o Consolidation - OCR = 1

Sample: S06Ac - Depth: 21.60 ft

Boring WR0017-265B



DSS INCREMENTAL CONSOLIDATION

Sample: S06Ac - Depth 21.60 ft

Boring No. WR0017-265B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: SDSS | Sta. No.: DSS-S05 | File Name: 0017-265B_S06
Task No.: | Assign, $\sigma'_{v,c}$ = 16.00 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA
Project Name: | Induced OCR = 1.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA
Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA
Assig. Remarks: | Specific Gravity: 2.750 | Meas.; | X Assumed

X Tube / Field Extruded	Liner / Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-265B	LPC Core	Impact/Rammer	Rammer Wgt.(lbf)= ; No. Layers =
Sample No.: S06A	Compostite No.:	Pluviated:	Tamper Force (lbf)= ; Drop (in.) =
Depth (ft): 21.60	Specimen No.: c	Kneading	Undercompaction: U_{ni} (%) = ; Dia. (in.) =
x Spec. Selection by X-ray;	Geomarine Sample		Ref. Effort= ; % Comp. = ; ± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS ;	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ / 90° Stress Path	X Used Automated System / Remarks:
Loading Conditions:	X Static / Rapid	X Strain / Stress	Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - Water / With - Bath	Cyclic (Hz) Rate: 0.1;	Strain / Stress 1; Other:

Water Content (WC);	Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	690	4025	6133	6071
Mass Moist Soil + Cont. (g)	53.98	51.52	84.18	63.19
Mass Dry Soil + Container (g)	51.19	48.22	75.19	57.52
Mass Container (g)	31.86	30.02	30.98	31.55
WATER CONTENT (%)	14.43	18.13	20.33	21.83
Avg. Initial WC, $W_{o,avg}$ (%)	17.63	Final W_{at}:	X Slice ;	Whole Spec.

See attached data sheet(s) for additional water contents

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	216.42	71.09
Mass Tare (g)	151.03	3.73
Mass Moist Soil, $M_{t,o}$ $M_{t,at}$ (g)	65.39	67.36

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

X Trimming Ring for Fugro Apparatus			Large-ring ID #
Trimming Ring for NGI Apparatus		FS1	Small-ring ID #
$H_{s,t}$ (mm):	18.82	$A_{s,t}$ (cm²):	17.93
$D_{s,t}$ (mm):	47.79	$V_{s,t}$ (cm³):	33.76

Remarks:

Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})		Diameter (D_o)	Remarks:	
1	18.850	1-T	NA		
2	18.810	2-M	NA		
3	18.790	3-B	NA		
4	18.840	1'-T	NA	For Free Standing	
5	18.820	2'-M	NA	or Reconstituted Spec.:	
Avg.		3'-B	NA	A_{tr} (cm²):	NA
=	18.822	Avg	NA	V_{tr} (cm³):	NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)= 120.93 | Dry, $\gamma_{d,o}$ (lb/ft³)= 102.80

Specimen Lateral Confinement by:

Wire Reinforced, Model: | Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

X **Regular Membrane with Ring Set No.** 14S | ID, Rings (mm) = 48.28
Thickness (mm): Top: 0.74 ,
Single | Bottom: 0.76 , | Corr. for mem.
X Double | Membr. Thick. = 0.38 | = 47.530
Area Ring with mem., A_o: (cm²)= 17.74 ; (in²)= 2.750

Note: NA indicates not applicable. | Top Cap No. 8S | Mass Top Cap, etc., M_{tc} = 268.2 g, 0.59 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus. | Data corr. for M_{tc}: X Yes; No | Plattens with Pins: Yes; X No

Sketch of Specimen

Final Visual Description:
Sandy Clay, Olive gray, with Organic Matters, (Roots)
Other Remarks :

Trim./ Recon. By: PL | Setup By: JTG | Take Down By: PL
Date: 2/14/2013 | Date: 2/15/2013 | Date: 2/20/2013
Prelim. Calc. By: JTG | Final Calc. By: JJ | Reviewed By: TP

Specimen Take Down: X Spec. removed right after shearing | Remarks:
Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: DSS-S05 File Name: 0017-265B_S06Ac

Task Number: Specific Gravity: 2.750 [ ] Measured; [X] Assumed

Type Test: SDSS Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X	Static Strain Rate = Value ? (%/hr or)	
Nominal Vertical Stress, σ'_v (ksf)	NA	16	NA		Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =	
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	NA	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)	Value ?	NA
Nominal OCR	NA	1	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	Value ?	NA
t_c,(ON,days,hrs)	NA	1.90days	NA	Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	14.43	18.13	20.33	17.63	17.63	18.27
S_o	63.9	74.0	79.3	72.7	72.7	74.3
Measured final mass of moist soil, $M_{t,at}$ (g)						67.36
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						67.36

Calculated Mass of Dry Soil (g)

Initial Selected Water Content (%)	17.63
Initial , $M_{d,o}$	55.59
Final, $M_{d,at}$	55.29
Selected, M_d	55.44

Initial Back Cal. Specific Gravity (TS):

Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary

Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	16.000	NA	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	1.330		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	1.330		
ΔV_n using A_o - spec. (cm^3)	2.39		
ΔV_n using $A_{c,n}$ - app. (cm^3)	2.36		
ΔV_n using burette meas.(cm^3)	-2.35		
Selected ΔV_n (cm^3)	2.36	NA	NA = ΔV_{uL}
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures

By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	2.36	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	-1.97
ΔV_c (cm^3)	2.36	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	2.39	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below

Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	19.52
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	NA

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	2.72	ΔH_c (mm) =	1.330	$\varepsilon_{a,c}$ (%) =	7.07	$\Delta V_{c,max}$ (cm^3) =	NA
V_c (cm^3) =	31.04	H_c (mm) =	17.492	$\varepsilon_{v,c}$ (%) =	8.06	$\varepsilon_{ac,max}$ (%)=	NA
A_c (cm^2) =	17.74	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:

Specific Gravity: G_s = 2.750 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	18.822	33.76	17.93	18.0	120.9	102.5	73.5
After Consol.: to $\sigma'_{v,c}$	17.492	31.04	17.74	19.5	133.3	111.5	100.0
After Consol.: to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.
& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable
3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ
Reviewed By: TP

Remarks:

Project Number: 04.11120056 Test Type: SDSS Test Sta. No.: DSS-S05 File Name: 0017-265B_S06
Project Name: Task No.: Test No.: NA Test Series for: NA

X Tube / Field Extruded	Liner / Remolded	Tamping	Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-265B	LPC Core	Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S06A	Compostite No.:	Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 21.6	Specimen No.: c	Kneading	Undercompaction: U_{ni} (%) =	Dia. (in.) =
x Spec. Selection by X-ray;	Geomarine Sample		Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90° Stress Path	X Used Automated System Remarks:	
Loading Conditions:	X Static / Dynamic	X Strain / Stress	Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1; 1; Strain / Stress Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.750 **Condition:**		Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI		
Initial		18.82	33.76	17.93	17.95	120.9	102.5	73.5			
After Consol.:	to $\sigma'_{v,c}$	17.49	31.04	17.74	19.52	133.3	111.5	100.0			
	to $\sigma'_{vc,max}$	NA	NA	NA	NA	NA	NA	NA			

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	NA	16.211	NA
Induced OCR:	-	NA	1.00	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	NA	7.07	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 4.2 %/hr.
Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	Value ?	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	Value ?	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA
$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %
at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.59
Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No
Wire Reinforced Membrane, Model:
X Regular Membrane with Rings
Data corr. for Membr. strength: Yes X No

Data Normalization: X Yes No Value: 16.211 (ksf)
Using Effective Vertical Stress:
X Pre-Shear Conditions / Post-Cyclic Conditions
Maximum Stress during Consol.

Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.
NA - Not Applicable
Final Visual Description and Remarks: Sandy Clay, Olive gray, with Organic Matters, (Roots)

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	5.828	21.88	9.806	0.594	0.395	0.359
at Maximum Strain	5.484	29.84	9.286	0.591	0.427	-

SECTION 6

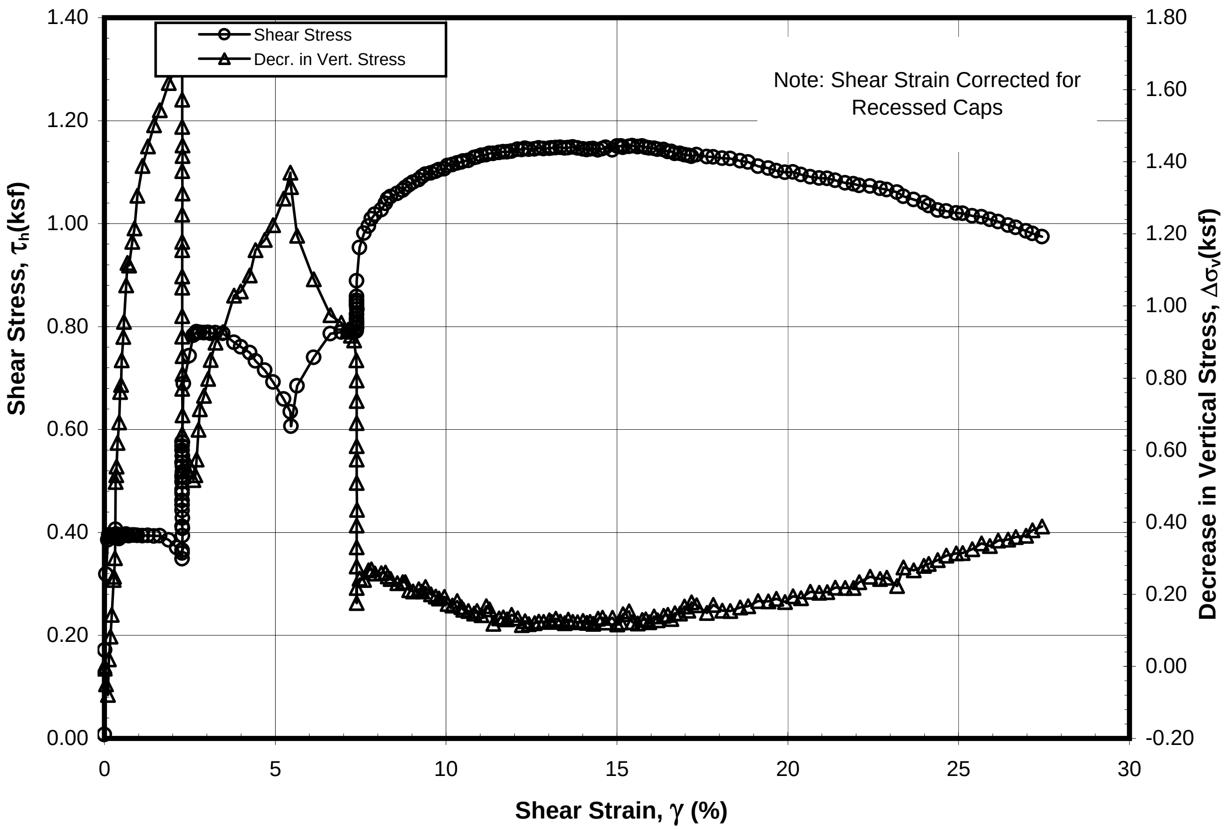
RESULTS OF STRESS-PATH CONTROLLED CONSOLIDATED DRAINED / UNDRAINED DIRECT SIMPLE SHEAR TESTS (CK_oDU-DSS)

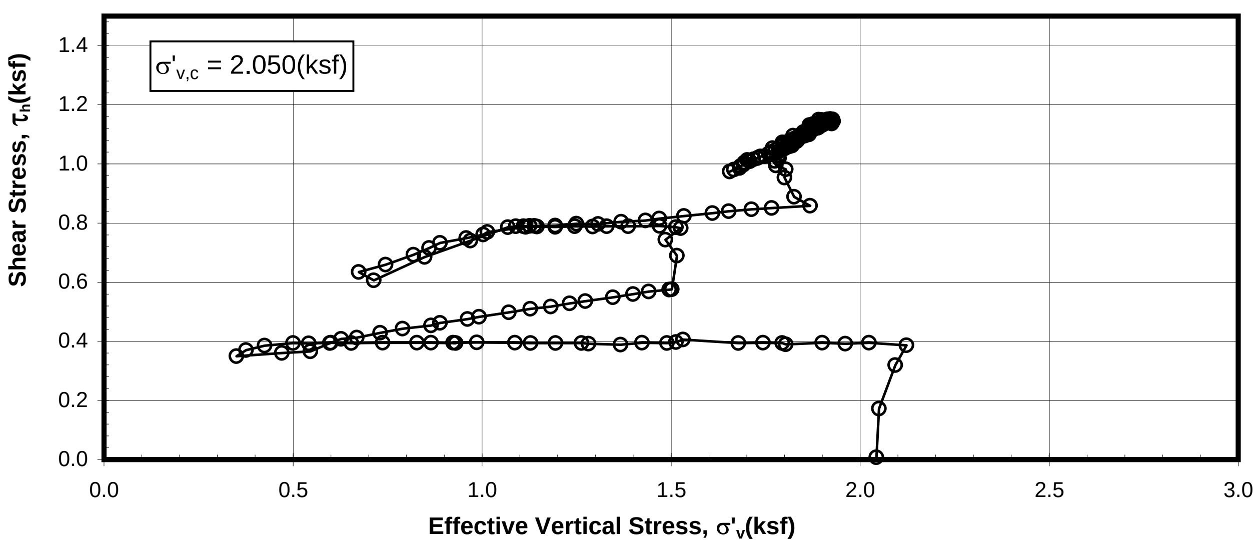
This section of the report presents the results of the stress-path controlled consolidated drained / undrained direct simple shear tests.

In addition to the summary table presented below, for each test, the following information is provided.

1. Plots of shear stress and excess pore water pressure versus axial strain,
2. Effective stress paths during drained and undrained shear,
3. The compression curve during consolidation (plot of axial strain versus consolidation stress),
4. Specimen setup data sheet and calculation of the physical properties of the test specimen prior to testing, at the end of consolidation, and at the end of the test (after shear),
5. Detailed measurements of shear strain, shear stress, effective vertical stress, excess pore water pressure, secant and tangent shear moduli, normalized shear stress (τ_h/σ_{vc}'), normalized vertical effective stress and normalized change in effective stress.

Boring No.	Sample No.	Sample Depth (ft)	Physical Index Properties					Stress-Path Direct Simple Shear (CkoDU-DSS)				
			Water Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Atterberg Limits LL (%)	Atterberg Limits PI (%)	Applied Max. Load σ_{vmax}' (ksf)	Pre-Shear Load σ_{vc}' (ksf)	Spec. OCR ($\sigma_{vmax}'/\sigma_{vc}'$)	Peak Shear Strength (ksf)	Norm. Strength Ratio (τ_h/σ_{vc}')
WR0017-218B	S07AcRt	20.85	34.0	81.4	109.1	41	18	8.0	2.1	3.91	1.151	0.561
WR0017-227B	S07AdRt	27.00	34.2	87.4	117.3	38	20	9.9	2.5	3.91	2.288	0.901
WR0017-228B	S07Aa	25.95	33.5	86.0	114.8	47	27	9.9	2.5	4.01	1.844	0.750
WR0017-229B	S06Ac	26.70	27.8	94.4	120.6	26	9	13.2	3.4	3.91	1.821	0.542
WR0017-230B	S09AbRt	27.40	29.9	94.0	122.1	38	19	9.9	2.5	3.94	1.506	0.600
WR0017-253B	S04AcRt	15.45	17.2	107.7	126.2	27	12	11.9	4.0	3.00	1.784	0.450
WR0017-286B	S07Ab	15.85	29.3	93.8	121.3	30	9	15.9	4.0	3.94	2.698	0.667
WR0017-296B	S07AbRt	10.00	32.1	91.0	120.2	34	13	11.8	3.0	3.95	1.694	0.566



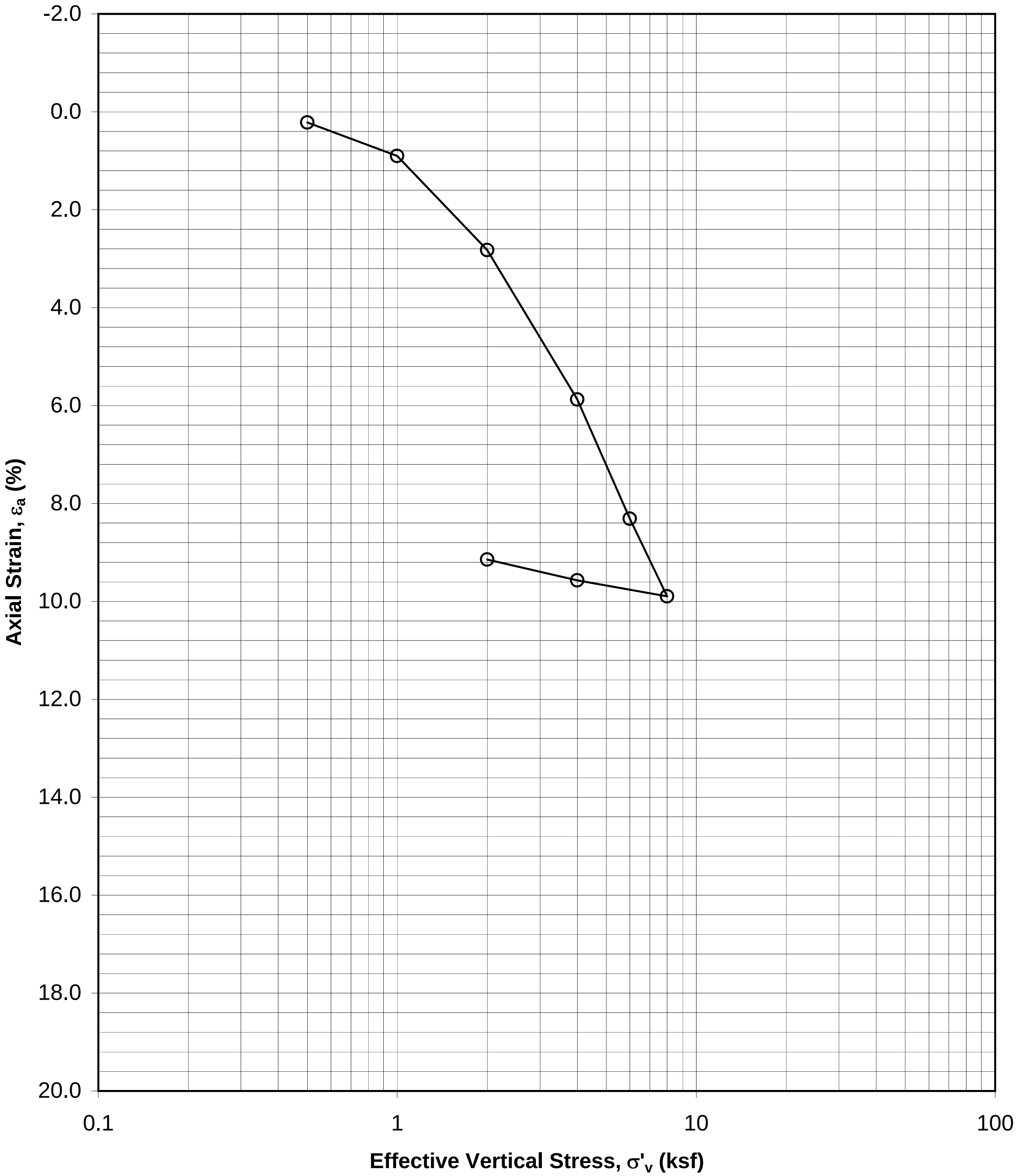


STATIC DSS TEST

K_o Consolidation - OCR = 3.91

Sample: S07Acrt - Depth: 20.85 ft

Boring WR0017-218B



DSS INCREMENTAL CONSOLIDATION

Sample: S07AbRt - Depth 20.85 ft

Boring No. WR0017-218B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: DSS Creep w/OCR>1 Sta. No.: DSS-S15 File Name: WR0017-218B

Task No.: Assign, $\sigma'_{v,c}$ = 2.00 ksf $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: Induced OCR = 4.00 $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: Specific Gravity: 2.700 [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-218B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 20.85	Specimen No.: cRt	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[X] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental / CRS	; [ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ / 90° Stress Path	[X] Used Automated System / Remarks:	
Loading Conditions:	[X] Static / [ ] Rapid	[ ] Strain / [X] Stress	[X] Creep / [ ] Post Cyclic	[X] Const, Vol./Ht / [ ] Drained	[X] Without - Water / [ ] With - Bath	[ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Strain [ ] 1; [ ] Stress Other:

Water Content (WC);	Initial - Trimming Location: Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	610		6526	6024
Mass Moist Soil + Cont. (g)	63.10		61.55	66.48
Mass Dry Soil + Container (g)	55.27		53.54	57.87
Mass Container (g)	32.01		30.11	31.55
WATER CONTENT (%)	33.66		34.19	32.71
Avg. Initial WC, $W_{o,avg}$ (%)	33.92	Final W_{at}:	[X] Slice ;	[ ] Whole Spec.

[ ] See attached data sheet(s) for additional water contents

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	254.13	104.80
Mass Tare (g)	151.41	3.15
Mass Moist Soil, $M_{t,o}$ $Mt_{,at}$ (g)	102.72	101.65

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

[X] Trimming Ring for Fugro Apparatus			Large-ring ID #
[ ] Trimming Ring for NGI Apparatus		NS3	Small-ring ID #
$H_{s,t}$ (mm):	30.21	$A_{s,t}$ (cm^2):	19.46
$D_{s,t}$ (mm) :	49.77	$V_{s,t}$ (cm^3):	58.78

Remarks:

[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})		Diameter (D_o)	Remarks:	
1	30.220	1-T	NA		
2	30.200	2-M	NA		
3	30.250	3-B	NA		
4	30.190	1'-T	NA	For Free Standing	
5	30.210	2'-M	NA	or Reconstituted Spec.:	
	Avg.	3'-B	NA	A_{tr} (cm^2):	NA
=	30.214	Avg	NA	V_{tr} (cm^3):	NA

Note: NA indicates not applicable. Top Cap No. 5SD

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus.

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft^3)=	109.09	Dry, $\gamma_{d,o}$ (lb/ft^3)=	81.45

Specimen Lateral Confinement by:

[ ] **Wire Reinforced, Model:** Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm^2)	(in^2)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

[X] **Regular Membrane with Ring Set No.** 5SD ID, Rings (mm)

Thickness (mm): Top: 0.64 , = 50.78

[ ] Single Bottom: 0.69 , Corr. for mem.

[X] Double Membr. Thick. = 0.33 = 50.110

Area Ring with mem., A_{o}: (cm^2)= 19.72 ; (in^2)= 3.057

Mass Top Cap, etc., M_{tc} = 251.2 g, 0.55 lbf

Data corr. for M_{tc}: [X] Yes; [ ] No Plattens with Pins: [ ] Yes; [X] No

Sketch of Specimen

Final Visual Description:

Sandy Clay, gray / olive gray

Other Remarks :

Trim./ Recon. By:	PL	Setup By:	JTG	Take Down By:	PL
Date:	4/16/2013	Date:	4/16/2013	Date:	4/26/2013
Prelim. Calc. By:	JTG	Final Calc. By:	JJ	Reviewed By:	RJ

Specimen Take Down: [X] Spec. removed right after shearing Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: DSS-S15 File Name: 017-218B_S07AcRt
Task Number: Specific Gravity: 2.700 [ ] Measured; [X] Assumed

Type Test: DSS Creep w/OCR>1 Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded
Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Pre-Shear	Post Cyclic
Nominal Vertical Stress, σ'_v (ksf)	8	2	NA
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA
Horizontal Force, $P_{hr,n}$ (lbf)	0	0	NA
Nominal OCR	1	4	NA
t_c,(ON,days,hrs)	1.04days	0.93days	NA

[X] Static Strain Rate = NA (%/hr or)
[ ] Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm)	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	NA	NA
Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	33.66		34.19	33.92	33.92	34.11
S_o	85.6		86.3	86.0	86.0	86.2
Measured final mass of moist soil, $M_{t,at}$ (g)						101.65
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						101.65

Calculated Mass of Dry Soil (g)

Initial Selected Water Content (%)	33.92
Initial , $M_{d,o}$	76.70
Final, $M_{d,at}$	76.59
Selected, M_d	76.65

Initial Back Cal. Specific Gravity (TS):

Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary

Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$ or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	8.000	2.000	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	2.950	-0.200	
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000	0.000	
Corr. Total Def. $\Delta H_{c,n}$ (mm)	2.950	-0.200	
ΔV_n using A_o - spec. (cm^3)	5.74	-0.39	
ΔV_n using $A_{c,n}$ - app. (cm^3)	5.82	-0.39	
ΔV_n using burette meas.(cm^3)	0.75	-0.65	
Selected ΔV_n (cm^3)	5.82	-0.39	NA $= \Delta V_{uL}$
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures

By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	5.43	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	1.07
ΔV_c (cm^3)	5.42	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	5.35	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below

Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	33.50
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	32.99

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	4.62	ΔH_c (mm) =	2.750	$\varepsilon_{a,c}$ (%) =	9.10	$\Delta V_{c,max}$ (cm^3) =	5.02
V_c (cm^3) =	54.16	H_c (mm) =	27.464	$\varepsilon_{v,c}$ (%) =	7.86	$\varepsilon_{ac,max}$ (%)=	9.76
A_c (cm^2) =	19.72	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:

Specific Gravity: G_s = 2.700 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	30.214	58.78	19.46	34.0	109.1	81.4	86.1
After Consol.: to $\sigma'_{v,c}$	27.464	54.16	19.72	33.5	117.9	88.3	100.0
After Consol.: to $\sigma'_{vc,max}$	27.264	53.77	19.72	33.0	118.4	89.0	100.0

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.
& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable
3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ
Reviewed By: RJ

Remarks:

Project Number: 04.11120056 Test Type: DSS Creep w/OCR>1 Test Sta. No.: DSS-S15 File Name: 017-218B_S07A

Project Name: Task No.: Test No.: NA Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-218B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S07A		Compostite No.:		Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 20.85		Specimen No.: cRt		Kneading	Undercompaction: U_{ni} (%) =	Dia. (in.) =
X Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90° Stress Path	X Used Automated System Remarks:	
Loading Conditions:	X Static / Dynamic	Strain / X Stress	X Creep / Post Cyclic	X Const. Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1; 1; Other: / Strain / Stress

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.700 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI		
Initial	30.21	58.78	19.46	34.02	109.1	81.4	86.1			
After Consol.: to $\sigma'_{v,c}$	27.46	54.16	19.72	33.50	117.9	88.3	100.0			
to $\sigma'_{vc,max}$	27.26	53.77	19.72	32.99	118.4	89.0	100.0			

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	8.027	2.050	NA
Induced OCR:	-	1.00	3.91	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	9.76	9.10	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c} / \sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 4.3 %/hr.

Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	NA	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.55		Data Normalization: X Yes / No	Value: 2.050 (ksf)
Data corr. for M_{tc}: X Yes; No	Plattens with Pins: Yes; X No	Using Effective Vertical Stress:	
Wire Reinforced Membrane, Model:	Data corr. for Membr. strength	X Pre-Shear Conditions	Post-Cyclic Conditions
X Regular Membrane with Rings	Yes X No	Maximum Stress during Consol.	

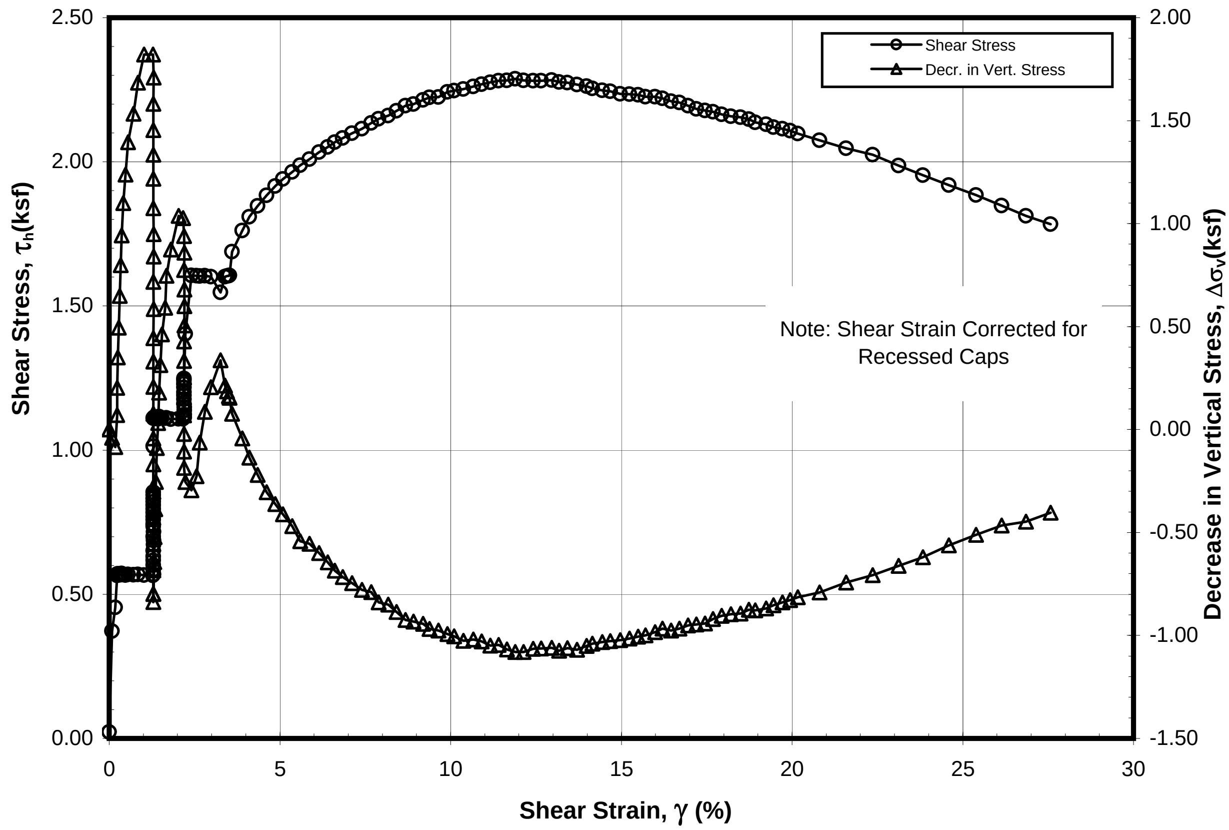
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

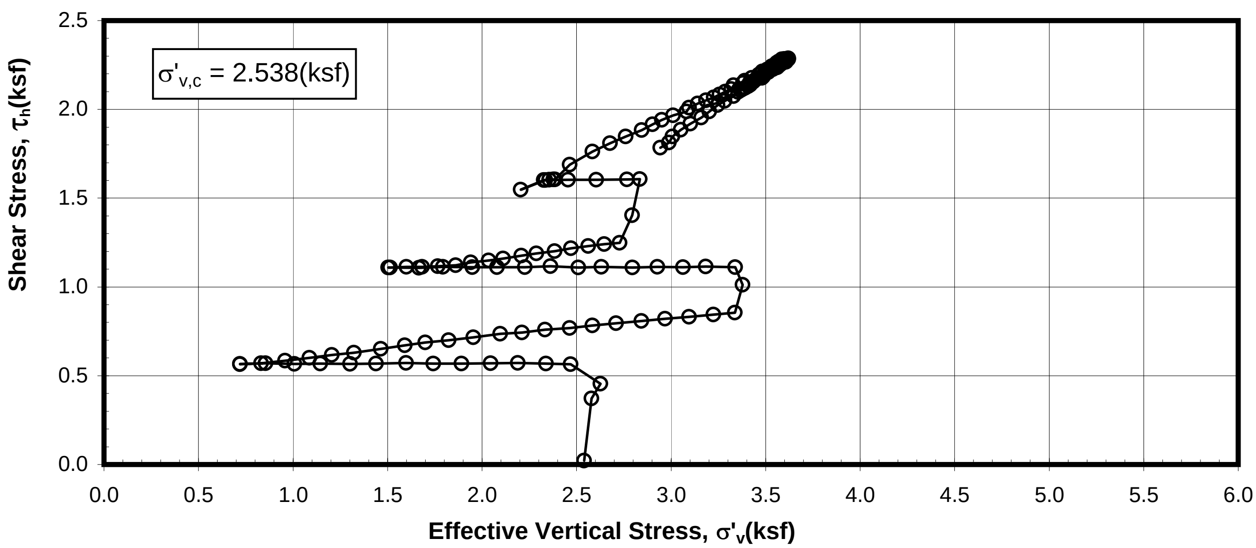
NA - Not Applicable

Final Visual Description and Remarks: Sandy Clay, gray / olive gray

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	1.151	15.45	1.921	0.599	0.060	0.561
at Maximum Strain	0.974	27.44	1.655	0.589	0.189	-



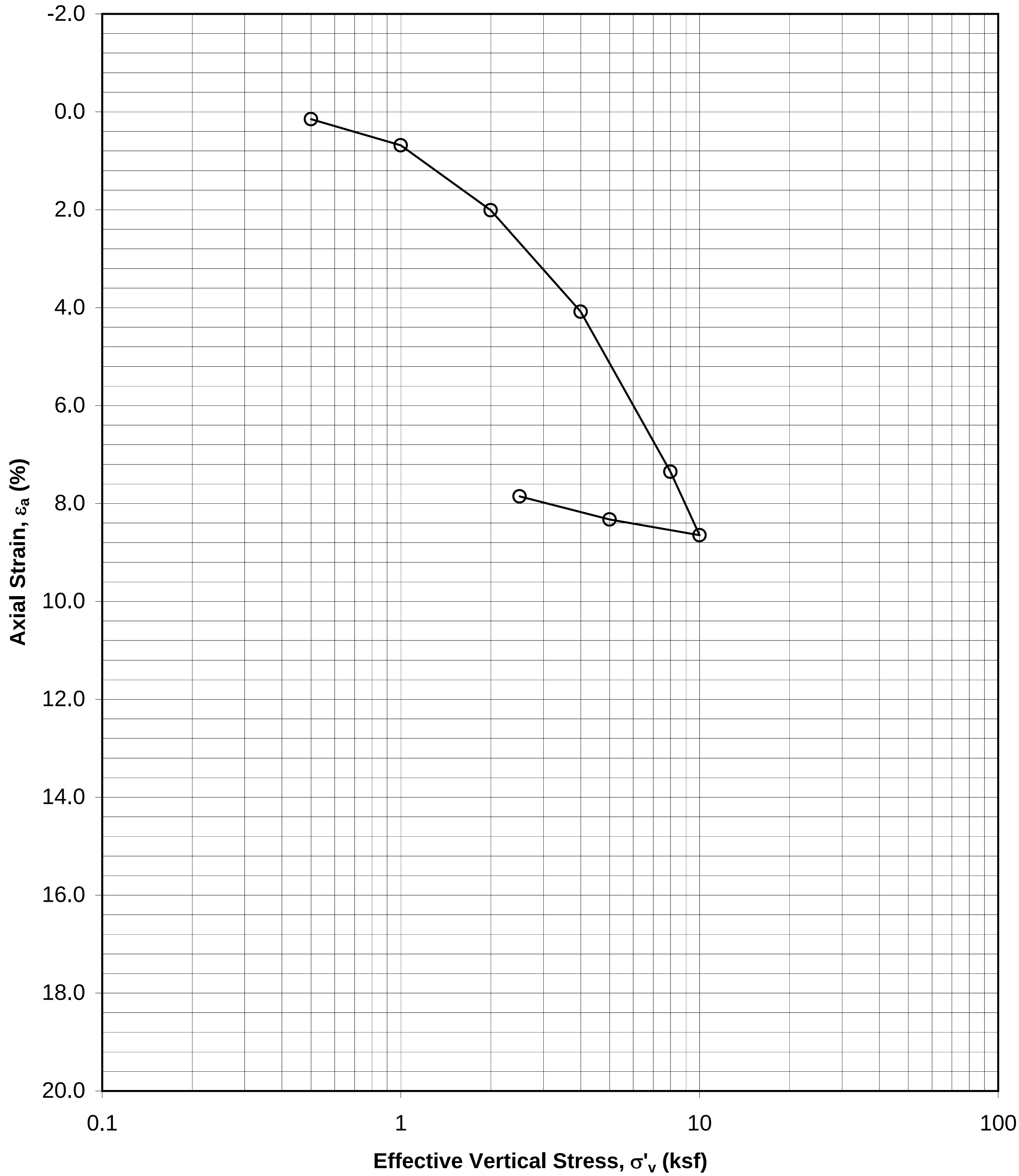


STATIC DSS TEST

K_o Consolidation - OCR = 3.91

Sample: S07Adrt - Depth: 27.00 ft

Boring WR0017-227B



DSS INCREMENTAL CONSOLIDATION

Sample: S07AdRt - Depth 27.00 ft

Boring No. WR0017-227B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04-11120056 | Test Type: DSS Creep w/OCR>1 | Sta. No.: DSS-S13 | File Name: WR0017-227E

Task No.: | Assign, $\sigma'_{v,c}$ = 2.50 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: | Induced OCR = 4.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.700 | [ ] Meas.; [X] Assumed

X Tube; Field Extruded	Liner; Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-227B	LPC Core	Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A	Compostite No.:	Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 27.00	Specimen No.: dRt	Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;	Geomarine Sample		Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental; CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$; 90^o Stress Path	X Used Automated System; Remarks:
Loading Conditions:	X Static; Rapid	Strain; X Stress	X Creep; Post Cyclic	X Const, Vol./Ht; Drained	X Without - Water; With - Bath; Cyclic (Hz) Rate: 0.1; Strain; Stress 1; Other:

Water Content (WC);	Initial - Trimming Location: Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	6189		6239	6526
Mass Moist Soil + Cont. (g)	61.04		75.95	84.43
Mass Dry Soil + Container (g)	53.39		65.16	71.58
Mass Container (g)	30.66		31.88	30.11
WATER CONTENT (%)	33.66		32.42	30.99
Avg. Initial WC, $W_{o,avg}$ (%)	33.04	Final W_{at}:	X Slice ;	Whole Spec.
[ ] See attached data sheet(s) for additional water contents				

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	261.11	109.32
Mass Tare (g)	151.43	3.13
Mass Moist Soil, $M_{t,o}$ $M_{t,at}$ (g)	109.68	106.19

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

X Trimming Ring for Fugro Apparatus			Large-ring ID #
Trimming Ring for NGI Apparatus		NS3	Small-ring ID #
$H_{s,t}$ (mm):	30.00	$A_{s,t}$ (cm^2):	19.46
$D_{s,t}$ (mm) :	49.77	$V_{s,t}$ (cm^3):	58.38
Remarks:			

[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})	Diameter (D_o)		Remarks:	
1	30.000	1-T	NA		
2	30.010	2-M	NA		
3	29.980	3-B	NA		
4	30.020	1'-T	NA	For Free Standing	
5	30.010	2'-M	NA	or Reconstituted Spec.:	
Avg.		3'-B	NA	A_{tr} (cm^2):	NA
=	30.004	Avg	NA	V_{tr} (cm^3):	NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft^3)=	117.30	Dry, $\gamma_{d,o}$ (lb/ft^3)=	88.17

Specimen Lateral Confinement by:

[ ] Wire Reinforced, Model: Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm^2)	(in^2)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

X Regular Membrane with Ring Set No. 5SD | ID, Rings (mm) = 50.78

Thickness (mm): Top: 0.62 ,

[ ] Single Bottom: 0.60 , | Corr. for mem.

X Double Membr. Thick. = 0.31 | = 50.165

Area Ring with mem., A_o: (cm^2)= 19.76 ; (in^2)= 3.064

Note: NA indicates not applicable. | Top Cap No. 5SD | Mass Top Cap, etc., M_{tc} = 251.2 g, 0.55 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus. | Data corr. for M_{tc}: X Yes; [ ] No | Plattens with Pins: [ ] Yes; X No

Sketch of Specimen

Final Visual Description:

Sandy Clay, brown, with Carbon Nodules

Other Remarks :

Trim./ Recon. By: PL | Setup By: JTG | Take Down By: GP

Date: 3/14/2013 | Date: 3/14/2013 | Date: 3/26/2013

Prelim. Calc. By: JTG | Final Calc. By: JJ | Reviewed By: RJ

Specimen Take Down: X Spec. removed right after shearing | Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: DSS-S13 File Name: WR0017-227B_S07A(

Task Number: Specific Gravity: 2.700 Measured; X Assumed

Type Test: DSS Creep w/OCR>1 Specimen: X "Intact"; Reconstituted; Remolded

Calculations Corr. for Salt (dissolved solids): X No or, Yes, with concentration = ppm

Consolidation Stress Summary and Loading Summary							
Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X	Static Strain Rate = NA (%/hr or)		
Nominal Vertical Stress, σ'_v (ksf)	10	2.5	NA		Cyclic Rate (Hz): 0.1; 1; Other =		
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading		Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	0	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)		NA	NA
Nominal OCR	1	4	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)		NA	NA
t_c,(ON,days,hrs)	1.95days	4.71days	NA	Post Cy.Displ. Reset to Null Position:		Yes;	No

Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	33.66		32.42	33.04	33.04	35.29
S_o	99.1		97.3	98.2	98.2	101.3
Measured final mass of moist soil, $M_{t,at}$ (g)						106.19
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						106.19

Calculated Mass of Dry Soil (g)

Initial Selected Water Content (%)	33.04
Initial , $M_{d,o}$	82.44
Final, $M_{d,at}$	81.07
Selected, M_d	81.76

Initial Back Cal. Specific Gravity (TS):

Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary

Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To	
Stress Units (ksf)	10.000	2.500	NA	
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up				
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	2.580	-0.240		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	2.580	-0.240		
ΔV_n using A_o - spec. (cm^3)	5.02	-0.47		
ΔV_n using $A_{c,n}$ - app. (cm^3)	5.10	-0.47		
ΔV_n using burette meas.(cm^3)	1.40	-1.70		
Selected ΔV_n (cm^3)	5.10	-0.47	NA	$= \Delta V_{uL}$
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA	

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures

By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	4.63	$\sim M_{t,o} - (M_{tat,c} + \Delta V_L + \Delta V_{uL})$	
By Cal. Height & App. Area		ΔV_c (cm^3)	3.49
ΔV_c (cm^3)	4.62	**By Saturation = 100% and**	
By Cal. Ht. & Init. Spec. Area		**Spec. Unloaded to 0 Stress**	
ΔV_c (cm^3)	4.55	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below

Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	29.72
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	29.14

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	3.70	ΔH_c (mm) =	2.340	$\varepsilon_{a,c}$ (%) =	7.80	$\Delta V_{c,max}$ (cm^3) =	4.17
V_c (cm^3) =	54.68	H_c (mm) =	27.664	$\varepsilon_{v,c}$ (%) =	6.33	$\varepsilon_{ac,max}$ (%)=	8.60
A_c (cm^2) =	19.76	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:

Specific Gravity: G_s = 2.700 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	30.004	58.38	19.46	34.2	117.3	87.4	99.8
After Consol.: to $\sigma'_{v,c}$	27.664	54.68	19.76	29.7	121.1	93.3	100.0
After Consol.: to $\sigma'_{vc,max}$	27.424	54.20	19.76	29.1	121.6	94.2	100.0

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume. Calculated By: JJ

& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable Reviewed By: RJ

3 - Uses measured value at appropriate stress level (NA for rings).

Remarks:

Project Number: 04-11120056 | Test Type: DSS Creep w/OCR>1 | Test Sta. No.: DSS-S13 | File Name: WR0017-227B
Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-227B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A		Compostite No.:		Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 27		Specimen No.: dRt		Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90^o Stress Path		X Used Automated System Remarks:
Loading Conditions:	X Static / Dynamic	Strain / X Stress	X Creep / Post Cyclic	X Const. Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1; 1; Other: / Strain / Stress

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.700	Height	Volume	Area	Water Content	Unit Weight Total	Unit Weight Dry	Saturation	LL PL		
Condition:	(mm)	(cm^3)	(cm^2)	(%)	(pcf)	(pcf)	(%)	PI		
Initial	30.00	58.38	19.46	34.16	117.3	87.4	99.8	38		
After Consol.: to $\sigma'_{v,c}$	27.66	54.68	19.76	29.72	121.1	93.3	100.0	18		
to $\sigma'_{vc,max}$	27.42	54.20	19.76	29.15	121.6	94.2	100.0	20		

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	9.920	2.538	NA
Induced OCR:	-	1.00	3.91	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	8.60	7.80	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 3.2 %/hr.
Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	NA	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA
$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %
at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

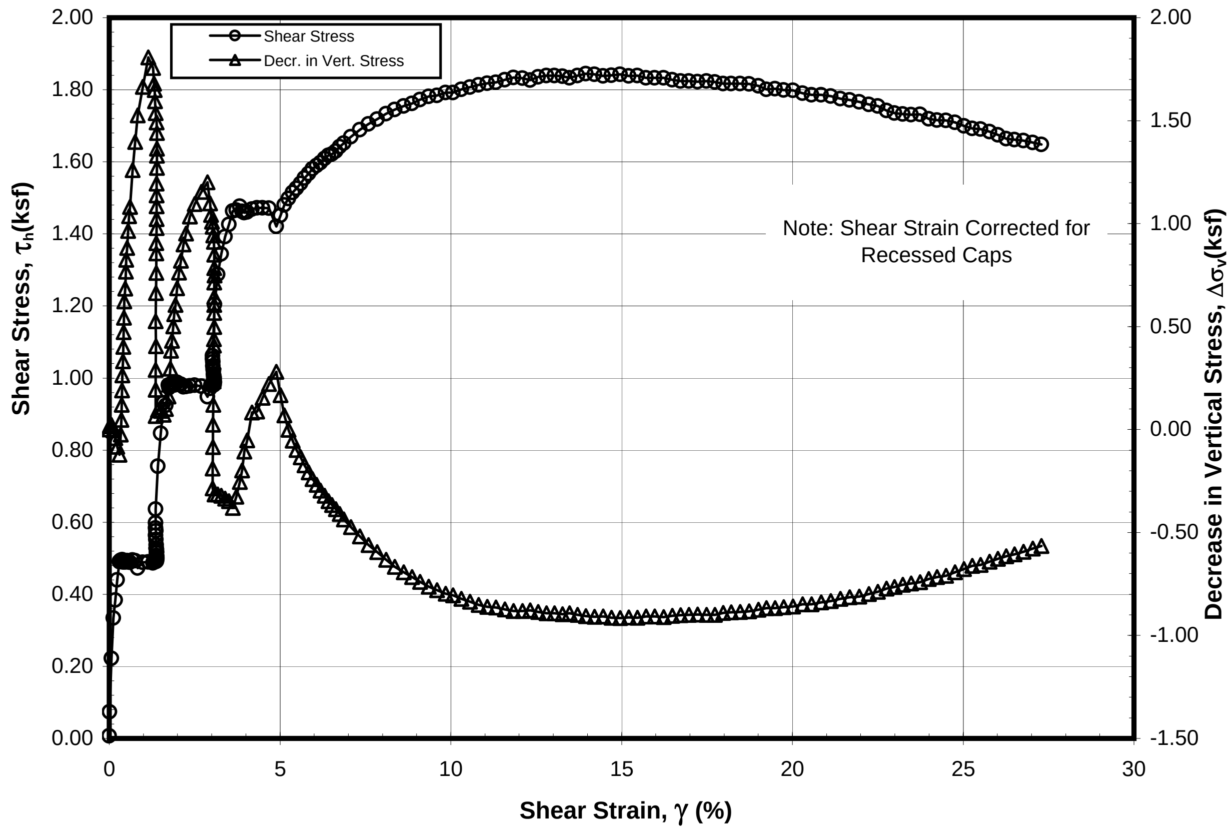
Weight Top Cap, etc., M_{tc} (lbf): 0.55
Data corr. for M_{tc}: X Yes; No | Plattens with Pins: Yes; X No
Wire Reinforced Membrane, Model:
X Regular Membrane with Rings
Data corr. for Membr. strength: Yes X No

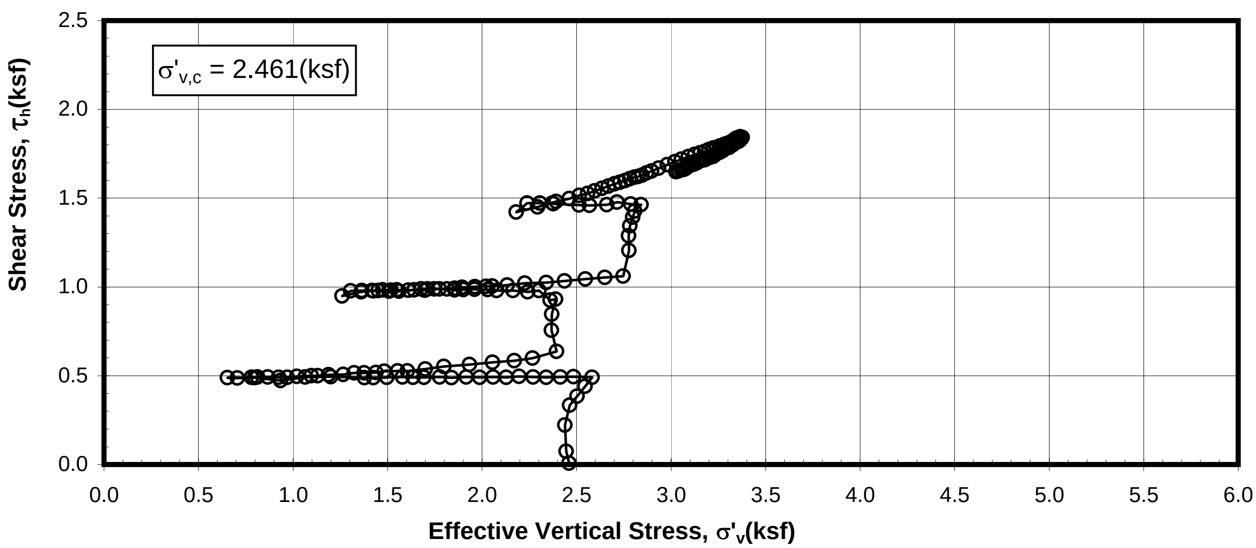
Data Normalization: X Yes No Value: 2.538 (ksf)
Using Effective Vertical Stress:
X Pre-Shear Conditions | Post-Cyclic Conditions
Maximum Stress during Consol.

Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.
NA - Not Applicable
Final Visual Description and Remarks: Sandy Clay, brown, with Carbon Nodules

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	2.288	11.89	3.620	0.632	-0.425	0.901
at Maximum Strain	1.783	27.58	2.944	0.606	-0.159	-



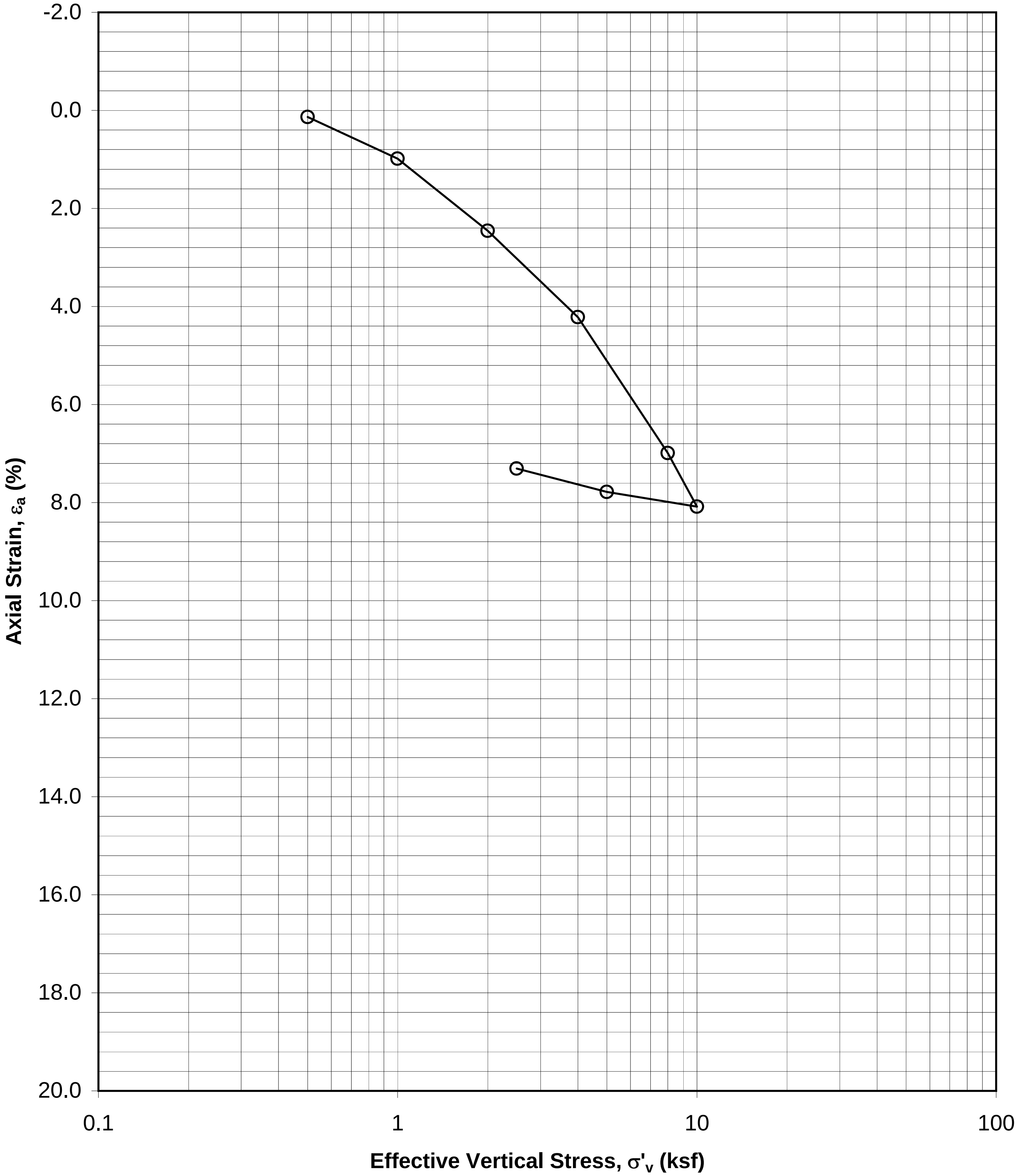


STATIC DSS TEST

K_o Consolidation - OCR = 4.01

Sample: S07Aa - Depth: 25.95 ft

Boring WR0017-228B



DSS INCREMENTAL CONSOLIDATION

Sample: S07Aa - Depth 25.95 ft

Boring No. WR0017-228B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: DSS Creep w/OCR>1 | Sta. No.: DSS-S05 | File Name: WR0017-228E

Task No.: | Assign, $\sigma'_{v,c}$ = 2.50 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: | Induced OCR = 4.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.750 | [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-228B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S07A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 25.95	Specimen No.: a	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) =	Dia. (in.) =
[ ] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental [ ] CRS	; [ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ [ ] 90° Stress Path	[X] Used Automated System Remarks:
Loading Conditions:	[X] Static [ ] Rapid	[ ] Strain [X] Stress	[X] Creep [ ] Post Cyclic	[X] Const, Vol./Ht [ ] Drained	[X] Without - Water [ ] With - Bath; [ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Strain [ ] 1; [ ] Stress Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	802		4096	6083
Mass Moist Soil + Cont. (g)	76.77		79.72	87.27
Mass Dry Soil + Container (g)	65.91		67.62	73.82
Mass Container (g)	32.02		30.57	31.50
WATER CONTENT (%)	32.04		32.66	31.78
Avg. Initial WC, $W_{o,avg}$ (%)	32.35	Final W_{at}:	[X] Slice ;	[ ] Whole Spec.

[ ] See attached data sheet(s) for additional water contents

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	258.22	107.68
Mass Tare (g)	151.32	3.03
Mass Moist Soil, $M_{t,o}$ $M_{t,at}$ (g)	106.90	104.65

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

[X] Trimming Ring for Fugro Apparatus			Large-ring ID #
[ ] Trimming Ring for NGI Apparatus		NS2	Small-ring ID #
$H_{s,t}$ (mm):	29.89	$A_{s,t}$ (cm²):	19.46
$D_{s,t}$ (mm) :	49.77	$V_{s,t}$ (cm³):	58.16

Remarks:

[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})		Diameter (D_o)	Remarks:	
1	29.870	1-T	NA		
2	29.900	2-M	NA		
3	29.920	3-B	NA		
4	29.900	1'-T	NA	For Free Standing	
5	29.880	2'-M	NA	or Reconstituted Spec.:	
	Avg.	3'-B	NA	A_{tr} (cm²):	NA
=	29.894	Avg	NA	V_{tr} (cm³):	NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)= 114.74 | Dry, $\gamma_{d,o}$ (lb/ft³)= 86.70

Specimen Lateral Confinement by:

[ ] **Wire Reinforced, Model:** Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

[X] **Regular Membrane with Ring Set No.** 6SD | ID, Rings (mm) = 50.79

Thickness (mm): Top: 0.58 ,

[ ] Single Bottom: 0.63 , | Corr. for mem.

[X] Double Membr. Thick. = 0.30 | = 50.190

Area Ring with mem., A_o: (cm²)= 19.78 ; (in²)= 3.067

Note: NA indicates not applicable. | Top Cap No. 6SD | Mass Top Cap, etc., M_{tc} = 252.1 g, 0.56 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus. | Data corr. for M_{tc}: [X] Yes; [ ] No | Plattens with Pins: [ ] Yes; [X] No

Sketch of Specimen

Final Visual Description:

Clay, dark brown, with sand pockets.

Other Remarks :

Trim./ Recon. By:	PL	Setup By:	JTG	Take Down By:	PL
Date:	3/22/2013	Date:	3/22/2013	Date:	4/2/2013
Prelim. Calc. By:	JTG	Final Calc. By:	JJ	Reviewed By:	RJ

Specimen Take Down: [X] Spec. removed right after shearing | Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 | Test Station No.: DSS-S05 | File Name: WR0017-228B_S07A

Task Number: | Specific Gravity: 2.750 | ☐ Measured; ☒ Assumed

Type Test: DSS Creep w/OCR>1 | Specimen: ☒ "Intact"; ☐ Reconstituted; ☐ Remolded

Calculations Corr. for Salt (dissolved solids): ☒ No or, ☐ Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary						
Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X Static Strain Rate = NA (%/hr or)		
Nominal Vertical Stress, σ'_v (ksf)	10	2.5	NA	Cyclic Rate (Hz): ☐ 0.1; ☐ 1; Other =		
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	0	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)	NA	NA
Nominal OCR	1	4	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	NA	NA
t_c,(ON,days,hrs)	2.03days	4.74days	NA	Post Cy.Displ. Reset to Null Position:	☐ Yes;	☐ No

☐ Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):						
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	32.04		32.66	32.35	32.35	34.62
S_o	90.7		91.5	91.1	91.1	94.2
Measured final mass of moist soil, $M_{t,at}$ (g)						104.65
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						104.65

Calculated Mass of Dry Soil (g)	
Initial Selected Water Content (%)	32.35
Initial , $M_{d,o}$	80.77
Final, $M_{d,at}$	79.41
Selected, M_d	80.09

Initial Back Cal. Specific Gravity (TS):	
Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary			
Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$ or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	10.000	2.500	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	2.420	-0.230	
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000	0.000	
Corr. Total Def. $\Delta H_{c,n}$ (mm)	2.420	-0.230	
ΔV_n using A_o - spec. (cm^3)	4.71	-0.45	
ΔV_n using $A_{c,n}$ - app. (cm^3)	4.79	-0.46	
ΔV_n using burette meas.(cm^3)	2.10	-1.35	
Selected ΔV_n (cm^3)	4.79	-0.46	NA = ΔV_{uL}
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures			
By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	4.33	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	2.25
ΔV_c (cm^3)	4.33	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	4.26	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below	
Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	31.95
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	31.38

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	3.35	ΔH_c (mm) =	2.190	$\varepsilon_{a,c}$ (%) =	7.33	$\Delta V_{c,max}$ (cm^3) =	3.81
V_c (cm^3) =	54.81	H_c (mm) =	27.704	$\varepsilon_{v,c}$ (%) =	5.76	$\varepsilon_{ac,max}$ (%)=	8.10
A_c (cm^2) =	19.78	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:							
Specific Gravity: G_s = 2.750 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	29.894	58.16	19.46	33.5	114.7	86.0	92.6
After Consol.: to $\sigma'_{v,c}$	27.704	54.81	19.78	31.9	120.4	91.2	100.0
After Consol.: to $\sigma'_{vc,max}$	27.474	54.35	19.78	31.4	120.8	92.0	100.0

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.
& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable
3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ
Reviewed By: RJ

Remarks:

Project Number: 04.11120056 Test Type: DSS Creep w/OCR>1 Test Sta. No.: DSS-S05 File Name: WR0017-228B

Project Name: Task No.: Test No.: NA Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-228B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S07A		Compostite No.:		Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 25.95		Specimen No.: a		Kneading	Undercompaction: U_{ni} (%) =	Dia. (in.) =
Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90° Stress Path	X Used Automated System	Remarks:
Loading Conditions:	X Static / Dynamic	Strain / X Stress	X Creep / Post Cyclic	X Const. Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1; Strain 1; Stress Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.750	Height	Volume	Area	Water Content	Unit Weight Total	Unit Weight Dry	Saturation	LL / PL / PI		
Condition:	(mm)	(cm^3)	(cm^2)	(%)	(pcf)	(pcf)	(%)	PI		
Initial	29.89	58.16	19.46	33.47	114.7	86.0	92.6	47		
After Consol. to $\sigma'_{v,c}$	27.70	54.81	19.78	31.95	120.4	91.2	100.0	20		
After Consol. to $\sigma'_{vc,max}$	27.47	54.35	19.78	31.37	120.8	92.0	100.0	27		

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	9.862	2.461	NA
Induced OCR:	-	1.00	4.01	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	8.10	7.33	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c} / \sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 3.5 %/hr.

Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	NA	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.56	Data Normalization: X Yes No Value: 2.461 (ksf)
Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No	Using Effective Vertical Stress:
Wire Reinforced Membrane, Model: / Data corr. for Membr. strength	X Pre-Shear Conditions / Post-Cyclic Conditions
X Regular Membrane with Rings / Yes X No	Maximum Stress during Consol.

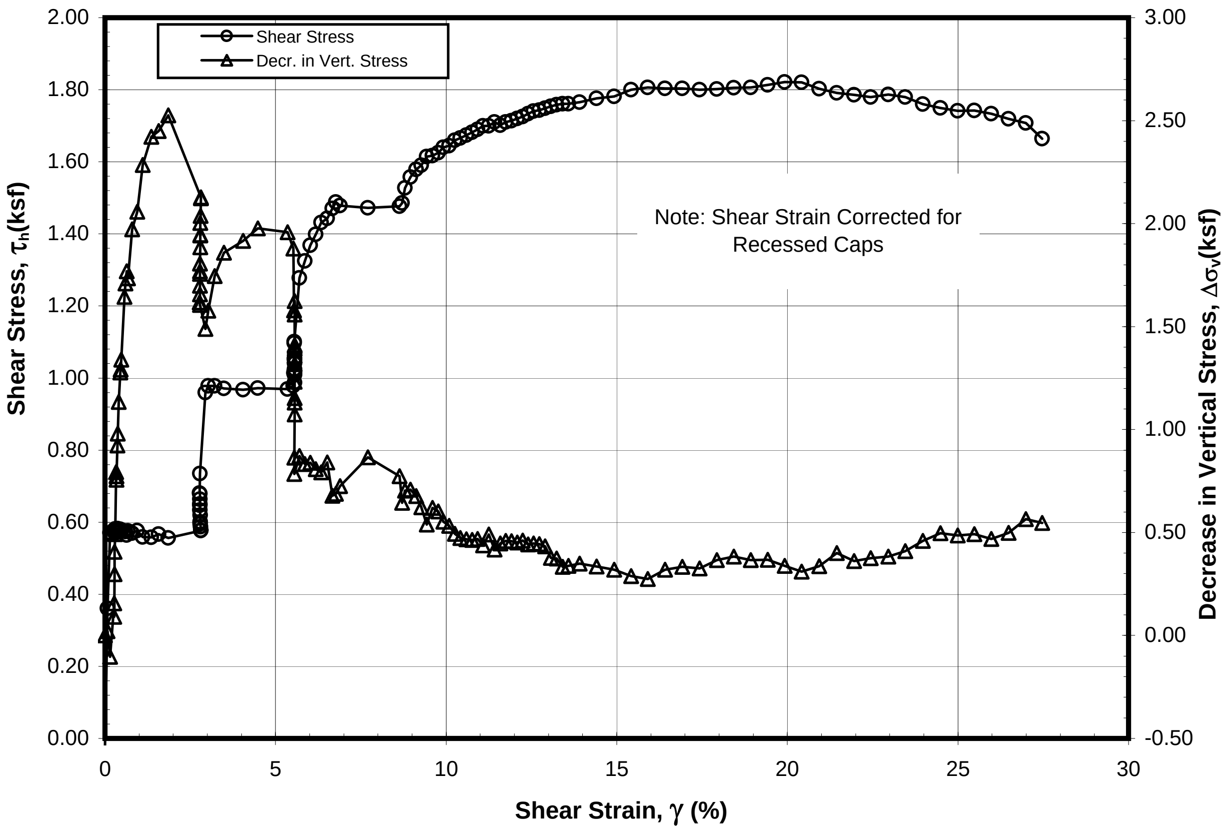
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

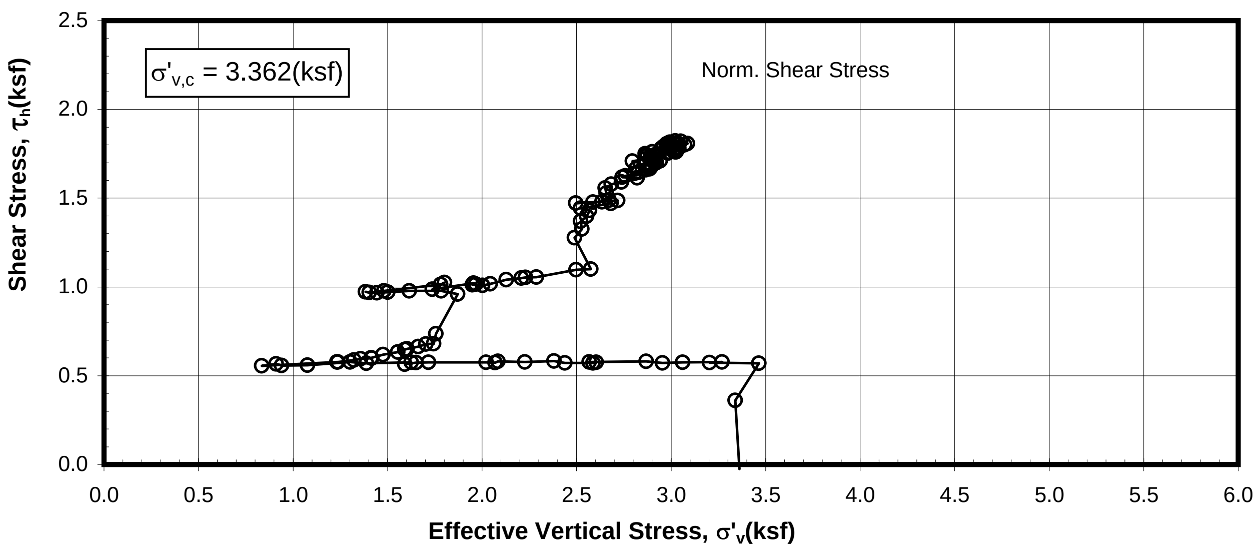
NA - Not Applicable

Final Visual Description and Remarks: Clay, dark brown, with sand pockets.

Loading Summary

	τ_h	γ	σ'_v	τ_h/σ'_v	$\Delta\sigma'_v/\sigma'_{v,c}$	$c_u/\sigma'_{v,c}$
	(ksf)	(%)	(ksf)	-	-	-
at Peak Shear Stress	1.844	13.96	3.367	0.548	-0.368	0.750
at Maximum Strain	1.648	27.29	3.026	0.545	-0.230	-



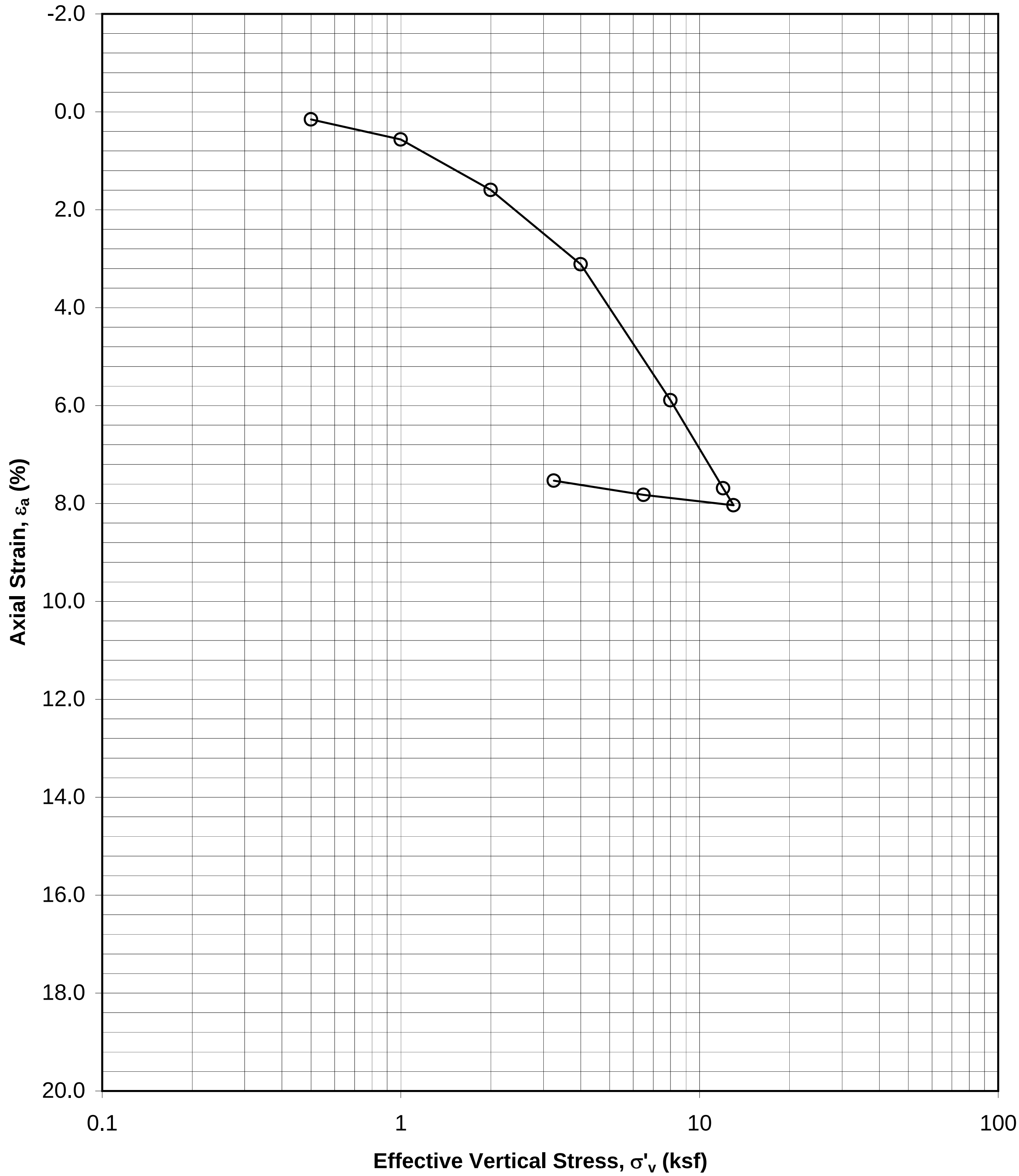


STATIC DSS TEST

K_o Consolidation - OCR = 3.91

Sample: S06Ac - Depth: 26.70 ft

Boring WR0017-229B



DSS INCREMENTAL CONSOLIDATION

Sample: S06Ac - Depth 26.70 ft

Boring No. WR0017-229B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: DSS Creep w/OCR>1 Sta. No.: DSS-S12 File Name: WR0017-229E

Task No.: Assign, $\sigma'_{v,c}$ = 3.25 ksf $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: Induced OCR = 4.00 $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: Specific Gravity: 2.700 [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-229B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S06A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 26.70	Specimen No.: c	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[X] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental [ ] CRS	; [ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ [ ] 90° Stress Path	[X] Used Automated System Remarks:
Loading Conditions:	[X] Static [ ] Rapid	[X] Strain [X] Stress	[X] Creep [ ] Post Cyclic	[X] Const, Vol./Ht [ ] Drained	[X] Without - Water [ ] With - Bath	[ ] Cyclic (Hz) Rate: [ ] 0.1;	[ ] Strain [ ] Stress 1; Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	6083		6526	6489
Mass Moist Soil + Cont. (g)	93.89		109.34	83.70
Mass Dry Soil + Container (g)	80.49		91.52	73.69
Mass Container (g)	31.51		30.11	29.94
WATER CONTENT (%)	27.36		29.02	22.88
Avg. Initial WC, $W_{o,avg}$ (%)	28.19	Final W_{at}:	[X] Slice ;	[ ] Whole Spec.
[ ] See attached data sheet(s) for additional water contents				

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	260.35	108.84
Mass Tare (g)	151.03	3.41
Mass Moist Soil, $M_{t,o}$ $Mt_{,at}$ (g)	109.32	105.43

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:			
[X] Trimming Ring for Fugro Apparatus			Large-ring ID #
[ ] Trimming Ring for NGI Apparatus		FS1	Small-ring ID #
$H_{s,t}$ (mm):	31.53	$A_{s,t}$ (cm²):	17.93
$D_{s,t}$ (mm) :	47.79	$V_{s,t}$ (cm³):	56.55
Remarks:			
[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)			

	Height (H_{tr})		Diameter (D_o)	Remarks:
1	31.540	1-T	NA	
2	31.530	2-M	NA	
3	31.540	3-B	NA	
4	31.510	1'-T	NA	For Free Standing
5	31.540	2'-M	NA	or Reconstituted Spec.:
Avg.		3'-B	NA	A_{tr} (cm²): NA
=	31.532	Avg	NA	V_{tr} (cm³): NA

Estimated Initial Unit Weight	
Total, $\gamma_{t,o}$ (lb/ft³)= 120.68	Dry, $\gamma_{d,o}$ (lb/ft³)= 94.14

Specimen Lateral Confinement by:				
[ ] Wire Reinforced, Model:		Thickness (mm) =		
Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				
[X] Regular Membrane with Ring Set No.	8S		ID, Rings (mm)	
Thickness (mm):	Top: 0.70	,	=	48.32
[ ] Single	Bottom: 0.74	,	Corr. for mem.	
[X] Double	Membr. Thick. = 0.36		=	47.600
Area Ring with mem., A_o: (cm²)=	17.80		; (in²)=	2.758
Mass Top Cap, etc., M_{tc} =	221.6 g,	0.49	lbf	
Data corr. for M_{tc}: [X] Yes; [ ] No	Plattens with Pins: [ ] Yes; [X] No			

Note: NA indicates not applicable. Top Cap No. 8SD

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus.

Sketch of Specimen

Final Visual Description:

Clay with sand, olive gray, with some Carbon Nodules

Other Remarks :

Trim./ Recon. By: PL Setup By: JTG Take Down By: PL

Date: 3/5/2013 Date: 3/6/2013 Date: 3/18/2013

Prelim. Calc. By: JJ Final Calc. By: JJ Reviewed By: RJ

Specimen Take Down: [X] Spec. removed right after shearing Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 | Test Station No.: DSS-S12 | File Name: WR0017-229B_S06A

Task Number: | Specific Gravity: 2.700 | [ ] Measured; [X] Assumed

Type Test: DSS Creep w/OCR>1 | Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Pre-Shear	Post Cyclic
Nominal Vertical Stress, σ'_v (ksf)	13	3.25	NA
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA
Horizontal Force, $P_{hr,n}$ (lbf)	0	0	NA
Nominal OCR	1	4	NA
t_c,(ON,days,hrs)	1.98days	1.98days	NA

[X] Static Strain Rate = NA (%/hr or)

[ ] Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm)	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	NA	NA
Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	27.36		29.02	28.19	28.19	27.41
S_o	95.2		98.1	96.7	96.7	95.3
Measured final mass of moist soil, $M_{t,at}$ (g)						105.43
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						105.43

Calculated Mass of Dry Soil (g)

Initial Selected Water Content (%)	28.19
Initial , $M_{d,o}$	85.28
Final, $M_{d,at}$	85.80
Selected, M_d	85.54

Initial Back Cal. Specific Gravity (TS):

Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary

Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	13.000	3.250	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	2.520	-0.160	
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000	0.000	
Corr. Total Def. $\Delta H_{c,n}$ (mm)	2.520	-0.160	
ΔV_n using A_o - spec. (cm^3)	4.52	-0.29	
ΔV_n using $A_{c,n}$ - app. (cm^3)	4.48	-0.28	
ΔV_n using burette meas.(cm^3)	2.10	-0.60	
Selected ΔV_n (cm^3)	4.48	-0.28	NA = ΔV_{uL}
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures

By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	4.20	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	3.89
ΔV_c (cm^3)	4.20	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	4.23	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below

Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	23.54
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	23.21

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	4.64	ΔH_c (mm) =	2.360	$\varepsilon_{a,c}$ (%) =	7.48	$\Delta V_{c,max}$ (cm^3) =	4.92
V_c (cm^3) =	51.91	H_c (mm) =	29.172	$\varepsilon_{v,c}$ (%) =	8.20	$\varepsilon_{ac,max}$ (%)=	7.99
A_c (cm^2) =	17.80	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:

Specific Gravity: G_s = 2.700 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	31.532	56.55	17.93	27.8	120.7	94.4	96.0
After Consol.: to $\sigma'_{v,c}$	29.172	51.91	17.80	23.5	127.1	102.9	100.0
After Consol.: to $\sigma'_{vc,max}$	29.012	51.63	17.80	23.2	127.4	103.4	100.0

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.

& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable

3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ

Reviewed By: RJ

Remarks:

Project Number: 04.11120056 | Test Type: DSS Creep w/OCR>1 | Test Sta. No.: DSS-S12 | File Name: WR0017-229B
Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-229B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S06A		Compostite No.:		Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 26.7		Specimen No.: c		Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90° Stress Path	X Used Automated System Remarks:		
Loading Conditions:	X Static / Dynamic	X Strain / X Stress	X Creep / Post Cyclic	X Const. Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1; 1; Other:	Strain / Stress

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.700	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI		
Condition: Initial	31.53	56.55	17.93	27.80	120.7	94.4	96.0	26		
After Consol.: to $\sigma'_{v,c}$	29.17	51.91	17.80	23.54	127.1	102.9	100.0	17		
to $\sigma'_{vc,max}$	29.01	51.63	17.80	23.21	127.4	103.4	100.0	9		

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic			
					X Static Strain Rate = 4.2 %/hr.		
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	13.161	3.362	NA	Cyclic Rate (Hz): 0.1; 1; Other =		
Induced OCR:	-	1.00	3.91	NA	During/End of Loading	Static	Cyclic
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	7.99	7.48	NA	Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3):	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA	Post Cy.Displ. Reset to Null Pos.:	Yes;	No
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA	Number of Loading Cycles, N = NA		
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA	$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %		
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA	at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)		

Weight Top Cap, etc., M_{tc} (lbf): 0.49	Data Normalization: X Yes No Value: 3.362 (ksf)
Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No	Using Effective Vertical Stress:
Wire Reinforced Membrane, Model: / Data corr. for Membr. strength	X Pre-Shear Conditions / Post-Cyclic Conditions
X Regular Membrane with Rings / Yes X No	Maximum Stress during Consol.

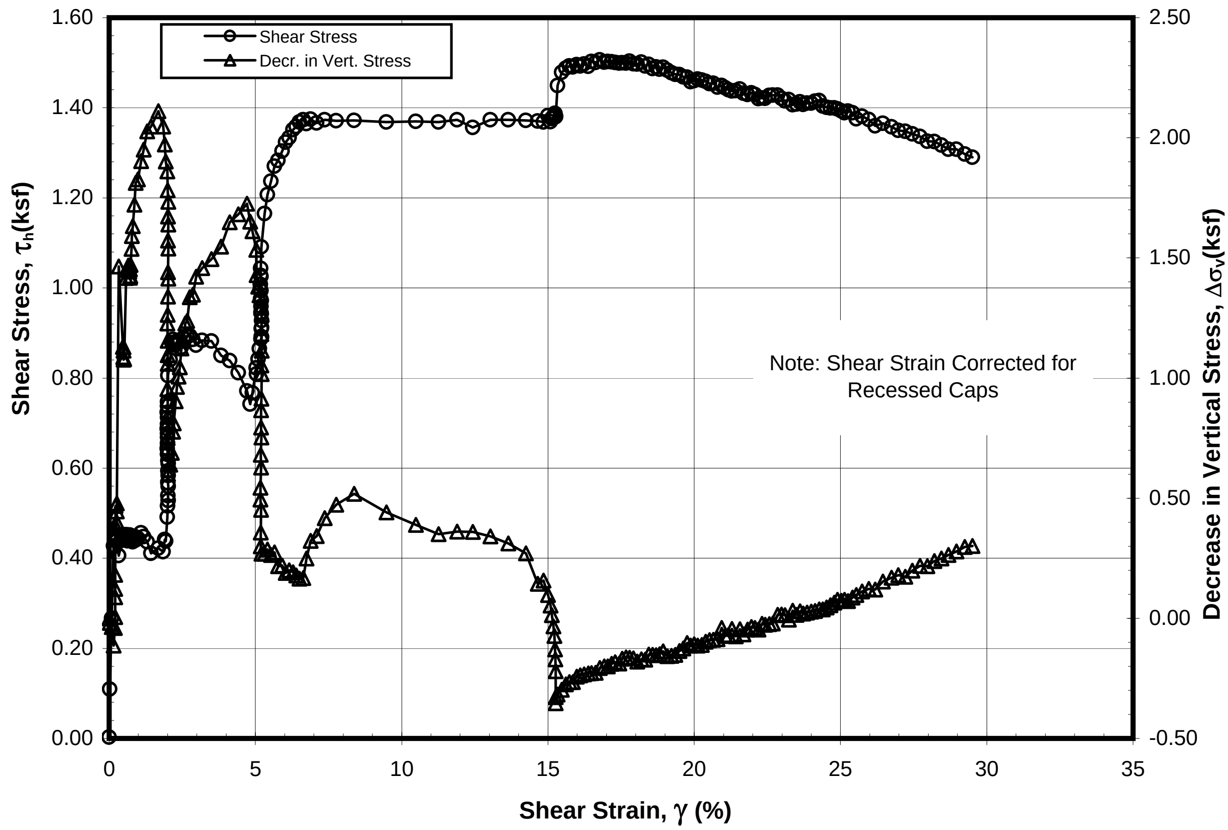
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

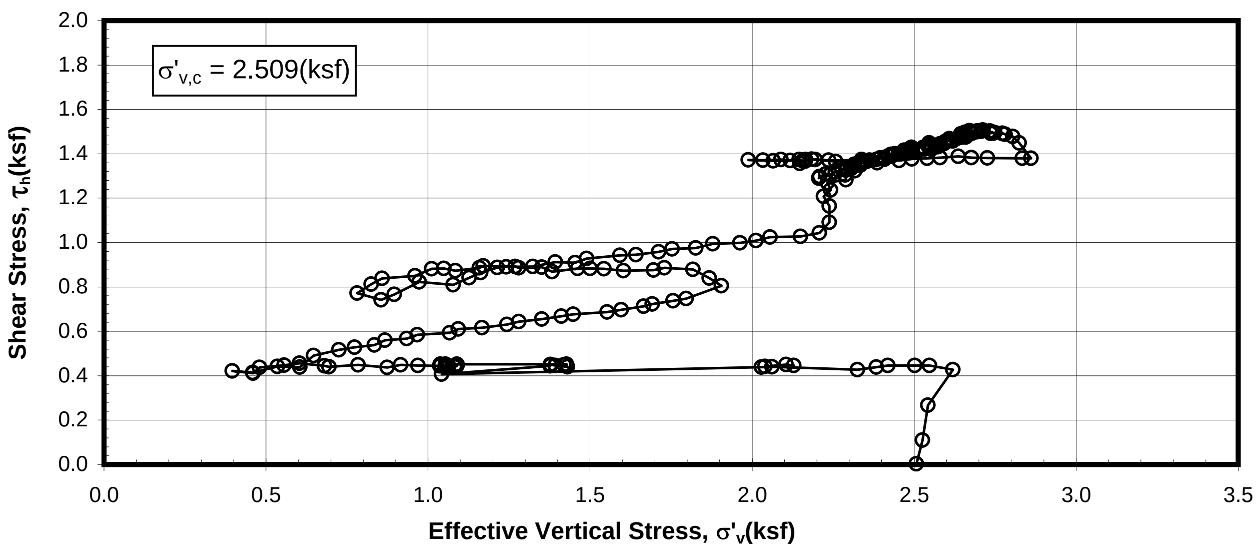
NA - Not Applicable

Final Visual Description and Remarks: Clay with sand, olive gray, with some Carbon Nodules

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	1.821	19.93	3.023	0.602	0.101	0.542
at Maximum Strain	1.664	27.47	2.815	0.591	0.162	-



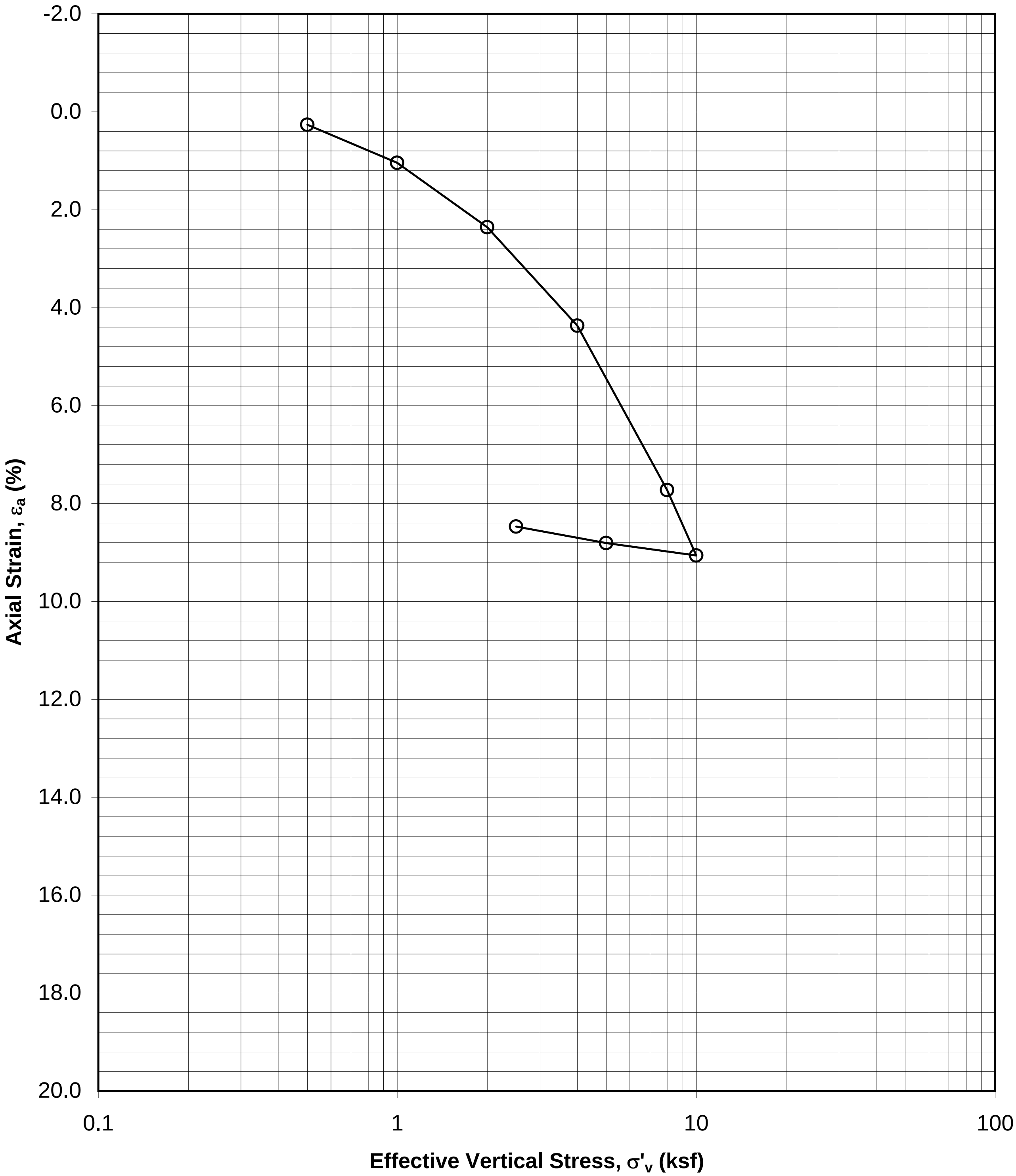


STATIC DSS TEST

K_o Consolidation - OCR = 3.94

Sample: S09Abrt - Depth: 27.40 ft

Boring WR0017-230B



DSS INCREMENTAL CONSOLIDATION

Sample: S09AbRt - Depth 27.40 ft

Boring No. WR0017-230B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: DSS Creep w/OCR>1 | Sta. No.: DSS-S06 | File Name: WR0017-230B

Task No.: | Assign, $\sigma'_{v,c}$ = 2.50 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: | Induced OCR = 4.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.750 | [ ] Meas.; [X] Assumed

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-230B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S09A		Compostite No.:		Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 27.40		Specimen No.: bRt		Kneading	Undercompaction: U_{ni} (%) =	Dia. (in.) =
X Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	X K_o at:	X Incremental ; CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ / 90° Stress Path	X Used Automated System / Remarks:
Loading Conditions:	X Static / Rapid	Strain / X Stress	X Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - Water / With - Bath	Cyclic (Hz) Rate: 0.1;	Strain / Stress 1; Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	4096		6071	6316
Mass Moist Soil + Cont. (g)	62.78		88.35	66.36
Mass Dry Soil + Container (g)	55.58		75.53	58.53
Mass Container (g)	30.57		31.56	29.84
WATER CONTENT (%)	28.79		29.16	27.29
Avg. Initial WC, $W_{o,avg}$ (%)	28.97	Final W_{at}:	X Slice ;	Whole Spec.
See attached data sheet(s) for additional water contents				

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	261.78	110.70
Mass Tare (g)	151.31	3.15
Mass Moist Soil, $M_{t,o}$ $Mt_{,at}$ (g)	110.47	107.55

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

X Trimming Ring for Fugro Apparatus			Large-ring ID #
Trimming Ring for NGI Apparatus		NS2	Small-ring ID #
$H_{s,t}$ (mm):	29.03	$A_{s,t}$ (cm²):	19.46
$D_{s,t}$ (mm) :	49.77	$V_{s,t}$ (cm³):	56.48
Remarks:			
Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)			

	Height (H_{tr})	Diameter (D_o)		Remarks:	
1	28.970	1-T	NA		
2	29.030	2-M	NA		
3	29.050	3-B	NA		
4	29.010	1'-T	NA	For Free Standing	
5	29.090	2'-M	NA	or Reconstituted Spec.:	
Avg.		3'-B	NA	A_{tr} (cm²):	NA
=	29.030	Avg	NA	V_{tr} (cm³):	NA

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)= 122.10 | Dry, $\gamma_{d,o}$ (lb/ft³)= 94.67

Specimen Lateral Confinement by:

Wire Reinforced, Model: | Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

X **Regular Membrane with Ring Set No.** 9SD | ID, Rings (mm) = 50.80

Thickness (mm): Top: 0.64 , Bottom: 0.68 ,

Single | Corr. for mem.

X Double Membr. Thick. = 0.33 | = 50.145

Area Ring with mem., $A_{o:}$ (cm²)= 19.75 ; (in²)= 3.061

Note: NA indicates not applicable. | Top Cap No. 9SD | Mass Top Cap, etc., M_{tc} = 252.8 g, 0.56 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus. | Data corr. for M_{tc}: X Yes; No | Plattens with Pins: Yes; X No

Sketch of Specimen

Final Visual Description:

Clay, gray / olive gray

Other Remarks :

Trim./ Recon. By:	PL	Setup By:	JTG	Take Down By:	PL
Date:	4/16/2013	Date:	4/16/2013	Date:	4/24/2013
Prelim. Calc. By:	JTG	Final Calc. By:	JJ	Reviewed By:	RJ

Specimen Take Down: X Spec. removed right after shearing | Remarks:

Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: DSS-S06 File Name: 0017-230B_S09Ab

Task Number: Specific Gravity: 2.750 [ ] Measured; [X] Assumed

Type Test: DSS Creep w/OCR>1 Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X	Static Strain Rate = NA (%/hr or)	
Nominal Vertical Stress, σ'_v (ksf)	10	2.5	NA		Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =	
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	0	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)	NA	NA
Nominal OCR	1	4	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	NA	NA
t_c,(ON,days,hrs)	2.88days	0.95days	NA	Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	28.79		29.16	28.97	28.97	30.75
S_o	98.0		98.7	98.4	98.4	101.3
Measured final mass of moist soil, $M_{t,at}$ (g)						107.55
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						107.55

Calculated Mass of Dry Soil (g)

Initial Selected Water Content (%)	28.97
Initial , $M_{d,o}$	85.65
Final, $M_{d,at}$	84.49
Selected, M_d	85.07

Initial Back Cal. Specific Gravity (TS):

Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary

Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To	
Stress Units (ksf)	10.000	2.500	NA	
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up				
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	2.670	-0.170		
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000	0.000		
Corr. Total Def. $\Delta H_{c,n}$ (mm)	2.670	-0.170		
ΔV_n using A_o - spec. (cm^3)	5.19	-0.33		
ΔV_n using $A_{c,n}$ - app. (cm^3)	5.27	-0.34		
ΔV_n using burette meas.(cm^3)	3.00	-0.45		
Selected ΔV_n (cm^3)	5.27	-0.34	NA	$= \Delta V_{uL}$
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA	

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures

By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	4.93	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	2.92
ΔV_c (cm^3)	4.94	**By Saturation = 100% and**	
By Cal. Ht. & Init. Spec. Area		**Spec. Unloaded to 0 Stress**	
ΔV_c (cm^3)	4.86	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. -
Based on the Consolidation Conclusions Given Below

Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	25.11
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	24.72

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	4.09	ΔH_c (mm) =	2.500	$\varepsilon_{a,c}$ (%) =	8.61	$\Delta V_{c,max}$ (cm^3) =	4.42
V_c (cm^3) =	52.39	H_c (mm) =	26.530	$\varepsilon_{v,c}$ (%) =	7.24	$\varepsilon_{ac,max}$ (%)=	9.20
A_c (cm^2) =	19.75	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:

Specific Gravity: G_s = 2.750 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	29.030	56.48	19.46	29.9	122.1	94.0	99.8
After Consol.: to $\sigma'_{v,c}$	26.530	52.39	19.75	25.1	126.8	101.4	100.0
After Consol.: to $\sigma'_{vc,max}$	26.360	52.06	19.75	24.7	127.2	102.0	100.0

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.
& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable
3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ
Reviewed By: RJ

Remarks:

FUGRO

Project Number: 04.11120056 Test Type: DSS Creep w/OCR>1 Test Sta. No.: DSS-S06 File Name: 0017-230B_S0

Project Name: Task No.: Test No.: NA Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-230B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S09A		Compostite No.:		Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 27.4		Specimen No.: bRt		Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90^o Stress Path		X Used Automated System Remarks:
Loading Conditions:	X Static / Dynamic	Strain / X Stress	X Creep / Post Cyclic	X Const. Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1; 1; Other: / Strain / Stress

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.750 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI		
Initial	29.03	56.48	19.46	29.85	122.1	94.0	99.8	38		
After Consol.: to $\sigma'_{v,c}$	26.53	52.39	19.75	25.11	126.8	101.4	100.0	19		
to $\sigma'_{vc,max}$	26.36	52.06	19.75	24.71	127.2	102.0	100.0	19		

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	9.878	2.509	NA
Induced OCR:	-	1.00	3.94	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	9.20	8.61	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 4.5 %/hr.

Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	NA	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.56

Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No

Wire Reinforced Membrane, Model:

X Regular Membrane with Rings

Data corr. for Membr. strength: Yes X No

Data Normalization: X Yes No Value: 2.509 (ksf)

Using Effective Vertical Stress:

X Pre-Shear Conditions; Post-Cyclic Conditions

Maximum Stress during Consol.

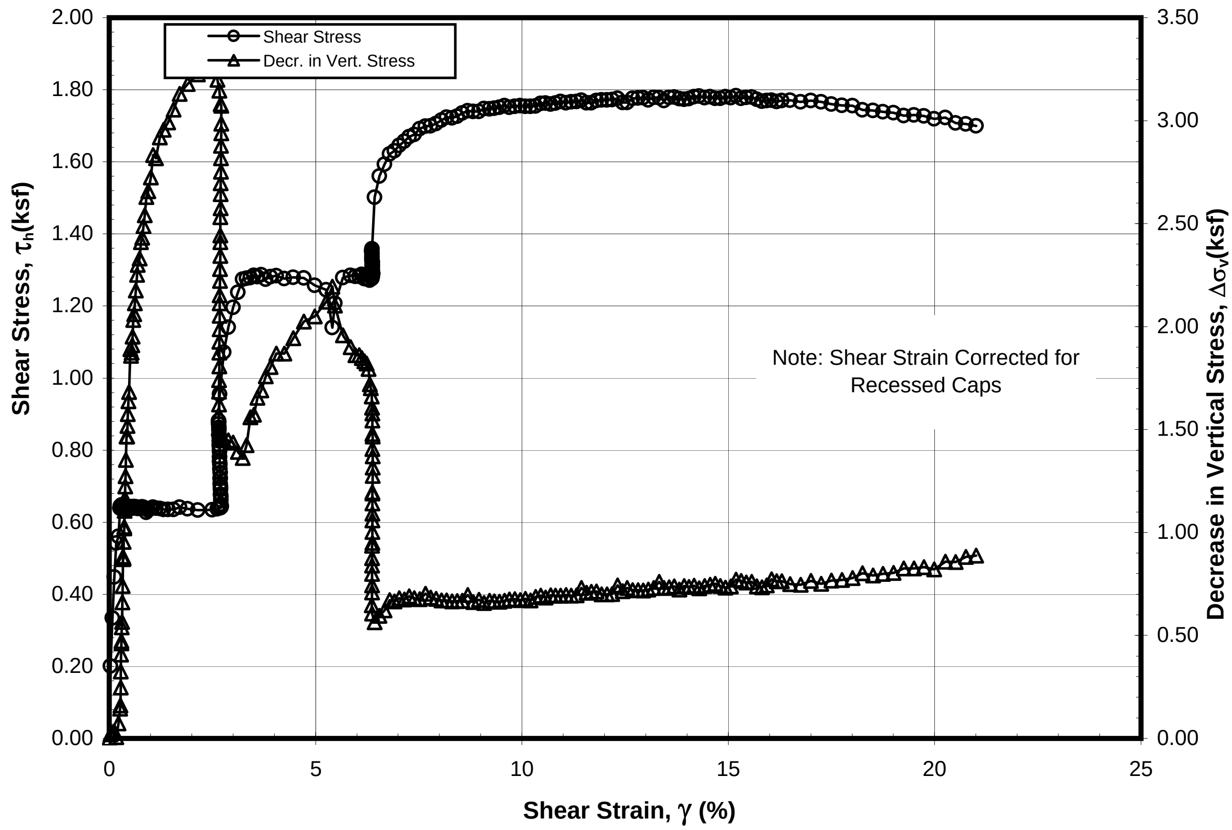
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

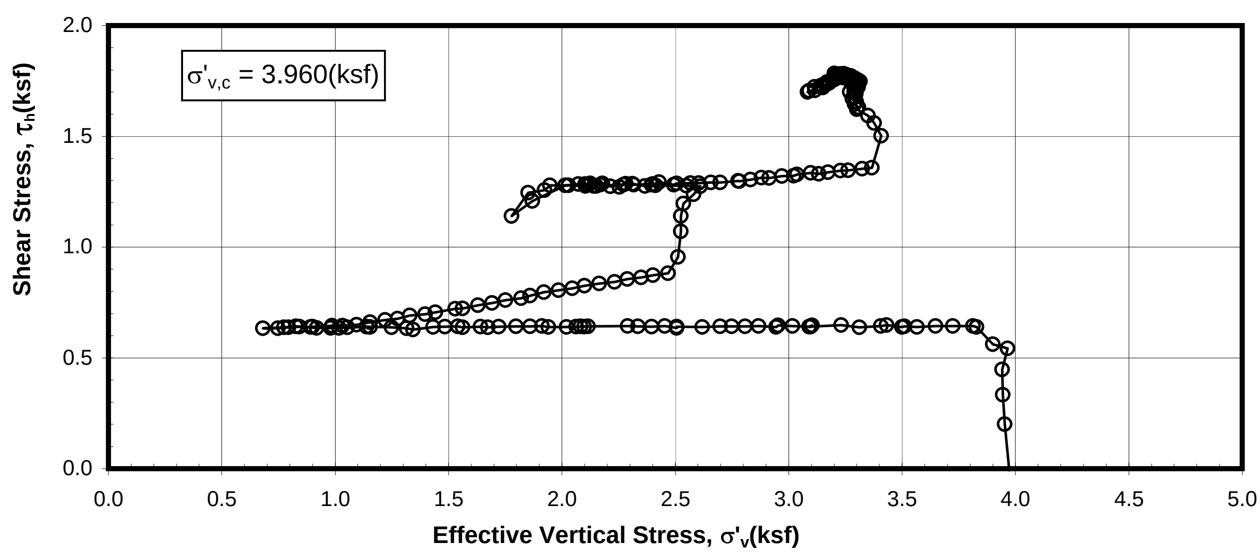
NA - Not Applicable

Final Visual Description and Remarks: Clay, gray / olive gray

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	1.506	16.77	2.713	0.555	-0.082	0.600
at Maximum Strain	1.290	29.51	2.206	0.585	0.120	-



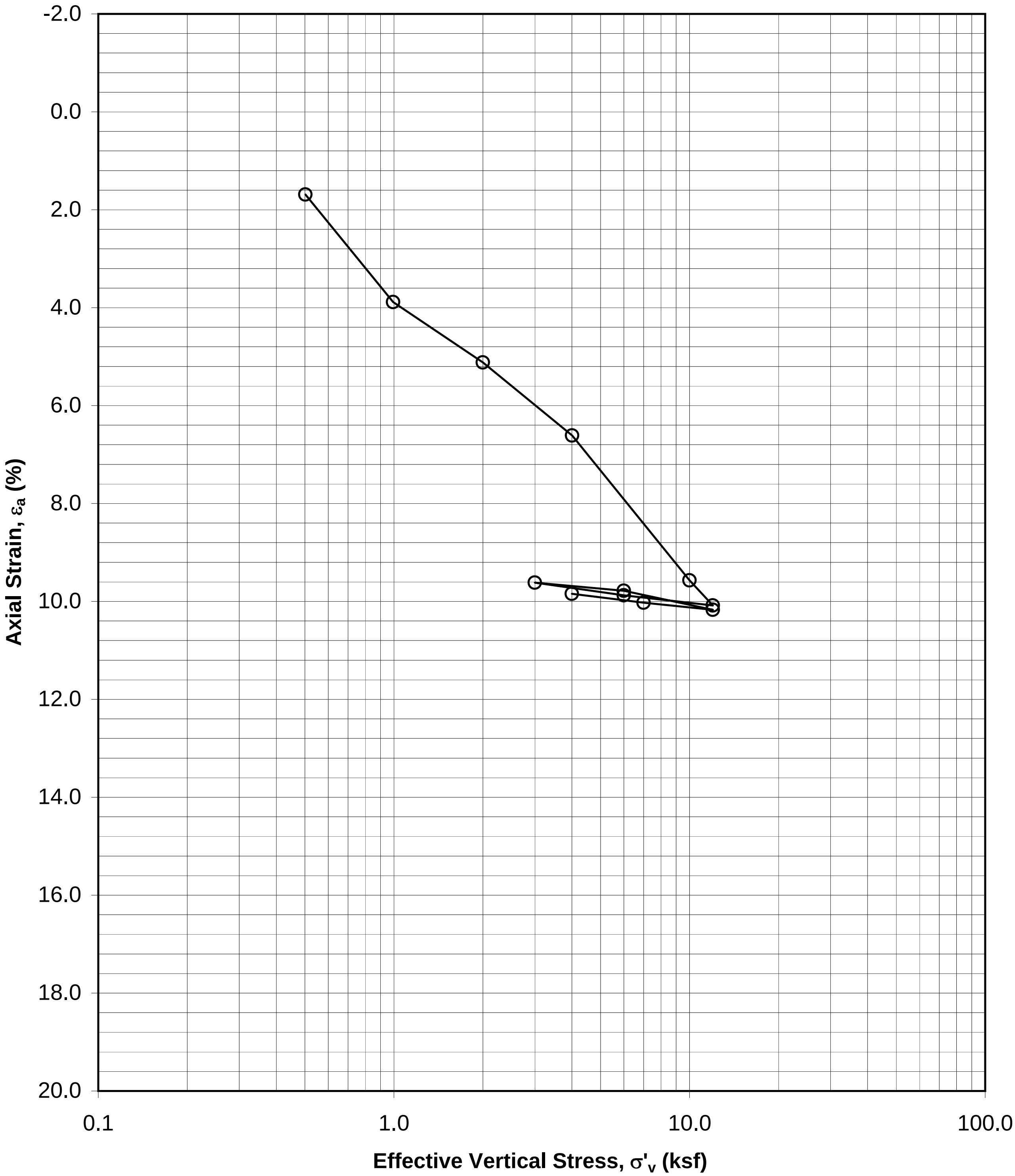


STATIC DSS TEST

K_o Consolidation - OCR = 3.0

Sample: S04Acrt - Depth: 15.45 ft

Boring WR0017-253B



DSS INCREMENTAL CONSOLIDATION

Sample: S04AcRt - Depth 15.45 ft

Boring No. WR0017-253B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: DSS Creep w/OCR>1 | Sta. No.: DSS-S07 | File Name: WR0017-253B

Task No.: | Assign, $\sigma'_{v,c}$ = 4.00 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: | Induced OCR = 3.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.700 | [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-253B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S04A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 15.45	Specimen No.: cRt	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[ ] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental [ ] CRS	; [ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ [ ] 90° Stress Path	[X] Used Automated System Remarks:
Loading Conditions:	[X] Static [ ] Rapid	[ ] Strain [X] Stress	[X] Creep [ ] Post Cyclic	[X] Const, Vol./Ht [ ] Drained	[X] Without - Water [ ] With - Bath	[ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] 1; [ ] Strain [ ] Stress Other:

Water Content (WC);	Initial - Trimming Location: Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	4193		6189	6489
Mass Moist Soil + Cont. (g)	68.66		62.55	64.78
Mass Dry Soil + Container (g)	62.91		58.18	59.32
Mass Container (g)	29.82		30.66	29.90
WATER CONTENT (%)	17.38		15.88	18.56
Avg. Initial WC, $W_{o,avg}$ (%)	16.63	Final W_{at}:	[X] Slice ;	[ ] Whole Spec.
[ ] See attached data sheet(s) for additional water contents				

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	270.64	123.31
Mass Tare (g)	151.43	3.30
Mass Moist Soil, $M_{t,o}$ $M_{t,at}$ (g)	119.21	120.01

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:			
[X] Trimming Ring for Fugro Apparatus			Large-ring ID #
[ ] Trimming Ring for NGI Apparatus		NS3	Small-ring ID #
$H_{s,t}$ (mm):	30.31	$A_{s,t}$ (cm²):	19.46
$D_{s,t}$ (mm) :	49.77	$V_{s,t}$ (cm³):	58.98
Remarks:			
[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)			

	Height (H_{tr})	Diameter (D_o)		Remarks:	
1	30.330	1-T	NA		
2	30.290	2-M	NA		
3	30.310	3-B	NA		
4	30.340	1'-T	NA	For Free Standing	
5	30.300	2'-M	NA	or Reconstituted Spec.:	
Avg.		3'-B	NA	A_{tr} (cm²):	NA
=	30.314	Avg	NA	V_{tr} (cm³):	NA

Estimated Initial Unit Weight			
Total, $\gamma_{t,o}$ (lb/ft³)=	126.18	Dry, $\gamma_{d,o}$ (lb/ft³)=	108.19

Specimen Lateral Confinement by:

[ ] Wire Reinforced, Model: Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

[X] Regular Membrane with Ring Set No. 7SD | ID, Rings (mm) = 50.80

Thickness (mm): Top: 0.73 ,

[ ] Single Bottom: 0.71 , Corr. for mem.

[x] Double Membr. Thick. = 0.36 | = 50.080

Area Ring with mem., A_o: (cm²)= 19.70 ; (in²)= 3.053

Note: NA indicates not applicable. | Top Cap No. 7SD | Mass Top Cap, etc., M_{tc} = 252.5 g, 0.56 lbf

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus. | Data corr. for M_{tc}: [X] Yes; [ ] No | Plattens with Pins: [ ] Yes; [X] No

Sketch of Specimen

Final Visual Description:

Sandy Clay, brown dark, with carbon nodules

Other Remarks :

Trim./ Recon. By:	PL	Setup By:	PL	Take Down By:	PL
Date:	4/9/2013	Date:	4/9/2013	Date:	4/17/2013
Prelim. Calc. By:	JTG	Final Calc. By:	JJ	Reviewed By:	RJ

Specimen Take Down: [X] Spec. removed right after shearing | Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 — Test Station No.: DSS-S07 — File Name: 017-253B_S04AcRt

Task Number: ______ — Specific Gravity: 2.700 — [ ] Measured; [X] Assumed

Type Test: DSS Creep w/OCR>1 — Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Pre-Shear	Post Cyclic
Nominal Vertical Stress, σ'_v (ksf)	12	4	NA
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA
Horizontal Force, $P_{hr,n}$ (lbf)	0	0	NA
Nominal OCR	1	3	NA
t_c,(ON,days,hrs)	1.14days	0.70days	NA

[X] Static Strain Rate = NA (%/hr or)

[ ] Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm)	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	NA	NA
Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	17.38		15.88	16.63	16.63	17.77
S_o	83.0		78.6	80.9	80.9	84.1
Measured final mass of moist soil, $M_{t,at}$ (g)						120.01
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						120.01

Calculated Mass of Dry Soil (g)

Initial Selected Water Content (%)	16.63
Initial , $M_{d,o}$	102.21
Final, $M_{d,at}$	101.22
Selected, M_d	101.72

Initial Back Cal. Specific Gravity (TS):

Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary

Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	12.000	4.000	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	3.060	-0.070	
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000	0.000	
Corr. Total Def. $\Delta H_{c,n}$ (mm)	3.060	-0.070	
ΔV_n using A_o - spec. (cm^3)	5.95	-0.14	
ΔV_n using $A_{c,n}$ - app. (cm^3)	6.03	-0.14	
ΔV_n using burette meas.(cm^3)	2.25	-0.70	
Selected ΔV_n (cm^3)	6.03	-0.14	NA $= \Delta V_{uL}$
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures

By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	5.89	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	-0.80
ΔV_c (cm^3)	5.89	**By Saturation = 100% and**	
By Cal. Ht. & Init. Spec. Area		**Spec. Unloaded to 0 Stress**	
ΔV_c (cm^3)	5.82	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below

Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	15.78
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	15.64

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	5.16	ΔH_c (mm) =	2.990	$\varepsilon_{a,c}$ (%) =	9.86	$\Delta V_{c,max}$ (cm^3) =	5.29
V_c (cm^3) =	53.82	H_c (mm) =	27.324	$\varepsilon_{v,c}$ (%) =	8.74	$\varepsilon_{ac,max}$ (%)=	10.09
A_c (cm^2) =	19.70	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:

Specific Gravity: G_s = 2.700 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	
Initial (as trimmed)	30.314	58.98	19.46	17.2	126.2	107.7	82.5	
After Consol.: to $\sigma'_{v,c}$	27.324	53.82	19.70	15.8	136.6	118.0	100.0	
to $\sigma'_{vc,max}$	27.254	53.68	19.70	15.6	136.8	118.3	100.0	

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.

& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable

3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ

Reviewed By: RJ

Remarks:

Project Number: 04.11120056 Test Type: DSS Creep w/OCR>1 Test Sta. No.: DSS-S07 File Name: 017-253B_S04/
Project Name: Task No.: Test No.: NA Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-253B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S04A		Compostite No.:		Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 15.45		Specimen No.: cRt		Kneading	Undercompaction: U_{ni} (%) =	Dia. (in.) =
Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90° Stress Path	X Used Automated System Remarks:

Loading Conditions:	X Static / Dynamic	Strain / X Stress	X Creep / Post Cyclic	X Const. Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1;	Strain / Stress 1; Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.700 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI		
Initial	30.31	58.98	19.46	17.20	126.2	107.7	82.5	27		
After Consol.: to $\sigma'_{v,c}$	27.32	53.82	19.70	15.78	136.6	118.0	100.0	15		
to $\sigma'_{vc,max}$	27.25	53.68	19.70	15.64	136.8	118.3	100.0	12		

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	11.875	3.960	NA
Induced OCR:	-	1.00	3.00	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	10.09	9.86	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 3.1 %/hr.
Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	NA	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

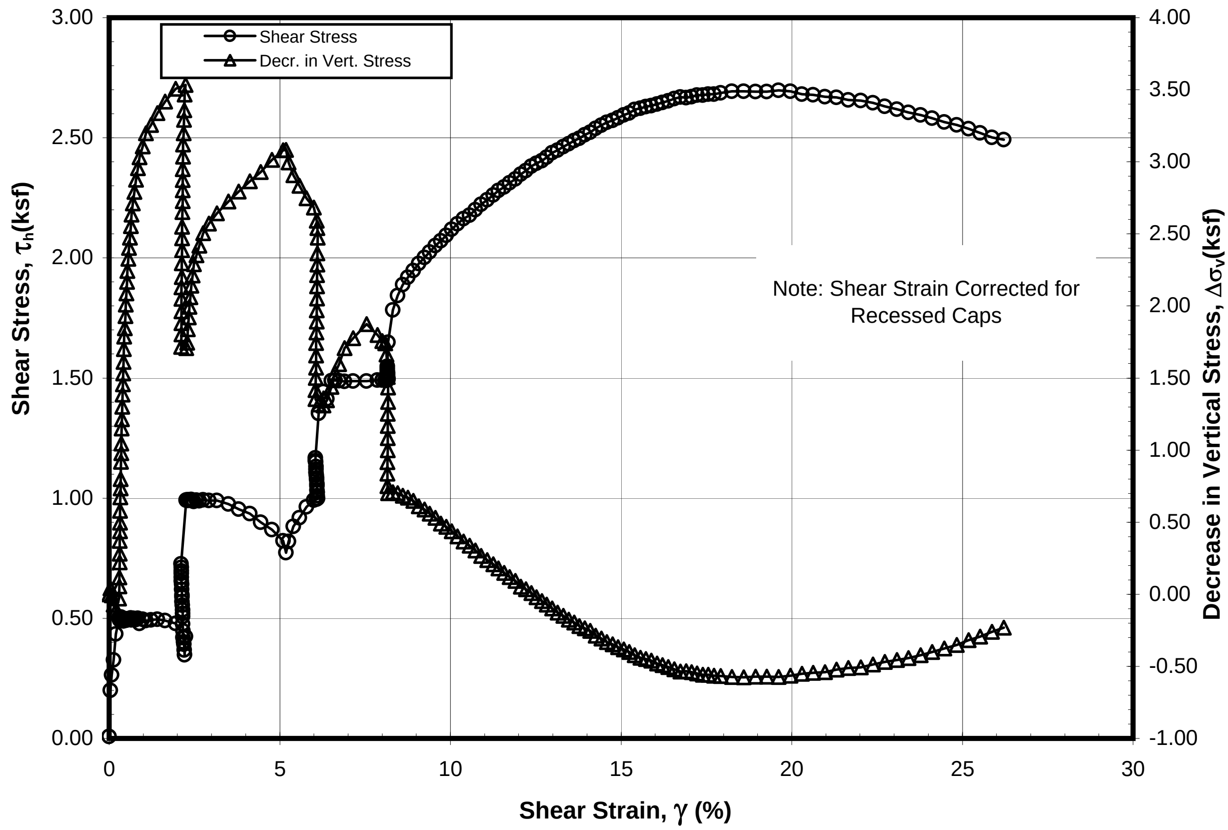
Number of Loading Cycles, N = NA
$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %
at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

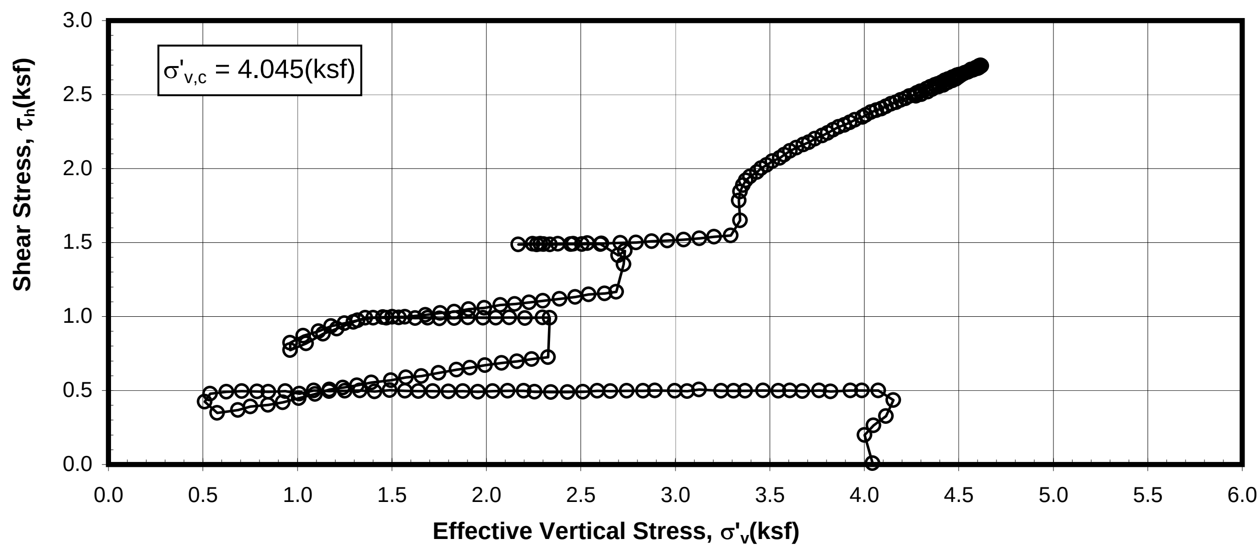
Weight Top Cap, etc., M_{tc} (lbf): 0.56	Data Normalization: X Yes No Value: 3.960 (ksf)
Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No	Using Effective Vertical Stress:
Wire Reinforced Membrane, Model: Data corr. for Membr. strength	X Pre-Shear Conditions / Post-Cyclic Conditions
x Regular Membrane with Rings Yes X No	Maximum Stress during Consol.

Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.
NA - Not Applicable
Final Visual Description and Remarks: Sandy Clay, brown dark, with carbon nodules

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	1.784	15.19	3.202	0.557	0.195	0.450
at Maximum Strain	1.700	21.00	3.084	0.551	0.224	-



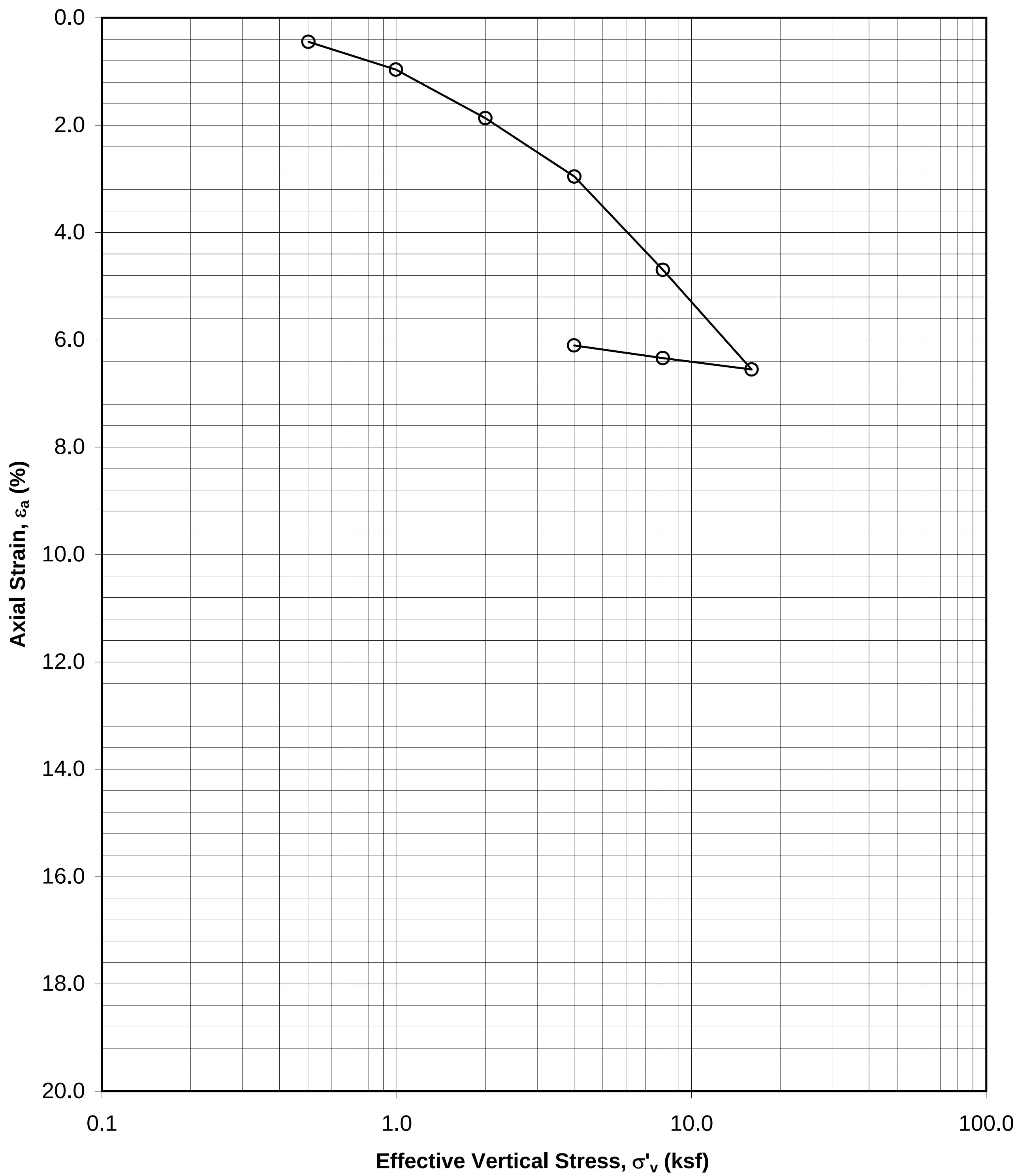


STATIC DSS TEST

K_o Consolidation - OCR = 3.94

Sample: S07Ab - Depth: 15.85 ft

Boring WR0017-286B



DSS INCREMENTAL CONSOLIDATION

Sample: S07Ab - Depth 15.85 ft

Boring No. WR0017-286B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: DSS Creep w/OCR>1 Sta. No.: DSS-S05 File Name: 0017-286B_S07

Task No.: Assign, $\sigma'_{v,c}$ = 4.00 ksf $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: Induced OCR = 4.00 $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: Specific Gravity: 2.700 [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort:	Blows/Tamps per Layer =
Boring No.: WR0017-286B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =
Sample No.: S07A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)=	Drop (in.) =
Depth (ft): 15.85	Specimen No.: b	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) =	Dia. (in.) =
[ ] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. =	± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental [ ] CRS	; [ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ [ ] 90° Stress Path	[X] Used Automated System Remarks:
Loading Conditions:	[X] Static [ ] Rapid	[ ] Strain [X] Stress	[X] Creep [ ] Post Cyclic	[X] Const, Vol./Ht [ ] Drained	[X] Without - Water [ ] With - Bath	[ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Strain [ ] 1; [ ] Stress Other:

Water Content (WC);	Initial - Trimming Location: Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	5007		6083	4096
Mass Moist Soil + Cont. (g)	59.42		86.38	48.09
Mass Dry Soil + Container (g)	53.17		73.84	44.39
Mass Container (g)	31.13		31.51	30.58
WATER CONTENT (%)	28.36		29.62	26.79
Avg. Initial WC, $W_{o,avg}$ (%)	28.99	Final W_{at}:	[X] Slice ;	[ ] Whole Spec.

[ ] See attached data sheet(s) for additional water contents

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	251.53	114.76
Mass Tare (g)	137.13	2.86
Mass Moist Soil, $M_{t,o}$ $M_{t,at}$ (g)	114.40	111.90

Excess Dry Soil (soil not included in final mass above)	
Container No.	
Mass Dry Soil + Container (g)	
Mass Container (g)	
Mass Excess Dry Soil (g)	0.00

Specimen Trimming:

[X] Trimming Ring for Fugro Apparatus			Large-ring ID #
[ ] Trimming Ring for NGI Apparatus		NS1	Small-ring ID #
$H_{s,t}$ (mm):	29.98	$A_{s,t}$ (cm²):	19.63
$D_{s,t}$ (mm) :	50.00	$V_{s,t}$ (cm³):	58.87

Remarks:

[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})		Diameter (D_o)	Remarks:	
1	30.050	1-T	NA		
2	29.850	2-M	NA		
3	29.950	3-B	NA		
4	30.010	1'-T	NA	For Free Standing	
5	30.040	2'-M	NA	or Reconstituted Spec.:	
	Avg.	3'-B	NA	A_{tr} (cm²):	NA
=	29.980	Avg	NA	V_{tr} (cm³):	NA

Note: NA indicates not applicable. Top Cap No. 5SD

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus.

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)=	121.32	Dry, $\gamma_{d,o}$ (lb/ft³)=	94.06

Specimen Lateral Confinement by:

[ ] **Wire Reinforced, Model:** Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

[X] **Regular Membrane with Ring Set No.** 5SD ID, Rings (mm)

Thickness (mm): Top: 0.60 , = 50.78

[ ] Single Bottom: 0.64 , Corr. for mem.

[X] Double Membr. Thick. = 0.31 = 50.155

Area Ring with mem., A_o: (cm²)= 19.76 ; (in²)= 3.062

Mass Top Cap, etc., M_{tc} = 251.2 g, 0.55 lbf

Data corr. for M_{tc}: [X] Yes; [ ] No Plattens with Pins: [ ] Yes; [X] No

Sketch of Specimen

Final Visual Description:

Sandy Clay, olive gray, with trace of organic matter

Other Remarks :

Trim./ Recon. By:	SB	Setup By:	SB	Take Down By:	SB
Date:	4/30/2013	Date:	5/1/2013	Date:	5/10/2013
Prelim. Calc. By:	SB	Final Calc. By:	JJ	Reviewed By:	RJ

Specimen Take Down: [X] Spec. removed right after shearing Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: DSS-S05 File Name: 0017-286B_S07Ab

Task Number: Specific Gravity: 2.700 [ ] Measured; [X] Assumed

Type Test: DSS Creep w/OCR>1 Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary						
Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X Static Strain Rate = NA (%/hr or)		
Nominal Vertical Stress, σ'_v (ksf)	16	4	NA	Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =		
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	0	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)	NA	NA
Nominal OCR	1	4	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	NA	NA
t_c,(ON,days,hrs)	1.18days	1.06days	NA	Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):						
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	28.36		29.62	28.99	28.99	29.62
S_o	98.2		100.3	99.2	99.2	100.3
Measured final mass of moist soil, $M_{t,at}$ (g)						111.90
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						111.90

Calculated Mass of Dry Soil (g)	
Initial Selected Water Content (%)	28.99
Initial , $M_{d,o}$	88.69
Final, $M_{d,at}$	88.25
Selected, M_d	88.47

Initial Back Cal. Specific Gravity (TS):	
Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary			
Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	16.000	4.000	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	1.979	-0.130	
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000	0.000	
Corr. Total Def. $\Delta H_{c,n}$ (mm)	1.979	-0.130	
ΔV_n using A_o - spec. (cm^3)	3.89	-0.26	
ΔV_n using $A_{c,n}$ - app. (cm^3)	3.91	-0.26	
ΔV_n using burette meas.(cm^3)	0.60	-0.50	
Selected ΔV_n (cm^3)	3.91	-0.26	NA = ΔV_{uL}
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures			
By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	3.65	~ $M_{t,o}$ - ($M_{tat,c}$ + ΔV_L + ΔV_{uL})	
By Cal. Height & App. Area		ΔV_c (cm^3)	2.50
ΔV_c (cm^3)	3.65	By Saturation = 100% and	
By Cal. Ht. & Init. Spec. Area		Spec. Unloaded to 0 Stress	
ΔV_c (cm^3)	3.63	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below	
Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	25.67
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	25.38

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	3.29	ΔH_c (mm) =	1.849	$\varepsilon_{a,c}$ (%) =	6.17	$\Delta V_{c,max}$ (cm^3) =	3.54
V_c (cm^3) =	55.58	H_c (mm) =	28.131	$\varepsilon_{v,c}$ (%) =	5.58	$\varepsilon_{ac,max}$ (%)=	6.60
A_c (cm^2) =	19.76	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:							
Specific Gravity: G_s = 2.700 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)
Initial (as trimmed)	29.980	58.87	19.63	29.3	121.3	93.8	99.7
After Consol.: to $\sigma'_{v,c}$	28.131	55.58	19.76	25.7	124.9	99.4	100.0
After Consol.: to $\sigma'_{vc,max}$	28.001	55.32	19.76	25.4	125.2	99.8	100.0

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.
& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable
3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ
Reviewed By: RJ

Remarks:

Project Number:	04.11120056	Test Type:	DSS Creep w/OCR>1	Test Sta. No.: DSS-S05	File Name: 0017-286B_S07
Project Name:		Task No.:		Test No.: NA	Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort:
Boring No.: WR0017-286B		LPC Core		Impact/Rammer	Rammer Wgt.(lbf)=
Sample No.: S07A		Compostite No.:		Pluviated:	Tamper Force (lbf)=
Depth (ft): 15.85		Specimen No.: b		Kneading	Undercompaction: U_{ni} (%) =
Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort= % Comp. =

Blows/Tamps per Layer =	
No. Layers =	
Drop (in.) =	
Dia. (in.) =	
± Opt.=	

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90^o Stress Path	X Used Automated System Remarks:	
Loading Conditions:	X Static / Dynamic	Strain / X Stress	X Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1; 1; Other: / Strain / Stress

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.700	Height	Volume	Area	Water Content	Unit Weight Total	Unit Weight Dry	Saturation	LL PL		
Condition:	(mm)	(cm^3)	(cm^2)	(%)	(pcf)	(pcf)	(%)	PI		
Initial	29.98	58.87	19.63	29.31	121.3	93.8	99.7	30		
After Consol. to $\sigma'_{v,c}$	28.13	55.58	19.76	25.67	124.9	99.4	100.0	21		
After Consol. to $\sigma'_{vc,max}$	28.00	55.32	19.76	25.38	125.2	99.8	100.0	9		

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	15.929	4.045	NA
Induced OCR:	-	1.00	3.94	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	6.60	6.17	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c}$ / $\sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 3.1 %/hr.

Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	NA	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.55	Data Normalization: X Yes No Value: 4.045 (ksf)
Data corr. for M_{tc}: X Yes; No Plattens with Pins: Yes; X No	Using Effective Vertical Stress:
Wire Reinforced Membrane, Model: / Data corr. for Membr. strength	X Pre-Shear Conditions / Post-Cyclic Conditions
X Regular Membrane with Rings / Yes X No	Maximum Stress during Consol.

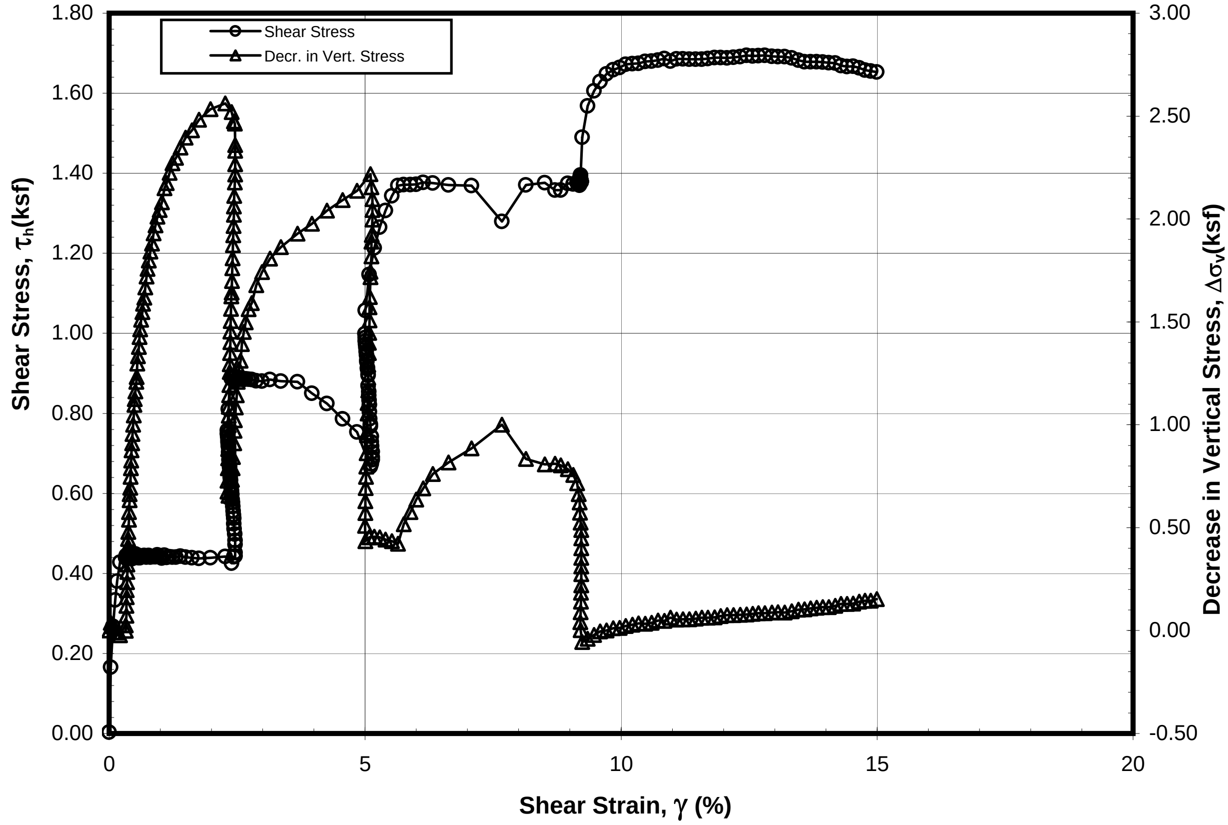
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.

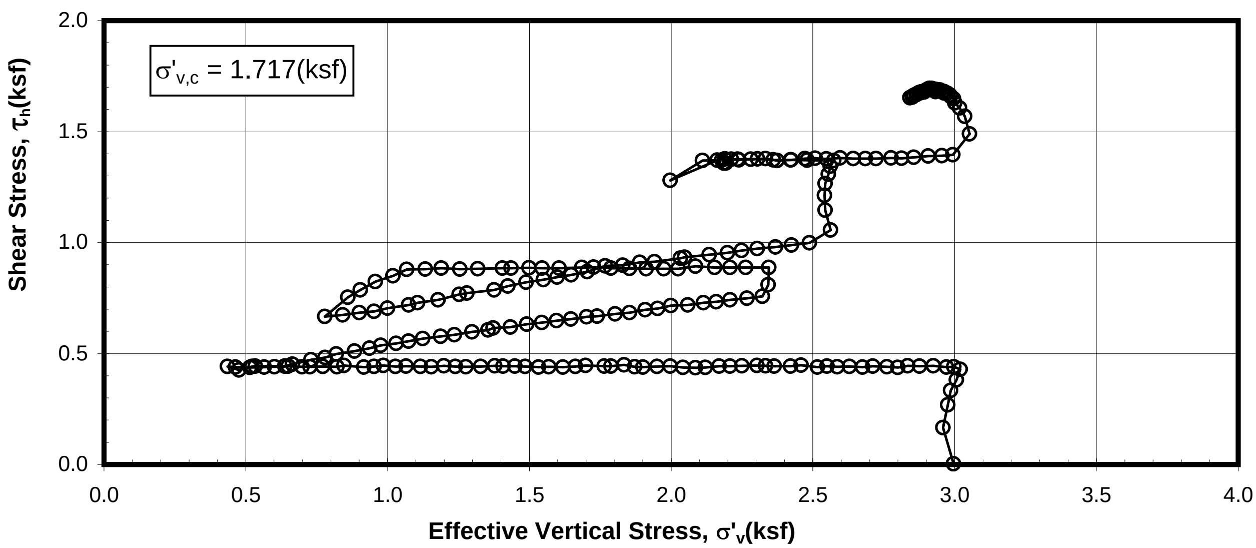
NA - Not Applicable

Final Visual Description and Remarks: Sandy Clay, olive gray, with trace of organic matter

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	2.698	19.61	4.617	0.584	-0.142	0.667
at Maximum Strain	2.492	26.21	4.275	0.583	-0.057	-



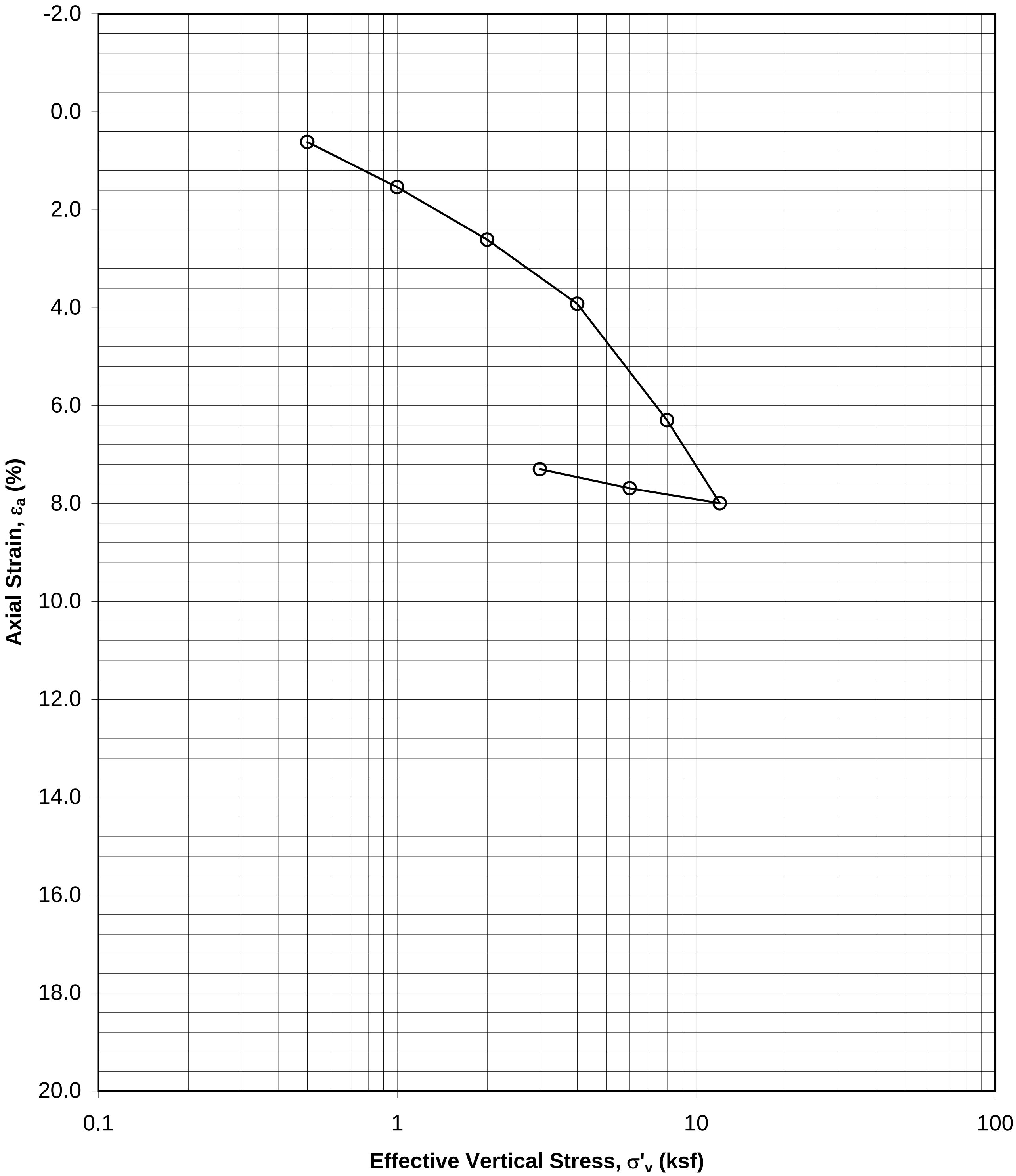


STATIC DSS CREEP TEST

K_o Consolidation - OCR = 3.95

Sample: S07Abrt - Depth: 10.00 ft

Boring WR0017-296B



DSS INCREMENTAL CONSOLIDATION

Sample: S07AbRt - Depth 10.00 ft

Boring No. WR0017-296B

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: DSS Creep w/OCR>1 | Sta. No.: DSS-S05 | File Name: WR0017-296B

Task No.: | Assign, $\sigma'_{v,c}$ = 3.00 ksf | $K_{c,DSS}$ ($\tau_{h,c}$ / $\sigma'_{v,c}$)= NA

Project Name: | Induced OCR = 4.00 | $K_{ub,DSS}$ ($\tau_{hu,b}$ / $\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.750 | [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-296B	[ ] LPC Core	[ ] Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 10.00	Specimen No.: bRt	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[ ] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort= % Comp. = ± Opt.=

Type Consolidation:	[X] K_o at:	[X] Incremental ; [ ] CRS	[ ] Anisotropic at:	[ ] Inclined Stress Path, $K_{c,DSS}$ [ ] 90° Stress Path	[X] Used Automated System Remarks:
Loading Conditions:	[X] Static [ ] Rapid	[ ] Strain [X] Stress	[X] Creep [ ] Post Cyclic	[X] Const, Vol./Ht [ ] Drained	[X] Without - Water [ ] With - Bath	[ ] Cyclic (Hz) Rate: [ ] 0.1;	[ ] Strain [ ] Stress [ ] 1; Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No.	610		6006	6083
Mass Moist Soil + Cont. (g)	47.04		68.28	52.48
Mass Dry Soil + Container (g)	43.41		59.33	47.63
Mass Container (g)	32.03		31.62	31.51
WATER CONTENT (%)	31.90		32.30	30.09
Avg. Initial WC, $W_{o,avg}$ (%)	32.10	Final W_{at}:	[X] Slice ;	[ ] Whole Spec.
[ ] See attached data sheet(s) for additional water contents				

Soil and Ring Masses	Initial	Final
Mass Moist Soil + Tare (g)	264.09	114.12
Mass Tare (g)	151.53	3.30
Mass Moist Soil, $M_{t,o}$ $Mt_{,at}$ (g)	112.56	110.82
Excess Dry Soil (soil not included in final mass above)		
Container No.		
Mass Dry Soil + Container (g)		
Mass Container (g)		
Mass Excess Dry Soil (g)	0.00	

Specimen Trimming:

[X] Trimming Ring for Fugro Apparatus		Large-ring ID #	
[ ] Trimming Ring for NGI Apparatus	NS2	Small-ring ID #	
$H_{s,t}$ (mm):	30.04	$A_{s,t}$ (cm²):	19.46
$D_{s,t}$ (mm) :	49.77	$V_{s,t}$ (cm³):	58.45

Remarks:

[ ] Free Standing by Wire Saw Lathe or Reconstituted Spec. (mm)

	Height (H_{tr})	Diameter (D_o)		Remarks:	
1	30.030	1-T	NA		
2	30.060	2-M	NA		
3	30.090	3-B	NA		
4	30.010	1'-T	NA	For Free Standing	
5	30.030	2'-M	NA	or Reconstituted Spec.:	
Avg.		3'-B	NA	A_{tr} (cm²):	NA
=	30.044	Avg	NA	V_{tr} (cm³):	NA

Note: NA indicates not applicable. | Top Cap No. 6SD

F or G in the Sta. No. indicates Fugro or GEOTAC apparatus.

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lb/ft³)=	120.21	Dry, $\gamma_{d,o}$ (lb/ft³)=	91.00

Specimen Lateral Confinement by:

[ ] **Wire Reinforced, Model:** Thickness (mm) =

Stress Level	Dia. by PiTape (mm) Meas.	Corr.	Area, $A_{c,n}$ (cm²)	(in²)
0				
$\sigma'_{v,c}$				
$\sigma'_{v,max}$				

[X] **Regular Membrane with Ring Set No.**	6SD	ID, Rings (mm)	
Thickness (mm): Top:	0.61 ,	=	50.79
[ ] Single Bottom:	0.59 ,	Corr. for mem.	
[X] Double Membr. Thick. =	0.30	=	50.195
Area Ring with mem., A_o: (cm²)=	19.79	; (in²)=	3.067
Mass Top Cap, etc., M_{tc} =	252.1 g,	0.56	lbf
Data corr. for M_{tc}: [X] Yes; [ ] No		Plattens with Pins: [ ] Yes; [X] No	

Sketch of Specimen

Final Visual Description:

Clay, brown, with Traces of Matter

Other Remarks :

Trim./ Recon. By:	PL	Setup By:	JTG	Take Down By:	PL
Date:	4/9/2013	Date:	4/9/2013	Date:	4/17/2013
Prelim. Calc. By:	JTG	Final Calc. By:	JJ	Reviewed By:	RJ

Specimen Take Down: [X] Spec. removed right after shearing | Remarks:

[ ] Spec. unloaded to zero stress with access to water

DIRECT SIMPLE SHEAR TEST (ASTM D 6528): Specimen Calculations & Summary

Project Number: 04.11120056 | Test Station No.: DSS-S05 | File Name: 017-296B_S07AbRt

Task Number: | Specific Gravity: 2.750 | [ ] Measured; [X] Assumed

Type Test: DSS Creep w/OCR>1 | Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Pre-Shear	Post Cyclic	X	Static Strain Rate = NA (%/hr or)	
Nominal Vertical Stress, σ'_v (ksf)	12	3	NA		Cyclic Rate (Hz): [ ] 0.1; [ ] 1; Other =	
Axial/Vertical Force, $P_{vr,n}$ (lbf)	NA	NA	NA	During/End of Loading	Static	Cyclic
Horizontal Force, $P_{hr,n}$ (lbf)	0	0	NA	Change in Height, $\Delta H_{L,n}$ (mm)	NA	NA
Nominal OCR	1	4	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	NA	NA
t_c,(ON,days,hrs)	3.04days	0.87days	NA	Post Cy.Displ. Reset to Null Position:	[ ] Yes;	[ ] No

[ ] Undrained ambient stress applied: with Delta shear force (lbf) = NA & Duration (min) = NA & Delta disp., $\Delta d_{h,ua}$ (mm) = NA

Trimmed Specimen (TS) - Inital Water Contents over Saturation (%):

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal.
W_o	31.90		32.30	32.10	32.10	32.13
S_o	99.7		100.3	100.0	100.0	100.0
Measured final mass of moist soil, $M_{t,at}$ (g)						110.82
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						110.82

Calculated Mass of Dry Soil (g)

Initial Selected Water Content (%)	32.10
Initial , $M_{d,o}$	85.21
Final, $M_{d,at}$	85.19
Selected, M_d	85.20

Initial Back Cal. Specific Gravity (TS):

Selected S_o (%)	
Selected W_o (%)	
Specific Gravity, $G_{s,bc}$	

Height/Volume Change Summary

Variation in Height & Volume During Consol.	During Initial Consol. to $\sigma'_{v,c}$or $\sigma'_{vc,max}$=	During Rebound to $\sigma'_{v,c}$ =	Specimen Unloaded After Test To
Stress Units (ksf)	12.000	3.000	NA
Sign Convention: (+) ΔV out & ΔH down; (-) ΔV in & ΔH up			
Delta Def. Read., $\Delta d_{ar,n}$ (mm)	2.390	-0.190	
Total Equip. Comp., $\Sigma\Delta d_{afc}$ (mm)	0.000	0.000	
Corr. Total Def. $\Delta H_{c,n}$ (mm)	2.390	-0.190	
ΔV_n using A_o - spec. (cm^3)	4.65	-0.37	
ΔV_n using $A_{c,n}$ - app. (cm^3)	4.73	-0.38	
ΔV_n using burette meas.(cm^3)	1.05	-0.65	
Selected ΔV_n (cm^3)	4.73	-0.38	NA $= \Delta V_{uL}$
After Test WC Corr. for ΔV during Shear & Unloading, $W_{at,c}$ (%)			NA

Lateral Confinement Area Cal. Approach (LCA); Method 1, 2, 3 or 4: 1

Calculation of ΔV_c by Different Procedures

By Selected Volumes		By Change in Mass	
ΔV_c (cm^3)	4.35	$\sim M_{t,o} - (M_{tat,c} + \Delta V_L + \Delta V_{uL})$	
By Cal. Height & App. Area		ΔV_c (cm^3)	1.74
ΔV_c (cm^3)	4.35	**By Saturation = 100% and**	
By Cal. Ht. & Init. Spec. Area		**Spec. Unloaded to 0 Stress**	
ΔV_c (cm^3)	4.28	ΔV_c (cm^3)	NA

Back Cal. Water Content During Consol. - Based on the Consolidation Conclusions Given Below

Assumed Saturation (%)	100.00
Back Cal. WC before Loading, $W_{c,bc}$ (%)	28.19
Back Cal.WC at Max. Stress, $W_{cmax,bc}$ (%)	27.75

Consolidation & Preshear Conclusions								
ΔV_c (cm^3) =	3.35	ΔH_c (mm) =	2.200	$\varepsilon_{a,c}$ (%) =	7.32	$\Delta V_{c,max}$ (cm^3) =	3.73
V_c (cm^3) =	55.10	H_c (mm) =	27.844	$\varepsilon_{v,c}$ (%) =	5.74	$\varepsilon_{ac,max}$ (%)=	7.95
A_c (cm^2) =	19.79	$\Delta\gamma_c$ (mm) =	NA	γ_c (%) =	NA	Preshear: γ_{ua} (%)=	NA

Summary of Specimen Physical Properties:

Specific Gravity: G_s = 2.750 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	
Initial (as trimmed)	30.044	58.45	19.46	32.1	120.2	91.0	100.0	
After Consol.: to $\sigma'_{v,c}$	27.844	55.10	19.79	28.2	123.7	96.5	100.0	
to $\sigma'_{vc,max}$	27.654	54.72	19.79	27.7	124.2	97.2	100.0	

LCA-Method: 1- Initial measured value remains constant. 4 - Based on change in height & volume.

& Note(s) 2 - Initial measured value corrected for applied stress. NA - Not Applicable

3 - Uses measured value at appropriate stress level (NA for rings).

Calculated By: JJ

Reviewed By: RJ

Remarks:

Project Number: 04.11120056 | Test Type: DSS Creep w/OCR>1 | Test Sta. No.: DSS-S05 | File Name: 017-296B_S07/
Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort:	Blows/Tamps per Layer =	
Boring No.:	WR0017-296B	LPC Core		Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =	
Sample No.:	S07A	Compostite No.:		Pluviated:	Tamper Force (lbf)=	Drop (in.) =	
Depth (ft):	10	Specimen No.:	bRt	Kneading	Undercompaction: U_{ni} (%) =	Dia. (in.) =	
Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort=	% Comp. =	± Opt.=

Type Consolidation:	X K_o at:	X Incremental CRS	Anisotropic at:	Inclined Stress Path, $K_{c,DSS}$ 90° Stress Path		X Used Automated System	Remarks:
Loading Conditions:	X Static / Dynamic	Strain / X Stress	X Creep / Post Cyclic	X Const, Vol./Ht / Drained	X Without - / With - Water Bath	Cyclic (Hz) Rate: 0.1;	Strain / Stress 1; Other:

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.750	Height	Volume	Area	Water Content	Unit Weight Total	Unit Weight Dry	Saturation	LL PL		
Condition:	(mm)	(cm^3)	(cm^2)	(%)	(pcf)	(pcf)	(%)	PI		
Initial	30.04	58.45	19.46	32.11	120.2	91.0	100.0	34		
After Consol. to $\sigma'_{v,c}$	27.84	55.10	19.79	28.19	123.7	96.5	100.0	21		
After Consol. to $\sigma'_{vc,max}$	27.65	54.72	19.79	27.74	124.2	97.2	100.0	13		

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Vert. Consol. Stress, $\sigma'_{v,c}$:	(ksf)	11.839	2.996	NA
Induced OCR:	-	1.00	3.95	NA
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	7.95	7.32	NA
Horiz. Consol. Stress, $\tau_{h,c}$:	(ksf)	NA	NA	NA
Consol. Stress Ratio, $\tau_{h,c} / \sigma'_{v,c}$:	-	NA	NA	NA
Shear Strain during Consol., $\varepsilon_{h,c}$:	%	NA	NA	NA
Undr. Ambient Shear Stress, $\tau_{h,ua}$:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, ε_{ua}:	%	NA	NA	NA

X Static Strain Rate = 2.4 %/hr.
Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm):	NA	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3):	NA	NA
Post Cy.Displ. Reset to Null Pos.:	Yes;	No

Number of Loading Cycles, N = NA
$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %
at end of cyclic loading, $\sigma'_{vcy,r}$ = NA (ksf)

Weight Top Cap, etc., M_{tc} (lbf): 0.56		Data Normalization: X Yes / No	Value: 2.996 (ksf)
Data corr. for M_{tc}: X Yes; No	Plattens with Pins: Yes; X No	Using Effective Vertical Stress:	
Wire Reinforced Membrane, Model:	Data corr. for Membr. strength	X Pre-Shear Conditions	Post-Cyclic Conditions
X Regular Membrane with Rings	Yes / X No	Maximum Stress during Consol.	

Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. F or G in the Test Sta. No. indicates Fugro or GEOTAC apparatus.
NA - Not Applicable
Final Visual Description and Remarks: Clay, brown, with Traces of Matter

Loading Summary

	τ_h (ksf)	γ (%)	σ'_v (ksf)	τ_h/σ'_v -	$\Delta\sigma'_v/\sigma'_{v,c}$ -	$c_u/\sigma'_{v,c}$ -
at Peak Shear Stress	1.694	12.45	2.919	0.580	0.026	0.566
at Maximum Strain	1.653	14.99	2.843	0.581	0.051	-

SECTION 7

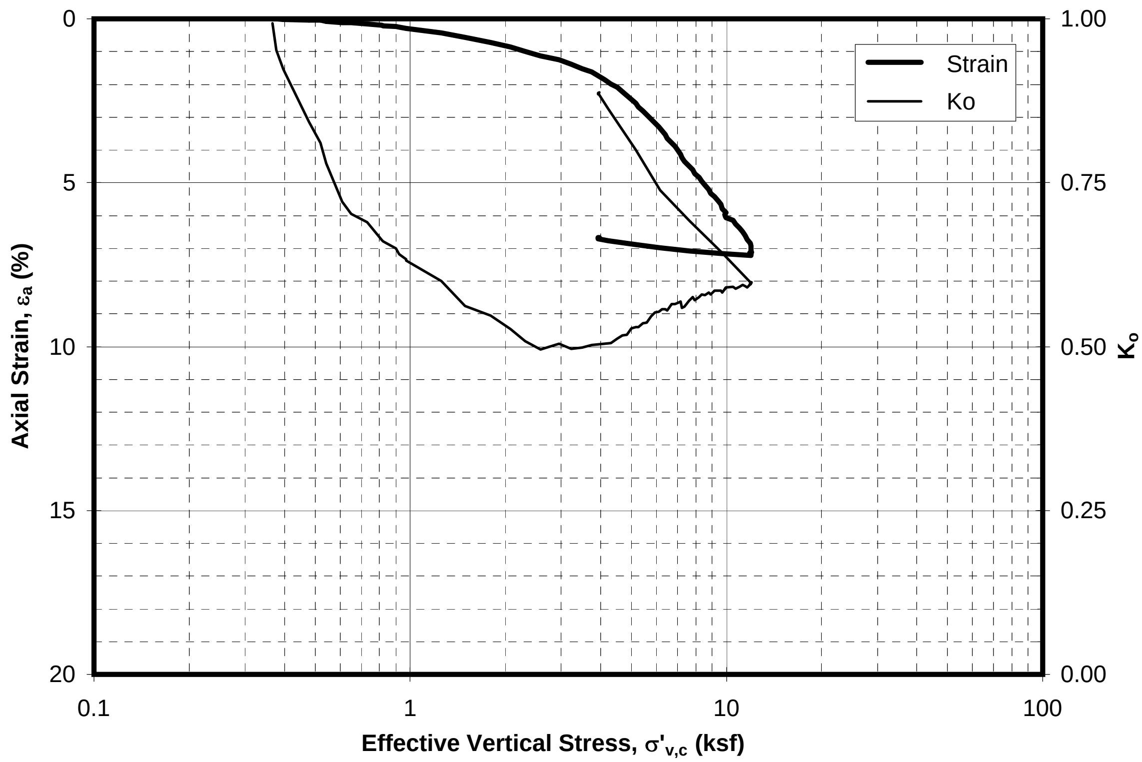
RESULTS OF STRESS-PATH CONTROLLED DRAINED/UNDRAINED TRIAXIAL TESTS (CKoDU-TX)

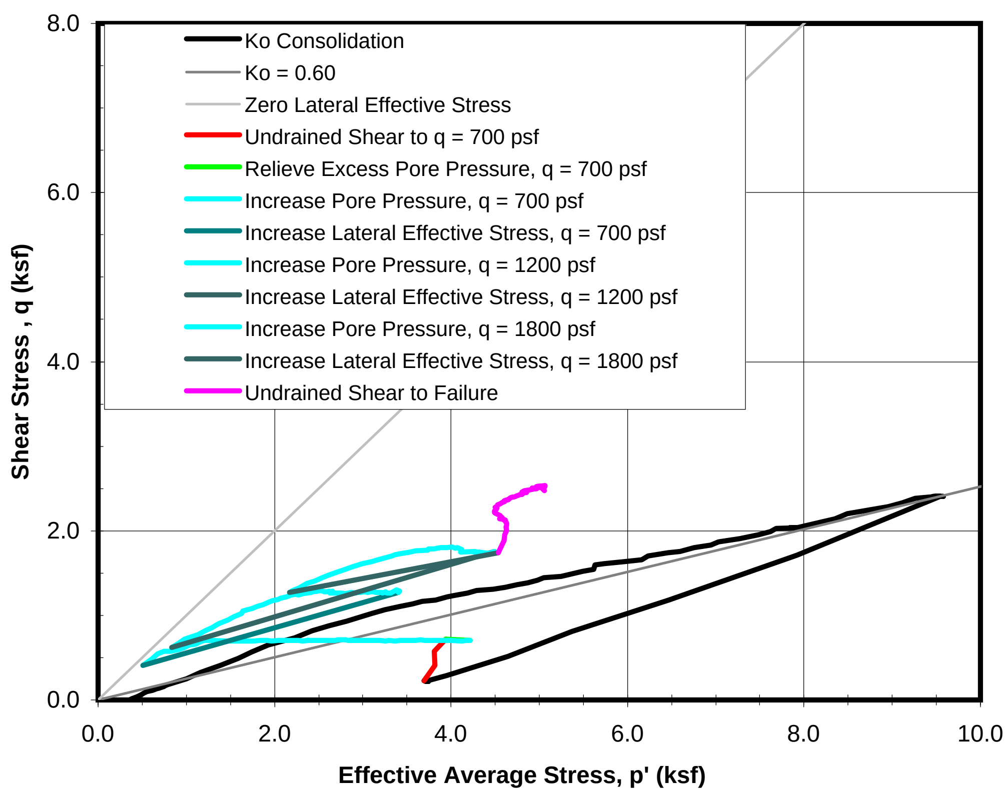
This section of the report presents the results of the stress path drained triaxial tests.

