SECTION

APPENDIX C.

TEST PAD TESTING RESULTS

TEST PAD DENSITY TEST (ASTM D-2922)

Client: WCH

ENVIROTECH ENGINEERING & CONSULTING INC

Test No.	Lift No.	No. of Passes	Dry Density lbs/cuft	Moisture Content (%)	Void Ratio	Moist Verify	% Sat.	Sand Cone Dry Density	Shelby Tube (cm/s)	Pass / Fail
TP-1	1	3	113.7	15.2%	0.483	15.9%	85.0%	-	-	Fail
TP-2	1	3	111.2	16.6%	0.515	N/A	87.0%	118.5	-	Pass
TP-3	1	3	111.1	16.0%	0.517	N/A	83.6%	-	-	Fail
TP-4	1	3	112.3	14.6%	0.501	16.0%	78.7%	-	1.38E-08	Fail
TP-5	1	3	113.5	14.7%	0.486	N/A	81.7%	-	-	Fail
TP-6	1	3	112.9	15.5%	0.493	N/A	84.9%	-	-	Fail
TP-6A	1	5	103.2	15.9%	0.633	N/A	67.8%	-	-	Fail
TP-5A	1	5	101.9	17.4%	0.654	N/A	71.8%	-	-	Fail
TP-6B	1	3	116.2	15.5%	0.451	N/A	92.8%	-	-	Pass
TP-5B	1	3	114.5	14.9%	0.473	N/A	85.1%	-	-	Pass
TP-4A	1	3	115.6	14.9%	0.458	N/A	87.8%	-	-	Pass
TP-2A	1	3	113.3	17.4%	0.487	N/A	96.5%	-	-	Pass
TP-3A	1	3	115.8	14.6%	0.455	N/A	86.6%	-	-	Pass
TP-1A	1	3	116.6	14.1%	0.445	N/A	85.6%	-	-	Pass
TP-7	2	3	114.7	15.1%	0.470	15.3%	86.7%	117.1	-	Pass
TP-8	2	3	116.6	14.4%	0.446	N/A	87.2%	-	-	Pass
TP-9	2	3	115.5	15.1%	0.460	N/A	88.6%	-	-	Pass
TP-10	2	3	115.0	13.6%	0.466	N/A	78.8%	-	-	Fail
TP-11	2	3	114.9	14.2%	0.467	N/A	82.1%	-	-	Fail
TP-12	2	3	117.0	14.2%	0.441	N/A	86.9%	-	-	Pass
TP-10A	2	6	116.6	14.4%	0.446	N/A	87.2%	-	-	Pass
TP-11A	2	6	112.3	16.8%	0.501	15.9%	90.5%	-	1.61E-08	Pass
TP-13	3	3	112.5	17.6%	0.498	18.1%	95.4%	111.2	1.38E-08	Pass
TP-14	3	3	115.2	15.0%	0.464	N/A	87.3%	-	-	Pass
TP-15	3	3	115.8	15.2%	0.481	N/A	85.3%	-	-	Pass
TP-16	3	3	112.8	16.2%	0.494	N/A	88.5%	-	-	Pass
TP-17	3	3	112.6	16.9%	0.497	N/A	91.8%	-	-	Pass
TP-18	3	3	110.5	15.0%	0.526	N/A	77.0%	-	-	Fail
TP-18A	3	6	110.4	17.0%	0.526	N/A	87.3%	-	-	Pass
TP-18B	3	9	111.6	17.2%	0.510	16.7%	91.1%	-	-	Pass

TEST PAD DENSITY TEST (ASTM D-2922)

Client: WCH

ENVIROTECH ENGINEERING & CONSULTING INC

Test No.	Lift No.	No. of Passes	Dry Density lbs/cuft	Moisture Content (%)	Void Ratio	Moist Verify	% Sat.	Sand Cone Dry Density	Shelby Tube (cm/s)	Pass / Fail
TP-19	4	3	116.6	14.4%	0.446	N/A	87.2%	-	-	Pass
TP-20	4	3	114.0	15.3%	0.478	17.7%	86.4%	-	1.61E-08	Pass
TP-21	4	3	113.7	15.6%	0.482	N/A	87.4%	-	-	Pass
TP-22	4	3	113.2	16.0%	0.488	N/A	88.5%	-	-	Pass
TP-23	4	3	114.0	15.3%	0.478	16.1%	86.4%	115.4	-	Pass
TP-24	4	3	113.1	14.0%	0.491	N/A	77.0%	-	-	Fail
TP-24A	4	6	114.7	14.1%	0.470	N/A	81.0%	-	-	Fail
TP-24B	4	9	114.6	14.7%	0.471	N/A	84.3%	-	-	Fail
TP-24C	4	12	115.1	15.4%	0.465	N/A	89.4%	-	-	Pass
TP-25	5	3	114.8	15.1%	0.468	16.0%	87.1%	114.3	-	Pass
TP-26	5	3	117.2	13.9%	0.438	N/A	85.7%	-	-	Pass
TP-27	5	3	115.2	15.2%	0.463	N/A	88.6%	-	-	Pass
TP-28	5	3	116.3	14.8%	0.449	15.9%	89.0%	-	3.25E-08	Pass
TP-29	5	3	112.2	16.0%	0.502	N/A	86.1%	-	-	Pass
TP-30	5	3	113.9	15.2%	0.480	N/A	85.5%	-	-	Pass
TP-31	6	3	111.4	17.3%	0.513	N/A	91.1%	-	-	Pass
TP-32	6	3	115.3	14.6%	0.461	N/A	85.5%	-	-	Pass
TP-33	6	3	112.7	16.4%	0.495	17.0%	89.5%	114.8	-	Pass
TP-34	6	3	115.0	15.0%	0.466	16.0%	86.9%	-	5.80E-08	Pass
TP-35	6	3	113.0	15.8%	0.492	N/A	86.7%	-	-	Pass
TP-36	6	3	116.4	14.7%	0.448	N/A	88.6%	-	-	Pass
TP-37	Repair	3	116.2	14.8%	0.450	14.2%	88.8%	115.6	1.63E-08	Pass

C.1

BASE SOIL

Pre-Construction Testing

Base Soil

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Base Soil Pre-Construction Testing

	Test Number	Sieve Analysis 3/4"	#4	#10	#40	#200	0.05	0.036	Soil Classification	Passing Test
	Specs	-	-	-	-	> 20%	-			
Cell 9 Execavation Testing	BS-01	100.0	98.9	96.2	72.3	34.4	-	19	SM -Silty Sand	Passes Specifications
	BS-02	100.0	99.6	98.8	84.8	33.0	-	16	SM -Silty Sand	Passes Specifications
	BS-03	100.0	99.3	98.3	84.5	27.9	-	10	SM -Silty Sand	Passes Specifications
	BS-04	100.0	97.0	95.7	82.9	31.0	-	12	SM -Silty Sand	Passes Specifications
	BS-05	97.2	95.7	94.0	84.3	40.4	-	19	SM -Silty Sand	Passes Specifications
	BS-06	96.0	93.5	90.5	73.0	30.8	-	15	SM -Silty Sand	Passes Specifications
	BS-07	100.0	96.0	93.2	74.9	45.9	-	22	SM -Silty Sand	Passes Specifications
	BS-08	100.0	97.9	95.8	77.8	33.3	-	15	SM -Silty Sand	Passes Specifications
	BS-09	100.0	99.6	98.2	86.4	26.5	-	10	SM -Silty Sand	Passes Specifications
	BS-10	94.5	85.7	80.0	61.6	30.7	-	18	SM -Silty Sand	Passes Specifications
	BS-11	100.0	100.0	99.0	89.7	54.2	-	26	SM -Silty Sand	Passes Specifications
Cell 10 Execavation Testing	BS-01	100.0	93.4	85.3	52.7	21.0	14.7	-	SM -Silty Sand	Passes Specifications
	BS-02	100.0	99.7	98.3	86.0	32.9	25.1	-	SM -Silty Sand	Passes Specifications
	BS-03	100.0	93.4	85.3	52.7	21.4	15.9	-	SM -Silty Sand	Passes Specifications
	BS-04	100.0	98.2	94.8	77.8	36.8	24.2	-	SM -Silty Sand	Passes Specifications
	BS-05	100.0	93.4	83.7	58.4	26.7	22.0	-	SM -Silty Sand	Passes Specifications
	BS-06	100.0	97.9	94.9	82.0	23.7	18.6	-	SM -Silty Sand	Passes Specifications
	BS-07	100.0	99.4	98.4	90.4	25.7	17.3	-	SM -Silty Sand	Passes Specifications
	BS-08	100.0	98.8	96.2	80.6	34.2	25.8	-	SM -Silty Sand	Passes Specifications
	BS-09	100.0	99.7	99.4	89.4	21.0	10.7	-	SM -Silty Sand	Passes Specifications
	BS-10	100.0	97.5	94.2	86.2	43.5	35.7	-	SM -Silty Sand	Passes Specifications

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-01
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/10/2009
Tested By:	CL	Date:	8/12/2009	Sampled By:	JV
Reviewed By:	JV	Date:	8/19/2009	Date Received:	8/11/2009

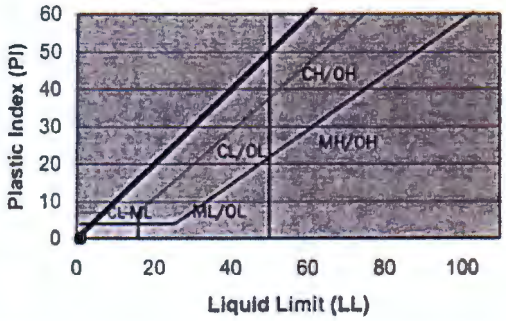
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

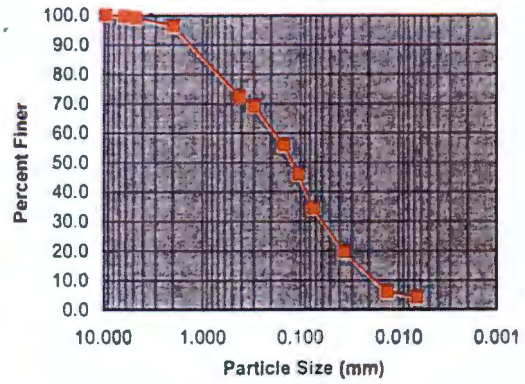
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
3/8 "	9.500	100.0	
1/4"	6.250	99.4	
No.4	4.750	98.9	
No. 10	2.000	96.2	
No. 40	0.425	72.3	
No. 50	0.300	68.9	
No. 100	0.150	55.8	
No.140	0.106	45.8	
No. 200	0.075	34.4	>20
	0.036	19	
	0.013	6	
	0.007	4	

Grain Size Analysis



Cc	1.25	Cu	9.85

Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/19/09

Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING, INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-02
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/11/2009
Tested By:	CL	Date:	8/12/2009	Sampled By:	JV
Reviewed By:	JV	Date:	8/19/2009	Date Received:	8/12/2009

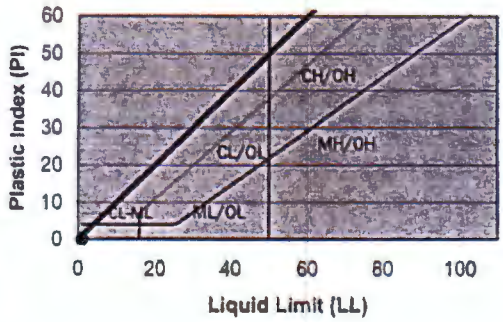
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

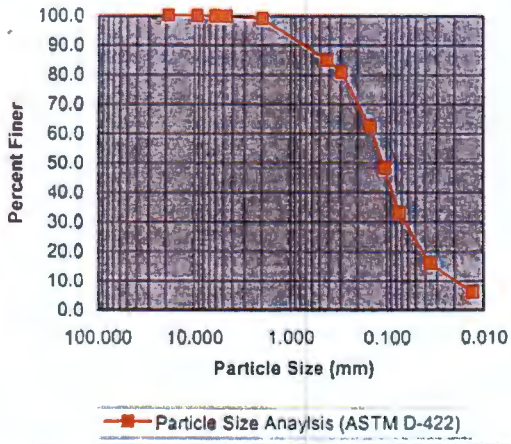
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
3/4 "	19.000	100.0	
3/8 "	9.500	99.9	
1/4"	6.250	99.7	
No.4	4.750	99.6	
No. 10	2.000	98.8	
No. 40	0.425	84.8	
No. 50	0.300	80.8	
No. 100	0.150	62.4	
No.140	0.106	48.2	
No. 200	0.075	33	>20
	0.036	16	
	0.013	6	
	0.007	3	
Cc	1.78	Cu	7.37

Grain Size Analysis



Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/19/09
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-03
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/12/2009
Tested By:	CL	Date:	8/13/2009	Sampled By:	JV
Reviewed By:	JV	Date:	8/18/2009	Date Received:	8/13/2009

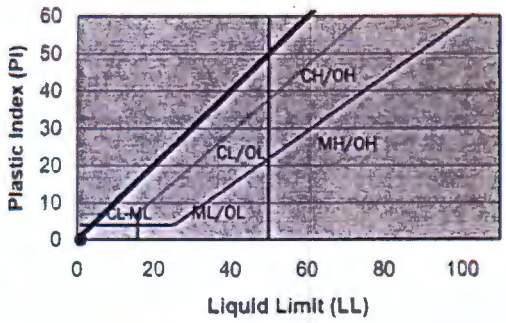
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

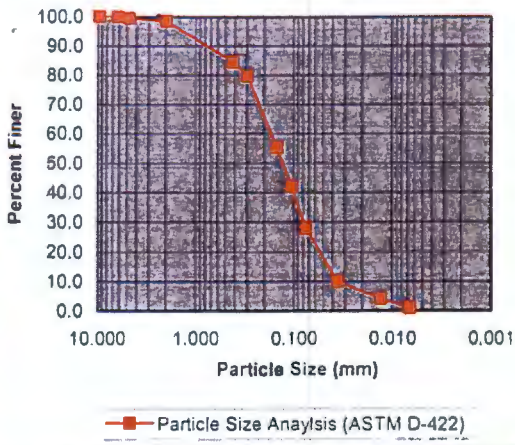
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
3/8 "	9.500	100.0	
1/4"	6.250	99.9	
No.4	4.750	99.3	
No. 10	2.000	98.3	
No. 40	0.425	84.5	
No. 50	0.300	79.6	
No. 100	0.150	55.4	
No.140	0.106	41.9	
No. 200	0.075	27.9	>20
	0.036	10	
	0.013	4	
	0.007	1	

Grain Size Analysis



Cc	1.03	Cu	4.65

Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/18/09
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING, INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-04
Project No.:	S86X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/12/2009
Tested By:	CL	Date:	8/13/2009	Sampled By:	JV
Reviewed By:	JV	Date:	8/18/2009	Date Received:	8/13/2009

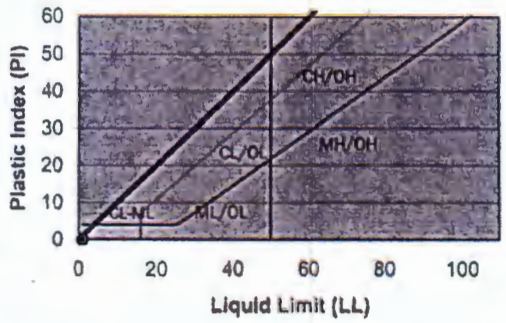
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

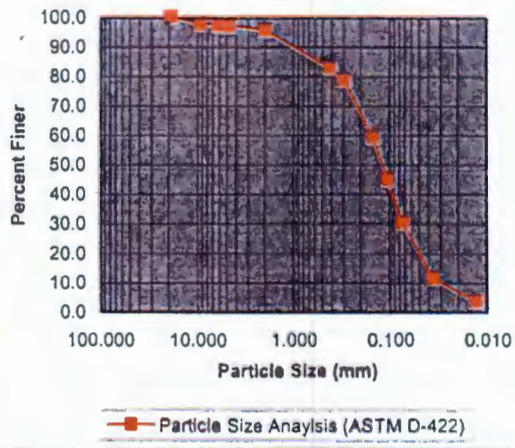
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
3/4 "	19.000	100.0	
3/8 "	9.500	97.7	
1/4"	6.250	97.2	
No.4	4.750	97.0	
No. 10	2.000	95.7	
No. 40	0.425	82.9	
No. 50	0.300	78.8	
No. 100	0.150	59.3	
No.140	0.106	45.0	
No. 200	0.075	31	>20
	0.036	12	
	0.013	4	
	0.007	1	
Cc	1.25	Cu	5.37

Grain Size Analysis



Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/18/09
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-05
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/13/2009
Tested By:	CL	Date:	8/14/2009	Sampled By:	JV
Reviewed By:	JV	Date:	8/19/2009	Date Received:	8/14/2009

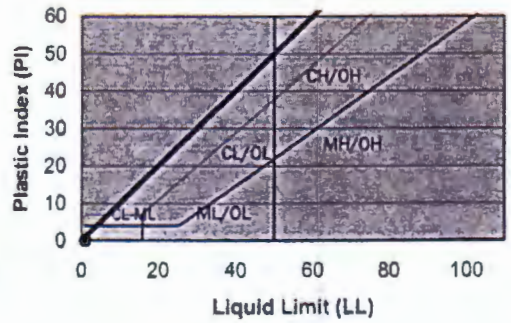
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

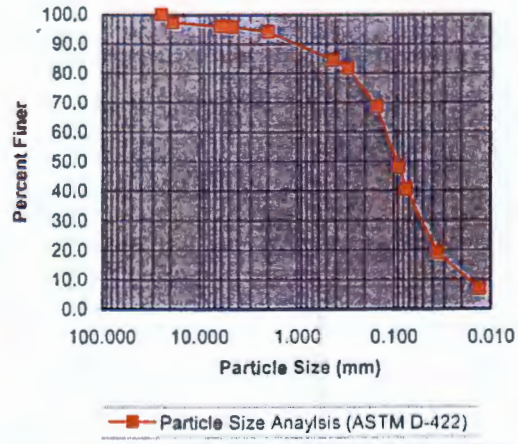
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	97.2	
1/4"	6.250	95.9	
No.4	4.750	95.7	
No. 10	2.000	94.0	
No. 40	0.425	84.3	
No. 50	0.300	81.6	
No. 100	0.150	68.5	
No.170	0.090	48.0	
No. 200	0.075	40.4	>20
	0.036	19.0	
	0.013	6.7	
	0.007	5.8	
Cc	1.26	Cu	5.89

Grain Size Analysis



Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/19/09
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-06
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/13/2009
Tested By:	CL	Date:	8/14/2009	Sampled By:	JV
Reviewed By:	JV	Date:	8/19/2009	Date Received:	8/14/2009

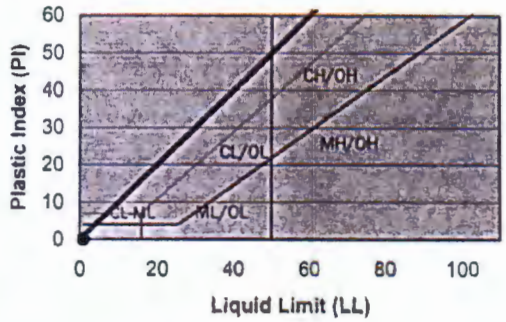
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

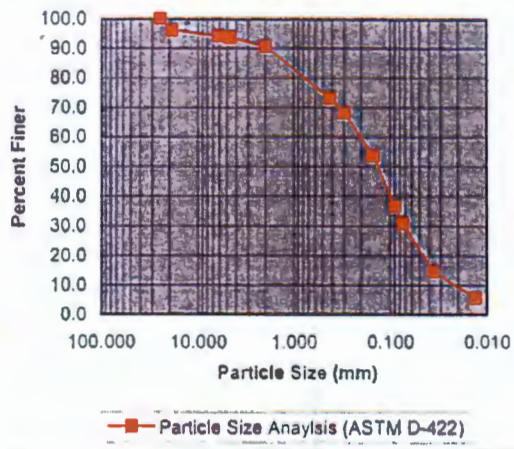
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	96.0	
1/4"	6.250	94.0	
No.4	4.750	93.5	
No. 10	2.000	90.5	
No. 40	0.425	73.0	
No. 50	0.300	68.1	
No. 100	0.150	53.6	
No.170	0.090	36.6	
No. 200	0.075	30.8	>20
	0.036	14.6	
	0.013	5.6	
	0.007	3.8	
Cc	1.45	Cu	10.08

Grain Size Analysis



Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/19/09

Date

Page 1 of 1

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-07
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/17/2009
Tested By:	CL	Date:	8/18/2009	Sampled By:	JV
Reviewed By:	JV	Date:	8/21/2009	Date Received:	8/17/2009

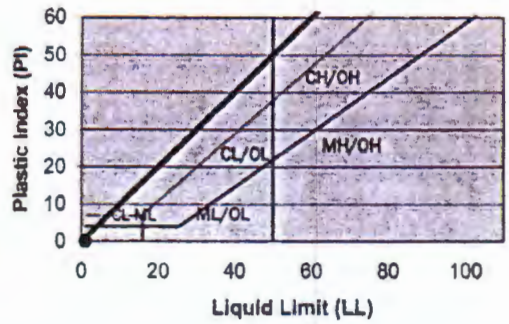
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

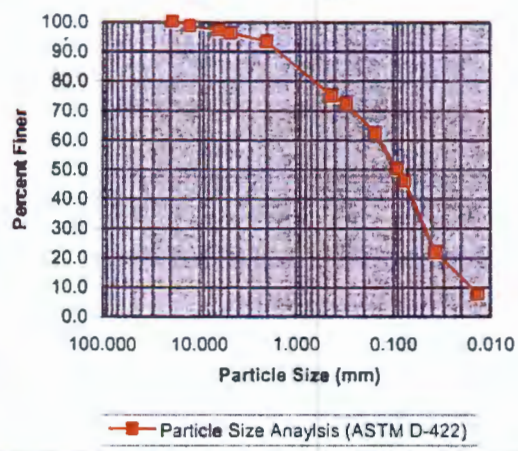
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
3/4 "	19.000	100.0	
1/2 "	12.500	98.3	
1/4"	6.250	97.1	
No.4	4.750	96.0	
No. 10	2.000	93.2	
No. 40	0.425	74.9	
No. 50	0.300	72.3	
No. 100	0.150	62.3	
No.170	0.090	50.0	
No. 200	0.075	45.9	>20
	0.036	21.6	
	0.013	7.6	
	0.007	3.9	
Cc	0.90	Cu	7.99

Grain Size Analysis



Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/21/09
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

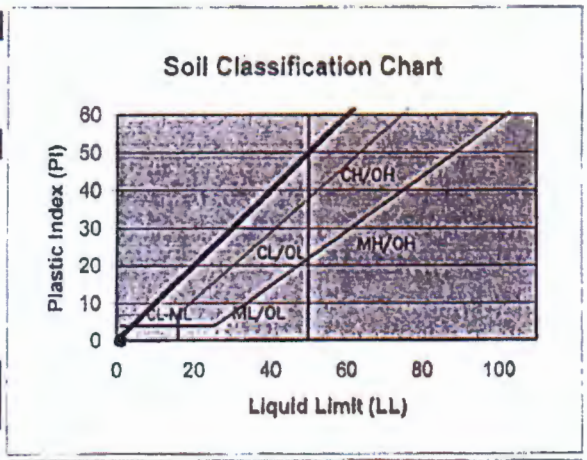
Contact Name:	Bill Borlaug			Sample ID:	BS-08
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/18/2009
Tested By:	CL	Date:	8/24/2009	Sampled By:	LH
Reviewed By:	JV	Date:	8/25/2009	Date Received:	8/19/2009

Natural Moisture Content

Natural Moisture	N/A

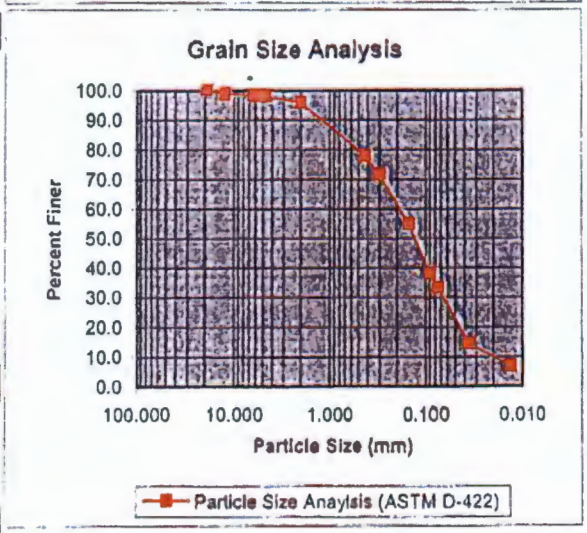
Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
3/4 "	19.000	100.0	
1/2 "	12.500	98.7	
1/4"	6.250	98.1	
No.4	4.750	97.9	
No. 10	2.000	95.8	
No. 40	0.425	77.8	
No. 50	0.300	71.5	
No. 100	0.150	54.8	
No.170	0.090	38.1	
No. 200	0.075	33.3	>20
	0.036	14.5	
	0.013	6.9	
	0.007	2.1	
Cc	1.21	Cu	8.84



Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/25/09

Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-09
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/19/2009
Tested By:	CL	Date:	8/26/2009	Sampled By:	LH
Reviewed By:	JV	Date:	8/28/2009	Date Received:	8/19/2009

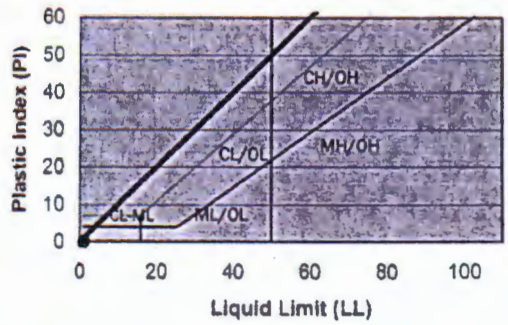
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

Soil Classification Chart

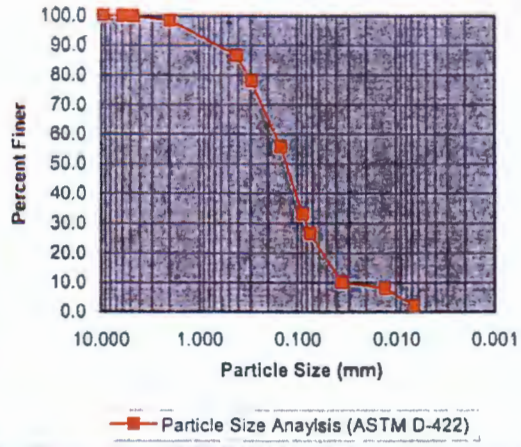


Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
3/8 "	9.500	100.0	
1/4"	6.250	99.7	
No.4	4.750	99.6	
No. 10	2.000	98.2	
No. 40	0.425	86.4	
No. 50	0.300	77.8	
No. 100	0.150	55.6	
No.170	0.090	33.0	
No. 200	0.075	26.5	>20
	0.036	10.0	
	0.013	8.0	
	0.007	2.1	

Cc	1.13	Cu	4.61

Grain Size Analysis



Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/28/09
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-10
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/20/2009
Tested By:	CL	Date:	8/26/2009	Sampled By:	LH
Reviewed By:	JV	Date:	8/28/2009	Date Received:	8/20/2009

Natural Moisture Content

Natural Moisture	N/A

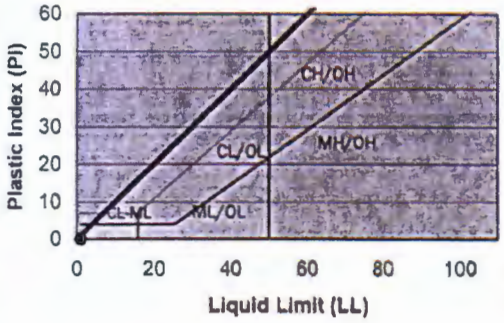
Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

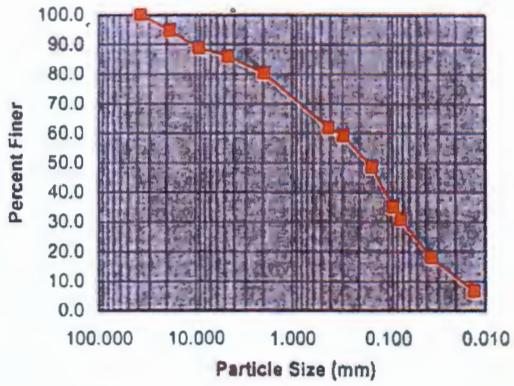
Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 1/2 "	37.500	100.0	
3/4 "	19.000	94.5	
3/8 "	9.500	88.7	
No.4	4.750	85.7	
No. 10	2.000	80.0	
No. 40	0.425	61.6	
No. 50	0.300	58.9	
No. 100	0.150	48.3	
No.170	0.090	34.9	
No. 200	0.075	30.7	>20
	0.036	17.7	
	0.013	6.5	
	0.007	4.1	
Cc	0.85	Cu	19.08

Soil Classification Chart



Grain Size Analysis



Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/28/09

Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	BS-11
Project No.:	S66X528A00			Sample Description:	Base Soil
Project Location:	ERDF SuperCell 9			Sampling Date:	8/24/2009
Tested By:	CL	Date:	8/27/2009	Sampled By:	LH
Reviewed By:	JV	Date:	8/28/2009	Date Received:	8/24/2009

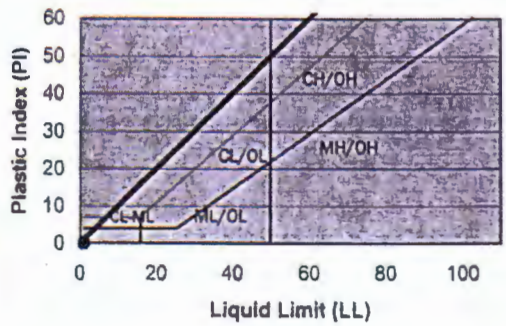
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	0	Spec
Liquid Limit	N/A	
Plastic Limit	N/A	
Plasticity Index	N/A	

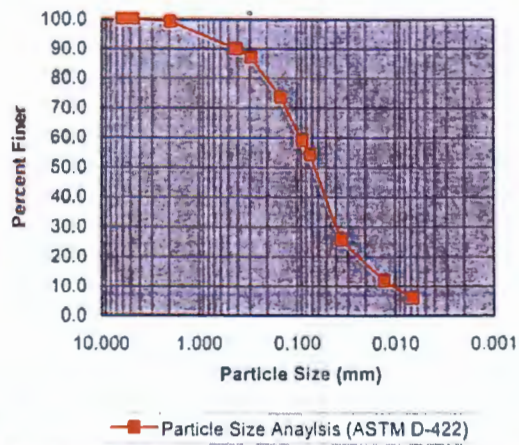
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1/4"	6.250	100.0	
No.4	4.750	- 100.0	
No. 10	2.000	99.0	
No. 40	0.425	89.7	
No. 50	0.300	86.9	
No. 100	0.150	73.4	
No.170	0.090	58.8	
No. 200	0.075	54.2	>20
	0.036	25.6	
	0.013	11.8	
	0.007	5.9	

Grain Size Analysis



Cc	1.76	Cu	9.74

Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech

8/28/09

Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS-01
Project:	S013213A00			Sample Description:	Base Soil
Project Location:	ERDF Cells 9-10			Sampling Date:	2/11/2010
Tested By:	L. Hay	Date:	3/5/2008	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/8/2010	Date Received:	2/11/2010

Natural Moisture Content

Natural Moisture	7.9

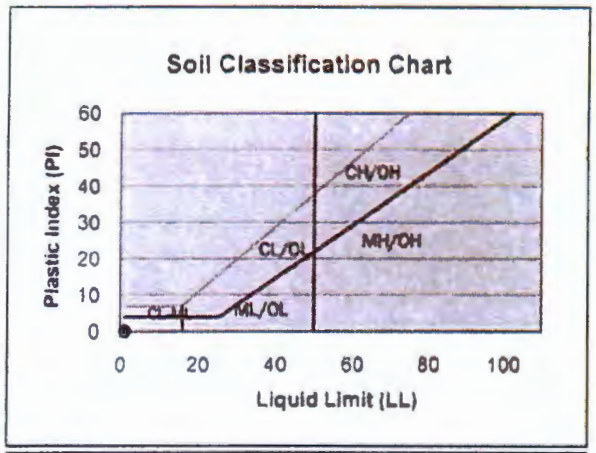
Atterberg Limits Test Results (ASTM D-4318)

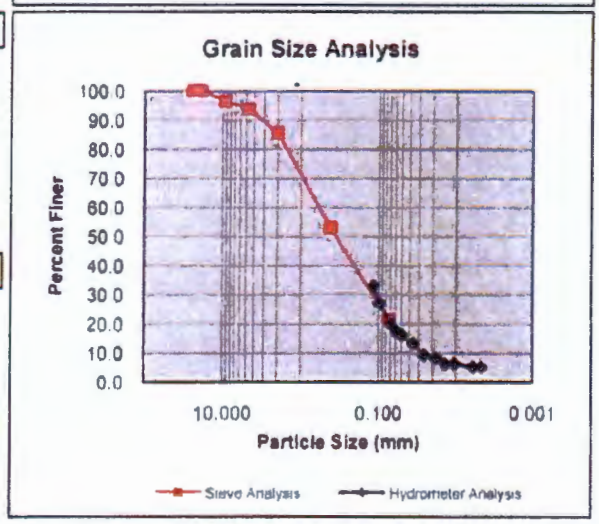
Flow Index	non-plastic	Spec
Liquid Limit	non-plastic	
Plastic Limit	non-plastic	
Plasticity Index	non-plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	96.4	
No.4	4.750	93.4	
No. 10	2.000	85.3	
No. 40	0.425	52.7	
	0.075	21.0	>20% Passing
	0.0500	14.7	

Cu	27.71
Cc	0.54





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Submittal: 05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS-02
Project:	S013213A00			Sample Description:	Base Soil
Project Location:	ERDF Cells 9-10			Sampling Date:	2/11/2010
Tested By:	L. Hay	Date:	3/5/2008	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/8/2010	Date Received:	2/11/2010

Natural Moisture Content

Natural Moisture	14.3

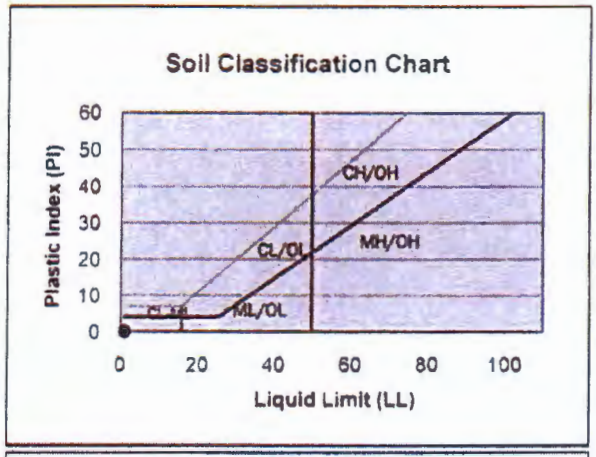
Atterberg Limits Test Results (ASTM D-4318)

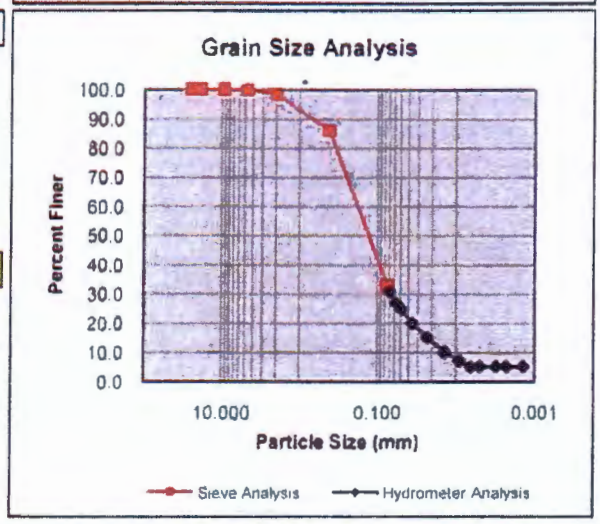
Flow Index	non-plastic	Spec
Liquid Limit	non-plastic	
Plastic Limit	non-plastic	
Plasticity Index	non-plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	100.0	
No.4	4.750	99.7	
No. 10	2.000	98.3	
No. 40	0.425	86.0	
	0.075	32.9	>20% Passing
	0.0500	25.1	

Cu	9.14
Cc	1.63





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Submittal: 05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS-03
Project:	S013213A00			Sample Description:	Base Soil
Project Location:	ERDF Cells 9-10			Sampling Date:	2/12/2010
Tested By:	L. Hay	Date:	L. Hay	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	3/8/2010	Date Received:	2/12/2010

Natural Moisture Content

Natural Moisture	6.1

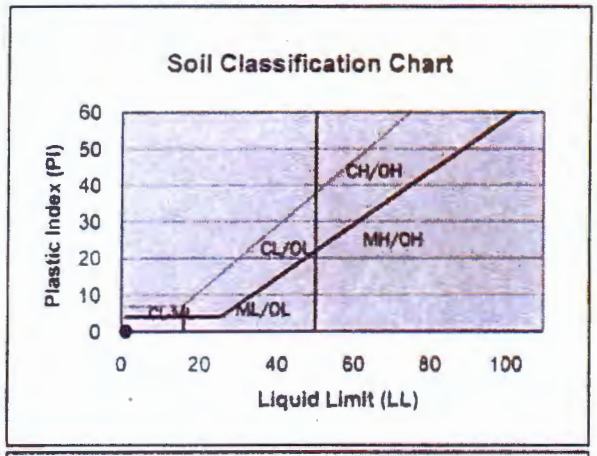
Atterberg Limits Test Results (ASTM D-4318)

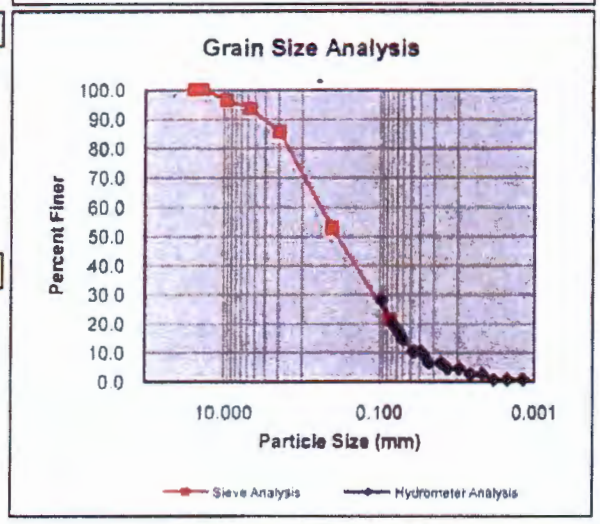
Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	96.4	
No.4	4.750	93.4	
No. 10	2.000	85.3	
No. 40	0.425	52.7	
	0.075	21.4	>20% Passing
	0.0500	15.9	

Cu	27.71
Cc	0.54





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS - 04
Project:	S013213A00			Sample Description:	Brown Sand w/ Silt
Project Location:	ERDF Cells 9-10			Sampling Date:	2/17/2010
Tested By:	L. Hay	Date:	3/8/2010	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/9/2010	Date Received:	2/17/2010

Natural Moisture Content

Natural Moisture	6.1

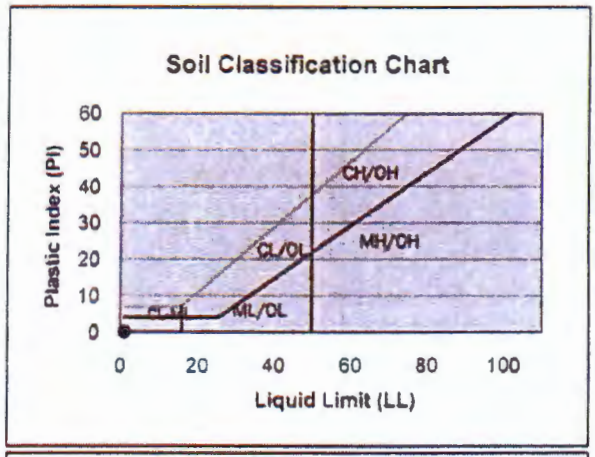
Atterberg Limits Test Results (ASTM D-4318)

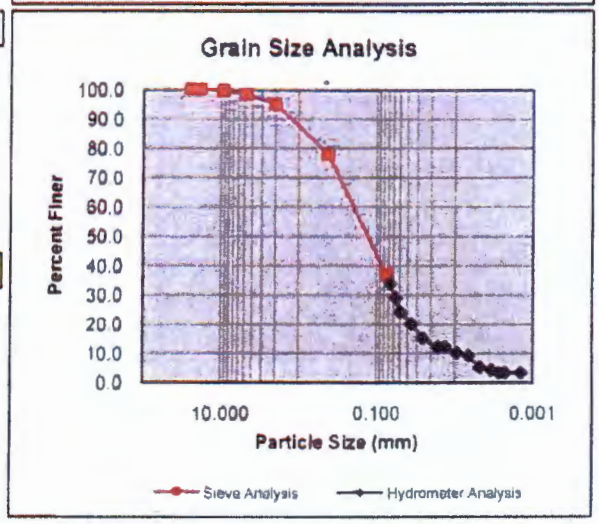
Flow Index	non-plastic	Spec
Liquid Limit	non-plastic	
Plastic Limit	non-plastic	
Plasticity Index	non-plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	99.6	
No.4	4.750	98.2	
No. 10	2.000	94.8	
No. 40	0.425	77.8	
	0.075	36.8	>20% Passing
	0.0500	24.2	

Cu	9.14
Cc	1.63





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Submittal: 05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS - 05
Project:	S013213A00			Sample Description:	Brown Sand w/ Silt
Project Location:	ERDF Cells 9-10			Sampling Date:	2/18/2010
Tested By:	L. Hay	Date:	3/9/2010	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/11/2010	Date Received:	2/18/2010

Natural Moisture Content

Natural Moisture	3.7

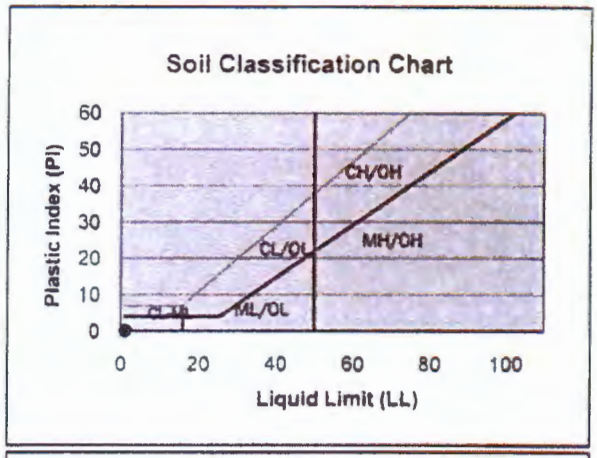
Atterberg Limits Test Results (ASTM D-4318)

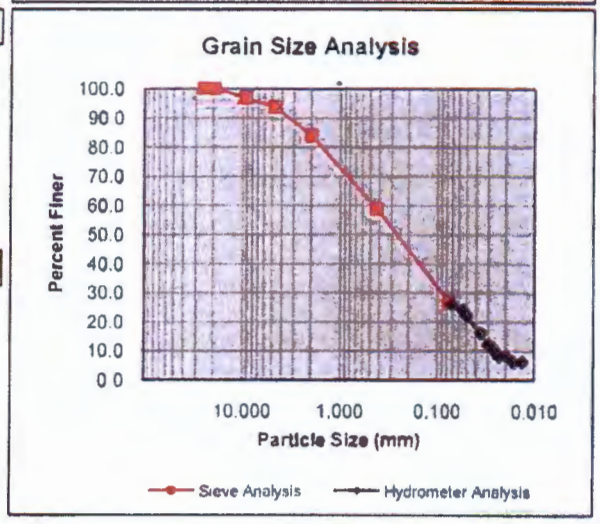
Flow Index	non-plastic	Spec
Liquid Limit	non-plastic	
Plastic Limit	non-plastic	
Plasticity Index	non-plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	96.5	
No.4	4.750	93.4	
No. 10	2.000	83.7	
No. 40	0.425	58.4	
	0.075	26.7	>20% Passing
	0.0500	22.0	

Cu	9.14
Cc	1.63





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS - 06
Project:	S013213A00			Sample Description:	Brown Sand w/ Silt
Project Location:	ERDF Cells 9-10			Sampling Date:	2/18/2010
Tested By:	L. Hay	Date:	3/9/2010	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/11/2010	Date Received:	2/18/2010

Natural Moisture Content

Natural Moisture	14.9

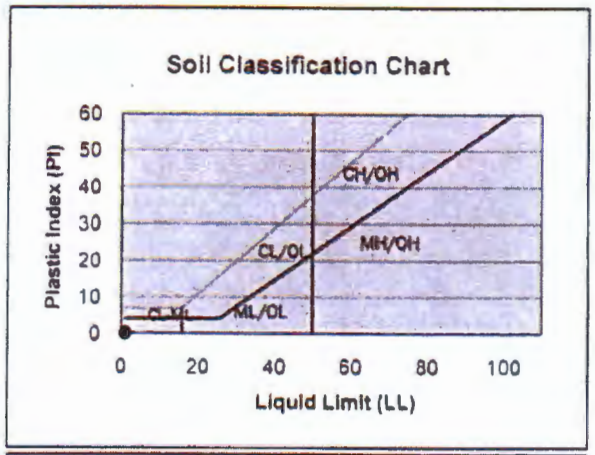
Atterberg Limits Test Results (ASTM D-4318)

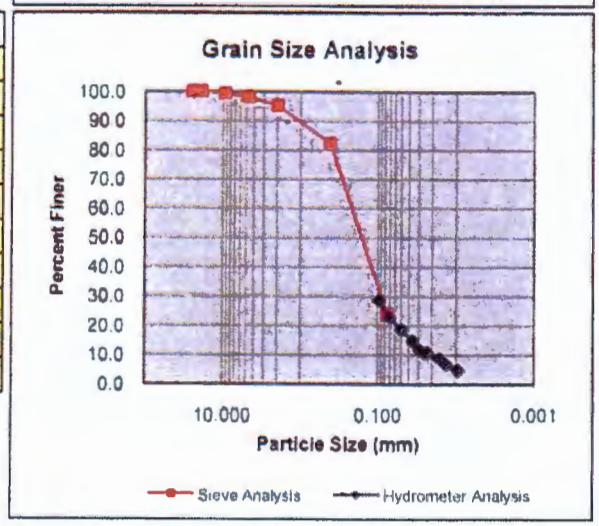
Flow Index	non-plastic	Spec
Liquid Limit	non-plastic	
Plastic Limit	non-plastic	
Plasticity Index	non-plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	99.3	
No.4	4.750	97.9	
No. 10	2.000	94.9	
No. 40	0.425	82.0	
	0.075	23.7	>20% Passing
	0.0500	18.6	

Cu	9.14
Cc	1.63





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS - 07
Project:	S013213A00			Sample Description:	Brown Sand w/ Silt
Project Location:	ERDF Cells 9-10			Sampling Date:	2/22/2010
Tested By:	L. Hay	Date:	3/15/2010	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/16/2010	Date Received:	2/22/2010

Natural Moisture Content

Natural Moisture	7.0

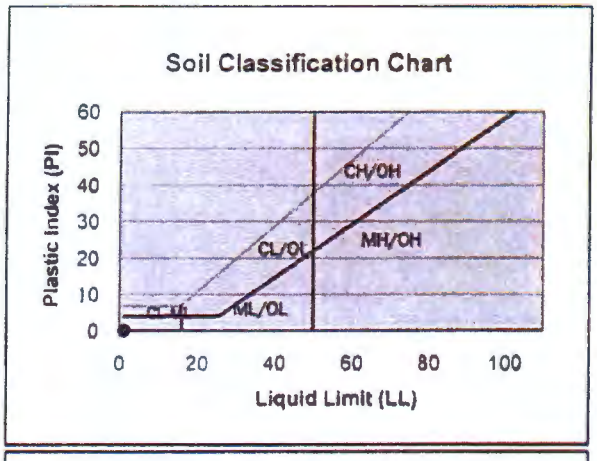
Atterberg Limits Test Results (ASTM D-4318)

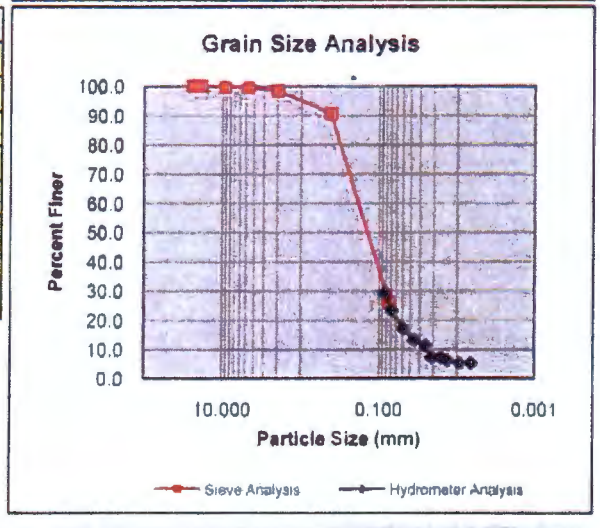
Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	99.7	
No.4	4.750	99.4	
No. 10	2.000	98.4	
No. 40	0.425	90.4	
	0.075	25.7	>20% Passing
	0.0500	17.3	

Cu	8.33
Cc	2.68





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Submittal: 05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS - 08
Project:	S013213A00			Sample Description:	Brown Sand w/ Silt
Project Location:	ERDF Cells 9-10			Sampling Date:	2/23/2010
Tested By:	L. Hay	Date:	3/15/2010	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/16/2010	Date Received:	2/23/2010

Natural Moisture Content

Natural Moisture	5.9

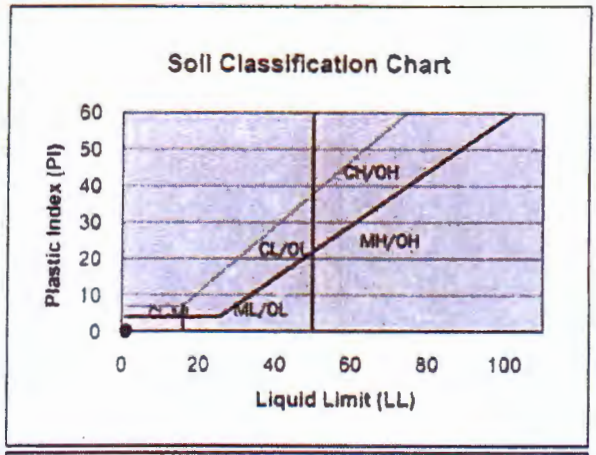
Atterberg Limits Test Results (ASTM D-4318)

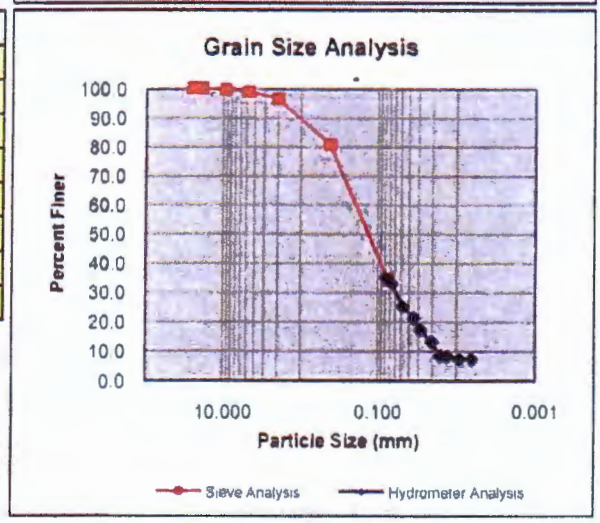
Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	99.7	
No.4	4.750	98.8	
No. 10	2.000	96.2	
No. 40	0.425	80.6	
	0.075	34.2	>20% Passing
	0.0500	25.8	

Cu	8.65
Cc	1.66





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM. None

Envirotech - Project Manager

5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID.	BS - 09
Project:	S013213A00			Sample Description:	Brown Sand w/ Silt
Project Location:	ERDF Cells 9-10			Sampling Date:	3/1/2010
Tested By:	L. Hay	Date:	3/15/2010	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/17/2010	Date Received:	3/1/2010

Natural Moisture Content

Natural Moisture	3.9

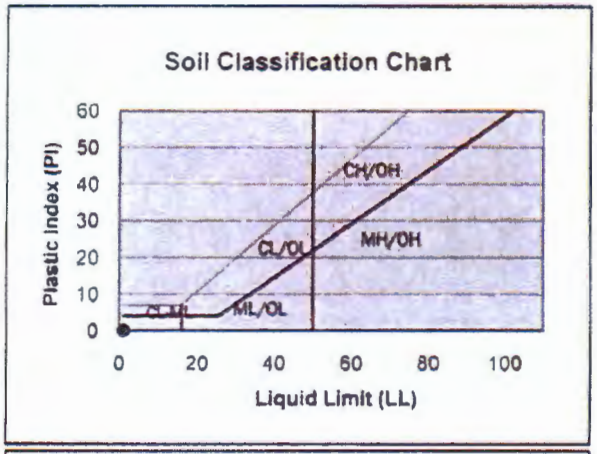
Atterberg Limits Test Results (ASTM D-4318)

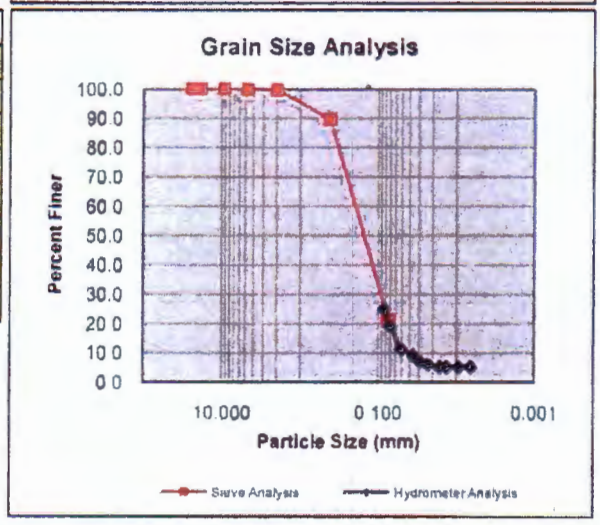
Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	100.0	
No.4	4.750	99.7	
No. 10	2.000	99.4	
No. 40	0.425	89.4	
	0.075	21.0	>20% Passing
	0.0500	10.7	

Cu	2.53
Cc	0.89





Unified Soil Classification (ASTM D-2487)

SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10

Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
ENGINEERING & CONSULTING, INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Submittal: 05-18F Base Soil Lab Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	BS - 10
Project:	S013213A00			Sample Description:	Brown Sand w/ Silt
Project Location:	ERDF Cells 9-10			Sampling Date:	3/1/2010
Tested By:	L. Hay	Date:	3/16/2010	Sampled By:	L. Hay
Reviewed By:	J. Stallings	Date:	3/17/2010	Date Received:	3/1/2010

Natural Moisture Content

Natural Moisture	5.7

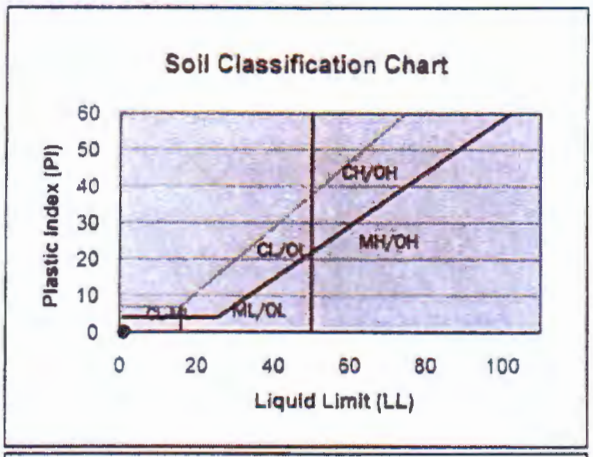
Atterberg Limits Test Results (ASTM D-4318)

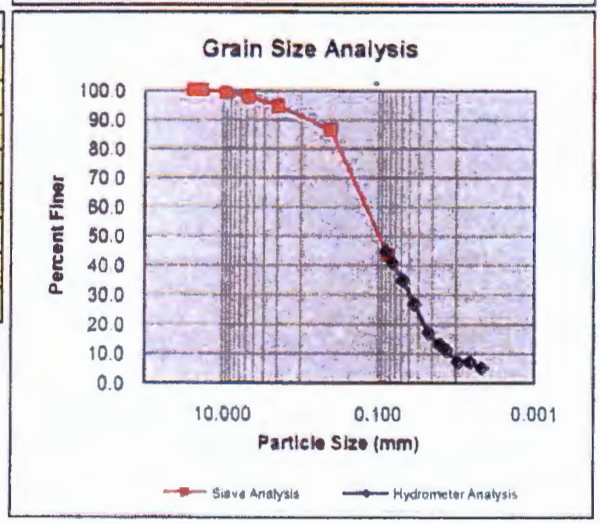
Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

Particle Size Anaylsis (ASTM D-422)

Sieve No	Particle Size	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	99.1	
No.4	4.750	97.5	
No. 10	2.000	94.2	
No. 40	0.425	86.2	
	0.075	43.5	>20% Passing
	0.0500	35.7	

Cu	49.23
Cc	0.08





Unified Soil Classification (ASTM D-2487)
SM - Silty Sand

Deviations from ASTM: None

Envirotech - Project Manager

5-4-10
Date

C.2

RECOMPACTED PERMEABILITY

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18D Admix Laboratory Data Sheets		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	3

Date:	4/13/2010
Sample ID:	AM-01
Sample Description:	Brown Sandy Clay

L_i =	7.69	cm	**Hydraulic System Constants**	
L_f =	7.68	cm	**Mercury U-Tube Manometer**	
Dia =	10.2	cm	Area annulus, a_a (cm^2)	0.76712
Temp =	20.6	C	Area permometer tube, a_p (cm^2)	0.031416
R_t =	0.987595		Delta Hg at equilibrium (cm)	1.70

B Coefficient	0.95	**Specific Gravity of Water, Gw**	1
Effective Stress	5		

Mercury Head Setting

Estimated k_t (cm/sec)	Max Gradient i_o=h/L	Permometer Setting (cm)	Min. Cell Pressure (psi)
10^{-4} - 10^{-5}	5	4.63	60
10^{-5} - 10^{-6}	10	7.57	60
10^{-6} - 10^{-7}	20	13.43	60
< 10^{-7}	30	19.30	60

Test No.	Readings by.	Date	Time mins	Cumulative t secs	Pressure Cell psi	Pressure Back psi	Mercury Head Tail cm Hg	Mercury Head Head cm Hg	Total Head Loss cm H_2O	Hyd Gradient Pret/final	Hydraulic Conductivity K cm/sec	Hydraulic Conductivity K_{20} cm/sec
	KR	4/13/2010	0				20.40	1.70	254.51	33.2		
1	KR	4/13/2010	20	1200	60	65	19.90	1.68	247.98	32.3	1.34E-08	1.33E-08
			20				19.90	1.68	247.98	32.3		
2	KR	4/13/2010	30	1800	60	65	19.50	1.66	242.76	31.6	1.6321E-08	1.61E-08
			30				19.50	1.66	242.76	31.6		
3	KR	4/13/2010	40	2400	60	65	19.10	1.65	237.54	30.9	1.789E-08	1.77E-08
			40				19.10	1.65	237.54	30.9		
4	KR	4/13/2010	50	3000	60	65	18.80	1.63	233.62	30.4	1.7773E-08	1.76E-08
			50				18.80	1.63	233.62	30.4		
5	KR	4/13/2010	60	3600	60	65	18.40	1.62	228.40	29.8	1.874E-08	1.85E-08

Project Manager

4-16-2010
Date

Average K:	1.6834E-08	1.6625E-08
Specification:	< 1.00E-07	

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18D: Admix Laboratory Data Sheets		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	Permeameter:	3

Date:	4/13/2010
Sample ID:	AM-01
Sample Description:	Brown Sandy Clay

Item	Initial		Final	
Sample Diameter (cm)	10.21		10.21	
Sample Length (cm)	7.69		7.68	
Sample Volume (cm^3)	629.8		628.5	
Tare Number	v		WO	
Tare Weight (gm)	49.9		50.15	
Wet Soil + Tare (gm)	375.7		311.18	
Dry Soil + Tare (gm)	332.94		274.36	
Water Weight (gm)		42.8		36.82
Dry Soil Weight (gm)		283.04		224.21
Moisture Content (%)		15.1%		16.4%
Wet Weight Sample (gm)	1335.3		1350.3	
Wet Density Sample (pcf)		132.08		133.85
Dry Density Sample (pcf)		114.75		114.97
Saturation %		87.1%		95.3%

Specific Gravity	2.7		Tested		Assumed	x
Sample Results:	Meets Specifications					

C.3

PROCTORS

Modified Proctor (ASTM D1557 and D4718)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	AM-01
Project:	S013213A00			Sample Des:	Admix
Project Location:	ERDF Cells 9-10			Sampling Date:	4/5/2010
Tested By:	L. Hay	Date:	4/12/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	4/13/2010	Date Received:	4/5/2010
Comments:				Report No.	#45

DENSITY DATA (lbs)

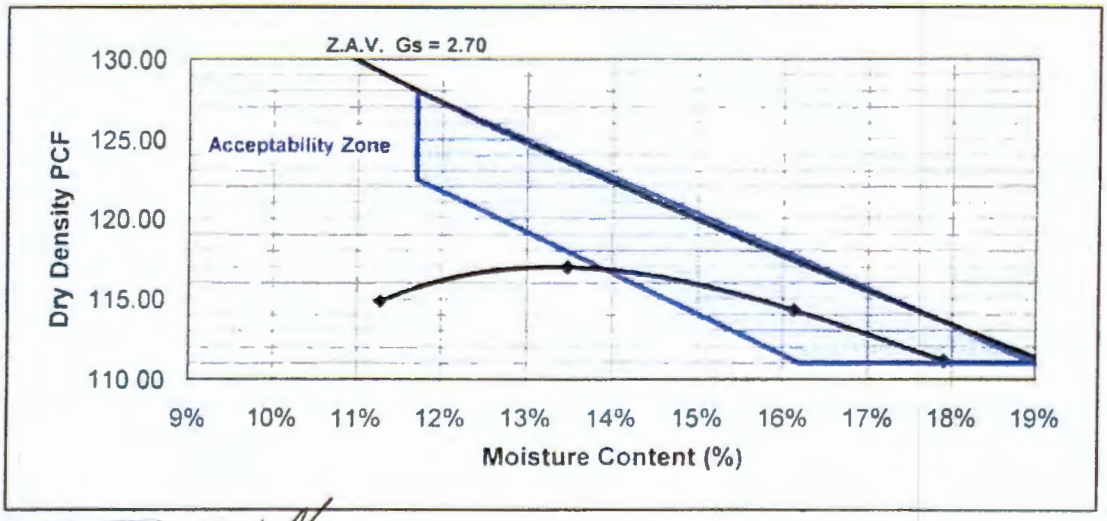
Mold + Wet Soil	12.98	13.15	13.15	13.09	12.99
Mold Wt.	8.72	8.72	8.72	8.72	8.72
Wet Soil	4 26	4.43	4.42	4.37	4.27
lbs/cu. ft. (wet)	127.8	132.8	132.7	131.0	128.0
lbs/cu. ft. (dry)	114.9	117.0	114.3	111.1	107.0

MOISTURE DATA (grams)

Tin No.	LH	AB	VI	BX	XIII
Wet Soil + Tin	538.90	565 10	535.10	482.20	512.50
Dry Soil + Tin	484.30	498 00	460.80	409.00	428.70
Tin Wt.	0.00	0.00	0.00	0.00	0.00
Dry Soil	484.30	498.00	460 80	409.00	428.70
% Moisture	11 3%	13.5%	16.1%	17.9%	19.5%
% Saturation	65 2%	82 7%	91.9%	93.7%	91.9%

MAXIMUM DRY DENSITY (PCF) 117.0

OPTIMUM MOISTURE CONTENT (%) 13.5%



Envirotech

4-14-10
Date

C.4

SOIL CLASSIFICATIONS

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH

2500 N. 11th Street | Enid, Ok. 73701
580) 234-8780 | Fax 580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

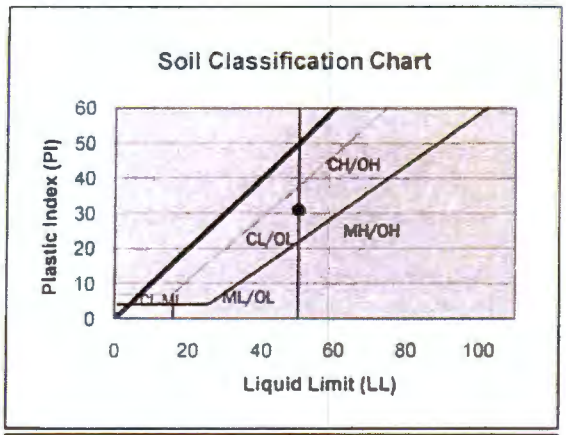
Contact Name:	Charlie Skiba			Sample ID:	AM-01
Project:	S013213A00			Sample Description	Admix from Test Pad
Project Location:	ERDF Cells 9-10			Sampling Date:	4/5/2010
Tested By:	L. Hay	Date:	4/12/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	4/13/2010	Date Received:	4/5/2010

Natural Moisture Content

Natural Moisture	14.8%

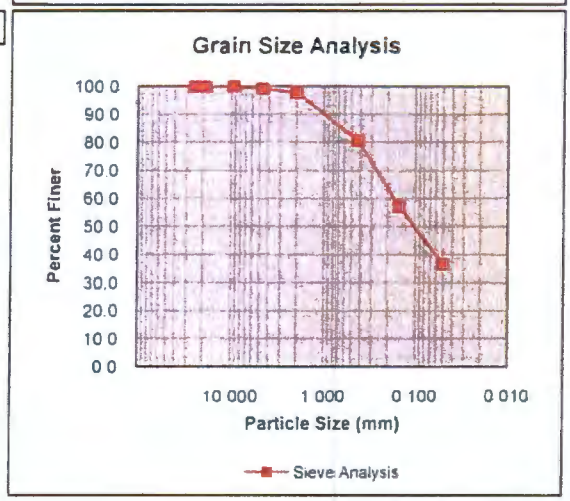
Atterberg Limits Test Results (ASTM D-4318)

Flow Index	-7	Spec
Liquid Limit	50	
Plastic Limit	19	
Plasticity Index	31	



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	100.0	
No.4	4.750	99.3	
No. 10	2.000	97.6	
No. 40	0.425	80.8	
No. 100	0.150	57.4	
No. 200	0.050	36.9	



Cu	N/A
Cc	N/A

Unified Soil Classification (ASTM D-2487)
CH: Sandy Fat Clay

Deviations from ASTM: None

Envirotech

4-14-2010
Date

C.5

PUGMILL BELT SCALES

Pugmill Calibration Worksheet

ENVIROTECH

Testing Information

Client:	Washington Closure Hanford	Test by:	Tyler Williams
Contact Name:	Charlie Skiba	Prepared by:	Joseph Voss
Project:	S013213A00	Reviewed by:	Tyler Williams
Project Location:	ERDF Cells 9-10		

Date/Time:	East Silo		West Silo		Time	Base Soil		Water	Totalizer	Bentonite	Base Dry	Bentonite	Totalizer Check	Comments
	Start	Stop	Start:	Stop:		Wet	Moist							
	lb	lb	lb	lb	min	T/hr	%	gal/hr	T/hr	T/hr	T/hr	(11-14) %	T/hr	
P19 East Silo Vein Feeder Calibration														
3/29/2010 9:20	51000	46440			6.0					22.8			22.8	Wind Affected
3/29/2010 10:30	44800	39460			6.0					26.7			26.7	Wind Affected
3/29/2010 13:15	31500	25840			6.0					28.3			28.3	Auger rate = 27.2
3/29/2010 13:40	53100	47460			6.0					28.2			28.2	Auger rate = 28.4
P9 Wast Silo Vein Feeder Calibration														
4/1/2010 16:00			34900	29020	6.0					29.4			29.4	Auger rate = 27.2
4/1/2010 16:15			27100	21400	6.0					28.5			28.5	Auger rate = 28.5
4/1/2010 16:20			20400	14340	6.0					30.3			30.3	Auger rate = 30.3
4/1/2010 17:30			62200	56560	6.0					28.2			28.2	Auger rate = 28.3
Base Soil and Totalizer Calibration - All quantities are in units of Tons														
4/1/2010 8:45						29.44			30.61		29.4			Actual 30.29 Tons
4/1/2010 9:00						28.89			28.73		28.9			Actual 28.72 Tons
4/1/2010 10:00						29.24			29.24		29.2			Actual 29.25 Tons

Water Calibration

Date/Time	Start	Stop	Elapsed Time		Flow Rate		Panel readout	Comments
	gal	gal	min	hr	gal/hr	Tons/hr	T/hr	
3/31/2010 16:35	6600	7100	3.13	0.0522	9574.468085	39.9	41.73	
3/31/2010 17:00	7200	7700	3.308	0.0551	9068.923821	37.8	38	Flow rate failed to remain constant
4/1/2010 9:50	0	300	1.9183	0.032	9383.145091	39.1	39.08	

Envirotech

4/2/10
Date

Belt Scale Measurements
Admix Test Pad

ENVIROTECH

Testing Information

Client:	Washington Closure Hanford	Test by:	Tyler Williams
Contact Name:	Charlie Skiba	Prepared by:	Joseph Voss
Project:	S013213A00	Reviewed by:	Tyler Williams
Project Location:	ERDF Cells 9-10 (Test Pad)		

Date/Time:	East Silo		West Silo		Time	Base Soil		Water	Totalizer	Bentonite	Base Dry	Bentonite	Totalizer Check	Moisture	Moisture Verify
	Start	Stop	Start:	Stop:		Wet	Moist								
	lb	lb	lb	lb	min	T/hr	%	T/hr	T/hr	T/hr	T/hr	(11-14) %	T/hr	%	%
4/2/2010 10:37	72200	67240	51500	47060	6.0	378	6.5	30.1	450	47	353.4	13.3%	455.1	12.0%	17.9%
4/2/2010 12:50	47700	43580			6.0	351	7.8	25.3	415	20.6	323.6	6.4%	371.7	14.2%	17.0%
The west silo was emptied of bentonite and was not restarted until 14:30															
4/2/2010 14:41	85000	80240	84160	80580	6.0	349	7.8	23.9	410	41.7	321.8	13.0%	390.8	13.1%	14.9%
4/2/2010 15:50	82000	77680			6.0	341	7.8	23	395	21.6	314.4	6.9%	362.7	13.7%	14.7%
The west silo was emptied of bentonite and was not restarted.															
4/5/2010 9:45	52640	48620	67600	63900	6.0	350	7	27.6	419	38.6	325.5	11.9%	388.7	13.4%	15.0%

Envirotech

4/9/10
Date

Moisture Content

ASTM (Conv D-2216, Micro D-4643, Wet D-2217)

ENVIROTECH

Sample Information

Client:	Washington Closure Hanford
Contact Name:	Charlie Skiba
Project:	S013213A00
Project Location:	ERDF Cells 9-10 (Test Pad)

Test by:	Joseph Voss
Prepared by:	Joseph Voss
Reviewed by:	Tyler Williams

Date	Tare No. (g)	Tare +Wet (g)	Tare +Dry (g)	Tare Wt. (g)	Moisture Content (%)	Verification
4/2/2010 10:36	DDD	246.15	233.61	50.04	6.8%	Base Soil
4/2/2010 10:37	L	216.9	191.55	49.86	17.9%	
4/2/2010 12:50	A8	290.48	255.53	50	17.0%	
4/2/2010 14:41	A9	197.3	177.98	48.5	14.9%	
4/2/2010 15:50	K	155.24	141.75	50.15	14.7%	
4/2/2010 15:51	E1	362.49	336.54	50.11	9.1%	Base Soil
4/5/2010 9:45	BOO	326.49	290.44	49.98	15.0%	

C.6

FIELD DENSITY TESTING

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

Client: WCH

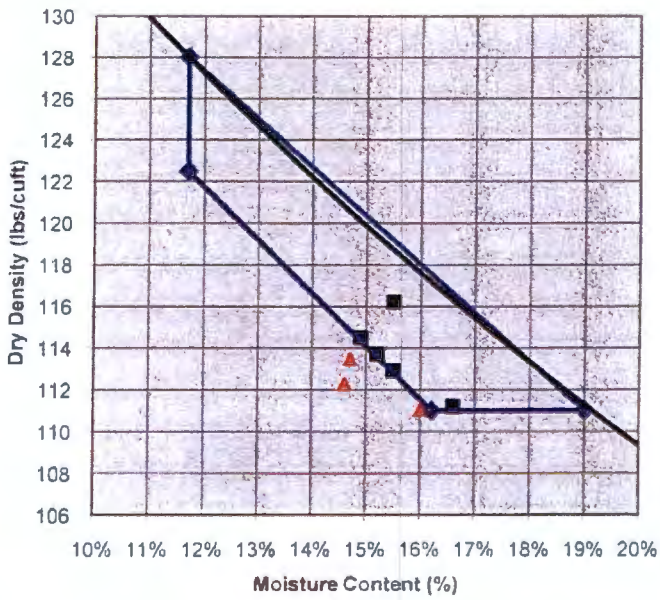
Project: S013213A00
Test Date: 4/5/2010
Description: Admix Soil
Report: 39

Model: 3430 Troxler ID: 27881
Moisture Std. 643 Density Std: 2187
Offsets: Moisture - Density -
Acceptable Zone

Comments: Lift 1 was initially placed to a thickness of 4-inches. The lift was tested and failed. DHI chose to recompact lift 1 with an additional 1 1/2 passes. The lift failed, and DHI moisture conditioned and placed material to bring lift 1 to 8-in. The lift was moisture conditioned and recompacted and cut to 8-in thick.

