Appendix A.
Construction Verification Data

Appendix A. Construction Verification Data

Contents

NOTE: Appendices A3 and A7 are not included as they are not relevant to the period covered in this Addendum.

Appendix A1.
Perimeter Embankment

Standard Proctor Test Results Summary
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Appendix A1. Perimeter Embankment Standard Proctor Test Results Summary

Proctor ID	Date Sampled	Date Approved	Maximum Dry Density (lb/ft^3)	Optimum Moisture Content (%)	Soils Description
Perimeter Embankment # 1 (2015)	8/20/15	9/1/15	122	11.5	Clay with some sand
Perimeter Embankment # 2 (2015)	8/20/15	9/1/15	123.5	12	Clay with some sand
Perimeter Embankment # 3 (2015)	8/20/15	9/1/15	128	10	Clay with some sand
Perimeter Embankment # 4 (2015)	8/20/15	9/1/15	121.5	12.5	Clay with some sand

lb/ft^3 = pounds per cubic foot

Appendix A1. Perimeter Embankment Lift Approval Summary

September 2015									
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Average Compaction (%)
9/9/15	UE1B34150909-00	0	0	0	≤ 1	PE # 4 (2015)	1	0	99.6
9/10/15	U1EB32150910-00	0	621	621	≤ 1	PE # 4 (2015)	1	0	96.0
9/10/15	UE1E34150910-00	1	0	621	≤ 1	PE # 4 (2015)	1	1	97.9
9/10/15	UE1B32150910-01	1	621	1,242	≤ 1	PE # 4 (2015)	1	0	99.7
9/10/15	UE1B32150910-02	1	621	1,863	≤ 1	PE # 4 (2015)	1	0	96.8
9/10/15	UE1B32150910-03	0	621	2,484	≤ 1	PE # 4 (2015)	1	0	96.5
9/10/15	UE1B32150910-04	0	621	3,105	≤ 1	PE # 4 (2015)	1	0	97.0
9/11/15	UE1B32150911-00	0	621	3,726	≤ 1	PE # 2 (2015)	1	0	96.2
9/11/15	UE1B32150911-01	0	621	4,347	≤ 1	PE # 2 (2015)	1	0	95.3
9/11/15	UE1B32150911-02	0	423	4,770	≤ 1	PE # 2 (2015)	1	0	95.3
9/11/15	UE1B32150911-03	0	423	5,193	≤ 1	PE # 2 (2015)	1	0	98.4
9/11/15	UE1B32150911-04	0	423	5,616	≤ 1	PE # 4 (2015)	1	0	96.4
9/14/15	UE1B32150914-00	0	208	5,824	≤ 1	PE # 4 (2015)	1	0	96.7
9/14/15	UE1B32150914-01	0	208	6,032	≤ 1	PE # 4 (2015)	1	0	99.0
9/14/15	UE1B32150914-02	1	208	6,240	≤ 1	PE # 4 (2015)	1	0	95.9
9/14/15	UE1B32150914-03	0	208	6,448	≤ 1	PE # 4 (2015)	1	0	95.0
9/14/15	UE1B32150914-04	0	208	6,656	≤ 1	PE # 4 (2015)	1	0	97.0
9/15/15	UE1B32150915-00	0	1670	8,326	≤ 1	PE # 4 (2015)	1	0	97.0
9/16/15	UE1B32150916-00	1	1670	9,996	≤ 1	PE # 2 (2015)	1	1	97.3
9/17/15	UE1B32150917-00	0	1670	11,666	≤ 1	PE # 2 (2015)	1	0	97.5
9/18/15	UE1B32150917-01	0	1670	13,336	≤ 1	PE # 2 (2015)	1	0	96.0
9/18/15	UE1B32150918-00	0	1670	15,006	≤ 1	PE # 1 (2015)	1	0	96.1
9/18/15	UE1B32150918-01	0	1670	16,676	≤ 1	PE # 1 (2015)	1	0	96.5
9/21/15	UE1B32150921-00	0	1670	18,346	≤ 1	PE # 1 (2015)	1	0	96.0
9/21/15	UE1B32150921-01	0	1670	20,016	≤ 1	PE # 1 (2015)	1	0	99.7
9/21/15	UE1B32150921-02	0	1670	21,686	≤ 1	PE # 1 (2015)	1	0	95.2
9/22/15	UE1B32150922-00	0	1670	23,356	≤ 1	PE # 1 (2015)	1	0	95.1
9/22/15	UE1B32150922-01	1	1670	25,026	≤ 1	PE # 1 (2015)	1	0	96.5
9/23/15	UE1B32150923-00	0	1352	26,378	≤ 1	PE # 1 (2015)	1	0	97.1
9/23/15	UE1B32150923-01	0	1352	27,730	≤ 1	PE # 1 (2015)	1	0	99.2
9/23/15	UE1B32150923-02	0	1352	29,082	≤ 1	PE # 1 (2015)	1	0	98.7
9/24/15	UE1B32150924-00	0	1352	30,434	≤ 1	PE # 1 (2015)	1	0	95.3
9/24/15	UE1B32150924-01	0	1352	31,786	≤ 1	PE # 1 (2015)	1	0	96.6
9/25/15	UE1B32150925-00	0	376	32,162	≤ 1	PE # 4 (2015)	1	0	96.1
9/25/15	UE1B32150925-01	0	376	32,538	≤ 1	PE # 4 (2015)	1	0	96.0
9/25/15	UE1B32150925-02	0	418	32,956	≤ 1	PE # 4 (2015)	1	0	95.0
9/25/15	UE1B32150925-03	0	418	33,374	≤ 1	PE # 4 (2015)	1	0	97.3