For each test, the following information is provided:

1. Consolidation data including the plot of consolidation stress versus axial strain (compression curve) and estimated K_o values versus consolidation stress.
2. Plots of effective stress paths during consolidation and shear.
3. Plots of shear stress, obliquity (principal stress ratio), and excess pore water pressure versus axial strain during shear.
4. Specimen setup data sheet and calculation of the physical properties prior to testing, after consolidation, and after shear.
5. The tabulated results of measurements made during shear including: axial strain, shear stress, average principal stress, excess pore water pressure, pore pressure coefficient A, secant and tangent modulus, normalized shear stress q/σ_{vmax}', normalized average principal effective stress p'/σ_{vmax}', and normalized excess pore water pressure $\Delta u/\sigma_{vmax}'$.

Boring No.	Specimen No.	Specimen Depth (ft)	Physical Index Properties					Stress-Path Triaxial (CKoDU-TX)		
			Water Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Atterberg Limits		Applied Max. Load σvmax' (ksf)	Pre-Shear Load σvc' (ksf)	Spec. OCR (σvmax'/σvc')
						LL (%)	PI (%)			
WR0017-210B	S07Aa	20.45	28.7	83.4	107.3	46	24	11.9	4.0	3.02
WR0017-213B	S07Ab	31.00	33.0	87.8	116.7	36	14	13.3	3.3	4.07
WR0017-223B	S08Ab	35.95	28.8	90.0	115.8	29	6	13.2	3.4	3.91
WR0017-229B	S04Ac	16.40	38.8	78.1	108.3	47	22	10.1	4.0	2.50



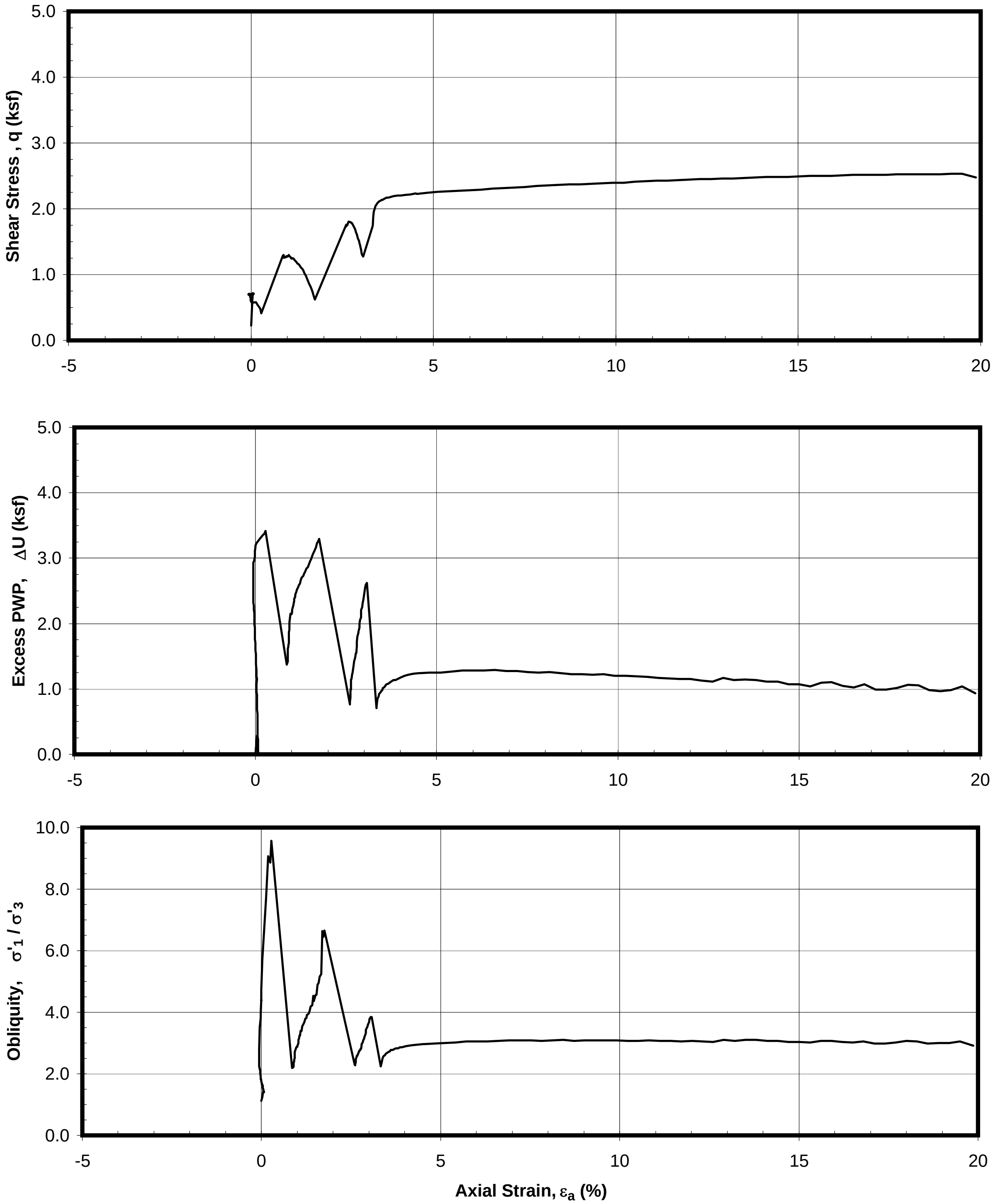


STATIC TRUEPATH TRIAXIAL TEST

K_o Consolidated - OCR = 3.0 - Compression

Sample: S07Aa - Depth: 20.45 ft.

Boring WR0017-210B



STATIC TRUEPATH TRIAXIAL TEST

K_o Consolidated - OCR = 3.0 - Compression

Sample: S07Aa - Depth: 20.45 ft.

Boring WR0017-210B

TRIAXIAL TEST (ASTM D 4767): Specimen Setup / Take Down

Project Number: 04.11120056 | Test Type: CKoUC w/OCR | Sta. No.: TRX-S08 | File Name:)17-210B_S07A

Task No.: | Assign, $\sigma'_{v,c}$ = ksf | Cell No.: | K_c ($\tau_c/\sigma'_{v,c}$) = NA

Project Name: | k ($\sigma'_{h,c}$ / $\sigma'_{v,c}$) = | Induced OCR = 3.00 | K_{ua} ($\sigma_{d,ua}/2\sigma'_{v,c}$) = NA

Test No.: NA | Test Series for/on: NA | Type Stage: NA = NA , NA , NA & NA

Assig. Remarks: | Specific Gravity: 2.720 | [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded	[ ] Liner [ ] Remolded	[ ] Tamping	[ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-210B	[ ] Reconstituted	[ ] Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A	Compostite No.:	[ ] Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 20.45	Specimen No.: a	[ ] Kneading	[ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[X] Spec. Selection by X-ray;	[ ] Geomarine Sample	[ ]	Ref. Effort = % Comp. = ± Opt. =

Type Consolidation	[ ] Isotropic [ ] Anistropic	[X] K_o stress path [ ] 45° stress path	[X] Used automated system: Drained Axial Strain Rate,$\varepsilon_{a,rate}$ (%/h) = 0.07 Remarks:
Loading Conditions :	[X] Static [ ] Post Cyclic	[X] Undrained [ ] Drained	[X] Comp. [ ] Ext.	[X] Strain [ ] Stress [ ] Stress Path	[X] Constant Cell Pressure [ ] Variable Cell Pressure	[ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Stress [ ] Strain 1; Other:

Water Content (WC);	Initial - Trimming Location			Final, W_{at}
	Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	(see below)
Container No	4004	4104	6482	695
Mass Moist Soil + Cont. (g)	62.67	67.68	76.64	131.26
Mass Dry Soil + Container (g)	55.34	59.30	66.35	108.41
Mass Container (g)	30.10	29.83	30.24	32.09
Water Content, $W_{o,n}$ (%)	29.04	28.44	28.50	29.94
Avg. Initial WC, $W_{o,avg}$ (%)	28.66	Final (W_{at});	[X] Slice ;	[ ] Whole Spec.

[ ] See attached data sheet(s) for additional water contents

SOIL MASSES:	Initial	Final
Moist + Tare (etc.)(g)	401.04	407.93
Tare (etc.) (g)	0.00	0.00
Mass Moist Spec., $M_{t,n}$ (g)	401.04	407.93
Excess Dry Soil (soil not included in final mass measurement)		
Container No.		
Mass Dry Soil + Cont. (g)		
Mass Container (g)		
Mass Excess Dry Soil, $M_{d,es}$ (g)	0.00	

Specimen Dimensions, (mm)

	Height: Initial (H_o)	Final (H_{at})		Dia.: Initial (D_o)	Final (D_{at})	
GB	100.040	100.040	1 T	50.80	52.00	For
1	15.09	-11.70	2 M	50.80	59.00	Wedge
2	15.02	-11.60	3 B	50.80	52.50	Failure
3	15.09	-11.83	1'T			= d_{max}
4	15.06	-11.60	2'M			= d_{min}
5	15.04	-11.93	3'B			= Δd
Avg.	115.10	88.31	Avg.	50.80	54.50	xxxxx

Dia., X indicates with membrane

Measuring Devices:

Pi Tape: [X] Dia	$A_o = \pi D^2/400$ (cm²)	20.27
Calipers: [ ] Ht.; [ ] Dia	V_o (cm³)	233.29
Dial Comparator: [X] Ht.; [ ] Dia	$A_{atb,m}=\pi (D^*_{at})^2/400$ (cm²)	24.30
	$A_{atw,m}=(d_{min}-2\Delta d)d_{max}\pi/400$ (cm²)	NA
Remarks:	$D^*_{at}=(D_T+2D_M+D_B)/4$ (mm)	55.63

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lbf/ft³) 107.32 | Dry, $\gamma_{d,o}$ (lbf/ft³) 83.41

Membrane / Filter Paper / Apparatus

Membrane (mm):		Top	Bottom
Number:	Thickness:	0.55	0.63
= 1	[ ] Single; [X] Double	0.55	0.63
	Circumference ($C_{m,o}$)	148.0	148.0
		Total Thickness	Dia.($C_{m,o}/\pi$)
	Average:	0.30	47.11

Filter Paper: Top + Bottom: [ ] Yes ; [X] No

Filter Strips: [X] Yes ; [ ] No Number = 8

Type of Filter Strips: [ ] Vertical: ¼ in. & Whatman #54; [X] Spiral: ¼ in. & Whatman #1

Apparatus: Mass Top Cap, M_{tc} = 66.5 g, 0.15 lbf

Mass Displ. System, M_{ds} (cap, dial, piston, etc) = NA g, NA lbf

Top Cap Attached: [X] Yes; [ ] No; | Piston Dia.(in.) [X] ½: [ ] ¾; | Load Cell: [ ] External [X] Internal

Top Cap - Rotation: [X] Fixed,<1°; [ ] Limited,<5°; [ ] Unlimited, >5°

With: [ ] Frictionless End Caps; [ ] Lat. Movement Top Cap; [ ] Internal LVDT Jacket

[ ] Photo Taken.

Failure Sketch

ε_a=

20%→

Failure Mode: [X] Bulge [ ] Wedge [ ] Parabolic [ ] Necked

NA - Not Applicable
GB - Gage Block
Other Remarks:

Wedge/Bulge Ht.= ? Value (mm)

Final Visual Classification: Lean Clay, Brown with silt pockets

Trimmed / Reconstituted By: EA | Set Up By: EA | Taken Down By: EA

Date: 2/15/2013 | Date: 2/15/2013 | Date: 3/30/2013

Prelim. Calc. By: EA | Final Calc. By: EA | Reviewed By: mmm

[ ] See more detailed sketch on attached sheet. Remarks:

Triaxial Test: Specimen Calculations & Summary

Project Number: 04.11120056 Test Type: CKoUC w/OCR Sta. No.: TRX-S08 File Name: 17-210B_S07

Task Number: Specific Gravity: 2.720 ☐ Measured; ☒ Assumed

Boring No.: NR0017-210B Sample No.: S07A Depth (ft): 20.45 Specimen No.: a

Specimen: ☒ "Intact"; ☐ Reconstituted; ☐ Remolded ☒ Static; ☒ Undrained;

Calculations Corr. for Salt (dissolved solids): ☒ No or, ☐ Yes, with concentration = ________ ppm ☐ Cyclic; ☐ Drained;

	Inital Water Contents (WC), (W_o) over Saturation, (S_o), in (%):					
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal., $W_{o,bc}$
W_o	29.04	28.44	28.50	28.66	28.66	28.66
S_o	76.1	75.2	75.3	75.5	75.5	75.5
Measured final mass of moist soil, $M_{t,at}$ (g)						407.93
Final mass of moist soil corrected for excess dry soil, $M_{t,at,c}$ (g)						407.93

Calculated Mass of Dry Soil (g)	
Initial Selected WC, w_o (%)	28.66
Initial , $M_{d,o}$	311.71
Final, $M_{d,at}$	313.94
Selected, M_d	311.71

Changes in Height (mm) and Volume (cm^3) Within Given Consolidation Stages	Stage 1 At Initial Seating Stress	Stage 2 During Back-Pressuring	Stage 3 1st Consol. Incr. (omit if one incr.)	Stage 4 End Stage 3 To Max. or Test Stress	Stage 5 During Rebound to Test Stress
Sign Convention: (+) Def. in comp. or Flow out of spec.; (-) Def. in ext. (swell) or Flow into spec.					
Change in Height, $\Delta H_{c,n}$	0.00	0.12		8.31	-0.64
Sum of changes in (+ out)	0.51			16.83	-1.62
Burette Readings, $\Delta b_{r,n}$ (- in)		-24.42			? Value
Theoretical $\Delta V_t = (3V_o \times \Delta H_{c,n} / H_o)$	0.02	0.72		127.76	4.01
Vol. Factor, $F_v = \Delta b_{r,n} / \Delta V_{t,n}$				0.13	-0.40
Corr. $\Delta V_{ct} = F_v \times \Delta V_{t,n}$			NA	NA	NA
Selected $\Delta V_{c,n}$	0.02	0.72		16.83	-1.62

Summary of Calculation of ΔV_c by Different Procedures	
By Selected Volumes	
ΔV_c (cm^3)	15.95
By Change in Mass	
~ $M_{t,o}-(M_{tat,c}+\Delta V_{in,stage1\&2}+\Delta V_{L,n})$	
ΔV_c (cm^3)	17.49
By Saturation = 100 %	
ΔV_c (cm^3)	17.79
For Selected ΔV_c, required G_s for S_c = 100 %:	2.677

Consolidation Stress Summary and Loading Summary			
Test Stage:	Max. Stress	Test Stress	Post Cyclic
Cell Pressure, σ_c (psi)	109.00	109.00	NA
Back or Pore Pressure, U_h (psi)	59.73	59.73	NA
Axial Force Reading, $P_{r,n}$ (lbf)	105.87	105.87	NA
Nominal OCR	1.00	3.00	NA
Nominal k = (σ'_h / σ'_v)	0.60	0.60	NA
t_c , ON or in ☒ days ☐ hrs	7.0	7.0	NA
Prelim. after test WC corr. for ΔV during loading (shear), $W_{at,c}$ (%)		32.25	

Static Axial Strain Rate, $\varepsilon_{a,rate}$ (%/h) =	0.30	
During/End of Loading	Static	Cyclic
Change in Height[1], $\Delta H_{L,n}$ (mm)	19.92	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	4.30	NA
Axial Force Reading, $P_{r,n}$ (lbf)	1	NA
Area Correction Constant[2], A_{cc}	0.986	NA
Post Cy.Displ. Reset to Null Position:	☐ Yes;	☐ No
Normalized difference in height change[3], (%)	0.9	

☐ Undrained ambiant stress applied: with Delta axial force (lbf) = NA & Duration (min) = NA & Delta disp., ΔH_{ua} (mm) = NA

Consolidation & Pre-shear Conclusions								
	ΔV_c (cm^3) =	15.95	ΔH_c (mm) =	7.79	$\varepsilon_{a,c}$ (%) =	6.77	$\Delta V_{c,max}$ (cm^3) =	17.57
	V_c (cm^3) =	217.34	H_c (mm) =	107.31	$\varepsilon_{v,c}$ (%) =	6.84	$\varepsilon_{ac,max}$ (%) =	7.33
	A_c (cm^2) =	20.25	ΔH_{ua} (mm) =	NA	$\varepsilon_{a,ua}$ (%) =	NA	$\varepsilon_{vc,max}$ (%) =	7.53

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.720 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)		Skempton B (%) (4)
Initial:	115.10	233.29	20.27	28.66	107.32	83.41	75.5		96
After Consol.: to $\sigma'_{v,c}$	107.31	217.34	20.25	32.25	118.41	89.53	98.2		
After Consol.: to $\sigma'_{vc,max}$	106.67	215.72	20.22	31.73	118.8	90.21	98.2		NA

Notes: (1) For static loading, recorded deformation during shear & preparation to take down. Back Calculated G_s for S=100% 2.677

(2) Equals $1/\varepsilon_{at} \times (1 - (A_c \times (1-\varepsilon_{v,L}))/A_{atb,m})$ (3) Equals $100 \times (((\Delta H_{ua} + \Delta H_{L,at} + \Delta H_{L,cy}) - (H_c - H_{at})) / H_c)$ (4) Initial value is after back pressuring

NA - Not Applicable ON - Over Night WC - Water Content Calculated By: mnm Reviewed By: mnm

Remarks:

Results of Triaxial Test

Project Number: 04.11120056 | Test Type: CKoUC w/OCR | Sta. No.: TRX-S08 | File Name: 17-210B_S07/

Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube	Field Extruded	Liner	Remolded
Boring No.: VR0017-210B		Reconstituted	
Sample No.: S07A	Compostite No.:		
Depth (ft): 20.45	Specimen No.: a		
X Spec. Selection by X-ray;		Geomarine Sample	

Tamping	Constant Effort:	Blows/Tamps per Layer =	
Impact/Rammer	Rammer Wgt.(lbf)=	No. Layers =	
Pluviated:	Tamper Force (lbf)=	Drop (in.) =	
Kneading	Undercompaction: U_{ni} (%) =	Dia. (in.) =	
	Ref. Effort =	% Comp. =	± Opt. =

Type Consolidation:	Isotropic	X K_o stress path	X Used automated system — Drained Axial Strain Rate, $\varepsilon_{a,rate}$ (%/hr.)= 0.07
	Anistropic	45° stress path	Remarks:

Loading Conditions:	X Static	X Undrained	X Comp.	X Strain	Stress	X Constant Cell pressure	Cyclic (Hz)	Stress / Strain
	Post Cyclic	Drained	Ext.	Stress Path		Variable Cell pressure	Rate: 0.1;	1; Other:

Summary of Specimen Physical and Index Properties

Specific Gravity: G_s = 2.720 — Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI	Liquidity Index LI	Skempton B (%) [1]
Initial	115.10	233.29	20.27	28.7	107.3	83.4	75.5		NA	96
After Consol.: to $\sigma'_{v,c}$	107.31	217.34	20.25	32.2	118.4	89.5	98.2		NA	
to $\sigma'_{vc,max}$	106.67	215.72	20.22	31.7	118.8	90.2	98.2		NA	NA

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	7.326	6.77	NA
Vol. Strain during Consol., $\varepsilon_{v,c}$:	%	7.531	6.84	NA
Effective Vertical Stress, σ'_v :	(ksf)	11.948	3.956	NA
Effective Horizontal Stress, σ'_h :	(ksf)	7.135	3.505	NA
Consol. Stress Ratio, k (σ'_h / σ'_v) :	-	0.597	0.886	NA
Induced OCR :	-	1.00	3.02	NA
Eff. Average Stress, $(\sigma'_v + \sigma'_h)/2$:	(ksf)	9.541	3.731	NA
Eff. Mean Stress, $(\sigma'_v + 2*\sigma'_h)/3$:	(ksf)	8.739	3.655	NA
Undr. Ambient Shear Stress, τ_{ua} :	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, $\varepsilon_{a,ua}$:	%	NA	NA	NA

X Static Strain Rate = 0.3 %/hr.

Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm)	19.92	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	4.30	NA
Axial Force (lbf)	1.00	NA
Post Cy.Displ. Reset to Null Pos.:	Yes	No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA

Membrane Correction	Area Correction	Filter Paper Correction	Data Normalization: X Yes / No
Type: Bulge	Type: Bulge	Type: None	X Eff. Vertical Stress
Modulus: 150.0 psi	Area Corr. Const.: 0.986	Strips: 8	Eff. Horizontal Stre — X Pre-Shear — Value:
Diameter: 47.11 mm	Meas. Final Area: 24.30 cm^2	Force: 0.000 lbf/strip	Eff. Average Stress — Max. Stress — 3.956 (ksf)
Thickness: 0.30 mm		Type Strips: Sprial #1	Other — Post-Cyclic

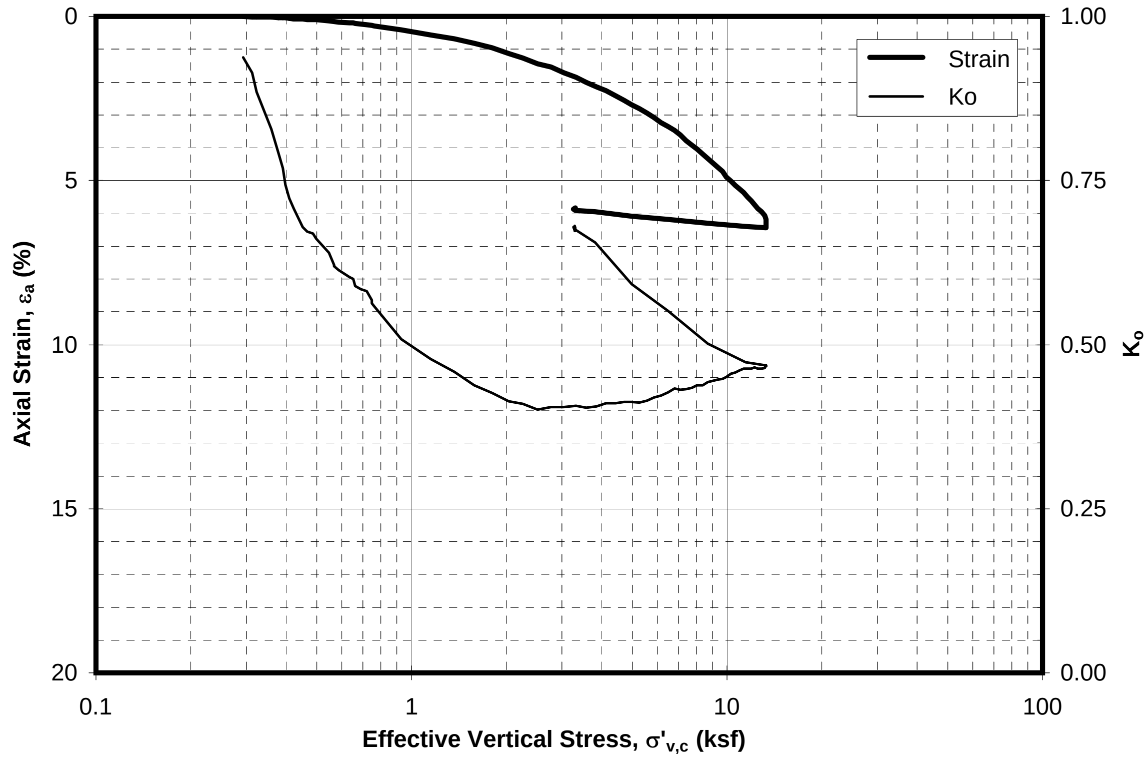
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. NA - Not Applicable [1] Initial B is after saturation

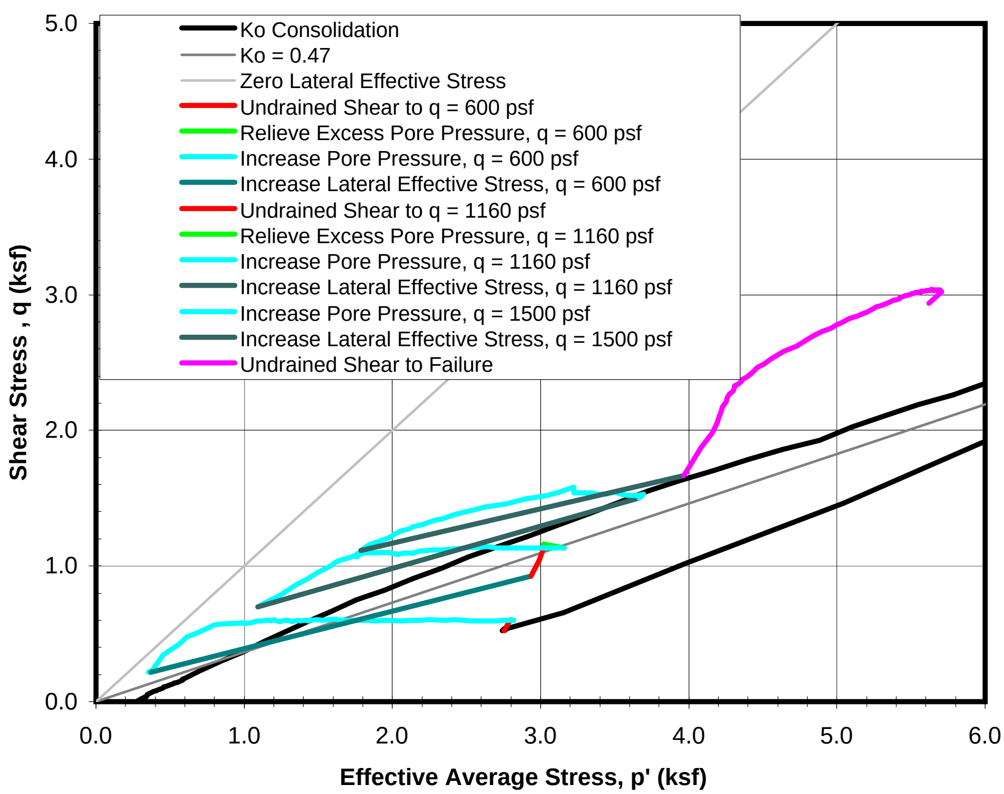
Final Visual Description and Remarks: Lean Clay, Brown with silt pockets

Loading Summary

	ε_a (%)	$q / \sigma'_{v,c}$ -	$\Delta U / \sigma'_{v,c}$ -	$p' / \sigma'_{v,c}$ -	q / p' -	ϕ' for c'=0 (degrees)	σ'_1 / σ'_3 -	
at Max Shear Stress	19.194	0.213	0.082	0.426	0.500	**29.988**	2.999	
at Max Obliquity	0.277	0.034	0.287	0.043	0.811	**54.183**	9.576	
Preconsolidation Stress (Casagrande Method)		σ'_p (ksf) =			ε_a (%) =	0.00		

Remarks:



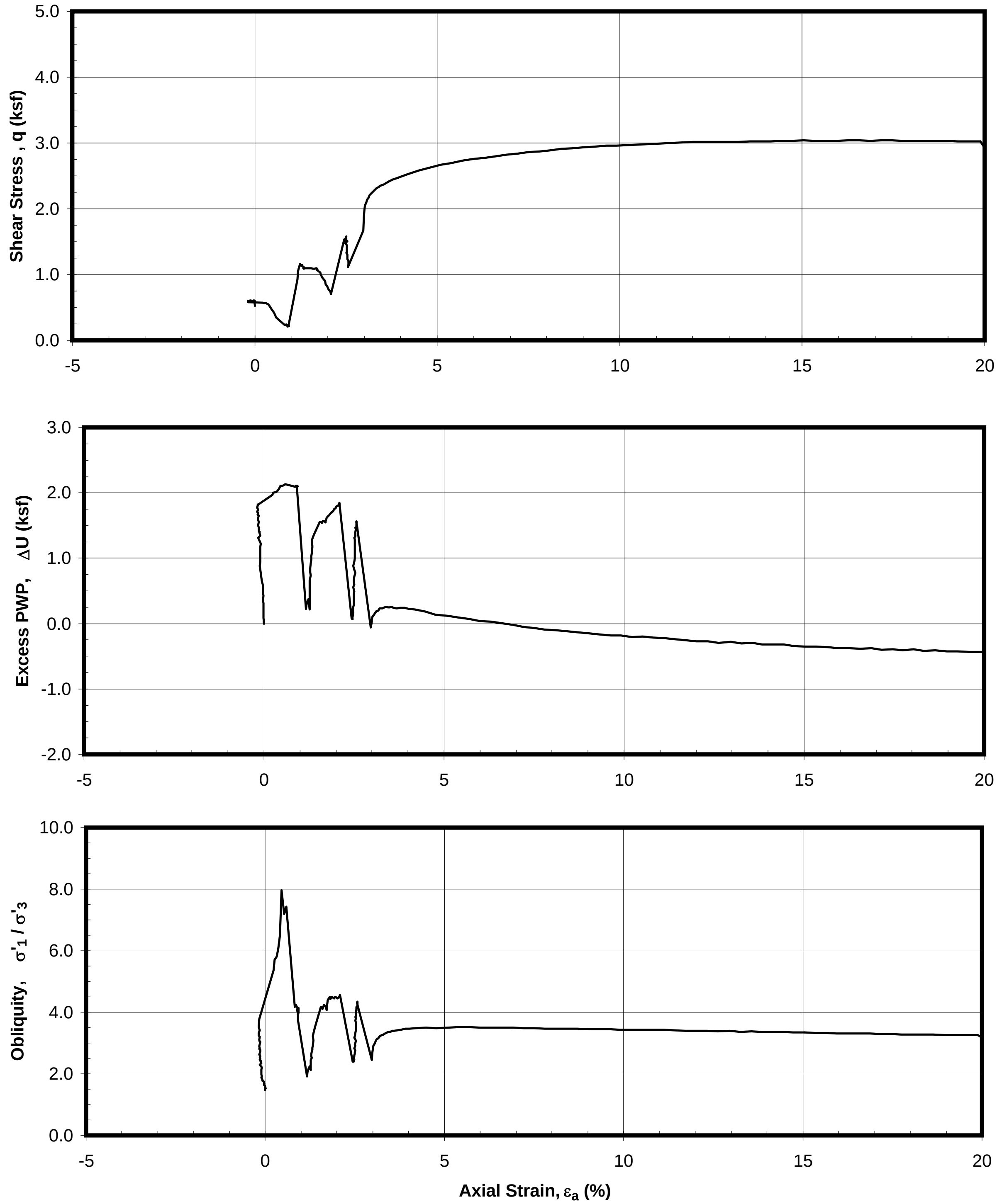


STATIC TRUEPATH TRIAXIAL TEST

K_o Consolidated - OCR = 4.0 - Compression

Sample: S07Ab - Depth: 31.00 ft.

Boring WR0017-213B



STATIC TRUEPATH TRIAXIAL TEST

K_o Consolidated - OCR = 4.0 - Compression

Sample: S07Ab - Depth: 31.00 ft.

Boring WR0017-213B

TRIAXIAL TEST (ASTM D 4767): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: CKoUC w/OCR Sta. No.: TRX-S07 File Name:)17-213B_S07A
Task No.: Assign, $\sigma'_{v,c}$ = ksf Cell No.: TRX-S07 K_c ($\tau_c/\sigma'_{v,c}$) = NA
Project Name: k ($\sigma'_{h,c}$ / $\sigma'_{v,c}$) = Induced OCR = 4.00 K_{ua} ($\sigma_{d,ua}/2\sigma'_{v,c}$) = NA
Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA
Assig. Remarks: Specific Gravity: 2.740 [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded [ ] Liner [ ] Remolded [ ] Tamping [ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-213B [ ] Reconstituted [ ] Impact/Rammer Rammer Wgt.(lbf)= No. Layers =
Sample No.: S07A Compostite No.: [ ] Pluviated: Tamper Force (lbf)= Drop (in.) =
Depth (ft): 31.0 Specimen No.: b [ ] Kneading [ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[X] Spec. Selection by X-ray; [ ] Geomarine Sample Ref. Effort = % Comp. = ± Opt. =

Type Consolidation: [ ] Isotropic [ ] Anistropic [X] K_o stress path [ ] 45° stress path [X] Used automated system: Drained Axial Strain Rate, $\varepsilon_{a,rate}$ (%/h) = 0.07
Remarks:

Loading Conditions: [X] Static [ ] Post Cyclic [X] Undrained [ ] Drained [X] Comp. [ ] Ext. [X] Strain [ ] Stress [ ] Stress Path [X] Constant Cell Pressure [ ] Variable Cell Pressure [ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Stress [ ] 1; [ ] Strain Other:

Water Content (WC);	Initial - Trimming Location Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No	695	4004	6504	695
Mass Moist Soil + Cont. (g)	92.09	122.10	121.42	96.61
Mass Dry Soil + Container (g)	77.40	99.27	98.73	82.18
Mass Container (g)	32.08	30.12	29.81	32.08
Water Content, $W_{o,n}$ (%)	32.41	33.02	32.92	28.80
Avg. Initial WC, $W_{o,avg}$ (%)	32.78	Final (W_{at});	[X] Slice ; [ ]	Whole Spec.

[ ] See attached data sheet(s) for additional water contents

SOIL MASSES:	Initial	Final
Moist + Tare (etc.)(g)	436.82	423.11
Tare (etc.) (g)	0.00	0.00
Mass Moist Spec., $M_{t,n}$ (g)	436.82	423.11
Excess Dry Soil (soil not included in final mass measurement)		
Container No.		
Mass Dry Soil + Cont. (g)		
Mass Container (g)		
Mass Excess Dry Soil, $M_{d,es}$ (g)		0.00

Specimen Dimensions, (mm)

	Height Initial (H_o)	Final (H_{at})		Dia., X indicates with membrane Initial (D_o)	Final (D_{at})	
GB	100.040	100.040	1 T	50.80	52.00	For
1	15.34	-11.34	2 M	50.80	60.00	Wedge
2	15.34	-11.22	3 B	50.75	53.00	Failure
3	15.33	-11.24	1'T			= d_{max}
4	15.21	-11.38	2'M			= d_{min}
5	15.23	-11.50	3'B			= Δd
Avg.	115.33	88.70	Avg.	50.78	55.00	xxxxx

Measuring Devices:
Pi Tape: [X] Dia
Calipers: [ ] Ht.; [ ] Dia
Dial Comparator: [X] Ht.; [ ] Dia
Remarks:

$A_o = \pi D^2/400$ (cm²)	20.26
V_o (cm³)	233.60
$A_{atb,m}=\pi (D^*_{at})^2/400$ (cm²)	24.85
$A_{atw,m}=(d_{min}-2\Delta d)d_{max}\pi/400$ (cm²)	NA
$D^*_{at}=(D_T+2D_M+D_B)/4$ (mm)	56.25

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lbf/ft³)	116.74	Dry, $\gamma_{d,o}$ (lbf/ft³)	87.91

Membrane / Filter Paper / Apparatus

Membrane (mm):		Top	Bottom
Number:	Thickness:	0.57	0.62
= 1	[ ] Single; [X] Double	0.57	0.62
	Circumference ($C_{rm,o}$)	156.0	156.0
		Total Thickness	Dia.($C_{rm,o}/\pi$)
	Average:	0.30	49.66

Filter Paper: Top + Bottom: [ ] Yes ; [X] No
Filter Strips: [X] Yes ; [ ] No Number = 8
Type of Filter Strips: [ ] Vertical: ¼ in. & Whatman #54
[X] Spiral: ¼ in. & Whatman #1

Apparatus: Mass Top Cap, M_{tc} = 66.4 g, 0.15 lbf
Mass Displ. System, M_{ds} (cap, dial, piston, etc) = NA g, NA lbf

Top Cap Attached: [X] Yes; [ ] No; Piston Dia.(in.) [X] ½: [ ] ¾; Load Cell: [ ] External [X] Internal
Top Cap - Rotation: [X] Fixed, <1°; [ ] Limited, <5°; [ ] Unlimited, >5°
With: [ ] Frictionless End Caps; [ ] Lat. Movement Top Cap
[ ] Internal LVDT Jacket

[ ] Photo Taken.
Failure Sketch
ε_a=
20%→

Failure Mode: [X] Bulge [ ] Wedge [ ] Parabolic [ ] Necked
NA - Not Applicable
GB - Gage Block
Other Remarks:

Wedge/Bulge Ht.= ? Value (mm)
Final Visual Classification: Lean Clay, Brown and Light Brown

Trimmed / Reconstituted By: EA Set Up By: EA Taken Down By: EA
Date: 2/12/2013 Date: 2/12/2013 Date: 3/28/2013
Prelim. Calc. By: EA Final Calc. By: EA Reviewed By: mnm

[ ] See more detailed sketch on attached sheet. Remarks:

Triaxial Test: Specimen Calculations & Summary

Project Number: 04.11120056 Test Type: CKoUC w/OCR Sta. No.: TRX-S07 File Name: 17-213B_S07

Task Number: ______ Specific Gravity: 2.740 [ ] Measured; [X] Assumed

Boring No.: WR0017-213B Sample No.: S07A Depth (ft): 31.0 Specimen No.: b

Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded [X] Static; [X] Undrained;

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm [ ] Cyclic; [ ] Drained;

	Inital Water Contents (WC), (W_o) over Saturation, (S_o), in (%):					
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal., $W_{o,bc}$
W_o	32.41	33.02	32.92	32.78	32.78	32.97
S_o	94.8	95.7	95.5	95.3	95.3	95.6
Measured final mass of moist soil, M_{tat} (g)						423.11
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						423.11

Calculated Mass of Dry Soil (g)	
Initial Selected WC, w_0 (%)	32.78
Initial , $M_{d,o}$	328.97
Final, $M_{d,at}$	328.50
Selected, M_d	328.50

Changes in Height (mm) and Volume (cm^3) Within Given Consolidation Stages	Stage 1 At Initial Seating Stress	Stage 2 During Back-Pressuring	Stage 3 1st Consol. Incr. (omit if one incr.)	Stage 4 End Stage 3 To Max. or Test Stress	Stage 5 During Rebound to Test Stress
Sign Convention: (+) Def. in comp. or Flow out of spec.; (-) Def. in ext. (swell) or Flow into spec.					
Change in Height, $\Delta H_{c,n}$	0.02	0.14		7.43	-0.66
Sum of changes in (+ out)	1.40			14.86	
Burette Readings, $\Delta b_{r,n}$ (- in)		-2.32			-1.63
Theoretical $\Delta V_t = (3V_o \times \Delta H_{c,n} / H_o)$	0.13	0.87		112.52	0.94
Vol. Factor, $F_v = \Delta b_{r,n} / \Delta V_{t,n}$				0.13	-1.72
Corr. $\Delta V_{ct} = F_v \times \Delta V_{t,n}$			NA	NA	NA
Selected $\Delta V_{c,n}$	0.13	0.87		14.86	-1.63

Summary of Calculation of ΔV_c by Different Procedures	
By Selected Volumes	
ΔV_c (cm^3)	14.24
By Change in Mass	
~ $M_{t,o}-(M_{tat,c}+\Delta V_{in,stage1\&2}+\Delta V_{L,n})$	
ΔV_c (cm^3)	16.02
By Saturation = 100 %	
ΔV_c (cm^3)	18.92
For Selected ΔV_c, required G_s for S_c = 100 %:	2.637

Consolidation Stress Summary and Loading Summary						
Test Stage:	Max. Stress	Test Stress	Post Cyclic	Static Axial Strain Rate, $\varepsilon_{a,rate}$ (%/h) =		0.30
Cell Pressure, σ_c (psi)	102.89	75.12	NA	During/End of Loading	Static	Cyclic
Back or Pore Pressure, U_n (psi)	59.83	59.83	NA	Change in Height(1), $\Delta H_{L,n}$ (mm)	20.05	NA
Axial Force Reading, $P_{r,n}$ (lbf)	154.32	23.56	NA	Change in Vol., $\Delta V_{L,n}$ (cm^3)	-0.21	NA
Nominal OCR	1.00	4.00	NA	Axial Force Reading, $P_{r,n}$ (lbf)	1	NA
Nominal k = (σ'_h / σ'_v)	0.47	0.68	NA	Area Correction Constant(2), A_{cc}	0.999	NA
t_c , ON or in [X] days [ ] hrs	6.0	2.0	NA	Post Cy.Displ. Reset to Null Position:	Yes; [ ]	No
Prelim. after test WC corr. for ΔV during loading (shear), $W_{at,c}$ (%)			28.74	Normalized difference in height change(3), (%)		0.3

[ ] Undrained ambiant stress applied: with Delta axial force (lbf) = NA & Duration (min) = NA & Delta disp., ΔH_{ua} (mm) = NA

Consolidation & Pre-shear Conclusions								
	ΔV_c (cm^3) =	14.24	ΔH_c (mm) =	6.93	$\varepsilon_{a,c}$ (%) =	6.01	$\Delta V_{c,max}$ (cm^3) =	15.87
	V_c (cm^3) =	219.36	H_c (mm) =	108.40	$\varepsilon_{v,c}$ (%) =	6.10	$\varepsilon_{ac,max}$ (%) =	6.58
	A_c (cm^2) =	20.24	ΔH_{ua} (mm) =	NA	$\varepsilon_{a,ua}$ (%) =	NA	$\varepsilon_{vc,max}$ (%) =	6.79

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.740 / **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)		Skempton B (%) (4)
Initial:	115.33	233.60	20.26	32.97	116.74	87.79	95.6		96
After Consol.: to $\sigma'_{v,c}$	108.40	219.36	20.24	28.74	120.35	93.49	95.3		
After Consol.: to $\sigma'_{vc,max}$	107.74	217.73	20.21	28.24	120.8	94.19	95.2		NA

Notes: (1) For static loading, recorded deformation during shear & preparation to take down. Back Calculated G_s for S=100% 2.637

(2) Equals $1/\varepsilon_{at} \times (1 - (A_c \times (1-\varepsilon_{v,L}))/A_{atb,m})$ (3) Equals $100 \times (((\Delta H_{ua} + \Delta H_{L,at} + \Delta H_{L,cy}) - (H_c - H_{at})) / H_c)$ (4) Initial value is after back pressuring

NA - Not Applicable ON - Over Night WC - Water Content Calculated By: mnm Reviewed By: ______

Remarks:

Results of Triaxial Test

Project Number: 04.11120056 Test Type: CKoUC w/OCR Sta. No.: TRX-S07 File Name: 17-213B_S07/

Project Name: Task No.: Test No.: NA Test Series for: NA

X Tube ☐ Field Extruded	☐ Liner ☐ Remolded	☐ Tamping	☐ Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-213B	☐ Reconstituted	☐ Impact/Rammer	Rammer Wgt.(lbf)= ☐ No. Layers =
Sample No.: S07A	Compostite No.:	☐ Pluviated:	Tamper Force (lbf)= ☐ Drop (in.) =
Depth (ft): 31.0	Specimen No.: b	☐ Kneading	☐ Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;	☐ Geomarine Sample	☐	Ref. Effort = % Comp. = ± Opt. =

Type Consolidation :	☐ Isotropic / ☐ Anistropic	X K_o stress path / ☐ 45° stress path	X Used automated system Drained Axial Strain Rate,$\varepsilon_{a,rate}$ (%/hr.)= 0.07 / Remarks:

Loading Conditions :	X Static / ☐ Post Cyclic	X Undrained / ☐ Drained	X Comp. / ☐ Ext.	X Strain ☐ Stress / ☐ Stress Path	X Constant Cell pressure / ☐ Variable Cell pressure	☐ Cyclic (Hz) / Rate: ☐ 0.1;	☐ Stress ☐ Strain / ☐ 1; Other:

Summary of Specimen Physical and Index Properties

Specific Gravity: G_s = 2.740 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI	Liquidity Index LI	Skempton B (%) (1)
Initial	115.33	233.60	20.26	33.0	116.7	87.8	95.6		NA	96
After Consol.: to $\sigma'_{v,c}$	108.40	219.36	20.24	28.7	120.4	93.5	95.3		NA	
After Consol.: to $\sigma'_{vc,max}$	107.74	217.73	20.21	28.2	120.8	94.2	95.2		NA	NA

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Axial Strain during Consol.,$\varepsilon_{a,c}$:	%	6.582	6.01	NA
Vol. Strain during Consol.,$\varepsilon_{v,c}$:	%	6.793	6.10	NA
Effective Vertical Stress,σ'_v :	(ksf)	13.288	3.264	NA
Effective Horizontal Stress,σ'_h :	(ksf)	6.223	2.218	NA
Consol. Stress Ratio, k (σ'_h / σ'_v) :	-	0.468	0.679	NA
Induced OCR :	-	1.00	4.07	NA
Eff. Average Stress, (σ'_v + σ'_h)/2 :	(ksf)	9.756	2.741	NA
Eff. Mean Stress, (σ'_v + 2*σ'_h)/3 :	(ksf)	8.578	2.566	NA
Undr. Ambient Shear Stress,τ_{ua} :	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain,$\varepsilon_{a,ua}$:	%	NA	NA	NA

X Static Strain Rate = 0.3 %/hr.

☐ Cyclic Rate (Hz): ☐ 0.1; ☐ 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm)	20.05	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	-0.21	NA
Axial Force (lbf)	1.00	NA
Post Cy.Displ. Reset to Null Pos.:	☐ Yes	☐ No

Number of Loading Cycles, N = NA

$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %

at end of cyclic loading, $\sigma'_{vcy,r}$ = NA

Membrane Correction	Area Correction	Filter Paper Correction	Data Normalization: X Yes ☐ No
Type: Bulge	Type: Bulge	Type: None	X Eff. Vertical Stress
Modulus: 150.0 psi	Area Corr. Const.: 0.999	Strips: 8	☐ Eff. Horizontal Stre X Pre-Shear Value:
Diameter: 49.66 mm	Meas. Final Area: 24.85 cm^2	Force: 0.000 lbf/strip	☐ Eff. Average Stress ☐ Max. Stress 3.264 (ksf)
Thickness: 0.30 mm		Type Strips: Sprial #1	☐ Other ☐ Post-Cyclic

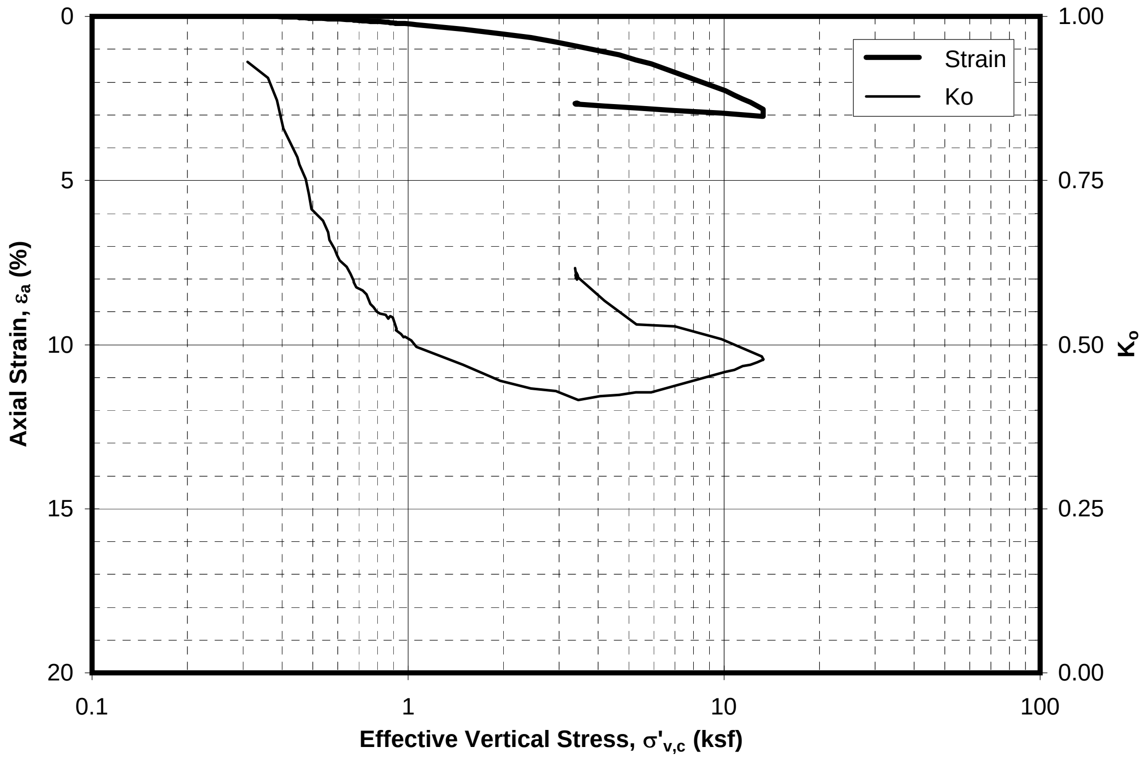
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. NA - Not Applicable (1) Initial B is after saturation

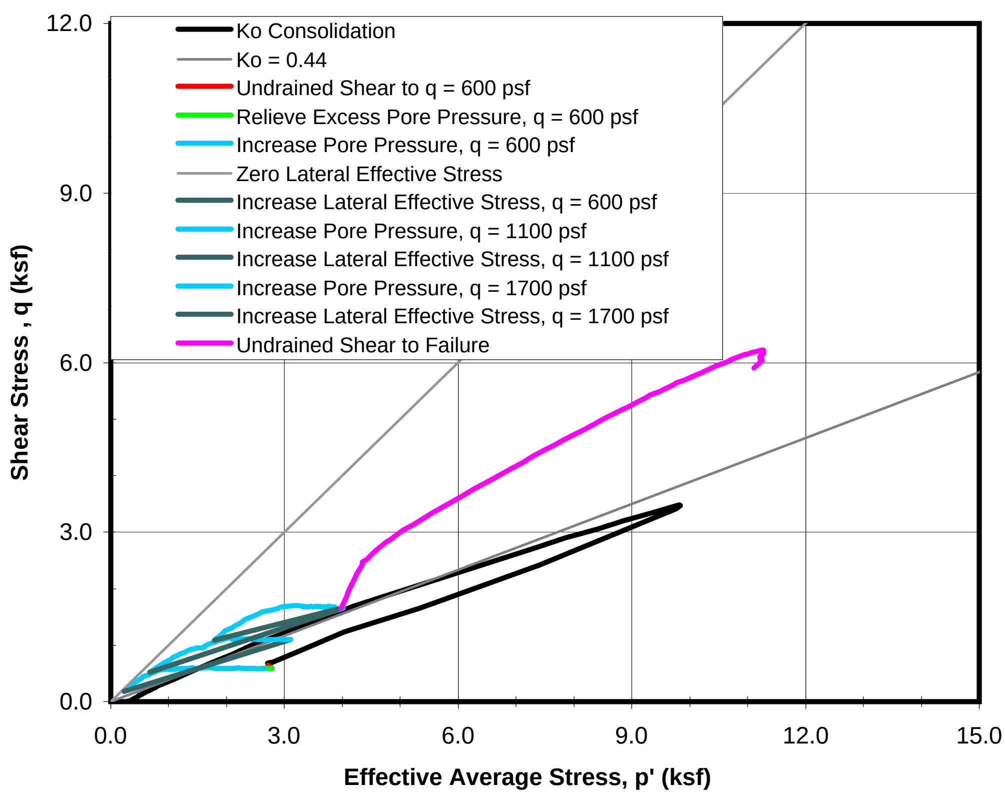
Final Visual Description and Remarks: Lean Clay, Brown and Light Brown

Loading Summary

	ε_a (%)	q / $\sigma'_{v,c}$ -	ΔU / $\sigma'_{v,c}$ -	p' /$\sigma'_{v,c}$ -	q / p' -	ϕ' for c'=0 (degrees)	σ'_1 / σ'_3 -	
at Max Shear Stress	15.045	0.938	-0.108	1.740	0.539	**32.643**	3.342	
at Max Obliquity	0.457	0.147	0.651	0.189	0.777	**50.996**	7.973	
Preconsolidation Stress (Casagrande Method)		σ'_p (ksf) =		ε_a (%) =		0.00		

Remarks:



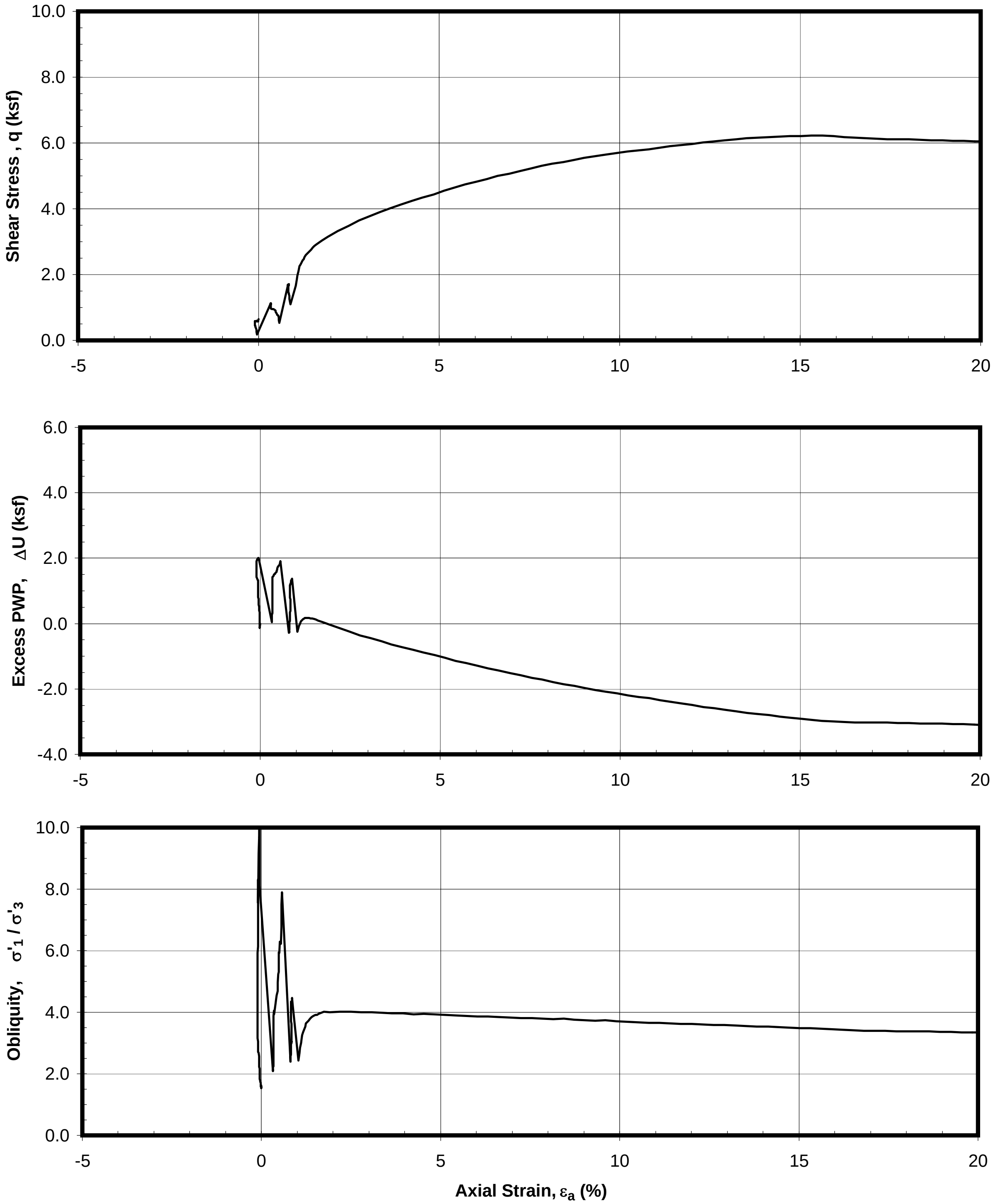


STATIC TRUEPATH TRIAXIAL TEST

K_o Consolidated - OCR = 4.0 - Compression

Sample: S08Ab - Depth: 35.95 ft.

Boring WR0017-223B



STATIC TRUEPATH TRIAXIAL TEST

K_o Consolidated - OCR = 4.0 - Compression

Sample: S08Ab - Depth: 35.95 ft.

Boring WR0017-223B

TRIAXIAL TEST (ASTM D 4767): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: CKoUC w/OCR Sta. No.: TRX-S04 File Name:)17-223B_S08/
Task No.: Assign, $\sigma'_{v,c}$ = 20.00 ksf Cell No.: TRX-S04 K_c ($\tau_c/\sigma'_{v,c}$) = NA
Project Name: k ($\sigma'_{h,c}$ / $\sigma'_{v,c}$) = Induced OCR = 4.00 K_{ua} ($\sigma_{d,ua}/2\sigma'_{v,c}$) = NA
Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA
Assig. Remarks: Specific Gravity: 2.700 [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded [ ] Liner [ ] Remolded [ ] Tamping [ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: VR0017-223B [ ] Reconstituted [ ] Impact/Rammer Rammer Wgt.(lbf)= No. Layers =
Sample No.: S08A Compostite No.: [ ] Pluviated: Tamper Force (lbf)= Drop (in.) =
Depth (ft): 35.95 Specimen No.: b [ ] Kneading [ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[X] Spec. Selection by X-ray; [ ] Geomarine Sample Ref. Effort = % Comp. = ± Opt. =

Type Consolidation: [ ] Isotropic [ ] Anistropic [X] K_o stress path [ ] 45° stress path [X] Used automated system: Drained Axial Strain Rate, $\varepsilon_{a,rate}$ (%/h) = 0.07
Remarks:

Loading Conditions: [X] Static [ ] Post Cyclic [X] Undrained [ ] Drained [X] Comp. [ ] Ext. [X] Strain [ ] Stress [ ] Stress Path [X] Constant Cell Pressure [ ] Variable Cell Pressure [ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Stress [ ] Strain 1; Other:

Water Content (WC);	Initial - Trimming Location: Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	Final, W_{at} (see below)
Container No	695	870	6177	5084
Mass Moist Soil + Cont. (g)	74.48	82.75	109.20	95.80
Mass Dry Soil + Container (g)	65.01	71.40	91.83	81.91
Mass Container (g)	32.09	32.17	30.95	31.30
Water Content, $W_{o,n}$ (%)	28.77	28.93	28.53	27.45
Avg. Initial WC, $W_{o,avg}$ (%)	28.74	Final (W_{at});	[X] Slice ;	[ ] Whole Spec.

[ ] See attached data sheet(s) for additional water contents

SOIL MASSES:	Initial	Final
Moist + Tare (etc.)(g)	432.03	494.19
Tare (etc.) (g)	0.00	66.47
Mass Moist Spec., $M_{t,n}$ (g)	432.03	427.72
Excess Dry Soil (soil not included in final mass measurement)		
Container No.		
Mass Dry Soil + Cont. (g)		
Mass Container (g)		
Mass Excess Dry Soil, $M_{d,es}$ (g)	0.00	

Specimen Dimensions, (mm)

	Height: Initial (H_o)	Final (H_{at})		Dia., X indicates with membrane: Initial (D_o)	Final (D_{at})	
GB	100.040	100.040	1 T	50.70	50.50	For
1	15.02	-8.34	2 M	50.80	57.50	Wedge
2	14.99	-9.38	3 B	50.80	53.50	Failure
3	14.98	-7.89	1'T			= d_{max}
4	15.03	-8.50	2'M			= d_{min}
5	15.02	-8.69	3'B			= Δd
Avg.	115.05	91.48	Avg.	50.77	53.83	xxxxx

Measuring Devices:
Pi Tape: [X] Dia
Calipers: [ ] Ht.; [ ] Dia
Dial Comparator: [X] Ht.; [ ] Dia
Remarks:

$A_o = \pi D^2/400$ (cm²)	20.24
V_o (cm³)	232.88
$A_{atb,m}=\pi (D^*_{at})^2/400$ (cm²)	23.54
$A_{atw,m}=(d_{min}-2\Delta d)d_{max}\pi/400$ (cm²)	NA
$D^*_{at}=(D_T+2D_M+D_B)/4$ (mm)	54.75

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lbf/ft³) 115.82 Dry, $\gamma_{d,o}$ (lbf/ft³) 89.96

Membrane / Filter Paper / Apparatus

Membrane (mm):	Top	Bottom
Number: = 1; Thickness: [ ] Single; [X] Double	0.53	0.64
	0.53	0.64
Circumference ($C_{rm,o}$)	156.0	156.0
Average: Total Thickness / Dia.($C_{rm,o}/\pi$)	0.29	49.66

Filter Paper: Top + Bottom: [ ] Yes ; [X] No
Filter Strips: [X] Yes ; [ ] No Number = 8
Type of Filter Strips: [ ] Vertical: ¼ in. & Whatman #54
[X] Spiral: ¼ in. & Whatman #1

Apparatus: Mass Top Cap, M_{tc} = 66.4 g, 0.15 lbf
Mass Displ. System, M_{ds} (cap, dial, piston, etc) = NA g, NA lbf
Top Cap Attached: [X] Yes; [ ] No; Piston Dia.(in.) [X] ½: [ ] ¾; Load Cell: [ ] External [X] Internal
Top Cap - Rotation: [X] Fixed,<1°; [ ] Limited, <5°; [ ] Unlimited, >5°
With: [ ] Frictionless End Caps; [ ] Lat. Movement Top Cap
[ ] Internal LVDT Jacket

[ ] Photo Taken.
Failure Sketch
ε_a=
20%→

Failure Mode: [X] Bulge [ ] Wedge [ ] Parabolic [ ] Necked
NA - Not Applicable
GB - Gage Block
Other Remarks:

Wedge/Bulge Ht.= ? Value (mm)
Final Visual Classification: Clayey Silt, Light Brown & Tan

Trimmed / Reconstituted By: EA Set Up By: EA Taken Down By: EA
Date: 3/7/2013 Date: 3/7/2013 Date: 4/7/2013
Prelim. Calc. By: EA Final Calc. By: EA Reviewed By: mnm

[ ] See more detailed sketch on attached sheet. Remarks:

Triaxial Test: Specimen Calculations & Summary

Project Number: 04.11120056 Test Type: CKoUC w/OCR Sta. No.: TRX-S04 File Name: 17-223B_S08

Task Number: ______ Specific Gravity: 2.700 [ ] Measured; [X] Assumed

Boring No.: WR0017-223B Sample No.: S08A Depth (ft): 35.95 Specimen No.: b

Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded [X] Static; [X] Undrained;

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm [ ] Cyclic; [ ] Drained;

	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal., $W_{o,bc}$
Inital Water Contents (WC), (W_o) over Saturation, (S_o), in (%):						
W_o	28.77	28.93	28.53	28.74	28.74	28.75
S_o	89.2	89.5	88.8	89.2	89.2	89.2
Measured final mass of moist soil, M_{tat} (g)						427.72
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						427.72

Calculated Mass of Dry Soil (g)	
Initial Selected WC, w_o (%)	28.74
Initial , $M_{d,o}$	335.57
Final, $M_{d,at}$	335.61
Selected, M_d	335.57

Changes in Height (mm) and Volume (cm^3) Within Given Consolidation Stages	Stage 1 At Initial Seating Stress	Stage 2 During Back-Pressuring	Stage 3 1st Consol. Incr. (omit if one incr.)	Stage 4 End Stage 3 To Max. or Test Stress	Stage 5 During Rebound to Test Stress
Sign Convention: (+) Def. in comp. or Flow out of spec.; (-) Def. in ext. (swell) or Flow into spec.					
Change in Height, $\Delta H_{c,n}$	0.00	0.33		3.50	-0.45
Sum of changes in (+ out)	0.91			7.26	
Burette Readings, $\Delta b_{r,n}$ (- in)		-2.73			-1.42
Theoretical $\Delta V_t = (3V_o \times \Delta H_{c,n} / H_o)$	-0.02	1.99		53.02	-4.32
Vol. Factor, $F_v = \Delta b_{r,n} / \Delta V_{t,n}$				0.14	0.33
Corr. $\Delta V_{ct} = F_v \times \Delta V_{t,n}$			NA	NA	NA
Selected $\Delta V_{c,n}$	-0.02	1.99		7.26	-1.42

Summary of Calculation of ΔV_c by Different Procedures	
By Selected Volumes	
ΔV_c (cm^3)	7.80
By Change in Mass	
~ $M_{t,o}-(M_{tat,c}+\Delta V_{in,stage1\&2}+\Delta V_{L,n})$	
ΔV_c (cm^3)	7.03
By Saturation = 100 %	
ΔV_c (cm^3)	10.47
For Selected ΔV_c, required G_s for S_c = 100 %:	2.643

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Test Stress	Post Cyclic
Cell Pressure, σ_c (psi)	104.17	74.45	NA
Back or Pore Pressure, U_h (psi)	59.97	60.02	NA
Axial Force Reading, $P_{r,n}$ (lbf)	150.26	28.34	NA
Nominal OCR	1.00	4.00	NA
Nominal k = (σ'_h / σ'_v)	0.48	0.62	NA
t_c , ON or in [X] days [ ] hrs	3.0	2.0	NA
Prelim. after test WC corr. for ΔV during loading (shear), $W_{at,c}$ (%)		29.12	

Static Axial Strain Rate, $\varepsilon_{a,rate}$ (%/h) =	0.30	
During/End of Loading	Static	Cyclic
Change in Height(1), $\Delta H_{L,n}$ (mm)	20.90	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	5.58	NA
Axial Force Reading, $P_{r,n}$ (lbf)	1	NA
Area Correction Constant(2), A_{cc}	0.882	NA
Post Cy.Displ. Reset to Null Position:	Yes; [ ]	No [ ]
Normalized difference in height change(3), (%)	0.6	

[ ] Undrained ambiant stress applied: with Delta axial force (lbf) = NA & Duration (min) = NA & Delta disp., ΔH_{ua} (mm) = NA

Consolidation & Pre-shear Conclusions							
ΔV_c (cm^3) =	7.80	ΔH_c (mm) =	3.38	$\varepsilon_{a,c}$ (%) =	2.94	$\Delta V_{c,max}$ (cm^3) =	9.22
V_c (cm^3) =	225.07	H_c (mm) =	111.67	$\varepsilon_{v,c}$ (%) =	3.35	$\varepsilon_{ac,max}$ (%) =	3.33
A_c (cm^2) =	20.16	ΔH_{ua} (mm) =	NA	$\varepsilon_{a,ua}$ (%) =	NA	$\varepsilon_{vc,max}$ (%) =	3.96

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.700 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)		Skempton B (%) (4)
Initial:	115.05	232.88	20.24	28.75	115.82	89.96	89.2		95
After Consol.: to $\sigma'_{v,c}$	111.67	225.07	20.16	29.12	120.18	93.08	97.3		
After Consol.: to $\sigma'_{vc,max}$	111.22	223.66	20.11	28.70	120.5	93.67	97.3		NA

Notes: (1) For static loading, recorded deformation during shear & preparation to take down. Back Calculated G_s for S=100% 2.643

(2) Equals $1/\varepsilon_{at} \times (1 - (A_c \times (1-\varepsilon_{v,L}))/A_{atb,m})$ (3) Equals $100 \times (((\Delta H_{ua} + \Delta H_{L,at} + \Delta H_{L,cy}) - (H_c - H_{at})) / H_c)$ (4) Initial value is after back pressuring

NA - Not Applicable ON - Over Night WC - Water Content Calculated By: mnm Reviewed By: mnm

Remarks:

Results of Triaxial Test

Project Number: 04.11120056 | Test Type: CKoUC w/OCR | Sta. No.: TRX-S04 | File Name: 17-223B_S08/
Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube ☐ Field Extruded	☐ Liner ☐ Remolded	☐ Tamping	☐ Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-223B	☐ Reconstituted	☐ Impact/Rammer	Rammer Wgt.(lbf)= ☐ No. Layers =
Sample No.: S08A	Compostite No.:	☐ Pluviated:	Tamper Force (lbf)= ☐ Drop (in.) =
Depth (ft): 35.95	Specimen No.: b	☐ Kneading	☐ Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;	☐ Geomarine Sample	☐	Ref. Effort = % Comp. = ± Opt. =

Type Consolidation :	☐ Isotropic ☐ Anistropic	X K_o stress path ☐ 45° stress path	X Used automated system Drained Axial Strain Rate, $\varepsilon_{a,rate}$ (%/hr.)= 0.07 Remarks:
Loading Conditions :	X Static ☐ Post Cyclic	X Undrained ☐ Drained; X Comp. ☐ Ext.; X Strain ☐ Stress ☐ Stress Path	X Constant Cell pressure ☐ Variable Cell pressure; ☐ Cyclic (Hz) Rate: ☐ 0.1; ☐ 1; Other:; ☐ Stress ☐ Strain

Summary of Specimen Physical and Index Properties

Specific Gravity: G_s = 2.700 **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI	Liquidity Index LI	Skempton B (%) [1]
Initial	115.05	232.88	20.24	28.7	115.8	90.0	89.2		NA	95
After Consol.: to $\sigma'_{v,c}$	111.67	225.07	20.16	29.1	120.2	93.1	97.3		NA	
After Consol.: to $\sigma'_{vc,max}$	111.22	223.66	20.11	28.7	120.5	93.7	97.3		NA	NA

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	3.327	2.94	NA
Vol. Strain during Consol., $\varepsilon_{v,c}$:	%	3.960	3.35	NA
Effective Vertical Stress, σ'_v :	(ksf)	13.175	3.370	NA
Effective Horizontal Stress, σ'_h :	(ksf)	6.351	2.079	NA
Consol. Stress Ratio, k (σ'_h / σ'_v) :	-	0.482	0.617	NA
Induced OCR :	-	1.00	3.91	NA
Eff. Average Stress, (σ'_v + σ'_h)/2 :	(ksf)	9.763	2.725	NA
Eff. Mean Stress, (σ'_v + 2*σ'_h)/3 :	(ksf)	8.625	2.509	NA
Undr. Ambient Shear Stress, τ_{ua} :	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, $\varepsilon_{a,ua}$:	%	NA	NA	NA

X Static Strain Rate = 0.3 %/hr.
☐ Cyclic Rate (Hz): ☐ 0.1; ☐ 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm)	20.90	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	5.58	NA
Axial Force (lbf)	1.00	NA

Post Cy.Displ. Reset to Null Pos.: ☐ Yes ☐ No

Number of Loading Cycles, N = NA
$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %
at end of cyclic loading, $\sigma'_{vcy,r}$ = NA

Membrane Correction	Area Correction	Filter Paper Correction	Data Normalization: X Yes ☐ No
Type: Bulge	Type: Bulge	Type: None	X Eff. Vertical Stress
Modulus: 150.0 psi	Area Corr. Const.: 0.882	Strips: 8	☐ Eff. Horizontal Stre; X Pre-Shear; Value:
Diameter: 49.66 mm	Meas. Final Area: 23.54 cm^2	Force: 0.000 lbf/strip	☐ Eff. Average Stress; ☐ Max. Stress; 3.370 (ksf)
Thickness: 0.29 mm		Type Strips: Sprial #1	☐ Other; ☐ Post-Cyclic

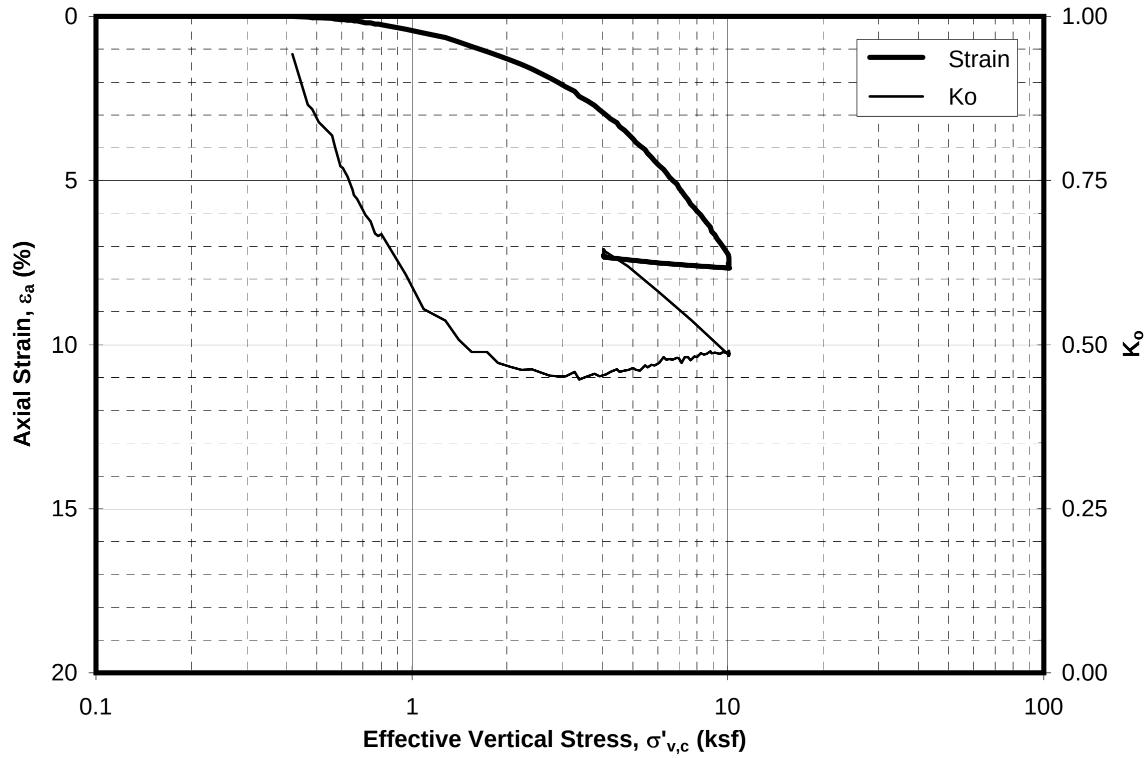
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. NA - Not Applicable [1] Initial B is after saturation

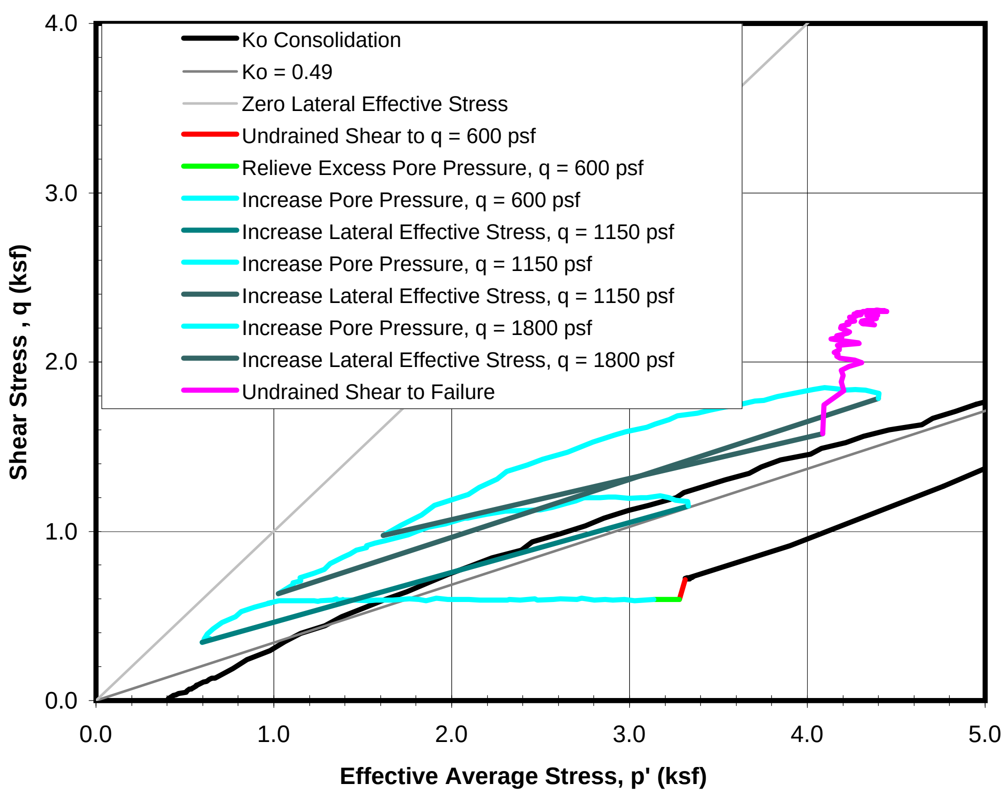
Final Visual Description and Remarks: Clayey Silt, Light Brown & Tan

Loading Summary

	ε_a (%)	q / $\sigma'_{v,c}$ -	ΔU / $\sigma'_{v,c}$ -	p' / $\sigma'_{v,c}$ -	q / p' -	ϕ' for c'=0 (degrees)	σ'_1 / σ'_3 -	
at Max Shear Stress	15.612	1.849	-0.884	3.350	0.552	**33.494**	3.463	
at Max Obliquity	-0.053	0.078	0.598	0.091	0.858	**59.123**	13.111	
Preconsolidation Stress (Casagrande Method)		σ'_p (ksf) =			ε_a (%) =	0.00		

Remarks:



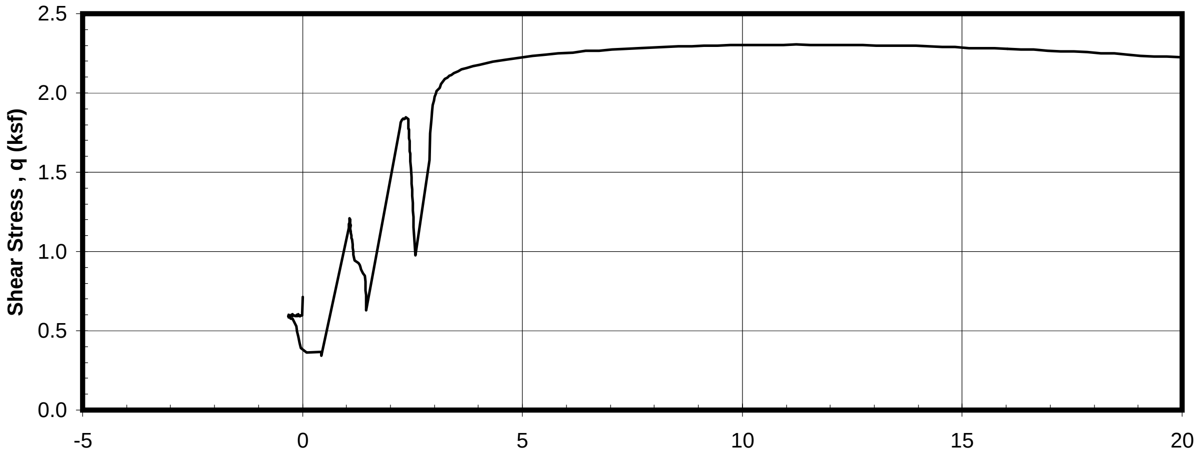


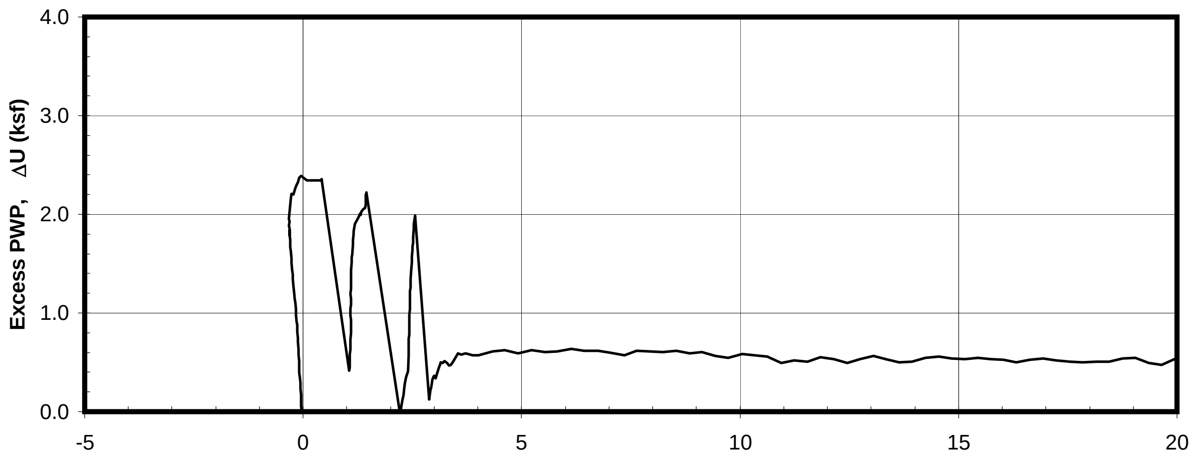
STATIC TRUEPATH TRIAXIAL TEST

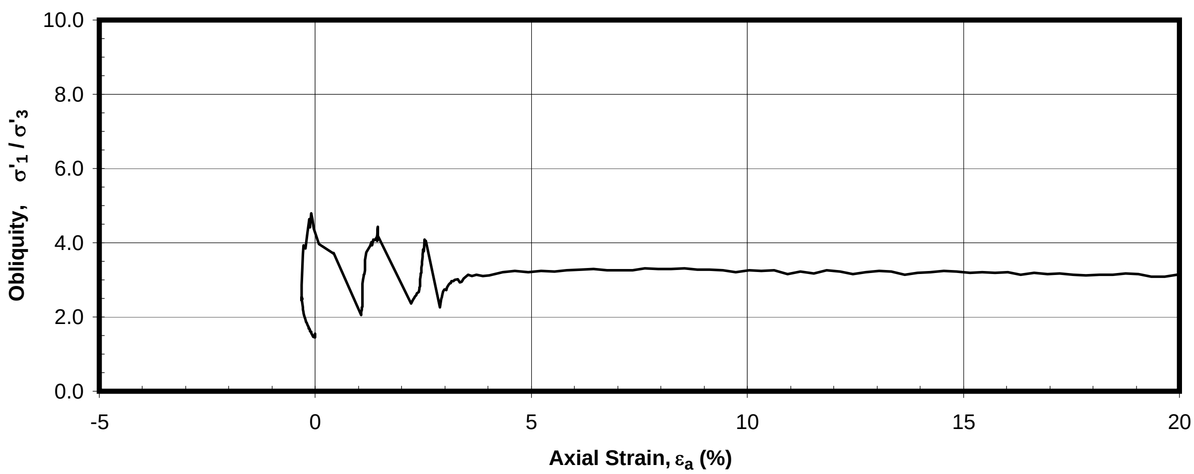
K_o Consolidated - OCR = 2.5 - Compression

Sample: S04Ac - Depth: 16.40 ft.

Boring WR0017-229B







STATIC TRUEPATH TRIAXIAL TEST

K_o Consolidated - OCR = 2.5 - Compression

Sample: S04Ac - Depth: 16.40 ft.

Boring WR0017-229B

TRIAXIAL TEST (ASTM D 4767): Specimen Setup / Take Down

Project Number: 04.11120056 Test Type: CKoUC w/OCR Sta. No.: TRX-S03 File Name:)17-229B_S04/
Task No.: Assign, $\sigma'_{v,c}$ = ksf Cell No.: K_c $(\tau_c/\sigma'_{v,c})$ = NA
Project Name: k $(\sigma'_{h,c} / \sigma'_{v,c})$ = Induced OCR = 2.50 K_{ua} $(\sigma_{d,ua}/2\sigma'_{v,c})$ = NA
Test No.: NA Test Series for/on: NA Type Stage: NA = NA , NA , NA & NA
Assig. Remarks: Specific Gravity: 2.740 [ ] Meas.; [X] Assumed

[X] Tube [ ] Field Extruded [ ] Liner [ ] Remolded [ ] Tamping [ ] Constant Effort: Blows/Tamps per Layer =
Boring No.: WR0017-229B [ ] Reconstituted [ ] Impact/Rammer Rammer Wgt.(lbf)= No. Layers =
Sample No.: S04A Compostite No.: [ ] Pluviated: Tamper Force (lbf)= Drop (in.) =
Depth (ft): 16.40 Specimen No.: c [ ] Kneading [ ] Undercompaction: U_{ni} (%) = Dia. (in.) =
[X] Spec. Selection by X-ray; [ ] Geomarine Sample Ref. Effort = % Comp. = ± Opt. =

Type Consolidation: [ ] Isotropic [ ] Anistropic [X] K_o stress path [ ] 45° stress path [X] Used automated system: Drained Axial Strain Rate, $\varepsilon_{a,rate}$ (%/h) = 0.07
Remarks:

Loading Conditions: [X] Static [ ] Post Cyclic [X] Undrained [ ] Drained [X] Comp. [ ] Ext. [X] Strain [ ] Stress [ ] Stress Path [X] Constant Cell Pressure [ ] Variable Cell Pressure [ ] Cyclic (Hz) Rate: [ ] 0.1; [ ] Stress [ ] 1; [ ] Strain Other:

Water Content (WC);	Initial - Trimming Location			Final, W_{at}
	Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	(see below)
Container No	77	5009	6054	685
Mass Moist Soil + Cont. (g)	57.74	65.27	86.40	100.34
Mass Dry Soil + Container (g)	50.75	55.85	71.87	82.26
Mass Container (g)	31.56	31.04	31.59	31.63
Water Content, $W_{o,n}$ (%)	36.43	37.97	36.07	35.71
Avg. Initial WC, $W_{o,avg}$ (%)	36.82	Final (W_{at});	[X] Slice ;	[ ] Whole Spec.

[ ] See attached data sheet(s) for additional water contents

SOIL MASSES:	Initial	Final
Moist + Tare (etc.)(g)	404.78	395.92
Tare (etc.) (g)	0.00	0.00
Mass Moist Spec., $M_{t,n}$ (g)	404.78	395.92
Excess Dry Soil (soil not included in final mass measurement)		
Container No.		
Mass Dry Soil + Cont. (g)		
Mass Container (g)		
Mass Excess Dry Soil, $M_{d,es}$ (g)		0.00

Specimen Dimensions, (mm)

	Height Initial (H_o)	Height Final (H_{at})		Dia. Initial (D_o)	Dia. Final (D_{at})	
GB	100.040	100.040	1 T	50.80	50.50	For
1	15.06	-14.99	2 M	50.80	62.00	Wedge
2	15.06	-15.02	3 B	50.80	55.00	Failure
3	15.07	-14.98	1'T			= d_{max}
4	14.97	-15.09	2'M			= d_{min}
5	14.96	-15.23	3'B			= Δd
Avg.	115.06	84.98	Avg.	50.80	55.83	xxxxx

Dia., X indicates with membrane

Measuring Devices:
Pi Tape: [X] Dia
Calipers: [ ] Ht.; [ ] Dia
Dial Comparator: [X] Ht.; [ ] Dia
Remarks:

$A_o = \pi D^2/400$ (cm²)	20.27
V_o (cm³)	233.22
$A_{atb,m}=\pi (D^*_{at})^2 /400$ (cm²)	25.85
$A_{atw,m}=(d_{min}-2\Delta d)d_{max}\pi/400$ (cm²)	NA
$D^*_{at}=(D_T+2D_M+D_B)/4$ (mm)	57.38

Estimated Initial Unit Weight

Total, $\gamma_{t,o}$ (lbf/ft³)	108.35	Dry, $\gamma_{d,o}$ (lbf/ft³)	79.19

Membrane / Filter Paper / Apparatus

Membrane (mm):		Top	Bottom
Number: = 1	Thickness: [ ] Single; [X] Double	0.56	0.63
		0.56	0.63
	Circumference ($C_{rm,o}$)	158.0	158.0
		Total Thickness	Dia.($C_{rm,o}/\pi$)
	Average:	0.30	50.29

Filter Paper: Top + Bottom: [ ] Yes ; [X] No
Filter Strips: [X] Yes ; [ ] No Number = 8
Type of Filter Strips: [ ] Vertical: ¼ in. & Whatman #54; [X] Spiral: ¼ in. & Whatman #1

Apparatus: Mass Top Cap, M_{tc} = 66.4 g, 0.15 lbf
Mass Displ. System, M_{ds} (cap, dial, piston, etc) = NA g, NA lbf

Top Cap Attached: [X] Yes; [ ] No; Piston Dia.(in.) [X] ½: [ ] ¾; Load Cell: [ ] External [X] Internal
Top Cap - Rotation: [X] Fixed,<1°; [ ] Limited,<5°; [ ] Unlimited, >5°
With: [ ] Frictionless End Caps; [ ] Lat. Movement Top Cap [ ] Internal LVDT Jacket

[ ] Photo Taken. Failure Mode: NA - Not Applicable
Failure Sketch [X] Bulge GB - Gage Block
ε_a= [ ] Wedge Other Remarks:
20%→ [ ] Parabolic
[ ] Necked

Wedge/Bulge Ht.= ? Value (mm)
Final Visual Classification: Lean Clay, Brown

Trimmed / Reconstituted By: EA Set Up By: EA Taken Down By: EA
Date: 2/14/2013 Date: 2/14/2013 Date: 3/25/2013
Prelim. Calc. By: EA Final Calc. By: EA Reviewed By: mmm

[ ] See more detailed sketch on attached sheet. Remarks:

Triaxial Test: Specimen Calculations & Summary

Project Number: 04.11120056 Test Type: CKoUC w/OCR Sta. No.: TRX-S03 File Name: 17-229B_S04

Task Number: ______ Specific Gravity: 2.740 [ ] Measured; [X] Assumed

Boring No.: VR0017-229B Sample No.: S04A Depth (ft): 16.40 Specimen No.: c

Specimen: [X] "Intact"; [ ] Reconstituted; [ ] Remolded [X] Static; [X] Undrained;

Calculations Corr. for Salt (dissolved solids): [X] No or, [ ] Yes, with concentration = ______ ppm [ ] Cyclic; [ ] Drained;

	Inital Water Contents (WC), (W_o) over Saturation, (S_o), in (%):					
	Top, $W_{o,1}$	Botttom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal., $W_{o,bc}$
W_o	36.43	37.97	36.07	36.82	36.82	38.75
S_o	86.8	88.6	86.4	87.3	87.3	89.5
Measured final mass of moist soil, M_{tat} (g)						395.92
Final mass of moist soil corrected for excess dry soil, $M_{tat,c}$ (g)						395.92

Calculated Mass of Dry Soil (g)	
Initial Selected WC, w_o (%)	36.82
Initial , $M_{d,o}$	295.84
Final, $M_{d,at}$	291.74
Selected, M_d	291.74

Changes in Height (**mm**) and Volume (**cm^3**) Within Given Consolidation Stages	Stage 1 At Initial Seating Stress	Stage 2 During Back-Pressuring	Stage 3 1st Consol. Incr. (omit if one incr.)	Stage 4 End Stage 3 To Max. or Test Stress	Stage 5 During Rebound to Test Stress
Sign Convention: (+) Def. in comp. or Flow out of spec.; (-) Def. in ext. (swell) or Flow into spec.					
Change in Height, $\Delta H_{c,n}$	-0.01	0.29		8.83	-0.45
Sum of changes in (+ out)	0.53			17.98	
Burette Readings, $\Delta b_{r,n}$ (- in)		-8.98			-1.21
Theoretical $\Delta V_t = (3V_o \times \Delta H_{c,n} / H_o)$	-0.04	1.75		134.79	4.98
Vol. Factor, $F_v = \Delta b_{r,n} / \Delta V_{t,n}$				0.13	-0.24
Corr. $\Delta V_{ct} = F_v \times \Delta V_{t,n}$			NA	NA	NA
Selected $\Delta V_{c,n}$	-0.04	1.75		17.98	-1.21

Summary of Calculation of ΔV_c by Different Procedures	
By Selected Volumes	
ΔV_c (cm^3)	18.48
By Change in Mass	
~ $M_{t,o}-(M_{tat,c}+\Delta V_{in,stage1\&2}+\Delta V_{L,n})$	
ΔV_c (cm^3)	17.83
By Saturation = 100 %	
ΔV_c (cm^3)	22.08
For Selected ΔV_c, required G_s for S_c = 100 %:	2.650

Consolidation Stress Summary and Loading Summary

Test Stage:	Max. Stress	Test Stress	Post Cyclic
Cell Pressure, σ_c (psi)	93.35	77.50	NA
Back or Pore Pressure, U_h (psi)	60.01	59.99	NA
Axial Force Reading, $P_{r,n}$ (lbf)	113.71	32.02	NA
Nominal OCR	1.00	2.50	NA
Nominal k = (σ'_h / σ'_v)	0.48	0.65	NA
t_c , ON or in [X] days [ ] hrs	5.0	1.0	NA
Prelim. after test WC corr. for ΔV during loading (shear), $W_{at,c}$ (%)			35.74

Static Axial Strain Rate, $\varepsilon_{a,rate}$ (%/h) =	0.30	
During/End of Loading	Static	Cyclic
Change in Height[1], $\Delta H_{L,n}$ (mm)	0.01	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	0.10	NA
Axial Force Reading, $P_{r,n}$ (lbf)	1	NA
Area Correction Constant[2], A_{cc}	2338.161	NA
Post Cy.Displ. Reset to Null Position:	Yes; [ ]	No
Normalized difference in height change[3], (%)	-20.1	

[ ] Undrained ambiant stress applied: with Delta axial force (lbf) = NA & Duration (min) = NA & Delta disp., ΔH_{ua} (mm) = NA

Consolidation & Pre-shear Conclusions				
ΔV_c (cm^3) = 18.48	ΔH_c (mm) = 8.66	$\varepsilon_{a,c}$ (%) = 7.53	$\Delta V_{c,max}$ (cm^3) = 19.68	
V_c (cm^3) = 214.74	H_c (mm) = 106.40	$\varepsilon_{v,c}$ (%) = 7.92	$\varepsilon_{ac,max}$ (%) = 7.92	
A_c (cm^2) = 20.18	ΔH_{ua} (mm) = NA	$\varepsilon_{a,ua}$ (%) = NA	$\varepsilon_{vc,max}$ (%) = 8.44	

Summary of Specimen Physical Properties

Specific Gravity: G_s = 2.740 **Condition:**	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)		Skempton B (%) (4)
Initial:	115.06	233.22	20.27	38.75	108.35	78.09	89.5		96
After Consol.: to $\sigma'_{v,c}$	106.40	214.74	20.18	35.74	115.13	84.81	96.7		
After Consol.: to $\sigma'_{vc,max}$	105.95	213.53	20.15	35.33	115.4	85.29	96.6		NA

Notes: (1) For static loading, recorded deformation during shear & preparation to take down. Back Calculated G_s for S=100% 2.650

(2) Equals $1/\varepsilon_{at} \times (1 - (A_c \times (1-\varepsilon_{v,L}))/A_{atb,m})$ (3) Equals $100 \times (((\Delta H_{ua} + \Delta H_{L,at} + \Delta H_{L,cy}) - (H_c - H_{at})) / H_c)$ (4) Initial value is after back pressuring

NA - Not Applicable ON - Over Night WC - Water Content Calculated By: mnm Reviewed By: mnm

Remarks:

Results of Triaxial Test

Project Number: 04.11120056 | Test Type: CKoUC w/OCR | Sta. No.: TRX-S03 | File Name: 17-229B_S04/
Project Name: | Task No.: | Test No.: NA | Test Series for: NA

X Tube	Field Extruded	Liner	Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: /VR0017-229B		Reconstituted		Impact/Rammer	Rammer Wgt.(lbf)= No. Layers =
Sample No.: S04A		Compostite No.:		Pluviated:	Tamper Force (lbf)= Drop (in.) =
Depth (ft): 16.40		Specimen No.: c		Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
X Spec. Selection by X-ray;		Geomarine Sample			Ref. Effort = % Comp. = ± Opt. =

Type Consolidation:	Isotropic	X K_o stress path	X Used automated system — Drained Axial Strain Rate, $\varepsilon_{a,rate}$ (%/hr.)= 0.07
	Anistropic	45° stress path	Remarks:

Loading Conditions:	X Static	X Undrained	X Comp.	X Strain / Stress	X Constant Cell pressure	Cyclic (Hz)	Stress / Strain
	Post Cyclic	Drained	Ext.	Stress Path	Variable Cell pressure	Rate: 0.1;	1; Other:

Summary of Specimen Physical and Index Properties

Specific Gravity: G_s = 2.740 / Condition:	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Unit Weight Total (pcf)	Unit Weight Dry (pcf)	Saturation (%)	LL PL PI	Liquidity Index LI	Skempton B (%) (1)
Initial	115.06	233.22	20.27	38.7	108.4	78.1	89.5		NA	96
After Consol.: to $\sigma'_{v,c}$	106.40	214.74	20.18	35.7	115.1	84.8	96.7		NA	
to $\sigma'_{vc,max}$	105.95	213.53	20.15	35.3	115.4	85.3	96.6		NA	NA

Consolidation Stress Summary and Loading Summary

Item	Unit	Max. Stress	Pre-Shear	Post Cyclic
Axial Strain during Consol., $\varepsilon_{a,c}$:	%	7.919	7.53	NA
Vol. Strain during Consol., $\varepsilon_{v,c}$:	%	8.440	7.92	NA
Effective Vertical Stress, σ'_v:	(ksf)	10.095	4.045	NA
Effective Horizontal Stress, σ'_h:	(ksf)	4.884	2.610	NA
Consol. Stress Ratio, k (σ'_h / σ'_v):	-	0.484	0.645	NA
Induced OCR:	-	1.00	2.50	NA
Eff. Average Stress, (σ'_v + σ'_h)/2:	(ksf)	7.489	3.327	NA
Eff. Mean Stress, (σ'_v + 2*σ'_h)/3:	(ksf)	6.621	3.088	NA
Undr. Ambient Shear Stress, τ_{ua}:	(ksf)	NA	NA	NA
Undr. Ambient Shear Strain, $\varepsilon_{a,ua}$:	%	NA	NA	NA

X Static Strain Rate = 0.3 %/hr.
Cyclic Rate (Hz): 0.1; 1; Other =

During/End of Loading	Static	Cyclic
Change in Height, $\Delta H_{L,n}$ (mm)	0.01	NA
Change in Vol., $\Delta V_{L,n}$ (cm^3)	0.10	NA
Axial Force (lbf)	1.00	NA

Post Cy.Displ. Reset to Null Pos.: Yes No

Number of Loading Cycles, N = NA
$\pm\tau_h$ = NA (ksf) $\pm\gamma$ = NA %
at end of cyclic loading, $\sigma'_{vcy,r}$ = NA

Membrane Correction	Area Correction	Filter Paper Correction	Data Normalization: X Yes / No
Type: Bulge	Type: Bulge	Type: None	X Eff. Vertical Stress
Modulus: 150.0 psi	Area Corr. Const.: 2338.161	Strips: 8	Eff. Horizontal Stress — X Pre-Shear — Value:
Diameter: 50.29 mm	Meas. Final Area: 25.85 cm^2	Force: 0.000 lbf/strip	Eff. Average Stress — Max. Stress — 4.045 (ksf)
Thickness: 0.30 mm		Type Strips: Sprial #1	Other — Post-Cyclic

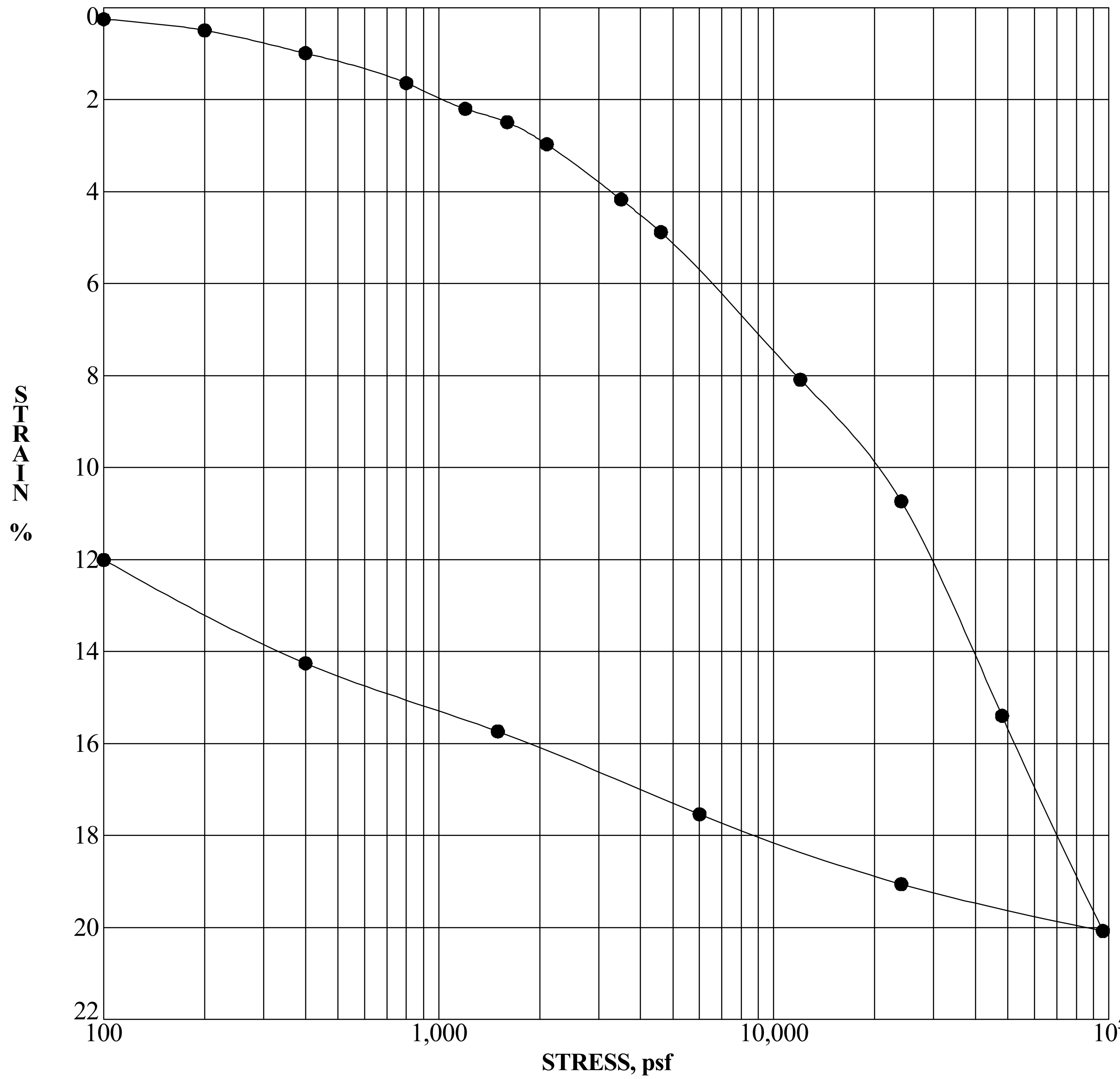
Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms. NA - Not Applicable (1) Initial B is after saturation

Final Visual Description and Remarks: Lean Clay, Brown

Loading Summary

	ε_a (%)	q / $\sigma'_{v,c}$ -	ΔU / $\sigma'_{v,c}$ -	p' / $\sigma'_{v,c}$ -	q / p' -	ϕ' for c'=0 (degrees)	σ'_1 / σ'_3 -	
at Max Shear Stress	11.231	0.585	0.132	1.113	0.526	**31.711**	3.216	
at Max Obliquity	-0.097	0.118	0.601	0.180	0.654	**40.866**	4.785	
Preconsolidation Stress (Casagrande Method)		σ'_p (ksf) =		ε_a (%) =	0.00			

Remarks:



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	074B	12.5	26.0	23.8	90.4	96.9	0.829	0.707	83.1	89.3			

TEST START DATE 04/19/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/19/07

DWG FILE:

CONSOLIDATION TEST RESULTS

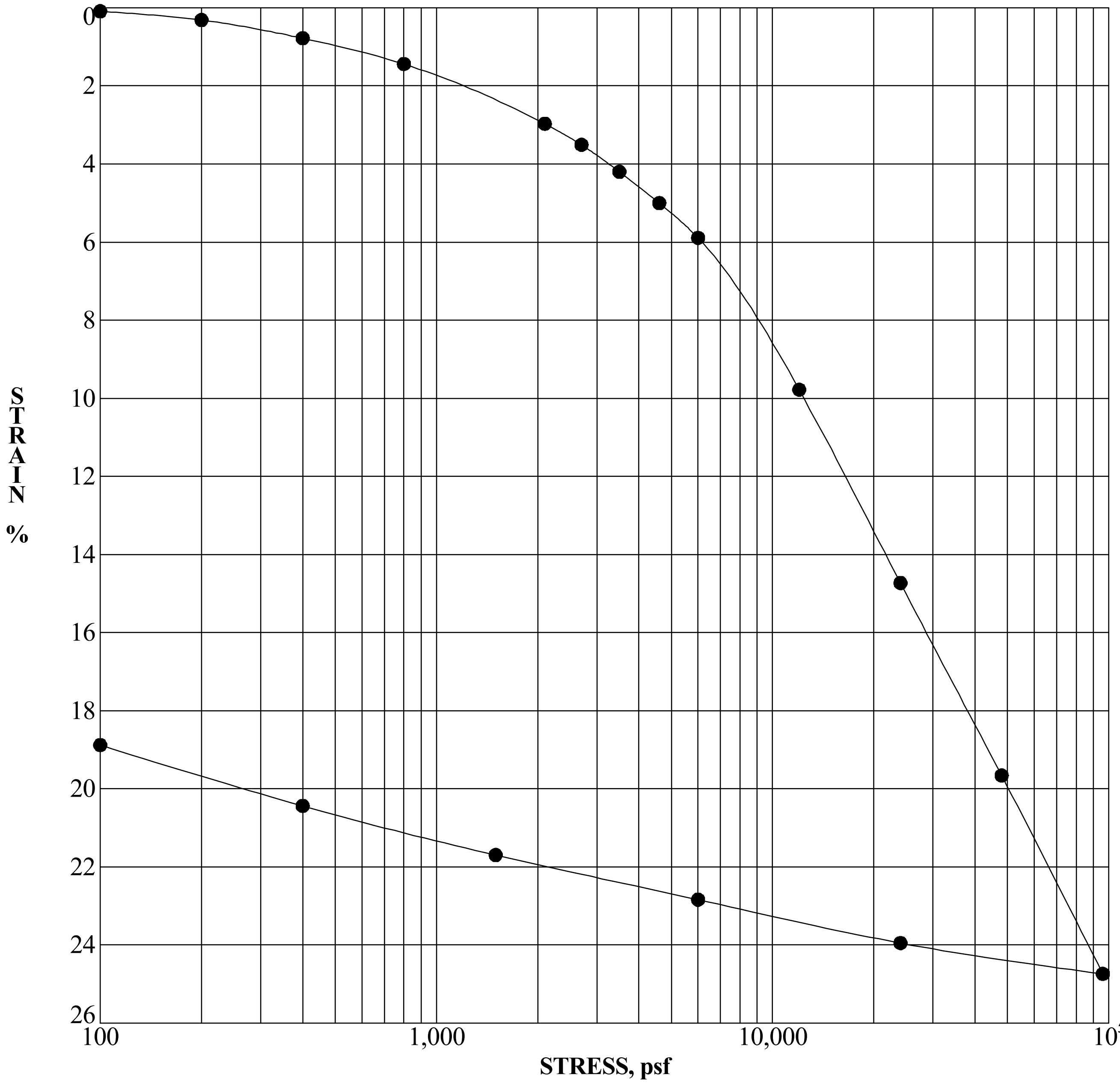
RECLAMATION DISTRICT 17
San Joaquin County, California

FIGURE

E-5c

PROJECT No.

1310.013



Key Symbol	Boring No.	Depth (Feet)	Water Content (%) Initial	Water Content (%) Final	Dry Density (pcf) Initial	Dry Density (pcf) Final	Void Ratio Initial	Void Ratio Final	Saturation (%) Initial	Saturation (%) Final	Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
●	080B	12.5	28.4	23.3	84.9	98.9	0.948	0.672	79.4	91.9			

TEST START DATE 04/19/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/19/07

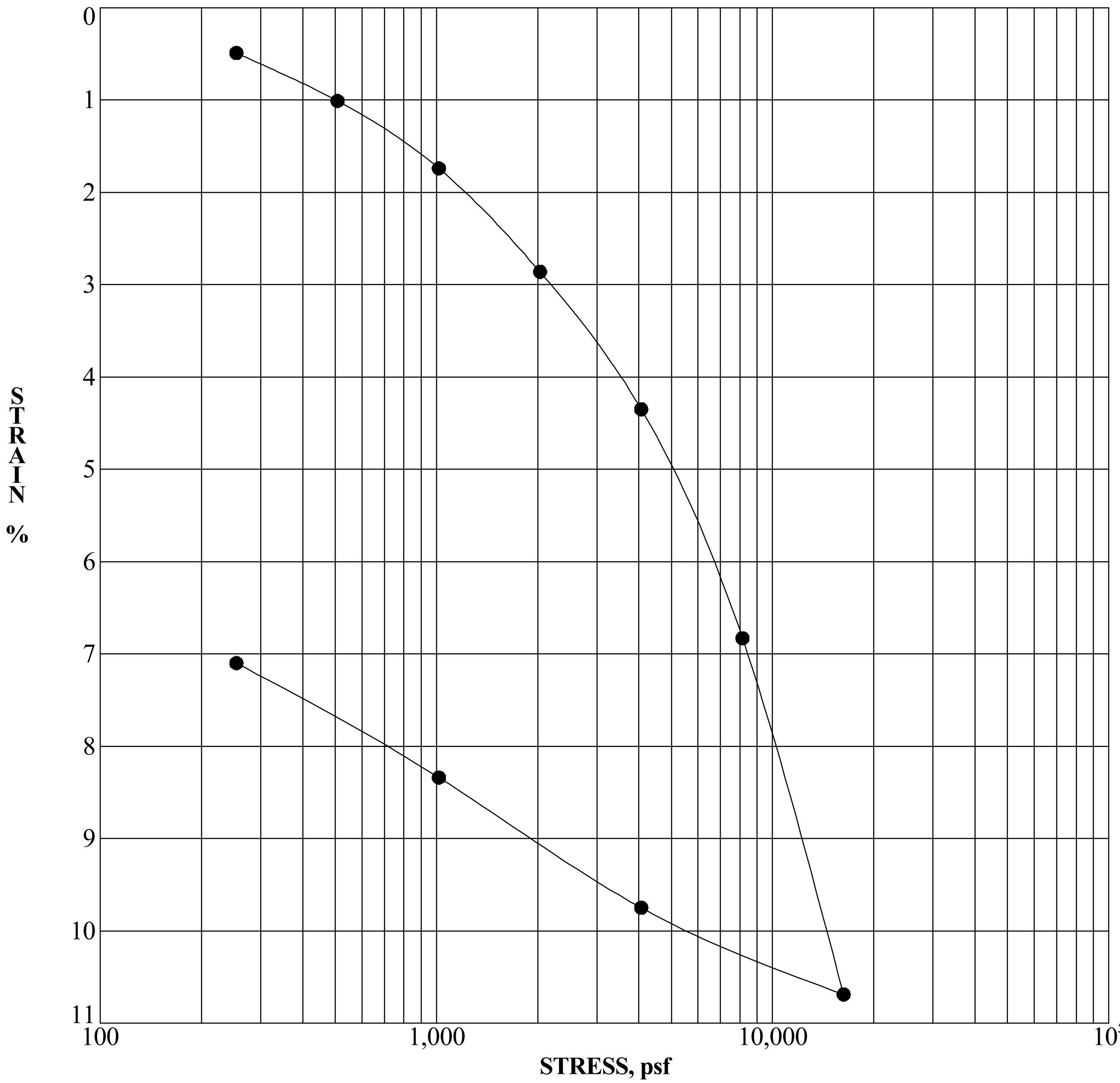
DWG FILE:

CONSOLIDATION TEST RESULTS

RECLAMATION DISTRICT 17
San Joaquin County, California

FIGURE **E-5d**

PROJECT No. 1310.013



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	090B	15.0	29.2	33.5	82.2	88.5	1.012	0.868	76.6	102.2			

TEST START DATE 04/10/07

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/10/07

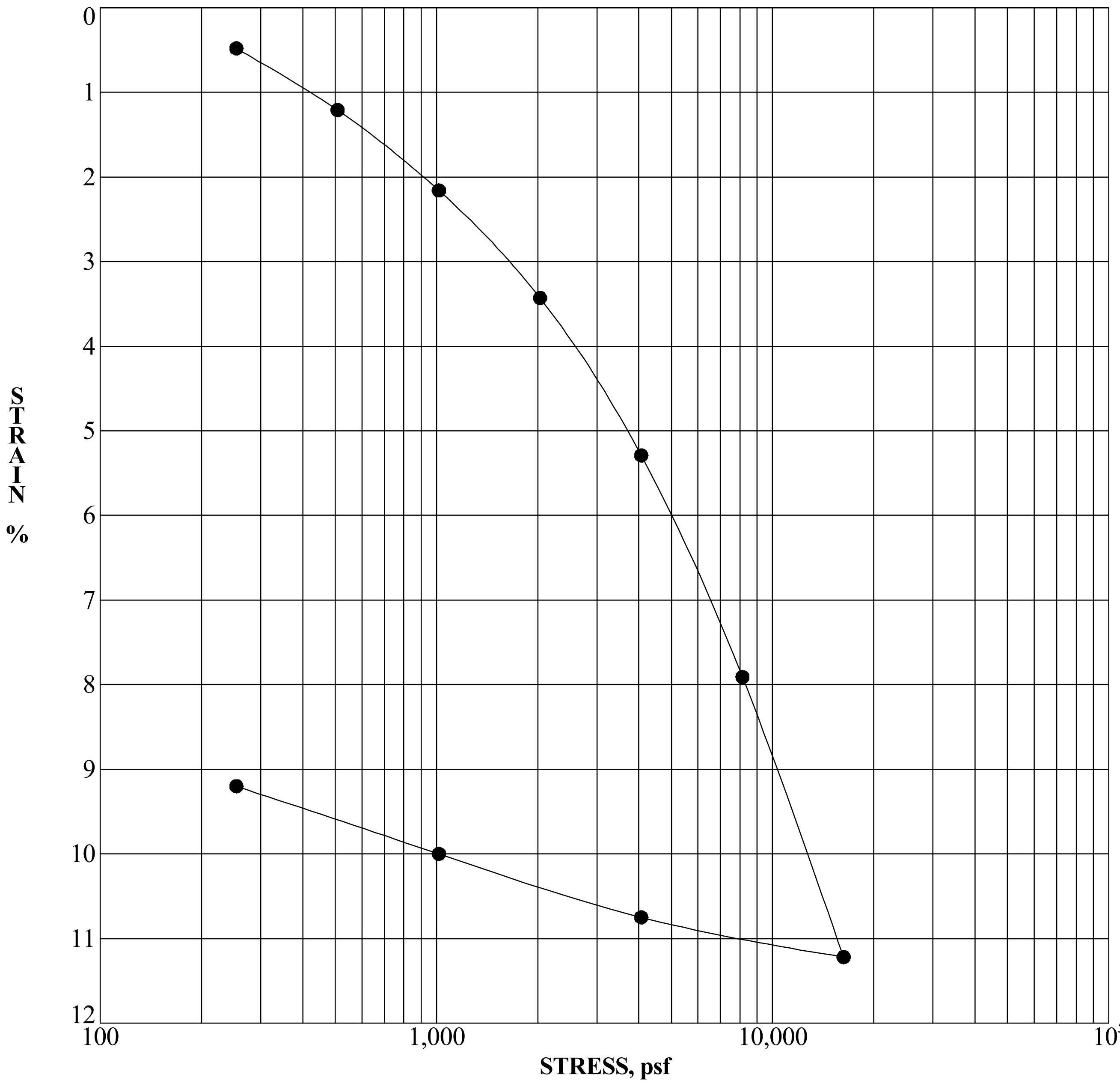
DWG FILE:

CONSOLIDATION TEST RESULTS

RECLAMATION DISTRICT 17
San Joaquin County, California

FIGURE **E-5e**

PROJECT No. 1310.013



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	096B	27.0	34.4	28.5	86.5	95.3	0.912	0.736	100.0	102.6			

TEST START DATE 04/10/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/10/07

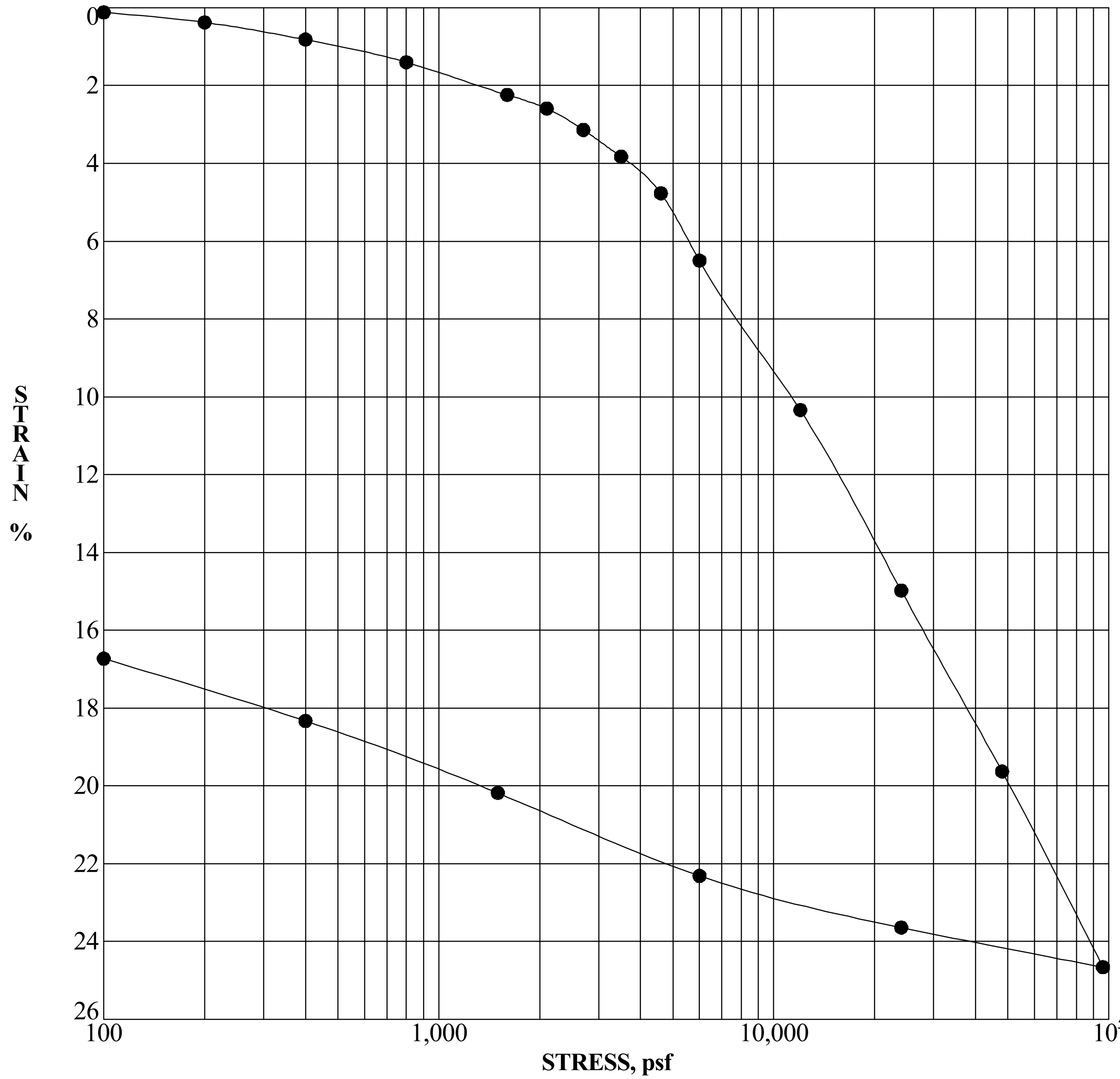
DWG FILE:

CONSOLIDATION TEST RESULTS

RECLAMATION DISTRICT 17
San Joaquin County, California

FIGURE **E-5f**

PROJECT No. 1310.013



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	102B	30.0	32.2	24.2	85.2	96.4	0.940	0.715	90.8	89.6			

TEST START DATE 04/19/07

FUGRO

PREP'D BY:

APP'D BY: L.Sansone

DATE: 04/19/07

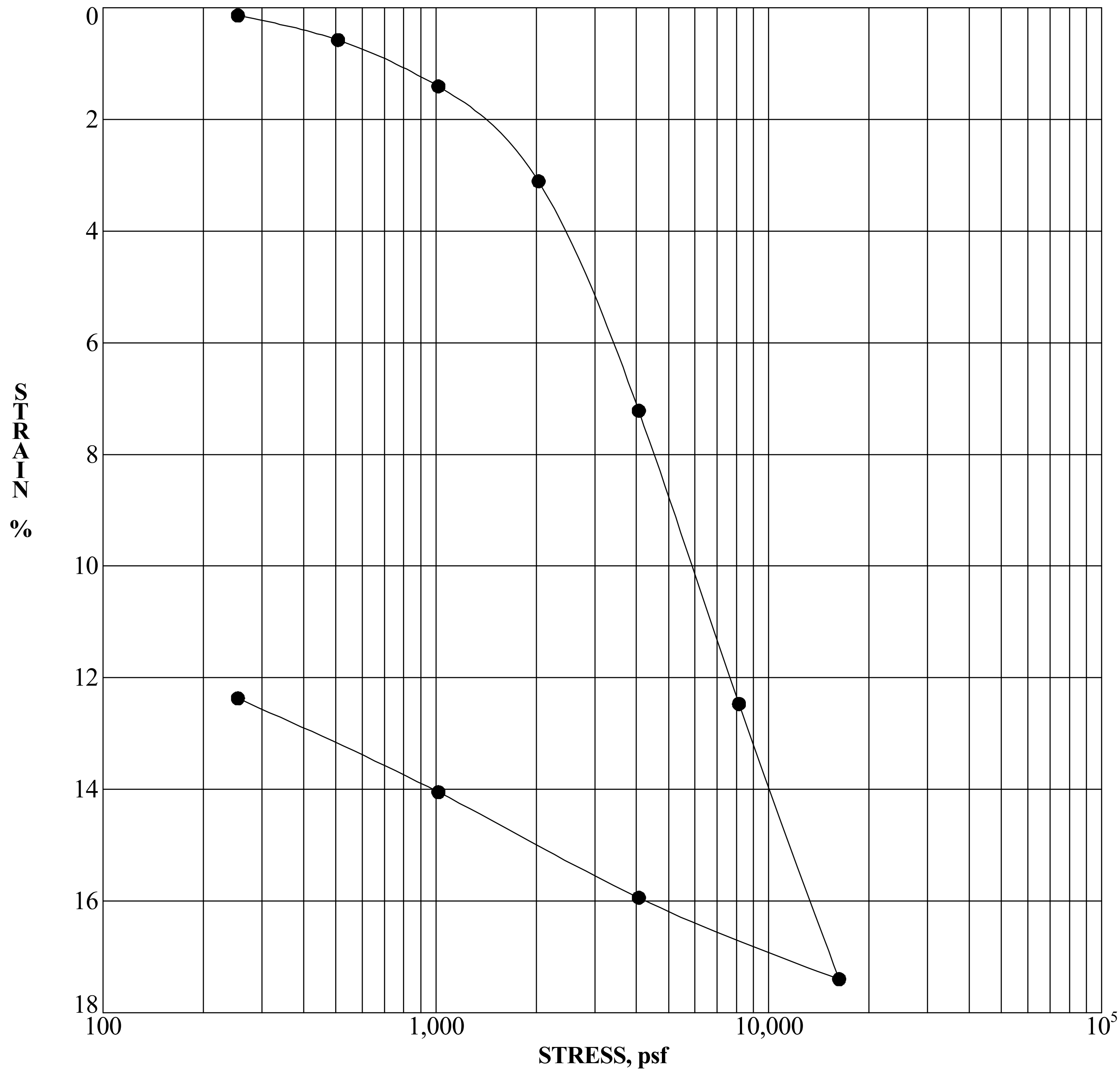
DWG FILE:

CONSOLIDATION TEST RESULTS

RECLAMATION DISTRICT 17
San Joaquin County, California

FIGURE **E-5g**

PROJECT No. 1310.013



Key Symbol	Boring No.	Depth (Feet)	Water Content (%) Initial	Water Content (%) Final	Dry Density (pcf) Initial	Dry Density (pcf) Final	Void Ratio Initial	Void Ratio Final	Saturation (%) Initial	Saturation (%) Final	Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
●	136B	3.0	33.6	44.2	75.0	84.5							

CONSOL_STRAIN 1310_022_V012505-051508.GPJ STD.GDT 6/20/08

FUGRO

PREP'D BY:

APP'D BY:

DATE: 6/20/08

DWG FILE:

CONSOLIDATION TEST RESULTS

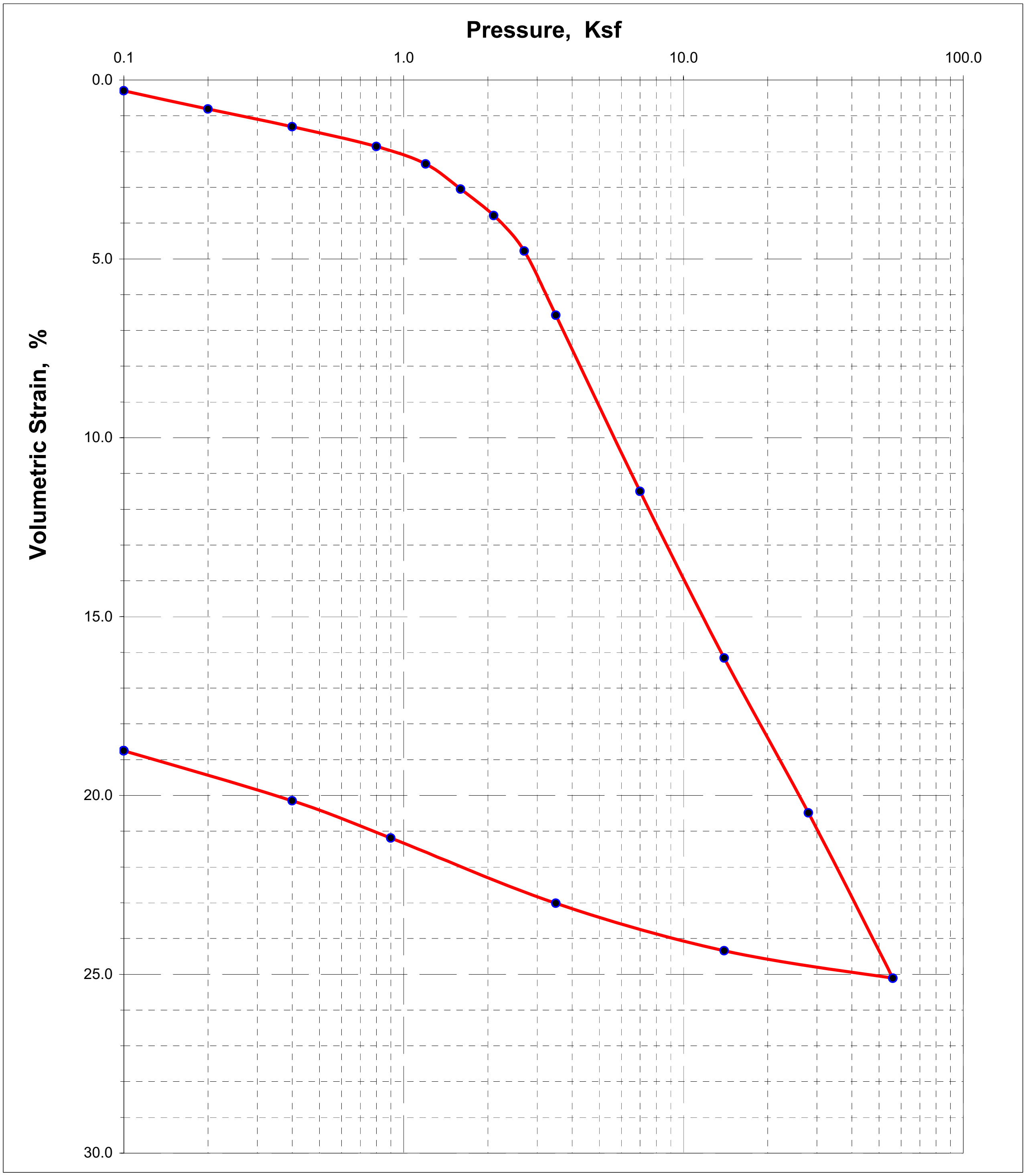
RECLAMATION DISTRICT 17
Stockton & Lathrop, California

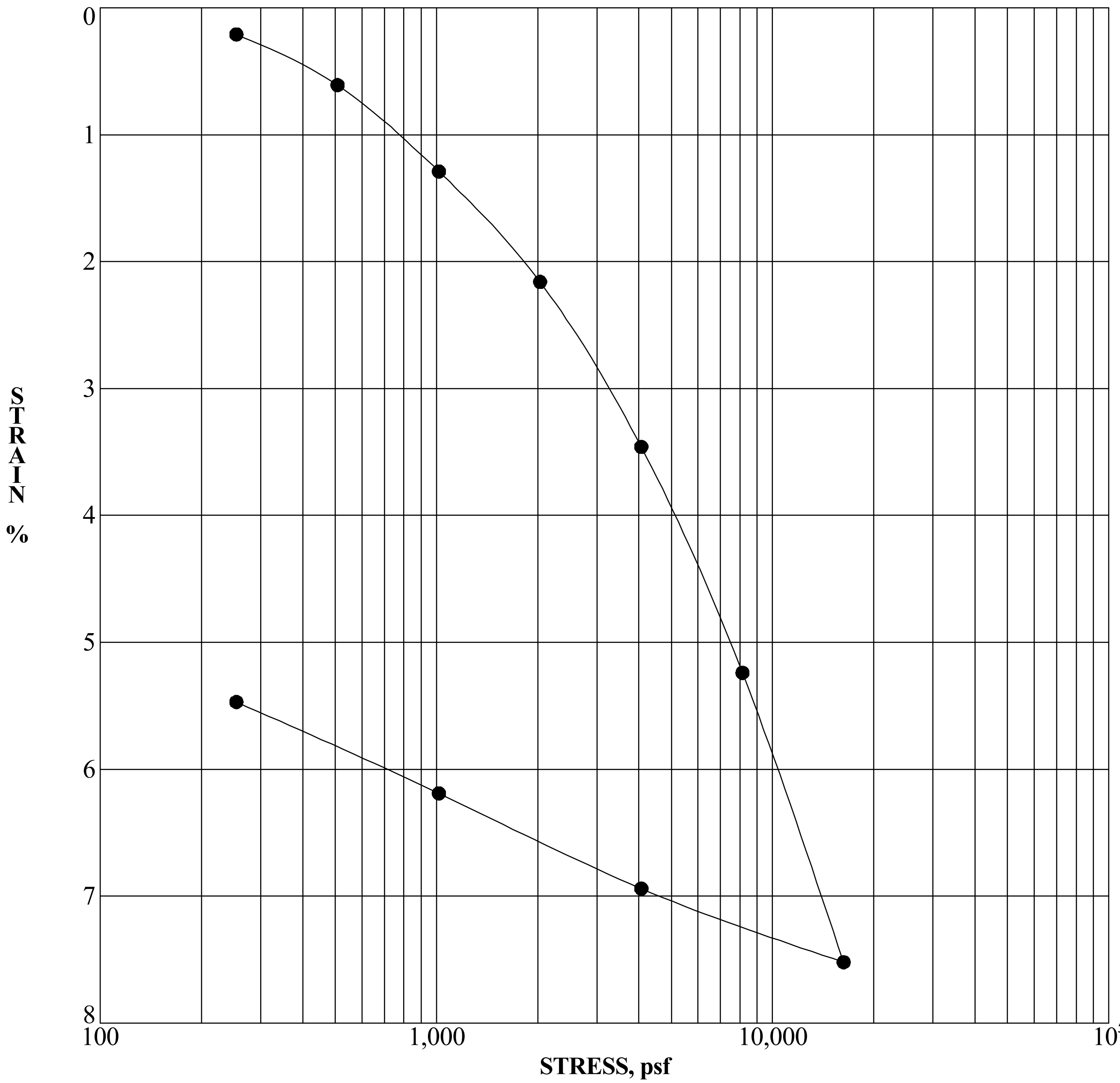
FIGURE **D-15**

PROJECT No. 1310.022

CONSOLIDATION TEST

Boring Number	WR0017_ 137B	Sample Number	S03A	Depth (ft)	3-5			
Soil Description	LEAN CLAY with sand (CL)							
	Water Content, %	Total Unit Weight, pcf	Void Ratio	Saturation %	Height in	Diameter in	Specific Gravity	Liquid Limit, %	Plasticity Index, %
Initial	30.1	103.8	1.113	73.0	1.00	2.420	(assumed) 2.70		
Final	26.6	124.3	0.717	100.1	0.813				

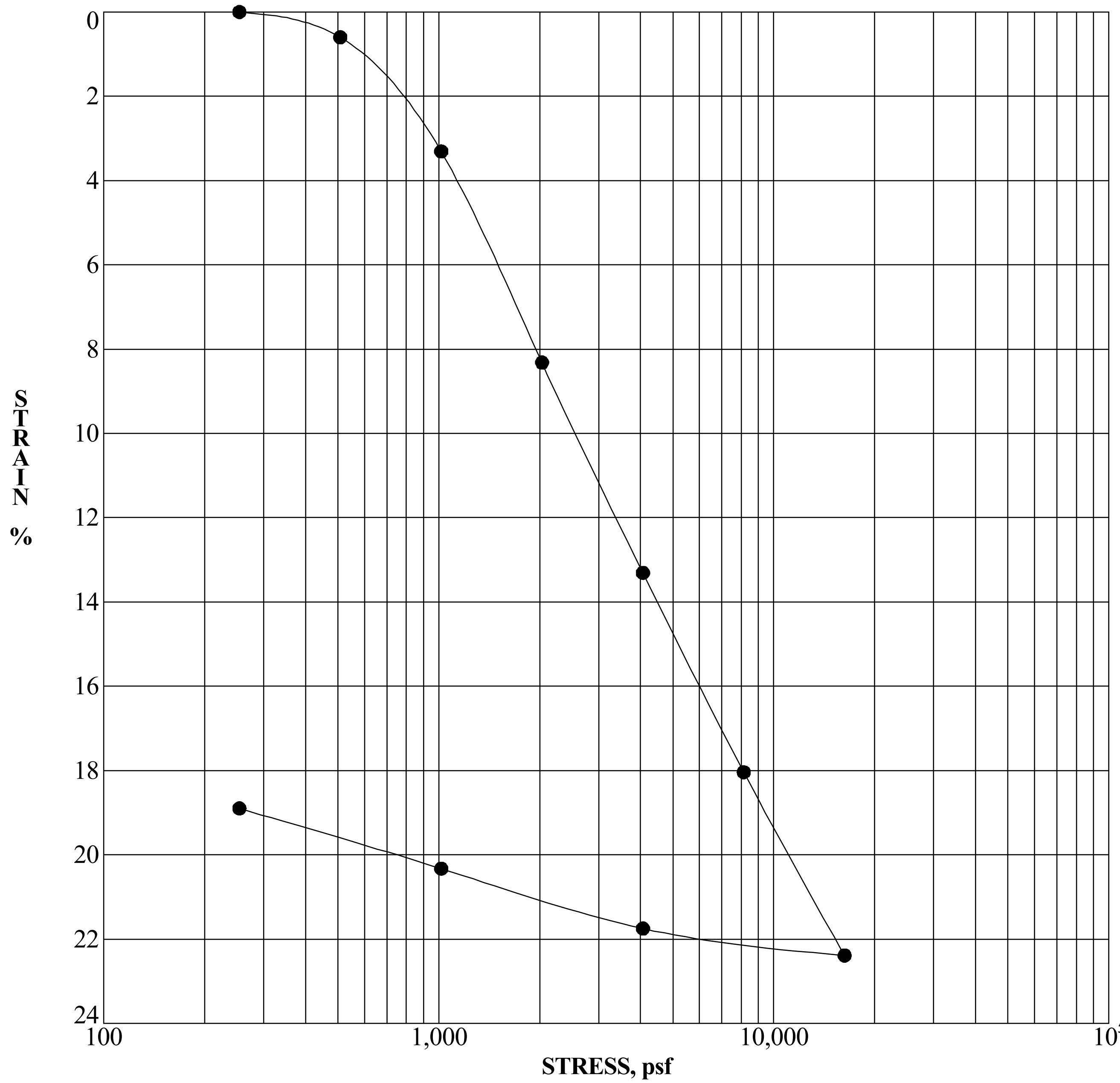




Key Symbol	Boring No.	Depth (Feet)	Water Content (%) Initial	Water Content (%) Final	Dry Density (pcf) Initial	Dry Density (pcf) Final	Void Ratio Initial	Void Ratio Final	Saturation (%) Initial	Saturation (%) Final	Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
●	137B	8.0	17.4	15.7	111.9	118.3	0.512	0.430	92.1	99.0			

CONSOLIDATION TEST RESULTS

RECLAMATION DISTRICT 17
Stockton & Lathrop, California



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	143B	3.0	15.3	23.1	84.3	103.9	0.999	0.622	41.3	100.1			

FUGRO

PREP'D BY:

APP'D BY:

DATE: 6/12/08

DWG FILE:

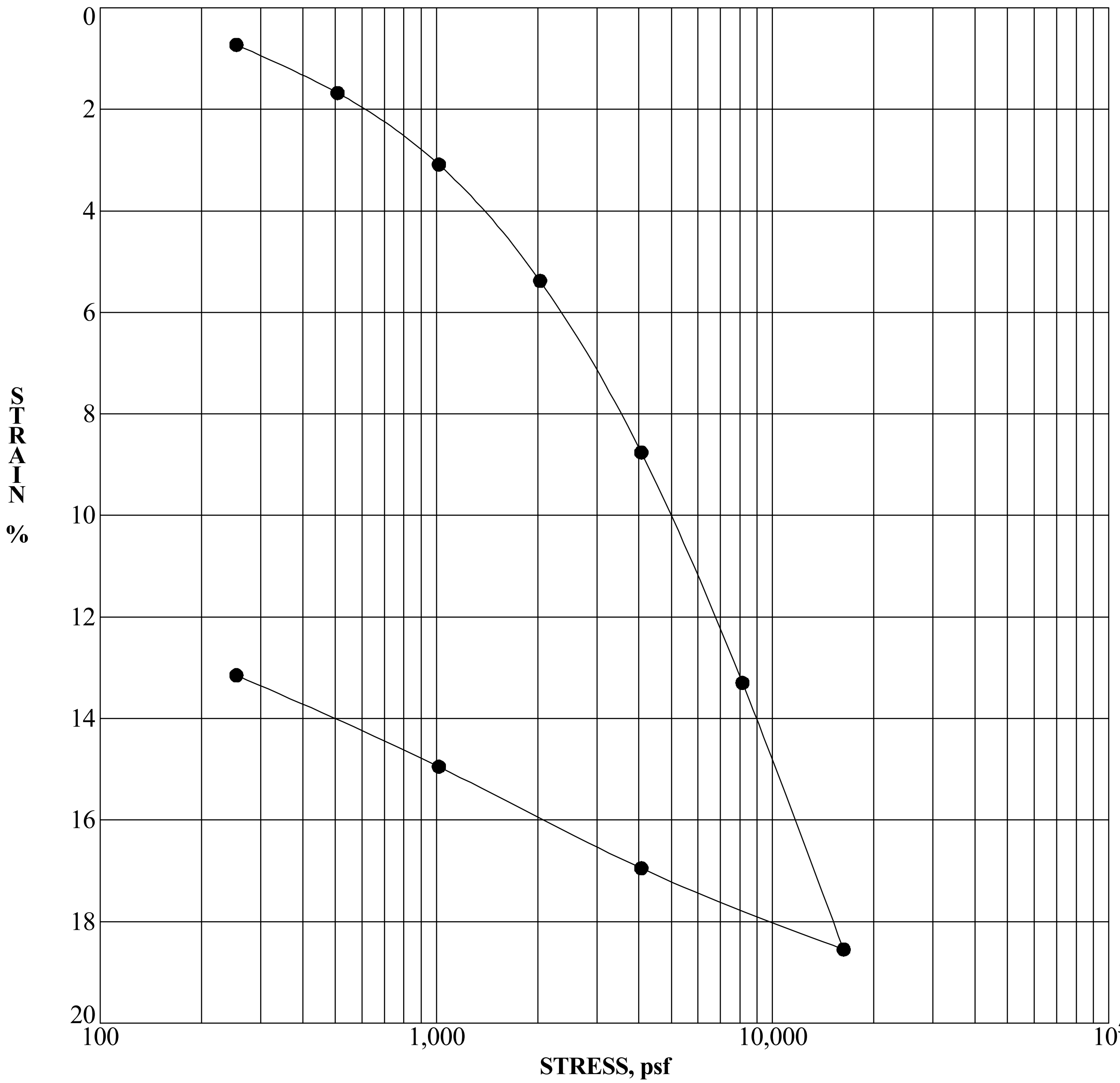
CONSOLIDATION TEST RESULTS

RECLAMATION DISTRICT 17
Stockton & Lathrop, California

FIGURE **D-17**

PROJECT No. 1310.022

CONSOL_STRAIN 1310_022_V012505-051508.GPJ STD.GDT 6/12/08



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Cec	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	182B	10.0	46.2	37.3	73.0	84.0	1.309	1.005	95.3	100.1			

CONSOL STRAIN 1310 022 V012505-051508.GPJ STD.GDT 6/12/08

FUGRO

PREP'D BY:

APP'D BY:

DATE: 6/12/08

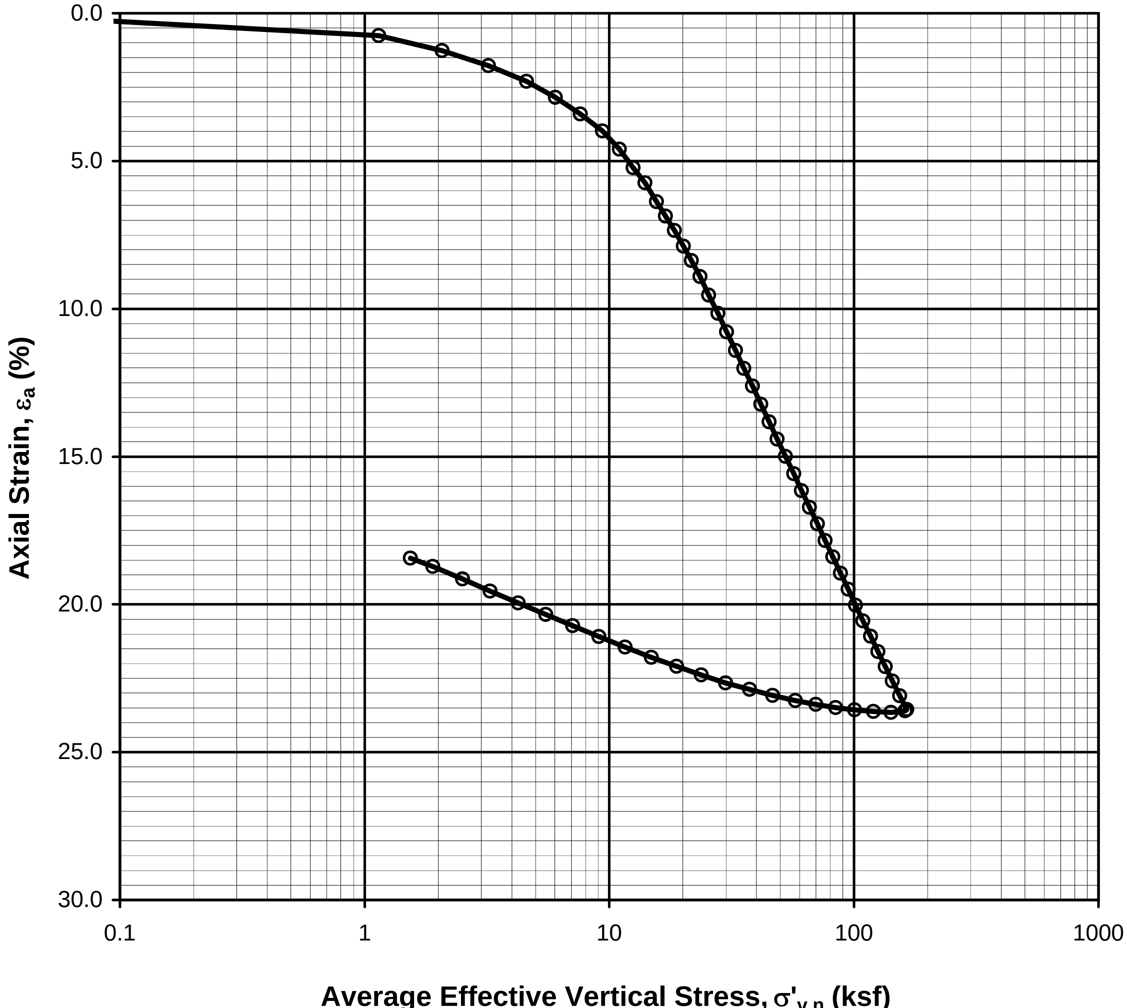
DWG FILE:

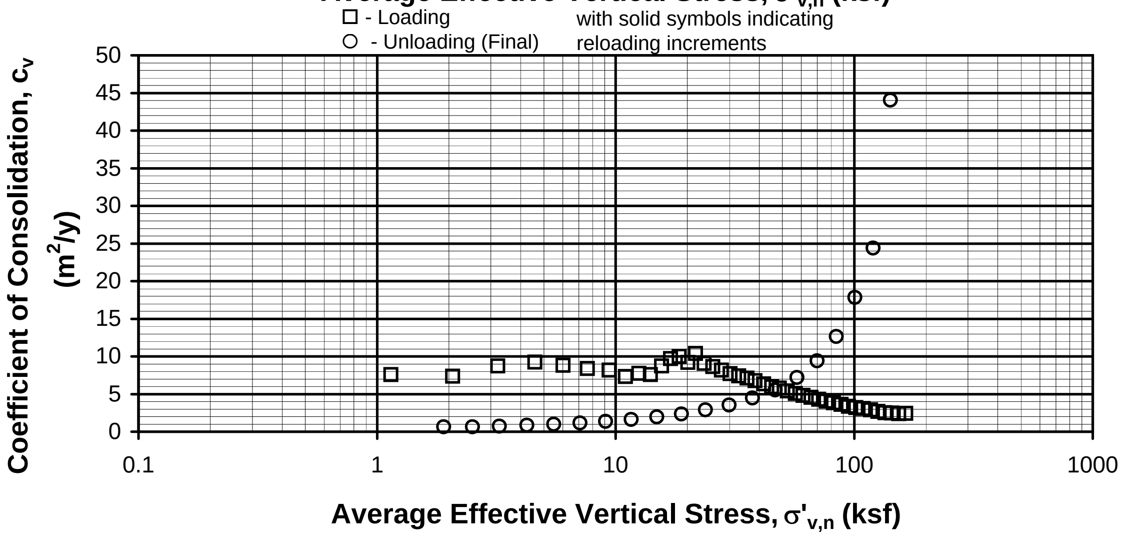
CONSOLIDATION TEST RESULTS

RECLAMATION DISTRICT 17
Stockton & Lathrop, California

FIGURE **D-18**

PROJECT No. 1310.022

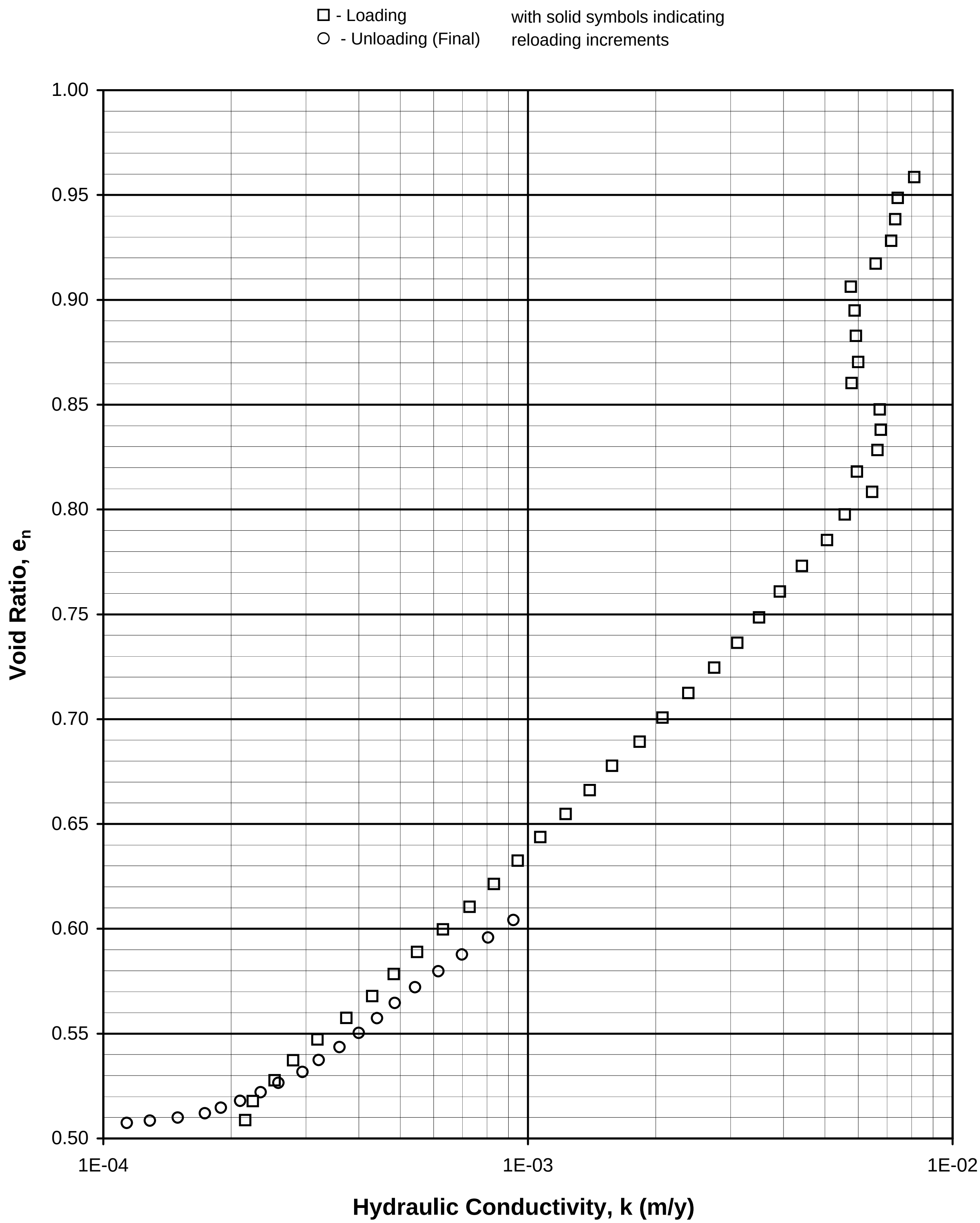




1-D CONSOLIDATION TEST: CRS

Sample No. S05Aa Depth 13.8 ft

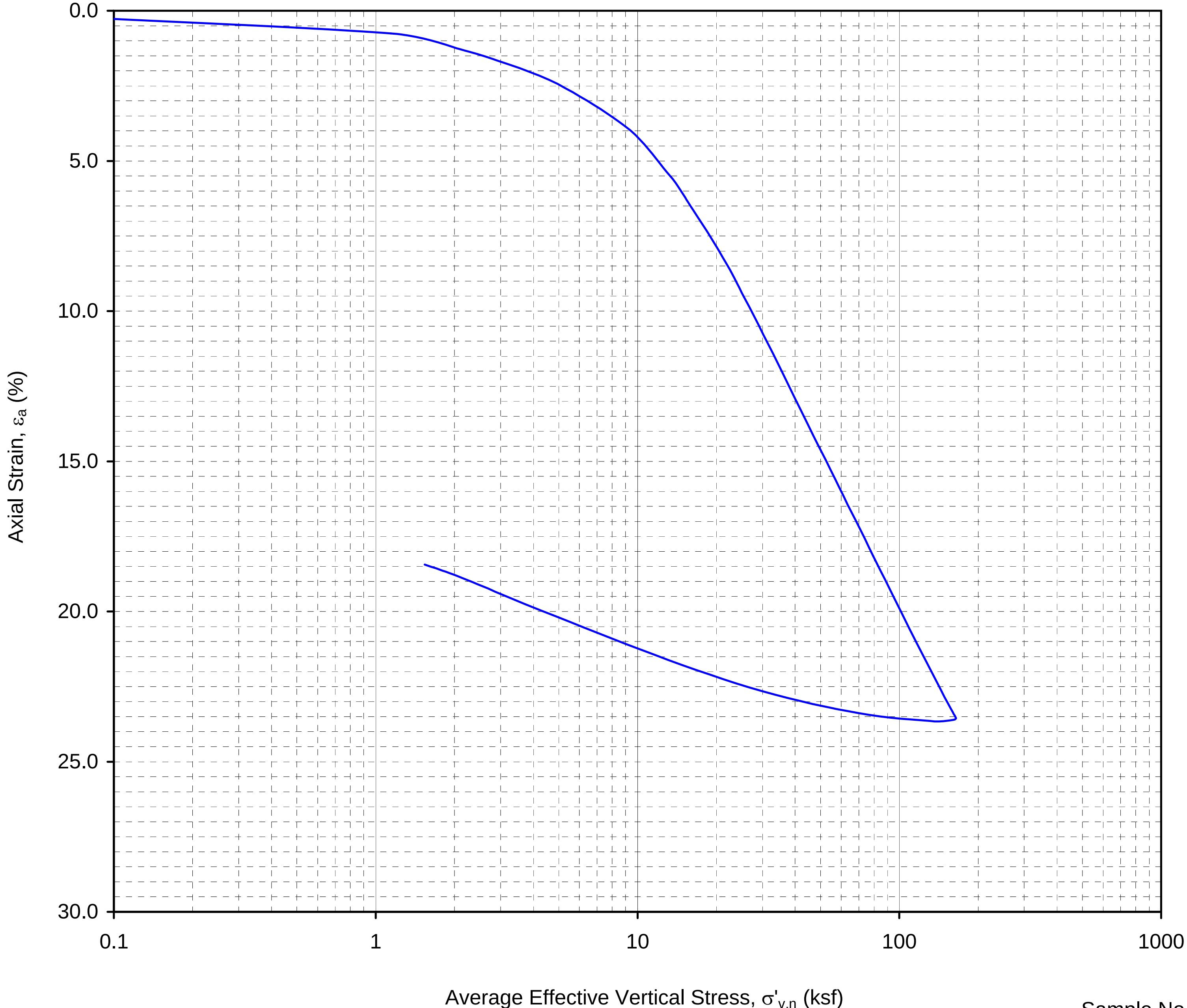
Boring WR0017-207B



1-D CONSOLIDATION TEST: CRS

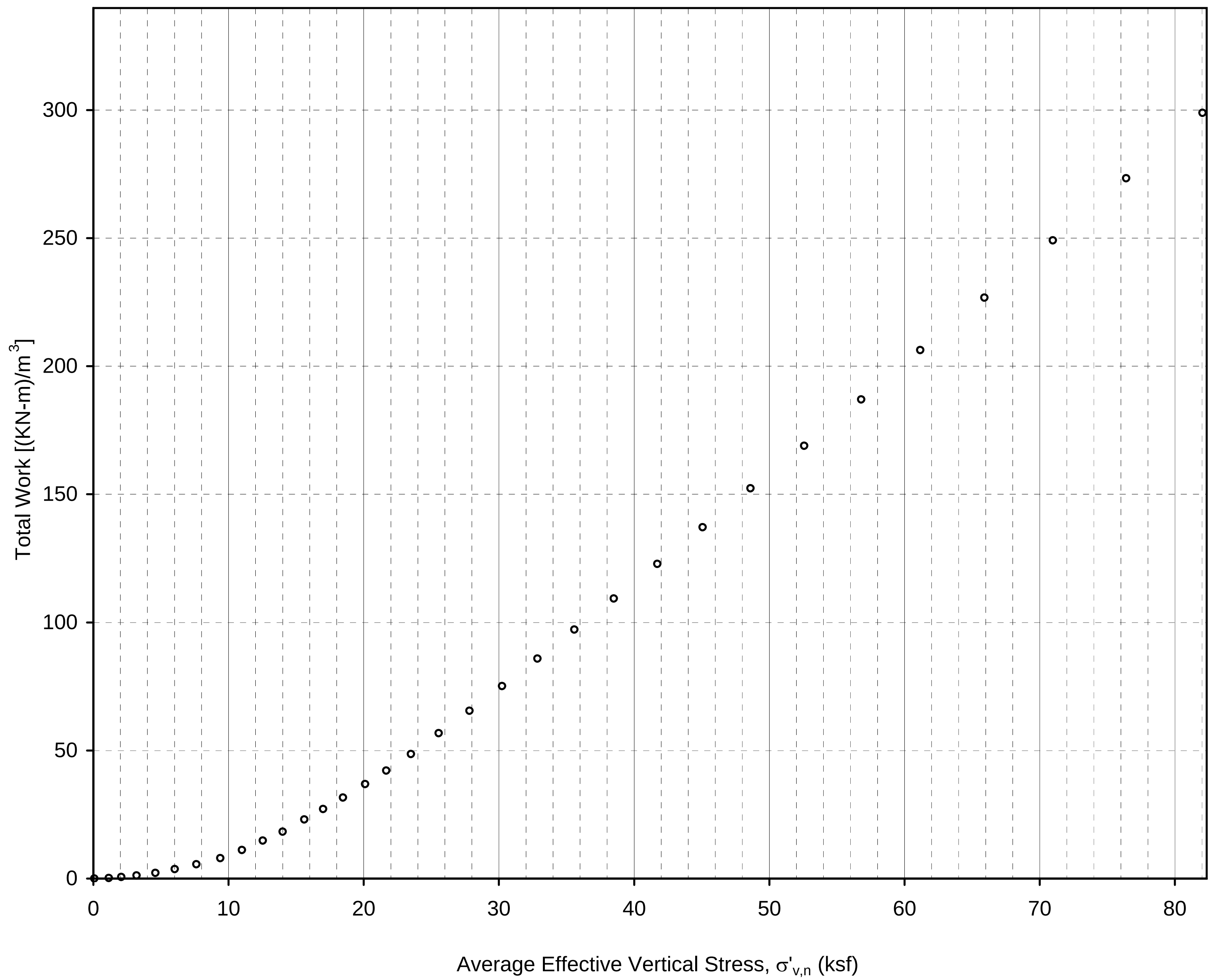
Sample No. S05Aa Depth 13.8 ft

Boring WR0017-207B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S05Aa   Depth 13.8



Sample No. S05Aa   Depth 13.8 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S06 File Name: WR0017-207B_S05Aa

Task No.: NA Cell No.: CRS-C06

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	32.87	53.85		91.7	98.9	106.4
2	"	Bottom, W2	31.87	54.26		90.3	96.9	104.3
3	"	Sides, W3	32.31	54.08		90.9	97.8	105.2
4	"	Average, W4	32.35	54.06		91.0	97.9	105.3
5	"	Back Calculated (1)	32.78	53.89	(3)	91.6	98.7	106.2
6	Final		24.09	53.89	(2)	91.6	100.0	107.5

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.697

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.709

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18153
Final Selected, K_f	0.18153

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 53.62

Avg. Back Calculated and Measured Mass Dry Soil (g) = 53.76

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 53.89; Final (4): NA — [X] From Cal. Routine No. [5] Note: Routine #5 is based on final measurements. [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.31 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.20 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	32.8	0.974	91.6	114.0	85.9	9.782	From	To (ksf)
Final	24.1	0.656	100.0	127.0	102.4	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

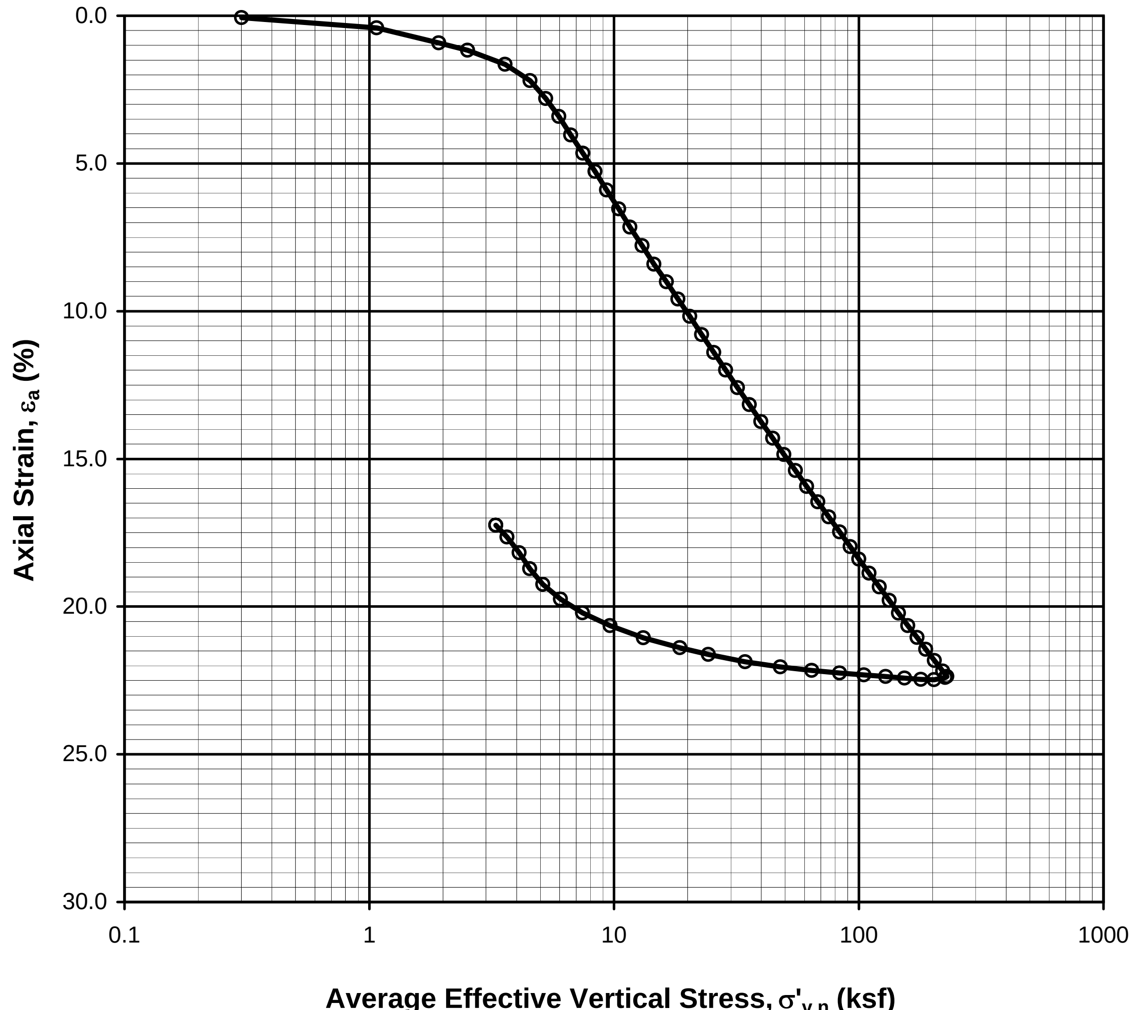
(3) This value is only different from the final value if there is soil extrusion during loading.