Test No	Lift	Time	No. of Passes	Depth of Test (inches)	Dry Density lbs/cuft	Moisture Content (%)	Void Ratio	Moist Verify	% Saturation	Pass / Fail
TP-1	1	10:22	3	4	113.7	15.2%	0.483	15.9%	85.0%	Pass
TP-2	1	10:37	3	4	111.2	16.6%	0.515	N/A	87.0%	Pass
TP-3	1	10:41	3	4	111.1	16.0%	0.517	N/A	84.0%	Fail
TP-4	1	10:44	3	4	112.3	14.6%	0.501	N/A	79.0%	Fail
TP-5	1	10:48	3	4	113.5	14.7%	0.486	N/A	82.0%	Fail
TP-6	1	10:51	3	4	112.9	15.5%	0.493	N/A	85.0%	Pass
TP-6A	1	11:03	4.5	4	103.2	15.9%	0.633	N/A	68.0%	Fail
TP-5A	1	11:15	4.5	4	101.9	17.4%	0.654	N/A	72.0%	Fail
TP-6B	1	12:50	3	6	116.2	15.5%	0.451	N/A	93.0%	Pass
TP-5B	1	12:51	3	6	114.5	14.9%	0.473	N/A	85.0%	Pass

Sample ID	Tare No.	Tare + Wet	Tare + Dry	Tare (g)
TP-1	SC	2015.9	1763.7	174.5
TP-2				
TP-3				
TP-4				
TP-5				
TP-6				
TP-6A				
TP-5A				
TP-6B				
TP-5B				



nvirotech Engineering & Consulting, Inc

4/9/10
Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

Client: WCH

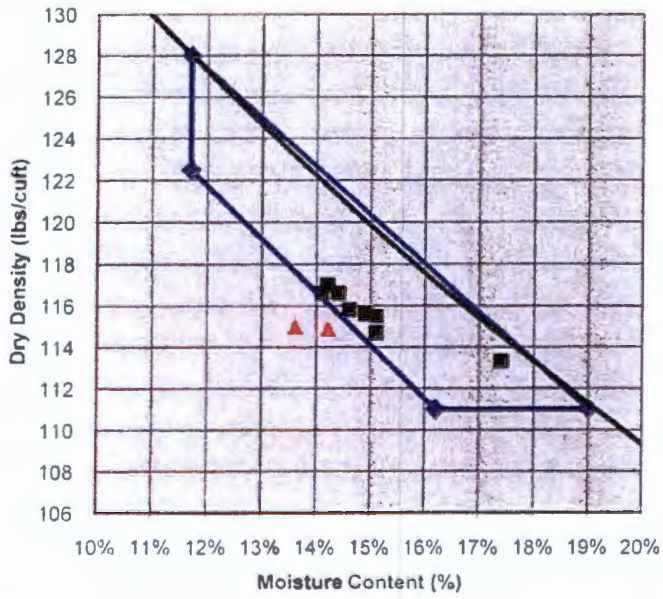
Project: S013213A00
Test Date: 4/5/2010
Description: Admix Soil
Report: 39

Model: 3430 Troxler ID: 27881
Moisture Std: 643 Density Std: 2187
Offsets: Moisture - Density -
Acceptable Zone

Comments: Lift 1 was initially placed to a thickness of 4-inches. The lift was tested and failed. DHI chose to recompact lift 1 with an additional 1 1/2 passes. The lift failed, and DHI moisture conditioned and placed material to bring lift 1 to 8-in. The lift was moisture conditioned and recompacted and cut to 8-in thick.

Test No	Lift	Time	No. of Passes	Depth of Test (inches)	Dry Density lbs/cuft	Moisture Content (%)	Void Ratio	Moist Verify	% Saturation	Pass / Fail
TP-4A	1	12:54	3	6	**115.6**	**14.9%**	**0.458**	N/A	88.0%	Pass
TP-2A	1	13:05	3	6	**113.3**	**17.4%**	**0.487**	N/A	96.0%	Pass
TP-3A	1	13:07	3	6	**115.8**	**14.6%**	**0.455**	N/A	87.0%	Pass
TP-1A	1	13:10	3	6	**116.6**	**14.1%**	**0.445**	N/A	86.0%	Pass
TP-7	2	13:55	3	6	**114.7**	**15.1%**	**0.470**	15.3%	87.0%	Pass
TP-8	2	14:02	3	6	**116.6**	**14.4%**	**0.446**	N/A	87.0%	Pass
TP-9	2	14:04	3	6	**115.5**	**15.1%**	**0.460**	N/A	89.0%	Pass
TP-10	2	14:07	3	6	**115.0**	**13.6%**	**0.466**	N/A	79.0%	Fail
TP-11	2	14:11	3	6	**114.9**	**14.2%**	**0.467**	N/A	82.0%	Fail
TP-12	2	14:12	3	6	**117.0**	**14.2%**	**0.441**	N/A	87.0%	Pass

Sample ID	Tare No.	Tare + Wet	Tare + Dry	Tare (g)
TP-4A	Shelby			
TP-2A				
TP-3A				
TP-1A				
TP-7	SC	**2251.5**	**1976.4**	**181.2**
TP-8				
TP-9				
TP-10				
TP-11				
TP-12				



Envirotech Engineering & Consulting, Inc

4/9/10
Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

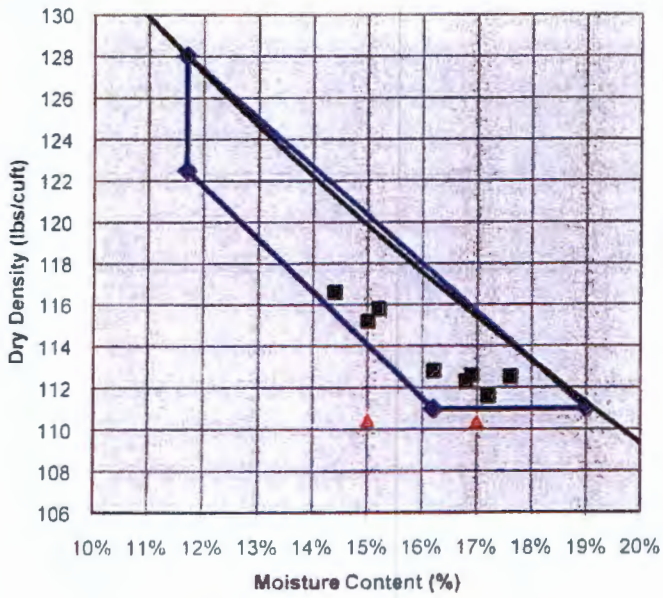
Client: WCH

Project: S013213A00
Test Date: 4/5/2010
Description: Admix Soil
Report: 39
Comments:

Model: 3430 Troxler ID: 27881
Moisture Std: 643 Density Std: 2187
Offsets: Moisture - Density -
Acceptable Zone

Test No	Lift	Time	No. of Passes	Depth of Test (inches)	Dry Density lbs/cuft	Moisture Content (%)	Void Ratio	Moist Verify	% Saturation	Pass / Fail
TP-10A	2	14:36	6	6	116.6	14.4%	0.446	N/A	87.0%	Pass
TP-11A	2	14:39	6	6	112.3	16.8%	0.501	N/A	91.0%	Pass
TP-13	3	15:24	3	6	112.5	17.6%	0.498	18.1%	95.0%	Pass
TP-14	3	15:27	3	6	115.2	15.0%	0.464	N/A	87.0%	Pass
TP-15	3	15:31	3	6	115.8	15.2%	0.481	N/A	85.0%	Pass
TP-16	3	15:32	3	6	112.8	16.2%	0.494	N/A	89.0%	Pass
TP-17	3	15:33	3	6	112.6	16.9%	0.497	N/A	92.0%	Pass
TP-18	3	15:36	3	6	110.5	15.0%	0.526	N/A	77.0%	Fail
TP-18A	3	16:00	6	6	110.4	17.0%	0.526	N/A	87.0%	Fail
TP-18B	3	16:20	9	6	111.6	17.2%	0.510	16.7%	91.0%	Pass

Sample ID	Tare No.	Tare + Wet	Tare + Dry	Tare (g)
TP-10A				
TP-11A	Shelby Tube			
TP-13	SC&ST	2122	1823.9	174.2
TP-14				
TP-15				
TP-16				
TP-17				
TP-18				
TP-18A				
TP-18B	A8	314.09	276.39	50.12



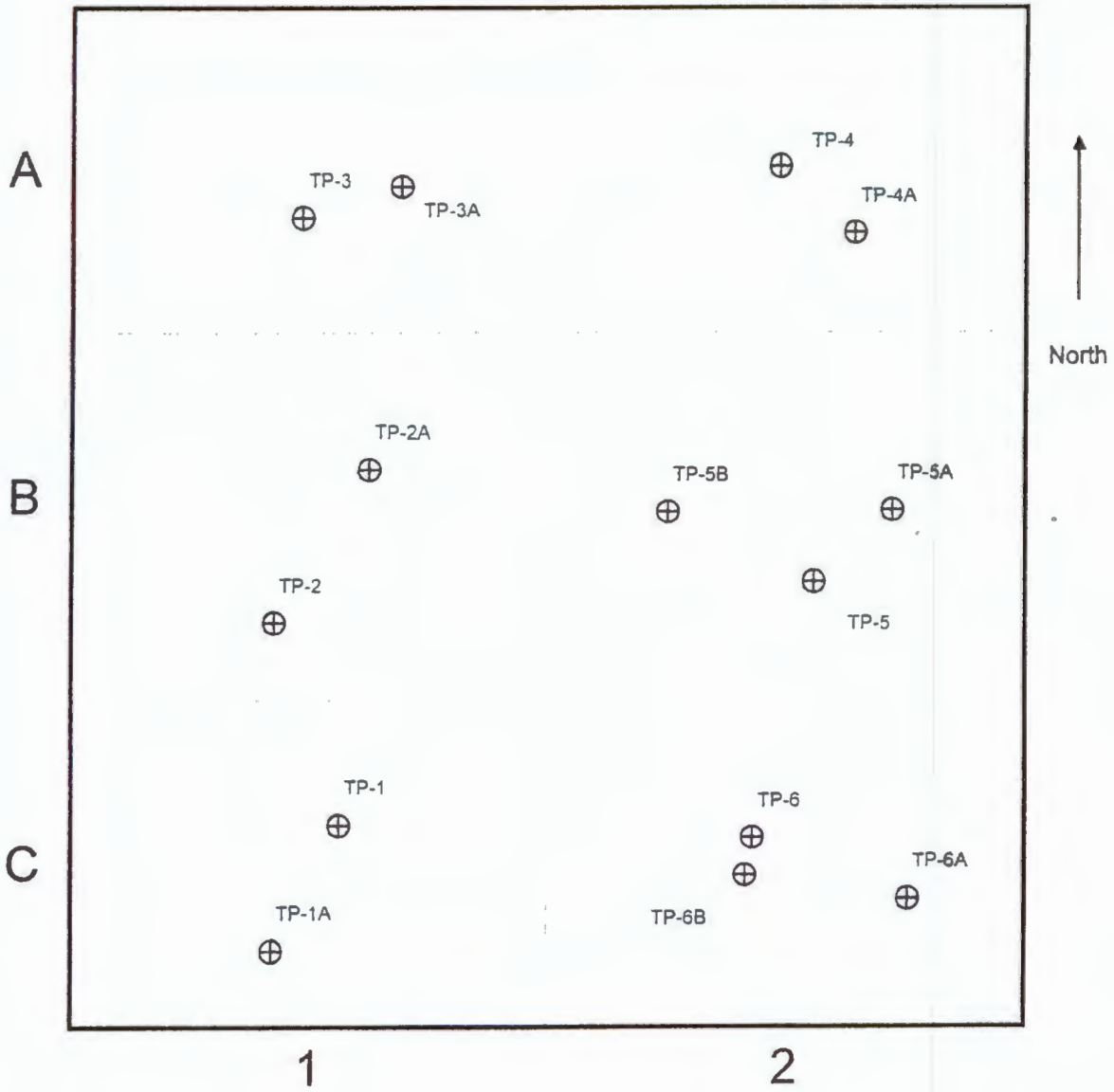
Envirotech Engineering & Consulting. Inc

4/9/10
Date

S/C: S66X528A00

CQA Moisture Density Map Test Pad

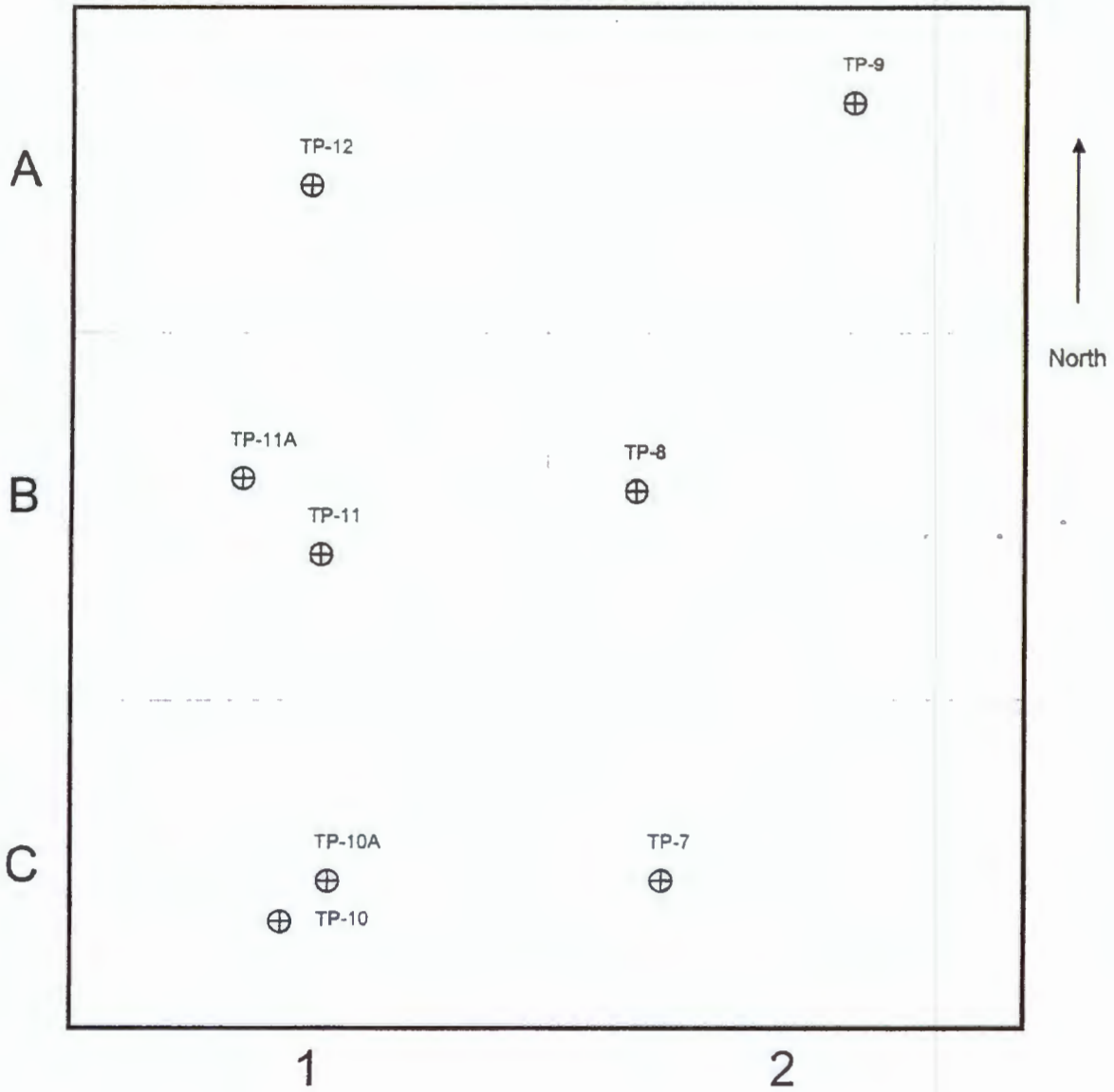
Date:	4/5/2010	Lift:	1
Report:	#39	Operator:	T. Williams
Map No:	1 of 3	Material:	Admix
Grid:	40x33	Notes:	



S/C: S66X528A00

CQA Moisture Density Map Test Pad

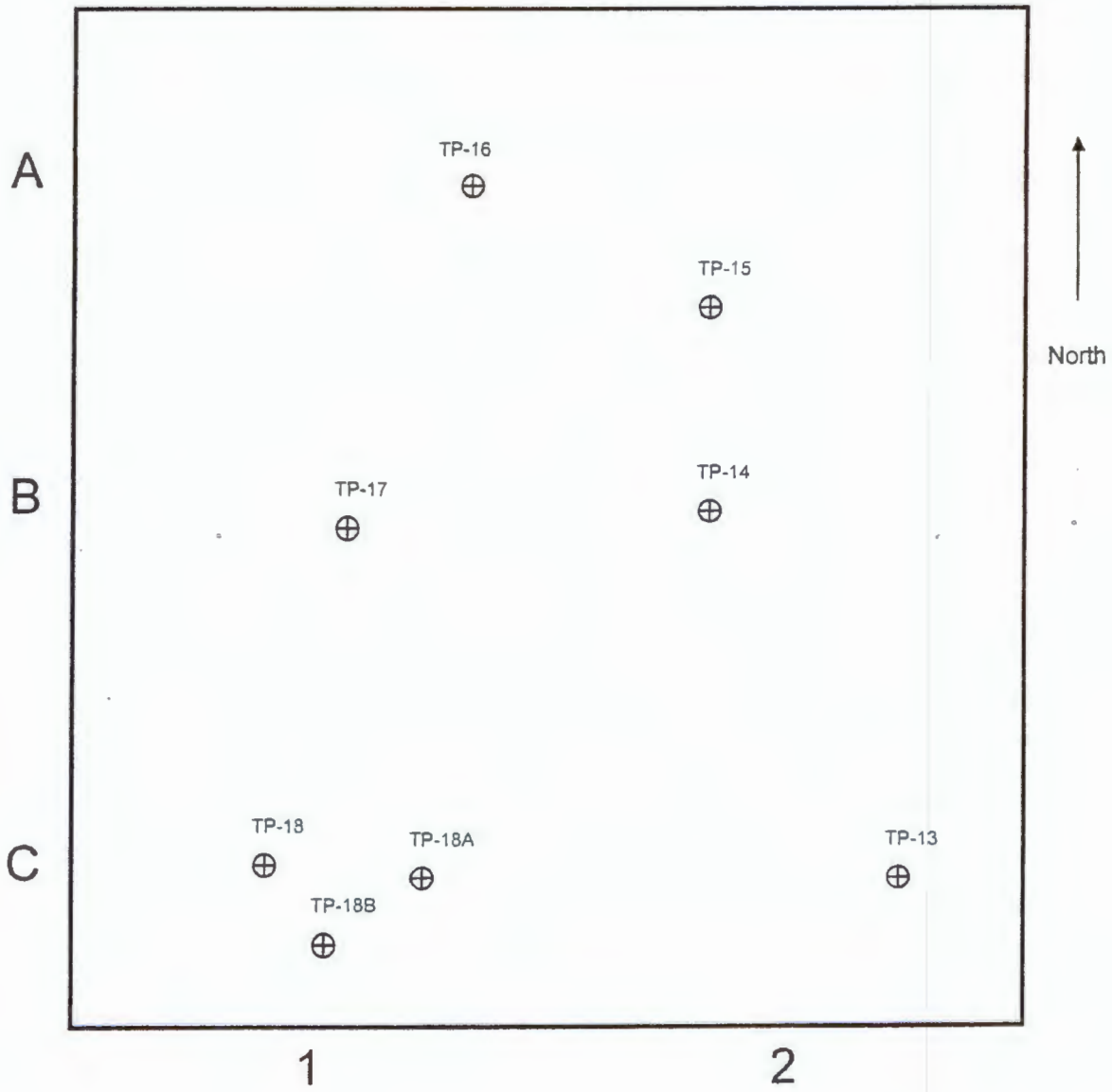
Date:	4/5/2010	Lift:	2
Report:	#39	Operator:	T. Williams
Map No:	2 of 3	Material:	Admix
Grid:	40x33	Notes:	



S/C: S66X528A00

CQA Moisture Density Map Test Pad

Date:	4/5/2010	Lift:	3
Report:	#39	Operator:	T. Williams
Map No:	3 of 3	Material:	Admix
Grid:	40x33	Notes:	



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	TP-01
Project:	S013213A00			Sample Description:	Admix
Project Location:	ERDF Cells 9-10			Sampling Date.	4/5/2010
Tested By:	L. Hay	Date:	4/5/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams TW	Date:	4/8/2010	Date Received:	4/5/2010
Comments				Report No.:	#39

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.20 g
2. Mass of Proctor mold + sand, W_2	5395.60 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.20 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6781.30 g
6. Mass of bottle + cone + sand (after use), W_4	5155.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.58 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6148.9 g
9. Mass of bottle + cone + sand (after use), W_8	3245.9 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0296 ft^3
11. Mass of gallon can, W_5	174.50 g
12. Mass of gallon can + moist soil, W_7	2015.90 g
13. Mass of gallon can + dry soil, W_9	1763.70 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	137.26 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	15.9%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	118.46 lb/ft^3
17. Comparision moisture content =	15.2%
18. Dry unit weight comparison =	113.7 lb/ft^3

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	TP-07
Project:	S013213A00			Sample Description:	Admix
Project Location:	ERDF Cells 9-10			Sampling Date:	4/5/2010
Tested By:	L. Hay	Date:	4/5/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams TW	Date:	4/8/2010	Date Received:	4/5/2010
Comments				Report No.:	#39

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.20 g
2. Mass of Proctor mold + sand, W_2	5395.60 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.20 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6781.30 g
6. Mass of bottle + cone + sand (after use), W_4	5155.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.58 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	5548.2 g
9. Mass of bottle + cone + sand (after use), W_8	2462.3 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0338 ft^3
11. Mass of gallon can, W_5	181.20 g
12. Mass of gallon can + moist soil, W_7	2251.50 g
13. Mass of gallon can + dry soil, W_9	1976.40 g
14 Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	134.99 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	15.3%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	117.05 lb/ft^3
17. Comparision moisture content =	15.1%
18. Dry unit weight comparison =	114.7 lb/ft^3

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	TP-13
Project:	S013213A00			Sample Description:	Admix
Project Location:	ERDF Cells 9-10			Sampling Date:	4/5/2010
Tested By:	L. Hay	Date:	4/5/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams TW	Date:	4/8/2010	Date Received:	4/5/2010
Comments				Report No.:	#39

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.20 g
2. Mass of Proctor mold + sand, W_2	5395.60 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.20 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6781.30 g
6. Mass of bottle + cone + sand (after use), W_4	5155.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.58 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6265.8 g
9. Mass of bottle + cone + sand (after use), W_8	3227.1 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0327 ft^3
11. Mass of gallon can, W_5	174.20 g
12. Mass of gallon can + moist soil, W_7	2122.00 g
13. Mass of gallon can + dry soil, W_9	1823.90 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	131.24 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	18.1%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	111.16 lb/ft^3
17. Comparision moisture content =	17.6%
18. Dry unit weight comparison =	112.5 lb/ft^3

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

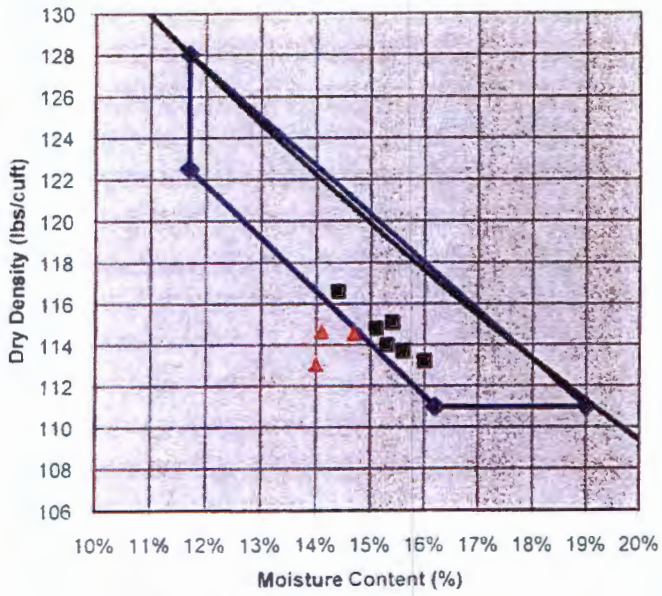
Client: WCH

Project: S013213A00
Test Date: 4/6/2010
Description: Admix Soil
Reprot 40
Comments:

Model: 3430 Troxler ID: 27881
Moisture Std: 645 Density Std: 2223
Offsets: Moisture - Density -
Acceptable Zone

Test No	Lift	Time	No. of Passes	Depth of Test (inches)	Dry Density lbs/cuft	Moisture Content (%)	Void Ratio	Moist Verify	% Saturation	Pass / Fail
TP-19	4	7:55	3	6	116.6	14.4%	0.446	N/A	87%	Pass
TP-20	4	8:04	3	6	114.0	15.3%	0.478	N/A	86%	Pass
TP-21	4	8:05	3	6	113.7	15.6%	0.482	N/A	87%	Pass
TP-22	4	8:07	3	6	113.2	16.0%	0.488	N/A	89%	Pass
TP-23	4	8:09	3	6	114.0	15.3%	0.478	16.1%	86%	Pass
TP-24	4	8:11	3	6	113.1	14.0%	0.491	N/A	77%	Fail
TP-24A	4	8:29	6	6	114.7	14.1%	0.470	N/A	81%	Fail
TP-24B	4	8:40	9	6	114.6	14.7%	0.471	N/A	84%	Fail
TP-24C	4	8:55	12	6	115.1	15.4%	0.465	N/A	89%	Pass
TP-25	5	9:55	3	6	114.8	15.1%	0.468	16.0%	87%	Pass

Sample ID	Tare No.	Tare + Wet	Tare + Dry	Tare (g)
TP-19				
TP-20	Shelby			
TP-21				
TP-22				
TP-23	SC	2633.9	2293.6	174.3
TP-24				
TP-24A				
TP-24B				
TP-24C				
TP-25	SC	2007.8	1755.2	175.5



nvirotech Engineering & Consulting Inc

4/9/10
Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

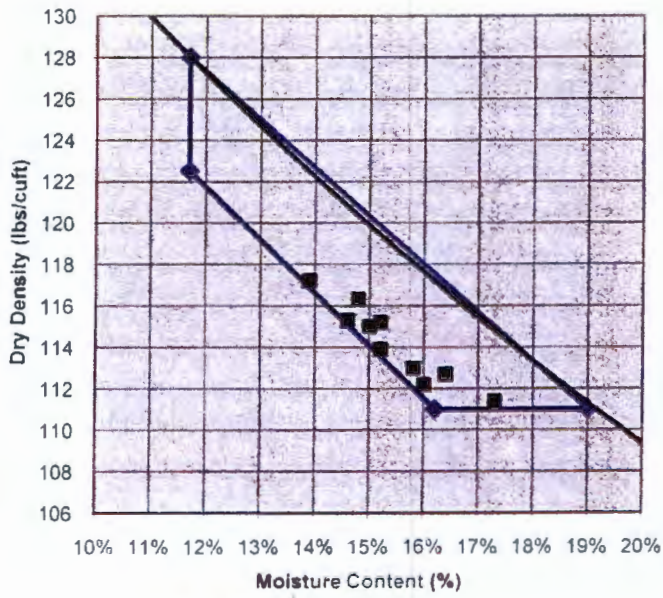
Client: WCH

Project: S013213A00
Test Date: 4/6/2010
Description: Admix Soil
Reprot 40
Comments:

Model: 3430 Troxler ID: 27881
Moisture Std: 645 Density Std: 2223
Offsets: Moisture - Density -
Acceptable Zone

Test No	Lift	Time	No. of Passes	Depth of Test (inches)	Dry Density lbs/cuft	Moisture Content (%)	Void Ratio	Moist Verify	% Saturation	Pass / Fail
TP-26	5	10:00	3	6	117.2	13.9%	0.438	N/A	86%	Pass
TP-27	5	10:05	3	6	115.2	15.2%	0.463	N/A	89%	Pass
TP-28	5	10:10	3	6	116.3	14.8%	0.449	N/A	89%	Pass
TP-29	5	10:15	3	6	112.2	16.0%	0.502	N/A	86%	Pass
TP-30	5	10:20	3	6	113.9	15.2%	0.480	N/A	86%	Pass
TP-31	6	11:24	3	6	111.4	17.3%	0.513	N/A	91%	Pass
TP-32	6	11:27	3	6	115.3	14.6%	0.461	N/A	86%	Pass
TP-33	6	11:30	3	6	112.7	16.4%	0.495	17.0%	89%	Pass
TP-34	6	11:35	3	6	115.0	15.0%	0.466	N/A	87%	Pass
TP-35	6	11:38	3	6	113.0	15.8%	0.492	N/A	87%	Pass

Sample ID	Tare No.	Tare + Wet	Tare + Dry	Tare (g)
TP-26				
TP-27				
TP-28	Shelby			
TP-29				
TP-30				
TP-31				
TP-32				
TP-33	SC	2137.2	1862.8	246.9
TP-34	Shelby			
TP-35				



nvirotech Engineering & Consulting, Inc

4/9/10
Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

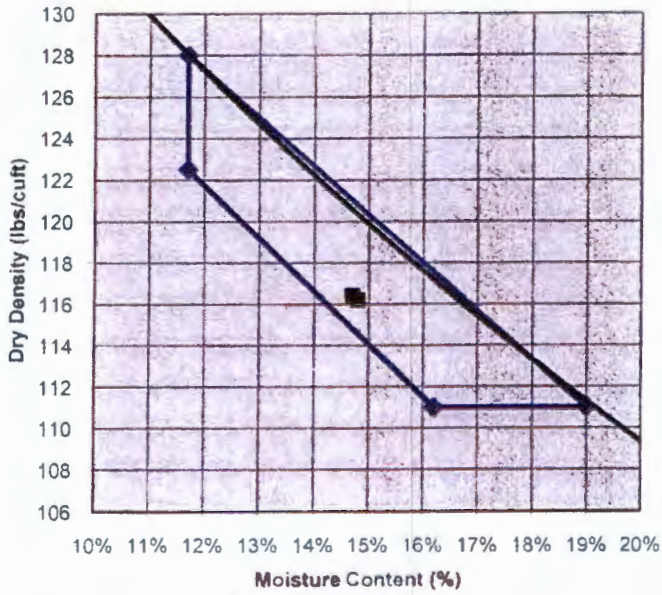
Client: WCH

Project: S013213A00
Test Date: 4/6/2010
Description: Admix Soil
Reprot 40
Comments:

Model: 3430 Troxler ID. 27881
Moisture Std: 645 Density Std: 2223
Offsets: Moisture - Density -
Acceptable Zone

Test No	Lift	Time	No. of Passes	Depth of Test (inches)	Dry Density lbs/cuft	Moisture Content (%)	Void Ratio	Moist Verify	% Saturation	Pass / Fail
TP-36	6	11:41	3	6	116.4	14.7%	0.448	N/A	89%	Pass
TP-37	Repair	12:20	3	6	116.2	14.8%	0.450	14.2%	89%	Pass
								N/A		
								N/A		
								N/A		
								N/A		
								N/A		
								N/A		
								N/A		
								N/A		

Sample ID	Tare No.	Tare + Wet	Tare + Dry	Tare (g)
TP-36				
TP-37	SC/Shelby	2096.7	1857.3	174.4

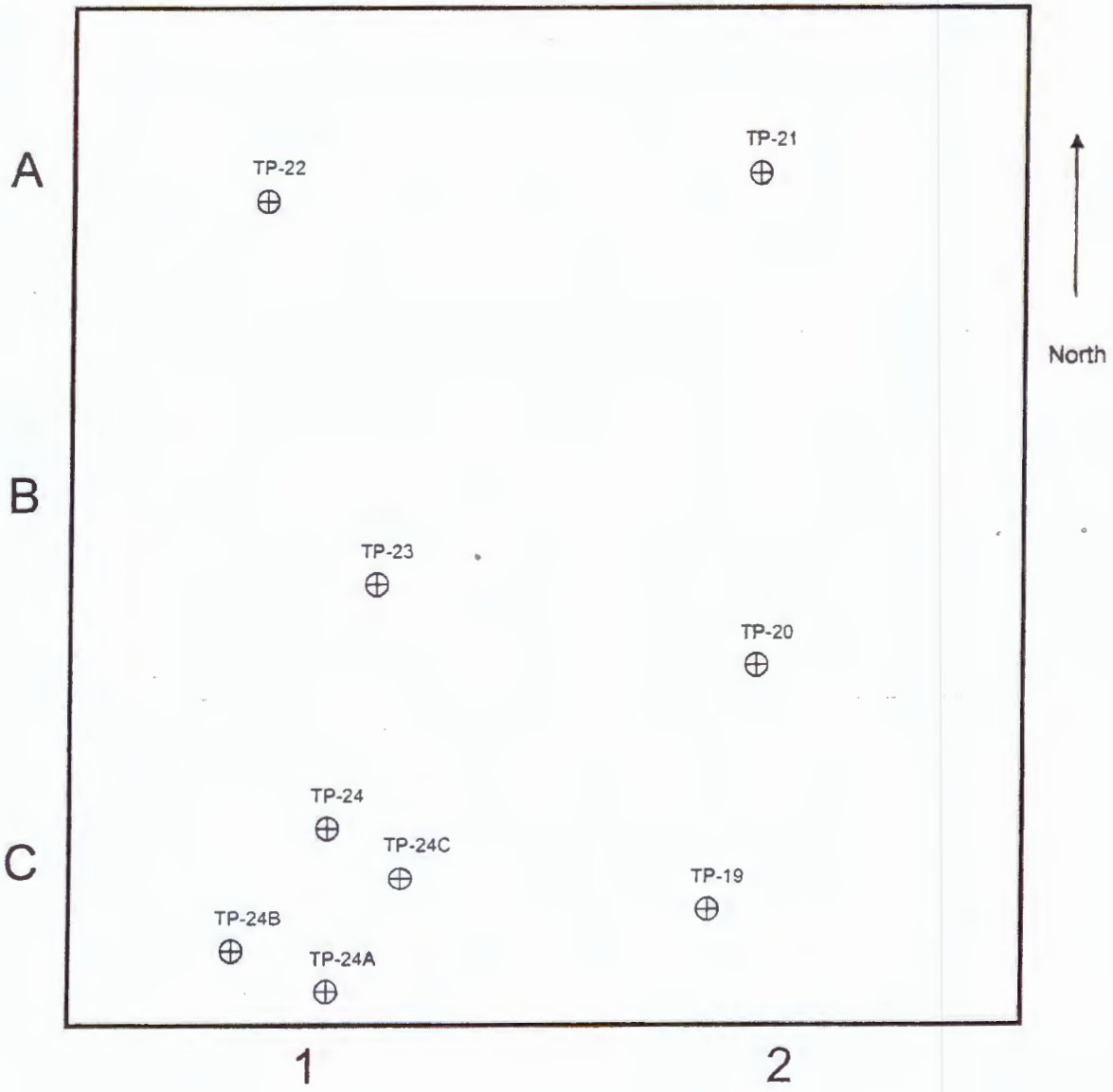


nvirotech Engineering & Consulting, Inc

4/9/10
Date

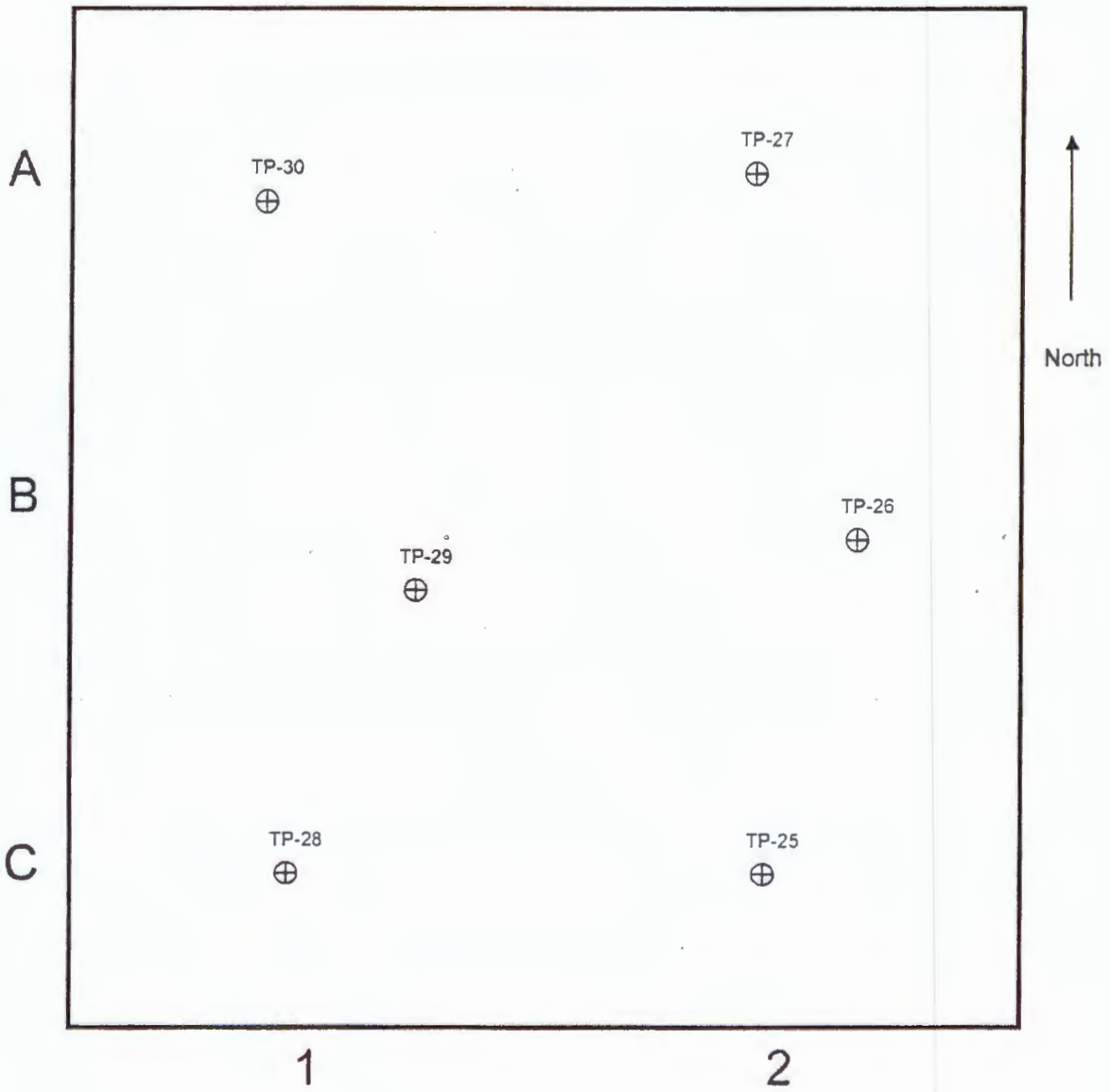
CQA Moisture Density Map Test Pad

Date: 4/6/2010	Lift: 4
Report: 5/16/1940	Operato TW
Map No: 1 of 3	Material: Admix
Grid: 40x33	Notes:



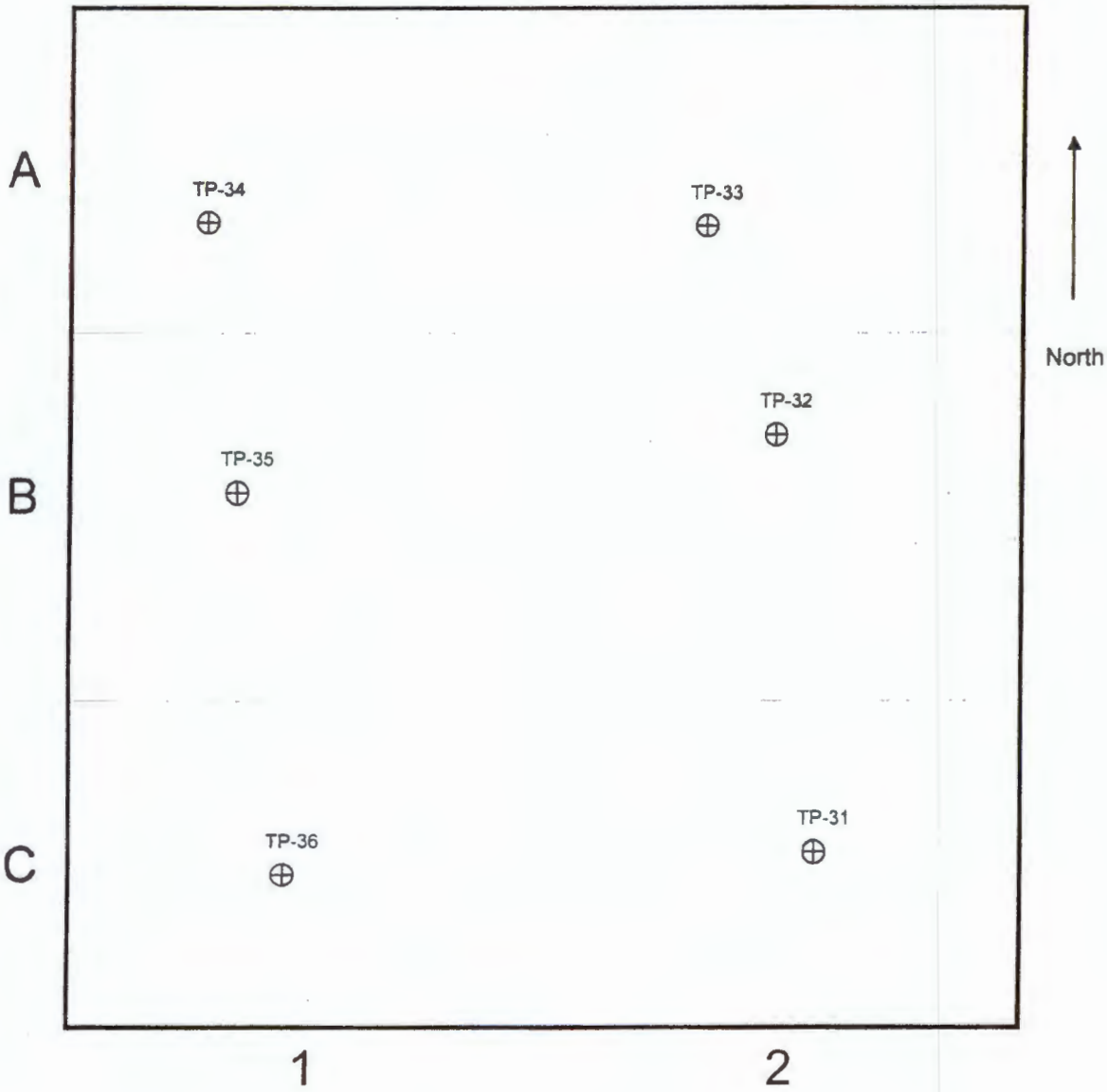
CQA Moisture Density Map Test Pad

Date: 4/6/2010	Lift: 5
Report: 5/16/1940	Operato TW
Map No: 2 of 3	Material: Admix
Grid: 40x33	Notes:



CQA Moisture Density Map Test Pad

Date: 4/6/2010	Lift: 6
Report: 5/16/1940	Operato TW
Map No: 3 of 3	Material: Admix
Grid: 40x33	Notes:



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	TP-23
Project:	S013213A00			Sample Description:	Admix Lift 4
Project Location:	ERDF Cells 9-10			Sampling Date:	4/6/2010
Tested By:	L. Hay	Date:	4/6/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams TW	Date:	4/8/2010	Date Received:	4/6/2010
Comments				Report No.:	#40

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.20 g
2. Mass of Proctor mold + sand, W_2	5395.60 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.20 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6781.30 g
6. Mass of bottle + cone + sand (after use), W_4	5155.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.58 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6444.7 g
9. Mass of bottle + cone + sand (after use), W_8	3070.4 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0405 ft^3
11. Mass of gallon can, W_5	174.30 g
12. Mass of gallon can + moist soil, W_7	2633.90 g
13. Mass of gallon can + dry soil, W_9	2293.60 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	133.92 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	16.1%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	115.39 lb/ft^3
17. Comparision moisture content =	15.3%
18. Dry unit weight comparison =	114.0 lb/ft^3

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH ENGINEERING & CONSULTING, INC

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	TP-25
Project:	S013213A00			Sample Description:	Admix Lift 5
Project Location:	ERDF Cells 9-10			Sampling Date:	4/6/2010
Tested By:	L. Hay	Date:	4/6/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams TW	Date:	4/8/2010	Date Received:	4/6/2010
Comments				Report No.:	#40

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.20 g
2. Mass of Proctor mold + sand, W_2	5395.60 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.20 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6781.30 g
6. Mass of bottle + cone + sand (after use), W_4	5155.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.58 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6421.4 g
9. Mass of bottle + cone + sand (after use), W_8	3479.8 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0305 ft^3
11. Mass of gallon can, W_5	175.50 g
12. Mass of gallon can + moist soil, W_7	2007.80 g
13. Mass of gallon can + dry soil, W_9	1755.20 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	132.57 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	16.0%
16. Dry unit weight in the field, $\gamma_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	114.29 lb/ft^3
17. Comparision moisture content =	15.1%
18. Dry unit weight comparison =	114.8 lb/ft^3

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	TP-33
Project:	S013213A00			Sample Description:	Admix Lift 6
Project Location:	ERDF Cells 9-10			Sampling Date:	4/5/2010
Tested By:	L. Hay	Date:	4/5/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams TW	Date:	4/8/2010	Date Received:	4/5/2010
Comments				Report No.:	#39

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.20 g
2. Mass of Proctor mold + sand, W_2	5395.60 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.20 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6781.30 g
6. Mass of bottle + cone + sand (after use), W_4	5155.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.58 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6345.6 g
9. Mass of bottle + cone + sand (after use), W_8	3379.8 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0310 ft^3
11. Mass of gallon can, W_5	246.90 g
12. Mass of gallon can + moist soil, W_7	2137.20 g
13. Mass of gallon can + dry soil, W_9	1862.80 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	134.30 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	17.0%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	114.80 lb/ft^3
17. Comparision moisture content =	16.4%
18. Dry unit weight comparison =	112.7 lb/ft^3

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	TP-33
Project:	S013213A00			Sample Description:	Admix Repair
Project Location:	ERDF Cells 9-10			Sampling Date:	4/6/2010
Tested By:	L. Hay	Date:	4/6/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams TW	Date:	4/8/2010	Date Received:	4/6/2010
Comments				Report No.:	#40

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.20 g
2. Mass of Proctor mold + sand, W_2	5395.60 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.20 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6781.30 g
6. Mass of bottle + cone + sand (after use), W_4	5155.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.58 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6542.9 g
9. Mass of bottle + cone + sand (after use), W_8	3530.6 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0321 ft^3
11. Mass of gallon can, W_5	174.40 g
12. Mass of gallon can + moist soil, W_7	2096.70 g
13. Mass of gallon can + dry soil, W_9	1857.30 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	131.99 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	14.2%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	115.55 lb/ft^3
17. Comparision moisture content =	14.8%
18. Dry unit weight comparison =	116.2 lb/ft^3

C.7

SHELBY TUBE PERMEABILITY

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G. Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	3

Date:	4/13/2010
Sample ID:	TP-04
Sample Description:	Brown Sandy Clay

L_i =	7.62	cm	**Hydraulic System Constants**	
L_f =	7.43	cm	**Mercury U-Tube Manometer**	
Dia =	7.3	cm	Area annulus, a_s (cm^2)	0.76712
Temp =	20.6	C	Area permometer tube, a_p (cm^2)	0.031416
R_f =	0.987595		Delta Hg at equilibrium (cm)	1.70

B Coefficient	0.95	**Specific Gravity of Water, Gw**	1
Effective Stress	5		

Mercury Head Setting

Estimated k_f (cm/sec)	Max Gradient i_o=h/L	Permometer Setting (cm)	Min. Cell Pressure (psi)
10^{-4} - 10^{-5}	5	4.54	60
10^{-5} - 10^{-6}	10	7.37	60
10^{-6} - 10^{-7}	20	13.05	60
< 10^{-7}	30	18.72	60

Test No.	Readings by:	Date:	Time mins	Cumulative t secs	Pressure Cell psi	Pressure Back psi	Mercury Head Tail cm Hg	Mercury Head Head cm Hg	Total Head Loss cm H_2O	Hyd Gradient Pre/final	Hydraulic Conductivity K cm/sec	Hydraulic Conductivity K_{20} cm/sec
	KR	4/13/2010	0				22.50	1.70	283.09	38.1		
1	KR	4/13/2010	30	1800	60	65	22.10	1.68	277.87	37.4	1.21E-08	1.20E-08
			30				22.10	1.68	277.87	37.4		
2	KR	4/13/2010	40	2400	60	65	21.80	1.67	273.95	36.9	1.6008E-08	1.58E-08
			40				21.80	1.67	273.95	36.9		
3	KR	4/13/2010	50	3000	60	65	21.70	1.67	272.65	36.7	1.4674E-08	1.45E-08
			50				21.70	1.67	272.65	36.7		
4	KR	4/13/2010	60	3600	60	65	21.60	1.66	271.34	36.5	1.3793E-08	1.36E-08
			60				21.60	1.66	271.34	36.5		
5	KR	4/13/2010	70	4200	60	65	21.50	1.66	270.04	36.4	1.317E-08	1.30E-08

Project Manager

4-16-10
Date

Average K:	1.395E-08	1.3777E-08
Specification:	< 1.00E-07	

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	Permeameter:	3

Date:	4/13/2010
Sample ID:	TP-04
Sample Description:	Brown Sandy Clay

Item	Initial		Final	
Sample Diameter (cm)	7.32		7.32	
Sample Length (cm)	7.62		7.43	
Sample Volume (cm^3)	320.3		312.1	
Tare Number	ac		a1	
Tare Weight (gm)	50.1		49.92	
Wet Soil + Tare (gm)	401.9		331.57	
Dry Soil + Tare (gm)	353.26		291.84	
Water Weight (gm)		48.6		39.73
Dry Soil Weight (gm)		303.16		241.92
Moisture Content (%)		16.0%		16.4%
Wet Weight Sample (gm)	671.8		675.3	
Wet Density Sample (pcf)		130.68		134.81
Dry Density Sample (pcf)		112.61		115.79
Saturation %		87.3%		97.4%

Specific Gravity	2.7		Tested		Assumed	x
Sample Results:	Meets Specifications					

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	6

Date:	4/13/2010
Sample ID:	TP-11A
Sample Description:	Brown Sandy Clay

L_i =	7.63	cm	**Hydraulic System Constants**	
L_f =	7.43	cm	**Mercury U-Tube Manometer**	
Dia =	7.3	cm	Area annulus, a_a (cm^2)	0.76712
Temp =	18.9	C	Area permometer tube, a_p (cm^2)	0.031416
R_1 =	1.028861		Delta Hg at equilibrium (cm)	1.70

B Coefficient	0.95	**Specific Gravity of Water, Gw**	1
Effective Stress	5		

Mercury Head Setting			
Estimated k_1 (cm/sec)	Max Gradient i_o=h/L	Permometer Setting (cm)	Min. Cell Pressure (psi)
10^{-4} - 10^{-5}	5	4.54	60
10^{-5} - 10^{-6}	10	7.38	60
10^{-6} - 10^{-7}	20	13.06	60
< 10^{-7}	30	18.74	60

Test No.	Readings by:	Date:	Time mins	Cumulative t secs	Pressure Cell psi	Pressure Back psi	Mercury Head Tail cm Hg	Mercury Head Head cm Hg	Total Head Loss cm H_2O	Hyd Gradient Pret/final	Hydraulic Conductivity K cm/sec	Hydraulic Conductivity K_{20} cm/sec
	KR	4/13/2010	0				22.50	1.70	283.09	38.1		
1	KR	4/13/2010	20	1200	60	65	22.20	1.69	279.17	37.6	1.36E-08	1.40E-08
			20				22.20	1.69	279.17	37.6		
2	KR	4/13/2010	30	1800	60	65	22.00	1.68	276.56	37.2	1.5178E-08	1.56E-08
			30				22.00	1.68	276.56	37.2		
3	KR	4/13/2010	40	2400	60	65	21.80	1.67	273.95	36.9	1.6019E-08	1.65E-08
			40				21.80	1.67	273.95	36.9		
4	KR	4/13/2010	50	3000	60	65	21.60	1.66	271.34	36.5	1.6563E-08	1.70E-08
			50				21.60	1.66	271.34	36.5		
5	KR	4/13/2010	60	3600	60	65	21.40	1.65	268.73	36.2	1.6958E-08	1.74E-08

Project Manager

4-16-2010
Date

Average K:	1.5662E-08	1.6114E-08
Specification:	< 1.00E-07	

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	Permeameter:	6

Date:	4/13/2010
Sample ID:	TP-11A
Sample Description:	Brown Sandy Clay

Item	Initial		Final	
Sample Diameter (cm)	7.32		7.32	
Sample Length (cm)	7.63		7.43	
Sample Volume (cm^3)	320.6		312.3	
Tare Number	M		bb	
Tare Weight (gm)	49.7		50.1	
Wet Soil + Tare (gm)	412.9		514.3	
Dry Soil + Tare (gm)	363.17		449.12	
Water Weight (gm)		49.7		65.18
Dry Soil Weight (gm)		313.47		399.02
Moisture Content (%)		15.9%		16.3%
Wet Weight Sample (gm)	667.3		671.3	
Wet Density Sample (pcf)		129.66		133.92
Dry Density Sample (pcf)		111.91		115.11
Saturation %		84.7%		95.1%

Specific Gravity	2.7		Tested		Assumed	x
Sample Results:	Meets Specifications					

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	2

Date:	4/13/2010
Sample ID:	TP-13
Sample Description:	Brown Sandy Clay

L_i =	7.66	cm	**Hydraulic System Constants**	
L_f =	7.55	cm	**Mercury U-Tube Manometer**	
Dia =	7.3	cm	Area annulus, a_a (cm^2)	0.76712
Temp =	20.6	C	Area permometer tube, a_p (cm^2)	0.031416
R_i =	0.987595		Delta Hg at equilibrium (cm)	1.70

B Coefficient	0.95	**Specific Gravity of Water, Gw**	1
Effective Stress	5		

Mercury Head Setting

Estimated k_t (cm/sec)	Max Gradient i_o=h/L	Permometer Setting (cm)	Min. Cell Pressure (psi)
10^{-4} - 10^{-5}	5	4.58	60
10^{-5} - 10^{-6}	10	7.47	60
10^{-6} - 10^{-7}	20	13.23	60
< 10^{-7}	30	19.00	60