Appendix A1. Perimeter Embankment Lift Approval Summary (*continued*)

September 2015									
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Average Compaction (%)
9/28/15	UE1B32150928-00	1	224	33,598	≤ 1	PE # 4 (2015)	1	0	96.8
9/29/15	UE1B32150929-00	1	224	33,822	≤ 1	PE # 4 (2015)	1	1	98.3
9/29/15	UE1B32150929-01	0	224	34,046	≤ 1	PE # 4 (2015)	1	0	97.9
9/29/15	UE1B32150929-02	0	224	34,270	≤ 1	PE # 4 (2015)	1	0	97.0

PE = Perimeter Embankment

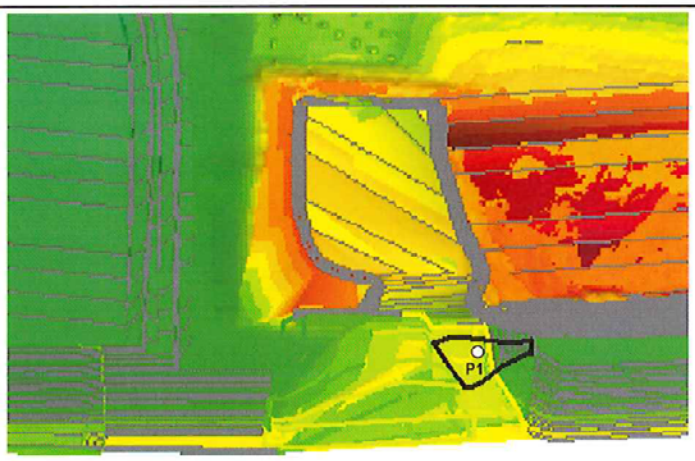
Total Quantity Approved (yd^3) = 34,270
Total # of Nuclear Density Gauge Tests = 41
Quantity per Nuclear Density Gauge Test (yd^3) = 835.85
Total Average Compaction (%) = 96.9%

Appendix A1. Perimeter Embankment Lift Approval Package

LIFT APPROVAL FORM

PROJECT: Moab UMTRA OTHER

NW CORNER DATE: 9/29/2015



P 1	6794238 N. 2123708 E.				
EW:	102	X	0.401	=	41
NS:	53	X	0.215	=	11
P 2					
EW:		X		=	
NS:		X		=	
P 3					
EW:		X		=	
NS:		X		=	
P 4					
EW:		X		=	
NS:		X		=	
P 5					
EW:		X		=	
NS:		X		=	

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: UE1B32150929-00 NW CORNER: 6794249 N. 2123667 E.

Uncompacted Thickness: ≤ 1.0' Compacted Thickness: N/A Debris Insp. By: N/A Date: N/A Time: N/A

NW CORNER of debris placement: N/A EW Dimension N/A NS Dimension N/A

Lift Area (ft²): 6,052 Lift Volume (yd³): 224

Comments: QC verified that the lift area was scarified prior to placement. QC observed material placed to be common fill. QC verified lift thickness by measuring with a tape measure with satisfactory results. QC performed a sandcone/ moisture correlation test on this lift.