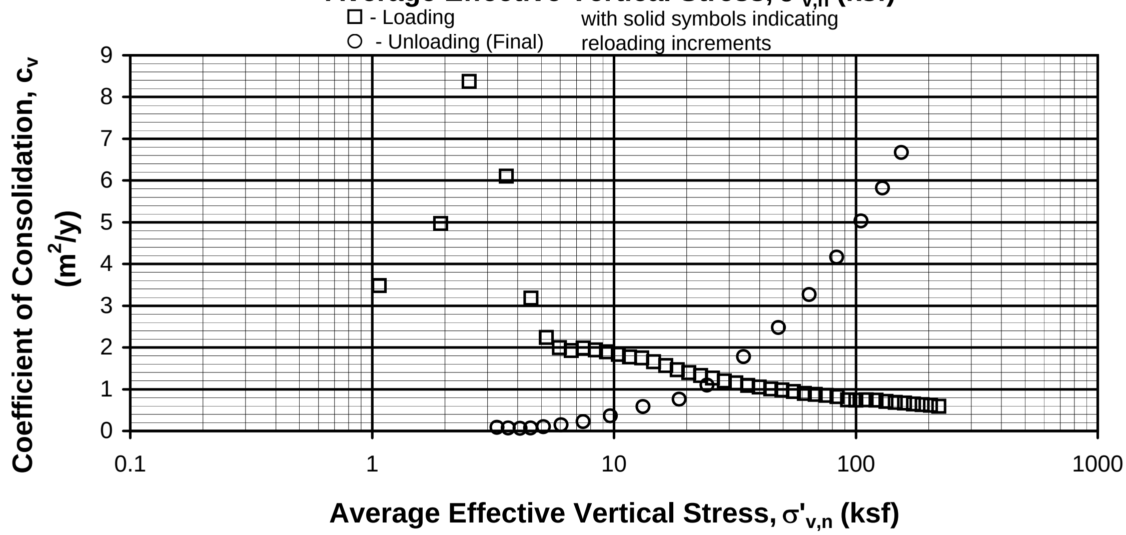
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/19/2012

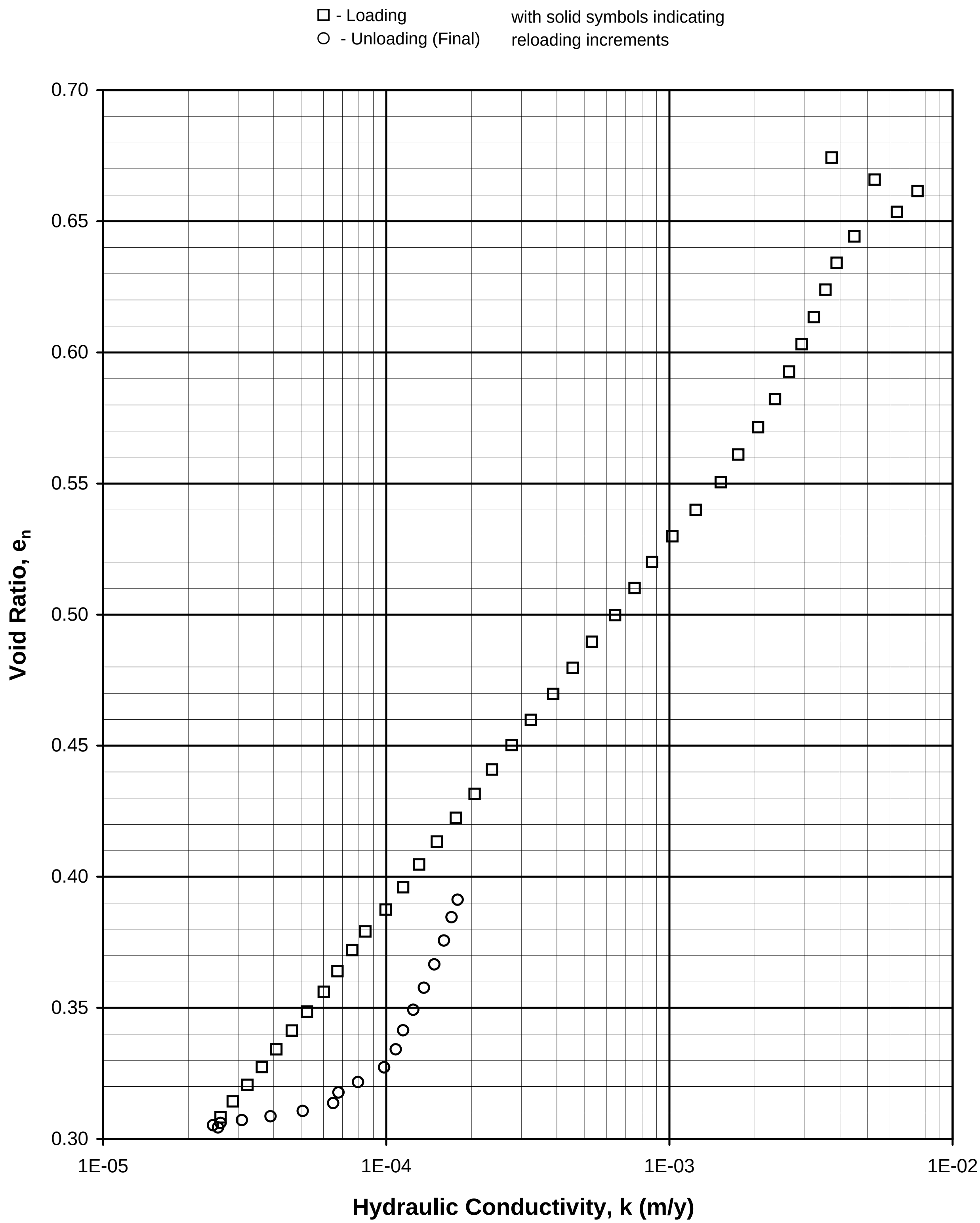




1-D CONSOLIDATION TEST: CRS

Sample No. S07Aa   Depth 19.85 ft

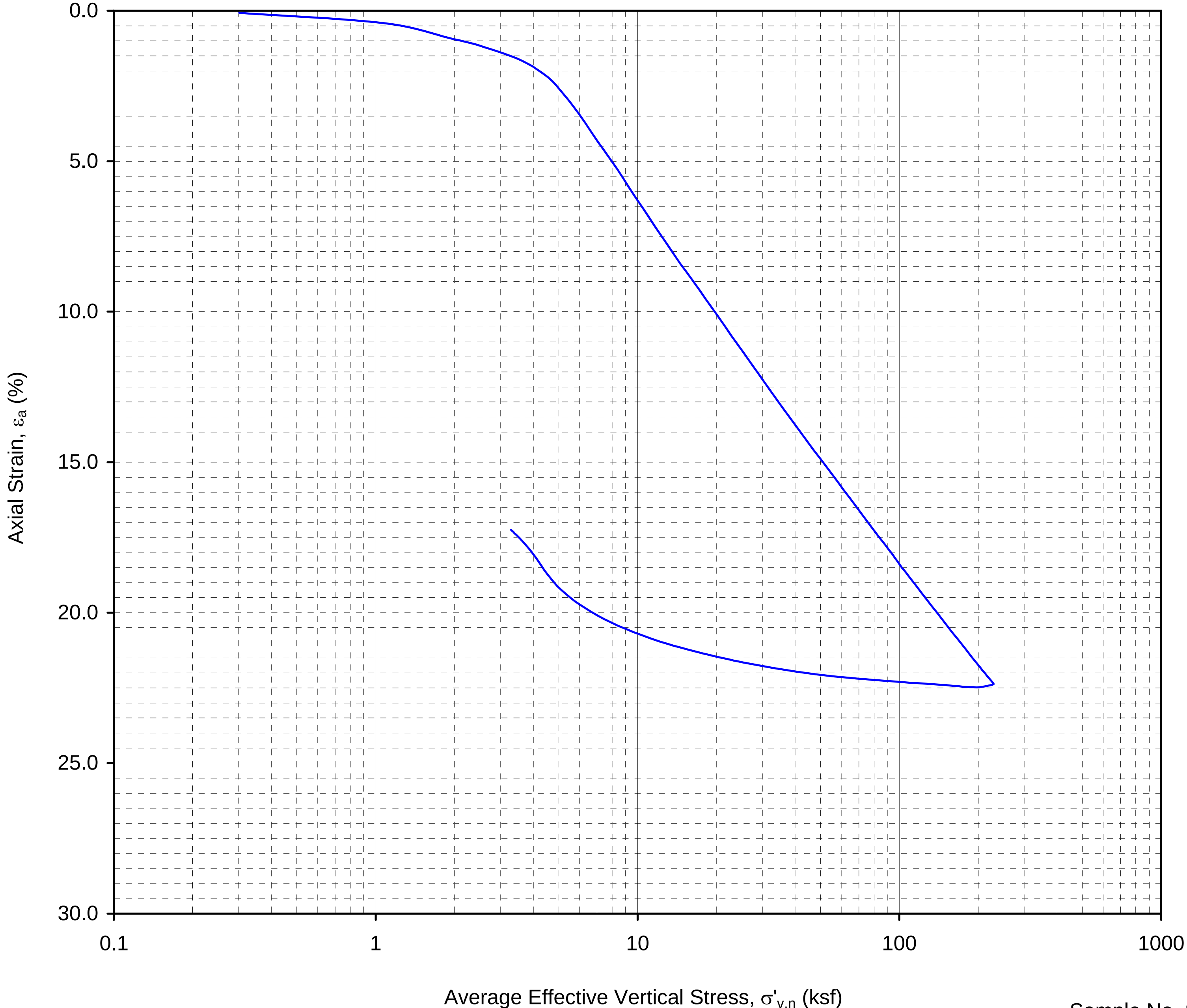
Boring WR0017-207B



1-D CONSOLIDATION TEST: CRS

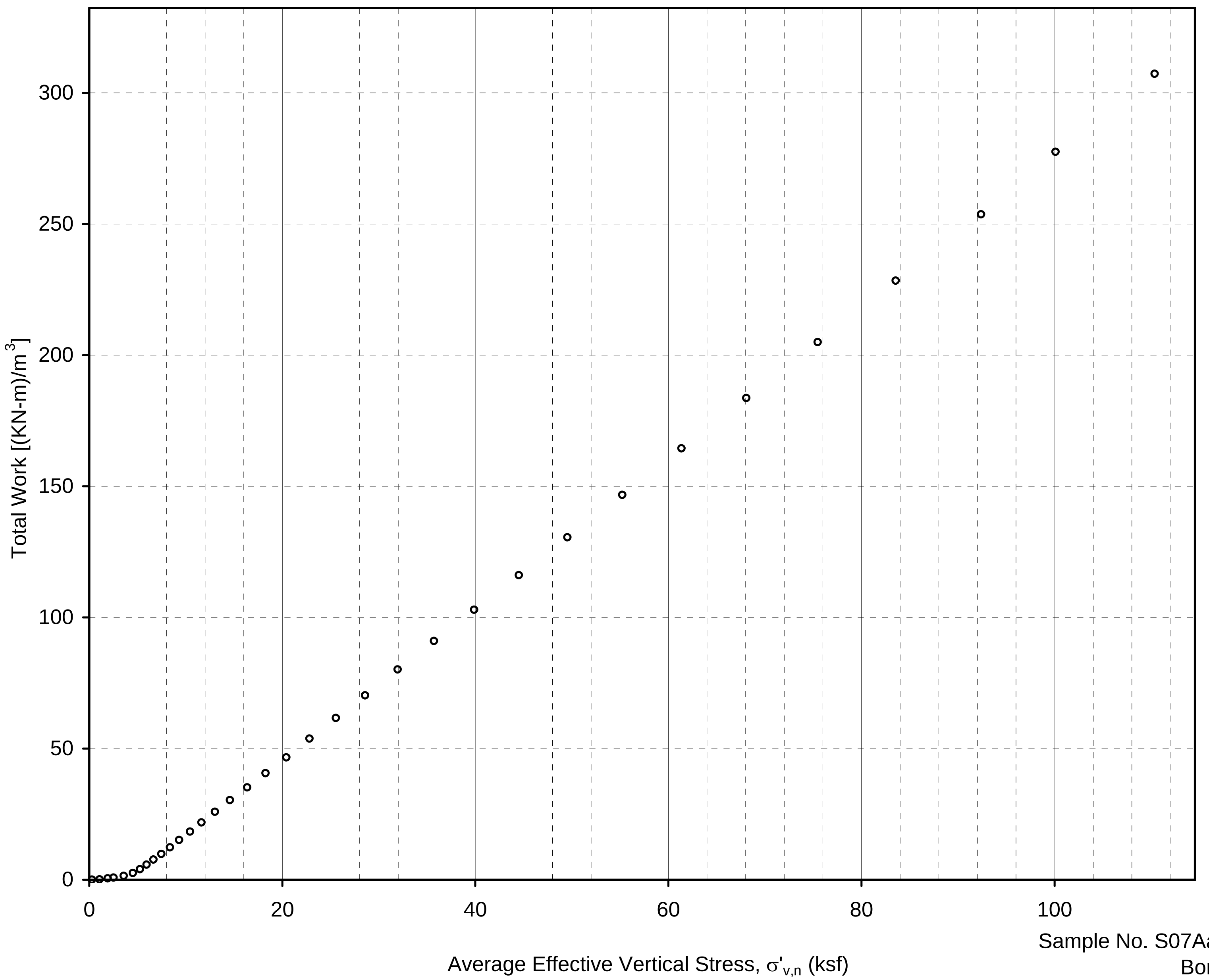
Sample No. S07Aa Depth 19.85 ft

Boring WR0017-207B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07Aa   Depth 19.85



Sample No. S07Aa   Depth 19.85 ft -
Boring WR0017-207B

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056   Test Station No.: CRS-S12   File Name: WR0017-207B_S07Aa

Task No.: NA   Cell No.: CRS-C12

Specific Gravity, G_s: 2.720   [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM	Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial, Top, W1	20.86	62.58	83.0	99.6	102.9
2	" Bottom, W2	21.48	62.27	84.4	101.8	105.1
3	" Sides, W3	21.59	62.21	84.6	102.1	105.5
4	" Average, W4	21.31	62.35	84.0	101.2	104.5
5	" Back Calculated (1)	20.68	62.68 (3)	82.6	99.0	102.3
6	Final	14.86	62.68 (2)	82.6	100.0	103.3

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.709

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.714

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18208
Final Selected, K_f	0.18208

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 62.53

Avg. Back Calculated and Measured Mass Dry Soil (g) = 62.61

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 62.68; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100% — Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.19 [X] Measured ; [ ] Back Calculated   Back-cal. Sat. (%) = NA

Final Height (mm) = 16.03 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	20.7	0.681	82.6	121.7	100.8	11.413	From	To (ksf)
Final	14.9	0.404	100.0	138.6	120.7	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

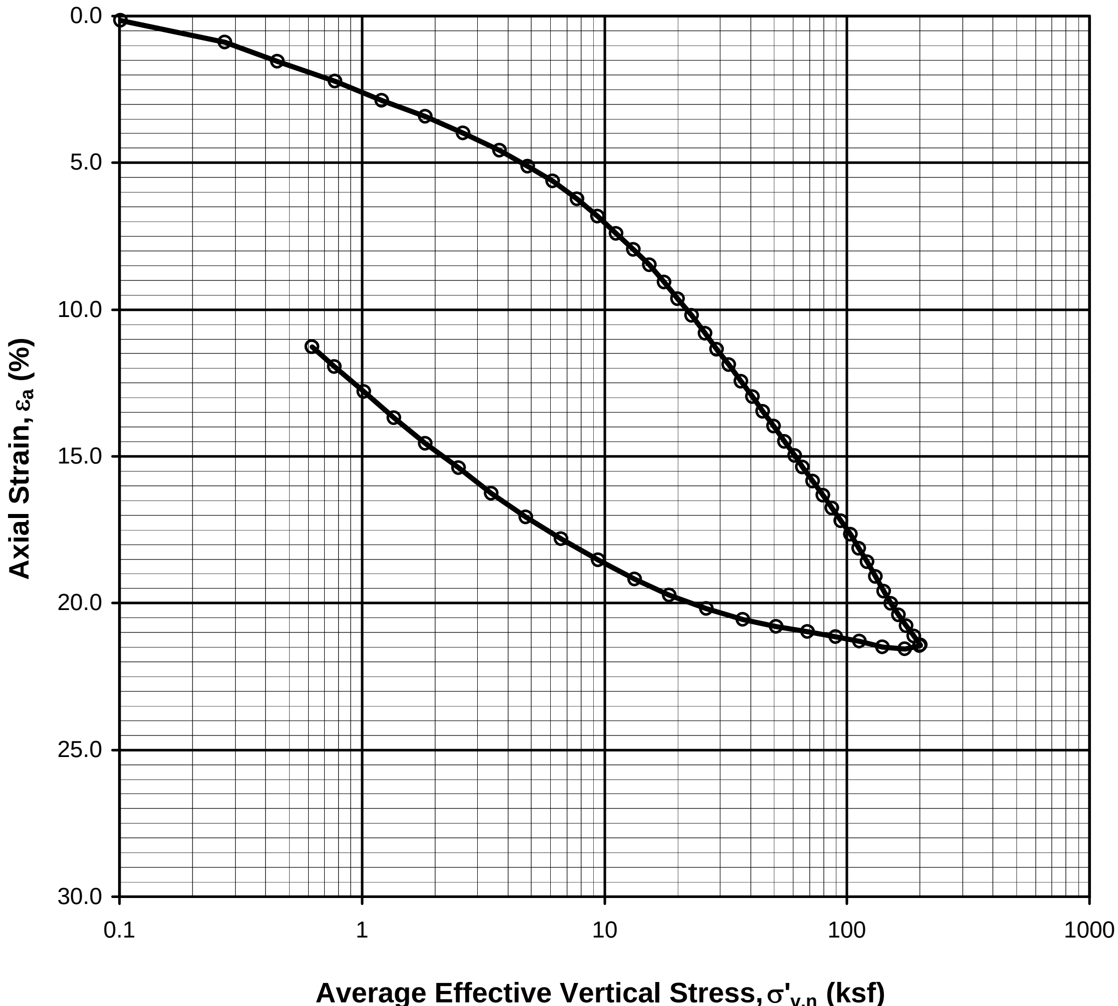
(3) This value is only different from the final value if there is soil extrusion during loading.

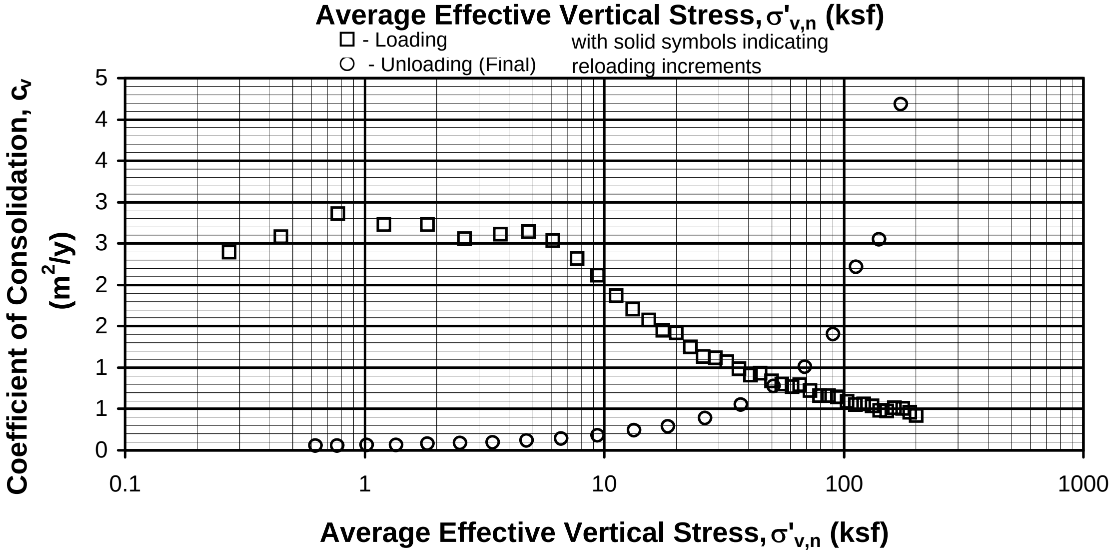
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ   Reviewed By: RJ

Date: 12/11/2012

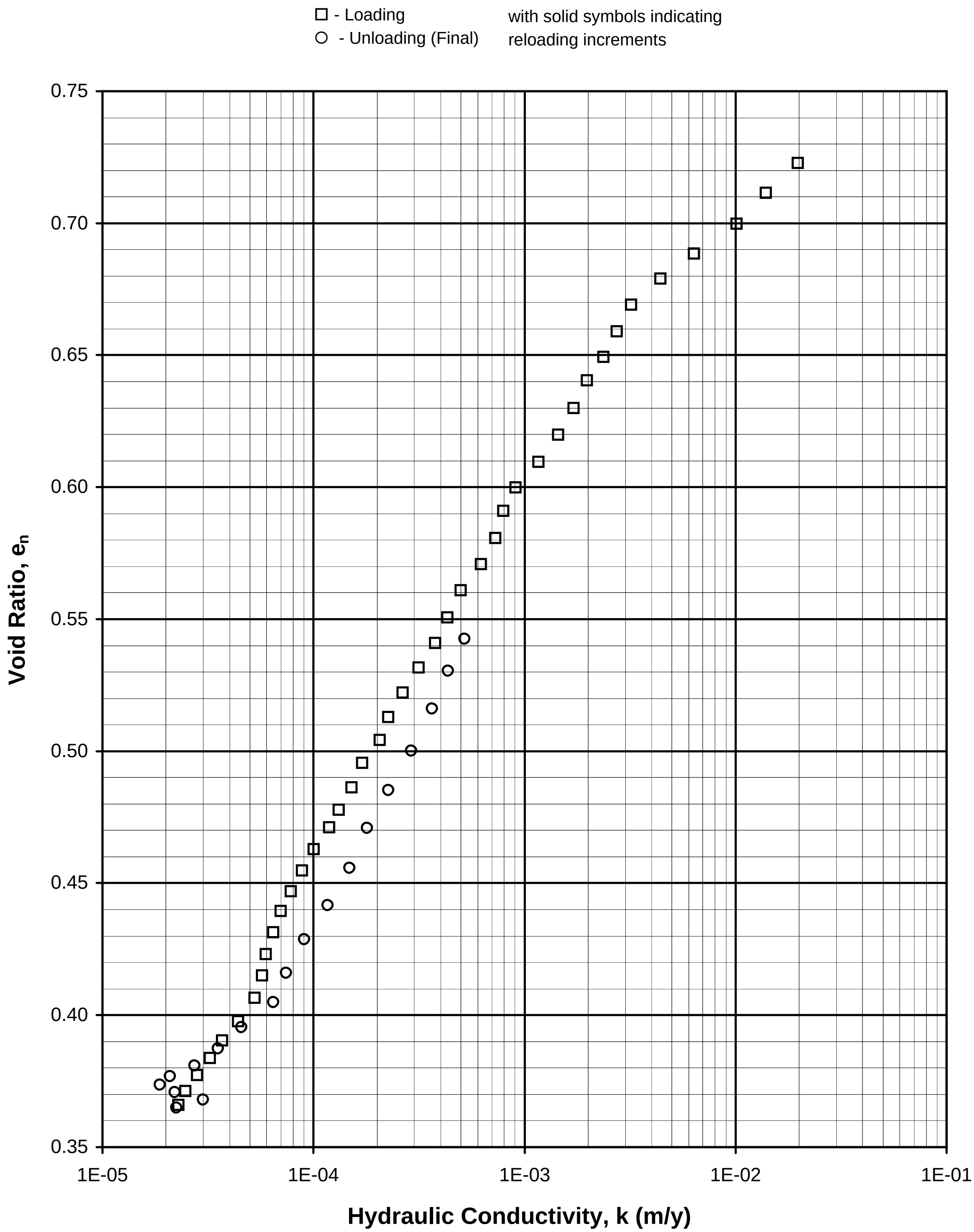




1-D CONSOLIDATION TEST: CRS

Sample No. S10Aa Depth 26.85 ft

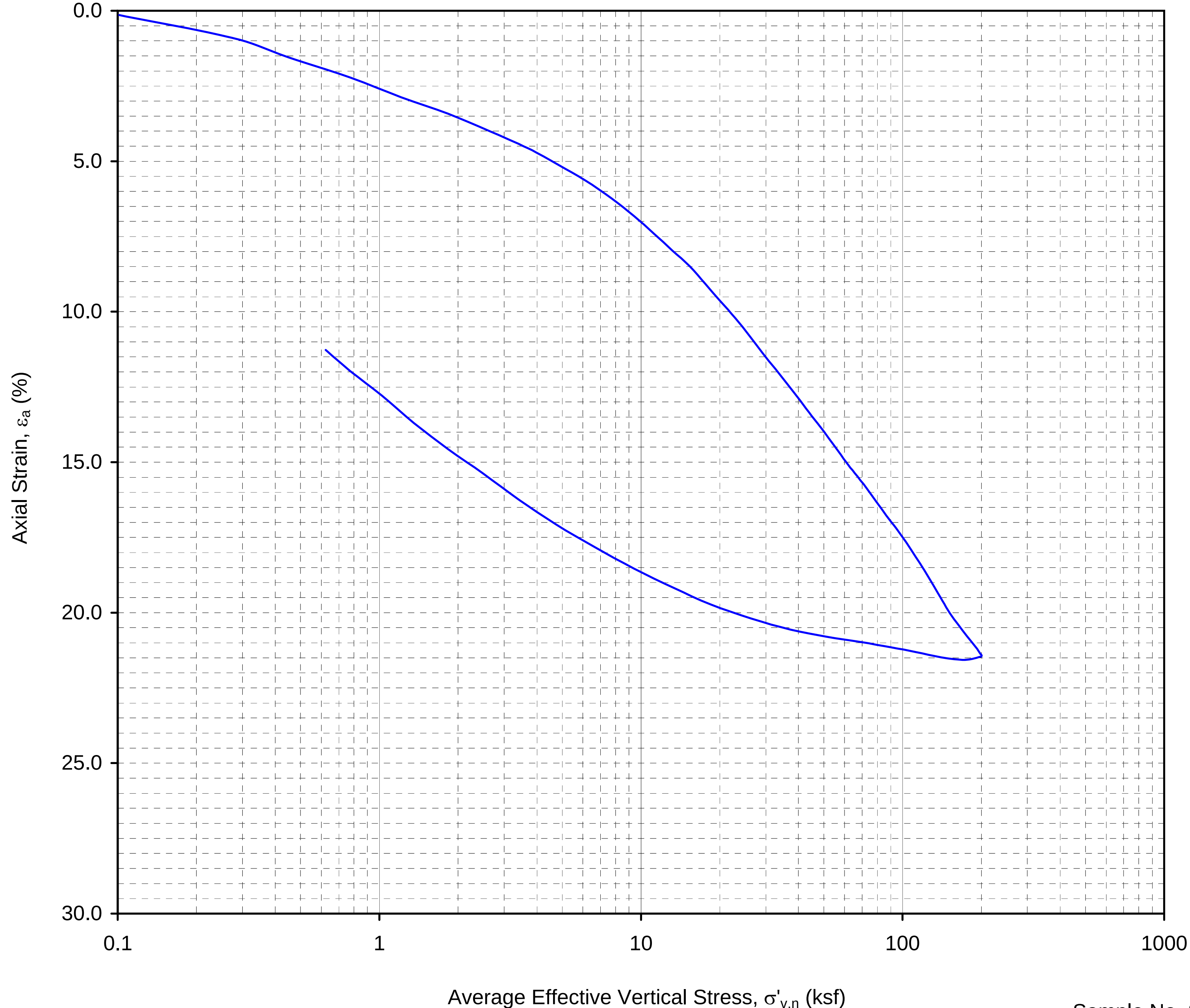
Boring WR0017-207B



1-D CONSOLIDATION TEST: CRS

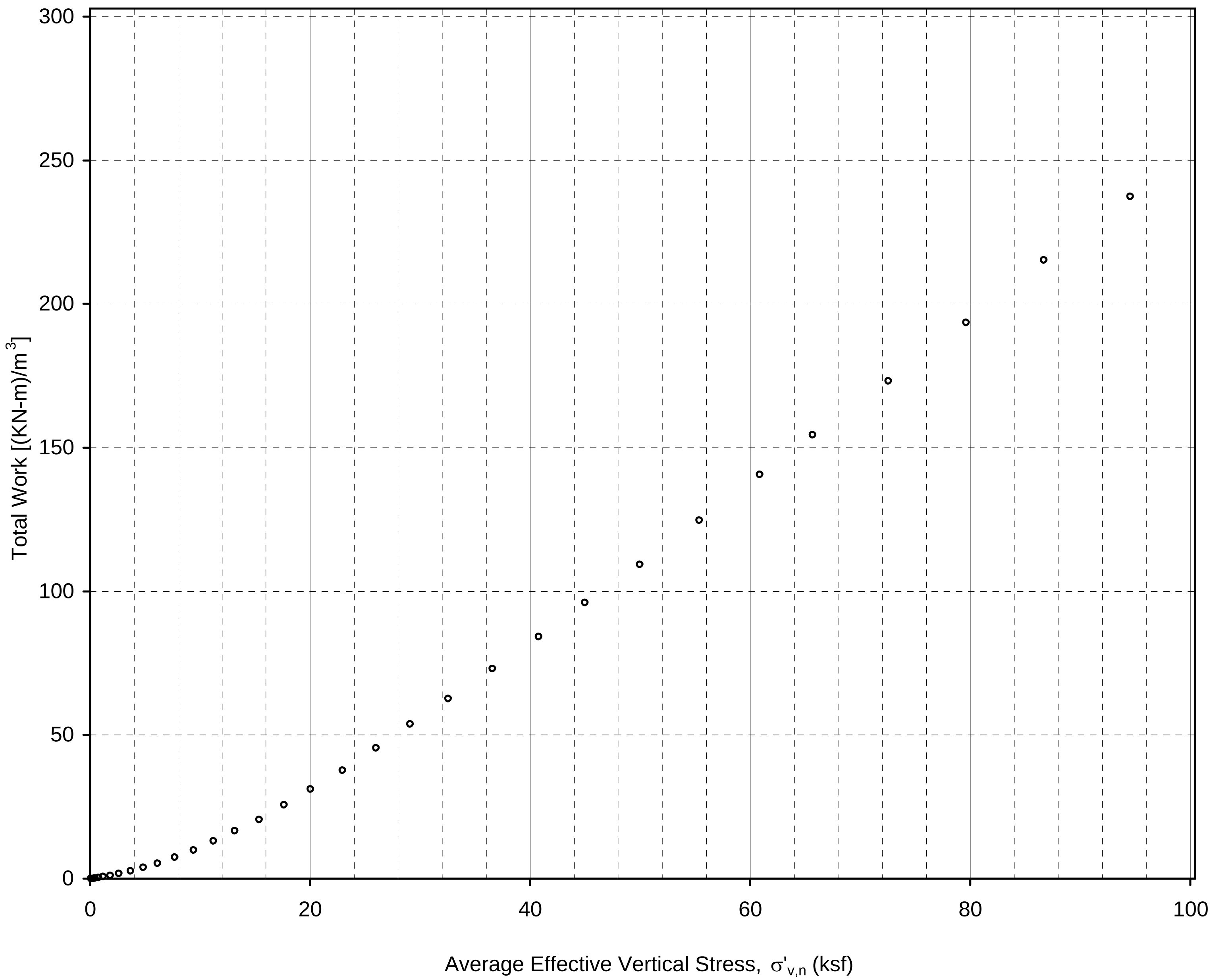
Sample No. S10Aa Depth 26.85 ft

Boring WR0017-207B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S10Aa   Depth 26.85



Sample No. S10Aa Depth 26.85

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S03 File Name: WR0017-207B_S10Aa

Task No.: NA Cell No.: CRS-C03

Specific Gravity, G_s: 2.750 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	24.91	93.88		92.8	98.7	105.2
2	"	Bottom, W2	24.12	94.47		91.2	96.8	103.2
3	"	Sides, W3	23.76	94.74		90.5	95.9	102.3
4	"	Average, W4	24.26	94.36		91.5	97.1	103.6
5	"	Back Calculated (1)	24.93	93.86	(3)	92.8	98.8	105.3
6	Final		21.03	93.86	(2)	92.8	100.0	106.6

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.731

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.740

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.11512
Final Selected, K_f	0.11512

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 93.49

Avg. Back Calculated and Measured Mass Dry Soil (g) = 93.67

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.750 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 93.86; Final (4): NA — [X] From Cal. Routine No. [5] Note: Routine #5 is based on final measurements. [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 18.78 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 17.05 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	24.9	0.738	92.8	123.2	98.6	10.805	From	To (ksf)
Final	21.0	0.578	100.0	131.4	108.6	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

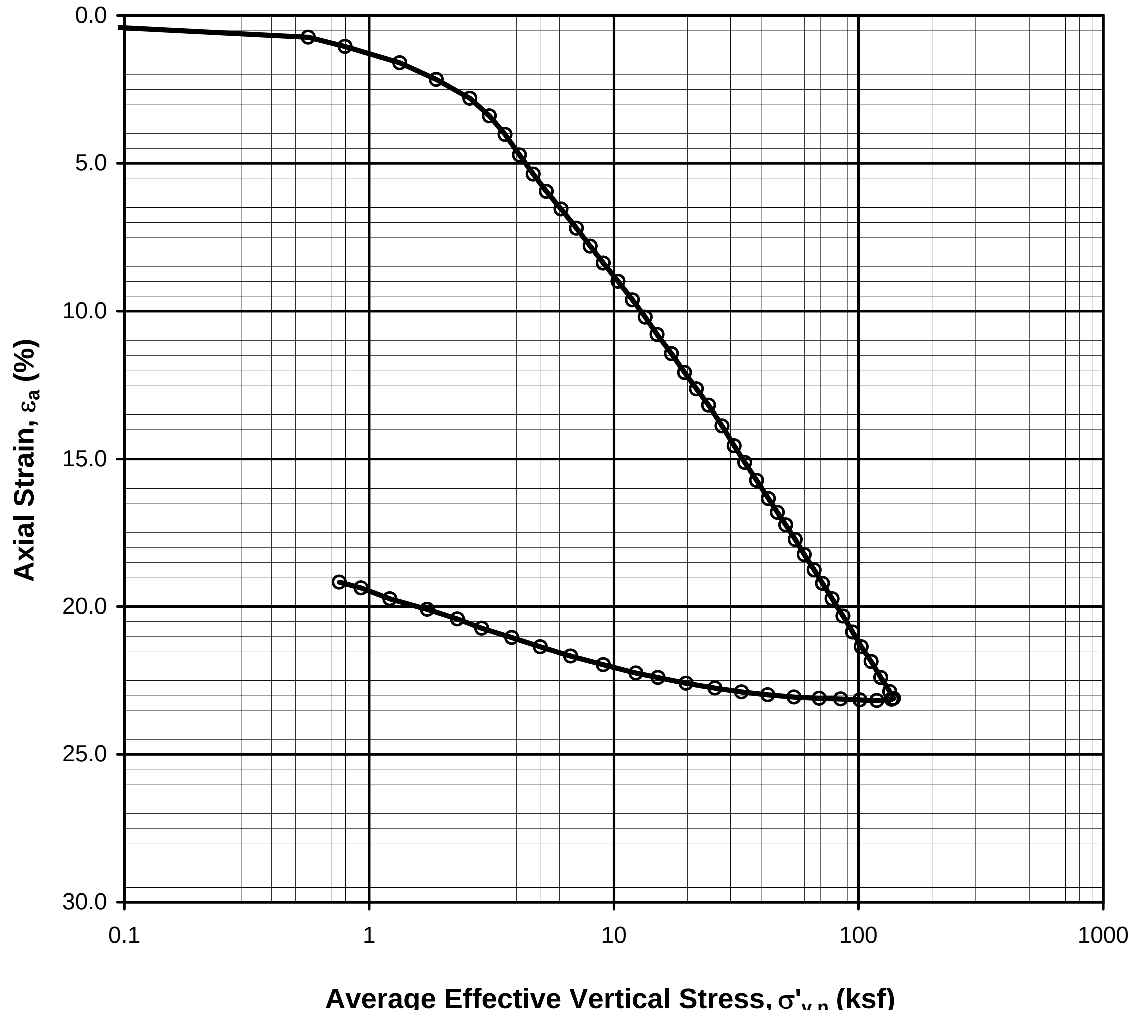
(3) This value is only different from the final value if there is soil extrusion during loading.

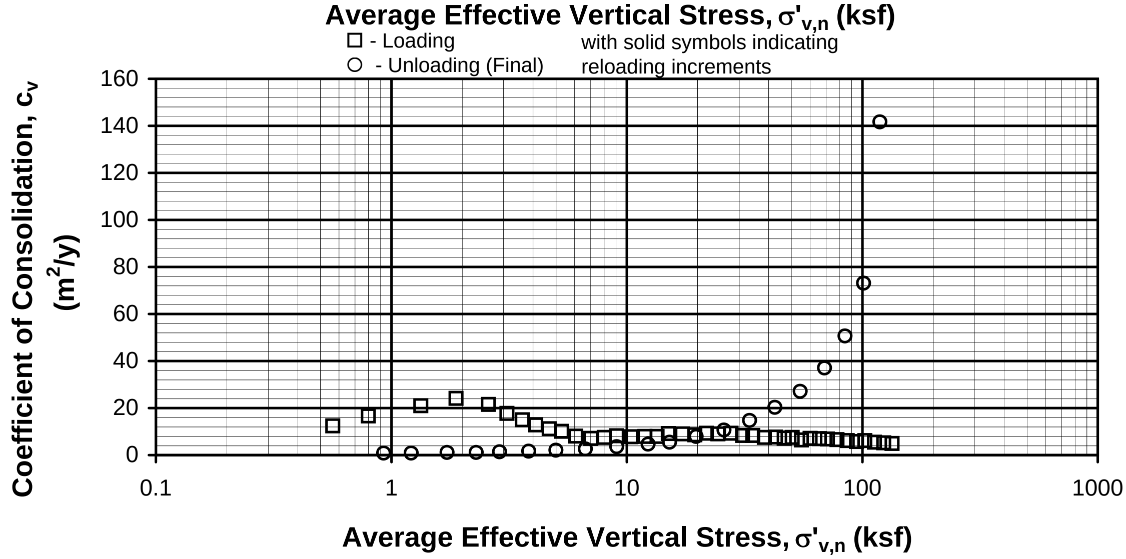
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/28/2012

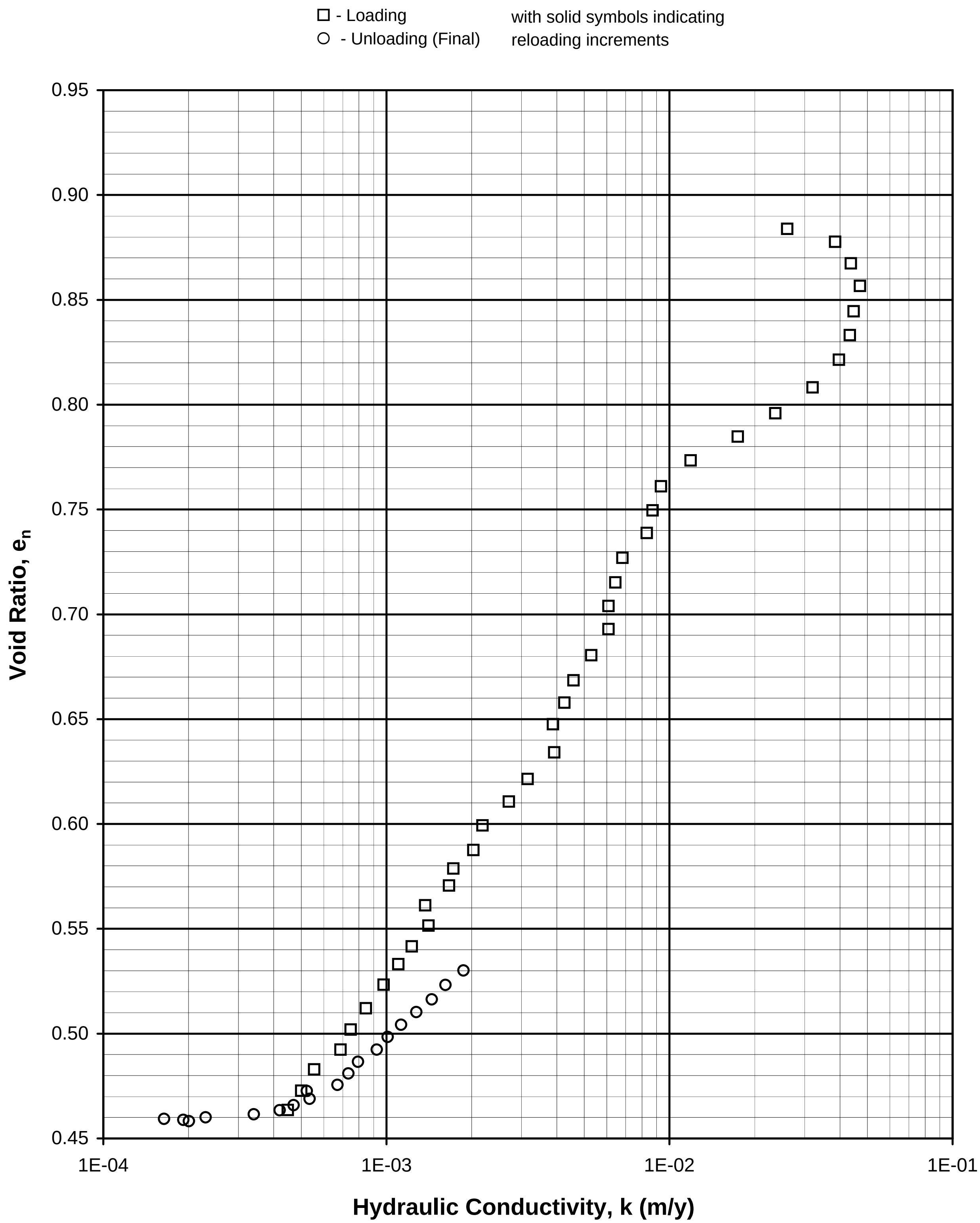




1-D CONSOLIDATION TEST: CRS

Sample No. S07b Depth 20.7 ft

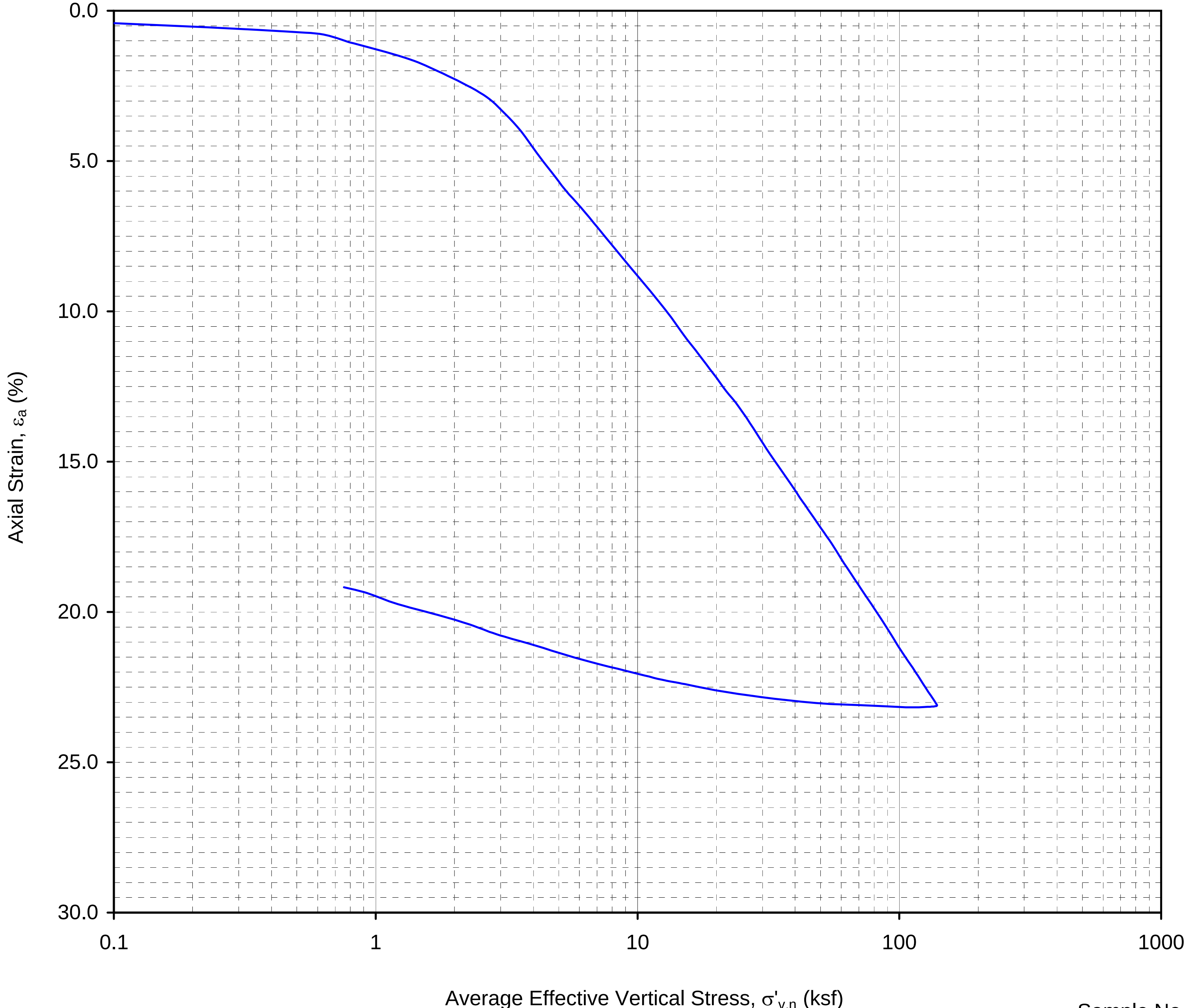
Boring WR0017-210B



1-D CONSOLIDATION TEST: CRS

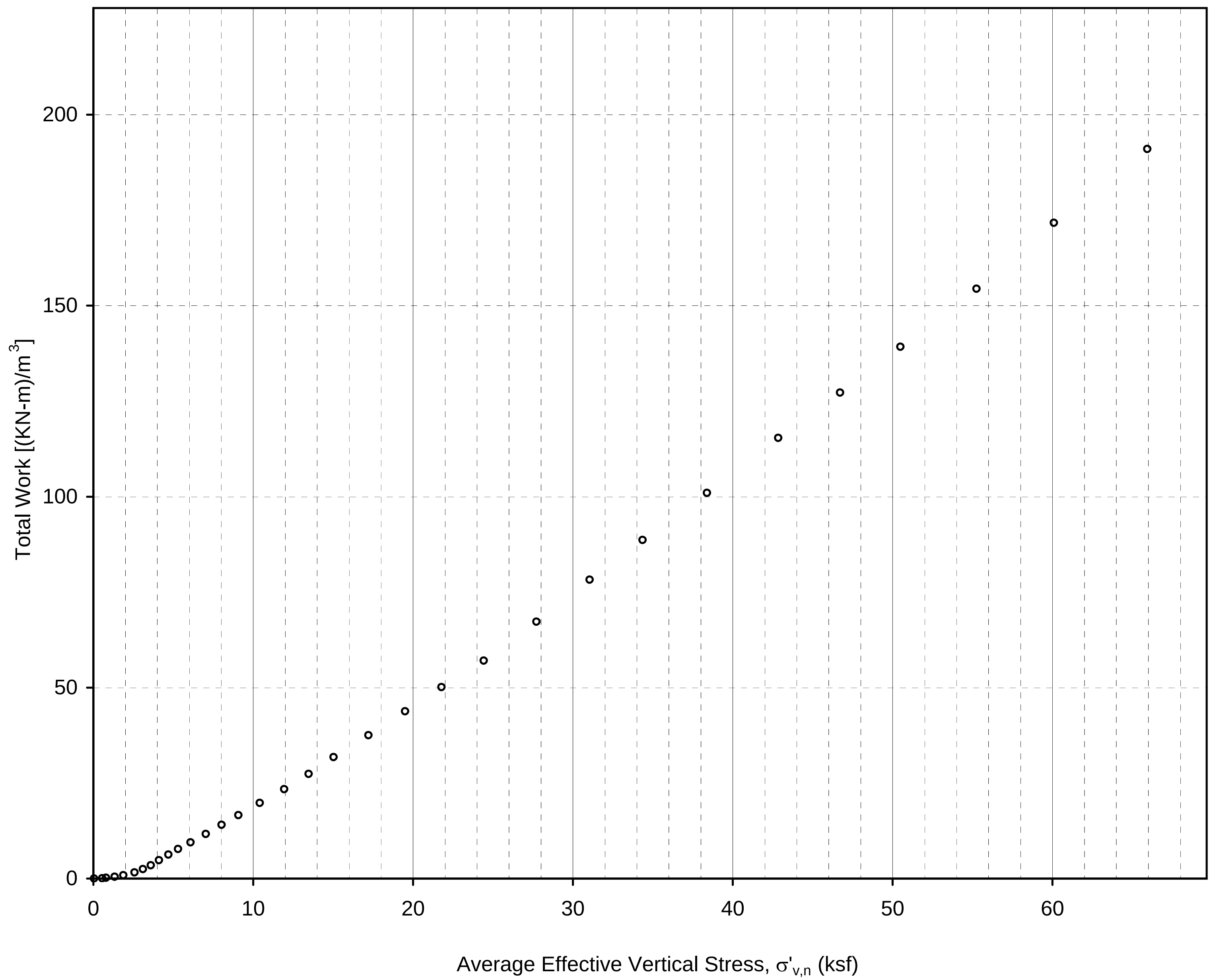
Sample No. S07b Depth 20.7 ft

Boring WR0017-210B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07b   Depth 20.7 ft



Sample No. S07b   Depth 20.7 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S04 File Name: WR0017-210B_S07b

Task No.: NA Cell No.: CRS-C04

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	26.68	55.21		80.3	99.0	101.2
2	"	Bottom, W2	26.65	55.22		80.3	99.0	101.2
3	"	Sides, W3	27.14	55.01		81.1	100.2	102.4
4	"	Average, W4	26.83	55.15		80.5	99.4	101.6
5	"	Back Calculated (1)	26.73	55.19	(3)	80.4	99.1	101.4
6	Final		20.26	55.19	(2)	80.4	100.2	102.5

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.688

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.694

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18359
Final Selected, K_f	0.18359

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 55.04

Avg. Back Calculated and Measured Mass Dry Soil (g) = 55.11

Summary of Specimen Physical Properties

Specific Gravity		[X] Assumed	[ ] To make S_f = 100% at end of test.
G_s =	2.700	[ ] Measured	[ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g)	Initial: 55.19	[X] From Cal. Routine No.	[5] Note: Routine #5 is based on final measurements.
	Final (4): NA	[ ] Make S_f = 100%, or;	[ ] Avg. of measured & make S_f = 100%

Initial Height (mm) =	19.23	[X] Measured ;	[ ] Back Calculated	Back-cal. Sat. (%) = NA
Final Height (mm) =	15.66	[X] Measured ;	[ ] Initial H_o & dial change during loading	

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	26.7	0.898	80.4	112.4	88.7	10.132	From	To (ksf)
Final	20.3	0.546	100.2	130.9	108.8	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

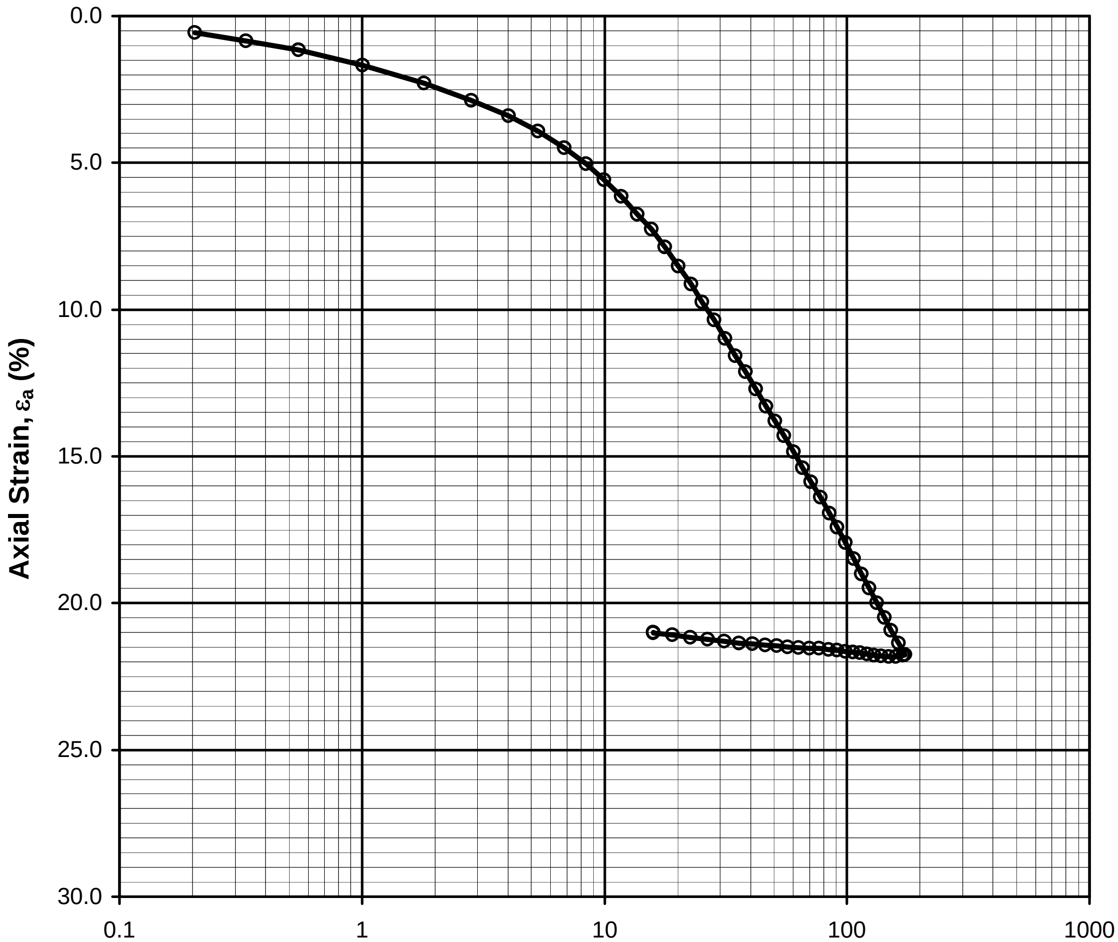
(3) This value is only different from the final value if there is soil extrusion during loading.

(4) Final is only different from the initial value if there is soil extrusion during loading.

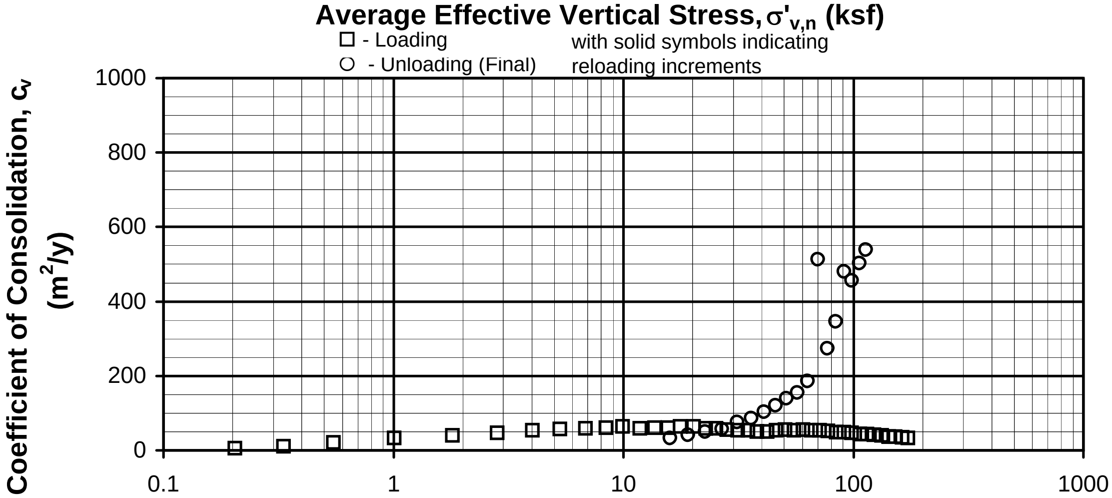
(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 10/19/2012



Average Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)

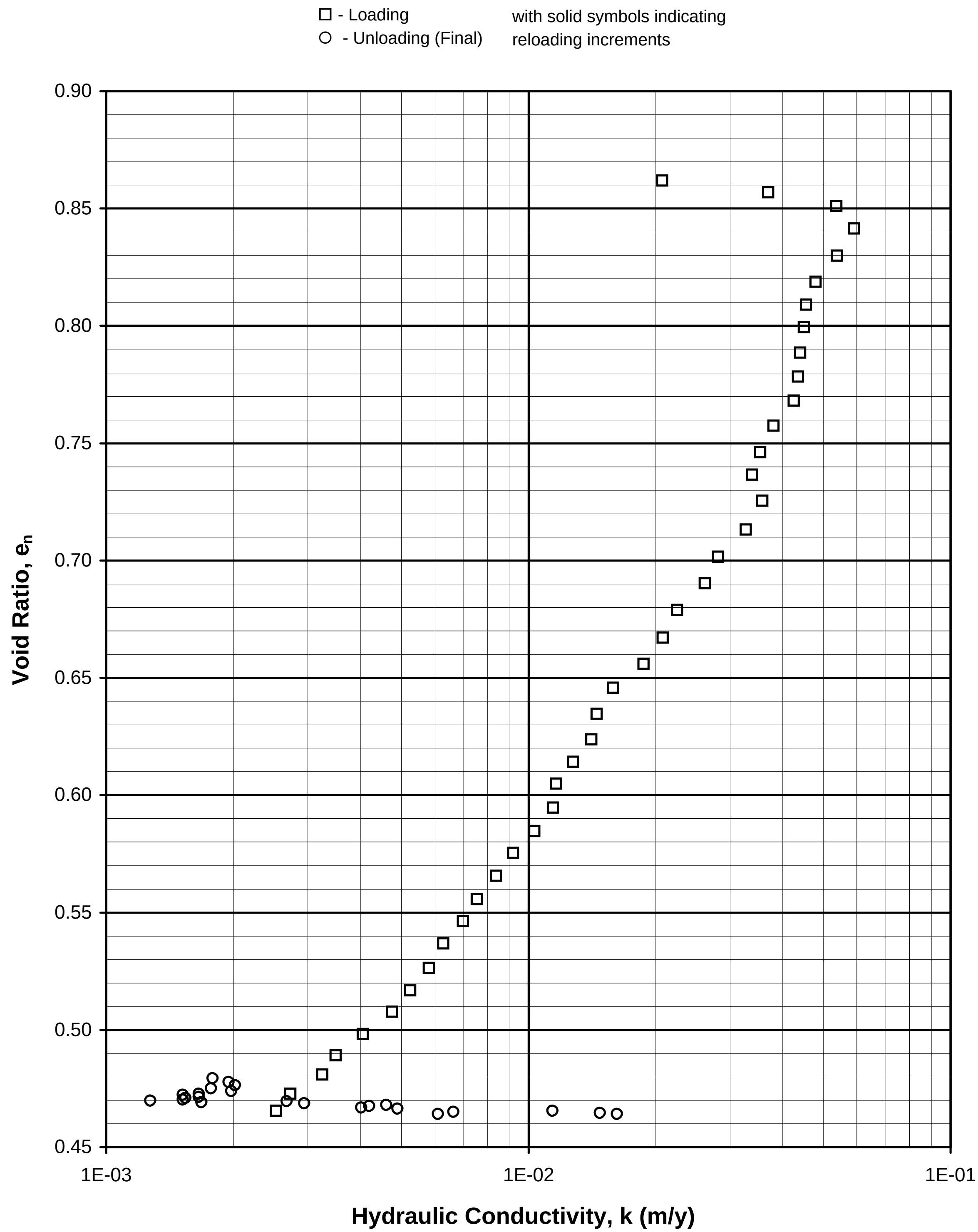


Average Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)

1-D CONSOLIDATION TEST: CRS

Sample No. S07Aa Depth 31.2 ft

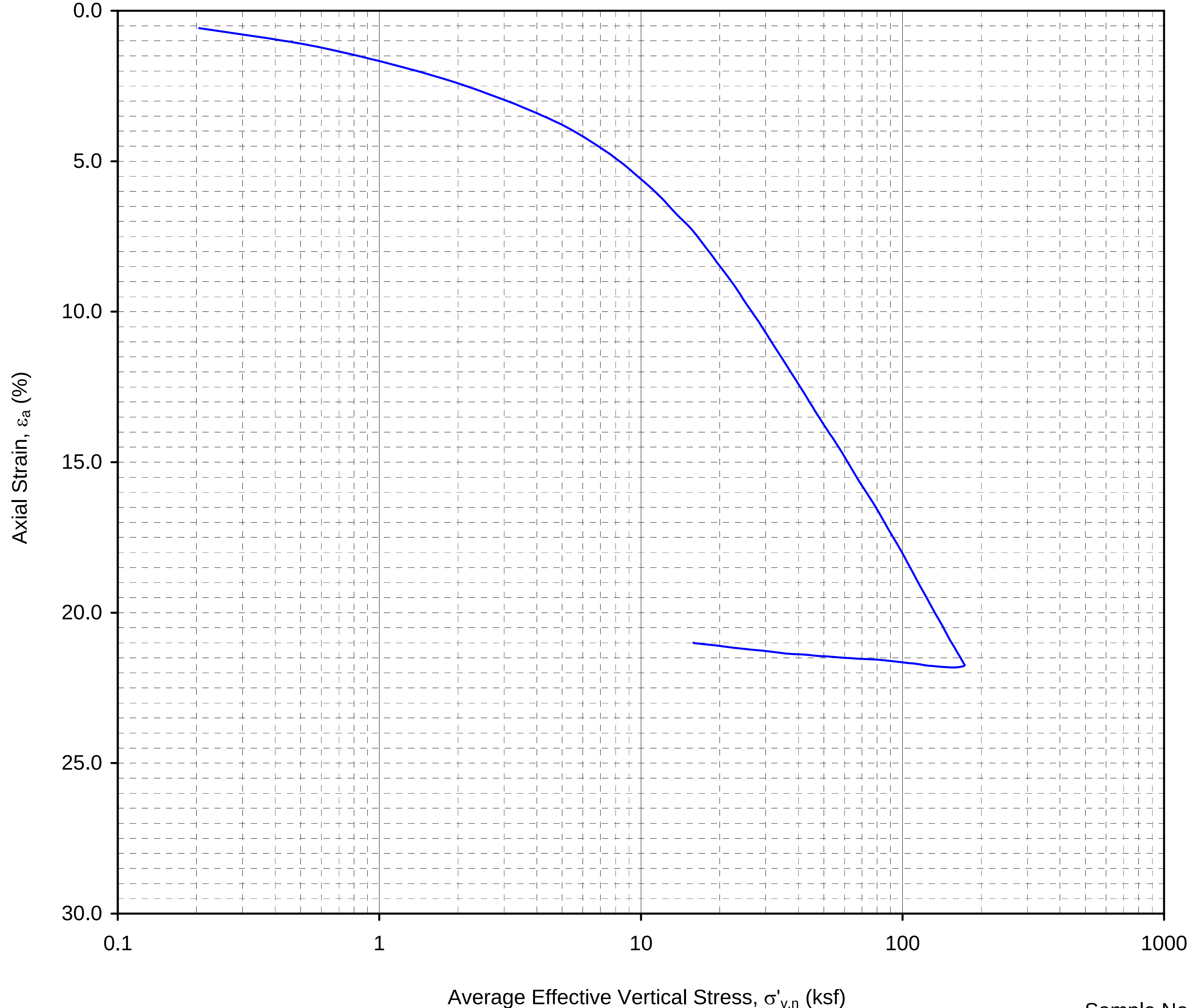
Boring WR0017-213B



1-D CONSOLIDATION TEST: CRS

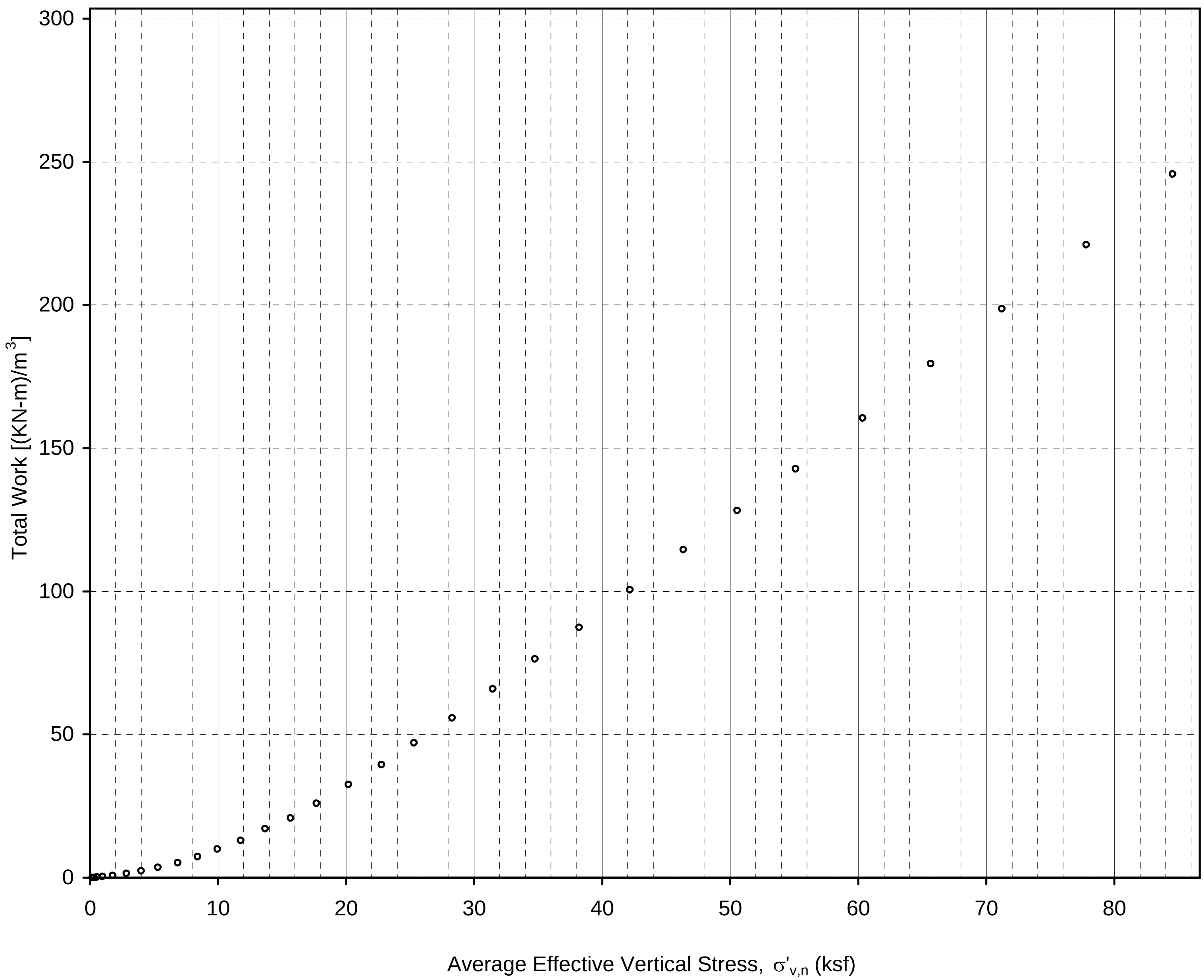
Sample No. S07Aa Depth 31.2 ft

Boring WR0017-213B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07Aa Depth 31.2



Sample No. S07Aa   Depth 31.2 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S03 File Name: WR0017-213B_S07Aa

Task No.: NA Cell No.: CRS-C03

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	31.76	86.78		97.9	99.7	107.2
2	"	Bottom, W2	31.79	86.77		97.9	99.8	107.3
3	"	Sides, W3	30.96	87.32		96.7	97.7	105.1
4	"	Average, W4	31.50	86.96		97.5	99.1	106.5
5	"	Back Calculated (1)	31.52	86.95	(3)	97.5	99.1	106.6
6	Final		19.09	86.95	(2)	97.5	100.0	107.5

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.688

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.694

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.11702
Final Selected, K_f	0.11702

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 86.71

Avg. Back Calculated and Measured Mass Dry Soil (g) = 86.83

Summary of Specimen Physical Properties

Specific Gravity	X	Assumed		To make S_f = 100% at end of test.
G_s = 2.700		Measured		Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g)	Initial: 86.95	X	From Cal. Routine No.	5	Note: Routine #5 is based on final measurements.
	Final (4): NA		Make S_f = 100%, or;		Avg. of measured & make S_f = 100%

Initial Height (mm) =	19.05	X	Measured ;		Back Calculated Back-cal. Sat. (%) = NA
Final Height (mm) =	15.42	X	Measured ;		Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	31.5	0.873	97.5	118.2	89.8	10.175	From	To (ksf)
Final	19.1	0.516	100.0	132.2	111.0	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

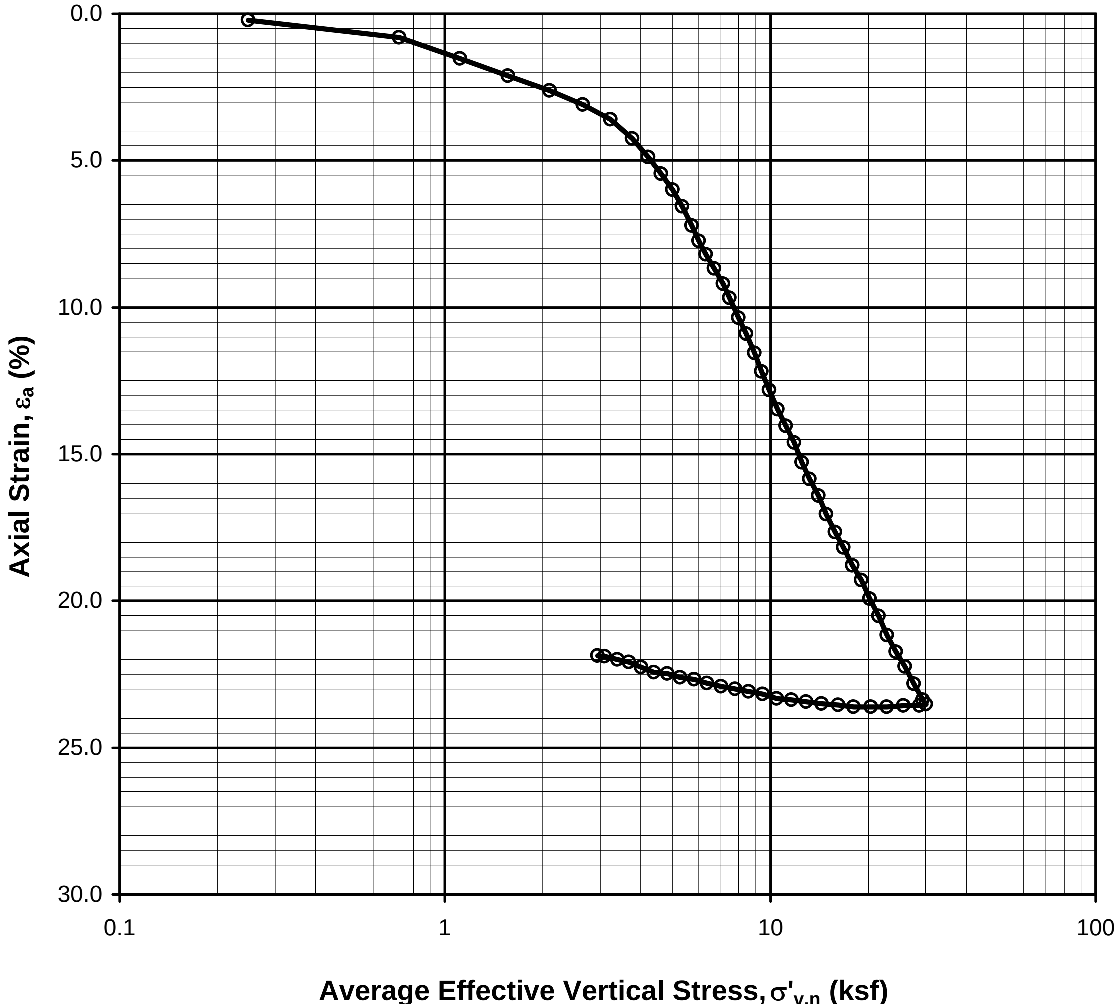
(3) This value is only different from the final value if there is soil extrusion during loading.

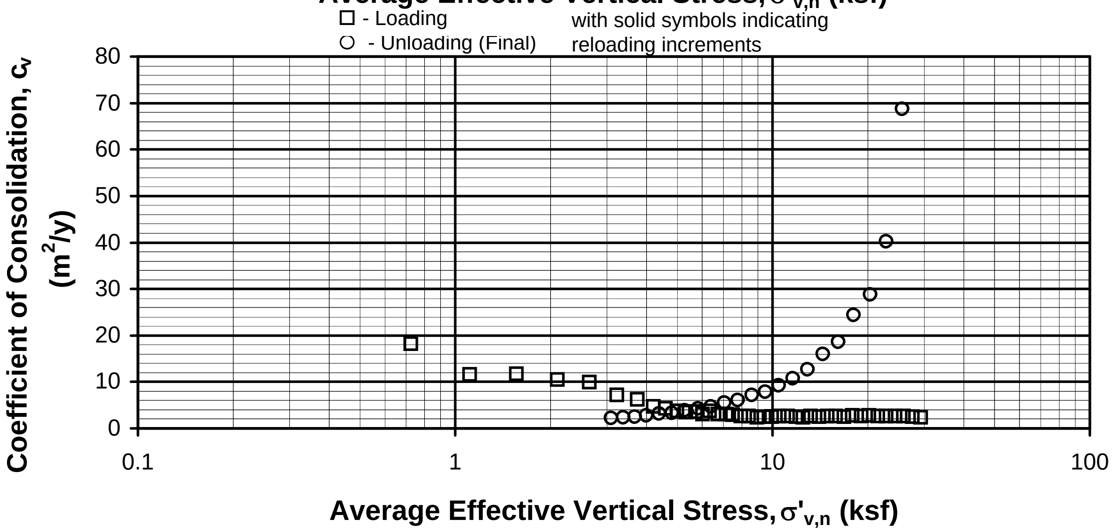
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: TM Reviewed By: RJ

Date: 2/18/2013

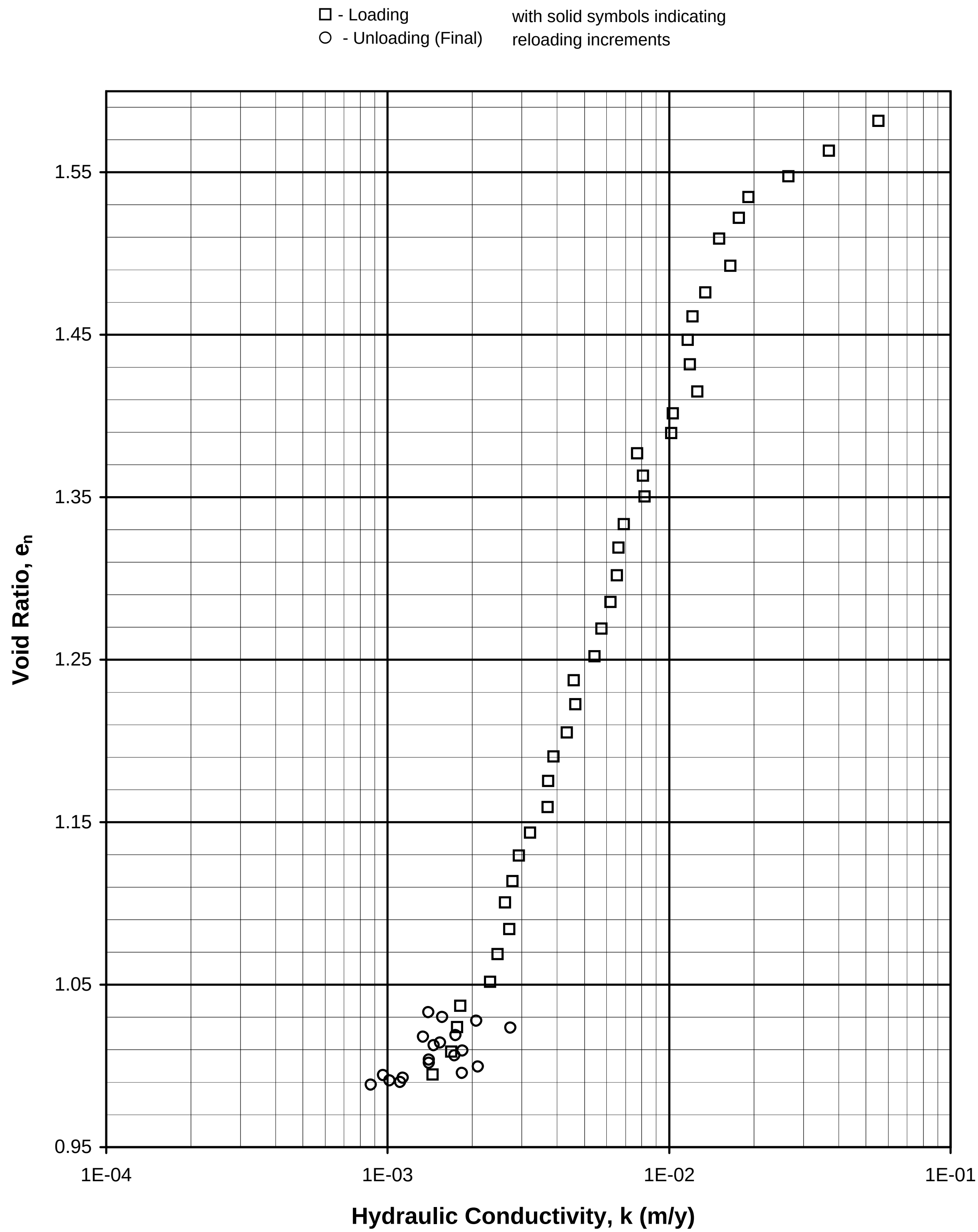




1-D CONSOLIDATION TEST: CRS

Sample No. S09Aa Depth 40.6 ft

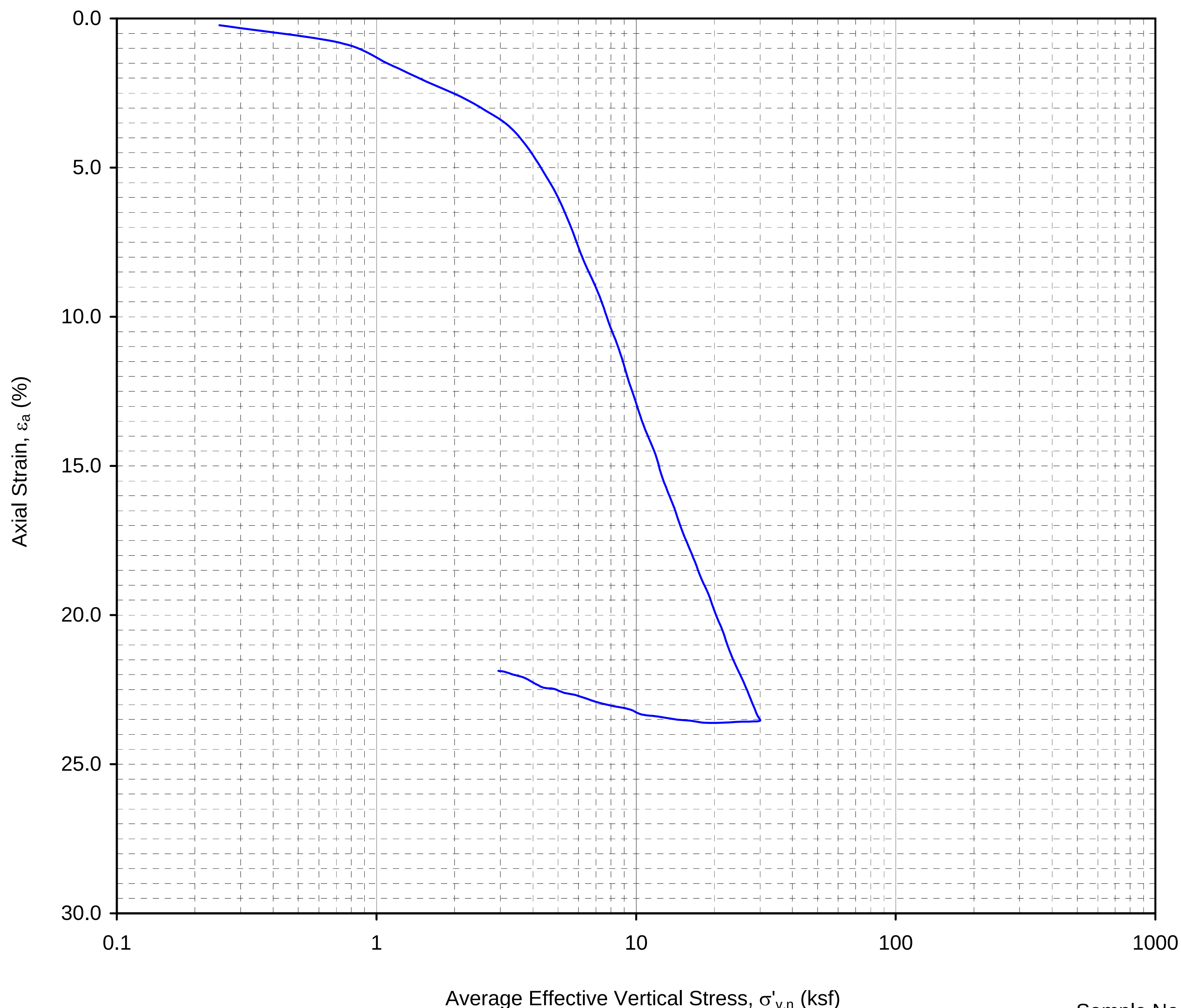
Boring WR0017-213B



1-D CONSOLIDATION TEST: CRS

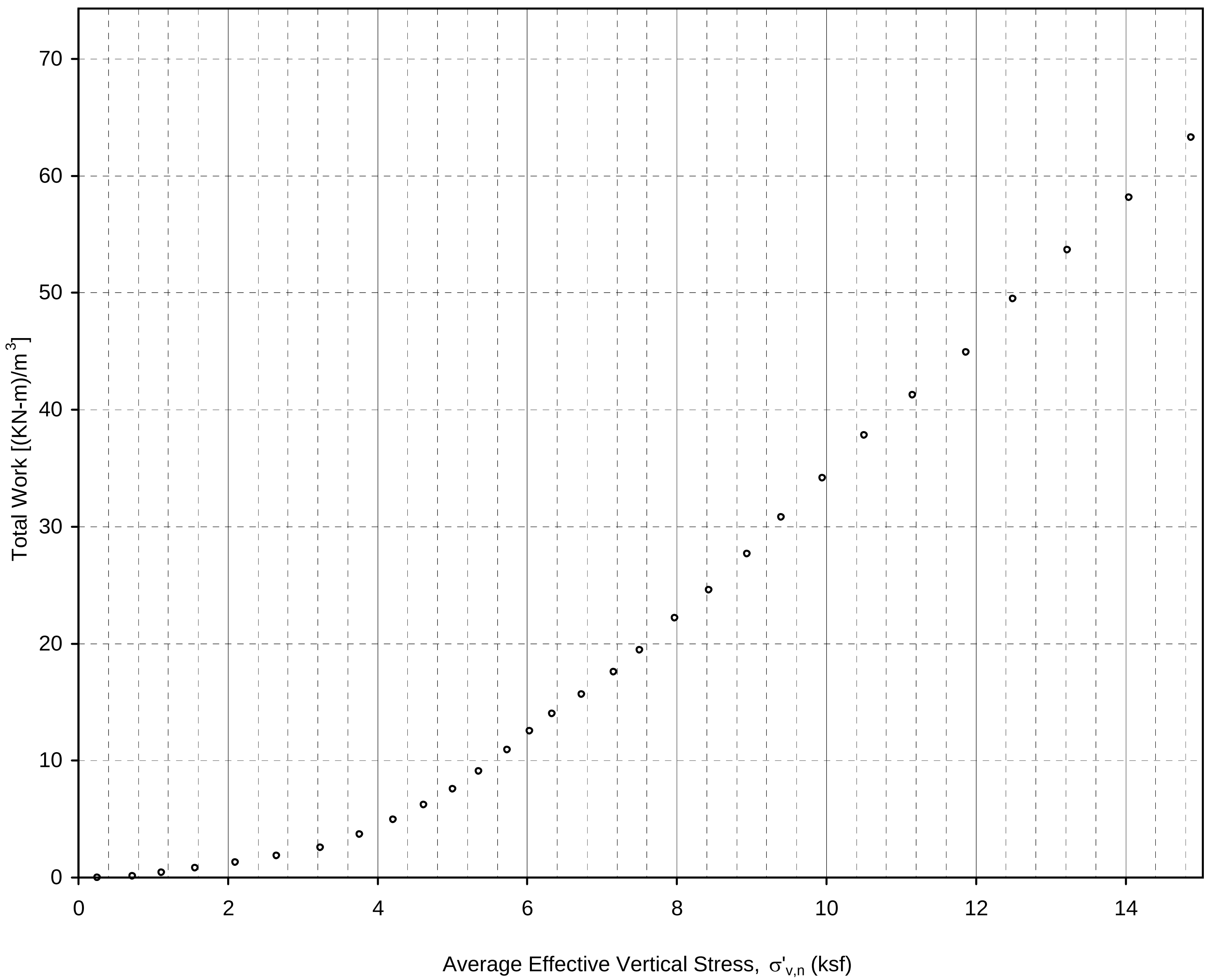
Sample No. S09Aa   Depth 40.6 ft

Boring WR0017-213B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S09Aa   Depth 40.6



Sample No. S09Aa   Depth 40.6

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S15 File Name: WR0017-213B_S09Aa

Task No.: NA Cell No.: CRS-C15

Specific Gravity, G_s: 2.750 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	53.32	64.26		94.5	96.6	102.0
2	"	Bottom, W2	51.69	64.95		93.2	94.7	100.1
3	"	Sides, W3	49.52	65.89		91.5	92.1	97.4
4	"	Average, W4	51.51	65.03		93.1	94.5	99.9
5	"	Back Calculated (1)	56.38	63.00	(3)	96.7	99.8	105.3
6	Final		39.67	63.00	(2)	96.7	100.0	105.6

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.745

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.747

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.11477
Final Selected, K_f	0.11477

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 62.93

Avg. Back Calculated and Measured Mass Dry Soil (g) = 62.97

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.750 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 63.00; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%. Note: Routine #5 is based on final measurements.

Initial Height (mm) = 18.82 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 15.12 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	56.4	1.603	96.7	103.0	65.8	7.231	From	To (ksf)
Final	39.7	1.091	100.0	114.5	82.0	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

(3) This value is only different from the final value if there is soil extrusion during loading.

(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/19/2012

Project Number: 04-11120056 Test Station No.: CRS-S15 [X] Intact or ; [ ] Reconstituted - Specimen File Name: WR0017-213B_S09Aa

Task No.: NA Cell No.: CRS-C15 Back Pressure, $U_{b,CS}$ (ksf): 10.0 Piston Uplift, P_{up} (lbf): 31.90

Project Name: NA Date; Start: 11/12/2012

Completed: 11/16/2012 Data Corrected for Salt (dissolved solids) [X] No or [ ] Yes, with Concentration = ________ g/kg (ppt)

Final Description of Specimen: Clay olive gray, with organic deposits, slickensided, mudstones

		Ring No.: 1	Area, A_r (cm^2): 31.741	Solids Ht., H_s (mm): 7.231	Specific Gravity, G_s = 2.750 [ ] Meas. ; [X] Assumed
Initial:	Height	H_o: 18.82	Water 56.4	Void 1.603	Deg. of 96.7	Total Unit 103.0	Dry Unit 65.8
Final:	(mm):	H_f: 15.12	Content, w (%): 39.7	Ratio, e: 1.091	Sat., S (%): 100.0	Weight, γ_t (pcf): 114.5	Weight, γ_d (pcf): 82.0

Notes:
(1) S - Seating, SB - Start of Back Pressure, EB - End of Back Pressure, SL - Start of Loading at CRS, SU - Start of Unloading at CRS, SH - Start of Holding Stress ("Constant" Load),
(2) Excess pore-water pressure measured at the base of the specimen.
(3) Only applicable during stress controlled (SC) loading.

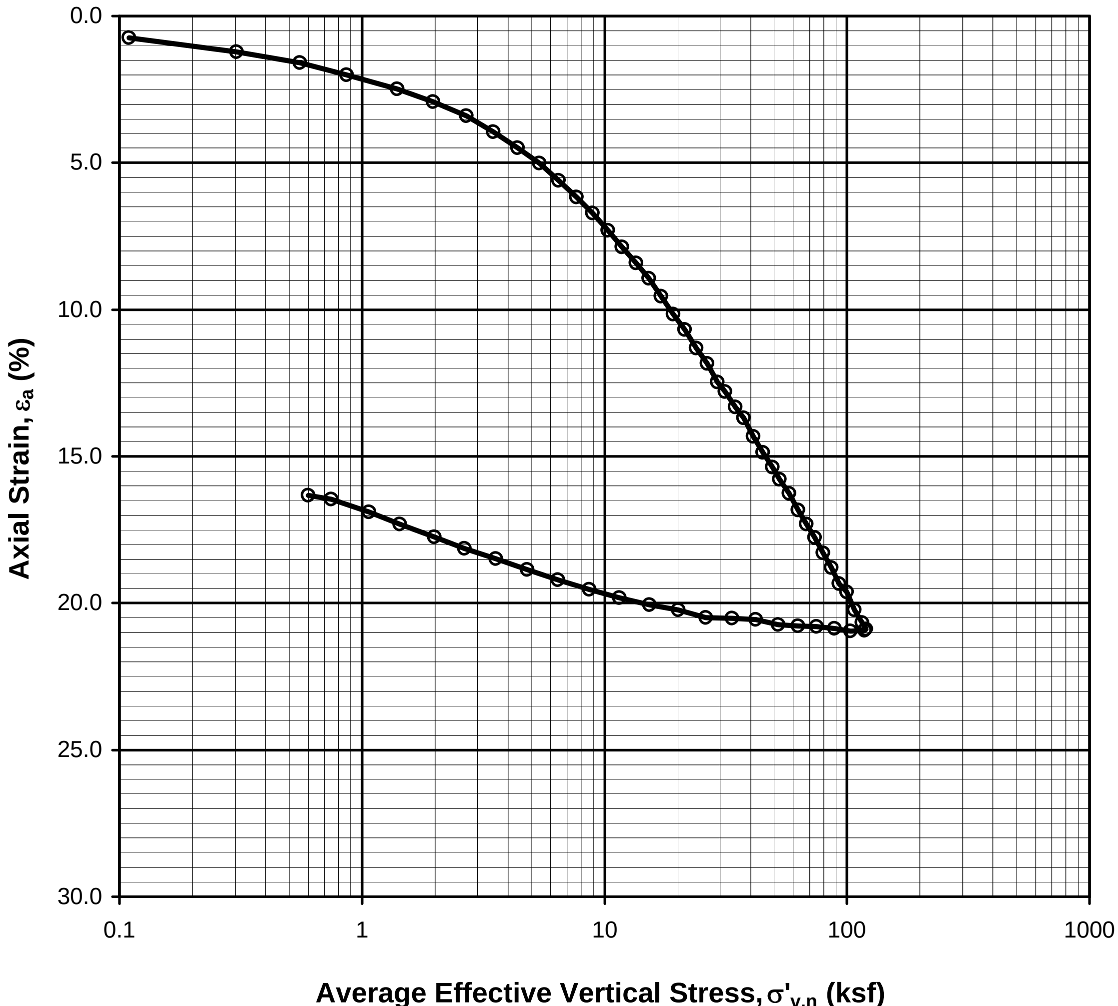
Graphical Construction	σ'_p (ksf)	ε_a (%)	CR	RR	SR	Liquid Limit (LL)	64
Casagrande Method						Plastic Limit (PL)	28
Becker Method						Plasticity Index (PI)	36

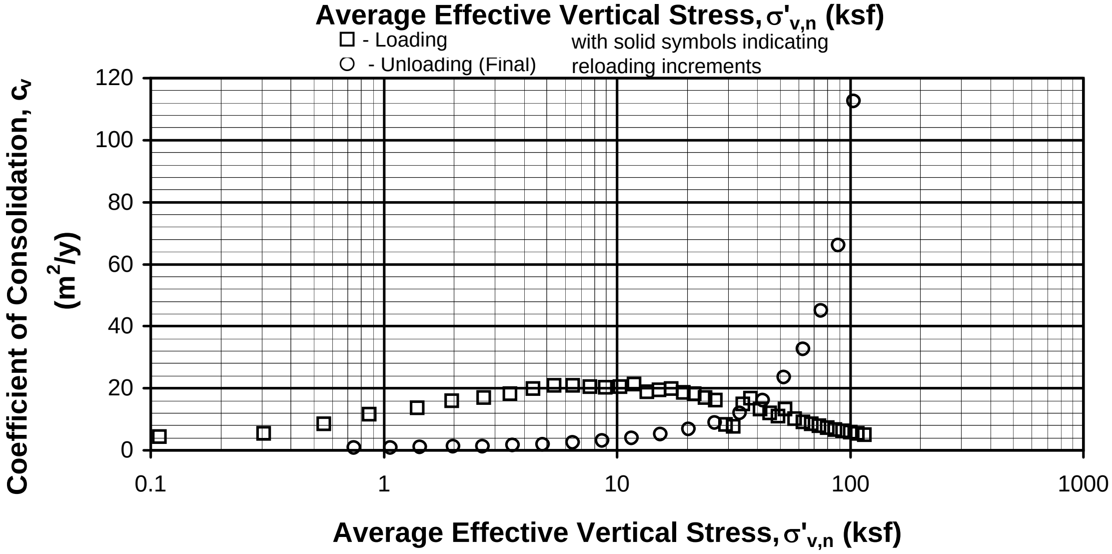
Conversion Factors: c_v in m^2/y x 3.169x10^{-4} = cm^2/s
m_v in ft^2/lbf x 20.8855 = m^2/kN
k in m/y x 3.169x10^{-6} = cm/s

**Note*: Values shown in italics are approximate due to transient conditions (i.e. F_n<0.4)

Data Management by: JJ Reviewed By: RJ

Load-ing Info. (1)	Elapsed Time from Start of Loading, Δt_n (min)	Average Effective Vertical Stress*, $\sigma'_{v,n}$ (ksf)	Corrected Volumetric (Axial) Strain, $\varepsilon_{v,n}$ ($\varepsilon_{ac,n}$) $\Delta H_{c,n}/H_o$ (%)	Void Ratio, e_n	Total Axial Stress, $\sigma_{a,n}$ (ksf)	Chamber Pressure, $\sigma_{c,n}$ (ksf)	Base Excess Pressure, $\Delta u_{m,n}$ (2) (ksf)	Loading Pore-Water Pressure Ratio, R_u $\Delta u_{m,n}/\sigma_{a,n}$ (%)	Corrected Specimen Height, $H_{c,n}$ (mm)	Calculations Between n+1 and n-1: Strain Rate $\varepsilon_{a,rate}$ (%/hr)	Coefficient of Consolidation, c_v (m^2/y)	Volume Compress-ibility m_v (ft^2/lbf)	Hydraulic Conductivity, k (m/y)	Steady State Function, F_n	Strain Energy (kN-m)/m^3
S	NA		0.00	1.603	0.08	-0.001			18.820	Data on given line represents average conditions					
SB	0		0.20	1.598	0.25	-0.002			18.783	between the following and the previous lines of data.					
EB	1496	0.24	0.23	1.597	0.22	10.022	-0.025		18.7775					N/A	
SL	0	0.25	0.23	1.597	0.23	10.028	-0.029	-12.4	18.7773					N/A	0
	98	0.72	0.81	1.582	0.74	10.052	0.022	3.0	18.6670	0.397	18.18	1.49E-05	5.55E-02	0.90	0.1
	195	1.11	1.52	1.563	1.13	10.035	0.034	3.0	18.535	0.402	11.61	1.56E-05	3.71E-02	0.93	0.4
	293	1.56	2.12	1.548	1.59	10.033	0.039	2.5	18.421	0.337	11.75	1.11E-05	2.66E-02	0.95	0.8
	390	2.10	2.61	1.535	2.13	10.030	0.049	2.3	18.328	0.302	10.40	9.02E-06	1.92E-02	0.96	1.3
	488	2.65	3.10	1.522	2.69	10.030	0.053	2.0	18.236	0.304	9.94	8.73E-06	1.78E-02	0.97	1.9
	585	3.23	3.60	1.509	3.28	10.032	0.071	2.2	18.142	0.351	7.17	1.03E-05	1.51E-02	0.97	2.6
	683	3.76	4.24	1.492	3.81	10.041	0.072	1.9	18.021	0.391	6.21	1.30E-05	1.65E-02	0.97	3.7
	780	4.21	4.87	1.476	4.27	10.035	0.083	1.9	17.903	0.369	4.70	1.40E-05	1.35E-02	0.97	5.0
	878	4.62	5.44	1.461	4.67	10.026	0.085	1.8	17.796	0.343	4.21	1.41E-05	1.21E-02	0.97	6.2
	975	5.00	5.99	1.447	5.06	10.035	0.089	1.8	17.693	0.347	3.74	1.53E-05	1.17E-02	0.98	7.6
	1073	5.35	6.57	1.432	5.42	10.031	0.094	1.7	17.583	0.375	3.48	1.67E-05	1.18E-02	0.98	9.1
	1170	5.73	7.21	1.415	5.80	10.022	0.100	1.7	17.463	0.428	3.59	1.71E-05	1.26E-02	0.98	10.9
	1236	6.03	7.73	1.402	6.12	10.047	0.133	2.2	17.365	0.471	3.07	1.64E-05	1.03E-02	0.97	12.5
	1296	6.33	8.19	1.390	6.44	10.036	0.157	2.4	17.278	0.549	3.66	1.36E-05	1.02E-02	0.97	14.0
	1339	6.73	8.68	1.377	6.89	10.031	0.247	3.6	17.186	0.658	3.06	1.24E-05	7.72E-03	0.96	15.7
	1388	7.15	9.21	1.363	7.33	10.042	0.268	3.7	17.088	0.752	3.04	1.30E-05	8.09E-03	0.96	17.6

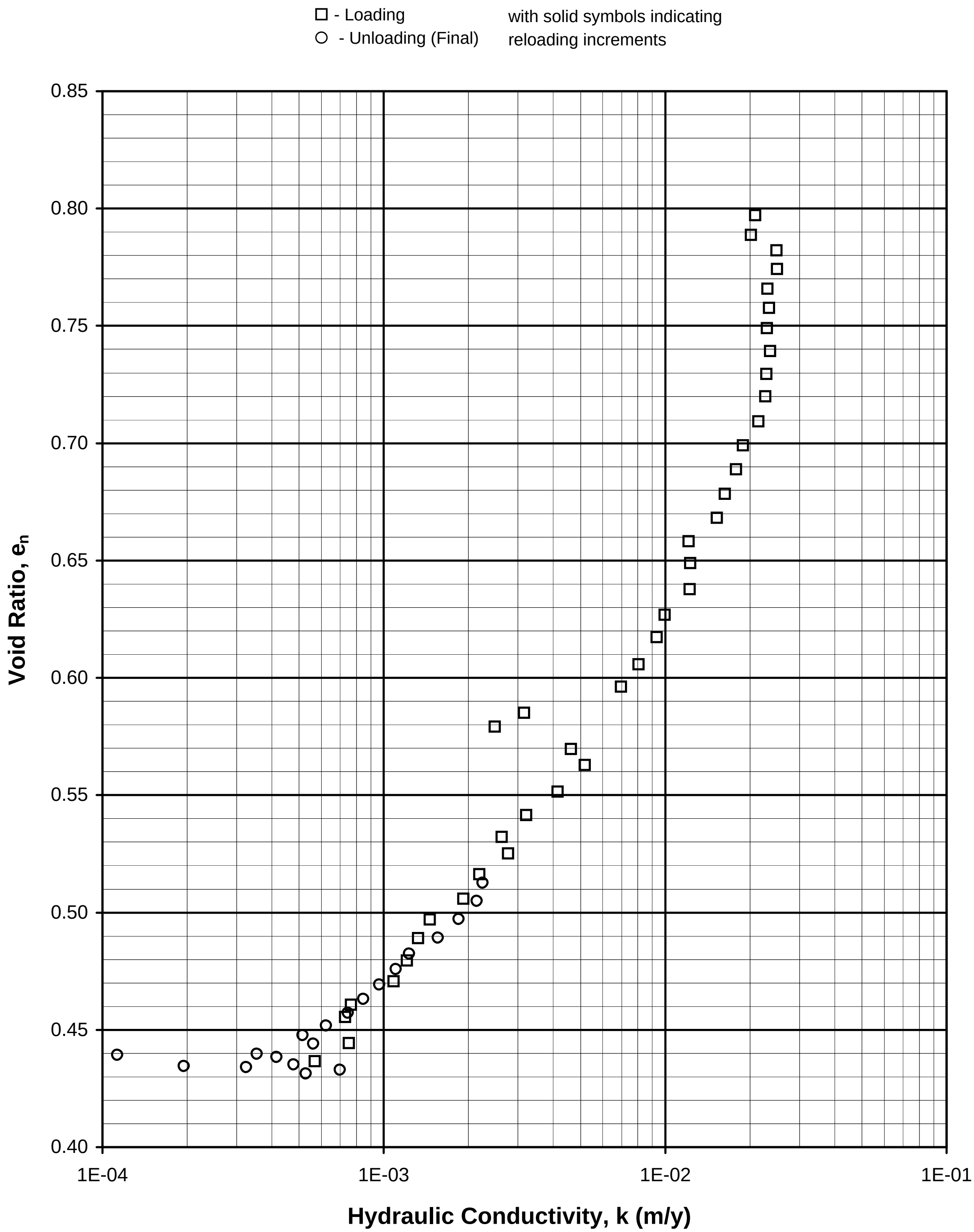




1-D CONSOLIDATION TEST: CRS

Sample No. S07Aa Depth 31.4 ft

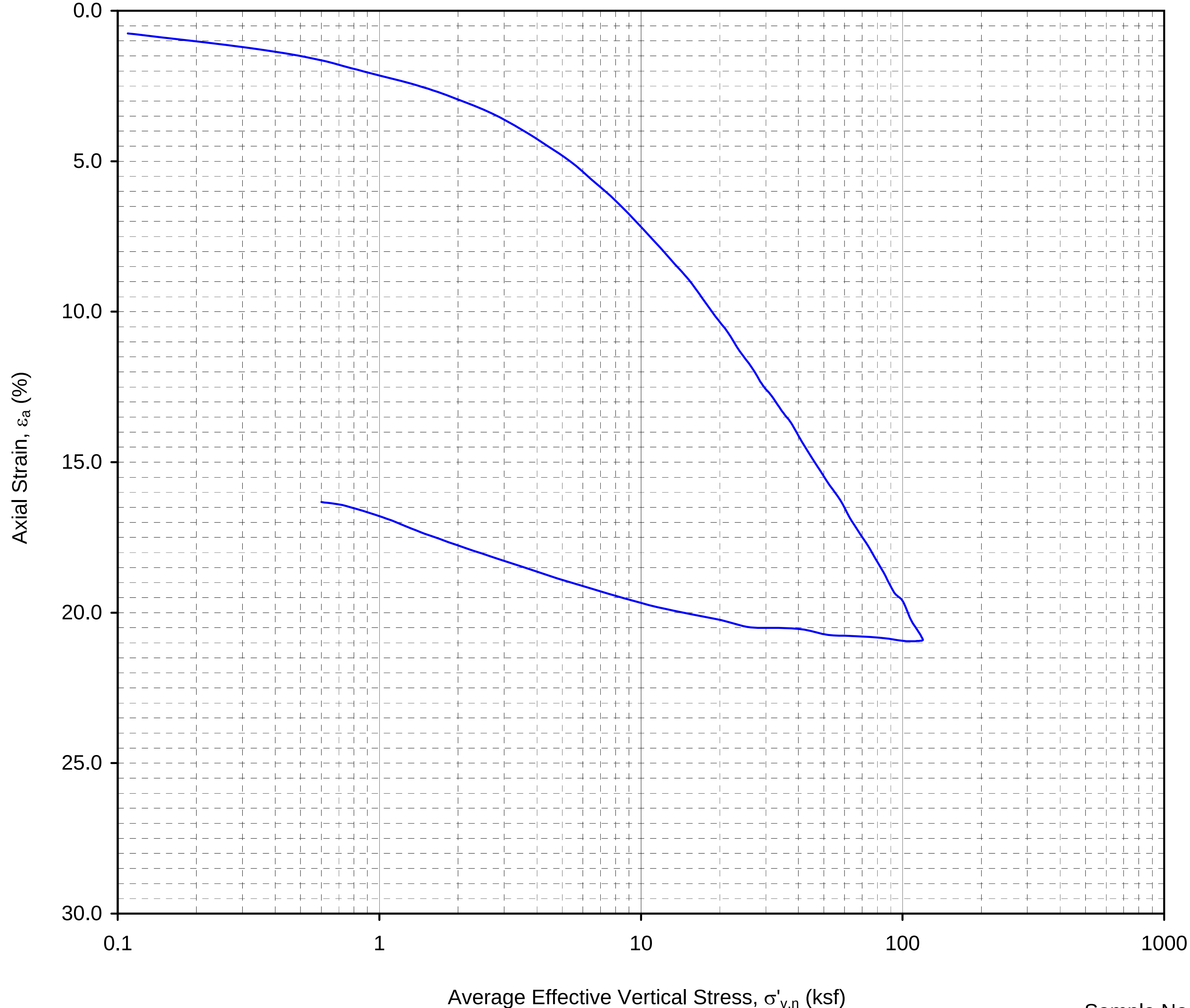
Boring WR0017-214B



1-D CONSOLIDATION TEST: CRS

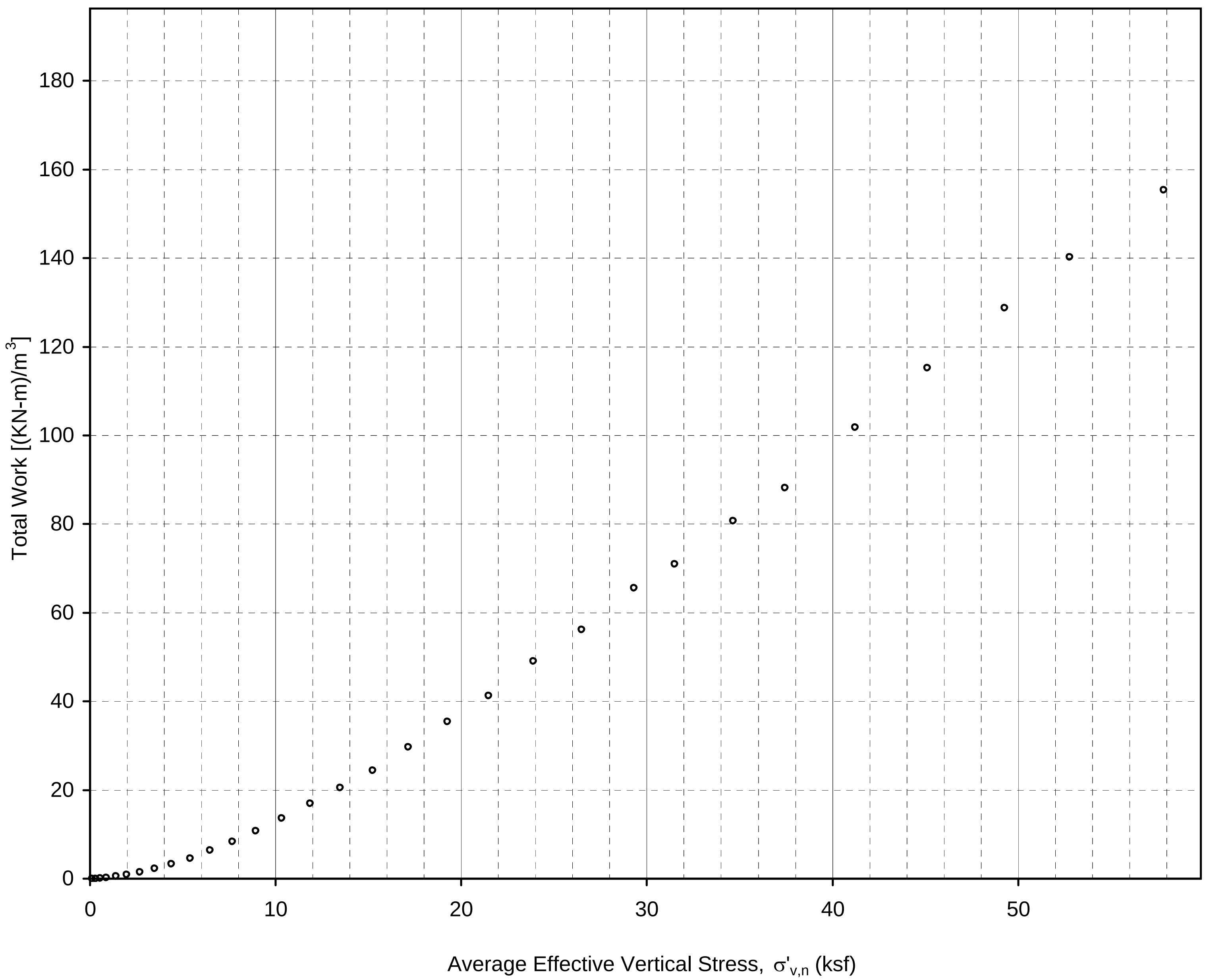
Sample No. S07Aa Depth 31.4 ft

Boring WR0017-214B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07Aa   Depth 31.4



Sample No. S07Aa   Depth 31.4 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S07 File Name: WR0017-214B_S07Aa

Task No.: NA Cell No.: CRS-C07

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height: Meas.	Final Height: Dial
1	Initial,	Top, W1	33.63	88.00		105.9	107.6	108.6
2	"	Bottom, W2	33.74	87.93		106.0	107.8	108.9
3	"	Sides, W3	33.06	88.37		105.0	106.3	107.4
4	"	Average, W4	33.48	88.10		105.6	107.2	108.3
5	"	Back Calculated (1)	29.80	90.60	(3)	100.0	98.5	99.5
6	Final		19.14	90.60	(2)	100.0	100.0	101.1

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.699

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.709

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.11648
Final Selected, K_f	0.11648

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 90.18

Avg. Back Calculated and Measured Mass Dry Soil (g) = 90.39

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720	X	Assumed		To make S_f = 100% at end of test.	
		Measured		Avg. of measured/assumed G_s and G_s to make S_f = 100%	
Mass Dry Soil, (g)	Initial: 90.60	X	From Cal. Routine No.	5	Note: Routine #5 is based on final measurements.
	Final (4): NA		Make S_f = 100%, or;		Avg. of measured & make S_f = 100%
Initial Height (mm) =	19.11	X	Measured ;		Back Calculated Back-cal. Sat. (%) = NA
Final Height (mm) =	16.05	X	Measured ;		Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	29.8	0.811	100.0	121.5	93.6	10.553	From	To (ksf)
Final	19.1	0.521	100.0	132.8	111.5	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

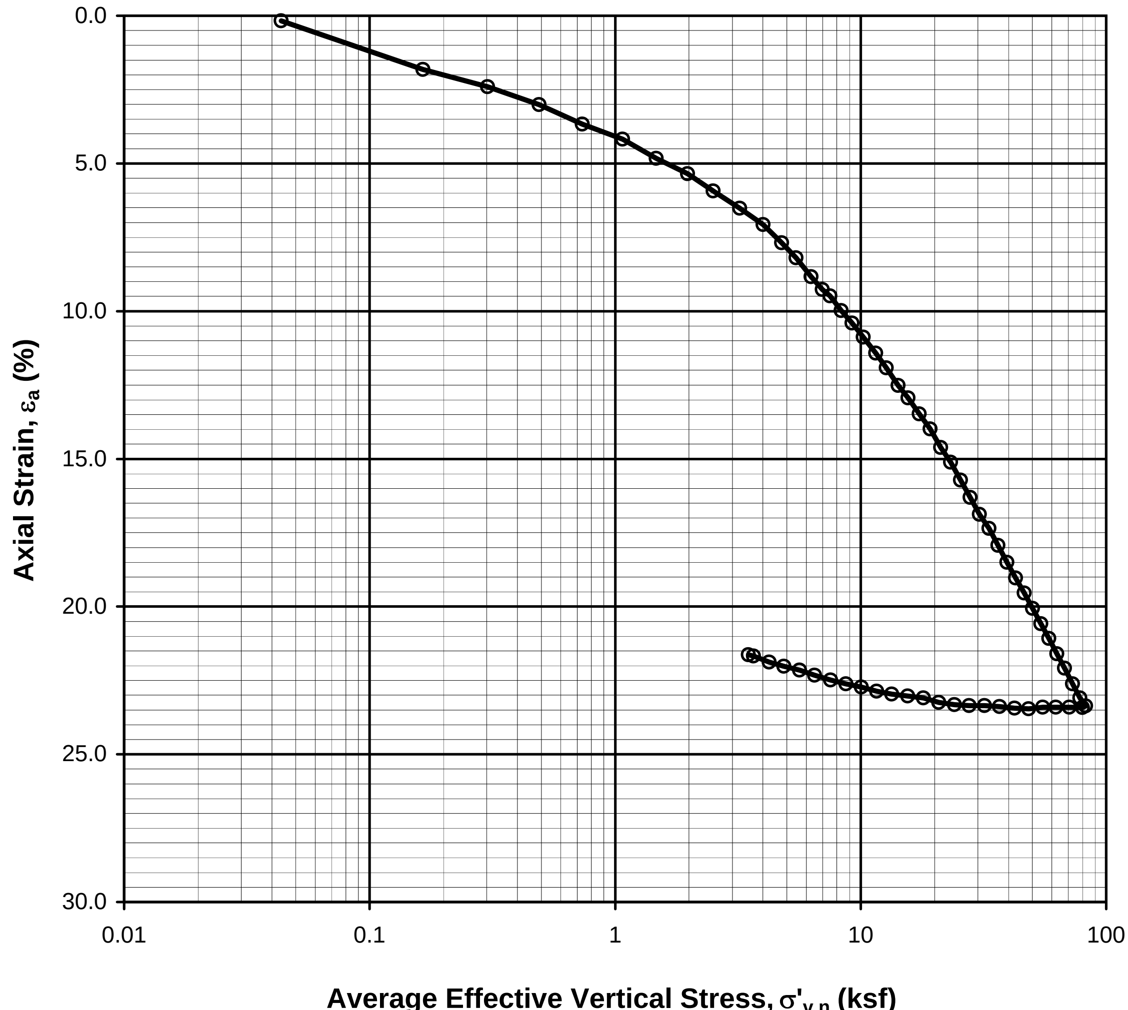
(3) This value is only different from the final value if there is soil extrusion during loading.

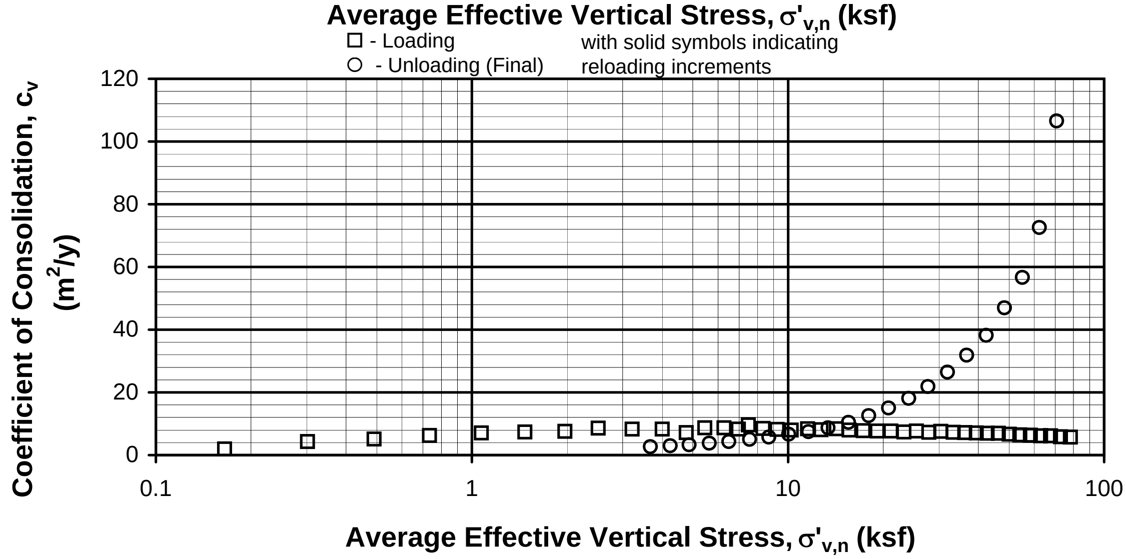
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 12/11/2012

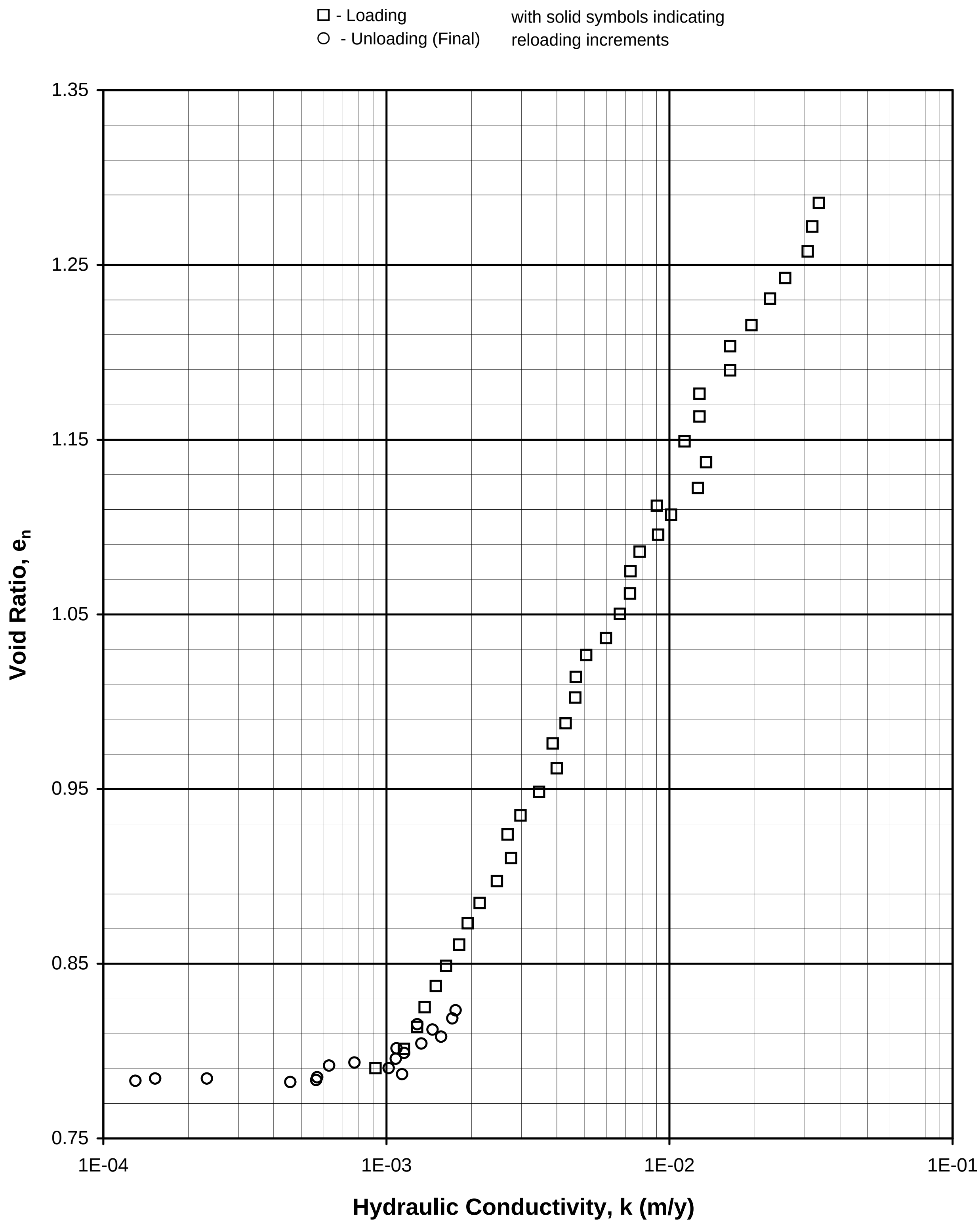




1-D CONSOLIDATION TEST: CRS

Sample No. S08b Depth 23.65 ft

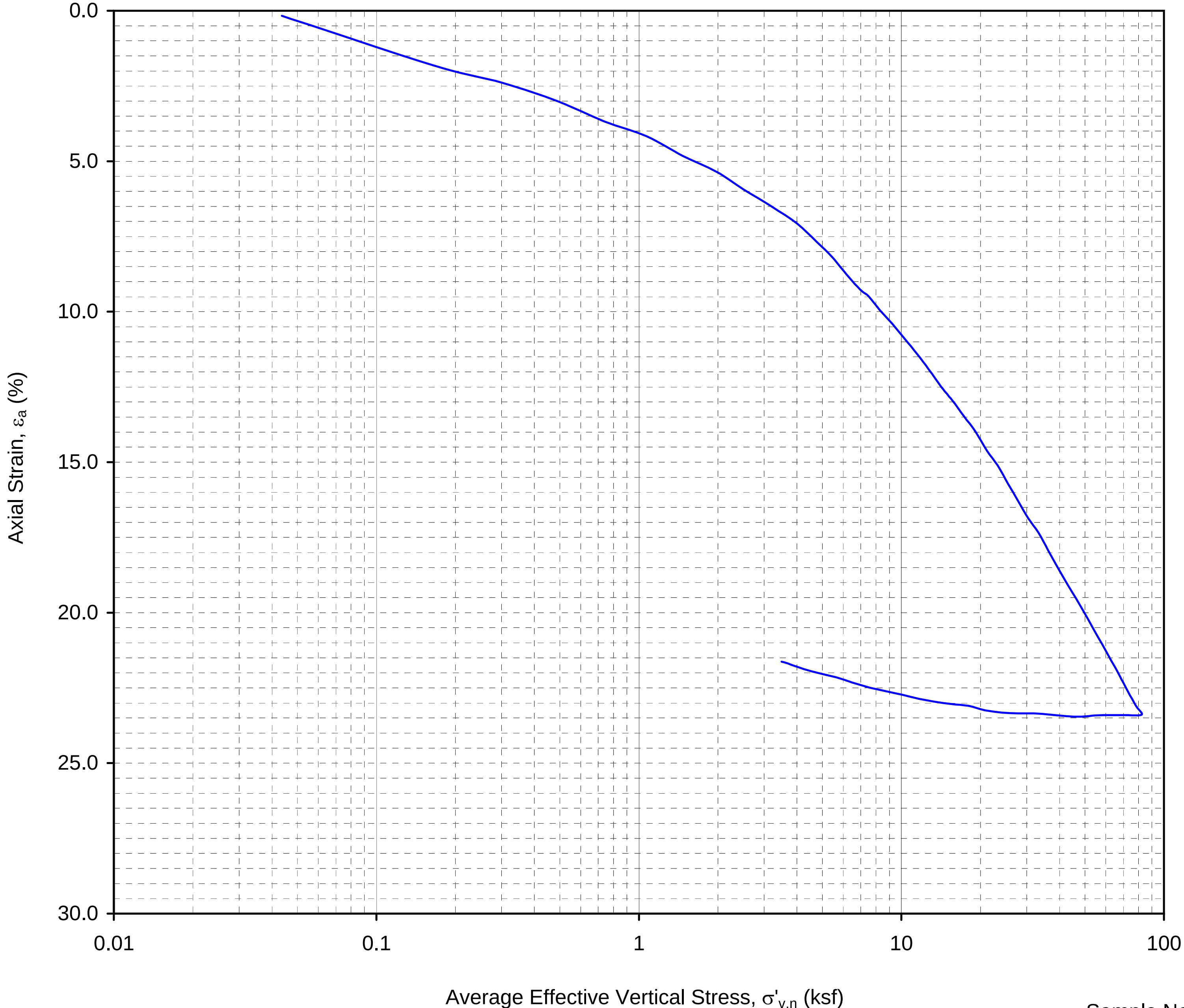
Boring WR0017-216B



1-D CONSOLIDATION TEST: CRS

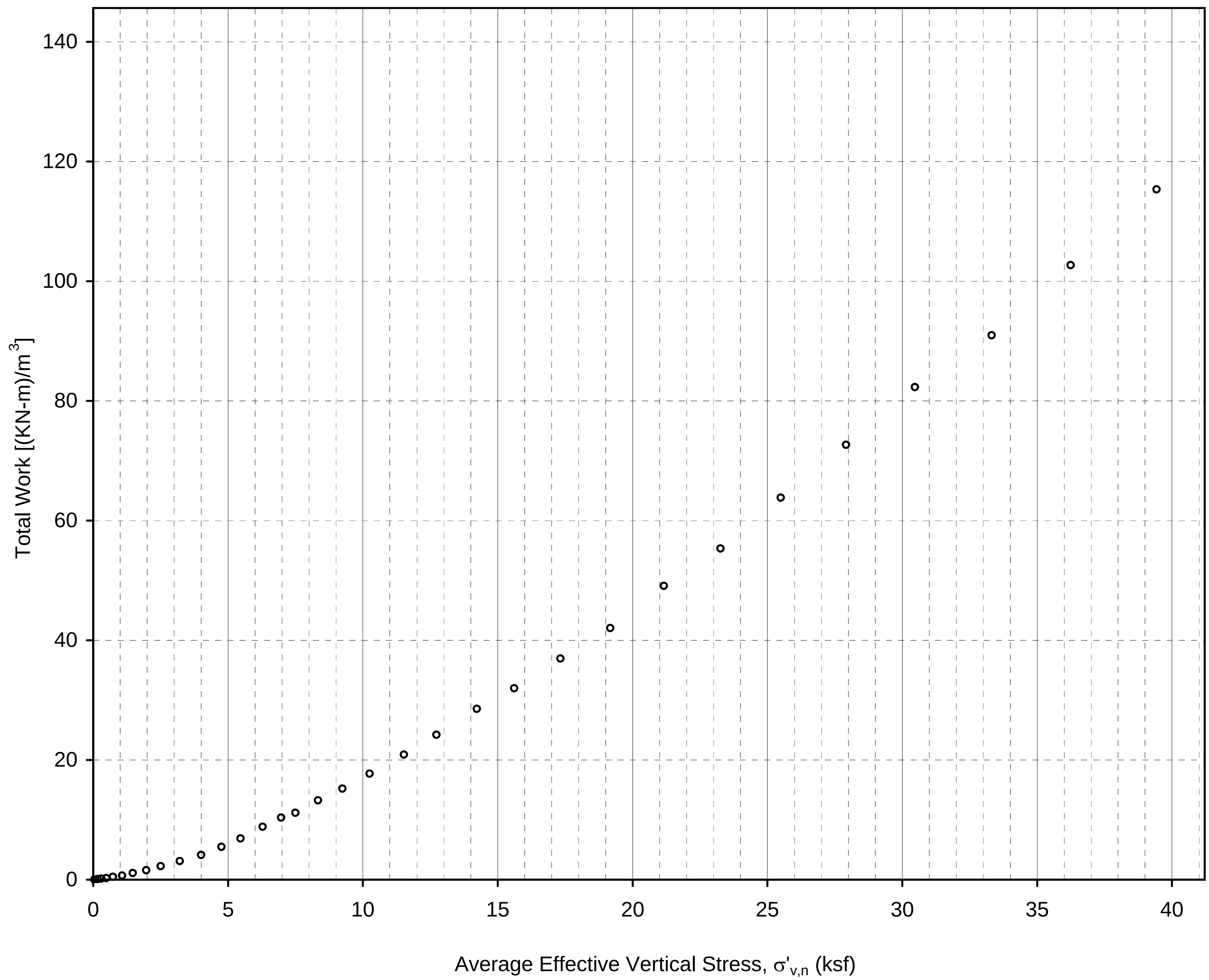
Sample No. S08b   Depth 23.65 ft

Boring WR0017-216B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S08b Depth 23.65



Sample No. S08b   Depth 23.65 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S19 File Name: WR0017-216B_S08b

Task No.: NA Cell No.: CRS-C19

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	45.62	46.22	95.1	97.9	103.9
2	"	Bottom, W2	42.30	47.30	91.9	93.1	98.9
3	"	Sides, W3	47.11	45.75	96.5	100.0	106.0
4	"	Average, W4	45.01	46.42	94.6	97.1	103.0
5	"	Back Calculated (1)	47.11	45.76 (3)	96.5	100.0	106.0
6	Final		32.29	45.76 (2)	96.5	100.5	106.5

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.719

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.720

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18205
Final Selected, K_f	0.18205

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 45.75

Avg. Back Calculated and Measured Mass Dry Soil (g) = 45.75

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 45.76; Final (4): NA — [X] From Cal. Routine No. [5] Note: Routine #5 is based on final measurements. [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.39 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 15.61 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	47.1	1.328	96.5	107.1	72.8	8.330		
Final	32.3	0.874	100.5	119.7	90.5	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

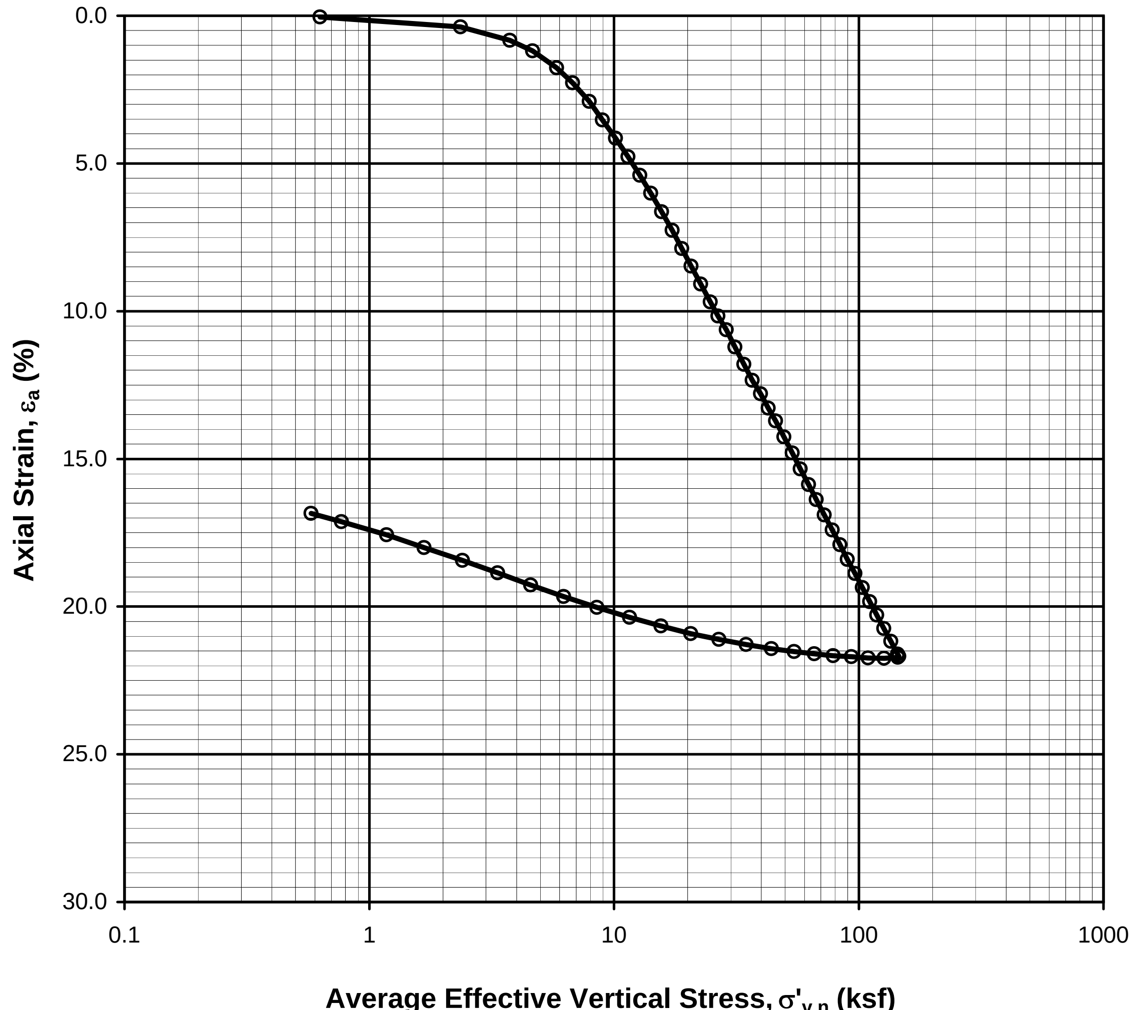
(3) This value is only different from the final value if there is soil extrusion during loading.

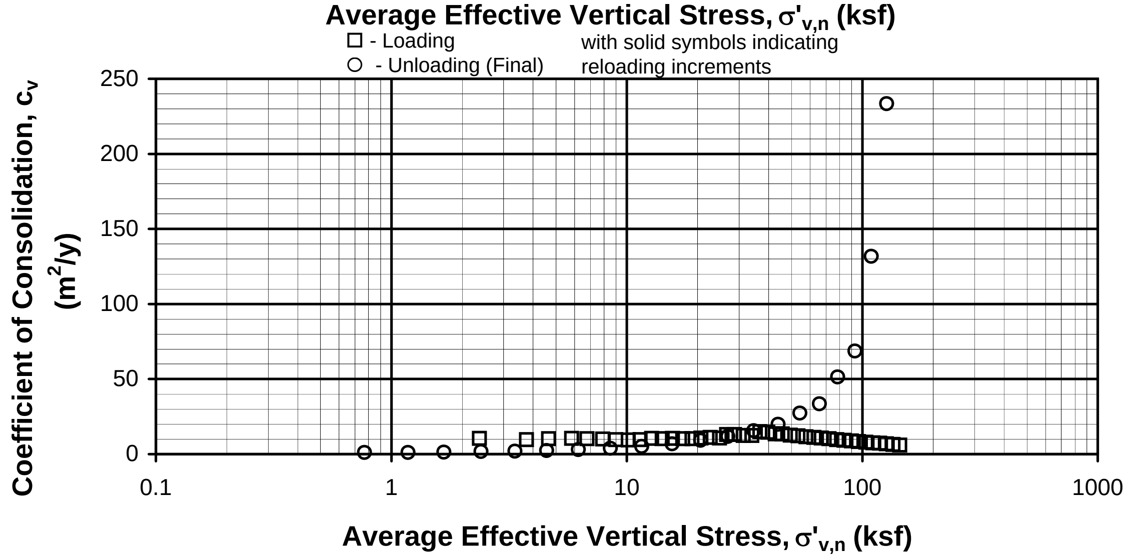
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: HP

Date: 10/19/2012

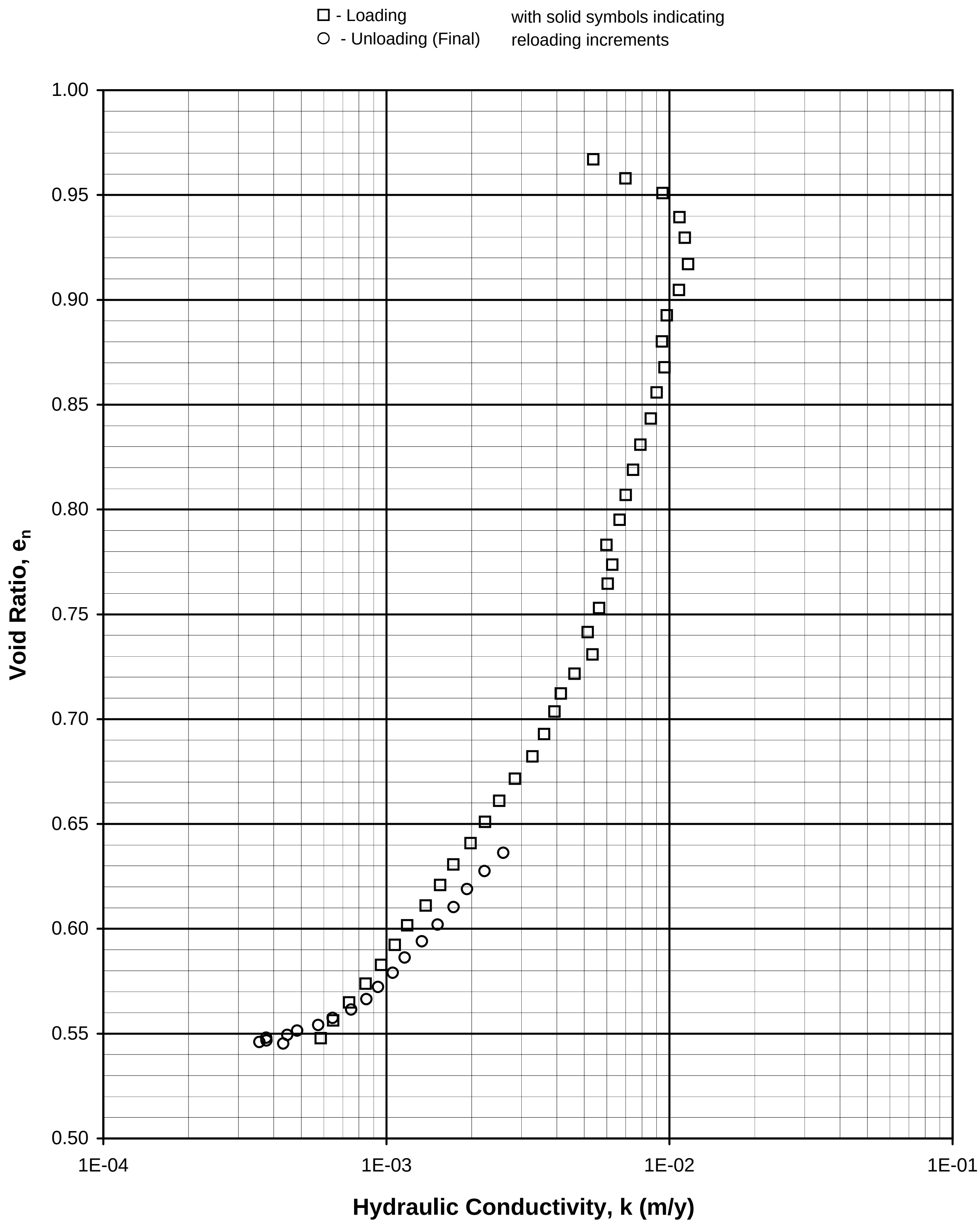




1-D CONSOLIDATION TEST: CRS

Sample No. S06Ab   Depth 17.9 ft

Boring WR0017-217B



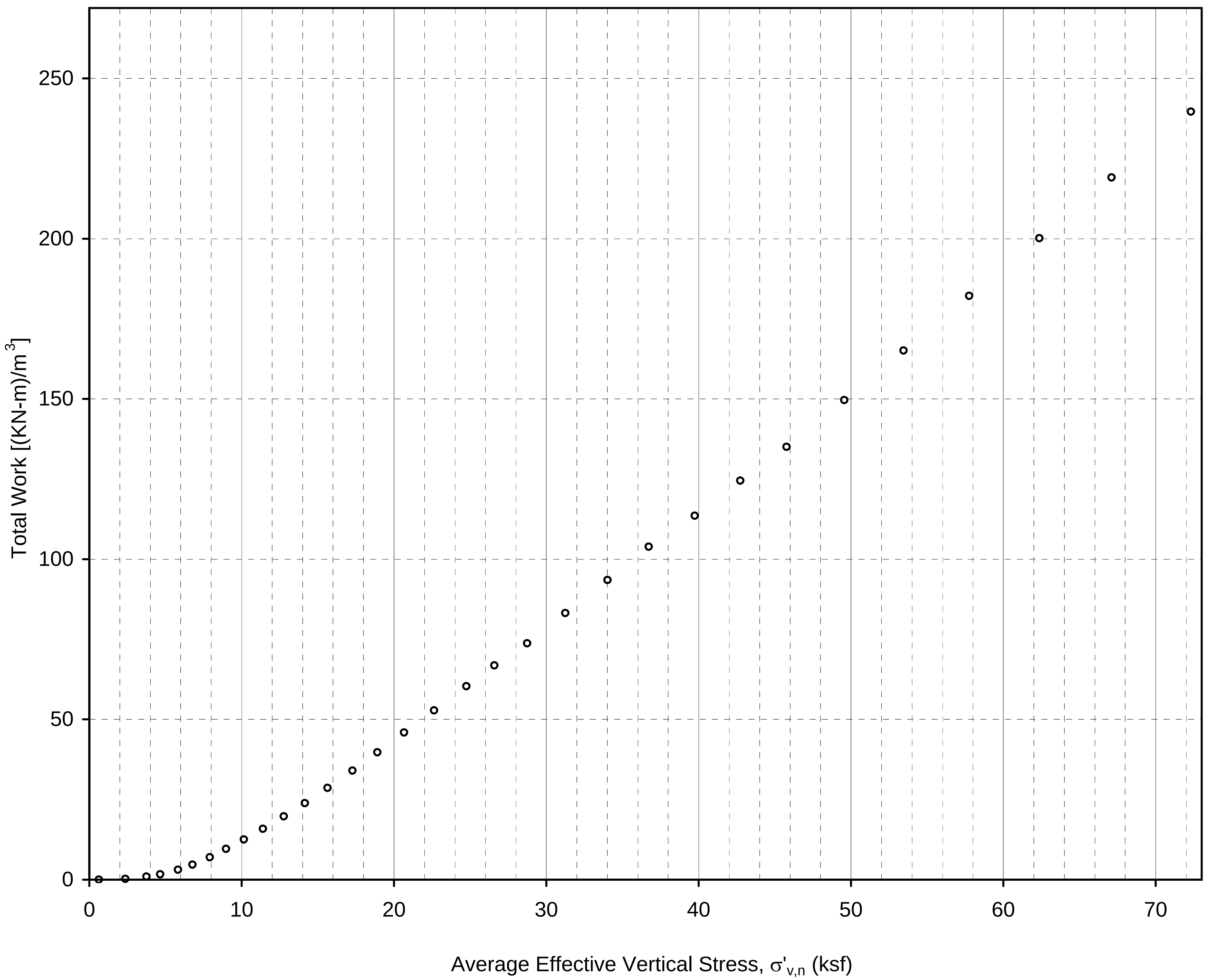
1-D CONSOLIDATION TEST: CRS

Sample No. S06Ab Depth 17.9 ft

Boring WR0017-217B

CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S06Ab Depth 17.9



Sample No. S06Ab   Depth 17.9 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S06 File Name: WR0017-217B_S06Ab

Task No.: NA Cell No.: CRS-C06

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	34.51	82.38		94.2	101.5	95.1
2	"	Bottom, W2	33.98	82.71		93.5	100.4	94.0
3	"	Sides, W3	33.73	82.86		93.2	99.8	93.5
4	"	Average, W4	34.07	82.65		93.6	100.6	94.2
5	"	Back Calculated (1)	33.52	82.99	(3)	92.9	99.4	93.1
6	Final		22.26	82.99	(2)	92.9	100.0	93.6

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.690

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.695

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.11724
Final Selected, K_f	0.11724

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 82.82

Avg. Back Calculated and Measured Mass Dry Soil (g) = 82.90

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700	X	Assumed		To make S_f = 100% at end of test.	
		Measured		Avg. of measured/assumed G_s and G_s to make S_f = 100%	
Mass Dry Soil, (g) Initial: 82.99	X	From Cal. Routine No.	5	Note: Routine #5 is based on final measurements.	
Final (4): NA		Make S_f = 100%, or;		Avg. of measured & make S_f = 100%	
Initial Height (mm) = 19.21	X	Measured ;		Back Calculated	Back-cal. Sat. (%) = NA
Final Height (mm) = 15.58	X	Measured ;		Initial H_o & dial change during loading	

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	33.5	0.974	92.9	113.8	85.2	9.730	From	To (ksf)
Final	22.3	0.601	100.0	128.5	105.1	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

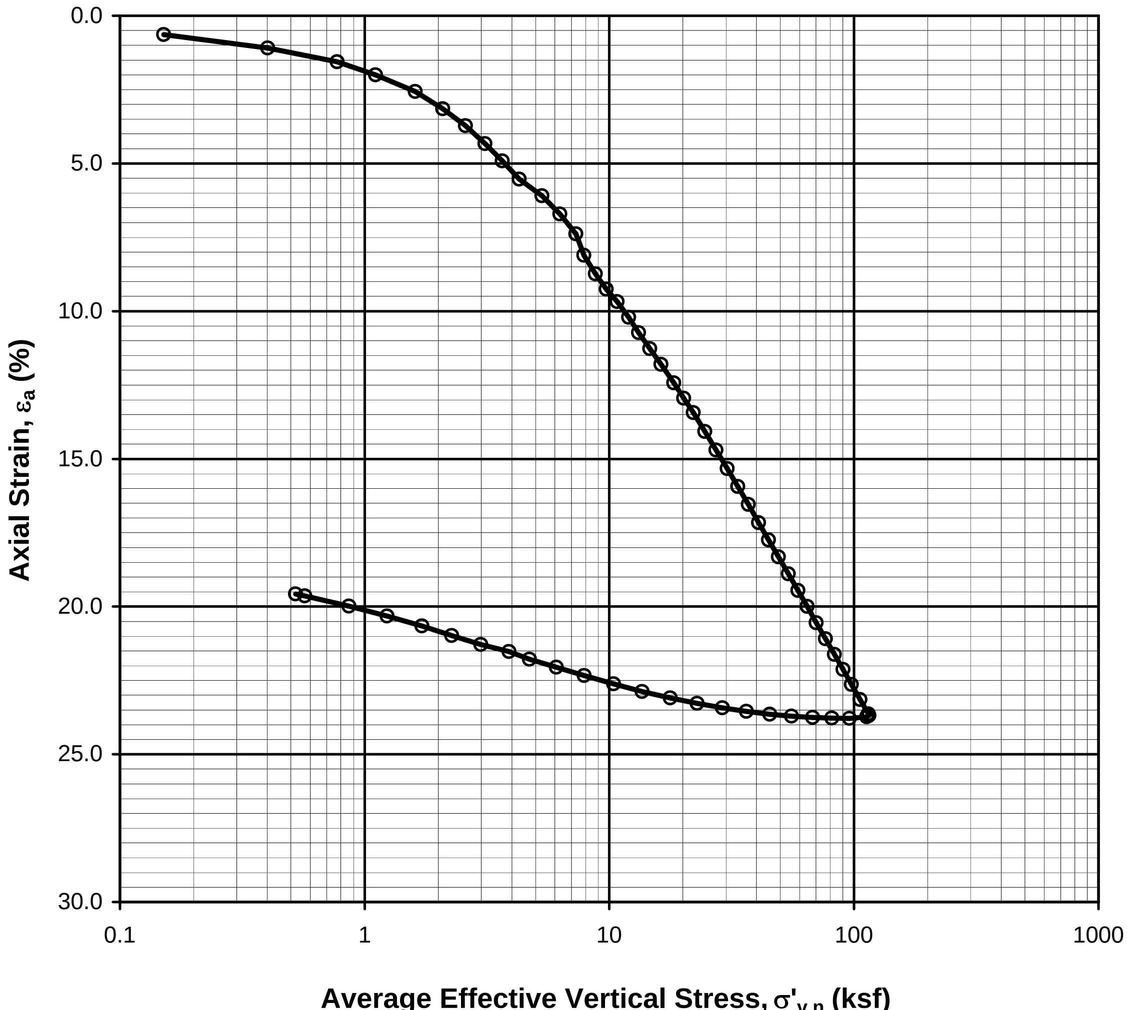
(3) This value is only different from the final value if there is soil extrusion during loading.