Test No.	Readings by:	Date	Time mins	Cumulative t secs	Pressure Cell psi	Pressure Back psi	Mercury Head Tail cm Hg	Mercury Head Head cm Hg	Total Head Loss cm H_2O	Hyd Gradient Pret/final	Hydraulic Conductivity K cm/sec	Hydraulic Conductivity K_{20} cm/sec
	KR	4/13/2010	0				21.20	1.70	265.40	35.2		
1	KR	4/13/2010	20	1200	60	65	20.90	1.69	261.48	34.6	1.47E-08	1.45E-08
			20				20.90	1.69	261.48	34.6		
2	KR	4/13/2010	30	1800	60	65	20.80	1.68	260.17	34.5	1.313E-08	1.30E-08
			30				20.80	1.68	260.17	34.5		
3	KR	4/13/2010	40	2400	60	65	20.60	1.68	257.56	34.1	1.4852E-08	1.47E-08
			40				20.60	1.68	257.56	34.1		
4	KR	4/13/2010	50	3000	60	65	20.50	1.67	256.26	34.0	1.39E-08	1.37E-08
			50				20.50	1.67	256.26	34.0		
5	KR	4/13/2010	60	3600	60	65	20.40	1.67	254.95	33.8	1.3275E-08	1.31E-08

Project Manager

4-16-2010
Date

Average K:	1.3978E-08	1.3804E-08
Specification:	< 1.00E-07	

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	Permeameter:	2

Date:	4/13/2010
Sample ID:	TP-13
Sample Description:	Brown Sandy Clay

Item	Initial		Final	
Sample Diameter (cm)	7.32		7.32	
Sample Length (cm)	7.66		7.55	
Sample Volume (cm^3)	322.0		317.2	
Tare Number	mj		jv	
Tare Weight (gm)	49.8		49.68	
Wet Soil + Tare (gm)	413.1		314.02	
Dry Soil + Tare (gm)	358.79		277.18	
Water Weight (gm)		54.3		36.84
Dry Soil Weight (gm)		308.99		227.5
Moisture Content (%)		17.6%		16.2%
Wet Weight Sample (gm)	679.1		683.1	
Wet Density Sample (pcf)		131.39		134.18
Dry Density Sample (pcf)		111.75		115.48
Saturation %		93.5%		95.3%

Specific Gravity	2.7		Tested		Assumed	x
Sample Results:	Meets Specifications					

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	7

Date:	4/13/2010
Sample ID:	TP-20
Sample Description:	Brown Sandy Clay

L_i =	7.58	cm	**Hydraulic System Constants**	
L_f =	7.43	cm	**Mercury U-Tube Manometer**	
Dia =	7.3	cm	Area annulus, a_a (cm^2)	0.76712
Temp =	18.9	C	Area permometer tube, a_p (cm^2)	0.031416
R_t =	1.028861		Delta Hg at equilibrium (cm)	1.70

B Coefficient	0.95	**Specific Gravity of Water, Gw**	1
Effective Stress	5		

Mercury Head Setting

Estimated k_t (cm/sec)	Max Gradient i_o=h/L	Permometer Setting (cm)	Min. Cell Pressure (psi)
10^{-4} - 10^{-5}	5	4.54	60
10^{-5} - 10^{-6}	10	7.38	60
10^{-6} - 10^{-7}	20	13.05	60
< 10^{-7}	30	18.73	60

Test No.	Readings by:	Date	Time mins	Cumulative t secs	Pressure Cell psi	Pressure Back psi	Mercury Head Tail cm Hg	Mercury Head Head cm Hg	Total Head Loss cm H_2O	Hyd Gradient Pret/final	Hydraulic Conductivity K cm/sec	Hydraulic Conductivity K_{20} cm/sec
	KR	4/13/2010	0				22.50	1.70	283.09	38.1		
1	KR	4/13/2010	20	1200	60	65	22.20	1.69	279.17	37.6	1.36E-08	1.40E-08
			20				22.20	1.69	279.17	37.6		
2	KR	4/13/2010	30	1800	60	65	22.00	1.68	276.56	37.2	1.517E-08	1.56E-08
			30				22.00	1.68	276.56	37.2		
3	KR	4/13/2010	40	2400	60	65	21.80	1.67	273.95	36.9	1.601E-08	1.65E-08
			40				21.80	1.67	273.95	36.9		
4	KR	4/13/2010	50	3000	60	65	21.60	1.66	271.34	36.5	1.6553E-08	1.70E-08
			50				21.60	1.66	271.34	36.5		
5	KR	4/13/2010	60	3600	60	65	21.40	1.65	268.73	36.2	1.6948E-08	1.74E-08

Project Manager

4-16-2010
Date

Average K:	1.5653E-08	1.6105E-08
Specification:	< 1.00E-07	

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	Permeameter:	7

Date:	4/13/2010
Sample ID:	TP-20
Sample Description:	Brown Sandy Clay

Item	Initial		Final	
Sample Diameter (cm)	7.32		7.32	
Sample Length (cm)	7.58		7.43	
Sample Volume (cm^3)	318.7		312.1	
Tare Number	AA		k	
Tare Weight (gm)	49.9		50.1	
Wet Soil + Tare (gm)	406.7		438.5	
Dry Soil + Tare (gm)	352.93		377.22	
Water Weight (gm)		53.8		61.28
Dry Soil Weight (gm)		303.03		327.12
Moisture Content (%)		17.7%		18.7%
Wet Weight Sample (gm)	650.9		654.7	
Wet Density Sample (pcf)		127.25		130.68
Dry Density Sample (pcf)		108.08		110.06
Saturation %		85.7%		95.3%

Specific Gravity	2.7		Tested		Assumed	x
Sample Results:	Meets Specifications					

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	4

Date:	4/13/2010
Sample ID:	TP-28
Sample Description:	Brown Sandy Clay

L_i =	7.64	cm	**Hydraulic System Constants**	
L_f =	7.50	cm	**Mercury U-Tube Manometer**	
Dia =	7.3	cm	Area annulus, a_a (cm^2)	0.76712
Temp =	20.6	C	Area permometer tube, a_p (cm^2)	0.031416
R_t =	0.987595		Delta Hg at equilibrium (cm)	1.70

B Coefficient	0.95	**Specific Gravity of Water, Gw**	1
Effective Stress	5		

Mercury Head Setting

Estimated k_t (cm/sec)	Max Gradient i_o=h/L	Permometer Setting (cm)	Min. Cell Pressure (psi)
10^{-4} - 10^{-5}	5	4.57	60
10^{-5} - 10^{-6}	10	7.43	60
10^{-6} - 10^{-7}	20	13.17	60
< 10^{-7}	30	18.90	60

Test No.	Readings by:	Date:	Time mins	Cumulative t secs	Pressure Cell psi	Pressure Back psi	Mercury Head Tail cm Hg	Mercury Head Head cm Hg	Total Head Loss cm H_2O	Hyd Gradient Pre/final	Hydraulic Conductivity K cm/sec	Hydraulic Conductivity K_{20} cm/sec
	KR	4/12/2010	0				22.10	1.70	277.64	37.0		
1	KR	4/12/2010	20	1200	60	65	21.50	1.68	269.81	36.0	2.82E-08	2.79E-08
			20				21.50	1.68	269.81	36.0		
2	KR	4/12/2010	30	1800	60	65	21.10	1.66	264.59	35.3	3.1671E-08	3.13E-08
			30				21.10	1.66	264.59	35.3		
3	KR	4/12/2010	40	2400	60	65	20.70	1.64	259.37	34.6	3.3614E-08	3.32E-08
			40				20.70	1.64	259.37	34.6		
4	KR	4/12/2010	50	3000	60	65	20.30	1.63	254.15	33.9	3.4955E-08	3.45E-08
			50				20.30	1.63	254.15	33.9		
5	KR	4/12/2010	60	3600	60	65	19.90	1.61	248.93	33.2	3.6002E-08	3.56E-08

Project Manager

4-16-2010
Date

Average K:	3.2889E-08	3.2481E-08
Specification:	< 1.00E-07	

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	4

Date:	4/13/2010
Sample ID:	TP-28
Sample Description:	Brown Sandy Clay

Item	Initial		Final	
Sample Diameter (cm)	7.32		7.32	
Sample Length (cm)	7.64		7.50	
Sample Volume (cm^3)	321.3		315.3	
Tare Number	FF		jv	
Tare Weight (gm)	49.9		49.7	
Wet Soil + Tare (gm)	361.6		375.3	
Dry Soil + Tare (gm)	318.77		328.89	
Water Weight (gm)		42.8		46.41
Dry Soil Weight (gm)		268.87		279.19
Moisture Content (%)		15.9%		16.6%
Wet Weight Sample (gm)	671.3		675.6	
Wet Density Sample (pcf)		130.17		133.50
Dry Density Sample (pcf)		112.28		114.47
Saturation %		85.9%		95.1%

Specific Gravity	2.7		Tested		Assumed	x
Sample Results:	**Meets Specifications**					

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	5

Date:	4/12/2010
Sample ID:	TP-34
Sample Description:	Brown Sandy Clay

L_i =	7.60	cm	**Hydraulic System Constants**	
L_f =	7.43	cm	**Mercury U-Tube Manometer**	
Dia =	7.3	cm	Area annulus, a_a (cm^2)	0.76712
Temp =	20.6	c	Area permometer tube, a_p (cm^2)	0.031416
R_t =	0.987595		Delta Hg at equilibrium (cm)	1.70

B Coefficient	0.95	**Specific Gravity of Water, Gw**	1
Effective Stress	5		

Mercury Head Setting

Estimated k_t (cm/sec)	Max Gradient i_o=h/L	Permometer Setting (cm)	Min. Cell Pressure (psi)
10^{-4} - 10^{-5}	5	4.54	60
10^{-5} - 10^{-6}	10	7.38	60
10^{-6} - 10^{-7}	20	13.06	60
< 10^{-7}	30	18.73	60

Test No.	Readings by:	Date:	Time mins	Cumulative t secs	Pressure Cell psi	Pressure Back psi	Mercury Head Tail cm Hg	Mercury Head Head cm Hg	Total Head Loss cm H_2O	Hyd Gradient Pret/final	Hydraulic Conductivity K cm/sec	Hydraulic Conductivity K_{20} cm/sec
	KR	4/12/2010	0				23.00	1.70	289.89	39.0		
1	KR	4/12/2010	20	1200	60	65	21.50	1.64	270.31	36.4	6.84E-08	6.75E-08
			20				21.50	1.64	270.31	36.4		
2	KR	4/12/2010	30	1800	60	65	21.00	1.62	263.79	35.5	6.1599E-08	6.08E-08
			30				21.00	1.62	263.79	35.5		
3	KR	4/12/2010	40	2400	60	65	20.60	1.60	258.57	34.8	5.6038E-08	5.53E-08
			40				20.60	1.60	258.57	34.8		
4	KR	4/12/2010	50	3000	60	65	20.10	1.58	252.04	33.9	5.4918E-08	5.42E-08
			50				20.10	1.58	252.04	33.9		
5	KR	4/12/2010	60	3600	60	65	19.70	1.56	246.82	33.2	5.2664E-08	5.20E-08

Project Manager

4-16-2010
Date

Average K:	5.8722E-08	5.7994E-08
Specification:	< 1.00E-07	

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	**Permeameter:**	5

Date:	4/12/2010
Sample ID:	TP-34
Sample Description:	Brown Sandy Clay

Item	Initial		Final	
Sample Diameter (cm)	7.32		7.32	
Sample Length (cm)	7.60		7.43	
Sample Volume (cm^3)	319.5		312.3	
Tare Number	D		wo	
Tare Weight (gm)	50.3		50.1	
Wet Soil + Tare (gm)	439.3		430.9	
Dry Soil + Tare (gm)	385.52		377.05	
Water Weight (gm)		53.8		53.85
Dry Soil Weight (gm)		335.22		326.95
Moisture Content (%)		16.0%		16.5%
Wet Weight Sample (gm)	668.7		671.4	
Wet Density Sample (pcf)		130.40		133.95
Dry Density Sample (pcf)		112.37		115.01
Saturation %		86.7%		95.7%

Specific Gravity	2.7		Tested		Assumed	x
Sample Results:	**Meets Specifications**					

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	Permeameter:	1

Date:	4/13/2010
Sample ID:	TP-37
Sample Description:	Brown Sandy Clay

L_i =	7.63	cm	Hydraulic System Constants	
L_f =	7.46	cm	Mercury U-Tube Manometer	
Dia =	7.3	cm	Area annulus, a_a (cm^2)	0.76712
Temp =	20.6	C	Area permometer tube, a_p (cm^2)	0.031416
R_i =	0.987595		Delta Hg at equilibrium (cm)	1.70

B Coefficient	0.95	Specific Gravity of Water, Gw	1
Effective Stress	5		

Mercury Head Setting			
Estimated k_i (cm/sec)	Max Gradient i_o=h/L	Permometer Setting (cm)	Min. Cell Pressure (psi)
10^{-4} - 10^{-5}	5	4.55	60
10^{-5} - 10^{-6}	10	7.40	60
10^{-6} - 10^{-7}	20	13.10	60
< 10^{-7}	30	18.80	60

Test No.	Readings by:	Date:	Time mins	Cumulative t secs	Pressure Cell psi	Pressure Back psi	Mercury Head Tail cm Hg	Mercury Head Head cm Hg	Total Head Loss cm H_2O	Hyd Gradient Prel/final	Hydraulic Conductivity K cm/sec	Hydraulic Conductivity K_{20} cm/sec
	KR	4/13/2010	0				22.40	1.70	281.73	37.8		
1	KR	4/13/2010	20	1200	60	65	22.10	1.69	277.81	37.2	1.37E-08	1.35E-08
			20				22.10	1.69	277.81	37.2		
2	KR	4/13/2010	30	1800	60	65	21.90	1.68	275.20	36.9	1.5312E-08	1.51E-08
			30				21.90	1.68	275.20	36.9		
3	KR	4/13/2010	40	2400	60	65	21.70	1.67	272.59	36.5	1.6161E-08	1.60E-08
			40				21.70	1.67	272.59	36.5		
4	KR	4/13/2010	50	3000	60	65	21.40	1.66	268.67	36.0	1.8614E-08	1.84E-08
			50				21.40	1.66	268.67	36.0		
5	KR	4/13/2010	60	3600	60	65	21.20	1.65	266.06	35.7	1.8713E-08	1.85E-08

Project Manager

4-16-2010
Date

Average K:	1.6502E-08	1.6297E-08
Specification:	< 1.00E-07	

HYDRAULIC CONDUCTIVITY TEST
ASTM 5084, METHOD F
Constant volume, Falling Head Hydraulic System

ENVIROTECH

Submittal:	05-18G: Admix Test Pad		
Project Name:	Hanford-ERDF Cells 9 & 10		
Poject Number:	S013213A00	Permeameter:	1

Date:	4/13/2010
Sample ID:	TP-37
Sample Description:	Brown Sandy Clay

Item	Initial		Final	
Sample Diameter (cm)	7.32		7.32	
Sample Length (cm)	7.63		7.46	
Sample Volume (cm^3)	320.6		313.5	
Tare Number	ee		mj	
Tare Weight (gm)	50.2		49.79	
Wet Soil + Tare (gm)	424.7		308.03	
Dry Soil + Tare (gm)	372.08		271.8	
Water Weight (gm)		52.6		36.23
Dry Soil Weight (gm)		321.88		222.01
Moisture Content (%)		16.3%		16.3%
Wet Weight Sample (gm)	672.5		676	
Wet Density Sample (pcf)		130.67		134.34
Dry Density Sample (pcf)		112.31		115.49
Saturation %		88.3%		96.0%

Specific Gravity	2.7		Tested		Assumed	x
Sample Results:	Meets Specifications					

C.8

BOUTWELL TEST RESULTS

SINGLE STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY *ASTM D-6391*

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	Control	Casing Length,(Z1):	18.00	in	45.72	cm
Location:	Floor of Cell 9	Depth to Boundry, (B1):	18.00	in	45.72	cm
Installation Date:	4/28/2010	Top of casing,(Ra):	2.00	in	5.08	cm
Units:	Metric	Buret Inner Diameter (D2):	0.50	in	1.27	cm
Inward Seepage when setting?	No	Casing Inner Dia. (D1):	4.00	in	10.16	cm
Permeable Base(0=infinate depth)	Yes	Variable a:	-1			

Test Data

Dates	End Date/Time	Buret (R)		TEG		TEMPERATURE		Ambient Temp		Tested
Start	End	Initial	Final	Initial	Final	Initial	Final	Initial	Final	By
Date/Time	Date/Time	cm	cm	cm	cm	C	C	C	C	
4/8/10 10:39	4/8/10 11:30			45.9	44.3	61	55	51	51.0	JV
4/8/10 11:30	4/8/10 12:30	0.00		44.3	43.7	55.0	55	51.0	52.0	TW
4/8/10 12:30	4/8/10 15:15	0.00		43.7	43.3	55.0	54	52.0	53.0	TW
4/8/10 15:15	4/8/10 19:20	0.00		43.3	43.7	54.0	52.0	53.0	49.0	TW
4/8/10 19:50	4/9/10 8:00	0.00		55.1	54.7	52.0	43.0	49.0	40.0	TW
4/9/10 8:00	4/9/10 11:05	0.00		54.7	54.0	43.0	46.0	40.0	50.0	TW
4/9/10 11:05	4/9/10 16:13	0.00		54.0	53.5	46.0	50.0	50.0	56.0	JV
4/9/10 16:13	4/10/10 8:13	0.00		53.5	54.1	50.0	43.0	56.0	41.0	LH
4/10/10 8:13	4/10/10 16:00	0.00		54.1	53.5	43.0	50.0	41.0	60.0	LH
4/10/10 16:00	4/11/10 8:00	0.00		53.5	53.7	50.0	48.0	60.0	50.0	JV
4/11/10 8:00	4/11/10 16:00	0.00		53.7	52.8	48.0	52.0	50.0	66.0	JV
4/11/10 16:00	4/12/10 8:03	0.00		52.8	53.3	52.0	52.0	66.0	52.0	JV
4/12/10 8:03	4/12/10 16:10	0.00		53.3	52.8	52.0	54.0	52.0	63.0	LH
4/12/10 16:10	4/13/10 8:00	0.00		52.8	53.1	54.0	52.0	63.0	50.0	LH
4/13/10 8:00	4/13/10 16:06	0.00		53.1	53.0	52.0	54.0	50.0	65.0	LH
4/13/10 16:06	4/14/10 8:11	0.00		53.0	52.7	54.0	46.0	65.0	50.0	LH
4/14/10 8:11	4/14/10 16:20	0.00		52.7	52.4	46.0	54.0	50.0	68.0	LH
4/14/10 16:20	4/15/10 8:15	0.00		52.4	52.2	54.0	52.0	68.0	46.0	TW
4/15/10 8:15	4/15/10 16:10	0.00		52.2	52.4	52.0	55.0	46.0	71.0	TW
4/15/10 16:20	4/16/10 8:00	0.00		52.4	52.2	55.0	54.0	71.0	56.0	TW
4/16/10 8:00	4/16/10 16:10	0.00		52.2	52.5	54.0	54.0	56.0	75.0	TW
4/16/10 16:20	4/17/10 8:10	0.00		52.5	52.0	54.0	55.0	75.0	58.0	TW
4/17/10 8:10	4/17/10 16:00	0.00		52.0	52.4	55.0	59.0	58.0	74.5	TW
4/17/10 16:00	4/18/10 8:00	0.00		52.4	51.2	59.0	54.0	74.5	56.0	TW
4/18/10 8:00	4/18/10 16:00	0.00		51.2	52.2	54.0	59.0	56.0	74.0	TW
4/18/10 16:00	4/19/10 8:06	0.00		52.2	52.1	59.0	57.0	74.0	58.0	LH
4/19/10 8:06	4/19/10 16:00	0.00		52.1	52.4	57.0	61.0	58.0	81.0	TW
4/19/10 16:00	4/20/10 8:10	0.00		52.4	51.7	61.0	63.0	81.0	64.0	JV
4/20/10 8:10	4/21/10 8:00	0.00		51.7	51.9	63.0	61.0	64.0	53.0	TW
4/21/10 8:00	4/22/10 8:00	0.00		51.9	51.7	61.0	55.0	53.0	52.0	JV

SINGLE STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY *ASTM D-6391*

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-North	Casing Length,(Z1):	18.00	in	45.72	cm
Location:	Floor of Cell 9	Depth to Boundry, (B1):	18.00	in	45.72	cm
Installation Date:	4/28/2010	Top of casing,(Ra):	2.00	in	5.08	cm
Units:	Metric	Buret Inner Diameter (D2):	0.50	in	1.27	cm
Inward Seepage when setting?	No	Casing Inner Dia. (D1):	4.00	in	10.16	cm
Permeable Base(0=infinate depth)	Yes	Variable a:	-1			

Test Data

Dates	End Date/Time	Buret (R)		TEG		TEMPERATURE		Ambient Temp		Tested
Start	End	Initial	Final	Initial	Final	Initial	Final	Initial	Final	By
Date/Time	Date/Time	cm	cm	cm	cm	C	C	C	C	
4/8/10 11:06	4/8/10 11:30	54.80	52.10	44.3	44.3	61.0	55.0	51.0	53.0	JV
4/8/10 11:30	4/8/10 12:30	52.10	50.50	44.3	43.7	55.0	55.0	51.0	52.0	TW
4/8/10 12:30	4/8/10 15:15	50.50	49.20	43.7	43.3	55.0	54.0	52.0	53.0	TW
4/8/10 15:15	4/8/10 19:20	49.20	48.80	43.3	43.7	54.0	52.0	53.0	49.0	TW
4/8/10 19:20	4/9/10 8:00	55.00	53.00	43.7	54.7	52.0	43.0	49.0	40.0	TW
4/9/10 8:00	4/9/10 11:05	53.00	52.30	54.7	54.0	43.0	46.0	40.0	50.0	TW
4/9/10 11:05	4/9/10 16:13	52.30	51.20	54.0	53.5	46.0	50.0	50.0	56.0	JV
4/9/10 16:13	4/10/10 8:13	51.20	50.60	53.5	54.1	50.0	43.0	56.0	41.0	LH
4/10/10 8:13	4/10/10 16:00	50.60	49.40	54.1	53.5	43.0	50.0	41.0	60.0	LH
4/10/10 16:00	4/11/10 8:00	49.40	48.30	53.5	53.7	50.0	48.0	60.0	50.0	JV
4/11/10 8:00	4/11/10 16:00	48.30	46.70	53.7	52.8	48.0	52.0	50.0	66.0	JV
4/11/10 16:00	4/12/10 8:03	46.70	45.20	52.8	53.3	52.0	52.0	66.0	52.0	JV
4/12/10 8:03	4/12/10 16:10	45.20	44.70	53.3	52.8	52.0	54.0	52.0	63.0	LH
4/12/10 16:10	4/13/10 8:00	44.70	43.40	52.8	53.1	54.0	52.0	63.0	50.0	LH
4/13/10 8:00	4/13/10 16:06	43.40	42.70	53.1	53.0	52.0	54.0	50.0	65.0	LH
4/13/10 16:06	4/14/10 8:11	42.70	41.10	53.0	52.7	54.0	46.0	65.0	50.0	LH
4/14/10 8:11	4/14/10 16:20	41.10	40.10	52.7	52.4	46.0	54.0	50.0	68.0	LH
4/14/10 16:20	4/15/10 8:15	40.10	39.40	52.4	52.2	54.0	52.0	68.0	46.0	TW
4/15/10 8:15	4/15/10 16:10	39.40	38.40	52.2	52.4	52.0	55.0	46.0	71.0	TW
4/15/10 16:10	4/16/10 8:00	57.70	56.00	52.4	52.2	55.0	54.0	71.0	56.0	TW
4/16/10 8:00	4/16/10 16:10	56.00	55.60	52.2	52.5	54.0	54.0	56.0	75.0	TW
4/16/10 16:10	4/17/10 8:10	55.60	53.70	52.5	52.0	54.0	55.0	75.0	58.0	TW
4/17/10 8:10	4/18/10 8:00	53.70	51.50	52.0	51.2	55.0	54.0	58.0	56.0	TW
4/18/10 8:00	4/18/10 16:00	51.50	51.10	51.2	52.2	59.0	59.0	74.5	74.0	TW
4/18/10 16:00	4/19/10 8:06	51.10	49.90	52.2	52.1	54.0	57.0	56.0	58.0	LH
4/19/10 8:06	4/20/10 8:10	49.90	48.20	52.1	51.7	59.0	63.0	74.0	64.0	JV
4/20/10 8:10	4/21/10 8:00	48.20	46.80	51.7	51.9	57.0	61.0	58.0	53.0	TW
4/21/10 8:00	4/22/10 8:00	46.80	45.00	51.9	51.7	61.0	55.0	81.0	52.0	JV

SIN..E STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY ASTM D-6391

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Test Information

Burret Area (A), pi()*D2^2/4 = 1.27 cm

Variable G1 = (pi()*D2^2/(11*D1)*(1+a*(D1/4b)) = 0.0428

Boutwell No.: BW-North

Location: Floor of Cell 9

Test Information

	Delta Time	Temp Correction	TEG	Height of Water		k_T	K_{20}	k x dt	TWA	%	Volume	Total Vol
Trial No	sec	R_t	fin-init	Hi, cm	Hf, cm	cm/sec	cm/sec	cm	last 2 rates	Change	cm^3	cm^3
1	1440	0.4556	0.00	151.3	148.6	5.4E-07	2.4E-07	9.756E-08			3.42	3.4
2	3600	0.4822	0.60	148.6	147.0	1.3E-07	6.2E-08	6.208E-08	8.80E-15		2.03	5.4
3	9900	0.4868	0.40	147.0	145.7	3.8E-08	1.9E-08	5.143E-08	2.34E-15	73%	1.65	7.1
4	14700	0.5010	-0.40	145.7	145.3	8.0E-09	4.0E-09	1.638E-08	7.66E-16	67%	0.51	7.6
5	45600	0.5571	-11.00	151.5	149.5	1.2E-08	7.0E-09	8.805E-08	4.81E-16	37%	2.53	10.1
6	11100	0.5909	0.70	149.5	148.8	1.8E-08	1.1E-08	3.298E-08	5.93E-16	23%	0.89	11.0
7	18480	0.5517	0.50	148.8	147.7	1.7E-08	9.5E-09	4.869E-08	7.67E-16	29%	1.39	12.4
8	57600	0.5681	-0.60	147.7	147.1	3.0E-09	1.7E-09	2.750E-08	2.78E-16	64%	0.76	13.2
9	28020	0.5681	0.60	147.1	145.9	1.3E-08	7.1E-09	5.535E-08	2.69E-16	3%	1.52	14.7
10	57600	0.5411	-0.20	145.9	144.8	5.6E-09	3.0E-09	4.870E-08	3.38E-16	26%	1.39	16.1
11	28800	0.5307	0.90	144.8	143.2	1.7E-08	8.8E-09	7.013E-08	3.82E-16	13%	2.03	18.1
12	57780	0.5107	-0.50	143.2	141.7	7.8E-09	4.0E-09	6.395E-08	4.30E-16	13%	1.90	20.0
13	29220	0.5010	0.50	141.7	141.2	5.2E-09	2.6E-09	2.106E-08	2.71E-16	37%	0.63	20.6
14	57000	0.5010	-0.30	141.2	139.9	6.9E-09	3.5E-09	5.511E-08	2.45E-16	10%	1.65	22.3
15	29160	0.5010	0.10	139.9	139.2	7.4E-09	3.7E-09	2.989E-08	2.74E-16	12%	0.89	23.2
16	57900	0.5307	0.30	139.2	137.6	8.5E-09	4.5E-09	7.297E-08	3.28E-16	20%	2.03	25.2
17	29340	0.5307	0.30	137.6	136.6	1.1E-08	5.6E-09	4.604E-08	3.79E-16	15%	1.27	26.5
18	57300	0.5010	0.20	136.6	135.9	3.8E-09	1.9E-09	3.061E-08	2.46E-16	35%	0.89	27.4
19	28500	0.4962	-0.20	135.9	134.9	1.1E-08	5.5E-09	4.358E-08	2.40E-16	2%	1.27	28.6
20	57000	0.4868	0.20	154.2	152.5	8.3E-09	4.1E-09	6.419E-08	3.50E-16	46%	2.15	30.8
21	29400	0.4915	-0.30	152.5	152.1	3.8E-09	1.9E-09	1.535E-08	2.56E-16	27%	0.51	31.3
22	57600	0.4868	0.50	152.1	150.2	9.3E-09	4.5E-09	7.278E-08	2.81E-16	10%	2.41	33.7
23	85800	0.4868	0.80	150.2	148.0	7.4E-09	3.6E-09	8.543E-08	3.06E-16	9%	2.79	36.5
24	28800	0.4471	-1.00	148.0	147.6	4.0E-09	1.8E-09	1.439E-08	2.42E-16	21%	0.51	37.0
25	57960	0.4777	0.10	147.6	146.4	6.0E-09	2.9E-09	4.637E-08	1.95E-16	20%	1.52	38.5
26	86640	0.4306	0.40	146.4	144.7	5.8E-09	2.5E-09	5.982E-08	2.04E-16	5%	2.15	40.7
27	85800	0.4471	-0.20	144.7	143.3	4.9E-09	2.2E-09	5.169E-08	1.80E-16	12%	1.77	42.4
28	86400	0.4556	0.20	143.3	141.5	6.3E-09	2.9E-09	6.849E-08	1.94E-16	8%	2.28	44.7

Average K_{20} (steady state) = 2.58E-09 cm/sec Log Calculation

Average K_{20} (steady state) = 2.63E-09 cm/sec Straight Average (Check)

Note: TWA last 24 hrs all less than 20% difference

SIN_LE STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY *ASTM D-6391*

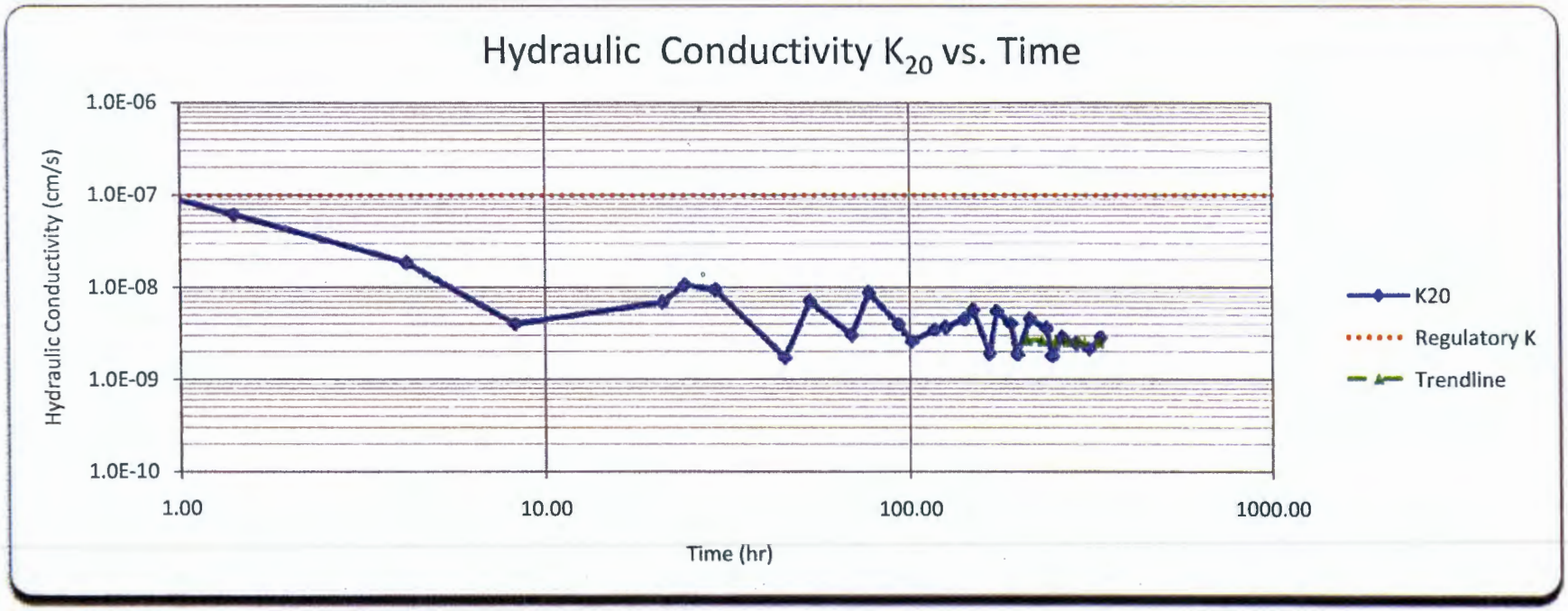
ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-North	Installation Date:	4/28/2010



Trend Line Slope =	1.000	Stable
Average K_{20} (steady state) =	2.58E-09	cm/sec

SINGLE STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY *ASTM D-6391*

ENVIROTECH
ENGINEERING & CONSULTING INC.
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-East	Casing Length,(Z1):	18.00	in	45.72	cm
Location:	Floor of Cell 9	Depth to Boundry, (B1):	18.00	in	45.72	cm
Installation Date:	4/28/2010	Top of casing,(Ra):	2.00	in	5.08	cm
Units:	Metric	Buret Inner Diameter (D2):	0.50	in	1.27	cm
Inward Seepage when setting?	No	Casing Inner Dia. (D1):	4.00	in	10.16	cm
Permeable Base(0=infinate depth)	Yes	Variable a:	-1			

Test Data

Dates	End Date/Time	Buret (R)		TEG		TEMPERATURE		Ambient Temp		Tested
Start	End	Initial	Final	Initial	Final	Initial	Final	Initial	Final	By
Date/Time	Date/Time	cm	cm	cm	cm	C	C	C	C	
4/8/10 10:47	4/8/10 11:30	51.50	36.90	44.3	44.3	61.0	55.0	51.0	53.0	JV
4/8/10 11:30	4/8/10 12:30	36.90	36.60	44.3	43.7	55.0	55.0	51.0	52.0	TW
4/8/10 12:30	4/8/10 15:15	36.60	36.30	43.7	43.3	55.0	54.0	52.0	53.0	TW
4/8/10 15:15	4/8/10 19:20	36.30	35.80	43.3	43.7	54.0	52.0	53.0	49.0	TW
4/8/10 19:20	4/9/10 8:00	55.70	53.30	43.7	54.7	52.0	43.0	49.0	40.0	TW
4/9/10 8:00	4/9/10 11:05	53.30	52.20	54.7	54.0	43.0	46.0	40.0	50.0	TW
4/9/10 11:05	4/9/10 16:13	52.20	51.10	54.0	53.5	46.0	50.0	50.0	56.0	JV
4/9/10 16:13	4/10/10 8:13	51.10	50.20	53.5	54.1	50.0	43.0	56.0	41.0	LH
4/10/10 8:13	4/10/10 16:00	50.20	48.90	54.1	53.5	43.0	50.0	41.0	60.0	LH
4/10/10 16:00	4/11/10 8:00	48.90	47.60	53.5	53.7	50.0	48.0	60.0	50.0	JV
4/11/10 8:00	4/11/10 16:00	47.60	46.10	53.7	52.8	48.0	52.0	50.0	66.0	JV
4/11/10 16:00	4/12/10 8:03	46.10	45.00	52.8	53.3	52.0	52.0	66.0	52.0	JV
4/12/10 8:03	4/12/10 16:10	45.00	43.80	53.3	52.8	52.0	54.0	52.0	63.0	LH
4/12/10 16:10	4/13/10 8:00	43.80	42.60	52.8	53.1	54.0	52.0	63.0	50.0	LH
4/13/10 8:00	4/13/10 16:06	42.60	42.00	53.1	53.0	52.0	54.0	50.0	65.0	LH
4/13/10 16:06	4/14/10 8:11	42.00	40.30	53.0	52.7	54.0	46.0	65.0	50.0	LH
4/14/10 8:11	4/14/10 16:20	40.30	39.70	52.7	52.4	46.0	54.0	50.0	68.0	LH
4/14/10 16:20	4/15/10 8:15	39.70	39.00	52.4	52.2	54.0	52.0	68.0	46.0	TW
4/15/10 8:15	4/15/10 16:10	39.00	38.50	52.2	52.4	52.0	55.0	46.0	71.0	TW
4/15/10 16:10	4/16/10 8:00	50.00	48.00	52.4	52.2	55.0	54.0	71.0	56.0	TW
4/16/10 8:00	4/17/10 8:10	48.00	46.30	52.2	52.0	54.0	55.0	56.0	58.0	TW
4/17/10 8:10	4/18/10 8:00	46.30	44.70	52.0	51.2	54.0	54.0	75.0	56.0	TW
4/18/10 8:00	4/19/10 8:06	44.70	43.40	51.2	52.1	55.0	57.0	58.0	58.0	LH
4/19/10 8:06	4/20/10 8:10	43.40	42.30	52.1	51.7	59.0	63.0	74.5	64.0	JV
4/20/10 8:10	4/21/10 8:00	42.30	41.20	51.7	51.9	54.0	61.0	56.0	53.0	TW
4/21/10 8:00	4/22/10 8:00	41.20	40.10	51.9	51.7	59.0	55.0	74.0	52.0	JV

SINGLE STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY ASTM D-6391

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Test Information

Burret Area (A), pi()*D2^2/4 = 1.27 cm

Variable G1 = (pi()*D2^2/(11*D1)*(1+a*(D1/4b)) = 0.0428

Boutwell No.: BW-East

Location: Floor of Cell 9

Test Information

	Delta Time	Temp Correction	TEG	Height of Water		k_T	K_{20}	k x dt	TWA	%	Volume	Total Vol
Trial No	sec	R_t	fin-init	Hi, cm	Hf, cm	cm/sec	cm/sec	cm	last 2 rates	Change	cm^3	cm^3
1	2580	0.4556	0.00	148.0	133.4	1.7E-06	7.9E-07	0.000			18.49	18.5
2	3600	0.4822	0.60	133.4	133.1	2.7E-08	1.3E-08	0.000	2.59E-14		0.38	18.9
3	9900	0.4868	0.40	133.1	132.8	9.8E-09	4.8E-09	0.000	5.34E-16	98%	0.38	19.3
4	14700	0.5010	-0.40	132.8	132.3	1.1E-08	5.5E-09	0.000	4.01E-16	25%	0.63	19.9
5	45600	0.5571	-11.00	152.2	149.8	1.5E-08	8.3E-09	0.000	5.89E-16	47%	3.04	22.9
6	11100	0.5909	0.70	149.8	148.7	2.8E-08	1.7E-08	0.000	7.70E-16	31%	1.39	24.3
7	18480	0.5517	0.50	148.7	147.6	1.7E-08	9.5E-09	0.000	9.44E-16	23%	1.39	25.7
8	57600	0.5681	-0.60	147.6	146.7	4.5E-09	2.6E-09	0.000	3.29E-16	65%	1.14	26.9
9	28020	0.5681	0.60	146.7	145.4	1.4E-08	7.7E-09	0.000	3.29E-16	0%	1.65	28.5
10	57600	0.5411	-0.20	145.4	144.1	6.7E-09	3.6E-09	0.000	3.83E-16	16%	1.65	30.1
11	28800	0.5307	0.90	144.1	142.6	1.6E-08	8.3E-09	0.000	3.98E-16	4%	1.90	32.0
12	57780	0.5107	-0.50	142.6	141.5	5.7E-09	2.9E-09	0.000	3.63E-16	9%	1.39	33.4
13	29220	0.5010	0.50	141.5	140.3	1.2E-08	6.3E-09	0.000	3.12E-16	14%	1.52	35.0
14	57000	0.5010	-0.30	140.3	139.1	6.5E-09	3.2E-09	0.000	3.28E-16	5%	1.52	36.5
15	29160	0.5010	0.10	139.1	138.5	6.3E-09	3.2E-09	0.000	2.48E-16	24%	0.76	37.2
16	57900	0.5307	0.30	138.5	136.8	9.1E-09	4.8E-09	0.000	3.31E-16	33%	2.15	39.4
17	29340	0.5307	0.30	136.8	136.2	6.4E-09	3.4E-09	0.000	3.37E-16	2%	0.76	40.2
18	57300	0.5010	0.20	136.2	135.5	3.9E-09	1.9E-09	0.000	1.87E-16	44%	0.89	41.0
19	28500	0.4962	-0.20	135.5	135.0	5.6E-09	2.8E-09	0.000	1.70E-16	9%	0.63	41.7
20	57000	0.4868	0.20	146.5	144.5	1.0E-08	5.0E-09	0.000	3.29E-16	94%	2.53	44.2
21	87000	0.4868	0.20	144.5	142.8	5.8E-09	2.8E-09	0.000	2.86E-16	13%	2.15	46.4
22	85800	0.4915	0.80	142.8	141.2	5.6E-09	2.8E-09	0.000	2.16E-16	24%	2.03	48.4
23	86760	0.4732	-0.90	141.2	139.9	4.6E-09	2.2E-09	0.000	1.90E-16	12%	1.65	50.0
24	86640	0.4306	0.40	139.9	138.8	3.9E-09	1.7E-09	0.000	1.48E-16	22%	1.39	51.4
25	85800	0.4599	-0.20	138.8	137.7	4.0E-09	1.8E-09	0.000	1.35E-16	9%	1.39	52.8
26	86400	0.4643	0.20	137.7	136.6	4.0E-09	1.8E-09	0.000	1.42E-16	5%	1.39	54.2

Average K_{20} (steady state) = 1.94E-09 cm/sec Log Calculation

Average K_{20} (steady state) = 1.88E-09 cm/sec Straight Average (Check)

Note: TWA last 24 hrs all less than 20% difference

SIN .E STAGE BOREHOLE

HYDRAULIC CONDUCTIVITY *ASTM D-6391*

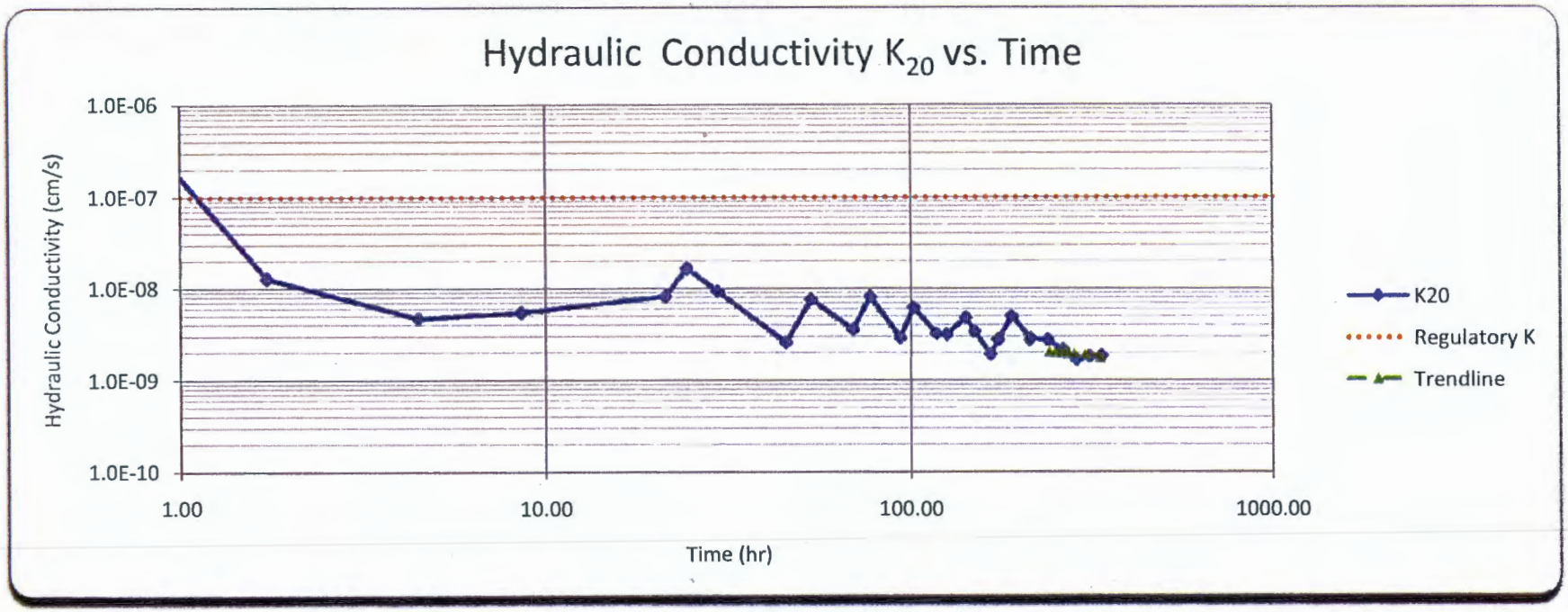
ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-East	Installation Date:	4/28/2010



Trend Line Slope =	0.998	Stable
Average K_{20} (steady state) =	1.94E-09	cm/sec

SINGLE STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY *ASTM D-6391*

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-South	Casing Length,(Z1):	18.00	in	45.72	cm
Location:	Floor of Cell 9	Depth to Boundry, (B1):	18.00	in	45.72	cm
Installation Date:	4/28/2010	Top of casing,(Ra):	2.00	in	5.08	cm
Units:	Metric	Buret Inner Diameter (D2):	0.50	in	1.27	cm
Inward Seepage when setting?	No	Casing Inner Dia. (D1):	4.00	in	10.16	cm
Permeable Base(0=infinate depth)	Yes	Variable a:	-1			

Test Data

Dates	End Date/Time	Buret (R)		TEG		TEMPERATURE		Ambient Temp		Tested
Start	End	Initial	Final	Initial	Final	Initial	Final	Initial	Final	By
Date/Time	Date/Time	cm	cm	cm	cm	C	C	C	C	
4/8/10 10:16	4/8/10 10:46	53.10	50.10	44.3	44.3	61.0	61.0	51.0	52.0	JV
4/8/10 10:46	4/8/10 11:30	50.10	48.80	44.3	44.3	55.0	55.0	51.0	51.0	JV
4/8/10 11:30	4/8/10 12:30	48.80	47.50	44.3	43.7	55.0	55.0	52.0	52.0	TW
4/8/10 12:30	4/8/10 15:15	47.50	45.70	43.7	43.3	54.0	54.0	53.0	53.0	TW
4/8/10 15:15	4/8/10 19:20	45.70	44.70	43.3	43.7	52.0	52.0	49.0	49.0	TW
4/8/10 19:50	4/9/10 8:00	54.00	50.80	43.7	54.7	43.0	43.0	40.0	40.0	TW
4/9/10 8:00	4/9/10 11:05	50.80	49.40	54.7	54.0	46.0	46.0	50.0	50.0	TW
4/9/10 11:05	4/9/10 16:13	49.40	48.00	54.0	53.5	50.0	50.0	56.0	56.0	JV
4/9/10 16:13	4/10/10 8:13	48.00	46.10	53.5	54.1	43.0	43.0	41.0	41.0	LH
4/10/10 8:13	4/10/10 16:00	46.10	44.00	54.1	53.5	50.0	50.0	60.0	60.0	LH
4/10/10 16:00	4/11/10 8:00	44.00	42.10	53.5	53.7	48.0	48.0	50.0	50.0	JV
4/11/10 8:00	4/11/10 16:00	42.10	39.80	53.7	52.8	52.0	52.0	66.0	66.0	JV
4/11/10 16:00	4/12/10 8:03	39.80	38.10	52.8	53.3	52.0	52.0	52.0	52.0	JV
4/12/10 8:03	4/12/10 16:10	38.10	36.30	53.3	52.8	54.0	54.0	63.0	63.0	LH
4/12/10 16:10	4/13/10 8:00	36.30	34.50	52.8	53.1	52.0	52.0	50.0	50.0	LH
4/13/10 8:00	4/13/10 16:06	34.50	33.40	53.1	53.0	54.0	54.0	65.0	65.0	LH
4/13/10 16:06	4/14/10 8:11	33.40	31.20	53.0	52.7	46.0	46.0	50.0	50.0	LH
4/14/10 8:11	4/14/10 16:20	31.20	29.90	52.7	52.4	54.0	54.0	68.0	68.0	LH
4/14/10 16:20	4/15/10 8:15	29.90	28.80	52.4	52.2	52.0	52.0	46.0	46.0	TW
4/15/10 8:15	4/15/10 16:10	28.80	27.40	52.2	52.4	55.0	55.0	71.0	71.0	TW
4/15/10 16:10	4/16/10 8:00	55.80	53.00	52.4	52.2	54.0	54.0	56.0	56.0	TW
4/16/10 8:00	4/17/10 8:10	53.00	50.40	52.2	52.0	54.0	55.0	75.0	58.0	TW
4/17/10 8:10	4/17/10 16:00	50.40	49.80	52.0	52.4	55.0	59.0	58.0	74.5	TW
4/17/10 16:00	4/18/10 8:00	49.80	47.60	52.4	51.2	59.0	54.0	74.5	56.0	TW
4/18/10 8:00	4/19/10 8:06	47.60	45.50	51.2	52.1	54.0	57.0	56.0	58.0	LH
4/19/10 8:06	4/20/10 8:10	45.50	43.20	52.1	51.7	59.0	63.0	74.0	64.0	JV
4/20/10 8:10	4/21/10 8:00	43.20	41.50	51.7	51.9	57.0	61.0	58.0	53.0	TW
4/21/10 8:00	4/22/10 8:00	41.50	39.80	51.9	51.7	61.0	55.0	81.0	52.0	JV

SINGLE STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY ASTM D-6391

ENVIROTECH
ENGINEERING & CONSULTING INC.
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Test Information

Burret Area (A), pi()*D2^2/4 = 1.27 cm

Variable G1 = (pi()*D2^2/(11*D1)*(1+a*(D1/4b)) = 0.0428

Boutwell No.: BW-South

Location: Floor of Cell 9

Test Information

	Delta Time	Temp Correction	TEG	Height of Water		k_T	K_{20}	k x dt	TWA	%	Volume	Total Vol
Trial No	sec	R_t	fin-init	Hi, cm	Hf, cm	cm/sec	cm/sec	cm	last 2 rates	Change	cm^3	cm^3
1	1800	0.4306	0.00	149.6	146.6	4.8E-07	2.1E-07	1.037E-07			3.80	3.8
2	2640	0.4822	0.00	146.6	145.3	1.4E-07	7.0E-08	5.108E-08	9.69E-15		1.65	5.4
3	3600	0.4822	0.60	145.3	144.0	1.1E-07	5.2E-08	5.154E-08	4.57E-15	53%	1.65	7.1
4	9900	0.4915	0.40	144.0	142.2	5.4E-08	2.7E-08	7.353E-08	2.57E-15	44%	2.28	9.4
5	14700	0.5107	-0.40	142.2	141.2	2.1E-08	1.0E-08	4.286E-08	1.31E-15	49%	1.27	10.6
6	43800	0.6088	-11.00	150.5	147.3	2.1E-08	1.3E-08	1.556E-07	9.42E-16	28%	4.05	14.7
7	11100	0.5737	0.70	147.3	145.9	3.7E-08	2.1E-08	6.516E-08	1.12E-15	19%	1.77	16.5
8	18480	0.5307	0.50	145.9	144.5	2.2E-08	1.2E-08	6.086E-08	1.18E-15	6%	1.77	18.2
9	57600	0.6088	-0.60	144.5	142.6	9.8E-09	6.0E-09	9.583E-08	5.72E-16	52%	2.41	20.6
10	28020	0.5307	0.60	142.6	140.5	2.3E-08	1.2E-08	9.364E-08	6.15E-16	7%	2.66	23.3
11	57600	0.5517	-0.20	140.5	138.6	1.0E-08	5.6E-09	8.934E-08	5.94E-16	3%	2.41	25.7
12	28800	0.5107	0.90	138.6	136.3	2.5E-08	1.3E-08	1.016E-07	6.14E-16	3%	2.91	28.6
13	57780	0.5107	-0.50	136.3	134.6	9.3E-09	4.7E-09	7.623E-08	5.71E-16	7%	2.15	30.8
14	29220	0.4915	0.50	134.6	132.8	2.0E-08	9.7E-09	7.870E-08	4.95E-16	13%	2.28	33.1
15	57000	0.5107	-0.30	132.8	131.0	1.0E-08	5.2E-09	8.288E-08	5.21E-16	5%	2.28	35.3
16	29160	0.4915	0.10	131.0	129.9	1.2E-08	6.1E-09	4.929E-08	4.26E-16	18%	1.39	36.7
17	57900	0.5737	0.30	129.9	127.7	1.3E-08	7.2E-09	1.165E-07	5.29E-16	24%	2.79	39.5
18	29340	0.4915	0.30	127.7	126.4	1.5E-08	7.3E-09	5.981E-08	5.62E-16	6%	1.65	41.2
19	57300	0.5107	0.20	126.4	125.3	6.5E-09	3.3E-09	5.308E-08	3.62E-16	36%	1.39	42.6
20	28500	0.4822	-0.20	125.3	123.9	1.7E-08	8.1E-09	6.444E-08	3.80E-16	5%	1.77	44.3
21	57000	0.4915	0.20	152.3	149.5	1.4E-08	6.9E-09	1.085E-07	5.62E-16	48%	3.55	47.9
22	87000	0.4868	0.20	149.5	146.9	8.6E-09	4.2E-09	1.016E-07	4.05E-16	28%	3.29	51.2
23	28200	0.4643	-0.40	146.9	146.3	6.2E-09	2.9E-09	2.260E-08	2.99E-16	26%	0.76	51.9
24	57600	0.4687	1.20	146.3	144.1	1.1E-08	5.3E-09	8.446E-08	3.47E-16	16%	2.79	54.7
25	86760	0.4777	-0.90	144.1	142.0	7.2E-09	3.5E-09	8.340E-08	3.23E-16	7%	2.66	57.4
26	86640	0.4306	0.40	142.0	139.7	8.1E-09	3.5E-09	8.363E-08	2.68E-16	17%	2.91	60.3
27	85800	0.4471	-0.20	139.7	138.0	6.1E-09	2.7E-09	6.510E-08	2.40E-16	10%	2.15	62.5
28	86400	0.4556	0.20	138.0	136.3	6.1E-09	2.8E-09	6.716E-08	2.13E-16	11%	2.15	64.6

Average K_{20} (steady state) = 3.33E-09 cm/sec Log Calculation

Average K_{20} (steady state) = 3.44E-09 cm/sec Straight Average (Check)

Note: TWA last 24 hrs all less than 20% difference

SIN_ _E STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY *ASTM D-6391*

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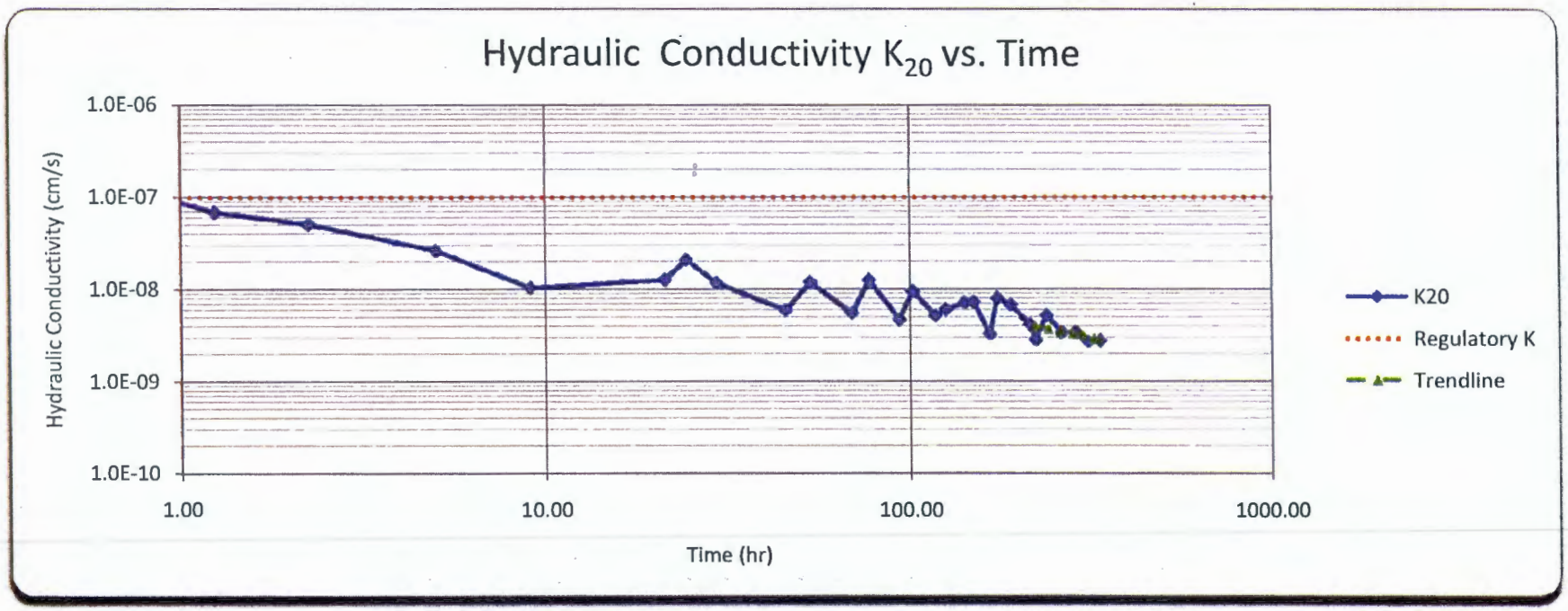
ENGINEERING & CONSULTING INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-South	Installation Date:	4/28/2010



Trend Line Slope =	0.997	Stable
Average K_{20} (steady state) =	3.33E-09	cm/sec

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Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-West	Casing Length,(Z1):	18.00	in	45.72	cm
Location:	Floor of Cell 9	Depth to Boundry, (B1):	18.00	in	45.72	cm
Installation Date:	4/28/2010	Top of casing,(Ra):	2.00	in	5.08	cm
Units:	Metric	Buret Inner Diameter (D2):	0.50	in	1.27	cm
Inward Seepage when setting?	No	Casing Inner Dia. (D1):	4.00	in	10.16	cm
Permeable Base(0=infinate depth)	Yes	Variable a:	-1			

Test Data

Dates	End Date/Time	Buret (R)		TEG		TEMPERATURE		Ambient Temp		Tested
Start	End	Initial	Final	Initial	Final	Initial	Final	Initial	Final	By
Date/Time	Date/Time	cm	cm	cm	cm	C	C	C	C	
4/8/10 10:59	4/8/10 11:30	51.00	47.20	44.3	44.3	61.0	55.0	51.0	53.0	JV
4/8/10 11:30	4/8/10 12:30	47.20	45.40	44.3	43.7	55.0	55.0	51.0	52.0	TW
4/8/10 12:30	4/8/10 15:15	45.40	44.00	43.7	43.3	55.0	54.0	52.0	53.0	TW
4/8/10 15:15	4/8/10 19:20	44.00	43.20	43.3	43.7	54.0	52.0	53.0	49.0	TW
4/8/10 19:20	4/9/10 8:00	55.20	52.30	43.7	54.7	52.0	43.0	49.0	40.0	TW
4/9/10 8:00	4/9/10 11:05	52.30	51.20	54.7	54.0	43.0	46.0	40.0	50.0	TW
4/9/10 11:05	4/9/10 16:13	51.20	50.00	54.0	53.5	46.0	50.0	50.0	56.0	JV
4/9/10 16:13	4/10/10 8:13	50.00	48.30	53.5	54.1	50.0	43.0	56.0	41.0	LH
4/10/10 8:13	4/10/10 16:00	48.30	46.90	54.1	53.5	43.0	50.0	41.0	60.0	LH
4/10/10 16:00	4/11/10 8:00	46.90	45.70	53.5	53.7	50.0	48.0	60.0	50.0	JV
4/11/10 8:00	4/11/10 16:00	45.70	43.80	53.7	52.8	48.0	52.0	50.0	66.0	JV
4/11/10 16:00	4/12/10 8:03	43.80	42.70	52.8	53.3	52.0	52.0	66.0	52.0	JV
4/12/10 8:03	4/12/10 16:10	42.70	41.40	53.3	52.8	52.0	54.0	52.0	63.0	LH
4/12/10 16:10	4/13/10 8:00	41.40	40.20	52.8	53.1	54.0	52.0	63.0	50.0	LH
4/13/10 8:00	4/13/10 16:06	40.20	39.40	53.1	53.0	52.0	54.0	50.0	65.0	LH
4/13/10 16:06	4/14/10 8:11	39.40	37.80	53.0	52.7	54.0	46.0	65.0	50.0	LH
4/14/10 8:11	4/14/10 16:20	37.80	36.70	52.7	52.4	46.0	54.0	50.0	68.0	LH
4/14/10 16:20	4/15/10 8:15	36.70	36.30	52.4	52.2	54.0	52.0	68.0	46.0	TW
4/15/10 8:15	4/15/10 16:10	36.30	35.20	52.2	52.4	52.0	55.0	46.0	71.0	TW
4/15/10 16:10	4/16/10 8:00	46.00	44.90	52.4	52.2	55.0	54.0	71.0	56.0	TW
4/16/10 8:00	4/16/10 16:10	44.90	44.50	52.2	52.5	54.0	54.0	56.0	75.0	TW
4/16/10 16:10	4/17/10 8:10	44.50	43.10	52.5	52.0	54.0	55.0	75.0	58.0	TW
4/17/10 8:10	4/18/10 8:00	43.10	41.30	52.0	51.2	55.0	54.0	58.0	56.0	TW
4/18/10 8:00	4/19/10 8:06	41.30	40.10	51.2	52.1	59.0	57.0	74.5	58.0	LH
4/19/10 8:06	4/20/10 8:10	40.10	39.00	52.1	51.7	54.0	63.0	56.0	64.0	JV
4/20/10 8:10	4/21/10 8:00	39.00	38.10	51.7	51.9	59.0	61.0	74.0	53.0	TW
4/21/10 8:00	4/22/10 8:00	38.10	37.10	51.9	51.7	57.0	55.0	58.0	52.0	JV

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Test Information

Burret Area (A), pi()*D2^2/4 = 1.27 cm

Variable G1 = (pi()*D2^2/(11*D1)*(1+a*(D1/4b)) = 0.0428

Boutwell No.: BW-West

Location: Floor of Cell 9

Test Information

	Delta Time	Temp Correction	TEG	Height of Water		k_T	K_{20}	k x dt	TWA	%	Volume	Total Vol
Trial No	sec	R_t	fin-init	Hi, cm	Hf, cm	cm/sec	cm/sec	cm	last 2 rates	Change	cm^3	cm^3
1	1860	0.4556	0.00	147.5	143.7	6.0E-07	2.7E-07	1.414E-07			4.81	4.8
2	3600	0.4822	0.60	143.7	141.9	1.5E-07	7.2E-08	7.229E-08	1.09E-14		2.28	7.1
3	9900	0.4868	0.40	141.9	140.5	4.3E-08	2.1E-08	5.741E-08	2.67E-15	75%	1.77	8.9
4	14700	0.5010	-0.40	140.5	139.7	1.7E-08	8.3E-09	3.402E-08	1.03E-15	61%	1.01	9.9
5	45600	0.5571	-11.00	151.7	148.8	1.8E-08	1.0E-08	1.279E-07	7.46E-16	28%	3.67	13.6
6	11100	0.5909	0.70	148.8	147.7	2.9E-08	1.7E-08	5.215E-08	8.82E-16	18%	1.39	14.9
7	18480	0.5517	0.50	147.7	146.5	1.9E-08	1.0E-08	5.353E-08	9.92E-16	13%	1.52	16.5
8	57600	0.5681	-0.60	146.5	144.8	8.7E-09	4.9E-09	7.886E-08	4.83E-16	51%	2.15	18.6
9	28020	0.5681	0.60	144.8	143.4	1.5E-08	8.4E-09	6.564E-08	4.69E-16	3%	1.77	20.4
10	57600	0.5411	-0.20	143.4	142.2	6.2E-09	3.4E-09	5.408E-08	3.88E-16	17%	1.52	21.9
11	28800	0.5307	0.90	142.2	140.3	2.0E-08	1.1E-08	8.490E-08	4.47E-16	15%	2.41	24.3
12	57780	0.5107	-0.50	140.3	139.2	5.8E-09	3.0E-09	4.780E-08	4.26E-16	5%	1.39	25.7
13	29220	0.5010	0.50	139.2	137.9	1.4E-08	6.9E-09	5.590E-08	3.31E-16	22%	1.65	27.4
14	57000	0.5010	-0.30	137.9	136.7	6.6E-09	3.3E-09	5.207E-08	3.48E-16	5%	1.52	28.9
15	29160	0.5010	0.10	136.7	135.9	8.6E-09	4.3E-09	3.497E-08	2.81E-16	19%	1.01	29.9
16	57900	0.5307	0.30	135.9	134.3	8.8E-09	4.6E-09	7.475E-08	3.50E-16	25%	2.03	31.9
17	29340	0.5307	0.30	134.3	133.2	1.2E-08	6.4E-09	5.191E-08	4.03E-16	15%	1.39	33.3
18	57300	0.5010	0.20	133.2	132.8	2.2E-09	1.1E-09	1.792E-08	2.24E-16	44%	0.51	33.8
19	28500	0.4962	-0.20	132.8	131.7	1.2E-08	6.2E-09	4.908E-08	2.17E-16	3%	1.39	35.2
20	57000	0.4868	0.20	142.5	141.4	5.8E-09	2.8E-09	4.487E-08	3.05E-16	41%	1.39	36.6
21	29400	0.4915	-0.30	141.4	141.0	4.1E-09	2.0E-09	1.656E-08	1.97E-16	35%	0.51	37.1
22	57600	0.4868	0.50	141.0	139.6	7.4E-09	3.6E-09	5.777E-08	2.37E-16	20%	1.77	38.9
23	85800	0.4868	0.80	139.6	137.8	6.5E-09	3.2E-09	7.514E-08	2.57E-16	8%	2.28	41.2
24	86760	0.4556	-0.90	137.8	136.6	4.3E-09	2.0E-09	4.739E-08	1.97E-16	23%	1.52	42.7
25	86640	0.4513	0.40	136.6	135.5	4.0E-09	1.8E-09	4.340E-08	1.45E-16	26%	1.39	44.1
26	85800	0.4388	-0.20	135.5	134.6	3.3E-09	1.5E-09	3.477E-08	1.26E-16	13%	1.14	45.2
27	86400	0.4732	0.20	134.6	133.6	3.7E-09	1.7E-09	0.000	1.24E-16	2%	1.27	46.5

Average K_{20} (steady state) = 1.78E-09 cm/sec Log Calculation

Average K_{20} (steady state) = 2.03E-09 cm/sec Straight Average (Check)

Note: TWA last 24 hrs all less than 20% difference

SI_ _E STAGE BOREHOLE

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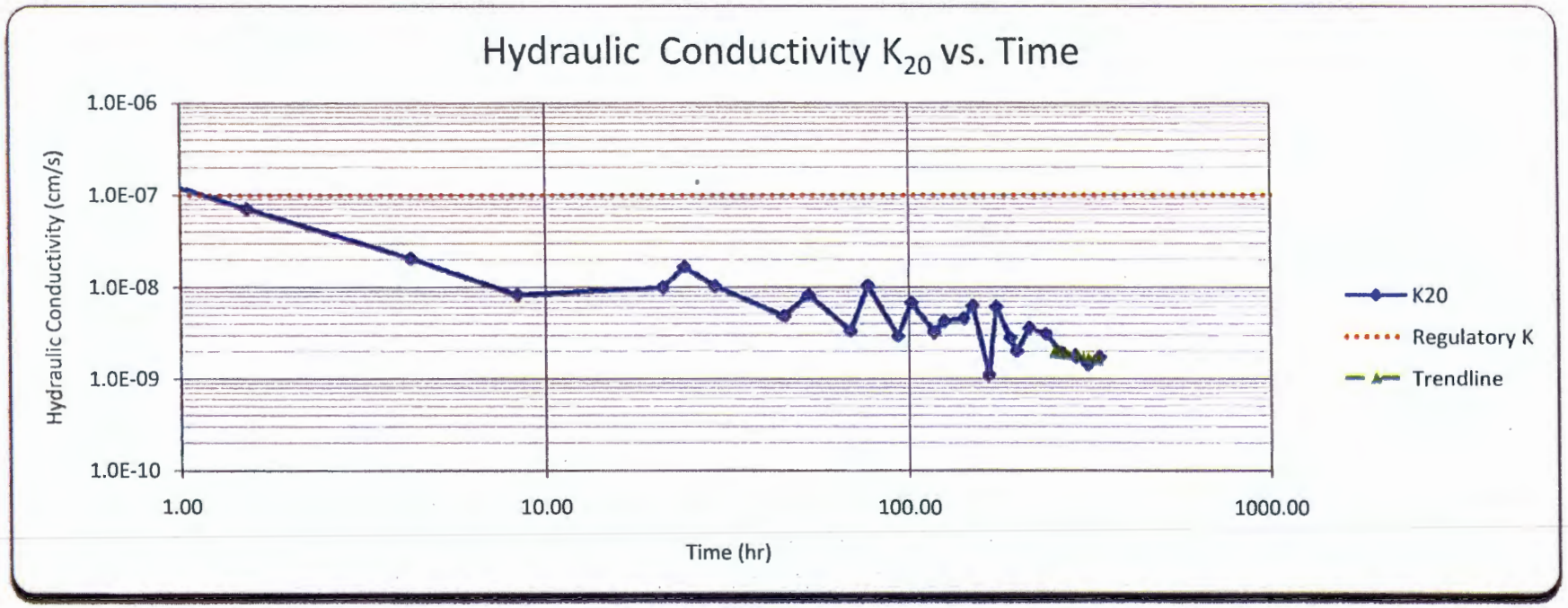
Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-West	Installation Date:	4/28/2010



Trend Line Slope =	0.998	Stable
Average K_{20} (steady state) =	1.78E-09	cm/sec

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Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-Center	Casing Length,(Z1):	18.00	in	45.72	cm
Location:	Floor of Cell 9	Depth to Boundry, (B1):	18.00	in	45.72	cm
Installation Date:	4/28/2010	Top of casing,(Ra):	2.00	in	5.08	cm
Units:	Metric	Buret Inner Diameter (D2):	0.50	in	1.27	cm
Inward Seepage when setting?	No	Casing Inner Dia. (D1):	4.00	in	10.16	cm
Permeable Base(0=infinate depth)	Yes	Variable a:	-1			

Test Data

Dates	End Date/Time	Buret (R)		TEG		TEMPERATURE		Ambient Temp		Tested
Start	End	Initial	Final	Initial	Final	Initial	Final	Initial	Final	By
Date/Time	Date/Time	cm	cm	cm	cm	C	C	C	C	
4/8/10 12:00	4/8/10 12:30	49.80	30.70	44.3	43.7	61.0	55.0	51.0	49.0	TW
4/8/10 12:30	4/8/10 15:15	30.70	27.50	43.7	43.3	55.0	54.0	51.0	53.0	TW
4/8/10 15:15	4/8/10 19:20	27.50	25.60	43.3	43.7	55.0	52.0	52.0	49.0	TW
4/8/10 19:50	4/9/10 8:00	55.30	50.30	43.7	54.7	54.0	43.0	53.0	40.0	TW
4/9/10 8:00	4/9/10 11:05	50.30	49.80	54.7	54.0	52.0	46.0	49.0	50.0	TW
4/9/10 11:05	4/9/10 16:13	49.80	47.30	54.0	53.5	43.0	50.0	40.0	56.0	JV
4/9/10 16:13	4/10/10 8:13	47.30	45.60	53.5	54.1	46.0	43.0	50.0	41.0	LH
4/10/10 8:13	4/10/10 16:00	45.60	44.60	54.1	53.5	50.0	50.0	56.0	60.0	LH
4/10/10 16:00	4/11/10 8:00	44.60	44.30	53.5	53.7	43.0	48.0	41.0	50.0	JV
4/11/10 8:00	4/11/10 16:00	44.30	43.20	53.7	52.8	50.0	52.0	60.0	66.0	JV
4/11/10 16:00	4/12/10 8:03	43.20	42.70	52.8	53.3	48.0	52.0	50.0	52.0	JV
4/12/10 8:03	4/12/10 16:10	42.70	42.10	53.3	52.8	52.0	54.0	66.0	63.0	LH
4/12/10 16:10	4/13/10 8:00	42.10	41.30	52.8	53.1	52.0	52.0	52.0	50.0	LH
4/13/10 8:00	4/13/10 16:06	41.30	41.00	53.1	53.0	54.0	54.0	63.0	65.0	LH
4/13/10 16:06	4/14/10 8:11	41.00	39.80	53.0	52.7	52.0	46.0	50.0	50.0	LH
4/14/10 8:11	4/14/10 16:20	39.80	39.50	52.7	52.4	54.0	54.0	65.0	68.0	LH
4/14/10 16:20	4/15/10 8:15	39.50	39.10	52.4	52.2	46.0	52.0	50.0	46.0	TW
4/15/10 8:15	4/15/10 16:10	39.10	38.30	52.2	52.4	54.0	55.0	68.0	71.0	TW
4/15/10 16:10	4/16/10 8:00	54.10	52.30	52.4	52.2	52.0	54.0	46.0	56.0	TW
4/16/10 8:00	4/16/10 16:10	52.30	51.70	52.2	52.5	55.0	54.0	71.0	75.0	TW
4/16/10 16:10	4/17/10 8:10	51.70	51.00	52.5	52.0	54.0	55.0	56.0	58.0	TW
4/17/10 8:10	4/17/10 16:00	51.00	50.60	52.0	52.4	54.0	59.0	75.0	74.5	TW
4/17/10 16:00	4/18/10 8:00	50.60	49.70	52.4	51.2	55.0	54.0	58.0	56.0	TW
4/18/10 8:00	4/19/10 8:06	49.70	48.70	51.2	52.1	59.0	57.0	74.5	58.0	LH
4/19/10 8:06	4/20/10 8:10	48.70	47.80	52.1	51.7	54.0	63.0	56.0	64.0	JV
4/20/10 8:10	4/21/10 8:00	47.80	46.90	51.7	51.9	59.0	61.0	74.0	53.0	TW
4/21/10 8:00	4/22/10 8:00	46.90	45.80	51.9	51.7	57.0	55.0	58.0	52.0	JV

SIN_ _E STAGE BOREHOLE
HYDRAULIC CONDUCTIVITY ASTM D-6391

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Test Information

Burret Area (A), pi()*D2^2/4 = 1.27 cm

Variable G1 = (pi()*D2^2/(11*D1)*(1+a*(D1/4b)) = 0.0428

Boutwell No.: BW-Center

Location: Floor of Cell 9

Test Information

	Delta Time	Temp Correction	TEG	Height of Water		k_T	K_{20}	k x dt	TWA	%	Volume	Total Vol
Trial No	sec	R_t	fin-init	Hi, cm	Hf, cm	cm/sec	cm/sec	cm	last 2 rates	Change	cm^3	cm^3
1	1800	0.4556	0.60	146.3	127.2	3.3E-06	1.5E-06	7.580E-07			24.20	24.2
2	9900	0.4868	0.40	127.2	124.0	1.1E-07	5.4E-08	1.475E-07	2.15E-14		4.05	28.2
3	14700	0.4962	-0.40	124.0	122.1	4.5E-08	2.2E-08	9.112E-08	2.69E-15	87%	2.41	30.7
4	43800	0.5464	-11.00	151.8	146.8	3.3E-08	1.8E-08	2.176E-07	1.47E-15	46%	6.33	37.0
5	11100	0.5411	0.70	146.8	146.3	1.3E-08	7.1E-09	2.196E-08	1.21E-15	17%	0.63	37.6
6	18480	0.5681	0.50	146.3	143.8	4.0E-08	2.3E-08	1.165E-07	1.30E-15	7%	3.17	40.8
7	57600	0.5909	-0.60	143.8	142.1	8.8E-09	5.2E-09	8.358E-08	7.30E-16	44%	2.15	42.9
8	28020	0.5307	0.60	142.1	141.1	1.1E-08	5.7E-09	4.458E-08	4.16E-16	43%	1.27	44.2
9	57600	0.5794	-0.20	141.1	140.8	1.6E-09	9.2E-10	1.467E-08	1.92E-16	54%	0.38	44.6
10	28800	0.5206	0.90	140.8	139.7	1.2E-08	6.1E-09	4.856E-08	2.03E-16	6%	1.39	46.0
11	57780	0.5307	-0.50	139.7	139.2	2.7E-09	1.4E-09	2.263E-08	2.28E-16	12%	0.63	46.6
12	29220	0.5010	0.50	139.2	138.6	6.3E-09	3.2E-09	2.574E-08	1.54E-16	32%	0.76	47.4
13	57000	0.5107	-0.30	138.6	137.8	4.3E-09	2.2E-09	3.516E-08	1.96E-16	27%	1.01	48.4
14	29160	0.4915	0.10	137.8	137.5	3.2E-09	1.6E-09	1.274E-08	1.54E-16	21%	0.38	48.8
15	57900	0.5411	0.30	137.5	136.3	6.5E-09	3.5E-09	5.641E-08	2.21E-16	43%	1.52	50.3
16	29340	0.4915	0.30	136.3	136.0	3.2E-09	1.6E-09	1.288E-08	2.21E-16	0%	0.38	50.7
17	57300	0.5411	0.20	136.0	135.6	2.2E-09	1.2E-09	1.896E-08	1.02E-16	54%	0.51	51.2
18	28500	0.4868	-0.20	135.6	134.8	8.9E-09	4.3E-09	3.426E-08	1.72E-16	69%	1.01	52.2
19	57000	0.5010	0.20	150.6	148.8	9.0E-09	4.5E-09	7.164E-08	3.44E-16	100%	2.28	54.5
20	29400	0.4868	-0.30	148.8	148.2	5.9E-09	2.9E-09	2.339E-08	3.06E-16	11%	0.76	55.2
21	57600	0.4868	0.50	148.2	147.5	3.5E-09	1.7E-09	2.741E-08	1.62E-16	47%	0.89	56.1
22	28200	0.4687	-0.40	147.5	147.1	4.1E-09	1.9E-09	1.514E-08	1.38E-16	15%	0.51	56.6
23	57600	0.4868	1.20	147.1	146.2	4.6E-09	2.2E-09	3.553E-08	1.64E-16	19%	1.14	57.8
24	86760	0.4556	-0.90	146.2	145.2	3.4E-09	1.5E-09	3.719E-08	1.40E-16	15%	1.27	59.0
25	86640	0.4513	0.40	145.2	144.3	3.1E-09	1.4E-09	3.337E-08	1.13E-16	19%	1.14	60.2
26	85800	0.4388	-0.20	144.3	143.4	3.1E-09	1.4E-09	3.265E-08	1.06E-16	6%	1.14	61.3
27	86400	0.4732	0.20	143.4	142.3	3.8E-09	1.8E-09	4.333E-08	1.23E-16	15%	1.39	62.7

Average K_{20} (steady state) = 1.73E-09 cm/sec Log Calculation

Average K_{20} (steady state) = 1.71E-09 cm/sec Straight Average (Check)

Note: TWA last 24 hrs all less than 20% difference

SI_ _E STAGE BOREHOLE

HYDRAULIC CONDUCTIVITY *ASTM D-6391*

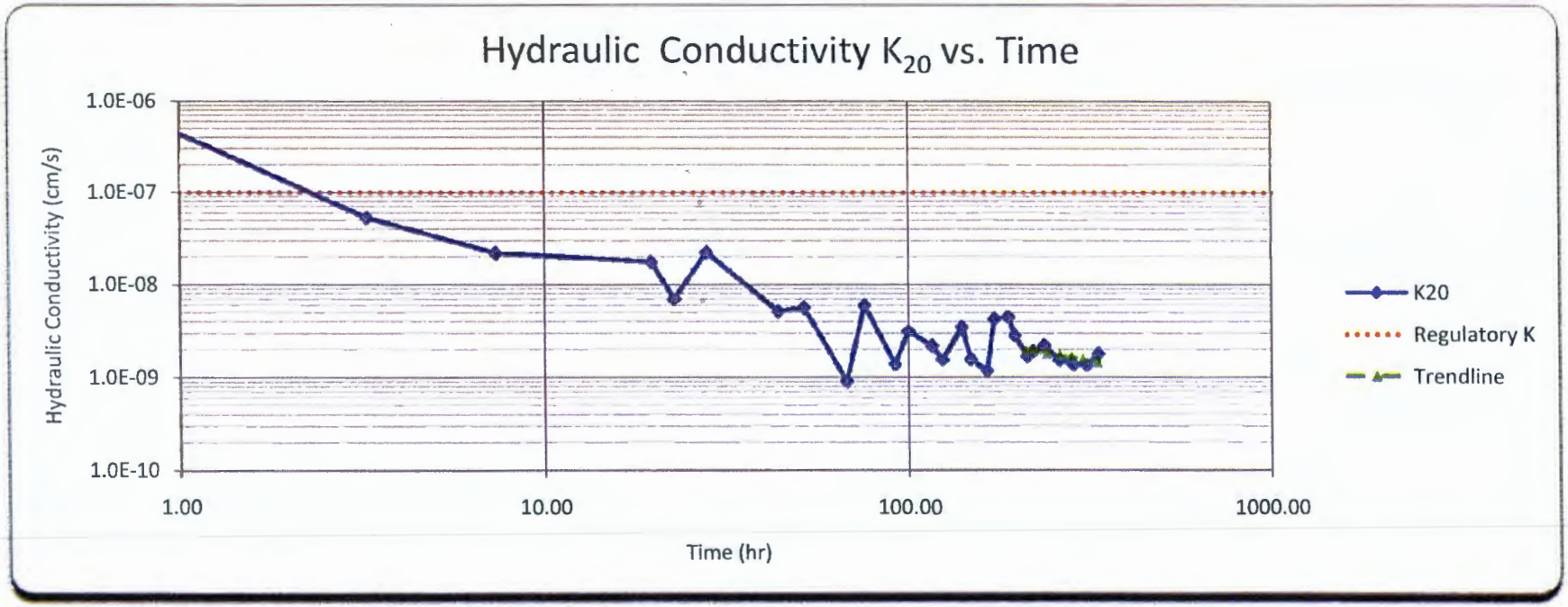
ENVIROTECH
ENGINEERING & CONSULTING, INC
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Project Information

Contact Name:	Charlie Skiba	Project No.:	S013213A00
Project:	ERDF 9&10	Test Location:	Test Pad 1

Test Information

Boutwell No.:	BW-Center	Installation Date:	4/28/2010



Trend Line Slope =	0.998	Stable
Average K_{20} (steady state) =	1.73E-09	cm/sec

APPENDIX D.

FIELD COMPACTION AND TESTING DOCUMENTATION

Field Density Testing Summary

Summary Log: Trench Subgrade

Client: WCH

ENVIROTECH ENGINEERING & CONSULTING

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
SG 9-1	SF-07	Sub	14:00	29	116.0	6.6%	92.8%	108.8	Pass
SG 9-2	SF-07	Sub	14:05	29	119.1	8.9%	93.2%	109.4	Pass
SG 9-3	SF-07	Sub	14:10	29	124.8	10.6%	96.2%	112.8	Pass
SG 9-4	Sf-07	Sub	14:15	29	128.6	10.5%	99.2%	116.4	Pass
SG9-05	SF-07	SG	12:50	58	121.6	4.9%	98.8%	115.9	Pass
SG9-06	SF-07	SG	12:55	58	112.5	3.4%	92.8%	108.8	Pass
SG9-07	SF-07	SG	13:00	58	110.0	2.8%	91.2%	107.0	Pass
SG9-08	SF-07	SG	13:05	58	117.3	2.4%	97.7%	114.6	Pass
SG9-09	SF-07	SG	13:10	58	117.4	3.7%	96.5%	113.2	Pass
SG9-10	SF-07	SG	13:15	58	113.0	2.5%	94.0%	110.2	Pass
SG9-11	SF-07	SG	13:20	58	115.0	3.8%	94.5%	110.8	Pass
SG9-12	SF-07	SG	13:25	58	117.2	2.0%	98.0%	114.9	Pass
SG9-13	SF-07	SG	13:30	58	112.2	2.8%	93.0%	109.1	Pass
SG9-14	SF-07	SG	13:35	58	116.6	2.5%	97.0%	113.8	Pass
SG9-15	SF-07	SG	13:40	58	115.1	4.9%	93.5%	109.7	Pass
SG9-16	SF-07	SG	13:45	58	115.6	2.5%	96.1%	112.8	Pass
SG9-17	SF-07	SG	13:50	58	110.8	1.7%	92.9%	108.9	Pass
SG9-18	SF-07	SG	13:55	58	112.8	2.4%	93.9%	110.2	Pass
SG9-19	SF-07	SG	14:00	58	117.2	2.4%	97.6%	114.5	Pass
SG9-20	SF-07	SG	14:05	58	108.9	2.5%	90.6%	106.2	Pass
SG9-21	SF-07	SG	14:10	58	117.3	2.9%	97.2%	114.0	Pass
SG9-22	SF-07	SG	14:15	58	116.6	2.5%	97.0%	113.8	Pass
SG9-23	SF-07	SG	14:20	58	115.8	1.7%	97.1%	113.9	Pass
SG9-24	SF-07	SG	14:25	58	121.0	4.0%	99.2%	116.3	Pass
SG9-25	SF-07	SG	14:30	58	117.9	4.0%	96.6%	113.4	Pass
SG9-26	SF-07	SG	14:35	58	112.2	2.3%	93.5%	109.7	Pass
SG9-27	SF-07	SG	14:40	58	111.3	1.8%	93.2%	109.3	Pass
SG9-28	SF-07	Sub	9:15	73	119.3	8.1%	94.1%	110.4	Pass
SG9-29	SF-07	Sub	9:18	73	118.5	9.2%	92.5%	108.5	Pass
SG9-30	SF-07	Sub	9:21	73	120.6	10.2%	93.3%	109.4	Pass
SG9-31	SF-07	Sub	9:25	73	121.3	10.3%	93.8%	110.0	Pass

Field Density Testing Summary

Summary Log: Trench Subgrade

Client: WCH

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
SG9-32	SF-07	Sub	9:30	73	120.1	8.6%	94.3%	110.6	Pass
SG9-33	SF-07	Sub	9:37	73	119.7	7.5%	94.9%	111.3	Pass
SG9-34	SF-07	Sub	9:41	73	119.5	6.8%	95.4%	111.9	Pass
SG9-35	SF-07	Sub	9:45	73	122.5	9.9%	95.0%	111.5	Pass
SG9-36	SF-07	Sub	9:48	73	120.7	10.1%	93.5%	109.6	Pass
SG9-37	SF-07	Sub	9:52	73	119.3	11.3%	91.4%	107.2	Pass
SG9-38	SF-07	Sub	9:55	73	119.6	12.2%	90.9%	106.6	Pass
SG9-39	SF-07	Sub	9:57	73	121.6	9.3%	94.8%	111.3	Pass
SG9-40	SF-07	Sub	10:03	73	120.1	8.7%	94.2%	110.5	Pass
SG9-41	SF-07	Sub	10:07	73	120.4	9.9%	93.4%	109.6	Pass
SG9-42	SF-07	Sub	10:12	73	119.3	11.5%	91.2%	107.0	Pass
SG9-43	SF-07	Sub	15:15	73	122.5	11.8%	93.4%	109.6	Pass
SG9-44	SF-07	Sub	10:18	73	121.3	12.5%	91.9%	107.8	Pass
SG9-45	SF-07	Sub	10:21	73	118.5	6.5%	94.9%	111.3	Pass
SG9-46	SF-07	Sub	10:25	73	119.0	7.7%	94.2%	110.5	Pass
SG9-47	SF-07	Sub	10:28	73	118.3	5.9%	95.2%	111.7	Pass
SG9-48	SF-07	Sub	10:33	73	117.6	6.1%	94.5%	110.8	Pass
SG9-49	SF-07	Sub	10:36	73	119.4	7.5%	94.7%	111.1	Pass
SG9-50	SF-07	Sub	10:39	73	118.9	8.9%	93.1%	109.2	Pass
SG9-51	SF-07	Sub	10:43	73	118.6	9.9%	92.0%	107.9	Pass
SG9-52	SF-07	Sub	15:30	76	121.5	13.4%	91.3%	107.1	Pass

Field Density Testing Summary

Summary Log: Lysimeter Gravel

Client: WCH

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
Cell 9 Lysimeter Sump (Necessary 90% Compaction)									
CG9-01	DGC-01	1	11:46	95	146.1	7.3%	95.4%	136.2	Pass

Field Density Testing Summary

ENVIROTECH
ENGINEERING & CONSULTING INC.

Summary Log: Lysimeter Riser Trench

Client: WCH

Note: Unless otherwise noted, all testing was verified to 90% modified Proctor

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
Cell 9 Lysimeter									
LY9-01	SF-06	1	12:55	61	126.2	8.6%	96.2%	116.2	Pass
LY9-02	SF-06	2	12:05	64	129.6	9.6%	97.9%	118.2	Pass

Field Density Testing Summary

ENVIROTECH ENGINEERING & CONSULTING, INC

Summary Log: Leachate Transmission Line

Client: WCH

Note: Unless otherwise noted, all testing was verified to 90% modified Proctor

Test No	Proctor	Lift Num	Time	Test Depth	Report Number	Wet Den. lbs/cuft	% Moist Content	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
Leachate Transmission Line: MH-32 to Crest Pad 9										
LT-09	SF-06	1	9:15	12	60	122.7	9.4%	92.8%	112.2	Pass
LT-10	SF-06	2	9:45	6	60	121.0	7.4%	93.3%	112.7	Pass
LT-11	SF-06	3	10:45	6	60	125.3	11.4%	93.1%	112.5	Pass
LT-12	SF-06	4	12:00	6	60	118.5	6.8%	91.9%	111.0	Pass
LT-13	SF-06	5	15:10	6	60	134.5	13.7%	97.9%	118.3	Pass
LT-14	SF-06	6	15:50	6	60	122.8	10.8%	91.7%	110.8	Pass
Leachate Transmission Line: MH-32 to Crest Pad 9										
LT-15	SF-06	7	7:22	6	61	123.3	10.0%	92.8%	112.1	Pass
LT-16	SF-06	8	9:00	6	61	124.9	12.6%	91.8%	110.9	Pass
LT-17	SF-06	9	9:41	6	61	120.1	9.2%	91.0%	110.0	Pass
LT-18	SF-06	10	12:45	6	61	129.5	14.2%	93.9%	113.4	Pass

Field Density Testing Summary

ENVIROTECH ENGINEERING & CONSULTING INC

Summary Log: Leachate Transmission Manholes

Client: WCH

Note: Unless otherwise noted, all testing was verified to 90% modified Proctor

Test No	Proctor	Lift Num	Time	Test Depth	Report Number	Wet Den. lbs/cuft	% Moist Content	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
Manhole #32										
MH32-01	SF-06	Sub	14:20	12	31	130.7	5.3%	102.7%	124.1	Pass
MH32-02	SF-06	Sub	14:25	12	31	126.0	4.9%	99.4%	120.1	Pass
Manhole #32										
MH32-03	SF-06	1	9:45	12	36	130.7	11.3%	97.2%	117.4	Pass
MH32-04	SF-06	2	10:45	12	36	125.0	7.4%	96.3%	116.4	Pass
MH32-05	SF-06	3	11:50	12	36	124.7	8.3%	95.3%	115.1	Pass
MH32-06	SF-06	4	13:00	12	36	128.4	7.9%	98.5%	119.0	Pass

Field Density Testing Summary

Summary Log: South Berm

Client: WCH

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
South Berm									
SB-01	SF-01	SG	N/A	14	128.4	4.1%	99.1%	123.3	Pass
SB-02	SF-01	SG	N/A	14	128.1	5.7%	97.4%	121.2	Pass
SB-03	SF-03	1	N/A	14	117.2	4.0%	90.8%	112.7	Pass
SB-04	SF-03	1	N/A	14	125.3	10.2%	91.6%	113.7	Pass
South Berm									
SB-05	SF-03	2	12:45	15	125.8	11.9%	90.6%	112.4	Pass
SB-06	SF-03	2	12:51	15	124.2	10.6%	90.5%	112.3	Pass
SB-07	SF-03	2	12:57	15	125.0	8.8%	92.6%	114.9	Pass
South Berm									
SB-08	SF-05	3	9:15	16	121.7	8.7%	97.4%	112.0	Pass
SB-09	SF-05	3	9:18	16	119.6	7.5%	96.7%	111.3	Pass
SB-10	SF-05	3	9:25	16	125.5	11.9%	97.5%	112.2	Pass
SB-11	SF-05	4	16:25	16	124.0	10.7%	97.4%	112.0	Pass
SB-12	SF-05	4	16:29	16	117.6	8.0%	94.7%	108.9	Pass
SB-13	SF-05	4	16:34	16	116.9	7.8%	94.3%	108.4	Pass
South Berm									
SB-14	SF-05	5	7:06	18	114.9	9.6%	91.2%	104.8	Pass
SB-15	SF-05	5	7:09	18	116.3	10.0%	91.9%	105.7	Pass
SB-16	SF-05	5	7:13	18	118.4	11.5%	92.3%	106.2	Pass
SB-17	SF-05	6	14:50	18	116.9	11.0%	91.6%	105.3	Pass
SB-18	SF-05	6	14:55	18	124.1	12.1%	96.3%	110.7	Pass
SB-19	SF-05	6	15:05	18	125.0	11.9%	97.1%	111.7	Pass
South Berm									
SB-20	SF-05	7	12:30	19	120.9	7.0%	98.3%	113.0	Pass
SB-21	SF-05	7	12:35	19	113.9	5.3%	94.1%	108.2	Pass
SB-22	SF-05	7	12:40	19	111.7	7.2%	90.6%	104.2	Pass
South Berm									
SB-23	SF-05	8	13:00	20	120.7	9.0%	96.3%	110.7	Pass
SB-24	SF-05	8	13:05	20	121.3	9.4%	96.4%	110.9	Pass
SB-25	SF-05	8	13:10	20	121.2	9.5%	96.2%	110.7	Pass

Field Density Testing Summary

Summary Log: South Berm

Client: WCH

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
South Berm									
SB-26	SF-05	9	10:30	21	129.0	12.9%	99.4%	114.3	Pass
SB-27	SF-05	9	10:35	21	123.6	12.4%	95.6%	110.0	Pass
SB-28	SF-05	9	10:40	21	122.5	11.9%	95.2%	109.5	Pass
South Berm									
SB-29	SF-05	10	7:30	22	117.1	5.7%	96.3%	110.8	Pass
SB-30	SF-05	10	7:35	22	122.3	6.5%	99.9%	114.8	Pass
SB-31	SF-05	10	7:44	22	119.7	8.1%	96.3%	110.7	Pass
South Berm									
SB-32	SF-05	11	7:30	23	120.3	8.7%	96.2%	110.7	Pass
SB-33	SF-05	11	7:35	23	118.7	8.8%	95.0%	109.1	Pass
SB-34	SF-05	11	7:40	23	121.6	8.1%	97.8%	112.5	Pass
SB-35	SF-05	12	15:45	23	122.3	11.9%	95.0%	109.3	Pass
SB-36	SF-05	12	15:50	23	125.2	12.9%	96.4%	110.9	Pass
SB-37	SF-05	12	15:55	23	123.1	10.2%	97.1%	111.7	Pass
South Berm									
SB-38	SF-05	13	15:00	24	120.3	9.7%	95.4%	109.7	Pass
SB-39	SF-05	13	15:05	24	120.9	9.7%	95.8%	110.2	Pass
SB-40	SF-05	13	15:10	24	121.2	9.1%	96.6%	111.1	Pass
South Berm									
SB-41	SF-05	14	6:40	26	120.9	9.9%	95.7%	110.0	Pass
SB-42	SF-05	14	6:43	26	121.7	10.1%	96.1%	110.5	Pass
SB-43	SF-05	14	6:47	26	121.7	9.8%	96.4%	110.8	Pass
SB-44	SF-05	15	15:30	26	123.1	10.2%	97.1%	111.7	Pass
SB-45	SF-05	15	15:34	26	124.2	10.1%	98.1%	112.8	Pass
SB-46	SF-05	15	15:45	26	123.2	10.0%			
South Berm									
SB-47	SF-05	16	9:30	27	126.4	13.2%	97.1%	111.7	Pass
SB-48	SF-05	16	9:35	27	125.1	12.8%	96.4%	110.9	Pass
SB-49	SF-05	16	9:40	27	125.5	12.6%	96.9%	111.5	Pass
outh Berm									

Field Density Testing Summary

Summary Log: South Berm

Client: WCH

ENVIROTECH ENGINEERING & CONSULTING, INC

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
SB-50	SF-05	17	12:30	28	121.4	8.5%	97.3%	111.9	Pass
SB-51	SF-05	17	12:35	28	123.9	10.7%	97.3%	111.9	Pass
SB-52	SF-05	17	12:40	28	120.6	7.1%	97.9%	112.6	Pass

Field Density Testing Summary

Summary Log: North Berm Testing

Client: WCH

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
North Berm									
NB-01	SF-02	SG	10:20	10	122.3	3.8%	98.2%	117.8	Pass
NB-02	SF-02	SG	13:50	10	124.1	6.1%	97.6%	117.0	Pass
North Berm									
NB-03	SF-03	SG	8:00	6	121.1	6.9%	91.2%	113.2	Pass
NB-04	SF-03	SG	8:13	6	123.0	10.1%	90.0%	111.7	Pass
North Berm									
NB-05	SF-03	2	N/A	14	134.3	9.4%	98.9%	122.7	Pass
NB-06	SF-03	2	N/A	14	129.8	8.7%	96.2%	119.4	Pass
North Berm									
NB-07	SF-03	3	7:45	15	119.2	9.2%	88.0%	109.2	Fail
NB-08	SF-03	3	7:51	15	111.8	6.9%	84.3%	104.6	Fail
NB-07A	SF-03	3	8:46	15	126.0	12.1%	90.6%	112.4	Pass
NB-08A	SF-03	3	8:50	15	120.8	6.4%	91.5%	113.5	Pass
NB-09	SF-03	3	8:56	15	125.2	9.4%	92.2%	114.4	Pass
NB-10	SF-03	4	15:55	15	125.4	11.1%	91.0%	112.9	Pass
NB-11	SF-03	4	16:03	15	130.9	9.9%	96.0%	119.1	Pass
NB-12	SF-03	4	16:12	15	127.0	10.9%	92.3%	114.5	Pass
North Berm									
NB-13	SF-05	5	13:05	16	115.3	9.4%	91.6%	105.4	Pass
NB-14	SF-05	5	13:09	16	117.5	9.2%	93.6%	107.6	Pass
NB-15	SF-05	5	13:15	16	109.6	5.3%	90.5%	104.1	Pass
North Berm									
NB-16	SF-05	6	12:30	17	127.8	13.2%	98.2%	112.9	Pass
NB-17	SF-05	6	12:41	17	126.2	12.2%	97.8%	112.5	Pass
NB-18	SF-05	6	12:47	17	122.4	10.6%	96.2%	110.7	Pass
North Berm									
NB-19	SF-05	7	10:00	18	114.6	4.8%	95.1%	109.4	Pass
NB-20	SF-05	7	10:05	18	113.7	3.5%	95.5%	109.9	Pass
NB-21	SF-05	7	10:10	18	117.1	6.3%	95.8%	110.2	Pass
North Berm									

Field Density Testing Summary

Summary Log: North Berm Testing

Client: WCH

ENVIROTECH ENGINEERING & CONSULTING, INC

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
NB-22	SF-05	8	8:50	19	120.1	9.8%	95.1%	109.4	Pass
NB-23	SF-05	8	8:55	19	119.5	8.8%	95.5%	109.8	Pass
NB-24	SF-05	8	9:00	19	125.0	11.1%	97.8%	112.5	Pass
North Berm									
NB-25	SF-06	9	8:45	20	112.8	6.4%	93.4%	106.0	Pass
NB-26	SF-06	9	8:44	20	112.5	6.7%	92.9%	105.4	Pass
NB-25A	SF-06	9	9:35	20	116.5	7.2%	95.7%	108.7	Pass
NB-26A	SF-06	9	9:37	20	119.1	10.4%	95.0%	107.9	Pass
NB-27	SF-06	9	9:40	20	117.0	8.3%	95.2%	108.0	Pass
North Berm									
NB-28	SF-05	10	8:00	21	122.9	11.1%	96.2%	110.6	Pass
NB-29	SF-05	10	8:05	21	123.4	8.1%	99.3%	114.2	Pass
NB-30	SF-05	10	8:15	21	125.1	14.2%	95.3%	109.5	Pass
NB-31	SF-05	11	14:15	21	121.8	10.8%	95.6%	109.9	Pass
NB-32	SF-05	11	14:19	21	123.5	12.1%	95.8%	110.2	Pass
NB-33	SF-05	11	14:23	21	121.7	8.9%	97.2%	111.8	Pass
North Berm									
NB-34	SF-05	12	12:30	22	121.7	10.0%	96.2%	110.6	Pass
NB-35	SF-05	12	12:37	22	123.0	10.2%	97.1%	111.6	Pass
NB-36	SF-05	12	12:44	22	125.9	11.7%	98.0%	112.7	Pass
North Berm									
NB-37	SF-05	13	12:40	23	123.5	9.7%	97.9%	112.6	Pass
NB-38	SF-05	13	12:45	23	127.6	12.4%	98.7%	113.5	Pass
NB-39	SF-05	13	12:55	23	123.4	12.0%	95.8%	110.2	Pass
North Berm									
NB-40	SF-05	14	9:45	24	117.4	12.7%	90.6%	104.2	Pass
NB-40A	SF-05	14	11:45	24	125.3	12.6%	96.8%	111.3	Pass
NB-41	SF-05	14	11:50	24	125.2	10.5%	98.5%	113.3	Pass
NB-42	SF-05	14	11:55	24	119.9	9.4%	95.3%	109.6	Pass
North Berm									
NB-43	SF-05	15	12:00	25	126.7	14.4%	96.3%	110.8	Pass

Field Density Testing Summary

Summary Log: North Berm Testing

Client: WCH

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
NB-44	SF-05	15	12:05	25	126.0	12.9%	97.0%	111.6	Pass
NB-45	SF-05	15	12:10	25	126.6	12.5%	97.9%	112.5	Pass
North Berm									
NB-46	SF-05	16	16:05	28	120.9	9.6%	95.9%	110.3	Pass
NB-47	SF-05	16	16:10	28	120.6	8.9%	96.3%	110.7	Pass
NB-48	SF-05	16	16:15	28	120.1	9.1%	95.7%	110.1	Pass

Field Density Testing Summary

ENVIROTECH ENGINEERING & CONSULTING INC

Summary Log: Electrical Bank

Client: WCH

Note: Unless otherwise noted, all testing was verified to 95% modified Proctor

Test No	Proctor	Lift Num	Time	Report Number	Wet Den. lbs/cuft	Moist Content (%)	Percent Proctor	Dry Den. lbs/cuft	Pass / Fail
Electrical Duct Bank between Cell 9									
EB-01	SF-06	1	12:52	93	123.0	6.9%	95.2%	115.1	Pass
EB-02	SF-06	1	14:07	93	122.8	6.7%	95.3%	115.1	Pass
EB-03	SF-06	2	14:13	93	125.8	5.5%	98.7%	119.2	Pass
EB-04	SF-06	2	15:41	93	130.3	12.3%	96.1%	116.0	Pass
Electrical Duct Bank between Cell 9 and 10									
EB-05	SF-06	2	8:15	94	121.8	6.0%	95.1%	114.9	Pass
EB-06	SF-06	1	9:25	94	129.8	11.5%	96.4%	116.4	Pass
EB-07	SF-06	2	14:50	94	129.0	12.0%	95.3%	115.2	Pass
Electrical Bank between Cell 9 and 10									
EB-08	SF-06	1	13:23	95	128.3	6.2%	100.0%	120.8	Pass

D.1

TRENCH SUBGRADE

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 05-18C Trench Subgrade

Soil Information

Project:	ERDF Cells 9-10 Expansion			Proctor:	SF-07
Project ID:	S013213A00			Max Dry Density (pcf):	117.3
Report No.	05-016-029	Date	3/22/2010	Optimum Moisture (%):	11.5%
Description:	Test Pad Subgrade Verification			Proctor:	
Troxler ID:	27881			Max Dry Density (pcf):	
Moist Std:	640	Density Std.	2199	Optimum Moisture (%):	
Moist offset:	-	Density offset:	-	Proctor:	
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	
Necessary % Proctor:		90%		Optimum Moisture (%):	

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
SG 9-1	Test Pad Subgrade	SF-07	Sub	14:00	LH	8	116.0	6.6%	92.8%	108.8	PASS
SG 9-2	Test Pad Subgrade	SF-07	Sub	14:05	LH	8	119.1	8.9%	93.2%	109.4	PASS
SG 9-3	Test Pad Subgrade	SF-07	Sub	14:10	LH	8	124.8	10.6%	96.2%	112.8	PASS
SG 9-4	Test Pad Subgrade	Sf-07	Sub	14:15	LH	8	128.6	10.5%	99.2%	116.4	PASS

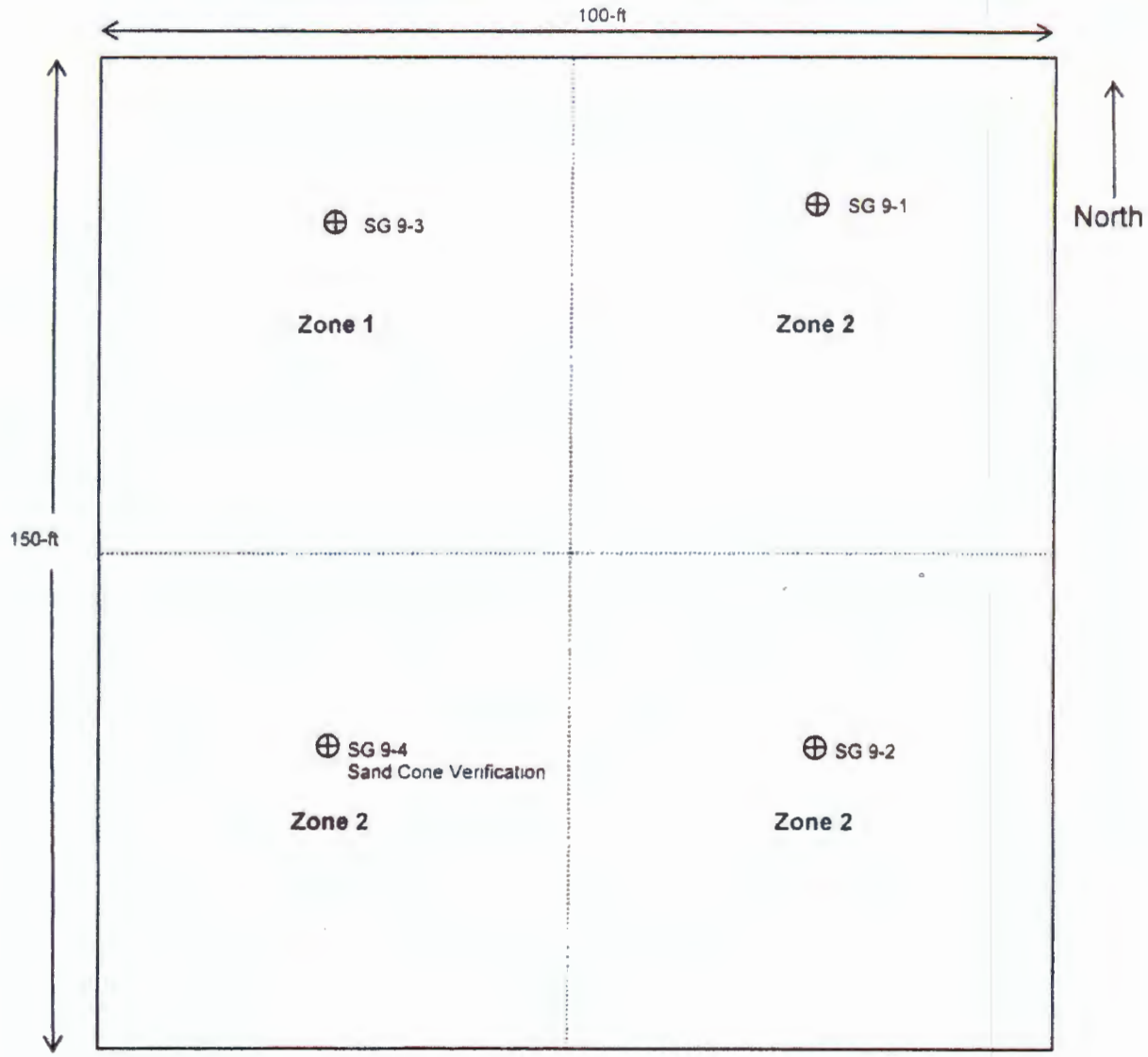
Reviewed by: TW

Envirotech Engineering & Consulting, Inc

5/5/10
Date

CQA Moisture Density Map Cell 10

Date:	3/22/2010	Lift:	Sub-Grade
Report:	05-016-029	Operator:	L. Hay
Map:	Test Pad	Material:	Brown Sand



South Embankment Toe (Cell 9)

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Submittal: 05-18B Earthwork Field Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SG9-04
Project:	S013213A00			Sample Description:	Brown Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/22/2010
Tested By:	L. Hay	Date:	3/22/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams TW	Date:	3/23/2010	Date Received:	3/22/2010
Comments				Report No.:	05-016-029

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3955.80 g
2. Mass of Proctor mold + sand, W_2	5396.10 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.26 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6718.40 g
6. Mass of bottle + cone + sand (after use), W_4	5097.10 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.57 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6138.3 g
9. Mass of bottle + cone + sand (after use), W_8	1785.3 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0632 ft^3
11. Mass of gallon can, W_5	0.00 g
12. Mass of gallon can + moist soil, W_7	3666.50 g
13. Mass of gallon can + dry soil, W_9	3313.90 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	127.86 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	10.6%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	115.56 lb/ft^3
17. Comparision moisture content =	10.5%
18. Dry unit weight comparison =	128.6 lb/ft^3

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 5-18C Trench Subgrade

Soil Information

Project:	ERDF Cells 9-10 Expansion		
Project ID:	S013213A00		
Report No	05-16-058	Date	4/30/2010
Description:	Cell 9 Subgrade		
Troxler ID:	27881		
Moist Std:	644	Density Std:	2224
Moist offset:	-	Density offset:	-
Allowable Moisture Range:	N/A		
Necessary % Proctor.	90%		

Proctor:	SF-05
Max Dry Density (pcf):	124.4
Optimum Moisture (%):	12.5%
Proctor:	SF-06
Max Dry Density (pcf):	120.8
Optimum Moisture (%):	14.3%
Proctor:	SF-07
Max Dry Density (pcf).	117.3
Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Cell 9 Subgrade											
SG9-05	Cell Floor M-1	SF-07	SG	12:50	LH	8	121.6	4.9%	98.8%	115.9	PASS
SG9-06	Cell Floor L-1	SF-07	SG	12:55	LH	8	112.5	3.4%	92.8%	108.8	PASS
SG9-07	Cell Floor K-1	SF-07	SG	13:00	LH	8	110.0	2.8%	91.2%	107.0	PASS
SG9-08	Cell Floor J-1	SF-07	SG	13:05	LH	8	117.3	2.4%	97.7%	114.6	PASS
SG9-09	Cell Floor I-1	SF-07	SG	13:10	LH	8	117.4	3.7%	96.5%	113.2	PASS
SG9-10	Cell Floor I-2	SF-07	SG	13.15	LH	8	113.0	2.5%	94.0%	110.2	PASS
SG9-11	Cell Floor J-2	SF-07	SG	13:20	LH	8	115.0	3.8%	94.5%	110.8	PASS
SG9-12	Cell Floor K-2	SF-07	SG	13:25	LH	8	117.2	2.0%	98.0%	114.9	PASS
SG9-13	Cell Floor L-2	SF-07	SG	13:30	LH	8	112.2	2.8%	93.0%	109.1	PASS
SG9-14	Cell Floor M-2	SF-07	SG	13:35	LH	8	116.6	2.5%	97.0%	113.8	PASS
SG9-15	Cell Floor L-3	SF-07	SG	13:40	LH	8	115.1	4.9%	93.5%	109.7	PASS
SG9-16	Cell Floor K-3	SF-07	SG	13:45	LH	8	115.6	2.5%	96.1%	112.8	PASS
SG9-17	Cell Floor J-3	SF-07	SG	13:50	LH	8	110.8	1.7%	92.9%	108.9	PASS
SG9-18	Cell Floor I-3	SF-07	SG	13:55	LH	8	112.8	2.4%	93.9%	110.2	PASS
SG9-19	Cell Floor I-4	SF-07	SG	14:00	LH	8	117.2	2.4%	97.6%	114.5	PASS
SG9-20	Cell Floor J-4	SF-07	SG	14:05	LH	8	108.9	2.5%	90.6%	106.2	PASS

Reviewed by: TW

Envirotech Engineering & Consulting Inc

5/5/10
Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 5-18C Trench Subgrade

Soil Information

Project	ERDF Cells 9-10 Expansion		
Project ID	S013213A00		
Report No	05-16-058	Date	4/30/2010
Description:	Cell 9 Subgrade		
Troxler ID	27881		
Moist Std:	644	Density Std:	2224
Moist offset:	-	Density offset:	-
Allowable Moisture Range:		N/A	
Necessary % Proctor:		90%	

Proctor:	SF-05
Max Dry Density (pcf):	124.4
Optimum Moisture (%):	12.5%
Proctor:	SF-06
Max Dry Density (pcf):	120.8
Optimum Moisture (%):	14.3%
Proctor:	SF-07
Max Dry Density (pcf):	117.3
Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Cell 9 Subgrade											
SG9-21	Cell Floor K-4	SF-07	SG	14:10	LH	8	117.3	2.9%	97.2%	114.0	PASS
SG9-22	Cell Floor L-1	SF-07	SG	14:15	LH	8	116.6	2.5%	97.0%	113.8	PASS
SG9-23	Cell Floor K-1	SF-07	SG	14:20	LH	8	115.8	1.7%	97.1%	113.9	PASS
SG9-24	Cell Floor J-1	SF-07	SG	14:25	LH	8	121.0	4.0%	99.2%	116.3	PASS
SG9-25	Cell Floor I-1	SF-07	SG	14:30	LH	8	117.9	4.0%	96.6%	113.4	PASS
SG9-26	Cell Floor I-2	SF-07	SG	14:35	LH	8	112.2	2.3%	93.5%	109.7	PASS
SG9-27	Cell Floor J-2	SF-07	SG	14:40	LH	8	111.3	1.8%	93.2%	109.3	PASS
Sand Cone Verification											
SCV-09	Cell Floor	-	SG	14.45	LH	6	111.1	2.3%	-	108.6	-

Reviewed by TW

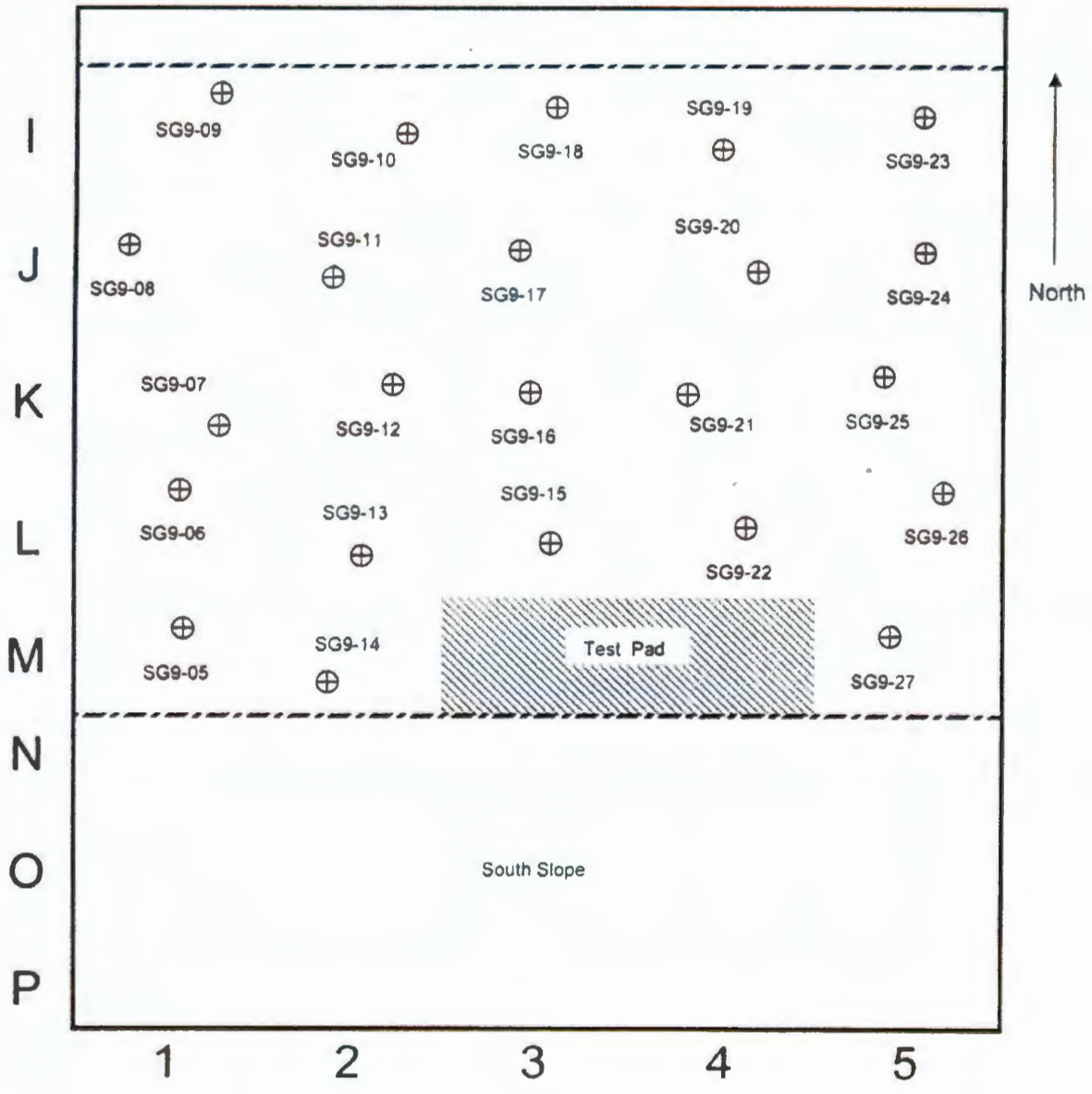
Envirotech Engineering & Consulting, Inc

5/5/10
Date

S/C: S66X528A00

CQA Moisture Density Map Cell 9

Date:	30-Apr-10	Lift:	Subgrade
Report:	58	Operator:	LH
Map No.	58-01	Material.	Admix
Grid:	100-ft x 90-ft	Notes:	



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18B Earthwork Field Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SCV-09
Project:	S013213A00			Sample Description:	Brown/Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	4/30/2010
Tested By:	L. Hay	Date:	4/30/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	5/3/2010	Date Received:	4/30/2010
Comments	Taken on the Cell 9 Floor			Report No.:	05-016-058

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.60 g
2. Mass of Proctor mold + sand, W_2	5394.30 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.09 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	3768.20 g
6. Mass of bottle + cone + sand (after use), W_4	2132.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6497.1 g
9. Mass of bottle + cone + sand (after use), W_8	3010.0 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma_d\,(sand)}$	0.0429 ft^3
11. Mass of gallon can, W_5	394.20 g
12. Mass of gallon can + moist soil, W_7	2578.50 g
13. Mass of gallon can + dry soil, W_9	2523.00 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	112.19 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	2.6%
16. Dry unit weight in the field, $\gamma_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	109.34 lb/ft^3
17. Comparision moisture content =	2.3%
18. Dry unit weight comparison =	108.6 lb/ft^3

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 05-18C Earthwork Subgrade

Soil Information

Project:	ERDF Cells 9-10 Expansion		
Project ID:	S013213A00		
Report No	05-016-073	Date	5/21/2010
Description:	Brown/Black Sand		
Troxler ID:	27881		
Moist Std:	638	Density Std:	2237
Moist offset:	-	Density offset:	-
Allowable Moisture Range:	N/A		
Necessary % Proctor:	90%		

Proctor:	SF-01
Max Dry Density (pcf):	113.6
Optimum Moisture (%):	12.4%
Proctor:	SF-06
Max Dry Density (pcf):	120.8
Optimum Moisture (%):	14.3%
Proctor:	SF-07
Max Dry Density (pcf):	117.3
Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
SG-28	Zone H1	SF-07	Sub	9:15	LH	8	119.3	8.1%	94.1%	110.4	PASS
SG-29	Zone H2	SF-07	Sub	9:18	LH	8	118.5	9.2%	92.5%	108.5	PASS
SG-30	Zone H3	SF-07	Sub	9:21	LH	8	120.6	10.2%	93.3%	109.4	PASS
SG-31	Zone H4	SF-07	Sub	9:25	LH	8	121.3	10.3%	93.8%	110.0	PASS
SG-32	Zone H5	SF-07	Sub	9:30	LH	8	120.1	8.6%	94.3%	110.6	PASS
SG-33	Zone G5	SF-07	Sub	9:37	LH	8	119.7	7.5%	94.9%	111.3	PASS
SG-34	Zone G4	SF-07	Sub	9:41	LH	8	119.5	6.8%	95.4%	111.9	PASS
SG-35	Zone G3	SF-07	Sub	9:45	LH	8	122.5	9.9%	95.0%	111.5	PASS
SG-36	Zone G2	SF-07	Sub	9:48	LH	8	120.7	10.1%	93.5%	109.6	PASS
SG-37	Zone G1	SF-07	Sub	9:52	LH	8	119.3	11.3%	91.4%	107.2	PASS
SG-38	Zone F1	SF-07	Sub	9:55	LH	8	119.6	12.2%	90.9%	106.6	PASS
SG-39	Zone F2	SF-07	Sub	9:57	LH	8	121.6	9.3%	94.8%	111.3	PASS
SG-40	Zone F3	SF-07	Sub	10:03	LH	8	120.1	8.7%	94.2%	110.5	PASS
SG-41	Zone F4	SF-07	Sub	10:07	LH	8	120.4	9.9%	93.4%	109.6	PASS
SG-42	Zone F5	SF-07	Sub	10:12	LH	8	119.3	11.5%	91.2%	107.0	PASS
SG-43	Zone E5	SF-07	Sub	15:15	LH	8	122.5	11.8%	93.4%	109.6	PASS
SG-44	Zone D5	SF-07	Sub	10:18	LH	8	121.3	12.5%	91.9%	107.8	PASS

Reviewed by: TW

nvirotech Engineering & Consulting, Inc

5/26/10
Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 05-18C Earthwork Subgrade

Soil Information

Project	ERDF Cells 9-10 Expansion		
Project ID	S013213A00		
Report No	05-016-073	Date	5/21/2010
Description	Brown/Black Sand		
Troxler ID	27881		
Moist Std	638	Density Std.	2237
Moist offset	-	Density offset:	-
Allowable Moisture Range	N/A		
Necessary % Proctor:	90%		

Proctor	SF-01
Max Dry Density (pcf):	113.6
Optimum Moisture (%):	12.4%
Proctor	SF-06
Max Dry Density (pcf):	120.8
Optimum Moisture (%):	14.3%
Proctor:	SF-07
Max Dry Density (pcf):	117.3
Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
SG-45	Zone D4	SF-07	Sub	10:21	LH	8	118.5	6.5%	94.9%	111.3	PASS
SG-46	Zone E4	SF-07	Sub	10:25	LH	8	119.0	7.7%	94.2%	110.5	PASS
SG-47	Zone E3	SF-07	Sub	10:28	LH	8	118.3	5.9%	95.2%	111.7	PASS
SG-48	Zone E2	SF-07	Sub	10:33	LH	8	117.6	6.1%	94.5%	110.8	PASS
SG-49	Zone E1	SF-07	Sub	10:36	LH	8	119.4	7.5%	94.7%	111.1	PASS
SG-50	Zone D1	SF-07	Sub	10:39	LH	8	118.9	8.9%	93.1%	109.2	PASS
SG-51	Zone D2	SF-07	Sub	10:43	LH	8	118.6	9.9%	92.0%	107.9	PASS

Reviewed by: TW

5/26/10

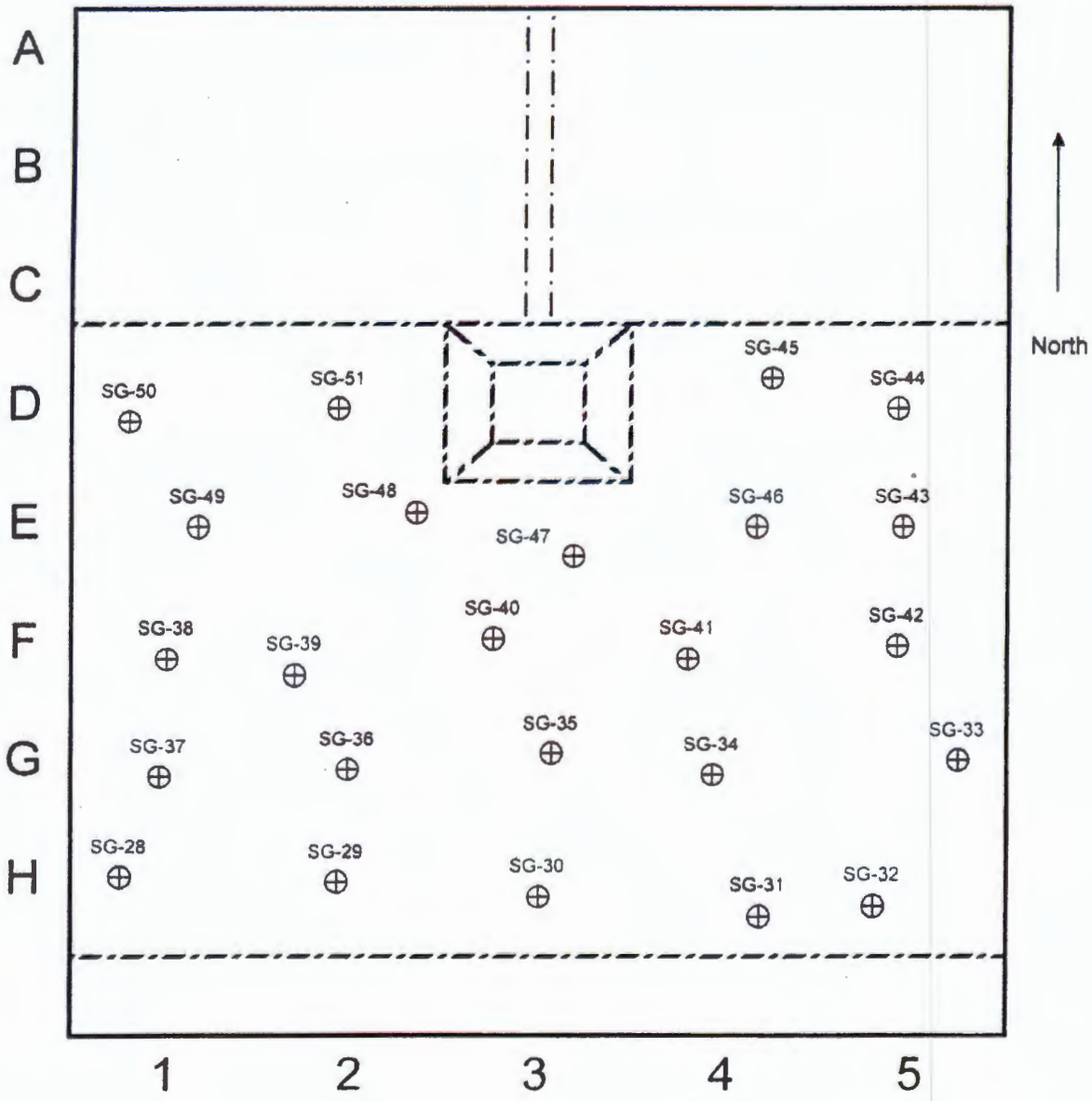
Envirotech Engineering & Consulting, Inc

Date

S/C: S013213A00

CQA Moisture Density Map Cell 9

Date:	5/21/2010	Lift:	Subgrade
Report:	05-016-073	Operator:	LH
Map No:	1 of 1	Material	Admix
Grid:	95-ft x 90-ft	Notes:	



FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
580-234-8780 | Fax 580-237-4302

Client: Washington Closure Hanford

Submittal: 05-18C Earthwork Subgrade

Soil Information

Project	ERDF Cells 9-10 Expansion			Proctor	SF-01
Project ID	S013213A00			Max Dry Density (pcf)	113.6
Report No.	05-016-076	Date	5/26/2010	Optimum Moisture (%)	12.4%
Description	Brown/Black Sand			Proctor	SF-04
Troxler ID	27881			Max Dry Density (pcf)	117.3
Moist Std	641	Density Std.	2225	Optimum Moisture (%)	12.5%
Moist offset	-	Density offset:	-	Proctor	SF-07
Allowable Moisture Range		N/A		Max Dry Density (pcf)	117.3
Necessary % Proctor		90%		Optimum Moisture (%)	11.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
SG-52	Zone D-3	SF-07	Sub	15.30	LH	8	121.5	13.4%	91.3%	107.1	PASS