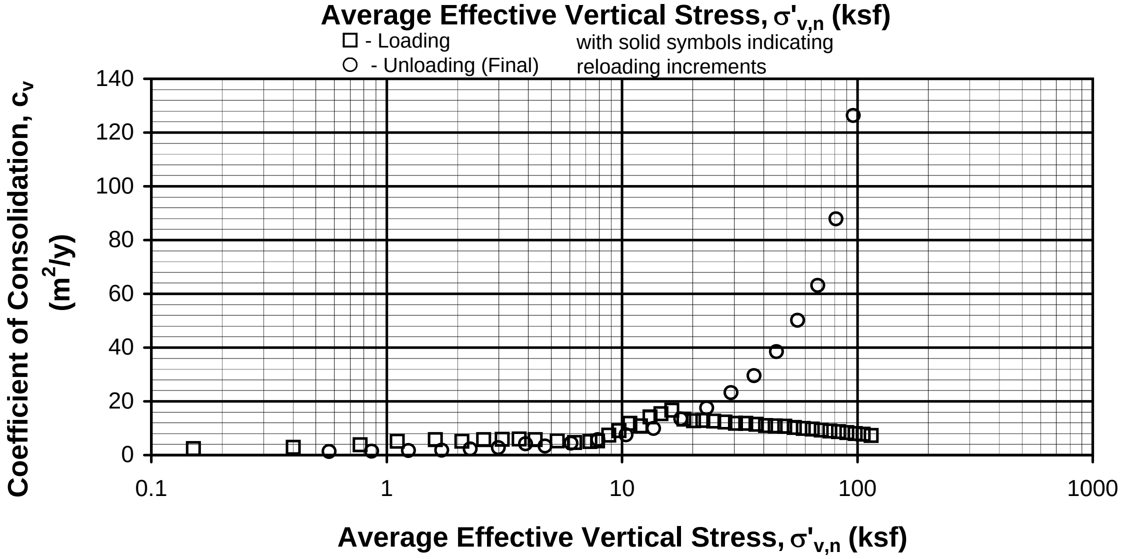
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/21/2012

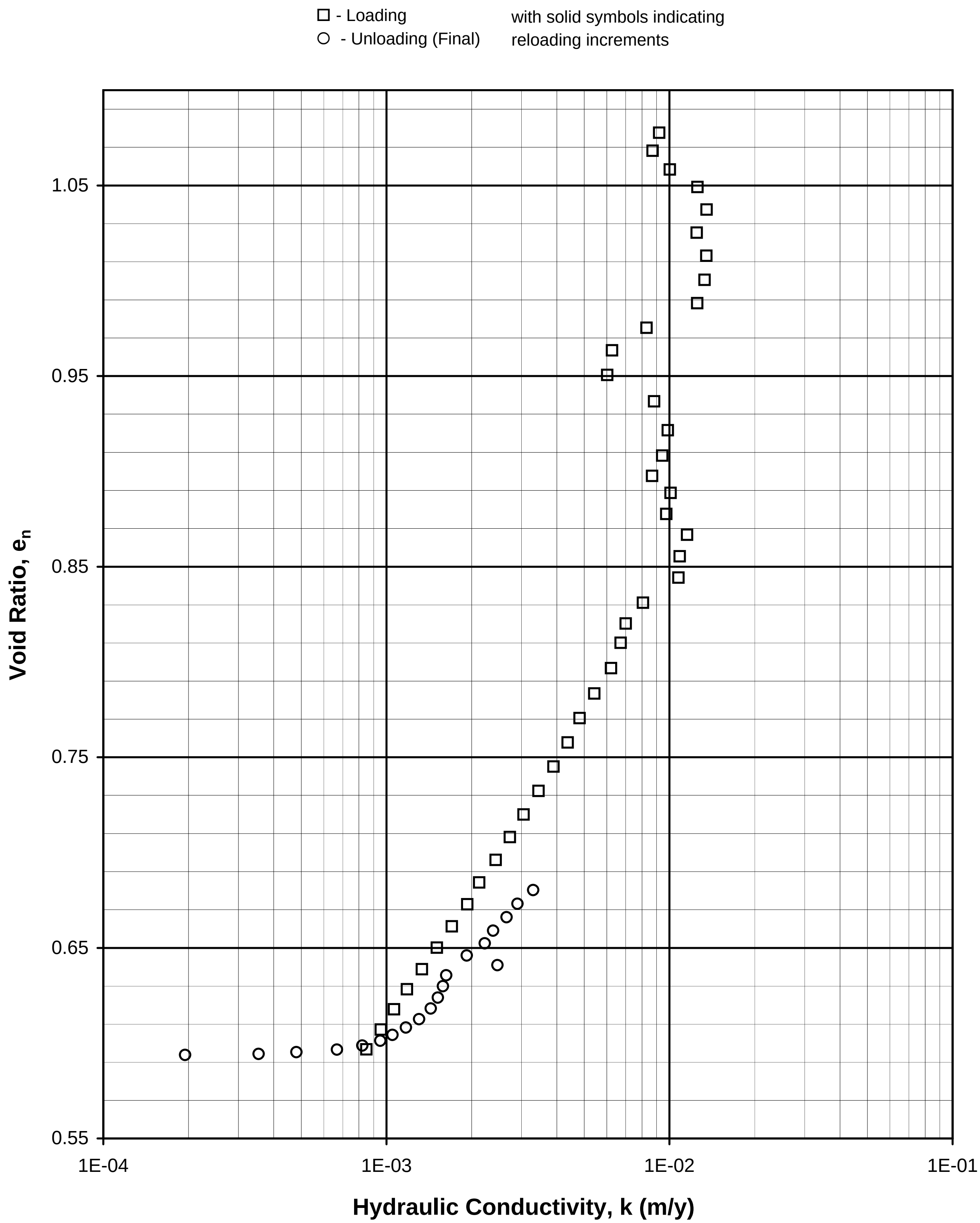




1-D CONSOLIDATION TEST: CRS

Sample No. S07b Depth 21.2 ft

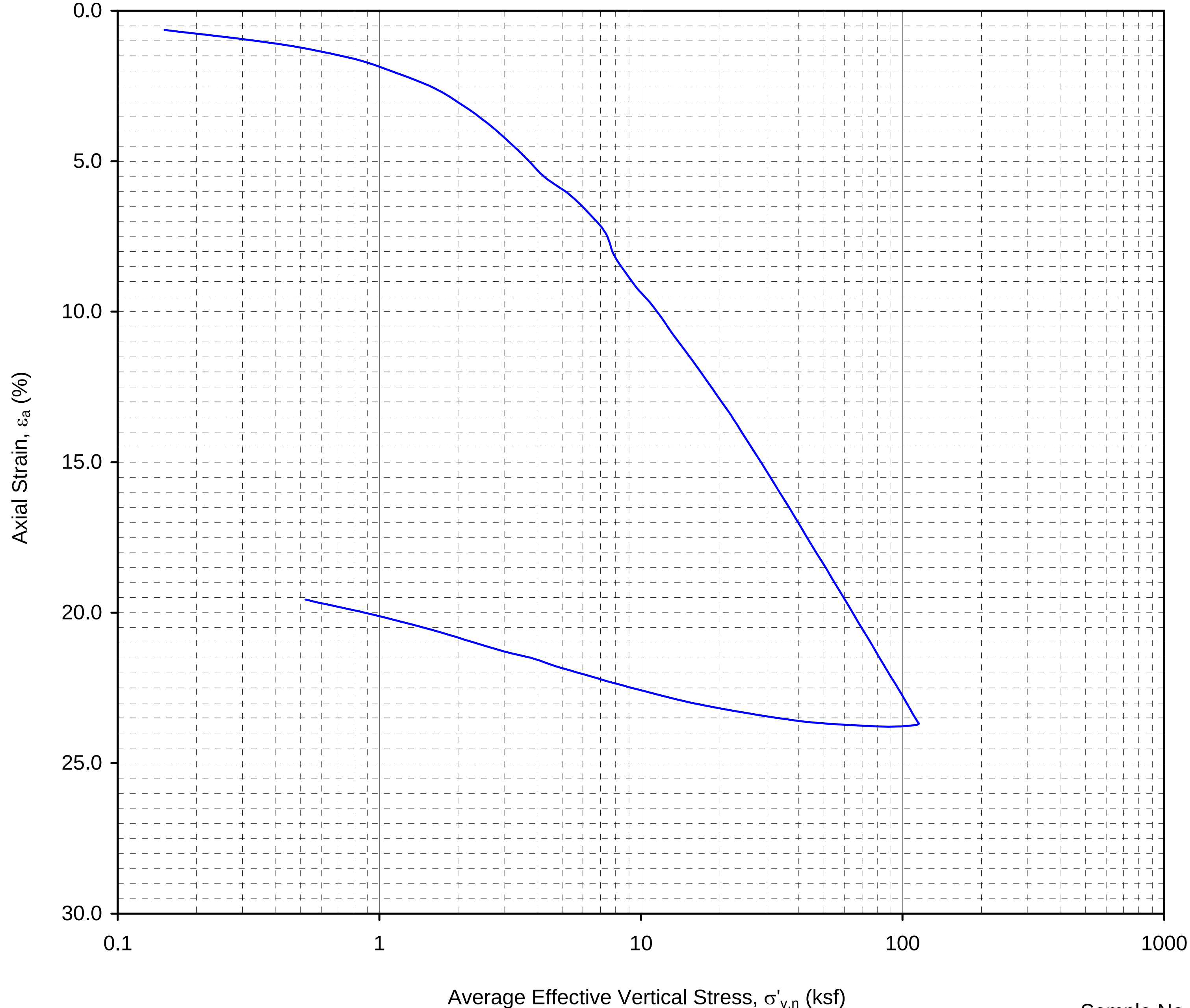
Boring WR0017-218B



1-D CONSOLIDATION TEST: CRS

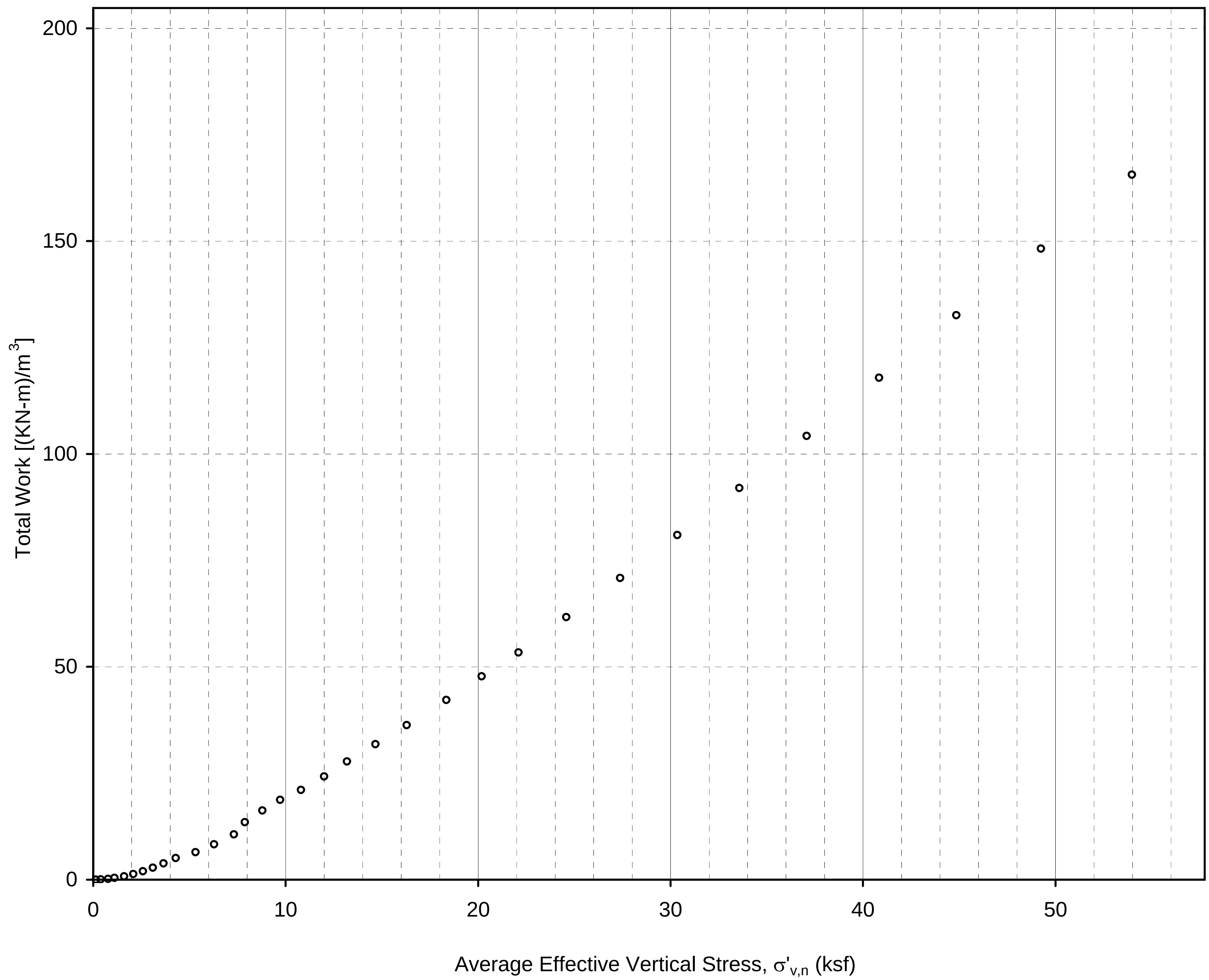
Sample No. S07b   Depth 21.2 ft

Boring WR0017-218B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07b   Depth 21.2 ft



Sample No. S07b   Depth 21.2 ft -

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

FUGRO

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S05 File Name: WR0017-218B_S07b

Task No.: NA Cell No.: CRS-C05

Specific Gravity, G_s: 2.750 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height: Meas.	Final Height: Dial
1	Initial,	Top, W1	35.08	50.40		85.9	102.4	102.7
2	"	Bottom, W2	33.88	50.85		84.4	100.2	100.5
3	"	Sides, W3	34.80	50.50		85.6	101.9	102.2
4	"	Average, W4	34.59	50.58		85.3	101.5	101.8
5	"	Back Calculated (1)	33.08	51.16	(3)	83.4	98.7	99.0
6	Final		24.85	51.16	(2)	83.4	100.0	100.2

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.725

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.738

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18025
Final Selected, K_f	0.18025

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 50.90

Avg. Back Calculated and Measured Mass Dry Soil (g) = 51.03

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.750 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 51.16; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100% — Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.28 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 15.53 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	33.1	1.091	83.4	109.1	82.0	9.221	From	To (ksf)
Final	24.9	0.684	100.0	127.1	101.8	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

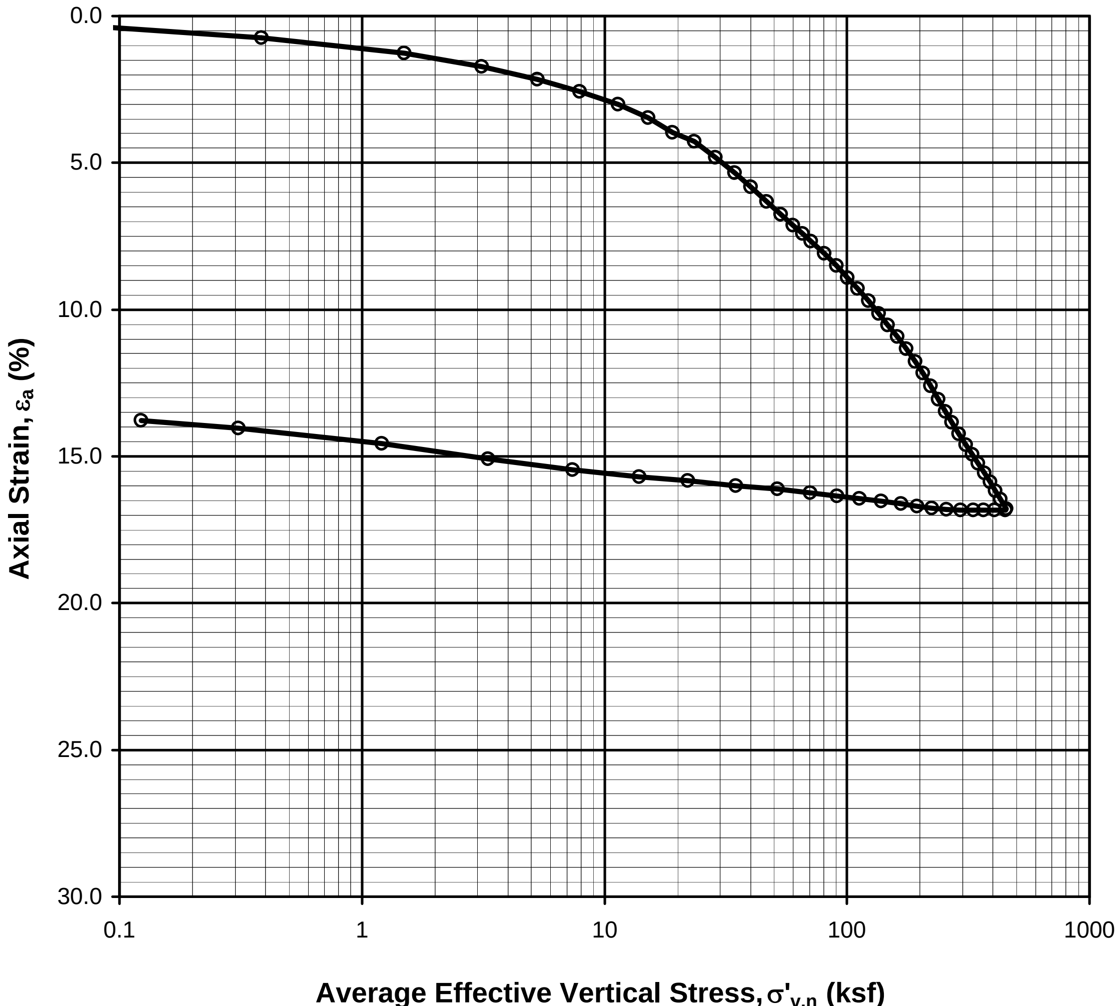
(3) This value is only different from the final value if there is soil extrusion during loading.

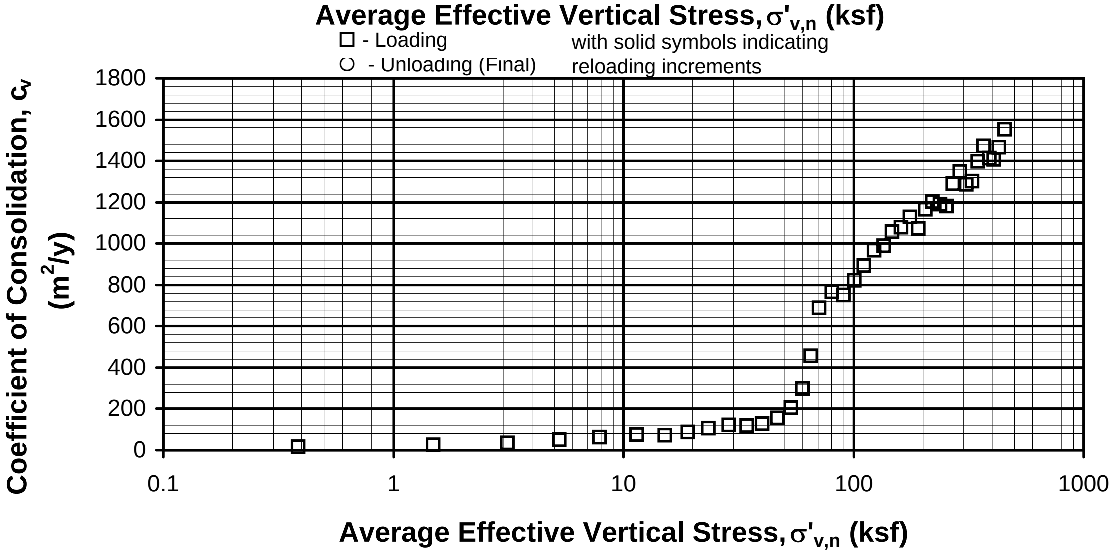
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 10/19/2012

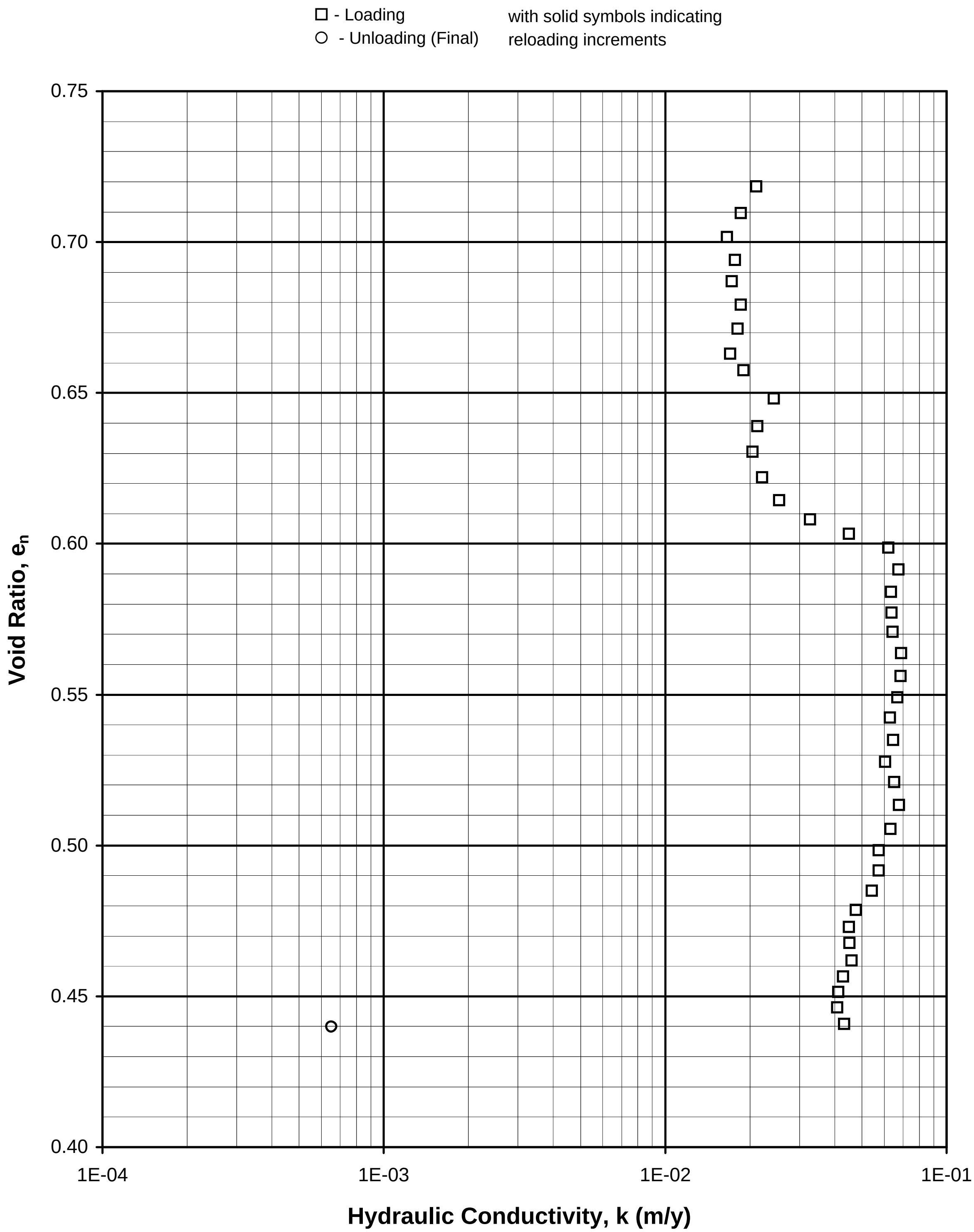




1-D CONSOLIDATION TEST: CRS

Sample No. S08Aa Depth 36.1 ft

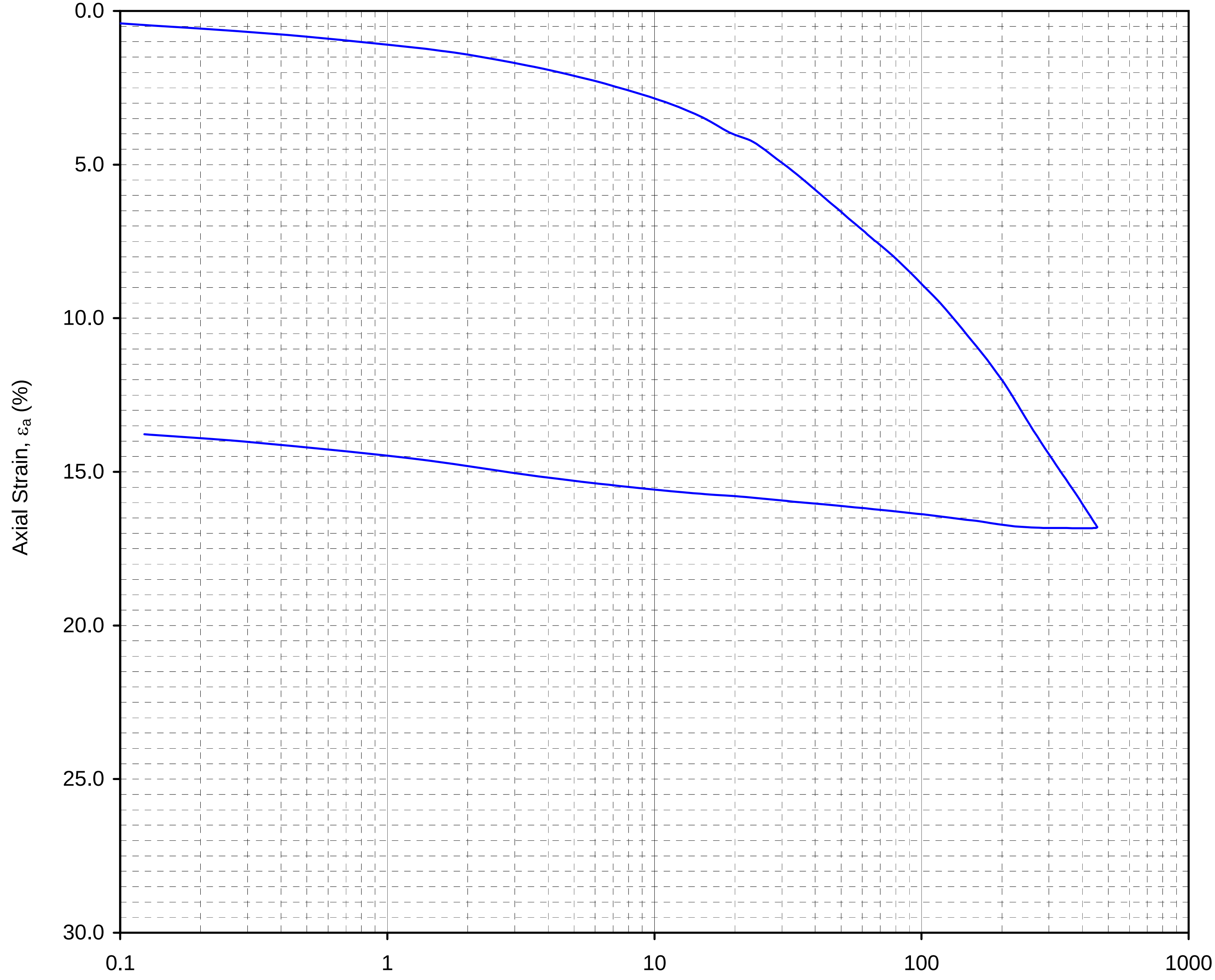
Boring WR0017-223B



1-D CONSOLIDATION TEST: CRS

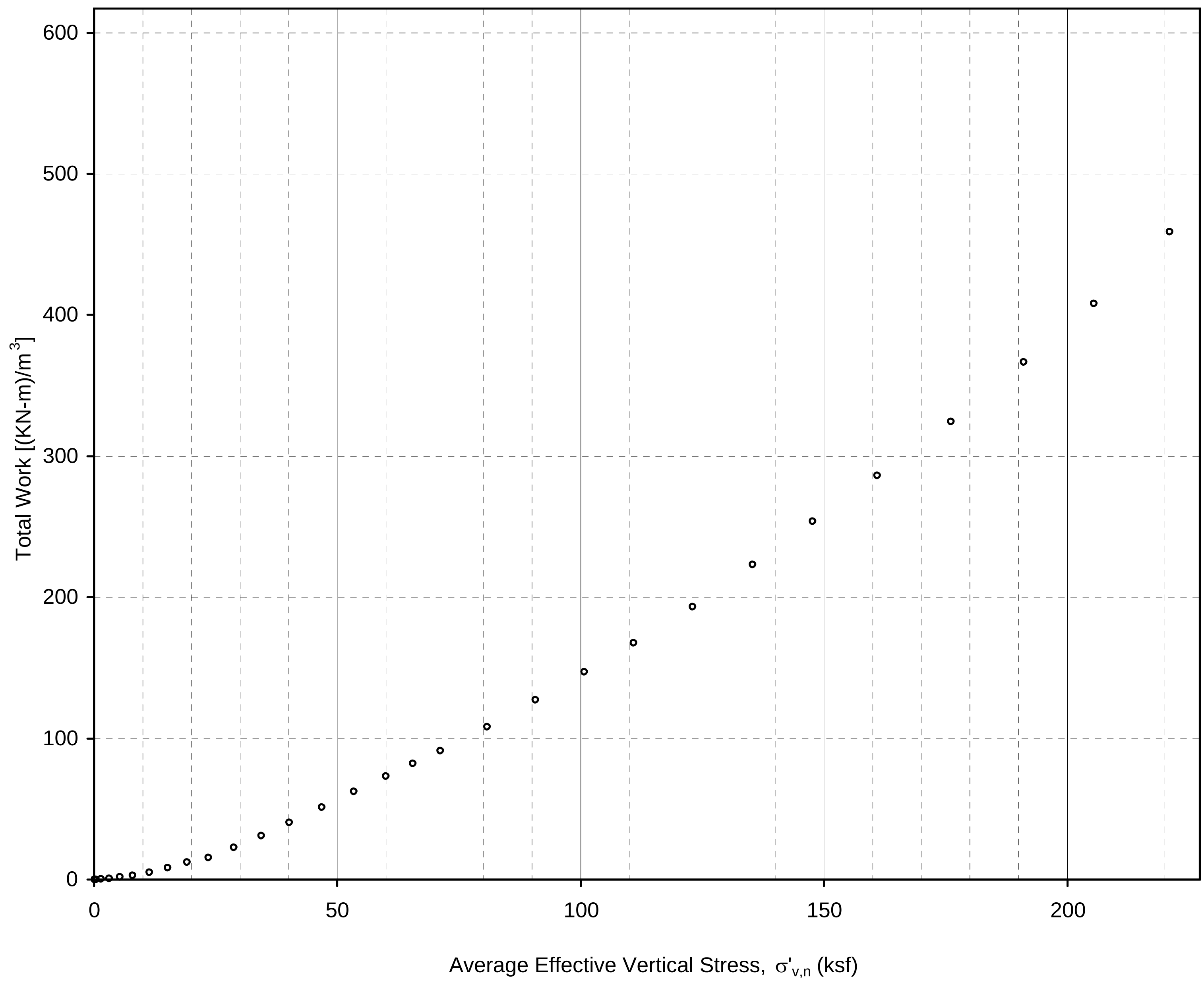
Sample No. S08Aa   Depth 36.1 ft

Boring WR0017-223B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S08Aa Depth 36.1



Sample No. S08Aa Depth 36.1

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S03 File Name: WR0017-223B_S08Aa

Task No.: NA Cell No.: CRS-C03

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	28.11	59.78		100.4	100.9	116.7
2	"	Bottom, W2	26.86	60.38		98.1	98.0	113.7
3	"	Sides, W3	26.69	60.45		97.8	97.7	113.3
4	"	Average, W4	27.22	60.20		98.8	98.9	114.6
5	"	Back Calculated (1)	26.32	60.63	(3)	97.1	96.8	112.4
6	Final		21.19	60.63	(2)	97.1	100.0	116.1

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.651

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.675

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.18346
Final Selected, K_f	0.18346

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 59.97

Avg. Back Calculated and Measured Mass Dry Soil (g) = 60.30

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 60.63; Final (4): NA — [X] From Cal. Routine No. 5 — Note: Routine #5 is based on final measurements. [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.26 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 17.49 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	26.3	0.731	97.1	122.7	97.2	11.124	From	To (ksf)
Final	21.2	0.572	100.0	129.7	107.0	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

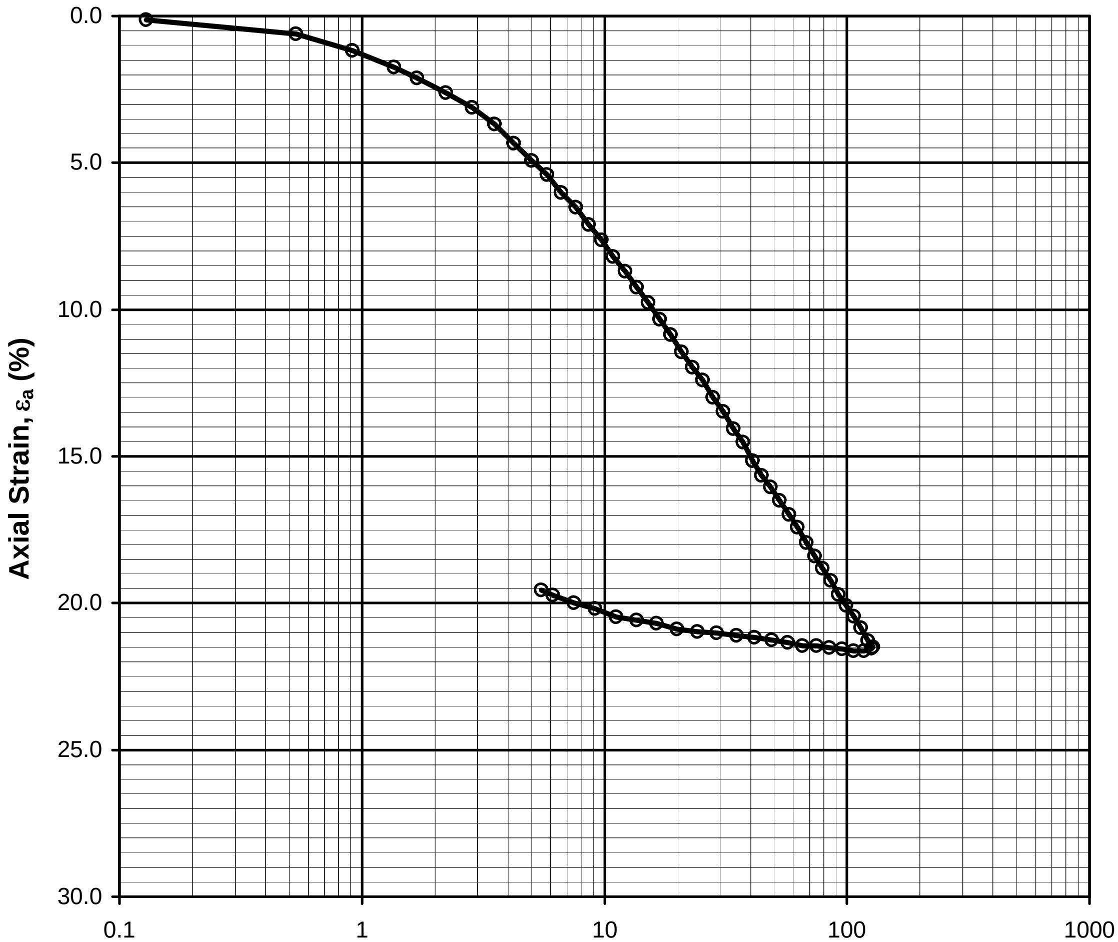
(3) This value is only different from the final value if there is soil extrusion during loading.

(4) Final is only different from the initial value if there is soil extrusion during loading.

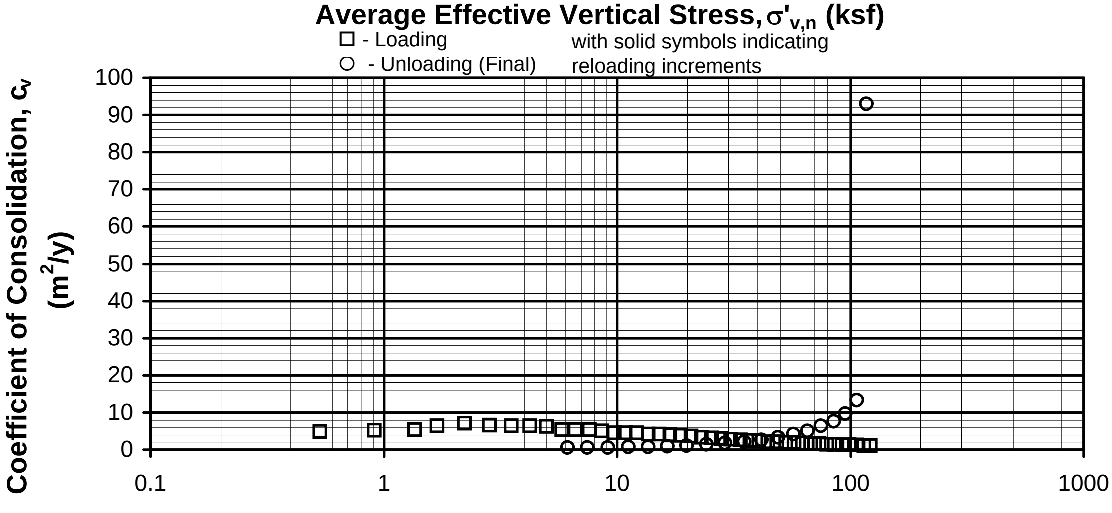
(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/19/2012



Average Effective Vertical Stress, σ'v,n (ksf)

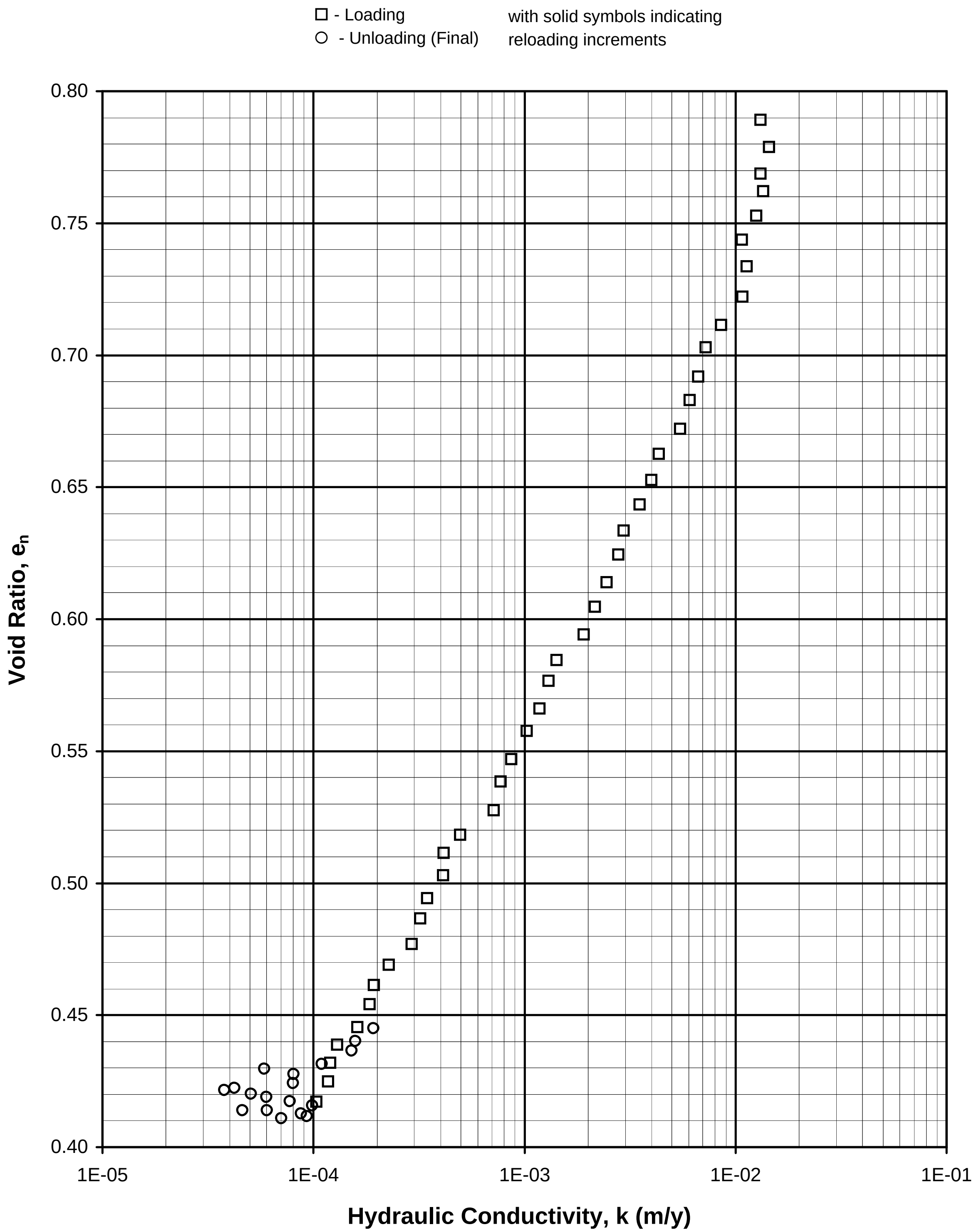


Average Effective Vertical Stress, σ'v,n (ksf)

1-D CONSOLIDATION TEST: CRS

Sample No. S07Aa Depth 22.15 ft

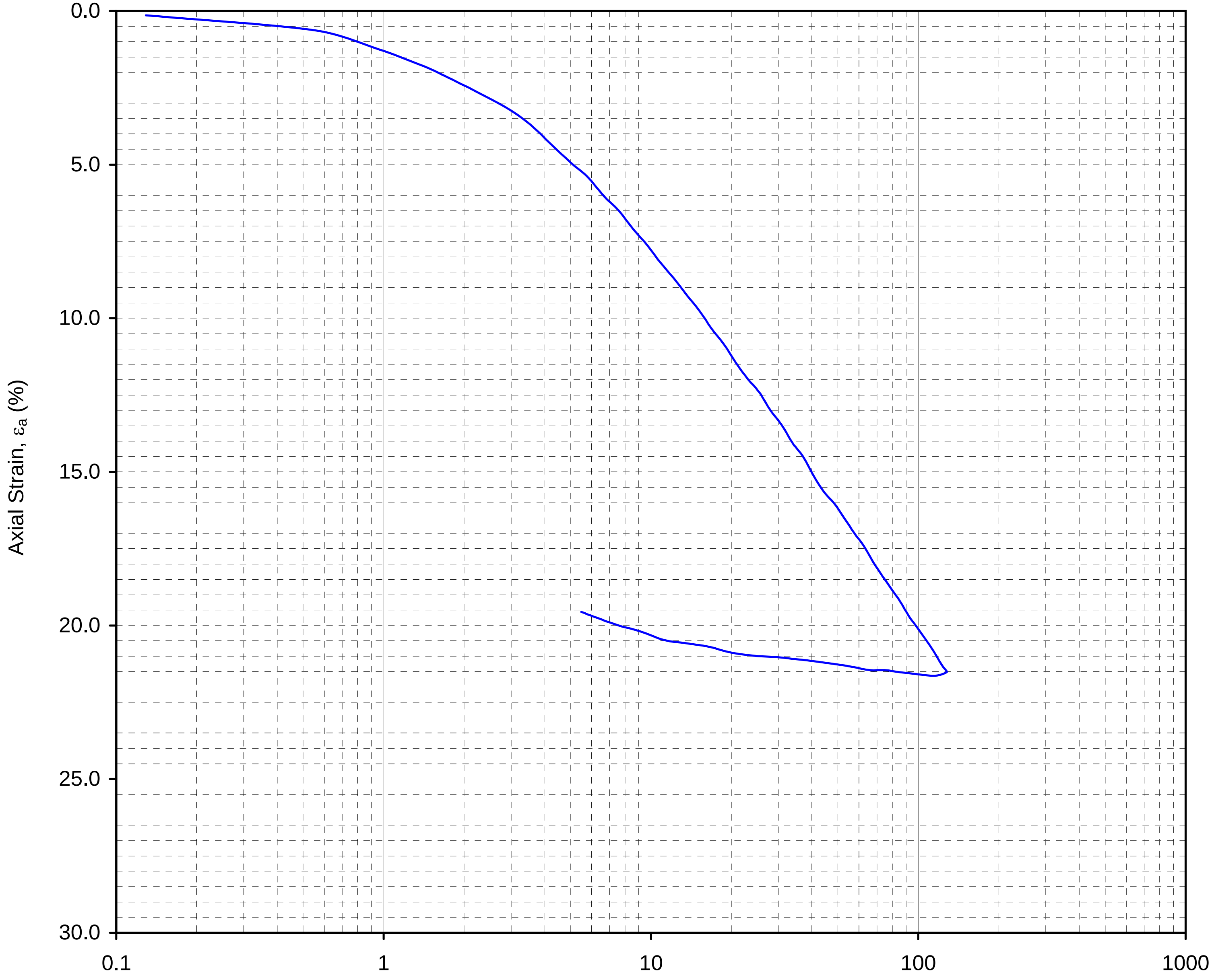
Boring WR0017-224B



1-D CONSOLIDATION TEST: CRS

Sample No. S07Aa Depth 22.15 ft

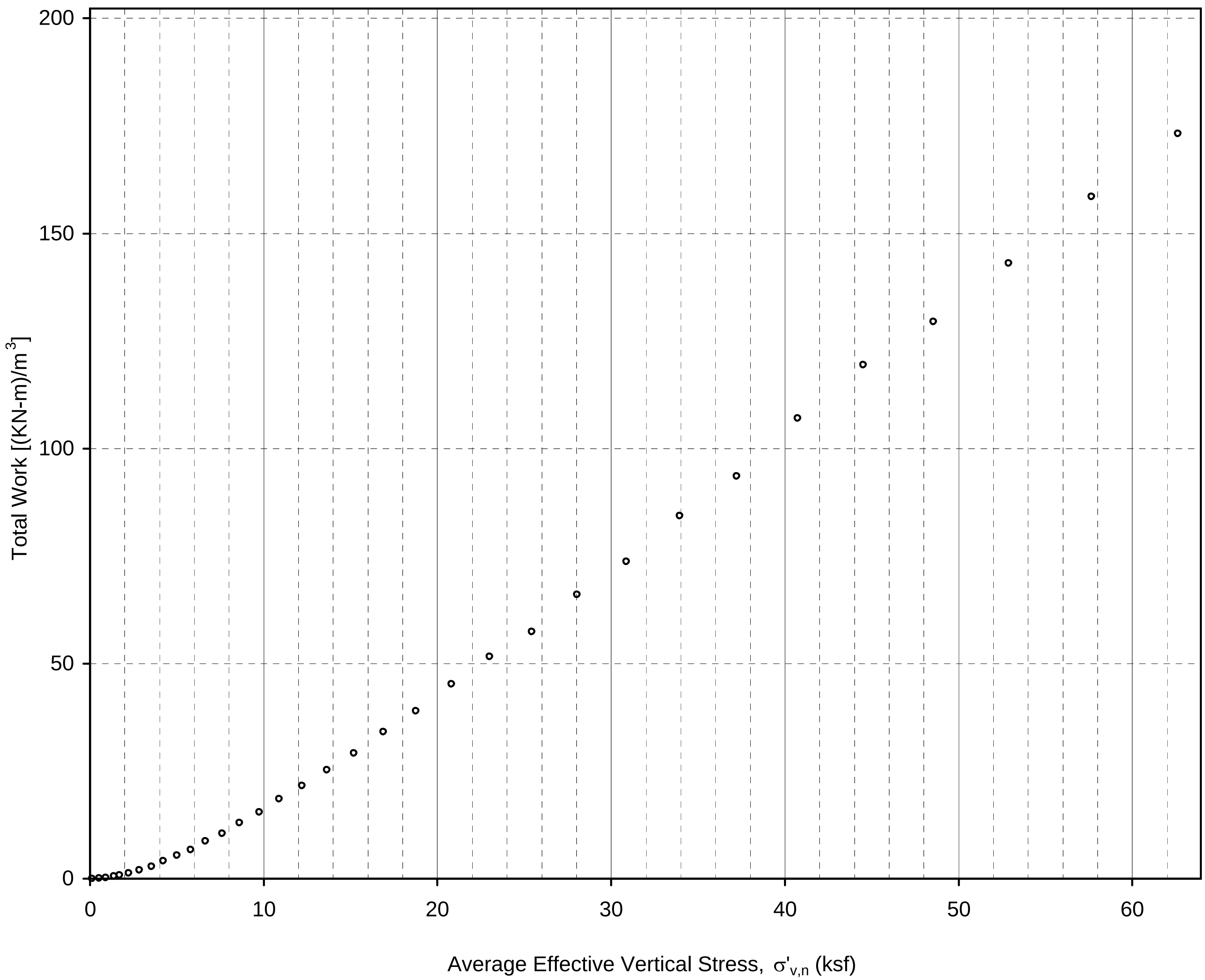
Boring WR0017-224B



Average Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)

CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07Aa Depth 22.15



Sample No. S07Aa   Depth 22.15

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S08 File Name: WR0017-224B_S07Aa

Task No.: NA Cell No.: CRS-C08

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height: Meas.	Final Height: Dial
1	Initial,	Top, W1	29.81	87.81		97.6	103.1	107.9
2	"	Bottom, W2	28.52	88.69		95.5	99.6	104.3
3	"	Sides, W3	28.65	88.61		95.7	99.9	104.7
4	"	Average, W4	28.99	88.37		96.3	100.9	105.7
5	"	Back Calculated (1)	28.09	89.00	(3)	94.8	98.4	103.1
6	Final		17.40	89.00	(2)	94.8	100.0	104.8

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.679

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.690

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.11732
Final Selected, K_f	0.11732

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 88.59

Avg. Back Calculated and Measured Mass Dry Soil (g) = 88.79

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 89.00; Final (4): NA — [X] From Cal. Routine No. [5] Note: Routine #5 is based on final measurements.; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 18.79 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 15.34 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	28.1	0.800	94.8	119.7	93.5	10.441	From	To (ksf)
Final	17.4	0.470	100.0	134.4	114.5	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

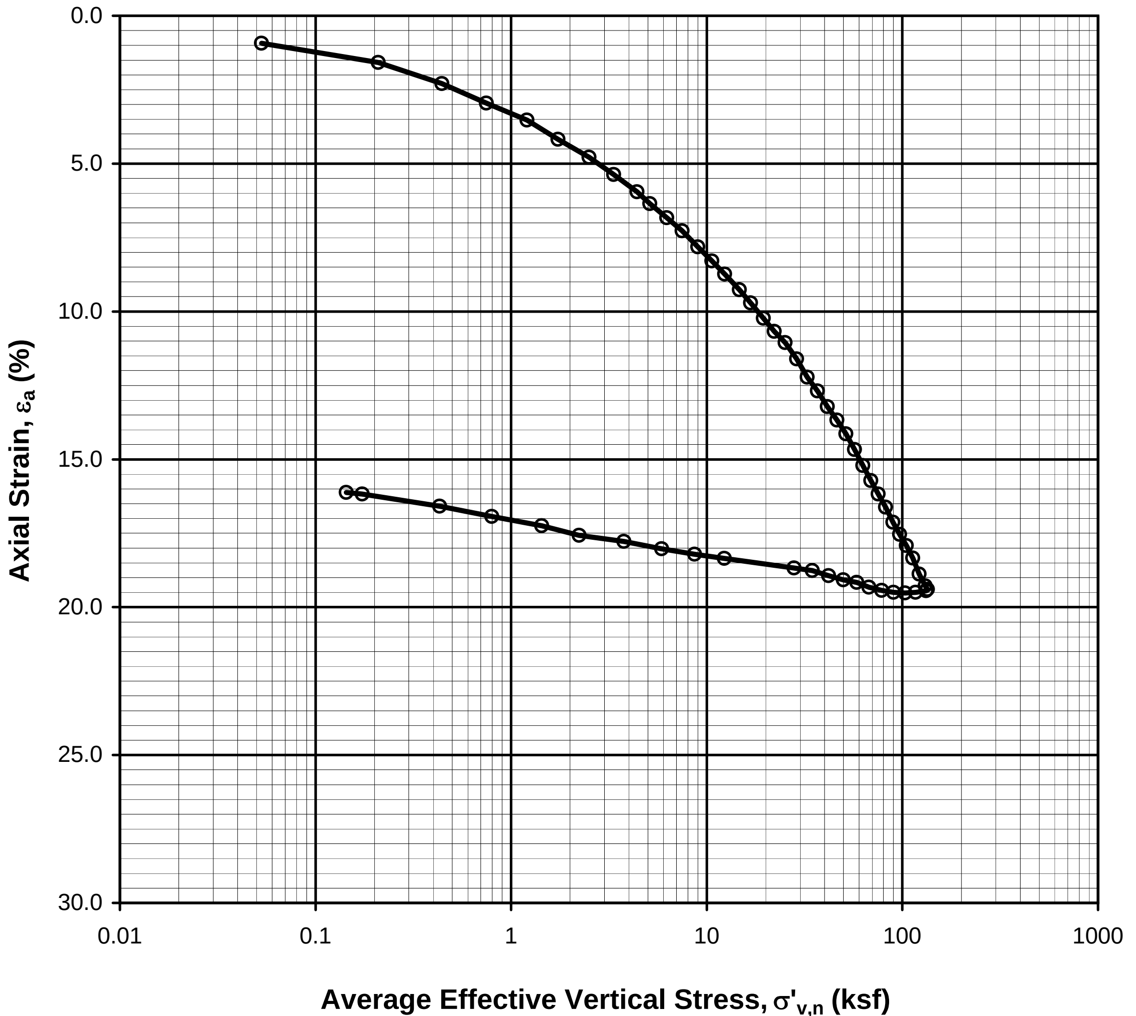
(3) This value is only different from the final value if there is soil extrusion during loading.

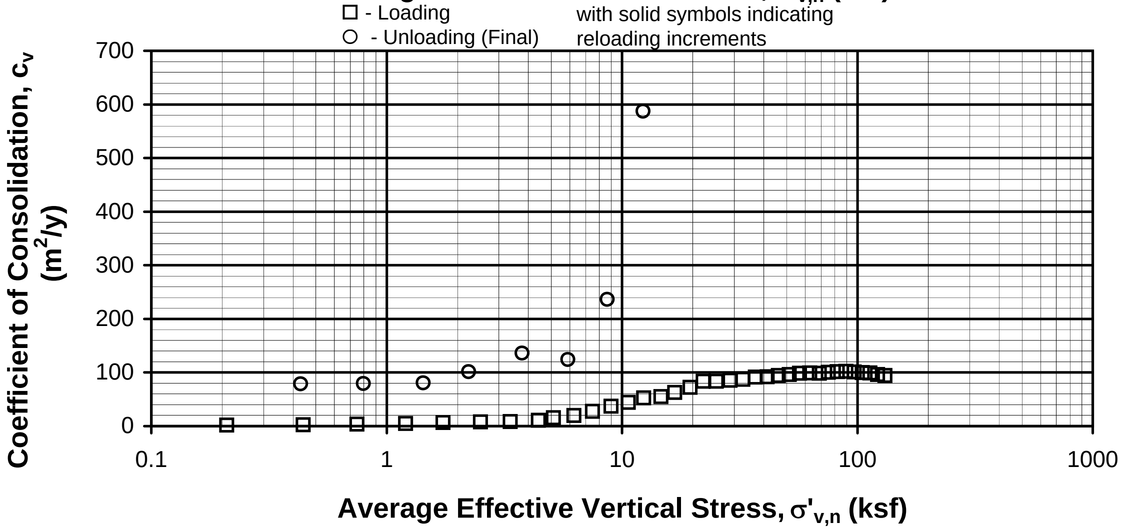
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/19/2012

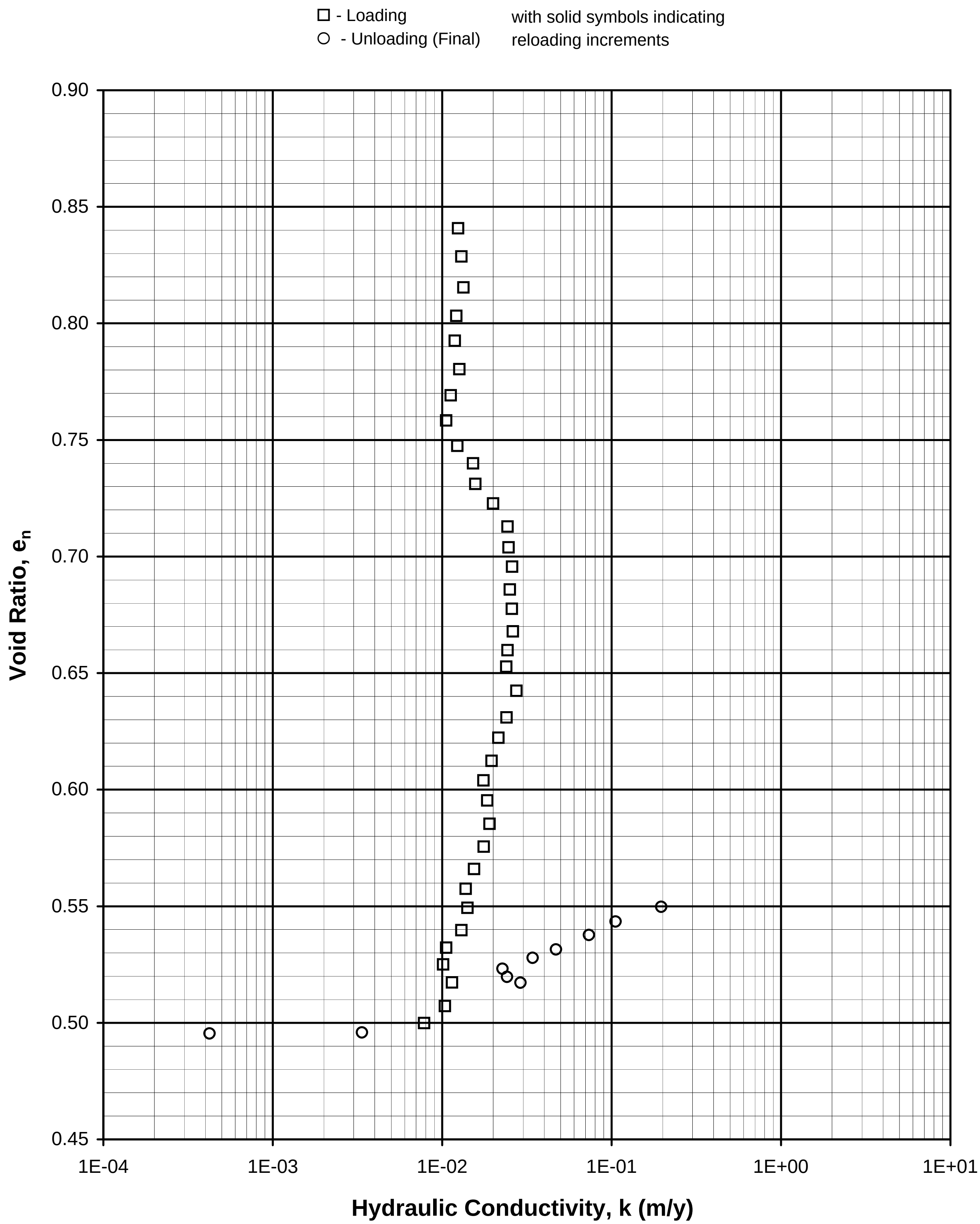




1-D CONSOLIDATION TEST: CRS

Sample No. S04Aa Depth 16.85 ft

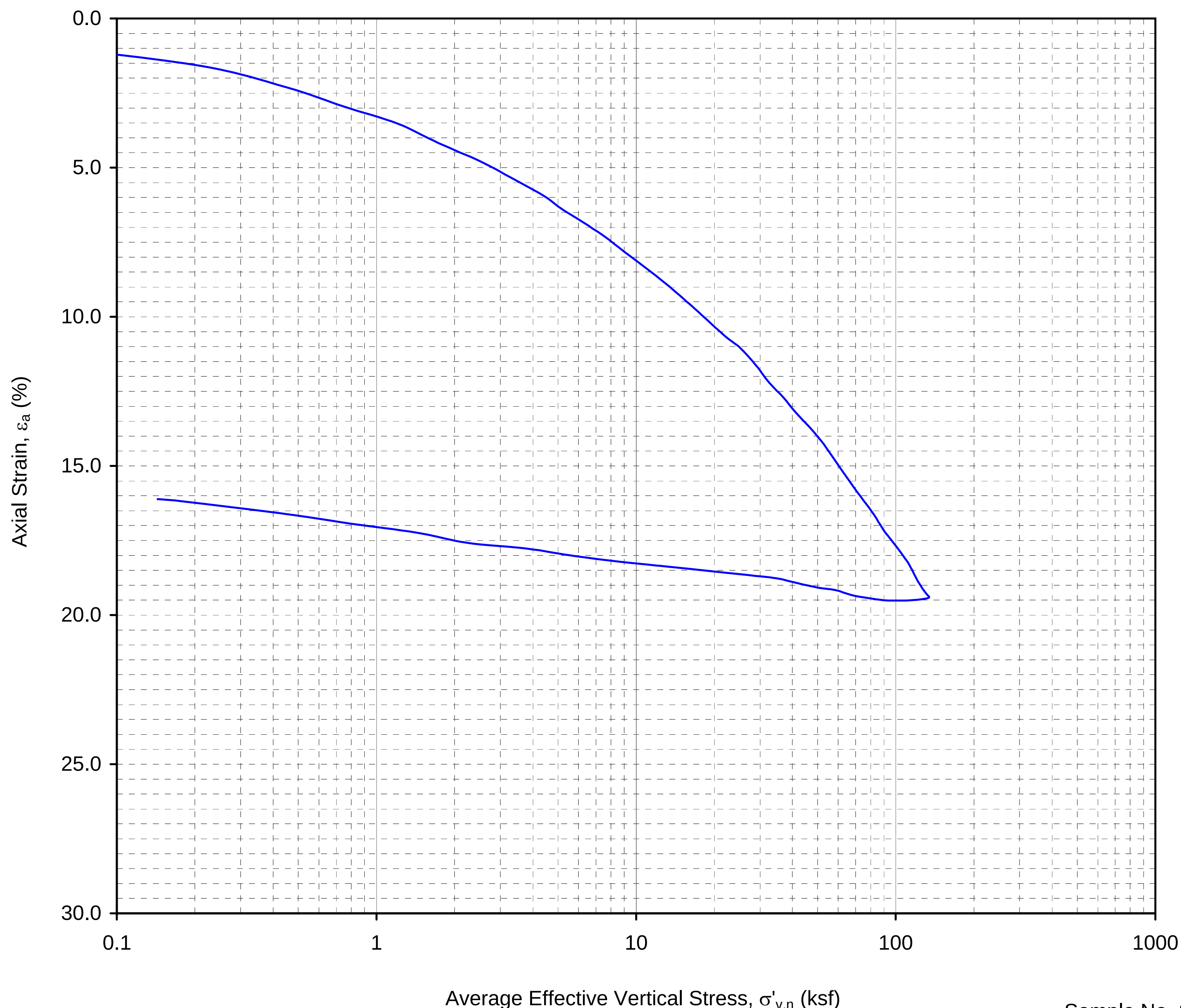
Boring WR0017-225B



1-D CONSOLIDATION TEST: CRS

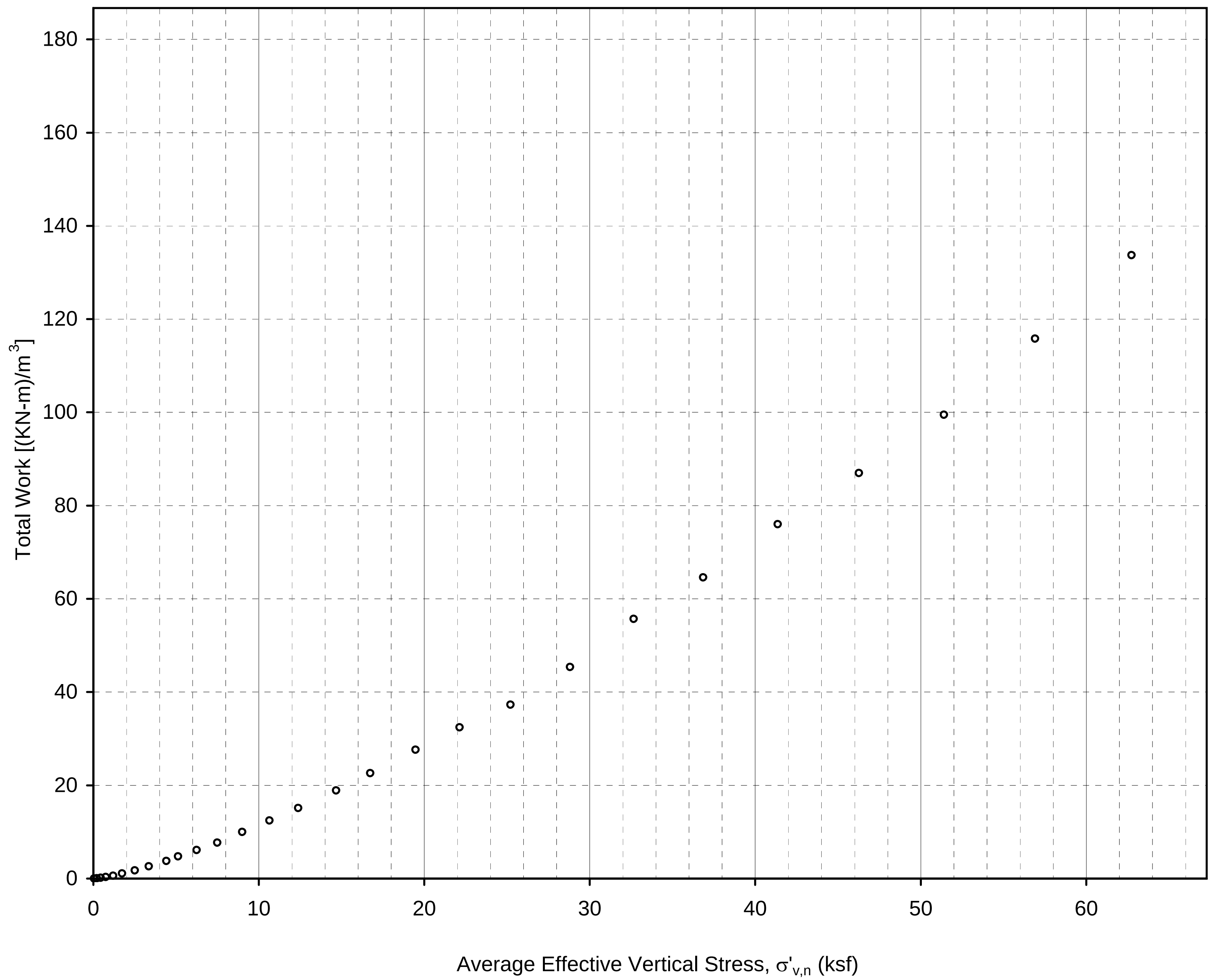
Sample No. S04Aa Depth 16.85 ft

Boring WR0017-225B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S04Aa   Depth 16.85



Sample No. S04Aa   Depth 16.85

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S09 File Name: WR0017-225B_S04Aa

Task No.: NA Cell No.: CRS-C09

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	34.56	86.44		105.6	103.0	110.0
2	"	Bottom, W2	30.29	89.28		99.2	93.6	100.4
3	"	Sides, W3	31.97	88.14		101.8	97.5	104.4
4	"	Average, W4	32.28	87.94		102.3	98.2	105.1
5	"	Back Calculated (1)	32.70	87.65	(3)	102.9	99.1	106.0
6	Final		22.14	87.65	(2)	102.9	100.0	107.0

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.685

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.693

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.11724
Final Selected, K_f	0.11724

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 87.37

Avg. Back Calculated and Measured Mass Dry Soil (g) = 87.51

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700		X	Assumed		To make S_f = 100% at end of test.		
			Measured		Avg. of measured/assumed G_s and G_s to make S_f = 100%		
Mass Dry Soil, (g)	Initial: 87.65	X	From Cal. Routine No.	5	Note: Routine #5 is based on final measurements.		
	Final (4): NA		Make S_f = 100%, or;		Avg. of measured & make S_f = 100%		
Initial Height (mm) =	19.09	X	Measured ;		Back Calculated	Back-cal. Sat. (%) =	NA
Final Height (mm) =	16.42	X	Measured ;		Initial H_o & dial change during loading		

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	32.7	0.858	102.9	120.2	90.6	10.276	From	To (ksf)
Final	22.1	0.598	100.0	128.6	105.3	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

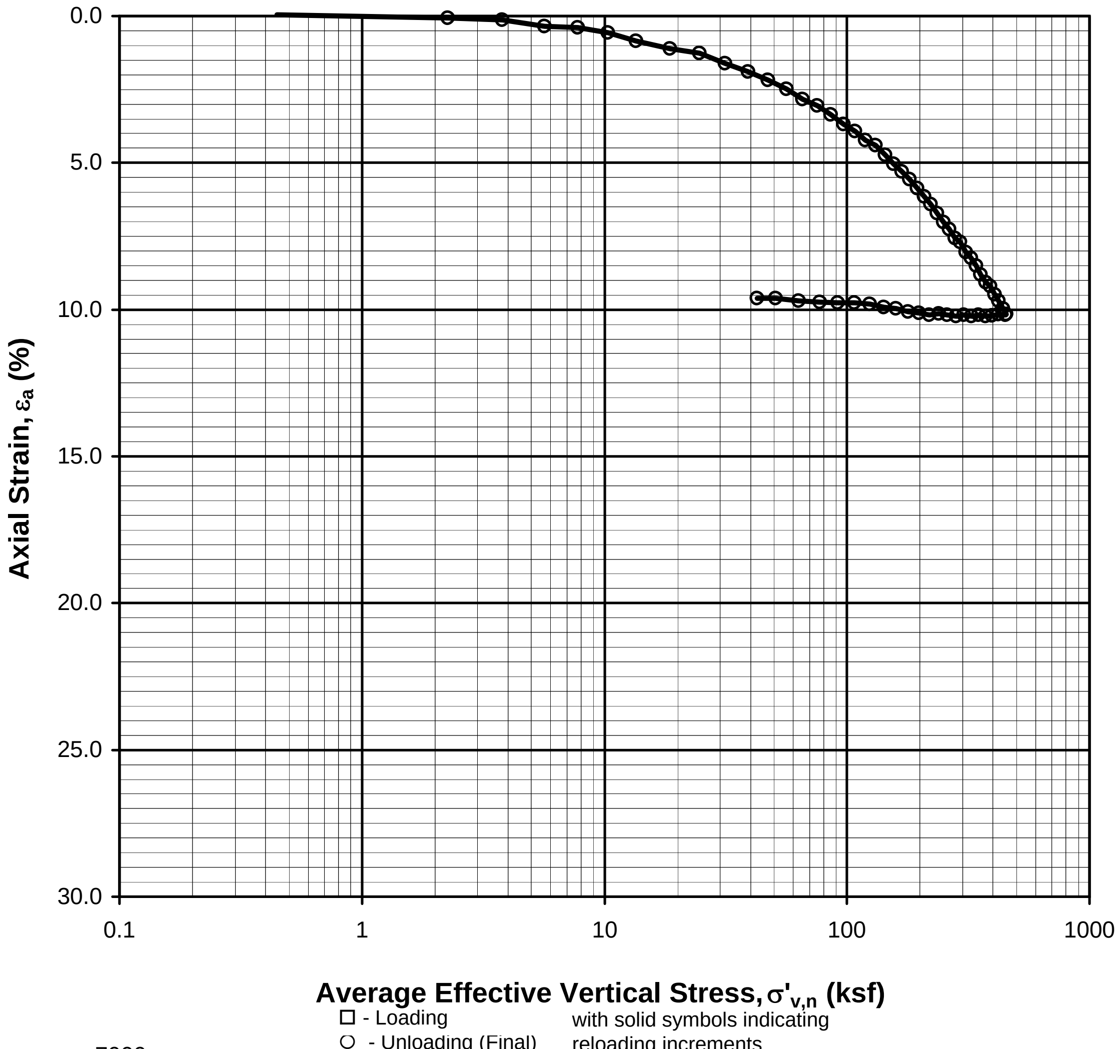
(3) This value is only different from the final value if there is soil extrusion during loading.

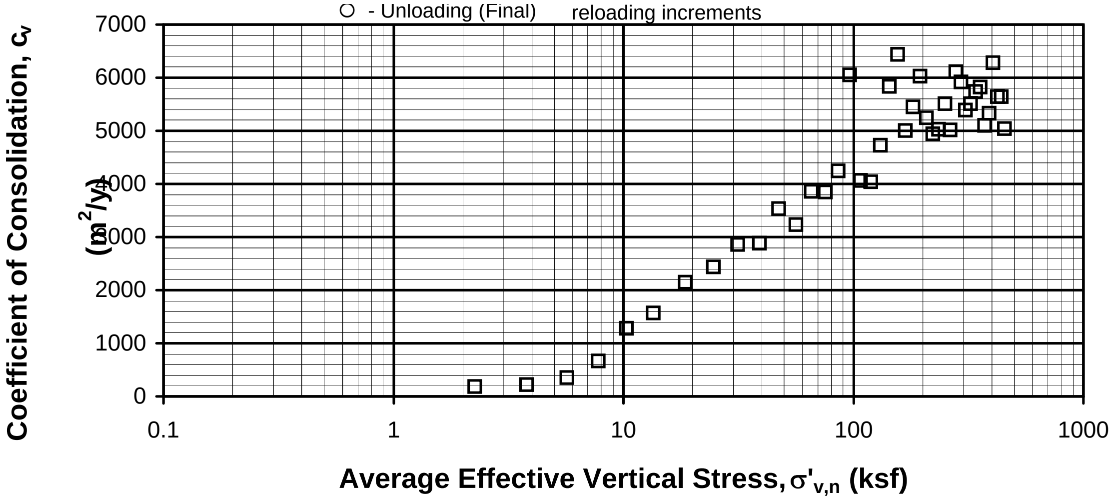
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/19/2012

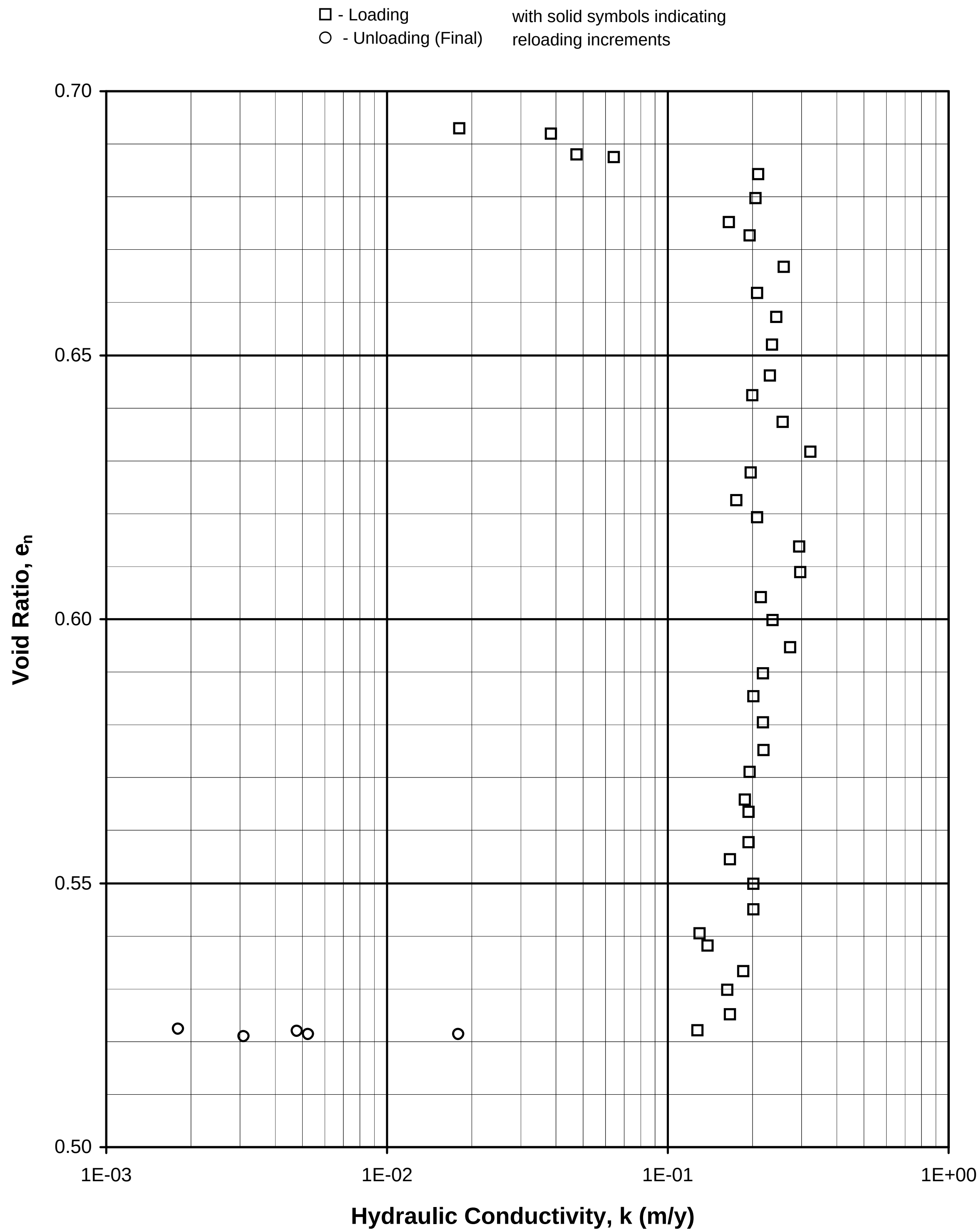




1-D CONSOLIDATION TEST: CRS

Sample No. S06Aa Depth 27.16 ft

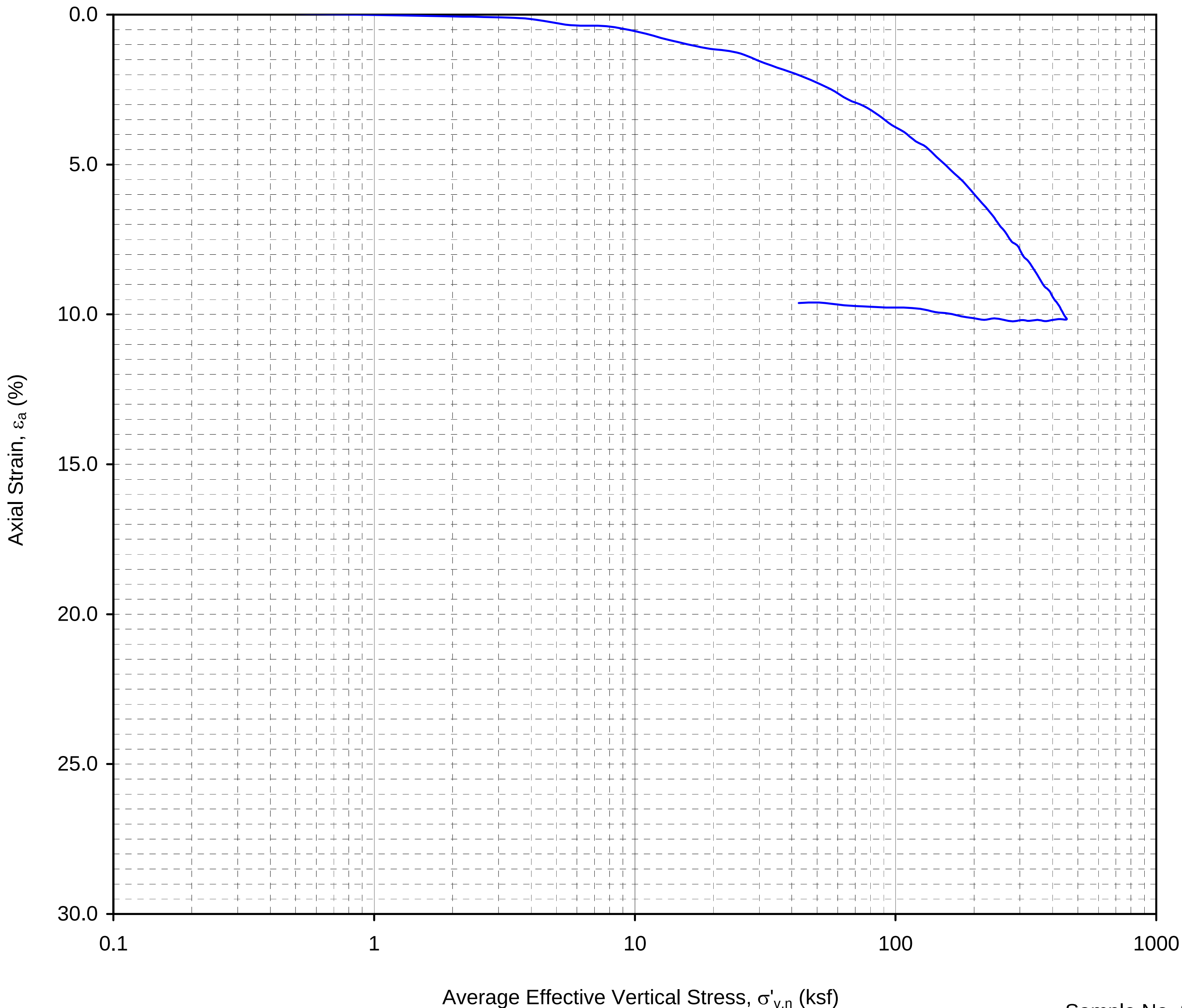
Boring WR0017-225B



1-D CONSOLIDATION TEST: CRS

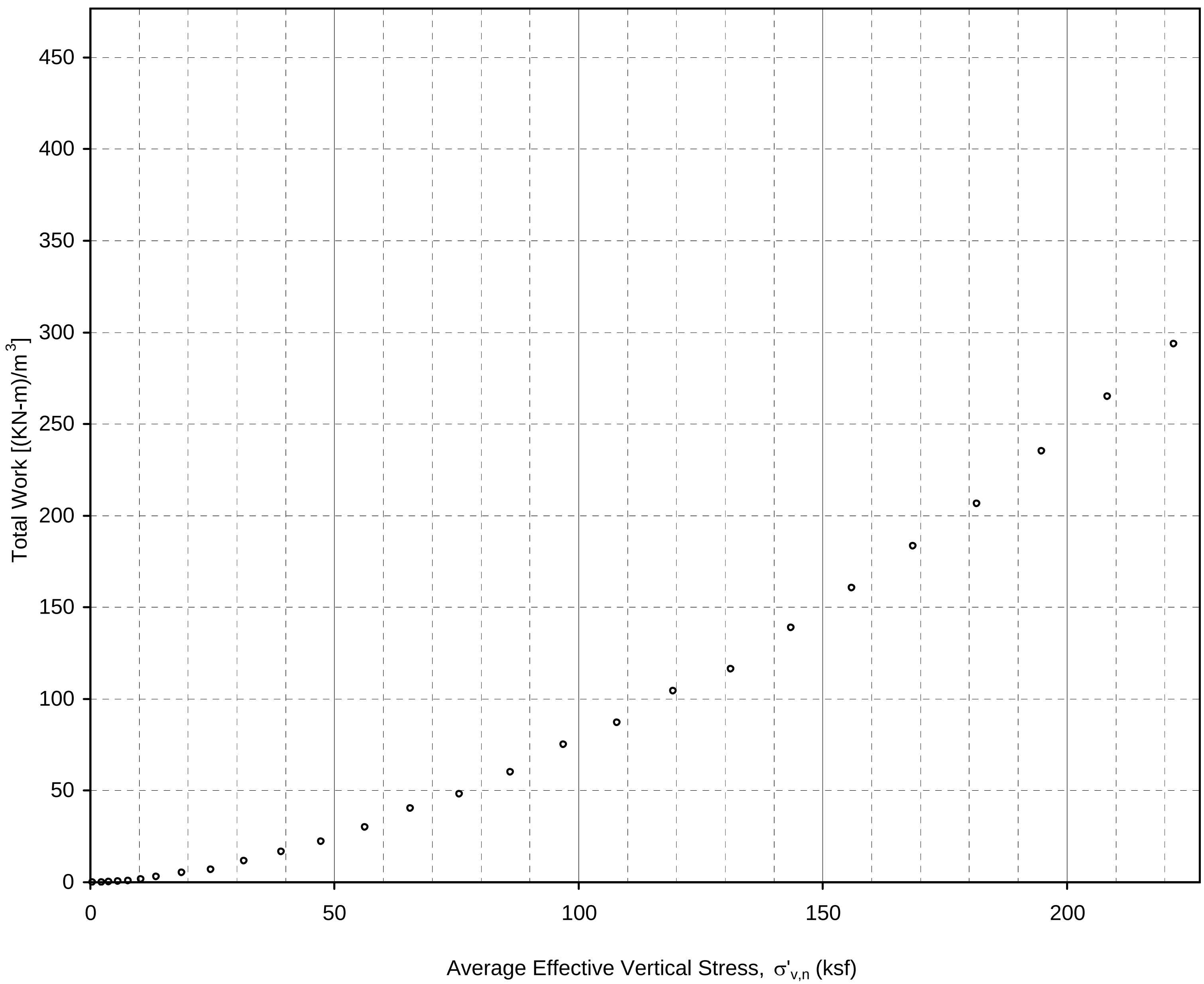
Sample No. S06Aa   Depth 27.16 ft

Boring WR0017-225B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S06Aa Depth 27.16



Sample No. S06Aa Depth 27.16

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S16 File Name: WR0017-225B_S06Aa

Task No.: NA Cell No.: CRS-C16

Specific Gravity, G_s: 2.750 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	22.87	63.26		92.1	88.2	95.5
2	"	Bottom, W2	25.17	62.10		96.9	94.1	101.6
3	"	Sides, W3	25.15	62.11		96.8	94.1	101.5
4	"	Average, W4	24.40	62.49		95.3	92.2	99.6
5	"	Back Calculated (1)	23.67	62.85	(3)	93.8	90.3	97.7
6	Final		20.88	62.85	(2)	93.8	100.0	108.1

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.605

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.678

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.18009
Final Selected, K_f	0.18009

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 60.86

Avg. Back Calculated and Measured Mass Dry Soil (g) = 61.86

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.750 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 62.85; Final (4): NA — [X] From Cal. Routine No. 5 — Note: Routine #5 is based on final measurements.; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.18 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 17.82 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	23.7	0.694	93.8	125.1	101.2	11.320	From	To (ksf)
Final	20.9	0.574	100.0	131.6	108.9	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

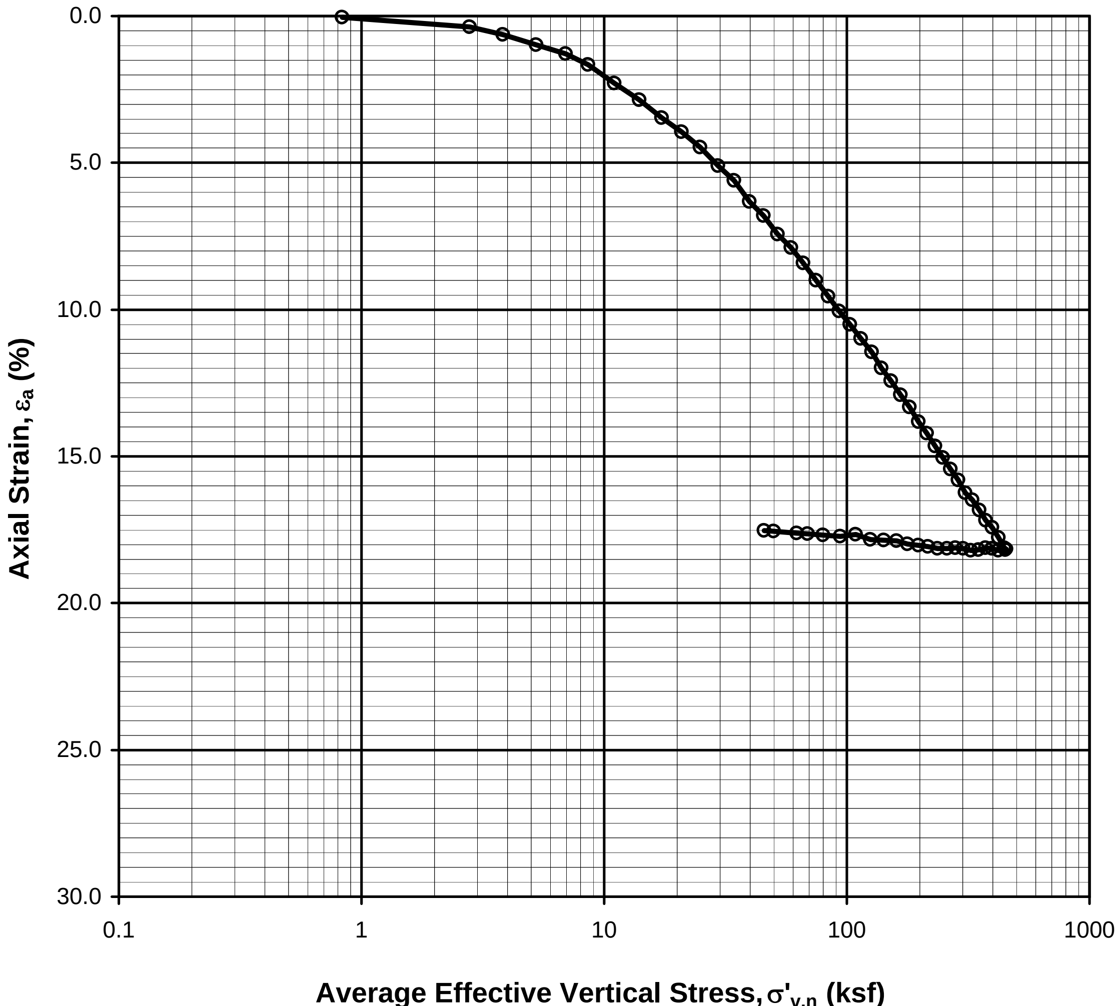
(3) This value is only different from the final value if there is soil extrusion during loading.

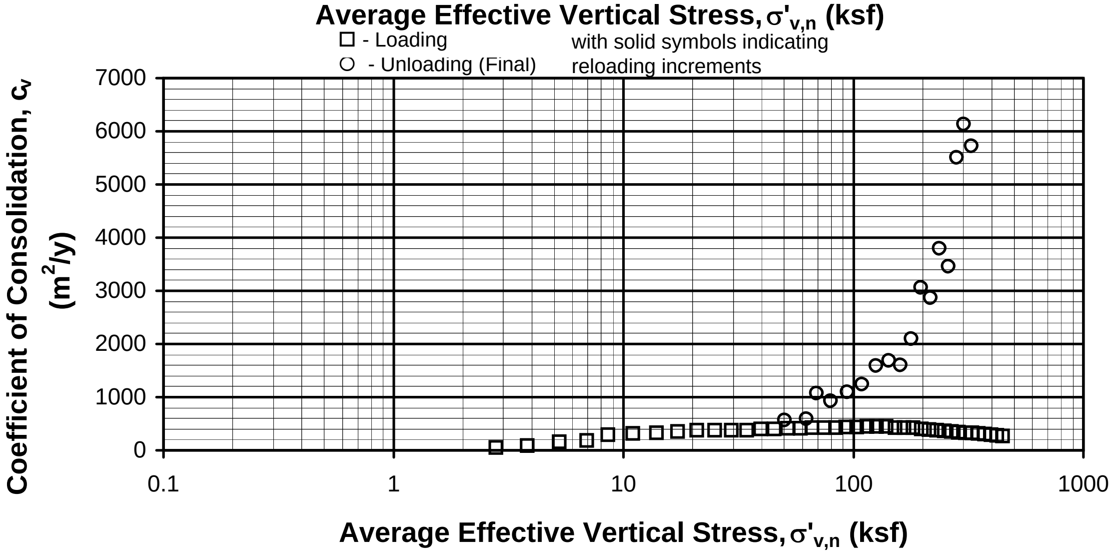
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/16/2012

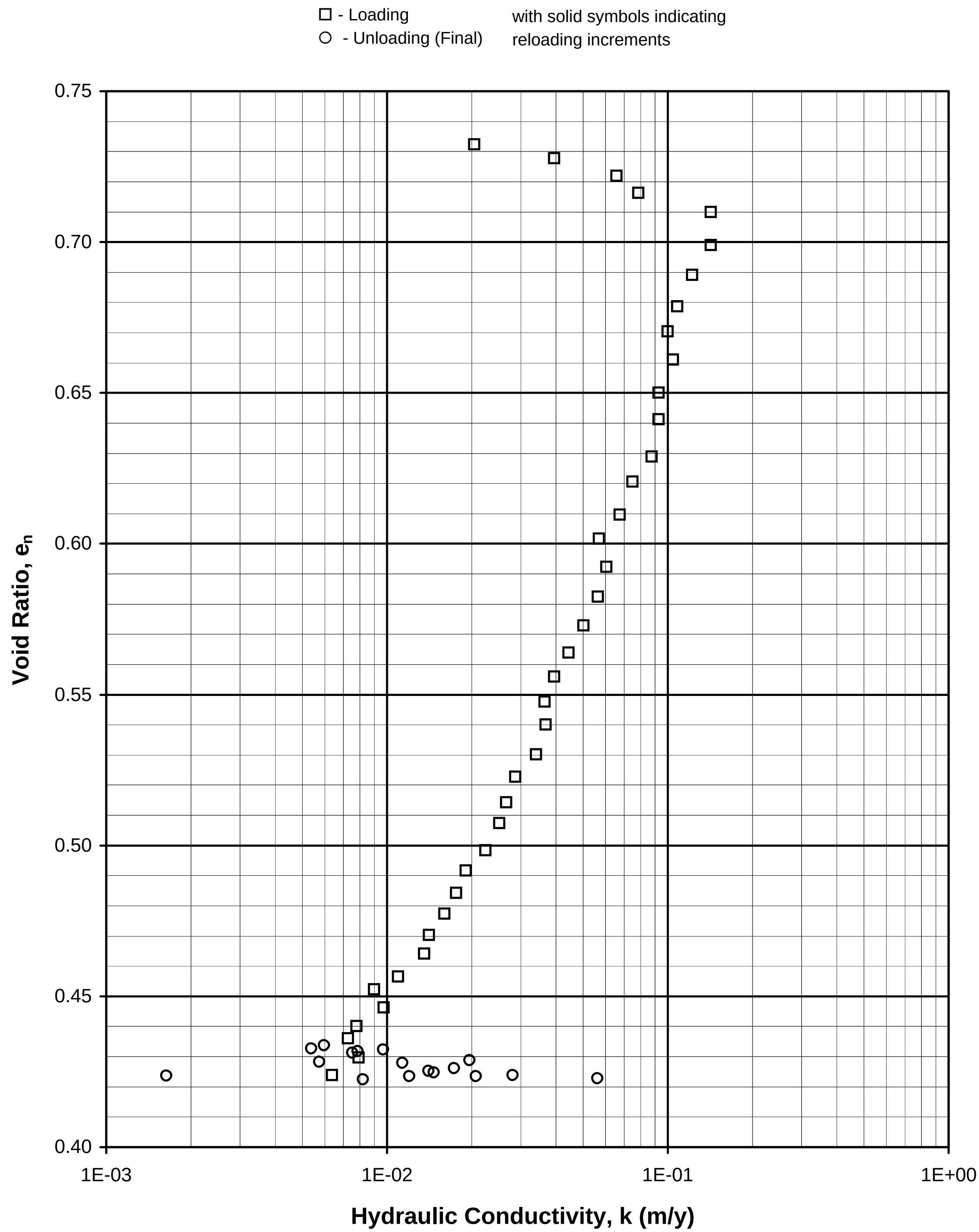




1-D CONSOLIDATION TEST: CRS

Sample No. S04Aa Depth 17.1 ft

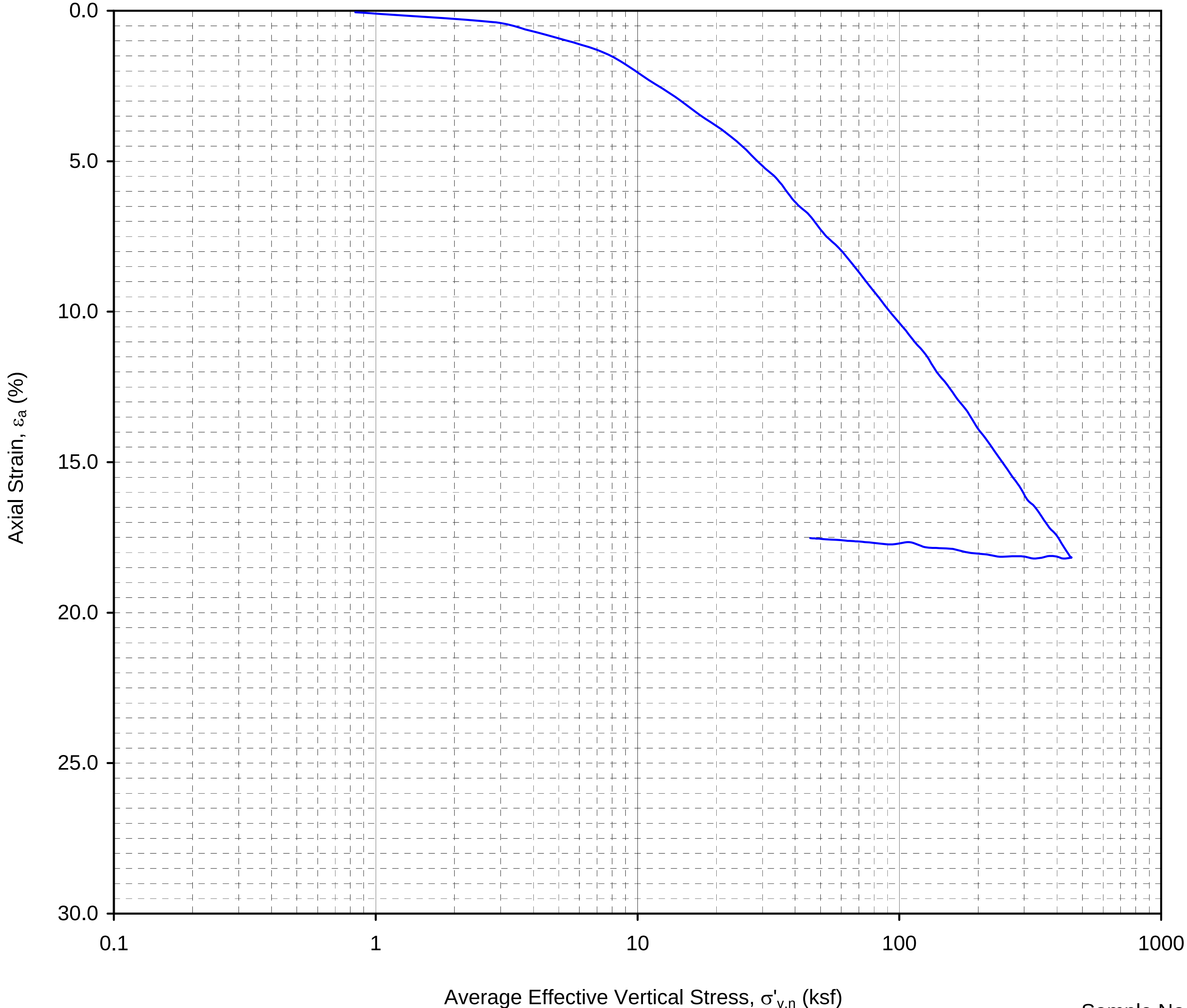
Boring WR0017-227B



1-D CONSOLIDATION TEST: CRS

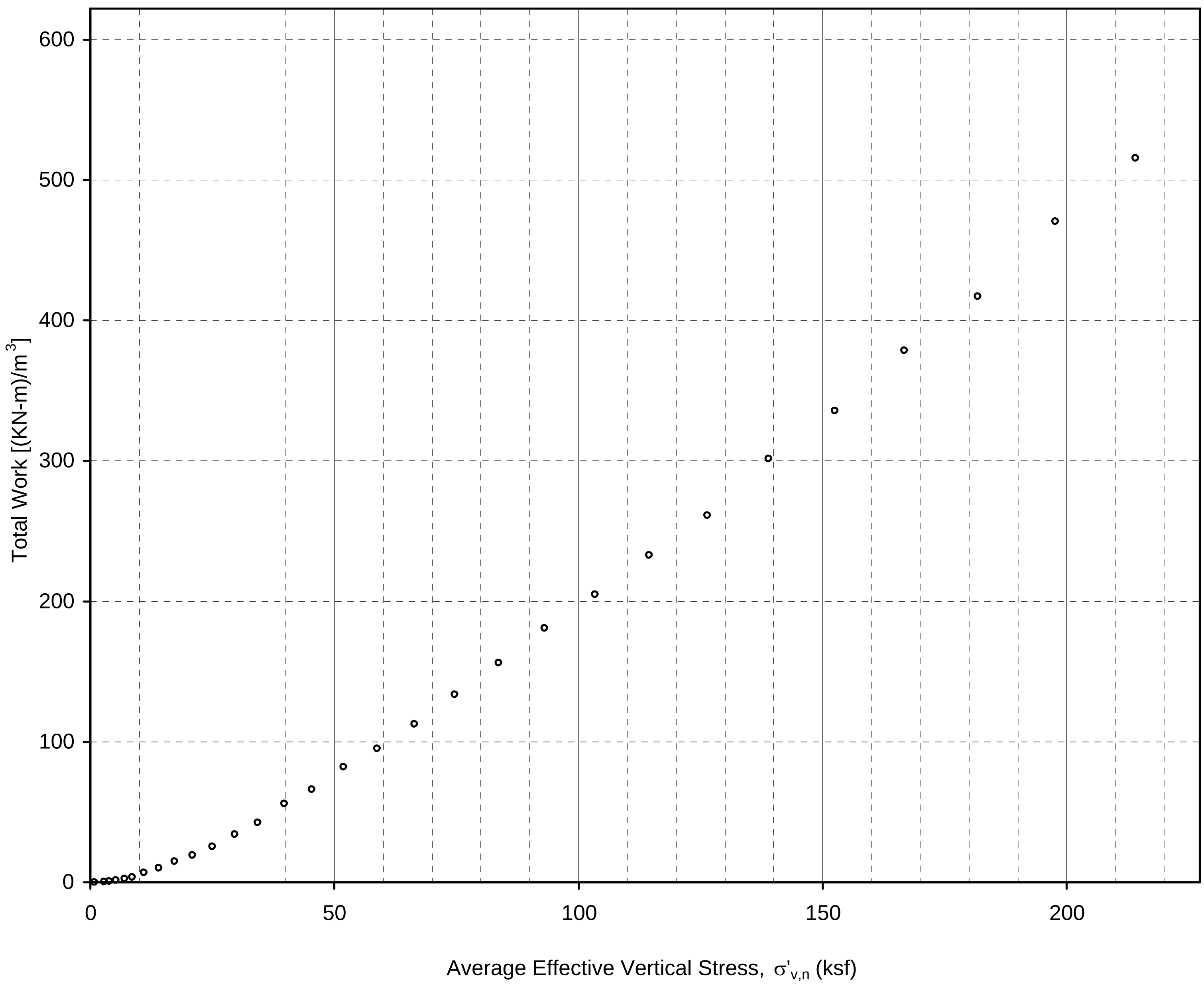
Sample No. S04Aa Depth 17.1 ft

Boring WR0017-227B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S04Aa   Depth 17.1



Sample No. S04Aa   Depth 17.1

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S16 File Name: WR0017-227B_S04Aa

Task No.: NA Cell No.: CRS-C16

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	25.58	61.44		95.2	95.3	98.0
2	"	Bottom, W2	27.35	60.58		98.5	100.7	103.5
3	"	Sides, W3	26.37	61.05		96.7	97.7	100.5
4	"	Average, W4	26.43	61.02		96.8	97.9	100.7
5	"	Back Calculated (1)	26.55	60.96	(3)	97.0	98.3	101.1
6	Final		16.54	60.96	(2)	97.0	100.0	102.8

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.680

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.690

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.18288
Final Selected, K_f	0.18288

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 60.69

Avg. Back Calculated and Measured Mass Dry Soil (g) = 60.83

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 60.96; Final (4): NA — [X] From Cal. Routine No. [5] Note: Routine #5 is based on final measurements. [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.39 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.13 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	26.6	0.739	97.0	122.5	96.8	11.149	From	To (ksf)
Final	16.5	0.446	100.0	135.6	116.3	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

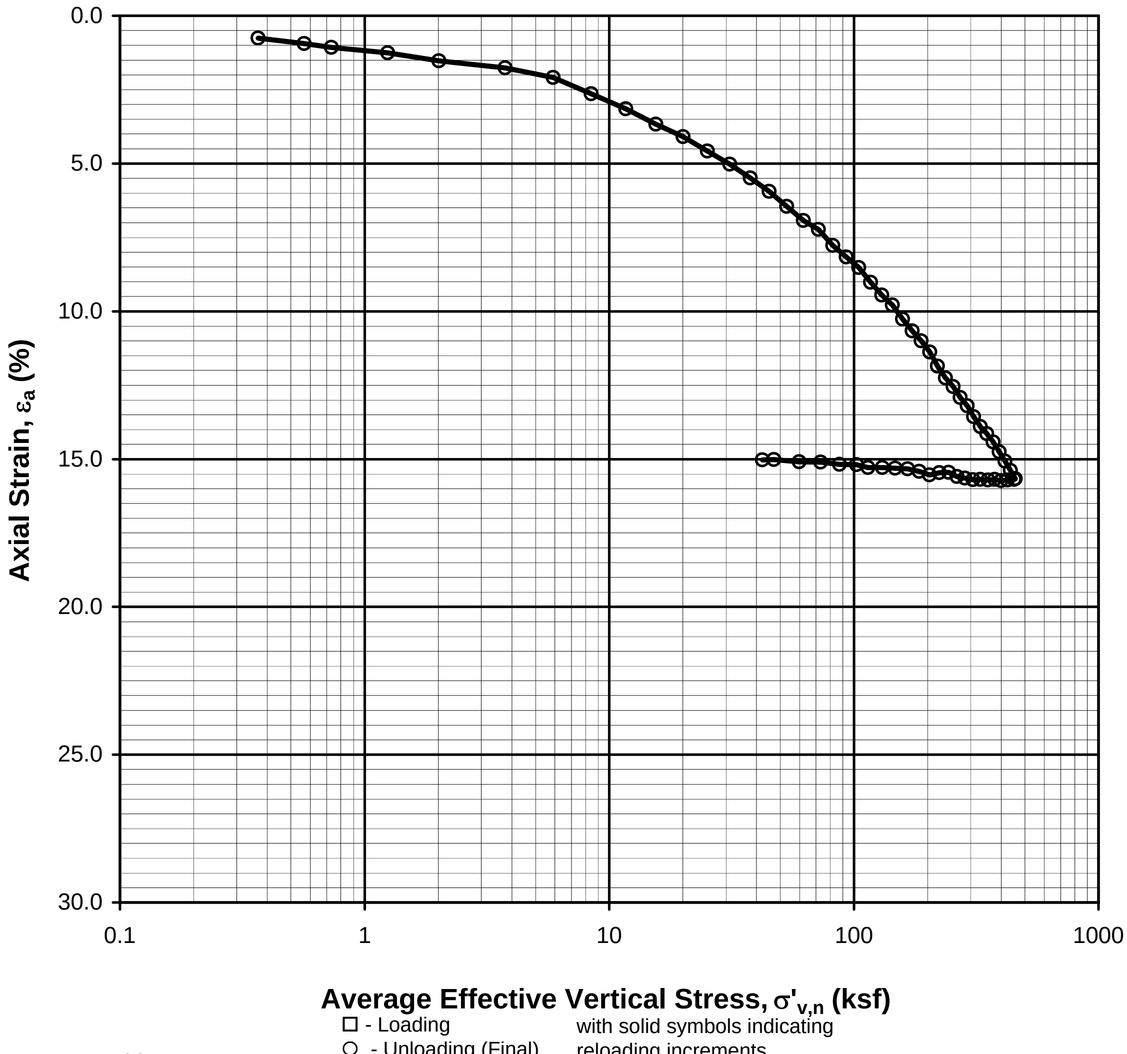
(3) This value is only different from the final value if there is soil extrusion during loading.

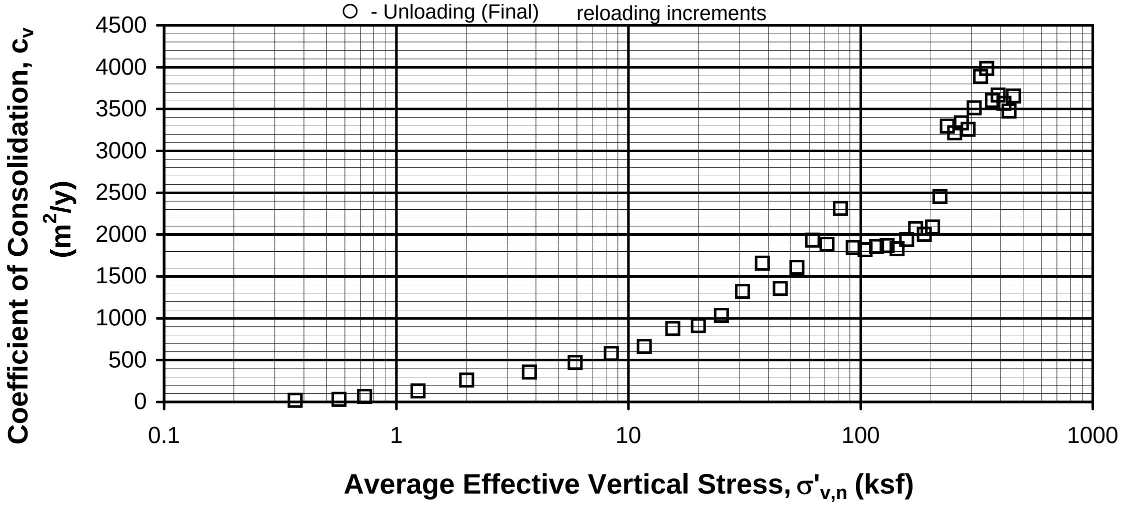
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/27/2012

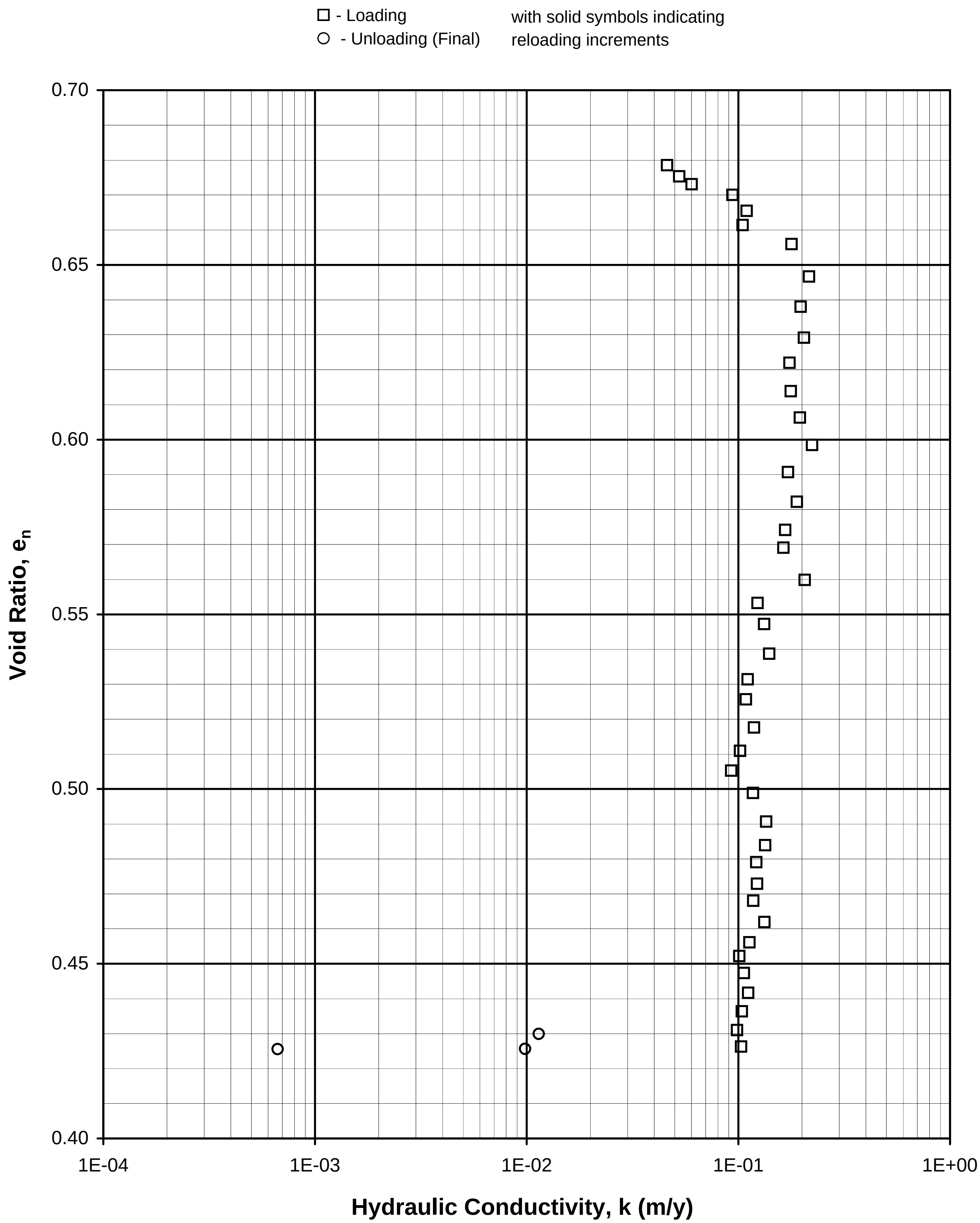




1-D CONSOLIDATION TEST: CRS

Sample No. S04Ae   Depth 16.4 ft

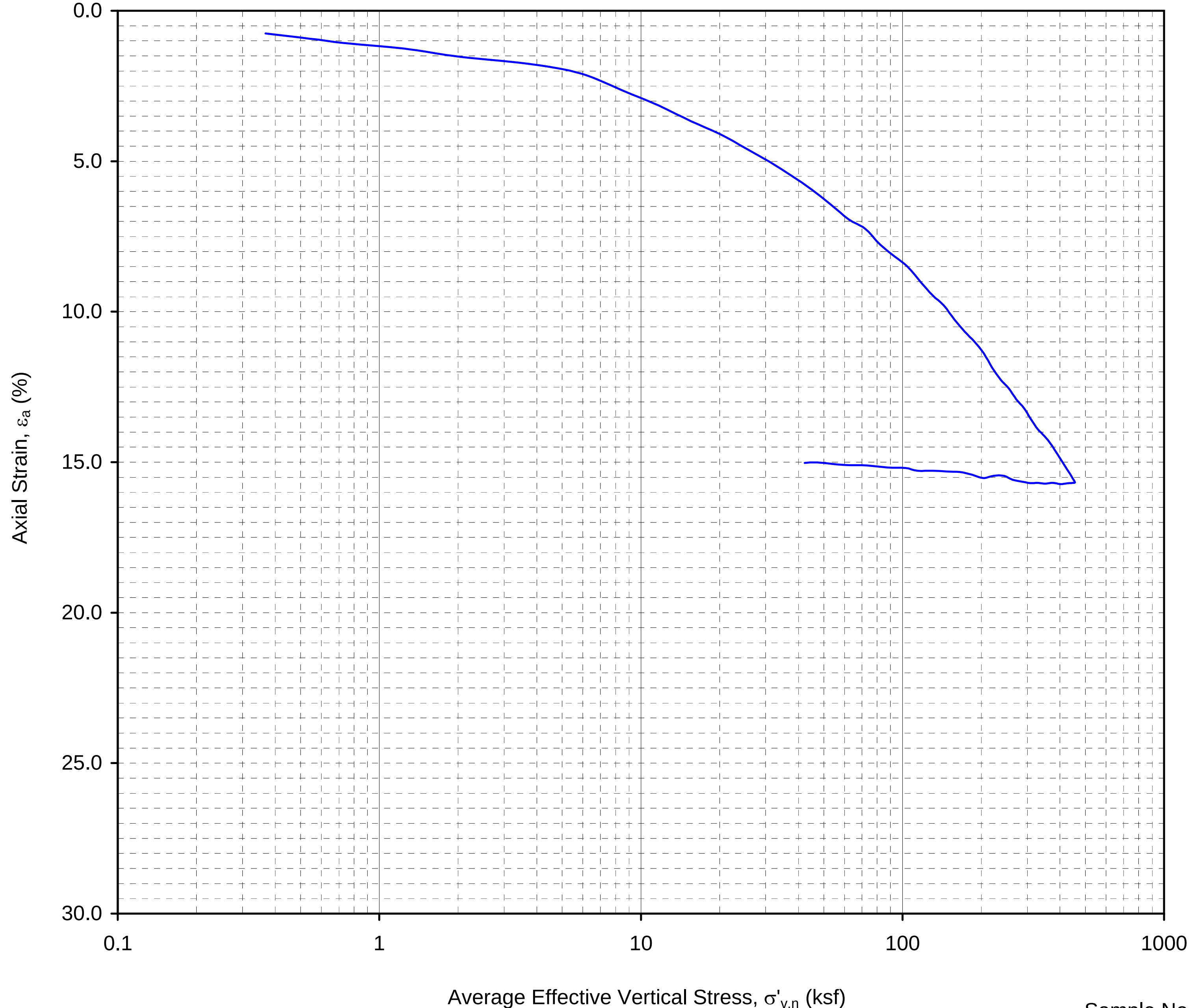
Boring WR0017-227B



1-D CONSOLIDATION TEST: CRS

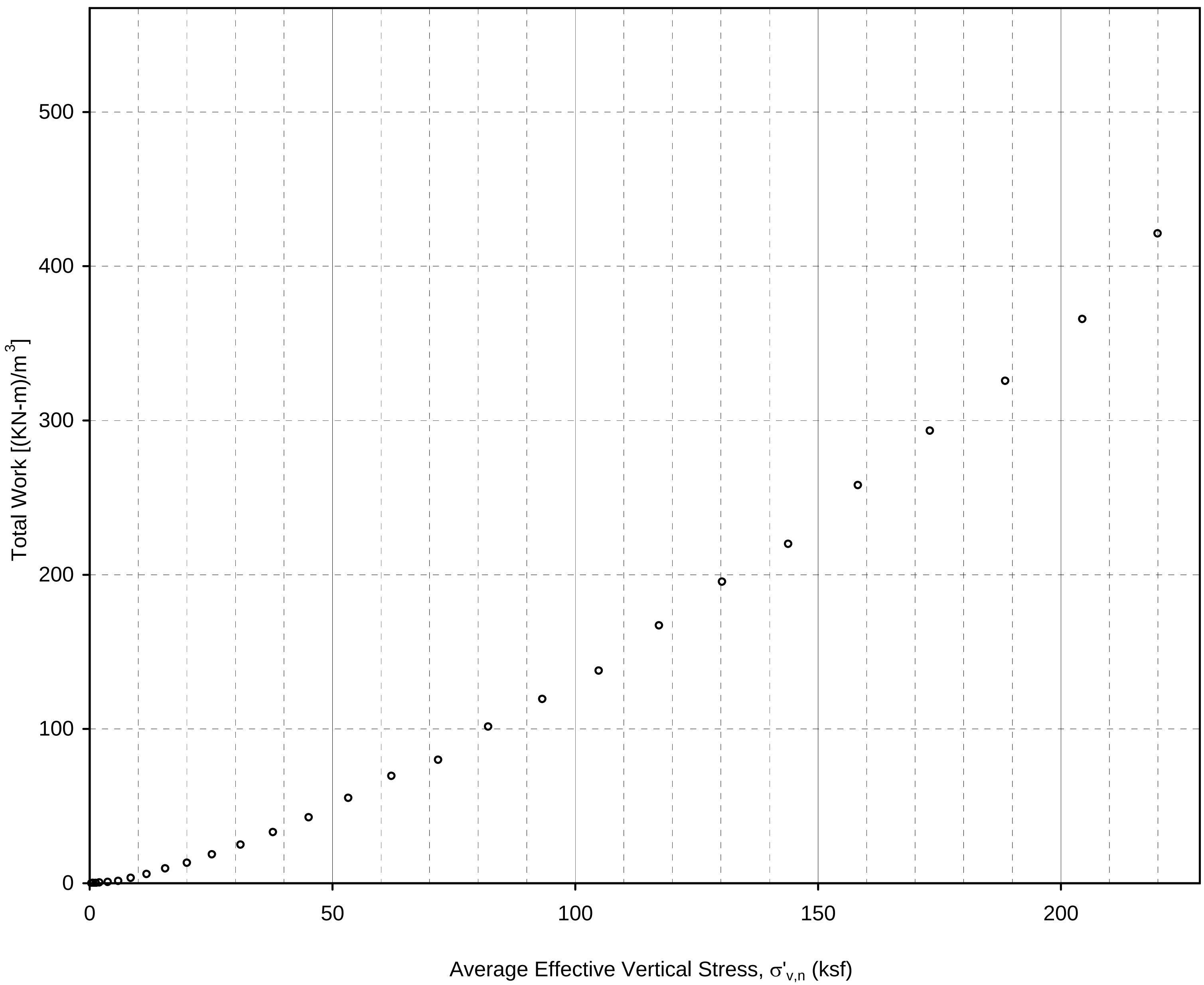
Sample No. S04Ae Depth 16.4 ft

Boring WR0017-227B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S04Ae Depth 16.4



Sample No. S04Ae   Depth 16.4 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S16 File Name: WR0017-227B_S04Ae

Task No.: NA Cell No.: CRS-C16

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	25.80	60.98		99.8	95.9	110.2
2	"	Bottom, W2	27.43	60.20		102.8	100.2	114.7
3	"	Sides, W3	27.18	60.32		102.4	99.6	114.0
4	"	Average, W4	26.80	60.50		101.7	98.6	113.0
5	"	Back Calculated (1)	25.30	61.22	(3)	98.8	94.6	108.7
6	Final		18.61	61.22	(2)	98.8	100.0	114.9

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.628

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.664

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18361
Final Selected, K_f	0.18361

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 60.24

Avg. Back Calculated and Measured Mass Dry Soil (g) = 60.73

Summary of Specimen Physical Properties

Specific Gravity		[X] Assumed	[ ] To make S_f = 100% at end of test.
G_s =	2.700	[ ] Measured	[ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g)	Initial: 61.22	[X] From Cal. Routine No.	5	Note: Routine #5 is based on final measurements.
	Final (4): NA	[ ] Make S_f = 100%, or;	[ ]	Avg. of measured & make S_f = 100%

Initial Height (mm) =	19.01	[X] Measured ;	[ ] Back Calculated Back-cal. Sat. (%) = NA
Final Height (mm) =	16.89	[X] Measured ;	[ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	25.3	0.691	98.8	124.6	99.5	11.241	From	To (ksf)
Final	18.6	0.503	100.0	132.8	112.0	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

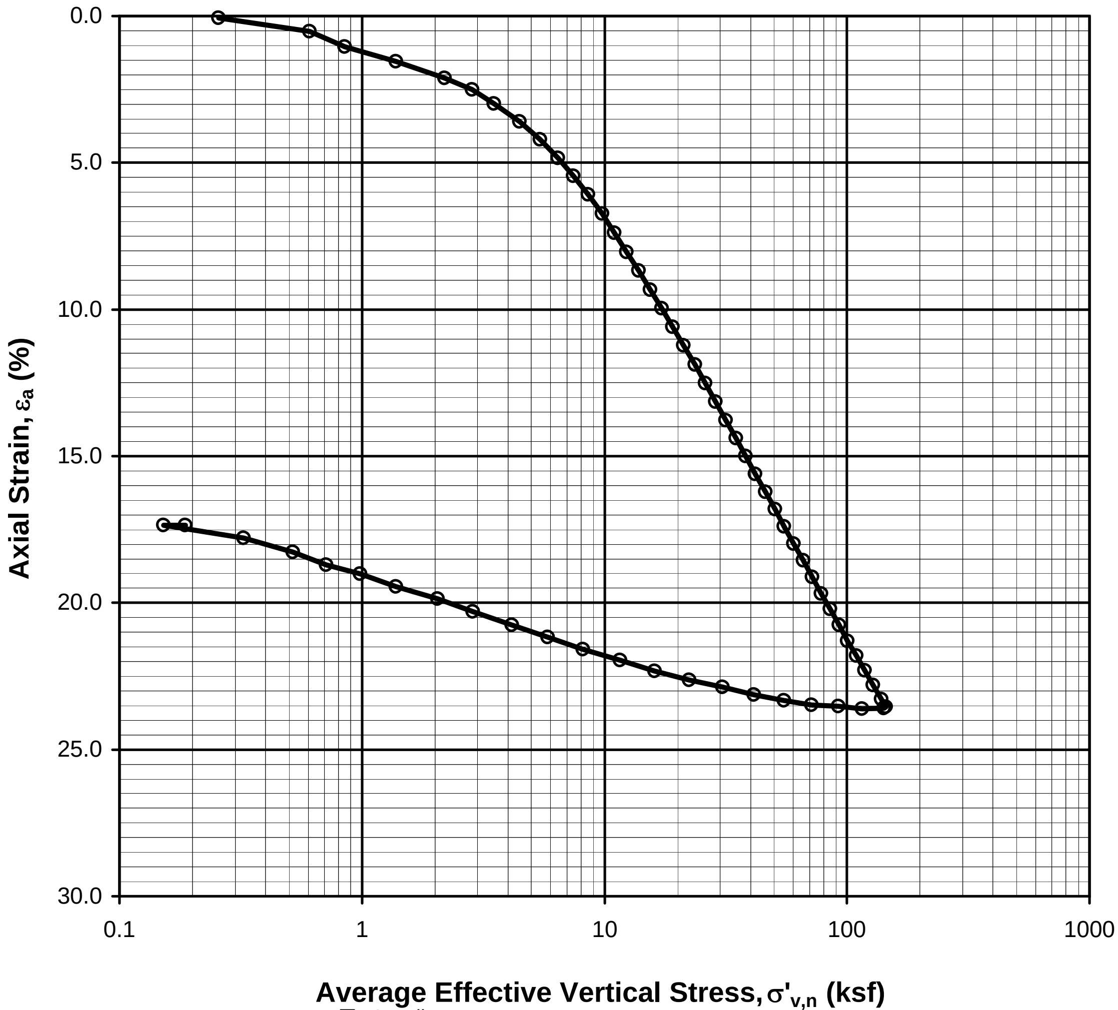
(3) This value is only different from the final value if there is soil extrusion during loading.

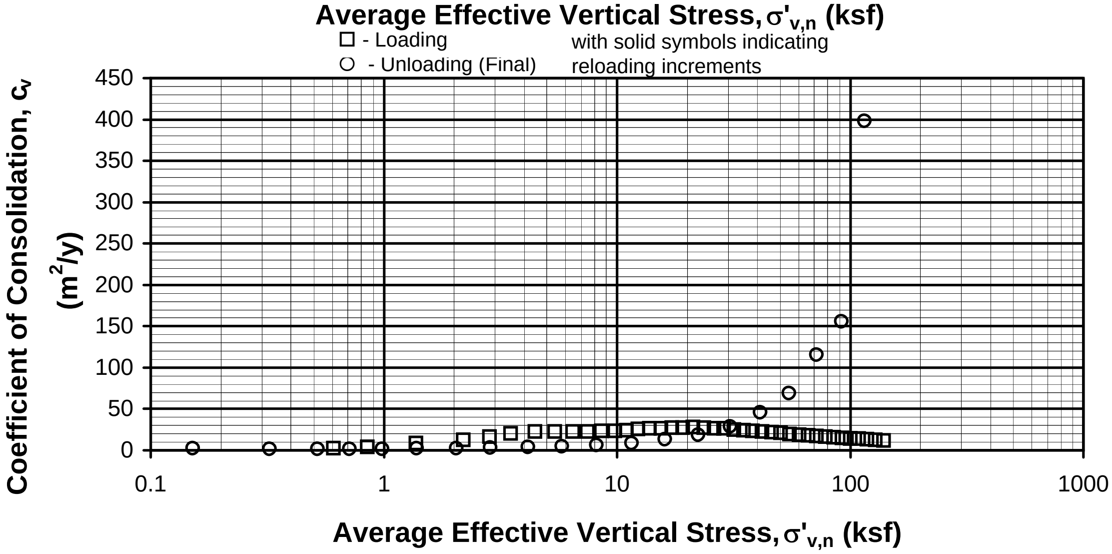
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: TM Reviewed By: RJ

Date: 2/18/2013

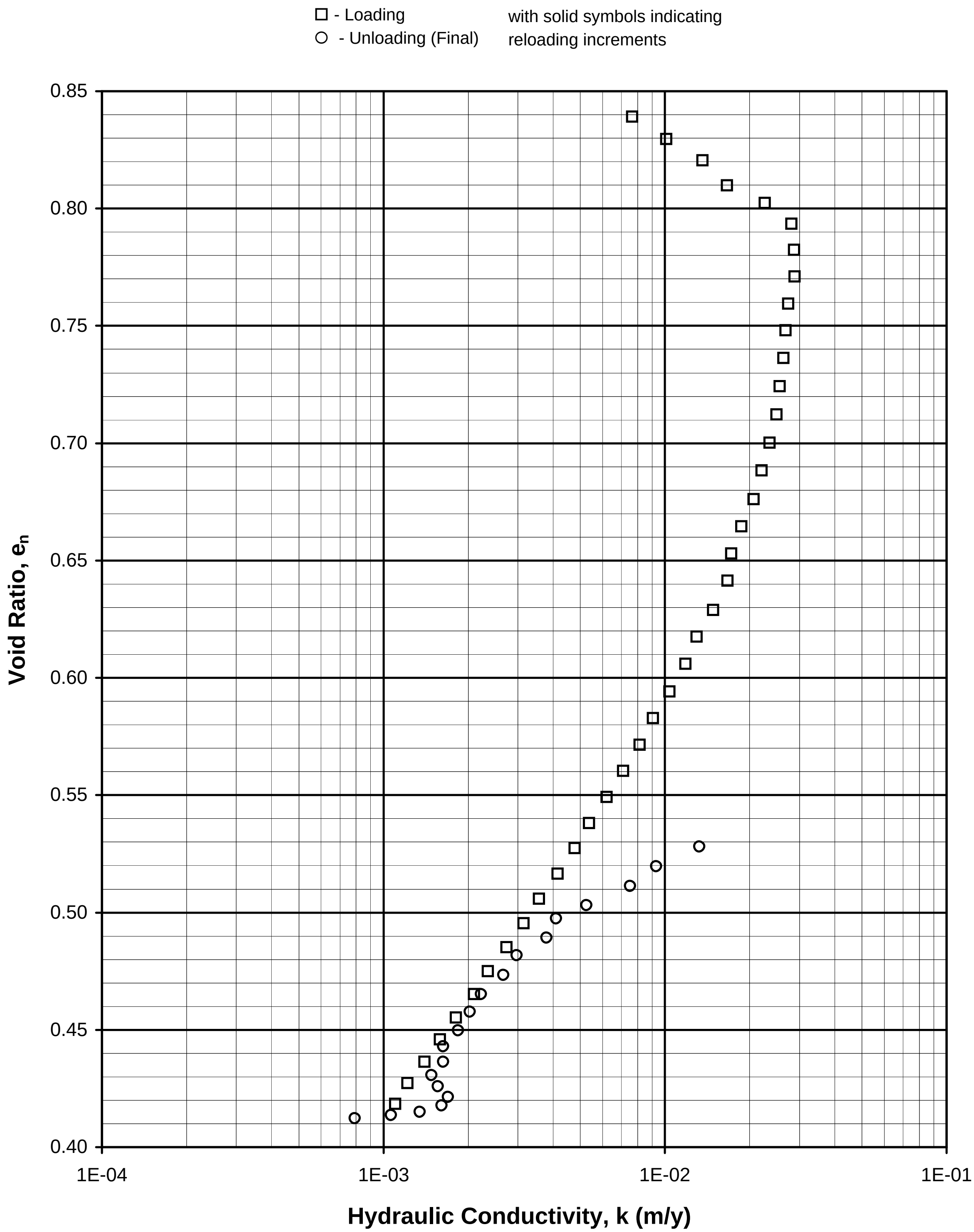




1-D CONSOLIDATION TEST: CRS

Sample No. S07Aa Depth 27.6 ft

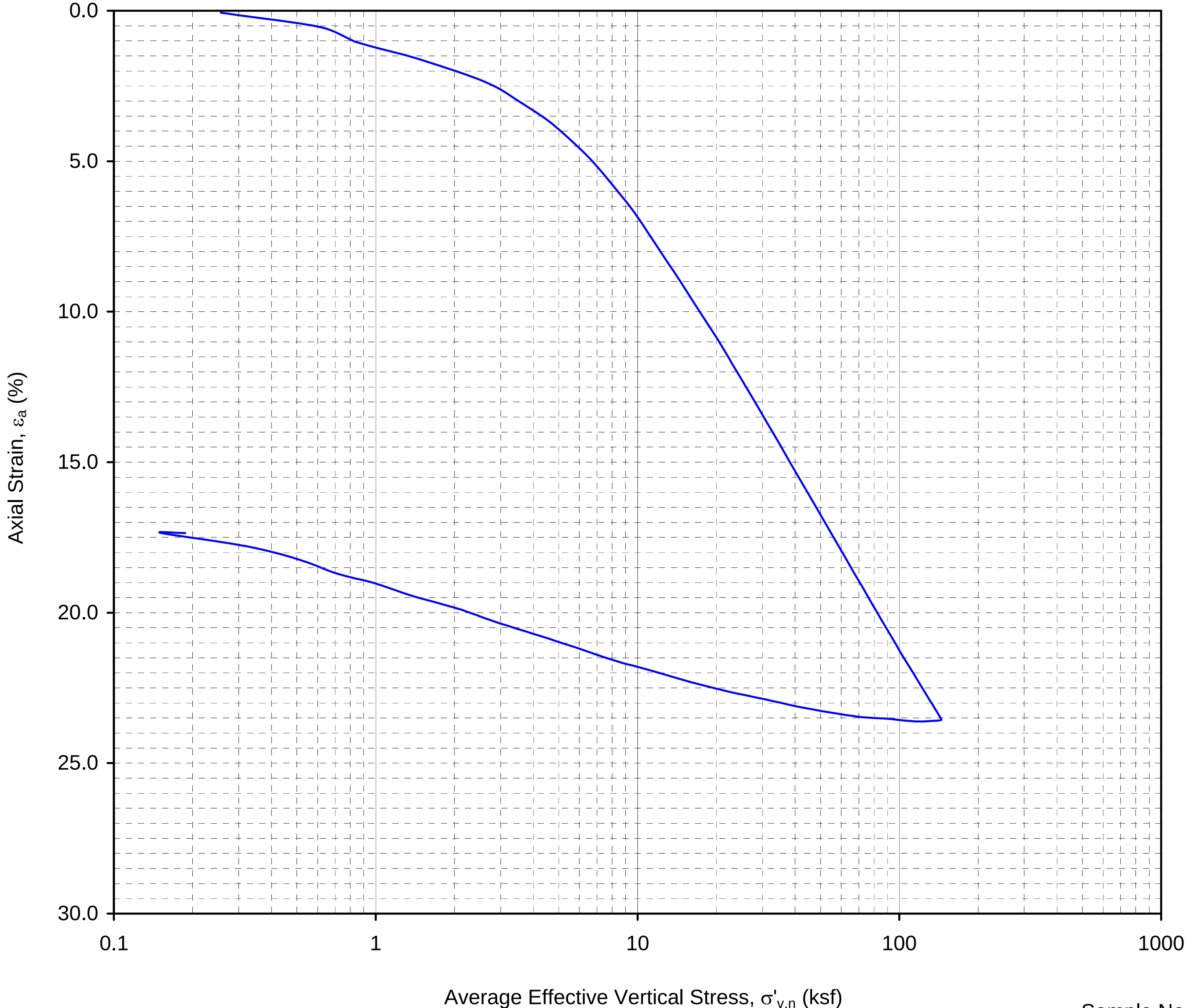
Boring WR0017-227B



1-D CONSOLIDATION TEST: CRS

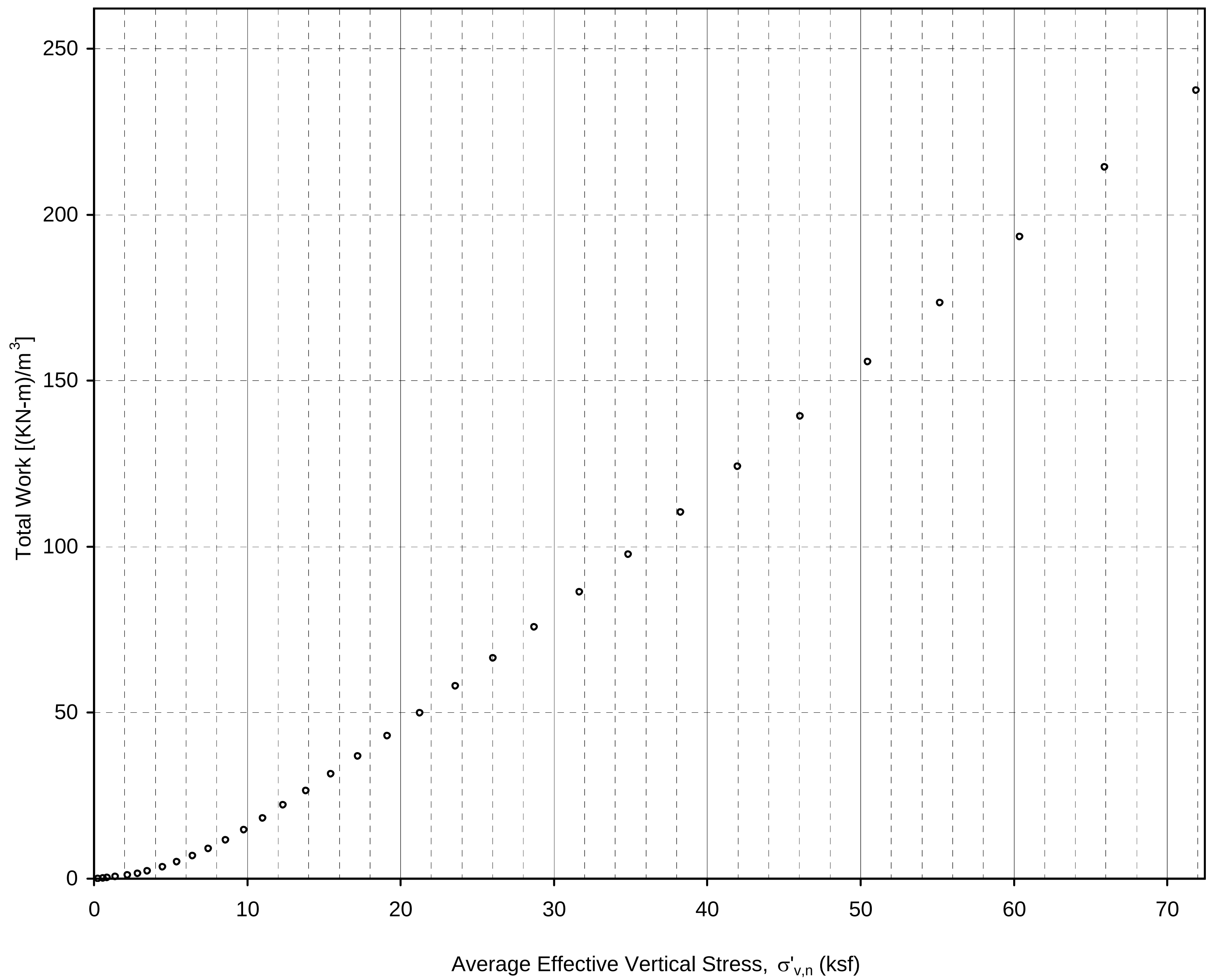
Sample No. S07Aa   Depth 27.6 ft

Boring WR0017-227B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07Aa   Depth 27.6



Sample No. S07Aa   Depth 27.6 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S13 File Name: WR0017-227B_S07Aa

Task No.: NA Cell No.: CRS-C13

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	32.98	54.99		97.9	110.1	110.5
2	"	Bottom, W2	28.86	56.75		91.6	100.8	101.2
3	"	Sides, W3	30.78	55.92		94.6	105.3	105.7
4	"	Average, W4	30.87	55.88		94.8	105.6	105.9
5	"	Back Calculated (1)	28.29	57.00	(3)	90.6	99.4	99.7
6	Final		19.48	57.00	(2)	90.6	100.0	100.4

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.711

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.715

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.18208
Final Selected, K_f	0.18208

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 56.89

Avg. Back Calculated and Measured Mass Dry Soil (g) = 56.95

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 57.00; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%. Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.19 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 15.88 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	28.3	0.849	90.6	117.6	91.7	10.379	From	To (ksf)
Final	19.5	0.530	100.0	132.4	110.8	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

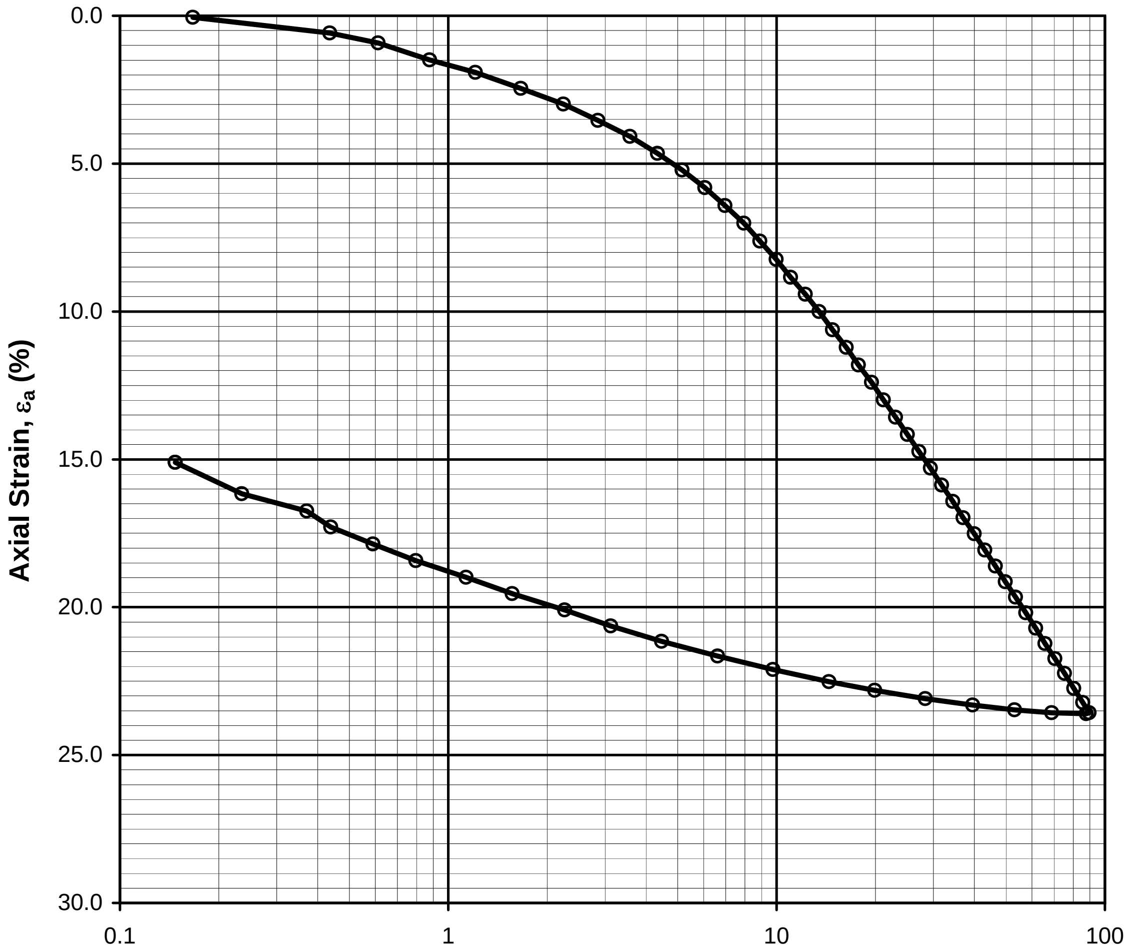
(3) This value is only different from the final value if there is soil extrusion during loading.

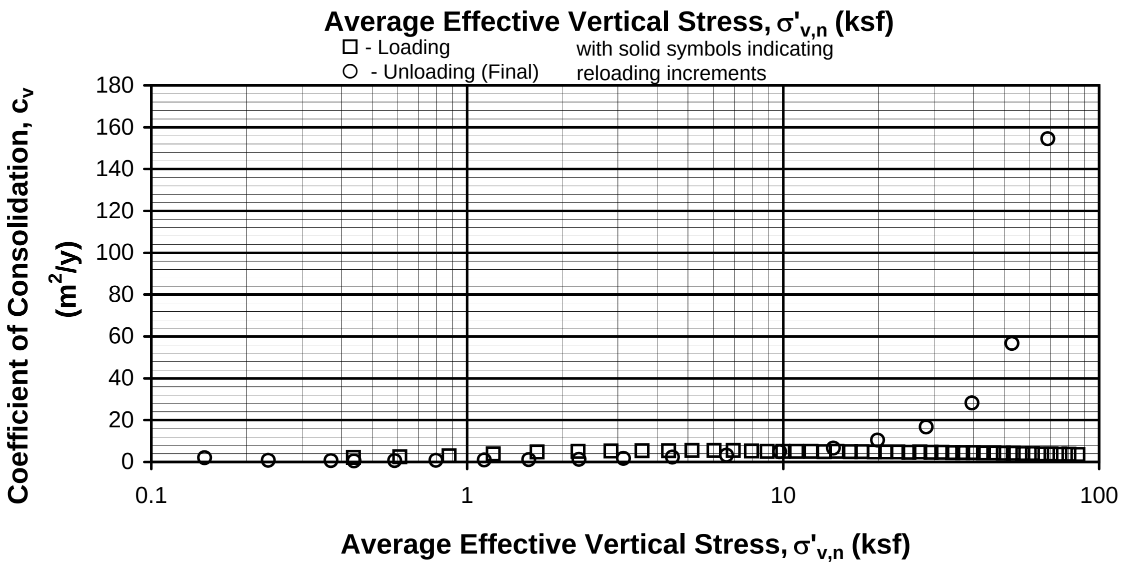
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/28/2012

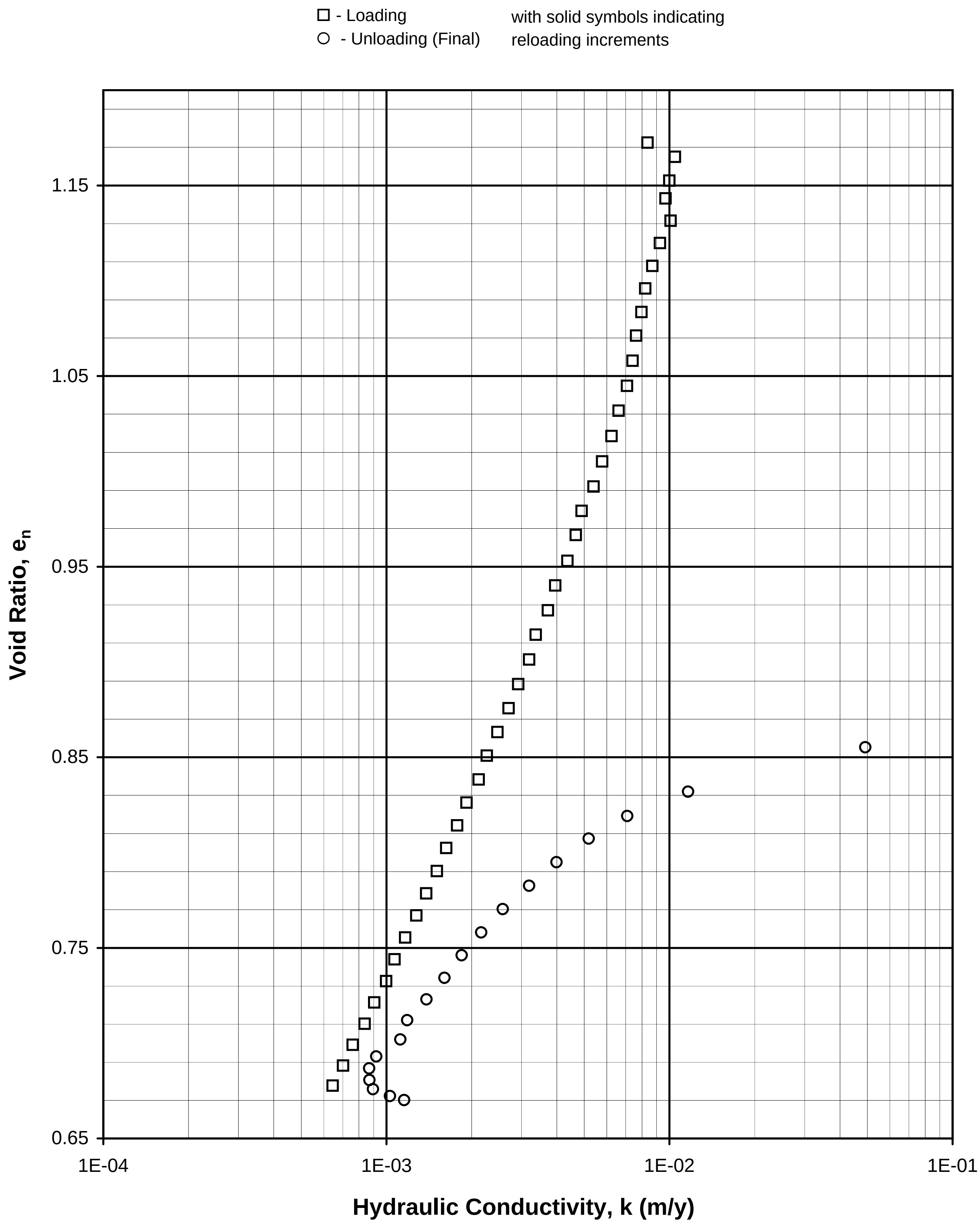




1-D CONSOLIDATION TEST: CRS

Sample No. S04Aa Depth 16.75 ft

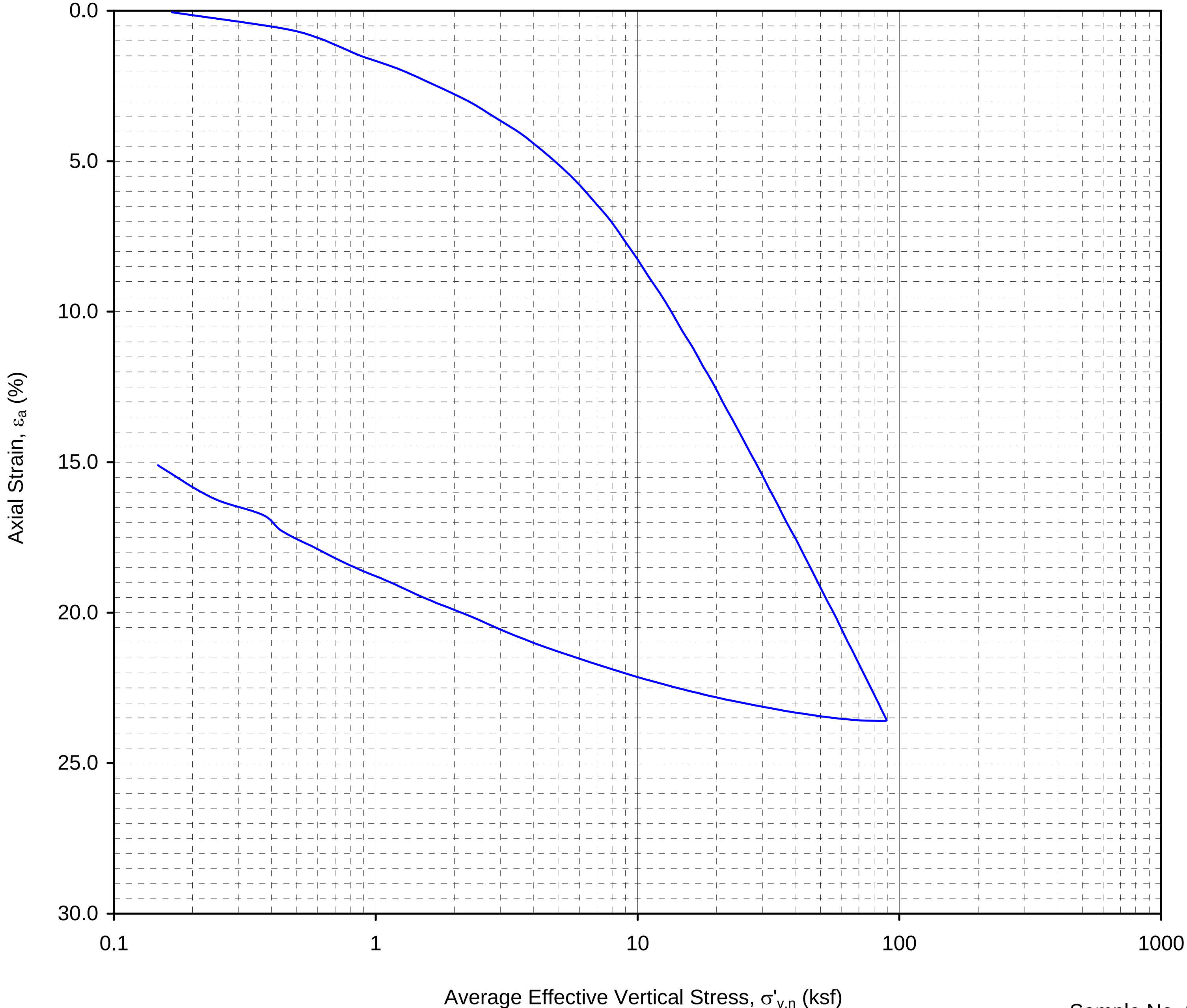
Boring WR0017-229B



1-D CONSOLIDATION TEST: CRS

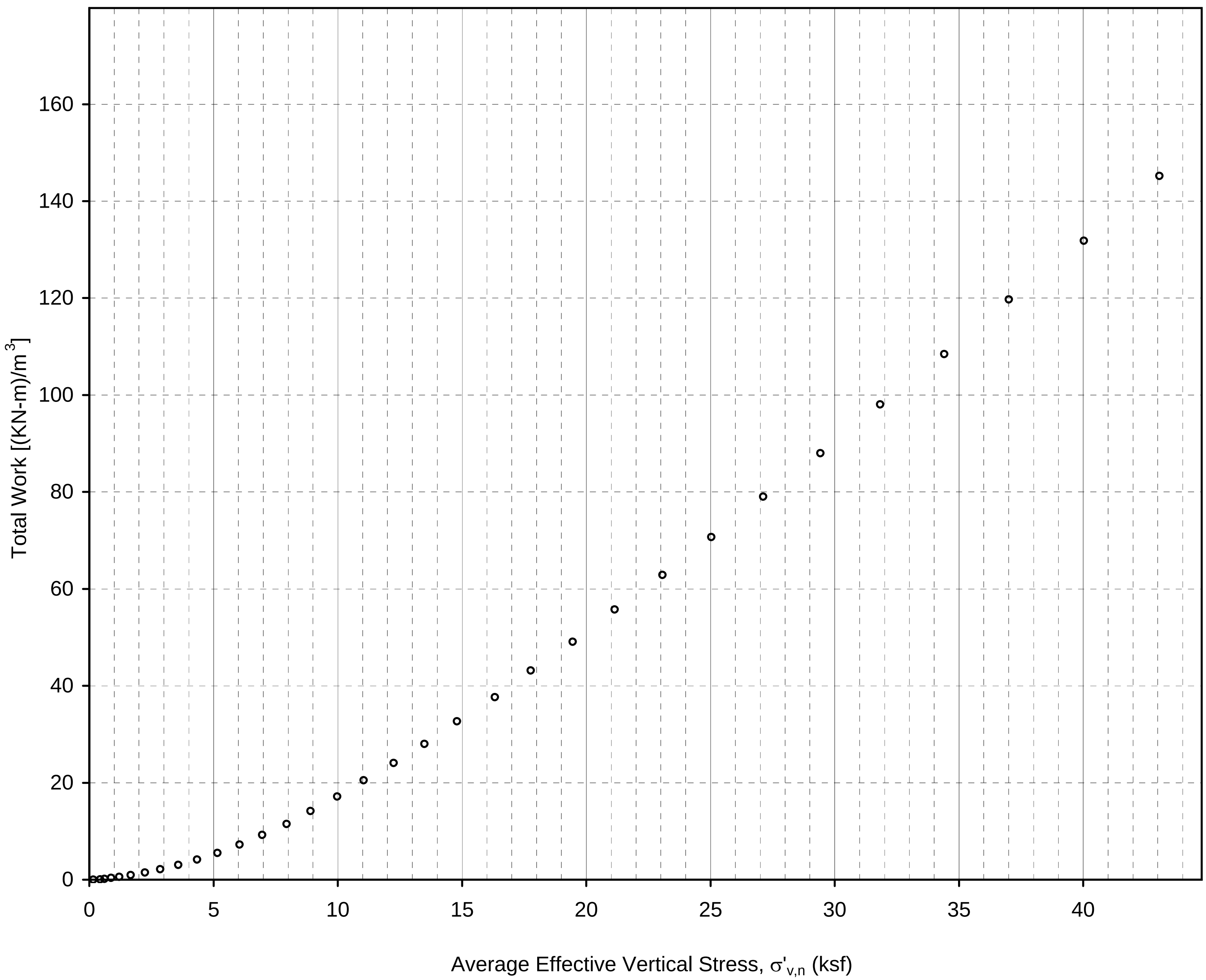
Sample No. S04Aa Depth 16.75 ft

Boring WR0017-229B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S04Aa   Depth 16.75



Sample No. S04Aa Depth 16.75

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S11 File Name: WR0017-229B_S04Aa

Task No.: NA Cell No.: CRS-C11

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	37.55	76.53		90.0	93.8	95.7
2	"	Bottom, W2	41.06	74.63		93.9	98.9	100.9
3	"	Sides, W3	37.80	76.39		90.3	94.1	96.1
4	"	Average, W4	38.80	75.84		91.4	95.7	97.6
5	"	Back Calculated (1)	41.36	74.47	(3)	94.2	99.4	101.3
6	Final		32.29	74.47	(2)	94.2	100.0	101.9

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.685

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.692

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.11730
Final Selected, K_f	0.11730

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 74.22

Avg. Back Calculated and Measured Mass Dry Soil (g) = 74.35

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 74.47; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%. Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.09 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.35 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5): From	To (ksf)
Initial	41.4	1.185	94.2	108.8	77.0	8.735		
Final	32.3	0.872	100.0	118.9	89.9	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

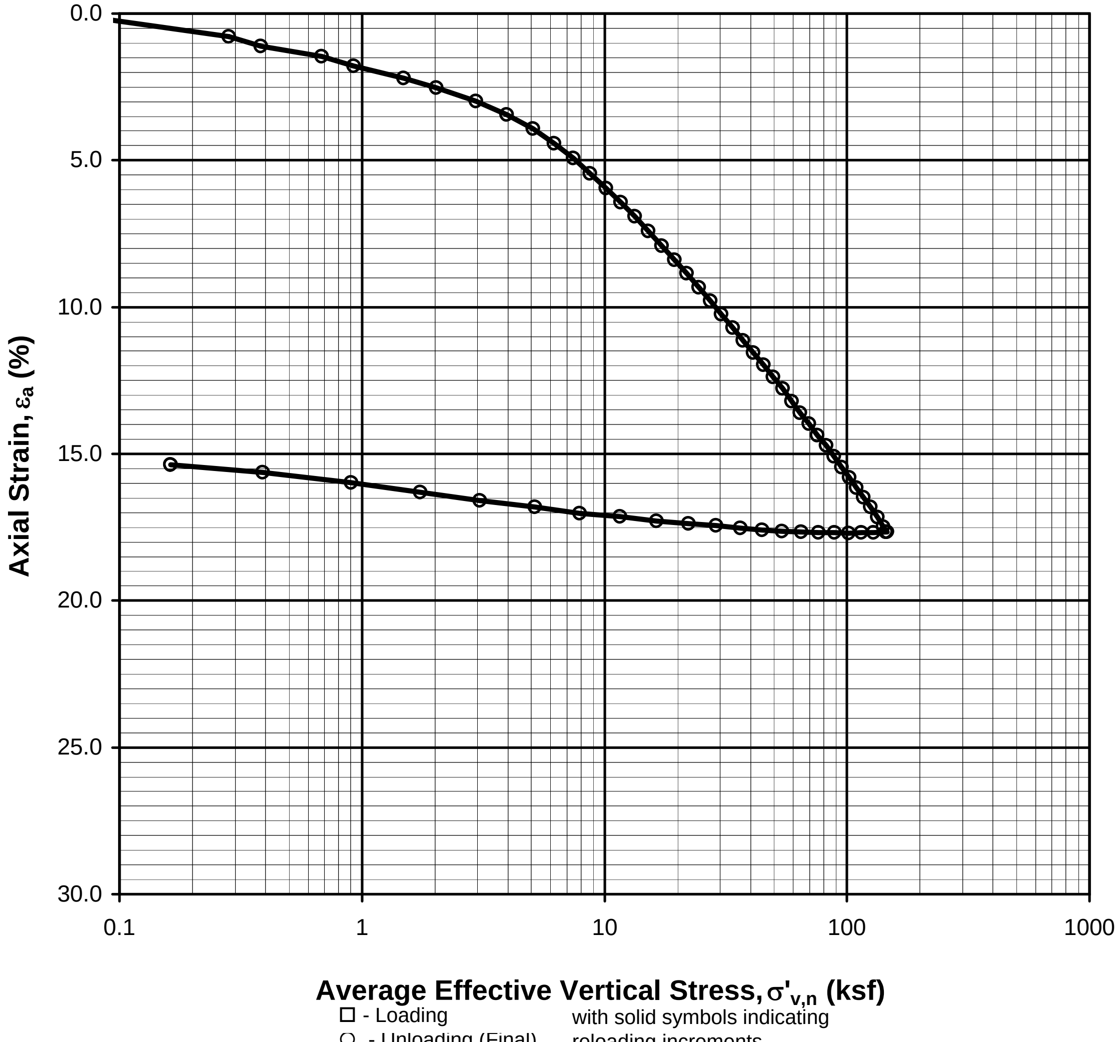
(3) This value is only different from the final value if there is soil extrusion during loading.