Reviewed by TWL

5/27/10

nvirotech Engineering & Consulting, Inc

Date

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Submittal: 05-18C Earthwork Subgrade

Sample Information

Contact Name	Charlie Skiba			Sample ID	SG-52
Project	S013213A00			Sample Description	Brown/Black Sand
Project Location	ERDF Cells 9-10			Sampling Date	5/26/2010
Tested By	L. Hay	Date	5/26/2010	Sampled By	L.Hay
Reviewed By	T. Williams	Date	5/27/2010	Date Received	5/26/2010
Comments				Report No	05-016-076

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3955.60 g
2. Mass of Proctor mold + sand, W_2	5404.60 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.84 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6374.50 g
6. Mass of bottle + cone + sand (after use), W_4	4749.20 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.58 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6480.3 g
9. Mass of bottle + cone + sand (after use), W_8	2981.5 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma_d\,(sand)}$	0.0431 ft^3
11. Mass of gallon can, W_5	506.30 g
12. Mass of gallon can + moist soil, W_7	2882.20 g
13. Mass of gallon can + dry soil, W_9	2602.60 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	121.53 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	13.3%
16. Dry unit weight in the field, $\gamma_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	107.23 lb/ft^3
17. Comparision moisture content =	13.4%
18. Dry unit weight comparison =	107.1 lb/ft^3

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 05-18C Earthwork Subgrade

Soil Information

Project:	ERDF Cells 9-10 Expansion			Proctor:	SF-01
Project ID	S013213A00			Max Dry Density (pcf):	113.6
Report No	5-16-096	Date	6/24/2010	Optimum Moisture (%):	12.4%
Description:	Brown/Black Sand			Proctor:	SF-04
Troxler ID:	27881			Max Dry Density (pcf):	117.3
Moist Std	643	Density Std.	2205	Optimum Moisture (%):	12.5%
Moist offset.	-	Density offset:	-	Proctor	SF-07
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	117.3
Necessary % Proctor:		90%		Optimum Moisture (%):	11.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
SG-63	Zone M8	SF-07	Sub	9:10	JS	8	115.3	3.5%	95.0%	111.4	PASS
SG-64	Zone L8	SF-07	Sub	9:13	JS	8	117.3	3.2%	96.9%	113.7	PASS
SG-65	Zone K8	SF-07	Sub	9:17	JS	8	107.9	2.0%	90.2%	105.8	PASS
SG-66	Zone J8	SF-07	Sub	9:25	JS	8	115.8	2.4%	96.4%	113.1	PASS
SG-67	Zone I8	SF-07	Sub	9:30	JS	8	120.6	4.8%	98.1%	115.1	PASS
SG-68	Zone M9	SF-07	Sub	10:01	JS	8	121.4	4.6%	98.9%	116.1	PASS
SG-69	Zone L9	SF-07	Sub	10:05	JS	8	121.6	4.6%	99.1%	116.3	PASS
SG-70	Zone K9	SF-07	Sub	10:07	JS	8	118.7	4.1%	97.2%	114.0	PASS
SG-71	Zone J9	SF-07	Sub	10:10	JS	8	122.4	4.6%	99.8%	117.0	PASS
SG-72	Zone I9	SF-07	Sub	10:13	JS	8	120.1	3.9%	98.5%	115.6	PASS
SG-73	Zone I10	SF-07	Sub	10:16	JS	8	111.8	5.1%	90.7%	106.4	PASS
SG-74	Zone J10	SF-07	Sub	10:19	JS	8	119.3	4.9%	97.0%	113.7	PASS
SG-75	Zone K10	SF-07	Sub	10:21	JS	8	121.9	5.5%	98.5%	115.5	PASS
SG-76	Zone L10	SF-07	Sub	10:23	JS	8	124.1	6.0%	99.8%	117.1	PASS
SG-77	Zone M10	SF-07	Sub	10:31	JS	8	116.1	6.4%	93.0%	109.1	PASS

Reviewed by: TW

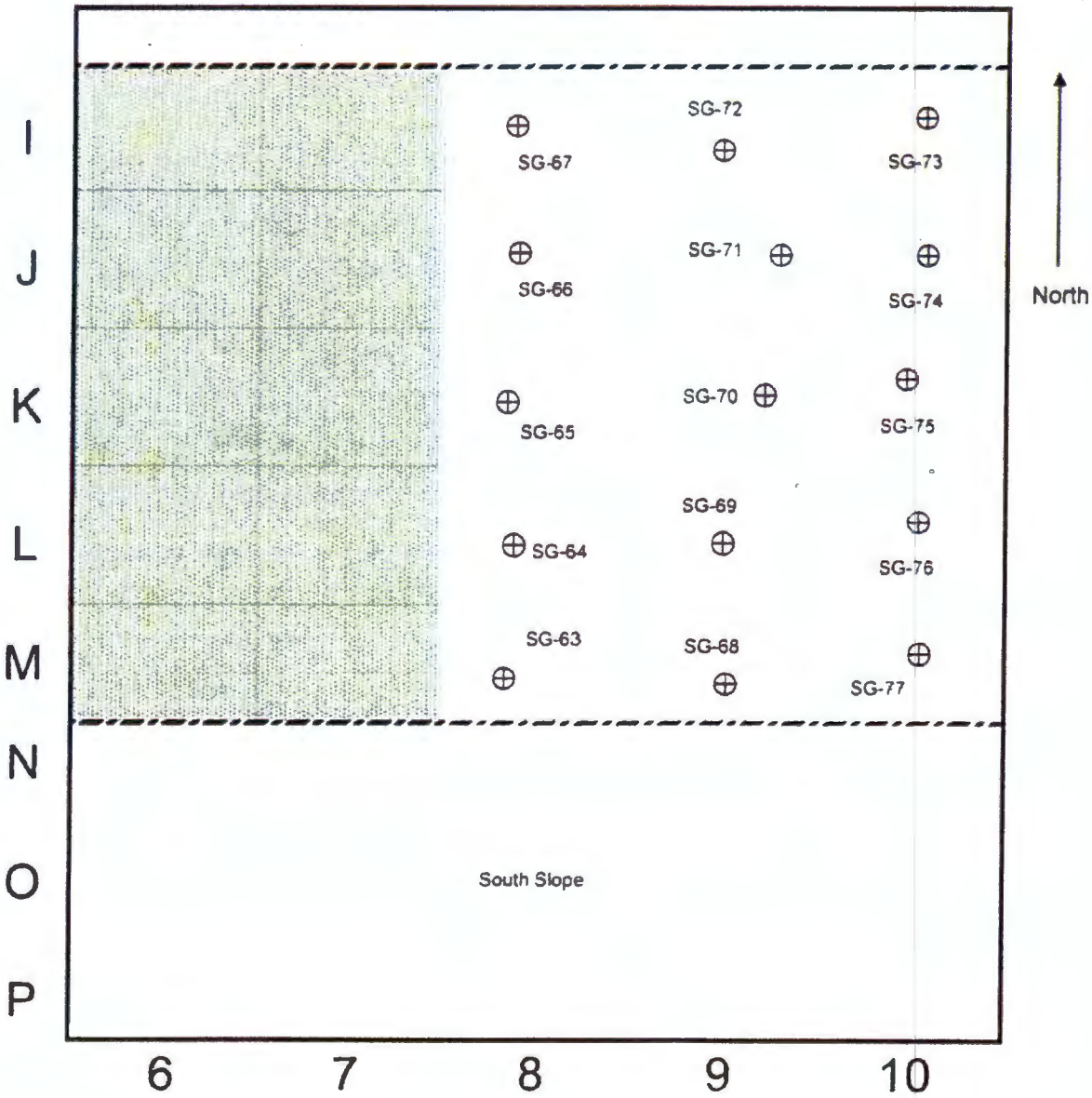
nvirotech Engineering & Consulting, Inc

7/12/10
Date

S/C S66X528A00

CQA Moisture Density Map Cell 9

Date	24-Jun-10	Lift:	Subgrade
Report:	5-16-96	Operator:	J. Schut
Map No:	1 of 1	Material:	Subgrade
Grid:	100-ft x 90-ft	Notes:	5-18C



D.2

LYSIMETER GRAVEL

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 5-18Q Anchor Trench/Riser Field Testing

Soil Information

Project	ERDF Cells 9-10 Expansion			Proctor:	SF-01
Project ID	S013213A00			Max Dry Density (pcf):	113.6
Report No.	5-16-061	Date	5/5/2010	Optimum Moisture (%):	12.4%
Description:	Brown/Black Sand			Proctor:	SF-06
Troxler ID:	27881			Max Dry Density (pcf):	120.8
Moist Std:	637	Density Std.	2195	Optimum Moisture (%):	14.3%
Moist offset	-	Density offset:	-	Proctor:	SF-07
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	117.3
Necessary % Proctor:		90%		Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Cell 9 Lysimeter Necessary Proctor : 90%											
LY9-01	Cell 9 Lysimeter	SF-06	1	12:55	LH	6	126.2	8.6%	96.2%	116.2	PASS

Reviewed by: Tim

Envirotech Engineering & Consulting, Inc

6/20/10

Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
580-234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 5-18Q Anchor Trench/Riser Field Testing

Soil Information

Project:	ERDF Cells 9-10 Expansion			Proctor	SF-01
Project ID.	S013213A00			Max Dry Density (pcf)	113.6
Report No	5-16-064	Date	5/10/2010	Optimum Moisture (%):	12.4%
Description.	Brown/Black Sand			Proctor.	SF-06
Troxler ID:	27881			Max Dry Density (pcf).	120.8
Moist Std	640	Density Std.	2250	Optimum Moisture (%):	14.3%
Moist offset	-	Density offset.	-	Proctor	SF-07
Allowable Moisture Range:		N/A		Max Dry Density (pcf).	117.3
Necessary % Proctor.		90%		Optimum Moisture (%).	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
LY9-02	Cell 9 Lysimeter	SF-06	2	12:05	LH	6	129.6	9.6%	97.9%	118.2	PASS
	Sand Cone Verification										
SCV-011	Loading Dock Area	N/A	N/A	15:15	LH	6	115.4	5.5%	N/A	109.4	N/A

Reviewed by: TW

Envirotech Engineering & Consulting, Inc

8/20/10
Date

D.3

LYSIMETER TRENCH

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 5-18Q Anchor Trench/Riser Field Testing

Soil Information

Project	ERDF Cells 9-10 Expansion			Proctor	SF-01
Project ID	S013213A00			Max Dry Density (pcf):	113.6
Report No	5-16-061	Date	5/5/2010	Optimum Moisture (%):	12.4%
Description	Brown/Black Sand			Proctor	SF-06
Troxler ID	27881			Max Dry Density (pcf):	120.8
Moist Std:	637	Density Std.	2195	Optimum Moisture (%):	14.3%
Moist offset	-	Density offset.	-	Proctor:	SF-07
Allowable Moisture Range		N/A		Max Dry Density (pcf).	117.3
Necessary % Proctor:		90%		Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Cell 9 Lysimeter Necessary Proctor : 90%											
LY9-01	Cell 9 Lysimeter	SF-06	1	12.55	LH	6	126.2	8.6%	96.2%	116.2	PASS

Reviewed by: Tim

Envirotech Engineering & Consulting, Inc

6/20/10
Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid OK 73701
580 234 8780 | Fax 580 237-4302

Client: Washington Closure Hanford

Submittal: 5-18Q Anchor Trench/Riser Field Testing

Soil Information

Project	ERDF Cells 9-10 Expansion			Proctor	SF-01
Project ID	S013213A00			Max Dry Density (pcf)	113.6
Report No	5-16-064	Date	5/10/2010	Optimum Moisture (%)	12.4%
Description	Brown/Black Sand			Proctor	SF-06
Troxler ID	27881			Max Dry Density (pcf)	120.8
Moist Std	640	Density Std	2250	Optimum Moisture (%)	14.3%
Moist offset	-	Density offset	-	Proctor	SF-07
Allowable Moisture Range		N/A		Max Dry Density (pcf)	117.3
Necessary % Proctor		90%		Optimum Moisture (%)	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
LY9-02	Cell 9 Lysimeter	SF-06	2	12:05	LH	6	129.6	9.6%	97.9%	118.2	PASS
Sand Cone Verification											
SCV-011	Loading Dock Area	N/A	N/A	15:15	LH	6	115.4	5.5%	N/A	109.4	N/A

Reviewed by: TW

Envirotech Engineering & Consulting, Inc

8/20/10
Date

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18B Earthwork Field Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SCV-011
Project	S013213A00			Sample Description:	Brown/Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	5/10/2010
Tested By:	L. Hay	Date:	5/10/2010	Sampled By:	L.Hay
Reviewed By:	T. Williams TW	Date:	5/11/2010	Date Received:	5/10/2010
Comments				Report No.:	05-016-064

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.60 g
2. Mass of Proctor mold + sand, W_2	5394.30 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.09 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	3768.20 g
6. Mass of bottle + cone + sand (after use), W_4	2132.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	5194.6 g
9. Mass of bottle + cone + sand (after use), W_8	1744.1 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0421 ft^3
11. Mass of gallon can, W_5	505.60 g
12. Mass of gallon can + moist soil, W_7	2710.80 g
13. Mass of gallon can + dry soil, W_9	2648.50 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	115.54 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	2.9%
16. Dry unit weight in the field, $\gamma_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	112.28 lb/ft^3
17. Comparision moisture content =	5.5%
18. Dry unit weight comparison =	109.4 lb/ft^3

D.4

LEACHATE TRANSMISSION

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 05-18B Earthwork Field Data

Soil Information

Project:	ERDF Cells 9-10 Expansion		
Project ID:	S013213A00		
Report No	05-016-060 Date	5/4/2010	
Description:	Brown/Black Sand		
Troxler ID:	27881		
Moist Std	647	Density Std:	2181
Moist offset:	-	Density offset:	-
Allowable Moisture Range:		N/A	
Necessary % Proctor:		95%	
Necessary % Proctor:		90%	

Proctor:	SF-05
Max Dry Density (pcf):	124.4
Optimum Moisture (%):	12.5%
Proctor:	SF-06
Max Dry Density (pcf):	120.8
Optimum Moisture (%):	14.3%
Proctor:	SF-07
Max Dry Density (pcf):	117.3
Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Leachate Transmission Line: 90% Proctor											
LT-09	Discharge line CP9 to MH-32	SF-06	1	9:15	LH	12	122.7	9.4%	92.8%	112.2	PASS
LT-10	Discharge line CP9 to MH-32	SF-06	2	9:45	LH	6	121.0	7.4%	93.3%	112.7	PASS
LT-11	Discharge line CP9 to MH-32	SF-06	3	10:45	LH	6	125.3	11.4%	93.1%	112.5	PASS
LT-12	Discharge line CP9 to MH-32	SF-06	4	12:00	LH	6	118.5	6.8%	91.9%	111.0	PASS
LT-13	Discharge line CP9 to MH-32	SF-06	5	15:10	LH	6	134.5	13.7%	97.9%	118.3	PASS
LT-14	Discharge line CP9 to MH-32	SF-06	6	15:50	LH	6	122.8	10.8%	91.7%	110.8	PASS
Crest Pad 10: 95% Proctor											
CP10-7	Crest Pad 10	SF-07	3	10:20	LH	6	116.9	4.2%	95.6%	112.2	PASS
CP10-8	Crest Pad 10	SF-07	3	10:25	LH	6	116.2	3.6%	95.6%	112.2	PASS

Reviewed by: TW

Envirotech Engineering & Consulting, Inc

5/5/10
Date

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
580) 234-8780 | Fax (580) 237-4302

Client: WCH
Submittal: 05-18B Earthwork Field Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	LT-12
Project:	S013213A00			Sample Description:	Brown/Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	5/4/2010
Tested By:	L. Hay	Date:	5/4/2010	Sampled By:	L.Hay
Reviewed By:	T. Williams	Date:	5/5/2010	Date Received:	5/4/2010
Comments				Report No.:	05-016-060

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.60 g
2. Mass of Proctor mold + sand, W_2	5394.30 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.09 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	3768.20 g
6. Mass of bottle + cone + sand (after use), W_4	2132.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	5958.9 g
9. Mass of bottle + cone + sand (after use), W_8	2550.7 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma_d\,(sand)}$	0.0411 ft^3
11. Mass of gallon can, W_5	394.40 g
12. Mass of gallon can + moist soil, W_7	2619.30 g
13. Mass of gallon can + dry soil, W_9	2466.50 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	119.36 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	7.4%
16. Dry unit weight in the field, $\gamma_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	111.16 lb/ft^3
17. Comparision moisture content =	6.8%
18. Dry unit weight comparison =	111.0 lb/ft^3

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid OK 73701
580 234-8780 | Fax 580 237-4302

Client: Washington Closure Hanford

Submittal: 5-18B Earthwork Field Data

Soil Information

Project	ERDF Cells 9-10 Expansion		
Project ID	S013213A00		
Report No	5-16-061	Date	5/5/2010
Description	Brown/Black Sand		
Troxler ID	27881		
Moist Std	637	Density Std	2195
Moist offset	-	Density offset	-
Allowable Moisture Range		N/A	
Necessary % Proctor		90%	

Proctor	SF-01
Max Dry Density (pcf)	113.6
Optimum Moisture (%):	12.4%
Proctor	SF-06
Max Dry Density (pcf):	120.8
Optimum Moisture (%):	14.3%
Proctor	SF-07
Max Dry Density (pcf):	117.3
Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Leachate Transmission Line: 90% Proctor											
LT-15	Discharge line CP9 to MH-32	SF-06	7	7.22	LH	6	123.3	10.0%	92.8%	112.1	PASS
LT-16	Discharge line CP9 to MH-32	SF-06	8	9 00	LH	6	124.9	12.6%	91.8%	110.9	PASS
LT-17	Discharge line CP9 to MH-32	SF-06	9	9:41	LH	6	120.1	9.2%	91.0%	110.0	PASS
LT-18	Discharge line CP9 to MH-32	SF-06	10	12:45	LH	6	129.5	14.2%	93.9%	113.4	PASS
Sand Cone Verification											
SCV-10	NE end of project	N/A	N/A	14:25	LH	6	108.1	4.1%	N/A	103.8	N/A

Reviewed by: TW

Envirotech Engineering & Consulting Inc

8/24/10
Date

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18B Earthwork Field Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SCV-10
Project:	S013213A00			Sample Description:	Lt. Brown Sand w/ Silt
Project Location:	ERDF Cells 9-10			Sampling Date:	5/5/2010
Tested By:	L. Hay	Date	5/5/2010	Sampled By:	L.Hay
Reviewed By:	T. Williams	Date	5/6/2010	Date Received:	5/5/2010
Comments				Report No.:	05-016-061

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3956.60 g
2. Mass of Proctor mold + sand, W_2	5394.30 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.09 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	3768.20 g
6. Mass of bottle + cone + sand (after use), W_4	2132.50 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6237.6 g
9. Mass of bottle + cone + sand (after use), W_8	2765.2 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma_d\,(sand)}$	0.0426 ft^3
11. Mass of gallon can, W_5	394.10 g
12. Mass of gallon can + moist soil, W_7	2487.50 g
13. Mass of gallon can + dry soil, W_9	2403.70 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	108.38 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	4.2%
16. Dry unit weight in the field, $\gamma_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	104.04 lb/ft^3
17. Comparision moisture content =	4.1%
18. Dry unit weight comparison =	103.8 lb/ft^3

D.5

MANHOLE 32

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 05-18B Earthwork Field Data

Soil Information

Project:	ERDF Cells 9-10 Expansion	Proctor:	SF-05
Project ID:	S013213A00	Max Dry Density (pcf):	124.4
Report No.	05-016-031 Date 3/24/2010	Optimum Moisture (%):	12.5%
Description:	Brown/Black Sand	Proctor:	SF-06
Troxler ID:	27881	Max Dry Density (pcf):	120.8
Moist Std:	648 Density Std. 2190	Optimum Moisture (%).	14.3%
Moist offset	- Density offset: -	Proctor:	
Allowable Moisture Range:	N/A	Max Dry Density (pcf):	
Necessary % Proctor:	90%	Optimum Moisture (%):	

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Manhole #21											
MH21-03	West Side MH21	SF-06	1	13:00	LH	12	118.5	7.6%	91.2%	110.1	PASS
MH21-04	North Side MH21	SF-06	2	13:10	LH	12	120.7	9.0%	91.7%	110.7	PASS
MH21-05	East Side MH21	SF-06	3	13:20	LH	12	121.4	9.2%	92.0%	111.2	PASS
MH21-06	South Side MH21	SF-06	4	13:30	LH	6	123.6	7.5%	95.2%	115.0	PASS
Manhole #39											
MH39-03	West Side MH21	SF-06	1	13:40	LH	12	127.8	8.0%	98.0%	118.3	PASS
MH39-04	North Side MH21	SF-06	2	13:50	LH	12	126.7	7.5%	97.6%	117.9	PASS
MH39-05	South Side MH21	SF-06	3	14:00	LH	12	127.8	7.7%	98.2%	118.7	PASS
MH39-06	East Side MH21	SF-06	4	14:10	LH	6	127.6	8.8%	97.1%	117.3	PASS
Manhole #32											
MH32-01	Manhole 32	SF-06	Sub	14:20	LH	12	130.7	5.3%	102.7%	124.1	PASS
MH32-02	Manhole 32	SF-06	Sub	14.25	LH	12	126.0	4.9%	99.4%	120.1	PASS
Manhole #33											
MH33-01	Manhole 33	SF-06	Sub	14:40	LH	12	129.9	8.7%	98.9%	119.5	PASS
MH33-02	Manhole 33	SF-06	Sub	14:45	LH	12	131.0	9.1%	99.4%	120.1	PASS

Reviewed by: TW

Envirotech Engineering & Consulting, Inc

5/5/10
Date

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18B Earthwork Field Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	MH39-06
Project:	S013213A00			Sample Description:	Brown Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date.	3/24/2010
Tested By:	L. Hay	Date:	3/24/2010	Sampled By	L. Hay
Reviewed By:	T. Williams TW	Date:	3/25/2010	Date Received:	3/24/2010
Comments				Report No.:	05-016-031

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3955.80 g
2. Mass of Proctor mold + sand, W_2	5396.10 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.26 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6718.40 g
6. Mass of bottle + cone + sand (after use), W_4	5097.10 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.57 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6408.0 g
9. Mass of bottle + cone + sand (after use), W_8	2269.2 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0583 ft^3
11. Mass of gallon can, W_5	0.00 g
12. Mass of gallon can + moist soil, W_7	3347.40 g
13. Mass of gallon can + dry soil, W_9	3080.80 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	126.66 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	8.7%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	116.57 lb/ft^3
17. Comparision moisture content =	8.8%
18. Dry unit weight comparison =	117.3 lb/ft^3

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 5-18B Earthwork Field Data

Soil Information

Project:	ERDF Cells 9-10 Expansion		
Project ID:	S013213A00		
Report No.	05-016-36 Date	03 / 31 / 2010	
Description:	Brown / Black Sand		
Troxler ID.	27881		
Moist Std:	639	Density Std.	2213
Moist offset:	-	Density offset.	-
Allowable Moisture Range:		N/A	
Necessary % Proctor:		95%	

Proctor:	SF-05
Max Dry Density (pcf):	124.4
Optimum Moisture (%):	12.5%
Proctor:	SF-06
Max Dry Density (pcf):	120.8
Optimum Moisture (%):	14.3%
Proctor.	
Max Dry Density (pcf):	
Optimum Moisture (%):	

Test No	LocationC26	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
	Manhole #33										
MH33-03	Manhole #33	SF-06	1	7:30	LH	12"	135.0	14.6%	97.5%	117.8	PASS
MH33-04	Manhole #33	SF-06	2	7:55	LH	12"	131.4	9.7%	99.2%	119.8	PASS
MH33-05	Manhole #33	SF-06	3	8:35	LH	6"	130.2	10.7%	97.4%	117.6	PASS
MH33-06	Manhole #33	SF-06	4	9:15	LH	6"	127.9	7.3%	98.7%	119.2	PASS
	Manhole #32										
MH32-03	Manhole#32	SF-06	1	9:45	LH	12"	130.7	11.3%	97.2%	117.4	PASS
MH32-04	Manhole#32	SF-06	2	10:45	LH	12"	125.0	7.4%	96.3%	116.4	PASS
MH32-05	Manhole#32	SF-06	3	11:50	LH	12"	124.7	8.3%	95.3%	115.1	PASS
MH32-06	Manhole#32	SF-06	4	13:00	LH	12"	128.4	7.9%	98.5%	119.0	PASS
	Manhole #33										
MH33-07	Manhole#33 (SC)	SF-06	5	14:00	LH	6"	128.2	10.7%	95.9%	115.8	PASS
MH33-08	Manhole#33	SF-06	6	14:30	LH	6"	126.8	9.7%	95.7%	115.6	PASS
MH33-09	Manhole#33	SF-06	7	15:00	LH	6"	128.1	10.9%	95.6%	115.5	PASS
MH33-10	Manhole#33	SF-06	8	15:30	LH	6"	127.6	10.1%	95.9%	115.9	PASS
MH33-11	Manhole#33	SF-06	9	15:45	LH	6"	129.4	11.3%	96.2%	116.3	PASS
MH33-12	Manhole#33	SF-06	10	16:10	LH	6"	128.8	9.6%	97.3%	117.5	PASS

Reviewed by: TW

Envirotech Engineering & Consulting, Inc

5/5/10
Date

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Submittal:	05-18B Earthwork Field Data

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	MH33-07
Project:	S013213A00			Sample Description:	Brown Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/31/2010
Tested By:	Lucas Hay	Date:	3/31/2010	Sampled By:	Lucas Hay
Reviewed By:	T. Williams TW	Date	4/1/2010	Date Received:	3/31/2010
Comments				Report No.:	05-016-036

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Mass of Proctor mold, W_1	3955.80 g
2. Mass of Proctor mold + sand, W_2	5396.10 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.26 lb/ft^3

Calibration Cone

5. Mass of bottle + cone + sand (before use), W_3	6718.40 g
6. Mass of bottle + cone + sand (after use), W_4	5097.10 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.57 lb

Results from Field Tests

8. Mass of bottle + cone + sand (before use), W_6	6268.2 g
9. Mass of bottle + cone + sand (after use), W_8	2348.0 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0532 ft^3
11. Mass of gallon can, W_5	0.00 g
12. Mass of gallon can + moist soil, W_7	3125.60 g
13. Mass of gallon can + dry soil, W_9	2814.10 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	129.52 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	11.1%
16. Dry unit weight in the field, $\gamma_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	116.61 lb/ft^3
17. Comparision moisture content =	10.7%
18. Dry unit weight comparison =	115.8 lb/ft^3

D.6

CELL EMBANKMENTS

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	1-10	Test Date:	9/14/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-02
Troxler ID:	1249			Max Dry Density (pcf):	119.9
Moist Std:	661	Density Std:	2241	Optimum Moisture (%):	10.0%
Moist offset:	-	Density offset:	-	Proctor:	
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	
Necessary % Proctor:		95%		Optimum Moisture (%):	

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-01	SE Section of N. Berm	SF-02	SG	10:20	LH	6	122.3	3.8%	98.2%	117.8	PASS
NB-02	NW Section of N. Berm	SF-02	SG	13:50	LH	6	124.1	6.1%	97.6%	117.0	PASS

Reviewed by:

Envirotech Engineering & Consulting, Inc

9/21/09
Date

UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, NC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	NB-01
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	9/14/2009
Tested By:	LH	Date:	9/14/2009	Sampled By:	LH
Reviewed By:	JV	Date:	9/17/2009	Date Received:	9/14/2009
Comments				Report No.:	010

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	0.00 g
2. Weight of Proctor mold + sand, W_2	1201.86 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $\gamma_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	79.49 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1366.53 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.01 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5458.46 g
9. Weight of bottle + cone + sand (after use), W_8	1177.97 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0808 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	4471.31 g
13. Weight of gallon can + dry soil, W_9	4284.38 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	121.97 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	4.4%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	116.87 lb/ft^3
17. Comparision moisture content =	3.8%
18. Dry unit weight comparison =	117.8 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	14-2	Test Date:	9/17/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-02
Troxler ID:	1249			Max Dry Density (pcf):	119.9
Moist Std:	670	Density Std:	2250	Optimum Moisture (%):	10.0%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		90%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Phase 3 Construction											
P3-20	NE Area Middle of P3	SF-03	1	N/A	LH	8	121.5	7.1%	91.4%	113.4	PASS
P3-21	SW Area Middle of P3	SF-03	1	N/A	LH	8	121.4	7.6%	90.9%	112.8	PASS

Reviewed by:

Envirotech Engineering & Consulting, Inc

9/22/09
Date

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	14-1	Test Date:	9/21/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-02
Troxler ID:	1249			Max Dry Density (pcf):	119.9
Moist Std:	670	Density Std:	2250	Optimum Moisture (%):	10.0%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		90%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-05	As per Map	SF-03	2	N/A	LH	8	134.3	9.4%	98.9%	122.7	PASS
NB-06	As per Map	SF-03	2	N/A	LH	8	129.8	8.7%	96.2%	119.4	PASS
South Berm											
SB-01	As per Map	SF-01	SG	N/A	LH	8	128.4	4.1%	99.1%	123.3	PASS
SB-02	As per Map	SF-01	SG	N/A	LH	8	128.1	5.7%	97.4%	121.2	PASS
SB-03	As per Map	SF-03	1	N/A	LH	8	117.2	4.0%	90.8%	112.7	PASS
SB-04	As per Map	SF-03	1	N/A	LH	8	125.3	10.2%	91.6%	113.7	PASS

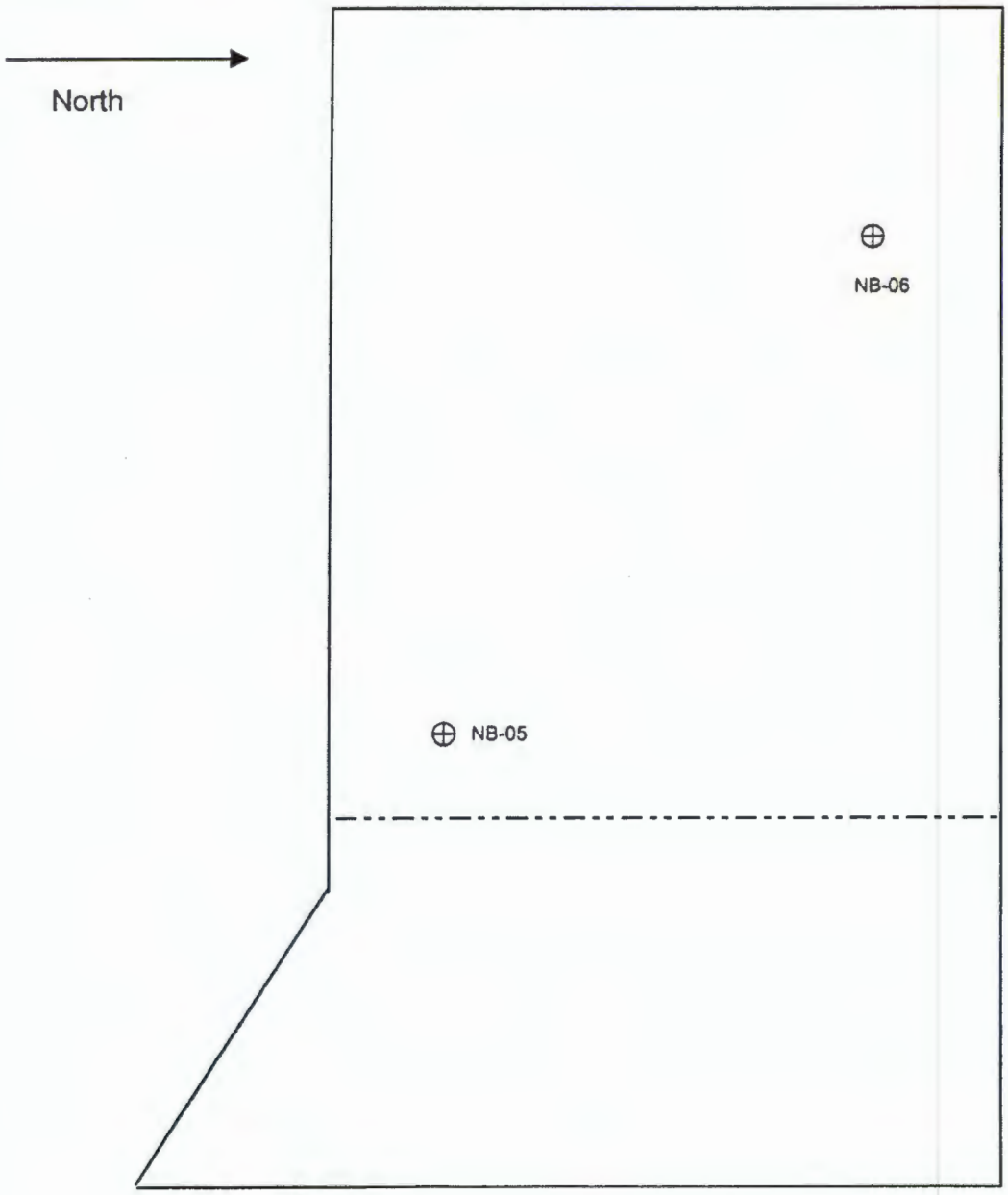
Reviewed by:

Envirotech Engineering & Consulting, Inc

9/22/09
Date

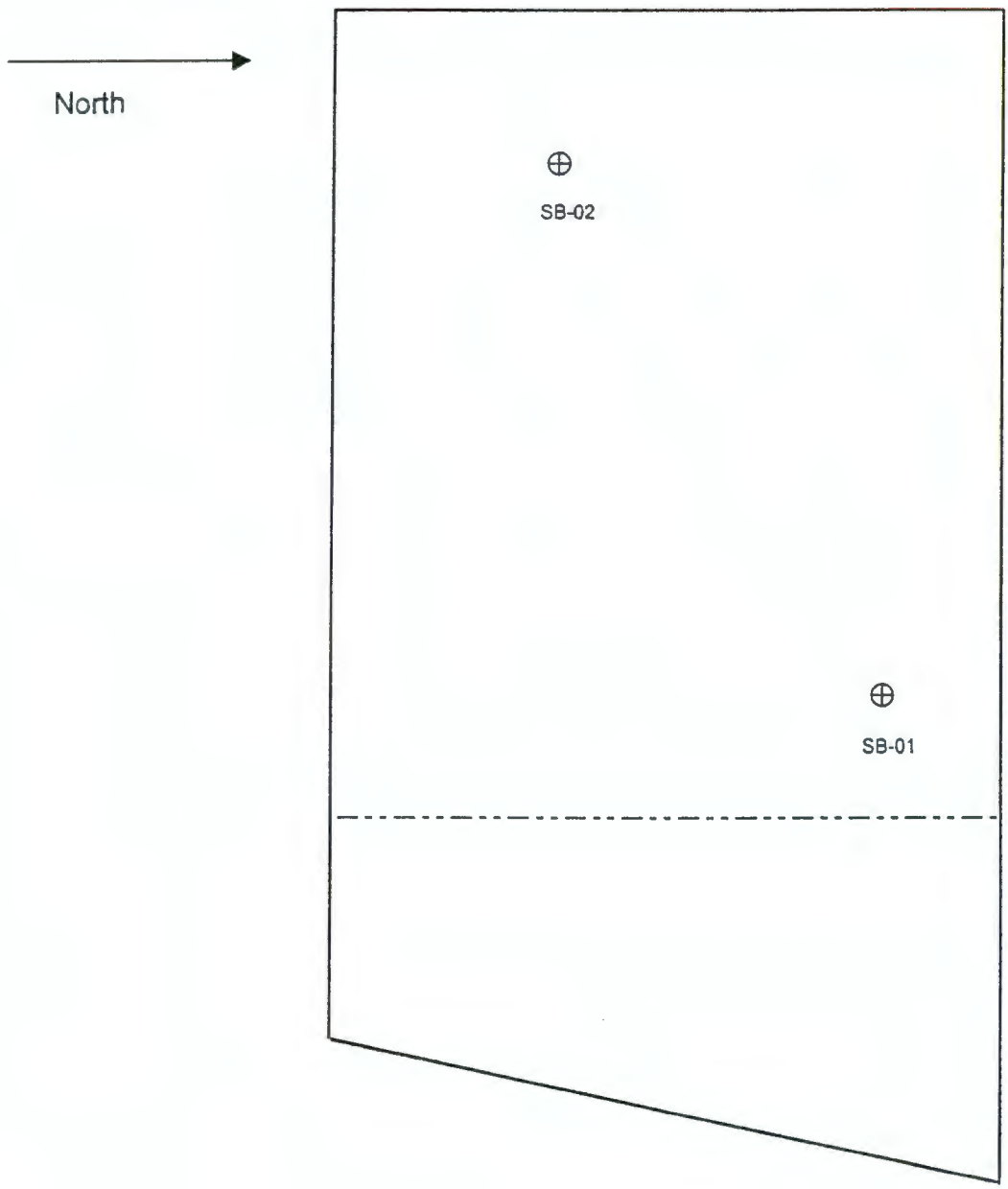
CQA Moisture Density Map Cells 7-8

Date:	21-Sep-09	Lift:	2
Report:	14	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-03
Notes:			



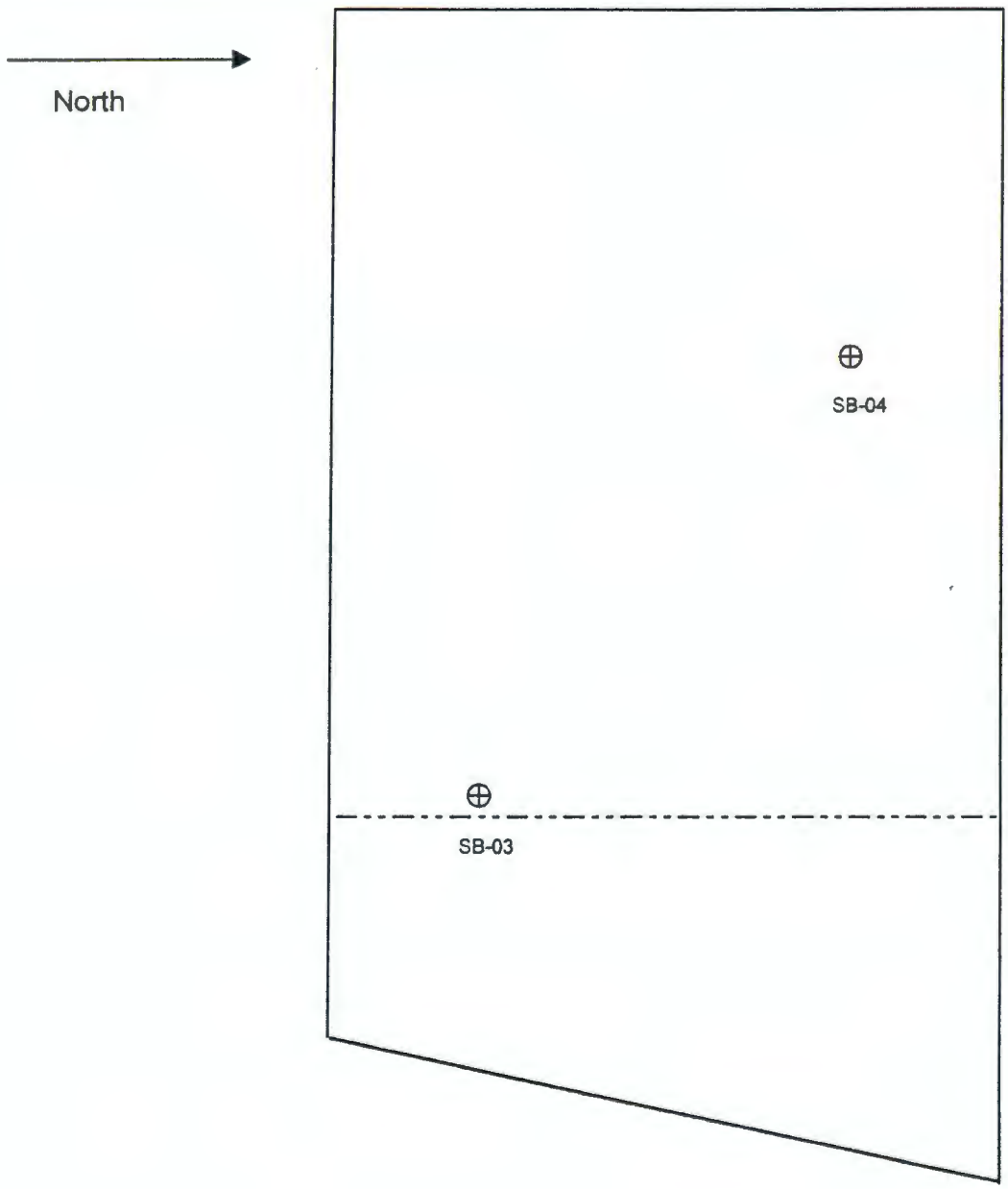
CQA Moisture Density Map Cells 7-8

Date:	21-Sep-09	Lift:	SG
Report:	14	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-01
Notes:			



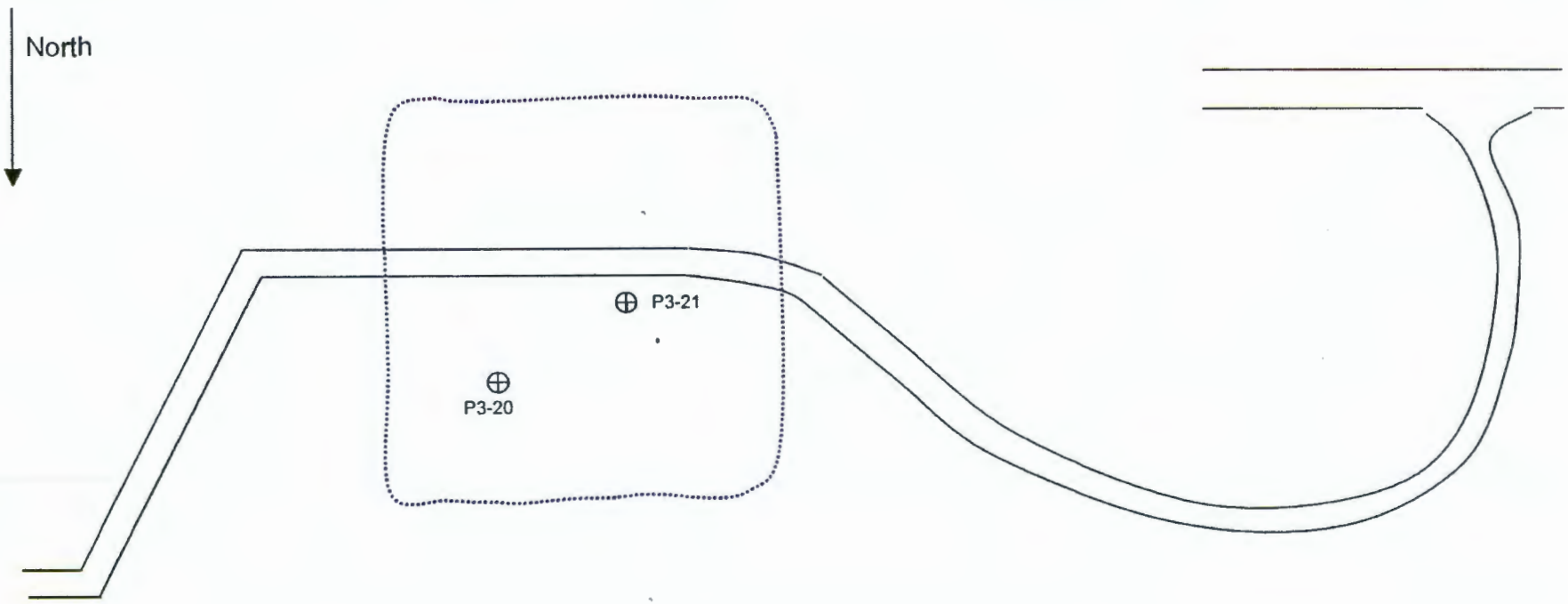
CQA Moisture Density Map Cells 7-8

Date:	21-Sep-09	Lift:	1
Report:	14	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-03
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	21-Sep-09	Lift:	1
Report:	14	Operator:	Luke Hay
Map:	Phase 3 Grid 1	Material:	SF-03
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client:	WCH
Address:	ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	NB-05
Project:	S66X528A00			Sample Description:	North Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	9/21/2009
Tested By:	LH	Date:	9/21/2009	Sampled By:	LH
Reviewed By:	JV	Date:	9/23/2009	Date Received:	9/21/2009
Comments				Report No.:	14

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	0.00 g
2. Weight of Proctor mold + sand, W_2	1201.86 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	79.49 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1366.53 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.01 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5485.72 g
9. Weight of bottle + cone + sand (after use), W_8	1172.98 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0817 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	4887.61 g
13. Weight of gallon can + dry soil, W_9	4484.05 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	131.87 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	9.0%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	120.98 lb/ft^3
17. Comparision moisture content =	9.4%
18. Dry unit weight comparison =	122.7 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	15-1	Test Date:	9/22/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-02
Troxler ID:	1249			Max Dry Density (pcf):	119.9
Moist Std:	672	Density Std:	2244	Optimum Moisture (%):	10.0%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		90%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-07	As per Map	SF-03	3	7:45	LH	8	119.2	9.2%	88.0%	109.2	FAIL
NB-08	As per Map	SF-03	3	7:51	LH	8	111.8	6.9%	84.3%	104.6	FAIL
NB-07A	As per Map	SF-03	3	8:46	LH	8	126.0	12.1%	90.6%	112.4	PASS
NB-08A	As per Map	SF-03	3	8:50	LH	8	120.8	6.4%	91.5%	113.5	PASS
NB-09	As per Map	SF-03	3	8:56	LH	8	125.2	9.4%	92.2%	114.4	PASS
NB-10	As per Map	SF-03	4	15:55	LH	8	125.4	11.1%	91.0%	112.9	PASS
NB-11	As per Map	SF-03	4	16:03	LH	8	130.9	9.9%	96.0%	119.1	PASS
NB-12	As per Map	SF-03	4	16:12	LH	8	127.0	10.9%	92.3%	114.5	PASS
South Berm											
SB-05	As per Map	SF-03	2	12:45	LH	8	125.8	11.9%	90.6%	112.4	PASS
SB-06	As per Map	SF-03	2	12:51	LH	8	124.2	10.6%	90.5%	112.3	PASS
SB-07	As per Map	SF-03	2	12:57	LH	8	125.0	8.8%	92.6%	114.9	PASS

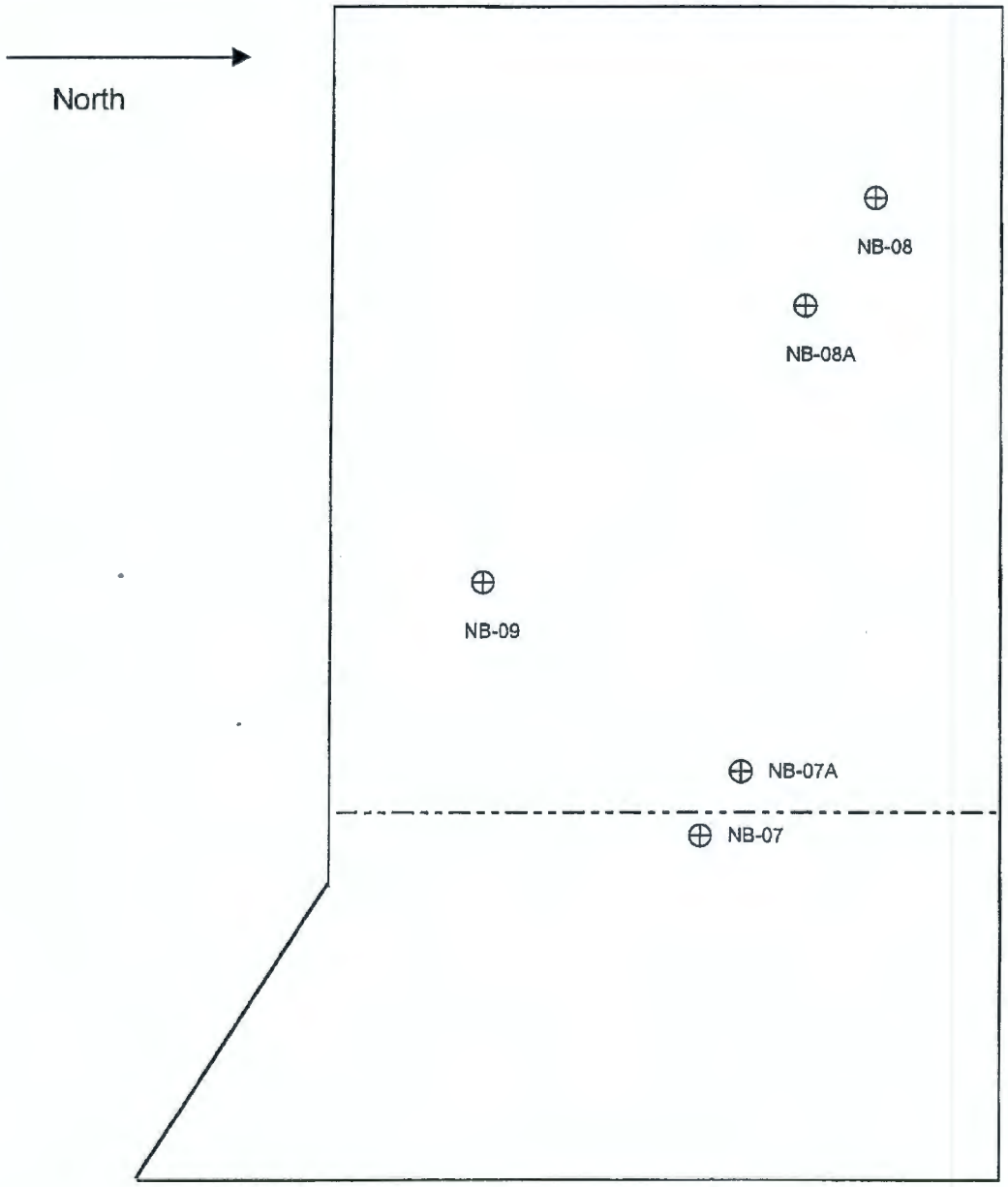
Reviewed by:

nvirotech Engineering & Consulting, Inc

9/23/09
Date

CQA Moisture Density Map Cells 7-8

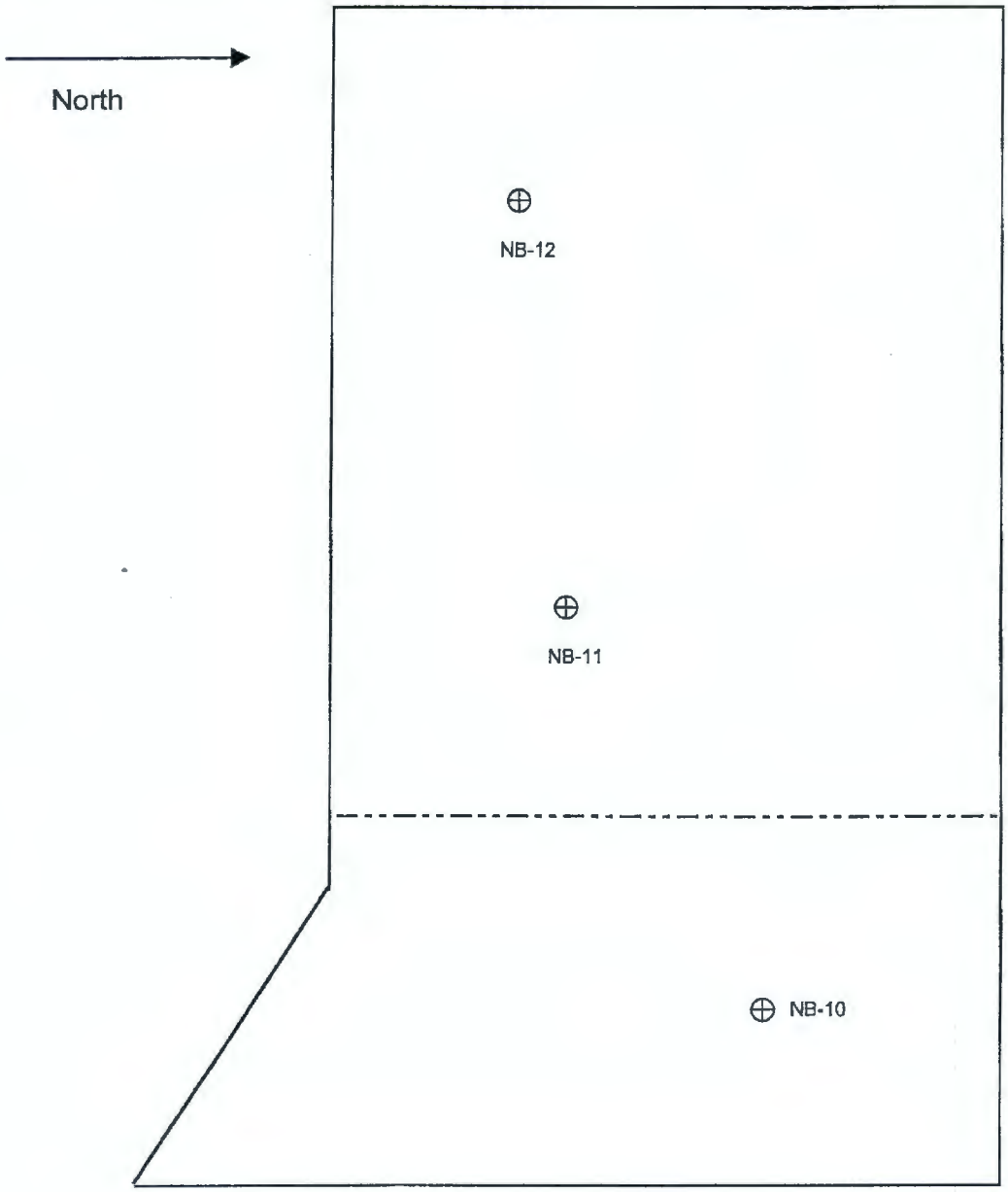
Date:	22-Sep-09	Lift:	3
Report:	15	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-03
Notes:			



ENVIROTECH
ENGINEERING & CONSULTING, INC.

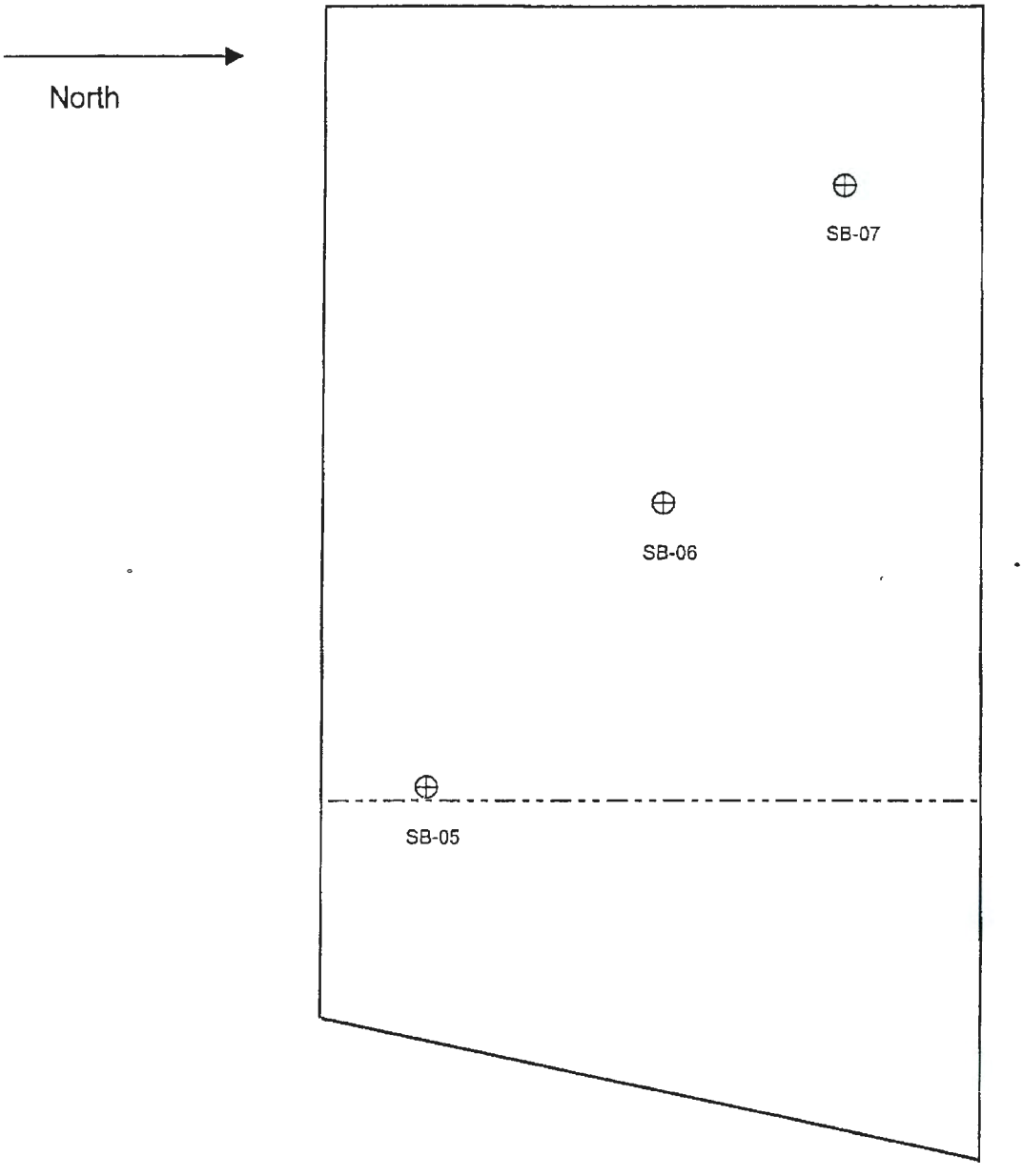
CQA Moisture Density Map Cells 7-8

Date:	22-Sep-09	Lift:	4
Report:	15	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-03
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	22-Sep-09	Lift:	2
Report:	15	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-03
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	SB-07
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	9/22/2009
Tested By:	LH	Date:	9/22/2009	Sampled By:	LH
Reviewed By:	JV	Date:	9/23/2009	Date Received:	9/22/2009
Comments				Report No.:	15

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	0.00 g
2. Weight of Proctor mold + sand, W_2	1201.86 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	79.49 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1366.53 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.01 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5678.49 g
9. Weight of bottle + cone + sand (after use), W_8	1312.24 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0832 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	4762.60 g
13. Weight of gallon can + dry soil, W_9	4343.49 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	126.20 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	9.6%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	115.10 lb/ft^3
17. Comparision moisture content =	8.8%
18. Dry unit weight comparison =	114.9 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	16-1	Test Date:	9/23/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	674	Density Std:	2250	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		90%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-13	As per Map	SF-05	5	13:05	LH	8	115.3	9.4%	91.6%	105.4	PASS
NB-14	As per Map	SF-05	5	13:09	LH	8	117.5	9.2%	93.6%	107.6	PASS
NB-15	As per Map	SF-05	5	13:15	LH	8	109.6	5.3%	90.5%	104.1	PASS
South Berm											
SB-08	As per Map	SF-05	3	9:15	LH	8	121.7	8.7%	97.4%	112.0	PASS
SB-09	As per Map	SF-05	3	9:18	LH	8	119.6	7.5%	96.7%	111.3	PASS
SB-10	As per Map	SF-05	3	9:25	LH	8	125.5	11.9%	97.5%	112.2	PASS
SB-11	As per Map	SF-05	4	16:25	LH	8	124.0	10.7%	97.4%	112.0	PASS
SB-12	As per Map	SF-05	4	16:29	LH	8	117.6	8.0%	94.7%	108.9	PASS
SB-13	As per Map	SF-05	4	16:34	LH	8	116.9	7.8%	94.3%	108.4	PASS

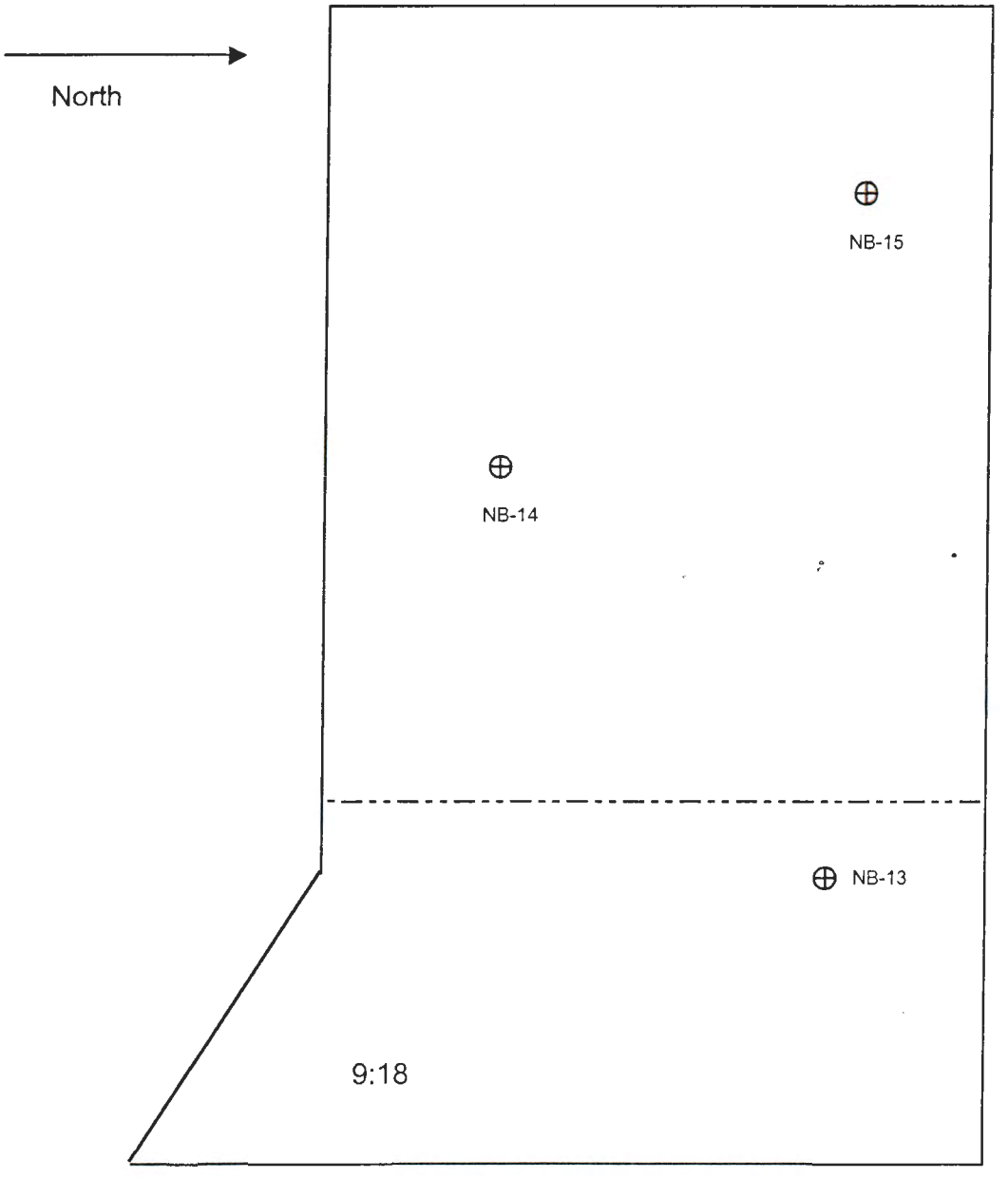
Reviewed by: [signature]