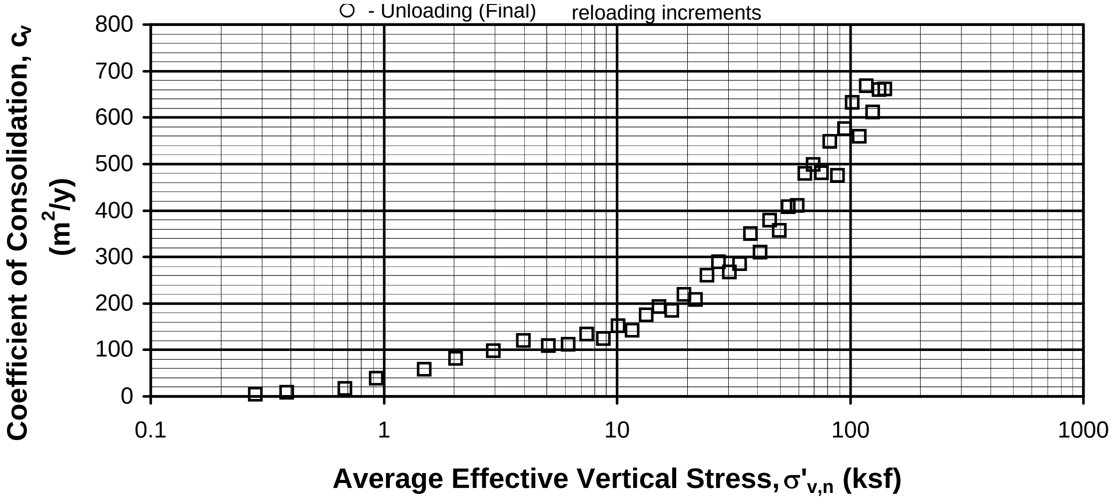
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/28/2012

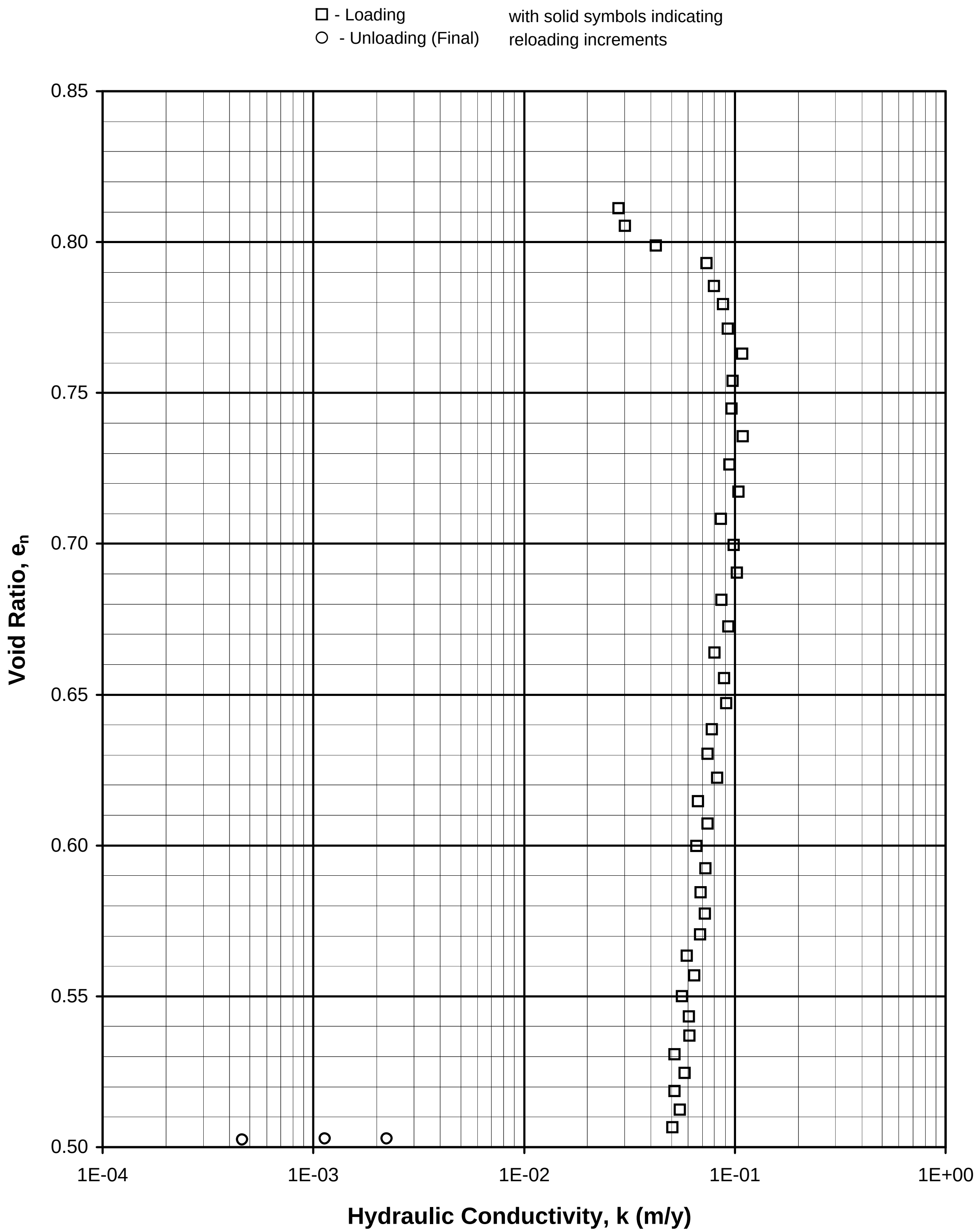




1-D CONSOLIDATION TEST: CRS

Sample No. S06Aa Depth 27.2 ft

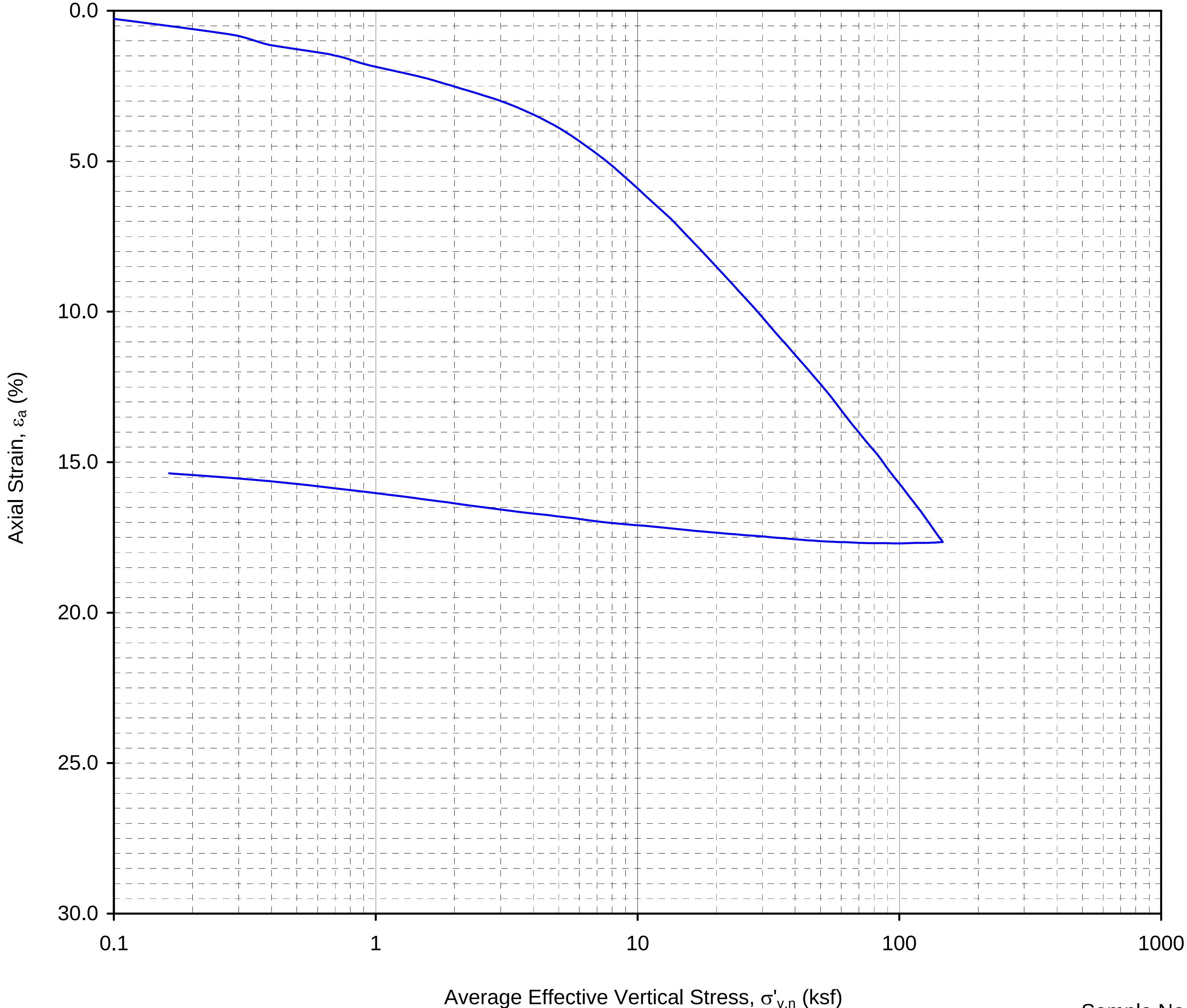
Boring WR0017-229B



1-D CONSOLIDATION TEST: CRS

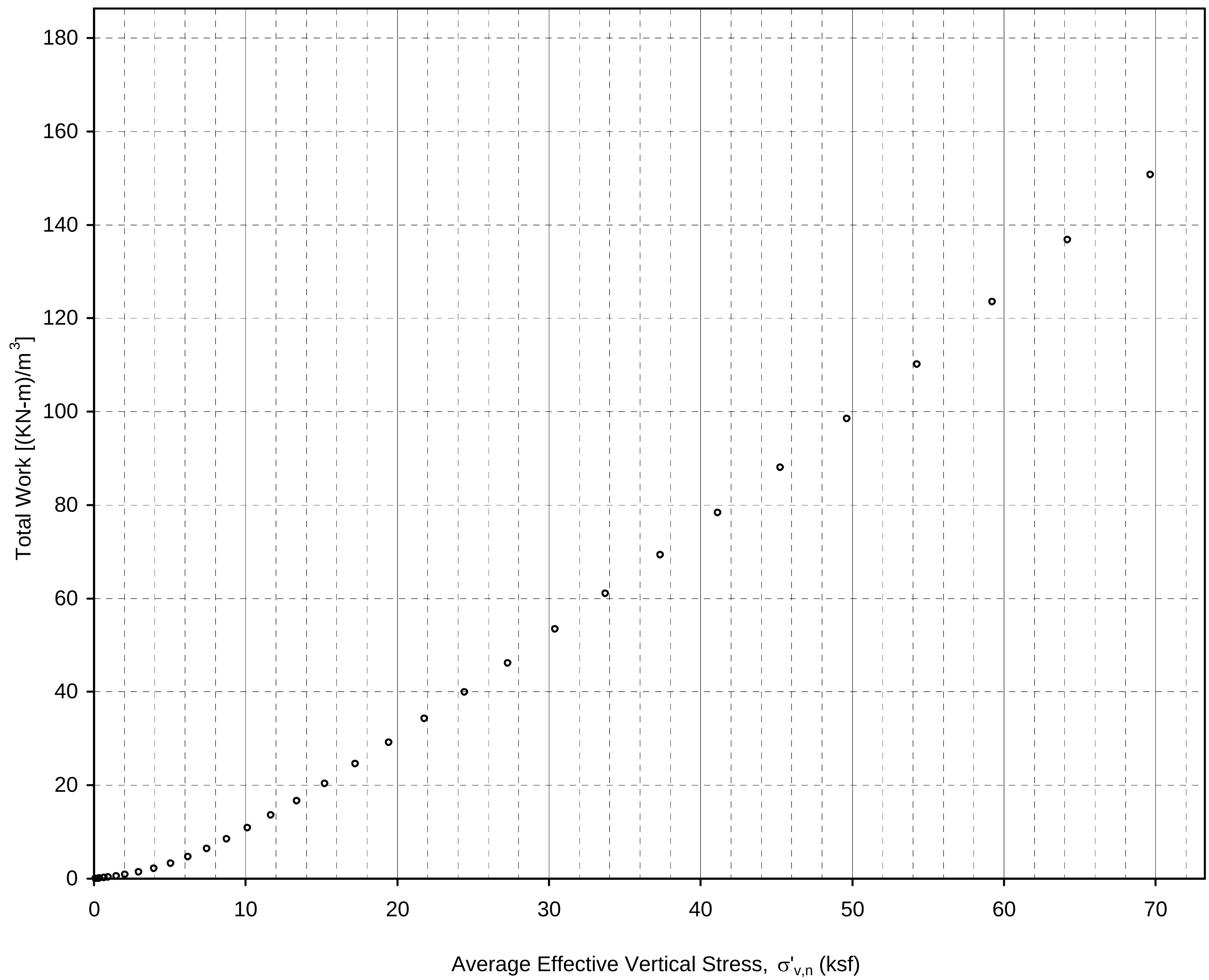
Sample No. S06Aa Depth 27.2 ft

Boring WR0017-229B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S06Aa   Depth 27.2



Sample No. S06Aa Depth 27.2 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S14 File Name: WR0017-229B_S06Aa

Task No.: NA Cell No.: CRS-C14

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	29.15	88.55		95.3	90.5	91.9
2	"	Bottom, W2	31.64	86.88		99.2	96.5	97.8
3	"	Sides, W3	29.64	88.22		96.1	91.8	93.1
4	"	Average, W4	30.14	87.87		96.9	93.0	94.3
5	"	Back Calculated (1)	29.13	88.56	(3)	95.3	90.5	91.8
6	Final		20.48	88.56	(2)	95.3	100.0	101.5

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.565

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.633

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.11702
Final Selected, K_f	0.11702

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 85.82

Avg. Back Calculated and Measured Mass Dry Soil (g) = 87.19

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700	[X] Assumed	[ ] Measured	[ ] To make S_f = 100% at end of test.	[ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%
Mass Dry Soil, (g)	Initial: 88.56	Final (4): NA	[X] From Cal. Routine No. [5]	Note: Routine #5 is based on final measurements.
			[ ] Make S_f = 100%, or;	[ ] Avg. of measured & make S_f = 100%
Initial Height (mm) = 18.92	[X] Measured ;	[ ] Back Calculated	Back-cal. Sat. (%) = NA	
Final Height (mm) = 16.10	[X] Measured ;	[ ] Initial H_o & dial change during loading		

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	29.1	0.826	95.3	119.0	92.2	10.364	From	To (ksf)
Final	20.5	0.553	100.0	130.5	108.3	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

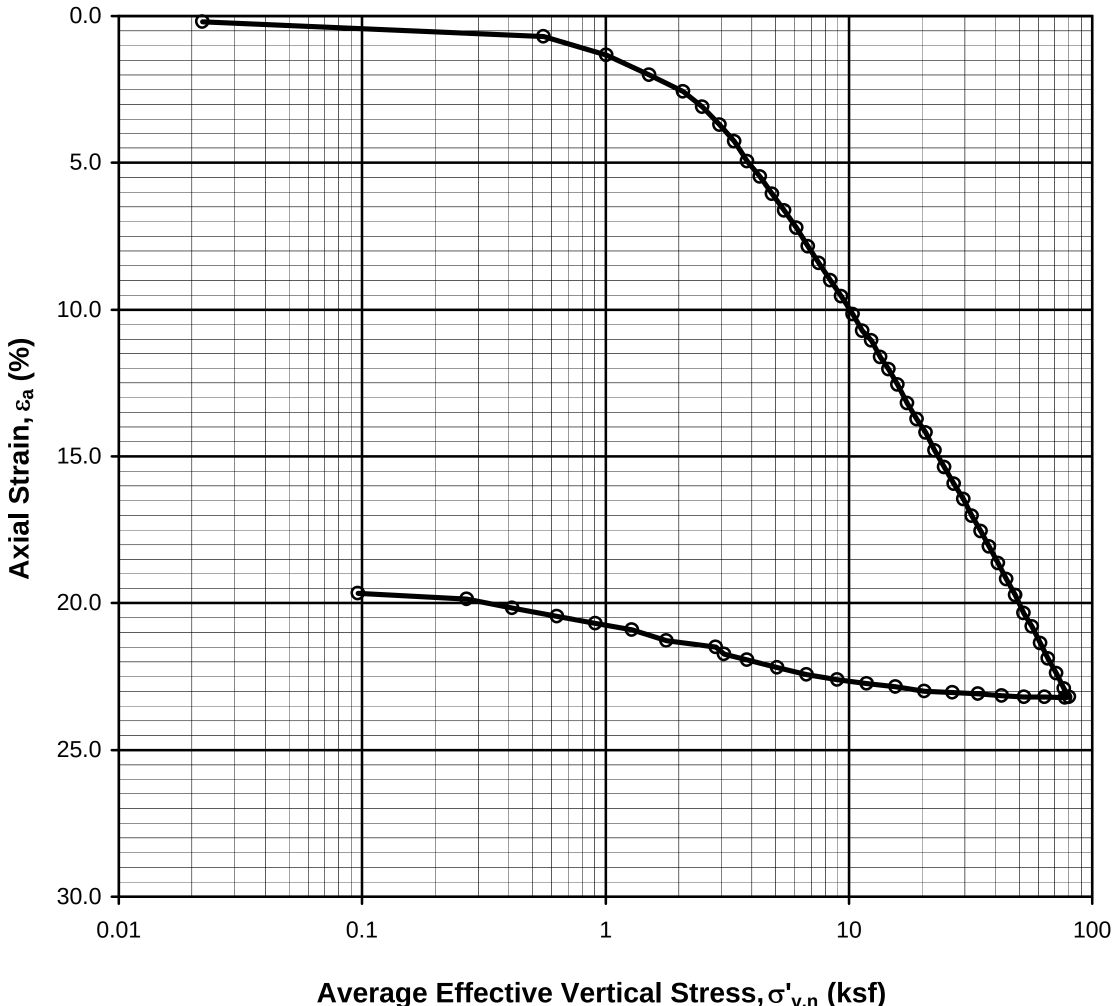
(3) This value is only different from the final value if there is soil extrusion during loading.

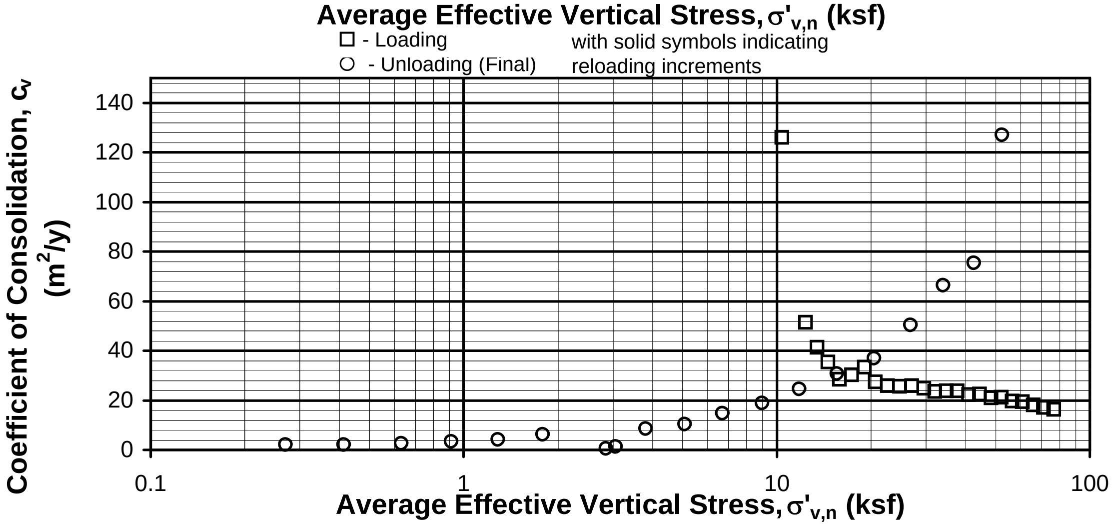
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/28/2012

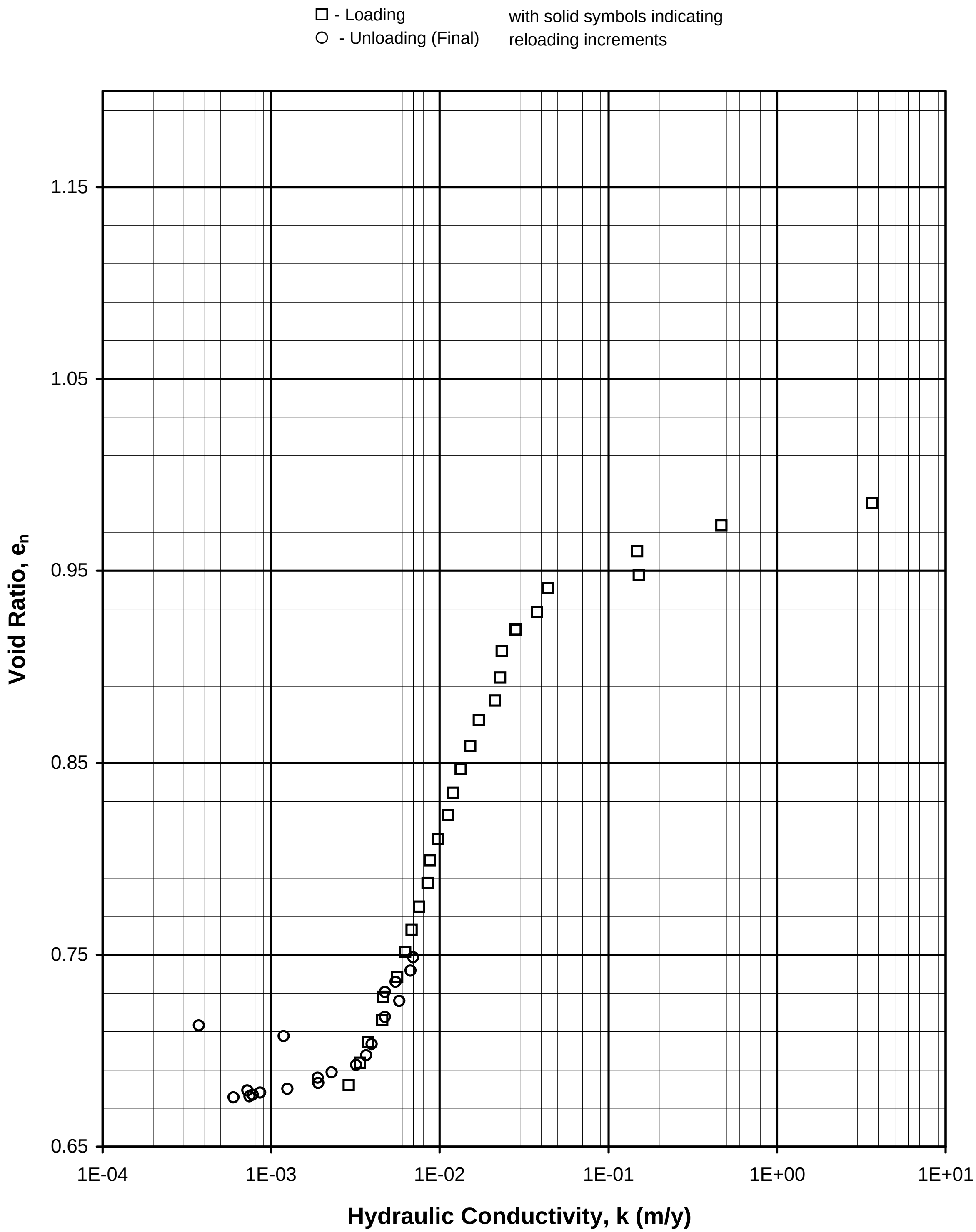




1-D CONSOLIDATION TEST: CRS

Sample No. S05Aa Depth 19.15 ft

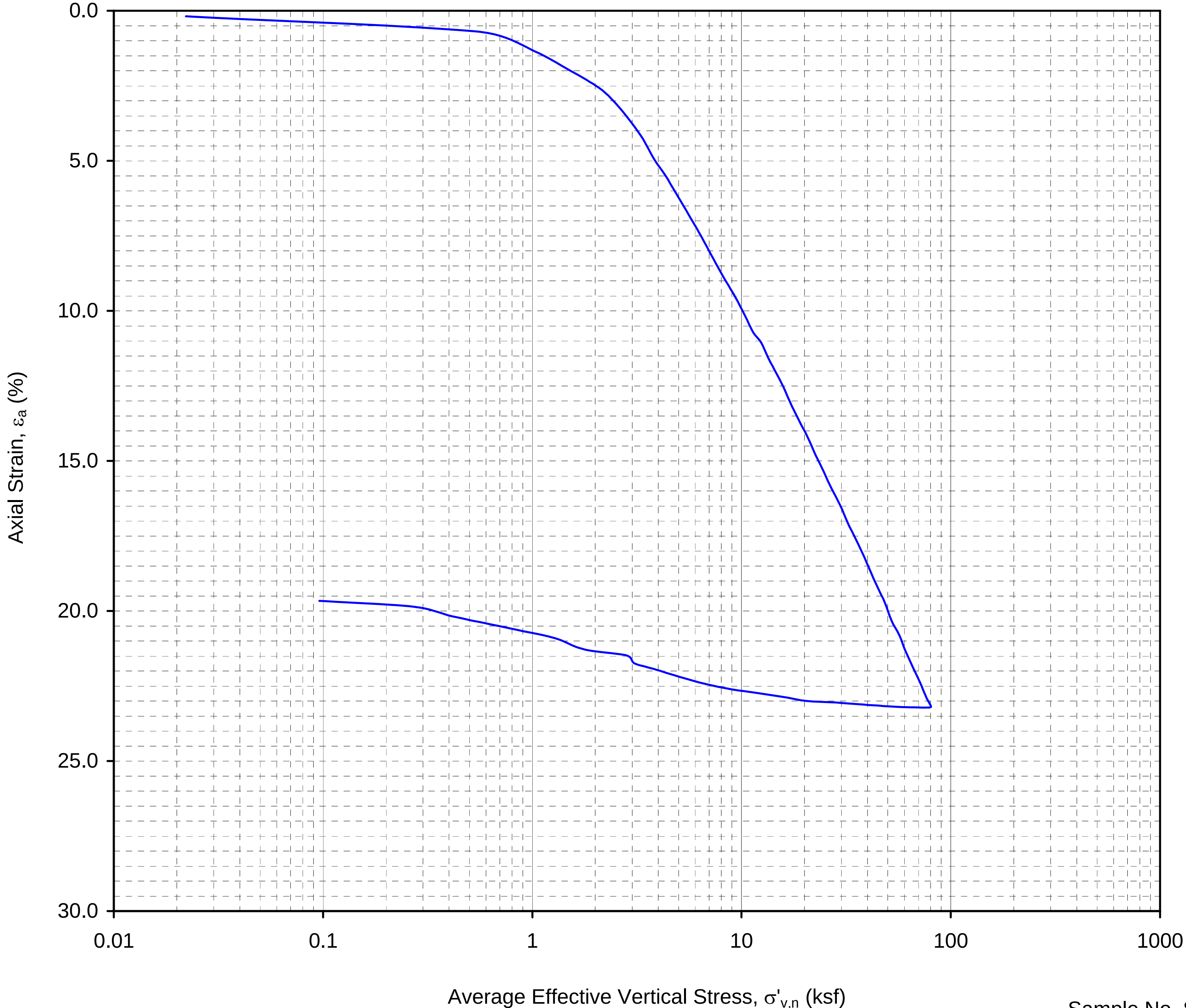
Boring WR0017-231B



1-D CONSOLIDATION TEST: CRS

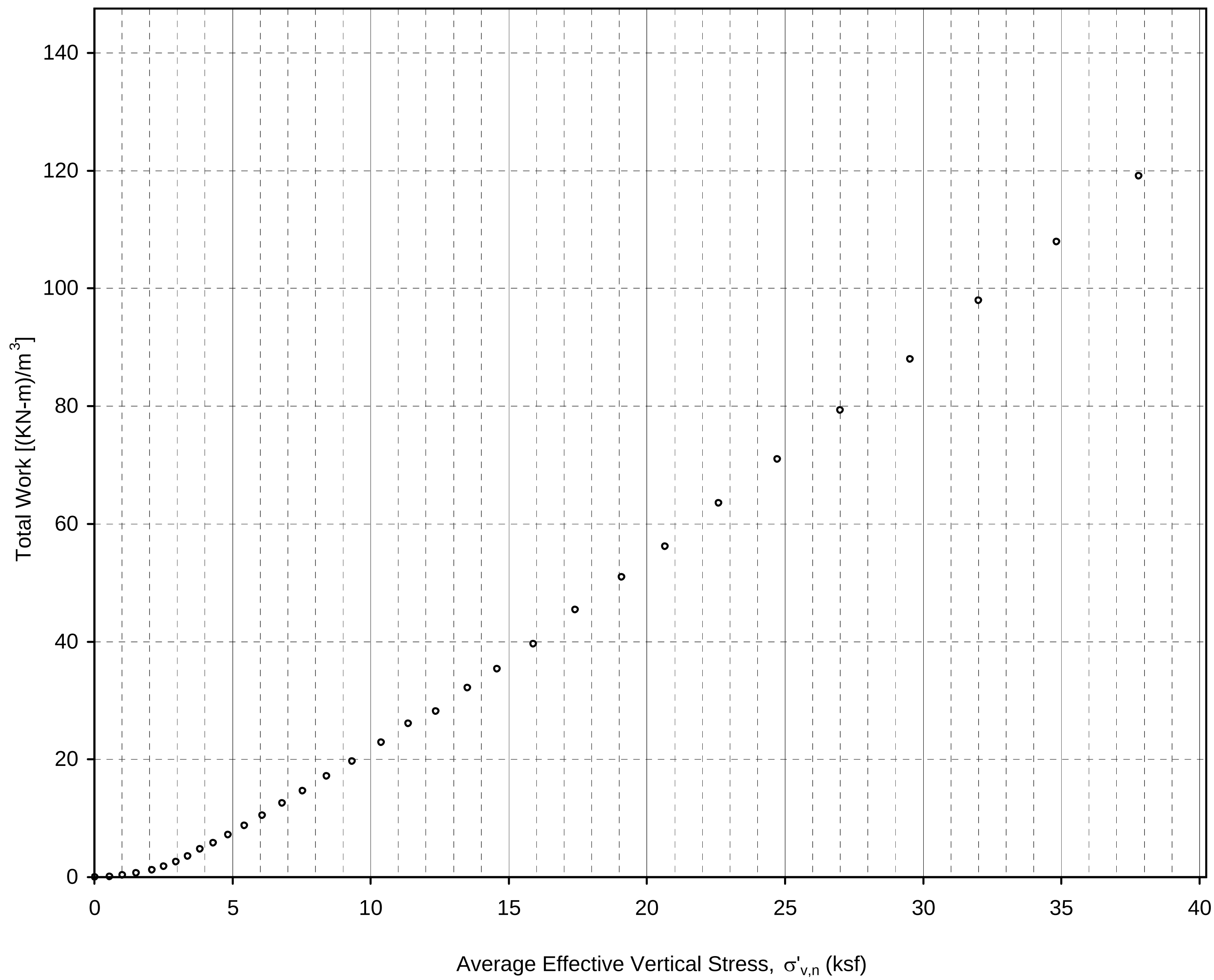
Sample No. S05Aa   Depth 19.15 ft

Boring WR0017-231B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S05Aa   Depth 19.15



Sample No. S05Aa Depth 19.15 ft
- Boring WR0017-231B

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

FUGRO

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04-11120056 Test Station No.: CRS-S15 File Name: WR0017-231B_S05Aa

Task No.: NA Cell No.: CRS-C15

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.-Routine	ITEM	Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial, Top, W1	34.27	49.46	81.6	94.1	105.1
2	" Bottom, W2	31.59	50.47	78.2	89.5	100.2
3	" Sides, W3	32.60	50.08	79.5	91.2	102.1
4	" Average, W4	32.82	50.00	79.8	91.6	102.5
5	" Back Calculated (1)	37.32	48.36 (3)	85.3	98.8	110.1
6	Final	31.04	48.36 (2)	85.3	100.0	111.3

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.674

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.687

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18306
Final Selected, K_f	0.18306

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 48.08

Avg. Back Calculated and Measured Mass Dry Soil (g) = 48.22

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 48.36; Final (4): NA — [X] From Cal. Routine No. 5; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%. Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.32 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.27 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	37.3	1.182	85.3	105.9	77.1	8.853	From	To (ksf)
Final	31.0	0.838	100.0	119.9	91.5	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

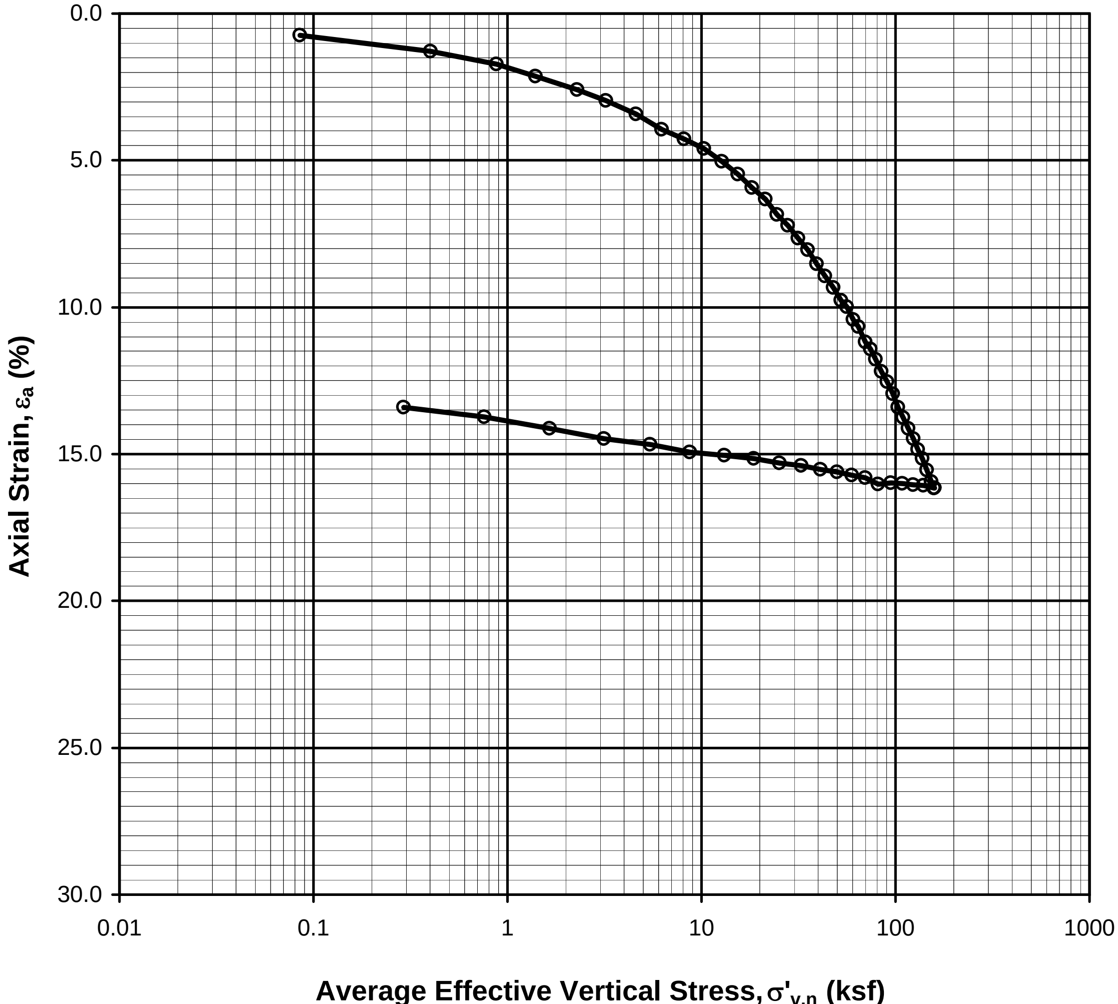
(3) This value is only different from the final value if there is soil extrusion during loading.

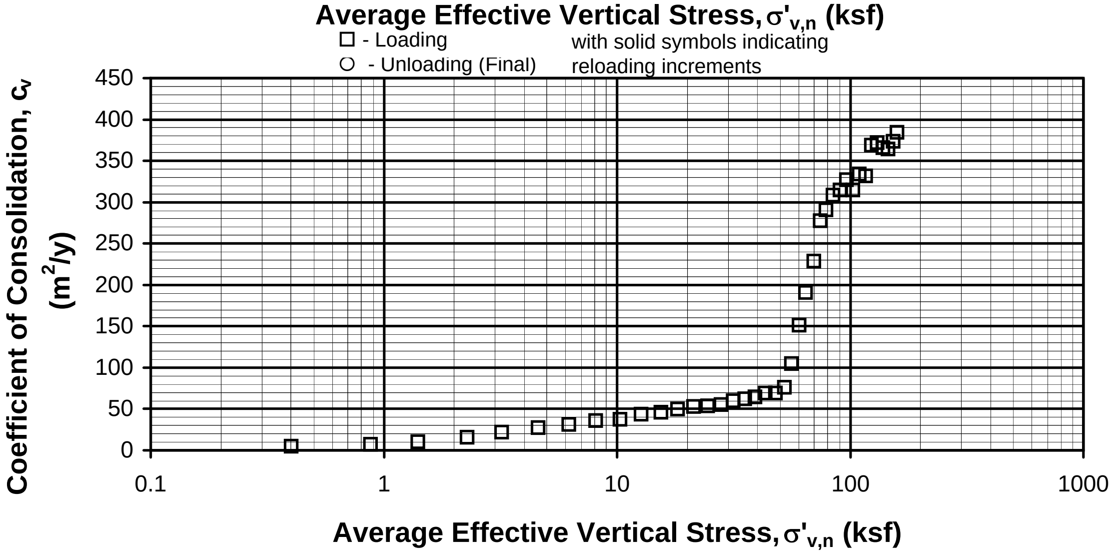
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/30/2012

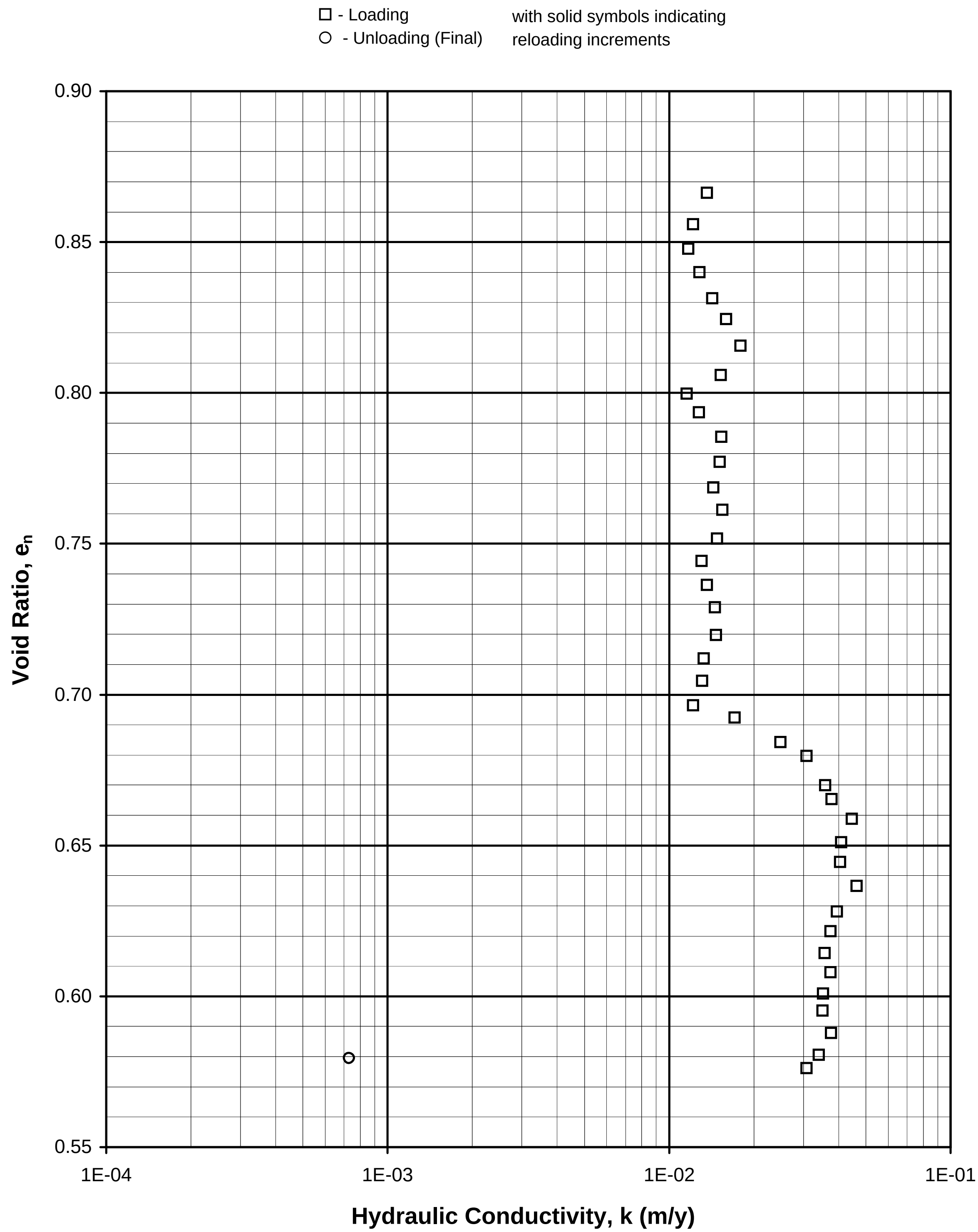




1-D CONSOLIDATION TEST: CRS

Sample No. S04Aa   Depth 17.5 ft

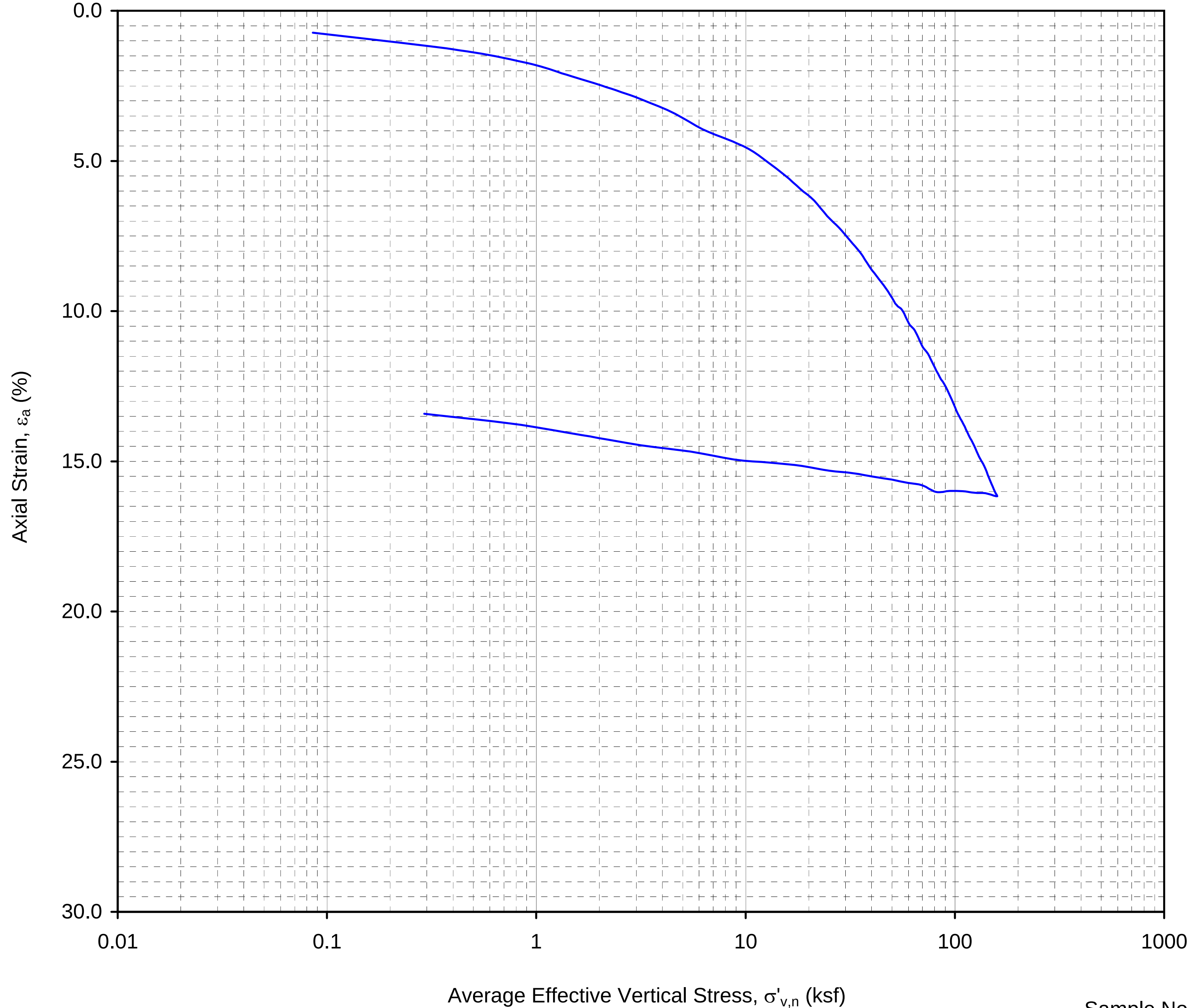
Boring WR0017-233B



1-D CONSOLIDATION TEST: CRS

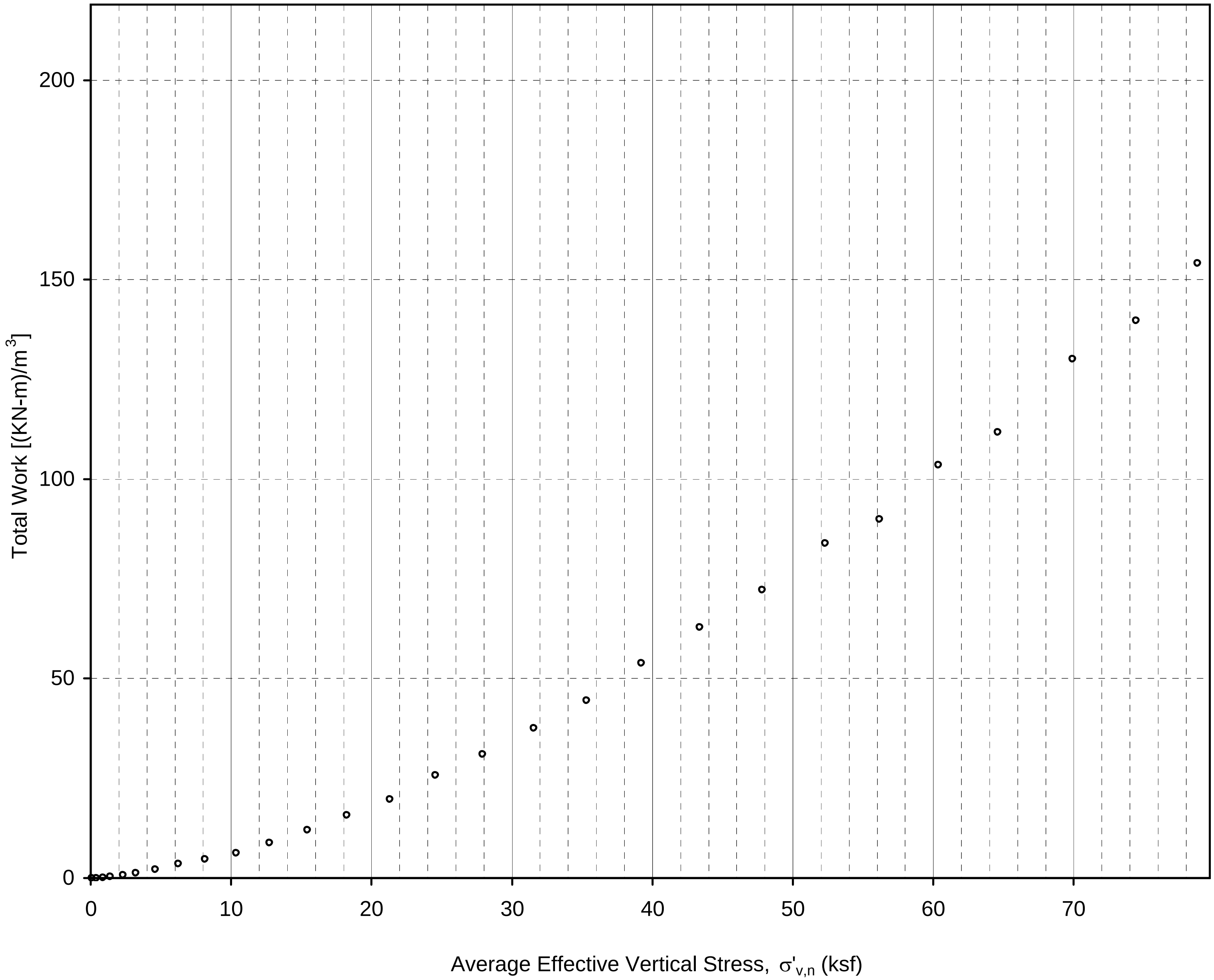
Sample No. S04Aa   Depth 17.5 ft

Boring WR0017-233B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S04Aa Depth 17.5



Sample No. S04Aa   Depth 17.5 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S09 File Name: WR0017-233B_S04Aa

Task No.: NA Cell No.: CRS-C09

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	23.42	90.88		78.7	88.7	96.1
2	"	Bottom, W2	26.11	88.94		83.6	94.7	102.4
3	"	Sides, W3	23.29	90.98		78.4	88.4	95.8
4	"	Average, W4	24.28	90.26		80.3	90.7	98.2
5	"	Back Calculated (1)	28.21	87.49	(3)	87.2	99.0	106.8
6	Final		25.24	87.49	(2)	87.2	100.0	107.9

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.702

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.711

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.11617
Final Selected, K_f	0.11617

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 87.15

Avg. Back Calculated and Measured Mass Dry Soil (g) = 87.32

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 87.49; Final (4): NA — [X] From Cal. Routine No. 5; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100% — Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.11 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 17.14 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	28.2	0.880	87.2	115.6	90.2	10.164	From	To (ksf)
Final	25.2	0.686	100.0	125.9	100.5	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

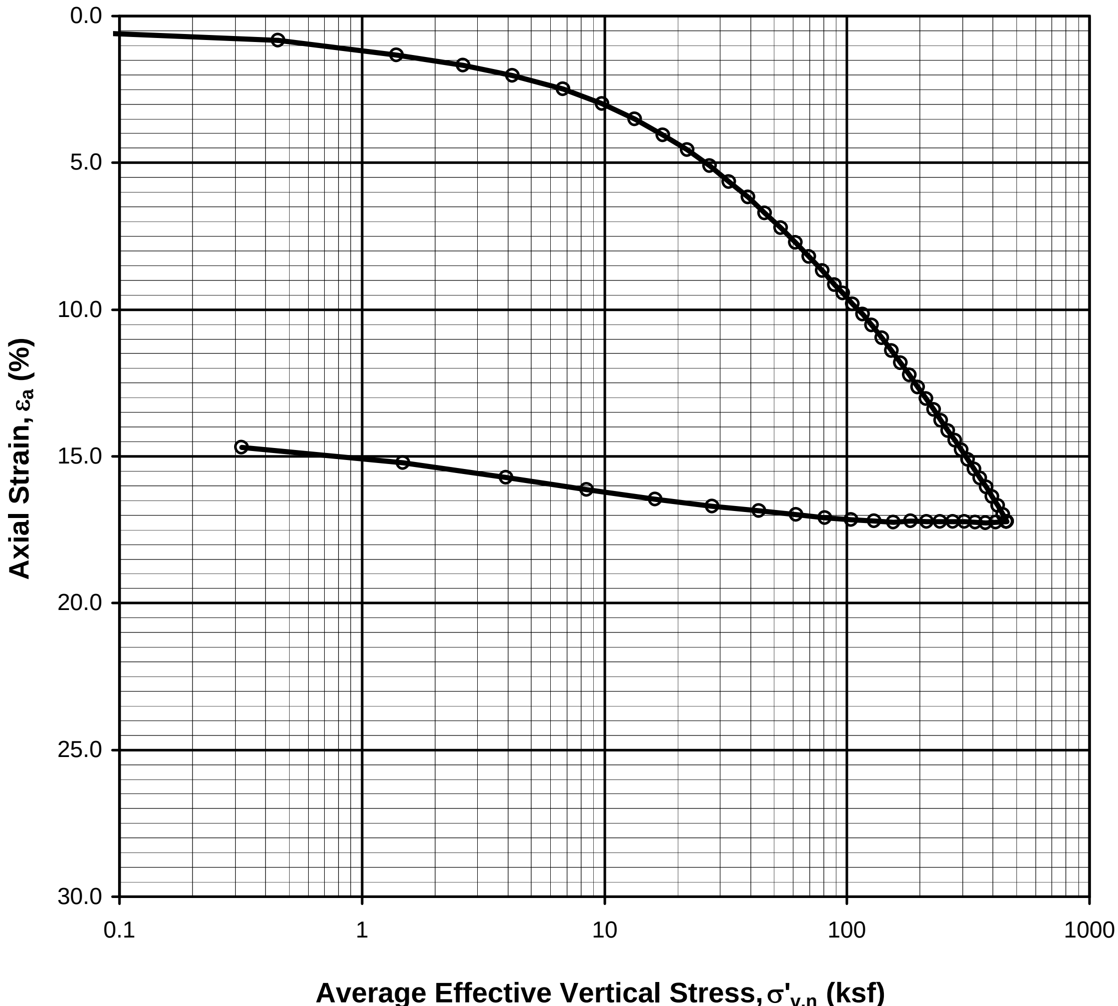
(3) This value is only different from the final value if there is soil extrusion during loading.

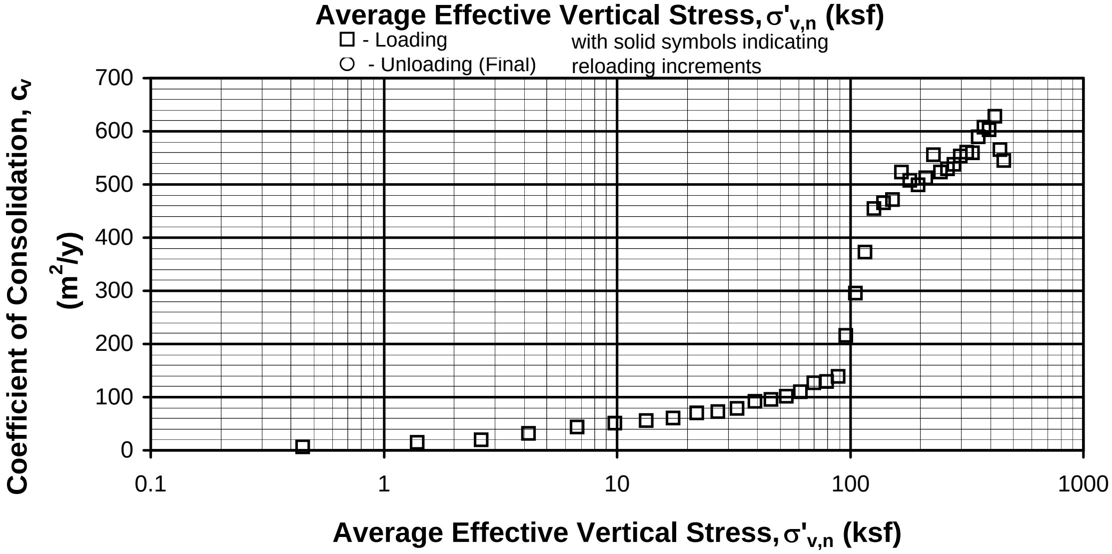
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/30/2012

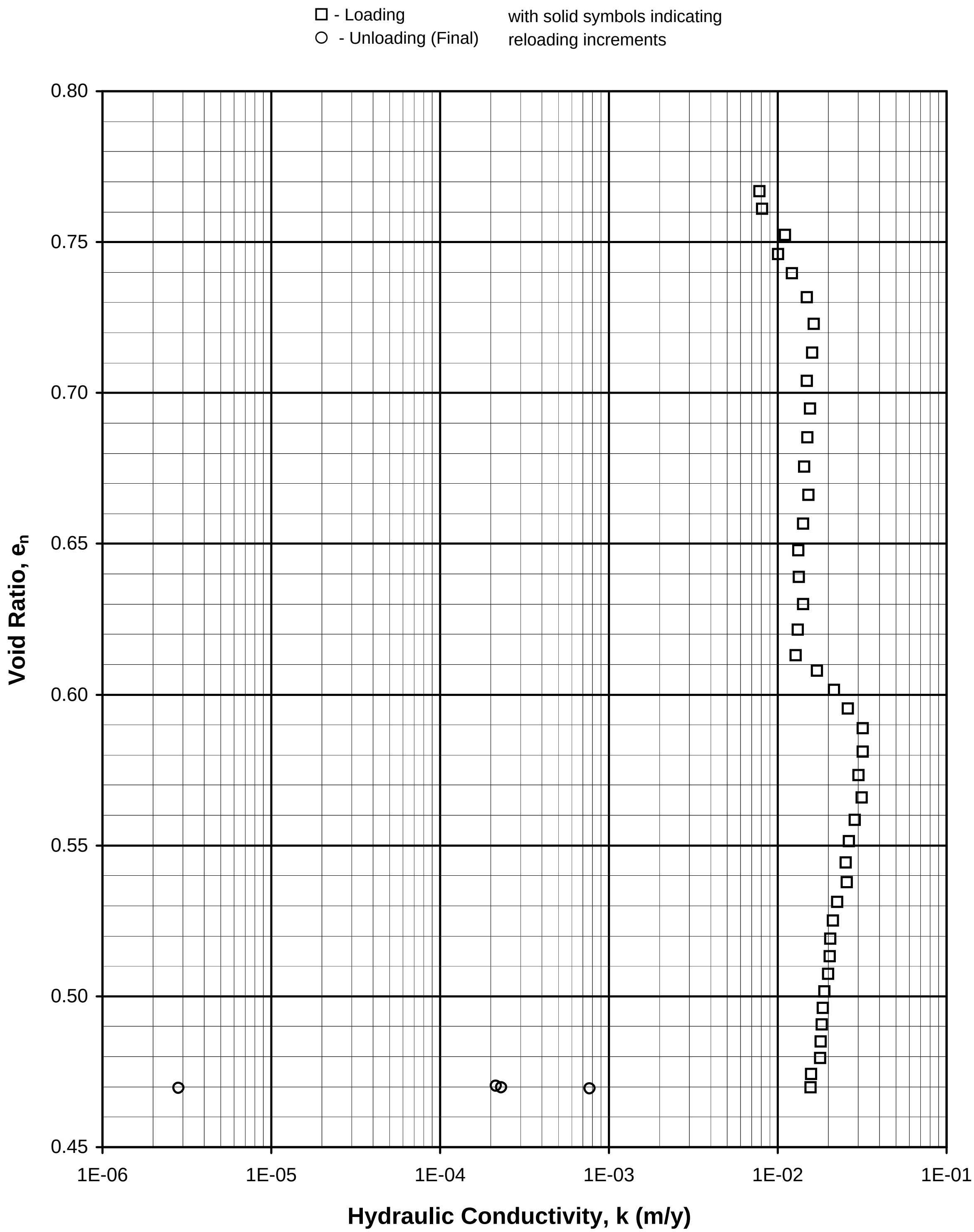




1-D CONSOLIDATION TEST: CRS

Sample No. S07Aa Depth 31.15 ft

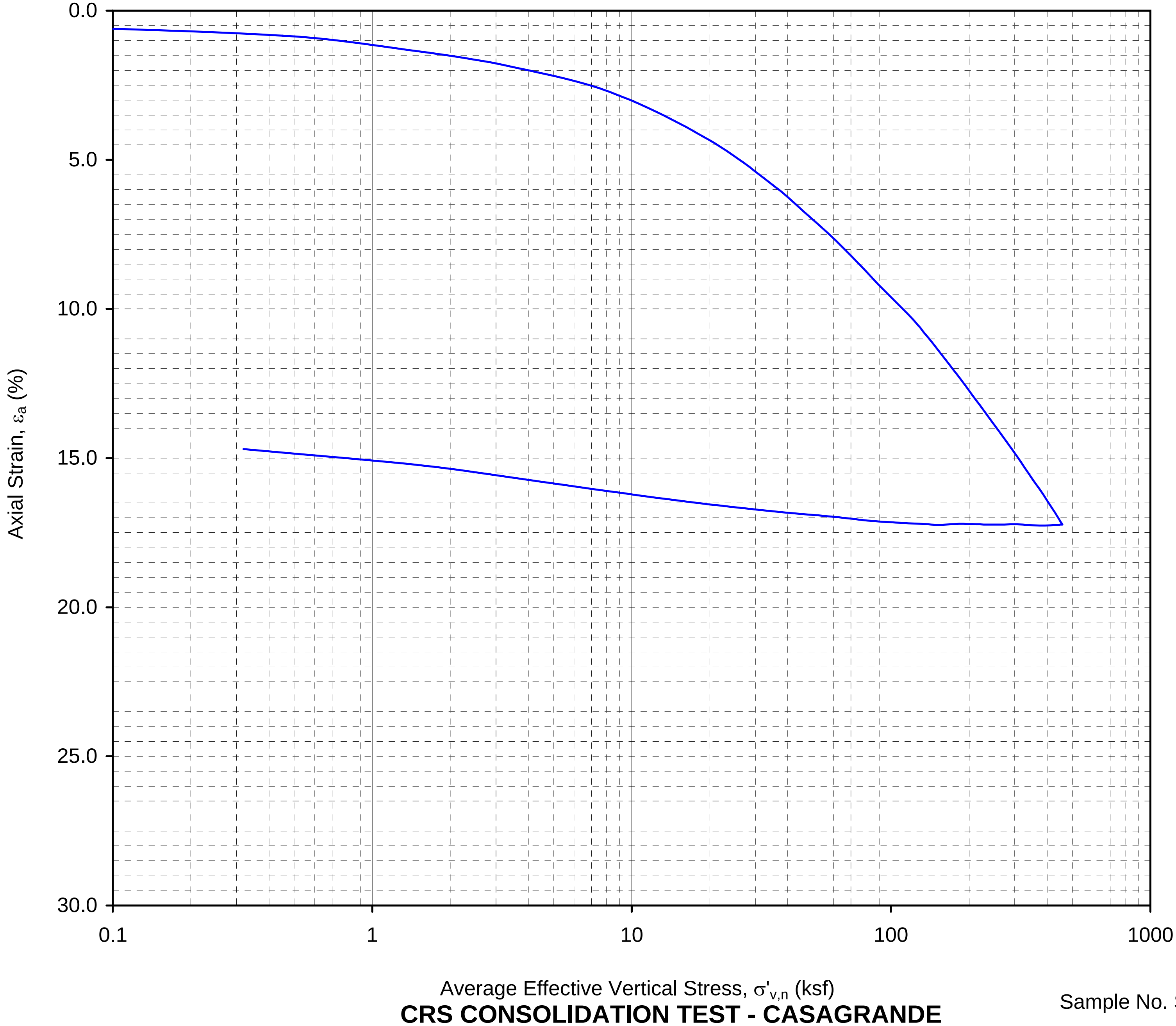
Boring WR0017-233B



1-D CONSOLIDATION TEST: CRS

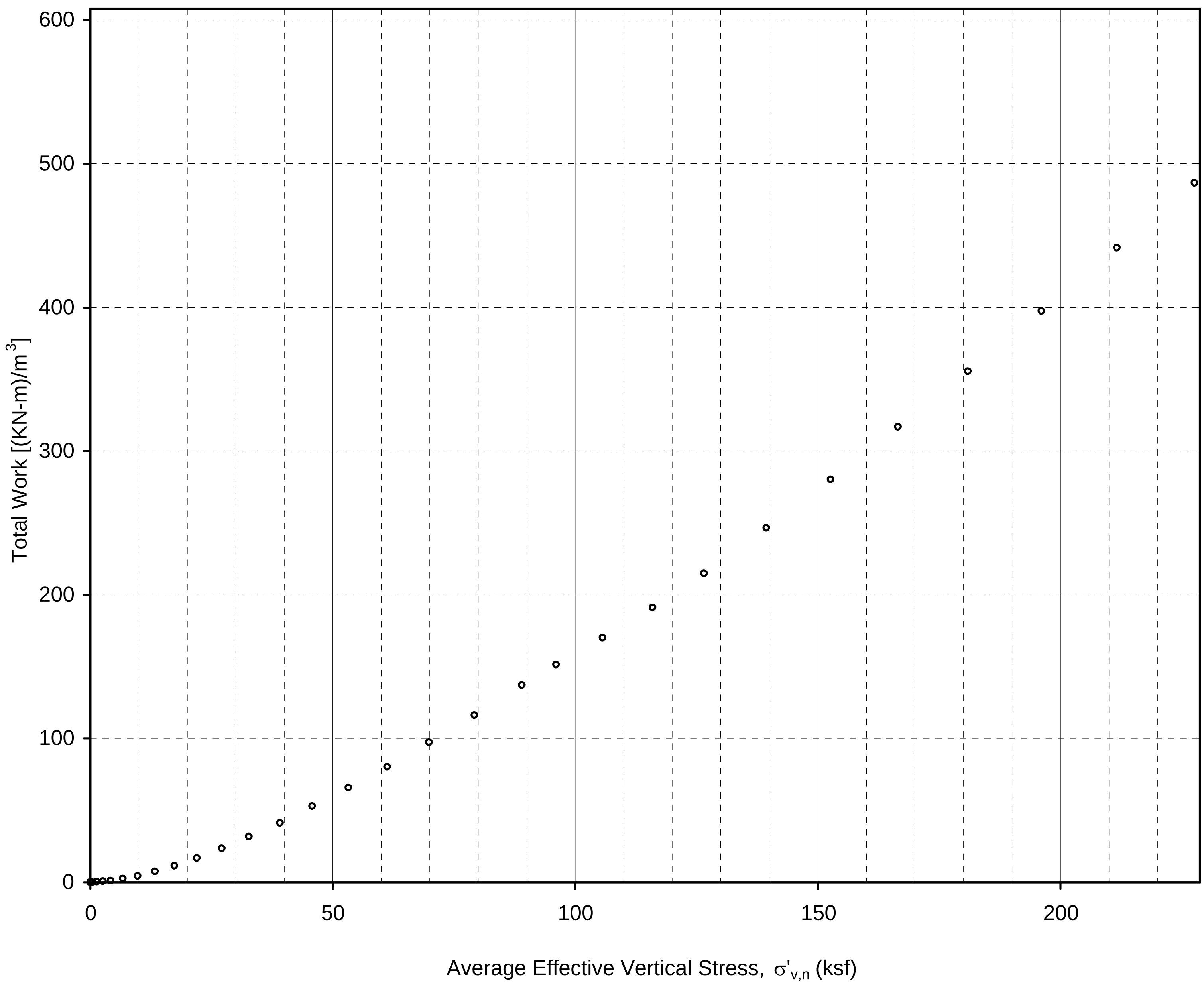
Sample No. S07Aa Depth 31.15 ft

Boring WR0017-233B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07Aa   Depth 31.15



Sample No. S07Aa   Depth 31.15

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S05 File Name: WR0017-233B_S07Aa

Task No.: NA Cell No.: CRS-C05

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	25.73	61.19		93.3	93.8	107.2
2	"	Bottom, W2	27.34	60.41		96.3	97.6	111.2
3	"	Sides, W3	26.48	60.82		94.7	95.6	109.1
4	"	Average, W4	26.52	60.81		94.8	95.7	109.2
5	"	Back Calculated (1)	27.57	60.30	(3)	96.7	98.2	111.8
6	Final		21.92	60.30	(2)	96.7	100.0	113.9

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.691

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.705

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.18153
Final Selected, K_f	0.18153

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 59.92

Avg. Back Calculated and Measured Mass Dry Soil (g) = 60.11

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 60.30; Final (4): NA — [X] From Cal. Routine No. [5] Note: Routine #5 is based on final measurements. [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.44 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 17.47 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	27.6	0.776	96.7	121.8	95.5	10.947	From	To (ksf)
Final	21.9	0.596	100.0	129.5	106.2	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

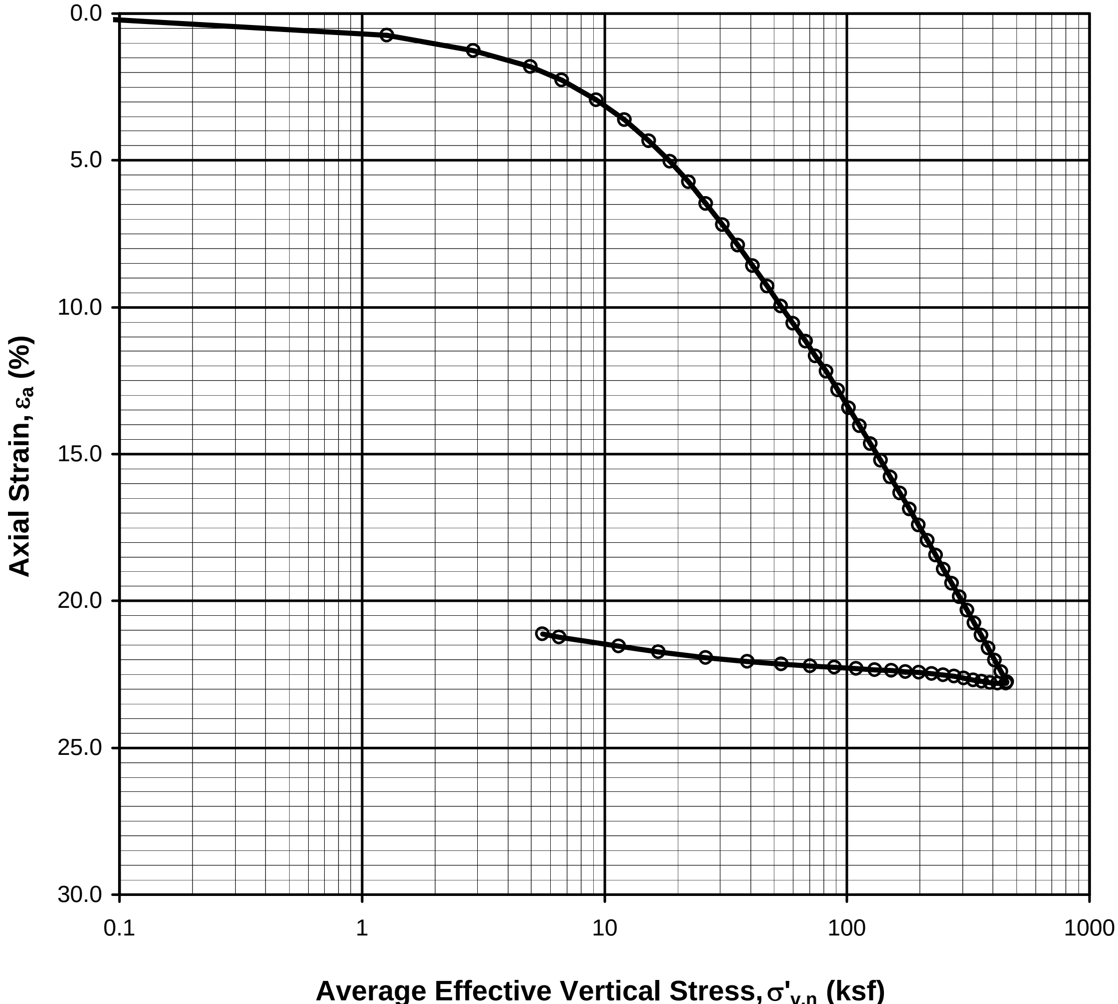
(3) This value is only different from the final value if there is soil extrusion during loading.

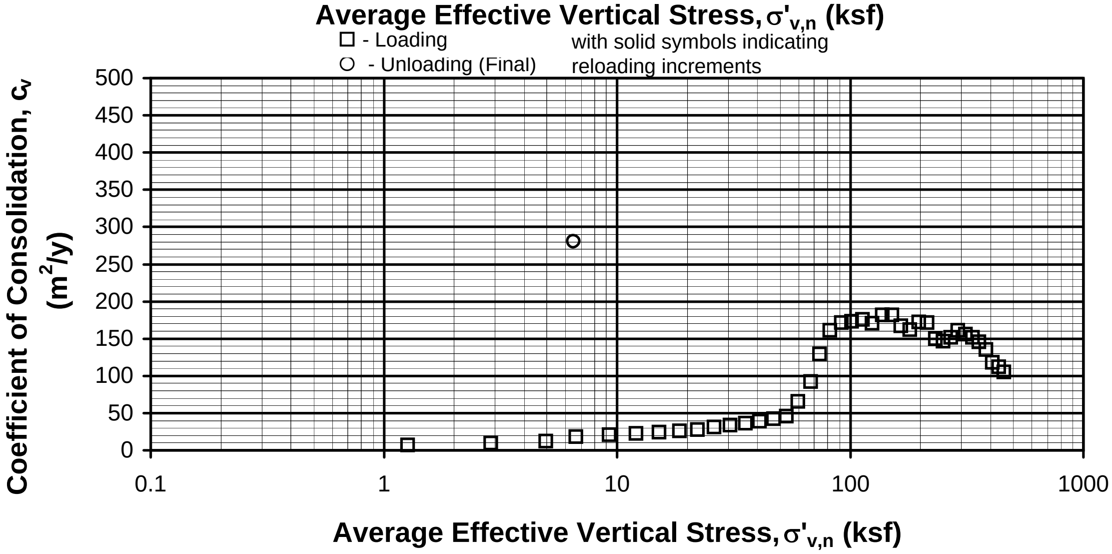
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/30/2012

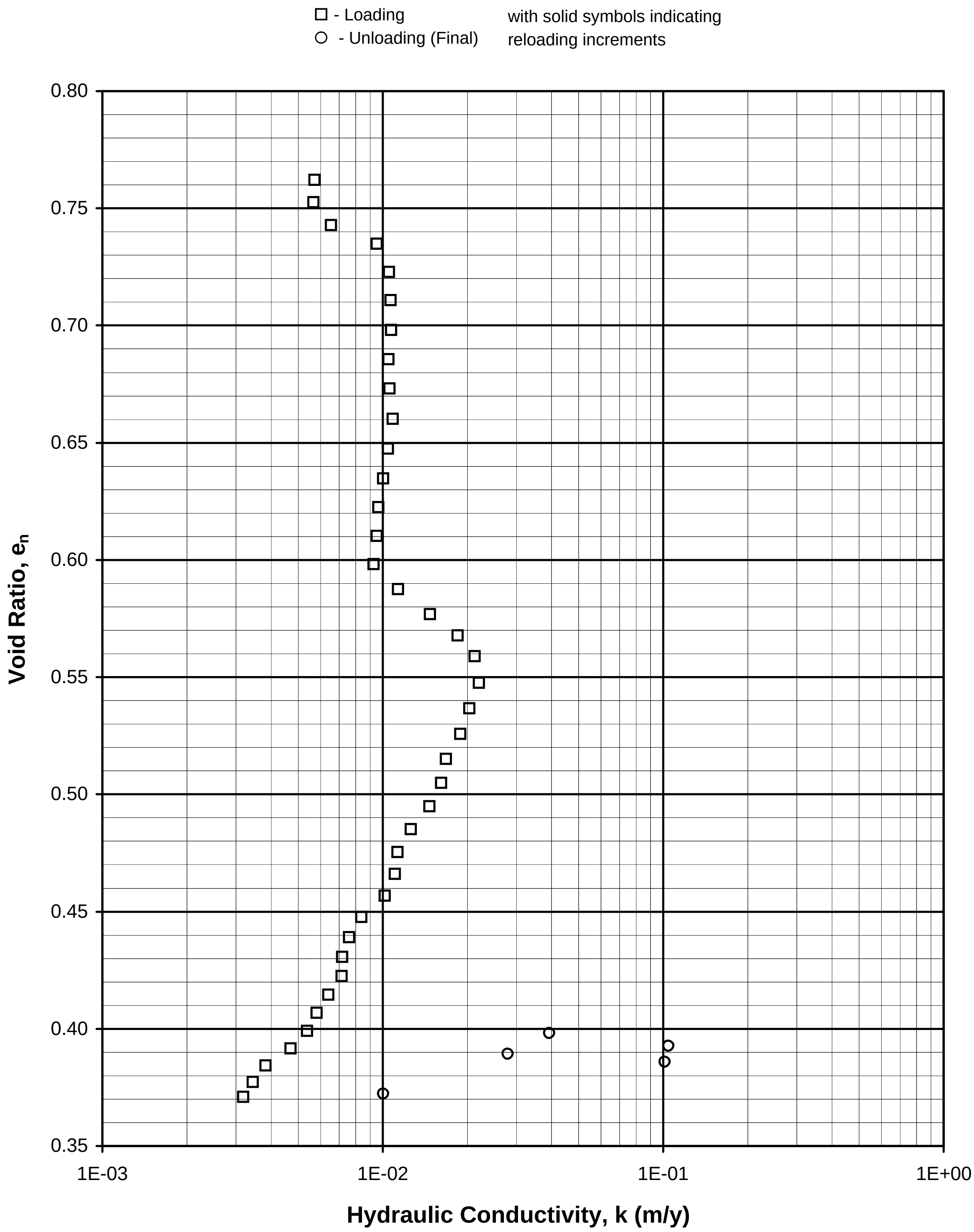




1-D CONSOLIDATION TEST: CRS

Sample No. S04Aa Depth 18.8 ft

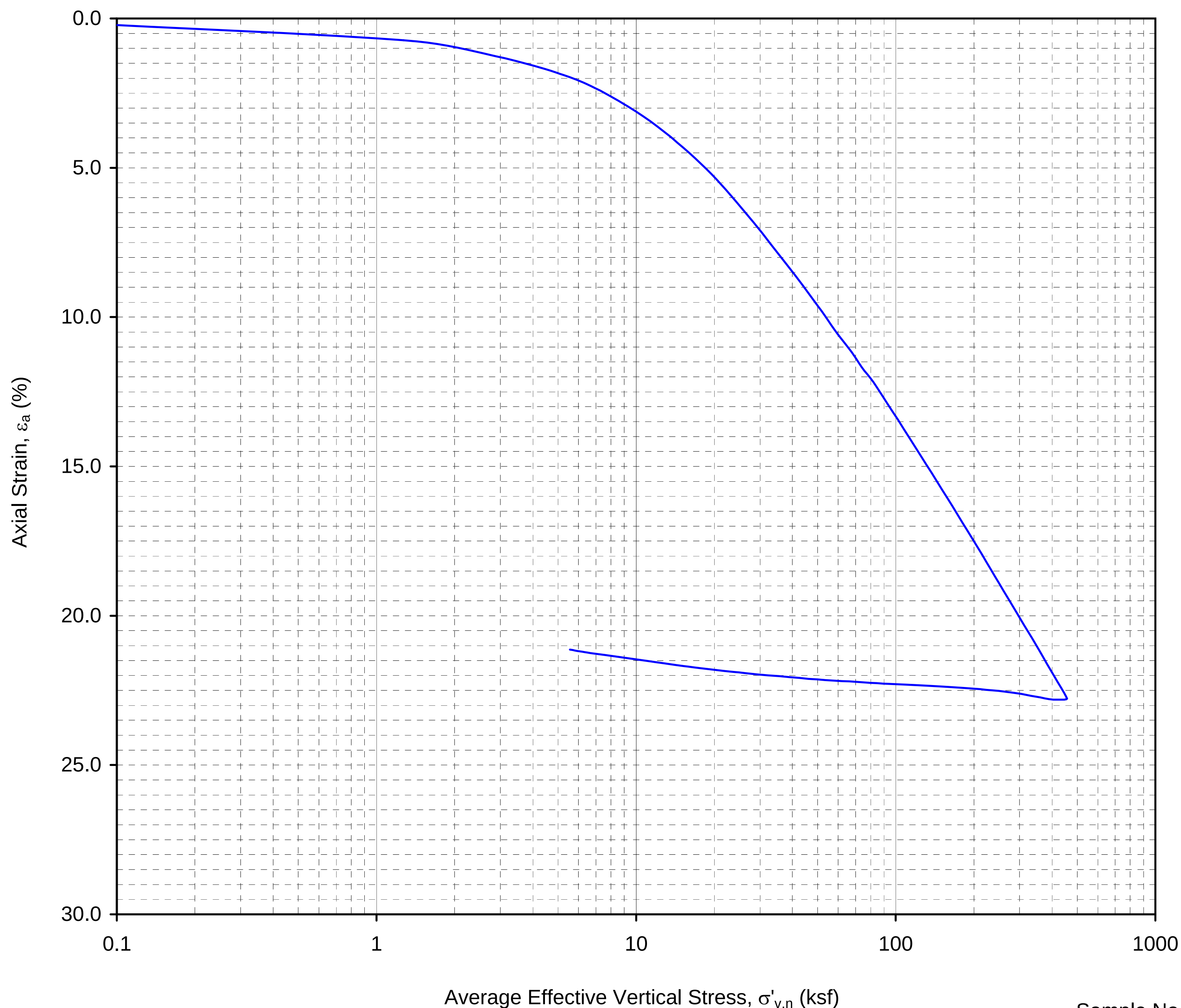
Boring WR0017-235B



1-D CONSOLIDATION TEST: CRS

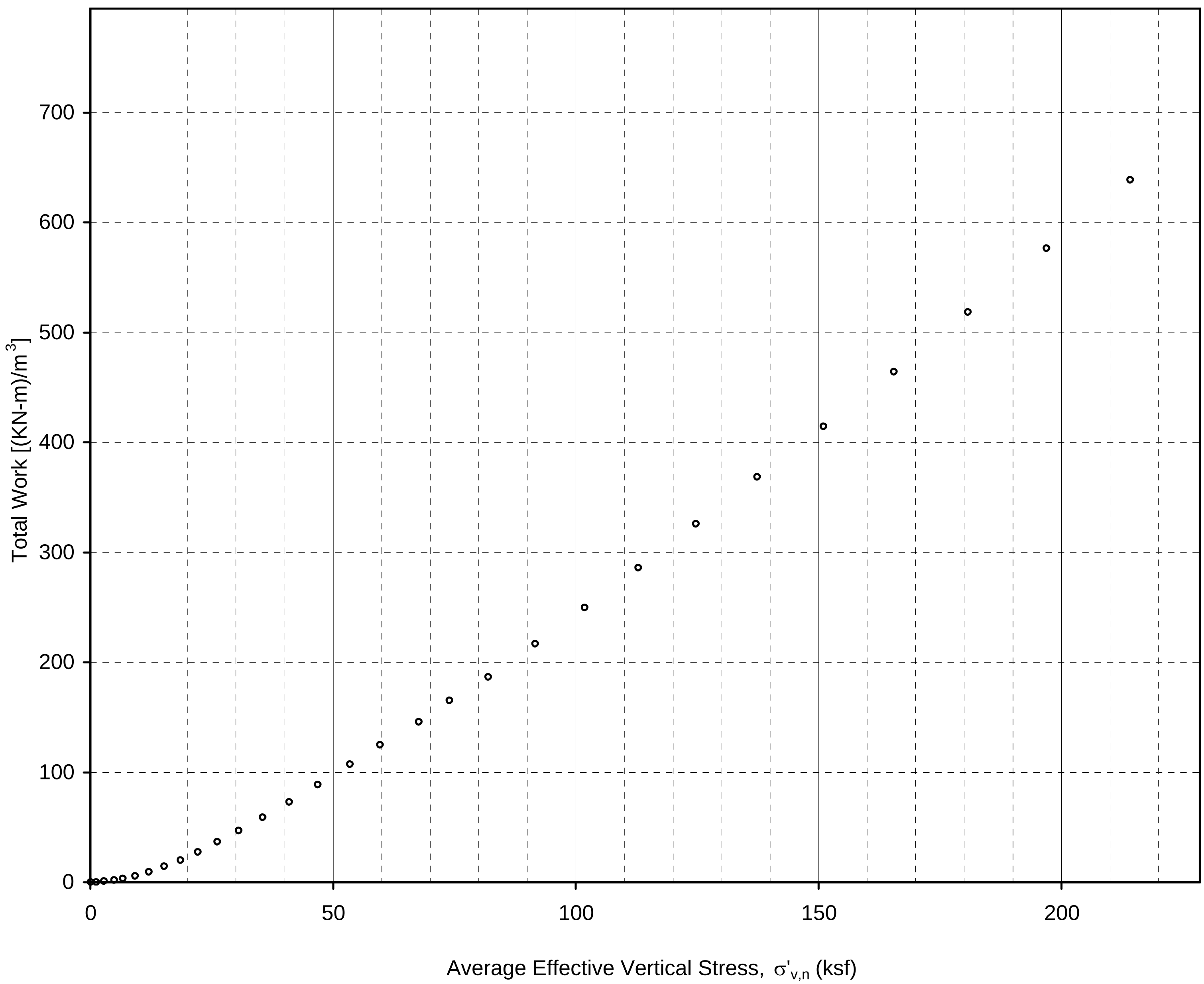
Sample No. S04Aa   Depth 18.8 ft

Boring WR0017-235B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S04Aa   Depth 18.8



Sample No. S04Aa Depth 18.8 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S12 File Name: WR0017-235B_S04Aa

Task No.: NA Cell No.: CRS-C12

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	18.50	61.20		69.2	88.1	106.0
2	"	Bottom, W2	17.39	61.78		66.5	84.0	101.6
3	"	Sides, W3	18.20	61.35		68.5	87.0	104.9
4	"	Average, W4	18.03	61.44		68.1	86.4	104.2
5	"	Back Calculated (1)	21.78	59.55	(3)	76.4	98.7	117.5
6	Final		17.49	59.55	(2)	76.4	100.0	119.0

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.704

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.712

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18211
Final Selected, K_f	0.18211

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 59.35

Avg. Back Calculated and Measured Mass Dry Soil (g) = 59.45

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 59.55; Final (4): NA — [X] From Cal. Routine No. 5; [ ] Make S_f = 100%, or; Note: Routine #5 is based on final measurements.; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.25 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.01 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	21.8	0.775	76.4	116.3	95.5	10.845	From	To (ksf)
Final	17.5	0.476	100.0	134.9	114.8	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

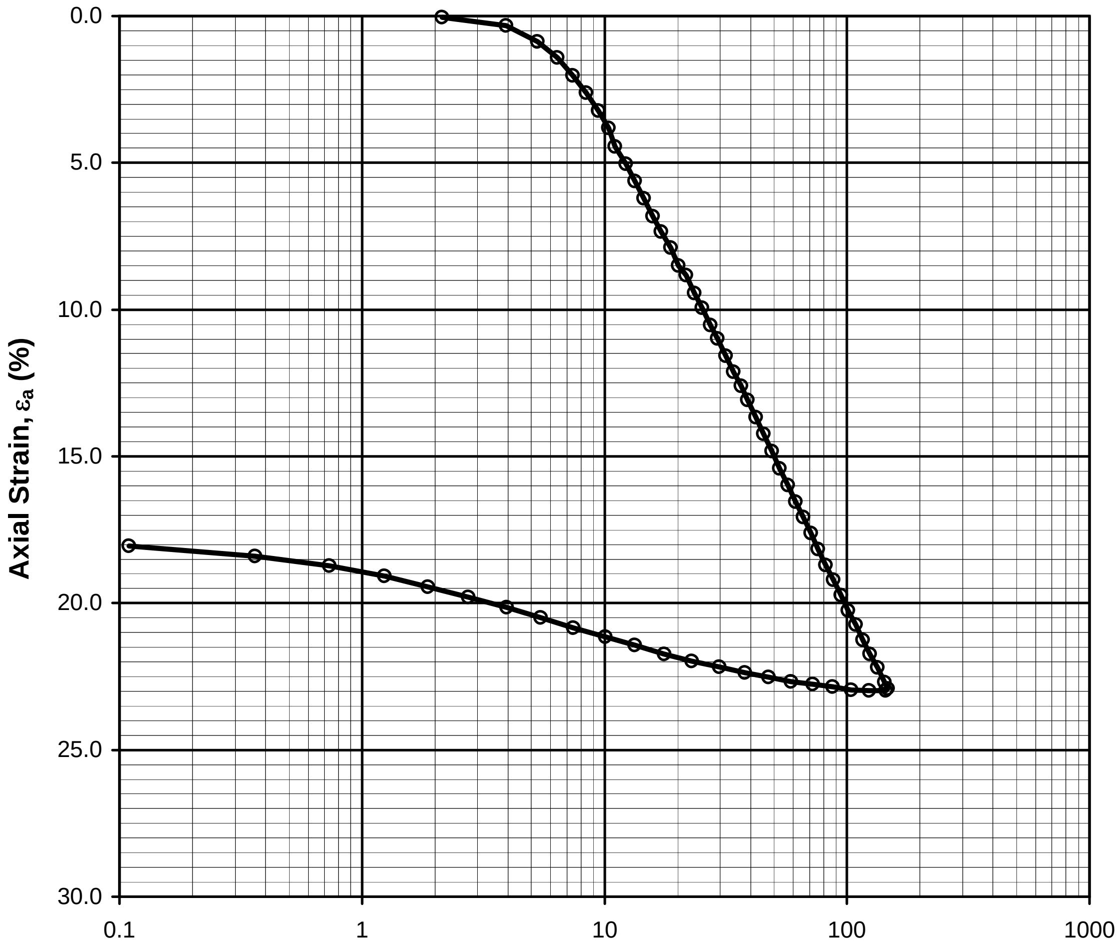
(3) This value is only different from the final value if there is soil extrusion during loading.

(4) Final is only different from the initial value if there is soil extrusion during loading.

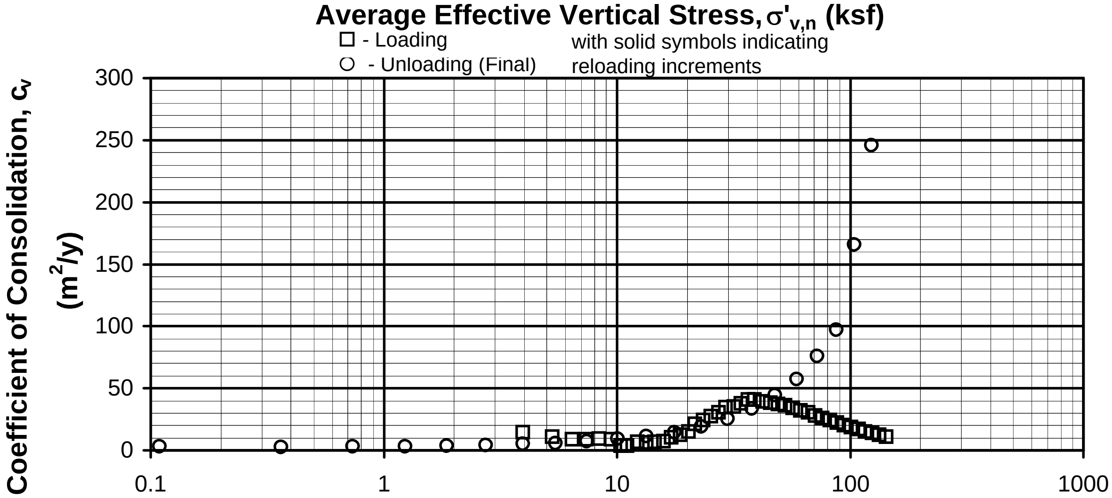
(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 11/30/2012



Average Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)

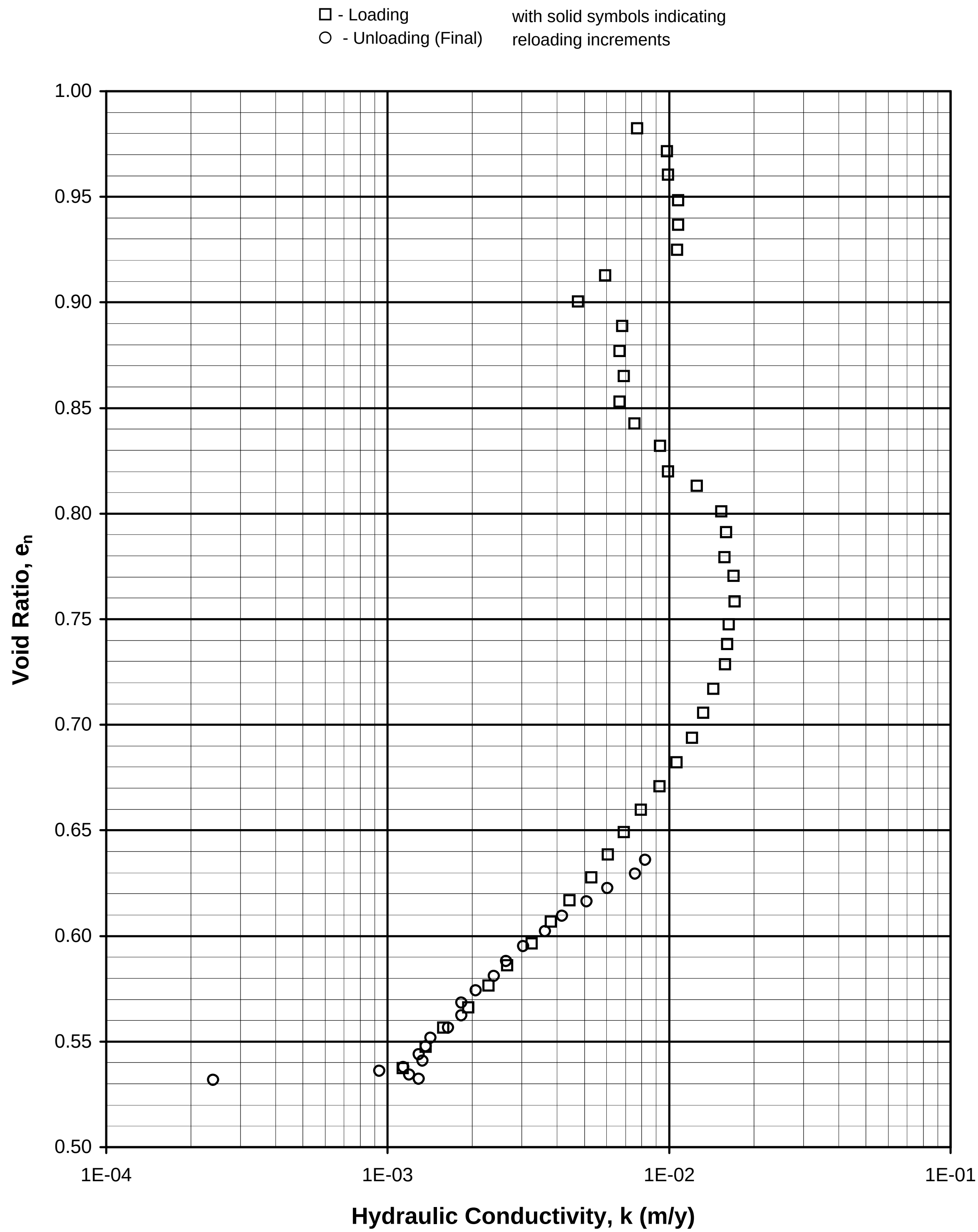


Average Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)

1-D CONSOLIDATION TEST: CRS

Sample No. S08Aa Depth 24.9 ft

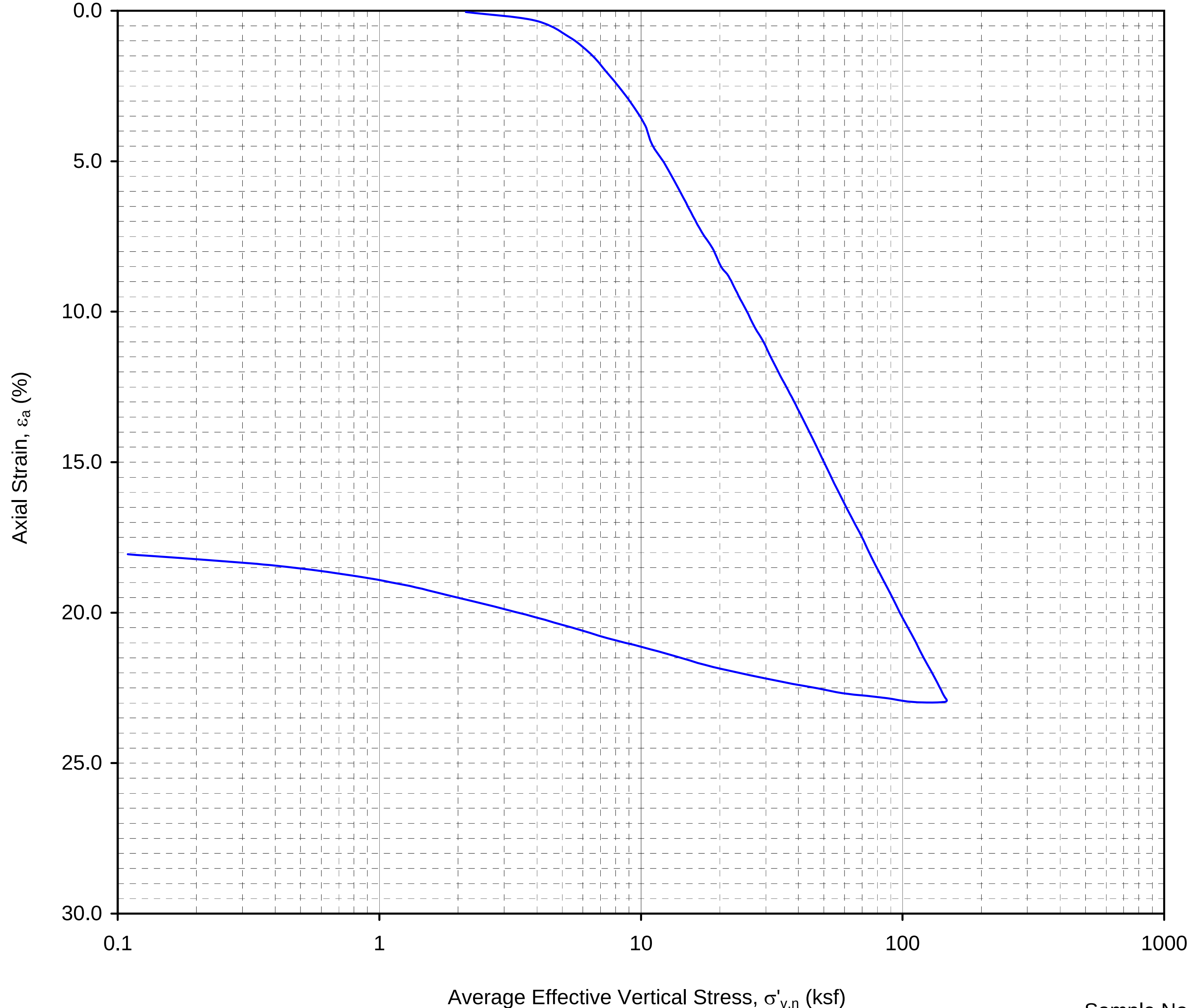
Boring WR0017-238B



1-D CONSOLIDATION TEST: CRS

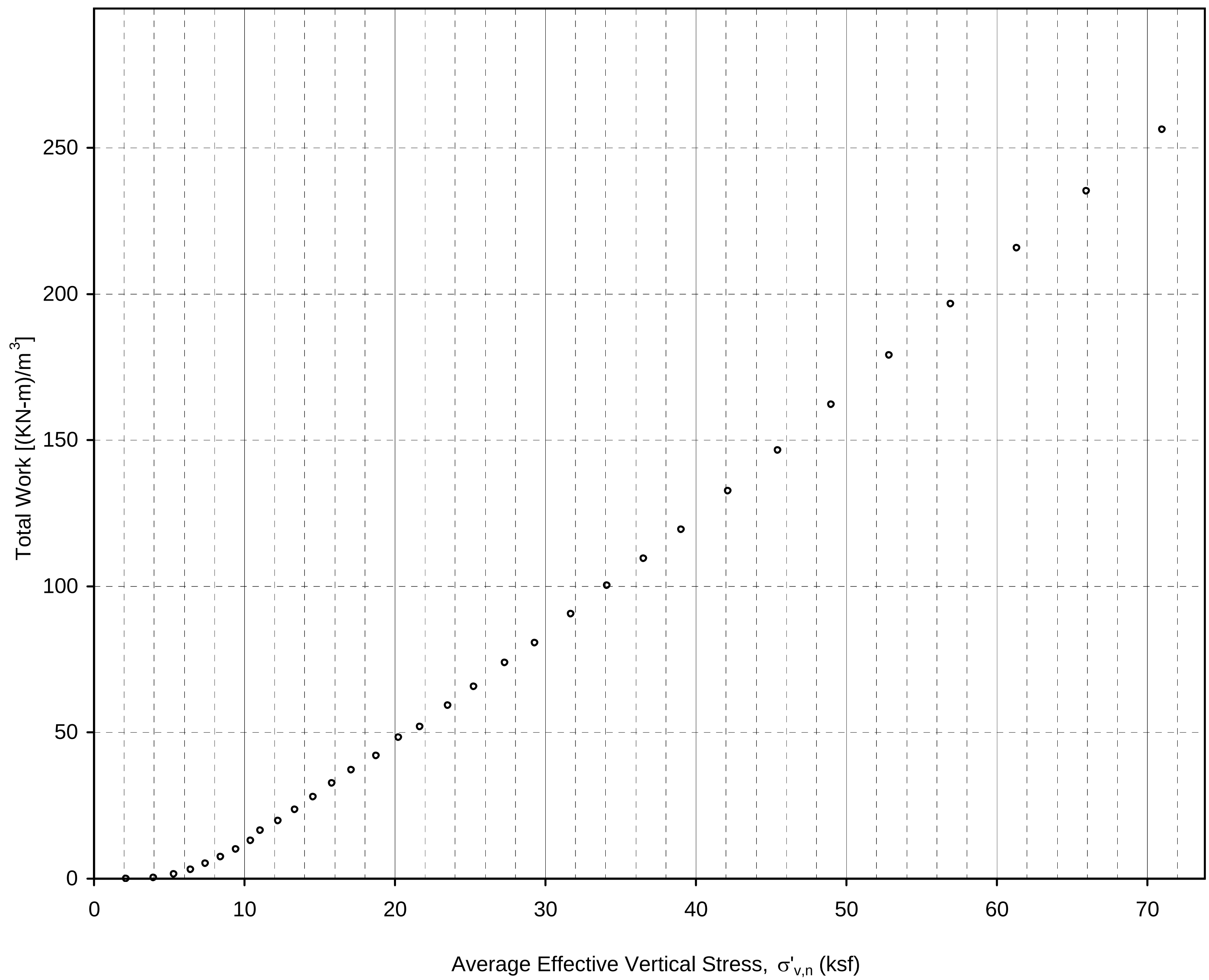
Sample No. S08Aa Depth 24.9 ft

Boring WR0017-238B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S08Aa Depth 24.9



Sample No. S08Aa   Depth 24.9 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S13 File Name: WR0017-238B_S08Aa

Task No.: NA Cell No.: CRS-C13

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	33.60	53.85		93.8	96.8	94.4
2	"	Bottom, W2	33.07	54.06		93.0	95.6	93.2
3	"	Sides, W3	32.30	54.38		92.0	93.9	91.5
4	"	Average, W4	32.99	54.09		92.9	95.4	93.1
5	"	Back Calculated (1)	34.56	53.46	(3)	95.1	98.8	96.4
6	Final		22.81	53.46	(2)	95.1	100.0	97.6

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.700

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.710

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18208
Final Selected, K_f	0.18208

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 53.23

Avg. Back Calculated and Measured Mass Dry Soil (g) = 53.35

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 53.46; Final (4): NA — [X] From Cal. Routine No. 5 — Note: Routine #5 is based on final measurements. [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.36 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 15.77 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	34.6	0.989	95.1	114.7	85.2	9.735	From	To (ksf)
Final	22.8	0.620	100.0	128.5	104.6	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

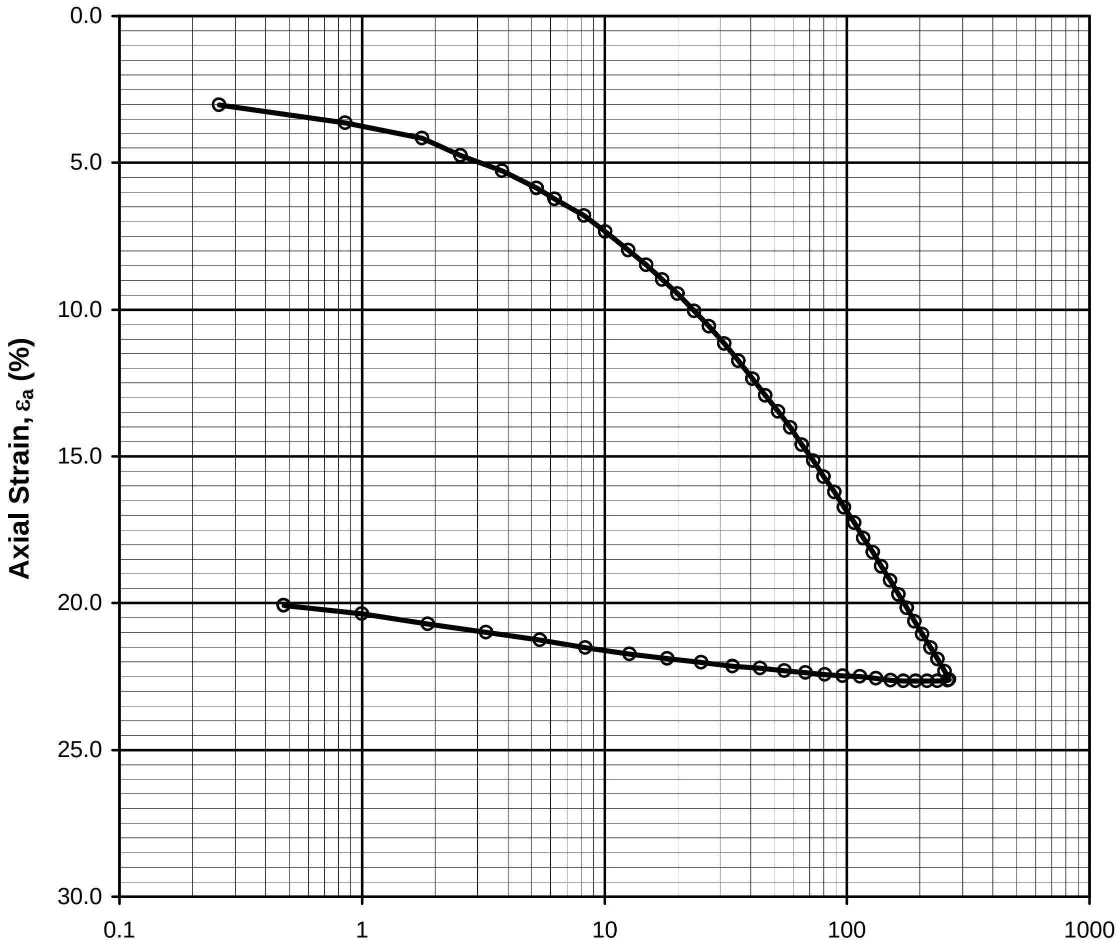
(3) This value is only different from the final value if there is soil extrusion during loading.

(4) Final is only different from the initial value if there is soil extrusion during loading.

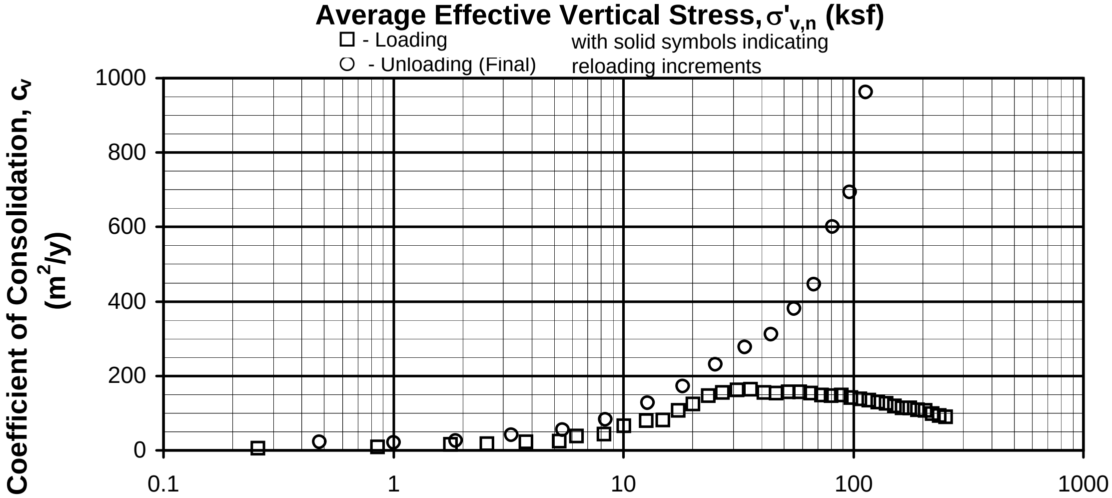
(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 12/3/2012



Average Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)

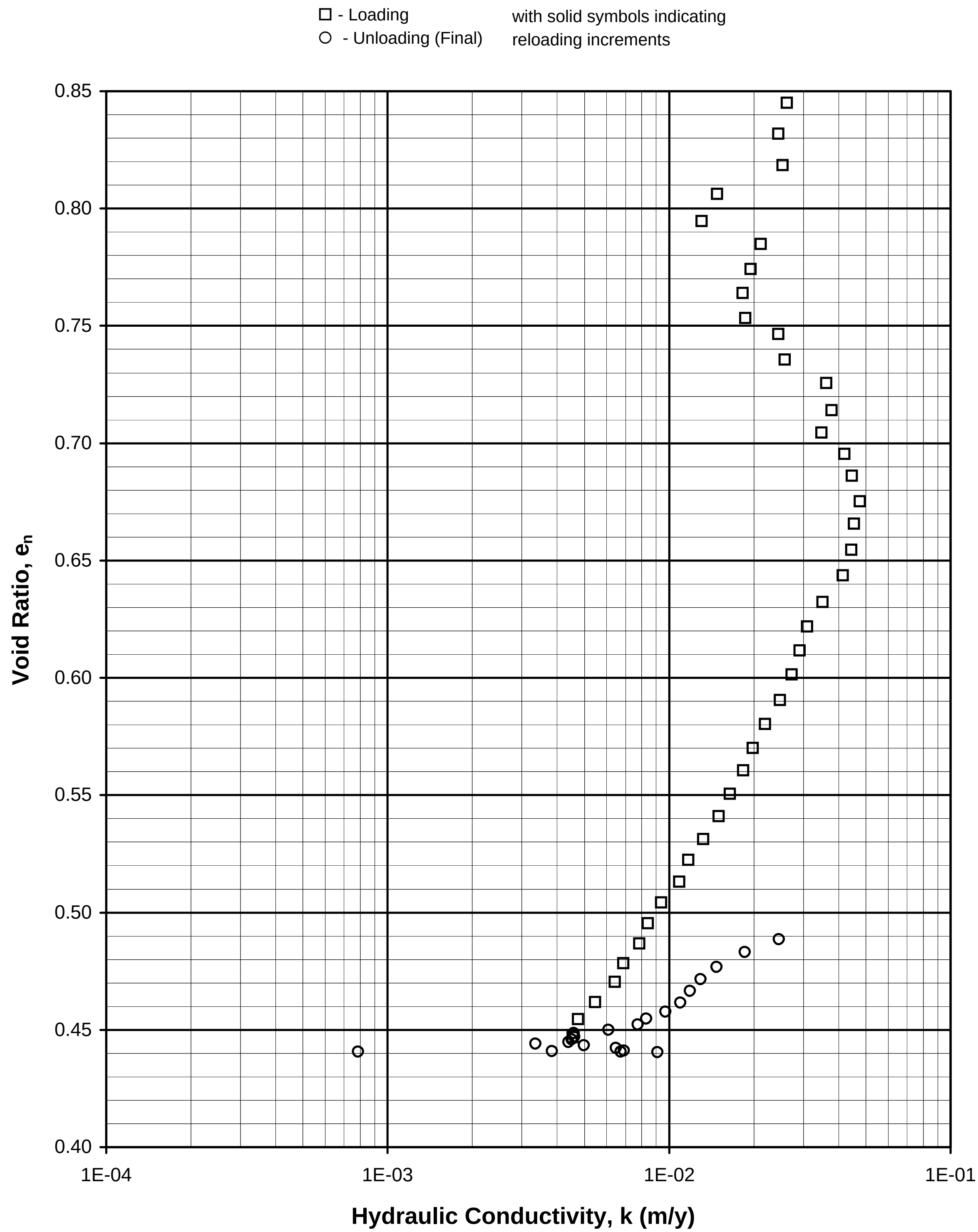


Average Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)

1-D CONSOLIDATION TEST: CRS

Sample No. S09Aa Depth 28.15 ft

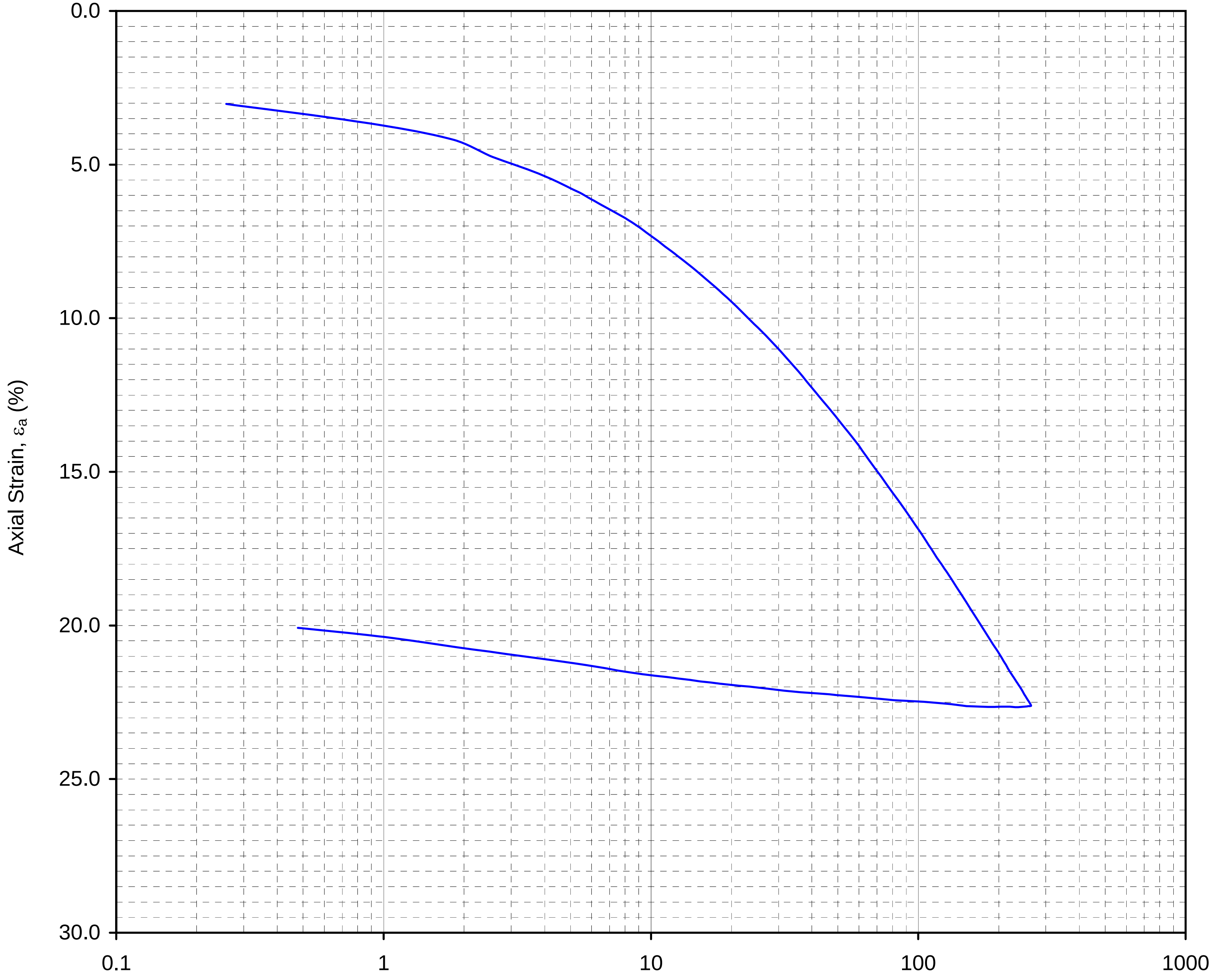
Boring WR0017-239B



1-D CONSOLIDATION TEST: CRS

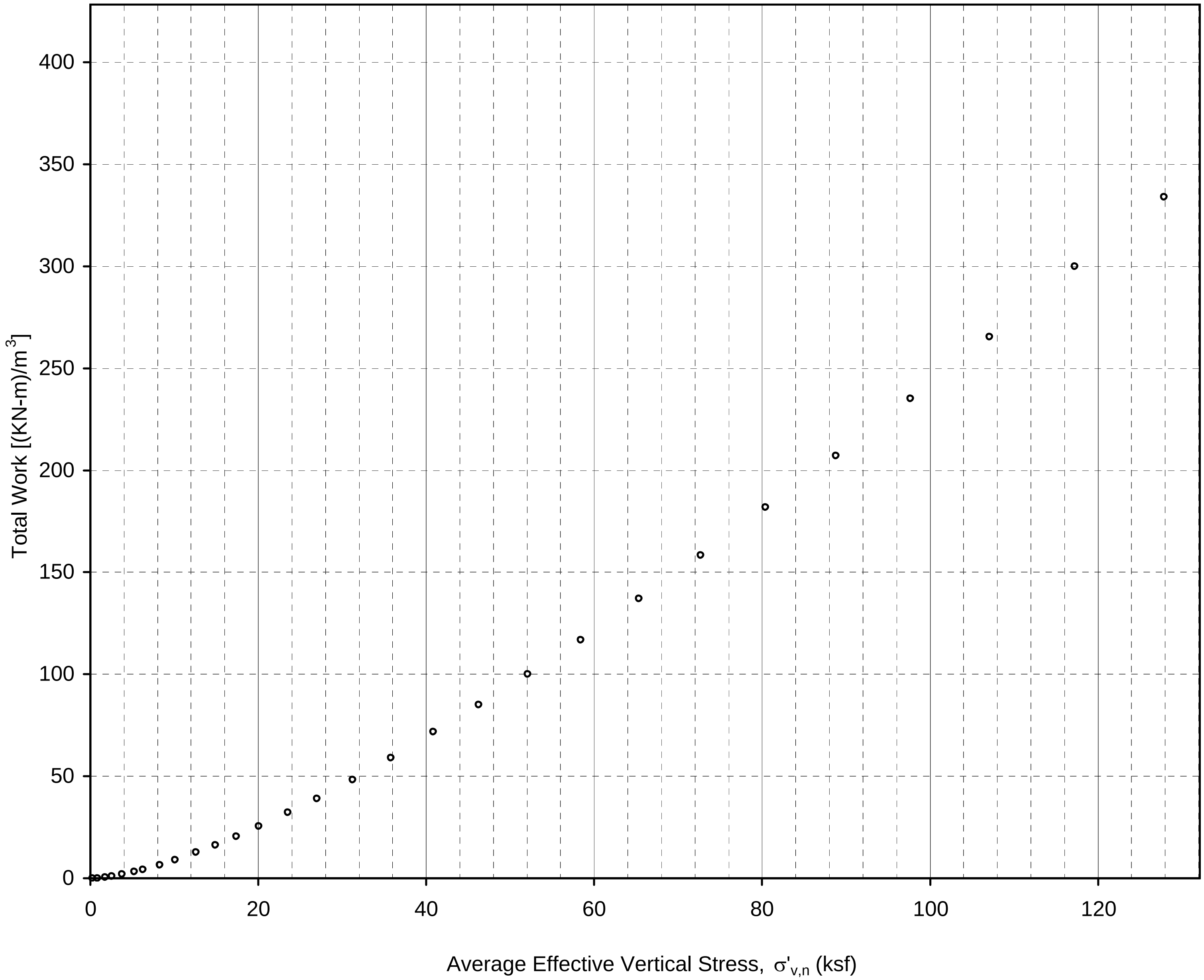
Sample No. S09Aa Depth 28.15 ft

Boring WR0017-239B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S09Aa Depth 28.15



Sample No. S09Aa   Depth 28.15

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S14 File Name: WR0017-239B_S09Aa

Task No.: NA Cell No.: CRS-C14

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	30.22	57.97		97.6	93.3	95.3
2	"	Bottom, W2	29.74	58.18		96.9	91.9	93.9
3	"	Sides, W3	30.31	57.93		97.8	93.5	95.5
4	"	Average, W4	30.09	58.03		97.4	92.9	94.9
5	"	Back Calculated (1)	32.12	57.14	(3)	100.5	98.5	100.5
6	Final		18.48	57.14	(2)	100.5	100.0	102.1

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.679

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.690

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.18361
Final Selected, K_f	0.18361

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 56.88

Avg. Back Calculated and Measured Mass Dry Soil (g) = 57.01

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 57.14; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%. Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.54 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 15.72 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5): From	To (ksf)
Initial	32.1	0.862	100.5	119.4	90.3	10.491	From	To (ksf)
Final	18.5	0.499	100.0	133.0	112.3	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

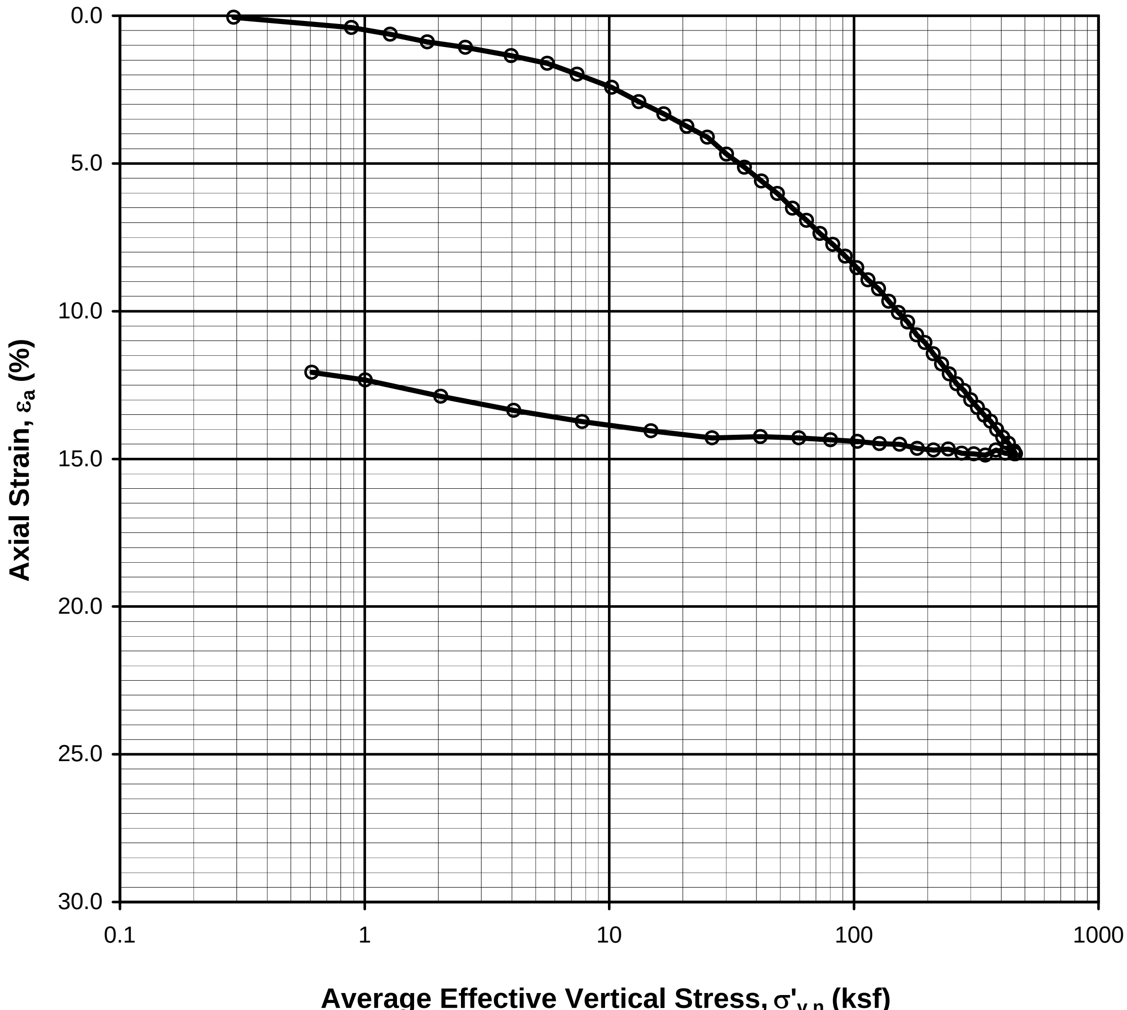
(3) This value is only different from the final value if there is soil extrusion during loading.

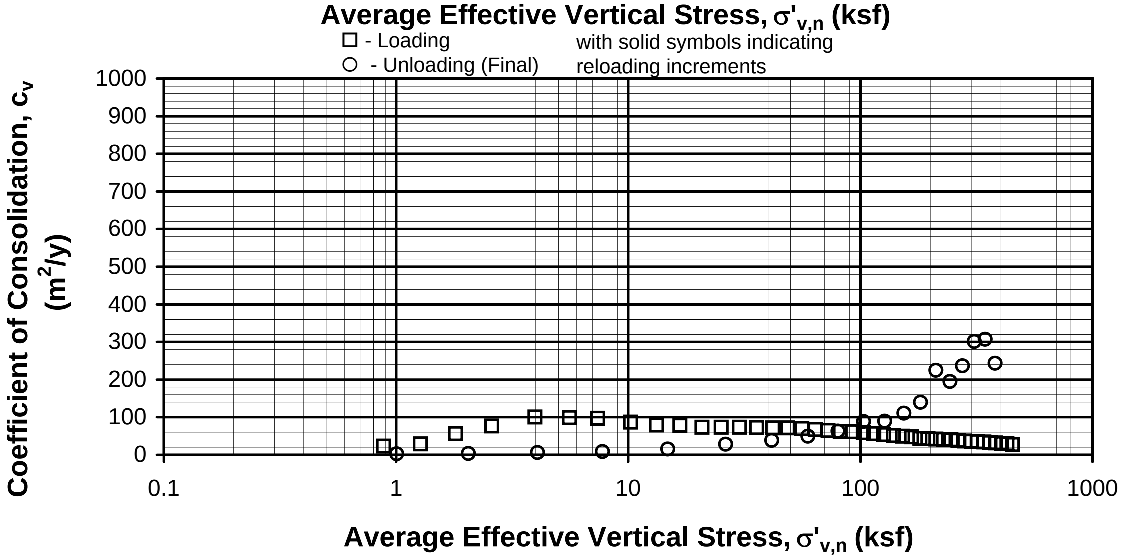
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 12/3/2012

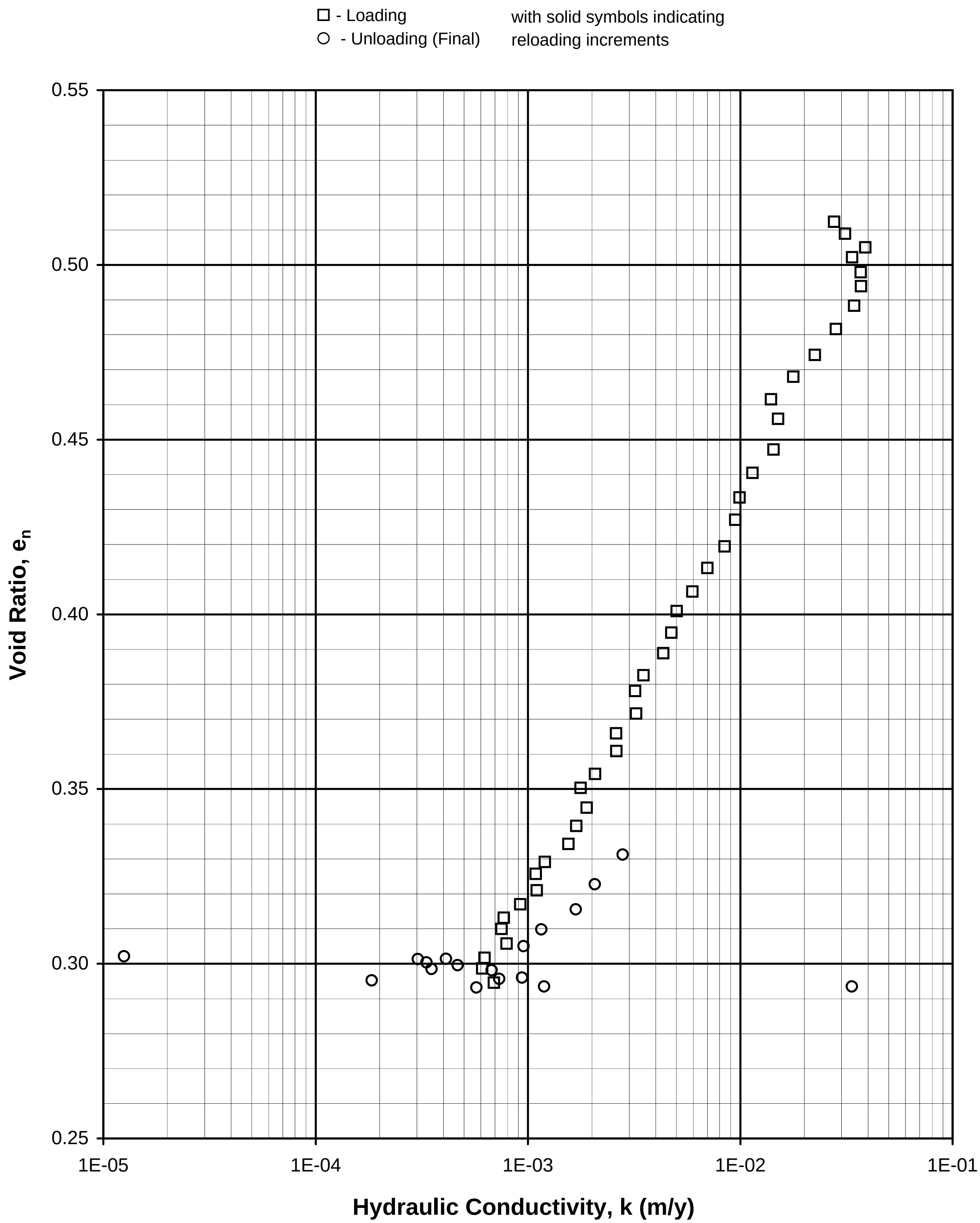




1-D CONSOLIDATION TEST: CRS

Sample No. S04Aa Depth 15.85 ft

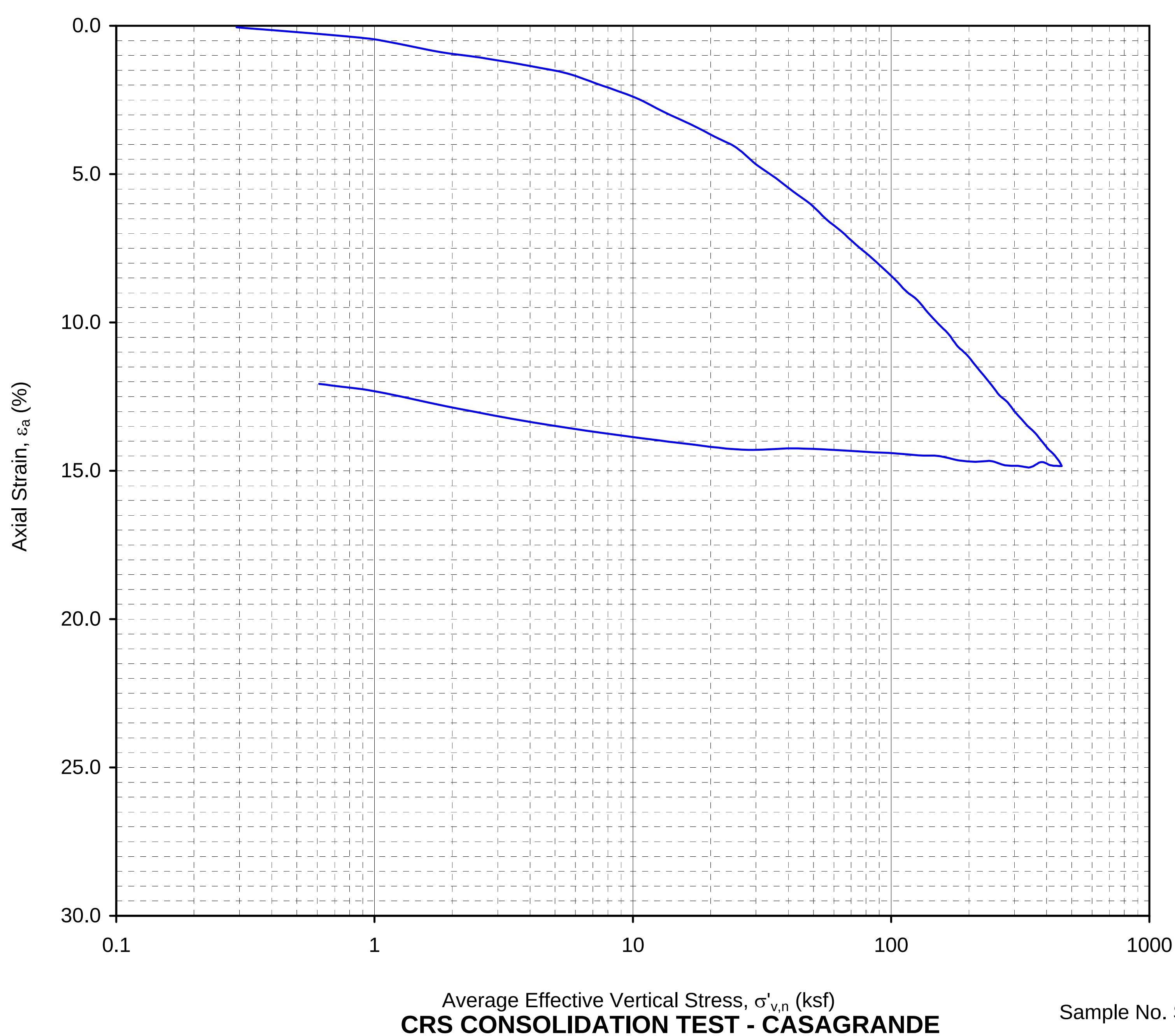
Boring WR0017-253B



1-D CONSOLIDATION TEST: CRS

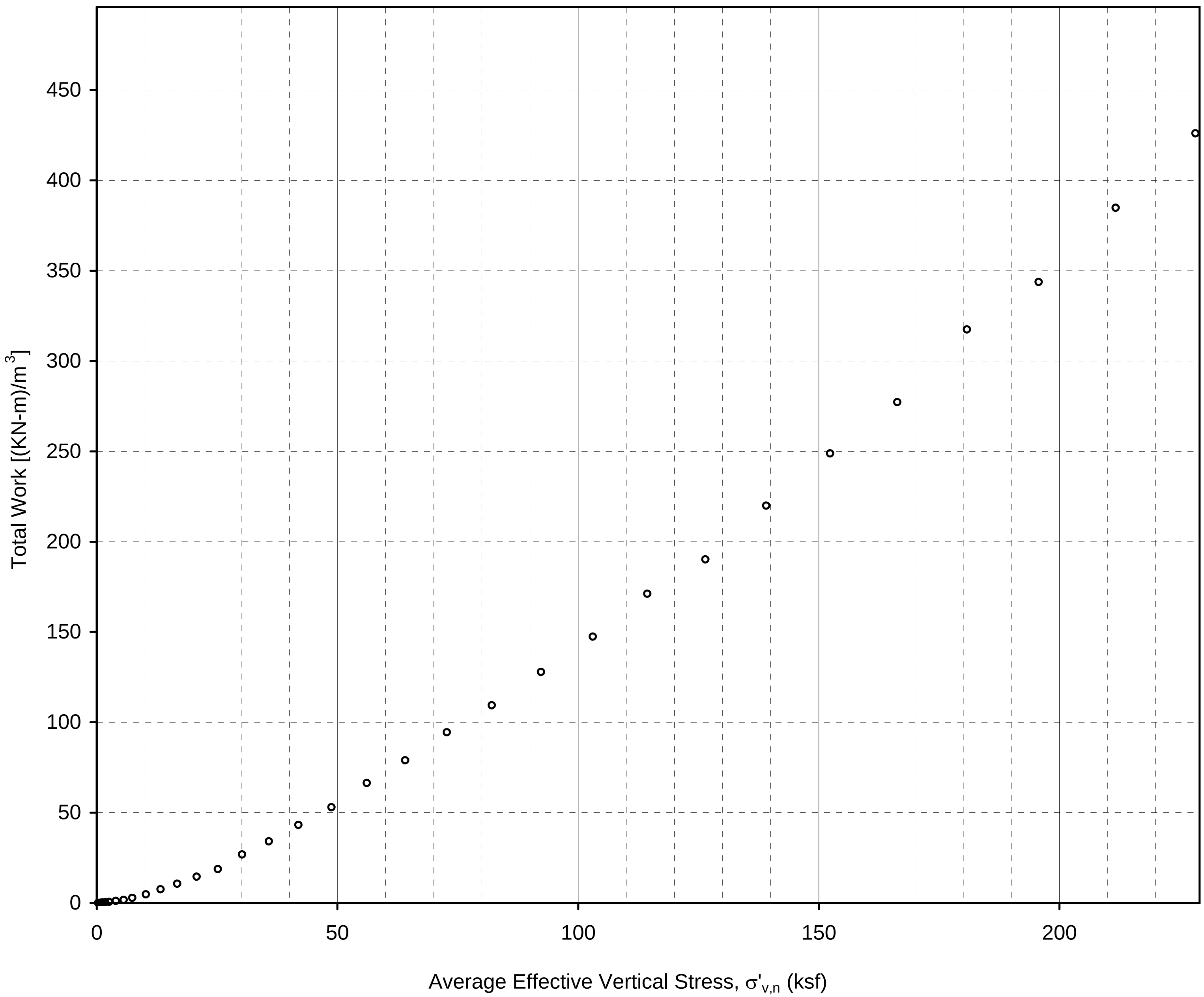
Sample No. S04Aa Depth 15.85 ft

Boring WR0017-253B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S04Aa   Depth 15.85



Sample No. S04Aa   Depth 15.85

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S16 File Name: WR0017-253B_S04Aa

Task No.: NA Cell No.: CRS-C16

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	17.09	69.20		87.6	101.0	106.0
2	"	Bottom, W2	16.47	69.56		85.7	98.5	103.4
3	"	Sides, W3	15.88	69.92		83.9	96.0	100.8
4	"	Average, W4	16.48	69.56		85.7	98.5	103.4
5	"	Back Calculated (1)	16.44	69.58	(3)	85.6	98.4	103.3
6	Final		13.03	69.58	(2)	85.6	100.0	105.0

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.685

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.692

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18303
Final Selected, K_f	0.18303

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 69.35

Avg. Back Calculated and Measured Mass Dry Soil (g) = 69.46

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 69.58; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100% — Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.34 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 17.22 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	16.4	0.518	85.6	129.0	110.8	12.736		
Final	13.0	0.352	100.0	140.7	124.5	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

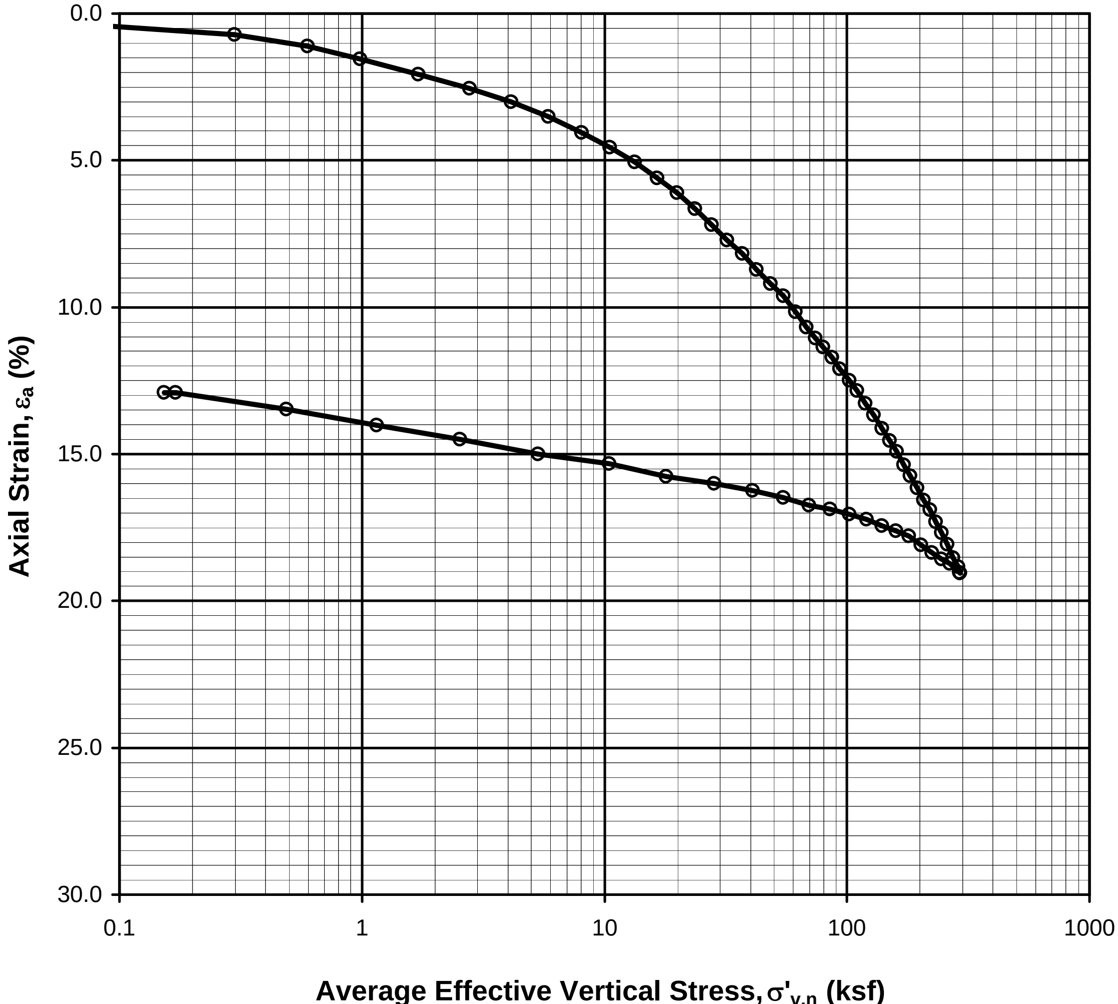
(3) This value is only different from the final value if there is soil extrusion during loading.

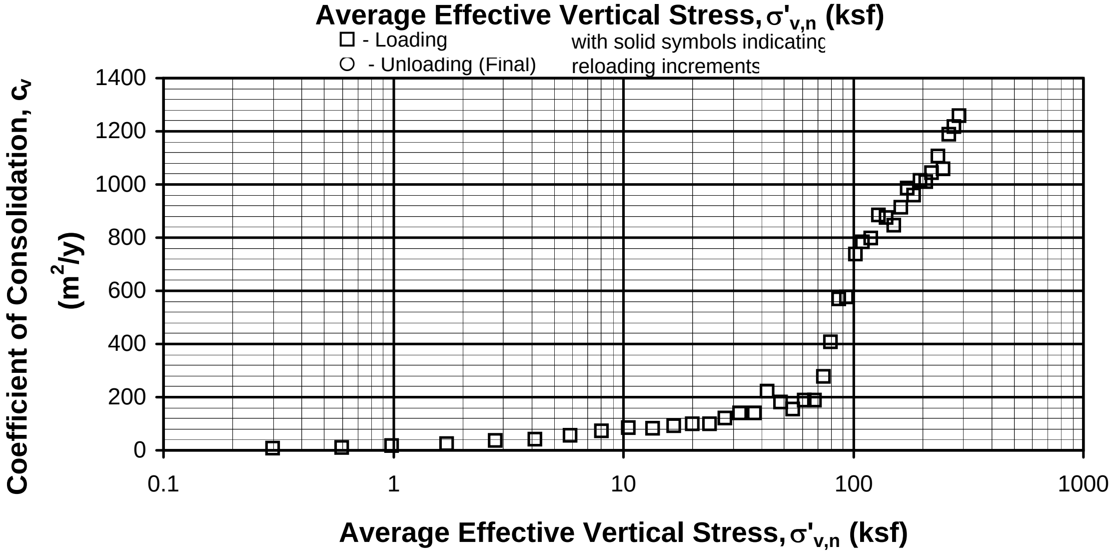
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 2/27/2013

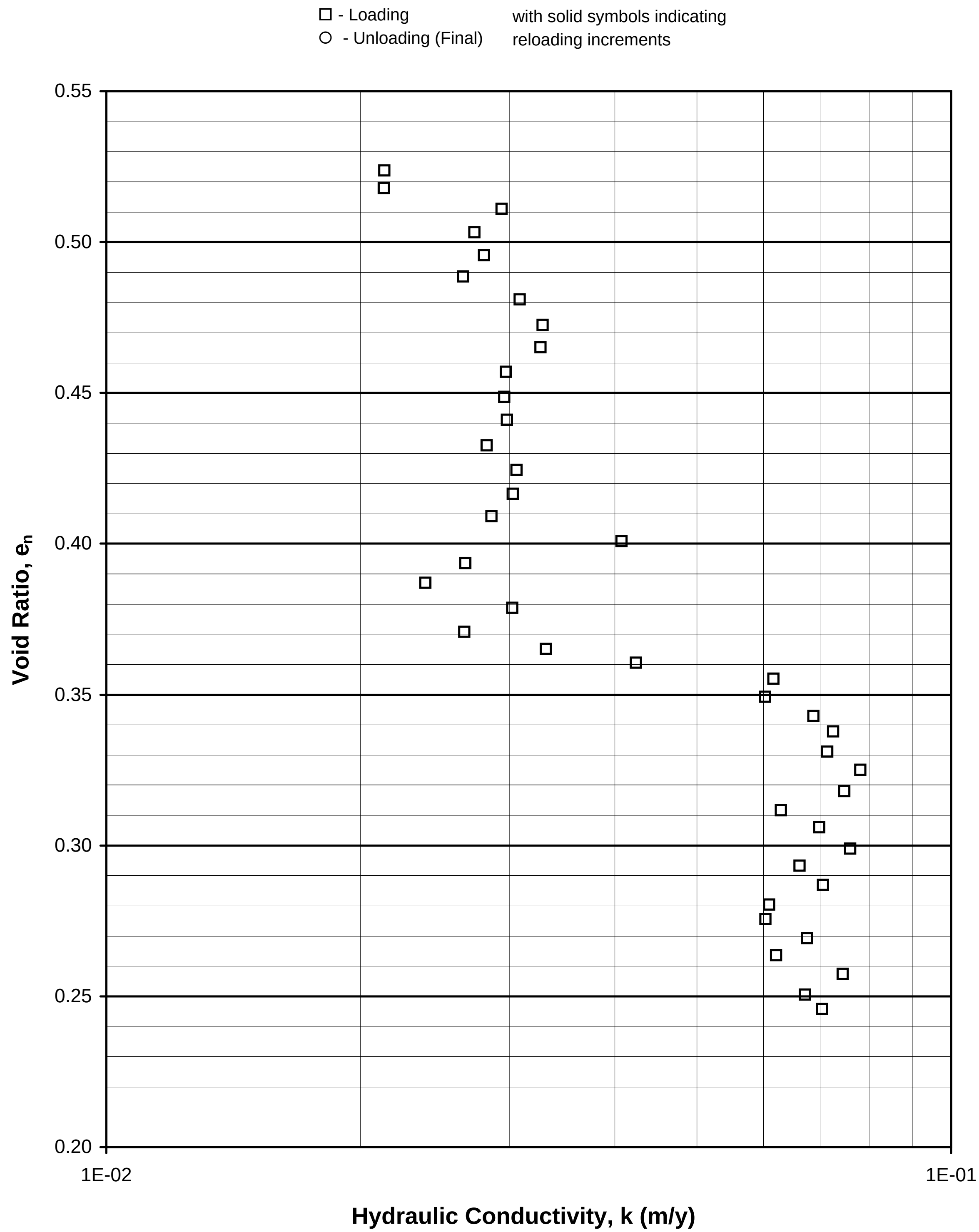




1-D CONSOLIDATION TEST: CRS

Sample No. S06b   Depth 25.15 ft

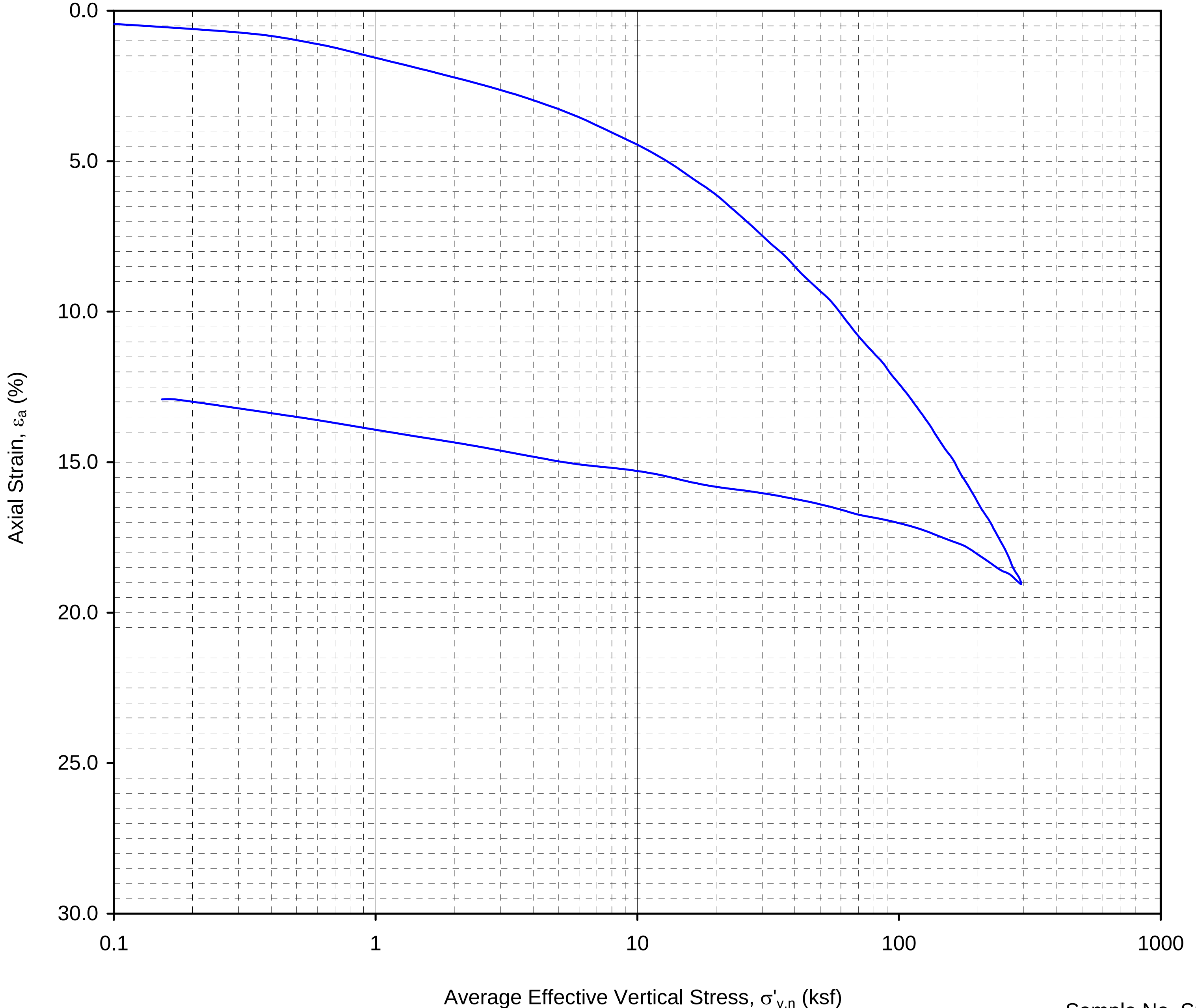
Boring WR0017-253B



1-D CONSOLIDATION TEST: CRS

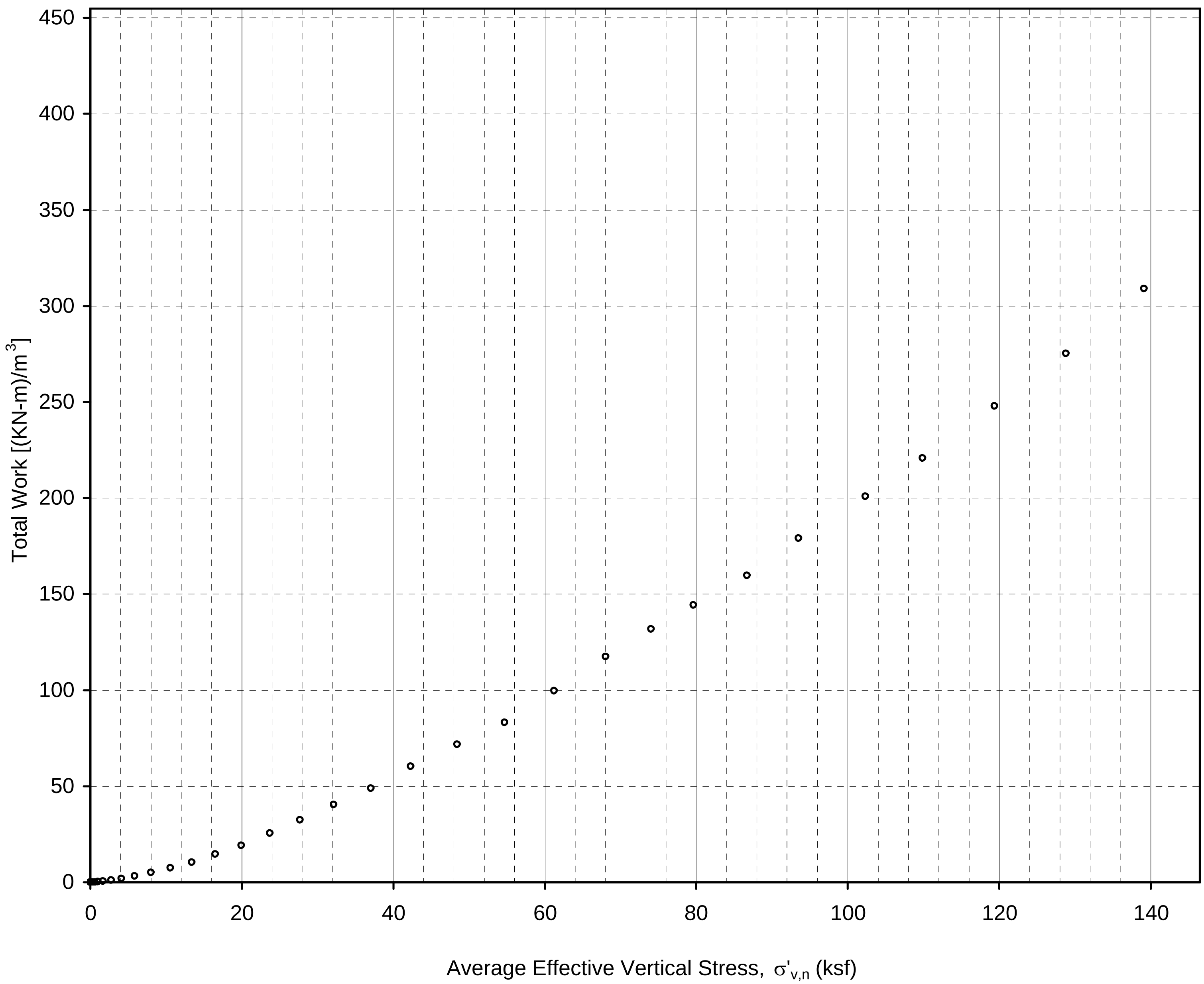
Sample No. S06b   Depth 25.15 ft

Boring WR0017-253B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S06b   Depth 25.15 ft



Sample No. S06b   Depth 25.15 ft

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S07 File Name: WR0017-253B_S06b

Task No.: NA Cell No.: CRS-C07

Specific Gravity, G_s: 2.700 ☐ Measured ; ☒ Assumed.