[signature]
nvirotech Engineering & Consulting, Inc

9/24/09
Date

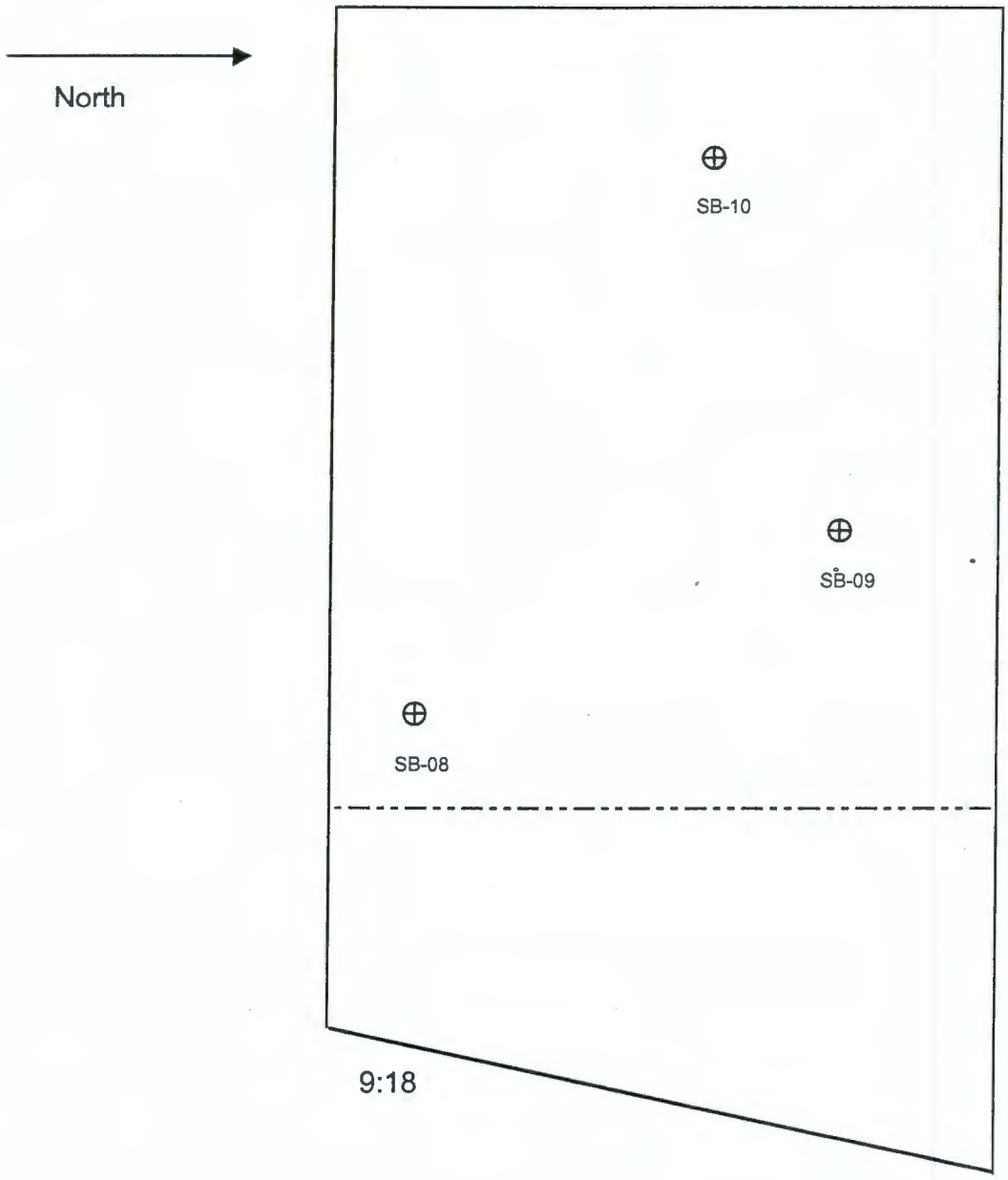
CQA Moisture Density Map Cells 7-8

Date:	23-Sep-09	Lift:	5
Report:	16	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



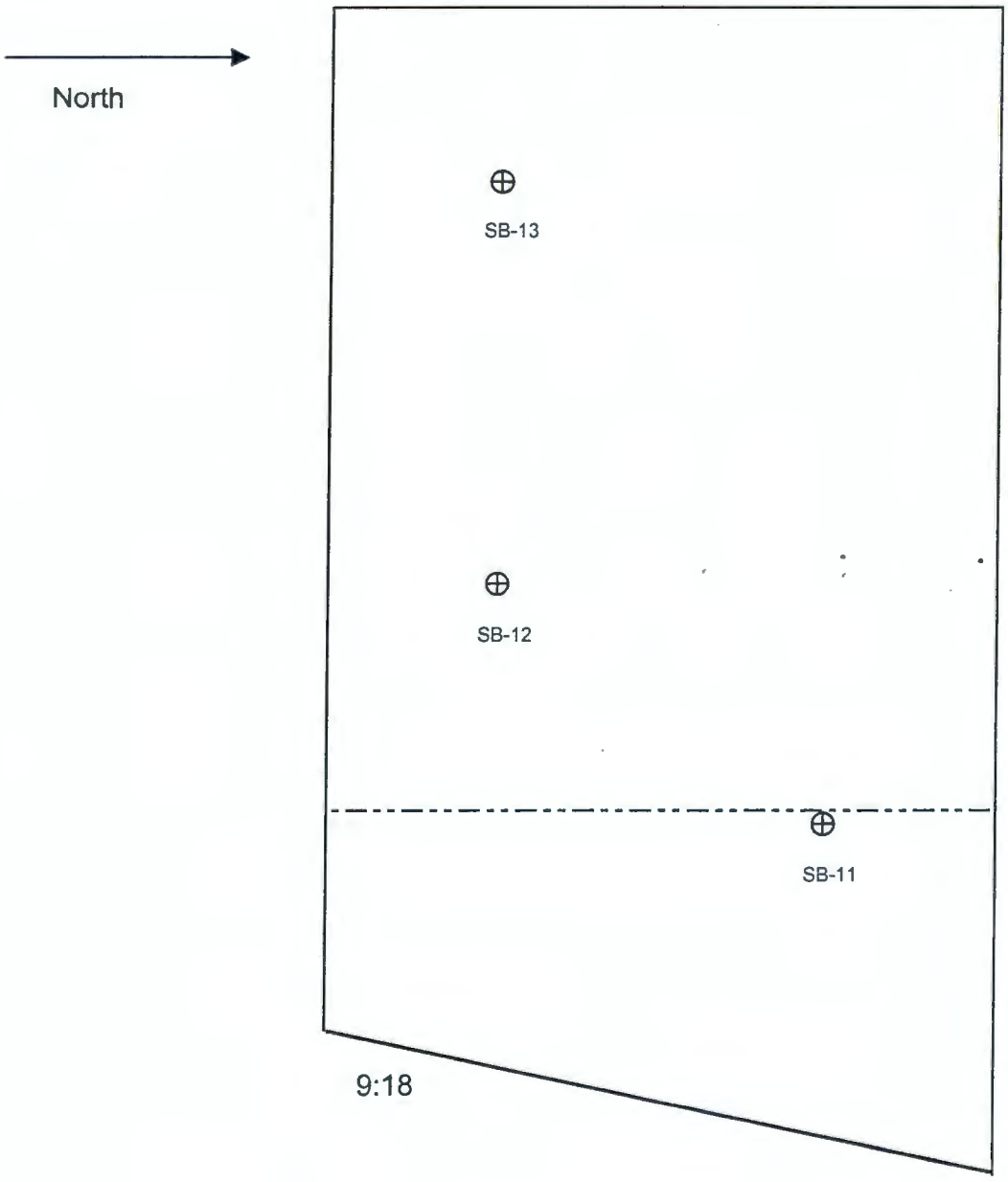
CQA Moisture Density Map Cells 7-8

Date:	23-Sep-09	Lift:	3
Report:	16	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	23-Sep-09	Lift:	4
Report:	16	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	SB-10
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	9/23/2009
Tested By:	LH	Date:	9/23/2009	Sampled By:	LH
Reviewed By:	JV	Date:	9/24/2009	Date Received:	9/23/2009
Comments				Report No.:	16

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	0.00 g
2. Weight of Proctor mold + sand, W_2	1201.86 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	79.49 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1366.53 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.01 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5021.24 g
9. Weight of bottle + cone + sand (after use), W_8	940.97 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0753 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	4329.29 g
13. Weight of gallon can + dry soil, W_9	3853.07 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	126.81 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	12.4%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	112.86 lb/ft^3
17. Comparision moisture content =	11.9%
18. Dry unit weight comparison =	112.2 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	17-1	Test Date:	9/24/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	666	Density Std:	2266	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper.	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-16	As per Map	SF-05	6	12:30	LH	6	127.8	13.2%	98.2%	112.9	PASS
NB-17	As per Map	SF-05	6	12:41	LH	6	126.2	12.2%	97.8%	112.5	PASS
NB-18	As per Map	SF-05	6	12:47	LH	6	122.4	10.6%	96.2%	110.7	PASS

Reviewed by: [signature]

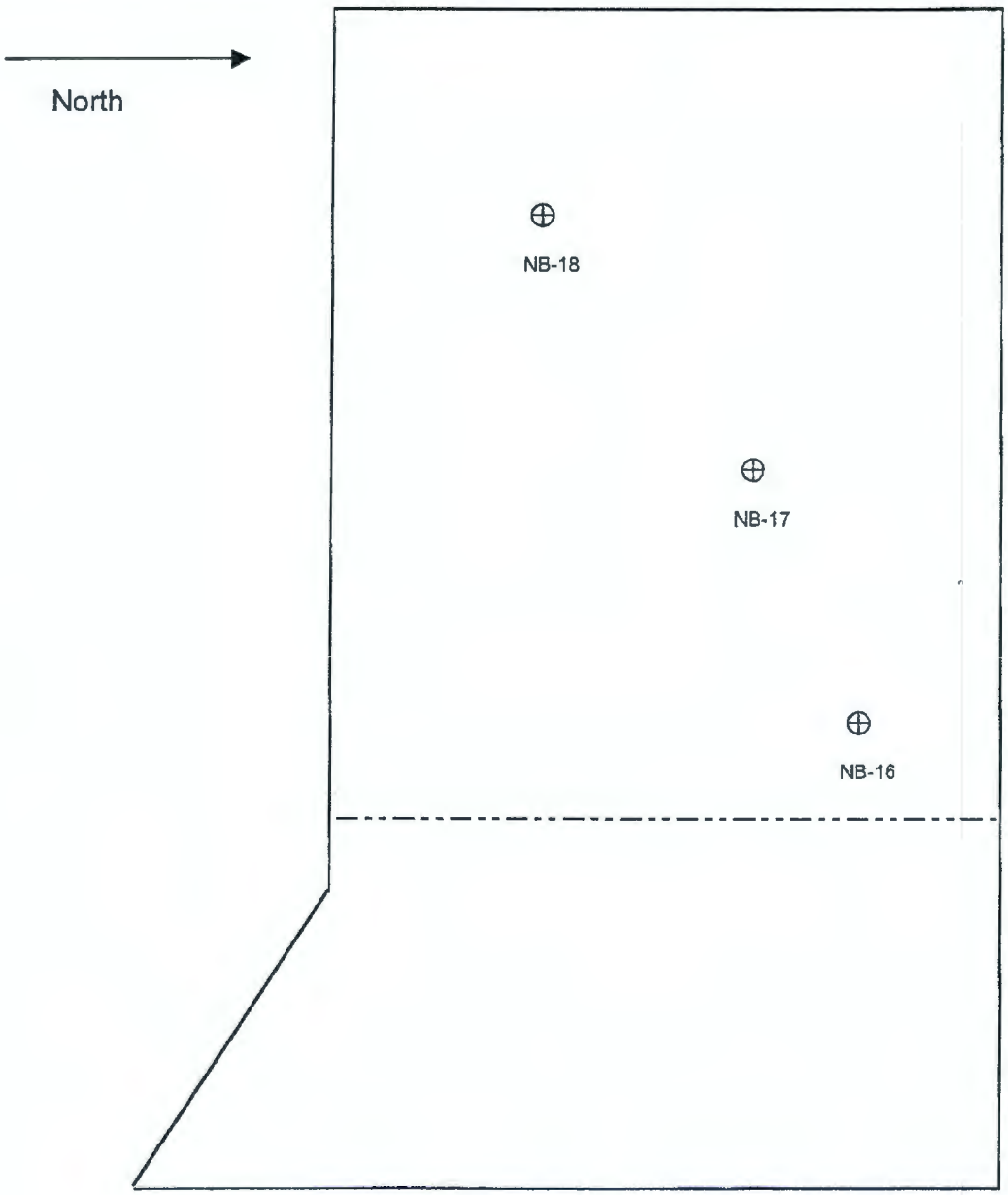
nvirotech Engineering & Consulting, Inc

Date 9/28/09

ENVIROTECH
ENGINEERING & CONSULTING, INC.

CQA Moisture Density Map Cells 7-8

Date:	24-Sep-09	Lift:	6
Report:	17	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	NB-16
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	9/24/2009
Tested By:	LH	Date:	9/24/2009	Sampled By:	LH
Reviewed By:	JV	Date:	9/28/2009	Date Received:	9/24/2009
Comments				Report No.:	17

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	0.00 g
2. Weight of Proctor mold + sand, W_2	1201.86 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	79.49 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1366.53 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.01 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5502.27 g
9. Weight of bottle + cone + sand (after use), W_8	1141.91 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0830 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	4739.34 g
13. Weight of gallon can + dry soil, W_9	4205.28 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	125.84 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	12.7%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	111.66 lb/ft^3
17. Comparision moisture content =	13.2%
18. Dry unit weight comparison =	112.9 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	18-1	Test Date:	9/28/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	672	Density Std:	2277	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-19	As per Map	SF-05	7	10:00	LH	6	114.6	4.8%	95.1%	109.4	PASS
NB-20	As per Map	SF-05	7	10:05	LH	6	113.7	3.5%	95.5%	109.9	PASS
NB-21	As per Map	SF-05	7	10:10	LH	6	117.1	6.3%	95.8%	110.2	PASS

Reviewed by:

Envirotech Engineering & Consulting. Inc

9/28/09
Date

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	18-2	Test Date:	9/28/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	672	Density Std:	2277	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		90%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
South Berm											
SB-14	As per Map	SF-05	5	7:06	LH	8	114.9	9.6%	91.2%	104.8	PASS
SB-15	As per Map	SF-05	5	7:09	LH	8	116.3	10.0%	91.9%	105.7	PASS
SB-16	As per Map	SF-05	5	7:13	LH	8	118.4	11.5%	92.3%	106.2	PASS
SB-17	As per Map	SF-05	6	14:50	LH	8	116.9	11.0%	91.6%	105.3	PASS
SB-18	As per Map	SF-05	6	14:55	LH	8	124.1	12.1%	96.3%	110.7	PASS
SB-19	As per Map	SF-05	6	15:05	LH	8	125.0	11.9%	97.1%	111.7	PASS

Reviewed by:

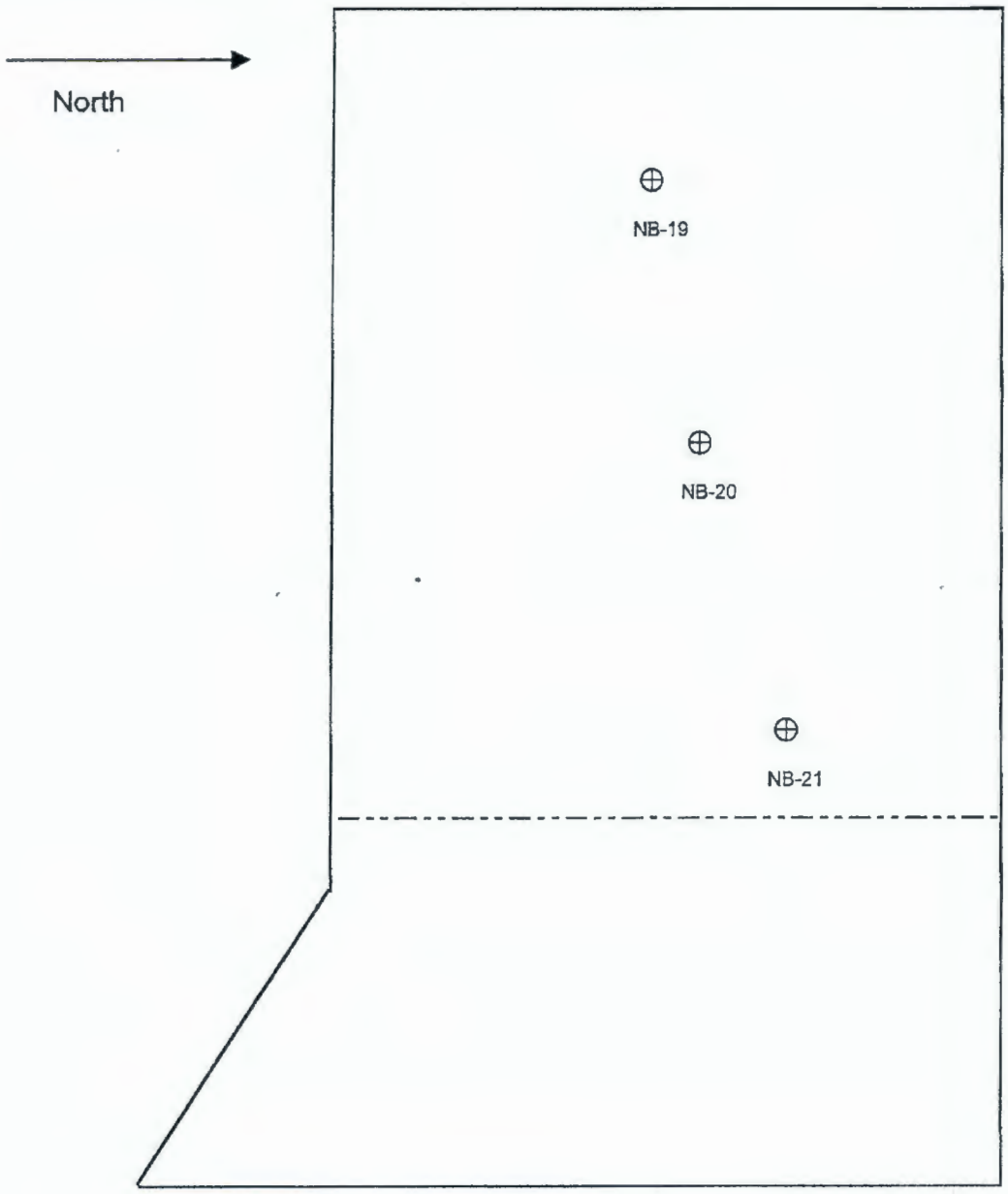
Envirotech Engineering & Consulting, Inc

9/28/09
Date

ENVIROTECH
ENGINEERING & CONSULTING, INC.

CQA Moisture Density Map Cells 7-8

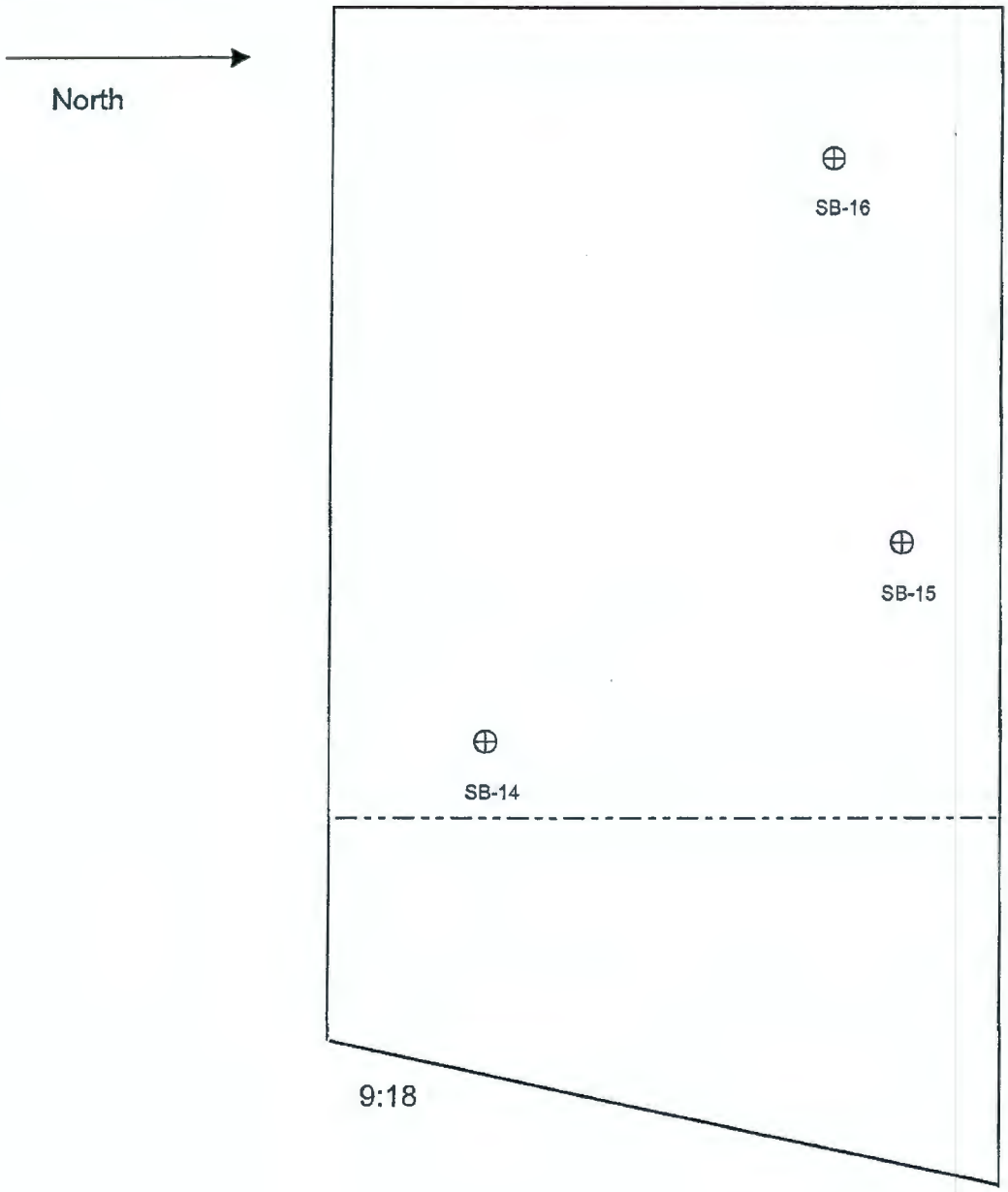
Date:	28-Sep-09	Lift:	7
Report:	18	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



ENVIROTECH
ENGINEERING & CONSULTING, INC.

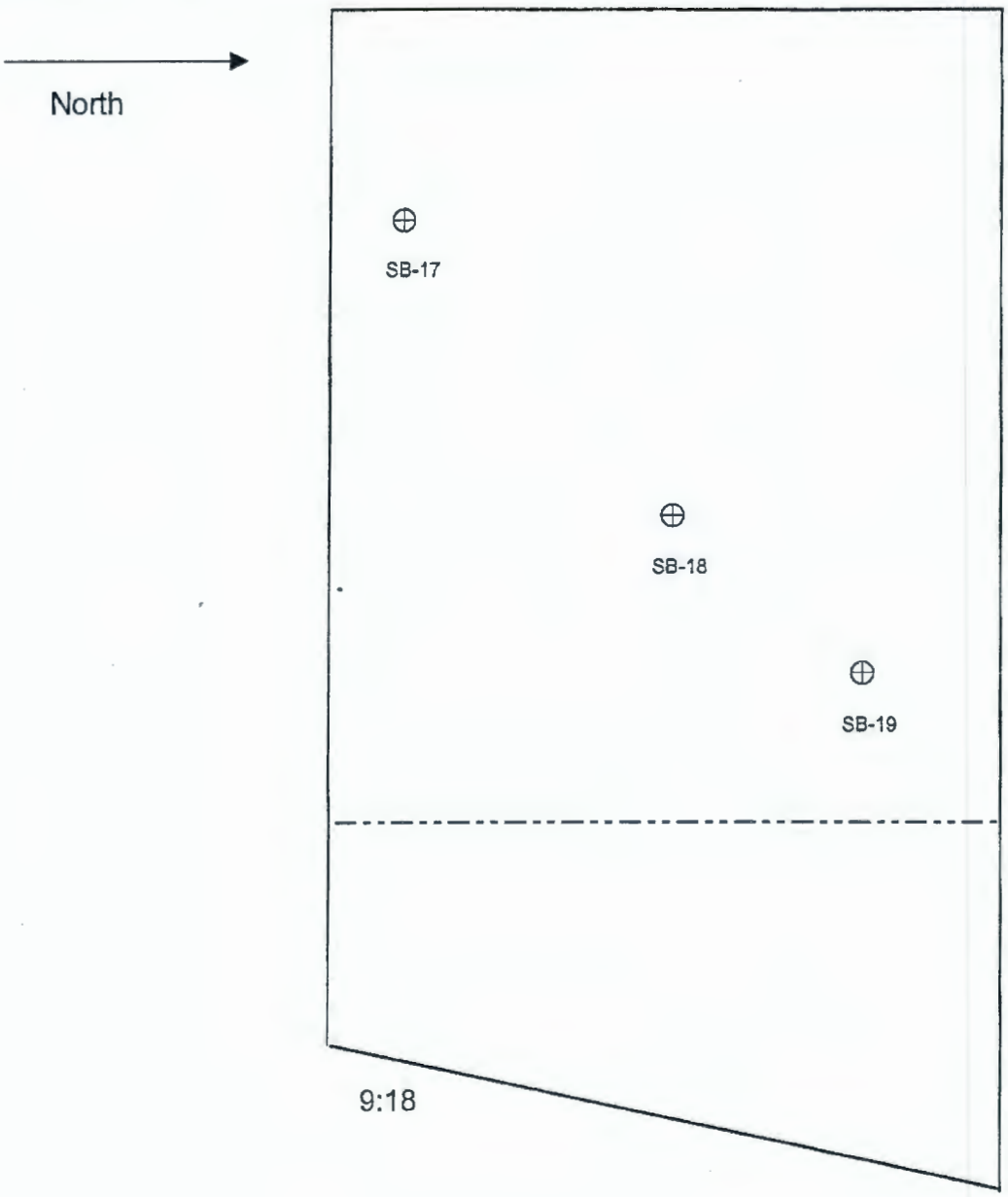
CQA Moisture Density Map Cells 7-8

Date:	28-Sep-09	Lift:	5
Report:	18	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	28-Sep-09	Lift:	6
Report:	18	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	SB-19
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	9/28/2009
Tested By:	LH	Date:	9/28/2009	Sampled By:	LH
Reviewed By:	JV	Date:	9/29/2009	Date Received:	9/28/2009
Comments				Report No.:	18

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	0.00 g
2. Weight of Proctor mold + sand, W_2	1201.86 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	79.49 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1366.53 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.01 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5445.35 g
9. Weight of bottle + cone + sand (after use), W_8	1185.46 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0802 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	4499.79 g
13. Weight of gallon can + dry soil, W_9	4035.68 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	123.62 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	11.5%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	110.87 lb/ft^3
17. Comparision moisture content =	11.9%
18. Dry unit weight comparison =	111.7 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	19-1	Test Date:	9/29/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	673	Density Std:	2272	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-22	As per Map	SF-05	8	8:50	LH	6	120.1	9.8%	95.1%	109.4	PASS
NB-23	As per Map	SF-05	8	8:55	LH	6	119.5	8.8%	95.5%	109.8	PASS
NB-24	As per Map	SF-05	8	9:00	LH	6	125.0	11.1%	97.8%	112.5	PASS

Reviewed by:

nvirotech Engineering & Consulting, Inc

10/1/09
Date

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-01
Project ID:	S66X528A00			Max Dry Density (pcf):	124.4
Sheet No.	19-2	Test Date:	9/29/2009	Optimum Moisture (%):	9.2%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	673	Density Std:	2272	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		90%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper.	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
South Berm											
SB-20	As per Map	SF-05	7	12:30	LH	8	120.9	7.0%	98.3%	113.0	PASS
SB-21	As per Map	SF-05	7	12:35	LH	8	113.9	5.3%	94.1%	108.2	PASS
SB-22	As per Map	SF-05	7	12:40	LH	8	111.7	7.2%	90.6%	104.2	PASS

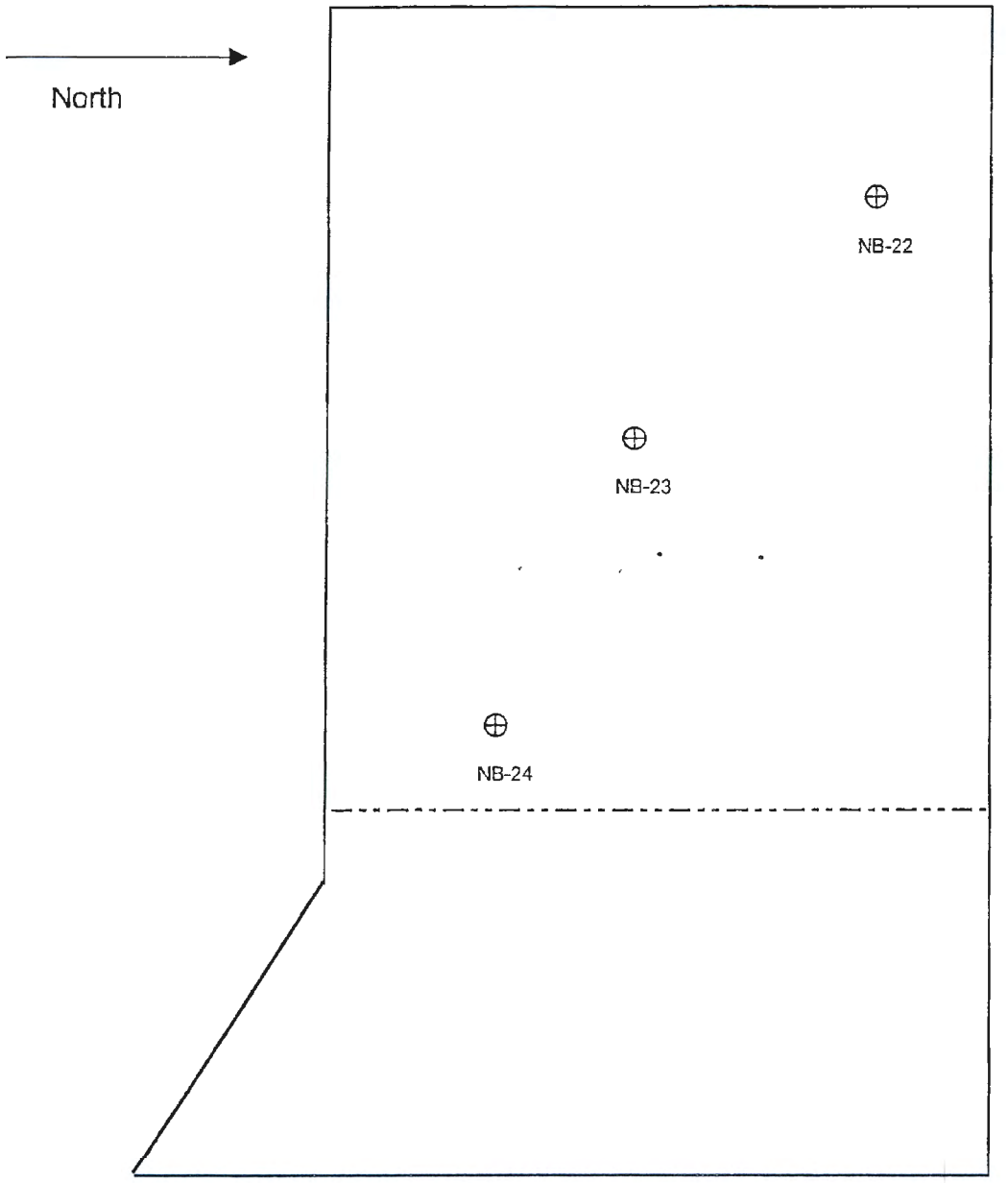
Reviewed by:

Envirotech Engineering & Consulting, Inc

10/1/09
Date

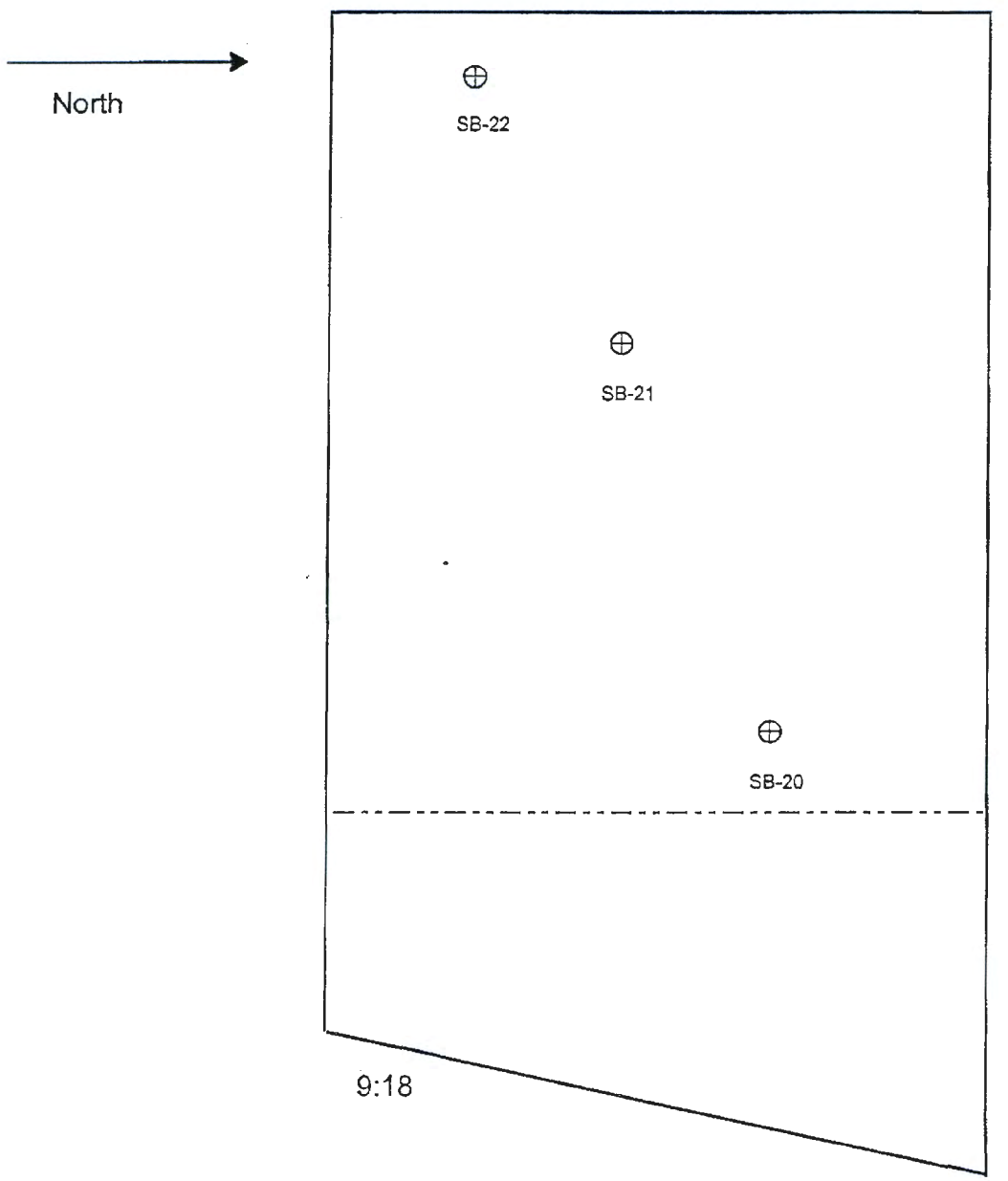
CQA Moisture Density Map Cells 7-8

Date:	29-Sep-09	Lift:	8
Report:	19	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	29-Sep-09	Lift:	7
Report:	19	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	NB-24
Project:	S66X528A00			Sample Description:	North Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	9/29/2009
Tested By:	LH	Date:	9/29/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/1/2009	Date Received:	9/29/2009
Comments				Report No.:	19

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	0.00 g
2. Weight of Proctor mold + sand, W_2	1201.86 g
3. Volume of mold, V_1	0.03 ft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	79.49 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1366.53 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.01 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5442.40 g
9. Weight of bottle + cone + sand (after use), W_8	911.94 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0878 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	4915.74 g
13. Weight of gallon can + dry soil, W_9	4428.58 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	123.50 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	11.0%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	111.26 lb/ft^3
17. Comparision moisture content =	11.1%
18. Dry unit weight comparison =	112.5 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-06
Project ID:	S66X528A00			Max Dry Density (pcf):	113.5
Sheet No.	20-1	Test Date:	9/30/2009	Optimum Moisture (%):	15.5%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	672	Density Std:	2262	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-25	As per Map	SF-06	9	8:45	LH	6	112.8	6.4%	93.4%	106.0	FAIL
NB-26	As per Map	SF-06	9	8:44	LH	6	112.5	6.7%	92.9%	105.4	FAIL
NB-25A	As per Map	SF-06	9	9:35	LH	6	116.5	7.2%	95.7%	108.7	PASS
NB-26A	As per Map	SF-06	9	9:37	LH	6	119.1	10.4%	95.0%	107.9	PASS
NB-27	As per Map	SF-06	9	9:40	LH	6	117.0	8.3%	95.2%	108.0	PASS
South Berm											
SB-23	As per Map	SF-05	8	13:00	LH	6	120.7	9.0%	96.3%	110.7	PASS
SB-24	As per Map	SF-05	8	13:05	LH	6	121.3	9.4%	96.4%	110.9	PASS
SB-25	As per Map	SF-05	8	13:10	LH	6	121.2	9.5%	96.2%	110.7	PASS

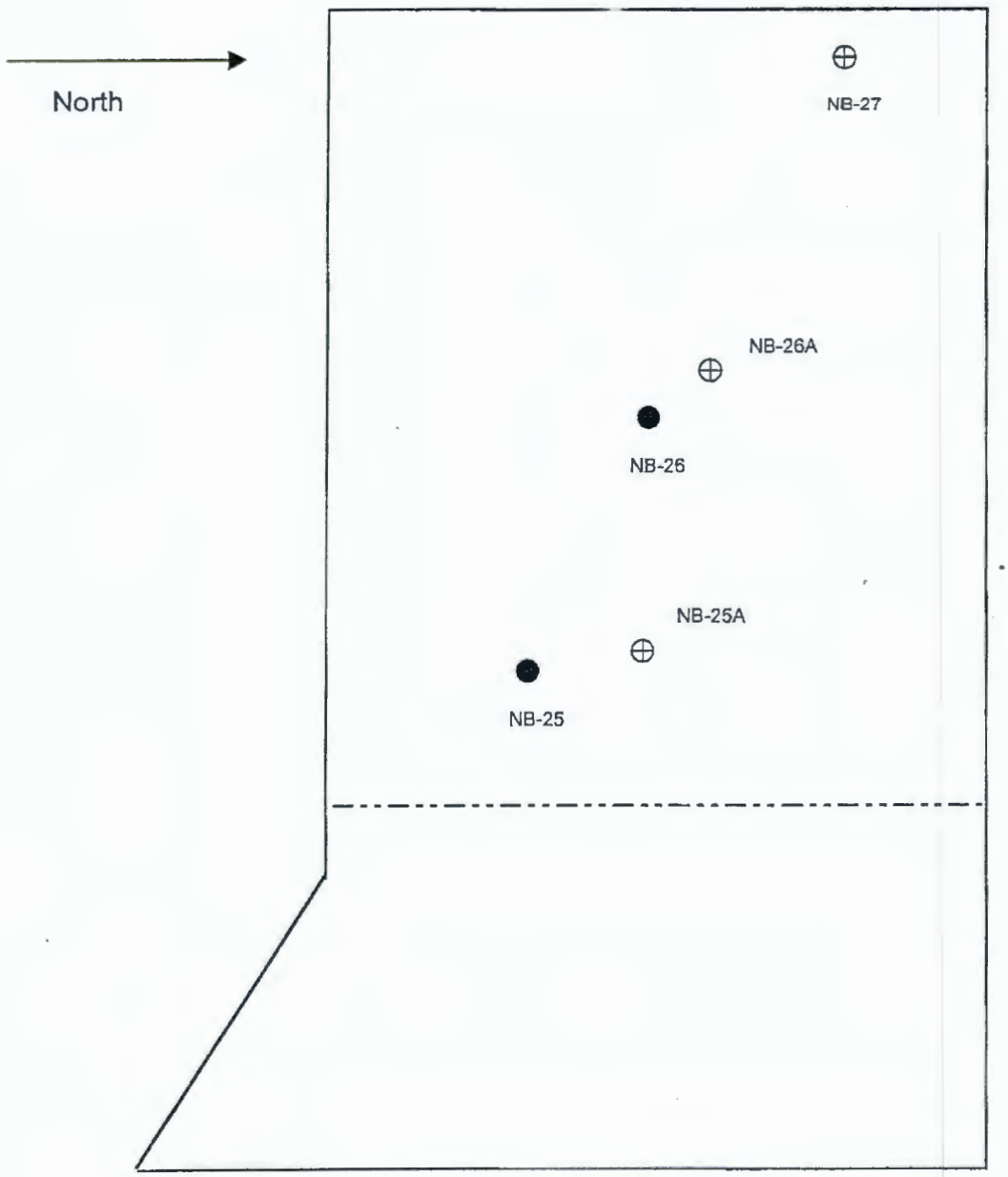
Reviewed by:

Envirotech Engineering & Consulting, Inc

10/1/09
Date

CQA Moisture Density Map Cells 7-8

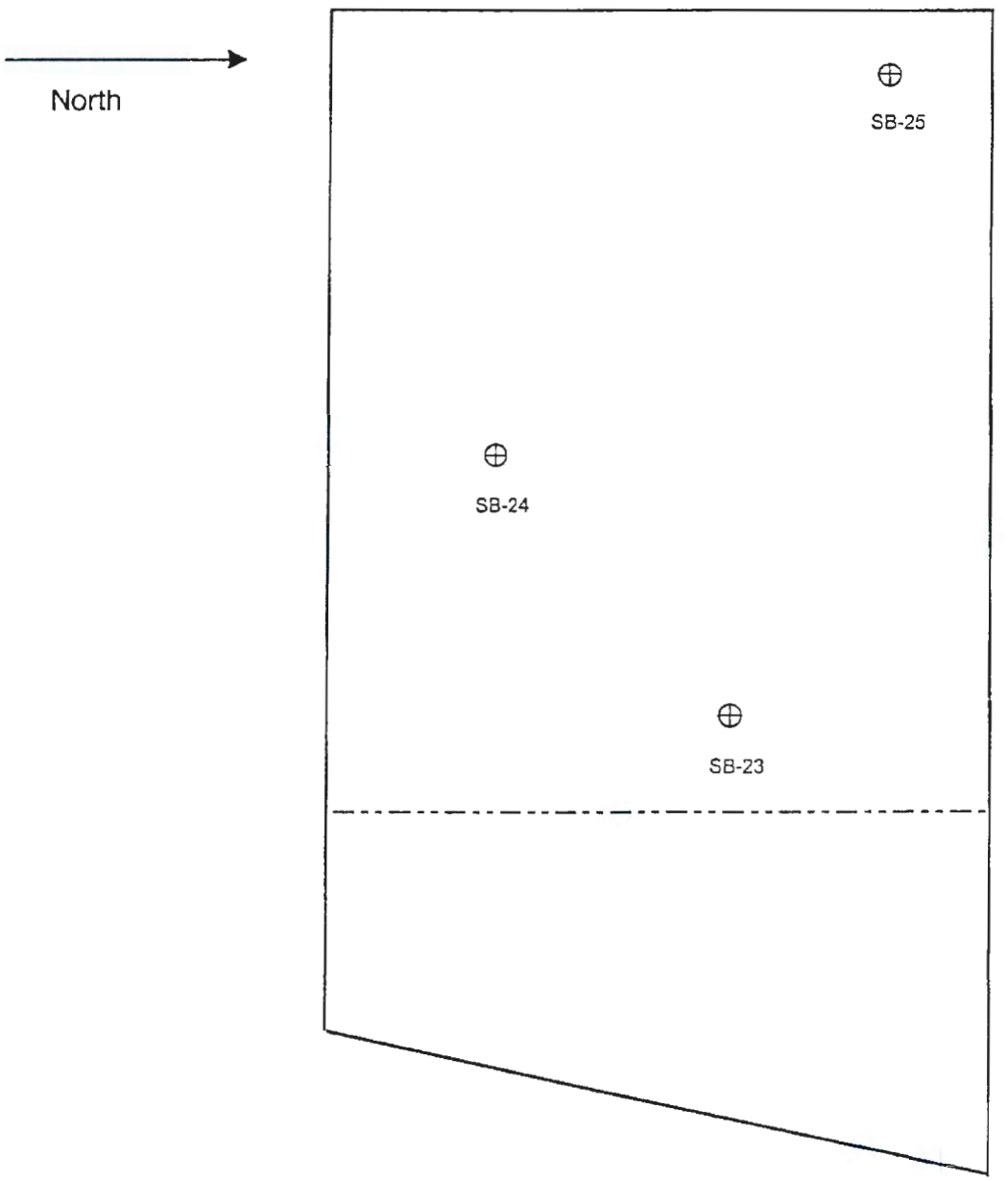
Date:	30-Sep-09	Lift:	9
Report:	20	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-06
Notes:			



ENVIROTECH
ENGINEERING & CONSULTING, INC.

CQA Moisture Density Map Cells 7-8

Date:	30-Sep-09	Lift:	7
Report:	20	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	SB-25
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	9/30/2009
Tested By:	LH	Date:	9/30/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/1/2009	Date Received:	9/30/2009
Comments				Report No.:	20

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	6171.77 g
9. Weight of bottle + cone + sand (after use), W_8	1729.09 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0648 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	3606.49 g
13. Weight of gallon can + dry soil, W_9	3271.52 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	122.62 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	10.2%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	111.23 lb/ft^3
17. Comparision moisture content =	9.5%
18. Dry unit weight comparison =	110.7 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-06
Project ID:	S66X528A00			Max Dry Density (pcf):	113.5
Sheet No.	21-1	Test Date:	10/1/2009	Optimum Moisture (%):	15.5%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	676	Density Std:	2265	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-28	As per Map	SF-05	10	8:00	LH	6	122.9	11.1%	96.2%	110.6	PASS
NB-29	As per Map	SF-05	10	8:05	LH	6	123.4	8.1%	99.3%	114.2	PASS
NB-30	As per Map	SF-05	10	8:15	LH	6	125.1	14.2%	95.3%	109.5	PASS
NB-31	As per Map	SF-05	11	14:15	LH	6	121.8	10.8%	95.6%	109.9	PASS
NB-32	As per Map	SF-05	11	14:19	LH	6	123.5	12.1%	95.8%	110.2	PASS
NB-33	As per Map	SF-05	11	14:23	LH	6	121.7	8.9%	97.2%	111.8	PASS
South Berm											
SB-26	As per Map	SF-05	9	10:30	LH	6	129.0	12.9%	99.4%	114.3	PASS
SB-27	As per Map	SF-05	9	10:35	LH	6	123.6	12.4%	95.6%	110.0	PASS
SB-28	As per Map	SF-05	9	10:40	LH	6	122.5	11.9%	95.2%	109.5	PASS

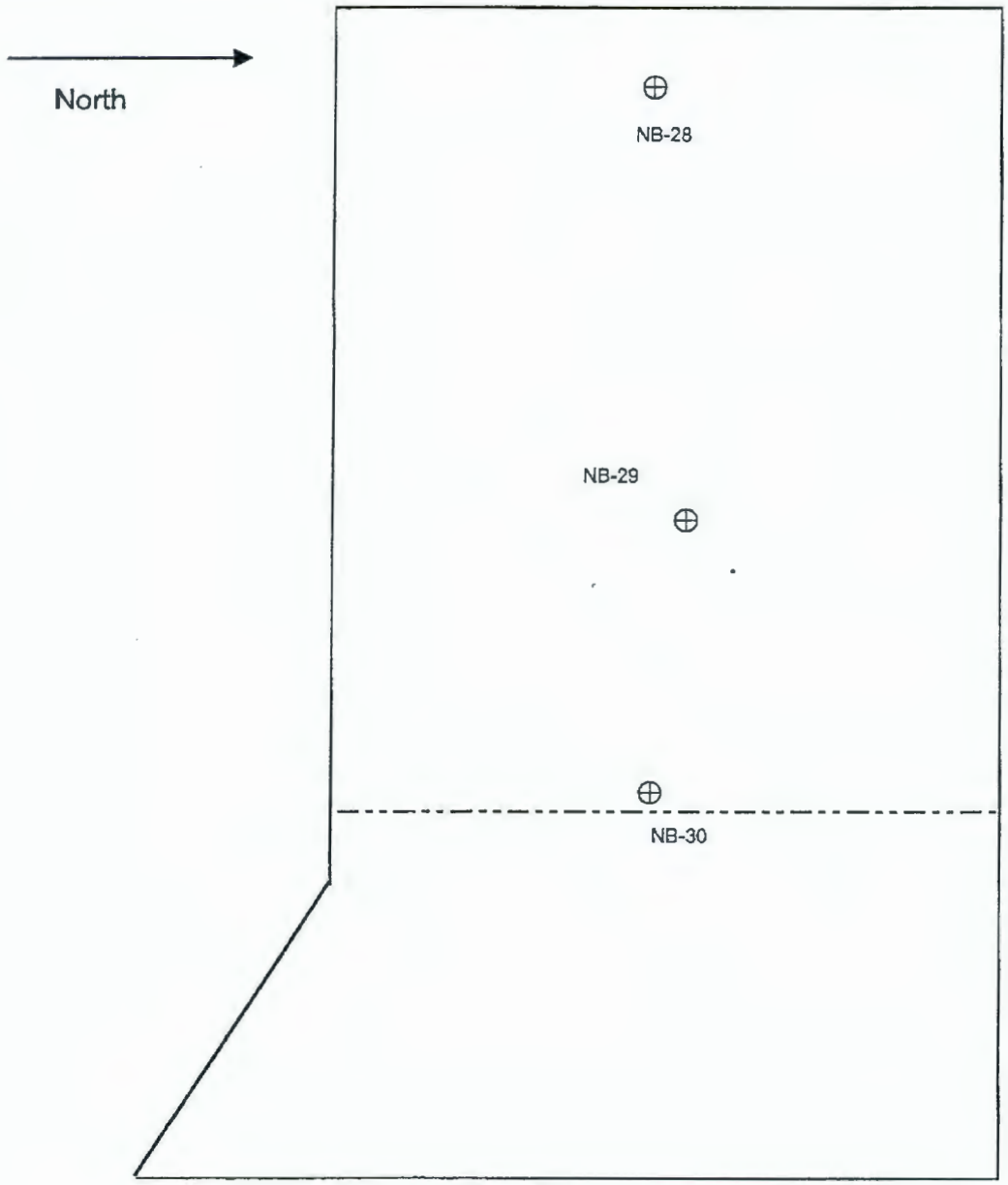
Reviewed by:

Envirotech Engineering & Consulting, Inc

Date 10/9/09

CQA Moisture Density Map Cells 7-8

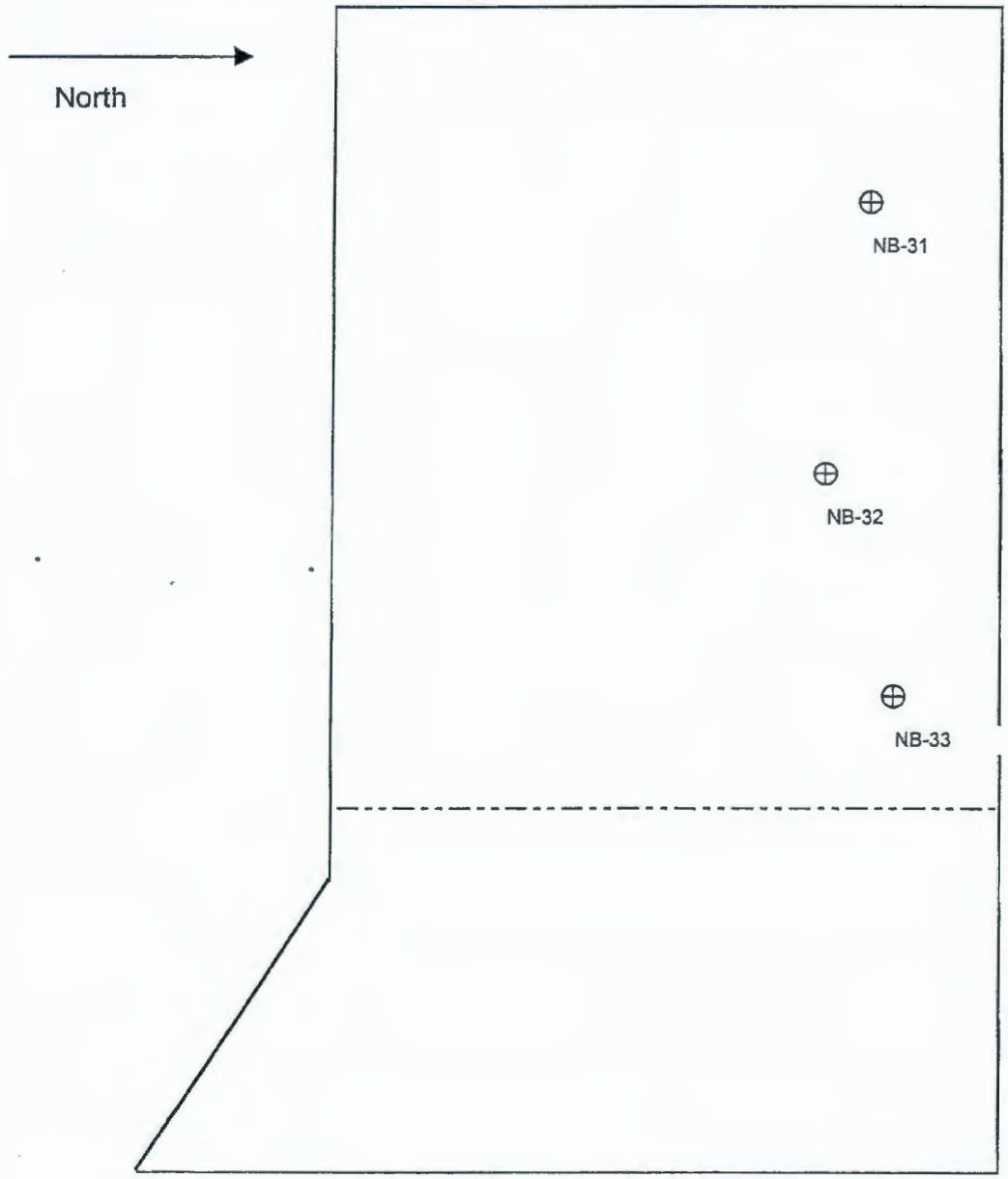
Date:	1-Oct-09	Lift:	10
Report:	21	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



ENVIROTECH
ENGINEERING & CONSULTING, INC.

CQA Moisture Density Map Cells 7-8

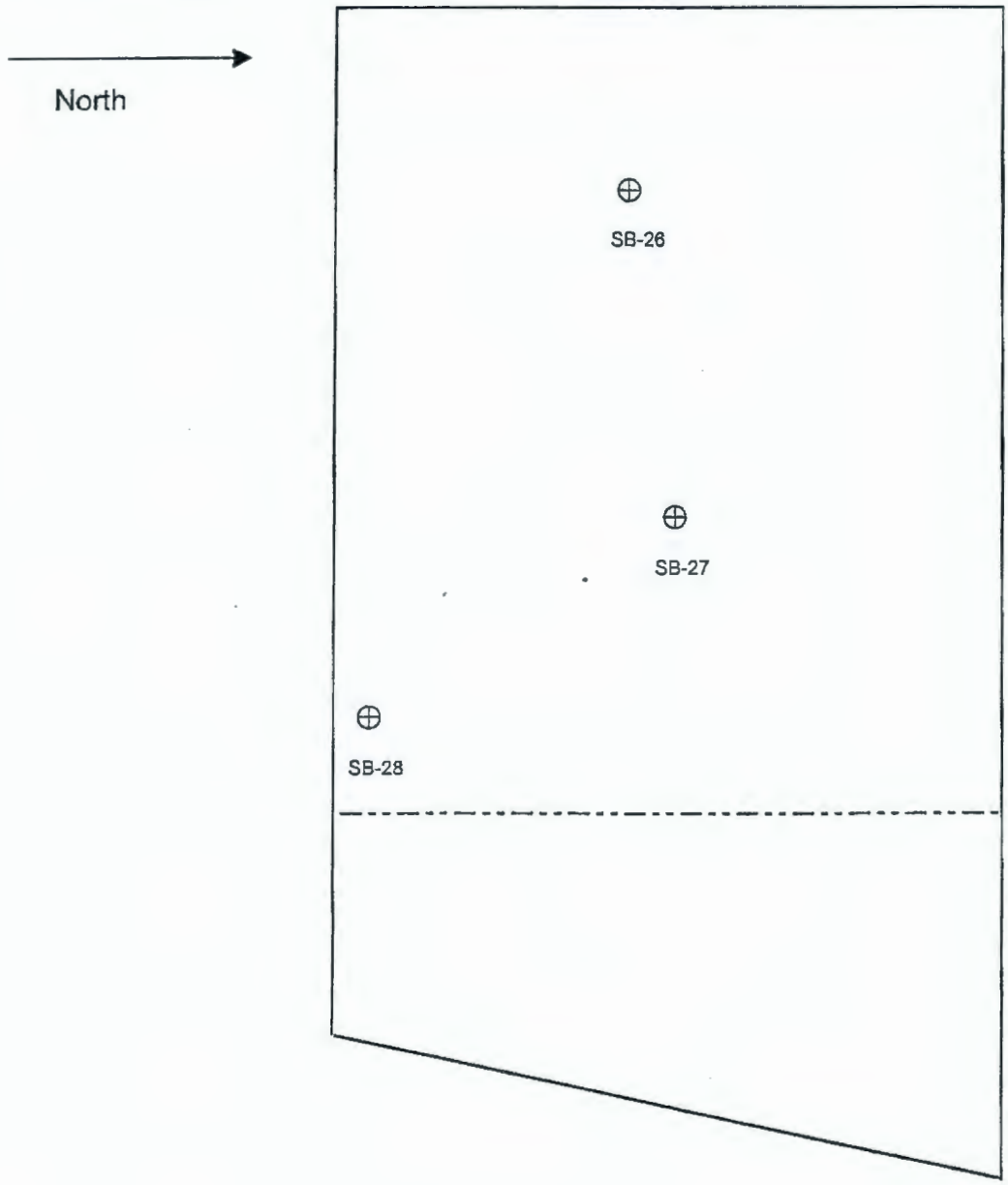
Date:	1-Oct-09	Lift:	11
Report:	21	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



ENVIROTECH
ENGINEERING & CONSULTING, INC.