Calculations Corrected for Salt (dissolved solids): ☒ No or, ☐ Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM	Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial, Top, W1	20.59	103.50	98.9	108.0	109.6
2	" Bottom, W2	19.79	104.19	96.8	105.0	106.6
3	" Sides, W3	18.48	105.34	93.3	99.7	101.3
4	" Average, W4	19.62	104.34	96.4	104.3	105.9
5	" Back Calculated (1)	18.48	105.34 (3)	93.3	99.7	101.3
6	Final	12.75	105.34 (2)	93.3	100.6	102.2

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: ☒ Measurement; ☐ Dial Change.

Back Cal. G_s = 2.697

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.699

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.11716
Final Selected, K_f	0.11716

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: ☒ Measurement; ☐ Dial Change.

Back Cal. Mass Dry Soil, (g) = 105.28

Avg. Back Calculated and Measured Mass Dry Soil (g) = 105.31

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 ☒ Assumed ☐ Measured ; ☐ To make S_f = 100% at end of test. ☐ Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 105.34; Final (4): NA ☒ From Cal. Routine No. 5 ; ☐ Make S_f = 100%, or; ☐ Avg. of measured & make S_f = 100%. Note: Routine #5 is based on final measurements.

Initial Height (mm) = 18.94 ☒ Measured ; ☐ Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.56 ☒ Measured ; ☐ Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	18.5	0.535	93.3	129.9	109.6	12.342	From	To (ksf)
Final	12.7	0.342	100.6	141.4	125.4	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

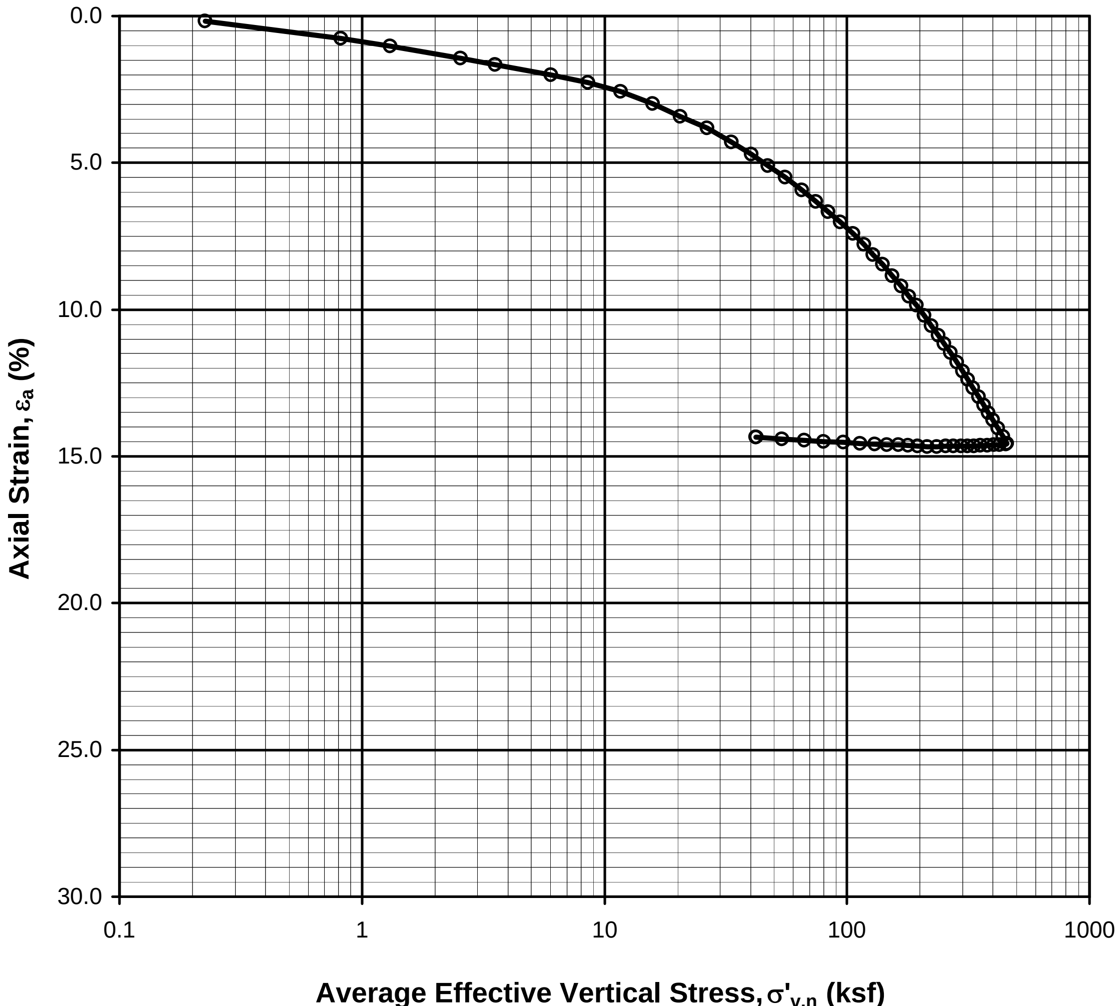
(3) This value is only different from the final value if there is soil extrusion during loading.

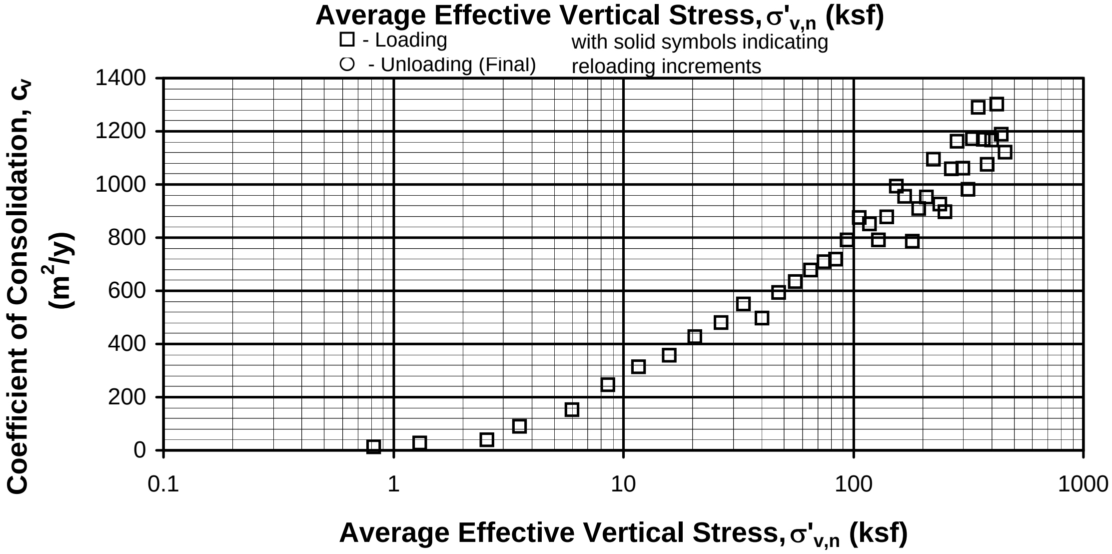
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: HP

Date: 10/19/2012

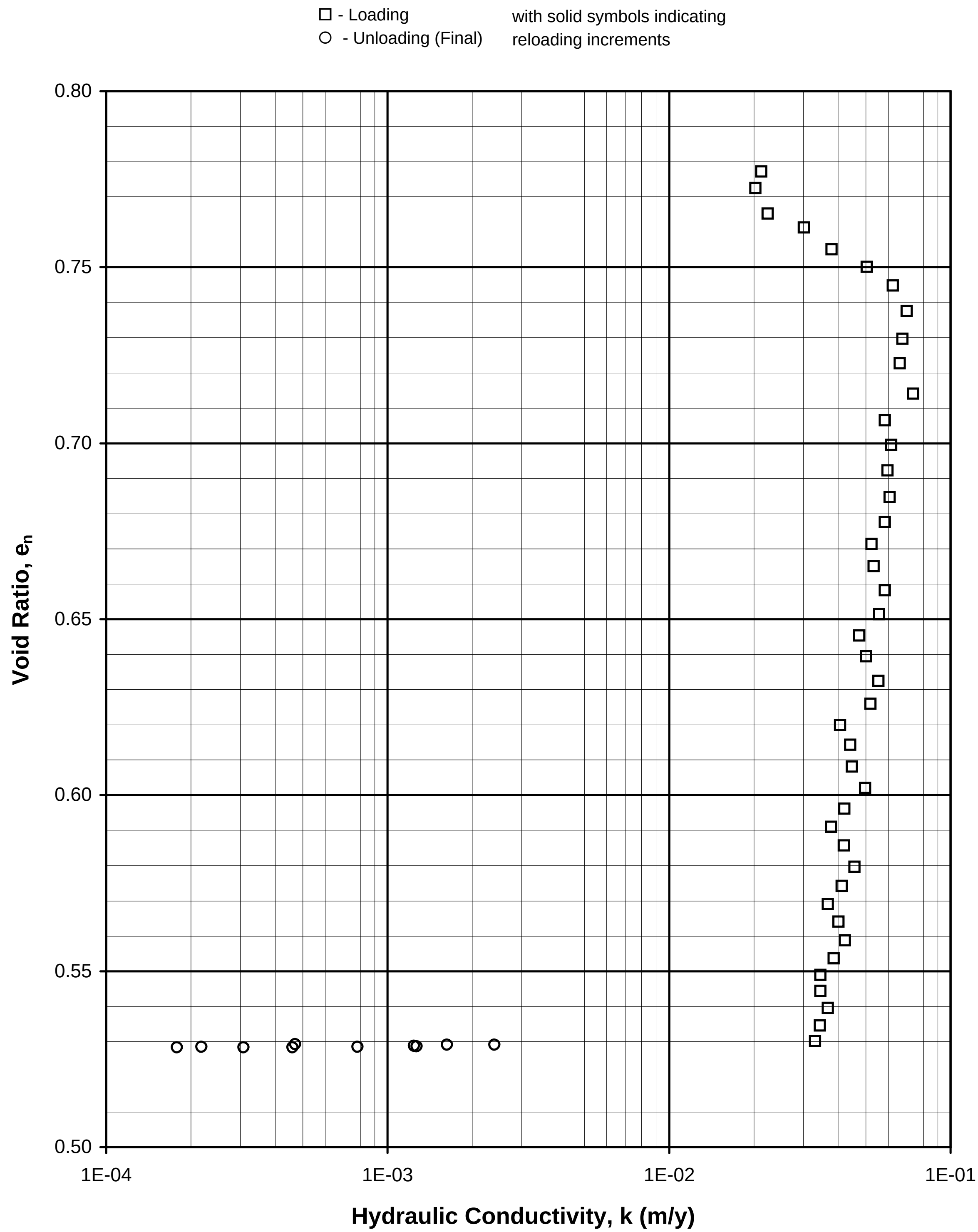




1-D CONSOLIDATION TEST: CRS

Sample No. S08Aa Depth 33.85 ft

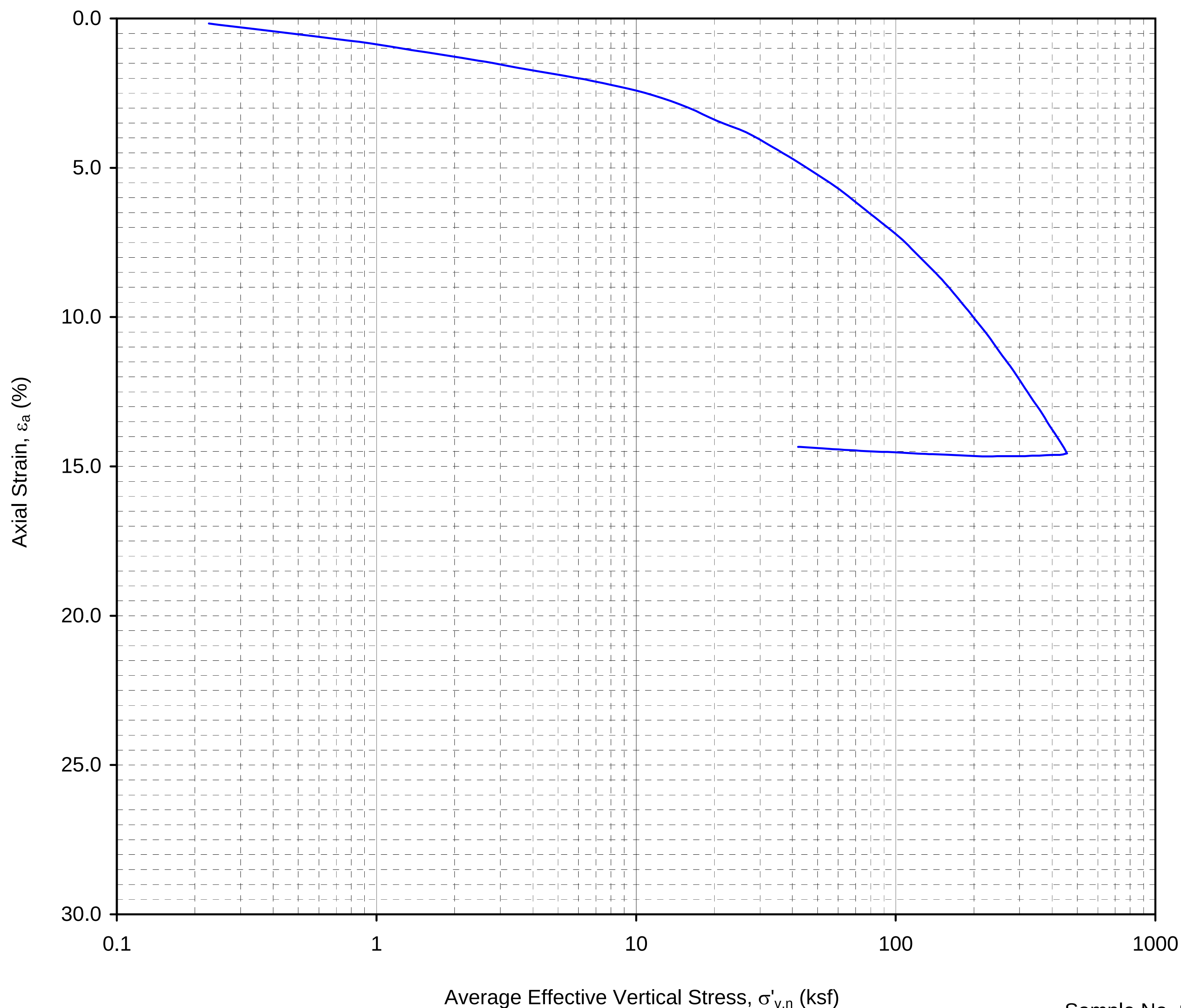
Boring WR0017-253B



1-D CONSOLIDATION TEST: CRS

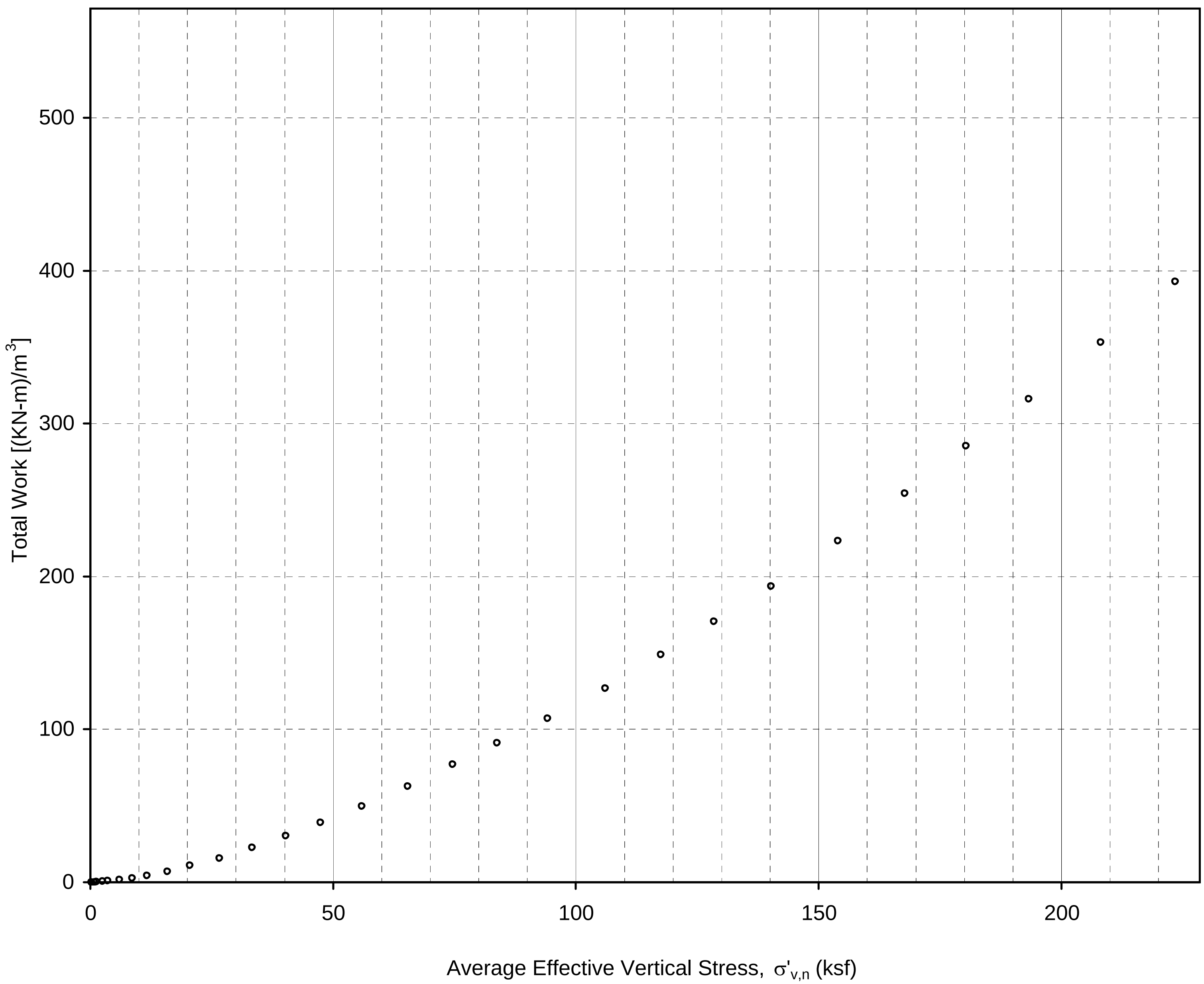
Sample No. S08Aa Depth 33.85 ft

Boring WR0017-253B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S08Aa Depth 33.85



Sample No. S08Aa Depth 33.85

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

FUGRO

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 | Test Station No.: CRS-S04 | File Name: WR0017-253B_S08Aa

Task No.: NA | Cell No.: CRS-C04

Specific Gravity, G_s: 2.720 | [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM	Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial, Top, W1	25.86	60.51	91.9	94.1	112.5
2	" Bottom, W2	28.39	59.32	96.4	99.6	118.4
3	" Sides, W3	26.11	60.39	92.4	94.6	113.1
4	" Average, W4	26.79	60.07	93.6	96.2	114.8
5	" Back Calculated (1)	27.68	59.65 (3)	95.2	98.1	116.8
6	Final	23.39	59.65 (2)	95.2	100.0	119.2

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.688

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.704

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18172
Final Selected, K_f	0.18172

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 59.23

Avg. Back Calculated and Measured Mass Dry Soil (g) = 59.44

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 | [X] Assumed | [ ] To make S_f = 100% at end of test.
| [ ] Measured | [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) Initial: 59.65 | [X] From Cal. Routine No. 5 | Note: Routine #5 is based on final measurements.
Final (4): NA | [ ] Make S_f = 100%, or; | [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.41 | [X] Measured ; | [ ] Back Calculated | Back-cal. Sat. (%) = NA
Final Height (mm) = 17.73 | [X] Measured ; | [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	27.7	0.791	95.2	120.8	94.6	10.839	From	To (ksf)
Final	23.4	0.636	100.0	127.8	103.6	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

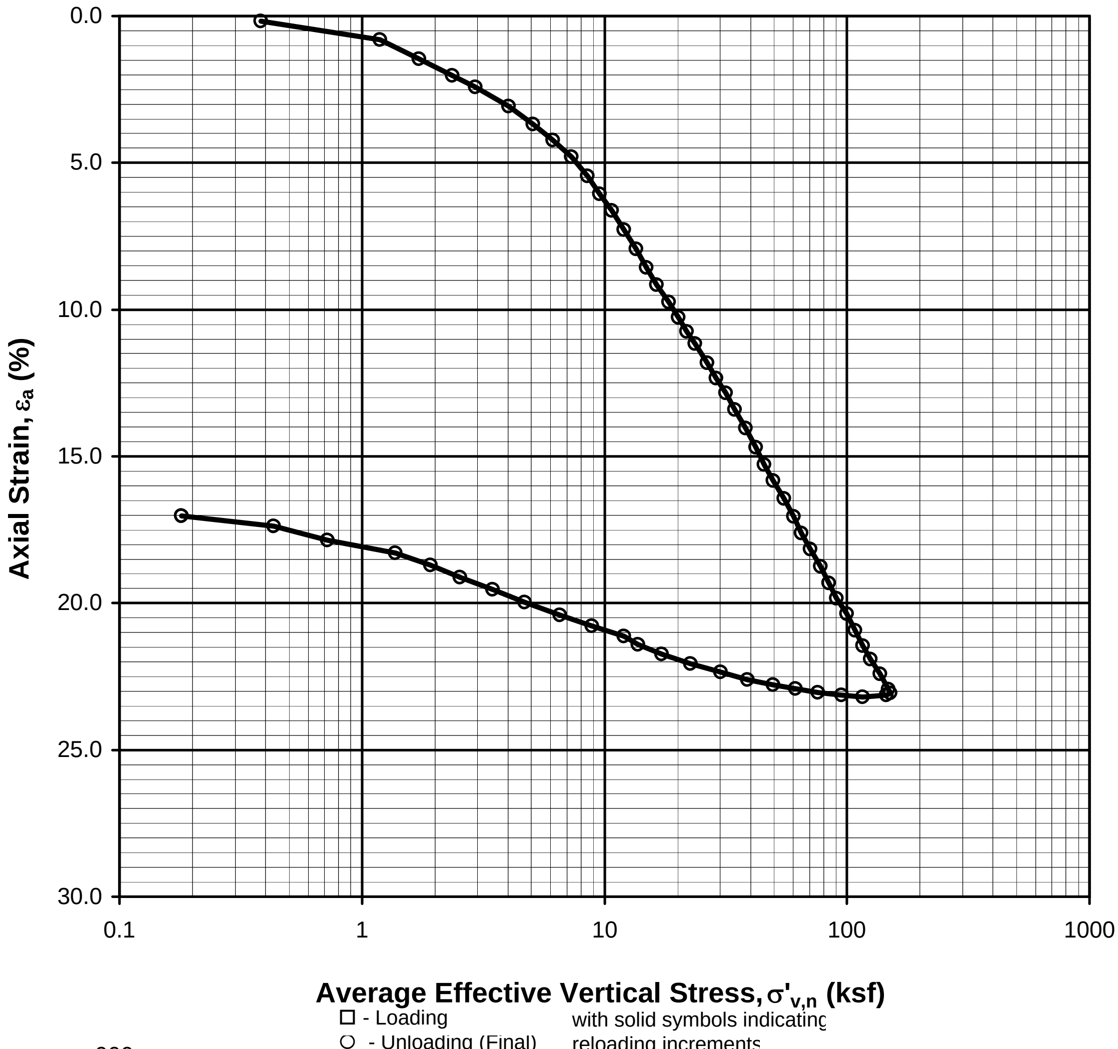
(3) This value is only different from the final value if there is soil extrusion during loading.

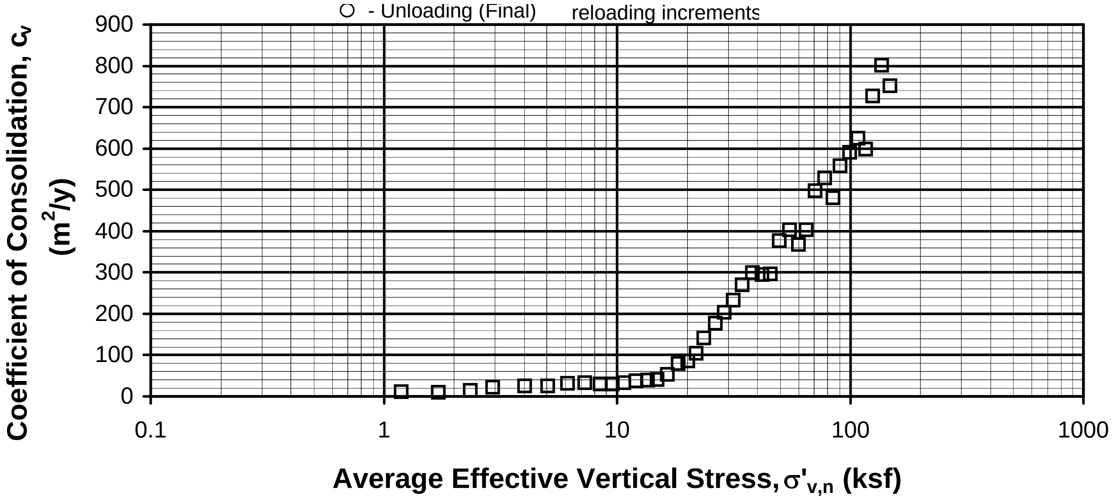
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 12/17/2012

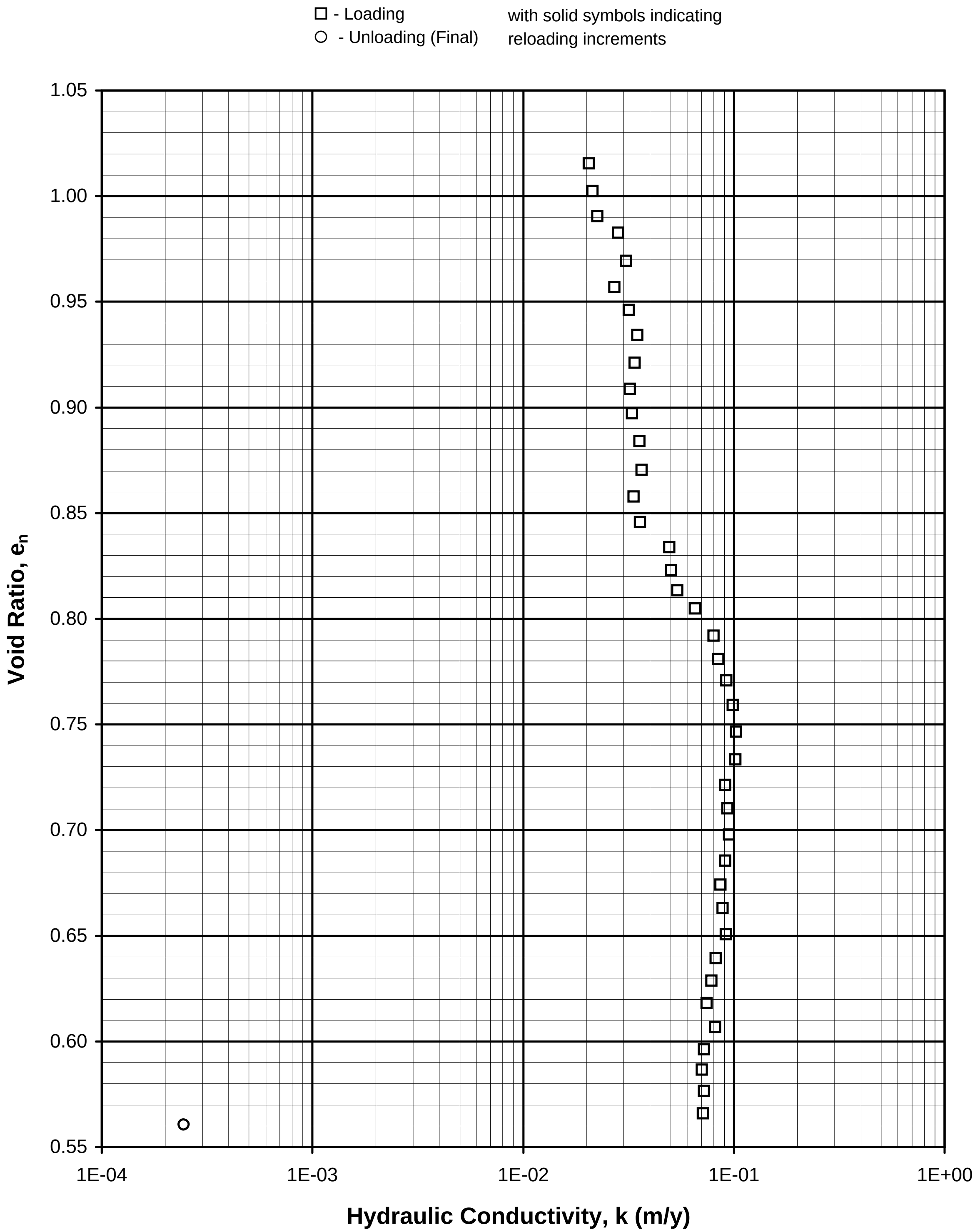




1-D CONSOLIDATION TEST: CRS

Sample No. S05b Depth 11 ft

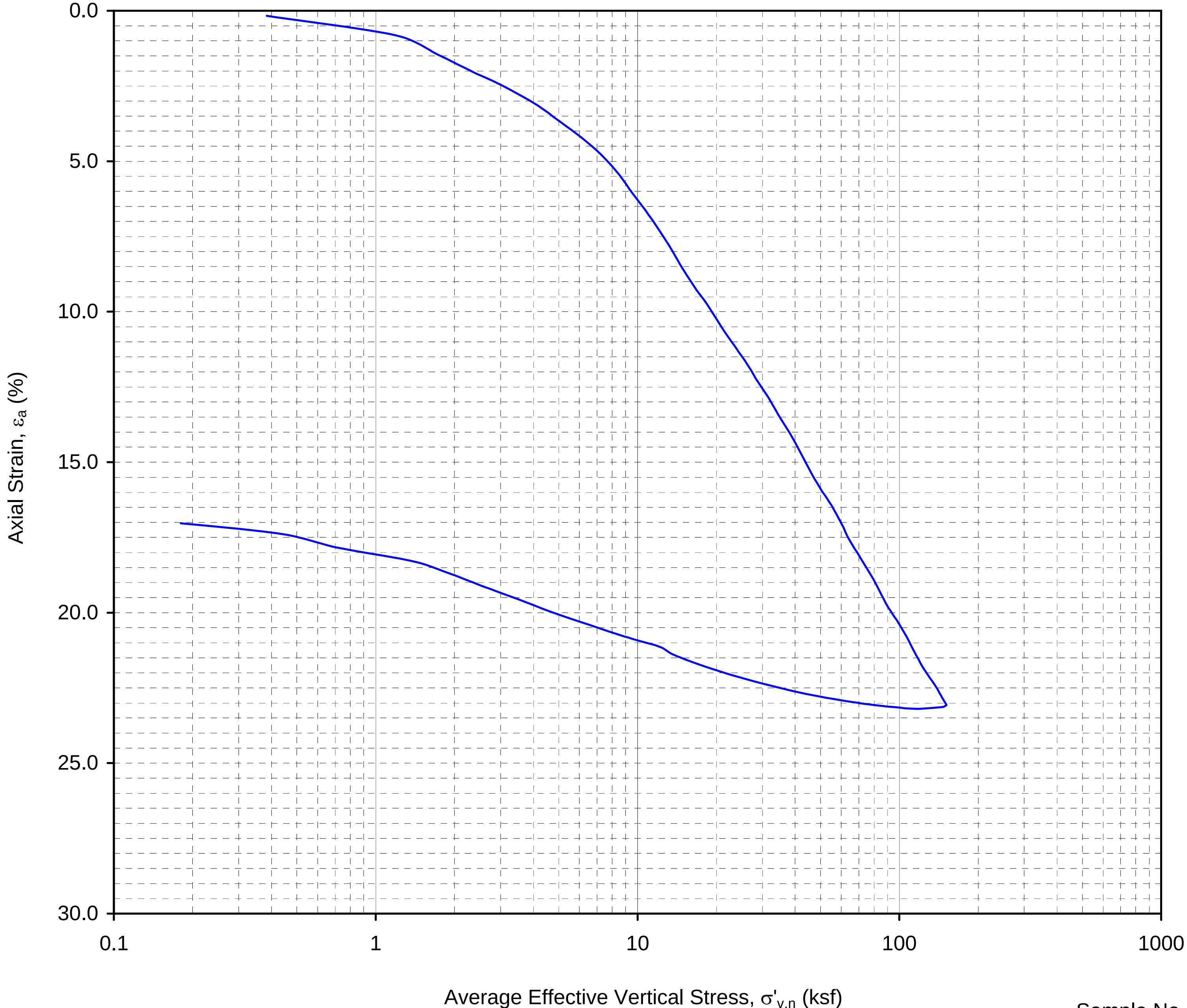
Boring WR0017-264B



1-D CONSOLIDATION TEST: CRS

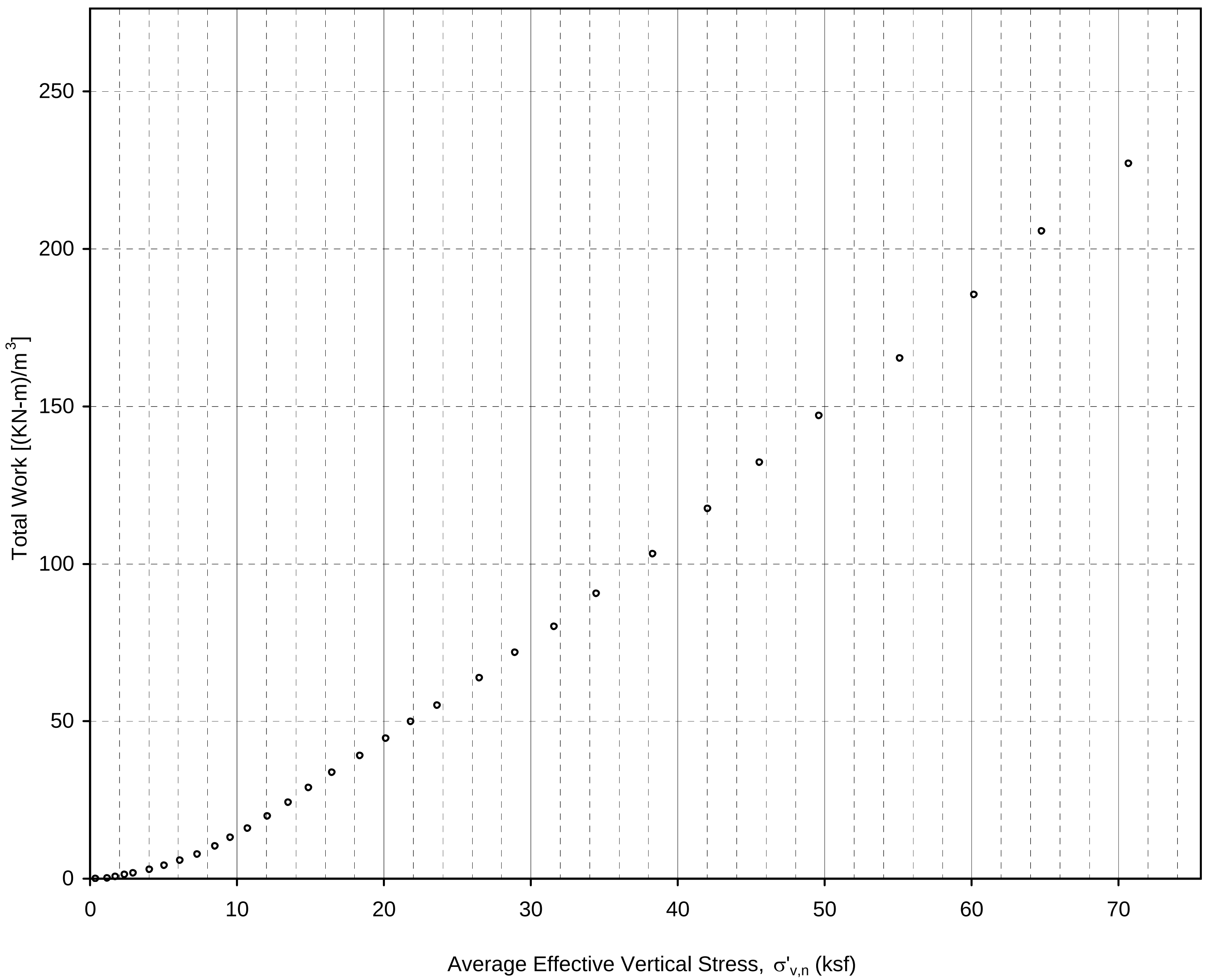
Sample No. S05b   Depth 11 ft

Boring WR0017-264B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S05b   Depth 11 ft -



Sample No. S05b Depth 11 ft -

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 | Test Station No.: CRS-S04 | File Name: WR0017-264B_S05b

Task No.: NA | Cell No.: CRS-C04

Specific Gravity, G_s: 2.750 | [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	31.81	53.70		87.6	94.2	96.8
2	"	Bottom, W2	30.69	54.16		86.0	91.9	94.4
3	"	Sides, W3	32.48	53.43		88.5	95.6	98.2
4	"	Average, W4	31.66	53.76		87.4	93.9	96.5
5	"	Back Calculated (1)	34.00	52.82	(3)	90.6	98.5	101.1
6	Final		25.59	52.82	(2)	90.6	100.0	102.6

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.722

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.736

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.17955
Final Selected, K_f	0.17955

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 52.51

Avg. Back Calculated and Measured Mass Dry Soil (g) = 52.66

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.750 | [X] Assumed | [ ] To make S_f = 100% at end of test.
| [ ] Measured | [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 52.82 | [X] From Cal. Routine No. [5] | Note: Routine #5 is based on final measurements.
Final (4): NA | [ ] Make S_f = 100%, or; | [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.27 | [X] Measured ; | [ ] Back Calculated | Back-cal. Sat. (%) = NA

Final Height (mm) = 16.16 | [X] Measured ; | [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5): From	To (ksf)
Initial	34.0	1.032	90.6	113.0	84.3	9.484	From	To (ksf)
Final	25.6	0.704	100.0	126.3	100.6	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

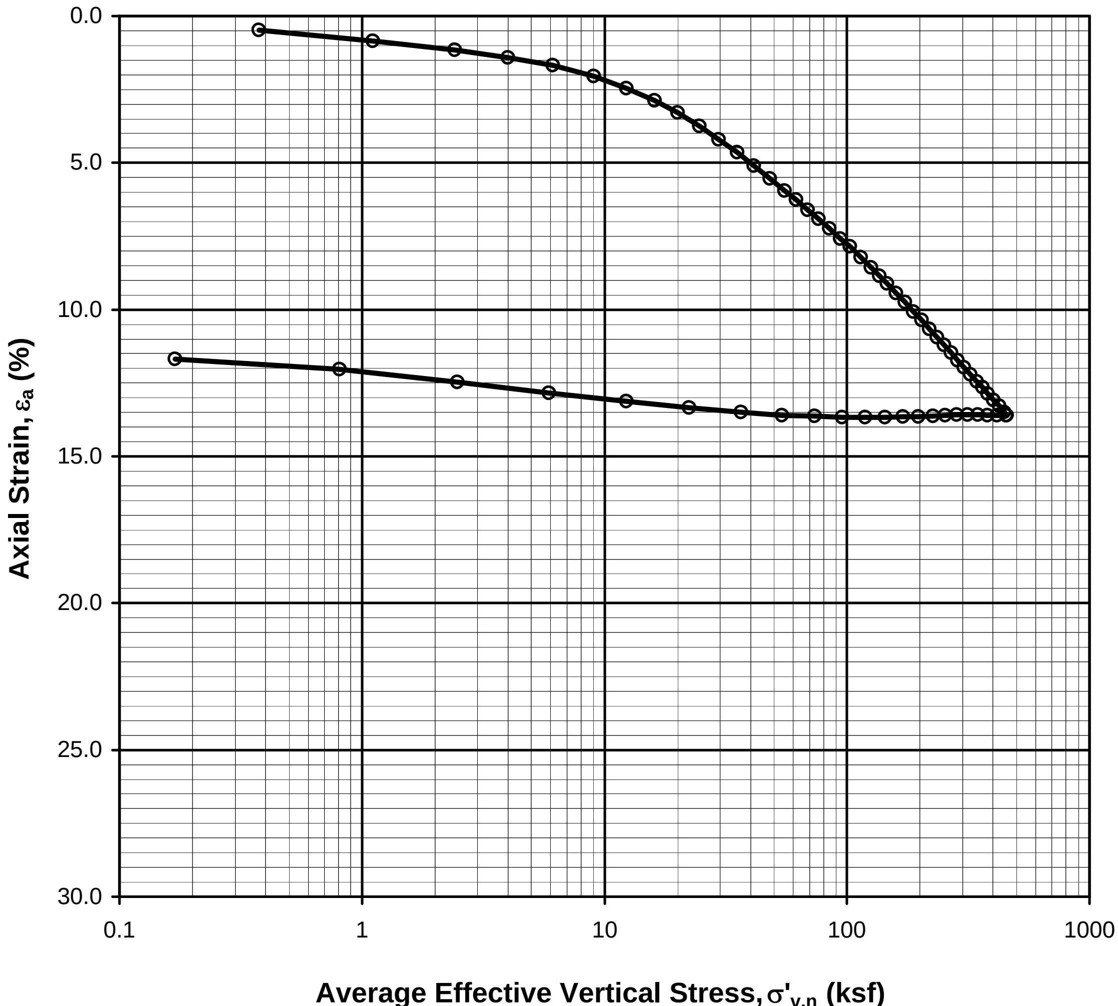
(3) This value is only different from the final value if there is soil extrusion during loading.

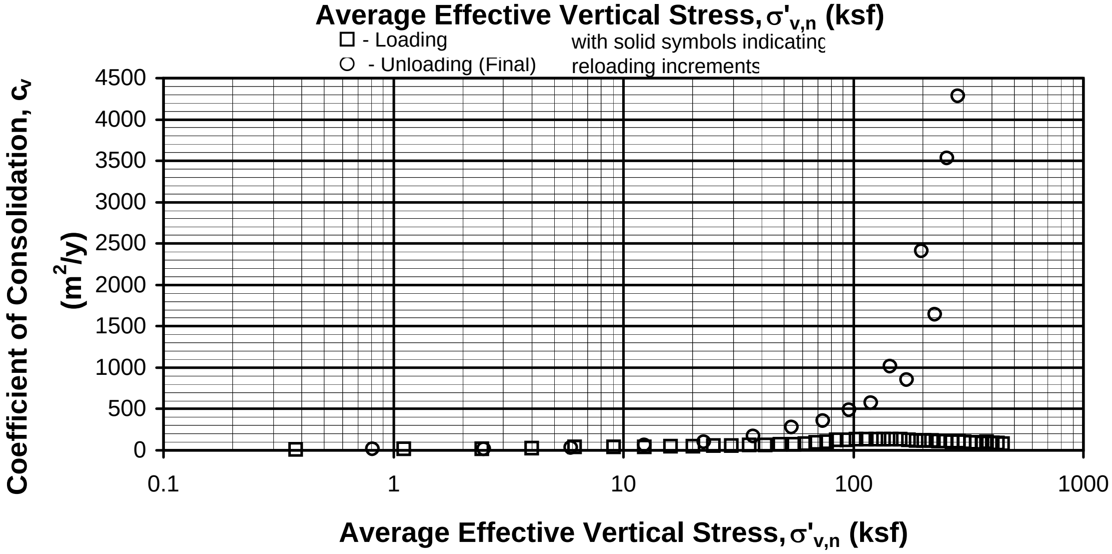
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ | Reviewed By: RJ

Date: 10/24/2012

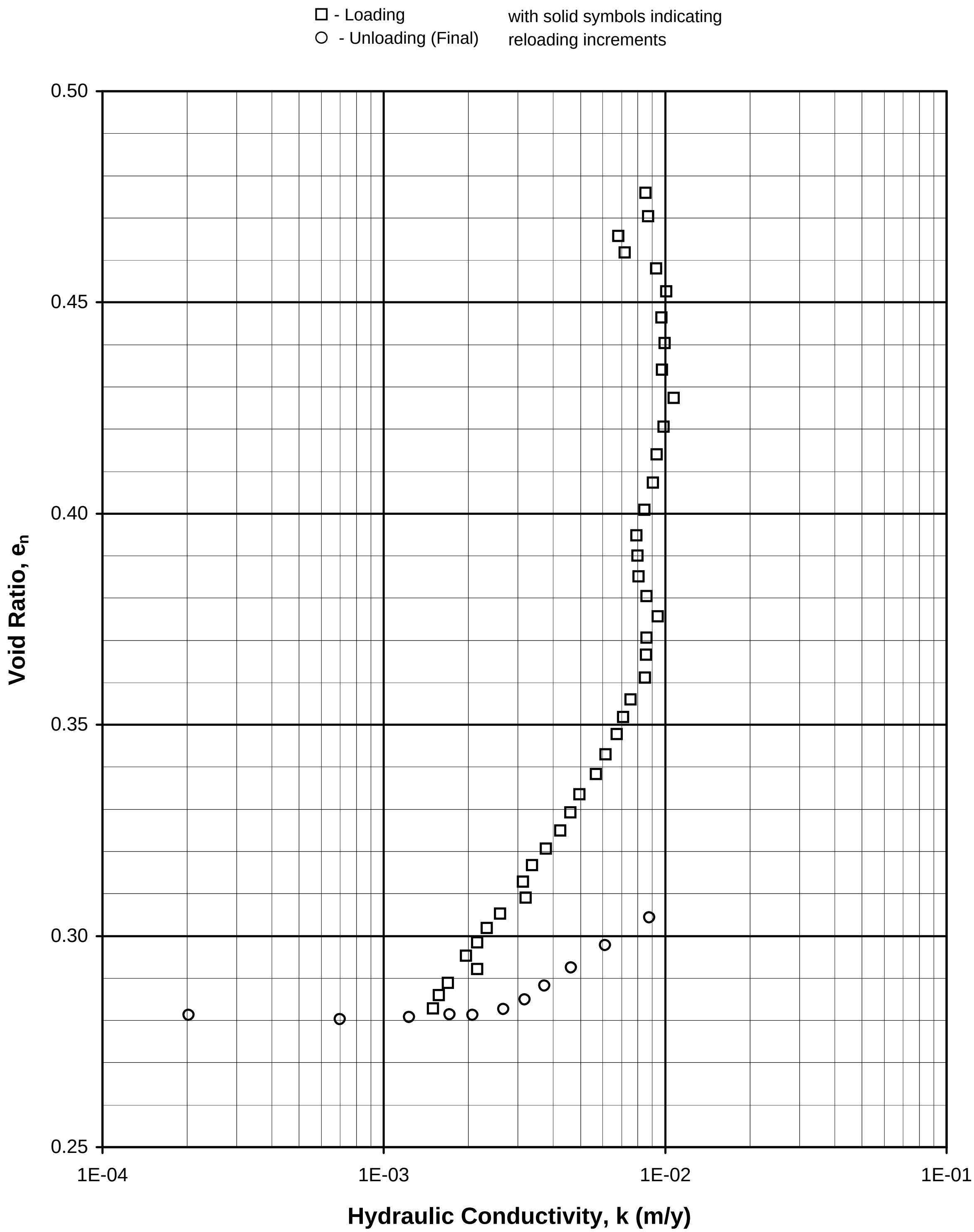




1-D CONSOLIDATION TEST: CRS

Sample No. S02b Depth 6.8 ft

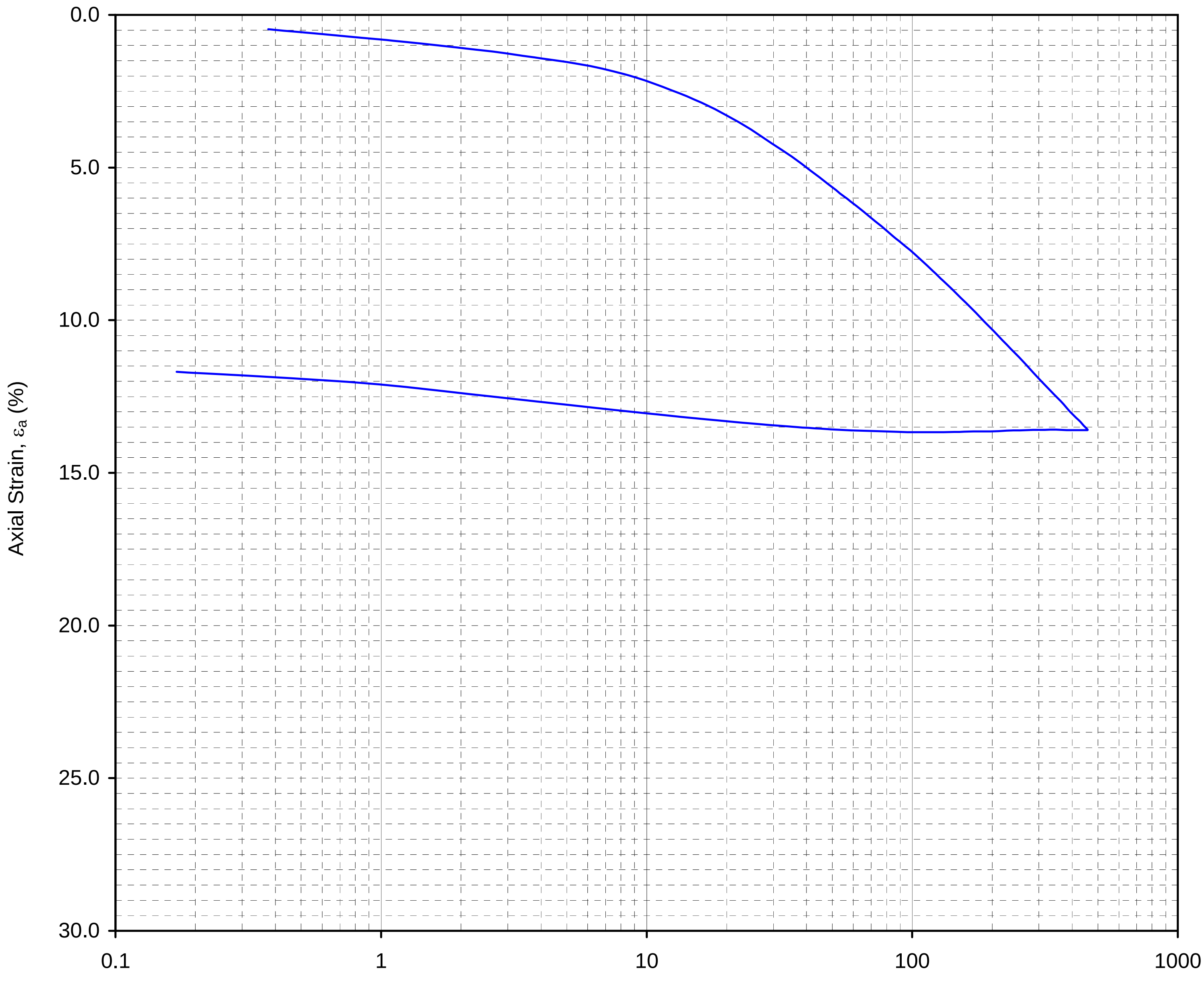
Boring WR0017-265B



1-D CONSOLIDATION TEST: CRS

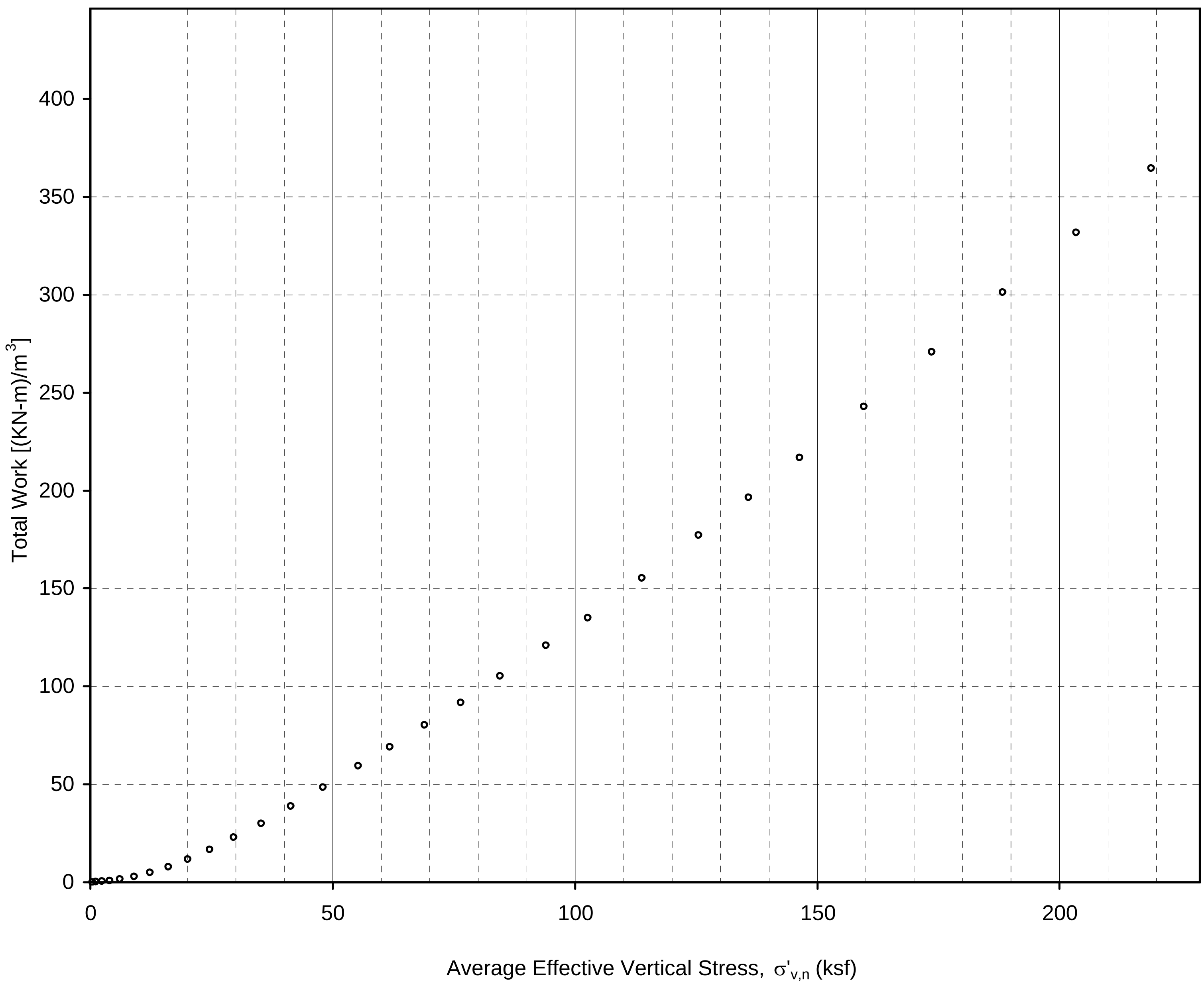
Sample No. S02b Depth 6.8 ft

Boring WR0017-265B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S02b Depth 6.8 ft -



Sample No. S02b Depth 6.8 ft -

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S05 File Name: WR0017-265B_S02b

Task No.: NA Cell No.: CRS-C05

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in %: Height Initial	Final Height: Meas.	Final Height: Dial
1	Initial,	Top, W1	15.06	71.02		83.7	100.3	111.0
2	"	Bottom, W2	11.90	73.03		72.2	85.2	95.2
3	"	Sides, W3	13.57	71.96		78.5	93.6	104.0
4	"	Average, W4	13.51	71.99		78.3	93.3	103.7
5	"	Back Calculated (1)	14.83	71.17	(3)	82.9	99.3	110.0
6	Final		12.69	71.17	(2)	82.9	100.0	110.7

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.694

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.697

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.18343
Final Selected, K_f	0.18343

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 71.07

Avg. Back Calculated and Measured Mass Dry Soil (g) = 71.12

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 71.17; Final (4): NA — [X] From Cal. Routine No. 5; Note: Routine #5 is based on final measurements. [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%

Initial Height (mm) = 19.36 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 17.53 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	14.8	0.483	82.9	130.3	113.5	13.054	From	To (ksf)
Final	12.7	0.343	100.0	141.2	125.3	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

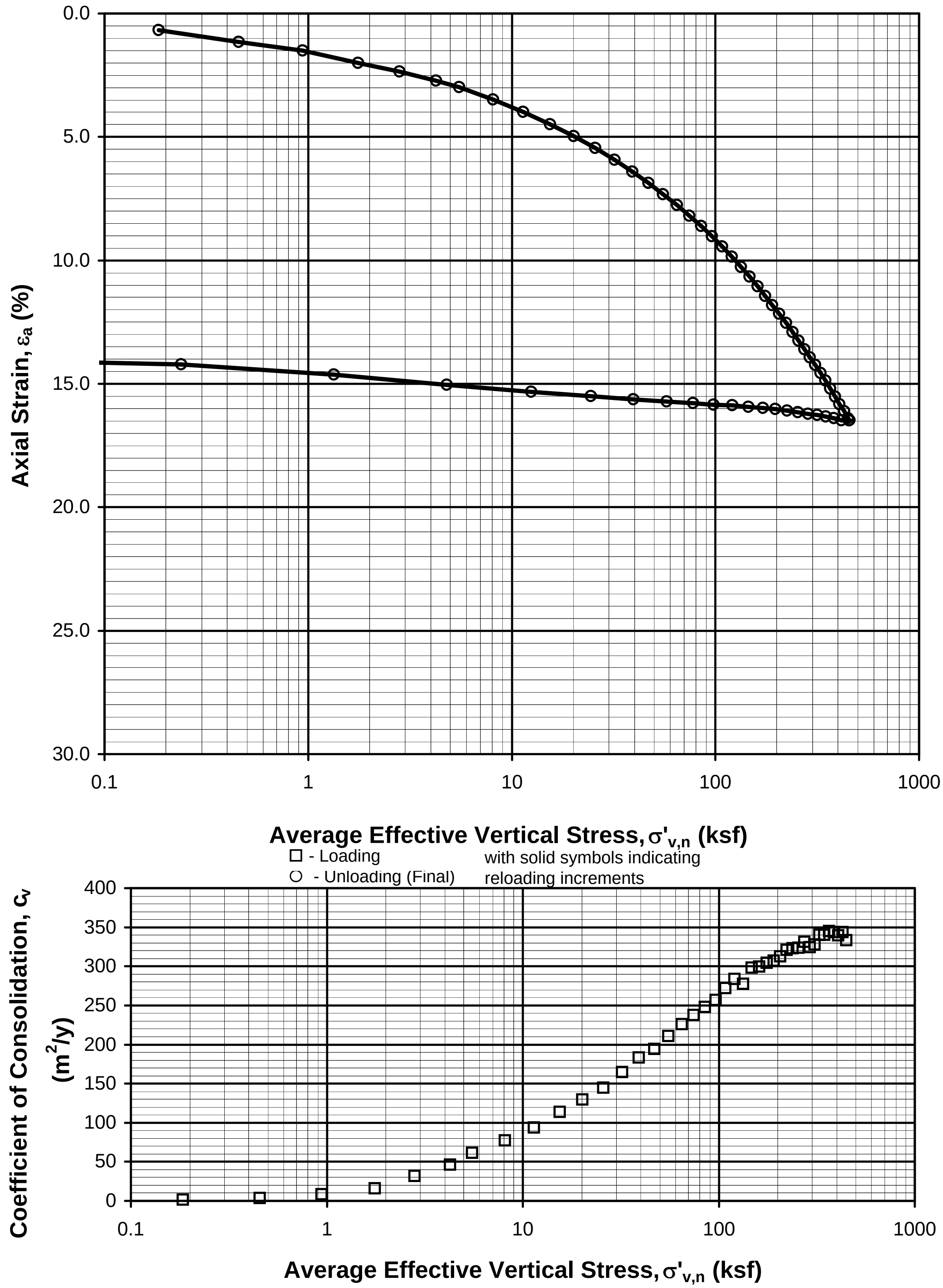
(3) This value is only different from the final value if there is soil extrusion during loading.

(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

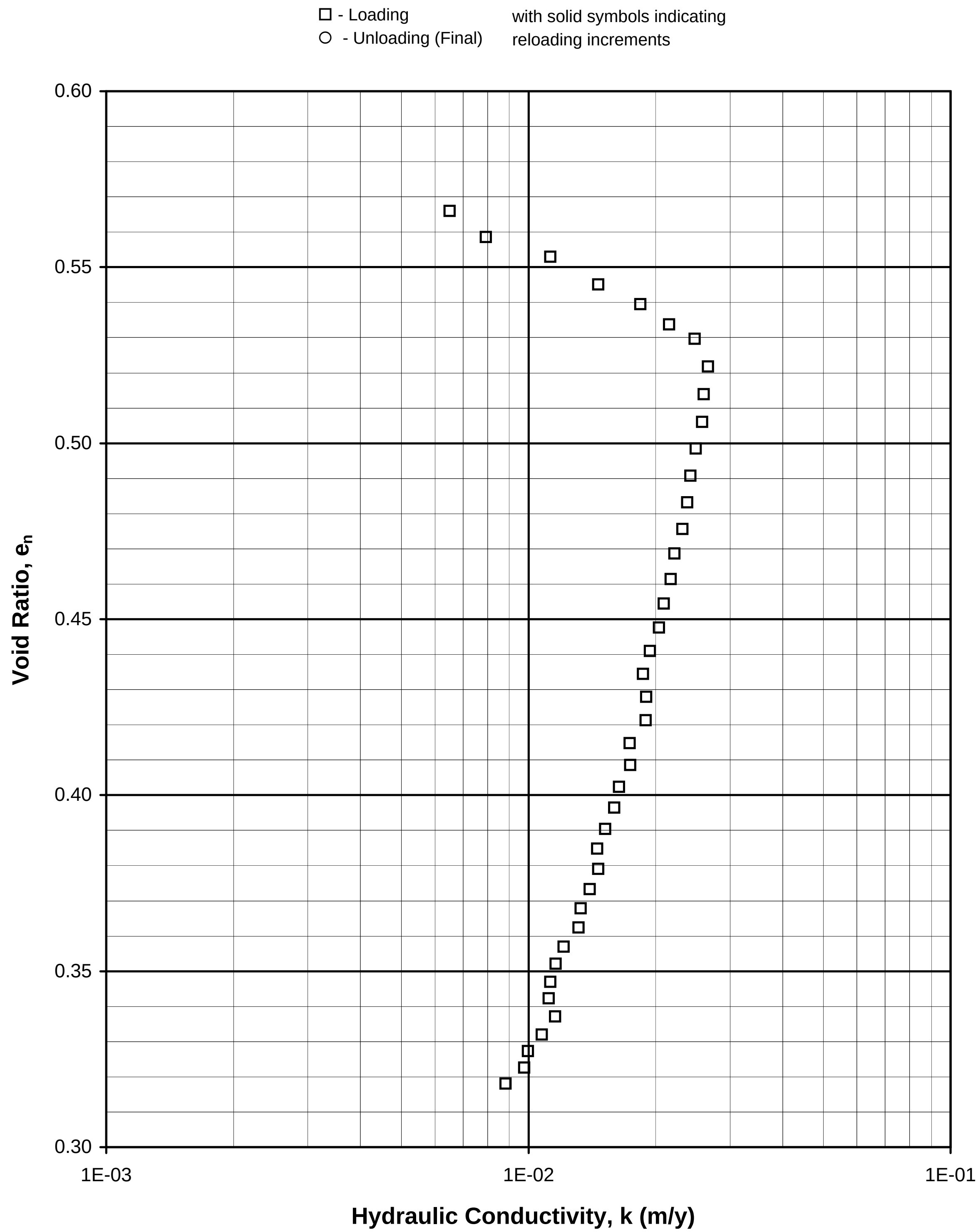
Date: 10/24/2012



1-D CONSOLIDATION TEST: CRS

Sample No. S08Aa Depth 21 ft

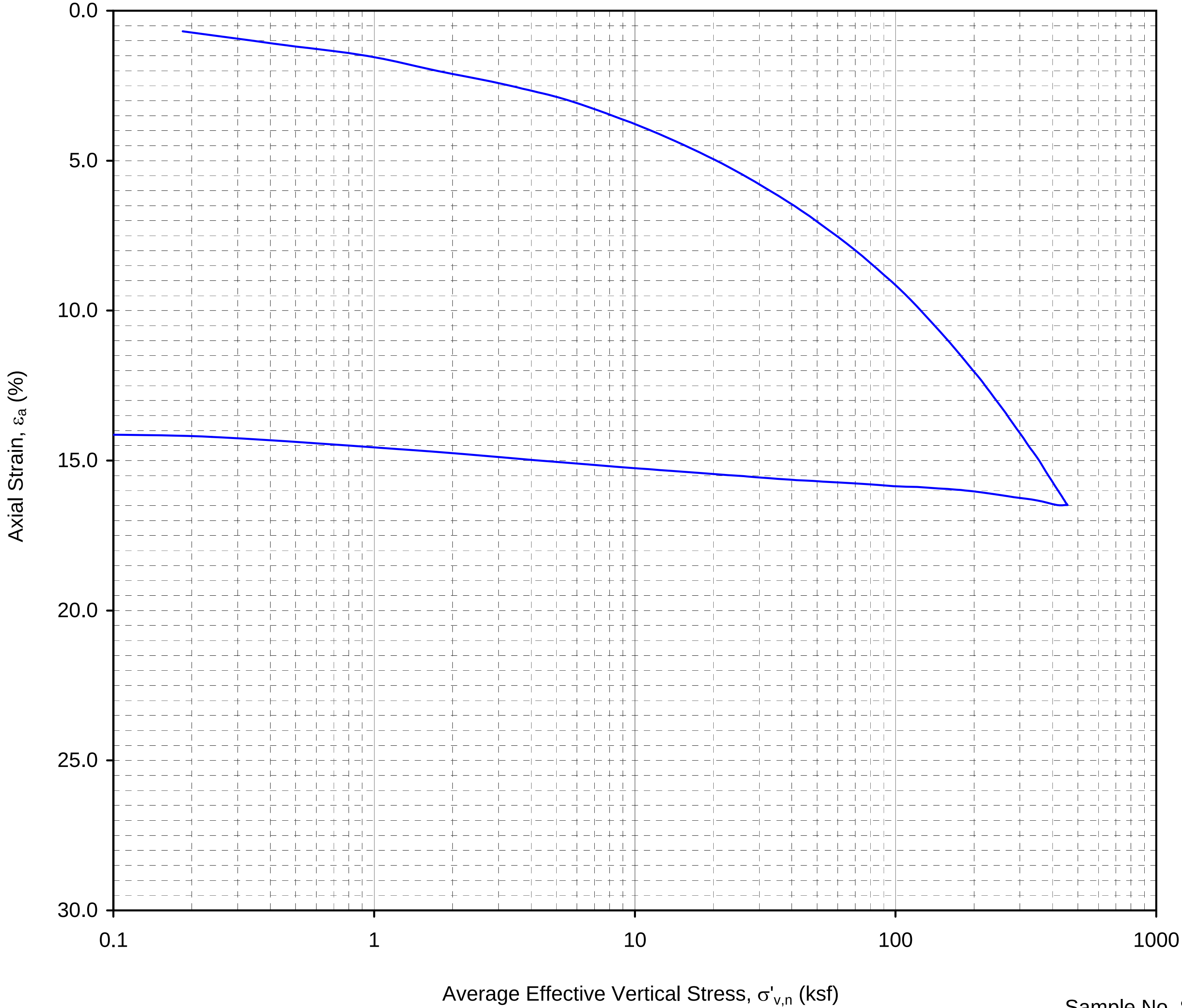
Boring WR0017-279B



1-D CONSOLIDATION TEST: CRS

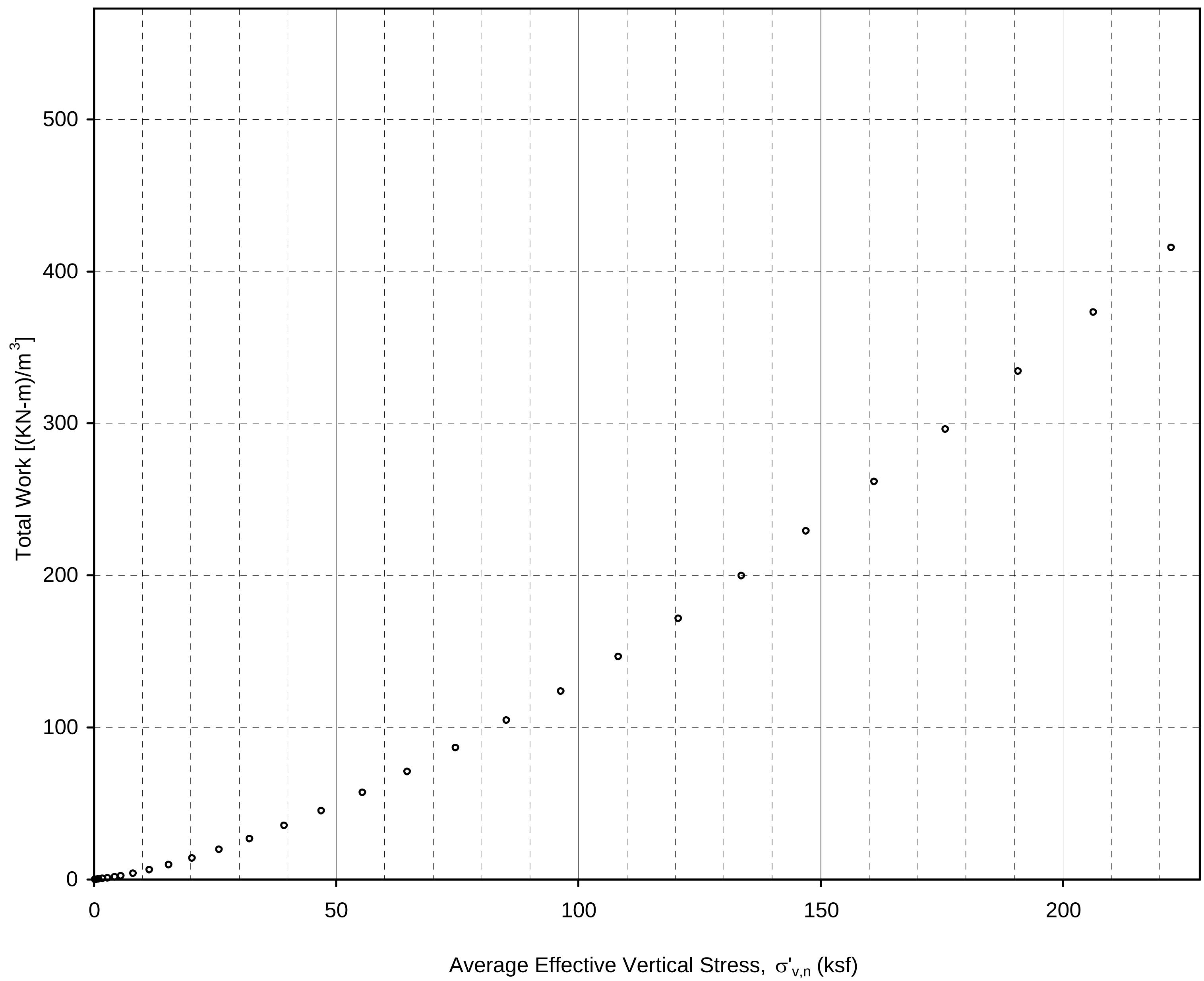
Sample No. S08Aa Depth 21 ft

Boring WR0017-279B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S08Aa Depth 21 ft



Sample No. S08Aa   Depth 21 ft -

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S13 File Name: WR0017-279B_S08Aa

Task No.: NA Cell No.: CRS-C13

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial,	Top, W1	19.24	67.42		93.1	94.1	99.2
2	"	Bottom, W2	18.77	67.68		91.8	92.1	97.2
3	"	Sides, W3	19.00	67.55		92.4	93.0	98.2
4	"	Average, W4	19.01	67.55		92.4	93.1	98.2
5	"	Back Calculated (1)	20.33	66.81	(3)	95.9	98.4	103.6
6	Final		13.71	66.81	(2)	95.9	100.0	105.3

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.704

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.712

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18208
Final Selected, K_f	0.18208

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 66.58

Avg. Back Calculated and Measured Mass Dry Soil (g) = 66.69

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 66.81; Final (4): NA — [X] From Cal. Routine No. 5; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100% — Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.18 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.70 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	20.3	0.577	95.9	129.4	107.5	12.165	From	To (ksf)
Final	13.7	0.373	100.0	140.4	123.5	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

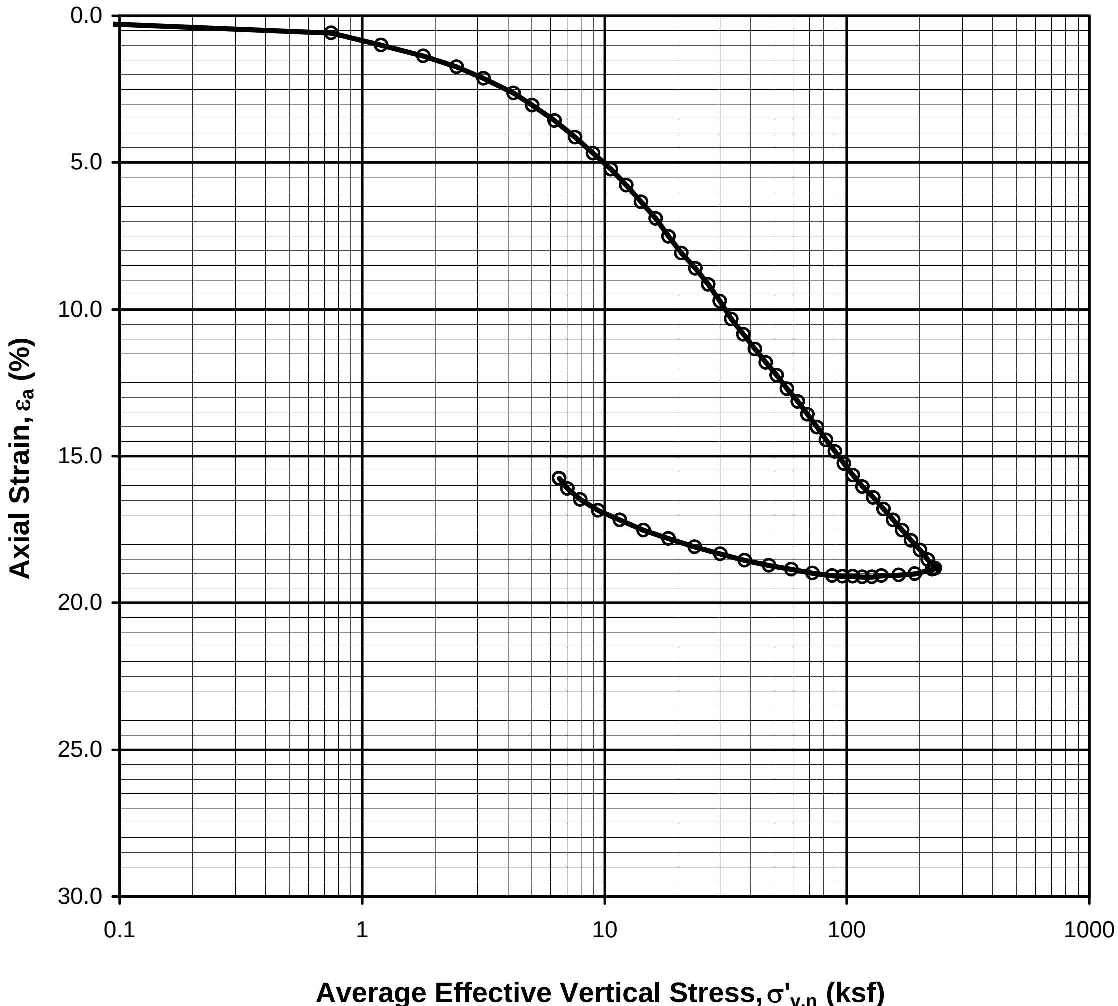
(3) This value is only different from the final value if there is soil extrusion during loading.

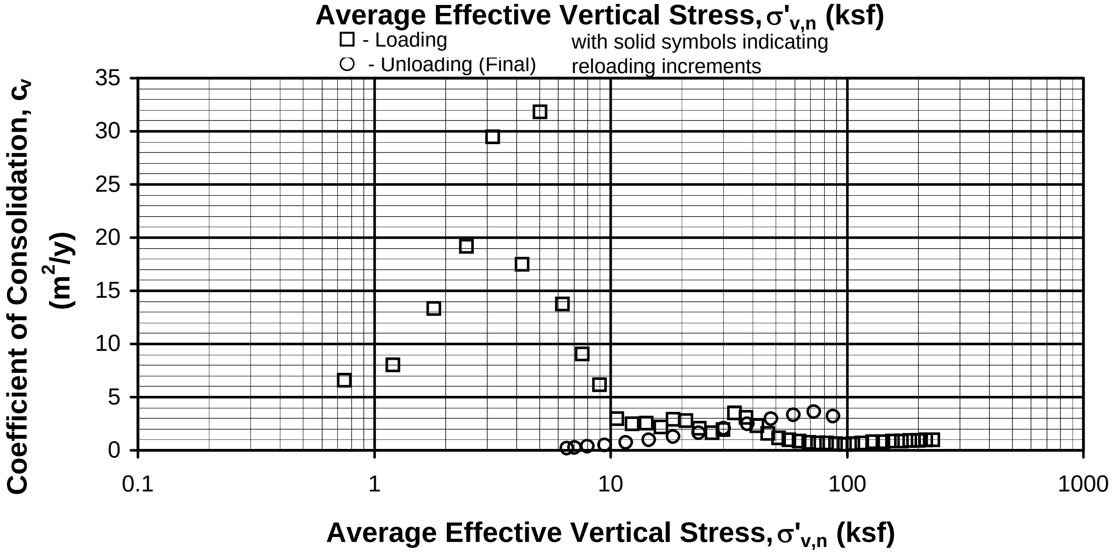
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 12/6/2012

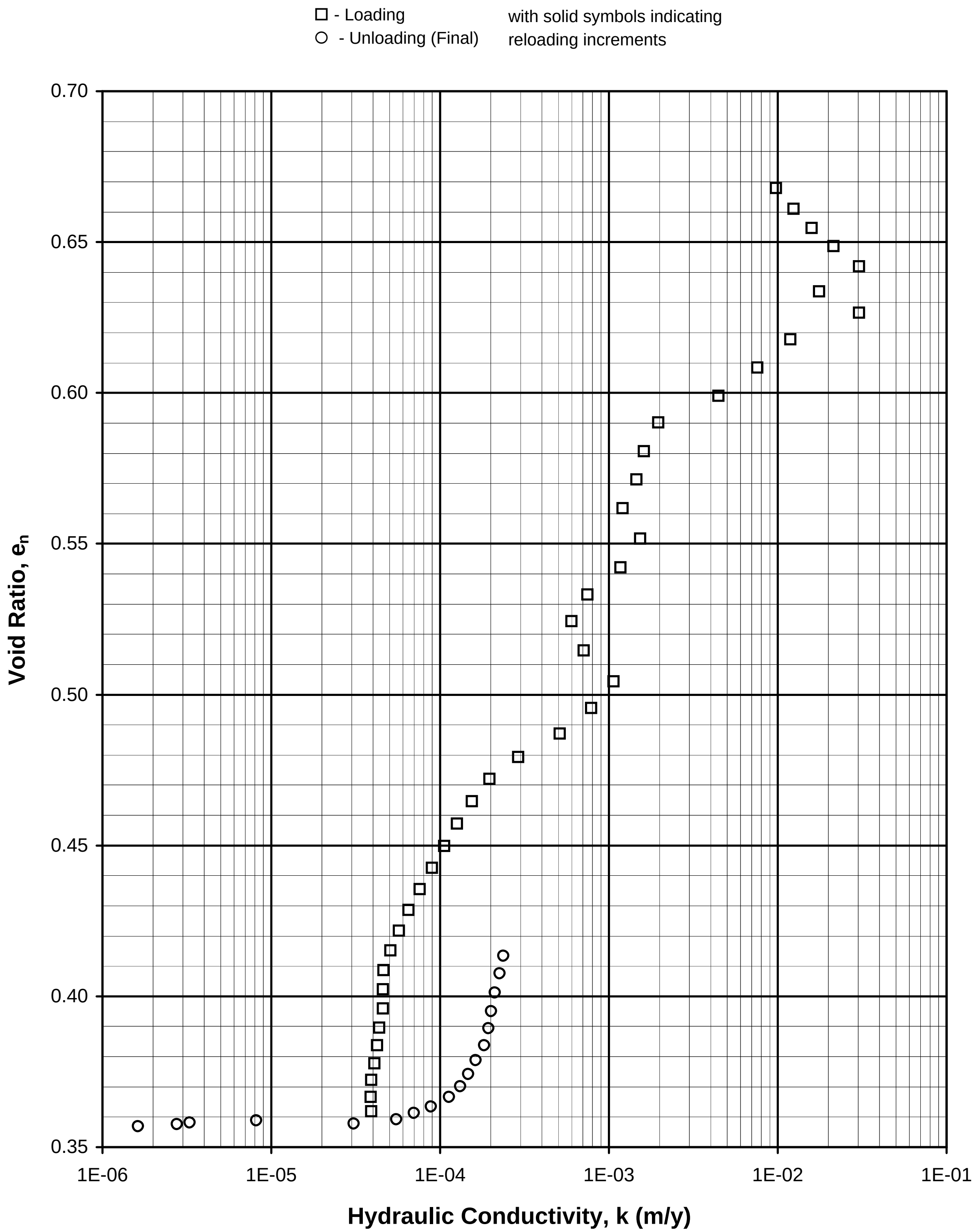




1-D CONSOLIDATION TEST: CRS

Sample No. S07Aa   Depth 18.2 ft

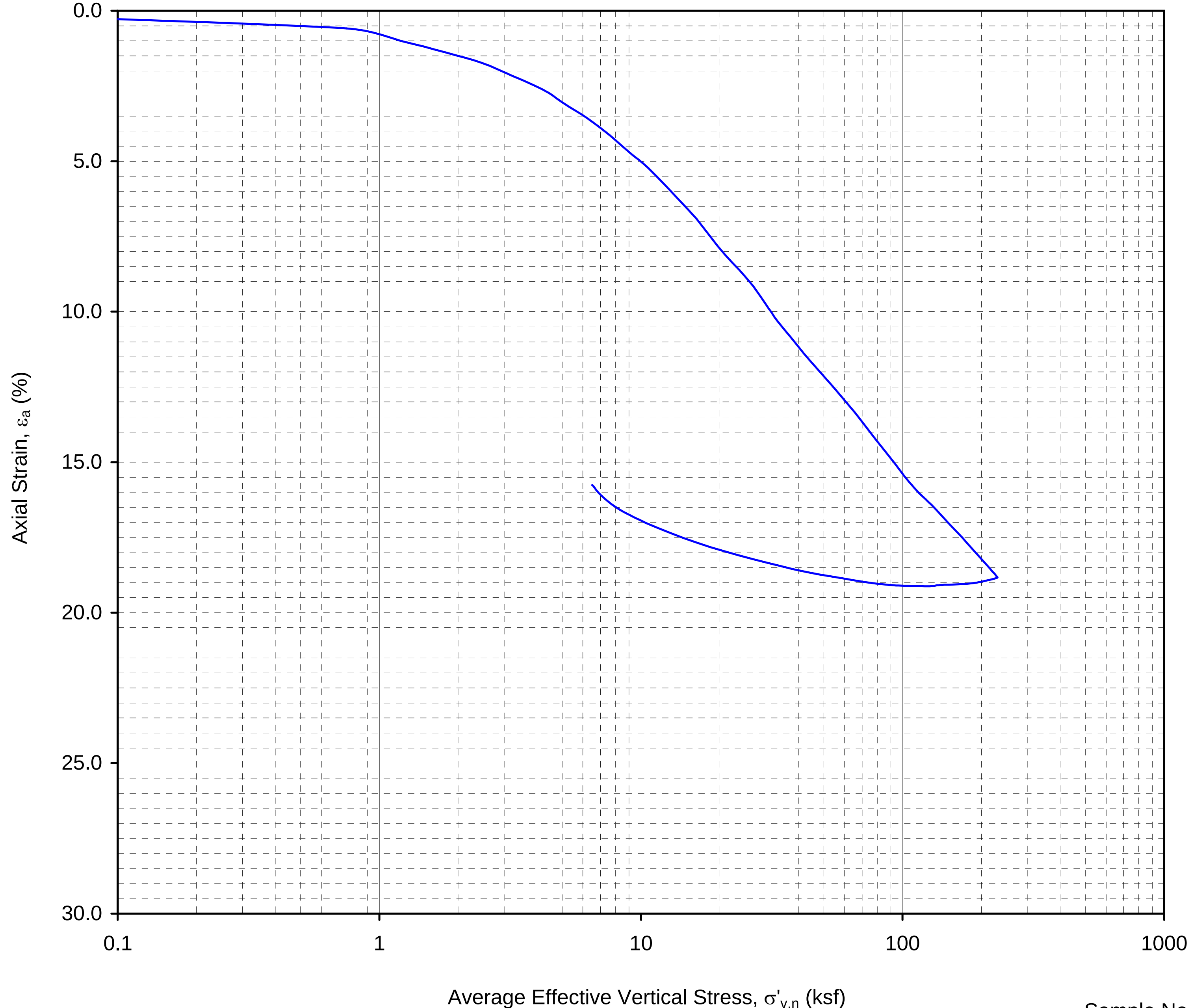
Boring WR0017-282B



1-D CONSOLIDATION TEST: CRS

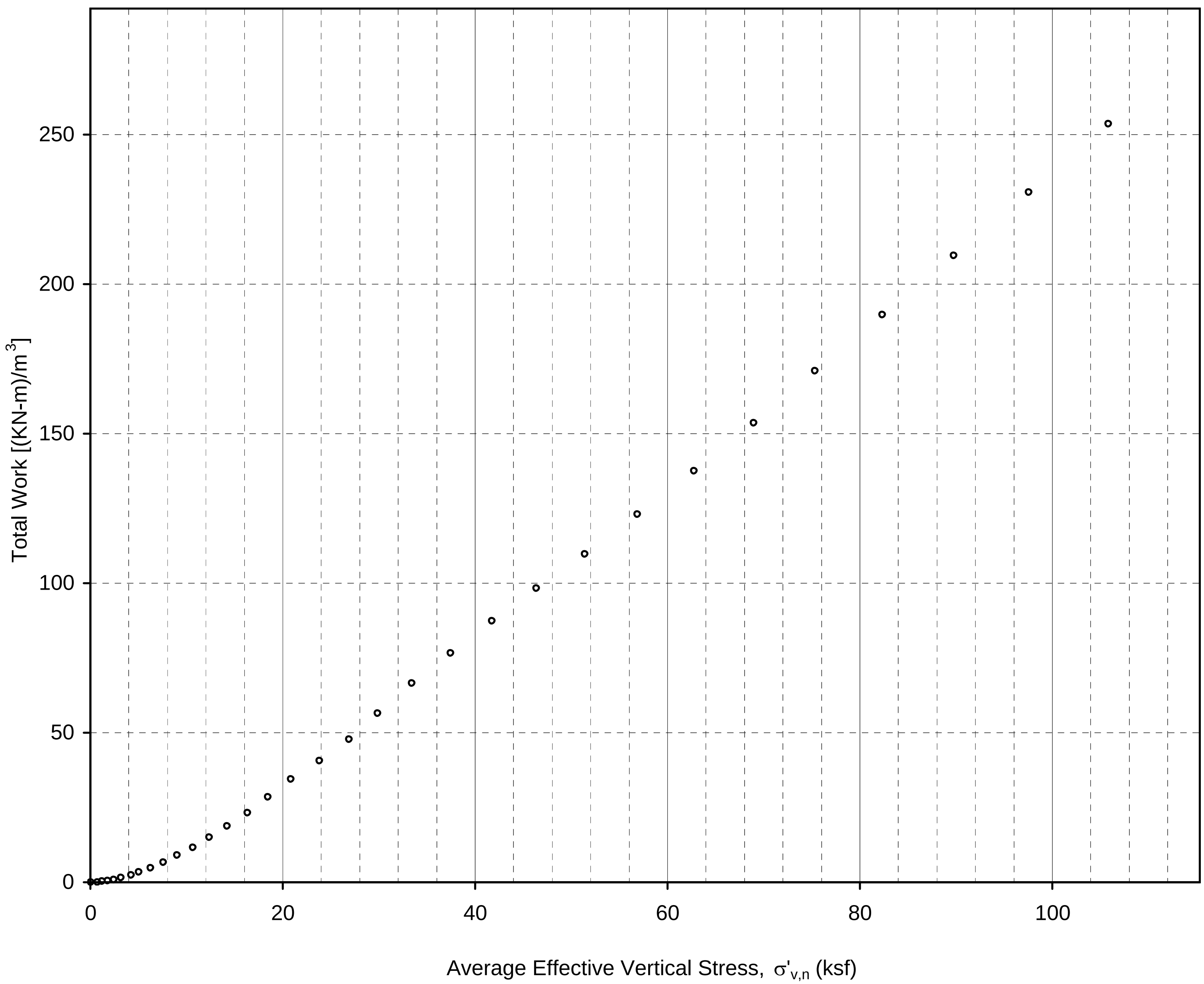
Sample No. S07Aa   Depth 18.2 ft

Boring WR0017-282B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S07Aa   Depth 18.2



Sample No. S07Aa   Depth 18.2

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S05 File Name: WR0017-282B_S07Aa

Task No.: NA Cell No.: CRS-C05

Specific Gravity, G_s: 2.720 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ____ g/kg (ppt)

Cal.- Routine	ITEM		Water Content, (%)	Mass Dry Soil, (g)		Degree of Saturation, S in % Height Initial	Final Height Meas.	Dial
1	Initial,	Top, W1	23.25	63.24		94.0	96.3	102.3
2	"	Bottom, W2	24.18	62.76		96.0	99.3	105.3
3	"	Sides, W3	23.39	63.16		94.4	96.8	102.8
4	"	Average, W4	23.61	63.05		94.8	97.4	103.5
5	"	Back Calculated (1)	23.64	63.04	(3)	94.9	97.6	103.6
6	Final		16.13	63.04	(2)	94.9	100.0	106.1

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.691

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.706

Calculation Constant, K

= (unit conversion) / $G_s \times \rho_w \times A_r$

Estimated, K_e	0.18211
Final Selected, K_f	0.18211

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 62.64

Avg. Back Calculated and Measured Mass Dry Soil (g) = 62.84

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.720 — [X] Assumed; [ ] Measured — [ ] To make S_f = 100% at end of test. [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 63.04; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100% — Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.26 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.52 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	23.6	0.678	94.9	124.9	101.0	11.480	From	To (ksf)
Final	16.1	0.439	100.0	136.8	117.8	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

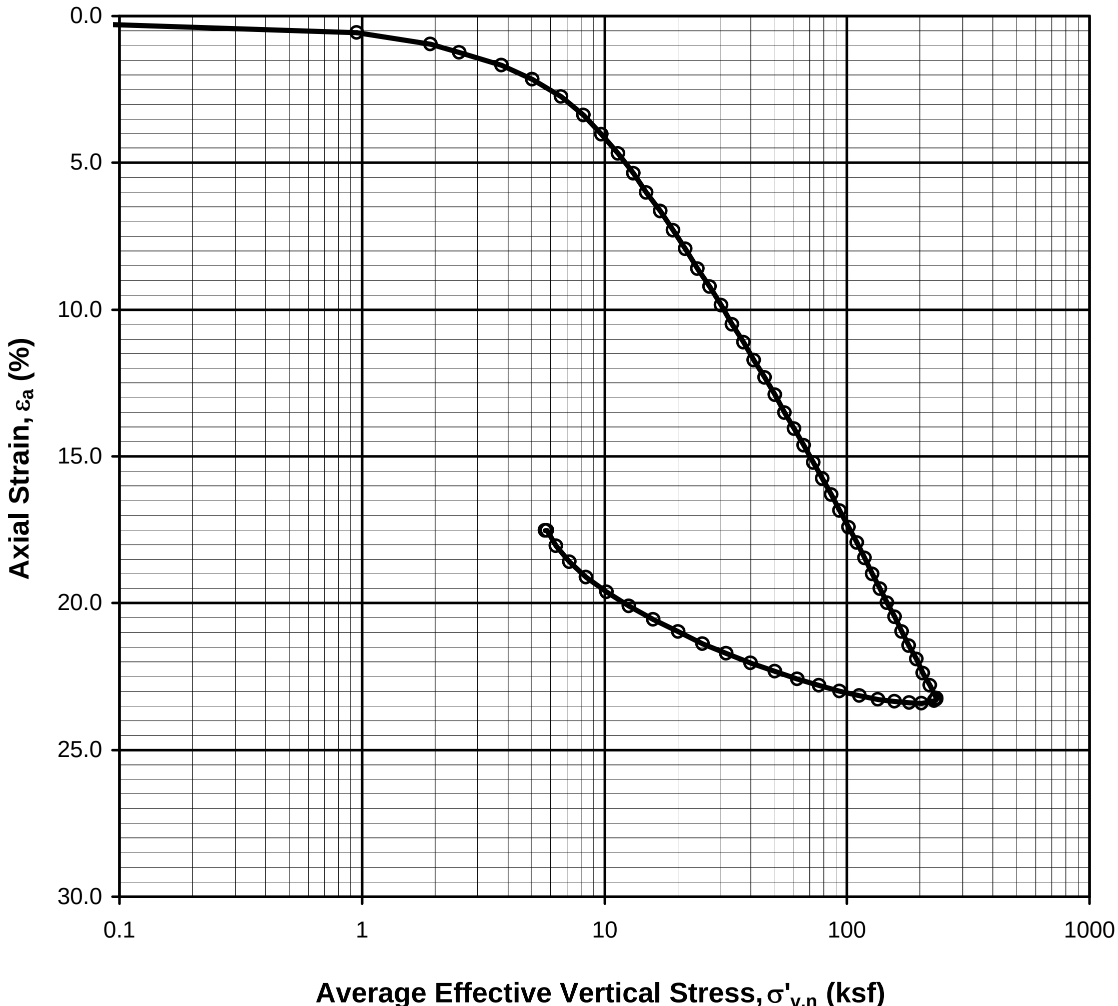
(3) This value is only different from the final value if there is soil extrusion during loading.

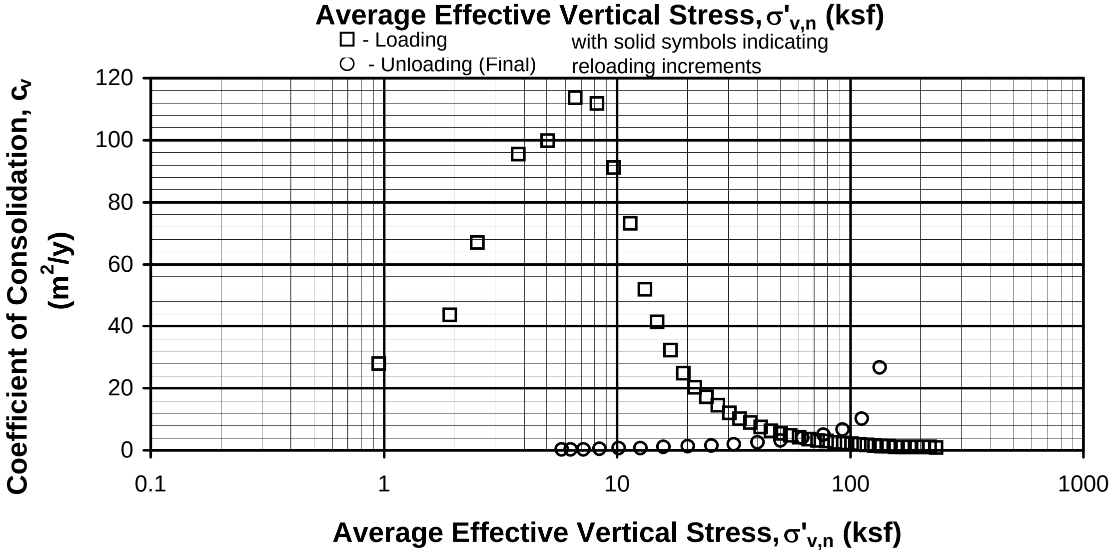
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 12/6/2012

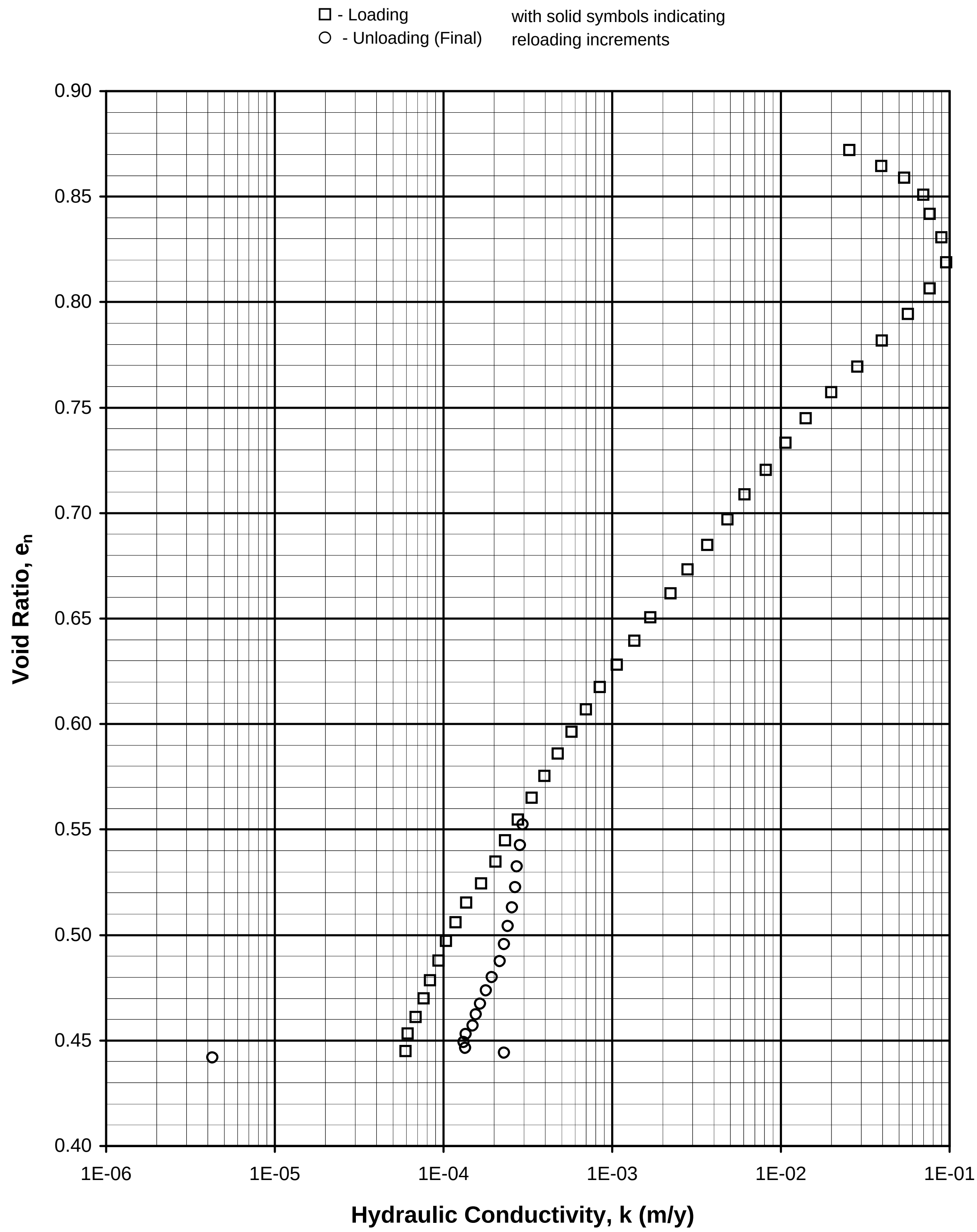




1-D CONSOLIDATION TEST: CRS

Sample No. S11Aa Depth 37.6 ft

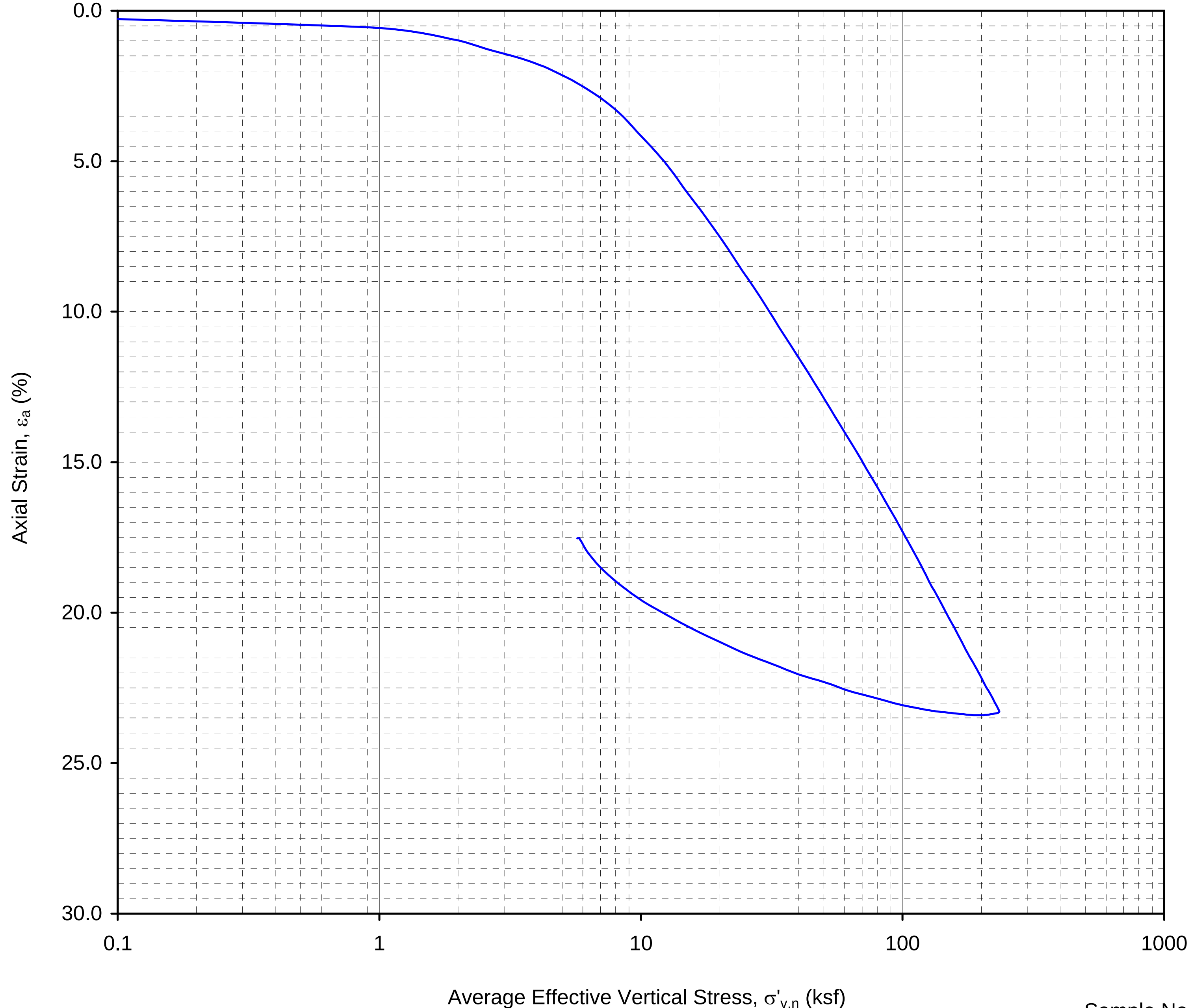
Boring WR0017-282B



1-D CONSOLIDATION TEST: CRS

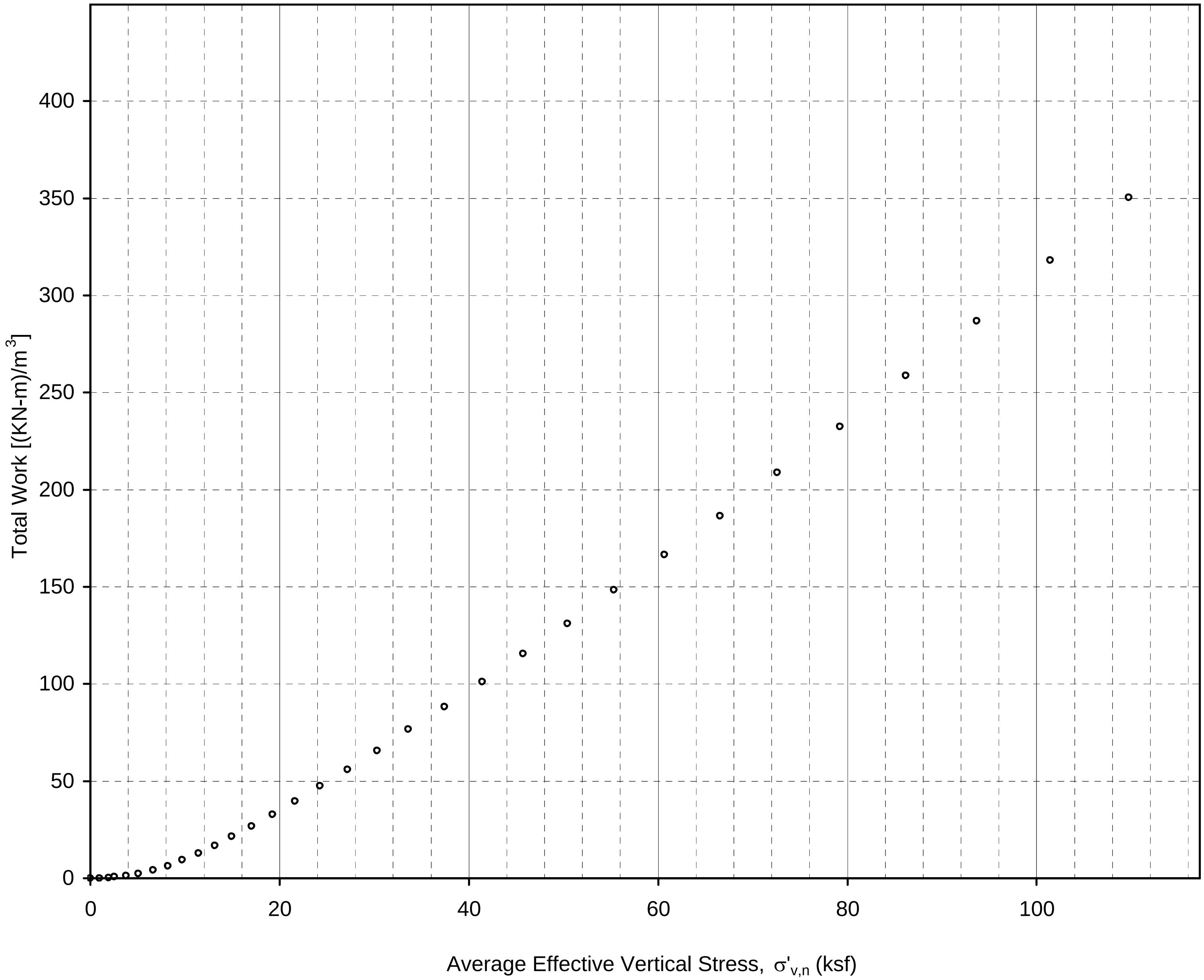
Sample No. S11Aa Depth 37.6 ft

Boring WR0017-282B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S11Aa Depth 37.6



Sample No. S11Aa Depth 37.6

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S14 File Name: WR0017-282B_S11Aa

Task No.: NA Cell No.: CRS-C14

Specific Gravity, G_s: 2.750 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM	Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial, Top, W1	26.34	57.42	84.1	93.6	103.4
2	" Bottom, W2	28.96	56.25	88.5	99.6	109.7
3	" Sides, W3	28.08	56.63	87.0	97.7	107.6
4	" Average, W4	27.79	56.76	86.5	97.0	106.9
5	" Back Calculated (1)	27.75	56.78 (3)	86.5	96.9	106.8
6	Final	22.15	56.78 (2)	86.5	100.0	110.3

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. 5 to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.699

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.724

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18028
Final Selected, K_f	0.18028

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 56.17

Avg. Back Calculated and Measured Mass Dry Soil (g) = 56.48

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.750 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g): Initial: 56.78; Final (4): NA — [X] From Cal. Routine No. 5; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100%. Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.27 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.47 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	27.8	0.882	86.5	116.3	91.0	10.237	From	To (ksf)
Final	22.2	0.609	100.0	130.1	106.5	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

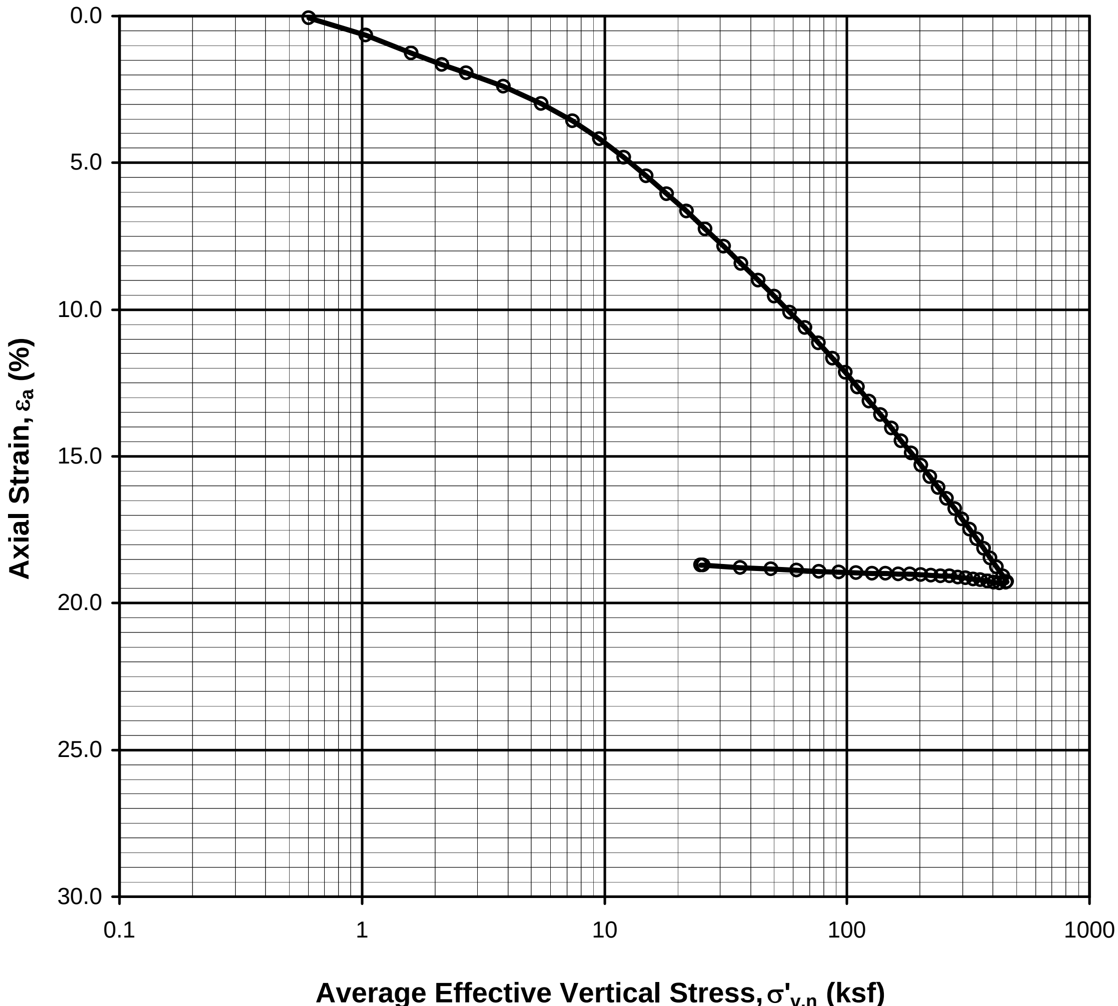
(3) This value is only different from the final value if there is soil extrusion during loading.

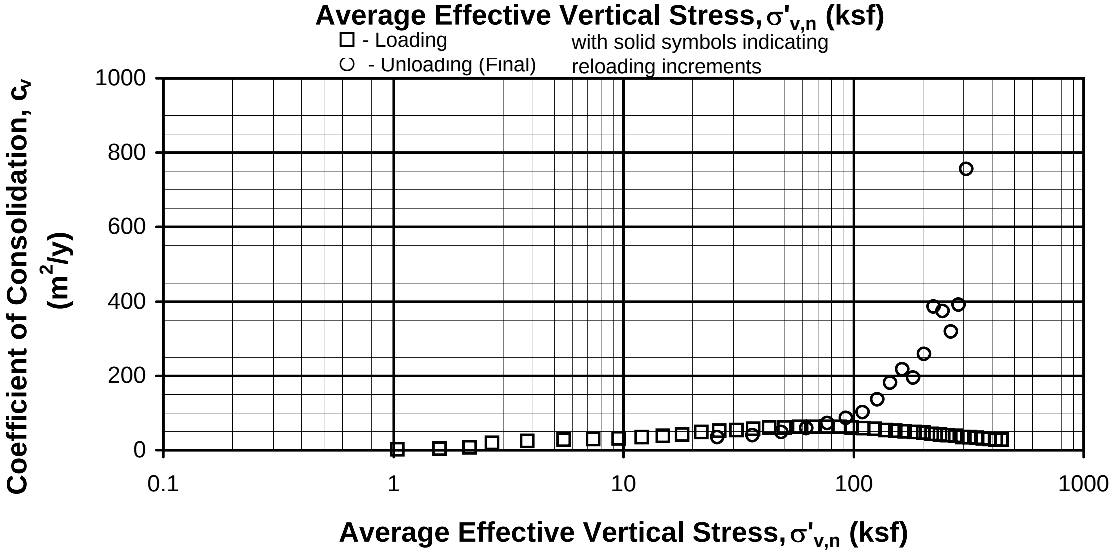
(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 12/6/2012

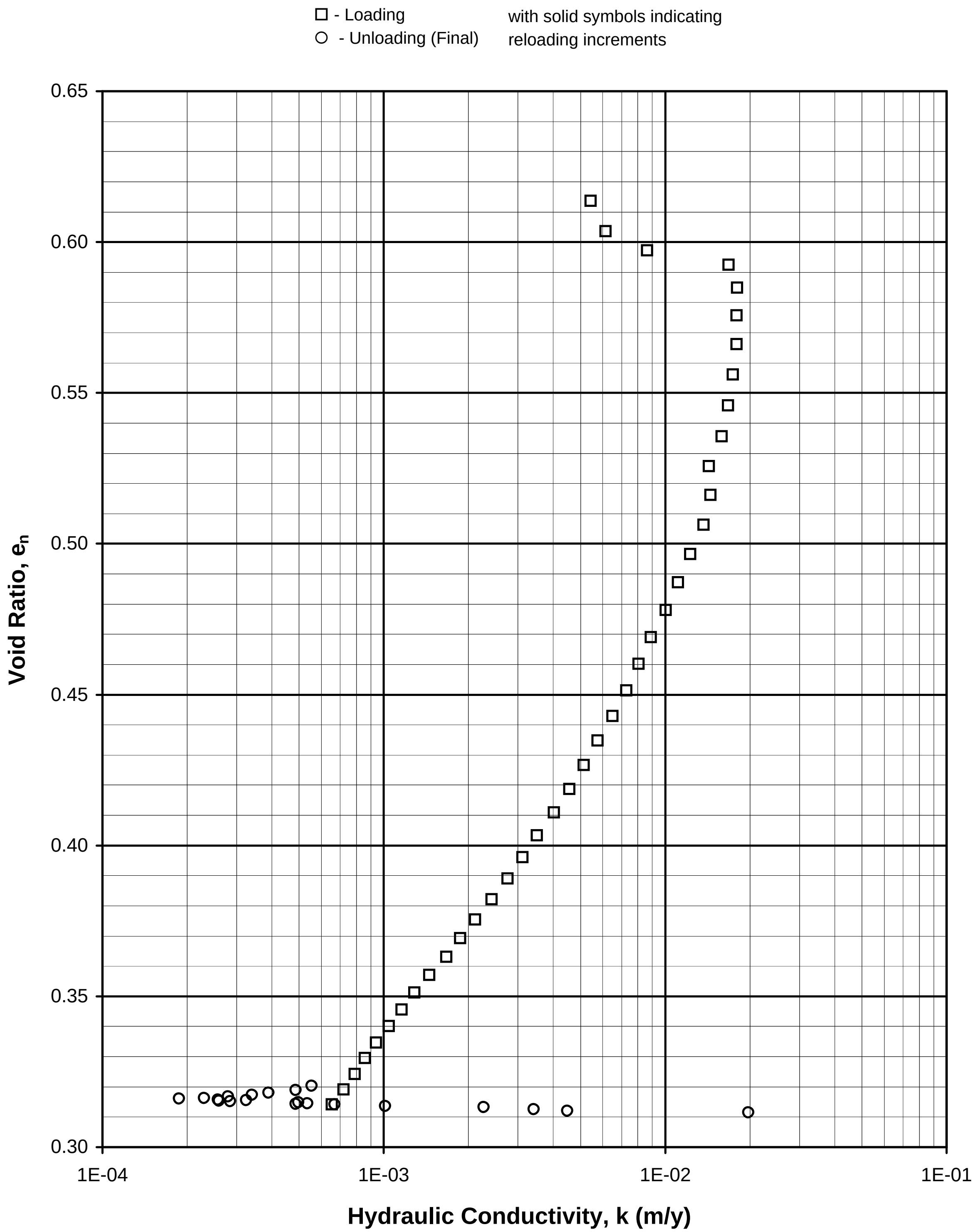




1-D CONSOLIDATION TEST: CRS

Sample No. S05Ab Depth 11.25 ft

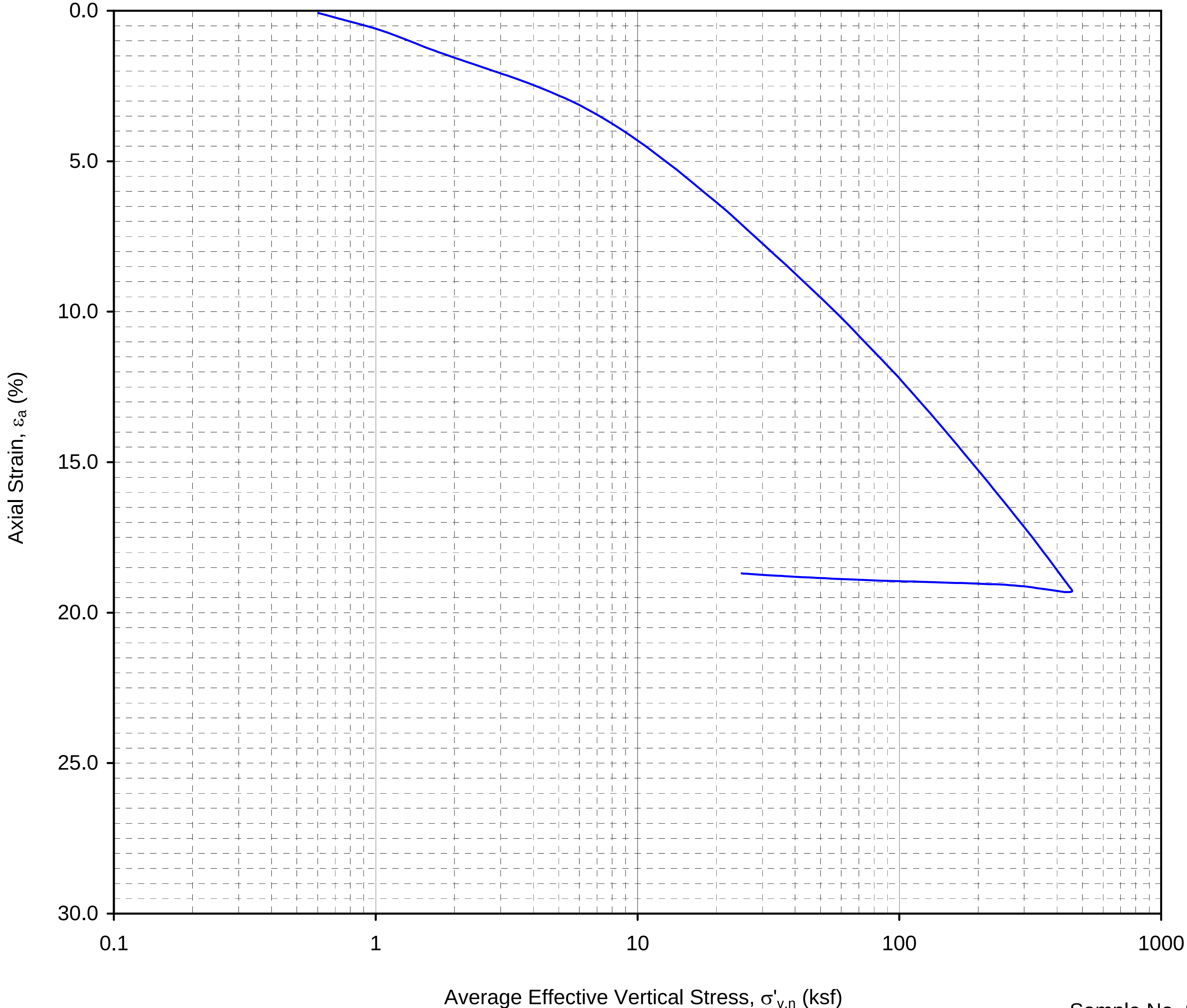
Boring WR0017-286B



1-D CONSOLIDATION TEST: CRS

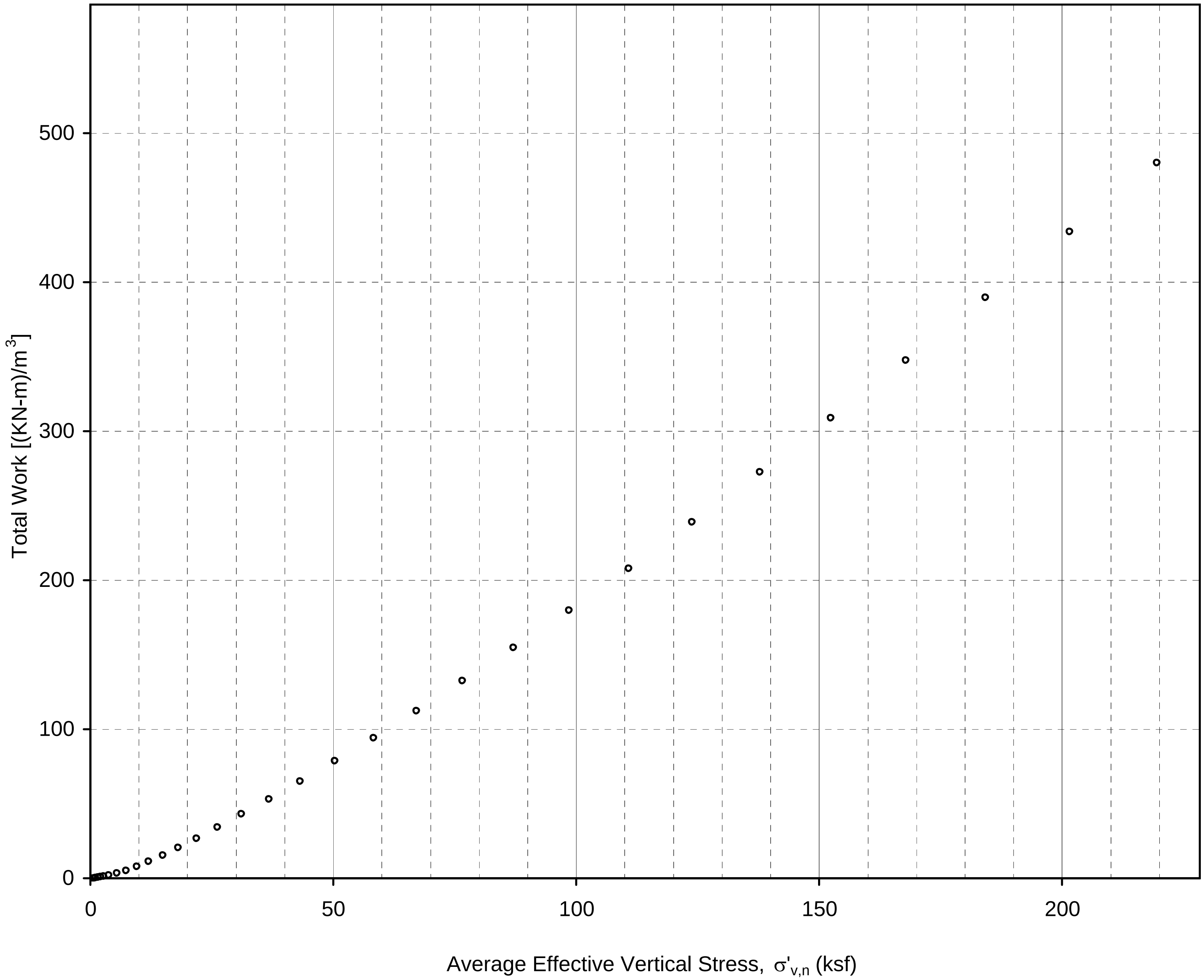
Sample No. S05Ab   Depth 11.25 ft

Boring WR0017-286B



CRS CONSOLIDATION TEST - CASAGRANDE

Sample No. S05Ab Depth 11.25



Sample No. S05Ab Depth 11.25

CRS CONSOLIDATION TEST-BECKER CONSTRUCTION

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 04.11120056 Test Station No.: CRS-S12 File Name: WR0017-286B_S05Ab

Task No.: NA Cell No.: CRS-C12

Specific Gravity, G_s: 2.700 [ ] Measured ; [X] Assumed.

Calculations Corrected for Salt (dissolved solids): [X] No or, [ ] Yes, with Concentration = ______ g/kg (ppt)

Cal.-Routine	ITEM	Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in % Height Initial	Final Height Meas.	Final Height Dial
1	Initial, Top, W1	20.63	65.83	93.2	90.5	98.6
2	" Bottom, W2	21.59	65.31	95.5	94.7	103.0
3	" Sides, W3	21.77	65.22	96.0	95.5	103.8
4	" Average, W4	21.33	65.45	94.9	93.6	101.8
5	" Back Calculated (1)	22.65	64.75 (3)	98.0	99.1	107.5
6	Final	12.87	64.75 (2)	98.0	100.0	108.4

Calculated Specific Gravity for Final Saturation = 100%:

Used Cal. Routine No. [5] to obtain the mass of dry soil

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. G_s = 2.692

Avg. G_s (measured/assumed) & Back Cal. G_s = 2.696

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.18343
Final Selected, K_f	0.18343

Calculated Mass Dry Soil for Final Saturation = 100%: using measured/assumed G_s

and final height by: [X] Measurement; [ ] Dial Change.

Back Cal. Mass Dry Soil, (g) = 64.63

Avg. Back Calculated and Measured Mass Dry Soil (g) = 64.69

Summary of Specimen Physical Properties

Specific Gravity G_s = 2.700 — [X] Assumed; [ ] Measured; [ ] To make S_f = 100% at end of test.; [ ] Avg. of measured/assumed G_s and G_s to make S_f = 100%

Mass Dry Soil, (g) — Initial: 64.75; Final (4): NA — [X] From Cal. Routine No. [5]; [ ] Make S_f = 100%, or; [ ] Avg. of measured & make S_f = 100% — Note: Routine #5 is based on final measurements.

Initial Height (mm) = 19.29 [X] Measured ; [ ] Back Calculated Back-cal. Sat. (%) = NA

Final Height (mm) = 16.00 [X] Measured ; [ ] Initial H_o & dial change during loading

	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) : From	To (ksf)
Initial	22.6	0.624	98.0	127.1	103.6	11.877	From	To (ksf)
Final	12.9	0.348	100.0	140.9	124.9	NA	NA	NA

NA - Indicates not applicable

Notes:

(1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).

(2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).

(3) This value is only different from the final value if there is soil extrusion during loading.

(4) Final is only different from the initial value if there is soil extrusion during loading.

(5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: JJ Reviewed By: RJ

Date: 12/14/2012

FUGRO

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 4/10/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. =SetupTD!E12	SAMPLE NO. S05A a	PENETRATION (Depth) 20.0	PERMEAMETER NO. CHP-1
MATERIAL DESCRIPTION	Silty Sand, brown with some visible non-uniformity		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	7.4	30.7	HEIGHT, H	8.700 (cm)	8.650 (cm)	Cell Pressure (psi)	62.50
Total Unit Weight (pcf)	92.6	119.0	DIAMETER, D	7.15 (cm)	6.98 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	86.2	91.0	AREA, A	40.14 (cm^2)	38.25 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	21.4	100.0	VOLUME, V	349.25 (cm^3)	330.84 (cm^3)	Axial Strain During Consolidation (%)	0.57
Void Ratio e	0.915	0.814	LENGTH, L Mamometer separation		8.650 (cm)	Volumetric Strain Consolidation (%)	5.27

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)

Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
03-28	60	40.0	34.2	23.6	0.7	5.8	10.7	6.63E-03	6.08E-03
03-28	60	40.0	34.2	23.6	0.7	5.8	10	6.19E-03	5.69E-03
03-28	60	40.0	34.2	23.6	0.7	5.8	10	6.19E-03	5.69E-03
03-28	60	40.0	34.2	23.6	0.7	5.8	10	6.19E-03	5.69E-03
				Gradient average:	0.7	5.8		6.30E-03	5.79E-03
03-28	60	43.0	34.2	23.6	1.0	8.8	12	4.90E-03	4.50E-03
03-28	60	43.0	34.2	23.6	1.0	8.8	11.4	4.65E-03	4.27E-03
03-28	60	43.0	34.2	23.6	1.0	8.8	11.2	4.57E-03	4.20E-03
03-28	60	43.0	34.2	23.6	1.0	8.8	11	4.49E-03	4.12E-03
				Gradient average:	1.0	8.8		4.65E-03	4.27E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 03-28-2013

Input By: RC,jr Date: 03-28-2013

Reviewed By: RJ Date: 04-10-2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-1 | Boring/Exploration No.: WR0017-209I

Task Number: | Test Stage: 1 of 2 | Test Station No.: 1 | Sample No.: S08A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 25.85

Test Series No.: NA | File Name: WR0017-209B_S08AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.740

Vert. Dial/DT No.: DG-072 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	83.630	19.92
= 60.0	Final:	83.630	20.15

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.32

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.0	61.2
1.0E-5 to 1.0E-6	≤10	6.3	62.4
1.0E-6 to 1.0E-7	≤20	12.9	64.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	19.6	67.1
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial / DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/7	12:59:53	23.0	0.8	NA	75.3	60.0	4.740	5.00	1.45	49.3	5.9	2.09E+00	1.92E+00	4.06
1	rc,jr	12/7	13:00:40	23.0		NA	75.3	60.0	4.740	4.00	XXXXX	36.2	5.9	6.62E-06	6.10E-06	
	rc,jr	12/7	13:01:08	23.0	0.8	NA	75.3	60.0	4.740	5.00	1.45	49.3	5.9	2.09E+00	1.92E+00	4.06
* 2	rc,jr	12/7	13:01:55	23.0		NA	75.3	60.0	4.740	4.00	XXXXX	36.2	5.9	6.62E-06	6.10E-06	
	rc,jr	12/7	13:02:19	23.0	0.8	NA	75.3	60.0	4.740	5.00	1.45	49.3	5.9	2.00E+00	1.84E+00	4.06
* 3	rc,jr	12/7	13:03:08	23.0		NA	75.3	60.0	4.740	4.00	XXXXX	36.2	5.9	6.35E-06	5.85E-06	
	rc,jr	12/7	13:03:36	23.0	0.8	NA	75.3	60.0	4.740	5.00	1.45	49.3	5.9	2.04E+00	1.88E+00	4.06
* 4	rc,jr	12/7	13:04:24	23.0		NA	75.3	60.0	4.740	4.00	XXXXX	36.2	5.9	6.48E-06	5.97E-06	
	rc,jr	12/7	13:04:58	23.0	0.8	NA	75.3	60.0	4.740	5.00	1.45	49.3	5.9	1.96E+00	1.81E+00	4.06
* 5	rc,jr	12/7	13:05:48	23.0		NA	75.3	60.0	4.740	4.00	XXXXX	36.2	5.9	6.22E-06	5.73E-06	

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

Average $k_{20°C}$:	5.91E-06	cm/s
Max. Dev. from Mean:	3.1%	
Avg. Initial Gradient (i_o) :	5.9	
Intrinsic (Absolute) Permeability, *K*:	6.05E-11	cm^2

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-1 | Boring/Exploration No.: WR0017-209I

Task Number: ______ | Test Stage: 2 of 2 | Test Station No.: 1 | Sample No.: S08A

Project Name: ______ | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 25.85

Test Series No.: NA | File Name: WR0017-209B_S08AaV | Composite Sample No.: ______

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.740

Vert. Dial/DT No.: DG-072 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): 4.700

Permeation & Specimen Information				
Permeant:	X	Tap Water;		
Direction of Flow:	X	Up;		Down
Perm. Orientation:	X	Vertical;		Horizontal
Specimen:	X	"Intact;"		Reconstituted;
Back	Stage		Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:		83.630	19.92
= 60.0	Final:		83.630	20.15
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.32				

Hydraulic System Constants	
Mercury U-Tube Manometer	
Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.0	61.2
1.0E-5 to 1.0E-6	≤10	6.3	62.4
1.0E-6 to 1.0E-7	≤20	12.9	64.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	19.6	67.1
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/17	13:22:10	23.0	0.5	NA	75.3	60.0	4.740	7.00	1.4	75.0	9.0	2.03E+00	1.87E+00	5.57
1	rc,jr	12/17	13:22:40	23.0		NA	75.3	60.0	4.740	6.00	XXXXX	62.0	9.0	6.44E-06	5.93E-06	
	rc,jr	12/17	13:23:11	23.0	0.5	NA	75.3	60.0	4.740	7.00	1.4	75.0	9.0	2.03E+00	1.87E+00	5.57
* 2	rc,jr	12/17	13:23:41	23.0		NA	75.3	60.0	4.740	6.00	XXXXX	62.0	9.0	6.44E-06	5.93E-06	
	rc,jr	12/17	13:24:20	23.0	0.5	NA	75.3	60.0	4.740	7.00	1.4	75.0	9.0	2.10E+00	1.93E+00	5.57
* 3	rc,jr	12/17	13:24:49	23.0		NA	75.3	60.0	4.740	6.00	XXXXX	62.0	9.0	6.66E-06	6.13E-06	
	rc,jr	12/17	13:25:11	23.0	0.5	NA	75.3	60.0	4.740	7.00	1.4	75.0	9.0	1.97E+00	1.81E+00	5.57
* 4	rc,jr	12/17	13:25:42	23.0		NA	75.3	60.0	4.740	6.00	XXXXX	62.0	9.0	6.23E-06	5.74E-06	
	rc,jr	12/17	13:26:31	23.0	0.5	NA	75.3	60.0	4.740	7.00	1.4	75.0	9.0	2.03E+00	1.87E+00	5.57
* 5	rc,jr	12/17	13:27:01	23.0		NA	75.3	60.0	4.740	6.00	XXXXX	62.0	9.0	6.44E-06	5.93E-06	

Average $k_{20°C}$:	5.93E-06	cm/s
Max. Dev. from Mean:	3.4%	
Avg. Initial Gradient (i_o) :	9.0	
Intrinsic (Absolute) Permeability, *K*:	6.07E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-3 | Boring/Exploration No.: WR0017-209B
Task Number: | Test Stage: 1 of 2 | Test Station No.: 2 | Sample No.: S09A
Project Name: | Test No.: NA | File Name: WR0017-209B_S09AaV | Penetration/Depth (ft): 29.05
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Sand, olive gray with diagonal sand seam | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.910
Vert. Dial/DT No.: DG-060 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.256	20.72
m/yr	Final:	81.256	20.35
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.65		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1) / Elev.	
If by Vol.: X Case 2 / Case 3	
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi): / Differential	

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.95	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.10	53.8
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	vr	3/26	16:08:10	23.7	19.1	NA	65.30	50.00	4.910	50.20	50.00	3.00	7.00	1.00	34.41	4.2	1.18E-05
1	vr	3/26	16:27:17	23.7		NA	65.30	50.00	4.910	50.20	50.00	4.00	6.00		24.25	4.2	1.10E-05
	vr	3/26	16:29:00	23.7	20.3	NA	65.30	50.00	4.910	50.20	50.00	3.00	7.00	1.00	34.413	4.2	1.25E-05
* 2	vr	3/26	16:49:15	23.7		NA	65.30	50.00	4.910	50.20	50.00	4.10	5.90		23.237	4.2	1.17E-05
	vr	3/26	16:50:37	23.7	22.3	NA	65.30	50.00	4.910	50.20	50.00	3.00	7.00	1.00	34.41	4.2	1.29E-05
* 3	vr	3/26	17:12:52	23.7		NA	65.30	50.00	4.910	50.20	50.00	4.22	5.78		22.02	4.2	1.21E-05
	vr	3/26	17:13:42	23.7	27.5	NA	65.30	50.00	4.910	50.20	50.00	3.00	7.00	1.00	34.41	4.2	1.27E-05
* 4	vr	3/26	17:41:13	23.7		NA	65.30	50.00	4.910	50.20	50.00	4.42	5.58		19.99	4.2	1.19E-05
	vr	3/26	17:44:42	23.7	26.6	NA	65.30	50.00	4.910	50.20	50.00	3.00	7.00	1.00	34.41	4.2	1.24E-05
* 5	vr	3/26	18:11:20	23.7		NA	65.30	50.00	4.910	50.20	50.00	4.36	5.64		20.60	4.2	1.16E-05

Average $k_{20°C}$:	1.18E-05 cm/s
Max. Dev. from mean:	2.3%
Avg. Initial Gradient (i_o) :	4.2
Intrinsic (Absolute) Permability, *K*:	1.21E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-3 | Boring/Exploration No.: WR0017-209B
Task Number: | Test Stage: 2 of 2 | Test Station No.: 2 | Sample No.: S09A
Project Name: | Test No.: NA | File Name: WR0017-209B_S09AaV | Penetration/Depth (ft): 29.05
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Sand, olive gray with diagonal sand seam | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.910
Vert. Dial/DT No.: DG-060 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm): 4.97

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.256	20.72
m/yr	Final:	81.256	20.35
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.65		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.			
Area headwater tube, a_{in} (cm^2):	0.1969		
Area tailwater tube, a_{out} (cm^2):	0.1969		
Permeant/Fluid Density, at 22^{o}C, $\rho_{f,n}$ (g/cm^3);	Accum.	NA	
	System	0.9978	
Elev. Heads by:	X Vol. (1)	Elev.	
If by Vol.:	X Case 2	Case 3	
Differential Pressure Head System			
Differential Manometer (cm Hg):			
U-tube;	Vert. Column		
X Pressure Trans./Gage (psi):	Differential		

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.95	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.10	53.8
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. ^{o}C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	3/27	7:49:00	23.6	9.7	NA	65.30	50.00	4.910	50.20	50.00	0.00	10.00	1.02	64.89	8.0	1.14E-05
1	rc,jr	3/27	7:58:41	23.6		NA	65.30	50.00	4.910	50.20	50.00	1.00	8.98		54.63	8.0	1.07E-05
	rc,jr	3/27	7:59:25	23.6	8.8	NA	65.30	50.00	4.910	50.20	50.00	0.00	10.00	1.00	64.893	8.0	1.25E-05
* 2	rc,jr	3/27	8:08:12	23.6		NA	65.30	50.00	4.900	50.20	50.00	1.00	9.00		54.733	8.0	1.17E-05
	rc,jr	3/27	8:09:15	23.6	8.9	NA	65.30	50.00	4.900	50.20	50.00	0.00	10.00	1.00	64.89	8.0	1.23E-05
* 3	rc,jr	3/27	8:18:09	23.6		NA	65.30	50.00	4.900	50.20	50.00	1.00	9.00		54.73	8.0	1.15E-05
	rc,jr	3/27	8:19:00	23.6	8.9	NA	65.30	50.00	4.900	50.20	50.00	0.00	10.00	1.01	64.89	8.0	1.24E-05
* 4	rc,jr	3/27	8:27:53	23.6		NA	65.30	50.00	4.900	50.20	50.00	1.00	8.99		54.68	8.0	1.16E-05
	rc,jr	3/27	8:29:45	23.6	11.2	NA	65.30	50.00	4.900	50.20	50.00	0.00	10.00	0.99	64.89	8.0	1.21E-05
* 5	rc,jr	3/27	8:40:57	23.6		NA	65.30	50.00	4.900	50.20	50.00	1.22	8.79		52.55	8.0	1.14E-05

Average k_{20^oC}:	1.16E-05	cm/s
Max. Dev. from mean:	1.7%	
Avg. Initial Gradient (i_o):	8.0	
Intrinsic (Absolute) Permability, *K*:	1.18E-10	cm^2

(*) Indicates trials used for calculations (Average k_{20^oC}, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jt | Final Calc. By: RC,jr | Reviewed By:

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-5 | Boring/Exploration No.: WR0017-210B
Task Number: | Test Stage: 1 of 3 | Test Station No.: 22 | Sample No.: S12A
Project Name: | Test No.: NA | File Name: WR0017-210B_S12AaV | Penetration/Depth (ft): 34.70
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Sand, olive gray. Non-uniform with horizontal silt seams/pockets. | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.050
Vert. Dial/DT No.: DG-068 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	83.848	39.66
m/yr	Final:	83.848	40.76
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.51		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1968
Area tailwater tube, a_{out} (cm^2):	0.1960
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.24	50.7
1.0E-5 to 1.0E-6	≤10	50.84	51.3
1.0E-6 to 1.0E-7	≤20	52.03	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.22	54.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	12/11	9:28:44	22.3	3.2	NA	69.40	50.00	4.050	50.00	50.00	3.00	7.00	1.00	20.37	2.4	7.50E-05
1	rc,jr	12/11	9:31:56	22.3		NA	69.40	50.00	4.040	50.00	50.00	4.00	6.00		10.18	2.4	6.92E-05
	rc,jr	12/11	9:39:45	22.3	3.1	NA	69.40	50.00	4.040	50.00	50.00	3.00	7.00	1.00	20.366	2.4	7.74E-05
* 2	rc,jr	12/11	9:42:51	22.3		NA	69.40	50.00	4.040	50.00	50.00	4.00	6.00		10.183	2.4	7.14E-05
	rc,jr	12/11	9:43:51	22.3	3.0	NA	69.40	50.00	4.040	50.00	50.00	3.00	7.00	1.00	20.37	2.4	8.04E-05
* 3	rc,jr	12/11	9:46:50	22.3		NA	69.40	50.00	4.040	50.00	50.00	4.00	6.00		10.18	2.4	7.42E-05
	rc,jr	12/11	9:47:10	22.3	3.3	NA	69.40	50.00	4.040	50.00	50.00	3.00	7.00	0.99	20.37	2.4	7.14E-05
* 4	rc,jr	12/11	9:50:30	22.3		NA	69.40	50.00	4.040	50.00	50.00	4.00	6.01		10.23	2.4	6.59E-05
	rc,jr	12/11	9:51:31	22.3	3.0	NA	69.40	50.00	4.040	50.00	50.00	3.00	7.00	1.00	20.37	2.4	8.00E-05
* 5	rc,jr	12/11	9:54:31	22.3		NA	69.40	50.00	4.040	50.00	50.00	4.00	6.00		10.18	2.4	7.38E-05

Average $k_{20°C}$:	7.13E-05	cm/s
Max. Dev. from mean:	7.6%	
Avg. Initial Gradient (i_o) :	2.4	
Intrinsic (Absolute) Permability, *K*:	7.31E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 Test Type: Permeability Vert. Cell No.: Perm-5 Boring/Exploration No.: WR0017-210B
Task Number: Test Stage: 2 of 3 Test Station No.: 22 Sample No.: S12A
Project Name: Test No.: NA File Name: WR0017-210B_S12AaV Penetration/Depth (ft): 34.70
Test Series No.: NA Test Sheet: 1 of Composite Sample No.:
Material Description: Silty Sand, olive gray. Non-uniform with horizontal silt seams/pockets. Specimen No.: a

Axial Load Cell No.: NA Factor, (lbf/V/V): NA Excit. Volt, V: NA Ch. No.: NA Ht. Reading before Perm. (mm): 3.840
Vert. Dial/DT No.: DG-068 Factor, (mm/V/V): Excit. Volt, V: Ch. No.: Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	83.648	39.58
m/yr	Final:	83.648	40.62
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.71	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =		NA	H_b = NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1968
Area tailwater tube, a_{out} (cm^2):	0.1960
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.24	50.7
1.0E-5 to 1.0E-6	≤10	50.83	51.3
1.0E-6 to 1.0E-7	≤20	52.02	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.21	54.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_f cm^3	Head Readings: Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	12/13	12:28:14	23.5	3.6	NA	84.70	50.00	3.840	50.00	50.00	3.00	7.00	0.98	20.37	2.4	6.66E-05
1	rc,jr	12/13	12:31:47	23.5		NA	84.70	50.00	3.840	50.00	50.00	4.00	6.02		10.29	2.4	5.98E-05
	rc,jr	12/13	12:32:50	23.5	3.6	NA	84.70	50.00	3.840	50.00	50.00	3.00	7.00	1.00	20.366	2.4	6.66E-05
* 2	rc,jr	12/13	12:36:26	23.5		NA	84.70	50.00	3.840	50.00	50.00	4.00	6.00		10.183	2.4	5.99E-05
	rc,jr	12/13	12:37:22	23.5	3.5	NA	84.70	50.00	3.840	50.00	50.00	3.00	7.00	1.00	20.37	2.4	6.79E-05
* 3	rc,jr	12/13	12:40:54	23.5		NA	84.70	50.00	3.840	50.00	50.00	4.00	6.00		10.18	2.4	6.10E-05
	rc,jr	12/13	12:41:45	23.5	3.6	NA	84.70	50.00	3.840	50.00	50.00	3.00	7.00	1.00	20.37	2.4	6.63E-05
* 4	rc,jr	12/13	12:45:22	23.5		NA	84.70	50.00	3.840	50.00	50.00	4.00	6.00		10.18	2.4	5.96E-05
	rc,jr	12/13	12:46:05	23.5	3.6	NA	84.70	50.00	3.840	50.00	50.00	3.00	7.00	1.00	20.37	2.4	6.69E-05
* 5	rc,jr	12/13	12:49:40	23.5		NA	84.70	50.00	3.840	50.00	50.00	4.00	6.00		10.18	2.4	6.01E-05

Average $k_{20°C}$:	6.02E-05	cm/s
Max. Dev. from mean:	1.4%	
Avg. Initial Gradient (i_o):	2.4	
Intrinsic (Absolute) Permability, *K*:	6.16E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-5 | Boring/Exploration No.: WR0017-210B
Task Number: | Test Stage: 3 of 3 | Test Station No.: 2 | Sample No.: S12A
Project Name: | Test No.: NA | File Name: WR0017-210B_S12AaV | Penetration/Depth (ft): 34.70
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Sand, olive gray. Non-uniform with horizontal silt seams/pockets. | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.840
Vert. Dial/DT No.: DG-068 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 4.05

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	83.648	39.58
m/yr	Final:	83.648	40.62
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.71	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
	U-tube;	Vert. Column
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.24	50.7
1.0E-5 to 1.0E-6	≤10	50.83	51.3
1.0E-6 to 1.0E-7	≤20	52.02	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.21	54.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	12/14	7:05:13	22.7	0.9	NA	84.70	50.00	3.840	50.00	50.00	0.00	10.00	1.00	50.80	6.1	8.93E-05
1	rc,jr	12/14	7:06:05	22.7		NA	84.70	50.00	3.840	50.00	50.00	1.00	9.00		40.64	6.1	8.17E-05
	rc,jr	12/14	7:06:40	22.7	0.9	NA	84.70	50.00	3.840	50.00	50.00	0.00	10.00	1.01	50.800	6.1	8.49E-05
* 2	rc,jr	12/14	7:07:35	22.7		NA	84.70	50.00	3.840	50.00	50.00	1.00	8.99		40.589	6.1	7.77E-05
	rc,jr	12/14	7:08:10	22.7	1.0	NA	84.70	50.00	3.840	50.00	50.00	0.00	10.00	0.91	50.80	6.1	8.04E-05
* 3	rc,jr	12/14	7:09:11	22.7		NA	84.70	50.00	3.840	50.00	50.00	1.10	9.00		40.13	6.1	7.36E-05
	rc,jr	12/14	7:09:55	22.7	1.0	NA	84.70	50.00	3.840	50.00	50.00	0.00	10.00	1.01	50.80	6.1	8.19E-05
* 4	rc,jr	12/14	7:10:52	22.7		NA	84.70	50.00	3.840	50.00	50.00	1.00	8.99		40.59	6.1	7.50E-05
	rc,jr	12/14	7:11:35	22.7	1.0	NA	84.70	50.00	3.840	50.00	50.00	0.00	10.00	1.00	50.80	6.1	7.87E-05
* 5	rc,jr	12/14	7:12:34	22.7		NA	84.70	50.00	3.840	50.00	50.00	1.00	9.00		40.64	6.1	7.20E-05

Average $k_{20^\circ C}$:	7.46E-05	cm/s
Max. Dev. from mean:	4.2%	
Avg. Initial Gradient (i_o):	6.1	
Intrinsic (Absolute) Permability, *K*:	7.64E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20^\circ C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr   Final Calc. By: RC,jr   Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 2/19/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-210B	SAMPLE NO. S20A b	PENETRATION (Depth) 58.80	PERMEAMETER NO. CHP-3
MATERIAL DESCRIPTION	Sand, olive gray with some cementation		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	17.8	17.9	HEIGHT, H	8.680 (cm)	8.623 (cm)	Cell Pressure (psi)	79.20
Total Unit Weight (pcf)	124.8	132.0	DIAMETER, D	7.23 (cm)	7.05 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	105.9	112.0	AREA, A	41.02 (cm^2)	39.06 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	84.5	100.0	VOLUME, V	356.03 (cm^3)	336.78 (cm^3)	Axial Strain During Consolidation (%)	0.66
Void Ratio e	0.559	0.475	LENGTH, L Mamometer separation		8.623 (cm)	Volumetric Strain Consolidation (%)	5.41

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
02-19	120	52.0	34.6	23.0	2.0	17.4	8.7	8.76E-04	8.16E-04
02-19	120	52.0	34.6	23.0	2.0	17.4	8.7	8.76E-04	8.16E-04
02-19	120	52.0	34.6	23.0	2.0	17.4	8.8	8.86E-04	8.25E-04
02-19	120	52.0	34.6	23.0	2.0	17.4	8.8	8.86E-04	8.25E-04
				Gradient average:	2.0	17.4		8.81E-04	8.20E-04
02-19	120	57.2	34.6	23.0	2.6	22.6	11.5	8.91E-04	8.30E-04
02-19	120	57.2	34.6	23.0	2.6	22.6	11.5	8.91E-04	8.30E-04
02-19	120	57.2	34.6	23.0	2.6	22.6	11.4	8.84E-04	8.23E-04
02-19	120	57.2	34.6	23.0	2.6	22.6	11.3	8.76E-04	8.16E-04
				Gradient average:	2.6	22.6		8.86E-04	8.25E-04
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 02-19-2013
Input By: RC,jr Date: 02-19-2013
Reviewed By: RJ Date: 02-25-2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-19 | Boring/Exploration No.: WR0017-211B

Task Number: | Test Stage: 1 of 3 | Test Station No.: 2 | Sample No.: S08A

Project Name: | Test No.: NA | File Name: WR0017-211B_S08AaV | Penetration/Depth (ft): 18.75

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Clayey sand, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 9.400

Vert. Dial/DT No.: DG-054 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	74.290	19.98
m/yr	Final:	74.290	20.07
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.36
Applied back pressure, U_b (psi) =			60.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
	U-tube;	Vert. Column
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.17	60.6
1.0E-5 to 1.0E-6	≤10	60.70	61.2
1.0E-6 to 1.0E-7	≤20	61.75	62.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	62.81	63.5
For Special Gradtient, i			

Remarks:

Trial No.	Readings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	12/3	10:28:21	22.9	11.0	NA	72.50	60.00	9.400	50.00	50.00	3.00	7.00	0.99	20.32	2.7	3.83E-05
1	rc,jr	12/3	10:39:19	22.9		NA	72.50	60.00	9.400	50.00	50.00	4.00	6.01		10.21	2.7	3.56E-05
	rc,jr	12/3	10:39:53	22.9	11.2	NA	72.50	60.00	9.400	50.00	50.00	3.00	7.00	0.99	20.320	2.7	4.44E-05
* 2	rc,jr	12/3	10:51:05	22.9		NA	72.50	60.00	9.400	50.00	50.00	4.12	5.89		8.992	2.7	4.13E-05
	rc,jr	12/3	10:52:53	22.9	10.7	NA	72.50	60.00	9.400	50.00	50.00	3.00	7.00	0.99	20.32	2.7	4.15E-05
* 3	rc,jr	12/3	11:03:35	22.9		NA	72.50	60.00	9.400	50.00	50.00	4.04	5.97		9.80	2.7	3.87E-05
	rc,jr	12/3	11:04:36	22.9	9.7	NA	72.50	60.00	9.400	50.00	50.00	3.00	7.00	1.00	20.32	2.7	4.34E-05
* 4	rc,jr	12/3	11:14:20	22.9		NA	72.50	60.00	9.400	50.00	50.00	4.00	6.00		10.16	2.7	4.04E-05
	rc,jr	12/3	11:14:54	22.9	11.6	NA	72.50	60.00	9.400	50.00	50.00	3.00	7.00	1.01	20.32	2.7	3.67E-05
* 5	rc,jr	12/3	11:26:30	22.9		NA	72.50	60.00	9.400	50.00	50.00	4.00	5.99		10.11	2.7	3.42E-05