CQA Moisture Density Map Cells 7-8

Date:	1-Oct-09	Lift:	9
Report:	21	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	NB-29
Project:	S66X528A00			Sample Description:	North Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	10/1/2009
Tested By:	LH	Date:	10/1/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/2/2009	Date Received:	10/1/2009
Comments				Report No.:	21

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	6447.33 g
9. Weight of bottle + cone + sand (after use), W_8	1928.21 g
10. Volume of hole, $V_2 = \frac{W_6 - W_3 - W_c}{\gamma\ d\ (sand)}$	0.0666 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	3752.78 g
13. Weight of gallon can + dry soil, W_9	3438.21 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	124.21 lb/ft^3
15. Moisture content in the field, $w\ (\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	9.1%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma\ /\ (1+(w\ (\%)/100)$	113.80 lb/ft^3
17. Comparision moisture content =	8.1%
18. Dry unit weight comparison =	114.2 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-06
Project ID:	S66X528A00			Max Dry Density (pcf):	113.5
Sheet No.	22-1	Test Date:	10/5/2009	Optimum Moisture (%):	15.5%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	677	Density Std:	2265	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper.	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass/ Fail
North Berm											
NB-34	As per Map	SF-05	12	12:30	LH	6	121.7	10.0%	96.2%	110.6	PASS
NB-35	As per Map	SF-05	12	12:37	LH	6	123.0	10.2%	97.1%	111.6	PASS
NB-36	As per Map	SF-05	12	12:44	LH	6	125.9	11.7%	98.0%	112.7	PASS
North Berm											
SB-29	As per Map	SF-05	10	7:30	LH	6	117.1	5.7%	96.3%	110.8	PASS
SB-30	As per Map	SF-05	10	7:35	LH	6	122.3	6.5%	99.9%	114.8	PASS
SB-31	As per Map	SF-05	10	7:44	LH	6	119.7	8.1%	96.3%	110.7	PASS

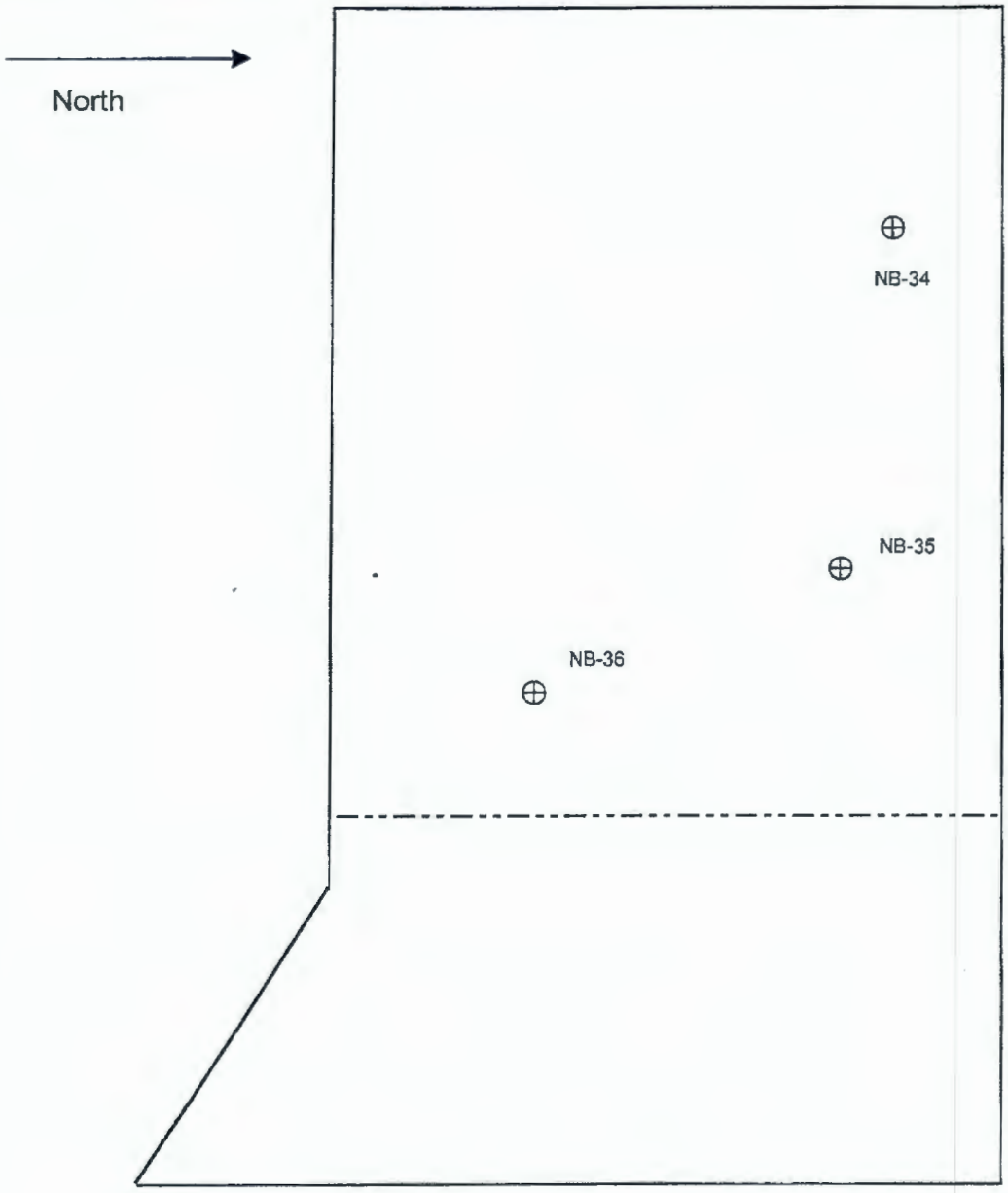
Reviewed by:

Envirotech Engineering & Consulting, Inc

10/13/09
Date

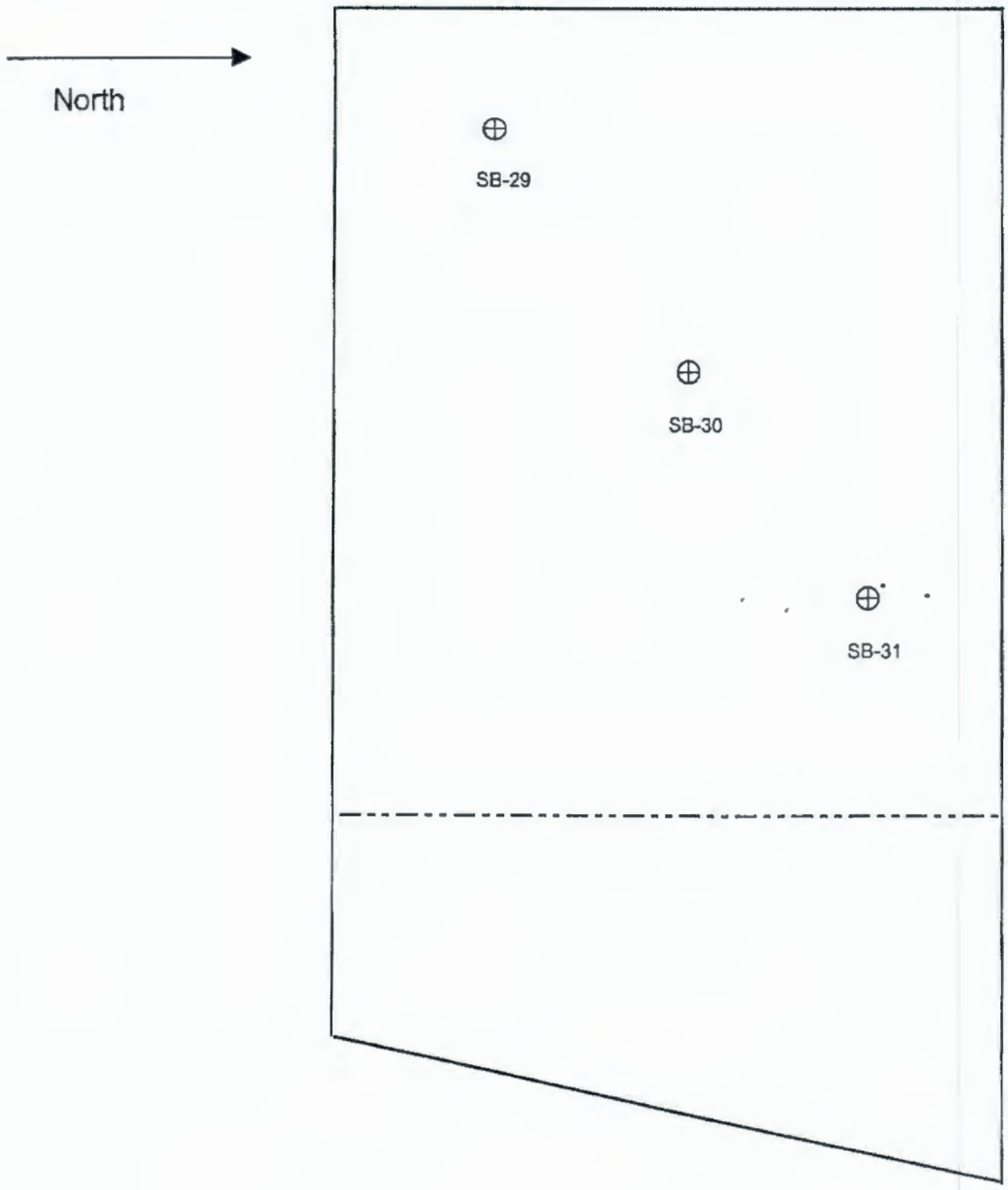
CQA Moisture Density Map Cells 7-8

Date:	5-Oct-09	Lift:	12
Report:	22	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	5-Oct-09	Lift:	10
Report:	22	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	NB-36
Project:	S66X528A00			Sample Description:	North Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	10/5/2009
Tested By:	LH	Date:	10/5/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/7/2009	Date Received:	10/5/2009
Comments				Report No.:	22

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	6452.54 g
9. Weight of bottle + cone + sand (after use), W_8	2308.55 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0579 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	3372.90 g
13. Weight of gallon can + dry soil, W_9	3000.95 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	128.35 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	12.4%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma\ /\ (1+(w\,(\%)/100)$	114.20 lb/ft^3
17. Comparision moisture content =	11.7%
18. Dry unit weight comparison =	112.7 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-06
Project ID:	S66X528A00			Max Dry Density (pcf):	113.5
Sheet No.	23-1	Test Date:	10/6/2009	Optimum Moisture (%):	15.5%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	671	Density Std:	2268	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper.	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-37	As per Map	SF-05	13	12:40	LH	6	123.5	9.7%	97.9%	112.6	PASS
NB-38	As per Map	SF-05	13	12:45	LH	6	127.6	12.4%	98.7%	113.5	PASS
NB-39	As per Map	SF-05	13	12:55	LH	6	123.4	12.0%	95.8%	110.2	PASS
South Berm											
SB-32	As per Map	SF-05	11	7:30	LH	6	120.3	8.7%	96.2%	110.7	PASS
SB-33	As per Map	SF-05	11	7:35	LH	6	118.7	8.8%	95.0%	109.1	PASS
SB-34	As per Map	SF-05	11	7:40	LH	6	121.6	8.1%	97.8%	112.5	PASS
SB-35	As per Map	SF-05	12	15:45	LH	6	122.3	11.9%	95.0%	109.3	PASS
SB-36	As per Map	SF-05	12	15:50	LH	6	125.2	12.9%	96.4%	110.9	PASS
SB-37	As per Map	SF-05	12	15:55	LH	6	123.1	10.2%	97.1%	111.7	PASS

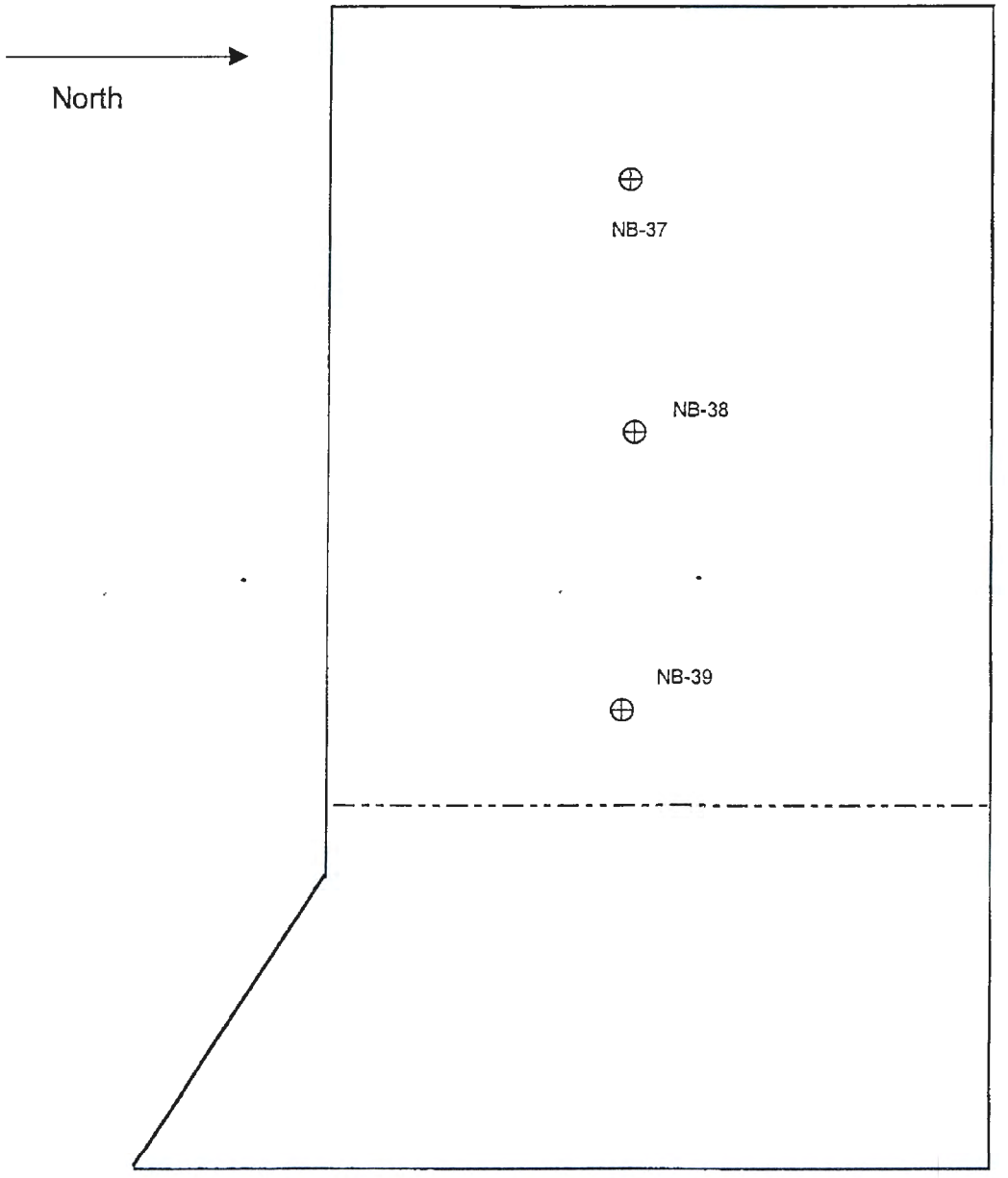
Reviewed by:

nvirotech Engineering & Consulting, Inc

10/9/09
Date

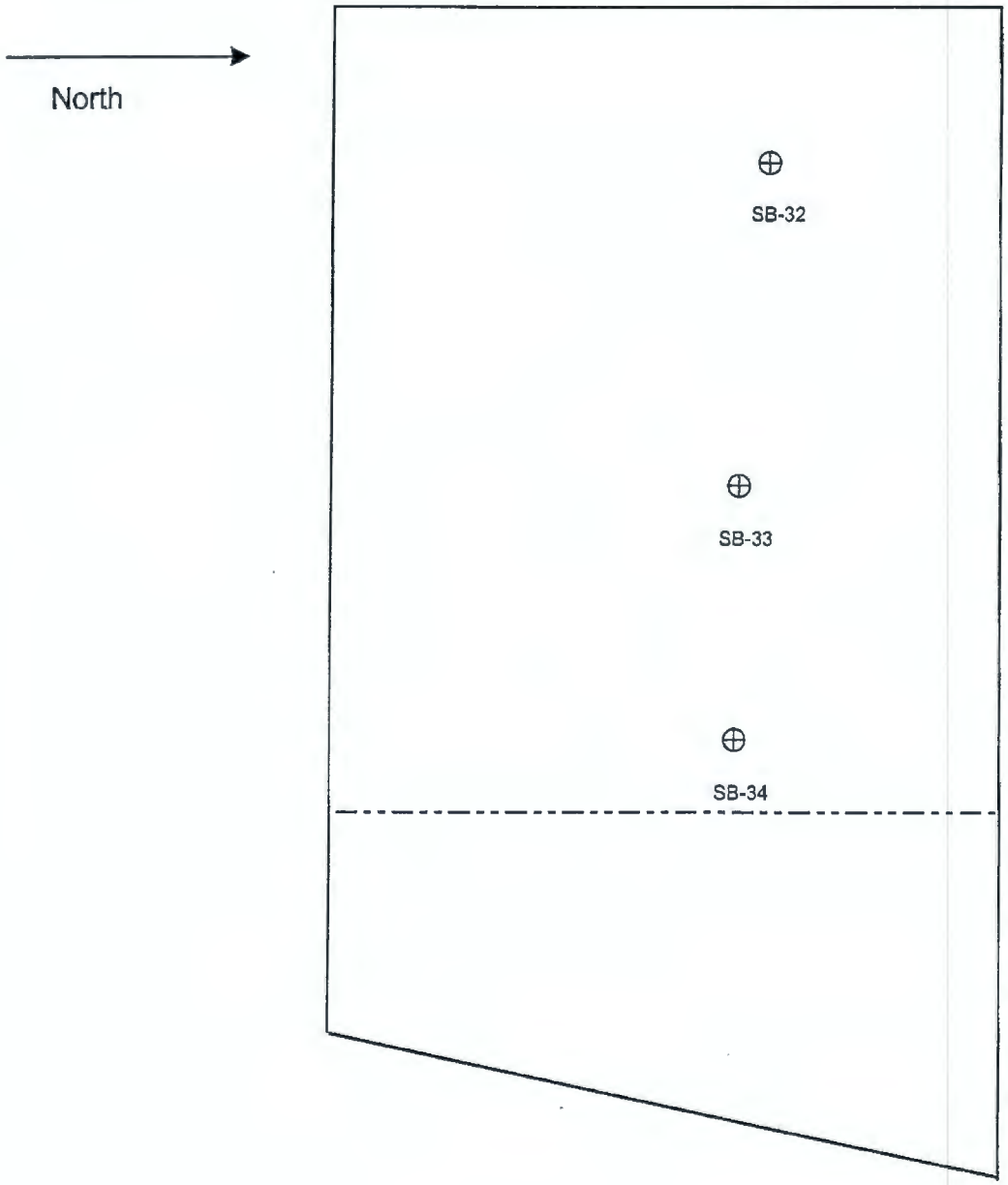
CQA Moisture Density Map Cells 7-8

Date:	6-Oct-09	Lift:	13
Report:	23	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



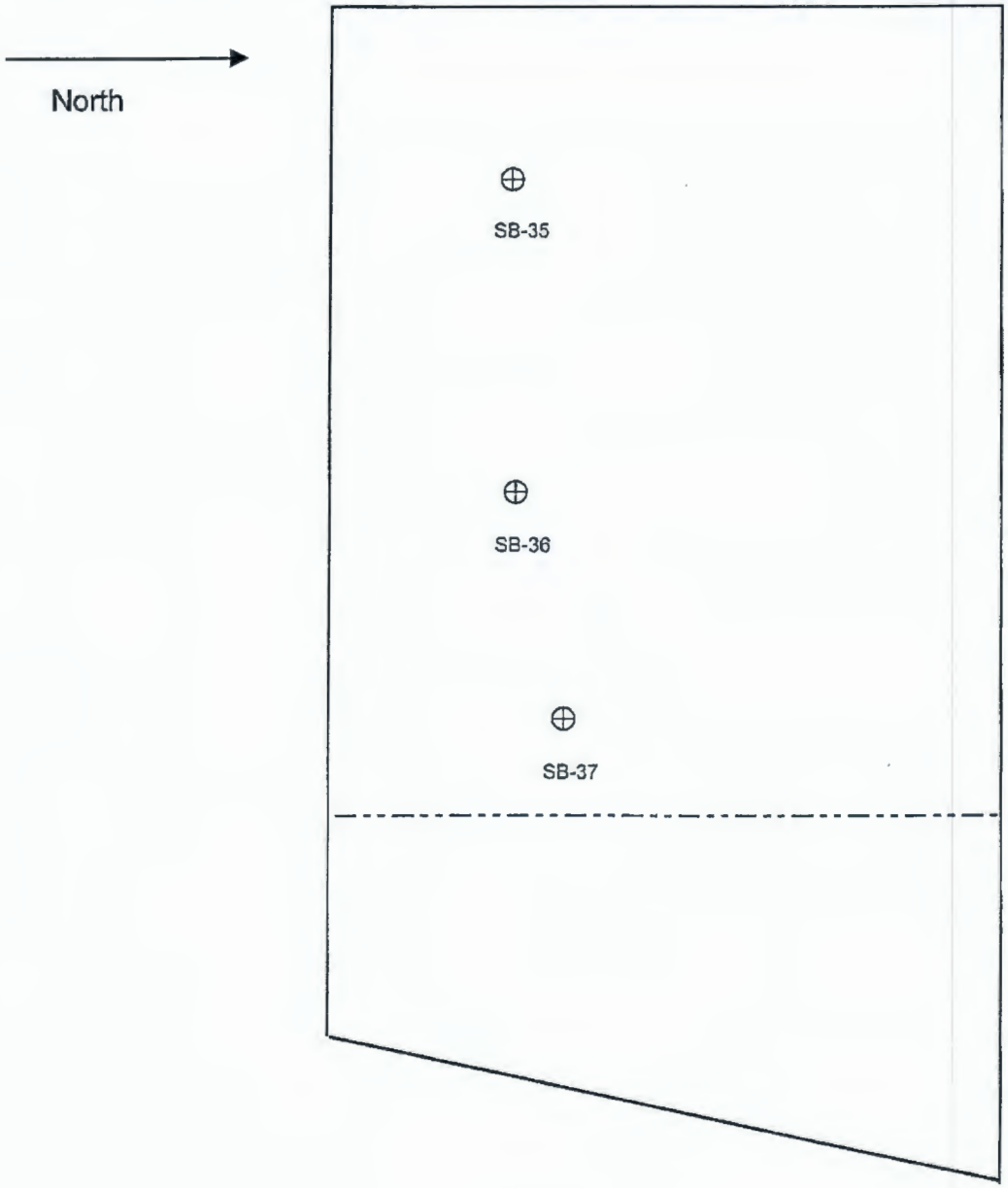
CQA Moisture Density Map Cells 7-8

Date:	6-Oct-09	Lift:	11
Report:	23	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	6-Oct-09	Lift:	12
Report:	23	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	NB-38
Project:	S66X528A00			Sample Description:	North Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	10/6/2009
Tested By:	LH	Date:	10/6/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/9/2009	Date Received:	10/6/2009
Comments				Report No.:	23

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	6274.96 g
9. Weight of bottle + cone + sand (after use), W_8	1502.29 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0725 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	4261.93 g
13. Weight of gallon can + dry soil, W_9	3803.58 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	129.65 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	12.1%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	115.70 lb/ft^3
17. Comparision moisture content =	12.4%
18. Dry unit weight comparison =	113.5 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-06
Project ID:	S66X528A00			Max Dry Density (pcf):	113.5
Sheet No.	24-1	Test Date:	10/7/2009	Optimum Moisture (%):	15.5%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	672	Density Std:	2271	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-40	As per Map	SF-05	14	9:45	LH	6	117.4	12.7%	90.6%	104.2	FAIL
NB-40A	As per Map	SF-05	14	11:45	LH	6	125.3	12.6%	96.8%	111.3	PASS
NB-41	As per Map	SF-05	14	11:50	LH	6	125.2	10.5%	98.5%	113.3	PASS
NB-42	As per Map	SF-05	14	11:55	LH	6	119.9	9.4%	95.3%	109.6	PASS
South Berm											
SB-38	As per Map	SF-05	13	15:00	LH	6	120.3	9.7%	95.0%	109.7	PASS
SB-39	As per Map	SF-05	13	15:05	LH	6	120.9	9.7%	95.8%	110.2	PASS
SB-40	As per Map	SF-05	13	15:10	LH	6	121.2	9.1%	96.6%	111.1	PASS

Reviewed by:

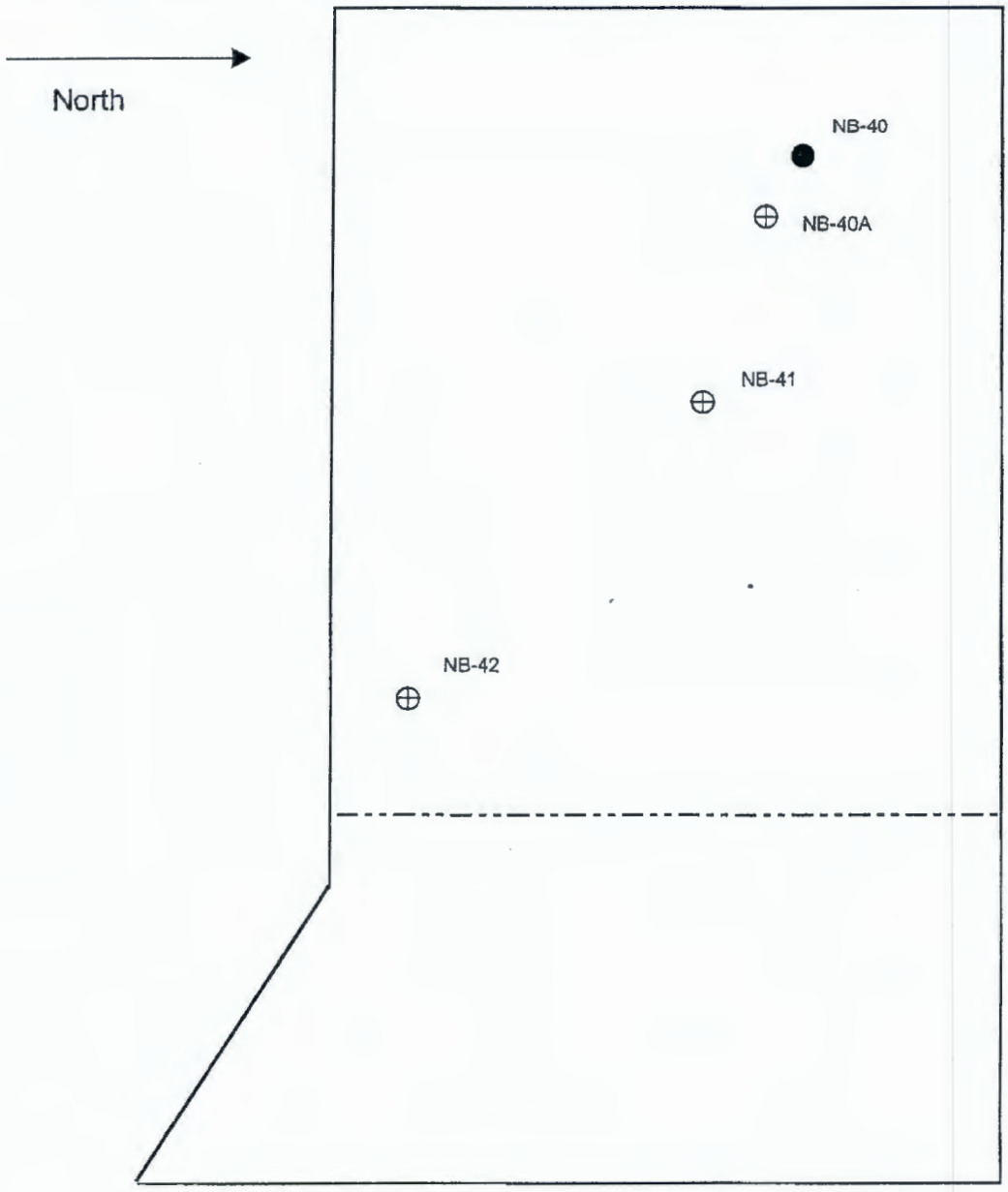
Envirotech Engineering & Consulting, Inc

10/12/09
Date

ENVIROTECH
ENGINEERING & CONSULTING, INC.

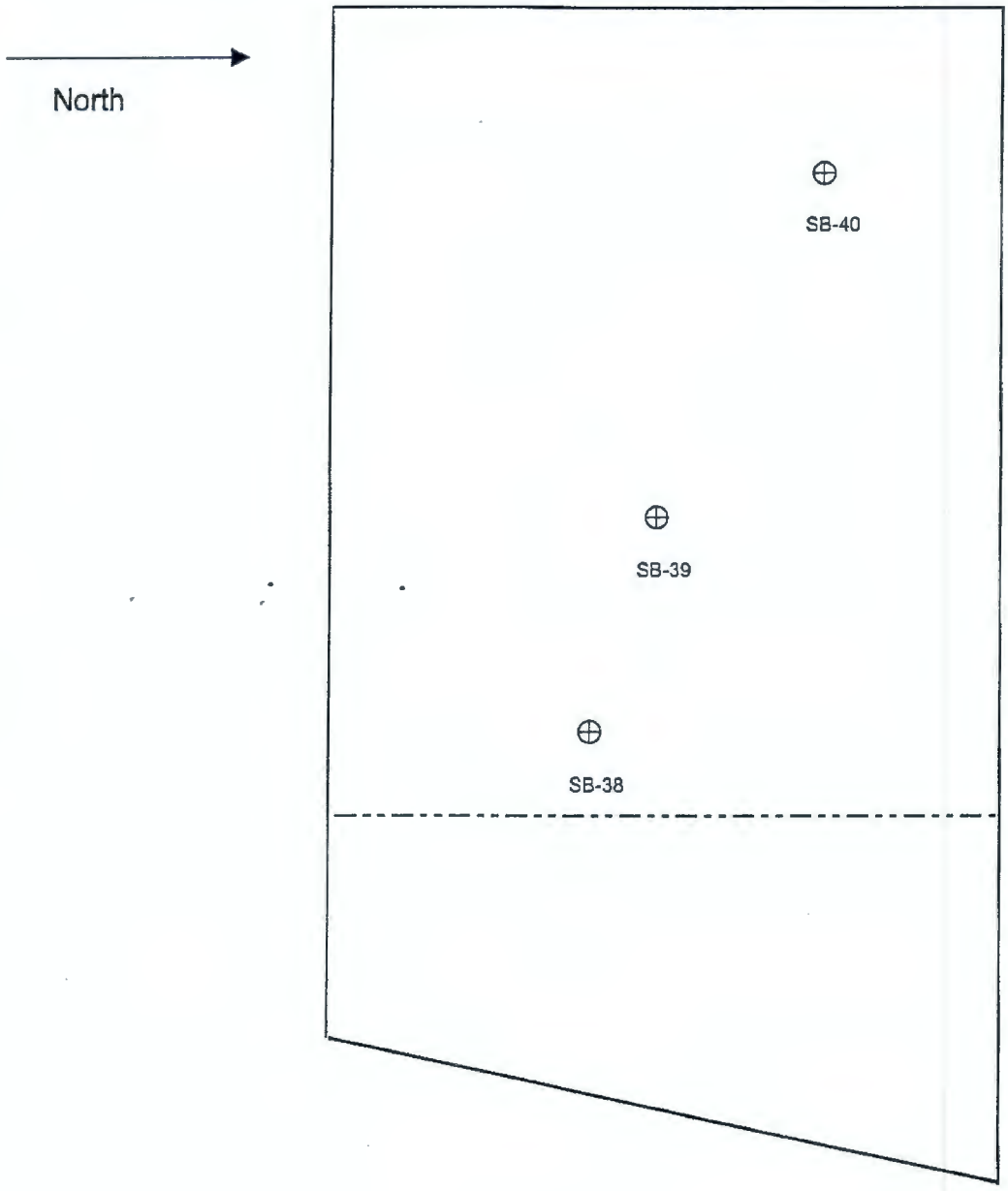
CQA Moisture Density Map Cells 7-8

Date:	7-Oct-09	Lift:	14
Report:	24	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	7-Oct-09	Lift:	13
Report:	24	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	SB-40
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	10/7/2009
Tested By:	LH	Date:	10/8/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/12/2009	Date Received:	10/7/2009
Comments				Report No.:	24

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5739.73 g
9. Weight of bottle + cone + sand (after use), W_8	1368.25 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0632 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	3508.29 g
13. Weight of gallon can + dry soil, W_9	3200.98 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	122.39 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	9.6%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	111.67 lb/ft^3
17. Comparision moisture content =	12.7%
18. Dry unit weight comparison =	104.2 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-06
Project ID:	S66X528A00			Max Dry Density (pcf):	113.5
Sheet No.	25-1	Test Date:	10/8/2009	Optimum Moisture (%):	15.5%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	675	Density Std:	2265	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-43	As per Map	SF-05	15	12:00	LH	6	126.7	14.4%	96.3%	110.8	PASS
NB-44	As per Map	SF-05	15	12:05	LH	6	126.0	12.9%	97.0%	111.6	PASS
NB-45	As per Map	SF-05	15	12:10	LH	6	126.6	12.5%	97.9%	112.5	PASS

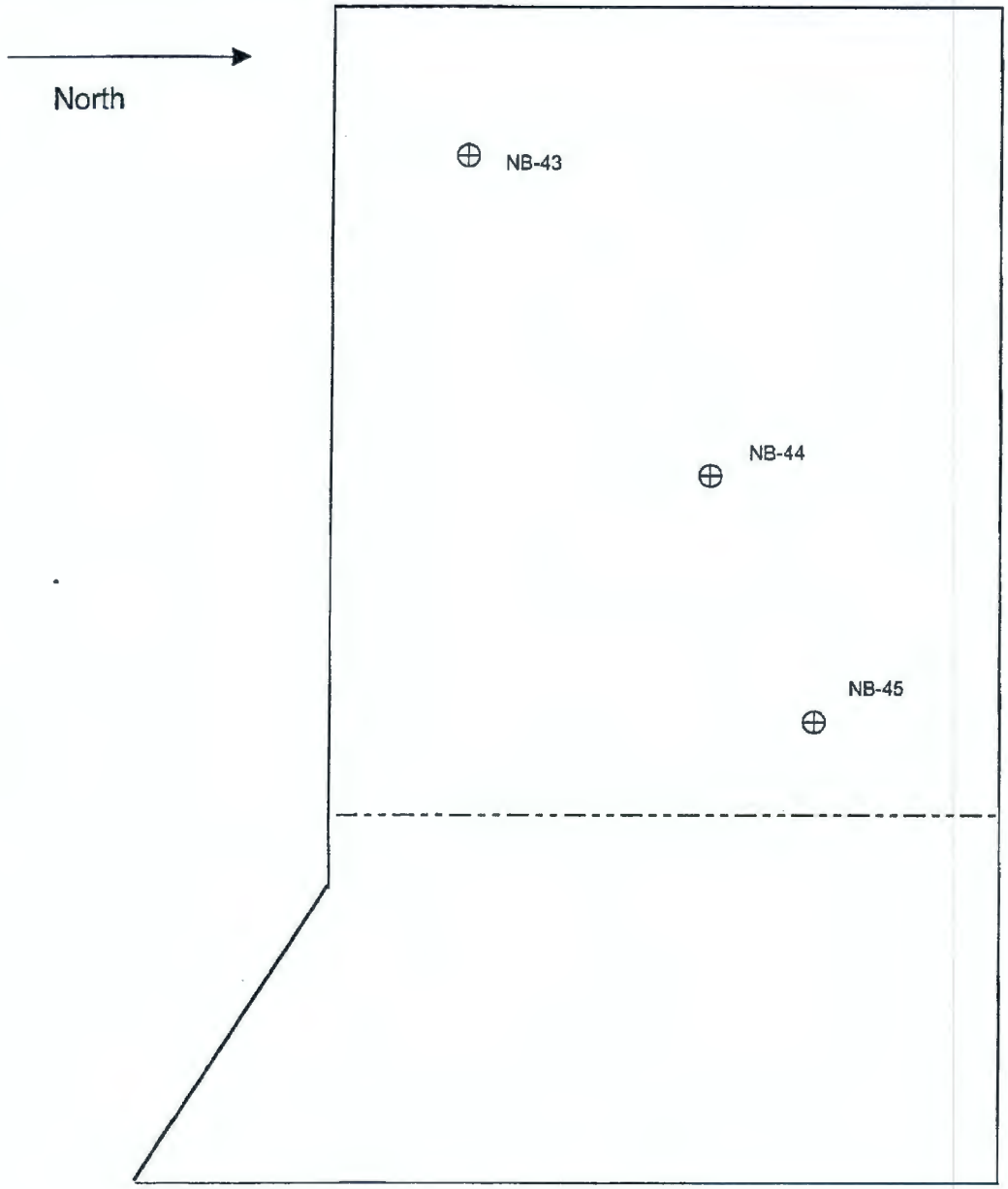
Reviewed by:

Envirotech Engineering & Consulting, Inc

10/12/09
Date

CQA Moisture Density Map Cells 7-8

Date:	8-Oct-09	Lift:	15
Report:	25	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street I Enid, OK 73701
(580) 234-8780 I Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	NB-45
Project:	S66X528A00			Sample Description:	North Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	10/8/2009
Tested By:	LH	Date:	10/9/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/12/2009	Date Received:	10/8/2009
Comments				Report No.:	25

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5498.87 g
9. Weight of bottle + cone + sand (after use), W_8	1502.52 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0545 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	3043.14 g
13. Weight of gallon can + dry soil, W_9	2734.83 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	123.05 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	11.3%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma\ /\ (1+(w\,(\%)/100)$	110.59 lb/ft^3
17. Comparision moisture content =	12.5%
18. Dry unit weight comparison =	112.5 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-06
Project ID:	S66X528A00			Max Dry Density (pcf):	113.5
Sheet No.	26-1	Test Date:	10/8/2009	Optimum Moisture (%):	15.5%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	672	Density Std:	2268	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (In.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
SB-41	As per Map	SF-05	14	6:40	LH	6	120.9	9.9%	95.7%	110.0	PASS
SB-42	As per Map	SF-05	14	6:43	LH	6	121.7	10.1%	96.1%	110.5	PASS
SB-43	As per Map	SF-05	14	6:47	LH	6	121.7	9.8%	96.4%	110.8	PASS
SB-44	As per Map	SF-05	15	15:30	LH	6	123.1	10.2%	97.1%	111.7	PASS
SB-45	As per Map	SF-05	15	15:34	LH	6	124.2	10.1%	98.1%	112.8	PASS
SB-46	As per Map	SF-05	15	15:45	LH	6	123.2	10.0%	97.4%	112.0	PASS

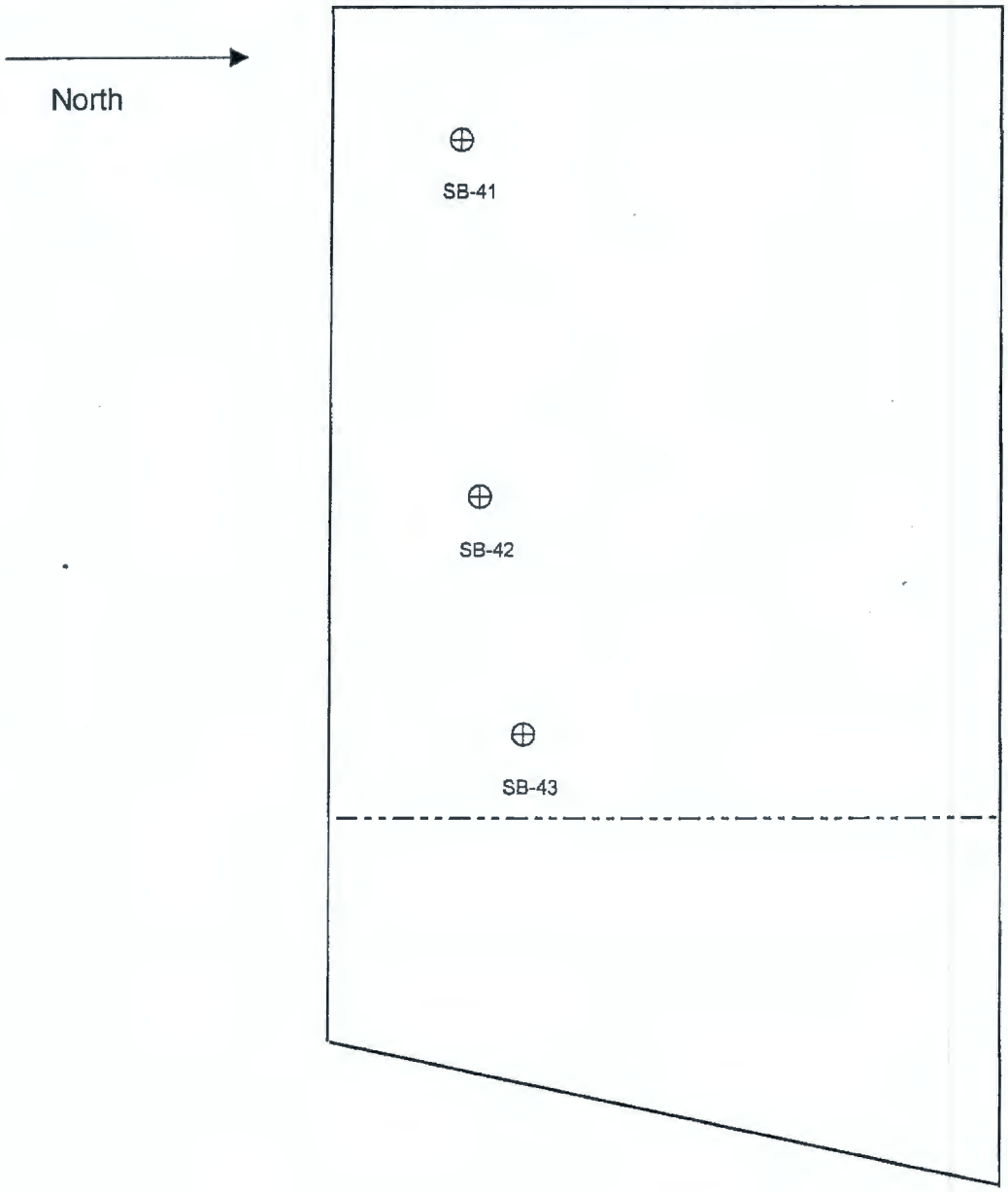
Reviewed by:

Envirotech Engineering & Consulting, Inc

10/13/09
Date

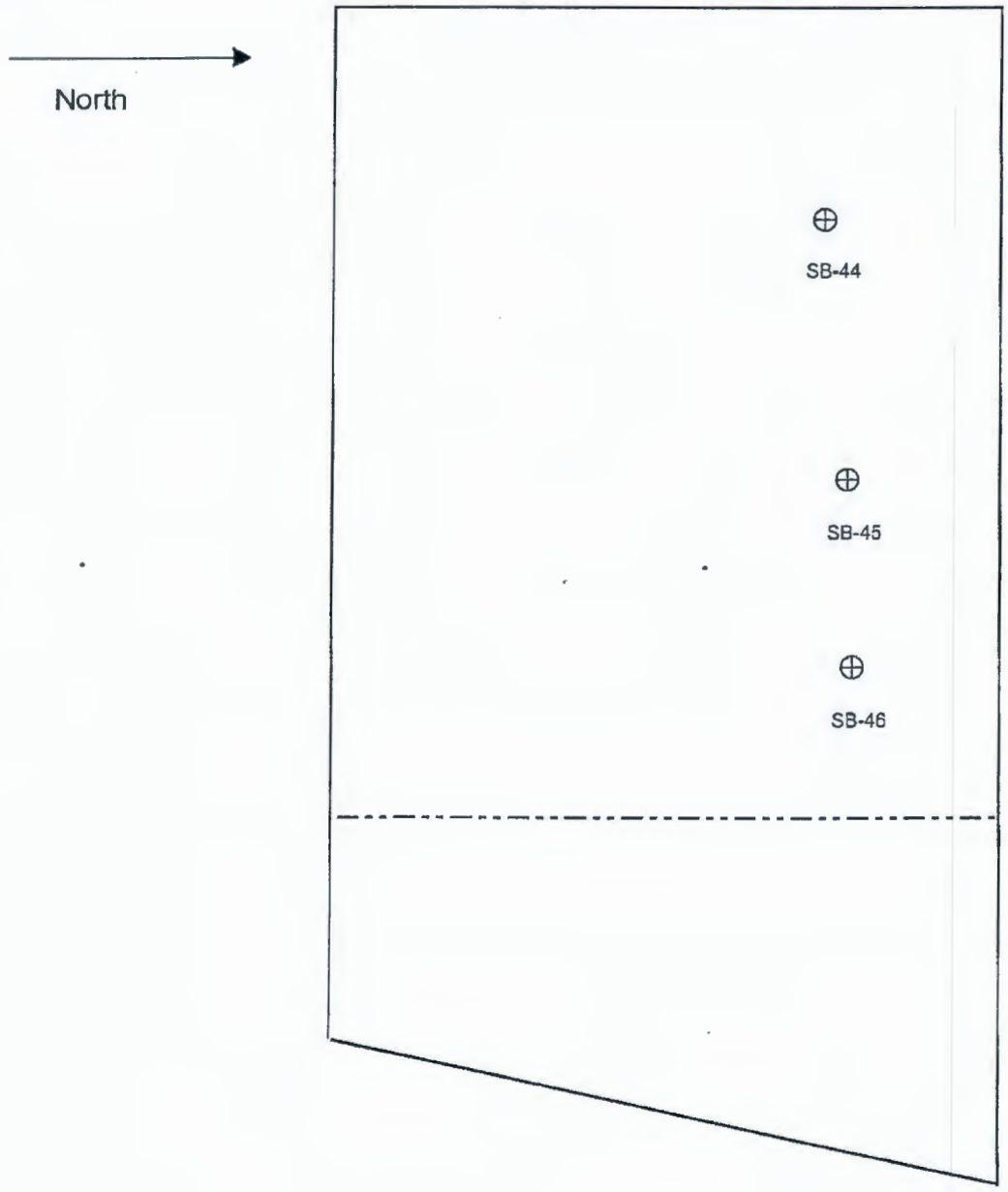
CQA Moisture Density Map Cells 7-8

Date:	12-Oct-09	Lift:	14
Report:	26	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



CQA Moisture Density Map Cells 7-8

Date:	12-Oct-09	Lift:	15
Report:	26	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	SB-46
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	10/12/2009
Tested By:	LH	Date:	10/12/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/13/2009	Date Received:	10/12/2009
Comments				Report No.:	26

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5346.24 g
9. Weight of bottle + cone + sand (after use), W_8	1014.68 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0623 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	3439.12 g
13. Weight of gallon can + dry soil, W_9	3135.89 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	121.76 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	9.7%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	111.02 lb/ft^3
17. Comparision moisture content =	10.0%
18. Dry unit weight comparison =	112.0 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Address: ERDF

Soil Information

Project:	ERDF Super Cell 9			Proctor:	SF-06
Project ID:	S66X528A00			Max Dry Density (pcf):	113.5
Sheet No.	27-1	Test Date:	10/13/2009	Optimum Moisture (%):	15.5%
Description:				Proctor:	SF-05
Troxler ID:	1249			Max Dry Density (pcf):	115.0
Moist Std:	671	Density Std:	2270	Optimum Moisture (%):	14.6%
Moist offset:	-	Density offset:	-	Proctor:	SF-03
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.1
Necessary % Proctor:		95%		Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
South Berm											
SB-47	As per Map	SF-05	16	9:30	LH	6	126.4	13.2%	97.1%	111.7	PASS
SB-48	As per Map	SF-05	16	9:35	LH	6	125.1	12.8%	96.4%	110.9	PASS
SB-49	As per Map	SF-05	16	9:40	LH	6	125.5	12.6%	96.9%	111.5	PASS

Reviewed by:

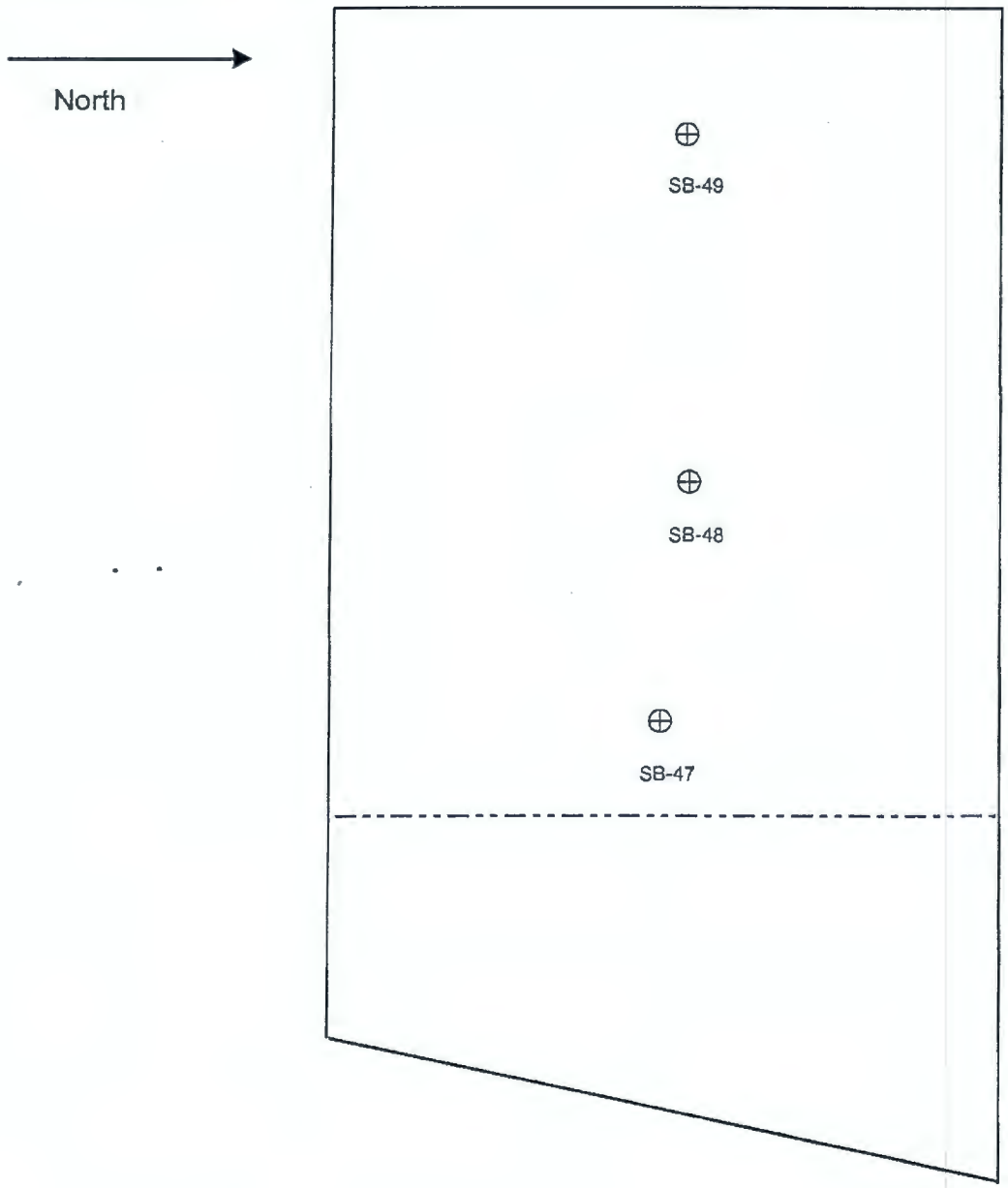
virotech Engineering & Consulting, Inc

10/19/09
Date

ENVIROTECH
ENGINEERING & CONSULTING, INC.

CQA Moisture Density Map Cells 7-8

Date:	13-Oct-09	Lift:	16
Report:	27	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	SB-49
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	10/13/2009
Tested By:	LH	Date:	10/13/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/14/2009	Date Received:	10/13/2009
Comments				Report No.:	27

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	5450.11 g
9. Weight of bottle + cone + sand (after use), W_8	1361.68 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0566 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	3181.39 g
13. Weight of gallon can + dry soil, W_9	2841.92 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	123.81 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	11.9%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	110.60 lb/ft^3
17. Comparision moisture content =	12.6%
18. Dry unit weight comparison =	111.5 lb/ft^3

FIELD DENSITY TEST (ASTM D-2922)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Address: ERDF

Soil Information

Project:	ERDF Super Cell 9	Proctor:	SF-06
Project ID:	S66X528A00	Max Dry Density (pcf):	113.5
Sheet No.	28-1 Test Date: 1015/09	Optimum Moisture (%):	15.5%
Description:		Proctor:	SF-05
Troxler ID:	1249	Max Dry Density (pcf):	115.0
Moist Std:	673 Density Std: 2266	Optimum Moisture (%):	14.6%
Moist offset:	- Density offset: -	Proctor:	SF-03
Allowable Moisture Range:	N/A	Max Dry Density (pcf):	124.1
Necessary % Proctor:	95%	Optimum Moisture (%):	9.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
North Berm											
NB-46	As per Map	SF-05	16	16:05	LH	6	120.9	9.6%	95.9%	110.3	PASS
NB-47	As per Map	SF-05	16	16:10	LH	6	120.6	8.9%	96.3%	110.7	PASS
NB-48	As per Map	SF-05	16	16:15	LH	6	120.1	9.1%	95.7%	110.1	PASS
South Berm											
SB-50	As per Map	SF-05	17	12:30	LH	6	121.4	8.5%	97.3%	111.9	PASS
SB-51	As per Map	SF-05	17	12:35	LH	6	123.9	10.7%	97.0%	111.9	PASS
SB-52	As per Map	SF-05	17	12:40	LH	6	120.6	7.1%	97.9%	112.6	PASS

Reviewed by:

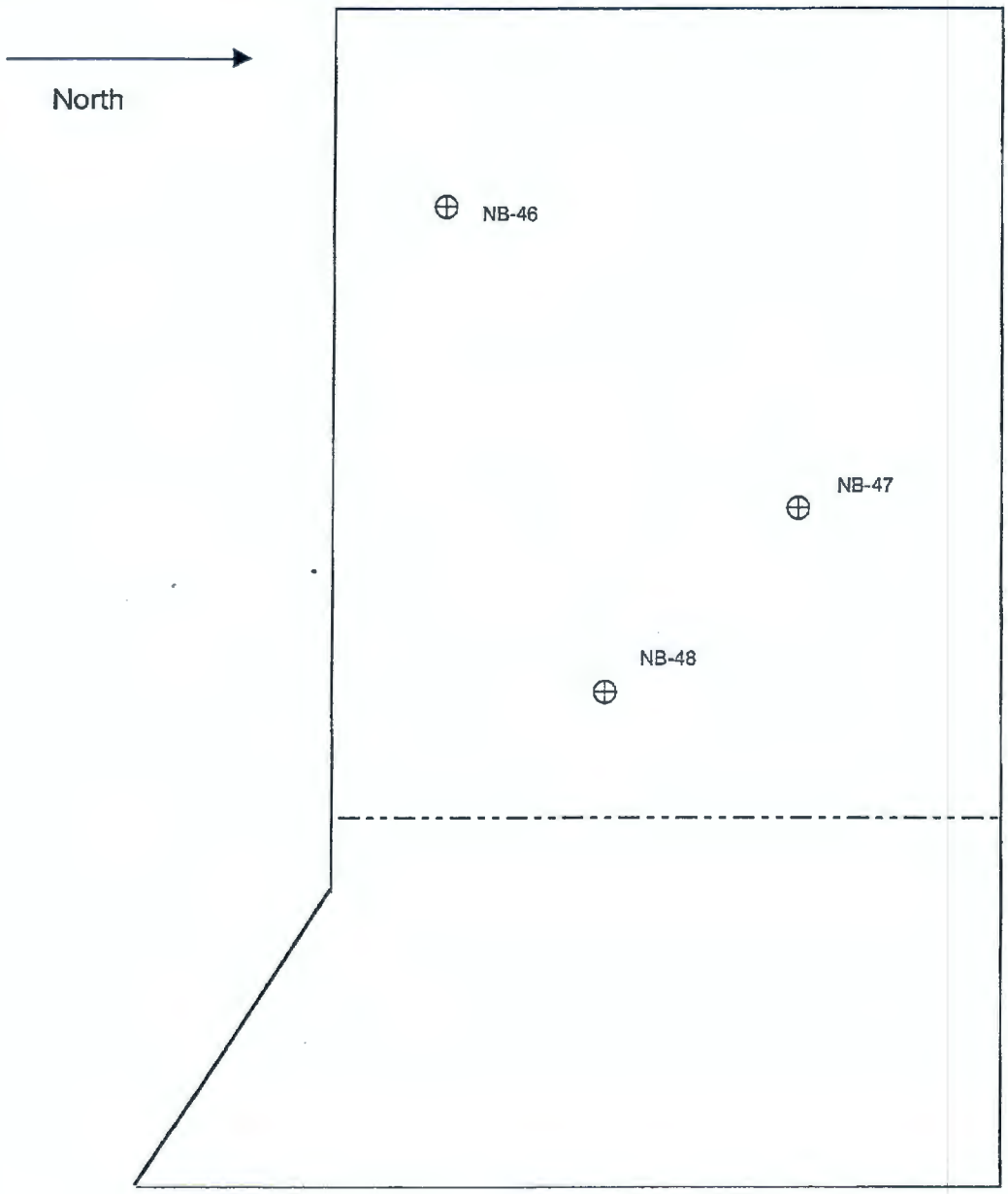
Envirotech Engineering & Consulting, Inc

10/19/09
Date

ENVIROTECH
ENGINEERING & CONSULTING, INC.

CQA Moisture Density Map Cells 7-8

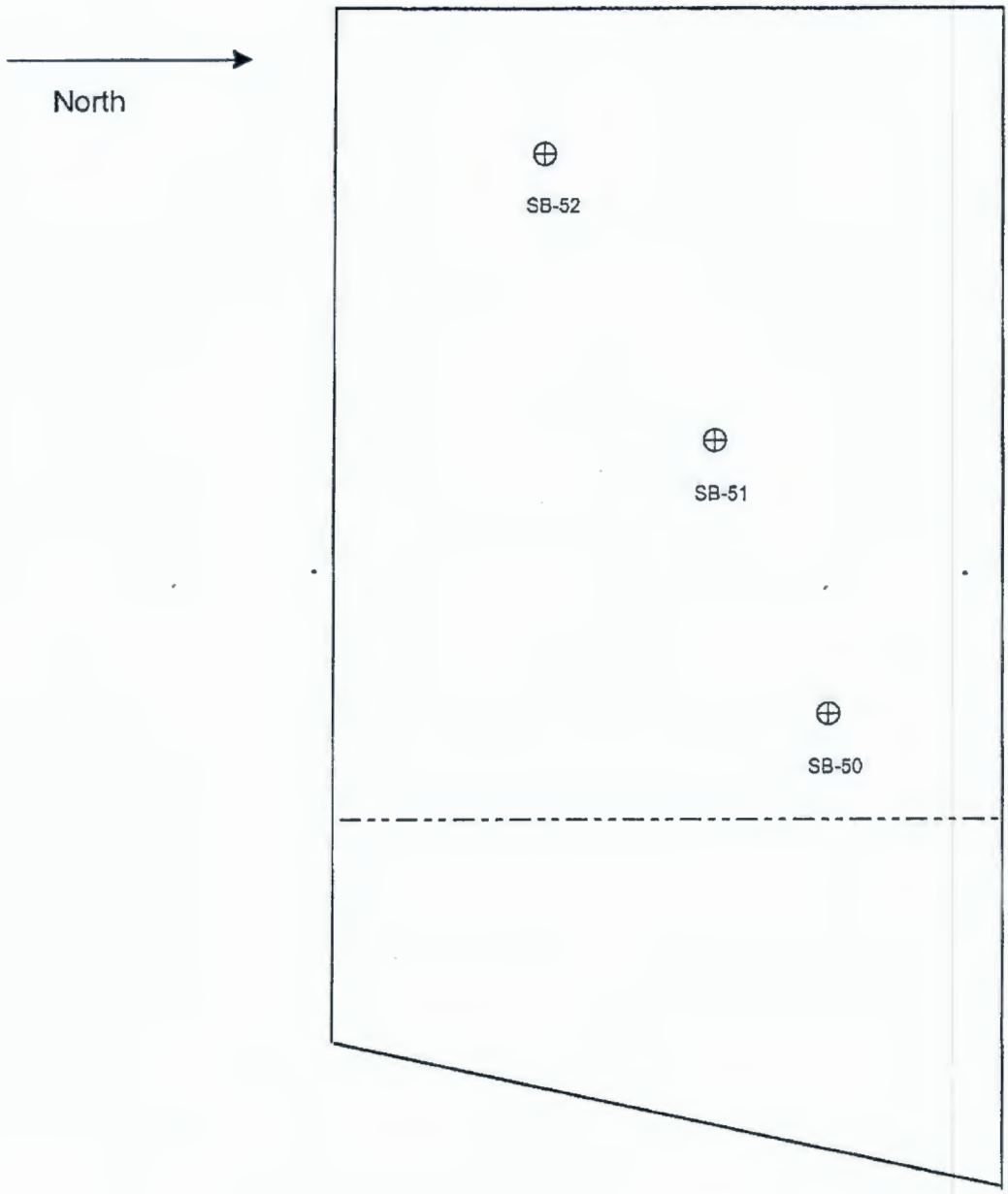
Date:	15-Oct-09	Lift:	16
Report:	28	Operator:	Luke Hay
Map:	North Berm Map-1	Material:	SF-05
Notes:			



ENVIROTECH
ENGINEERING & CONSULTING, INC.

CQA Moisture Density Map Cells 7-8

Date:	15-Oct-09	Lift:	17
Report:	28	Operator:	Luke Hay
Map:	South Berm Map-1	Material:	SF-05
Notes:			



UNIT WEIGHT OF COMPACTION
BY SAND CONE (ASTM 1556)

ENVIROTECH
ENGINEERING & CONSULTING, INC.
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: WCH
Address: ERDF Construction

Sample Information

Contact Name:	Bill Borlaug			Sample ID:	SB-52
Project:	S66X528A00			Sample Description:	South Berm
Project Location:	ERDF Super Cell 9			Sampling Date:	10/15/2009
Tested By:	LH	Date:	10/15/2009	Sampled By:	LH
Reviewed By:	JV	Date:	10/19/2009	Date Received:	10/15/2009
Comments				Report No.:	28

FIELD UNIT WEIGHT - SAND CONE METHOD

Calibration of Unit Weight of Ottawa Sand

1. Weight of Proctor mold, W_1	2268.86 g
2. Weight of Proctor mold + sand, W_2	5511.95 g
3. Volume of mold, V_1	0.075 cuft
4. Dry unit weight, $Y_{d\,(sand)} = \frac{W_2 - W_1}{V_1}$	95.33 lb/ft^3

Calibration Cone

5. Weight of bottle + cone + sand (before use), W_3	1638.82 g
6. Weight of bottle + cone + sand (after use), W_4	0.00 g
7. Weight of sand to fill the cone, $W_c = W_4 - W_3$	3.61 lb

Results from Field Tests

8. Weight of bottle + cone + sand (before use), W_6	4976.34 g
9. Weight of bottle + cone + sand (after use), W_8	621.19 g
10. Volume of hole, $V_2 = \frac{W_6 - W_8 - W_c}{\gamma\, d\,(sand)}$	0.0628 ft^3
11. Weight of gallon can, W_5	0.00 g
12. Weight of gallon can + moist soil, W_7	3432.09 g
13. Weight of gallon can + dry soil, W_9	3180.80 g
14. Moist unit weight of soil in field, $\gamma = W_7 - W_5 / V_2$	120.45 lb/ft^3
15. Moisture content in the field, $w\,(\%) = \frac{W_7 - W_9}{W_9 - W_5} \times 100$	7.9%
16. Dry unit weight in the field, $_{d\,(sand)} = \gamma / (1+(w\,(\%)/100)$	111.63 lb/ft^3
17. Comparision moisture content =	7.1%
18. Dry unit weight comparison =	112.6 lb/ft^3

D.7

ELECTRICAL DUCT BANK

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford

Submittal: 05-18B Earthwork Field Data

Soil Information

Project:	ERDF Cells 9-10 Expansion		
Project ID	S013213A00		
Report No	5-16-093	Date	6/21/2010
Description	Brown/Black Sand		
Troxler ID.	27881		
Moist Std:	638	Density Std:	2225
Moist offset:	-	Density offset:	-
Allowable Moisture Range:		N/A	
Necessary % Proctor:		95%	

Proctor:	SF-06
Max Dry Density (pcf):	120.8
Optimum Moisture (%):	14.3%
Proctor:	SF-04
Max Dry Density (pcf):	117.3
Optimum Moisture (%):	12.5%
Proctor:	SF-05
Max Dry Density (pcf):	124.4
Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Electrical Duct Bank between Cell 8 and 9 (Necessary 95% Compaction)											
EB-01	Duct Bank West End	SF-06	1	12:52	JS	6	123.0	6.9%	95.2%	115.1	PASS
EB-02	Duct Bank East End	SF-06	1	14:07	JS	6	122.8	6.7%	95.3%	115.1	PASS
EB-03	Duct Bank West End	SF-06	2	14:13	JS	6	125.8	5.5%	98.7%	119.2	PASS
EB-04	Duct Bank East End	SF-06	2	15:41	JS	6	130.3	12.3%	96.1%	116.0	PASS

Reviewed by: TW

nvirotech Engineering & Consulting, Inc

6/23/10
Date

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax 580/237-4302

Client: Washington Closure Hanford

Submittal: 05-18B Earthwork Field Data

Soil Information

Project:	ERDF Cells 9-10 Expansion			Proctor:	SF-06
Project ID	S013213A00			Max Dry Density (pcf).	120.8
Report No	5-16-094	Date	6/22/2010	Optimum Moisture (%):	14.3%
Description	Brown/Black Sand			Proctor:	SF-04
Troxler ID:	27881			Max Dry Density (pcf).	117.3
Moist Std:	640	Density Std:	2229	Optimum Moisture (%):	12.5%
Moist offset:	-	Density offset.	-	Proctor:	SF-05
Allowable Moisture Range:		N/A		Max Dry Density (pcf):	124.4
Necessary % Proctor:		95%/90%		Optimum Moisture (%):	12.5%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Electrical Duct Bank between Cell 9 and 10 (Necessary 95% Compaction)											
EB-05	Duct Bank West End	SF-06	2	8:15	JS	6	121.8	6.0%	95.1%	114.9	PASS
EB-06	Duct Bank East End	SF-06	1	9:25	JS	6	129.8	11.5%	96.4%	116.4	PASS
EB-07	Duct Bank East End	SF-06	2	14:50	JS	6	129.0	12.0%	95.3%	115.2	PASS
A test was not performed on the first lift on the west end of the duct back trench. CQA shall perform the test in Report 5-16-095											
Transmission Line MH-37 to MH-38 (Necessary 90% Compaction)											
LT-101	MH-37 to MH-38 West	SF-06	1	13:21	JS	6	119.1	10.9%	88.9%	107.4	FAIL
LT-102	MH-37 to MH-38 East	SF-06	1	13:56	JS	6	117.7	12.0%	87.0%	105.1	FAIL
The backfill material between MH-37 and MH-38 has changed consistancy; therefore, a new proctor shall be performed.											