Average $k_{20°C}$:	3.87E-05	cm/s
Max. Dev. from mean:	11.6%	
Avg. Initial Gradient (i_o) :	2.7	
Intrinsic (Absolute) Permability, *K*:	3.96E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-19 | Boring/Exploration No.: WR0017-211B
Task Number: | Test Stage: 2 of 3 | Test Station No.: 2 | Sample No.: S08A
Project Name: | Test No.: NA | File Name: WR0017-211B_S08AaV | Penetration/Depth (ft): 18.75
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Clayey sand, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 9.830
Vert. Dial/DT No.: DG-054 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	73.860	19.88
m/yr	Final:	73.860	19.85
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.79	
Applied back pressure, U_b (psi) =		60.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm³); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.17	60.6
1.0E-5 to 1.0E-6	≤10	60.69	61.2
1.0E-6 to 1.0E-7	≤20	61.74	62.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	62.79	63.5
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	vr	12/6	7:55:05	23.3	7.2	NA	101.70	60.00	9.830	60.00	60.00	3.00	7.00	1.00	20.32	2.8	5.87E-05
1	vr	12/6	8:02:17	23.3		NA	101.70	60.00	9.830	60.00	60.00	4.00	6.00		10.16	2.8	5.45E-05
	vr	12/6	8:03:09	23.3	18.8	NA	101.70	60.00	9.830	60.00	60.00	3.00	7.00	0.99	20.320	2.8	2.23E-05
* 2	vr	12/6	8:21:57	23.3		NA	101.70	60.00	9.830	60.00	60.00	4.00	6.01		10.211	2.8	2.07E-05
	vr	12/6	8:24:27	23.3	17.9	NA	101.70	60.00	9.830	60.00	60.00	3.00	7.00	1.01	20.32	2.8	2.48E-05
* 3	vr	12/6	8:42:20	23.3		NA	101.70	60.00	9.830	60.00	60.00	4.03	5.96		9.80	2.8	2.31E-05
	vr	12/6	8:44:13	23.3	17.4	NA	101.70	60.00	9.830	60.00	60.00	3.00	7.00	1.00	20.32	2.8	2.43E-05
* 4	vr	12/6	9:01:37	23.3		NA	101.70	60.00	9.830	60.00	60.00	4.00	6.00		10.16	2.8	2.25E-05
	vr	12/6	9:02:50	23.3	21.5	NA	101.70	60.00	9.830	60.00	60.00	3.00	7.00	1.00	20.32	2.8	2.26E-05
5	vr	12/6	9:24:21	23.3		NA	101.70	60.00	9.830	60.00	60.00	4.10	5.90		9.14	2.8	2.10E-05

Average $k_{20°C}$:	2.21E-05	cm/s
Max. Dev. from mean:	6.3%	
Avg. Initial Gradient (i_o):	2.8	
Intrinsic (Absolute) Permability, *K*:	2.26E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.:	04-11120056	Test Type:	Permeability Vert.	Cell No.:	CU-19	Boring/Exploration No.:	WR0017-211B
Task Number:		Test Stage:	3 of 3	Test Station No.:	2	Sample No.:	S08A
Project Name:		Test No.:	NA	File Name:	WR0017-211B_S08AaV	Penetration/Depth (ft):	18.75
		Test Series No.:	NA	Test Sheet:	1 of	Composite Sample No.:	
Material Description:	Clayey sand, brown					Specimen No.:	a
Axial Load Cell No.:	NA	Factor, (lbf/V/V):	NA	Excit. Volt, V:	NA	Ch. No.: NA	Ht. Reading before Perm. (mm): 9.830
Vert. Dial/DT No.:	DG-054	Factor, (mm/V/V):		Excit. Volt, V:		Ch. No.:	Ht. Reading at σ_c = 0 (mm): 9.73

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	73.860	19.88
m/yr	Final:	73.860	19.85
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.79		
Applied back pressure, U_b (psi) =	60.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.17	60.6
1.0E-5 to 1.0E-6	≤10	60.69	61.2
1.0E-6 to 1.0E-7	≤20	61.74	62.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	62.79	63.5
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_f cm^3	Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary Final	Hyd. Conductivity, k Preliminary, k_t Final, $k_{20°C}$ cm/s
	rc,jr	12/7	9:26:20	23	5.1	NA	101.70	60.00	9.830	60.00	60.00	0.00	10.00	1.01	50.80	6.9	3.47E-05
1	rc,jr	12/7	9:31:27	23.0		NA	101.70	60.00	9.830	60.00	60.00	1.26	8.73		37.95	6.9	3.25E-05
	rc,jr	12/7	9:32:00	23.0	5.2	NA	101.70	60.00	9.830	60.00	60.00	0.20	9.80	0.99	48.768	6.6	2.77E-05
* 2	rc,jr	12/7	9:37:14	23.0		NA	101.70	60.00	9.830	60.00	60.00	1.22	8.79		38.456	6.6	2.59E-05
	rc,jr	12/7	9:38:05	23.0	6.3	NA	101.70	60.00	9.830	60.00	60.00	0.20	9.80	1.00	48.77	6.6	3.36E-05
* 3	rc,jr	12/7	9:44:20	23.0		NA	101.70	60.00	9.830	60.00	60.00	1.60	8.40		34.54	6.6	3.14E-05
	rc,jr	12/7	9:45:10	23.0	5.3	NA	101.70	60.00	9.830	60.00	60.00	0.20	9.80	1.01	48.77	6.6	3.62E-05
* 4	rc,jr	12/7	9:50:30	23.0		NA	101.70	60.00	9.830	60.00	60.00	1.50	8.49		35.51	6.6	3.39E-05
	rc,jr	12/7	9:51:57	23.0	5.5	NA	101.70	60.00	9.830	60.00	60.00	0.20	9.80	1.00	48.77	6.6	3.29E-05
* 5	rc,jr	12/7	9:57:29	23.0		NA	101.70	60.00	9.830	60.00	60.00	1.44	8.56		36.17	6.6	3.08E-05

Average $k_{20°C}$:	3.05E-05	cm/s
Max. Dev. from mean:	15.2%	
Avg. Initial Gradient (i_o) :	6.6	
Intrinsic (Absolute) Permability, *K*:	3.12E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr   Final Calc. By: RC,jr   Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-2 | Boring/Exploration No.: WR0017-212B

Task Number: ______ | Test Stage: 1 of 2 | Test Station No.: 2 | Sample No.: S04A

Project Name: ______ | Test No.: NA | File Name: WR0017-212B_S04AaV | Penetration/Depth (ft): 10.65

Test Series No.: NA | Test Sheet: 1 of ____ | Composite Sample No.: ______

Material Description: Silty Clayey Sand, Brown with small clay pockets and few vertical cracks in the top half of the sample | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.290

Vert. Dial/DT No.: DG-015 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): ______

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	66.484	39.66
m/yr	Final:	66.484	37.32

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.4

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System

Differential Manometer (cm Hg):

U-tube; Vert. Column

X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.12	50.5
1.0E-5 to 1.0E-6	≤10	50.59	51.0
1.0E-6 to 1.0E-7	≤20	51.53	52.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.48	53.1
For Special Gradient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/28	8:35:34	23.6	0.7	NA	60.40	50.00	3.290	50.00	50.00	3.00	7.00	1.01	20.32	3.1	2.88E-04
1	rc,jr	3/28	8:36:14	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	5.99		10.11	3.1	2.82E-04
	rc,jr	3/28	8:37:14	23.6	0.8	NA	60.40	50.00	3.280	50.00	50.00	3.00	7.00	0.99	20.320	3.1	2.27E-04
* 2	rc,jr	3/28	8:38:04	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	6.01		10.211	3.1	2.22E-04
	rc,jr	3/28	8:39:20	23.6	0.9	NA	60.40	50.00	3.280	50.00	50.00	3.00	7.00	0.99	20.32	3.1	2.18E-04
* 3	rc,jr	3/28	8:40:12	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	6.01		10.21	3.1	2.14E-04
	rc,jr	3/28	8:40:50	23.6	0.8	NA	60.40	50.00	3.280	50.00	50.00	3.00	7.00	1.00	20.32	3.1	2.29E-04
* 4	rc,jr	3/28	8:41:40	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	6.00		10.16	3.1	2.24E-04
	rc,jr	3/28	8:42:25	23.6	0.8	NA	60.40	50.00	3.280	50.00	50.00	3.00	7.00	1.00	20.32	3.1	2.29E-04
* 5	rc,jr	3/28	8:43:15	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	6.00		10.16	3.1	2.24E-04

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Average $k_{20°C}$:	2.21E-04	cm/s
Max. Dev. from mean:	3.3%	
Avg. Initial Gradient (i_o) :	3.1	
Intrinsic (Absolute) Permability, *K*:	2.26E-09	cm^2

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 — Test Type: Permeability Vert. — Cell No.: Perm-2 — Boring/Exploration No.: WR0017-212B
Task Number: — Test Stage: 2 of 2 — Test Station No.: 2 — Sample No.: S04A
Project Name: — Test No.: NA — File Name: WR0017-212B_S04AaV — Penetration/Depth (ft): 10.65
Test Series No.: NA — Test Sheet: 1 of — Composite Sample No.:
Material Description: Silty Clayey Sand, Brown with small clay pockets and few vertical cracks in the top half of the sample — Specimen No.: a

Axial Load Cell No.: NA — Factor, (lbf/V/V): NA — Excit. Volt, V: NA — Ch. No.: NA — Ht. Reading before Perm. (mm): 3.280
Vert. Dial/DT No.: DG-015 — Factor, (mm/V/V): — Excit. Volt, V: — Ch. No.: — Ht. Reading at σ_c = 0 (mm): 3.81

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	66.474	39.65
m/yr	Final:	66.484	37.32

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.41
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA — H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.12	50.5
1.0E-5 to 1.0E-6	≤10	50.59	51.0
1.0E-6 to 1.0E-7	≤20	51.53	52.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.48	53.1
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/28	10:39:00	23.7	0.3	NA	60.40	50.00	3.280	50.00	50.00	0.00	10.00	1.00	50.80	7.6	1.75E-04
1	rc,jr	3/28	10:39:21	23.7		NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00		40.64	7.6	1.71E-04
	rc,jr	3/28	10:40:00	23.7	0.3	NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00	0.99	40.640	6.1	2.25E-04
* 2	rc,jr	3/28	10:40:21	23.7		NA	60.40	50.00	3.280	50.00	50.00	2.00	8.01		30.531	6.1	2.19E-04
	rc,jr	3/28	10:41:30	23.7	0.4	NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00	1.01	40.64	6.1	2.27E-04
* 3	rc,jr	3/28	10:41:51	23.7		NA	60.40	50.00	3.280	50.00	50.00	2.00	7.99		30.43	6.1	2.22E-04
	rc,jr	3/28	10:43:00	23.7	0.3	NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00	1.00	40.64	6.1	2.26E-04
* 4	rc,jr	3/28	10:43:21	23.7		NA	60.40	50.00	3.280	50.00	50.00	2.00	8.00		30.48	6.1	2.21E-04
	rc,jr	3/28	10:44:00	23.7	0.4	NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00	0.99	40.64	6.1	2.15E-04
* 5	rc,jr	3/28	10:44:22	23.7		NA	60.40	50.00	3.280	50.00	50.00	2.00	8.01		30.53	6.1	2.09E-04

Average $k_{20°C}$:	2.18E-04	cm/s
Max. Dev. from mean:	3.9%	
Avg. Initial Gradient (i_o) :	6.1	
Intrinsic (Absolute) Permability, *K*:	2.23E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr — Final Calc. By: RC,jr — Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-2 | Boring/Exploration No.: WR0017-212B

Task Number: | Test Stage: 1 of 2 | Test Station No.: 2 | Sample No.: S04A

Project Name: | Test No.: NA | File Name: WR0017-212B_S04AaV | Penetration/Depth (ft): 10.65

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silty Clayey Sand, Brown with small clay pockets and few vertical cracks in the top half of the sample | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.290

Vert. Dial/DT No.: DG-015 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	66.484	39.66
m/yr	Final:	66.484	37.32

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.4

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System

Differential Manometer (cm Hg):

U-tube; Vert. Column

X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.12	50.5
1.0E-5 to 1.0E-6	≤10	50.59	51.0
1.0E-6 to 1.0E-7	≤20	51.53	52.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.48	53.1
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/28	8:35:34	23.6	0.7	NA	60.40	50.00	3.290	50.00	50.00	3.00	7.00	1.01	20.32	3.1	2.88E-04
1	rc,jr	3/28	8:36:14	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	5.99		10.11	3.1	2.82E-04
	rc,jr	3/28	8:37:14	23.6	0.8	NA	60.40	50.00	3.280	50.00	50.00	3.00	7.00	0.99	20.320	3.1	2.27E-04
* 2	rc,jr	3/28	8:38:04	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	6.01		10.211	3.1	2.22E-04
	rc,jr	3/28	8:39:20	23.6	0.9	NA	60.40	50.00	3.280	50.00	50.00	3.00	7.00	0.99	20.32	3.1	2.18E-04
* 3	rc,jr	3/28	8:40:12	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	6.01		10.21	3.1	2.14E-04
	rc,jr	3/28	8:40:50	23.6	0.8	NA	60.40	50.00	3.280	50.00	50.00	3.00	7.00	1.00	20.32	3.1	2.29E-04
* 4	rc,jr	3/28	8:41:40	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	6.00		10.16	3.1	2.24E-04
	rc,jr	3/28	8:42:25	23.6	0.8	NA	60.40	50.00	3.280	50.00	50.00	3.00	7.00	1.00	20.32	3.1	2.29E-04
* 5	rc,jr	3/28	8:43:15	23.6		NA	60.40	50.00	3.280	50.00	50.00	4.00	6.00		10.16	3.1	2.24E-04

Average $k_{20°C}$:	2.21E-04	cm/s
Max. Dev. from mean:	3.3%	
Avg. Initial Gradient (i_o) :	3.1	
Intrinsic (Absolute) Permability, *K*:	2.26E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-2 | Boring/Exploration No.: WR0017-212B

Task Number: ______ | Test Stage: 2 of 2 | Test Station No.: 2 | Sample No.: S04A

Project Name: ______ | Test No.: NA | File Name: WR0017-212B_S04AaV | Penetration/Depth (ft): 10.65

Test Series No.: NA | Test Sheet: 1 of ____ | Composite Sample No.: ______

Material Description: Silty Clayey Sand, Brown with small clay pockets and few vertical cracks in the top half of the sample | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.280

Vert. Dial/DT No.: DG-015 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): 3.81

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	66.474	39.65
m/yr	Final:	66.484	37.32
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		1.41	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =		NA	H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.12	50.5
1.0E-5 to 1.0E-6	≤10	50.59	51.0
1.0E-6 to 1.0E-7	≤20	51.53	52.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.48	53.1
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/28	10:39:00	23.7	0.3	NA	60.40	50.00	3.280	50.00	50.00	0.00	10.00	1.00	50.80	7.6	1.75E-04
1	rc,jr	3/28	10:39:21	23.7		NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00		40.64	7.6	1.71E-04
	rc,jr	3/28	10:40:00	23.7	0.3	NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00	0.99	40.640	6.1	2.25E-04
* 2	rc,jr	3/28	10:40:21	23.7		NA	60.40	50.00	3.280	50.00	50.00	2.00	8.01		30.531	6.1	2.19E-04
	rc,jr	3/28	10:41:30	23.7	0.4	NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00	1.01	40.64	6.1	2.27E-04
* 3	rc,jr	3/28	10:41:51	23.7		NA	60.40	50.00	3.280	50.00	50.00	2.00	7.99		30.43	6.1	2.22E-04
	rc,jr	3/28	10:43:00	23.7	0.3	NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00	1.00	40.64	6.1	2.26E-04
* 4	rc,jr	3/28	10:43:21	23.7		NA	60.40	50.00	3.280	50.00	50.00	2.00	8.00		30.48	6.1	2.21E-04
	rc,jr	3/28	10:44:00	23.7	0.4	NA	60.40	50.00	3.280	50.00	50.00	1.00	9.00	0.99	40.64	6.1	2.15E-04
* 5	rc,jr	3/28	10:44:22	23.7		NA	60.40	50.00	3.280	50.00	50.00	2.00	8.01		30.53	6.1	2.09E-04

Average $k_{20°C}$:	2.18E-04	cm/s
Max. Dev. from mean:	3.9%	
Avg. Initial Gradient (i_o) :	6.1	
Intrinsic (Absolute) Permability, *K*:	2.23E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12/10/2012	PROJECT NAME RD17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-212B	SAMPLE NO. S08A a	PENETRATION (Depth) 22.75	PERMEAMETER NO. Perm 3
MATERIAL DESCRIPTION	Sand, brown with silt seams		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	14.7	28.4	HEIGHT, H	8.760 (cm)	8.721 (cm)	Cell Pressure (psi)	1140.94
Total Unit Weight (pcf)	100.6	121.0	DIAMETER, D	7.13 (cm)	(cm)	Back Pressure (psi)	577.74
Dry Unit Weight (pcf)	86.8	94.3	AREA, A	39.88 (cm^2)	36.90 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	46.7	100.0	VOLUME, V	349.38 (cm^3)	321.84 (cm^3)	Axial Strain During Consolidation (%)	0.45
Void Ratio e	0.902	0.752	LENGTH, L Mamometer separation		8.760 (cm)	Volumetric Strain Consolidation (%)	7.88

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec) Q = Volume of Water (cm^3)

A = Cross. Area of Specimen (cm^2) L = Length of Specimen (cm)

h = Head (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
#####	60	50.0	36.2	23.3	1.6	13.8	8.9	2.36E-03	2.18E-03
#####	60	50.0	36.2	23.3	1.6	13.8	8.9	2.36E-03	2.18E-03
#####	60	50.0	36.2	23.3	1.6	13.8	9	2.39E-03	2.21E-03
#####	60	50.0	36.2	23.3	1.6	13.8	8	2.12E-03	1.96E-03
				Gradient average:	1.6	13.8		2.31E-03	2.13E-03
#####	30	50.0	34.6	23.3	1.8	15.4	5.5	2.61E-03	2.42E-03
#####	30	50.0	34.6	23.3	1.8	15.4	5.3	2.52E-03	2.33E-03
#####	60	50.0	34.6	23.3	1.8	15.4	10.3	2.45E-03	2.26E-03
#####	30	50.0	34.6	23.3	1.8	15.4	5.3	2.52E-03	2.33E-03
				Gradient average:	1.8	15.4		2.53E-03	2.34E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 12/12/12

Input By: RC,jr Date: 12/12/12

Reviewed By: RJ Date: 12/13/2012

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 4/9/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-212B	SAMPLE NO. S12A a	PENETRATION (Depth) 34.3	PERMEAMETER NO. CHP-1
MATERIAL DESCRIPTION	Silty Clayey Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	21.1	19.3	HEIGHT, H	8.741 (cm)	8.687 (cm)	Cell Pressure (psi)	68.80
Total Unit Weight (pcf)	129.0	130.3	DIAMETER, D	7.22 (cm)	7.15 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	106.5	109.3	AREA, A	40.98 (cm^2)	40.21 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	101.7	100.0	VOLUME, V	358.21 (cm^3)	349.29 (cm^3)	Axial Strain During Consolidation (%)	0.62
Void Ratio e	0.550	0.511	LENGTH, L Mamometer separation		8.687 (cm)	Volumetric Strain Consolidation (%)	2.49

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
04-01	120	53.8	34.2	23.2	2.3	19.6	9.5	8.56E-04	7.94E-04
04-01	120	53.8	34.2	23.2	2.3	19.6	9.2	8.29E-04	7.69E-04
04-01	120	53.8	34.2	23.2	2.3	19.6	9.1	8.20E-04	7.60E-04
04-01	120	53.8	34.2	23.2	2.3	19.6	9.1	8.20E-04	7.60E-04
				Gradient average:	2.3	19.6		8.31E-04	7.71E-04
04-01	180	46.0	34.2	23.2	1.4	11.8	8.6	8.58E-04	7.96E-04
04-01	180	46.0	34.2	23.2	1.4	11.8	8.3	8.28E-04	7.68E-04
04-01	180	46.0	34.2	23.2	1.4	11.8	8.3	8.28E-04	7.68E-04
04-01	180	46.0	34.2	23.2	1.4	11.8	8	7.98E-04	7.40E-04
				Gradient average:	1.4	11.8		8.28E-04	7.68E-04
				Gradient average:					
				Gradient average:					

Tested By: RJ
Date: 04-01-2013

Input By: RC,jr
Date: 04-05-13

Reviewed By:
Date: 04-09-13

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-8 | Boring/Exploration No.: WR0017-215B
Task Number: | Test Stage: 1 of 4 | Test Station No.: 2 | Sample No.: S05A
Project Name: | Test No.: NA | File Name: WR0017-215B_S05AbV | Penetration/Depth (ft): 14.65
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Sandy Clay, Brown with few borrow holes. Some non-uniformity is observed within the sample | Specimen No.: bRt

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.340
Vert. Dial/DT No.: | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	78.290	28.81
☐ m/yr	Final:	78.290	27.93
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.53	
Applied back pressure, U_b (psi) =		60.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.			
Area headwater tube, a_{in} (cm^2):			0.1969
Area tailwater tube, a_{out} (cm^2):			0.1969
Permeant/Fluid Density,		Accum.	NA
at 22^{o}C, $\rho_{f,n}$ (g/cm^3);		System	0.9978
Elev. Heads by:	X Vol. (1)	☐ Elev.	
If by Vol.:	X Case 2	☐ Case 3	
Differential Pressure Head System			
☐ Differential Manometer (cm Hg):			
	☐ U-tube;	☐ Vert. Column	
X Pressure Trans./Gage (psi):		☐ Differential	

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.20	60.6
1.0E-5 to 1.0E-6	≤10	60.76	61.2
1.0E-6 to 1.0E-7	≤20	61.87	62.5
<1.0E-7 or <3.0E-2 (m/yr)	≤30	62.98	63.7
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. ^{o}C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	3/4	7:58:37	23.1	1.7	NA	70.04	60.00	4.340	60.00	60.00	3.00	7.00	1.02	20.32	2.6	1.88E-04
1	rc,jr	3/4	8:00:17	23.1		NA	70.04	60.00	4.340	60.00	60.00	4.00	5.98		10.06	2.6	1.81E-04
	rc,jr	3/4	8:02:28	23.1	1.6	NA	70.04	60.00	4.340	60.00	60.00	3.00	7.00	1.02	20.320	2.6	1.90E-04
* 2	rc,jr	3/4	8:04:07	23.1		NA	70.04	60.00	4.340	60.00	60.00	4.00	5.98		10.058	2.6	1.82E-04
	rc,jr	3/4	8:05:12	23.1	1.6	NA	70.04	60.00	4.340	60.00	60.00	3.00	7.00	1.00	20.32	2.6	1.89E-04
* 3	rc,jr	3/4	8:06:50	23.1		NA	70.04	60.00	4.340	60.00	60.00	4.00	6.00		10.16	2.6	1.82E-04
	rc,jr	3/4	8:07:50	23.1	1.7	NA	70.04	60.00	4.340	60.00	60.00	3.00	7.00	1.00	20.32	2.6	1.85E-04
* 4	rc,jr	3/4	8:09:30	23.1		NA	70.04	60.00	4.340	60.00	60.00	4.00	6.00		10.16	2.6	1.78E-04
	rc,jr	3/4	8:10:36	23.1	1.6	NA	70.04	60.00	4.340	60.00	60.00	3.00	7.00	1.01	20.32	2.6	1.89E-04
* 5	rc,jr	3/4	8:12:15	23.1		NA	70.04	60.00	4.340	60.00	60.00	4.00	5.99		10.11	2.6	1.81E-04

Average k_{20^oC} :	1.81E-04	cm/s
Max. Dev. from mean:	1.5%	
Avg. Initial Gradient (i_o) :	2.6	
Intrinsic (Absolute) Permability, *K*:	1.85E-09	cm^2

(*) Indicates trials used for calculations (Average k_{20^oC}, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RJ | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-8 | Boring/Exploration No.: WR0017-215B
Task Number: ______ | Test Stage: 2 of 4 | Test Station No.: 2 | Sample No.: S05A
Project Name: ______ | Test No.: NA | File Name: WR0017-215B_S05AbV | Penetration/Depth (ft): 14.65
Test Series No.: NA | Test Sheet: 1 of ___ | Composite Sample No.: ______
Material Description: Sandy Clay, Brown with few borrow holes. Some non-uniformity is observed within the sample | Specimen No.: bRt

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.340
Vert. Dial/DT No.: DG-026 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): ______

Permeation & Specimen Information

Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	78.290	28.81
☐ m/yr	Final:	78.290	27.93

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.53
Applied back pressure, U_b (psi) = 60.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	☐ Elev.
If by Vol.: X Case 2	☐ Case 3

Differential Pressure Head System
☐ Differential Manometer (cm Hg):
☐ U-tube; ☐ Vert. Column
X Pressure Trans./Gage (psi): ☐ Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.20	60.6
1.0E-5 to 1.0E-6	≤10	60.76	61.2
1.0E-6 to 1.0E-7	≤20	61.87	62.5
<1.0E-7 or <3.0E-2 (m/yr)	≤30	62.98	63.7
For Special Gradtient, i			

Remarks: ______

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/4	9:45:40	23.1	0.5	NA	70.40	60.00	4.340	60.00	60.00	0.20	9.80	1.01	48.77	6.2	1.96E-04
1	rc,jr	3/4	9:46:12	23.1		NA	70.40	60.00	4.340	60.00	60.00	1.20	8.79		38.56	6.2	1.89E-04
	rc,jr	3/4	9:47:03	23.1	0.6	NA	70.40	60.00	4.340	60.00	60.00	0.20	9.80	1.02	48.768	6.2	1.86E-04
* 2	rc,jr	3/4	9:47:37	23.1		NA	70.40	60.00	4.340	60.00	60.00	1.20	8.78		38.506	6.2	1.79E-04
	rc,jr	3/4	9:48:30	23.1	0.6	NA	70.40	60.00	4.340	60.00	60.00	0.20	9.80	1.00	48.77	6.2	1.84E-04
* 3	rc,jr	3/4	9:49:04	23.1		NA	70.40	60.00	4.340	60.00	60.00	1.20	8.80		38.61	6.2	1.77E-04
	rc,jr	3/4	9:49:51	23.1	0.6	NA	70.40	60.00	4.340	60.00	60.00	0.20	9.80	1.01	48.77	6.2	1.70E-04
* 4	rc,jr	3/4	9:50:28	23.1		NA	70.40	60.00	4.340	60.00	60.00	1.20	8.79		38.56	6.2	1.63E-04
	rc,jr	3/4	9:51:16	23.1	0.6	NA	70.40	60.00	4.340	60.00	60.00	0.20	9.80	1.02	48.77	6.2	1.71E-04
* 5	rc,jr	3/4	9:51:53	23.1		NA	70.40	60.00	4.340	60.00	60.00	1.20	8.78		38.51	6.2	1.64E-04

Average $k_{20°C}$:	1.71E-04	cm/s
Max. Dev. from mean:	4.7%	
Avg. Initial Gradient (i_o) :	6.2	
Intrinsic (Absolute) Permability, *K*:	1.75E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RJ | Reviewed By: Rj

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-8 | Boring/Exploration No.: WR0017-215B

Task Number: ______ | Test Stage: 3 of 4 | Test Station No.: 2 | Sample No.: S05A

Project Name: ______ | Test No.: NA | File Name: WR0017-215B_S05AbV | Penetration/Depth (ft): 14.65

Test Series No.: NA | Test Sheet: ___ of ___ | Composite Sample No.: ______

Material Description: Sandy Clay, Brown with few borrow holes. Some non-uniformity is observed within the sample | Specimen No.: bRt

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.140

Vert. Dial/DT No.: DG-026 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at $\sigma_c = 0$ (mm): ______

Permeation & Specimen Information

Permeant:	X	Tap Water;		
Direction of Flow:	X	Up;		Down
Perm. Orientation:	X	Vertical;		Horizontal
Specimen:	X	"Intact;"		Reconstituted;

Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	77.490	28.57
m/yr	Final:	77.490	27.39

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.33

Applied back pressure, U_b (psi) = 60.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permaent/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System

Differential Manometer (cm Hg):

U-tube; Vert. Column

X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.20	60.6
1.0E-5 to 1.0E-6	≤10	60.74	61.2
1.0E-6 to 1.0E-7	≤20	61.84	62.4
<1.0E-7 or <3.0E-2 (m/yr)	≤30	62.94	63.7
For Special Gradient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/8	7:57:56	24	2.8	NA	87.80	60.00	5.140	60.00	60.00	3.00	7.00	1.00	20.32	2.6	1.11E-04
1	rc,jr	3/8	8:00:42	24.0		NA	87.80	60.00	5.140	60.00	60.00	4.00	6.00		10.16	2.6	1.06E-04
	rc,jr	3/8	8:03:58	24.0	5.7	NA	87.80	60.00	5.140	60.00	60.00	3.00	7.00	1.00	20.320	2.6	1.09E-04
* 2	rc,jr	3/8	8:09:37	24.0		NA	87.80	60.00	5.140	60.00	60.00	4.50	5.50		5.080	2.6	1.04E-04
	rc,jr	3/8	8:10:24	24.0	2.6	NA	87.80	60.00	5.140	60.00	60.00	3.00	7.00	1.01	20.32	2.6	1.19E-04
* 3	rc,jr	3/8	8:13:01	24.0		NA	87.80	60.00	5.140	60.00	60.00	4.00	5.99		10.11	2.6	1.13E-04
	rc,jr	3/8	8:14:27	24.0	2.7	NA	87.80	60.00	5.140	60.00	60.00	3.00	7.00	1.00	20.32	2.6	1.14E-04
* 4	rc,jr	3/8	8:17:10	24.0		NA	87.80	60.00	5.140	60.00	60.00	4.00	6.00		10.16	2.6	1.08E-04
	rc,jr	3/8	8:17:58	24.0	2.6	NA	87.80	60.00	5.140	60.00	60.00	3.00	7.00	1.00	20.32	2.6	1.18E-04
* 5	rc,jr	3/8	8:20:35	24.0		NA	87.80	60.00	5.140	60.00	60.00	4.00	6.00		10.16	2.6	1.12E-04

Average $k_{20°C}$:	1.09E-04	cm/s
Max. Dev. from mean:	4.9%	
Avg. Initial Gradient (i_o) :	2.6	
Intrinsic (Absolute) Permability, *K*:	1.12E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RJ | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-8 | Boring/Exploration No.: WR0017-215B
Task Number: | Test Stage: 4 of 4 | Test Station No.: 2 | Sample No.: S05A
Project Name: | Test No.: NA | File Name: WR0017-215B_S05AbV | Penetration/Depth (ft): 14.65
Test Series No.: NA | Test Sheet: __ of __ | Composite Sample No.:
Material Description: Sandy Clay, Brown with few borrow holes. Some non-uniformity is observed within the sample | Specimen No.: bRt

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.140
Vert. Dial/DT No.: DG-026 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm): 5.05

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	77.490	28.57
m/yr	Final:	77.490	27.39
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	1.33		
Applied back pressure, U_b (psi) =	60.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permaent/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1) / Elev.	
If by Vol.: X Case 2 / Case 3	
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.20	60.6
1.0E-5 to 1.0E-6	≤10	60.74	61.2
1.0E-6 to 1.0E-7	≤20	61.84	62.4
<1.0E-7 or <3.0E-2 (m/yr)	≤30	62.94	63.7
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/8	7:32:21	24	0.9	NA	87.80	60.00	5.140	60.00	60.00	0.10	9.90	1.01	49.78	6.4	1.13E-04
1	rc,jr	3/8	7:33:15	24.0		NA	87.80	60.00	5.140	60.00	60.00	1.10	8.89		39.57	6.4	1.08E-04
	rc,jr	3/8	7:34:15	24.0	0.9	NA	87.80	60.00	5.140	60.00	60.00	0.10	9.90	1.02	49.784	6.4	1.14E-04
* 2	rc,jr	3/8	7:35:09	24.0		NA	87.80	60.00	5.140	60.00	60.00	1.10	8.88		39.522	6.4	1.09E-04
	rc,jr	3/8	7:36:10	24.0	0.9	NA	87.80	60.00	5.140	60.00	60.00	0.10	9.90	1.02	49.78	6.4	1.16E-04
* 3	rc,jr	3/8	7:37:03	24.0		NA	87.80	60.00	5.140	60.00	60.00	1.10	8.88		39.52	6.4	1.11E-04
	rc,jr	3/8	7:37:43	24.0	0.9	NA	87.80	60.00	5.140	60.00	60.00	0.10	9.90	1.01	49.78	6.4	1.16E-04
* 4	rc,jr	3/8	7:38:36	24.0		NA	87.80	60.00	5.140	60.00	60.00	1.10	8.89		39.57	6.4	1.10E-04
	rc,jr	3/8	7:39:28	24.0	0.8	NA	87.80	60.00	5.140	60.00	60.00	0.10	9.90	1.01	49.78	6.4	1.20E-04
* 5	rc,jr	3/8	7:40:19	24.0		NA	87.80	60.00	5.140	60.00	60.00	1.10	8.89		39.57	6.4	1.14E-04

Average $k_{20°C}$:	1.11E-04	cm/s
Max. Dev. from mean:	3.1%	
Avg. Initial Gradient (i_o) :	6.4	
Intrinsic (Absolute) Permability, *K*:	1.14E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RJ | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm 3 | Boring/Exploration No.: WR0017-215B

Task Number: | Test Stage: 1 of 4 | Test Station No.: 4 | Sample No.: S06A

Project Name: | Test No.: NA | File Name: WR0017-215B_S06AbV | Penetration/Depth (ft): 19.40

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Clayey fine sand, brown with clay pockets/seams | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.080

Vert. Dial/DT No.: DG-016 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	100.152	39.84
☐ m/yr	Final:	100.152	39.49
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		1.42	
Applied back pressure, U_b (psi) =		60.0	
Bladder Inteface: H_f & H_b in cm, with H_f =		NA	H_b = NA

Test Station Constants/App. Imfo.			
Area headwater tube, a_{in} (cm^2):			0.1969
Area tailwater tube, a_{out} (cm^2):			0.1969
Permeant/Fluid Density,		Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);		System	0.9978
Elev. Heads by:	X Vol. (1)		☐ Elev.
If by Vol.:	X Case 2		☐ Case 3
Differential Pressure Head System			
☐ Differential Manometer (cm Hg):			
	☐ U-tube;	☐ Vert. Column	
X Pressure Trans./Gage (psi):			☐ Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.36	60.8
1.0E-5 to 1.0E-6	≤10	61.07	61.6
1.0E-6 to 1.0E-7	≤20	62.49	63.2
<1.0E-7 or <3.0E-2 (m/yr)	≤30	63.91	64.7
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	VR	11/20	10:10:17	23.7	33.8	NA	72.50	60.00	3.080	60.00	60.00	3.00	7.00	0.18	20.32	2.0	#NUM!
1	VR	11/20	10:44:07	23.7		NA	72.50	60.00	3.080	60.00	60.00	7.00	6.30		-3.56	2.0	#NUM!
	VR	11/20	10:46:17	23.7	32.8	NA	72.50	60.00	3.080	60.00	60.00	3.00	7.00	1.00	20.320	2.0	5.22E-06
* 2	VR	11/20	11:19:07	23.7		NA	72.50	60.00	3.080	60.00	60.00	3.68	6.32		13.411	2.0	4.84E-06
	VR	11/20	11:20:59	23.7	68.0	NA	72.50	60.00	3.080	60.00	60.00	3.00	7.00	1.00	20.32	2.0	5.71E-06
* 3	VR	11/20	12:28:57	23.7		NA	72.50	60.00	3.080	60.00	60.00	4.22	5.78		7.92	2.0	5.29E-06
	VR	11/20	12:30:12	23.7	40.0	NA	72.50	60.00	3.080	60.00	60.00	3.00	7.00	1.00	20.32	2.0	5.27E-06
* 4	VR	11/20	13:10:12	23.7		NA	72.50	60.00	3.080	60.00	60.00	3.80	6.20		12.19	2.0	4.88E-06
	VR	11/20	13:11:39	23.7	32.3	NA	72.50	60.00	3.080	60.00	60.00	3.00	7.00	1.00	20.32	2.0	5.11E-06
* 5	VR	11/20	13:43:57	23.7		NA	72.50	60.00	3.080	60.00	60.00	3.66	6.34		13.61	2.0	4.74E-06

Average $k_{20°C}$:	4.94E-06	cm/s
Max. Dev. from mean:	7.2%	
Avg. Initial Gradient (i_o):	2.0	
Intrinsic (Absolute) Permability, *K*:	5.05E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm 3 | Boring/Exploration No.: WR0017-215B
Task Number: | Test Stage: 2 of 4 | Test Station No.: 4 | Sample No.: S06A
Project Name: | Test No.: NA | File Name: WR0017-215B_S06AbV | Penetration/Depth (ft): 19.40
Test Series No.: NA | Test Sheet: ___ of ___ | Composite Sample No.:
Material Description: Clayey fine sand, brown with clay pockets/seams | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.080
Vert. Dial/DT No.: DG016 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	100.152	39.84
m/yr	Final:	100.152	39.49

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.42
Applied back pressure, U_b (psi) = 60.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permaent/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.36	60.8
1.0E-5 to 1.0E-6	≤10	61.07	61.6
1.0E-6 to 1.0E-7	≤20	62.49	63.2
<1.0E-7 or <3.0E-2 (m/yr)	≤30	63.91	64.7
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	vr	11/21	5:11:12	23.6	12.1	NA	72.50	60.00	3.080	60.00	60.00	0.00	10.00	1.00	50.80	5.1	3.60E-06
1	vr	11/21	5:23:17	23.6		NA	72.50	60.00	3.080	60.00	60.00	0.50	9.50		45.72	5.1	3.34E-06
	vr	11/21	5:24:19	23.6	26.2	NA	72.50	60.00	3.080	60.00	60.00	0.00	10.00	1.00	50.800	5.1	3.52E-06
* 2	vr	11/21	5:50:29	23.6		NA	72.50	60.00	3.080	60.00	60.00	1.00	9.00		40.640	5.1	3.27E-06
	vr	11/21	5:51:17	23.6	26.6	NA	72.50	60.00	3.080	60.00	60.00	0.00	10.00	1.00	50.80	5.1	3.46E-06
* 3	vr	11/21	6:17:51	23.6		NA	72.50	60.00	3.080	60.00	60.00	1.00	9.00		40.64	5.1	3.22E-06
	vr	11/21	6:18:52	23.6	26.6	NA	72.50	60.00	3.080	60.00	60.00	0.00	10.00	1.00	50.80	5.1	3.46E-06
* 4	vr	11/21	6:45:27	23.6		NA	72.50	60.00	3.080	60.00	60.00	1.00	9.00		40.64	5.1	3.21E-06
	vr	11/21	6:46:20	23.6	26.6	NA	72.50	60.00	3.080	60.00	60.00	0.00	10.00	1.00	50.80	5.1	3.46E-06
* 5	vr	11/21	7:12:57	23.6		NA	72.50	60.00	3.080	60.00	60.00	1.00	9.00		40.64	5.1	3.21E-06

Average $k_{20°C}$:	3.23E-06 cm/s
Max. Dev. from mean:	1.2%
Avg. Initial Gradient (i_o):	5.1
Intrinsic (Absolute) Permability, *K*:	3.30E-11 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm 3 | Boring/Exploration No.: WR0017-215B
Task Number: | Test Stage: 3 of 4 | Test Station No.: 4 | Sample No.: S06A
Project Name: | Test No.: NA | File Name: WR0017-215B_S06AbV | Penetration/Depth (ft): 19.40
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Clayey fine sand, brown with clay pockets/seams | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 2.350
Vert. Dial/DT No.: DG-016 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	99.422	39.60
m/yr	Final:	99.422	39.09
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		2.15	
Applied back pressure, U_b (psi) =		60.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.35	60.8
1.0E-5 to 1.0E-6	≤10	61.06	61.6
1.0E-6 to 1.0E-7	≤20	62.47	63.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	63.88	64.7
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_f cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	11/27	10:44:31	23.5	65.8	NA	87.80	60.00	2.350	60.30	60.00	3.00	7.00	1.00	41.46	4.2	1.97E-06
1	rc,jr	11/27	11:50:20	23.5		NA	87.80	60.00	2.350	60.30	60.00	4.10	5.90		30.28	4.2	1.84E-06
	rc,jr	11/27	11:54:55	23.5	53.8	NA	87.80	60.00	2.350	60.50	60.00	3.00	7.00	1.01	55.553	5.6	1.61E-06
* 2	rc,jr	11/27	12:48:40	23.5		NA	87.80	60.00	2.350	60.50	60.00	4.03	5.96		45.037	5.6	1.50E-06
	rc,jr	11/27	12:49:23	23.5	108.1	NA	87.80	60.00	2.350	60.50	60.00	3.00	7.00	1.01	55.55	5.6	1.53E-06
* 3	rc,jr	11/27	14:37:27	23.5		NA	87.80	60.00	2.350	60.50	60.00	4.80	5.19		37.21	5.6	1.43E-06
	rc,jr	11/28	4:55:00	23.5	70.6	NA	87.80	60.00	2.350	60.50	60.00	3.00	7.00	0.99	55.55	5.6	1.47E-06
* 4	rc,jr	11/28	6:05:37	23.5		NA	87.80	60.00	2.350	60.50	60.00	4.22	5.79		43.21	5.6	1.37E-06
	rc,jr	11/28	9:50:48	23.5	73.2	NA	87.80	60.00	2.350	60.50	60.00	3.00	7.00	1.01	55.55	5.6	1.56E-06
* 5	rc,jr	11/28	11:03:58	23.5		NA	87.80	60.00	2.350	60.50	60.00	4.32	5.67		42.09	5.6	1.46E-06

Average $k_{20°C}$:	1.44E-06	cm/s
Max. Dev. from mean:	4.9%	
Avg. Initial Gradient (i_o) :	5.6	
Intrinsic (Absolute) Permability, *K*:	1.47E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RCjr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm 3 | Boring/Exploration No.: /VR0017-215B
Task Number: | Test Stage: 4 of 4 | Test Station No.: 4 | Sample No.: S06A
Project Name: | Test No.: NA | File Name: WR0017-215B_S06AbV | Penetration/Depth (ft): 19.40
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Clayey fine sand, brown with clay pockets/seams | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 2.350
Vert. Dial/DT No.: DG-016 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 2.57

Permeation & Specimen Information			
Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	99.422	39.60
☐ m/yr	Final:	99.422	39.09
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	2.15		
Applied back pressure, U_b (psi) =	60.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1) ☐ Elev.	
If by Vol.: X Case 2 ☐ Case 3	
Differential Pressure Head System	
☐ Differential Manometer (cm Hg):	
☐ U-tube; ☐ Vert. Column	
X Pressure Trans./Gage (psi): ☐ Differential	

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.35	60.8
1.0E-5 to 1.0E-6	≤10	61.06	61.6
1.0E-6 to 1.0E-7	≤20	62.47	63.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	63.88	64.7
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary Final	Hyd. Conductivity, k Preliminary, k_t Final, k_{20^oC} cm/s
	rc,jr	11/28	12:50:30	23.7	88.6	NA	87.80	60.00	2.350	60.50	60.00	0.00	10.00	1.00	86.03	8.7	1.55E-06
1	vr	11/28	14:19:07	23.7		NA	87.80	60.00	2.350	60.50	60.00	2.40	7.60		61.65	8.7	1.44E-06
	rc,jr	11/29	4:54:40	23.3	52.7	NA	87.80	60.00	2.350	60.50	60.00	0.00	10.00	1.01	86.033	8.7	1.46E-06
* 2	rc,jr	11/29	5:47:23	23.3		NA	87.80	60.00	2.350	60.50	60.00	1.44	8.55		71.351	8.7	1.37E-06
	rc,jr	11/29	5:48:12	23.3	38.8	NA	87.80	60.00	2.350	60.50	60.00	0.00	10.00	1.01	86.03	8.7	1.48E-06
* 3	rc,jr	11/29	6:26:59	23.3		NA	87.80	60.00	2.350	60.50	60.00	1.10	8.89		74.81	8.7	1.39E-06
	rc,jr	11/29	6:22:56	23.3	40.4	NA	87.80	60.00	2.350	60.50	60.00	0.00	10.00	1.00	86.03	8.7	1.28E-06
* 4	vr	11/29	7:03:17	23.3		NA	87.80	60.00	2.350	60.50	60.00	1.00	9.00		75.87	8.7	1.20E-06
	vr	11/29	7:04:37	23.3	40.1	NA	87.80	60.00	2.350	60.50	60.00	0.00	10.00	1.00	86.03	8.7	1.43E-06
* 5	rc,jr	11/29	7:44:45	23.3		NA	87.80	60.00	2.350	60.50	60.00	1.10	8.90		74.86	8.7	1.34E-06

Average $k_{20^\circ C}$:	1.33E-06	cm/s
Max. Dev. from mean:	9.3%	
Avg. Initial Gradient (i_o) :	8.7	
Intrinsic (Absolute) Permability, *K*:	1.36E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20^\circ C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 4/3/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-216B	SAMPLE NO. S03A a	PENETRATION (Depth) 7.85	PERMEAMETER NO. CHP-3
MATERIAL DESCRIPTION	Poorly Graded Sand, brown		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	3.7	24.8	HEIGHT, H	10.768 (cm)	10.730 (cm)	Cell Pressure (psi)	56.90
Total Unit Weight (pcf)	98.2	124.4	DIAMETER, D	5.01 (cm)	4.89 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	94.6	99.7	AREA, A	19.69 (cm^2)	18.75 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	13.3	100.0	VOLUME, V	211.99 (cm^3)	201.20 (cm^3)	Axial Strain During Consolidation (%)	0.35
Void Ratio e	0.746	0.657	LENGTH, L Mamometer separation		10.730 (cm)	Volumetric Strain Consolidation (%)	5.09

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
04-03	60	39.3	34.1	23.1	0.5	5.2	13	2.27E-02	2.11E-02
04-03	60	39.3	34.1	23.1	0.5	5.2	13	2.27E-02	2.11E-02
04-03	60	39.3	34.1	23.1	0.5	5.2	12.7	2.22E-02	2.06E-02
04-03	60	39.3	34.1	23.1	0.5	5.2	12.7	2.22E-02	2.06E-02
				Gradient average:	0.5	5.2		2.24E-02	2.09E-02
04-03	120	36.8	34.1	23.1	0.3	2.7	14	2.35E-02	2.19E-02
04-03	120	36.8	34.1	23.1	0.3	2.7	13.8	2.32E-02	2.16E-02
04-03	120	36.8	34.1	23.1	0.3	2.7	13.3	2.24E-02	2.08E-02
04-03	120	36.8	34.1	23.1	0.3	2.7	13.2	2.22E-02	2.06E-02
				Gradient average:	0.3	2.7		2.28E-02	2.12E-02
				Gradient average:					
				Gradient average:					

Tested By: RJ
Date: 04-03-2013

Input By: RC,jr
Date: 04-08-2013

Reviewed By: RJ
Date: 04-11-2013

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12/12/2012	PROJECT NAME RD17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-216B	SAMPLE NO. S05A a	PENETRATION (Depth) 13.55	PERMEAMETER NO. CH P-2
MATERIAL DESCRIPTION	Sand, Brown		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	3.8	30.6	HEIGHT, H	9.500 (cm)	9.422 (cm)	Cell Pressure (psi)	60.40
Total Unit Weight (pcf)	86.5	119.1	DIAMETER, D	5.15 (cm)	4.94 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	83.3	91.2	AREA, A	20.80 (cm^2)	19.16 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	10.4	100.0	VOLUME, V	197.58 (cm^3)	180.48 (cm^3)	Axial Strain During Consolidation (%)	0.82
Void Ratio e	0.982	0.810	LENGTH, L Mamometer separation		9.500 (cm)	Volumetric Strain Consolidation (%)	8.65

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec)
Q = Volume of Water (cm^3)
A = Cross. Area of Specimen (cm^2)
L = Length of Specimen (cm)
h = Head (cm)
t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12-12-12	60	38.5	34.6	21.7	0.4	3.9	13.2	2.58E-02	2.47E-02
12-12-12	60	38.5	34.6	21.7	0.4	3.9	12.9	2.52E-02	2.42E-02
12-12-12	60	38.5	34.6	21.7	0.4	3.9	13.1	2.56E-02	2.46E-02
12-12-12	60	38.5	34.6	21.7	0.4	3.9	13.3	2.60E-02	2.49E-02
				Gradient average:	0.4	3.9		2.56E-02	2.46E-02
12-12-12	60	40.0	34.6	21.7	0.6	5.4	18.2	2.57E-02	2.46E-02
12-12-12	60	40.0	34.6	21.7	0.6	5.4	18.2	2.57E-02	2.46E-02
12-12-12	60	40.0	34.6	21.7	0.6	5.4	18.4	2.59E-02	2.49E-02
12-12-12	60	40.0	34.6	21.7	0.6	5.4	18.8	2.65E-02	2.54E-02
				Gradient average:	0.6	5.4		2.59E-02	2.49E-02
				Gradient average:					
				Gradient average:					

Tested By: RC,jr
Date: 12/12/12

Input By: RC,jr
Date: 12/12/12

Reviewed By: RJ
Date: 12/14/2012

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-216E

Task Number: | Test Stage: 1 of 2 | Test Station No.: 18 | Sample No.: S06A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 16.70

Test Series No.: NA | File Name: WR0017-216B_S06AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.310

Vert. Dial/DT No.: DG-026 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	74.254	19.82
= 50.0	Final:	74.254	19.98

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.22

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.6	51.1
1.0E-5 to 1.0E-6	≤10	5.5	52.1
1.0E-6 to 1.0E-7	≤20	11.4	54.2
<1.0E-7 or <3.0E-2 (m/yr)	≤30	17.4	56.3
For Special Gradient, i_o			

Trial No.	Readings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	vr	12/21	8:52:13	23.8	0.9	NA	61.8	50.0	3.310	10.00	1.25	114.6	15.4	6.61E-01	6.00E-01	7.81
1	vr	12/21	8:53:05	23.8		NA	61.8	50.0	3.310	9.00	XXXXX	101.6	15.4	2.10E-06	1.90E-06	
	vr	12/21	8:53:39	23.8	0.9	NA	61.8	50.0	3.310	10.00	1.25	114.6	15.4	6.61E-01	6.00E-01	7.81
* 2	vr	12/21	8:54:31	23.8		NA	61.8	50.0	3.310	9.00	XXXXX	101.6	15.4	2.10E-06	1.90E-06	
	vr	12/21	8:55:14	23.8	0.9	NA	61.8	50.0	3.310	10.00	1.25	114.6	15.4	6.37E-01	5.77E-01	7.81
* 3	vr	12/21	8:56:08	23.8		NA	61.8	50.0	3.310	9.00	XXXXX	101.6	15.4	2.02E-06	1.83E-06	
	vr	12/21	8:56:44	23.8	0.9	NA	61.8	50.0	3.310	10.00	1.25	114.6	15.4	6.49E-01	5.88E-01	7.81
* 4	vr	12/21	8:57:37	23.8		NA	61.8	50.0	3.310	9.00	XXXXX	101.6	15.4	2.06E-06	1.87E-06	
	vr	12/21	8:58:48	23.8	0.9	NA	61.8	50.0	3.310	10.00	1.25	114.6	15.4	6.61E-01	6.00E-01	7.81
* 5	vr	12/21	8:59:40	23.8		NA	61.8	50.0	3.310	9.00	XXXXX	101.6	15.4	2.10E-06	1.90E-06	

Average $k_{20°C}$:	1.87E-06	cm/s
Max. Dev. from Mean:	2.3%	
Avg. Initial Gradient (i_o) :	15.4	
Intrinsic (Absolute) Permeability, *K*:	1.92E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: VR | Final Calc. By: RJ | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-216E

Task Number: ______ | Test Stage: 2 of 2 | Test Station No.: 18 | Sample No.: S06A

Project Name: ______ | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 16.70

Test Series No.: NA | File Name: WR0017-216B_S06AaV | Composite Sample No.: ______

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.310

Vert. Dial/DT No.: DG026 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): 3.440

Permeation & Specimen Information

Permeant:	X	Tap Water;		
Direction of Flow:	X	Up;		Down
Perm. Orientation:	X	Vertical;		Horizontal
Specimen:	X	"Intact;"		Reconstituted;
Back	Stage		Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:		74.254	19.82
= 50.0	Final:		74.254	19.98

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.22

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25^{o}C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.6	51.1
1.0E-5 to 1.0E-6	≤10	5.5	52.1
1.0E-6 to 1.0E-7	≤20	11.4	54.2
<1.0E-7 or <3.0E-2 (m/yr)	≤30	17.4	56.3
For Special Gradient, i_o			

Trial No.	Readings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. ^{o}C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial / DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	vr	12/21	9:38:44	23.8	2.1	NA	61.8	50.0	3.310	5.00	1.45	49.3	6.6	7.06E-01	6.40E-01	4.06
1	vr	12/21	9:40:48	23.8		NA	61.8	50.0	3.310	4.00	XXXXX	36.2	6.6	2.24E-06	2.03E-06	
	vr	12/21	9:41:10	23.8	2.2	NA	61.8	50.0	3.310	5.00	1.45	49.3	6.6	6.63E-01	6.02E-01	4.06
* 2	vr	12/21	9:43:22	23.8		NA	61.8	50.0	3.310	4.00	XXXXX	36.2	6.6	2.10E-06	1.91E-06	
	vr	1/12	9:44:23	23.8	2.2	NA	61.8	50.0	3.310	5.00	1.45	49.3	6.6	6.63E-01	6.02E-01	4.06
* 3	vr	1/12	9:46:35	23.8		NA	61.8	50.0	3.310	4.00	XXXXX	36.2	6.6	2.10E-06	1.91E-06	
	vr	12/21	9:47:12	23.8	2.2	NA	61.8	50.0	3.310	5.00	1.45	49.3	6.6	6.69E-01	6.06E-01	4.06
* 4	vr	12/21	9:49:23	23.8		NA	61.8	50.0	3.310	4.00	XXXXX	36.2	6.6	2.12E-06	1.92E-06	
	vr	12/21	9:49:59	23.8	2.2	NA	61.8	50.0	3.310	5.00	1.45	49.3	6.6	6.69E-01	6.06E-01	4.06
* 5	vr	12/21	9:52:10	23.8		NA	61.8	50.0	3.310	4.00	XXXXX	36.2	6.6	2.12E-06	1.92E-06	

Average k_{20^oC} :	1.91E-06	cm/s
Max. Dev. from Mean:	0.4%	
Avg. Initial Gradient (i_o) :	6.6	
Intrinsic (Absolute) Permeability, *K*:	1.96E-11	cm^2

(*) Indicates trials used for calculations of: Average k_{20^oC}, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: VR | Final Calc. By: RJ | Reviewed By: RJ

PERMEABILITY TEST

CONSTANT HEAD (ASTM D 5084)

DATE 12-18-12	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-216B	SAMPLE NO. S15B a	PENETRATION (Depth) 44.50	PERMEAMETER NO. CH Perm-3
MATERIAL DESCRIPTION	Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	20.1	22.0	HEIGHT, H	10.900 (cm)	10.852 (cm)	Cell Pressure (psi)	72.90
Total Unit Weight (pcf)	124.7	127.2	DIAMETER, D	6.10 (cm)	6.10 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	103.8	104.2	AREA, A	29.22 (cm^2)	29.24 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	90.4	100.0	VOLUME, V	318.55 (cm^3)	317.31 (cm^3)	Axial Strain During Consolidation (%)	0.44
Void Ratio e	0.591	0.584	LENGTH, L Mamometer separation		10.900 (cm)	Volumetric Strain Consolidation (%)	0.39

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)

Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12-18-12	300	43.0	34.6	23.3	0.8	8.4	11.3	1.67E-03	1.55E-03
12-18-12	300	43.0	34.6	23.3	0.8	8.4	11.3	1.67E-03	1.55E-03
12-18-12	300	43.0	34.6	23.3	0.8	8.4	11.7	1.73E-03	1.60E-03
12-18-12	300	43.0	34.6	23.3	0.8	8.4	11.3	1.67E-03	1.55E-03
				Gradient average:	0.8	8.4		1.69E-03	1.56E-03
12-18-12	300	47.0	34.6	23.3	1.1	12.4	14.2	1.42E-03	1.32E-03
12-18-12	300	47.0	34.6	23.3	1.1	12.4	14.4	1.44E-03	1.34E-03
12-18-12	300	47.0	34.6	23.3	1.1	12.4	14.2	1.42E-03	1.32E-03
12-18-12	300	47.0	34.6	23.3	1.1	12.4	14.3	1.43E-03	1.33E-03
				Gradient average:	1.1	12.4		1.43E-03	1.32E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 12-18-2012

Input By: RC,jr Date: 12-18-2012

Reviewed By: RJ Date: 12/20/2012

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 4/4/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-216B	SAMPLE NO. S21A a	PENETRATION (Depth) 63.0	PERMEAMETER NO. CHP-1
MATERIAL DESCRIPTION	Sand with Silt, olive gray with cementation		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	21.9	22.2	HEIGHT, H	9.429 (cm)	9.395 (cm)	Cell Pressure (psi)	81.20
Total Unit Weight (pcf)	126.1	127.1	DIAMETER, D	6.12 (cm)	6.12 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	103.5	104.0	AREA, A	29.45 (cm^2)	29.41 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	97.4	100.0	VOLUME, V	277.68 (cm^3)	276.29 (cm^3)	Axial Strain During Consolidation (%)	0.36
Void Ratio e	0.596	0.588	LENGTH, L Mamometer separation		9.395 (cm)	Volumetric Strain Consolidation (%)	0.50

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec)
Q = Volume of Water (cm^3)
A = Cross. Area of Specimen (cm^2)
L = Length of Specimen (cm)
h = Head (cm)
t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
04-04	420	49.8	34.2	23.1	1.7	15.6	5.5	2.68E-04	2.49E-04
04-04	420	49.8	34.2	23.1	1.7	15.6	5.8	2.82E-04	2.62E-04
04-04	420	49.8	34.2	23.1	1.7	15.6	5.6	2.73E-04	2.53E-04
04-04	420	49.8	34.2	23.1	1.7	15.6	5.2	2.53E-04	2.35E-04
				Gradient average:	1.7	15.6		2.69E-04	2.50E-04
04-04	300	58.6	34.2	23.1	2.6	24.4	6.3	2.75E-04	2.55E-04
04-04	300	58.6	34.2	23.1	2.6	24.4	6.5	2.83E-04	2.63E-04
04-04	300	58.6	34.2	23.1	2.6	24.4	6.4	2.79E-04	2.59E-04
04-04	300	58.6	34.2	23.1	2.6	24.4	6.2	2.70E-04	2.51E-04
				Gradient average:	2.6	24.4		2.77E-04	2.57E-04
				Gradient average:					
				Gradient average:					

Tested By: RJ
Date: 04-04-2013

Input By: RC,jr
Date: 04-05-13

Reviewed By: RJ
Date: 04-11-13

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 1/10/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-217B	SAMPLE NO. S08A a	PENETRATION (Depth) 22.95	PERMEAMETER NO. CHP-3
MATERIAL DESCRIPTION	Silty sand, brown		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	15.0	16.1	HEIGHT, H	9.470 (cm)	9.432 (cm)	Cell Pressure (psi)	63.90
Total Unit Weight (pcf)	131.6	134.4	DIAMETER, D	6.09 (cm)	6.07 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	114.5	115.7	AREA, A	29.13 (cm^2)	28.93 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	89.6	100.0	VOLUME, V	275.84 (cm^3)	272.86 (cm^3)	Axial Strain During Consolidation (%)	0.40
Void Ratio e	0.442	0.427	LENGTH, L Mamometer separation		9.432 (cm)	Volumetric Strain Consolidation (%)	1.08

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
1/10/13	300	56.7	34.6	23.3	2.3	22.1	6.4	3.13E-04	2.89E-04
1/10/13	300	56.7	34.6	23.3	2.3	22.1	5.8	2.83E-04	2.62E-04
1/10/13	300	56.7	34.6	23.3	2.3	22.1	5.6	2.73E-04	2.53E-04
1/10/13	300	56.7	34.6	23.3	2.3	22.1	5.5	2.69E-04	2.48E-04
				Gradient average:	2.3	22.1		2.84E-04	2.63E-04
1/10/13	300	61.9	34.6	23.3	2.9	27.3	7.3	2.89E-04	2.67E-04
1/10/13	300	61.9	34.6	23.3	2.9	27.3	7.5	2.97E-04	2.74E-04
1/10/13	300	61.9	34.6	23.3	2.9	27.3	8.6	3.40E-04	3.14E-04
1/10/13	300	61.9	34.6	23.3	2.9	27.3	5.6	2.21E-04	2.05E-04
				Gradient average:	2.9	27.3		2.87E-04	2.65E-04
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 01/10/2013
Input By: RC,jr Date: 1/11/2013
Reviewed By: RJ Date: 1/15/2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-4 | Boring/Exploration No.: WR0017-218B

Task Number: | Test Stage: 1 of 2 | Test Station No.: 2 | Sample No.: S11B

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 31.0

Test Series No.: NA | File Name: WR0017-218B_S11BaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.940

Vert. Dial/DT No.: DG-036 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;			
Direction of Flow:	X Up;	Down		
Perm. Orientation:	X Vertical;	Horizontal		
Specimen:	X "Intact;"	Reconstituted;		
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)	
Pressure, U_b (psi)	Preliminary:	91.942	29.46	
= 50.0	Final:	91.942	29.45	

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.51

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.3	51.3
1.0E-5 to 1.0E-6	≤10	6.9	52.6
1.0E-6 to 1.0E-7	≤20	14.3	55.2
<1.0E-7 or <3.0E-2 (m/yr)	≤30	21.6	57.8
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/14	7:00:04	23.3	1.0	NA	67.3	50.0	4.940	6.00	1.45	61.8	6.7	9.06E-01	8.38E-01	4.82
1	rc,jr	12/14	7:01:06	23.3		NA	67.3	50.0	4.940	5.00	XXXXX	48.8	6.7	2.87E-06	2.66E-06	
	rc,jr	12/14	7:01:43	23.3	1.6	NA	67.3	50.0	4.940	6.00	1.45	61.8	6.7	8.09E-01	7.48E-01	4.82
* 2	rc,jr	12/14	7:03:17	23.3		NA	67.3	50.0	4.940	4.70	XXXXX	44.8	6.7	2.56E-06	2.37E-06	
	rc,jr	12/14	7:03:43	23.3	1.1	NA	67.3	50.0	4.940	6.00	1.45	61.8	6.7	8.64E-01	8.00E-01	4.82
* 3	rc,jr	12/14	7:04:48	23.3		NA	67.3	50.0	4.940	5.00	XXXXX	48.8	6.7	2.74E-06	2.54E-06	
	rc,jr	12/14	7:05:18	23.3	1.0	NA	67.3	50.0	4.940	6.00	1.45	61.8	6.7	9.06E-01	8.38E-01	4.82
* 4	rc,jr	12/14	7:06:20	23.3		NA	67.3	50.0	4.940	5.00	XXXXX	48.8	6.7	2.87E-06	2.66E-06	
	rc,jr	12/14	7:06:57	23.3	1.4	NA	67.3	50.0	4.940	6.00	1.45	61.8	6.7	8.44E-01	7.81E-01	4.82
* 5	rc,jr	12/14	7:08:19	23.3		NA	67.3	50.0	4.940	4.80	XXXXX	46.1	6.7	2.68E-06	2.48E-06	

Average $k_{20°C}$:	2.51E-06	cm/s
Max. Dev. from Mean:	5.9%	
Avg. Initial Gradient (i_o) :	6.7	
Intrinsic (Absolute) Permeability, *K*:	2.57E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056
Task Number:
Project Name:

Test Type: Permeability Vert.
Test Stage: 2 of 2
Test No.: NA
Test Series No.: NA

Cell No.: CU-4
Test Station No.: 2
Hyd. App. No. (Permometer): 3
File Name: WR0017-218B_S11BaV

Boring/Exploration No.: WR0017-218B
Sample No.: S11B
Penetration/Depth (ft): 31.0
Composite Sample No.:

Axial Load Cell No.: NA
Factor, (lbf/V/V): NA
Excit. Volt, V: NA
Ch. No.: NA
Ht. Reading before Perm. (mm): 4.940

Vert. Dial/DT No.: DG-036
Factor, (mm/V/V):
Excit. Volt, V:
Ch. No.:
Ht. Reading at σ_c = 0 (mm): 5.060

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	91.942	29.46
= 50.0	Final:	91.942	29.45

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.51

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.3	51.3
1.0E-5 to 1.0E-6	≤10	6.9	52.6
1.0E-6 to 1.0E-7	≤20	14.3	55.2
<1.0E-7 or <3.0E-2 (m/yr)	≤30	21.6	57.8
For Special Gradient, i_o			

Trial No.	Readings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/14	7:32:57	23.4	0.6	NA	67.3	50.0	4.940	10.00	1.25	114.6	12.5	8.42E-01	7.78E-01	7.81
1	rc,jr	12/14	7:33:31	23.4		NA	67.3	50.0	4.940	9.00	XXXXX	101.6	12.5	2.67E-06	2.47E-06	
	rc,jr	12/14	7:34:00	23.4	0.6	NA	67.3	50.0	4.940	10.00	1.25	114.6	12.5	8.42E-01	7.78E-01	7.81
* 2	rc,jr	12/14	7:34:34	23.4		NA	67.3	50.0	4.940	9.00	XXXXX	101.6	12.5	2.67E-06	2.47E-06	
	rc,jr	12/14	7:34:56	23.4	0.6	NA	67.3	50.0	4.940	10.00	1.25	114.6	12.5	8.42E-01	7.78E-01	7.81
* 3	rc,jr	12/14	7:35:30	23.4		NA	67.3	50.0	4.940	9.00	XXXXX	101.6	12.5	2.67E-06	2.47E-06	
	rc,jr	12/14	7:36:03	23.4	0.6	NA	67.3	50.0	4.940	10.00	1.25	114.6	12.5	8.42E-01	7.78E-01	7.81
* 4	rc,jr	12/14	7:36:37	23.4		NA	67.3	50.0	4.940	9.00	XXXXX	101.6	12.5	2.67E-06	2.47E-06	
	rc,jr	12/14	7:37:10	23.4	0.6	NA	67.3	50.0	4.940	10.00	1.25	114.6	12.5	8.18E-01	7.55E-01	7.81
* 5	rc,jr	12/14	7:37:45	23.4		NA	67.3	50.0	4.940	9.00	XXXXX	101.6	12.5	2.59E-06	2.40E-06	

Average $k_{20°C}$:	2.45E-06	cm/s
Max. Dev. from Mean:	2.2%	
Avg. Initial Gradient (i_o) :	12.5	
Intrinsic (Absolute) Permeability, *K*:	2.51E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 1/14/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-218B	SAMPLE NO. S22B a	PENETRATION (Depth) 61.0-61.5	PERMEAMETER NO. CHP-1
MATERIAL DESCRIPTION	Sand with silt, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	26.1	25.7	HEIGHT, H	12.268 (cm)	12.139 (cm)	Cell Pressure (psi)	81.30
Total Unit Weight (pcf)	125.0	123.5	DIAMETER, D	6.10 (cm)	6.16 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	99.1	98.2	AREA, A	29.22 (cm^2)	29.82 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	104.0	100.0	VOLUME, V	358.54 (cm^3)	361.99 (cm^3)	Axial Strain During Consolidation (%)	1.05
Void Ratio e	0.666	0.682	LENGTH, L Mamometer separation		12.139 (cm)	Volumetric Strain Consolidation (%)	-0.96

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec)
Q = Volume of Water (cm^3)
A = Cross. Area of Specimen (cm^2)
L = Length of Specimen (cm)
h = Head (cm)
t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
1/14/13	120	51.0	36.4	24.0	1.2	14.6	15.1	3.58E-03	3.26E-03
1/14/13	120	51.0	36.4	24.0	1.2	14.6	15.6	3.70E-03	3.37E-03
1/14/13	120	51.0	36.4	24.0	1.2	14.6	15	3.56E-03	3.24E-03
1/14/13	120	51.0	36.4	24.0	1.2	14.6	15.3	3.63E-03	3.30E-03
				Gradient average:	1.2	14.6		3.62E-03	3.29E-03
1/14/13	120	54.3	36.4	24.0	1.5	17.9	17.9	3.46E-03	3.15E-03
1/14/13	120	54.3	36.4	24.0	1.5	17.9	18	3.48E-03	3.17E-03
1/14/13	120	54.3	36.4	24.0	1.5	17.9	18.1	3.50E-03	3.18E-03
1/14/13	120	54.3	36.4	24.0	1.5	17.9	18	3.48E-03	3.17E-03
				Gradient average:	1.5	17.9		3.48E-03	3.17E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr
Date: 1/14/2013

Input By: RC,jr
Date: 1/14/2013

Reviewed By: RJ
Date: 1/22/2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-2 | Boring/Exploration No.: WR0017-219E

Task Number: ______ | Test Stage: 1 of 2 | Test Station No.: 7 | Sample No.: S02B

Project Name: ______ | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 6.0

Test Series No.: NA | File Name: WR0017-219B_S02BaV | Composite Sample No.: ______

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.480

Vert. Dial/DT No.: DG-045 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): ______

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	100.784	29.02
= 50.0	Final:	100.784	28.47

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.27

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks: ______

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.6	51.4
1.0E-5 to 1.0E-6	≤10	7.6	52.9
1.0E-6 to 1.0E-7	≤20	15.7	55.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	23.7	58.6
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2): Tail, tw_r (cm) (3&4)	Mercury Head Readings (2): Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k: Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k: Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/11	12:06:22	23.4	39.6	NA	56.9	50.0	4.480	10.00	1.25	114.6	11.4	1.34E-02	1.26E-02	7.81
1	rc,jr	12/11	12:45:56	23.4		NA	56.9	50.0	4.470	9.00	XXXXX	101.6	11.4	4.26E-08	4.00E-08	
	rc,jr	12/11	12:46:10	23.4	50.8	NA	56.9	50.0	4.470	10.00	1.25	114.6	11.4	1.10E-02	1.04E-02	7.81
* 2	rc,jr	12/11	13:36:57	23.4		NA	56.9	50.0	4.470	8.95	XXXXX	100.9	11.4	3.49E-08	3.29E-08	
	rc,jr	12/11	13:37:35	23.4	51.0	NA	56.9	50.0	4.470	10.00	1.25	114.6	11.4	1.04E-02	9.79E-03	7.81
* 3	vr	12/11	14:28:37	23.4		NA	56.9	50.0	4.470	9.00	XXXXX	101.6	11.4	3.30E-08	3.10E-08	
	rc,jr	12/12	4:55:06	23.5	94.7	NA	56.9	50.0	4.470	10.00	1.25	114.6	11.4	1.20E-02	1.12E-02	7.81
* 4	rc,jr	12/12	6:29:50	23.5		NA	56.9	50.0	4.470	8.00	XXXXX	88.5	11.4	3.80E-08	3.57E-08	
	rc,jr	12/12	6:30:28	23.5	60.0	NA	56.9	50.0	4.470	10.00	1.254	114.6	11.4	1.08E-02	1.01E-02	7.81
* 5	vr	12/12	7:30:27	23.5		NA	56.9	50.0	4.470	8.80	XXXXX	98.9	11.4	3.41E-08	3.20E-08	

Average $k_{20°C}$:	3.29E-08	cm/s
Max. Dev. from Mean:	8.4%	
Avg. Initial Gradient (i_o) :	11.4	
Intrinsic (Absolute) Permeability, *K*:	3.37E-13	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-2 | Boring/Exploration No.: WR0017-219B

Task Number: | Test Stage: 2 of 2 | Test Station No.: 7 | Sample No.: S02B

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 6.0

Test Series No.: NA | File Name: WR0017-219B_S02BaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.470

Vert. Dial/DT No.: DG-045 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 4.560

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	100.784	29.02
= 50.0	Final:	100.784	28.47
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.27			

Hydraulic System Constants	
Mercury U-Tube Manometer	
Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.6	51.4
1.0E-5 to 1.0E-6	≤10	7.6	52.9
1.0E-6 to 1.0E-7	≤20	15.7	55.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	23.7	58.6
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/12	7:58:05	23.5	33.9	NA	56.9	50.0	4.470	20.00	0.8	246.0	24.4	1.45E-02	1.37E-02	15.30
1	rc,jr	12/12	8:31:58	23.5		NA	56.9	50.0	4.470	18.00	XXXXX	219.8	24.4	4.61E-08	4.33E-08	
	rc,jr	12/12	8:32:59	23.5	18.3	NA	56.9	50.0	4.470	20.00	0.8	246.0	24.4	1.31E-02	1.23E-02	15.30
* 2	rc,jr	12/12	8:51:15	23.5		NA	56.9	50.0	4.460	19.00	XXXXX	232.9	24.4	4.16E-08	3.90E-08	
	rc,jr	12/12	8:52:08	23.5	39.0	NA	56.9	50.0	4.460	20.00	0.8	246.0	24.4	1.13E-02	1.06E-02	15.30
* 3	rc,jr	12/12	9:31:10	23.5		NA	56.9	50.0	4.460	18.20	XXXXX	222.4	24.4	3.58E-08	3.36E-08	
	rc,jr	12/12	9:31:48	23.5	26.7	NA	56.9	50.0	4.460	20.00	0.8	246.0	24.4	1.18E-02	1.10E-02	15.30
* 4	rc,jr	12/12	9:58:31	23.5		NA	56.9	50.0	4.460	18.70	XXXXX	229.0	24.4	3.73E-08	3.50E-08	
	rc,jr	12/12	9:59:11	23.5	38.3	NA	56.9	50.0	4.460	20.00	0.8	246.0	24.4	1.29E-02	1.21E-02	15.30
* 5	rc,jr	12/12	10:37:28	23.5		NA	56.9	50.0	4.460	18.00	XXXXX	219.8	24.4	4.08E-08	3.83E-08	

Average $k_{20°C}$:	3.65E-08	cm/s
Max. Dev. from Mean:	7.8%	
Avg. Initial Gradient (i_o) :	24.4	
Intrinsic (Absolute) Permeability, *K*:	3.74E-13	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-9 | Boring/Exploration No.: WR0017-219B

Task Number: | Test Stage: 1 of 4 | Test Station No.: 7 | Sample No.: S04A

Project Name: | Test No.: NA | File Name: WR0017-219B_S04AbV | Penetration/Depth (ft): 10.40

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silty Sand, brown | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.430

Vert. Dial/DT No.: DG-033 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	50.500	19.62
m/yr	Final:	50.500	15.32
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.13
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.9852
Area tailwater tube, a_{out} (cm^2):	1.0000
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm³); System	0.9978
Elev. Heads by: X Vol. (1) / Elev.	
If by Vol.: X Case 2 / Case 3	
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi): / Differential	

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.08	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.80	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/24	7:28:06	22.7	0.8	NA	60.40	50.00	4.430	50.00	50.00	9.00	18.00	1.00	9.07	1.8	6.98E-04
1	rc,jr	1/24	7:28:52	22.7		NA	60.40	50.00	4.430	50.00	50.00	10.00	17.00		7.05	1.8	8.40E-04
	rc,jr	1/24	7:30:31	22.7	1.0	NA	60.40	50.00	4.430	50.00	50.00	10.00	17.00	1.00	7.052	1.4	6.93E-04
* 2	rc,jr	1/24	7:31:33	22.7		NA	60.40	50.00	4.430	50.00	50.00	11.00	16.00		5.037	1.4	8.34E-04
	rc,jr	1/24	7:32:38	22.7	1.0	NA	60.40	50.00	4.430	50.00	50.00	10.00	17.00	1.05	7.05	1.4	7.14E-04
* 3	rc,jr	1/24	7:33:40	22.7		NA	60.40	50.00	4.430	50.00	50.00	11.00	15.95		4.99	1.4	8.59E-04
	rc,jr	1/24	7:34:40	22.7	1.0	NA	60.40	50.00	4.430	50.00	50.00	10.00	17.00	1.05	7.05	1.4	7.38E-04
* 4	rc,jr	1/24	7:35:40	22.7		NA	60.40	50.00	4.430	50.00	50.00	11.00	15.95		4.99	1.4	8.88E-04
	rc,jr	1/24	7:36:31	22.7	1.0	NA	60.40	50.00	4.430	50.00	50.00	10.00	17.00	1.00	7.05	1.4	6.93E-04
* 5	rc,jr	1/24	7:37:33	22.7		NA	60.40	50.00	4.430	50.00	50.00	11.00	16.00		5.04	1.4	8.34E-04

Average $k_{20°C}$:	8.54E-04	cm/s
Max. Dev. from mean:	4.0%	
Avg. Initial Gradient (i_o):	1.4	
Intrinsic (Absolute) Permability, *K*:	8.74E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-9 | Boring/Exploration No.: WR0017-219B
Task Number: | Test Stage: 2 of 4 | Test Station No.: 7 | Sample No.: S04A
Project Name: | Test No.: NA | File Name: WR0017-219B_S04AbV | Penetration/Depth (ft): 10.40
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Sand, brown | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.430
Vert. Dial/DT No.: DG-033 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	50.500	19.62
m/yr	Final:	50.500	15.32
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.13
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.9852
Area tailwater tube, a_{out} (cm^2):	1.0000
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.08	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.80	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_f cm^3	Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/24	7:54:11	22.7	0.4	NA	60.40	50.00	4.430	50.00	50.00	5.00	20.00	1.00	15.11	3.0	7.31E-04
1	rc,jr	1/24	7:54:36	22.7		NA	60.40	50.00	4.430	50.00	50.00	6.00	19.00		13.10	3.0	8.80E-04
	rc,jr	1/24	7:55:28	22.7	0.4	NA	60.40	50.00	4.430	50.00	50.00	5.00	20.00	0.95	15.112	3.0	6.84E-04
* 2	rc,jr	1/24	7:55:54	22.7		NA	60.40	50.00	4.430	50.00	50.00	6.00	19.05		13.147	3.0	8.23E-04
	rc,jr	1/24	7:56:49	22.7	0.4	NA	60.40	50.00	4.430	50.00	50.00	5.00	20.00	1.00	15.11	3.0	7.62E-04
* 3	rc,jr	1/24	7:57:13	22.7		NA	60.40	50.00	4.430	50.00	50.00	6.00	19.00		13.10	3.0	9.17E-04
	rc,jr	1/24	7:58:27	22.7	0.4	NA	60.40	50.00	4.430	50.00	50.00	5.00	20.00	1.00	15.11	3.0	7.31E-04
* 4	rc,jr	1/24	7:58:52	22.7		NA	60.40	50.00	4.430	50.00	50.00	6.00	19.00		13.10	3.0	8.80E-04
	rc,jr	1/24	8:00:00	22.7	0.4	NA	60.40	50.00	4.430	50.00	50.00	5.00	20.00	1.00	15.11	3.0	7.95E-04
* 5	rc,jr	1/24	8:00:23	22.7		NA	60.40	50.00	4.430	50.00	50.00	6.00	19.00		13.10	3.0	9.56E-04

Average $k_{20°C}$:	8.94E-04	cm/s
Max. Dev. from mean:	7.9%	
Avg. Initial Gradient (i_o):	3.0	
Intrinsic (Absolute) Permability, *K*:	9.16E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-9 | Boring/Exploration No.: WR0017-219B
Task Number: | Test Stage: 3 of 4 | Test Station No.: 2 | Sample No.: S04A
Project Name: | Test No.: NA | File Name: WR0017-219B_S04AbV | Penetration/Depth (ft): 10.40
Test Series No.: NA | Test Sheet: of | Composite Sample No.:
Material Description: Silty Sand, brown | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.760
Vert. Dial/DT No.: DG-033 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	50.170	19.52
m/yr	Final:	50.170	15.10
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.46
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permaent/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.07	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.78	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	1/31	6:32:12	23.2	0.7	NA	84.70	50.00	4.760	50.00	50.00	3.00	7.00	1.01	20.32	4.1	4.42E-04
1	rc,jr	1/31	6:32:52	23.2		NA	84.70	50.00	4.760	50.00	50.00	4.00	5.99		10.11	4.1	5.30E-04
	rc,jr	1/31	6:33:42	23.2	0.7	NA	84.70	50.00	4.760	50.00	50.00	3.00	7.00	1.00	20.320	4.1	4.18E-04
* 2	rc,jr	1/31	6:34:24	23.2		NA	84.70	50.00	4.760	50.00	50.00	4.00	6.00		10.160	4.1	5.02E-04
	rc,jr	1/31	6:35:13	23.2	0.7	NA	84.70	50.00	4.760	50.00	50.00	3.00	7.00	1.00	20.32	4.1	4.18E-04
* 3	rc,jr	1/31	6:35:55	23.2		NA	84.70	50.00	4.760	50.00	50.00	4.00	6.00		10.16	4.1	5.02E-04
	rc,jr	1/31	6:36:39	23.2	0.7	NA	84.70	50.00	4.760	50.00	50.00	3.00	7.00	1.00	20.32	4.1	4.38E-04
* 4	rc,jr	1/31	6:37:19	23.2		NA	84.70	50.00	4.760	50.00	50.00	4.00	6.00		10.16	4.1	5.27E-04
	rc,jr	1/31	6:38:43	23.2	0.7	NA	84.70	50.00	4.760	50.00	50.00	3.00	7.00	1.00	20.32	4.1	4.28E-04
* 5	rc,jr	1/31	6:39:24	23.2		NA	84.70	50.00	4.760	50.00	50.00	4.00	6.00		10.16	4.1	5.14E-04

Average $k_{20°C}$:	5.11E-04	cm/s
Max. Dev. from mean:	3.1%	
Avg. Initial Gradient (i_o):	4.1	
Intrinsic (Absolute) Permability, *K*:	5.23E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-9 | Boring/Exploration No.: WR0017-219B

Task Number: | Test Stage: 4 of 4 | Test Station No.: 2 | Sample No.: S04A

Project Name: | Test No.: NA | File Name: WR0017-219B_S04AbV | Penetration/Depth (ft): 10.40

Test Series No.: NA | Test Sheet: ___ of ___ | Composite Sample No.:

Material Description: Silty Sand, brown | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.760

Vert. Dial/DT No.: DG-033 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm): 4.67

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	50.170	19.52
m/yr	Final:	50.170	15.10
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.46
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permaent/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.07	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.78	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	2/1	7:39:12	22.8	0.2	NA	84.70	50.00	4.760	50.00	50.00	0.20	9.80	1.00	48.77	9.7	6.71E-04
1	rc,jr	2/1	7:39:25	22.8		NA	84.70	50.00	4.760	50.00	50.00	1.60	8.40		34.54	9.7	8.14E-04
	rc,jr	2/1	7:40:34	22.8	0.2	NA	84.70	50.00	4.760	50.00	50.00	1.00	9.00	1.00	40.640	8.1	7.28E-04
* 2	rc,jr	2/1	7:40:44	22.8		NA	84.70	50.00	4.760	50.00	50.00	2.00	8.00		30.480	8.1	8.82E-04
	rc,jr	2/1	7:41:44	22.8	0.2	NA	84.70	50.00	4.760	50.00	50.00	1.00	9.00	1.00	40.64	8.1	7.28E-04
* 3	rc,jr	2/1	7:41:54	22.8		NA	84.70	50.00	4.760	50.00	50.00	2.00	8.00		30.48	8.1	8.82E-04
	rc,jr	2/1	7:43:04	22.8	0.2	NA	84.70	50.00	4.760	50.00	50.00	1.00	9.00	1.02	40.64	8.1	7.36E-04
* 4	rc,jr	2/1	7:43:14	22.8		NA	84.70	50.00	4.760	50.00	50.00	2.00	7.98		30.38	8.1	8.93E-04
	rc,jr	2/1	7:44:18	22.8	0.2	NA	84.70	50.00	4.760	50.00	50.00	1.00	9.00	1.01	40.64	8.1	8.13E-04
* 5	rc,jr	2/1	7:44:27	22.8		NA	84.70	50.00	4.760	50.00	50.00	2.00	7.99		30.43	8.1	9.86E-04

Average $k_{20°C}$:	9.20E-04	cm/s
Max. Dev. from mean:	7.1%	
Avg. Initial Gradient (i_o):	8.1	
Intrinsic (Absolute) Permability, *K*:	9.43E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-2 | Boring/Exploration No.: WR0017-219B

Task Number: | Test Stage: 1 of 2 | Test Station No.: 1 | Sample No.: S08A

Project Name: | Test No.: NA | File Name: WR0017-219B_S08AaV | Penetration/Depth (ft): 23.95

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silty Sand, olive gray | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.200

Vert. Dial/DT No.: DG-067 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	107.344	19.97
m/yr	Final:	107.344	20.07

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.4

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System

Differential Manometer (cm Hg):

U-tube; Vert. Column

X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o ($i_o = h/Lc,p$)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.41	50.8
1.0E-5 to 1.0E-6	≤10	51.17	51.7
1.0E-6 to 1.0E-7	≤20	52.69	53.4
<1.0E-7 or <3.0E-2 (m/yr)	≤30	54.22	55.1
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/14	6:25:40	24	3.4	NA	63.90	50.00	4.200	50.00	50.00	3.00	7.00	0.98	20.32	1.9	1.76E-04
1	rc,jr	1/14	6:29:05	24.0		NA	63.90	50.00	4.180	50.00	50.00	4.00	6.02		10.26	1.9	1.60E-04
	rc,jr	1/14	6:30:17	24.0	3.5	NA	63.90	50.00	4.180	50.00	50.00	3.00	7.00	0.98	20.320	1.9	1.84E-04
* 2	rc,jr	1/14	6:33:45	24.0		NA	63.90	50.00	4.180	50.00	50.00	4.04	5.98		9.855	1.9	1.67E-04
	rc,jr	1/14	6:34:51	24.0	3.3	NA	63.90	50.00	4.180	50.00	50.00	3.00	7.00	1.00	20.32	1.9	2.13E-04
* 3	rc,jr	1/14	6:38:09	24.0		NA	63.90	50.00	4.180	50.00	50.00	4.10	5.90		9.14	1.9	1.94E-04
	rc,jr	1/14	6:39:02	24.0	3.4	NA	63.90	50.00	4.180	50.00	50.00	3.00	7.00	1.00	20.32	1.9	2.39E-04
* 4	rc,jr	1/14	6:42:25	24.0		NA	63.90	50.00	4.180	50.00	50.00	4.20	5.80		8.13	1.9	2.17E-04
	rc,jr	1/14	6:43:32	24.0	2.5	NA	63.90	50.00	4.180	50.00	50.00	3.00	7.00	0.99	20.32	1.9	2.46E-04
* 5	rc,jr	1/14	6:46:02	24.0		NA	63.90	50.00	4.180	50.00	50.00	4.01	6.00		10.11	1.9	2.23E-04

Average $k_{20^\circ C}$:	2.00E-04	cm/s
Max. Dev. from mean:	16.6%	
Avg. Initial Gradient (i_o) :	1.9	
Intrinsic (Absolute) Permability, *K*:	2.05E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20^\circ C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-2 | Boring/Exploration No.: WR0017-219B
Task Number: | Test Stage: 2 of 2 | Test Station No.: 1 | Sample No.: S08A
Project Name: | Test No.: NA | File Name: WR0017-219B_S08AaV | Penetration/Depth (ft): 23.95
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Sand, olive gray | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.18
Vert. Dial/DT No.: DG-067 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 4.30

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	107.344	19.97
m/yr	Final:	107.344	20.07
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.4		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.			
Area headwater tube, a_{in} (cm^2):	0.1969		
Area tailwater tube, a_{out} (cm^2):	0.1969		
Permeant/Fluid Density, at 22°C, $\rho_{f,n}$ (g/cm^3);	Accum.	NA	
	System	0.9978	
Elev. Heads by:	X Vol. (1)	Elev.	
If by Vol.:	X Case 2	Case 3	
Differential Pressure Head System			
Differential Manometer (cm Hg):			
U-tube;	Vert. Column		
X Pressure Trans./Gage (psi):	Differential		

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.41	50.8
1.0E-5 to 1.0E-6	≤10	51.17	51.7
1.0E-6 to 1.0E-7	≤20	52.69	53.4
<1.0E-7 or <3.0E-2 (m/yr)	≤30	54.22	55.1
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_f cm^3	Head Readings: Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	1/14	8:30:08	24	0.8	NA	63.90	50.00	4.180	50.00	50.00	0.20	9.80	1.01	48.77	4.5	2.59E-04
1	rc,jr	1/14	8:30:56	24.0		NA	63.90	50.00	4.180	50.00	50.00	1.20	8.79		38.56	4.5	2.35E-04
	rc,jr	1/14	8:32:10	24.0	0.8	NA	63.90	50.00	4.180	50.00	50.00	0.20	9.80	1.01	48.768	4.5	2.49E-04
* 2	rc,jr	1/14	8:33:00	24.0		NA	63.90	50.00	4.180	50.00	50.00	1.20	8.79		38.557	4.5	2.26E-04
	rc,jr	1/14	8:33:50	24.0	0.8	NA	63.90	50.00	4.180	50.00	50.00	0.20	9.80	1.00	48.77	4.5	2.45E-04
* 3	rc,jr	1/14	8:34:41	24.0		NA	63.90	50.00	4.180	50.00	50.00	1.21	8.79		38.51	4.5	2.22E-04
	rc,jr	1/14	8:35:54	24.0	0.9	NA	63.90	50.00	4.180	50.00	50.00	0.20	9.80	1.00	48.77	4.5	2.25E-04
* 4	rc,jr	1/14	8:36:49	24.0		NA	63.90	50.00	4.180	50.00	50.00	1.20	8.80		38.61	4.5	2.04E-04
	rc,jr	1/14	8:38:36	24.0	1.0	NA	63.90	50.00	4.180	50.00	50.00	0.20	9.80	0.99	48.77	4.5	2.18E-04
* 5	rc,jr	1/14	8:39:33	24.0		NA	63.90	50.00	4.180	50.00	50.00	1.21	8.80		38.56	4.5	1.98E-04

Average $k_{20°C}$:	2.12E-04	cm/s
Max. Dev. from mean:	6.9%	
Avg. Initial Gradient (i_o) :	4.5	
Intrinsic (Absolute) Permability, *K*:	2.18E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12-13-12	PROJECT NAME RD 17 Study Area	JOB NO. 04.11120056

BORING NO. WR0017-219B	SAMPLE NO. S10Aa	PENETRATION (Depth) 32.25	PERMEAMETER NO. ch perm-1

MATERIAL DESCRIPTION: Poorly Graded Sand, olive gray

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	21.5	24.6	HEIGHT, H	9.160 (cm)	9.083 (cm)	Cell Pressure (psi)	67.30
Total Unit Weight (pcf)	114.8	124.6	DIAMETER, D	7.12 (cm)	6.95 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	94.4	100.0	AREA, A	39.85 (cm^2)	37.96 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	76.2	100.0	VOLUME, V	365.05 (cm^3)	344.76 (cm^3)	Axial Strain During Consolidation (%)	0.84
Void Ratio e	0.749	0.651	LENGTH, L Mamometer separation	9.160 (cm)		Volumetric Strain Consolidation (%)	5.56

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12-13-12	60	36.0	34.6	23.4	0.2	1.4	13.1	3.58E-02	3.31E-02
12-13-12	60	36.0	34.6	23.4	0.2	1.4	12.6	3.45E-02	3.18E-02
12-13-12	60	36.0	34.6	23.4	0.2	1.4	13	3.56E-02	3.28E-02
12-13-12	60	36.0	34.6	23.4	0.2	1.4	13	3.56E-02	3.28E-02
				Gradient average:	0.2	1.4		3.54E-02	3.26E-02
12-13-12	30	38.0	34.6	23.4	0.4	3.4	16.9	3.81E-02	3.51E-02
12-13-12	60	38.0	34.6	23.4	0.4	3.4	33.5	3.77E-02	3.48E-02
12-13-12	30	38.0	34.6	23.4	0.4	3.4	17	3.83E-02	3.53E-02
12-13-12	30	38.0	34.6	23.4	0.4	3.4	16.8	3.79E-02	3.49E-02
				Gradient average:	0.4	3.4		3.80E-02	3.51E-02
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 12/13/12
Input By: RC,jr Date: 12/13/12
Reviewed By: RJ Date: 12/18/2012

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 Test Type: Permeability Vert. Cell No.: Perm-4 Boring/Exploration No.: WR0017-219B

Task Number: Test Stage: 1 of 2 Test Station No.: 19 Sample No.: S14A

Project Name: Test No.: NA Hyd. App. No. (Permometer): 3 Penetration/Depth (ft): 42.50

Test Series No.: NA File Name: WR0017-219B_S14AaV Composite Sample No.:

Axial Load Cell No.: NA Factor, (lbf/V/V): NA Excit. Volt, V: NA Ch. No.: NA Ht. Reading before Perm. (mm): 3.920

Vert. Dial/DT No.: DG-038 Factor, (mm/V/V): Excit. Volt, V: Ch. No.: Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;			
Direction of Flow:	X Up;	Down		
Perm. Orientation:	X Vertical;	Horizontal		
Specimen:	X "Intact;"	Reconstituted;		
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)	
Pressure, U_b (psi)	Preliminary:	85.074	20.03	
= 50.0	Final:	85.074	20.07	

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.65

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.0	51.2
1.0E-5 to 1.0E-6	≤10	6.4	52.4
1.0E-6 to 1.0E-7	≤20	13.2	54.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	19.9	57.2
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/17	6:35:32	22.8	1.7	NA	72.2	50.0	3.920	7.00	1.4	75.0	8.8	6.10E-01	5.70E-01	5.57
1	rc,jr	12/17	6:37:13	22.8		NA	72.2	50.0	3.920	6.00	XXXXX	62.0	8.8	1.94E-06	1.81E-06	
	rc,jr	12/17	6:38:02	22.8	2.1	NA	72.2	50.0	3.920	6.00	1.4	62.5	7.3	5.86E-01	5.47E-01	4.81
* 2	rc,jr	12/17	6:40:11	22.8		NA	72.2	50.0	3.920	5.00	XXXXX	49.4	7.3	1.86E-06	1.74E-06	
	rc,jr	12/17	6:40:45	22.8	2.1	NA	72.2	50.0	3.920	6.00	1.4	62.5	7.3	6.00E-01	5.60E-01	4.81
* 3	rc,jr	12/17	6:42:51	22.8		NA	72.2	50.0	3.920	5.00	XXXXX	49.4	7.3	1.90E-06	1.78E-06	
	rc,jr	12/17	6:43:38	22.8	2.2	NA	72.2	50.0	3.920	6.00	1.4	62.5	7.3	5.82E-01	5.43E-01	4.81
* 4	rc,jr	12/17	6:45:48	22.8		NA	72.2	50.0	3.920	5.00	XXXXX	49.4	7.3	1.84E-06	1.72E-06	
	rc,jr	12/17	6:46:31	22.8	2.1	NA	72.2	50.0	3.920	6.00	1.4	62.5	7.3	5.86E-01	5.47E-01	4.81
* 5	rc,jr	12/17	6:48:40	22.8		NA	72.2	50.0	3.920	5.00	XXXXX	49.4	7.3	1.86E-06	1.74E-06	

Average $k_{20°C}$:	1.74E-06	cm/s
Max. Dev. from Mean:	2.0%	
Avg. Initial Gradient (i_o) :	7.3	
Intrinsic (Absolute) Permeability, *K*:	1.78E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number:	04.11120056	Test Type:	Permeability Vert.	Cell No.:	Perm-4	Boring/Exploration No.:	WR0017-219E
Task Number:		Test Stage:	2 of 2	Test Station No.:	19	Sample No.:	S14A
Project Name:		Test No.:	NA	Hyd. App. No. (Permometer):	3	Penetration/Depth (ft):	42.50
		Test Series No.:	NA	File Name:	WR0017-219B_S14AaV	Composite Sample No.:	
Axial Load Cell No.:	NA	Factor, (lbf/V/V):	NA	Excit. Volt, V:	NA	Ch. No.: NA	Ht. Reading before Perm. (mm): 3.920
Vert. Dial/DT No.:	DG-038	Factor, (mm/V/V):		Excit. Volt, V:		Ch. No.:	Ht. Reading at σ_c = 0 (mm): 4.010

Permeation & Specimen Information

Permeant:	X Tap Water;			
Direction of Flow:	X Up;	Down		
Perm. Orientation:	X Vertical;	Horizontal		
Specimen:	X "Intact;"	Reconstituted;		
Back Pressure, U_b (psi) = 50.0	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)	
	Preliminary:	85.074	20.03	
	Final:	85.074	20.07	

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.65

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.0	51.2
1.0E-5 to 1.0E-6	≤10	6.4	52.4
1.0E-6 to 1.0E-7	≤20	13.2	54.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	19.9	57.2
For Special Gradient, i_o			

Trial No.	Readings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/17	7:00:24	22.8	1.1	NA	72.2	50.0	3.920	10.00	1.25	114.6	13.5	6.00E-01	5.60E-01	7.81
1	rc,jr	12/17	7:01:29	22.8		NA	72.2	50.0	3.920	9.00	XXXXX	101.6	13.5	1.90E-06	1.78E-06	
	rc,jr	12/17	7:02:26	22.8	1.1	NA	72.2	50.0	3.920	10.00	1.25	114.6	13.5	6.09E-01	5.69E-01	7.81
* 2	rc,jr	12/17	7:03:30	22.8		NA	72.2	50.0	3.920	9.00	XXXXX	101.6	13.5	1.93E-06	1.80E-06	
	rc,jr	12/17	7:04:25	22.8	1.1	NA	72.2	50.0	3.920	10.00	1.25	114.6	13.5	5.82E-01	5.43E-01	7.81
* 3	rc,jr	12/17	7:05:32	22.8		NA	72.2	50.0	3.920	9.00	XXXXX	101.6	13.5	1.85E-06	1.72E-06	
	rc,jr	12/17	7:06:03	22.8	1.1	NA	72.2	50.0	3.920	10.00	1.25	114.6	13.5	5.91E-01	5.52E-01	7.81
* 4	rc,jr	12/17	7:07:09	22.8		NA	72.2	50.0	3.920	9.00	XXXXX	101.6	13.5	1.87E-06	1.75E-06	
	rc,jr	12/17	7:07:34	22.8	1.1	NA	72.2	50.0	3.920	10.00	1.25	114.6	13.5	6.00E-01	5.60E-01	7.81
* 5	rc,jr	12/17	7:08:39	22.8		NA	72.2	50.0	3.920	9.00	XXXXX	101.6	13.5	1.90E-06	1.78E-06	

Average $k_{20°C}$:	1.76E-06	cm/s
Max. Dev. from Mean:	2.3%	
Avg. Initial Gradient (i_o) :	13.5	
Intrinsic (Absolute) Permeability, *K*:	1.81E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12/19/12	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-219B	SAMPLE NO. S17A a	PENETRATION (Depth) 53.30	PERMEAMETER NO. CH Perm 2
MATERIAL DESCRIPTION	Silty Sand, brown with some non-uniformity		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	28.2	27.0	HEIGHT, H	9.953 (cm)	9.882 (cm)	Cell Pressure (psi)	76.40
Total Unit Weight (pcf)	121.7	122.2	DIAMETER, D	7.25 (cm)	7.23 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	94.9	96.2	AREA, A	41.28 (cm^2)	41.02 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	100.9	100.0	VOLUME, V	410.88 (cm^3)	405.38 (cm^3)	Axial Strain During Consolidation (%)	0.71
Void Ratio e	0.740	0.717	LENGTH, L Mamometer separation		9.953 (cm)	Volumetric Strain Consolidation (%)	1.34

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12/19/12	300	52.4	34.6	23.0	1.8	17.8	15.4	6.97E-04	6.49E-04
12-19-12	300	52.4	34.6	23.0	1.8	17.8	15.4	6.97E-04	6.49E-04
12-1912	300	52.4	34.6	23.0	1.8	17.8	15.4	6.97E-04	6.49E-04
12-19-12	300	52.4	34.6	23.0	1.8	17.8	15.3	6.93E-04	6.45E-04
				Gradient average:	1.8	17.8		6.96E-04	6.48E-04
12-1912	300	57.0	34.6	23.0	2.3	22.4	19.5	7.00E-04	6.51E-04
12-19-12	300	57.0	34.6	23.0	2.3	22.4	19.9	7.14E-04	6.65E-04
12-19-12	300	57.0	34.6	23.0	2.3	22.4	19.8	7.10E-04	6.61E-04
12-19-12	300	57.0	34.6	23.0	2.3	22.4	19	6.82E-04	6.35E-04
				Gradient average:	2.3	22.4		7.01E-04	6.53E-04
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 12-19-12
Input By: RC,jr Date: 12-19-12
Reviewed By: RJ Date: 12/21/2012

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 — Test Type: Permeability Vert. — Cell No.: CU-17 — Boring/Exploration No.: WR0017-219B
Task Number: ______ — Test Stage: 1 of 2 — Test Station No.: 1 — Sample No.: S19A
Project Name: ______ — Test No.: NA — File Name: WR0017-219B_S19AaV — Penetration/Depth (ft): 59.45
Test Series No.: NA — Test Sheet: 1 of ____ — Composite Sample No.: ______
Material Description: Silty Clayey Sand, brown — Specimen No.: a

Axial Load Cell No.: NA — Factor, (lbf/V/V): NA — Excit. Volt, V: NA — Ch. No.: NA — Ht. Reading before Perm. (mm): 4.930
Vert. Dial/DT No.: DG-061 — Factor, (mm/V/V): ______ — Excit. Volt, V: ______ — Ch. No.: ______ — Ht. Reading at σ_c = 0 (mm): ______

Permeation & Specimen Information

Permeant:	X Tap Water;	☐
Direction of Flow:	X Up;	☐ Down
Perm. Orientation:	X Vertical;	☐ Horizontal
Specimen:	X "Intact;"	☐ Reconstituted; ☐

Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	74.590	19.78
☐ m/yr	Final:	74.590	19.35

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.41
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22^{o}C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	☐ Elev.
If by Vol.: X Case 2	☐ Case 3

Differential Pressure Head System
☐ Differential Manometer (cm Hg):
☐ U-tube; ☐ Vert. Column
X Pressure Trans./Gage (psi): ☐ Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.17	50.6
1.0E-5 to 1.0E-6	≤10	50.70	51.2
1.0E-6 to 1.0E-7	≤20	51.76	52.4
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.82	53.5
For Special Gradient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. ^{o}C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k: Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	3/27	12:43:32	23.6	3.6	NA	79.20	50.00	4.930	50.00	50.00	3.00	7.00	1.00	20.32	2.7	1.21E-04
1	rc,jr	3/27	12:47:05	23.6		NA	79.20	50.00	4.930	50.00	50.00	4.00	6.00		10.16	2.7	1.14E-04
	rc,jr	3/27	12:50:15	23.6	4.1	NA	79.20	50.00	4.930	50.00	50.00	3.00	7.00	1.02	20.320	2.7	1.06E-04
* 2	rc,jr	3/27	12:54:22	23.6		NA	79.20	50.00	4.930	50.00	50.00	4.00	5.98		10.058	2.7	9.94E-05
	rc,jr	3/27	12:55:15	23.6	3.6	NA	79.20	50.00	4.930	50.00	50.00	3.00	7.00	1.00	20.32	2.7	1.21E-04
* 3	rc,jr	3/27	12:58:48	23.6		NA	79.20	50.00	4.930	50.00	50.00	4.00	6.00		10.16	2.7	1.14E-04
	rc,jr	3/27	12:59:55	23.6	4.1	NA	79.20	50.00	4.930	50.00	50.00	3.00	7.00	1.00	20.32	2.7	1.05E-04
* 4	rc,jr	3/27	13:04:01	23.6		NA	79.20	50.00	4.930	50.00	50.00	4.00	6.00		10.16	2.7	9.84E-05
	rc,jr	3/27	13:05:30	23.6	3.9	NA	79.20	50.00	4.930	50.00	50.00	3.00	7.00	1.00	20.32	2.7	1.09E-04
* 5	rc,jr	3/27	13:09:25	23.6		NA	79.20	50.00	4.930	50.00	50.00	4.00	6.00		10.16	2.7	1.03E-04

Average k_{20^oC} :	1.04E-04	cm/s
Max. Dev. from mean:	9.7%	
Avg. Initial Gradient (i_o) :	2.7	
Intrinsic (Absolute) Permability, *K*:	1.06E-09	cm^2

(*) Indicates trials used for calculations (Average k_{20^oC}, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr — Final Calc. By: RC,jr — Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 — Test Type: Permeability Vert. — Cell No.: CU-17 — Boring/Exploration No.: WR0017-219B
Task Number: ______ — Test Stage: 2 of 2 — Test Station No.: 1 — Sample No.: S19A
Project Name: ______ — Test No.: NA — File Name: WR0017-219B_S19AaV — Penetration/Depth (ft): 59.45
Test Series No.: NA — Test Sheet: 1 of ____ — Composite Sample No.: ______
Material Description: Silty Clayey Sand, brown — Specimen No.: a

Axial Load Cell No.: NA — Factor, (lbf/V/V): NA — Excit. Volt, V: NA — Ch. No.: NA — Ht. Reading before Perm. (mm): 4.930
Vert. Dial/DT No.: DG-061 — Factor, (mm/V/V): ______ — Excit. Volt, V: ______ — Ch. No.: ______ — Ht. Reading at σ_c = 0 (mm): 4.85

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	74.590	19.78
m/yr	Final:	74.590	19.35

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.41
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22^{o}C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.17	50.6
1.0E-5 to 1.0E-6	≤10	50.70	51.2
1.0E-6 to 1.0E-7	≤20	51.76	52.4
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.82	53.5
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. ^{o}C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	3/27	13:18:30	23.6	1.0	NA	79.20	50.00	4.930	50.00	50.00	0.00	10.00	1.11	50.80	6.8	1.47E-04
1	rc,jr	3/27	13:19:30	23.6		NA	79.20	50.00	4.930	50.00	50.00	1.00	8.89		40.08	6.8	1.38E-04
	rc,jr	3/27	13:20:30	23.6	1.0	NA	79.20	50.00	4.930	50.00	50.00	0.00	10.00	1.11	50.800	6.8	1.44E-04
* 2	rc,jr	3/27	13:21:31	23.6		NA	79.20	50.00	4.930	50.00	50.00	1.00	8.89		40.081	6.8	1.36E-04
	rc,jr	3/27	13:22:20	23.6	1.0	NA	79.20	50.00	4.930	50.00	50.00	0.00	10.00	1.11	50.80	6.8	1.44E-04
* 3	rc,jr	3/27	13:23:21	23.6		NA	79.20	50.00	4.930	50.00	50.00	1.00	8.89		40.08	6.8	1.36E-04
	rc,jr	3/27	13:24:10	23.6	1.0	NA	79.20	50.00	4.930	50.00	50.00	0.00	10.00	1.11	50.80	6.8	1.44E-04
* 4	rc,jr	3/27	13:25:11	23.6		NA	79.20	50.00	4.930	50.00	50.00	1.00	8.89		40.08	6.8	1.36E-04
	rc,jr	3/27	13:25:50	23.6	1.0	NA	79.20	50.00	4.930	50.00	50.00	0.00	10.00	1.00	50.80	6.8	1.34E-04
* 5	rc,jr	3/27	13:26:52	23.6		NA	79.20	50.00	4.930	50.00	50.00	1.00	9.00		40.64	6.8	1.26E-04

Average k_{20^oC} :	1.33E-04	cm/s
Max. Dev. from mean:	5.6%	
Avg. Initial Gradient (i_o) :	6.8	
Intrinsic (Absolute) Permability, *K*:	1.36E-09	cm^2

(*) Indicates trials used for calculations (Average k_{20^oC}, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr — Final Calc. By: RC,jr — Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-13 | Boring/Exploration No.: WR0017-220B
Task Number: | Test Stage: 1 of 2 | Test Station No.: 4 | Sample No.: S04A
Project Name: | Test No.: NA | File Name: WR0017-220B_S04AaV | Penetration/Depth (ft): 11.20
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt, brown with sand pockets | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.450
Vert. Dial/DT No.: DG-032 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	50.616	19.90
m/yr	Final:	50.616	19.60
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.09		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.08	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.80	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2): Differential or Head	Head Readings Pressure (2): Tail	Head Readings Fluid (3): Head, hw_r cm^3	Head Readings Fluid (3): Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	12/3	11:03:04	22.9	16.4	NA	56.90	50.00	4.450	50.50	50.00	3.00	7.00	0.99	55.55	11.0	5.11E-06
1	rc,jr	12/3	11:19:29	22.9		NA	56.90	50.00	4.450	50.50	50.00	4.00	6.01		45.44	11.0	4.85E-06
	rc,jr	12/3	11:20:39	22.9	17.5	NA	56.90	50.00	4.450	50.50	50.00	3.00	7.00	0.99	55.553	11.0	4.80E-06
* 2	vr	12/3	11:38:07	22.9		NA	56.90	50.00	4.450	50.50	50.00	4.00	6.01		45.443	11.0	4.56E-06
	vr	12/3	11:39:17	22.9	19.1	NA	56.90	50.00	4.450	50.50	50.00	3.00	7.00	0.98	55.55	11.0	4.55E-06
* 3	rcjr	12/3	11:58:25	22.9		NA	56.90	50.00	4.450	50.50	50.00	4.04	5.98		45.09	11.0	4.32E-06
	rcjr	12/3	11:59:17	22.9	18.6	NA	56.90	50.00	4.450	50.50	50.00	3.00	7.00	1.00	55.55	11.0	4.54E-06
* 4	vr	12/3	12:17:51	22.9		NA	56.90	50.00	4.450	50.50	50.00	4.00	6.00		45.39	11.0	4.31E-06
	vr	12/3	12:19:02	22.9	18.7	NA	56.90	50.00	4.450	50.50	50.00	3.00	7.00	1.00	55.55	11.0	4.51E-06
* 5	vr	12/3	12:37:44	22.9		NA	56.90	50.00	4.450	50.50	50.00	4.00	6.00		45.39	11.0	4.28E-06

Average $k_{20°C}$:	4.37E-06 cm/s
Max. Dev. from mean:	4.3%
Avg. Initial Gradient (i_o):	11.0
Intrinsic (Absolute) Permability, *K*:	4.47E-11 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-13 | Boring/Exploration No.: WR0017-220B

Task Number: | Test Stage: 2 of 2 | Test Station No.: 4 | Sample No.: S04A

Project Name: | Test No.: NA | File Name: WR0017-220B_S04AaV | Penetration/Depth (ft): 11.20

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silt, brown with sand pockets | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.450

Vert. Dial/DT No.: DG032 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 4.2

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	50.616	19.90
m/yr	Final:	50.616	19.60
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.09	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.08	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.80	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2006 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	vr	12/3	12:48:47	23	11.5	NA	56.90	50.00	4.450	50.50	50.00	0.00	10.00	1.02	86.03	17.0	4.88E-06
1	vr	12/3	13:00:20	23.0		NA	56.90	50.00	4.450	50.50	50.00	1.06	8.92		75.16	17.0	4.62E-06
	vr	12/3	13:08:27	23.0	11.3	NA	56.90	50.00	4.450	50.50	50.00	0.00	10.00	0.99	86.033	17.0	4.60E-06
* 2	vr	12/3	13:19:47	23.0		NA	56.90	50.00	4.450	50.50	50.00	1.00	9.01		75.923	17.0	4.36E-06
	vr	12/3	13:20:47	23.0	11.5	NA	56.90	50.00	4.450	50.50	50.00	0.00	10.00	1.00	86.03	17.0	4.54E-06
* 3	vr	12/3	13:32:20	23.0		NA	56.90	50.00	4.450	50.50	50.00	1.00	9.00		75.87	17.0	4.30E-06
	vr	12/3	13:33:06	23.0	11.7	NA	56.90	50.00	4.450	50.50	50.00	0.00	10.00	1.00	86.03	17.0	4.49E-06
* 4	vr	12/3	13:44:47	23.0		NA	56.90	50.00	4.450	50.50	50.00	1.00	9.00		75.87	17.0	4.25E-06
	vr	12/3	13:45:47	23.0	11.7	NA	56.90	50.00	4.450	50.50	50.00	0.00	10.00	1.00	86.03	17.0	4.50E-06
* 5	vr	12/3	13:57:27	23.0		NA	56.90	50.00	4.450	50.50	50.00	1.00	9.00		75.87	17.0	4.26E-06

Average $k_{20°C}$:	4.29E-06	cm/s
Max. Dev. from mean:	1.6%	
Avg. Initial Gradient (i_o):	17.0	
Intrinsic (Absolute) Permability, *K*:	4.40E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

FUGRO

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-2 | Boring/Exploration No.: WR0017-221B

Task Number: | Test Stage: 1 of 2 | Test Station No.: 1 | Sample No.: S09A

Project Name: | Test No.: NA | File Name: WR0017-221B_S09AaV | Penetration/Depth (ft): 30.10

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silty Sand, olive gray with horizontal to sub-horizontal sand seams | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.110

Vert. Dial/DT No.: DG-0404 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	84.414	39.40
m/yr	Final:	84.414	40.40
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	1.5		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.24	50.7
1.0E-5 to 1.0E-6	≤10	50.84	51.3
1.0E-6 to 1.0E-7	≤20	52.04	52.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.24	54.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Fluid (3) Head, hw_f cm^3	Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	4/5	7:18:38	23.5	6.3	NA	67.40	50.00	3.110	50.00	50.00	3.00	7.00	0.98	20.32	2.4	3.79E-05
1	rc,jr	4/5	7:24:58	23.5		NA	67.40	50.00	3.100	50.00	50.00	4.00	6.02		10.26	2.4	3.41E-05
	rc,jr	4/5	7:25:54	23.5	6.8	NA	67.40	50.00	3.100	50.00	50.00	3.00	7.00	1.02	20.320	2.4	3.63E-05
* 2	rc,jr	4/5	7:32:42	23.5		NA	67.40	50.00	3.100	50.00	50.00	4.00	5.98		10.058	2.4	3.27E-05
	rc,jr	4/5	7:33:53	23.5	6.8	NA	67.40	50.00	3.100	50.00	50.00	3.00	7.00	0.99	20.32	2.4	3.57E-05
* 3	rc,jr	4/5	7:40:39	23.5		NA	67.40	50.00	3.100	50.00	50.00	4.00	6.01		10.21	2.4	3.22E-05
	rc,jr	4/5	7:41:43	23.5	6.7	NA	67.40	50.00	3.100	50.00	50.00	3.00	7.00	0.98	20.32	2.4	3.59E-05
* 4	rc,jr	4/5	7:48:24	23.5		NA	67.40	50.00	3.100	50.00	50.00	4.00	6.02		10.26	2.4	3.23E-05
	rc,jr	4/5	7:49:11	23.5	7.1	NA	67.40	50.00	3.100	50.00	50.00	3.00	7.00	0.99	20.32	2.4	3.62E-05
* 5	rc,jr	4/5	7:56:15	23.5		NA	67.40	50.00	3.100	50.00	50.00	4.04	5.97		9.80	2.4	3.26E-05

Average $k_{20°C}$:	3.25E-05 cm/s
Max. Dev. from mean:	0.9%
Avg. Initial Gradient (i_o) :	2.4
Intrinsic (Absolute) Permability, *K*:	3.32E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 Test Type: Permeability Vert. Cell No.: CHP-2 Boring/Exploration No.: WR0017-221B
Task Number: ______ Test Stage: 2 of 2 Test Station No.: 1 Sample No.: S09A
Project Name: ______ Test No.: NA File Name: WR0017-221B_S09AaV Penetration/Depth (ft): 30.10
Test Series No.: NA Test Sheet: 1 of ____ Composite Sample No.: ______
Material Description: Silty Sand, olive gray with horizontal to sub-horizontal sand seams Specimen No.: a

Axial Load Cell No.: NA Factor, (lbf/V/V): NA Excit. Volt, V: NA Ch. No.: NA Ht. Reading before Perm. (mm): 3.100
Vert. Dial/DT No.: DG-040 Factor, (mm/V/V): ______ Excit. Volt, V: ______ Ch. No.: ______ Ht. Reading at σ_c = 0 (mm): 3.26

Permeation & Specimen Information			
Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	84.414	39.40
☐ m/yr	Final:	84.414	40.40
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	1.5		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.			
Area headwater tube, a_{in} (cm^2):	0.1969		
Area tailwater tube, a_{out} (cm^2):	0.1969		
Permeant/Fluid Density,	Accum.	NA	
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978	
Elev. Heads by:	X Vol. (1)	☐ Elev.	
If by Vol.:	X Case 2	☐ Case 3	
Differential Pressure Head System			
☐ Differential Manometer (cm Hg):			
☐ U-tube;	☐ Vert. Column		
X Pressure Trans./Gage (psi):	☐ Differential		

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.24	50.7
1.0E-5 to 1.0E-6	≤10	50.84	51.3
1.0E-6 to 1.0E-7	≤20	52.04	52.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.24	54.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	4/5	8:01:30	23.5	2.0	NA	67.40	50.00	3.100	50.00	50.00	0.00	10.00	1.00	50.80	6.0	3.86E-05
1	rc,jr	4/5	8:03:32	23.5		NA	67.40	50.00	3.100	50.00	50.00	1.00	9.00		40.64	6.0	3.47E-05
	rc,jr	4/5	8:05:00	23.5	2.0	NA	67.40	50.00	3.100	50.00	50.00	0.00	10.00	1.00	50.800	6.0	3.92E-05
* 2	rc,jr	4/5	8:07:00	23.5		NA	67.40	50.00	3.100	50.00	50.00	1.00	9.00		40.640	6.0	3.53E-05
	rc,jr	4/5	8:08:00	23.5	2.0	NA	67.40	50.00	3.100	50.00	50.00	0.00	10.00	0.99	50.80	6.0	3.85E-05
* 3	rc,jr	4/5	8:10:03	23.5		NA	67.40	50.00	3.100	50.00	50.00	1.01	9.00		40.59	6.0	3.46E-05
	rc,jr	4/5	8:11:30	23.5	2.0	NA	67.40	50.00	3.100	50.00	50.00	0.00	10.00	1.00	50.80	6.0	3.92E-05
* 4	rc,jr	4/5	8:13:30	23.5		NA	67.40	50.00	3.100	50.00	50.00	1.00	9.00		40.64	6.0	3.53E-05
	rc,jr	4/5	8:14:45	23.5	2.0	NA	67.40	50.00	3.100	50.00	50.00	0.00	10.00	1.02	50.80	6.0	3.90E-05
* 5	rc,jr	4/5	8:16:47	23.5		NA	67.40	50.00	3.100	50.00	50.00	1.00	8.98		40.54	6.0	3.51E-05

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Average $k_{20°C}$:	3.51E-05	cm/s
Max. Dev. from mean:	1.3%	
Avg. Initial Gradient (i_o):	6.0	
Intrinsic (Absolute) Permability, *K*:	3.59E-10	cm^2

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: ______

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 4/8/2013	PROJECT NAME RD 17 Study Area	JOB NO. 04.11120056

BORING NO. WR0017-223B	SAMPLE NO. S04A a	PENETRATION (Depth) 16.45	PERMEAMETER NO. CHP-2

MATERIAL DESCRIPTION: Silty Sand, brown with borrow holes

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	15.7	28.2	HEIGHT, H	8.547 (cm)	8.470 (cm)	Cell Pressure (psi)	61.10
Total Unit Weight (pcf)	103.1	121.2	DIAMETER, D	7.17 (cm)	6.99 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	89.1	94.5	AREA, A	40.34 (cm^2)	38.36 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	48.8	100.0	VOLUME, V	344.79 (cm^3)	324.92 (cm^3)	Axial Strain During Consolidation (%)	0.90
Void Ratio e	0.854	0.747	LENGTH, L Mamometer separation		8.470 (cm)	Volumetric Strain Consolidation (%)	5.76

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
04-08	180	41.0	34.2	23.0	0.8	6.8	7.7	1.32E-03	1.23E-03
04-08	180	41.0	34.2	23.0	0.8	6.8	7.8	1.34E-03	1.25E-03
04-08	180	41.0	34.2	23.0	0.8	6.8	9.1	1.56E-03	1.45E-03
04-08	180	41.0	34.2	23.0	0.8	6.8	9.3	1.60E-03	1.49E-03
				Gradient average:	0.8	6.8		1.45E-03	1.35E-03
04-08	120	44.0	34.2	23.0	1.2	9.8	11.4	2.04E-03	1.90E-03
04-08	120	44.0	34.2	23.0	1.2	9.8	11.5	2.05E-03	1.91E-03
04-08	120	44.0	34.2	23.0	1.2	9.8	11.6	2.07E-03	1.93E-03
04-08	120	44.0	34.2	23.0	1.2	9.8	11.6	2.07E-03	1.93E-03
				Gradient average:	1.2	9.8		2.06E-03	1.92E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 04-08-2013
Input By: RC,jr Date: 04-11-2013
Reviewed By: RJ Date: 04-12-2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-19 | Boring/Exploration No.: WR0017-226I

Task Number: | Test Stage: 1 of 2 | Test Station No.: 1 | Sample No.: S03A

Project Name: | Test No.: NA | Hyd. App. No. (Permeometer): 3 | Penetration/Depth (ft): 31.0

Test Series No.: NA | File Name: WR0017-226B_S03AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 7.250

Vert. Dial/DT No.: DG054 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	71.740	19.60
= 50.0	Final:	71.740	19.85

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.06

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.5	51.0
1.0E-5 to 1.0E-6	≤10	5.3	52.0
1.0E-6 to 1.0E-7	≤20	11.0	54.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	16.8	56.1
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_c Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	vr	4/1	10:54:13	23.0	1.4	NA	67.4	50.0	7.250	12.00	1.15	141.0	19.7	3.29E-01	3.03E-01	9.31
1	vr	4/1	10:55:35	23.0		NA	67.4	50.0	7.250	11.00	XXXXX	128.0	19.7	1.04E-06	9.59E-07	
	vr	4/1	10:56:20	23.0	1.4	NA	67.4	50.0	7.250	12.00	1.15	141.0	19.7	3.21E-01	2.95E-01	9.31
* 2	vr	4/1	10:57:44	23.0		NA	67.4	50.0	7.250	11.00	XXXXX	128.0	19.7	1.02E-06	9.37E-07	
	vr	4/1	11:22:10	23.0	1.4	NA	67.4	50.0	7.250	12.00	1.15	141.0	19.7	3.21E-01	2.95E-01	9.31
* 3	vr	4/1	11:23:34	23.0		NA	67.4	50.0	7.250	11.00	XXXXX	128.0	19.7	1.02E-06	9.37E-07	
	vr	4/1	11:24:20	23.0	1.4	NA	67.4	50.0	7.250	12.00	1.15	141.0	19.7	3.21E-01	2.95E-01	9.31
* 4	vr	4/1	11:25:44	23.0		NA	67.4	50.0	7.250	11.00	XXXXX	128.0	19.7	1.02E-06	9.37E-07	
	vr	4/1	11:26:27	23.0	1.4	NA	67.4	50.0	7.250	12.00	1.15	141.0	19.7	3.25E-01	2.99E-01	9.31
* 5	vr	4/1	11:27:50	23.0		NA	67.4	50.0	7.250	11.00	XXXXX	128.0	19.7	1.03E-06	9.48E-07	

Average $k_{20°C}$:	9.39E-07	cm/s
Max. Dev. from Mean:	0.9%	
Avg. Initial Gradient (i_o) :	19.7	
Intrinsic (Absolute) Permeability, *K*:	9.62E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: VR | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-19 | Boring/Exploration No.: WR0017-226I

Task Number: | Test Stage: 2 of 2 | Test Station No.: 1 | Sample No.: S03A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 31.0

Test Series No.: NA | File Name: WR0017-226B_S03AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 7.250

Vert. Dial/DT No.: DG054 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 7.190

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	71.740	19.60
= 50.0	Final:	71.740	19.85

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.06

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.5	51.0
1.0E-5 to 1.0E-6	≤10	5.3	52.0
1.0E-6 to 1.0E-7	≤20	11.0	54.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	16.8	56.1
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) (cm/s)	Minimum Allowable tw_r (cm)
	vr	4/1	12:40:36	23.1	3.3	NA	67.4	50.0	7.250	6.00	1.4	62.5	8.7	3.24E-01	2.97E-01	4.81
1	vr	4/1	12:43:57	23.1		NA	67.4	50.0	7.250	5.00	XXXXX	49.4	8.7	1.03E-06	9.43E-07	
	vr	4/1	12:44:49	23.1	3.2	NA	67.4	50.0	7.250	6.00	1.4	62.5	8.7	3.41E-01	3.13E-01	4.81
* 2	vr	4/1	12:48:00	23.1		NA	67.4	50.0	7.250	5.00	XXXXX	49.4	8.7	1.08E-06	9.92E-07	
	vr	4/1	12:48:37	23.1	3.2	NA	67.4	50.0	7.250	6.00	1.4	62.5	8.7	3.43E-01	3.14E-01	4.81
* 3	vr	4/1	12:51:47	23.1		NA	67.4	50.0	7.250	5.00	XXXXX	49.4	8.7	1.09E-06	9.97E-07	
	vr	4/1	12:52:19	23.1	3.2	NA	67.4	50.0	7.250	6.00	1.4	62.5	8.7	3.41E-01	3.13E-01	4.81
* 4	vr	4/1	12:55:30	23.1		NA	67.4	50.0	7.250	5.00	XXXXX	49.4	8.7	1.08E-06	9.92E-07	
	vr	4/1	12:56:05	23.1	3.2	NA	67.4	50.0	7.250	6.00	1.4	62.5	8.7	3.39E-01	3.11E-01	4.81
* 5	vr	4/1	12:59:17	23.1		NA	67.4	50.0	7.250	5.00	XXXXX	49.4	8.7	1.08E-06	9.87E-07	

Average $k_{20°C}$:	9.92E-07	cm/s
Max. Dev. from Mean:	0.5%	
Avg. Initial Gradient (i_o) :	8.7	
Intrinsic (Absolute) Permeability, *K*:	1.02E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: VR | Final Calc. By: RC,jr | Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 3/26/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-226B	SAMPLE NO. S06A a	PENETRATION (Depth) 44.9	PERMEAMETER NO. CHP -3
MATERIAL DESCRIPTION	Poorly Graded Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	5.0	21.2	HEIGHT, H	9.380 (cm)	9.318 (cm)	Cell Pressure (psi)	72.90
Total Unit Weight (pcf)	106.8	128.1	DIAMETER, D	7.14 (cm)	7.03 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	101.7	105.7	AREA, A	40.04 (cm^2)	38.79 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	21.1	100.0	VOLUME, V	375.60 (cm^3)	361.45 (cm^3)	Axial Strain During Consolidation (%)	0.66
Void Ratio e	0.623	0.562	LENGTH, L Mamometer separation		9.318 (cm)	Volumetric Strain Consolidation (%)	3.77

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$ K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
03-26	60	37.6	34.2	23.7	0.4	3.4	22.7	2.59E-02	2.37E-02
03-26	60	37.6	34.2	23.7	0.4	3.4	22.1	2.52E-02	2.31E-02
03-26	60	37.6	34.2	23.7	0.4	3.4	21.3	2.43E-02	2.23E-02
03-26	60	37.6	34.2	23.7	0.4	3.4	20.9	2.38E-02	2.18E-02
				Gradient average:	0.4	3.4		2.48E-02	2.27E-02
03-26	30	40.4	34.2	23.7	0.7	6.2	19.9	2.49E-02	2.28E-02
03-26	30	40.4	34.2	23.7	0.7	6.2	19.3	2.41E-02	2.21E-02
03-26	30	40.4	34.2	23.7	0.7	6.2	18.3	2.29E-02	2.10E-02
03-26	30	40.4	34.2	23.7	0.7	6.2	19	2.38E-02	2.18E-02
				Gradient average:	0.7	6.2		2.39E-02	2.19E-02
				Gradient average:					
				Gradient average:					

Tested By: RJ Date: 03-26-2013
Input By: RC,jr Date: 04-03-2013
Reviewed By: RJ Date: 04-04-2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-227B

Task Number: | Test Stage: 1 of 4 | Test Station No.: 1 | Sample No.: S04A

Project Name: | Test No.: NA | File Name: WR0017-227B_S04AdV | Penetration/Depth (ft): 16.95

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Gravelly silty clay with sand, olive gray. | Specimen No.: d

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.600

Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	91.236	28.96
m/yr	Final:	91.236	29.27
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.22		
Applied back pressure, U_b (psi) =	60.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.29	60.7
1.0E-5 to 1.0E-6	≤10	60.94	61.4
1.0E-6 to 1.0E-7	≤20	62.23	62.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	63.53	64.3
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	12/4	7:35:51	23.1	19.3	NA	71.10	60.00	4.600	60.00	60.00	3.00	7.00	0.99	20.32	2.2	2.25E-05
1	rc,jr	12/4	7:55:06	23.1		NA	71.10	60.00	4.600	60.00	60.00	4.14	5.87		8.79	2.2	2.07E-05
	rc,jr	12/4	7:55:53	23.1	20.7	NA	71.10	60.00	4.600	60.00	60.00	3.00	7.00	0.99	20.320	2.2	1.48E-05
* 2	rc,jr	12/4	8:16:36	23.1		NA	71.10	60.00	4.600	60.00	60.00	3.90	6.11		11.227	2.2	1.36E-05
	rc,jr	12/4	8:17:38	23.1	28.5	NA	71.10	60.00	4.600	60.00	60.00	3.00	7.00	1.01	20.32	2.2	1.38E-05
* 3	rc,jr	12/4	8:46:11	23.1		NA	71.10	60.00	4.600	60.00	60.00	4.06	5.93		9.50	2.2	1.27E-05
	rc,jr	12/4	8:47:11	23.1	28.9	NA	71.10	60.00	4.600	60.00	60.00	3.00	7.00	1.01	20.32	2.2	1.36E-05
* 4	rc,jr	12/4	9:16:05	23.1		NA	71.10	60.00	4.600	60.00	60.00	4.06	5.93		9.50	2.2	1.25E-05
	rc,jr	12/4	9:16:59	23.1	26.1	NA	71.10	60.00	4.600	60.00	60.00	3.00	7.00	1.01	20.32	2.2	1.38E-05
* 5	vr	12/4	9:43:07	23.1		NA	71.10	60.00	4.600	60.00	60.00	4.00	5.99		10.11	2.2	1.27E-05

Average $k_{20^\circ C}$:	1.29E-05	cm/s
Max. Dev. from mean:	5.8%	
Avg. Initial Gradient (i_o):	2.2	
Intrinsic (Absolute) Permability, *K*:	1.32E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20^\circ C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-227B
Task Number: | Test Stage: 2 of 4 | Test Station No.: 1 | Sample No.: S04A
Project Name: | Test No.: NA | File Name: WR0017-227B_S04AdV | Penetration/Depth (ft): 16.95
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Gravelly silty clay with sand, olive gray. | Specimen No.: d

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.790
Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	91.046	28.91
m/yr	Final:	91.046	28.99
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.41	
Applied back pressure, U_b (psi) =		60.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density, at 22°C, $\rho_{f,n}$ (g/cm^3);	Accum.	NA
	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.29	60.7
1.0E-5 to 1.0E-6	≤10	60.94	61.4
1.0E-6 to 1.0E-7	≤20	62.23	62.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	63.52	64.3
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	12/7	7:49:08	23	27.9	NA	84.31	60.00	4.790	60.00	60.00	3.00	7.00	0.99	20.32	2.2	1.78E-05
1	rc,jr	12/7	8:17:00	23.0		NA	84.31	60.00	4.790	60.00	60.00	4.24	5.77		7.77	2.2	1.66E-05
	rc,jr	12/7	8:17:49	23.0	20.6	NA	84.31	60.00	4.790	60.00	60.00	3.00	7.00	1.01	20.320	2.2	1.75E-05
* 2	rc,jr	12/7	8:38:27	23.0		NA	84.31	60.00	4.790	60.00	60.00	4.00	5.99		10.109	2.2	1.63E-05
	rc,jr	12/7	8:39:04	23.0	20.4	NA	84.31	60.00	4.790	60.00	60.00	3.00	7.00	1.00	20.32	2.2	1.75E-05
* 3	rc,jr	12/7	8:59:30	23.0		NA	84.31	60.00	4.790	60.00	60.00	4.00	6.00		10.16	2.2	1.63E-05
	rc,jr	12/7	9:00:10	23.0	20.7	NA	84.31	60.00	4.790	60.00	60.00	3.00	7.00	1.02	20.32	2.2	1.80E-05
* 4	rc,jr	12/7	9:20:55	23.0		NA	84.31	60.00	4.790	60.00	60.00	4.02	5.96		9.86	2.2	1.68E-05
	rc,jr	12/7	9:22:05	23.0	23.7	NA	84.31	60.00	4.790	60.00	60.00	3.00	7.00	1.00	20.32	2.2	1.79E-05
* 5	rc,jr	12/7	9:45:44	23.0		NA	84.31	60.00	4.790	60.00	60.00	4.12	5.88		8.94	2.2	1.67E-05

Average $k_{20^\circ C}$:	1.65E-05 cm/s
Max. Dev. from mean:	1.6%
Avg. Initial Gradient (i_o):	2.2
Intrinsic (Absolute) Permability, *K*:	1.69E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20^\circ C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-227B
Task Number: | Test Stage: 3 of 4 | Test Station No.: 1 | Sample No.: S04A
Project Name: | Test No.: NA | File Name: WR0017-227B_S04AdV | Penetration/Depth (ft): 16.95
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Gravelly silty clay with sand, olive gray. | Specimen No.: d

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.030
Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	90.806	28.85
m/yr	Final:	90.806	28.80
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.65		
Applied back pressure, U_b (psi) =	60.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.			
Area headwater tube, a_{in} (cm^2):	0.1969		
Area tailwater tube, a_{out} (cm^2):	0.1969		
Permeant/Fluid Density, Accum.	NA		
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978		
Elev. Heads by:	X Vol. (1)	Elev.	
If by Vol.:	X Case 2	Case 3	
Differential Pressure Head System			
Differential Manometer (cm Hg):			
U-tube;	Vert. Column		
X Pressure Trans./Gage (psi):	Differential		

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o ($i_o = h/Lc,p$)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.29	60.7
1.0E-5 to 1.0E-6	≤10	60.93	61.4
1.0E-6 to 1.0E-7	≤20	62.22	62.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	63.51	64.3
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	12/11	8:26:26	24	39.4	NA	108.60	60.00	5.030	60.00	60.00	3.00	7.00	1.00	20.32	2.2	9.08E-06
1	rc,jr	12/11	9:05:51	24.0		NA	108.60	60.00	5.030	60.00	60.00	4.00	6.00		10.16	2.2	8.30E-06
	rc,jr	12/11	9:07:11	24.0	48.1	NA	108.60	60.00	5.030	60.00	60.00	3.00	7.00	1.00	20.320	2.2	1.01E-05
* 2	rc,jr	12/11	9:55:15	23.9		NA	108.60	60.00	5.030	60.00	60.00	4.22	5.78		7.925	2.2	9.25E-06
	rc,jr	12/11	9:56:23	23.9	36.2	NA	108.60	60.00	5.030	60.00	60.00	3.00	7.00	1.00	20.32	2.2	9.89E-06
* 3	rc,jr	12/11	10:32:35	23.9		NA	108.60	60.00	5.030	60.00	60.00	4.00	6.00		10.16	2.2	9.05E-06
	rc,jr	12/11	10:33:08	23.9	36.1	NA	108.60	60.00	5.030	60.00	60.00	3.00	7.00	1.01	20.32	2.2	1.06E-05
* 4	rc,jr	12/11	11:09:15	23.9		NA	108.60	60.00	5.030	60.00	60.00	4.04	5.95		9.70	2.2	9.68E-06
	rc,jr	12/11	11:10:07	23.9	35.1	NA	108.60	60.00	5.030	60.00	60.00	3.00	7.00	1.01	20.32	2.2	1.09E-05
* 5	rc,jr	12/11	11:45:15	23.9		NA	108.60	60.00	5.030	60.00	60.00	4.04	5.95		9.70	2.2	9.95E-06

Average $k_{20°C}$:	9.48E-06	cm/s
Max. Dev. from mean:	4.9%	
Avg. Initial Gradient (i_o) :	2.2	
Intrinsic (Absolute) Permability, *K*:	9.71E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-227B
Task Number: | Test Stage: 4 of 4 | Test Station No.: 1 | Sample No.: S04A
Project Name: | Test No.: NA | File Name: WR0017-227B_S04AdV | Penetration/Depth (ft): 16.95
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Gravelly silty clay with sand, olive gray. | Specimen No.: d

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.030
Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm): 4.9

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	90.806	28.85
m/yr	Final:	90.806	28.80
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.65
Applied back pressure, U_b (psi) =			60.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	60.29	60.7
1.0E-5 to 1.0E-6	≤10	60.93	61.4
1.0E-6 to 1.0E-7	≤20	62.22	62.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	63.51	64.3
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	12/11	11:59:37	23.7	8.8	NA	108.60	60.00	5.030	60.50	60.00	0.00	10.00	1.00	86.03	9.5	7.54E-06
1	rc,jr	12/11	12:08:24	23.7		NA	108.60	60.00	5.030	60.50	60.00	1.02	8.98		75.67	9.5	6.94E-06
	rc,jr	12/11	12:08:49	23.7	9.9	NA	108.60	60.00	5.030	60.50	60.00	0.00	10.00	1.00	86.033	9.5	6.52E-06
* 2	rc,jr	12/11	12:18:46	23.7		NA	108.60	60.00	5.030	60.50	60.00	1.00	9.00		75.873	9.5	6.00E-06
	rc,jr	12/11	12:19:19	23.7	9.2	NA	108.60	60.00	5.030	60.50	60.00	0.00	10.00	1.01	86.03	9.5	7.12E-06
* 3	rc,jr	12/11	12:28:29	23.7		NA	108.60	60.00	5.030	60.50	60.00	1.00	8.99		75.82	9.5	6.55E-06
	rc,jr	12/11	12:29:16	23.7	15.3	NA	108.60	60.00	5.030	60.50	60.00	0.00	10.00	0.99	86.03	9.5	7.03E-06
* 4	rc,jr	12/11	12:44:36	23.7		NA	108.60	60.00	5.030	60.50	60.00	1.60	8.41		69.83	9.5	6.47E-06
	rc,jr	12/11	12:45:17	23.7	9.4	NA	108.60	60.00	5.030	60.50	60.00	0.00	10.00	1.00	86.03	9.5	7.02E-06
* 5	rc,jr	12/11	12:54:43	23.7		NA	108.60	60.00	5.030	60.50	60.00	1.02	8.98		75.67	9.5	6.46E-06

Average $k_{20°C}$:	6.37E-06 cm/s
Max. Dev. from mean:	5.8%
Avg. Initial Gradient (i_o) :	9.5
Intrinsic (Absolute) Permability, *K*:	6.52E-11 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-19 | Boring/Exploration No.: WR0017-227B
Task Number: ______ | Test Stage: 1 of 3 | Test Station No.: 2 | Sample No.: S04A
Project Name: ______ | Test No.: NA | File Name: WR0017-227B_S04AgV | Penetration/Depth (ft): 16.2
Test Series No.: NA | Test Sheet: 1 of ___ | Composite Sample No.: ______
Material Description: Silty Clay, olive gray with some gravel sized coral | Specimen No.: g

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 6.700
Vert. Dial/DT No.: DG-054 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at $\sigma_c = 0$ (mm): ______

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	50.304	19.58
m/yr	Final:	50.304	19.23

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.67
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm³); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.07	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.79	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Readings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, U_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_f cm^3	Head Readings: Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	3/12	7:46:44	23.8	25.8	NA	60.40	50.00	6.700	50.00	50.00	3.00	7.00	1.00	20.32	4.0	1.20E-05
1	rc,jr	3/12	8:12:30	23.8		NA	60.40	50.00	6.700	50.00	50.00	4.04	5.96		9.75	4.0	1.12E-05
	rc,jr	3/12	8:13:26	23.8	8.9	NA	60.40	50.00	6.700	50.40	50.00	3.00	7.00	1.01	48.506	9.6	1.65E-05
* 2	rc,jr	3/12	8:22:19	23.8		NA	60.40	50.00	6.700	50.40	50.00	4.40	5.59		34.231	9.6	1.54E-05
	rc,jr	3/12	8:23:18	23.8	6.2	NA	60.40	50.00	6.700	50.40	50.00	3.00	7.00	0.98	48.51	9.6	1.63E-05
* 3	rc,jr	3/12	8:29:27	23.8		NA	60.40	50.00	6.700	50.40	50.00	4.02	6.00		38.24	9.6	1.52E-05
	rc,jr	3/12	8:30:16	23.8	7.6	NA	60.40	50.00	6.700	50.40	50.00	3.00	7.00	0.99	48.51	9.6	1.62E-05
* 4	rc,jr	3/12	8:37:54	23.8		NA	60.40	50.00	6.700	50.40	50.00	4.22	5.79		36.16	9.6	1.51E-05
	rc,jr	3/12	8:38:54	23.8	8.3	NA	60.40	50.00	6.700	50.40	50.00	3.00	7.00	1.00	48.51	9.6	1.62E-05
* 5	rc,jr	3/12	8:47:09	23.8		NA	60.40	50.00	6.700	50.40	50.00	4.30	5.70		35.30	9.6	1.51E-05

Average $k_{20°C}$:	1.52E-05 cm/s
Max. Dev. from mean:	1.3%
Avg. Initial Gradient (i_o):	9.6
Intrinsic (Absolute) Permability, *K*:	1.56E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.:	04.11120056	Test Type:	Permeability Vert.	Cell No.:	CU-19	Boring/Exploration No.:	WR0017-227B
Task Number:		Test Stage:	2 of 3	Test Station No.:	2	Sample No.:	S04A
Project Name:		Test No.:	NA	File Name:	WR0017-227B_S04AgV	Penetration/Depth (ft):	16.2
		Test Series No.:	NA	Test Sheet:	1 of	Composite Sample No.:	
Material Description:	Silty Clay, olive gray with some gravel sized coral					Specimen No.:	g
Axial Load Cell No.:	NA	Factor, (lbf/V/V):	NA	Excit. Volt, V:	NA	Ch. No.: NA	Ht. Reading before Perm. (mm): 6.910
Vert. Dial/DT No.:	DG-054	Factor, (mm/V/V):		Excit. Volt, V:		Ch. No.:	Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information				
Permeant:	X Tap Water;			
Direction of Flow:	X Up;	Down		
Perm. Orientation:	X Vertical;	Horizontal		
Specimen:	X "Intact;"	Reconstituted;		
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)	
X cm/s	Preliminary:	50.094	19.51	
m/yr	Final:	50.094	19.11	
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.88			
Applied back pressure, U_b (psi) =	50.0			
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA	

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.07	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.78	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	3/14	7:24:24	24.2	31.3	NA	77.80	50.00	6.910	50.00	50.00	3.00	7.00	0.98	20.32	4.1	9.72E-06
1	rc,jr	3/14	7:55:45	24.2		NA	77.80	50.00	6.910	50.00	50.00	4.04	5.98		9.86	4.1	9.01E-06
	rc,jr	3/14	7:56:51	24.2	16.8	NA	77.80	50.00	6.910	50.20	50.00	3.00	7.00	0.97	34.413	6.9	9.02E-06
* 2	rc,jr	3/14	8:13:41	24.2		NA	77.80	50.00	6.910	50.20	50.00	4.04	5.99		23.999	6.9	8.36E-06
	rc,jr	3/14	8:14:54	24.2	22.1	NA	77.80	50.00	6.910	50.20	50.00	3.00	7.00	1.00	34.41	6.9	9.22E-06
* 3	rc,jr	3/14	8:37:01	24.2		NA	77.80	50.00	6.910	50.20	50.00	4.30	5.70		21.21	6.9	8.55E-06
	rc,jr	3/14	8:38:05	24.2	20.7	NA	77.80	50.00	6.910	50.20	50.00	3.00	7.00	1.00	34.41	6.9	9.18E-06
* 4	rc,jr	3/14	8:58:47	24.2		NA	77.80	50.00	6.910	50.20	50.00	4.23	5.77		21.92	6.9	8.51E-06
	rc,jr	3/14	8:59:29	24.2	17.7	NA	77.80	50.00	6.910	50.20	50.00	3.00	7.00	1.00	34.41	6.9	9.14E-06
* 5	rc,jr	3/14	9:17:10	24.2		NA	77.80	50.00	6.910	50.20	50.00	4.08	5.92		23.44	6.9	8.48E-06

Average $k_{20°C}$:	8.47E-06	cm/s
Max. Dev. from mean:	1.3%	
Avg. Initial Gradient (i_o):	6.9	
Intrinsic (Absolute) Permability, *K*:	8.67E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-19 | Boring/Exploration No.: WR0017-227B
Task Number: | Test Stage: 3 of 3 | Test Station No.: 2 | Sample No.: S04A
Project Name: | Test No.: NA | File Name: WR0017-227B_S04AgV | Penetration/Depth (ft): 16.2
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Clay, olive gray with some gravel sized coral | Specimen No.: g

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 6.910
Vert. Dial/DT No.: DG-054 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 6.88

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	50.094	19.51
m/yr	Final:	50.094	19.11
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.88
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.00	50.4
1.0E-5 to 1.0E-6	≤10	50.36	50.8
1.0E-6 to 1.0E-7	≤20	51.07	51.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.78	52.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary Final	Hyd. Conductivity, k Preliminary, k_t Final, k_{20^oC} cm/s
	rc,jr	3/14	9:19:33	24.2	8.9	NA	77.80	50.00	6.910	50.20	50.00	0.00	10.00	1.01	64.89	13.0	9.91E-06
1	rc,jr	3/14	9:28:26	24.2		NA	77.80	50.00	6.910	50.20	50.00	1.20	8.79		52.65	13.0	9.19E-06
	rc,jr	3/14	9:29:10	24.2	7.2	NA	77.80	50.00	6.910	50.20	50.00	0.00	10.00	1.01	64.893	13.0	9.99E-06
* 2	rc,jr	3/14	9:36:23	24.2		NA	77.80	50.00	6.910	50.20	50.00	1.00	8.99		54.682	13.0	9.26E-06
	rc,jr	3/14	9:37:10	24.2	8.8	NA	77.80	50.00	6.910	50.20	50.00	0.00	10.00	1.01	64.89	13.0	1.01E-05
* 3	rc,jr	3/14	9:45:55	24.2		NA	77.80	50.00	6.910	50.20	50.00	1.20	8.79		52.65	13.0	9.33E-06
	rc,jr	3/14	9:47:00	24.2	12.4	NA	77.80	50.00	6.910	50.20	50.00	0.00	10.00	1.01	64.89	13.0	9.81E-06
* 4	rc,jr	3/14	9:59:25	24.2		NA	77.80	50.00	6.910	50.20	50.00	1.60	8.39		48.59	13.0	9.10E-06
	rc,jr	3/14	10:00:30	24.2	15.2	NA	77.80	50.00	6.910	50.20	50.00	0.00	10.00	1.01	64.89	13.0	9.83E-06
* 5	rc,jr	3/14	10:15:40	24.2		NA	77.80	50.00	6.910	50.20	50.00	1.90	8.09		45.54	13.0	9.12E-06

Average $k_{20°C}$:	9.20E-06	cm/s
Max. Dev. from mean:	1.4%	
Avg. Initial Gradient (i_o):	13.0	
Intrinsic (Absolute) Permability, *K*:	9.42E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 Test Type: Permeability Vert. Cell No.: CHP-3 Boring/Exploration No.: WR0017-228B
Task Number: ____ Test Stage: 1 of 2 Test Station No.: 1 Sample No.: S03A
Project Name: ____ Test No.: NA File Name: WR0017-228B_S03AaV Penetration/Depth (ft): 10.3
Test Series No.: NA Test Sheet: 1 of ____ Composite Sample No.: ____
Material Description: Silty Clayey Sand, brown with small silt pockets Specimen No.: a
Axial Load Cell No.: NA Factor, (lbf/V/V): NA Excit. Volt, V: NA Ch. No.: NA Ht. Reading before Perm. (mm): 3.060
Vert. Dial/DT No.: DG-040 Factor, (mm/V/V): ____ Excit. Volt, V: ____ Ch. No.: ____ Ht. Reading at σ_c = 0 (mm): ____

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	42.016	28.51
m/yr	Final:	42.016	27.72

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.41
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22^{o}C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	49.94	50.3
1.0E-5 to 1.0E-6	≤10	50.24	50.7
1.0E-6 to 1.0E-7	≤20	50.84	51.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.43	52.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. ^{o}C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary Final	Hyd. Conductivity, k Preliminary, k_t Final, k_{20^oC} cm/s
	RC,jr	3/26	13:31:44	23.7	6.8	NA	60.40	50.00	3.060	50.00	50.00	3.00	7.00	0.99	20.32	4.8	2.44E-05
1	RC,jr	3/26	13:38:33	23.7		NA	60.40	50.00	3.050	50.00	50.00	4.00	6.01		10.21	4.8	2.31E-05
	RC,jr	3/26	13:39:40	23.7	8.6	NA	60.40	50.00	3.050	50.00	50.00	3.00	7.00	0.99	20.320	4.8	2.36E-05
* 2	RC,jr	3/26	13:48:15	23.7		NA	60.40	50.00	3.050	50.00	50.00	4.14	5.87		8.788	4.8	2.23E-05
	RC,jr	3/26	13:49:30	23.7	8.0	NA	60.40	50.00	3.050	50.00	50.00	3.00	7.00	1.00	20.32	4.8	2.41E-05
* 3	RC,jr	3/26	13:57:30	23.7		NA	60.40	50.00	3.050	50.00	50.00	4.10	5.90		9.14	4.8	2.28E-05
	RC,jr	3/26	13:58:45	23.7	7.1	NA	60.40	50.00	3.050	50.00	50.00	3.00	7.00	1.00	20.32	4.8	2.36E-05
* 4	RC,jr	3/26	14:05:51	23.7		NA	60.40	50.00	3.050	50.00	50.00	4.00	6.00		10.16	4.8	2.23E-05
	RC,jr	3/26	14:06:25	23.7	7.8	NA	60.40	50.00	3.050	50.00	50.00	3.00	7.00	1.01	20.32	4.8	2.27E-05
* 5	RC,jr	3/26	14:14:11	23.7		NA	60.40	50.00	3.050	50.00	50.00	4.03	5.96		9.80	4.8	2.14E-05

Average $k_{20^\circ C}$:	2.22E-05	cm/s
Max. Dev. from mean:	3.5%	
Avg. Initial Gradient (i_o) :	4.8	
Intrinsic (Absolute) Permability, *K*:	2.27E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20^\circ C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RJ Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-3 | Boring/Exploration No.: WR0017-228B

Task Number: | Test Stage: 2 of 2 | Test Station No.: 1 | Sample No.: S03A

Project Name: | Test No.: NA | File Name: WR0017-228B_S03AaV | Penetration/Depth (ft): 10.3

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silty Clayey Sand, brown with small silt pockets | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.06

Vert. Dial/DT No.: DG-040 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 3.30

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	42.016	28.51
m/yr	Final:	42.016	27.72

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.41

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System

Differential Manometer (cm Hg):

U-tube; Vert. Column

X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	49.94	50.3
1.0E-5 to 1.0E-6	≤10	50.24	50.7
1.0E-6 to 1.0E-7	≤20	50.84	51.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	51.43	52.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary Final	Hyd. Conductivity, k Preliminary, k_t Final, $k_{20°C}$ cm/s
	vr	3/26	16:12:07	23.7	1.6	NA	60.40	50.00	3.050	50.00	50.00	0.00	10.00	1.00	50.80	12.1	3.30E-05
1	vr	3/26	16:13:45	23.7		NA	60.40	50.00	3.050	50.00	50.00	1.00	9.00		40.64	12.1	3.12E-05
	vr	3/26	16:14:57	23.7	3.1	NA	60.40	50.00	3.050	50.00	50.00	0.00	10.00	1.00	50.800	12.1	2.16E-05
* 2	vr	3/26	16:18:01	23.7		NA	60.40	50.00	3.050	50.00	50.00	1.20	8.80		38.608	12.1	2.04E-05
	vr	3/26	16:19:17	23.7	3.1	NA	60.40	50.00	3.050	50.00	50.00	0.00	10.00	1.00	50.80	12.1	2.13E-05
* 3	vr	3/26	16:22:24	23.7		NA	60.40	50.00	3.050	50.00	50.00	1.20	8.80		38.61	12.1	2.01E-05
	vr	3/26	16:23:07	23.7	3.1	NA	60.40	50.00	3.050	50.00	50.00	0.00	10.00	1.00	50.80	12.1	2.16E-05
* 4	vr	3/26	16:26:11	23.7		NA	60.40	50.00	3.050	50.00	50.00	1.20	8.80		38.61	12.1	2.04E-05
	vr	3/26	16:27:56	23.7	3.1	NA	60.40	50.00	3.050	50.00	50.00	0.00	10.00	1.00	50.80	12.1	2.14E-05
* 5	vr	3/26	16:31:02	23.7		NA	60.40	50.00	3.050	50.00	50.00	1.20	8.80		38.61	12.1	2.02E-05

Average $k_{20°C}$:	2.03E-05	cm/s
Max. Dev. from mean:	0.9%	
Avg. Initial Gradient (i_o) :	12.1	
Intrinsic (Absolute) Permability, *K*:	2.08E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RJ | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-228I

Task Number: | Test Stage: 1 of 2 | Test Station No.: 1.5 | Sample No.: S12A

Project Name: | Test No.: NA | Hyd. App. No. (Permeometer): 3 | Penetration/Depth (ft): 47.3

Test Series No.: NA | File Name: WR0017-228B_S12AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 2.660

Vert. Dial/DT No.: DG-045 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back Pressure, U_b (psi)	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
= 50.0	Preliminary:	68.538	28.77
	Final:	68.538	28.63

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.32

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.4	51.0
1.0E-5 to 1.0E-6	≤10	5.1	51.9
1.0E-6 to 1.0E-7	≤20	10.5	53.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	16.0	55.8
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	3/28	5:16:47	23.4	7.5	NA	74.3	50.0	2.660	7.00	1.35	75.7	11.0	7.64E-02	7.09E-02	5.55
1	rc,jr	3/28	5:24:15	23.4		NA	74.3	50.0	2.650	6.00	XXXXX	62.6	11.0	2.42E-07	2.25E-07	
	rc,jr	3/28	5:25:20	23.4	8.1	NA	74.3	50.0	2.650	7.00	1.35	75.7	11.0	7.44E-02	6.89E-02	5.55
* 2	rc,jr	3/28	5:33:26	23.4		NA	74.3	50.0	2.650	5.95	XXXXX	61.9	11.0	2.36E-07	2.19E-07	
	rc,jr	3/28	5:33:59	23.4	9.8	NA	74.3	50.0	2.650	7.00	1.35	75.7	11.0	7.17E-02	6.65E-02	5.55
* 3	rc,jr	3/28	5:43:44	23.4		NA	74.3	50.0	2.650	5.80	XXXXX	60.0	11.0	2.27E-07	2.11E-07	
	rc,jr	3/28	5:44:22	23.4	8.1	NA	74.3	50.0	2.650	7.00	1.35	75.7	11.0	7.39E-02	6.85E-02	5.55
* 4	rc,jr	3/28	5:52:31	23.4		NA	74.3	50.0	2.650	5.95	XXXXX	61.9	11.0	2.34E-07	2.17E-07	
	rc,jr	3/28	5:53:13	23.4	9.4	NA	74.3	50.0	2.650	7.00	1.35	75.7	11.0	7.46E-02	6.92E-02	5.55
* 5	rc,jr	3/28	6:02:35	23.4		NA	74.3	50.0	2.650	5.80	XXXXX	60.0	11.0	2.37E-07	2.19E-07	

Average $k_{20°C}$:	2.17E-07	cm/s
Max. Dev. from Mean:	2.6%	
Avg. Initial Gradient (i_o) :	11.0	
Intrinsic (Absolute) Permeability, *K*:	2.22E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-228I

Task Number: | Test Stage: 2 of 2 | Test Station No.: 1.5 | Sample No.: S12A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 47.3

Test Series No.: NA | File Name: WR0017-228B_S12AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 2.650

Vert. Dial/DT No.: DG-045 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm): 2.710

Permeation & Specimen Information

Permeant:	X Tap Water;			
Direction of Flow:	X Up;	Down		
Perm. Orientation:	X Vertical;	Horizontal		
Specimen:	X "Intact;"	Reconstituted;		
Back	Stage		Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:		68.538	28.77
= 50.0	Final:		68.538	28.63
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.32				

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25^{o}C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.4	51.0
1.0E-5 to 1.0E-6	≤10	5.1	51.9
1.0E-6 to 1.0E-7	≤20	10.5	53.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	16.0	55.8
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time (1) hr:min	Temp. ^{o}C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial / DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	3/28	6:34:46	23.5	3.2	NA	74.3	50.0	2.650	14.00	1.1	166.8	24.3	7.76E-02	7.17E-02	10.81
1	rc,jr	3/28	6:37:56	23.5		NA	74.3	50.0	2.640	13.00	XXXXX	153.7	24.3	2.46E-07	2.27E-07	
	rc,jr	3/28	6:38:43	23.5	3.3	NA	74.3	50.0	2.640	14.00	1.1	166.8	24.3	7.37E-02	6.82E-02	10.81
* 2	rc,jr	3/28	6:42:03	23.5		NA	74.3	50.0	2.640	13.00	XXXXX	153.7	24.3	2.34E-07	2.16E-07	
	rc,jr	3/28	6:42:31	23.5	3.5	NA	74.3	50.0	2.640	14.00	1.1	166.8	24.3	7.05E-02	6.52E-02	10.81
* 3	rc,jr	3/28	6:46:00	23.5		NA	74.3	50.0	2.640	13.00	XXXXX	153.7	24.3	2.24E-07	2.07E-07	
	rc,jr	3/28	6:46:33	23.5	3.3	NA	74.3	50.0	2.640	14.00	1.1	166.8	24.3	7.44E-02	6.88E-02	10.81
* 4	rc,jr	3/28	6:49:51	23.5		NA	74.3	50.0	2.640	13.00	XXXXX	153.7	24.3	2.36E-07	2.18E-07	
	rc,jr	3/28	6:50:29	23.5	3.3	NA	74.3	50.0	2.640	14.00	1.1	166.8	24.3	7.33E-02	6.78E-02	10.81
* 5	rc,jr	3/28	6:53:50	23.5		NA	74.3	50.0	2.640	13.00	XXXXX	153.7	24.3	2.32E-07	2.15E-07	

Average $k_{20°C}$:	2.14E-07	cm/s
Max. Dev. from Mean:	3.4%	
Avg. Initial Gradient (i_o) :	24.3	
Intrinsic (Absolute) Permeability, *K*:	2.19E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-17 | Boring/Exploration No.: WR0017-229B

Task Number: | Test Stage: 1 of 2 | Test Station No.: 2 | Sample No.: S06A

Project Name: | Test No.: NA | File Name: WR0017-229B_S06AbV | Penetration/Depth (ft): 27.05

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silty Clay, olive gray with few calcareous nodules | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.180

Vert. Dial/DT No.: DG-035 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	89.728	20.01
m/yr	Final:	89.728	20.96
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.63	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.28	50.7
1.0E-5 to 1.0E-6	≤10	50.92	51.4
1.0E-6 to 1.0E-7	≤20	52.19	52.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.47	54.2
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	11/29	10:20:51	23.6	21.1	NA	65.30	50.00	5.180	50.20	50.00	3.00	7.00	0.99	34.41	3.8	8.01E-06
1	rc,jr	11/29	10:41:57	23.6		NA	65.30	50.00	5.180	50.20	50.00	3.70	6.31		27.35	3.8	7.04E-06
	rc,jr	11/29	10:42:58	23.6	23.3	NA	65.30	50.00	5.180	50.20	50.00	3.00	7.00	0.99	34.413	3.8	1.15E-05
* 2	rc,jr	11/29	11:06:15	23.6		NA	65.30	50.00	5.180	50.20	50.00	4.04	5.97		23.897	3.8	1.01E-05
	rc,jr	11/29	11:07:04	23.6	25.5	NA	65.30	50.00	5.180	50.20	50.00	3.00	7.00	0.99	34.41	3.8	1.10E-05
* 3	rc,jr	11/29	11:32:32	23.6		NA	65.30	50.00	5.180	50.20	50.00	4.08	5.93		23.49	3.8	9.69E-06
	rc,jr	11/29	11:32:55	23.6	28.1	NA	65.30	50.00	5.180	50.20	50.00	3.00	7.00	1.01	34.41	3.8	1.06E-05
* 4	rc,jr	11/29	12:01:00	23.6		NA	65.30	50.00	5.180	50.20	50.00	4.12	5.87		22.98	3.8	9.29E-06
	rc,jr	11/29	12:02:12	23.6	25.1	NA	65.30	50.00	5.180	50.20	50.00	3.00	7.00	1.00	34.41	3.8	1.03E-05
* 5	rc,jr	11/29	12:27:17	23.6		NA	65.30	50.00	5.180	50.20	50.00	4.00	6.00		24.25	3.8	9.02E-06

Average $k_{20°C}$:	9.53E-06	cm/s
Max. Dev. from mean:	6.2%	
Avg. Initial Gradient (i_o):	3.8	
Intrinsic (Absolute) Permability, *K*:	9.76E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04-11120056 | Test Type: Permeability Vert. | Cell No.: CU-17 | Boring/Exploration No.: WR0017-229B
Task Number: | Test Stage: 2 of 2 | Test Station No.: 2 | Sample No.: S06A
Project Name: | Test No.: NA | File Name: WR0017-229B_S06AbV | Penetration/Depth (ft): 27.05
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Clay, olive gray with few calcareous nodules | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.180
Vert. Dial/DT No.: | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 5.15

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	89.728	20.01
m/yr	Final:	89.728	20.96
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.63		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.28	50.7
1.0E-5 to 1.0E-6	≤10	50.92	51.4
1.0E-6 to 1.0E-7	≤20	52.19	52.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.47	54.2
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, U_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_f cm^3	Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	11/30	5:33:54	23	21.1	NA	65.30	50.00	5.180	50.00	50.00	0.00	10.00	0.99	50.80	5.7	1.04E-05
1	rc,jr	11/30	5:55:01	23.0		NA	65.30	50.00	5.180	50.00	50.00	1.30	8.71		37.64	5.7	9.30E-06
	rc,jr	11/30	5:55:52	23.0	18.1	NA	65.30	50.00	5.180	50.00	50.00	0.00	10.00	1.00	50.800	5.7	1.05E-05
* 2	rc,jr	11/30	6:13:55	23.0		NA	65.30	50.00	5.180	50.00	50.00	1.14	8.86		39.218	5.7	9.40E-06
	rc,jr	11/30	6:14:42	23.0	17.2	NA	65.30	50.00	5.180	50.00	50.00	0.00	10.00	1.00	50.80	5.7	1.06E-05
* 3	rc,jr	11/30	6:31:53	23.0		NA	65.30	50.00	5.180	50.00	50.00	1.10	8.90		39.62	5.7	9.48E-06
	rc,jr	11/30	6:32:11	23.0	25.1	NA	65.30	50.00	5.180	50.00	50.00	0.00	10.00	0.99	50.80	5.7	1.04E-05
* 4	rc,jr	11/30	6:57:19	23.0		NA	65.30	50.00	5.180	50.00	50.00	1.50	8.51		35.61	5.7	9.26E-06
	rc,jr	11/30	6:57:48	23.0	16.3	NA	65.30	50.00	5.180	50.00	50.00	0.00	10.00	0.99	50.80	5.7	1.02E-05
* 5	rc,jr	11/30	7:14:07	23.0		NA	65.30	50.00	5.180	50.00	50.00	1.02	8.99		40.49	5.7	9.11E-06

Average $k_{20°C}$:	9.31E-06 cm/s
Max. Dev. from mean:	2.1%
Avg. Initial Gradient (i_o) :	5.7
Intrinsic (Absolute) Permability, *K*:	9.54E-11 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-5 | Boring/Exploration No.: WR0017-230I

Task Number: | Test Stage: 1 of 2 | Test Station No.: 1 | Sample No.: S04B

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 6 | Penetration/Depth (ft): 10.5

Test Series No.: NA | File Name: WR0017-230B_S04BaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.680

Vert. Dial/DT No.: DG-068 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	82.986	29.43
= 50.0	Final:	82.986	29.54

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.62

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.9	51.2
1.0E-5 to 1.0E-6	≤10	6.2	52.4
1.0E-6 to 1.0E-7	≤20	12.8	54.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	19.4	57.1
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	3/18	12:13:35	23.2	8.2	NA	58.3	50.0	3.680	12.00	1.2	140.4	16.9	4.25E-02	3.93E-02	9.32
1	rc,jr	3/18	12:21:46	23.2		NA	58.3	50.0	3.680	11.00	XXXXX	127.3	16.9	1.35E-07	1.25E-07	
	rc,jr	3/18	12:23:18	23.2	8.9	NA	58.3	50.0	3.680	12.00	1.2	140.4	16.9	3.92E-02	3.62E-02	9.32
* 2	rc,jr	3/18	12:32:11	23.2		NA	58.3	50.0	3.680	11.00	XXXXX	127.3	16.9	1.24E-07	1.15E-07	
	rc,jr	3/18	12:33:29	23.2	8.8	NA	58.3	50.0	3.680	12.00	1.2	140.4	16.9	3.98E-02	3.67E-02	9.32
* 3	rc,jr	3/18	12:42:14	23.2		NA	58.3	50.0	3.680	11.00	XXXXX	127.3	16.9	1.26E-07	1.17E-07	
	rc,jr	3/18	12:43:45	23.2	8.4	NA	58.3	50.0	3.680	12.00	1.2	140.4	16.9	4.17E-02	3.85E-02	9.32
* 4	rc,jr	3/18	12:52:06	23.2		NA	58.3	50.0	3.680	11.00	XXXXX	127.3	16.9	1.32E-07	1.22E-07	
	rc,jr	3/18	12:52:40	23.2	7.3	NA	58.3	50.0	3.680	12.00	1.2	140.4	16.9	4.25E-02	3.93E-02	9.32
* 5	rc,jr	3/18	13:00:00	23.2		NA	58.3	50.0	3.680	11.10	XXXXX	128.6	16.9	1.35E-07	1.24E-07	

Average $k_{20°C}$:	1.19E-07	cm/s
Max. Dev. from Mean:	4.2%	
Avg. Initial Gradient (i_o) :	16.9	
Intrinsic (Absolute) Permeability, *K*:	1.22E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-5 | Boring/Exploration No.: WR0017-230I

Task Number: | Test Stage: 2 of 2 | Test Station No.: 1 | Sample No.: S04B

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 6 | Penetration/Depth (ft): 10.5

Test Series No.: NA | File Name: WR0017-230B_S04BaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.680

Vert. Dial/DT No.: DG-068 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 3.720

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back Pressure, U_b (psi) = 50.0	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
	Preliminary:	82.986	29.43
	Final:	82.986	29.54

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.62

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.9	51.2
1.0E-5 to 1.0E-6	≤10	6.2	52.4
1.0E-6 to 1.0E-7	≤20	12.8	54.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	19.4	57.1
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	3/19	6:25:33	23.0	3.5	NA	58.3	50.0	3.680	18.00	0.9	219.6	26.5	6.25E-02	5.80E-02	13.80
1	rc,jr	3/19	6:29:03	23.0		NA	58.3	50.0	3.670	17.00	XXXXX	206.5	26.5	1.98E-07	1.84E-07	
	rc,jr	3/19	6:30:05	23.0	4.3	NA	58.3	50.0	3.670	18.00	0.9	219.6	26.5	5.06E-02	4.70E-02	13.80
* 2	rc,jr	3/19	6:34:24	23.0		NA	58.3	50.0	3.670	17.00	XXXXX	206.5	26.5	1.61E-07	1.49E-07	
	rc,jr	3/19	6:35:00	23.0	4.5	NA	58.3	50.0	3.670	18.00	0.9	219.6	26.5	4.84E-02	4.49E-02	13.80
* 3	rc,jr	3/19	6:39:31	23.0		NA	58.3	50.0	3.660	17.00	XXXXX	206.5	26.5	1.53E-07	1.42E-07	
	rc,jr	3/19	6:40:18	23.0	4.7	NA	58.3	50.0	3.660	18.00	0.9	219.6	26.5	4.64E-02	4.30E-02	13.80
* 4	rc,jr	3/19	6:45:01	23.0		NA	58.3	50.0	3.660	17.00	XXXXX	206.5	26.5	1.47E-07	1.36E-07	
	rc,jr	3/19	6:45:42	23.0	4.8	NA	58.3	50.0	3.660	18.00	0.9	219.6	26.5	4.54E-02	4.21E-02	13.80
* 5	rc,jr	3/19	6:50:31	23.0		NA	58.3	50.0	3.660	17.00	XXXXX	206.5	26.5	1.44E-07	1.34E-07	

Average $k_{20°C}$:	1.40E-07	cm/s
Max. Dev. from Mean:	6.2%	
Avg. Initial Gradient (i_o) :	26.5	
Intrinsic (Absolute) Permeability, *K*:	1.44E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-2 | Boring/Exploration No.: WR0017-230B
Task Number: | Test Stage: 1 of 2 | Test Station No.: 1 | Sample No.: S16A
Project Name: | Test No.: NA | File Name: WR0017-230B_S16AaV | Penetration/Depth (ft): 52.75
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Sand with clay, olive gray with some non-uniformity and cementation | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.450
Vert. Dial/DT No.: DG-040 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.602	29.06
m/yr	Final:	81.602	29.58

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.19
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.96	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.12	53.9
For Special Gradient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_f cm^3	Head Readings: Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/28	12:39:45	23.6	14.0	NA	76.40	50.00	3.450	50.20	50.00	3.00	7.00	1.00	34.41	4.2	1.15E-05
1	rc,jr	3/28	12:53:45	23.6		NA	76.40	50.00	3.440	50.20	50.00	4.00	6.00		24.25	4.2	1.04E-05
	rc,jr	3/28	12:54:20	23.6	14.3	NA	76.40	50.00	3.440	50.20	50.00	3.00	7.00	1.00	34.413	4.2	1.13E-05
* 2	vr	3/28	13:08:37	23.6		NA	76.40	50.00	3.440	50.20	50.00	4.00	6.00		24.253	4.2	1.02E-05
	vr	3/28	13:09:35	23.6	16.0	NA	76.40	50.00	3.440	50.20	50.00	3.00	7.00	1.00	34.41	4.2	1.08E-05
* 3	vr	3/28	13:25:37	23.6		NA	76.40	50.00	3.440	50.20	50.00	4.06	5.94		23.64	4.2	9.75E-06
	vr	3/28	13:26:54	23.6	15.8	NA	76.40	50.00	3.440	50.20	50.00	3.00	7.00	1.01	34.41	4.2	1.05E-05
* 4	rc,jr	3/28	13:42:40	23.6		NA	76.40	50.00	3.440	50.20	50.00	4.02	5.97		24.00	4.2	9.52E-06
	rc,jr	3/28	13:43:45	23.6	16.4	NA	76.40	50.00	3.440	50.20	50.00	3.00	7.00	1.00	34.41	4.2	1.06E-05
* 5	rc,jr	3/28	14:00:08	23.6		NA	76.40	50.00	3.440	50.20	50.00	4.06	5.94		23.64	4.2	9.54E-06

Average $k_{20°C}$:	9.75E-06	cm/s
Max. Dev. from mean:	4.6%	
Avg. Initial Gradient (i_o) :	4.2	
Intrinsic (Absolute) Permability, *K*:	9.99E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RJ | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-2 | Boring/Exploration No.: WR0017-230B
Task Number: | Test Stage: 2 of 2 | Test Station No.: 1 | Sample No.: S16A
Project Name: | Test No.: NA | File Name: WR0017-230B_S16AaV | Penetration/Depth (ft): 52.75
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Sand with clay, olive gray with some non-uniformity and cementation | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.440
Vert. Dial/DT No.: DG-040 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 3.6

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.602	29.06
m/yr	Final:	81.602	29.58

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.19
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.96	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.12	53.9
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary Final	Hyd. Conductivity, k Preliminary, k_t Final, k_{20^oC} cm/s
	VR	3/28	14:12:37	23.7	8.4	NA	76.40	50.00	3.440	50.20	50.00	0.00	10.00	1.00	64.89	8.0	1.21E-05
1	VR	3/28	14:21:00	23.7		NA	76.40	50.00	3.440	50.20	50.00	1.26	8.74		52.09	8.0	1.09E-05
	VR	3/28	14:22:12	23.7	6.4	NA	76.40	50.00	3.440	50.20	50.00	0.00	10.00	1.00	64.893	8.0	1.23E-05
* 2	VR	3/28	14:28:36	23.7		NA	76.40	50.00	3.440	50.20	50.00	1.00	9.00		54.733	8.0	1.11E-05
	RJ	3/28	15:03:50	23.7	6.6	NA	76.40	50.00	3.440	50.20	50.00	0.00	10.00	1.00	64.89	8.0	1.19E-05
* 3	RJ	3/28	15:10:26	23.7		NA	76.40	50.00	3.440	50.20	50.00	1.00	9.00		54.73	8.0	1.07E-05
	RJ	3/28	15:12:15	23.7	6.6	NA	76.40	50.00	3.430	50.20	50.00	0.00	10.00	1.00	64.89	8.0	1.19E-05
* 4	RJ	3/28	15:18:52	23.7		NA	76.40	50.00	3.430	50.20	50.00	1.00	9.00		54.73	8.0	1.07E-05
	RJ	3/28	15:20:29	23.7	6.8	NA	76.40	50.00	3.430	50.20	50.00	0.00	10.00	1.00	64.89	8.0	1.15E-05
* 5	RJ	3/28	15:27:18	23.7		NA	76.40	50.00	3.430	50.20	50.00	1.00	9.00		54.73	8.0	1.04E-05

Average $k_{20^\circ C}$:	1.07E-05	cm/s
Max. Dev. from mean:	3.2%	
Avg. Initial Gradient (i_o) :	8.0	
Intrinsic (Absolute) Permability, *K*:	1.10E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20^\circ C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RJ Final Calc. By: RC,jr Reviewed By: RJ

PERMEABILITY TEST

CONSTANT HEAD (ASTM D 5084)

DATE 4/8/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-232B	SAMPLE NO. S06A a	PENETRATION (Depth) 19.65	PERMEAMETER NO. CHP-1
MATERIAL DESCRIPTION	Clayey Sand, brown with few small void pockets which could be root holes (Can be clearly seen in the top l		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	23.6	28.4	HEIGHT, H	10.569 (cm)	10.522 (cm)	Cell Pressure (psi)	62.50
Total Unit Weight (pcf)	116.2	121.0	DIAMETER, D	5.02 (cm)	5.02 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	94.0	94.2	AREA, A	19.78 (cm^2)	19.81 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	82.6	100.0	VOLUME, V	209.05 (cm^3)	208.42 (cm^3)	Axial Strain During Consolidation (%)	0.44
Void Ratio e	0.758	0.752	LENGTH, L Mamometer separation		10.522 (cm)	Volumetric Strain Consolidation (%)	0.30

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)

Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
04-08	300	43.8	34.2	23.1	0.9	9.6	8.5	1.57E-03	1.46E-03
04-08	300	43.8	34.2	23.1	0.9	9.6	8.7	1.61E-03	1.49E-03
04-08	300	43.8	34.2	23.1	0.9	9.6	8.7	1.61E-03	1.49E-03
04-08	300	43.8	34.2	23.1	0.9	9.6	8.7	1.61E-03	1.49E-03
				Gradient average:	0.9	9.6		1.60E-03	1.48E-03
04-09	180	48.0	34.2	22.9	1.3	13.8	7.8	1.67E-03	1.56E-03
04-09	180	48.0	34.2	22.9	1.3	13.8	7.7	1.65E-03	1.54E-03
04-09	180	48.0	34.2	22.9	1.3	13.8	7.6	1.63E-03	1.52E-03
04-09	180	48.0	34.2	22.9	1.3	13.8	7.7	1.65E-03	1.54E-03
				Gradient average:	1.3	13.8		1.65E-03	1.54E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 04-08-2013

Input By: RC,jr Date: 04-09-2013

Reviewed By: RJ Date: 04-12-2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-4 | Boring/Exploration No.: WR0017-233B
Task Number: | Test Stage: 1 of 2 | Test Station No.: 2 | Sample No.: S07A
Project Name: | Test No.: NA | File Name: WR0017-233B_S07AbV | Penetration/Depth (ft): 30.95
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Lean Clay, olive gray | Specimen No.: b

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.330
Vert. Dial/DT No.: DG-038 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	56.198	19.97
m/yr	Final:	56.198	20.03

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.37
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.04	50.4
1.0E-5 to 1.0E-6	≤10	50.44	50.9
1.0E-6 to 1.0E-7	≤20	51.24	51.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.04	52.7
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	1/24	8:53:11	22.8	68.9	NA	67.40	50.00	4.330	50.00	50.00	3.00	7.00	0.98	20.32	3.6	2.46E-06
1	rc,jr	1/24	10:02:06	22.8		NA	67.40	50.00	4.300	50.00	50.00	3.62	6.39		14.07	3.6	2.30E-06
	rc,jr	1/24	10:03:30	22.8	33.6	NA	67.40	50.00	4.300	50.50	50.00	3.00	7.00	0.99	55.553	9.9	3.39E-06
* 2	rc,jr	1/24	10:37:07	22.8		NA	67.40	50.00	4.300	50.50	50.00	4.20	5.81		43.411	9.9	3.17E-06
	rc,jr	1/24	10:45:54	22.8	27.9	NA	67.40	50.00	4.300	50.50	50.00	3.00	7.00	1.00	55.55	9.9	3.34E-06
* 3	rc,jr	1/24	11:13:47	22.8		NA	67.40	50.00	4.300	50.50	50.00	4.00	6.00		45.39	9.9	3.13E-06
	rc,jr	1/24	11:14:39	22.8	33.8	NA	67.40	50.00	4.300	50.50	50.00	3.00	7.00	0.99	55.55	9.9	3.18E-06
* 4	rc,jr	1/24	11:48:24	22.8		NA	67.40	50.00	4.300	50.50	50.00	4.14	5.87		44.02	9.9	2.98E-06
	rc,jr	1/24	11:48:52	22.8	35.4	NA	67.40	50.00	4.300	50.50	50.00	3.00	7.00	1.00	55.55	9.9	3.23E-06
* 5	rc,jr	1/24	12:24:17	22.8		NA	67.40	50.00	4.300	50.50	50.00	4.20	5.80		43.36	9.9	3.02E-06

Average $k_{20°C}$:	3.07E-06	cm/s
Max. Dev. from mean:	3.1%	
Avg. Initial Gradient (i_o):	9.9	
Intrinsic (Absolute) Permability, *K*:	3.15E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.:	04.11120056	Test Type:	Permeability Vert.	Cell No.:	Perm-4	Boring/Exploration No.:	WR0017-233B
Task Number:		Test Stage:	2 of 2	Test Station No.:	2	Sample No.:	S07A
Project Name:		Test No.:	NA	File Name:	WR0017-233B_S07AbV	Penetration/Depth (ft):	30.95
		Test Series No.:	NA	Test Sheet:	1 of	Composite Sample No.:	

Material Description: Lean Clay, olive gray   Specimen No.: b

Axial Load Cell No.:	NA	Factor, (lbf/V/V):	NA	Excit. Volt, V:	NA	Ch. No.:	NA	Ht. Reading before Perm. (mm):	4.330
Vert. Dial/DT No.:	DG-038	Factor, (mm/V/V):		Excit. Volt, V:		Ch. No.:		Ht. Reading at σ_c = 0 (mm):	4.43

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	56.198	19.97
m/yr	Final:	56.198	20.03

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.37

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.04	50.4
1.0E-5 to 1.0E-6	≤10	50.44	50.9
1.0E-6 to 1.0E-7	≤20	51.24	51.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.04	52.7
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, U_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/25	5:26:34	22.5	18.8	NA	67.40	50.00	4.300	50.50	50.00	0.00	10.00	0.98	86.03	15.3	3.12E-06
1	rc,jr	1/25	5:45:23	22.5		NA	67.40	50.00	4.300	50.50	50.00	1.02	9.00		75.77	15.3	2.93E-06
	rc,jr	1/25	5:46:59	22.5	19.0	NA	67.40	50.00	4.300	50.50	50.00	0.00	10.00	1.01	86.033	15.3	3.27E-06
* 2	rc,jr	1/25	6:05:56	22.5		NA	67.40	50.00	4.300	50.50	50.00	1.06	8.93		75.212	15.3	3.08E-06
	rc,jr	1/25	6:06:50	22.5	59.6	NA	67.40	50.00	4.300	50.50	50.00	0.00	10.00	1.00	86.03	15.3	3.11E-06
* 3	rc,jr	1/25	7:06:28	22.5		NA	67.40	50.00	4.300	50.50	50.00	2.80	7.20		57.58	15.3	2.93E-06
	rc,jr	1/25	7:17:03	22.5	18.8	NA	67.40	50.00	4.300	50.50	50.00	0.00	10.00	1.01	86.03	15.3	3.10E-06
* 4	rc,jr	1/25	7:35:53	22.5		NA	67.40	50.00	4.300	50.50	50.00	1.00	8.99		75.82	15.3	2.92E-06
	rc,jr	1/25	7:36:52	22.5	22.1	NA	67.40	50.00	4.300	50.50	50.00	0.00	10.00	1.00	86.03	15.3	2.99E-06
* 5	rc,jr	1/25	7:59:00	22.5		NA	67.40	50.00	4.300	50.50	50.00	1.13	8.87		74.55	15.3	2.81E-06

Average $k_{20°C}$:	2.93E-06	cm/s
Max. Dev. from mean:	5.1%	
Avg. Initial Gradient (i_o):	15.3	
Intrinsic (Absolute) Permability, *K*:	3.00E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr   Final Calc. By: RC,jr   Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 4/1/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-235B	SAMPLE NO. S08A a	PENETRATION (Depth) 38.15	PERMEAMETER NO. CHP-2
MATERIAL DESCRIPTION	Poorly Graded Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	19.4	24.2	HEIGHT, H	7.380 (cm)	7.309 (cm)	Cell Pressure (psi)	70.10
Total Unit Weight (pcf)	117.0	125.0	DIAMETER, D	6.10 (cm)	6.05 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	98.0	100.7	AREA, A	29.22 (cm^2)	28.72 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	75.1	100.0	VOLUME, V	215.68 (cm^3)	209.94 (cm^3)	Axial Strain During Consolidation (%)	0.96
Void Ratio e	0.685	0.640	LENGTH, L Mamometer separation		7.309 (cm)	Volumetric Strain Consolidation (%)	2.66

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec)
Q = Volume of Water (cm^3)
A = Cross. Area of Specimen (cm^2)
L = Length of Specimen (cm)
h = Head (cm)
t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
04-01	30	37.8	34.2	23.2	0.5	3.6	19.9	4.61E-02	4.27E-02
04-01	30	37.8	34.2	23.2	0.5	3.6	19.3	4.47E-02	4.14E-02
04-01	30	37.8	34.2	23.2	0.5	3.6	18.8	4.35E-02	4.04E-02
04-01	30	37.8	34.2	23.2	0.5	3.6	18.7	4.33E-02	4.01E-02
				Gradient average:	0.5	3.6		4.44E-02	4.12E-02
04-01	30	35.8	34.2	23.2	0.2	1.6	19.3	1.01E-01	9.32E-02
04-01	60	35.8	34.2	23.2	0.2	1.6	18.4	4.79E-02	4.44E-02
04-01	60	35.8	34.2	23.2	0.2	1.6	17.8	4.64E-02	4.30E-02
04-01	60	35.8	34.2	23.2	0.2	1.6	17.2	4.48E-02	4.15E-02
				Gradient average:	0.2	1.6		5.99E-02	5.55E-02
				Gradient average:					
				Gradient average:					

Tested By: RJ
Date: 0401-2013

Input By: RC,jr
Date: 04-05-2013

Reviewed By: RJ
Date: 04-09-2013

FUGRO

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12/4/2012	PROJECT NAME RD17 Study Area	JOB NO. 04.11120056

BORING NO. WR0017-243B	SAMPLE NO. S06A a	PENETRATION (Depth) 20.05	PERMEAMETER NO. Perm 3

MATERIAL DESCRIPTION Silty Sand, Brown

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	27.8	25.4	HEIGHT, H	5.084 (cm)	5.045 (cm)	Cell Pressure (psi)	72.50
Total Unit Weight (pcf)	123.0	123.8	DIAMETER, D	5.00 (cm)	4.95 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	96.2	98.7	AREA, A	19.63 (cm^2)	19.30 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	103.0	100.0	VOLUME, V	99.82 (cm^3)	97.35 (cm^3)	Axial Strain During Consolidation (%)	0.77
Void Ratio e	0.716	0.674	LENGTH, L Mamometer separation		5.045 (cm)	Volumetric Strain Consolidation (%)	2.47

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$ K_T = Permeability (cm/sec) Q = Volume of Water (cm^3) A = Cross. Area of Specimen (cm^2) L = Length of Specimen (cm) h = Head (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12/4/12	60	50.2	44.0	22.8	1.2	6.2	12.3	8.50E-03	7.95E-03
12/4/12	60	50.2	44.0	22.8	1.2	6.2	12.3	8.50E-03	7.95E-03
12/4/12	60	50.2	44.0	22.8	1.2	6.2	12.2	8.43E-03	7.88E-03
12/4/12	60	50.2	44.0	22.8	1.2	6.2	12.2	8.43E-03	7.88E-03
				Gradient average:	1.2	6.2		8.46E-03	7.92E-03
12/4/12	60	50.2	40.2	22.8	2.0	10.0	19.6	8.39E-03	7.85E-03
12/4/12	60	50.2	40.2	22.8	2.0	10.0	19.6	8.39E-03	7.85E-03
12/4/12	60	50.2	40.2	22.8	2.0	10.0	19.6	8.39E-03	7.85E-03
12/4/12	60	50.2	40.2	22.8	2.0	10.0	19.6	8.39E-03	7.85E-03
				Gradient average:	2.0	10.0		8.39E-03	7.85E-03
12/4/12	30	50.2	34.6	22.8	3.1	15.6	16.5	9.059E-03	8.475E-03
12/4/12	30	50.2	34.6	22.8	3.1	15.6	15.9	8.729E-03	8.167E-03
12/4/12	30	50.2	34.6	22.8	3.1	15.6	16.2	8.894E-03	8.321E-03
12/4/12	30	50.2	34.6	22.8	3.1	15.6	15.9	8.729E-03	8.167E-03
				Gradient average:	3.1	15.6		8.853E-03	8.282E-03
				Gradient average:					

Tested By: RC,jr Date: 12/4/12

Input By: RC,jr Date: 12/4/12

Reviewed By: RJ Date: 12/10/2012

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12/10/2012	PROJECT NAME RD17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-243B	SAMPLE NO. S08A a	PENETRATION (Depth) 23.35	PERMEAMETER NO. Perm 3
MATERIAL DESCRIPTION	Sand, brown		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	10.0	25.6	HEIGHT, H	8.380 (cm)	8.330 (cm)	Cell Pressure (psi)	63.90
Total Unit Weight (pcf)	109.0	123.6	DIAMETER, D	6.10 (cm)	6.14 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	99.1	98.4	AREA, A	29.22 (cm^2)	29.60 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	39.9	100.0	VOLUME, V	244.90 (cm^3)	246.53 (cm^3)	Axial Strain During Consolidation (%)	0.85
Void Ratio e	0.667	0.678	LENGTH, L Mamometer separation	8.380	(cm)	Volumetric Strain Consolidation (%)	4.66

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec)
Q = Volume of Water (cm^3)
A = Cross. Area of Specimen (cm^2)
L = Length of Specimen (cm)
h = Head (cm)
t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12-10-12	30	48.0	45.3	23.4	0.3	2.7	9.5	3.36E-02	3.10E-02
12-10-12	30	48.0	45.3	23.4	0.3	2.7	9.6	3.40E-02	3.14E-02
12-10-12	30	48.0	45.3	23.4	0.3	2.7	9.6	3.40E-02	3.14E-02
12-10-12	30	48.0	45.3	23.4	0.3	2.7	9.5	3.36E-02	3.10E-02
				Gradient average:	0.3	2.7		3.38E-02	3.12E-02
12-10-12	30	50.0	45.3	23.4	0.6	4.7	17.6	3.58E-02	3.30E-02
12-10-12	30	50.0	45.3	23.4	0.6	4.7	17	3.46E-02	3.19E-02
12-10-12	60	50.0	45.3	23.4	0.6	4.7	33	3.36E-02	3.10E-02
12-10-12	60	50.0	45.3	23.4	0.6	4.7	32.4	3.29E-02	3.04E-02
				Gradient average:	0.6	4.7		3.42E-02	3.16E-02
				Gradient average:					
				Gradient average:					

Tested By: RC,jr
Date: 12/10/12

Input By: RC,jr
Date: 12/10/12

Reviewed By: RJ
Date: 12/14/2012

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12/12/2012	PROJECT NAME RD17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-243B	SAMPLE NO. S08A a	PENETRATION (Depth) 23.35	PERMEAMETER NO. Perm 3
MATERIAL DESCRIPTION	Sand, brown		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	10.0	25.6	HEIGHT, H	8.380 (cm)	8.309 (cm)	Cell Pressure (psi)	84.70
Total Unit Weight (pcf)	109.0	123.6	DIAMETER, D	6.10 (cm)	5.98 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	99.1	98.4	AREA, A	29.22 (cm^2)	28.10 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	39.9	100.0	VOLUME, V	244.90 (cm^3)	233.48 (cm^3)	Axial Strain During Consolidation (%)	0.85
Void Ratio e	0.667	0.678	LENGTH, L Mamometer separation		8.380 (cm)	Volumetric Strain Consolidation (%)	4.66

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12-12-12	60	37.0	34.6	23.5	0.3	2.4	16.2	3.23E-02	2.97E-02
12-12-12	60	37.0	34.6	23.5	0.3	2.4	16.1	3.21E-02	2.95E-02
12-12-12	60	37.0	34.6	23.5	0.3	2.4	16.1	3.21E-02	2.95E-02
12-12-12	60	37.0	34.6	23.5	0.3	2.4	16.3	3.25E-02	2.99E-02
				Gradient average:	0.3	2.4		3.22E-02	2.96E-02
12-12-12	60	39.0	34.6	23.5	0.5	4.4	32.1	3.49E-02	3.21E-02
12-12-12	60	39.0	34.6	23.5	0.5	4.4	32.5	3.53E-02	3.25E-02
12-12-12	60	39.0	34.6	23.5	0.5	4.4	32.8	3.56E-02	3.28E-02
12-12-12	60	39.0	34.6	23.5	0.5	4.4	32.4	3.52E-02	3.24E-02
				Gradient average:	0.5	4.4		3.52E-02	3.24E-02
				Gradient average:					
				Gradient average:					

Tested By: RC,jr
Date: 12/12/12

Input By: RC,jr
Date: 12/12/12

Reviewed By: RJ
Date: 12/14/2012

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 Test Type: Permeability Vert. Cell No.: CU-16 Boring/Exploration No.: WR0017-253B
Task Number: ______ Test Stage: 1 of 3 Test Station No.: 1 Sample No.: S07A
Project Name: ______ Test No.: NA File Name: WR0017-253B_S07AaV Penetration/Depth (ft): 28.75
Test Series No.: NA Test Sheet: 1 of ______ Composite Sample No.: ______
Material Description: Silty Clay with Sand, brown Specimen No.: a

Axial Load Cell No.: NA Factor, (lbf/V/V): NA Excit. Volt, V: NA Ch. No.: NA Ht. Reading before Perm. (mm): 8.100
Vert. Dial/DT No.: DG-069 Factor, (mm/V/V): ______ Excit. Volt, V: ______ Ch. No.: ______ Ht. Reading at σ_c = 0 (mm): ______

Permeation & Specimen Information

Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	87.814	19.72
m/yr	Final:	87.814	19.45

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.2
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	☐ Elev.
If by Vol.: X Case 2	☐ Case 3

Differential Pressure Head System
☐ Differential Manometer (cm Hg):
☐ U-tube; ☐ Vert. Column
X Pressure Trans./Gage (psi): ☐ Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.27	50.7
1.0E-5 to 1.0E-6	≤10	50.89	51.4
1.0E-6 to 1.0E-7	≤20	52.14	52.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.38	54.2
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary Final	Hyd. Conductivity, k Preliminary, k_t Final, $k_{20°C}$ cm/s
	rc,jr	12/2	9:20:06	22.9	36.5	NA	66.00	50.00	8.100	50.00	50.00	3.00	7.00	1.00	20.32	2.3	1.16E-05
1	rc,jr	12/2	9:56:34	22.9		NA	66.00	50.00	8.100	50.00	50.00	3.88	6.12		11.38	2.3	1.10E-05
	rc,jr	12/2	9:57:01	22.9	43.0	NA	66.00	50.00	8.100	50.00	50.00	3.00	7.00	1.00	20.320	2.3	1.15E-05
* 2	rc,jr	12/2	10:39:58	22.9		NA	66.00	50.00	8.100	50.00	50.00	3.98	6.02		10.363	2.3	1.09E-05
	rc,jr	12/2	10:40:46	22.9	83.4	NA	66.00	50.00	8.100	50.00	50.00	3.00	7.00	1.01	20.32	2.3	9.26E-06
3	rc,jr	12/2	12:04:10	22.9		NA	66.00	50.00	8.100	50.00	50.00	4.30	5.69		7.06	2.3	8.78E-06
	rc,jr	12/2	12:04:35	22.9	51.0	NA	66.00	50.00	8.100	50.00	50.00	3.00	7.00	1.00	20.32	2.3	1.04E-05
* 4	rc,jr	12/2	12:55:33	22.9		NA	66.00	50.00	8.100	50.00	50.00	4.03	5.97		9.86	2.3	9.84E-06
	rc,jr	12/2	12:56:06	22.9	37.0	NA	66.00	50.00	8.100	50.00	50.00	3.00	7.00	1.00	20.32	2.3	1.22E-05
* 5	rc,jr	12/2	13:33:07	22.9		NA	66.00	50.00	8.100	50.00	50.00	3.92	6.08		10.97	2.3	1.15E-05

Average $k_{20°C}$:	1.07E-05	cm/s
Max. Dev. from mean:	8.4%	
Avg. Initial Gradient (i_o) :	2.3	
Intrinsic (Absolute) Permability, *K*:	1.10E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-16 | Boring/Exploration No.: WR0017-253B
Task Number: | Test Stage: 2 of 3 | Test Station No.: 1 | Sample No.: S07A
Project Name: | Test No.: NA | File Name: WR0017-253B_S07AaV | Penetration/Depth (ft): 28.75
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silty Clay with Sand, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 8.500
Vert. Dial/DT No.: DG-069 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	87.414	19.64
m/yr	Final:	87.414	19.27
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.6		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.27	50.7
1.0E-5 to 1.0E-6	≤10	50.89	51.4
1.0E-6 to 1.0E-7	≤20	52.13	52.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.37	54.1
For Special Gradient, i			

Remarks:

Trial No.	Readings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Fluid (3) Head, hw_r cm^3	Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/3	8:59:50	24.3	91.6	NA	84.70	50.00	8.500	50.00	50.00	3.00	7.00	0.99	20.32	2.3	5.33E-06
1	rc,jr	1/3	10:31:25	24.3		NA	84.70	50.00	8.500	50.00	50.00	3.98	6.03		10.41	2.3	4.92E-06
	rc,jr	1/3	10:28:19	24.3	19.7	NA	84.70	50.00	8.500	50.50	50.00	3.00	7.00	1.01	55.553	6.4	7.93E-06
* 2	rc,jr	1/3	10:48:03	24.3		NA	84.70	50.00	8.500	50.50	50.00	4.05	5.94		44.834	6.4	7.32E-06
	rc,jr	1/3	10:49:15	24.3	18.5	NA	84.70	50.00	8.500	50.50	50.00	3.00	7.00	1.00	55.55	6.4	7.96E-06
* 3	rc,jr	1/3	11:07:47	24.3		NA	84.70	50.00	8.500	50.50	50.00	4.00	6.00		45.39	6.4	7.34E-06
	rc,jr	1/3	11:09:27	24.3	35.1	NA	84.70	50.00	8.500	50.50	50.00	3.00	7.00	0.99	55.55	6.4	7.89E-06
* 4	rc,jr	1/3	11:44:30	24.3		NA	84.70	50.00	8.500	50.50	50.00	4.73	5.28		38.03	6.4	7.29E-06
	rc,jr	1/3	11:45:19	24.3	18.5	NA	84.70	50.00	8.500	50.50	50.00	3.00	7.00	0.99	55.55	6.4	7.91E-06
5	rc,jr	1/3	12:03:51	24.3		NA	84.70	50.00	8.500	50.50	50.00	4.00	6.01		45.44	6.4	7.30E-06

Average $k_{20°C}$:	7.32E-06	cm/s
Max. Dev. from mean:	0.4%	
Avg. Initial Gradient (i_o) :	6.4	
Intrinsic (Absolute) Permability, *K*:	7.49E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-16 | Boring/Exploration No.: WR0017-253B

Task Number: ______ | Test Stage: 3 of 3 | Test Station No.: 1 | Sample No.: S07A

Project Name: ______ | Test No.: NA | File Name: WR0017-253B_S07AaV | Penetration/Depth (ft): 28.75

Test Series No.: NA | Test Sheet: 1 of ____ | Composite Sample No.: ______

Material Description: Silty Clay with Sand, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 8.500

Vert. Dial/DT No.: DG-069 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): 8.42

Permeation & Specimen Information

Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	87.414	19.64
☐ m/yr	Final:	87.414	19.27

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.6

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	☐ Elev.
If by Vol.: X Case 2	☐ Case 3

Differential Pressure Head System

☐ Differential Manometer (cm Hg):

☐ U-tube; ☐ Vert. Column

X Pressure Trans./Gage (psi): ☐ Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.27	50.7
1.0E-5 to 1.0E-6	≤10	50.89	51.4
1.0E-6 to 1.0E-7	≤20	52.13	52.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.37	54.1
For Special Gradient, i			

Remarks: ______

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	1/4	5:07:50	23.5	11.9	NA	84.70	50.00	8.500	50.50	50.00	0.00	10.00	1.01	86.03	9.8	7.93E-06
1	rc,jr	1/4	5:19:43	23.5		NA	84.70	50.00	8.500	50.50	50.00	1.02	8.97		75.62	9.8	7.45E-06
	rc,jr	1/4	5:20:38	23.5	16.6	NA	84.70	50.00	8.500	50.50	50.00	0.00	10.00	1.00	86.033	9.8	8.13E-06
* 2	rc,jr	1/4	5:37:15	23.5		NA	84.70	50.00	8.500	50.50	50.00	1.43	8.57		71.504	9.8	7.64E-06
	rc,jr	1/4	5:38:11	23.5	18.0	NA	84.70	50.00	8.500	50.50	50.00	0.00	10.00	1.01	86.03	9.8	7.66E-06
* 3	rc,jr	1/4	5:56:09	23.5		NA	84.70	50.00	8.500	50.50	50.00	1.45	8.54		71.25	9.8	7.20E-06
	rc,jr	1/4	5:57:00	23.5	12.7	NA	84.70	50.00	8.500	50.50	50.00	0.00	10.00	1.00	86.03	9.8	8.00E-06
* 4	rc,jr	1/4	6:09:42	23.5		NA	84.70	50.00	8.500	50.50	50.00	1.10	8.90		74.86	9.8	7.52E-06
	rc,jr	1/4	6:10:17	23.5	15.1	NA	84.70	50.00	8.500	50.50	50.00	0.00	10.00	1.00	86.03	9.8	8.07E-06
* 5	rc,jr	1/4	6:25:22	23.5		NA	84.70	50.00	8.500	50.50	50.00	1.30	8.70		72.82	9.8	7.59E-06

Average $k_{20°C}$:	7.49E-06	cm/s
Max. Dev. from mean:	3.8%	
Avg. Initial Gradient (i_o) :	9.8	
Intrinsic (Absolute) Permability, *K*:	7.67E-11	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-23 | Boring/Exploration No.: WR0017-264E

Task Number: | Test Stage: 1 of 2 | Test Station No.: 16 | Sample No.: S07A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 18.20

Test Series No.: NA | File Name: WR0017-264B_S07AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 6.250

Vert. Dial/DT No.: DG-073 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	76.428	19.73
= 50.0	Final:	76.428	19.25

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = -0.12

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.7	51.1
1.0E-5 to 1.0E-6	≤10	5.7	52.2
1.0E-6 to 1.0E-7	≤20	11.8	54.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	17.9	56.5
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	vr	12/26	10:17:44	24.1	6.4	NA	61.8	50.0	6.250	5.00	1.45	49.3	6.4	2.95E-01	2.74E-01	4.06
1	vr	12/26	10:24:06	24.1		NA	61.8	50.0	6.250	3.80	XXXXX	33.6	6.4	9.35E-07	8.69E-07	
	vr	12./26	10:24:52	24.1	5.1	NA	61.8	50.0	6.250	5.00	1.4	49.9	6.5	2.58E-01	2.40E-01	4.05
* 2	vr	12./26	10:31:11	24.1		NA	61.8	50.0	6.250	4.10	XXXXX	38.1	6.5	8.18E-07	7.61E-07	
	vr	12/26	10:31:51	24.1	5.1	NA	61.8	50.0	6.250	5.00	1.4	49.9	6.5	2.56E-01	2.39E-01	4.05
* 3	vr	12/26	10:36:59	24.1		NA	61.8	50.0	6.250	4.10	XXXXX	38.1	6.5	8.13E-07	7.56E-07	
	vr	12/26	10:37:35	24.1	5.1	NA	61.8	50.0	6.250	5.00	1.4	49.9	6.5	2.57E-01	2.39E-01	4.05
* 4	vr	12/26	10:42:42	24.1		NA	61.8	50.0	6.250	4.10	XXXXX	38.1	6.5	8.16E-07	7.59E-07	
	vr	12/26	10:43:37	24.1	5.1	NA	61.8	50.0	6.250	5.00	1.4	49.9	6.5	2.58E-01	2.40E-01	4.05
* 5	vr	12/26	10:48:45	24.1		NA	61.8	50.0	6.250	4.10	XXXXX	38.1	6.5	8.18E-07	7.61E-07	

Average $k_{20°C}$:	7.59E-07	cm/s
Max. Dev. from Mean:	0.4%	
Avg. Initial Gradient (i_o) :	6.5	
Intrinsic (Absolute) Permeability, *K*:	7.78E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: VR | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-23 | Boring/Exploration No.: WR0017-264E

Task Number: | Test Stage: 2 of 2 | Test Station No.: 16 | Sample No.: S07A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 3 | Penetration/Depth (ft): 18.20

Test Series No.: NA | File Name: WR0017-264B_S07AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 6.250

Vert. Dial/DT No.: DG-073 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 6.170

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	76.428	19.73
= 50.0	Final:	76.428	19.25

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = -0.12

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.7	51.1
1.0E-5 to 1.0E-6	≤10	5.7	52.2
1.0E-6 to 1.0E-7	≤20	11.8	54.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	17.9	56.5
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) (cm/s)	Minimum Allowable tw_r (cm)
	vr	12/26	12:54:20	24.1	2.1	NA	61.8	50.0	6.250	10.00	1.2	115.3	15.1	2.81E-01	2.61E-01	7.80
1	vr	12/26	12:56:26	24.1		NA	61.8	50.0	6.250	9.00	XXXXX	102.2	15.1	8.90E-07	8.28E-07	
	vr	12/26	12:57:16	24.1	2.1	NA	61.8	50.0	6.250	10.00	1.2	115.3	15.1	2.78E-01	2.59E-01	7.80
* 2	vr	12/26	12:59:23	24.1		NA	61.8	50.0	6.250	9.00	XXXXX	102.2	15.1	8.83E-07	8.21E-07	
	vr	12/26	13:00:09	24.1	2.1	NA	61.8	50.0	6.250	10.00	1.2	115.3	15.1	2.76E-01	2.57E-01	7.80
* 3	vr	12/26	13:02:17	24.1		NA	61.8	50.0	6.250	9.00	XXXXX	102.2	15.1	8.76E-07	8.15E-07	
	vr	12/26	13:03:14	24.1	2.1	NA	61.8	50.0	6.250	10.00	1.2	115.3	15.1	2.78E-01	2.59E-01	7.80
* 4	vr	12/26	13:05:21	24.1		NA	61.8	50.0	6.250	9.00	XXXXX	102.2	15.1	8.83E-07	8.21E-07	
	vr	12/26	13:06:04	24.1	2.1	NA	61.8	50.0	6.250	10.00	1.21	115.1	15.1	2.79E-01	2.59E-01	7.80
* 5	vr	12/26	13:08:11	24.1		NA	61.8	50.0	6.250	9.00	XXXXX	102.1	15.1	8.84E-07	8.22E-07	

Average $k_{20°C}$:	8.20E-07	cm/s
Max. Dev. from Mean:	0.6%	
Avg. Initial Gradient (i_o) :	15.1	
Intrinsic (Absolute) Permeability, *K*:	8.39E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: VR | Final Calc. By: RC,jr | Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12/14/2012	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-264B	SAMPLE NO. S09Aa	PENETRATION (Depth) 26.05	PERMEAMETER NO. ch perm3
MATERIAL DESCRIPTION	Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	23.0	24.2	HEIGHT, H	9.592 (cm)	9.551 (cm)	Cell Pressure (psi)	61.80
Total Unit Weight (pcf)	120.6	125.0	DIAMETER, D	6.10 (cm)	6.03 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	98.1	100.6	AREA, A	29.22 (cm^2)	28.60 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	89.0	100.0	VOLUME, V	280.33 (cm^3)	273.21 (cm^3)	Axial Strain During Consolidation (%)	0.43
Void Ratio e	0.684	0.641	LENGTH, L Mamometer separation		9.592 (cm)	Volumetric Strain Consolidation (%)	2.54

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12-14-12	60	39.2	34.6	24.3	0.5	4.6	11.4	1.36E-02	1.22E-02
12-14-12	60	39.2	34.6	24.3	0.5	4.6	11.4	1.36E-02	1.22E-02
12-14-12	60	39.2	34.6	24.3	0.5	4.6	11.6	1.38E-02	1.25E-02
12-14-12	60	39.2	34.6	24.3	0.5	4.6	11.7	1.39E-02	1.26E-02
				Gradient average:	0.5	4.6		1.37E-02	1.24E-02
12-14-12	60	41.1	34.6	24.3	0.7	6.5	16.6	1.40E-02	1.26E-02
12-14-12	60	41.1	34.6	24.3	0.7	6.5	16.6	1.40E-02	1.26E-02
12-14-12	60	41.1	34.6	24.3	0.7	6.5	16.6	1.40E-02	1.26E-02
12-14-12	60	41.1	34.6	24.3	0.7	6.5	16.8	1.41E-02	1.28E-02
				Gradient average:	0.7	6.5		1.40E-02	1.27E-02
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 12/14/2012

Input By: RC,jr Date: 12/14/2012

Reviewed By: RJ Date: 12/18/2012

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 4/10/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-264B	SAMPLE NO. S11A a	PENETRATION (Depth) 36.0	PERMEAMETER NO. CHP-1
MATERIAL DESCRIPTION	Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	17.8	19.9	HEIGHT, H	10.822 (cm)	10.796 (cm)	Cell Pressure (psi)	69.40
Total Unit Weight (pcf)	125.5	129.7	DIAMETER, D	5.01 (cm)	4.98 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	106.6	108.2	AREA, A	19.71 (cm^2)	19.47 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	85.6	100.0	VOLUME, V	213.34 (cm^3)	210.15 (cm^3)	Axial Strain During Consolidation (%)	0.24
Void Ratio e	0.549	0.526	LENGTH, L Mamometer separation		10.796 (cm)	Volumetric Strain Consolidation (%)	1.50

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
03-28	120	49.0	34.2	23.6	1.4	14.8	14.6	4.50E-03	4.13E-03
03-28	120	49.0	34.2	23.6	1.4	14.8	17.2	5.30E-03	4.87E-03
03-28	120	49.0	34.2	23.6	1.4	14.8	17.2	5.30E-03	4.87E-03
03-28	120	49.0	34.2	23.6	1.4	14.8	17.1	5.27E-03	4.84E-03
				Gradient average:	1.4	14.8		5.10E-03	4.68E-03
03-28	60	54.6	34.2	23.6	1.9	20.4	12.5	5.59E-03	5.14E-03
03-28	60	54.6	34.2	23.6	1.9	20.4	12.4	5.55E-03	5.09E-03
03-28	60	54.6	34.2	23.6	1.9	20.4	12	5.37E-03	4.93E-03
03-28	120	54.6	34.2	23.6	1.9	20.4	23.9	5.35E-03	4.91E-03
				Gradient average:	1.9	20.4		5.46E-03	5.02E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 03-28-2013
Input By: RC,jr Date: 03-28-2013
Reviewed By: RJ Date: 04-10-2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-265E

Task Number: | Test Stage: 1 of 2 | Test Station No.: 7.5 | Sample No.: S06A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 6 | Penetration/Depth (ft): 22.25

Test Series No.: NA | File Name: WR0017-265B_S06AbV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.100

Vert. Dial/DT No.: DG-026 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	37.946	19.54
= 50.0	Final:	37.946	19.46

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.3

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	1.1	50.5
1.0E-5 to 1.0E-6	≤10	2.6	51.1
1.0E-6 to 1.0E-7	≤20	5.7	52.2
<1.0E-7 or <3.0E-2 (m/yr)	≤30	8.7	53.2
For Special Gradient, i_o			

Trial No.	Readings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) (cm/s)	Minimum Allowable tw_r (cm)
	vr	12/7	8:20:17	22.9	5.8	NA	63.9	50.0	4.100	9.00	1.4	100.2	26.4	5.88E-02	5.51E-02	7.09
1	vr	12/7	8:26:07	22.9		NA	63.9	50.0	4.100	8.00	XXXXX	87.1	26.4	1.87E-07	1.75E-07	
	vr	12/7	8:27:17	22.9	6.0	NA	63.9	50.0	4.100	9.00	1.4	100.2	26.4	5.72E-02	5.36E-02	7.09
* 2	vr	12/7	8:33:17	22.9		NA	63.9	50.0	4.100	8.00	XXXXX	87.1	26.4	1.81E-07	1.70E-07	
	vr	12/7	8:34:54	22.9	6.7	NA	63.9	50.0	4.100	9.00	1.4	100.2	26.4	5.16E-02	4.83E-02	7.09
* 3	vr	12/7	8:41:33	22.9		NA	63.9	50.0	4.100	8.00	XXXXX	87.1	26.4	1.64E-07	1.53E-07	
	vr	12/7	8:43:18	22.9	6.6	NA	63.9	50.0	4.100	9.00	1.4	100.2	26.4	5.19E-02	4.86E-02	7.09
* 4	vr	12/7	8:49:55	22.9		NA	63.9	50.0	4.100	8.00	XXXXX	87.1	26.4	1.64E-07	1.54E-07	
	vr	12/7	8:52:40	22.9	6.6	NA	63.9	50.0	4.100	9.00	1.4	100.2	26.4	5.19E-02	4.86E-02	7.09
* 5	vr	12/7	8:59:17	22.9		NA	63.9	50.0	4.100	8.00	XXXXX	87.1	26.4	1.64E-07	1.54E-07	

Average $k_{20°C}$:	1.58E-07	cm/s
Max. Dev. from Mean:	7.6%	
Avg. Initial Gradient (i_o) :	26.4	
Intrinsic (Absolute) Permeability, *K*:	1.62E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-265E

Task Number: | Test Stage: 2 of 2 | Test Station No.: 7.5 | Sample No.: S06A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 6 | Penetration/Depth (ft): 22.25

Test Series No.: NA | File Name: WR0017-265B_S06AbV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.100

Vert. Dial/DT No.: DG-026 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 4.140

Permeation & Specimen Information

Permeant: X Tap Water; ☐

Direction of Flow: X Up; ☐ Down

Perm. Orientation: X Vertical; ☐ Horizontal

Specimen: X "Intact;" ☐ Reconstituted; ☐

Back Pressure, U_b (psi)	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
= 50.0	Preliminary:	37.946	19.54
	Final:	37.946	19.46

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.3

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2): 0.7671

Area tailwater tube, a_{out} (cm^2): 0.03142

ΔHg_{eq} at equilibrium (cm): 0.4

Fluid Density Const. (15-25°C): 12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	1.1	50.5
1.0E-5 to 1.0E-6	≤10	2.6	51.1
1.0E-6 to 1.0E-7	≤20	5.7	52.2
<1.0E-7 or <3.0E-2 (m/yr)	≤30	8.7	53.2
For Special Gradient, i_o			

Trial No.	Readings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial ☐ DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/7	9:19:30	22.9	4.1	NA	63.9	50.0	4.100	12.00	1.3	139.1	36.7	5.98E-02	5.60E-02	9.34
1	rc,jr	12/7	9:23:33	22.9		NA	63.9	50.0	4.100	11.00	XXXXX	126.1	36.7	1.90E-07	1.78E-07	
	rc,jr	12/7	9:24:11	22.9	4.0	NA	63.9	50.0	4.100	12.00	1.3	139.1	36.7	6.05E-02	5.67E-02	9.34
* 2	vr	12/7	9:28:11	22.9		NA	63.9	50.0	4.100	11.00	XXXXX	126.1	36.7	1.92E-07	1.80E-07	
	vr	12/7	9:29:09	22.9	4.1	NA	63.9	50.0	4.100	12.00	1.3	139.1	36.7	5.93E-02	5.55E-02	9.34
* 3	vr	12/7	9:33:14	22.9		NA	63.9	50.0	4.100	11.00	XXXXX	126.1	36.7	1.88E-07	1.76E-07	
	vr	12/7	9:33:47	22.9	4.1	NA	63.9	50.0	4.100	12.00	1.3	139.1	36.7	5.93E-02	5.55E-02	9.34
* 4	vr	12/7	9:37:52	22.9		NA	63.9	50.0	4.100	11.00	XXXXX	126.1	36.7	1.88E-07	1.76E-07	
	vr	12/7	9:38:37	22.9	4.1	NA	63.9	50.0	4.100	12.00	1.3	139.1	36.7	5.93E-02	5.55E-02	9.34
* 5	vr	12/7	9:42:42	22.9		NA	63.9	50.0	4.100	11.00	XXXXX	126.1	36.7	1.88E-07	1.76E-07	

Average $k_{20°C}$:	1.77E-07	cm/s
Max. Dev. from Mean:	1.6%	
Avg. Initial Gradient (i_o) :	36.7	
Intrinsic (Absolute) Permeability, *K*:	1.81E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number:	04.11120056	Test Type:	Permeability Vert.	Cell No.:	Perm-10	Boring/Exploration No.:	WR0017-265E
Task Number:		Test Stage:	1 of 2	Test Station No.:	1	Sample No.:	S08A
Project Name:		Test No.:	NA	Hyd. App. No. (Permometer):	3	Penetration/Depth (ft):	30.15
		Test Series No.:	NA	File Name:	WR0017-265B_S08bV	Composite Sample No.:	
Axial Load Cell No.:	NA	Factor, (lbf/V/V):	NA	Excit. Volt, V: NA	Ch. No.: NA	Ht. Reading before Perm. (mm):	4.190
Vert. Dial/DT No.:	DG-037	Factor, (mm/V/V):		Excit. Volt, V:	Ch. No.:	Ht. Reading at σ_c = 0 (mm):	

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	78.068	20.01
= 50.0	Final:	78.068	20.43
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.43			

Hydraulic System Constants

Mercury U-Tube Manometer	
Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.7	51.1
1.0E-5 to 1.0E-6	≤10	5.8	52.2
1.0E-6 to 1.0E-7	≤20	12.1	54.4
<1.0E-7 or <3.0E-2 (m/yr)	≤30	18.3	56.7
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/17	9:51:43	22.9	0.8	NA	66.7	50.0	4.190	6.00	1.45	61.8	7.9	1.38E+00	1.26E+00	4.82
1	rc,jr	12/17	9:52:34	22.9		NA	66.7	50.0	4.190	5.00	XXXXX	48.8	7.9	4.37E-06	3.99E-06	
	rc,jr	12/17	9:52:34	22.9	1.1	NA	66.7	50.0	4.190	5.00	1.5	48.6	6.2	1.38E+00	1.26E+00	4.07
* 2	rc,jr	12/17	9:53:41	22.9		NA	66.7	50.0	4.190	4.00	XXXXX	35.6	6.2	4.38E-06	4.01E-06	
	rc,jr	12/17	9:54:02	22.9	1.2	NA	66.7	50.0	4.190	5.00	1.5	48.6	6.2	1.32E+00	1.21E+00	4.07
* 3	rc,jr	12/17	9:55:12	22.9		NA	66.7	50.0	4.190	4.00	XXXXX	35.6	6.2	4.19E-06	3.83E-06	
	rc,jr	12/17	9:55:42	22.9	1.1	NA	66.7	50.0	4.190	5.00	1.5	48.6	6.2	1.40E+00	1.28E+00	4.07
* 4	rc,jr	12/17	9:56:48	22.9		NA	66.7	50.0	4.190	4.00	XXXXX	35.6	6.2	4.45E-06	4.07E-06	
	rc,jr	12/17	9:57:18	22.9	1.1	NA	66.7	50.0	4.190	5.00	1.5	48.6	6.2	1.34E+00	1.23E+00	4.07
* 5	rc,jr	12/17	9:58:27	22.9		NA	66.7	50.0	4.190	4.00	XXXXX	35.6	6.2	4.25E-06	3.89E-06	

Average $k_{20°C}$:	3.95E-06	cm/s
Max. Dev. from Mean:	3.0%	
Avg. Initial Gradient (i_o) :	6.2	
Intrinsic (Absolute) Permeability, *K*:	4.04E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number:	04.11120056	Test Type:	Permeability Vert.	Cell No.:	Perm-10	Boring/Exploration No.:	WR0017-265E
Task Number:		Test Stage:	2 of 2	Test Station No.:	1	Sample No.:	S08A
Project Name:		Test No.:	NA	Hyd. App. No. (Permometer):	3	Penetration/Depth (ft):	30.15
		Test Series No.:	NA	File Name:	WR0017-265B_S08bV	Composite Sample No.:	
Axial Load Cell No.:	NA	Factor, (lbf/V/V):	NA	Excit. Volt, V:	NA	Ch. No.: NA	Ht. Reading before Perm. (mm): 4.190
Vert. Dial/DT No.:	DG-037	Factor, (mm/V/V):		Excit. Volt, V:		Ch. No.:	Ht. Reading at σ_c = 0 (mm): 4.240

Permeation & Specimen Information

Permeant:	X Tap Water;			
Direction of Flow:	X Up;	Down		
Perm. Orientation:	X Vertical;	Horizontal		
Specimen:	X "Intact;"	Reconstituted;		
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)	
Pressure, U_b (psi)	Preliminary:	78.068	20.01	
= 50.0	Final:	78.068	20.43	
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.43				

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	2.7	51.1
1.0E-5 to 1.0E-6	≤10	5.8	52.2
1.0E-6 to 1.0E-7	≤20	12.1	54.4
<1.0E-7 or <3.0E-2 (m/yr)	≤30	18.3	56.7
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	12/17	10:18:35	22.9	0.5	NA	66.7	50.0	4.190	9.00	1.3	101.4	13.0	1.41E+00	1.29E+00	7.06
1	rc,jr	12/17	10:19:04	22.9		NA	66.7	50.0	4.190	8.00	XXXXX	88.4	13.0	4.46E-06	4.08E-06	
	rc,jr	12/17	10:19:04	22.9	0.6	NA	66.7	50.0	4.190	8.00	1.35	88.2	11.3	1.44E+00	1.31E+00	6.31
* 2	rc,jr	12/17	10:19:37	22.9		NA	66.7	50.0	4.190	7.00	XXXXX	75.2	11.3	4.56E-06	4.17E-06	
	rc,jr	12/17	10:20:10	22.9	0.6	NA	66.7	50.0	4.190	8.00	1.35	88.2	11.3	1.36E+00	1.24E+00	6.31
* 3	rc,jr	12/17	10:20:45	22.9		NA	66.7	50.0	4.190	7.00	XXXXX	75.2	11.3	4.30E-06	3.93E-06	
	rc,jr	12/17	10:21:10	22.9	0.6	NA	66.7	50.0	4.190	8.00	1.35	88.2	11.3	1.36E+00	1.24E+00	6.31
* 4	rc,jr	12/17	10:21:45	22.9		NA	66.7	50.0	4.190	7.00	XXXXX	75.2	11.3	4.30E-06	3.93E-06	
	rc,jr	12/17	10:22:25	22.9	0.6	NA	66.7	50.0	4.190	8.00	1.35	88.2	11.3	1.36E+00	1.24E+00	6.31
* 5	rc,jr	12/17	10:23:00	22.9		NA	66.7	50.0	4.190	7.00	XXXXX	75.2	11.3	4.30E-06	3.93E-06	

Average $k_{20°C}$:	3.99E-06	cm/s
Max. Dev. from Mean:	4.5%	
Avg. Initial Gradient (i_o) :	11.3	
Intrinsic (Absolute) Permeability, *K*:	4.08E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr   Final Calc. By: RC,jr   Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-4 | Boring/Exploration No.: WR0017-278B
Task Number: | Test Stage: 1 of 3 | Test Station No.: 2 | Sample No.: S07A
Project Name: | Test No.: NA | File Name: WR0017-278B_S07AaV | Penetration/Depth (ft): 17.70
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt with Sand, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 11.470
Vert. Dial/DT No.: DG-036 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	83.732	29.06
m/yr	Final:	83.732	28.71

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.59
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.24	50.7
1.0E-5 to 1.0E-6	≤10	50.83	51.3
1.0E-6 to 1.0E-7	≤20	52.02	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.21	54.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	vr	12/26	14:05:56	23.9	7.0	NA	61.80	50.00	11.470	50.00	50.00	3.00	7.00	1.00	20.32	2.4	4.67E-05
1	vr	12/26	14:12:57	23.9		NA	61.80	50.00	11.470	50.00	50.00	4.00	6.00		10.16	2.4	4.32E-05
	vr	12/26	14:13:45	23.9	7.2	NA	61.80	50.00	11.470	50.00	50.00	3.00	7.00	1.00	20.320	2.4	4.55E-05
* 2	vr	12/26	14:20:57	23.9		NA	61.80	50.00	11.470	50.00	50.00	4.00	6.00		10.160	2.4	4.21E-05
	vr	12/26	14:21:35	23.9	7.9	NA	61.80	50.00	11.470	50.00	50.00	3.00	7.00	1.00	20.32	2.4	4.15E-05
* 3	vr	12/26	14:29:27	23.9		NA	61.80	50.00	11.470	50.00	50.00	4.00	6.00		10.16	2.4	3.84E-05
	vr	12/26	14:30:17	23.9	7.9	NA	61.80	50.00	11.470	50.00	50.00	3.00	7.00	1.00	20.32	2.4	4.16E-05
* 4	vr	12/26	14:38:10	23.9		NA	61.80	50.00	11.470	50.00	50.00	4.00	6.00		10.16	2.4	3.85E-05
	vr	12/26	14:38:00	23.9	8.0	NA	61.80	50.00	11.470	50.00	50.00	3.00	7.00	1.00	20.32	2.4	4.10E-05
* 5	vr	12/26	14:46:00	23.9		NA	61.80	50.00	11.470	50.00	50.00	4.00	6.00		10.16	2.4	3.79E-05

Average $k_{20°C}$:	3.92E-05 cm/s
Max. Dev. from mean:	7.4%
Avg. Initial Gradient (i_o) :	2.4
Intrinsic (Absolute) Permability, *K*:	4.01E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: VR | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-4 | Boring/Exploration No.: WR0017-278B
Task Number: | Test Stage: 2 of 3 | Test Station No.: 6 | Sample No.: S07A
Project Name: | Test No.: NA | File Name: WR0017-278B_S07AaV | Penetration/Depth (ft): 17.70
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt with Sand, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 11.760
Vert. Dial/DT No.: DG-036 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	83.442	28.98
m/yr	Final:	83.442	28.56

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.88
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1965
Area tailwater tube, a_{out} (cm^2):	0.1965
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm³); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.24	50.7
1.0E-5 to 1.0E-6	≤10	50.83	51.3
1.0E-6 to 1.0E-7	≤20	52.01	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.20	53.9
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	vr	1/4	9:22:56	23.9	5.6	NA	77.80	50.00	11.760	50.00	50.00	3.00	7.00	1.00	20.36	2.4	5.85E-05
1	vr	1/4	9:28:31	23.9		NA	77.80	50.00	11.760	50.00	50.00	4.00	6.00		10.18	2.4	5.43E-05
	vr	1/4	9:29:52	23.9	7.4	NA	77.80	50.00	11.760	50.00	50.00	3.00	7.00	1.00	20.360	2.4	5.08E-05
* 2	vr	1/4	9:37:17	23.9		NA	77.80	50.00	11.760	50.00	50.00	4.10	5.90		9.162	2.4	4.71E-05
	vr	1/4	9:38:35	23.9	6.5	NA	77.80	50.00	11.760	50.00	50.00	3.00	7.00	1.00	20.36	2.4	5.01E-05
* 3	vr	1/4	9:45:06	23.9		NA	77.80	50.00	11.760	50.00	50.00	4.00	6.00		10.18	2.4	4.65E-05
	vr	1/4	9:46:05	23.9	6.5	NA	77.80	50.00	11.760	50.00	50.00	3.00	7.00	1.00	20.36	2.4	5.01E-05
* 4	vr	1/4	9:52:36	23.9		NA	77.80	50.00	11.760	50.00	50.00	4.00	6.00		10.18	2.4	4.65E-05
	vr	1/4	9:53:30	23.9	6.5	NA	77.80	50.00	11.760	50.00	50.00	3.00	7.00	1.00	20.36	2.4	5.01E-05
* 5	vr	1/4	10:00:01	23.9		NA	77.80	50.00	11.760	50.00	50.00	4.00	6.00		10.18	2.4	4.65E-05

Average $k_{20°C}$:	4.67E-05 cm/s
Max. Dev. from mean:	0.9%
Avg. Initial Gradient (i_o):	2.4
Intrinsic (Absolute) Permability, *K*:	4.78E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-4 | Boring/Exploration No.: WR0017-278B

Task Number: | Test Stage: 3 of 3 | Test Station No.: 6 | Sample No.: S07A

Project Name: | Test No.: NA | File Name: WR0017-278B_S07AaV | Penetration/Depth (ft): 17.70

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silt with Sand, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 11.760

Vert. Dial/DT No.: DG-036 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 11.72

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	83.442	28.98
m/yr	Final:	83.442	28.56

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.88

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1965
Area tailwater tube, a_{out} (cm^2):	0.1965
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm³); System	0.9978

Elev. Heads by: X Vol. (1) | Elev.

If by Vol.: X Case 2 | Case 3

Differential Pressure Head System

Differential Manometer (cm Hg):

U-tube; | Vert. Column

X Pressure Trans./Gage (psi): | Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.24	50.7
1.0E-5 to 1.0E-6	≤10	50.83	51.3
1.0E-6 to 1.0E-7	≤20	52.01	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.20	53.9
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_f cm^3	Fluid (3) Tail, tw_t cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	am	1/7	8:22:40	23.8	4.1	NA	77.80	50.00	11.760	50.00	50.00	0.00	10.00	1.00	50.90	6.1	2.57E-05
1	am	1/7	8:26:46	23.8		NA	77.80	50.00	11.760	50.00	50.00	1.00	9.00		40.72	6.1	2.39E-05
	am	1/7	8:29:45	23.8	4.6	NA	77.80	50.00	11.760	50.00	50.00	0.00	10.00	1.00	50.900	6.1	2.27E-05
* 2	am	1/7	8:34:23	23.8		NA	77.80	50.00	11.760	50.00	50.00	1.00	9.00		40.720	6.1	2.11E-05
	am	1/7	8:37:03	23.8	4.1	NA	77.80	50.00	11.760	50.00	50.00	0.00	10.00	1.00	50.90	6.1	2.53E-05
* 3	am	1/7	8:41:12	23.8		NA	77.80	50.00	11.760	50.00	50.00	1.00	9.00		40.72	6.1	2.36E-05
	am	1/7	8:43:32	23.8	4.6	NA	77.80	50.00	11.760	50.00	50.00	0.00	10.00	1.00	50.90	6.1	2.31E-05
* 4	am	1/7	8:48:05	23.8		NA	77.80	50.00	11.760	50.00	50.00	1.00	9.00		40.72	6.1	2.15E-05
	am	1/7	8:52:20	23.8	4.4	NA	77.80	50.00	11.760	50.00	50.00	0.00	10.00	1.00	50.90	6.1	2.38E-05
* 5	am	1/7	8:56:45	23.8		NA	77.80	50.00	11.760	50.00	50.00	1.00	9.00		40.72	6.1	2.21E-05

Average $k_{20°C}$:	2.21E-05 cm/s
Max. Dev. from mean:	6.7%
Avg. Initial Gradient (i_o):	6.1
Intrinsic (Absolute) Permability, *K*:	2.26E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-3 | Boring/Exploration No.: WR0017-279B
Task Number: | Test Stage: 1 of 2 | Test Station No.: 4 | Sample No.: S09A
Project Name: | Test No.: NA | File Name: WR0017-279B_S09AaV | Penetration/Depth (ft): 25.85
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Sandy Silt, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.570
Vert. Dial/DT No.: DG-060 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant: X Tap Water; ☐
Direction of Flow: X Up; ☐ Down
Perm. Orientation: X Vertical; ☐ Horizontal
Specimen: X "Intact;" ☐ Reconstituted; ☐

Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	92.072	29.22
m/yr	Final:	92.072	29.29

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.77
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978

Elev. Heads by: X Vol. (1) ☐ Elev.
If by Vol.: X Case 2 ☐ Case 3
Differential Pressure Head System
☐ Differential Manometer (cm Hg):
☐ U-tube; ☐ Vert. Column
X Pressure Trans./Gage (psi): ☐ Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.30	50.7
1.0E-5 to 1.0E-6	≤10	50.95	51.5
1.0E-6 to 1.0E-7	≤20	52.26	52.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.57	54.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	4/9	8:25:12	23	9.0	NA	65.30	50.00	3.570	50.00	50.00	3.00	7.00	1.00	20.32	2.2	4.00E-05
1	rc,jr	4/9	8:34:09	23.0		NA	65.30	50.00	3.560	50.00	50.00	4.00	6.00		10.16	2.2	3.73E-05
	rc,jr	4/9	8:35:38	23.0	9.2	NA	65.30	50.00	3.560	50.00	50.00	3.00	7.00	1.02	20.320	2.2	3.93E-05
* 2	rc,jr	4/9	8:44:53	23.0		NA	65.30	50.00	3.560	50.00	50.00	4.00	5.98		10.058	2.2	3.66E-05
	rc,jr	4/9	8:45:46	23.0	9.3	NA	65.30	50.00	3.560	50.00	50.00	3.00	7.00	1.02	20.32	2.2	3.90E-05
* 3	rc,jr	4/9	8:55:05	23.0		NA	65.30	50.00	3.560	50.00	50.00	4.00	5.98		10.06	2.2	3.63E-05
	rc,jr	4/9	8:56:12	23.0	9.3	NA	65.30	50.00	3.560	50.00	50.00	3.00	7.00	1.01	20.32	2.2	3.94E-05
* 4	rc,jr	4/9	9:05:29	23.0		NA	65.30	50.00	3.560	50.00	50.00	4.01	5.98		10.01	2.2	3.67E-05
	rc,jr	4/9	9:06:39	23.0	9.4	NA	65.30	50.00	3.560	50.00	50.00	3.00	7.00	1.01	20.32	2.2	3.84E-05
* 5	rc,jr	4/9	9:16:03	23.0		NA	65.30	50.00	3.560	50.00	50.00	4.00	5.99		10.11	2.2	3.58E-05

Average $k_{20°C}$:	3.64E-05	cm/s
Max. Dev. from mean:	1.6%	
Avg. Initial Gradient (i_o) :	2.2	
Intrinsic (Absolute) Permability, *K*:	3.72E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-3 | Boring/Exploration No.: WR0017-279B

Task Number: ______ | Test Stage: 2 of 2 | Test Station No.: 4 | Sample No.: S09A

Project Name: ______ | Test No.: NA | File Name: WR0017-279B_S09AaV | Penetration/Depth (ft): 25.85

Test Series No.: NA | Test Sheet: 1 of ____ | Composite Sample No.: ______

Material Description: Sandy Silt, brown | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.56

Vert. Dial/DT No.: DG-060 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): 3.76

Permeation & Specimen Information

Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	92.062	29.22
☐ m/yr	Final:	92.072	29.29

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.78

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	☐ Elev.
If by Vol.: X Case 2	☐ Case 3

Differential Pressure Head System

☐ Differential Manometer (cm Hg):

☐ U-tube; ☐ Vert. Column

X Pressure Trans./Gage (psi): ☐ Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.30	50.7
1.0E-5 to 1.0E-6	≤10	50.95	51.5
1.0E-6 to 1.0E-7	≤20	52.26	52.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.56	54.4
For Special Gradtient, i			

Remarks: ______

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	4/9	10:18:00	23.1	2.9	NA	65.30	50.00	3.560	50.00	50.00	0.00	10.00	1.02	50.80	5.5	4.00E-05
1	rc,jr	4/9	10:20:55	23.1		NA	65.30	50.00	3.560	50.00	50.00	1.00	8.98		40.54	5.5	3.72E-05
	rc,jr	4/9	10:21:50	23.1	2.9	NA	65.30	50.00	3.560	50.00	50.00	0.00	10.00	1.00	50.800	5.5	3.95E-05
* 2	rc,jr	4/9	10:24:45	23.1		NA	65.30	50.00	3.560	50.00	50.00	1.00	9.00		40.640	5.5	3.67E-05
	rc,jr	4/9	10:26:00	23.1	2.8	NA	65.30	50.00	3.560	50.00	50.00	0.00	10.00	1.01	50.80	5.5	4.17E-05
* 3	rc,jr	4/9	10:28:47	23.1		NA	65.30	50.00	3.560	50.00	50.00	1.00	8.99		40.59	5.5	3.87E-05
	rc,jr	4/9	10:30:00	23.1	3.9	NA	65.30	50.00	3.560	50.00	50.00	0.00	10.00	1.01	50.80	5.5	3.99E-05
* 4	rc,jr	4/9	10:33:55	23.1		NA	65.30	50.00	3.560	50.00	50.00	1.30	8.69		37.54	5.5	3.71E-05
	rc,jr	4/9	10:47:30	23.1	3.0	NA	65.30	50.00	3.560	50.00	50.00	0.00	10.00	1.02	50.80	5.5	3.93E-05
* 5	rc,jr	4/9	10:50:28	23.1		NA	65.30	50.00	3.560	50.00	50.00	1.00	8.98		40.54	5.5	3.65E-05

Average $k_{20°C}$:	3.73E-05 cm/s
Max. Dev. from mean:	3.9%
Avg. Initial Gradient (i_o) :	5.5
Intrinsic (Absolute) Permability, *K*:	3.82E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

FUGRO

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 Test Type: Permeability Vert. Cell No.: CU-21 Boring/Exploration No.: WR0017-282B
Task Number: ______ Test Stage: 1 of 3 Test Station No.: 1 Sample No.: S04A
Project Name: ______ Test No.: NA File Name: WR0017-282B_S04AaV Penetration/Depth (ft): 6.80
Test Series No.: NA Test Sheet: 1 of ____ Composite Sample No.: ______
Material Description: Silt, brown with a small clay seam/pocket in the center of the sample. Specimen No.: a

Axial Load Cell No.: NA Factor, (lbf/V/V): NA Excit. Volt, V: NA Ch. No.: NA Ht. Reading before Perm. (mm): 12.510
Vert. Dial/DT No.: DG-058 Factor, (mm/V/V): ______ Excit. Volt, V: ______ Ch. No.: ______ Ht. Reading at $\sigma_c = 0$ (mm): ______

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.562	20.05
m/yr	Final:	81.562	20.34
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.07
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =		NA	H_b = NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.96	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.12	53.9
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	12/17	8:06:52	22.9	7.8	NA	56.90	50.00	12.510	50.00	50.00	3.00	7.00	1.00	20.32	2.5	5.94E-05
1	rc,jr	12/17	8:14:39	22.9		NA	56.90	50.00	12.510	50.00	50.00	4.00	6.00		10.16	2.5	5.48E-05
	rc,jr	12/17	8:16:03	22.9	9.9	NA	56.90	50.00	12.510	50.00	50.00	3.00	7.00	1.00	20.320	2.5	4.67E-05
* 2	rc,jr	12/17	8:25:57	22.9		NA	56.90	50.00	12.510	50.00	50.00	4.00	6.00		10.160	2.5	4.31E-05
	rc,jr	12/17	8:26:46	22.9	9.5	NA	56.90	50.00	12.510	50.00	50.00	3.00	7.00	0.99	20.32	2.5	4.82E-05
* 3	rc,jr	12/17	8:36:18	22.9		NA	56.90	50.00	12.510	50.00	50.00	4.00	6.01		10.21	2.5	4.44E-05
	rc,jr	12/17	8:36:48	22.9	11.6	NA	56.90	50.00	12.510	50.00	50.00	3.00	7.00	1.01	20.32	2.5	4.70E-05
* 4	rc,jr	12/17	8:48:23	22.9		NA	56.90	50.00	12.510	50.00	50.00	4.11	5.88		8.99	2.5	4.33E-05
	rc,jr	12/17	8:52:20	22.9	11.0	NA	56.90	50.00	12.510	50.00	50.00	3.00	7.00	1.02	20.32	2.5	4.90E-05
* 5	rc,jr	12/17	9:03:22	22.9		NA	56.90	50.00	12.510	50.00	50.00	4.10	5.88		9.04	2.5	4.52E-05

Average $k_{20°C}$:	4.40E-05 cm/s
Max. Dev. from mean:	2.6%
Avg. Initial Gradient (i_o):	2.5
Intrinsic (Absolute) Permability, *K*:	4.50E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RJ Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 Test Type: Permeability Vert. Cell No.: CU-21 Boring/Exploration No.: WR0017-282B
Task Number: Test Stage: 2 of 3 Test Station No.: 1 Sample No.: S04A
Project Name: Test No.: NA File Name: WR0017-282B_S04AaV Penetration/Depth (ft): 6.80
Test Series No.: NA Test Sheet: 1 of Composite Sample No.:
Material Description: Silt, brown with a small clay seam/pocket in the center of the sample. Specimen No.: a

Axial Load Cell No.: NA Factor, (lbf/V/V): NA Excit. Volt, V: NA Ch. No.: NA Ht. Reading before Perm. (mm): 12.730
Vert. Dial/DT No.: DG-058 Factor, (mm/V/V): Excit. Volt, V: Ch. No.: Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.342	20.00
m/yr	Final:	81.342	20.13
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.29
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.			
Area headwater tube, a_{in} (cm^2):			0.1969
Area tailwater tube, a_{out} (cm^2):			0.1969
Permeant/Fluid Density,		Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);		System	0.9978
Elev. Heads by:	X Vol. (1)		Elev.
If by Vol.:	X Case 2		Case 3
Differential Pressure Head System			
Differential Manometer (cm Hg):			
	U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):			Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.95	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.11	53.8
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	12/19	6:09:35	22.5	16.5	NA	77.80	50.00	12.730	50.00	50.00	3.00	7.00	0.99	20.32	2.5	3.48E-05
1	rc,jr	12/19	6:26:06	22.5		NA	77.80	50.00	12.730	50.00	50.00	4.16	5.85		8.59	2.5	3.26E-05
	rc,jr	12/19	6:27:08	22.5	14.0	NA	77.80	50.00	12.730	50.00	50.00	3.00	7.00	0.99	20.320	2.5	3.58E-05
* 2	rc,jr	12/19	6:41:07	22.5		NA	77.80	50.00	12.730	50.00	50.00	4.06	5.95		9.601	2.5	3.36E-05
	rc,jr	12/19	6:42:03	22.5	12.9	NA	77.80	50.00	12.730	50.00	50.00	3.00	7.00	1.00	20.32	2.5	3.58E-05
* 3	rc,jr	12/19	6:54:57	22.5		NA	77.80	50.00	12.730	50.00	50.00	4.00	6.00		10.16	2.5	3.36E-05
	rc,jr	12/19	6:55:51	22.5	13.4	NA	77.80	50.00	12.730	50.00	50.00	3.00	7.00	0.99	20.32	2.5	3.57E-05
* 4	rc,jr	12/19	7:09:16	22.5		NA	77.80	50.00	12.730	50.00	50.00	4.03	5.98		9.91	2.5	3.35E-05
	rc,jr	12/19	7:10:11	22.5	13.6	NA	77.80	50.00	12.730	50.00	50.00	3.00	7.00	1.01	20.32	2.5	3.52E-05
* 5	rc,jr	12/19	7:23:49	22.5		NA	77.80	50.00	12.730	50.00	50.00	4.02	5.97		9.91	2.5	3.30E-05

Average $k_{20°C}$:	3.34E-05	cm/s
Max. Dev. from mean:	1.3%	
Avg. Initial Gradient (i_o):	2.5	
Intrinsic (Absolute) Permability, *K*:	3.42E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RJ Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-21 | Boring/Exploration No.: WR0017-282B
Task Number: | Test Stage: 3 of 3 | Test Station No.: 1 | Sample No.: S04A
Project Name: | Test No.: NA | File Name: WR0017-282B_S04AaV | Penetration/Depth (ft): 6.80
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt, brown with a small clay seam/pocket in the center of the sample. | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 12.730
Vert. Dial/DT No.: DG-058 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm): 12.7

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.342	20.00
m/yr	Final:	81.342	20.13
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.29		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm³);	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.95	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.11	53.8
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2): Differential or Head	Pressure (2): Tail	Fluid (3): Head, hw_r cm^3	Fluid (3): Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	12/20	5:38:29	22.8	46.1	NA	77.80	50.00	12.730	50.00	50.00	0.10	9.90	1.00	49.78	6.1	3.68E-05
1	rc,jr	12/20	6:24:37	22.8		NA	77.80	50.00	12.730	50.00	50.00	4.62	5.39		3.91	6.1	3.43E-05
	rc,jr	12/20	6:26:32	22.8	5.4	NA	77.80	50.00	12.730	50.00	50.00	0.10	9.90	1.01	49.784	6.1	3.48E-05
* 2	rc,jr	12/20	6:31:57	22.8		NA	77.80	50.00	12.730	50.00	50.00	1.30	8.69		37.541	6.1	3.24E-05
	rc,jr	12/20	6:32:50	22.8	4.4	NA	77.80	50.00	12.730	50.00	50.00	0.20	9.80	0.99	48.77	6.0	3.67E-05
* 3	rc,jr	12/20	6:37:15	22.8		NA	77.80	50.00	12.730	50.00	50.00	1.24	8.77		38.25	6.0	3.42E-05
	rc,jr	12/20	6:38:35	22.8	4.4	NA	77.80	50.00	12.730	50.00	50.00	0.20	9.80	1.00	48.77	6.0	3.57E-05
* 4	rc,jr	12/20	6:42:57	22.8		NA	77.80	50.00	12.730	50.00	50.00	1.20	8.80		38.61	6.0	3.32E-05
	rc,jr	12/20	6:44:01	22.8	4.3	NA	77.80	50.00	12.730	50.00	50.00	0.20	9.80	0.91	48.77	6.0	3.43E-05
* 5	rc,jr	12/20	6:48:20	22.8		NA	77.80	50.00	12.730	50.00	50.00	1.20	8.89		39.07	6.0	3.19E-05

Average $k_{20^\circ C}$:	3.29E-05	cm/s
Max. Dev. from mean:	3.8%	
Avg. Initial Gradient (i_o):	6.0	
Intrinsic (Absolute) Permability, *K*:	3.37E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20^\circ C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RJ Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 Test Type: Permeability Vert. Cell No.: CU-20 Boring/Exploration No.: WR0017-286B
Task Number: Test Stage: 1 of 3 Test Station No.: 2 Sample No.: S03A
Project Name: Test No.: NA File Name: WR0017-286B_S03AaV Penetration/Depth (ft): 6.25
Test Series No.: NA Test Sheet: 1 of Composite Sample No.:
Material Description: Lean Clay,brown w/ some mica and borrow/root holes Specimen No.: a

Axial Load Cell No.: NA Factor, (lbf/V/V): NA Excit. Volt, V: NA Ch. No.: NA Ht. Reading before Perm. (mm): 7.820
Vert. Dial/DT No.: DG057 Factor, (mm/V/V): Excit. Volt, V: Ch. No.: Ht. Reading at $\sigma_c = 0$ (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	88.222	20.08
m/yr	Final:	88.222	19.87
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.32
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.27	50.7
1.0E-5 to 1.0E-6	≤10	50.90	51.4
1.0E-6 to 1.0E-7	≤20	52.15	52.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.40	54.2
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Pressure (2) Tail	Fluid (3) Head, hw_f cm^3	Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	vr	12/25	10:39:50	23.1	14.9	NA	56.90	50.00	7.820	50.00	50.00	3.00	7.00	0.98	20.32	2.3	3.34E-05
1	vr	12/25	10:54:47	23.1		NA	56.90	50.00	7.820	50.00	50.00	4.01	6.01		10.16	2.3	3.14E-05
	vr	12/25	10:57:09	23.1	14.7	NA	56.90	50.00	7.820	50.00	50.00	3.00	7.00	1.00	20.320	2.3	3.41E-05
* 2	vr	12/25	11:11:49	23.1		NA	56.90	50.00	7.820	50.00	50.00	4.00	6.00		10.160	2.3	3.20E-05
	vr	12/25	11:13:53	23.1	14.7	NA	56.90	50.00	7.820	50.00	50.00	3.00	7.00	1.00	20.32	2.3	3.39E-05
* 3	vr	12/25	11:28:37	23.1		NA	56.90	50.00	7.820	50.00	50.00	4.00	6.00		10.16	2.3	3.19E-05
	vr	12/25	11:30:47	23.1	14.7	NA	56.90	50.00	7.820	50.00	50.00	3.00	7.00	1.00	20.32	2.3	3.41E-05
* 4	vr	12/25	11:45:27	23.1		NA	56.90	50.00	7.820	50.00	50.00	4.00	6.00		10.16	2.3	3.20E-05
	vr	12/25	11:47:27	23.1	14.7	NA	56.90	50.00	7.820	50.00	50.00	3.00	7.00	1.00	20.32	2.3	3.41E-05
* 5	vr	12/25	12:02:07	23.1		NA	56.90	50.00	7.820	50.00	50.00	4.00	6.00		10.16	2.3	3.20E-05

Average $k_{20°C}$:	3.20E-05 cm/s
Max. Dev. from mean:	0.3%
Avg. Initial Gradient (i_o) :	2.3
Intrinsic (Absolute) Permability, *K*:	3.28E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-20 | Boring/Exploration No.: WR0017-286B
Task Number: | Test Stage: 2 of 3 | Test Station No.: 1 | Sample No.: S03A
Project Name: | Test No.: NA | File Name: WR0017-286B_S03AaV | Penetration/Depth (ft): 6.25
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Lean Clay,brown w/ some mica and borrow/root holes | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 8.360
Vert. Dial/DT No.: DG-057 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	87.682	19.98
m/yr	Final:	87.682	19.51
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.86		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.27	50.7
1.0E-5 to 1.0E-6	≤10	50.89	51.4
1.0E-6 to 1.0E-7	≤20	52.13	52.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.38	54.1
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/4	7:12:35	23.7	26.9	NA	77.80	50.00	8.360	50.00	50.00	3.00	7.00	1.00	20.32	2.3	2.26E-05
1	rc,jr	1/4	7:39:27	23.7		NA	77.80	50.00	8.360	50.00	50.00	4.14	5.86		8.74	2.3	2.13E-05
	rc,jr	1/4	7:40:27	23.7	33.1	NA	77.80	50.00	8.360	50.00	50.00	3.00	7.00	1.00	20.320	2.3	2.22E-05
* 2	rc,jr	1/4	8:13:34	23.7		NA	77.80	50.00	8.360	50.00	50.00	4.28	5.72		7.315	2.3	2.09E-05
	rc,jr	1/4	8:16:12	23.7	20.5	NA	77.80	50.00	8.360	50.00	50.00	3.00	7.00	1.00	20.32	2.3	2.43E-05
* 3	am	1/4	8:36:42	23.7		NA	77.80	50.00	8.360	50.00	50.00	4.00	6.00		10.16	2.3	2.29E-05
	am	1/4	8:41:15	23.7	20.7	NA	77.80	50.00	8.360	50.00	50.00	3.00	7.00	1.00	20.32	2.3	2.41E-05
* 4	am	1/4	9:01:58	23.7		NA	77.80	50.00	8.360	50.00	50.00	4.00	6.00		10.16	2.3	2.27E-05
	am	1/4	9:06:18	23.7	20.4	NA	77.80	50.00	8.360	50.00	50.00	3.00	7.00	1.00	20.32	2.3	2.44E-05
* 5	am	1/4	9:26:44	23.7		NA	77.80	50.00	8.360	50.00	50.00	4.00	6.00		10.16	2.3	2.30E-05

Average $k_{20°C}$:	2.24E-05	cm/s
Max. Dev. from mean:	6.5%	
Avg. Initial Gradient (i_o) :	2.3	
Intrinsic (Absolute) Permability, *K*:	2.29E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-20 | Boring/Exploration No.: WR0017-286B
Task Number: | Test Stage: 3 of 3 | Test Station No.: 1 | Sample No.: S03A
Project Name: | Test No.: NA | File Name: WR0017-286B_S03AaV | Penetration/Depth (ft): 6.25
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Lean Clay,brown w/ some mica and borrow/root holes | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 8.360
Vert. Dial/DT No.: DG-057 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 8.31

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	87.682	19.98
m/yr	Final:	87.682	19.51

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.86
Applied back pressure, U_b (psi) = 50.0
Bladder Inteface: H_f & H_b in cm, with H_f = NA H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3

Differential Pressure Head System
Differential Manometer (cm Hg):
U-tube; Vert. Column
X Pressure Trans./Gage (psi): Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.27	50.7
1.0E-5 to 1.0E-6	≤10	50.89	51.4
1.0E-6 to 1.0E-7	≤20	52.13	52.8
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.38	54.1
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	am	1/4	10:34:55	23.9	7.2	NA	77.80	50.00	8.360	50.00	50.00	0.00	10.00	1.00	50.80	5.8	2.22E-05
1	am	1/4	10:42:09	23.9		NA	77.80	50.00	8.360	50.00	50.00	1.00	9.00		40.64	5.8	2.08E-05
	am	1/4	10:45:55	23.9	7.2	NA	77.80	50.00	8.360	50.00	50.00	0.00	10.00	1.00	50.800	5.8	2.22E-05
* 2	am	1/4	10:53:09	23.9		NA	77.80	50.00	8.360	50.00	50.00	1.00	9.00		40.640	5.8	2.08E-05
	am	1/4	10:56:40	23.9	7.2	NA	77.80	50.00	8.360	50.00	50.00	0.00	10.00	1.00	50.80	5.8	2.22E-05
* 3	am	1/4	11:03:54	23.9		NA	77.80	50.00	8.360	50.00	50.00	1.00	9.00		40.64	5.8	2.08E-05
	am	1/4	11:07:15	23.9	7.2	NA	77.80	50.00	8.360	50.00	50.00	0.00	10.00	1.00	50.80	5.8	2.24E-05
* 4	am	1/4	11:14:25	23.9		NA	77.80	50.00	8.360	50.00	50.00	1.00	9.00		40.64	5.8	2.10E-05
	am	1/4	11:16:40	23.9	7.2	NA	77.80	50.00	8.360	50.00	50.00	0.00	10.00	1.00	50.80	5.8	2.24E-05
* 5	am	1/4	11:23:51	23.9		NA	77.80	50.00	8.360	50.00	50.00	1.00	9.00		40.64	5.8	2.09E-05

Average $k_{20°C}$:	2.09E-05 cm/s
Max. Dev. from mean:	0.5%
Avg. Initial Gradient (i_o) :	5.8
Intrinsic (Absolute) Permability, *K*:	2.14E-10 cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

FUGRO

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-9 | Boring/Exploration No.: WR0017-286B

Task Number: | Test Stage: 1 of 2 | Test Station No.: 17 | Sample No.: S05A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 6 | Penetration/Depth (ft): 11.05

Test Series No.: NA | File Name: WR0017-286B_S05AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.570

Vert. Dial/DT No.: DG-033 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back Pressure, U_b (psi) = 50.0	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
	Preliminary:	90.280	19.67
	Final:	90.280	19.50

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.26

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.2	51.3
1.0E-5 to 1.0E-6	≤10	6.8	52.6
1.0E-6 to 1.0E-7	≤20	14.0	55.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	21.2	57.7
For Special Gradient, i_o			

Trial No.	Readings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, $k_{20°C}$ (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	vr	12/21	10:27:24	23.8	2.7	NA	56.9	50.0	4.570	5.00	1.05	54.3	6.0	5.92E-01	5.45E-01	3.96
1	vr	12/21	10:30:06	23.8		NA	56.9	50.0	4.570	4.00	XXXXX	41.2	6.0	1.88E-06	1.73E-06	
	vr	12/21	10:30:47	23.8	2.7	NA	56.9	50.0	4.570	5.00	1.05	54.3	6.0	5.88E-01	5.42E-01	3.96
* 2	vr	12/21	10:33:30	23.8		NA	56.9	50.0	4.570	4.00	XXXXX	41.2	6.0	1.86E-06	1.72E-06	
	vr	12/21	10:34:09	23.8	2.7	NA	56.9	50.0	4.570	5.00	1.05	54.3	6.0	5.95E-01	5.49E-01	3.96
* 3	vr	12/21	10:36:50	23.8		NA	56.9	50.0	4.570	4.00	XXXXX	41.2	6.0	1.89E-06	1.74E-06	
	vr	12/21	10:37:50	23.8	2.7	NA	56.9	50.0	4.570	5.00	1.05	54.3	6.0	5.92E-01	5.45E-01	3.96
* 4	vr	12/21	10:40:32	23.8		NA	56.9	50.0	4.570	4.00	XXXXX	41.2	6.0	1.88E-06	1.73E-06	
	vr	12/21	10:41:20	23.8	2.7	NA	56.9	50.0	4.570	5.00	1.05	54.3	6.0	5.99E-01	5.52E-01	3.96
* 5	vr	12/21	10:44:00	23.8		NA	56.9	50.0	4.570	4.00	XXXXX	41.2	6.0	1.90E-06	1.75E-06	

Average $k_{20°C}$:	1.74E-06	cm/s
Max. Dev. from Mean:	0.9%	
Avg. Initial Gradient (i_o) :	6.0	
Intrinsic (Absolute) Permeability, *K*:	1.78E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: VR | Final Calc. By: RJ | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number:	04.11120056	Test Type:	Permeability Vert.	Cell No.:	CU-9	Boring/Exploration No.:	WR0017-286E
Task Number:		Test Stage:	2 of 2	Test Station No.:	17	Sample No.:	S05A
Project Name:		Test No.:	NA	Hyd. App. No. (Permeometer):	6	Penetration/Depth (ft):	11.05
		Test Series No.:	NA	File Name:	WR0017-286B_S05AaV	Composite Sample No.:	

Axial Load Cell No.:	NA	Factor, (lbf/V/V):	NA	Excit. Volt, V:	NA	Ch. No.:	NA	Ht. Reading before Perm. (mm):	4.570
Vert. Dial/DT No.:	DG-033	Factor, (mm/V/V):		Excit. Volt, V:		Ch. No.:		Ht. Reading at σ_c = 0 (mm):	4.450

Permeation & Specimen Information

Permeant:	X	Tap Water;			
Direction of Flow:	X	Up;		Down	
Perm. Orientation:	X	Vertical;		Horizontal	
Specimen:	X	"Intact;"		Reconstituted;	
Back	Stage		Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)	
Pressure, U_b (psi)	Preliminary:		90.280	19.67	
= 50.0	Final:		90.280	19.50	

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.26

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.2	51.3
1.0E-5 to 1.0E-6	≤10	6.8	52.6
1.0E-6 to 1.0E-7	≤20	14.0	55.1
<1.0E-7 or <3.0E-2 (m/yr)	≤30	21.2	57.7
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2012 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) (cm/s)	Minimum Allowable tw_r (cm)
	vr	12/21	11:08:29	23.8	1.2	NA	56.9	50.0	4.570	10.00	1.35	113.4	12.6	9.31E-01	8.58E-01	7.83
1	vr	12/21	11:09:40	23.8		NA	56.9	50.0	4.570	8.50	XXXXX	93.8	12.6	2.95E-06	2.72E-06	
	vr	12/21	11:10:18	23.8	0.8	NA	56.9	50.0	4.570	10.00	1.35	113.4	12.6	8.88E-01	8.19E-01	7.83
* 2	vr	12/21	11:11:06	23.8		NA	56.9	50.0	4.570	9.00	XXXXX	100.3	12.6	2.82E-06	2.60E-06	
	vr	12/21	11:11:44	23.8	0.8	NA	56.9	50.0	4.570	10.00	1.35	113.4	12.6	8.52E-01	7.86E-01	7.83
* 3	vr	12/21	11:12:34	23.8		NA	56.9	50.0	4.570	9.00	XXXXX	100.3	12.6	2.70E-06	2.49E-06	
	vr	12/21	11:13:22	23.8	0.8	NA	56.9	50.0	4.570	10.00	1.35	113.4	12.6	8.52E-01	7.86E-01	7.83
* 4	vr	12/21	11:14:12	23.8		NA	56.9	50.0	4.570	9.00	XXXXX	100.3	12.6	2.70E-06	2.49E-06	
	vr	12/21	11:14:51	23.8	0.8	NA	56.9	50.0	4.570	10.00	1.35	113.4	12.6	8.70E-01	8.02E-01	7.83
* 5	vr	12/21	11:15:40	23.8		NA	56.9	50.0	4.570	9.00	XXXXX	100.3	12.6	2.76E-06	2.54E-06	

Average $k_{20°C}$:	2.53E-06	cm/s
Max. Dev. from Mean:	2.6%	
Avg. Initial Gradient (i_o) :	12.6	
Intrinsic (Absolute) Permeability, *K*:	2.59E-11	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: VR Final Calc. By: RJ Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-13 | Boring/Exploration No.: WR0017-286E
Task Number: | Test Stage: 1 of 2 | Test Station No.: 18.5 | Sample No.: S07A
Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 2 | Penetration/Depth (ft): 16.20
Test Series No.: NA | File Name: WR0017-286B_S07AaV | Composite Sample No.:
Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.980
Vert. Dial/DT No.: DG-032 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;			
Direction of Flow:	X Up;	Down		
Perm. Orientation:	X Vertical;	Horizontal		
Specimen:	X "Intact;"	Reconstituted;		
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)	
Pressure, U_b (psi)	Preliminary:	86.214	19.75	
= 50.0	Final:	86.214	19.39	

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.11

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.1	51.2
1.0E-5 to 1.0E-6	≤10	6.5	52.4
1.0E-6 to 1.0E-7	≤20	13.3	54.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	20.2	57.3
For Special Gradient, i_o			

Trial No.	Readings By	Date y= 2013 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial / DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	1/19	9:30:47	23.5	4.9	NA	61.1	50.0	3.980	8.00	1.1	91.4	10.6	1.74E-01	1.63E-01	6.25
1	rc,jr	1/19	9:35:41	23.5		NA	61.1	50.0	3.980	7.00	XXXXX	78.3	10.6	5.51E-07	5.16E-07	
	rc,jr	1/19	9:36:34	23.5	4.9	NA	61.1	50.0	3.980	8.00	1.1	91.4	10.6	1.76E-01	1.65E-01	6.25
* 2	rc,jr	1/19	9:41:25	23.5		NA	61.1	50.0	3.980	7.00	XXXXX	78.3	10.6	5.57E-07	5.22E-07	
	rc,jr	1/19	9:41:58	23.5	5.0	NA	61.1	50.0	3.980	8.00	1.1	91.4	10.6	1.70E-01	1.60E-01	6.25
* 3	rc,jr	1/19	9:46:58	23.5		NA	61.1	50.0	3.980	7.00	XXXXX	78.3	10.6	5.40E-07	5.06E-07	
	rc,jr	1/19	9:47:30	23.5	9.4	NA	61.1	50.0	3.980	8.00	1.1	91.4	10.6	1.74E-01	1.63E-01	6.25
* 4	rc,jr	1/19	9:56:57	23.5		NA	61.1	50.0	3.980	6.20	XXXXX	67.8	10.6	5.51E-07	5.16E-07	
	rc,jr	1/19	9:58:32	23.5	5.5	NA	61.1	50.0	3.980	8.00	1.1	91.4	10.6	1.72E-01	1.61E-01	6.25
* 5	rc,jr	1/19	10:04:02	23.5		NA	61.1	50.0	3.980	6.90	XXXXX	77.0	10.6	5.45E-07	5.10E-07	

Average $k_{20°C}$:	5.14E-07	cm/s
Max. Dev. from Mean:	1.6%	
Avg. Initial Gradient (i_o) :	10.6	
Intrinsic (Absolute) Permeability, *K*:	5.26E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD F:
Using Flexible Wall Permeameter and Mercury Constant Volume - Falling Head Hydraulic System

Project Number: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-13 | Boring/Exploration No.: WR0017-286E

Task Number: | Test Stage: 2 of 2 | Test Station No.: 18.5 | Sample No.: S07A

Project Name: | Test No.: NA | Hyd. App. No. (Permometer): 2 | Penetration/Depth (ft): 16.20

Test Series No.: NA | File Name: WR0017-286B_S07AaV | Composite Sample No.:

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.980

Vert. Dial/DT No.: DG-032 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm): 3.910

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Back	Stage	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
Pressure, U_b (psi)	Preliminary:	86.214	19.75
= 50.0	Final:	86.214	19.39

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 0.11

Hydraulic System Constants

Mercury U-Tube Manometer

Area headwater tube, a_{in} (cm^2):	0.7671
Area tailwater tube, a_{out} (cm^2):	0.03142
ΔHg_{eq} at equilibrium (cm):	0.4
Fluid Density Const. (15-25°C):	12.57

Remarks:

Mercury Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Gradient ($i_o = h/L_{t,p}$)	Permometer ΔHg Setting (cm)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	3.1	51.2
1.0E-5 to 1.0E-6	≤10	6.5	52.4
1.0E-6 to 1.0E-7	≤20	13.3	54.9
<1.0E-7 or <3.0E-2 (m/yr)	≤30	20.2	57.3
For Special Gradient, i_o			

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time (1) hr:min	Temp. °C	Δt (min)	Axial Force (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	X Dial DT Reading (mm)	Mercury Head Readings (2) Tail, tw_r (cm) (3&4)	Mercury Head Readings (2) Head, hw_r (cm)	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hydraulic Conductivity, k Preliminary, k_t (m/yr) / (cm/s)	Hydraulic Conductivity, k Final, k_{20^oC} (m/yr) / (cm/s)	Minimum Allowable tw_r (cm)
	rc,jr	1/19	12:10:00	23.6	3.0	NA	61.1	50.0	3.980	12.00	0.9	144.2	16.7	1.76E-01	1.64E-01	9.25
1	rc,jr	1/19	12:12:59	23.6		NA	61.1	50.0	3.980	11.00	XXXXX	131.1	16.7	5.57E-07	5.21E-07	
	rc,jr	1/19	12:13:43	23.6	3.0	NA	61.1	50.0	3.980	12.00	0.9	144.2	16.7	1.76E-01	1.64E-01	9.25
* 2	rc,jr	1/19	12:16:42	23.6		NA	61.1	50.0	3.980	11.00	XXXXX	131.1	16.7	5.57E-07	5.21E-07	
	rc,jr	1/19	12:17:21	23.6	3.1	NA	61.1	50.0	3.980	12.00	0.9	144.2	16.7	1.70E-01	1.59E-01	9.25
* 3	rc,jr	1/19	12:20:26	23.6		NA	61.1	50.0	3.980	11.00	XXXXX	131.1	16.7	5.39E-07	5.04E-07	
	rc,jr	1/19	12:21:05	23.6	3.6	NA	61.1	50.0	3.980	12.00	0.9	144.2	16.7	1.74E-01	1.63E-01	9.25
* 4	rc,jr	1/19	12:24:44	23.6		NA	61.1	50.0	3.980	10.80	XXXXX	128.5	16.7	5.52E-07	5.16E-07	
	rc,jr	1/19	12:25:16	23.6	3.0	NA	61.1	50.0	3.980	12.00	0.9	144.2	16.7	1.73E-01	1.62E-01	9.25
* 5	rc,jr	1/19	12:28:18	23.6		NA	61.1	50.0	3.980	11.00	XXXXX	131.1	16.7	5.48E-07	5.12E-07	

Average $k_{20°C}$:	5.13E-07	cm/s
Max. Dev. from Mean:	1.8%	
Avg. Initial Gradient (i_o) :	16.7	
Intrinsic (Absolute) Permeability, *K*:	5.26E-12	cm^2

(*) Indicates trials used for calculations of: Average $k_{20°C}$, Max. Dev. from mean, and Average (i_o).

(1) If a stopwatch is used to obtain Δt, only record the initial time reading.

(2) Read both mercury levels at top of meniscus.

(3) The tailwater column is the column of mercury which is higher than the other (headwater) column.

(4) To meet the reading accuracy requirement of 5%, the drop in the tail water reading has to be > 1 cm. For CMT testing with k < about 5×10^{-8} cm/sec, that requirement can be reduced by about ½.

Prelim. Calc. By: RC,jr Final Calc. By: RC,jr Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 2/20/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-286B	SAMPLE NO. S10A a	PENETRATION (Depth) 25.50	PERMEAMETER NO. CH Perm-1
MATERIAL DESCRIPTION	Sand with Silt, brown		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	24.4	21.5	HEIGHT, H	8.316 (cm)	8.228 (cm)	Cell Pressure (psi)	61.30
Total Unit Weight (pcf)	120.7	127.8	DIAMETER, D	6.10 (cm)	5.89 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	97.0	105.2	AREA, A	29.22 (cm^2)	27.25 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	92.0	100.0	VOLUME, V	243.03 (cm^3)	224.17 (cm^3)	Axial Strain During Consolidation (%)	1.06
Void Ratio e	0.703	0.570	LENGTH, L Mamometer separation		8.228 (cm)	Volumetric Strain Consolidation (%)	7.76

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec)
Q = Volume of Water (cm^3)
A = Cross. Area of Specimen (cm^2)
L = Length of Specimen (cm)
h = Head (cm)
t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
02-20	90	38.0	34.6	23.1	0.4	3.4	8.1	7.45E-03	6.92E-03
02-20	90	38.0	34.6	23.1	0.4	3.4	8.1	7.45E-03	6.92E-03
02-20	90	38.0	34.6	23.1	0.4	3.4	8.1	7.45E-03	6.92E-03
02-20	90	38.0	34.6	23.1	0.4	3.4	8	7.36E-03	6.84E-03
				Gradient average:	0.4	3.4		7.43E-03	6.90E-03
02-20	60	43.6	34.6	23.1	1.1	9.0	11.7	6.10E-03	5.67E-03
02-20	60	43.6	34.6	23.1	1.1	9.0	11.4	5.94E-03	5.52E-03
02-20	60	43.6	34.6	23.1	1.1	9.0	11.6	6.05E-03	5.62E-03
02-20	60	43.6	34.6	23.1	1.1	9.0	11.7	6.10E-03	5.67E-03
				Gradient average:	1.1	9.0		6.05E-03	5.62E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 02-20-2013
Input By: RC,jr Date: 02-20-2013
Reviewed By: RJ Date: 02-25-2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-293B
Task Number: | Test Stage: 1 of 3 | Test Station No.: 1 | Sample No.: S08A
Project Name: | Test No.: NA | File Name: WR0017-293B_S08AaV | Penetration/Depth (ft): 13.80
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt, brown with some calcareous nodules | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 4.890
Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.430	29.14
m/yr	Final:	81.430	28.41
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.3	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.96	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.11	53.9
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	1/19	9:50:06	23.4	1.2	NA	60.40	50.00	4.890	50.00	50.00	3.00	7.00	1.00	20.32	2.5	2.61E-04
1	rc,jr	1/19	9:51:19	23.4		NA	60.40	50.00	4.890	50.00	50.00	4.00	6.00		10.16	2.5	2.48E-04
	rc,jr	1/19	9:52:13	23.4	1.5	NA	60.40	50.00	4.890	50.00	50.00	3.00	7.00	1.00	20.320	2.5	2.10E-04
* 2	rc,jr	1/19	9:53:44	23.4		NA	60.40	50.00	4.890	50.00	50.00	4.00	6.00		10.160	2.5	1.99E-04
	rc,jr	1/19	9:54:36	23.4	1.5	NA	60.40	50.00	4.890	50.00	50.00	3.00	7.00	1.01	20.32	2.5	2.06E-04
* 3	rc,jr	1/19	9:56:09	23.4		NA	60.40	50.00	4.890	50.00	50.00	4.00	5.99		10.11	2.5	1.96E-04
	rc,jr	1/19	9:59:15	23.4	1.7	NA	60.40	50.00	4.890	50.00	50.00	3.00	7.00	1.00	20.32	2.5	1.87E-04
* 4	rc,jr	1/19	10:00:57	23.4		NA	60.40	50.00	4.890	50.00	50.00	4.00	6.00		10.16	2.5	1.77E-04
	rc,jr	1/19	10:01:55	23.4	1.5	NA	60.40	50.00	4.890	50.00	50.00	3.00	7.00	1.00	20.32	2.5	2.05E-04
8 5	rc,jr	1/19	10:03:28	23.4		NA	60.40	50.00	4.890	50.00	50.00	4.00	6.00		10.16	2.5	1.94E-04

Average $k_{20°C}$:	1.91E-04	cm/s
Max. Dev. from mean:	7.0%	
Avg. Initial Gradient (i_o) :	2.5	
Intrinsic (Absolute) Permability, *K*:	1.95E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-293B

Task Number: | Test Stage: 2 of 3 | Test Station No.: 1 | Sample No.: S08A

Project Name: | Test No.: NA | File Name: WR0017-293B_S08AaV | Penetration/Depth (ft): 13.80

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silt, brown with some calcareous nodules | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.080

Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.240	29.08
m/yr	Final:	81.240	28.30
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.49		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.95	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.10	53.8
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/22	8:38:29	23.6	1.6	NA	70.80	50.00	5.080	50.00	50.00	3.00	7.00	1.01	20.32	2.5	1.96E-04
1	rc,jr	1/22	8:40:07	23.6		NA	70.80	50.00	5.080	50.00	50.00	4.00	5.99		10.11	2.5	1.85E-04
	rc,jr	1/22	8:41:04	23.6	1.7	NA	70.80	50.00	5.080	50.00	50.00	3.00	7.00	1.01	20.320	2.5	1.86E-04
* 2	rc,jr	1/22	8:42:47	23.6		NA	70.80	50.00	5.080	50.00	50.00	4.00	5.99		10.109	2.5	1.76E-04
	rc,jr	1/22	8:43:53	23.6	1.8	NA	70.80	50.00	5.080	50.00	50.00	3.00	7.00	1.02	20.32	2.5	1.84E-04
* 3	rc,jr	1/22	8:45:38	23.6		NA	70.80	50.00	5.080	50.00	50.00	4.00	5.98		10.06	2.5	1.74E-04
	rc,jr	1/22	8:46:52	23.6	1.8	NA	70.80	50.00	5.080	50.00	50.00	3.00	7.00	1.00	20.32	2.5	1.81E-04
* 4	rc,jr	1/22	8:48:37	23.6		NA	70.80	50.00	5.080	50.00	50.00	4.00	6.00		10.16	2.5	1.72E-04
	rc,jr	1/22	8:49:25	23.6	1.8	NA	70.80	50.00	5.080	50.00	50.00	3.00	7.00	1.01	20.32	2.5	1.83E-04
* 5	rc,jr	1/22	8:51:10	23.6		NA	70.80	50.00	5.080	50.00	50.00	4.00	5.99		10.11	2.5	1.73E-04

Average $k_{20°C}$:	1.74E-04	cm/s
Max. Dev. from mean:	1.4%	
Avg. Initial Gradient (i_o) :	2.5	
Intrinsic (Absolute) Permability, *K*:	1.78E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: Rj

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-293B
Task Number: | Test Stage: 3 of 3 | Test Station No.: 1 | Sample No.: S08A
Project Name: | Test No.: NA | File Name: WR0017-293B_S08AaV | Penetration/Depth (ft): 13.80
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt, brown with some calcareous nodules | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.080
Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm):

Permeation & Specimen Information

Permeant:	X Tap Water;	☐	
Direction of Flow:	X Up;	☐ Down	
Perm. Orientation:	X Vertical;	☐ Horizontal	
Specimen:	X "Intact;"	☐ Reconstituted;	☐
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	81.240	29.08
☐ m/yr	Final:	81.240	28.30
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.49	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):			0.1969
Area tailwater tube, a_{out} (cm^2):			0.1969
Permeant/Fluid Density,		Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);		System	0.9978
Elev. Heads by:	X Vol. (1)	☐ Elev.	
If by Vol.:	X Case 2	☐ Case 3	
Differential Pressure Head System			
☐ Differential Manometer (cm Hg):			
☐ U-tube;	☐ Vert. Column		
X Pressure Trans./Gage (psi):	☐ Differential		

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.80	51.3
1.0E-6 to 1.0E-7	≤20	51.95	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.10	53.8
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	1/22	9:05:18	23.6	0.8	NA	70.80	50.00	5.080	50.00	50.00	1.00	9.00	1.00	40.64	5.0	1.65E-04
1	rc,jr	1/22	9:06:06	23.6		NA	70.80	50.00	5.080	50.00	50.00	2.00	8.00		30.48	5.0	1.56E-04
	rc,jr	1/22	9:06:58	23.6	0.7	NA	70.80	50.00	5.080	50.00	50.00	1.00	9.00	1.01	40.640	5.0	1.81E-04
* 2	rc,jr	1/22	9:07:42	23.6		NA	70.80	50.00	5.080	50.00	50.00	2.00	7.99		30.429	5.0	1.71E-04
	rc,jr	1/22	9:08:37	23.6	0.7	NA	70.80	50.00	5.080	50.00	50.00	1.00	9.00	1.02	40.64	5.0	1.82E-04
* 3	rc,jr	1/22	9:09:21	23.6		NA	70.80	50.00	5.080	50.00	50.00	2.00	7.98		30.38	5.0	1.72E-04
	rc,jr	1/22	9:11:22	23.6	0.7	NA	70.80	50.00	5.080	50.00	50.00	1.00	9.00	1.00	40.64	5.0	1.84E-04
* 4	rc,jr	1/22	9:12:05	23.6		NA	70.80	50.00	5.080	50.00	50.00	2.00	8.00		30.48	5.0	1.74E-04
	rc,jr	1/22	9:12:51	23.6	0.8	NA	70.80	50.00	5.080	50.00	50.00	1.00	9.00	1.00	40.64	5.0	1.68E-04
* 5	rc,jr	1/22	9:13:38	23.6		NA	70.80	50.00	5.080	50.00	50.00	2.00	8.00		30.48	5.0	1.59E-04

Average $k_{20°C}$:	1.69E-04	cm/s
Max. Dev. from mean:	5.8%	
Avg. Initial Gradient (i_o):	5.0	
Intrinsic (Absolute) Permability, *K*:	1.73E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-293B
Task Number: | Test Stage: 1 of 2 | Test Station No.: 1 | Sample No.: S08A
Project Name: | Test No.: NA | File Name: WR0017-293B_S08AaV | Penetration/Depth (ft): 13.80
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt, brown with some calcareous nodules | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.440
Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	80.880	28.98
m/yr	Final:	80.880	28.43
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		0.85	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube;	Vert. Column
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.79	51.3
1.0E-6 to 1.0E-7	≤20	51.94	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.09	53.8
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force (volt) X	Pressure Cell, σ_c (psi)	Pressure Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/29	12:55:39	22.5	3.0	NA	91.70	50.00	5.440	50.00	50.00	3.00	7.00	1.00	20.32	2.5	1.07E-04
1	rc,jr	1/29	12:58:37	22.5		NA	91.70	50.00	5.440	50.00	50.00	4.00	6.00		10.16	2.5	1.03E-04
	rc,jr	1/29	12:59:40	22.5	3.1	NA	91.70	50.00	5.440	50.00	50.00	3.00	7.00	1.01	20.320	2.5	1.04E-04
* 2	rc,jr	1/29	13:02:45	22.5		NA	91.70	50.00	5.440	50.00	50.00	4.00	5.99		10.109	2.5	9.98E-05
	rc,jr	1/29	13:03:41	22.5	3.1	NA	91.70	50.00	5.440	50.00	50.00	3.00	7.00	1.00	20.32	2.5	1.02E-04
* 3	rc,jr	1/29	13:06:47	22.5		NA	91.70	50.00	5.440	50.00	50.00	4.00	6.00		10.16	2.5	9.85E-05
	rc,jr	1/29	13:07:48	22.5	3.1	NA	91.70	50.00	5.440	50.00	50.00	3.00	7.00	1.01	20.32	2.5	1.04E-04
* 4	rc,jr	1/29	13:10:53	22.5		NA	91.70	50.00	5.440	50.00	50.00	4.00	5.99		10.11	2.5	9.98E-05
	rc,jr	1/29	13:11:43	22.5	3.2	NA	91.70	50.00	5.440	50.00	50.00	3.00	7.00	0.93	20.32	2.5	1.07E-04
* 5	rc,jr	1/29	13:14:56	22.5		NA	91.70	50.00	5.440	50.00	50.00	4.10	5.98		9.55	2.5	1.03E-04

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Average $k_{20°C}$:	1.00E-04	cm/s
Max. Dev. from mean:	3.0%	
Avg. Initial Gradient (i_o) :	2.5	
Intrinsic (Absolute) Permability, *K*:	1.03E-09	cm^2

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CU-2 | Boring/Exploration No.: WR0017-293B

Task Number: | Test Stage: 2 of 2 | Test Station No.: 1 | Sample No.: S08A

Project Name: | Test No.: NA | File Name: WR0017-293B_S08AaV | Penetration/Depth (ft): 13.80

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silt, brown with some calcareous nodules | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 5.440

Vert. Dial/DT No.: DG-062 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 5.3

Permeation & Specimen Information

Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	80.880	28.98
m/yr	Final:	80.880	28.43
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.85
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =		NA	H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.22	50.6
1.0E-5 to 1.0E-6	≤10	50.79	51.3
1.0E-6 to 1.0E-7	≤20	51.94	52.6
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.09	53.8
For Special Gradtient, i			

Remarks:

Trial No.	Readings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, k_{20^oC} cm/s
	rc,jr	1/29	13:20:04	22.5	0.8	NA	91.70	50.00	5.440	50.00	50.00	0.50	9.50	1.01	45.72	5.7	1.36E-04
1	rc,jr	1/29	13:20:55	22.5		NA	91.70	50.00	5.440	50.00	50.00	1.50	8.49		35.51	5.7	1.31E-04
	rc,jr	1/29	13:22:06	22.5	0.9	NA	91.70	50.00	5.440	50.00	50.00	0.20	9.80	1.02	48.768	6.0	1.16E-04
* 2	rc,jr	1/29	13:23:02	22.5		NA	91.70	50.00	5.440	50.00	50.00	1.20	8.78		38.506	6.0	1.12E-04
	rc,jr	1/29	13:24:17	22.5	1.0	NA	91.70	50.00	5.440	50.00	50.00	0.20	9.80	1.02	48.77	6.0	1.12E-04
* 3	rc,jr	1/29	13:25:15	22.5		NA	91.70	50.00	5.440	50.00	50.00	1.20	8.78		38.51	6.0	1.08E-04
	rc,jr	1/29	13:27:38	22.5	1.1	NA	91.70	50.00	5.440	50.00	50.00	0.20	9.50	1.01	47.24	5.8	1.03E-04
* 4	rc,jr	1/29	13:28:43	22.5		NA	91.70	50.00	5.440	50.00	50.00	1.20	8.49		37.03	5.8	9.91E-05
	rc,jr	1/29	13:31:10	22.5	0.9	NA	91.70	50.00	5.440	50.00	50.00	0.20	9.80	1.00	48.77	6.0	1.19E-04
* 5	rc,jr	1/29	13:32:04	22.5		NA	91.70	50.00	5.440	50.00	50.00	1.20	8.80		38.61	6.0	1.14E-04

Average $k_{20°C}$:	1.08E-04	cm/s
Max. Dev. from mean:	8.4%	
Avg. Initial Gradient (i_o):	6.0	
Intrinsic (Absolute) Permability, *K*:	1.11E-09	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-293B
Task Number: | Test Stage: 1 of 4 | Test Station No.: 6 | Sample No.: S08A
Project Name: | Test No.: NA | File Name: WR0017-293B_S08AbRt | Penetration/Depth (ft): 14.10
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt, brown | Specimen No.: bRt

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.710
Vert. Dial/DT No.: DG-045 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	71.944	29.00
m/yr	Final:	71.944	29.50
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	0.69		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1965
Area tailwater tube, a_{out} (cm^2):	0.1965
Permeant/Fluid Density, at 22°C, $\rho_{f,n}$ (g/cm^3); Accum.	NA
System	0.9978
Elev. Heads by: X Vol. (1)	Elev.
If by Vol.: X Case 2	Case 3
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.16	50.6
1.0E-5 to 1.0E-6	≤10	50.67	51.1
1.0E-6 to 1.0E-7	≤20	51.69	52.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.71	53.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/5	6:42:20	23.3	9.1	NA	60.40	50.00	3.710	50.00	50.00	3.00	7.00	1.00	20.36	2.8	3.08E-05
1	rc,jr	3/5	6:51:28	23.3		NA	60.40	50.00	3.700	50.00	50.00	4.00	6.00		10.18	2.8	2.81E-05
	rc,jr	3/5	6:52:20	23.3	10.7	NA	60.40	50.00	3.700	50.00	50.00	3.00	7.00	1.01	20.360	2.8	3.04E-05
* 2	rc,jr	3/5	7:03:04	23.3		NA	60.40	50.00	3.700	50.00	50.00	4.10	5.89		9.111	2.8	2.77E-05
	rc,jr	3/5	7:03:40	23.3	9.5	NA	60.40	50.00	3.700	50.00	50.00	3.00	7.00	0.99	20.36	2.8	3.01E-05
* 3	rc,jr	3/5	7:13:13	23.3		NA	60.40	50.00	3.700	50.00	50.00	4.02	5.99		10.03	2.8	2.74E-05
	rc,jr	3/5	7:14:07	23.3	9.1	NA	60.40	50.00	3.700	50.00	50.00	3.00	7.00	1.00	20.36	2.8	3.11E-05
* 4	rc,jr	3/5	7:23:11	23.3		NA	60.40	50.00	3.700	50.00	50.00	4.00	6.00		10.18	2.8	2.83E-05
	rc,jr	3/5	7:24:07	23.3	9.8	NA	60.40	50.00	3.700	50.00	50.00	3.00	7.00	0.99	20.36	2.8	2.93E-05
* 5	rc,jr	3/5	7:33:56	23.3		NA	60.40	50.00	3.700	50.00	50.00	4.02	5.99		10.03	2.8	2.67E-05

Average $k_{20°C}$:	2.75E-05	cm/s
Max. Dev. from mean:	3.1%	
Avg. Initial Gradient (i_o) :	2.8	
Intrinsic (Absolute) Permability, *K*:	2.82E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).
Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.
(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).
(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RJ | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-293B

Task Number: ______ | Test Stage: 2 of 4 | Test Station No.: 6 | Sample No.: S08A

Project Name: ______ | Test No.: NA | File Name: WR0017-293B_S08AbRt | Penetration/Depth (ft): 14.10

Test Series No.: NA | Test Sheet: 1 of ___ | Composite Sample No.: ______

Material Description: Silt, brown | Specimen No.: bRt

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.700

Vert. Dial/DT No.: DG-045 | Factor, (mm/V/V): ______ | Excit. Volt, V: ______ | Ch. No.: ______ | Ht. Reading at σ_c = 0 (mm): ______

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	71.944	29.00
m/yr	Final:	71.944	29.50
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =			0.69
Applied back pressure, U_b (psi) =			50.0
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1965
Area tailwater tube, a_{out} (cm^2):		0.1965
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978
Elev. Heads by:	X Vol. (1)	Elev.
If by Vol.:	X Case 2	Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.16	50.6
1.0E-5 to 1.0E-6	≤10	50.67	51.1
1.0E-6 to 1.0E-7	≤20	51.69	52.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.71	53.4
For Special Gradtient, i			

Remarks: ______

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, u_b (psi)	Dial Reading (mm)	Head Readings: Pressure (2) Differential or Head	Head Readings: Pressure (2) Tail	Head Readings: Fluid (3) Head, hw_r cm^3	Head Readings: Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/5	7:41:40	23.3	3.2	NA	60.40	50.00	3.700	50.00	50.00	0.00	10.00	1.01	50.90	7.1	3.12E-05
1	rc,jr	3/5	7:44:55	23.3		NA	60.40	50.00	3.700	50.00	50.00	1.10	8.89		39.65	7.1	2.84E-05
	rc,jr	3/5	7:45:55	23.3	2.9	NA	60.40	50.00	3.700	50.00	50.00	0.00	10.00	1.02	50.900	7.1	3.18E-05
* 2	rc,jr	3/5	7:48:48	23.3		NA	60.40	50.00	3.700	50.00	50.00	1.00	8.98		40.618	7.1	2.90E-05
	rc,jr	3/5	7:49:20	23.3	3.0	NA	60.40	50.00	3.700	50.00	50.00	0.00	10.00	1.02	50.90	7.1	3.09E-05
* 3	rc,jr	3/5	7:52:18	23.3		NA	60.40	50.00	3.700	50.00	50.00	1.00	8.98		40.62	7.1	2.82E-05
	rc,jr	3/5	7:53:15	23.3	3.3	NA	60.40	50.00	3.700	50.00	50.00	0.00	10.00	1.00	50.90	7.1	3.04E-05
* 4	rc,jr	3/5	7:56:34	23.3		NA	60.40	50.00	3.700	50.00	50.00	1.10	8.90		39.70	7.1	2.77E-05
	rc,jr	3/5	7:57:47	23.3	3.2	NA	60.40	50.00	3.700	50.00	50.00	0.00	10.00	1.00	50.90	7.1	3.15E-05
* 5	rc,jr	3/5	8:00:59	23.3		NA	60.40	50.00	3.700	50.00	50.00	1.10	8.90		39.70	7.1	2.87E-05

Average $k_{20°C}$:	2.84E-05	cm/s
Max. Dev. from mean:	2.4%	
Avg. Initial Gradient (i_o) :	7.1	
Intrinsic (Absolute) Permability, *K*:	2.91E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RJ | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-293B

Task Number: | Test Stage: 3 of 4 | Test Station No.: 6 | Sample No.: S08A

Project Name: | Test No.: NA | File Name: WR0017-293B_S08AbRt | Penetration/Depth (ft): 14.10

Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:

Material Description: Silt, brown | Specimen No.: bRt

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.200

Vert. Dial/DT No.: DG-045 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information

Permeant: [X] Tap Water; [ ]

Direction of Flow: [X] Up; [ ] Down

Perm. Orientation: [X] Vertical; [ ] Horizontal

Specimen: [X] "Intact;" [ ] Reconstituted; [ ]

Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	71.444	28.84
m/yr	Final:	71.444	29.31

Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) = 1.19

Applied back pressure, U_b (psi) = 50.0

Bladder Inteface: H_f & H_b in cm, with H_f = NA | H_b = NA

Test Station Constants/App. Imfo.

Area headwater tube, a_{in} (cm^2): 0.1965

Area tailwater tube, a_{out} (cm^2): 0.1965

Permeant/Fluid Density, at 22°C, $\rho_{f,n}$ (g/cm^3); Accum.: NA; System: 0.9978

Elev. Heads by: [X] Vol. (1) [ ] Elev.

If by Vol.: [X] Case 2 [ ] Case 3

Differential Pressure Head System

[ ] Differential Manometer (cm Hg): [ ] U-tube; [ ] Vert. Column

[X] Pressure Trans./Gage (psi): [ ] Differential

Pressure Head Settings (D 5084)

Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.15	50.6
1.0E-5 to 1.0E-6	≤10	50.66	51.1
1.0E-6 to 1.0E-7	≤20	51.67	52.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.69	53.4
For Special Gradient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/12	6:58:48	23.8	12.4	NA	77.80	50.00	3.200	50.00	50.00	3.00	7.00	1.02	20.36	2.8	2.57E-05
1	rc,jr	3/12	7:11:14	23.8		NA	77.80	50.00	3.200	50.00	50.00	4.08	5.90		9.26	2.8	2.32E-05
	rc,jr	3/12	7:12:14	23.8	11.9	NA	77.80	50.00	3.200	50.00	50.00	3.00	7.00	1.00	20.360	2.8	2.57E-05
* 2	rc,jr	3/12	7:24:10	23.8		NA	77.80	50.00	3.200	50.00	50.00	4.06	5.94		9.569	2.8	2.31E-05
	rc,jr	3/12	7:25:16	23.8	12.7	NA	77.80	50.00	3.200	50.00	50.00	3.00	7.00	1.01	20.36	2.8	2.57E-05
* 3	rc,jr	3/12	7:37:58	23.8		NA	77.80	50.00	3.200	50.00	50.00	4.10	5.89		9.11	2.8	2.32E-05
	rc,jr	3/12	7:38:41	23.8	10.9	NA	77.80	50.00	3.200	50.00	50.00	3.00	7.00	1.00	20.36	2.8	2.57E-05
* 4	rc,jr	3/12	7:49:37	23.8		NA	77.80	50.00	3.200	50.00	50.00	4.00	6.00		10.18	2.8	2.32E-05
	rc,jr	3/12	7:50:33	23.8	11.2	NA	77.80	50.00	3.200	50.00	50.00	3.00	7.00	1.02	20.36	2.8	2.54E-05
* 5	rc,jr	3/12	8:01:47	23.8		NA	77.80	50.00	3.200	50.00	50.00	4.00	5.98		10.08	2.8	2.29E-05

Average $k_{20°C}$:	2.31E-05	cm/s
Max. Dev. from mean:	0.9%	
Avg. Initial Gradient (i_o) :	2.8	
Intrinsic (Absolute) Permability, *K*:	2.36E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RJ | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: Perm-1 | Boring/Exploration No.: WR0017-293B
Task Number: | Test Stage: 4 of 4 | Test Station No.: 6 | Sample No.: S08A
Project Name: | Test No.: NA | File Name: WR0017-293B_S08AbRt | Penetration/Depth (ft): 14.10
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Silt, brown | Specimen No.: bRt

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.20
Vert. Dial/DT No.: DG-045 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm): 3.30

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	71.444	28.84
m/yr	Final:	71.444	29.31
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =		1.19	
Applied back pressure, U_b (psi) =		50.0	
Bladder Inteface: H_f & H_b in cm, with H_f =		NA	H_b = NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1965
Area tailwater tube, a_{out} (cm^2):	0.1965
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1) / Elev.	
If by Vol.: X Case 2 / Case 3	
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi): / Differential	

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.15	50.6
1.0E-5 to 1.0E-6	≤10	50.66	51.1
1.0E-6 to 1.0E-7	≤20	51.67	52.3
<1.0E-7 or <3.0E-2 (m/yr)	≤30	52.69	53.4
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_r cm^3	Head Readings Fluid (3) Tail, tw_r cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	rc,jr	3/12	8:40:47	23.8	3.7	NA	77.80	50.00	3.200	50.00	50.00	0.10	9.90	1.00	49.88	7.0	2.51E-05
1	rc,jr	3/12	8:44:28	23.8		NA	77.80	50.00	3.200	50.00	50.00	1.10	8.90		39.70	7.0	2.27E-05
	rc,jr	3/12	8:46:30	23.8	3.6	NA	77.80	50.00	3.200	50.00	50.00	0.10	9.90	1.01	49.882	7.0	2.62E-05
* 2	rc,jr	3/12	8:50:03	23.8		NA	77.80	50.00	3.200	50.00	50.00	1.10	8.89		39.651	7.0	2.36E-05
	rc,jr	3/12	8:53:18	23.8	5.1	NA	77.80	50.00	3.200	50.00	50.00	0.10	9.90	1.01	49.88	7.0	2.48E-05
* 3	rc,jr	3/12	8:58:22	23.8		NA	77.80	50.00	3.200	50.00	50.00	1.40	8.59		36.60	7.0	2.24E-05
	rc,jr	3/12	8:59:11	23.8	4.8	NA	77.80	50.00	3.200	50.00	50.00	0.10	9.90	1.00	49.88	7.0	2.62E-05
* 4	rc,jr	3/12	9:03:57	23.8		NA	77.80	50.00	3.200	50.00	50.00	1.40	8.60		36.65	7.0	2.37E-05
	rc,jr	3/12	9:05:12	23.8	6.2	NA	77.80	50.00	3.200	50.00	50.00	0.10	9.90	1.00	49.88	7.0	2.59E-05
* 5	rc,jr	3/12	9:11:23	23.8		NA	77.80	50.00	3.200	50.00	50.00	1.70	8.30		33.59	7.0	2.34E-05

Average $k_{20°C}$:	2.33E-05	cm/s
Max. Dev. from mean:	3.9%	
Avg. Initial Gradient (i_o) :	7.0	
Intrinsic (Absolute) Permability, *K*:	2.38E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RJ | Reviewed By: RJ

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 1/15/2013	PROJECT NAME South Sacramento Study Area		JOB NO. 04.11120056
BORING NO. WR0017-293B	SAMPLE NO. S12A a	PENETRATION (Depth) 25.95	PERMEAMETER NO. CHP-3
MATERIAL DESCRIPTION	Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	20.2	22.9	HEIGHT, H	9.300 (cm)	9.219 (cm)	Cell Pressure (psi)	65.30
Total Unit Weight (pcf)	120.2	126.3	DIAMETER, D	6.10 (cm)	6.04 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	100.0	102.8	AREA, A	29.22 (cm^2)	28.67 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	82.1	100.0	VOLUME, V	271.79 (cm^3)	264.27 (cm^3)	Axial Strain During Consolidation (%)	0.87
Void Ratio e	0.652	0.606	LENGTH, L Mamometer separation		9.219 (cm)	Volumetric Strain Consolidation (%)	2.77

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec)
Q = Volume of Water (cm^3)
A = Cross. Area of Specimen (cm^2)
L = Length of Specimen (cm)
h = Head (cm)
t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
1/15/13	120	36.6	34.6	23.6	0.2	2.0	8.8	1.16E-02	1.06E-02
1/15/13	120	36.6	34.6	23.6	0.2	2.0	8.4	1.10E-02	1.01E-02
1/15/13	120	36.6	34.6	23.6	0.2	2.0	8.2	1.08E-02	9.90E-03
1/15/13	120	36.6	34.6	23.6	0.2	2.0	8.2	1.08E-02	9.90E-03
				Gradient average:	0.2	2.0		1.10E-02	1.01E-02
1/15/13	120	39.7	34.6	23.6	0.6	5.1	18.7	9.64E-03	8.85E-03
1/15/13	120	39.7	34.6	23.6	0.6	5.1	18.1	9.33E-03	8.57E-03
1/15/13	120	39.7	34.6	23.6	0.6	5.1	17.8	9.17E-03	8.43E-03
1/15/13	120	39.7	34.6	23.6	0.6	5.1	17.1	8.81E-03	8.09E-03
				Gradient average:	0.6	5.1		9.24E-03	8.48E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr
Date: 1/15/2013

Input By: RC,jr
Date: 1/15/2013

Reviewed By: RJ
Date: 1/22/2013

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 2/4/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-293B	SAMPLE NO. S-13A	PENETRATION (Depth) 31.10	PERMEAMETER NO. CHP-2
MATERIAL DESCRIPTION	Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	20.6	23.8	HEIGHT, H	8.500 (cm)	8.417 (cm)	Cell Pressure (psi)	67.40
Total Unit Weight (pcf)	116.9	125.3	DIAMETER, D	6.10 (cm)	6.00 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	96.9	101.2	AREA, A	29.22 (cm^2)	28.25 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	77.5	100.0	VOLUME, V	248.41 (cm^3)	237.82 (cm^3)	Axial Strain During Consolidation (%)	0.98
Void Ratio e	0.704	0.631	LENGTH, L Mamometer separation		8.417 (cm)	Volumetric Strain Consolidation (%)	4.26

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec)
Q = Volume of Water (cm^3)
A = Cross. Area of Specimen (cm^2)
L = Length of Specimen (cm)
h = Head (cm)
t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
02-04	60	36.3	34.6	22.8	0.2	1.7	16	4.52E-02	4.23E-02
02-04	60	36.3	34.6	22.8	0.2	1.7	16.1	4.55E-02	4.25E-02
02-04	60	36.3	34.6	22.8	0.2	1.7	15.8	4.46E-02	4.17E-02
02-04	60	36.3	34.6	22.8	0.2	1.7	15.3	4.32E-02	4.04E-02
				Gradient average:	0.2	1.7		4.46E-02	4.17E-02
02-04	60	37.3	34.6	22.8	0.3	2.7	21.5	3.82E-02	3.58E-02
02-04	60	37.3	34.6	22.8	0.3	2.7	20.8	3.70E-02	3.46E-02
02-04	60	37.3	34.6	22.8	0.3	2.7	19.8	3.52E-02	3.29E-02
02-04	60	37.3	34.6	22.8	0.3	2.7	20.7	3.68E-02	3.44E-02
				Gradient average:	0.3	2.7		3.68E-02	3.44E-02
				Gradient average:					
				Gradient average:					

Tested By: RC,jr
Date: 02-04-2013

Input By: RC,jr
Date: 02-04-2013

Reviewed By: RJ
Date: 02-15-2013

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 12/6/2012	PROJECT NAME RD17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-295B	SAMPLE NO. S11Aa	PENETRATION (Depth) 27.10	PERMEAMETER NO. Perm 3
MATERIAL DESCRIPTION	Sand, light gray and olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	10.3	26.7	HEIGHT, H	9.160 (cm)	9.118 (cm)	Cell Pressure (psi)	66.00
Total Unit Weight (pcf)	104.6	122.5	DIAMETER, D	7.13 (cm)	7.22 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	94.8	96.7	AREA, A	39.87 (cm^2)	39.30 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	36.9	100.0	VOLUME, V	365.22 (cm^3)	358.34 (cm^3)	Axial Strain During Consolidation (%)	0.46
Void Ratio e	0.741	0.708	LENGTH, L Mamometer separation		9.118 (cm)	Volumetric Strain Consolidation (%)	1.88

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)

Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
12/6/12	120	50.0	48.5	23.1	0.2	1.5	13.6	1.73E-02	1.61E-02
12/6/12	120	50.0	48.5	23.1	0.2	1.5	13.5	1.72E-02	1.59E-02
12/6/12	120	50.0	48.5	23.1	0.2	1.5	13.6	1.73E-02	1.61E-02
12/6/12	120	50.0	48.5	23.1	0.2	1.5	13.7	1.74E-02	1.62E-02
				Gradient average:	0.2	1.5		1.73E-02	1.61E-02
12/6/12	30	50.0	47.0	23.1	0.3	3.0	11	2.80E-02	2.60E-02
12/6/12	30	50.0	47.0	23.1	0.3	3.0	11.1	2.82E-02	2.62E-02
12/6/12	30	50.0	47.0	23.1	0.3	3.0	11	2.80E-02	2.60E-02
12/6/12	30	50.0	47.0	23.1	0.3	3.0	11	2.80E-02	2.60E-02
				Gradient average:	0.3	3.0		2.80E-02	2.60E-02
12/6/12	30	50.0	45.4	23.1	0.5	4.6	18.2	3.016E-02	2.802E-02
12/6/12	30	50.0	45.4	23.1	0.5	4.6	18.2	3.016E-02	2.802E-02
12/6/12	30	50.0	45.4	23.1	0.5	4.6	18.2	3.016E-02	2.802E-02
12/6/12	30	50.0	45.4	23.1	0.5	4.6	18.2	3.016E-02	2.802E-02
				Gradient average:	0.5	4.6		3.016E-02	2.802E-02
				Gradient average:					

Tested By: RC,jr Date: 12/6/12

Input By: RC,jr Date: 12/12/12

Reviewed By: RJ Date: 12/13/2012

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 2/6/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-296B	SAMPLE NO. S12A a	PENETRATION (Depth) 21.15	PERMEAMETER NO. CH-Perm-1
MATERIAL DESCRIPTION	Fine Sand, olive gray		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	16.9	20.2	HEIGHT, H	9.180 (cm)	9.122 (cm)	Cell Pressure (psi)	63.90
Total Unit Weight (pcf)	119.6	129.3	DIAMETER, D	6.10 (cm)	5.97 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	102.4	107.6	AREA, A	29.22 (cm^2)	27.98 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	72.9	100.0	VOLUME, V	268.28 (cm^3)	255.23 (cm^3)	Axial Strain During Consolidation (%)	0.63
Void Ratio e	0.613	0.535	LENGTH, L Mamometer separation		9.122 (cm)	Volumetric Strain Consolidation (%)	4.86

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)

Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
02-06	60	37.6	34.6	22.6	0.3	3.0	28.7	4.98E-02	4.68E-02
02-06	60	37.6	34.6	22.6	0.3	3.0	27.9	4.84E-02	4.55E-02
02-06	60	37.6	34.6	22.6	0.3	3.0	27.7	4.80E-02	4.51E-02
02-06	60	37.6	34.6	22.6	0.3	3.0	25.6	4.44E-02	4.17E-02
				Gradient average:	0.3	3.0		4.76E-02	4.48E-02
02-06	60	36.6	34.6	22.6	0.2	2.0	22.1	5.75E-02	5.40E-02
02-06	60	36.6	34.6	22.6	0.2	2.0	21.6	5.62E-02	5.28E-02
02-06	60	36.6	34.6	22.6	0.2	2.0	20.6	5.36E-02	5.04E-02
02-06	60	36.6	34.6	22.6	0.2	2.0	21.8	5.67E-02	5.33E-02
				Gradient average:	0.2	2.0		5.60E-02	5.26E-02
				Gradient average:					
				Gradient average:					

Tested By: RC,jr
Date: 02-06-2013

Input By: RC,jr
Date: 02-06-2013

Reviewed By: RJ
Date: 02-15-2013

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 2/28/2013	PROJECT NAME RD 17 Study Area		JOB NO. 04.11120056
BORING NO. WR0017-296B	SAMPLE NO. S14A a	PENETRATION (Depth) 31.20	PERMEAMETER NO. CHP-1
MATERIAL DESCRIPTION	Silty Sand, gray with multiple mica beds		

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	30.0	30.0	HEIGHT, H	8.935 (cm)	8.866 (cm)	Cell Pressure (psi)	77.40
Total Unit Weight (pcf)	120.2	119.6	DIAMETER, D	6.12 (cm)	6.16 (cm)	Back Pressure (psi)	60.00
Dry Unit Weight (pcf)	92.4	92.1	AREA, A	29.43 (cm^2)	29.78 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	101.0	100.0	VOLUME, V	262.93 (cm^3)	264.00 (cm^3)	Axial Strain During Consolidation (%)	0.77
Void Ratio e	0.787	0.794	LENGTH, L Mamometer separation		8.866 (cm)	Volumetric Strain Consolidation (%)	-0.41

PERMEABILITY DATA

$$K_T = \frac{QL}{Aht}$$

K_T = Permeability (cm/sec) A = Cross. Area of Specimen (cm^2) h = Head (cm)
Q = Volume of Water (cm^3) L = Length of Specimen (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
02-28	120	50.2	34.6	23.4	1.8	15.6	7.1	1.14E-03	1.05E-03
02-28	120	50.2	34.6	23.4	1.8	15.6	8.6	1.38E-03	1.28E-03
02-28	120	50.2	34.6	23.4	1.8	15.6	8.4	1.35E-03	1.25E-03
02-28	120	50.2	34.6	23.4	1.8	15.6	8.7	1.40E-03	1.29E-03
				Gradient average:	1.8	15.6		1.32E-03	1.22E-03
02-28	120	55.5	34.6	23.4	2.4	20.9	11.8	1.42E-03	1.31E-03
02-28	180	55.5	34.6	23.4	2.4	20.9	16.6	1.33E-03	1.23E-03
02-28	120	55.5	34.6	23.4	2.4	20.9	10.9	1.31E-03	1.21E-03
02-28	720	55.5	34.6	23.4	2.4	20.9	65.2	1.31E-03	1.20E-03
				Gradient average:	2.4	20.9		1.34E-03	1.24E-03
				Gradient average:					
				Gradient average:					

Tested By: RC,jr Date: 2/28/2013
Input By: RC,jr Date: 03-05-2013
Reviewed By: RJ Date: 03-08-2013

PERMEABILITY TEST
CONSTANT HEAD (ASTM D 5084)

DATE 4/9/2013	PROJECT NAME RD 17 Study Area	JOB NO. 04.11120056

BORING NO. WR0017-296B	SAMPLE NO. S16A a	PENETRATION (Depth) 41.1	PERMEAMETER NO. CHP-3

MATERIAL DESCRIPTION Poorly Graded Sand, olive gray

SPECIMEN INFORMATION

	Initial	Consolidated		Initial	Consolidated		Initial
Moisture Content (%)	19.5	20.2	HEIGHT, H	10.791 (cm)	10.752 (cm)	Cell Pressure (psi)	71.50
Total Unit Weight (pcf)	127.5	129.3	DIAMETER, D	5.02 (cm)	5.01 (cm)	Back Pressure (psi)	50.00
Dry Unit Weight (pcf)	106.7	107.6	AREA, A	19.78 (cm^2)	19.70 (cm^2)	Axial Force (lb)	0.00
Saturation (%)	94.3	100.0	VOLUME, V	213.45 (cm^3)	211.79 (cm^3)	Axial Strain During Consolidation (%)	0.36
Void Ratio e	0.547	0.535	LENGTH, L Mamometer separation		10.752 (cm)	Volumetric Strain Consolidation (%)	0.78

PERMEABILITY DATA

$K_T = \frac{QL}{Aht}$

K_T = Permeability (cm/sec) Q = Volume of Water (cm^3)

A = Cross. Area of Specimen (cm^2) L = Length of Specimen (cm)

h = Head (cm) t = Elapsed Time (sec)

Date	Elapsed Time, t (sec)	Manom. 1 (cm)	Manom. 2 (cm)	Temperature (°C)	Gradient (h/L)	Head, h (cm)	Q (cm^3)	K_T (cm/sec)	K_{T20} (cm/sec)
04-01	60	47.4	34.2	23.1	1.2	13.2	12.1	8.31E-03	7.72E-03
04-01	60	47.4	34.2	23.1	1.2	13.2	12.2	8.37E-03	7.78E-03
04-01	60	47.7	34.2	23.1	1.3	13.5	11.9	7.99E-03	7.42E-03
04-01	60	47.4	34.2	23.1	1.2	13.2	12.1	8.31E-03	7.72E-03
				Gradient average:	1.2	13.3		8.24E-03	7.66E-03
04-01	60	54.0	34.2	23.1	1.8	19.8	18.2	8.33E-03	7.74E-03
04-01	60	54.0	34.2	23.1	1.8	19.8	18.1	8.28E-03	7.69E-03
04-01	60	54.0	34.2	23.1	1.8	19.8	17.8	8.15E-03	7.57E-03
04-01	60	54.0	34.2	23.1	1.8	19.8	17.8	8.15E-03	7.57E-03
				Gradient average:	1.8	19.8		8.23E-03	7.64E-03
				Gradient average:					
				Gradient average:					

Tested By: RJ Date: 04-01-2013

Input By: RC,jr Date: 04-05-2013

Reviewed By: RJ Date: 04-09-2013

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-3 | Boring/Exploration No.: WR0017-296B
Task Number: | Test Stage: 1 of 2 | Test Station No.: 4 | Sample No.: S18A
Project Name: | Test No.: NA | File Name: WR0017-296B_S18AaV | Penetration/Depth (ft): 51.25
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Clayey Sand, olive gray | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.200
Vert. Dial/DT No.: DG-016 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at σ_c = 0 (mm):

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	85.179	28.87
m/yr	Final:	85.180	29.51
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	1.31		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.		
Area headwater tube, a_{in} (cm^2):		0.1969
Area tailwater tube, a_{out} (cm^2):		0.1969
Permeant/Fluid Density,	Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3);	System	0.9978
Elev. Heads by: X Vol. (1)		Elev.
If by Vol.: X Case 2		Case 3
Differential Pressure Head System		
Differential Manometer (cm Hg):		
U-tube;	Vert. Column	
X Pressure Trans./Gage (psi):		Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.25	50.7
1.0E-5 to 1.0E-6	≤10	50.85	51.3
1.0E-6 to 1.0E-7	≤20	52.06	52.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.27	54.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure: Cell, σ_c (psi)	Pressure: Back, U_b (psi)	Dial Reading (mm)	Head Readings Pressure (2): Differential or Head	Head Readings Pressure (2): Tail	Head Readings Fluid (3): Head, hw_f cm^3	Head Readings Fluid (3): Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary Final	Hyd. Conductivity, k Preliminary, k_t Final, $k_{20°C}$ cm/s
	am	2/7	8:35:59	22.7	4.3	NA	74.30	50.00	3.200	50.00	50.00	3.00	7.00	1.00	20.32	2.4	7.74E-05
1	am	2/7	8:40:19	22.7		NA	74.30	50.00	3.020	50.00	50.00	4.00	6.00		10.16	2.4	7.12E-05
	am	2/7	8:48:25	22.7	5.0	NA	74.30	50.00	3.020	50.00	50.00	3.00	7.00	1.00	20.320	2.4	6.69E-05
* 2	am	2/7	8:53:26	22.7		NA	74.30	50.00	3.010	50.00	50.00	4.00	6.00		10.160	2.4	6.15E-05
	am	2/7	8:56:28	22.7	5.1	NA	74.30	50.00	3.010	50.00	50.00	3.00	7.00	1.00	20.32	2.4	6.54E-05
* 3	am	2/7	9:01:36	22.7		NA	74.30	50.00	3.010	50.00	50.00	4.00	6.00		10.16	2.4	6.01E-05
	am	2/7	9:08:48	22.7	4.4	NA	74.30	50.00	3.010	50.00	50.00	3.00	7.00	1.00	20.32	2.4	7.63E-05
* 4	am	2/7	9:13:12	22.7		NA	74.30	50.00	3.010	50.00	50.00	4.00	6.00		10.16	2.4	7.01E-05
	am	2/7	9:15:39	22.7	4.3	NA	74.30	50.00	3.010	50.00	50.00	3.00	7.00	1.00	20.32	2.4	7.74E-05
* 5	am	2/7	9:19:59	22.7		NA	74.30	50.00	3.000	50.00	50.00	4.00	6.00		10.16	2.4	7.12E-05

Average $k_{20°C}$:	6.57E-05	cm/s
Max. Dev. from mean:	8.6%	
Avg. Initial Gradient (i_o) :	2.4	
Intrinsic (Absolute) Permability, *K*:	6.73E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TEST: ASTM D 5084, METHOD C (Falling Head/Rising Tail Method):
Flexible Wall Permeameter Using Water/"Fluid" Open Faling Head Hydraulic System - First Sheet

Project No.: 04.11120056 | Test Type: Permeability Vert. | Cell No.: CHP-3 | Boring/Exploration No.: WR0017-296B
Task Number: | Test Stage: 2 of 2 | Test Station No.: 4 | Sample No.: S18A
Project Name: | Test No.: NA | File Name: WR0017-296B_S18AaV | Penetration/Depth (ft): 51.25
Test Series No.: NA | Test Sheet: 1 of | Composite Sample No.:
Material Description: Clayey Sand, olive gray | Specimen No.: a

Axial Load Cell No.: NA | Factor, (lbf/V/V): NA | Excit. Volt, V: NA | Ch. No.: NA | Ht. Reading before Perm. (mm): 3.000
Vert. Dial/DT No.: DG-016 | Factor, (mm/V/V): | Excit. Volt, V: | Ch. No.: | Ht. Reading at $\sigma_c = 0$ (mm): 3.12

Permeation & Specimen Information			
Permeant:	X Tap Water;		
Direction of Flow:	X Up;	Down	
Perm. Orientation:	X Vertical;	Horizontal	
Specimen:	X "Intact;"	Reconstituted;	
Required Units:	Calc. Stage;	Height, $L_{t,n}$ (mm)	Area, $A_{t,n}$ (cm^2)
X cm/s	Preliminary:	85.179	28.87
m/yr	Final:	85.179	29.51
Prelim. change in height during consol., $\Delta H_{c,p}$ (mm) =	1.31		
Applied back pressure, U_b (psi) =	50.0		
Bladder Inteface: H_f & H_b in cm, with H_f =	NA	H_b =	NA

Test Station Constants/App. Imfo.	
Area headwater tube, a_{in} (cm^2):	0.1969
Area tailwater tube, a_{out} (cm^2):	0.1969
Permeant/Fluid Density, Accum.	NA
at 22°C, $\rho_{f,n}$ (g/cm^3); System	0.9978
Elev. Heads by: X Vol. (1) / Elev.	
If by Vol.: X Case 2 / Case 3	
Differential Pressure Head System	
Differential Manometer (cm Hg):	
U-tube; Vert. Column	
X Pressure Trans./Gage (psi):	Differential

Pressure Head Settings (D 5084)			
Estimated k_t (cm/sec)	Max. Initial Gradient, i_o (i_o = h/Lc,p)	Max. Press. Head Setting (psi)	Min. Cell Pressure (psi)
1.0E-4 to 1.0E-5	≤5	50.25	50.7
1.0E-5 to 1.0E-6	≤10	50.85	51.3
1.0E-6 to 1.0E-7	≤20	52.06	52.7
<1.0E-7 or <3.0E-2 (m/yr)	≤30	53.27	54.0
For Special Gradtient, i			

Remarks:

Trial No.	Read-ings By	Date y= 2013 (m/d)	Time hr:min	Temp. °C	Δt (min)	Axial Force X (volt)	Pressure Cell, σ_c (psi)	Pressure Back, u_b (psi)	Dial Reading (mm)	Head Readings Pressure (2) Differential or Head	Head Readings Pressure (2) Tail	Head Readings Fluid (3) Head, hw_f cm^3	Head Readings Fluid (3) Tail, tw_f cm^3	Flow Ratio; outflow to inflow	Total Head Loss (cm of water)	Initial Hyd. Gradient, i_o Preliminary / Final	Hyd. Conductivity, k Preliminary, k_t / Final, $k_{20°C}$ cm/s
	am	2/7	12:25:09	23.3	2.0	NA	74.30	50.00	3.000	50.00	50.00	0.20	9.80	1.00	48.77	5.7	5.52E-05
1	am	2/7	12:27:12	23.3		NA	74.30	50.00	3.000	50.00	50.00	1.20	8.80		38.61	5.7	5.00E-05
	am	2/7	12:30:42	23.3	2.1	NA	74.30	50.00	3.000	50.00	50.00	0.20	9.80	1.00	48.768	5.7	5.39E-05
* 2	am	2/7	12:32:48	23.3		NA	74.30	50.00	3.000	50.00	50.00	1.20	8.80		38.608	5.7	4.88E-05
	am	2/7	12:34:53	23.3	2.1	NA	74.30	50.00	3.000	50.00	50.00	0.20	9.80	1.00	48.77	5.7	5.43E-05
* 3	am	2/7	12:36:58	23.3		NA	74.30	50.00	3.000	50.00	50.00	1.20	8.80		38.61	5.7	4.92E-05
	am	2/7	12:39:37	23.3	2.1	NA	74.30	50.00	3.000	50.00	50.00	0.20	9.80	1.00	48.77	5.7	5.47E-05
* 4	am	2/7	12:41:41	23.3		NA	74.30	50.00	3.000	50.00	50.00	1.20	8.80		38.61	5.7	4.96E-05
	am	2/7	12:43:52	23.3	2.1	NA	74.30	50.00	3.000	50.00	50.00	0.20	9.80	1.00	48.77	5.7	5.47E-05
* 5	am	2/7	12:45:56	23.3		NA	74.30	50.00	3.000	50.00	50.00	1.20	8.80		38.61	5.7	4.96E-05

Average $k_{20°C}$:	4.93E-05	cm/s
Max. Dev. from mean:	1.0%	
Avg. Initial Gradient (i_o):	5.7	
Intrinsic (Absolute) Permability, *K*:	5.05E-10	cm^2

(*) Indicates trials used for calculations (Average $k_{20°C}$, Max. Dev. from mean, Average (i)).

Notes: (1) If by vol.: Case 2-Burettes have equal areas, scales & elev.; while for Case 3 they are not equal & see attached sheet.

(2) A manometer reads differential pressure between the headwater and tailwater burettes, while gage does not (unless differential).

(3) Make sure the SCF in Cells A51, A54, A57, A60 & A63 are correct.

Prelim. Calc. By: RC,jr | Final Calc. By: RC,jr | Reviewed By: RJ