Reviewed by: TW

Envirotech Engineering & Consulting, Inc

Date 6/24/10

FIELD DENSITY TEST (ASTM D-6938)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
580: 234-8780 | Fax 580 237 4302

Client: Washington Closure Hanford

Submittal: 05-18B Earthwork Field Data

Soil Information

Project	ERDF Cells 9-10 Expansion			Proctor	SF-06
Project ID	S013213A00			Max Dry Density (pcf)	120.8
Report No	5-16-095	Date	6/23/2010	Optimum Moisture (%)	14.3%
Description	Brown/Black Sand			Proctor	SF-08
Troxler ID	27881			Max Dry Density (pcf)	118.0
Moist Std	637	Density Std.	2227	Optimum Moisture (%):	11.3%
Moist offset:	-	Density offset:	-	Proctor:	DGC-01
Allowable Moisture Range		N/A		Max Dry Density (pcf)	142.7
Necessary % Proctor		95%/90%		Optimum Moisture (%)	5.7%

Test No	Location	Pr.	Lift	Time	Oper	Depth (in.)	Wet Density (pcf)	Moist Content (%)	% Proctor (calc)	Dry Density (calc)	Pass / Fail
Transmission Line MH-37 to MH-38 (Necessary 90% Compaction)											
LT-103	MH-37 to MH-38 West	SF-08	2	7:45	JS	6	116.9	11.0%	89.3%	105.3	FAIL
LT-104	MH-37 to MH-38 East	SF-08	2	9.32	JS	6	118.3	9.9%	91.2%	107.6	PASS
LT-105	MH-37 to MH-38 West	SF-08	3	12:32	JS	6	115.0	7.3%	90.8%	107.2	PASS
LT-106	MH-37 to MH-38 East	SF-08	3	12:35	JS	6	114.2	6.3%	91.0%	107.4	PASS
LT-107	MH-37 to MH-38 West	SF-08	4	15.12	JS	6	116.3	8.0%	91.3%	107.7	PASS
LT-108	MH-37 to MH-38 East	SF-08	4	15.18	JS	6	116.5	9.3%	90.3%	106.6	PASS
Transmission Line MH-37 to MH-38 From Report 5-16-094 (Necessary 90% Compaction)											
LT-101	MH-37 to MH-38 West	SF-08	1	13:21	JS	6	119.1	10.9%	91.0%	107.4	PASS
LT-102	MH-37 to MH-38 East	SF-08	1	13.56	JS	6	117.7	12.0%	89.1%	105.1	FAIL
Missed Electrical Bank Test Between Cell 9 and 10 (Necessary 95% Compaction)											
EB-08	Cell 9 and 10 West	SF-06	1	13:23	JS	12	128.3	6.2%	100.0%	120.8	PASS

Reviewed by: TW

Envirotech Engineering & Consulting, Inc

8/20/10
Date

D.8

STRUCTURAL FILL PROCTORS

Modified Proctor (ASTM D1557 and D4718)

Client: Washington Closure Hanford
Form: 05-18A Earthwork Data Sheets

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Sample Information

Contact Name:	Charlie Skiba			Sample ID.	SF-01
Project:	S013213A00			Sample Des.	Base Soil
Project Location:	ERDF Cells 9-10			Sampling Date:	2/12/2010
Tested By:	P. Davis	Date:	2/13/2010	Sampled By:	L. Hay
Reviewed By.	J. Voss	Date:	2/15/2010	Date Received:	2/12/2010
Comments:				Report No.	05-016-004

DENSITY DATA (lbs)

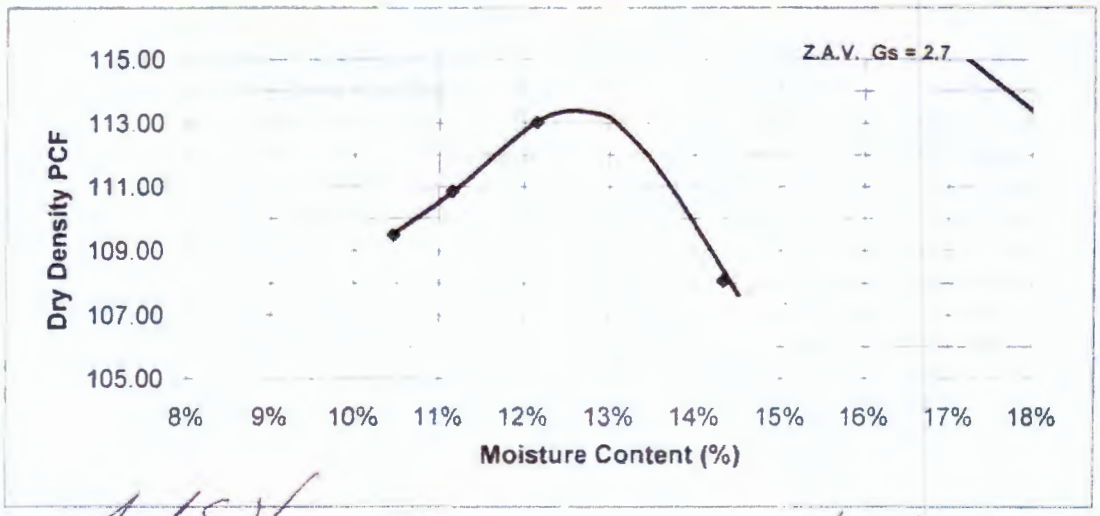
Mold + Wet Soil	13.30	13.38	13.50	13.39	
Mold Wt.	9.27	9.27	9.27	9.27	
Wet Soil	4.03	4.11	4.22	4.12	
lbs/cu. ft. (wet)	120.9	123.2	126.7	123.6	
lbs/cu. ft. (dry)	109.5	110.9	113.0	108.1	

MOISTURE DATA (grams)

Tin No.	1	2	3	4	
Wet Soil + Tin	711.00	725.50	706.50	706.10	
Dry Soil + Tin	643.70	652.70	630.00	617.60	
Tin Wt.	0.00	0.00	0.00	0.00	
Dry Soil	643.70	652.70	630.00	617.60	
% Moisture	10.5%	11.2%	12.1%	14.3%	
% Saturation	52.4%	57.9%	66.8%	69.2%	

MAXIMUM DRY DENSITY (PCF) **113.6**

OPTIMUM MOISTURE CONTENT (%) **12.4%**



Envirotech

4/30/10
Date

Modified Proctor (ASTM D1557 and D4718)

Client: Washington Closure Hanford
Form: 05-18A Earthwork Data Sheets

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-02
Project:	S013213A00			Sample Des.	Brown/Black
Project Location:	ERDF Cells 9-10			Sampling Date:	2/12/2010
Tested By:	P. Davis	Date:	2/13/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	2/15/2010	Date Received:	2/12/2010
Comments:				Report No.	05-016-004

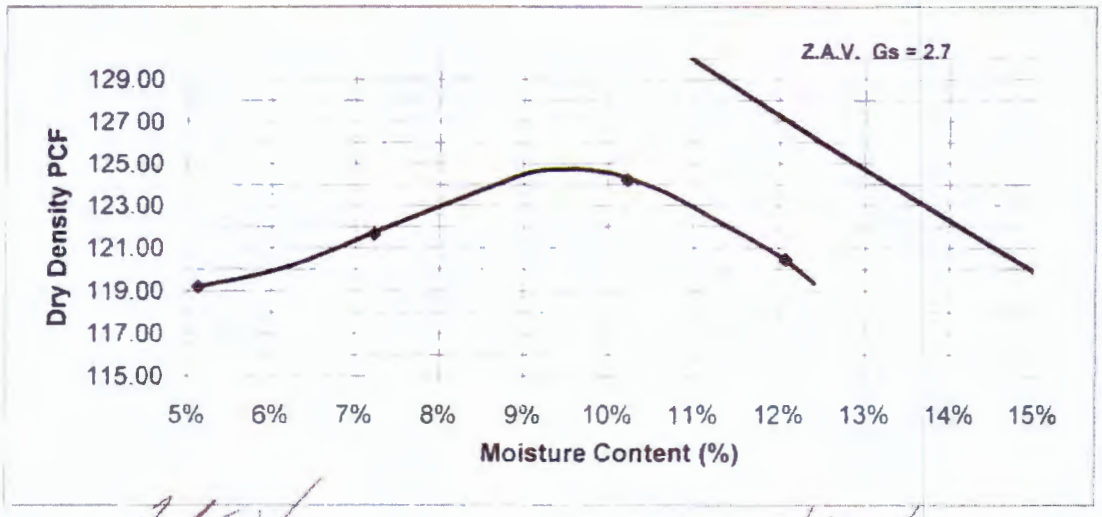
DENSITY DATA (lbs)

Mold + Wet Soil	13.45	13.62	13.84	13.77	
Mold Wt.	9.27	9.27	9.27	9.27	
Wet Soil	4.18	4.35	4.56	4.50	
lbs/cu. ft. (wet)	125.3	130.4	136.9	135.0	
lbs/cu. ft. (dry)	119.2	121.6	124.2	120.5	

MOISTURE DATA (grams)

Tin No.	1	2	3	4	
Wet Soil + Tin	722.20	720.50	637.20	743.50	
Dry Soil + Tin	687.00	672.00	578.10	663.40	
Tin Wt.	0.00	0.00	0.00	0.00	
Dry Soil	687.00	672.00	578.10	663.40	
% Moisture	5.1%	7.2%	10.2%	12.1%	
% Saturation	33.5%	50.6%	77.4%	81.8%	

MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
124.9	9.7%



Envirotech

4/20/10
Date

Modified Proctor (ASTM D1557 and D4718)

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-03
Project:	S013213A00			Sample Des.	Black Sand with Gravel
Project Location:	ERDF Cells 9-10			Sampling Date:	2/24/2010
Tested By:	LH	Date:	3/1/2010	Sampled By.	L. Hay
Reviewed By:	TW	Date:	3/1/2010	Date Received:	2/24/2010
Comments:	Method C - (ASTM D4718)			Report No.	1/11/1900

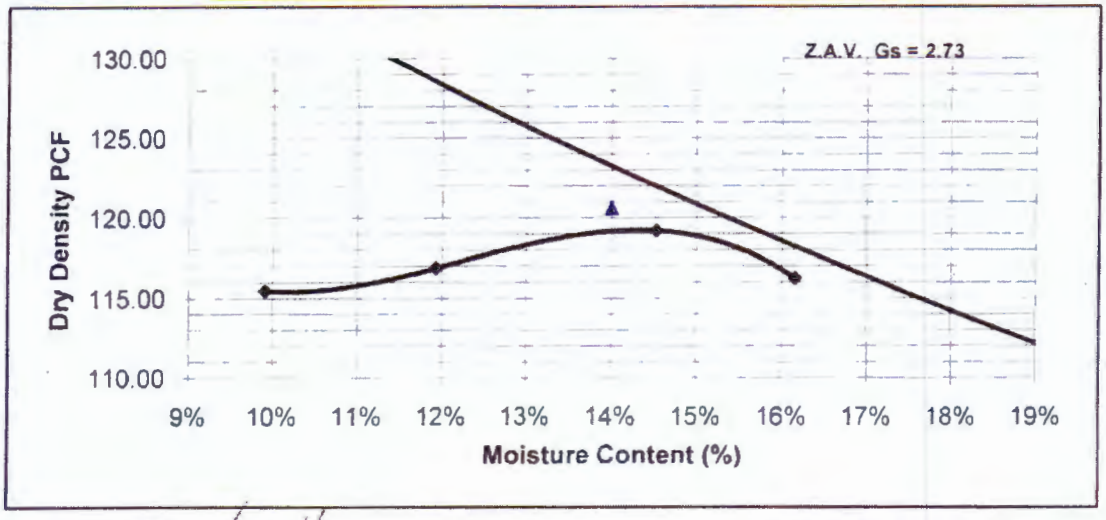
DENSITY DATA (lbs)

Mold + Wet Soil	12.95	13.08	13.27	13.22	
Mold Wt.	8.72	8.72	8.72	8.72	
Wet Soil	4.23	4.36	4.55	4.50	
lbs/cu. ft. (wet)	126.9	130.8	136.5	135.0	
lbs/cu ft. (dry)	115.5	116.9	119.2	116.2	

MOISTURE DATA (grams)

Tin No.	E3	E2	E5	E1	
Wet Soil + Tin	913.20	976.10	1122.60	1032.10	
Dry Soil + Tin	853.10	898.40	1011.50	922.70	
Tin Wt.	246.30	246.80	246.60	245.30	
Dry Soil	606.80	651.60	764.90	677.40	
% Moisture	9.9%	11.9%	14.5%	16.1%	
% Saturation	56.9%	71.1%	92.4%	94.7%	

	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
	119.3	14.5%
Corrected	120.6	14.0%



Envirotech

5-4-10
Date

Modified Proctor (ASTM D1557 and D4718)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-04
Project:	S013213A00			Sample Des.	Brown/Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/1/2010
Tested By:	LH	Date:	3/4/2010	Sampled By:	LH
Reviewed By:	TW	Date:	3/4/2010	Date Received:	3/1/2010
Comments:				Report No.	05-016-017

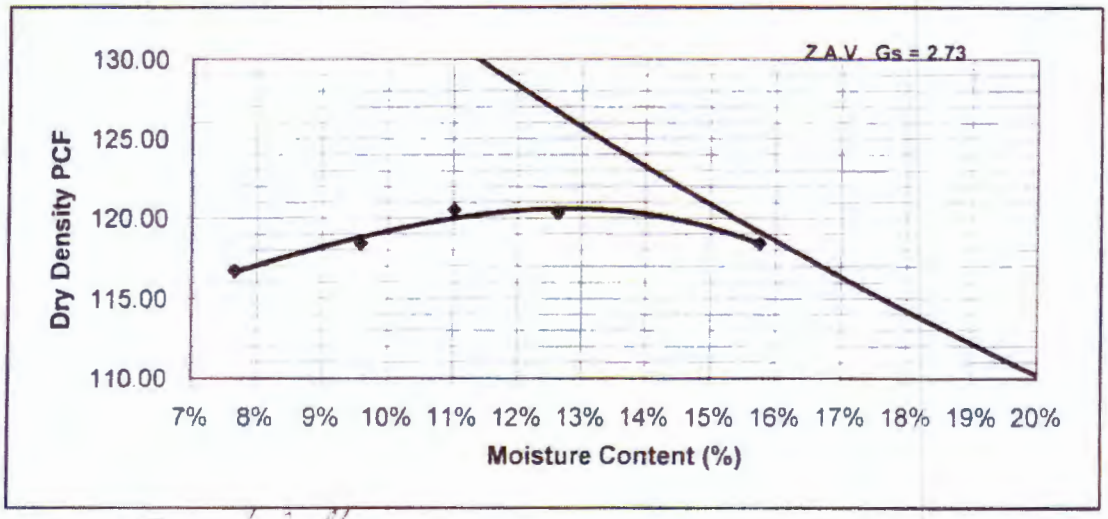
DENSITY DATA (lbs)

Mold + Wet Soil	12.91	13.05	13.18	13.24	13.29
Mold Wt.	8.72	8.72	8.72	8.72	8.72
Wet Soil	4.19	4.33	4.46	4.52	4.57
lbs/cu. ft. (wet)	125.6	129.8	133.8	135.5	137.1
lbs/cu. ft. (dry)	116.7	118.4	120.5	120.3	118.4

MOISTURE DATA (grams)

Tin No.	XIII	E-1	V-1	E-2	E-5
Wet Soil + Tin	1025.10	1110.90	930.30	959.10	960.30
Dry Soil + Tin	965.10	1035.40	855.30	879.30	863.20
Tin Wt.	181.50	247.30	174.00	246.90	246.60
Dry Soil	783.60	788.10	681.30	632.40	616.60
% Moisture	7.7%	9.6%	11.0%	12.6%	15.7%
% Saturation	45.5%	59.7%	72.7%	82.9%	98.1%

MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
120.5	12.8%



Envirotech

5-4-10
Date

Modified Proctor (ASTM D1557 and D4718)

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-05
Project:	S013213A00			Sample Des:	Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/3/2010
Tested By:	LH	Date:	3/8/2010	Sampled By:	LH
Reviewed By:	TW	Date:	3/10/2010	Date Received:	3/3/2010
Comments:	Gs Estimated based on Saturation			Report No.	05-016-021

DENSITY DATA (lbs)

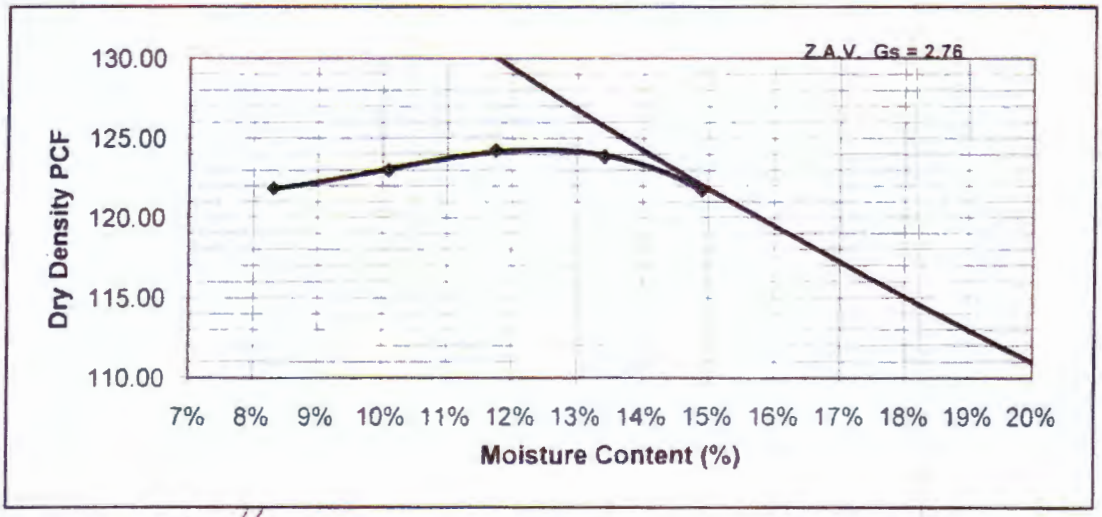
Mold + Wet Soil	13.12	13.24	13.35	13.41	13.39
Mold Wt.	8.72	8.72	8.72	8.72	8.72
Wet Soil	4.40	4.51	4.63	4.68	4.66
lbs/cu. ft. (wet)	132.0	135.4	138.9	140.5	139.9
lbs/cu. ft. (dry)	121.8	123.0	124.3	123.9	121.7

MOISTURE DATA (grams)

Tin No.	A	k	A11	BBB	ddd
Wet Soil + Tin	539.30	575.20	614.90	574.10	609.30
Dry Soil + Tin	501.80	527.10	555.50	512.17	536.80
Tin Wt.	50.40	50.20	49.80	50.10	50.10
Dry Soil	451.40	476.90	505.70	462.07	486.70
% Moisture	8.3%	10.1%	11.7%	13.4%	14.9%
% Saturation	55.5%	69.6%	84.0%	94.7%	99.1%

MAXIMUM DRY DENSITY (PCF) 124.4

OPTIMUM MOISTURE CONTENT (%) 12.5%



Envirotech

5-11-10
Date

Modified Proctor (ASTM D1557 and D4718)

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

ENVIROTECH
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(580) 234-8780 | Fax (580) 237-4302

Sample Information

Contact Name:	Charlie Skiba			Sample ID.	SF-06
Project:	S013213A00			Sample Des:	Brown/Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/9/2010
Tested By:	L. Hay	Date:	3/11/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	3/11/2010	Date Received:	3/9/2010
Comments				Report No.	05-016-022

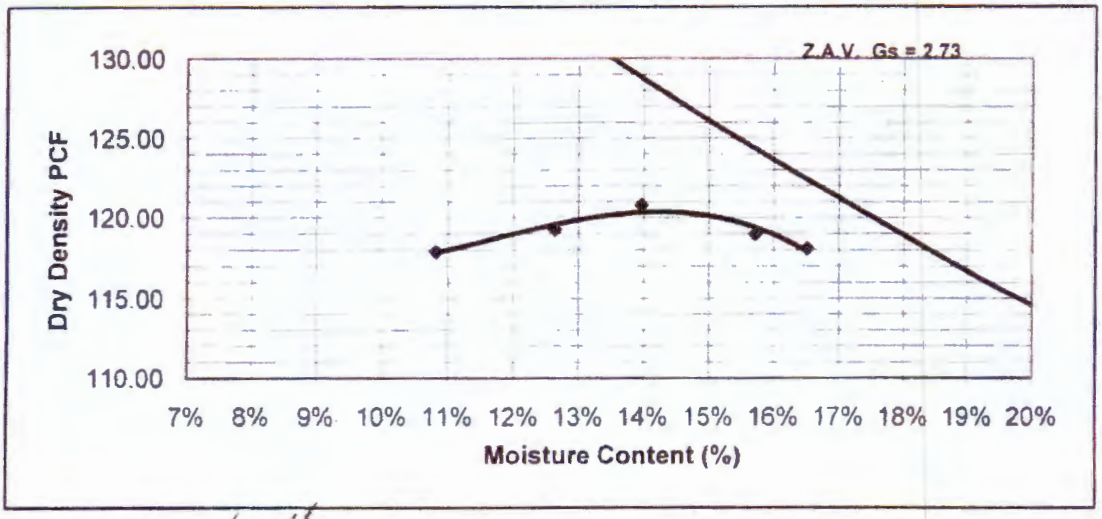
DENSITY DATA (lbs)

Mold + Wet Soil	13.08	13.20	13.31	13.31	13.31
Mold Wt.	8.72	8.72	8.72	8.72	8.72
Wet Soil	4.35	4.48	4.59	4.59	4.59
lbs/cu. ft. (wet)	130.6	134.3	137.6	137.7	137.6
lbs/cu. ft. (dry)	117.9	119.3	120.8	119.0	118.1

MOISTURE DATA (grams)

Tin No.	K	A9	A12	A8	A7
Wet Soil + Tin	540.00	577.40	632.00	622.30	588.80
Dry Soil + Tin	492.20	518.10	560.70	544.60	512.40
Tin Wt.	50.20	48.50	50.00	50.00	49.60
Dry Soil	442.00	469.60	510.70	494.60	462.80
% Moisture	10.8%	12.6%	14.0%	15.7%	16.5%
% Saturation	58.6%	70.8%	81.2%	87.4%	89.9%

MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
120.8	14.3%



Envirotech

5-4-10
Date

Modified Proctor (ASTM D1557 and D4718)

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

ENVIROTECH
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(580) 234-8780 | Fax (580) 237-4302

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-07
Project:	S013213A00			Sample Des:	Brown Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/17/2010
Tested By:	L. Hay	Date:	3/18/2009	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	3/19/2010	Date Received:	3/9/2010
Comments:	Proctor for use on Subgrade of test pad			Report No.	05-016-027

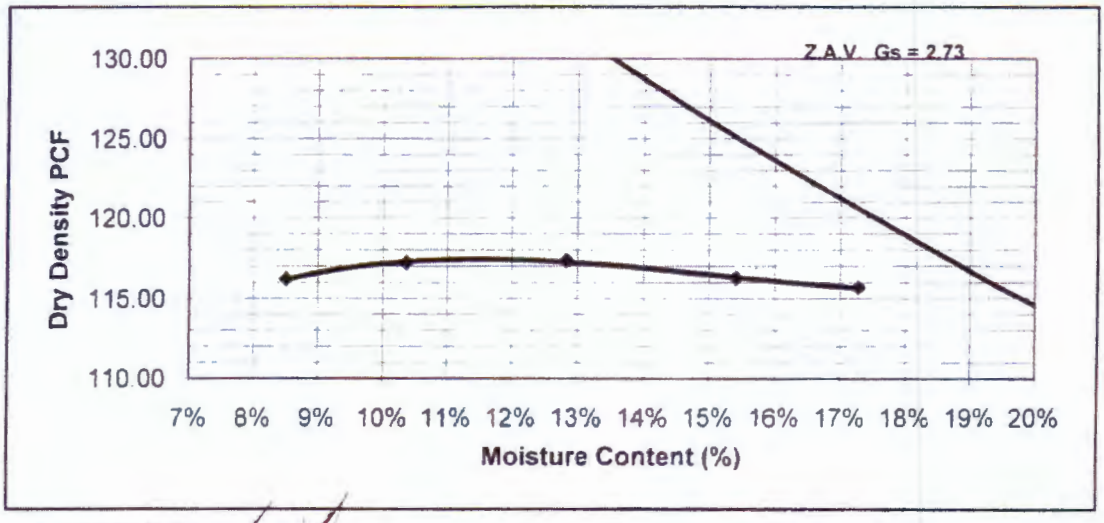
DENSITY DATA (lbs)

Mold + Wet Soil	12.92	13.03	13.13	13.19	13.24
Mold Wt.	8.72	8.72	8.72	8.72	8.72
Wet Soil	4.20	4.31	4.41	4.47	4.52
lbs/cu. ft. (wet)	126.1	129.3	132.4	134.2	135.7
lbs/cu. ft. (dry)	116.2	117.2	117.3	116.3	115.7

MOISTURE DATA (grams)

Tin No.	VI	B	LH	Bx	XIII
Wet Soil + Tin	656.80	712.10	575.90	750.20	727.20
Dry Soil + Tin	609.30	649.80	516.10	656.70	627.40
Tin Wt.	50.20	48.50	50.00	50.00	49.60
Dry Soil	559.10	601.30	466.10	606.70	577.80
% Moisture	8.5%	10.4%	12.8%	15.4%	17.3%
% Saturation	44.2%	55.2%	68.6%	80.3%	88.8%

MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
117.3	11.5%



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5-21-10
Date

Modified Proctor (ASTM D1557 and D4718)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
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Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-08
Project:	S013213A00			Sample Des.	Brown Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	6/22/2010
Tested By:	L. Hay	Date:	6/23/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	6/24/2010	Date Received:	6/22/2010
Comments:	Proctor for use on Subgrade of test pad			Report No.	05-016-095

DENSITY DATA (lbs)

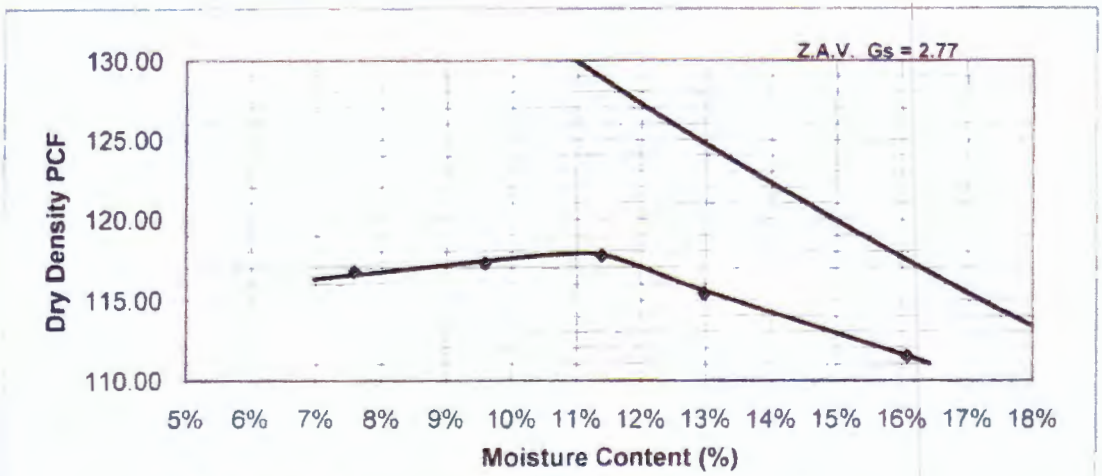
Mold + Wet Soil	12.91	13.00	13.09	13.07	13.03
Mold Wt.	8.72	8.72	8.72	8.72	8.72
Wet Soil	4 19	4 28	4.37	4.35	4.31
lbs/cu. ft. (wet)	125.6	128.5	131.2	130.4	129.4
lbs/cu. ft. (dry)	116.8	117.3	117.8	115.4	111.5

MOISTURE DATA (grams)

Tin No.	M0	M7	M8	M9	M6
Wet Soil + Tin	634.70	636.70	505.20	623.80	653.80
Dry Soil + Tin	593.50	585.40	458.70	557.90	570.10
Tin Wt.	50.00	50.00	50.10	49.80	49.60
Dry Soil	543.50	535.40	408.60	508.10	520.50
% Moisture	7.6%	9.6%	11.4%	13.0%	16.1%
% Saturation	46.2%	59.3%	71.4%	76.2%	85.0%

MAXIMUM DRY DENSITY (PCF) 118.0

OPTIMUM MOISTURE CONTENT (%) 11.3%



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6/24/10
Date

Modified Proctor (ASTM D1557 and D4718)

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

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Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-09
Project:	S013213A00			Sample Des:	Base Course
Project Location:	ERDF Cell 9-10			Sampling Date:	7/16/2010
Tested By:	QISI	Date:	7/30/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	8/2/2010	Date Received:	7/16/2010
Comments:	Method C - (ASTM D4718)			Report No.	5-16-123

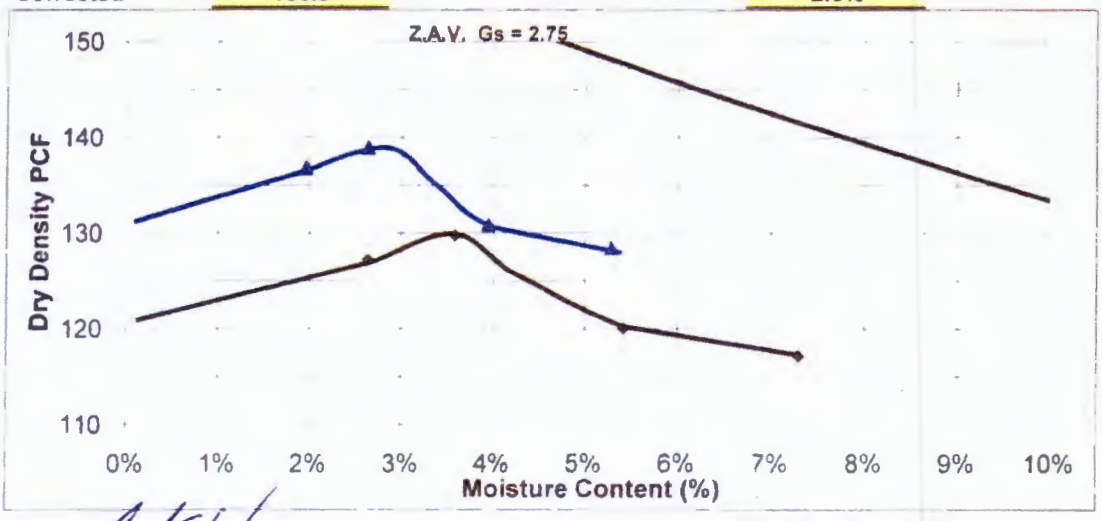
DENSITY DATA (lbs)

Mold + Wet Soil	23.91	24.50	24.21	23.85	
Mold Wt.	14.42	14.42	14.42	14.42	
Wet Soil	9.49	10.08	9.79	9.43	
lbs/cu. ft. (wet)	126.5	134.4	130.5	125.7	
lbs/cu. ft. (dry)	120.0	129.8	127.2	117.2	

MOISTURE DATA (grams)

Tin No.					
Wet Soil + Tin	3477.90	4276.10	4557.40	3395.20	
Dry Soil + Tin	3299.20	4128.40	4440.60	3164.40	
Tin Wt.	0.00	0.00	0.00	0.00	
Dry Soil	3299.20	4128.40	4440.60	3164.40	
% Moisture	5.4%	3.6%	2.6%	7.3%	
% Saturation	36.2%	32.4%	21.9%	45.0%	

	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
	129.8	3.5%
Corrected	138.9	2.6%



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8/2/10
Date

Modified Proctor (ASTM D1557 and D4718)

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2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-10
Project:	S013213A00			Sample Des:	Top Course
Project Location:	ERDF Cell 9-10			Sampling Date:	7/16/2010
Tested By:	QISI	Date.	7/30/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date.	8/2/2010	Date Received:	7/16/2010
Comments:				Report No.	5-16-123

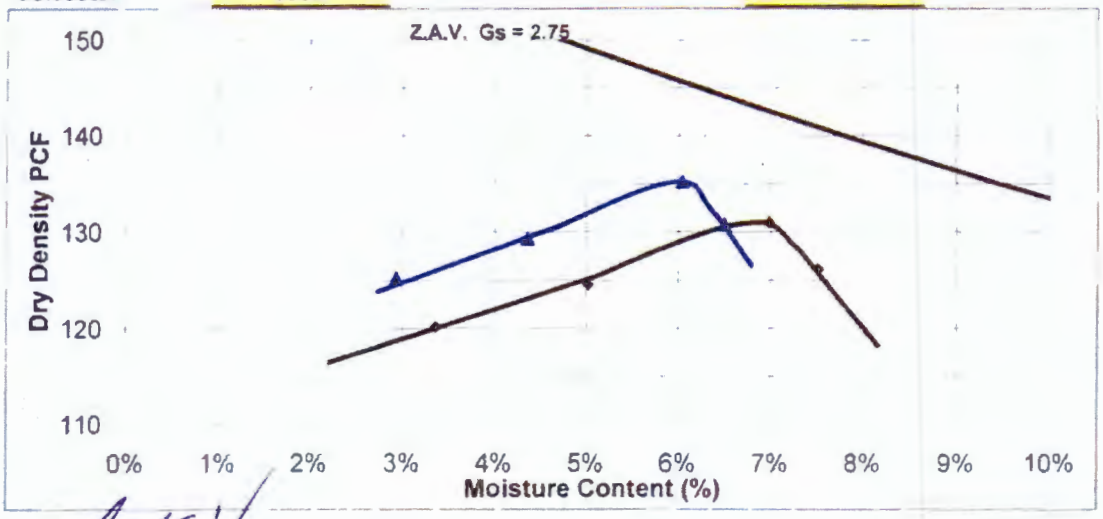
DENSITY DATA (lbs)

Mold + Wet Soil	13.41	13.63	13.94	13.79	
Mold Wt.	9.27	9.27	9.27	9.27	
Wet Soil	4.14	4.36	4.67	4.52	
lbs/cu. ft. (wet)	124.2	130.8	140.1	135.6	
lbs/cu. ft. (dry)	120.2	124.6	131.0	126.1	

MOISTURE DATA (grams)

Tin No.					
Wet Soil + Tin	1933.40	1976.00	2026.30	2026.40	
Dry Soil + Tin	1870.60	1881.70	1894.20	1884.90	
Tin Wt.	0.00	0.00	0.00	0.00	
Dry Soil	1870.60	1881.70	1894.20	1884.90	
% Moisture	3.4%	5.0%	7.0%	7.5%	
% Saturation	22.5%	38.4%	65.7%	60.4%	

	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
	131.0	7.0%
Corrected	135.2	6.0%



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8/2/10
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Modified Proctor (ASTM D1557 and D4718)

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheets

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Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-11
Project:	S013213A00			Sample Des:	Riser Trench Fill
Project Location:	ERDF Cells 9-10			Sampling Date:	7/22/2010
Tested By:	Ryan S.	Date:	7/26/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	7/26/2010	Date Received:	7/22/2010
Comments:	Proctor for riser trenches			Report No.	5-16-119

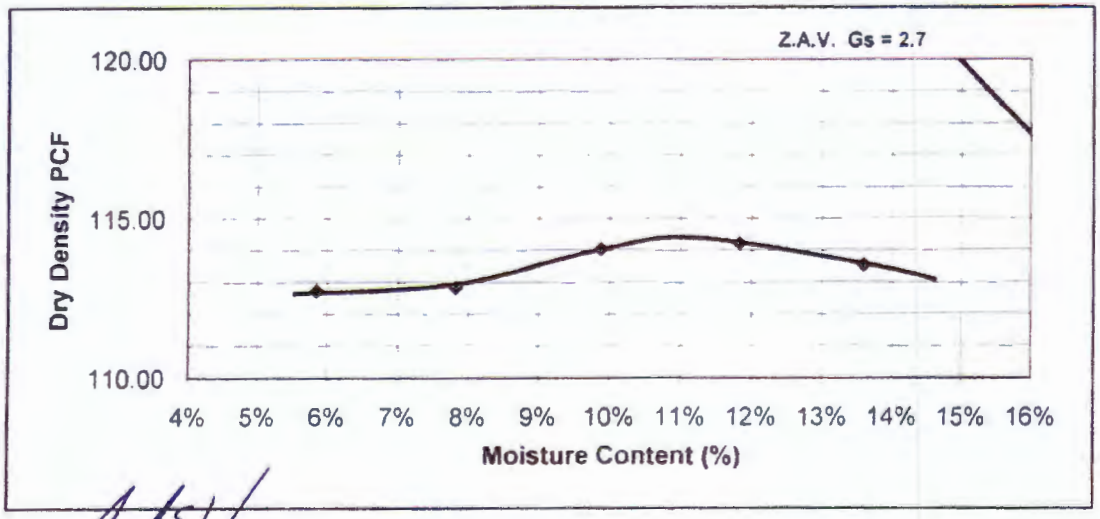
DENSITY DATA (lbs)

Mold + Wet Soil	5758.90	5794.40	5849.40	5886.10	5904.80
Mold Wt.	3954.80	3954.80	3954.80	3954.80	3954.80
Wet Soil	3.98	4.06	4.18	4.26	4.30
lbs/cu. ft. (wet)	119.3	121.7	125.3	127.7	129.0
lbs/cu. ft. (dry)	112.7	112.8	114.0	114.2	113.5

MOISTURE DATA (grams)

Tin No.	E1	Bx	LH	E4	XIII
Wet Soil + Tin	2047.20	1990.60	2023.10	2061.20	2124.00
Dry Soil + Tin	1947.80	1858.90	1857.00	1861.60	1891.50
Tin Wt.	245.30	174.10	175.30	174.40	181.00
Dry Soil	1702.50	1684.80	1681.70	1687.20	1710.50
% Moisture	5.8%	7.8%	9.9%	11.8%	13.6%
% Saturation	31.9%	42.8%	55.9%	67.2%	75.8%

MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
114.5	11.0%



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8/2/10
Date

D.9

STRUCTURAL FILL SOIL CLASSIFICATIONS

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Form: 05-18A Earthwork Data Sheet

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-01
Project:	S013213A00			Sample Des:	Brown Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	2/12/2010
Tested By:	P. Davis	Date:	2/13/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	2/15/2010	Date Received:	2/12/2010

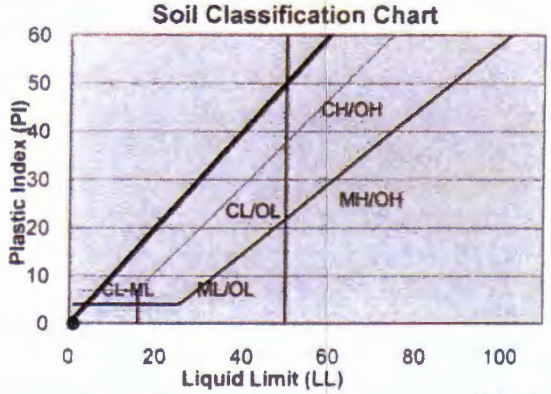
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

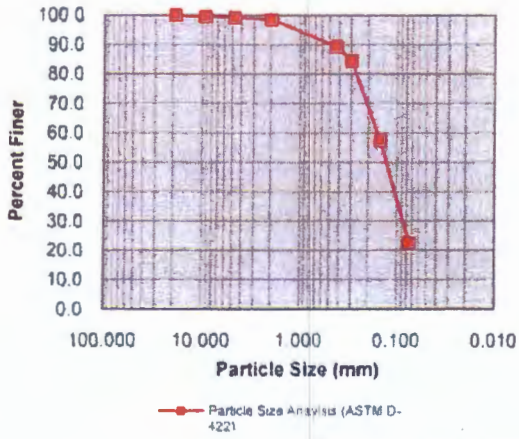
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
3/4 "	19.000	100.0	
3/8 "	9.500	99.5	
No.4	4.750	99.1	
No. 10	2.000	98.5	
No. 40	0.425	89.2	
No. 50	0.300	84.5	
No. 100	0.150	57.5	
No. 200	0.075	22.6	
Pan	-	0.0	

Grain Size Analysis



Cu	N/A
Cc	N/A

Unified Soil Classification (ASTM D-2487)
SM: Silty Sand

Deviations from ASTM: None

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SOIL CLASSIFICATION (ASTM D-2487)

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Client: Washington Closure Hanford
Form: 05-18A Earthwork Data Sheet

Sample Information

Contact Name:	Charlie Skiba			Sample ID.	SF-02
Project:	S013213A00			Sample Des.	Brown/Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date.	2/12/2010
Tested By:	P. Davis	Date.	2/13/2010	Sampled By.	L. Hay
Reviewed By.	J. Voss	Date:	2/15/2010	Date Received.	2/12/2010

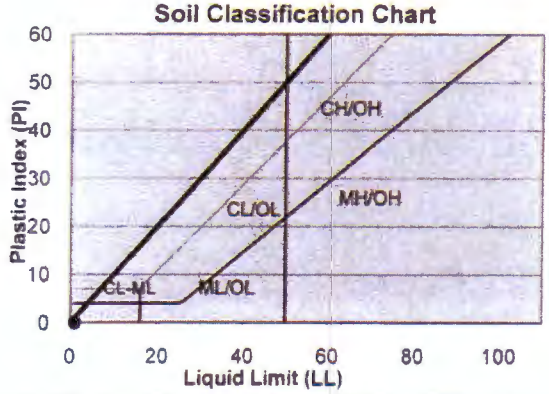
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

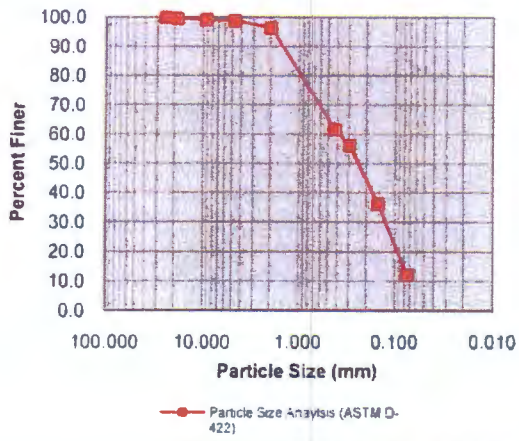
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	99.6	
3/8 "	9.500	99.1	
No.4	4.750	98.7	
No. 10	2.000	96.2	
No. 40	0.425	61.6	
No. 50	0.300	56.1	
No. 100	0.150	36.1	
No. 200	0.075	12.4	

Grain Size Analysis



Cu	5.80
Cc	0.66

Unified Soil Classification (ASTM D-2487)
SP-SM: Pooly-Graded Sand with Silt

Deviations from ASTM: None

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4/30/10
Date

SOIL CLASSIFICATION (ASTM D-2487)

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2500 N. 11th Street | Enid, OK 73701
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Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Shee

Sample Information

Contact Name:	Charlie Skiba			Sample ID.	SF-03
Project:	S013213A00			Sample Des:	Black Sand w/ Gravel
Project Location:	ERDF Cells 9-10			Sampling Date.	2/24/2010
Tested By:	L. Hay	Date:	3/8/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	3/8/2010	Date Received:	2/24/2010

Natural Moisture Content

Natural Moisture	8.2

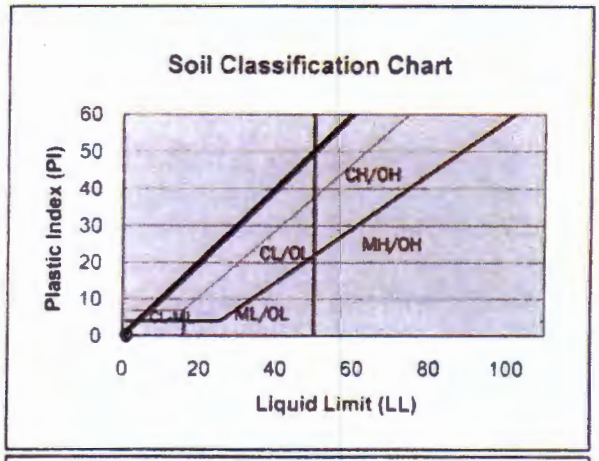
Atterberg Limits Test Results (ASTM D-4318)

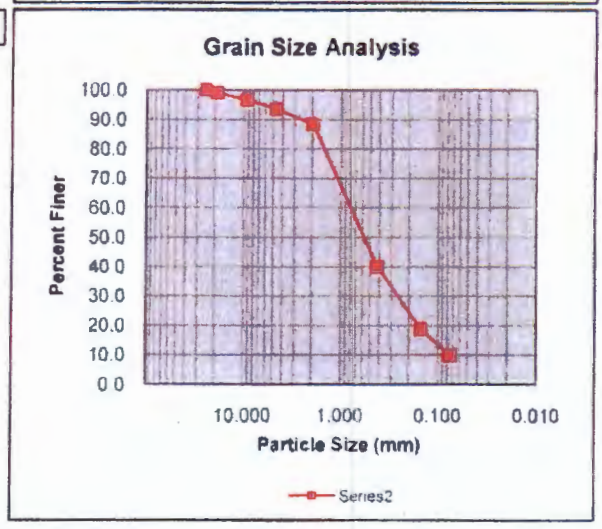
Flow Index	N/A	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	99.0	
3/8 "	9.500	96.4	
No.4	4.750	93.3	
No. 10	2.000	88.3	
No. 40	0.425	39.7	
No. 100	0.150	18.4	
No. 200	0.075	9.8	
Pan	-	0	

Cu	11.17
Cc	1.27





Unified Soil Classification (ASTM D-2487)
SW-SM: Well Graded Sand with Silt

Deviations from ASTM: None

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5-4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheet

Sample Information

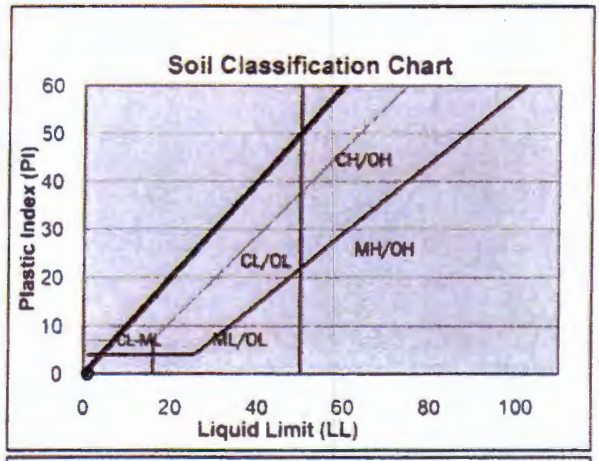
Contact Name:	Charlie Skiba			Sample ID:	SF-04
Project:	S013213A00			Sample Des:	Brown/Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/1/2010
Tested By:	L. Hay	Date:	3/8/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	3/9/2010	Date Received:	3/1/2010

Natural Moisture Content

Natural Moisture	8.2

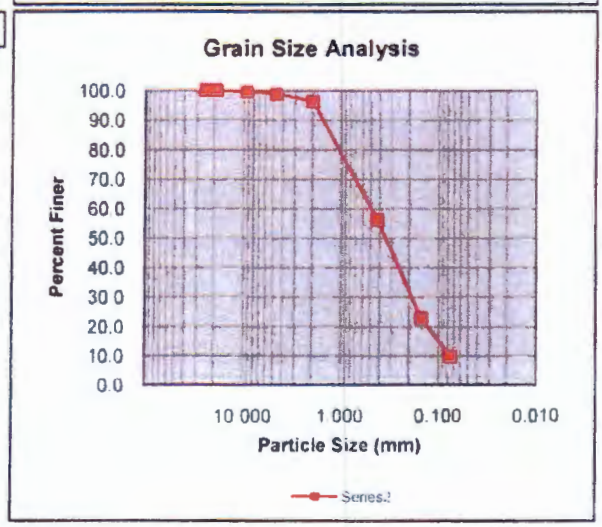
Atterberg Limits Test Results (ASTM D-4318)

Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	99.5	
No.4	4.750	98.8	
No. 10	2.000	96.2	
No. 40	0.425	56.0	
No. 100	0.150	22.6	
No. 200	0.075	9.6	
Pan	-	0	



Cu	7.25
Cc	0.95

Unified Soil Classification (ASTM D-2487)
SW-SM: Well Graded Sand with Silt

Deviations from ASTM: None

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5 4-10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH

2500 N. 11th Street | Enid, Ok. 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheet

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-05
Project:	S013213A00			Sample Des:	Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/3/2010
Tested By:	L. Hay	Date:	3/8/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	3/9/2010	Date Received:	3/3/2010

Natural Moisture Content

Natural Moisture	4.7

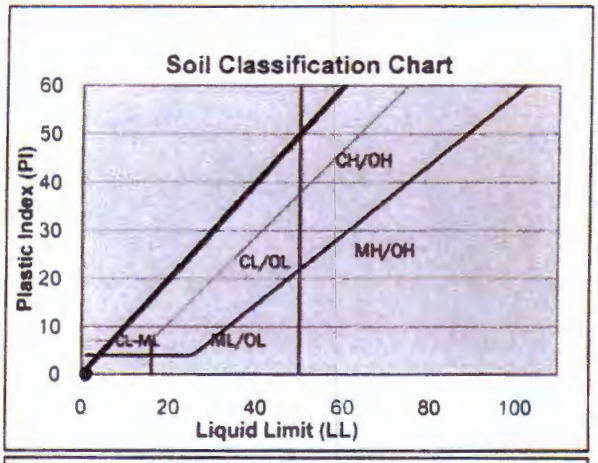
Atterberg Limits Test Results (ASTM D-4318)

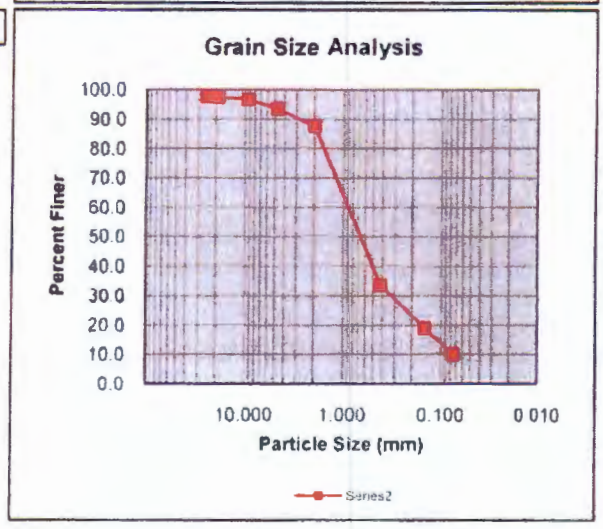
Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	97.6	
3/4 "	19.000	97.4	
3/8 "	9.500	96.7	
No.4	4.750	93.2	
No. 10	2.000	87.5	
No. 40	0.425	33.6	
No. 100	0.150	19.0	
No. 200	0.075	9.8	
Pan	-	0	

Cu	7.25
Cc	0.95





Unified Soil Classification (ASTM D-2487)
SW-SM: Well Graded Sand with Silt

Deviations from ASTM: None

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Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Shee

Sample Information

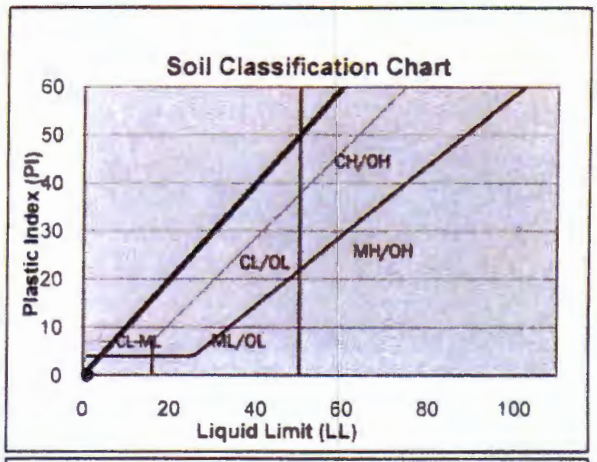
Contact Name:	Charlie Skiba			Sample ID:	SF-06
Project:	S013213A00			Sample Des.:	Brown/Black Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/9/2010
Tested By:	L. Hay	Date:	3/10/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	3/11/2010	Date Received:	3/9/2010

Natural Moisture Content

Natural Moisture	5.7

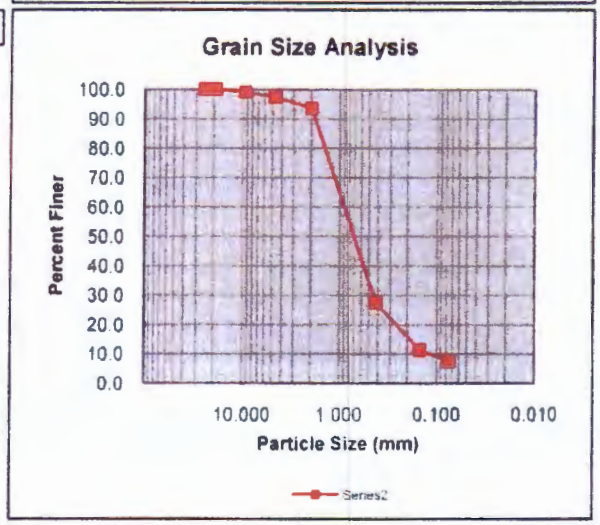
Atterberg Limits Test Results (ASTM D-4318)

Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	99.0	
No.4	4.750	97.2	
No. 10	2.000	93.4	
No. 40	0.425	27.3	
No. 100	0.150	11.3	
No. 200	0.075	7.3	
Pan	-	0.0	



Cu	7.18
Cc	1.99

Unified Soil Classification (ASTM D-2487)
SW: Well Graded Sand

Deviations from ASTM: None

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SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH

2500 N. 11th Street | Enid, OK 73701
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Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheet

Sample Information

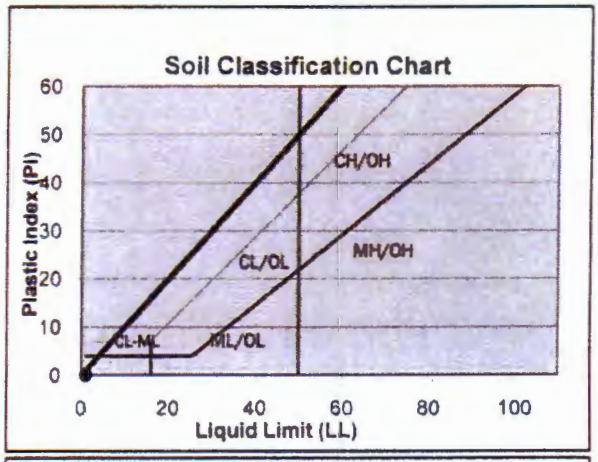
Contact Name:	Charlie Skiba			Sample ID:	SF-07
Project:	S013213A00			Sample Des:	Brown Sand
Project Location:	ERDF Cells 9-10			Sampling Date:	3/17/2010
Tested By:	L. Hay	Date:	3/18/2010	Sampled By:	L. Hay
Reviewed By:	T. Williams	Date:	3/19/2010	Date Received:	3/17/2010

Natural Moisture Content

Natural Moisture	6.0%

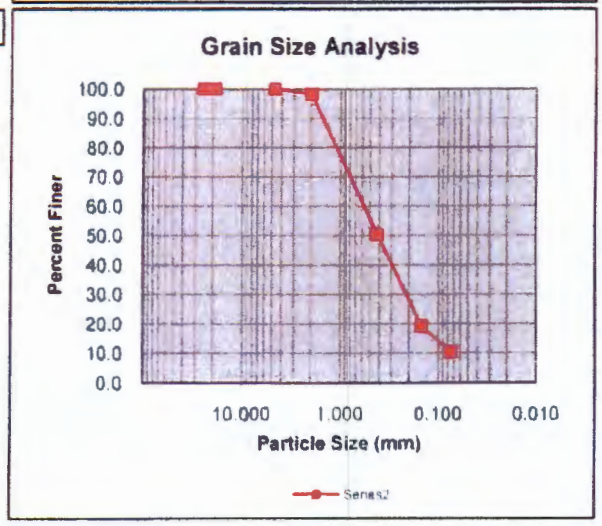
Atterberg Limits Test Results (ASTM D-4318)

Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	10000.0	
No.4	4.750	99.9	
No. 10	2.000	98.1	
No. 40	0.425	50.2	
No. 100	0.150	19.1	
No. 200	0.075	10.4	
Pan	-	0.0	



Cu	10.71
Cc	1.19

Unified Soil Classification (ASTM D-2487)
SW: Well Graded Sand

Deviations from ASTM: None

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SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Shee'

Sample Information

Contact Name:	Charlie Skiba			Sample ID	SF-08
Project:	S013213A00			Sample Des:	Brown Sand:MH-37 to MH-38 Fill
Project Location:	ERDF Cells 9-10			Sampling Date:	6/22/2010
Tested By:	L. Hay	Date:	6/23/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	6/24/2010	Date Received:	6/22/2010

Natural Moisture Content

Natural Moisture	7.6%

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

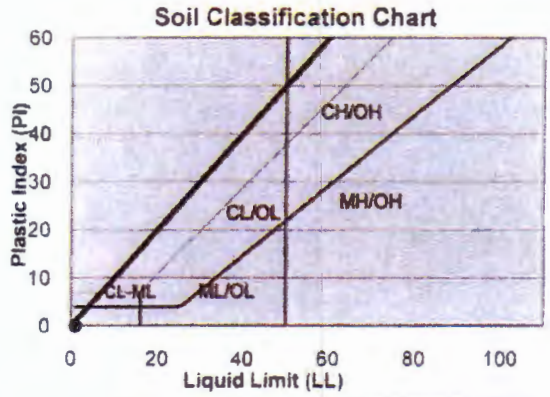
Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

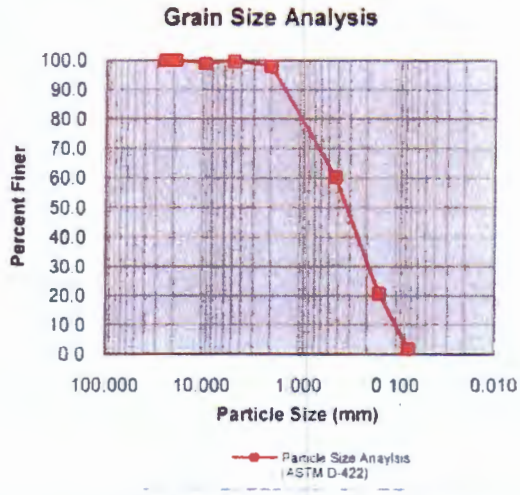
Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	99.0	
No.4	4.750	99.6	
No. 10	2.000	98.1	
No. 40	0.425	60.4	
No. 100	0.150	20.7	
No. 200	0.075	1.8	
Pan	-	0.1	

Cu	3.93
Cc	1.01

Unified Soil Classification (ASTM D-2487)
SP: Pooly Graded Sand

Deviations from ASTM: None





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6/24/10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N. 11th Street | Enid, Ok. 73701
(580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Shee

Sample Information

Contact Name:	Charlie Skiba			Sample ID:	SF-09
Project:	S013213A00			Sample Des:	Round Rock Base Course
Project Location:	ERDF Cells 9-10			Sampling Date:	7/16/2010
Tested By:	QISI	Date:	7/30/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	8/2/2010	Date Received:	7/16/2010

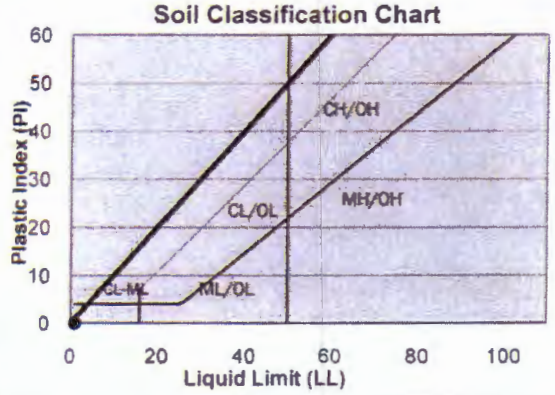
Natural Moisture Content

Natural Moisture	N/A

Atterberg Limits Test Results (ASTM D-4318)

Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

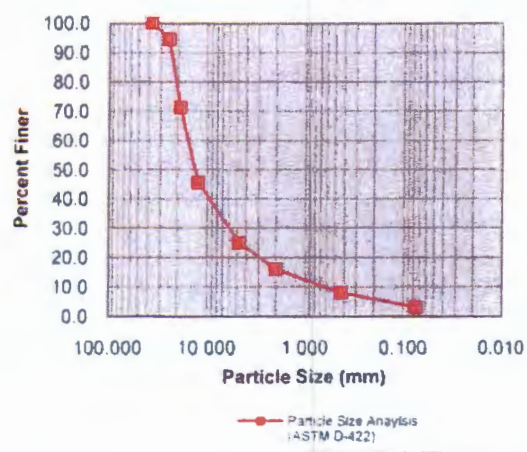
Soil Classification Chart



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 1/2 "	37.500	100.0	
1 "	25.000	94.3	
3/4 "	19.000	71.2	
1/2 "	12.500	45.6	
No.4	4.750	25.1	
No. 10	2.000	16.1	
No. 40	0.425	8.1	
No. 200	0.075	3.1	

Grain Size Analysis



Cu	20.22
Cc	3.38

Unified Soil Classification (ASTM D-2487)
GP: Pooly Graded Gravel

Deviations from ASTM: None

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8/2/10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N. 11th Street | Enid, OK 73701
580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheet

Sample Information

Contact Name:	Charlie Skiba			Sample ID.	SF-10
Project:	S013213A00			Sample Des.	Top Course
Project Location:	ERDF Cells 9-10			Sampling Date.	7/16/2010
Tested By.	QISI	Date:	7/30/2010	Sampled By.	L. Hay
Reviewed By.	J. Voss	Date.	8/2/2010	Date Received.	7/16/2010

Natural Moisture Content

Natural Moisture	N/A

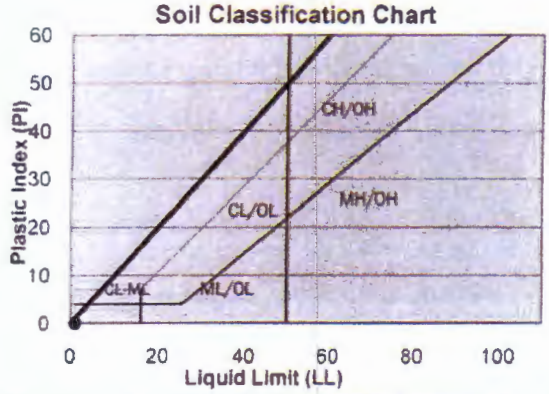
Atterberg Limits Test Results (ASTM D-4318)

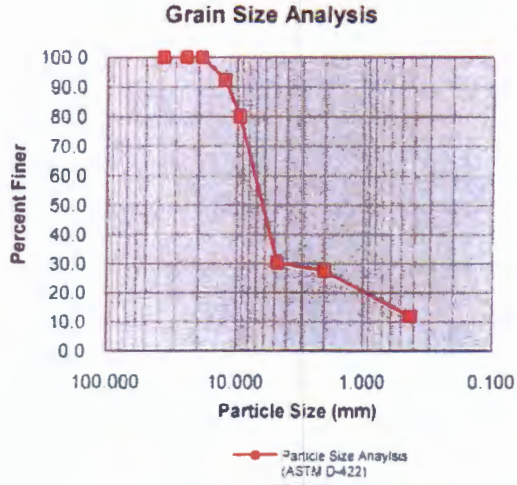
Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	

Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 1/2 "	37.500	100.0	
1 "	25.000	100.0	
3/4 "	19.000	100.0	
1/2 "	12.500	92.2	
3/8 "	9.500	80.0	
No.4	4.750	30.3	
No. 10	2.000	27.5	
No. 40	0.425	11.8	
No. 200	0.075	5 1	

Cu	22.93
Cc	7.90





Unified Soil Classification (ASTM D-2487)
GP: Pooly Graded Gravel

Deviations from ASTM: None

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8/10/10
Date

SOIL CLASSIFICATION (ASTM D-2487)

ENVIROTECH
2500 N. 11th Street | Enid, Ok 73701
580) 234-8780 | Fax (580) 237-4302

Client: Washington Closure Hanford
Address: 05-18A Earthwork Data Sheet

Sample Information

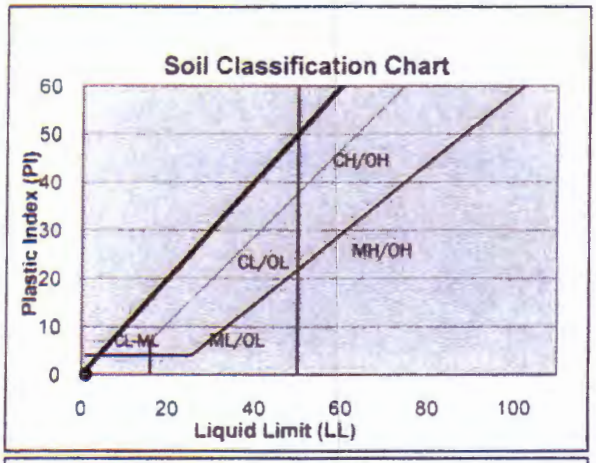
Contact Name:	Charlie Skiba			Sample ID:	SF-11
Project:	S013213A00			Sample Des:	Riser Trench Backfill
Project Location:	ERDF Cells 9-10			Sampling Date:	7/23/2010
Tested By:	L. Hay	Date	7/26/2010	Sampled By:	L. Hay
Reviewed By:	J. Voss	Date:	7/26/2010	Date Received:	7/23/2010

Natural Moisture Content

Natural Moisture	11.1%

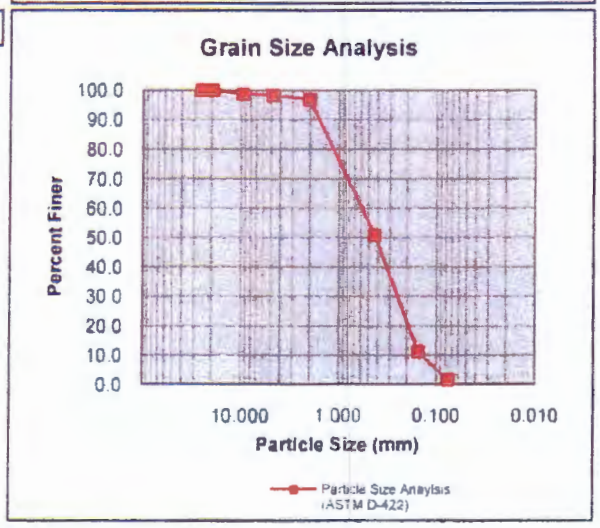
Atterberg Limits Test Results (ASTM D-4318)

Flow Index	Non-Plastic	Spec
Liquid Limit	Non-Plastic	
Plastic Limit	Non-Plastic	
Plasticity Index	Non-Plastic	



Particle Size Anaylsis (ASTM D-422)
200 Wash Sieve Analysis (ASTM D-1140)

Sieve No	Sieve Opening	% Passing	Spec
1 "	25.000	100.0	
3/4 "	19.000	100.0	
3/8 "	9.500	98 8	
No.4	4.750	98.3	
No. 10	2.000	97.0	
No. 40	0.425	51.0	
No. 100	0.150	11.2	
No. 200	0.075	1.6	
Pan	-	0.0	



Cu	5.23
Cc	0.76

Unified Soil Classification (ASTM D-2487)
SP: Pooly Graded Sand

Deviations from ASTM: None

Envirotech

8/2/10
Date