Attached Forms: Grid Slope N/A Compaction Macro N/A Print Screen N/A Moisture/ Density X

KEYING IN NOTES: N [E] S [W] Satisfactory MOISTURE/ DENSITY TESTS ID # (S): 1

LIFT APPROVED BY: Beachem Bosh/ DATE: 9/29/2015 TIME: 0845

QA/QC APPROVAL 09·30·2015 DATE

Density Testing
DOE-EM/GJRAC1783
Rev. 1

QC-F-001
File index No. 43.8.2
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Appendix A1. Perimeter Embankment Lift Approval Package (*continued*)

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER

LIFT IDENTIFICATION: UE1B32150929-00 DATE: 9/29/2015

TEST ID NUMBER(S): # 1

TEST LOCATION: P1 TEST METHOD: X D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 28098

Last Calibration Date: 12/22/14

Daily Standard Counts: *Off-Cell Standard*

Density 2228 Moisture 682

Method A (Direct Transmission)

Depth Setting 6 *(inches)* Count Time 1 *(minutes)*

Moisture Count 155 Density Count 1639

Wet Density (ρ_m) 133.8 *(lbs/ft³)* Dry Density 121.1 *(lbs/ft³)*

Moisture Density 12.7 *(lbs/ft³)* Moisture Fraction 10.5 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID KT # 1

Scale Serial # 14714971 Last Calibration Date: 12/2/14

Mass of container & wet specimen (M_{cms})	544.5	g
Mass of container & dry specimen (M_{cds})	514.2	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	30.3	g
Mass of container (M_c)	220.6	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	293.6	g
Moisture content (w) $w = (M_w / M_s) \times 100$	10.3	%

Dry Density $(\rho_d) = (100 \times \rho_m)/(100 + w)$

$\rho d = (100 \times 131.7) / (100 + 10.3 = 119.4$ *lbs/ft³*

Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)

Percent Compaction = ρ_d / $\gamma_d max \times 100$

119.4 / 121.5 x 100 = 98.3 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus Ω Calibrated Vol. *(lbs/ft³)* 0.03784

Bulk Density of sand (ρ_1) 1.54 *g/cm³* 96.4 *lbs/ft³*

Mass of Sand to Fill Cone & Plate (M_2) 1654.5 *g*

Mass of bottle & cone **before** filling cone, plate & hole	6259.2	g
Mass of bottle & cone **after** filling cone, plate & hole	2012.3	g
Mass of sand to fill cone, plate, & hole (M_1)	4246.9	g
Mass of sand to fill hole	2592.4	g
Mass of wet soil & container	3550.5	g
Mass of container	8.8	g
Mass of wet soil (M_3)	3541.7	g

Test Hole Volume

$V = (M_1 - M_2) / \rho_1$ 1679 *cm³*

Dry Mass of soil

$M_4 = 100\ M_3 / (w + 100)$ 3210.4 *g*

Wet Density

$\rho_m = (M_3 / V) \times 62.43$ 131.7 *lbs/ft³*

Dry Density

$\rho_d = M_4 / V$ 1.9 *g/cm³*

Dry Unit Weight

$\gamma_d = \rho_d \times 62.43$ 119.4 *lbs/ft³*

Soil Description: Clay with some sand.

Proctor ID: Perimeter Embankment # 4 (2015)

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.5 (lbs/ft³)

Optimum Moisture (w_{opt}) 12.5 (%)

Required Moisture: 7.5 % to 17.5 %

Required Percent Compaction: 95.0 (%)

Comments:

Microwave oven power setting on HIGH. Initial time setting of 3 minutes and subsequent incremental drying periods of 1 minute until a change of 0.1 % or less of the initial wet mass of the soil.

TEST RESULTS:

X Pass Date: 9/29/15

Failed Moisture

Failed Compaction Time: 0840

By: Beachem Bosh *(print)* *(signature)*

QA/QC APPROVAL 09.30.2015 DATE

Density Testing
DOE-EM/GJRAC1783

QC-F-002
File Index No. 43.8.2
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Appendix A1. Perimeter Embankment Lift Approval Package (*continued*)

Appendix A2.
RRM

Standard Proctor Test Results Summary
Lift Approval Summaries
Lift Approval Package

Appendix A2. RRM Standard Proctor Test Results Summary

Set	Proctor ID #	Date Sampled	Date Approved	Maximum Dry Density (lb/ft^3)	Optimum Moisture Content (%)	Soils Description
Set # 149	RRM#451	10/9/14	12/5/14	110.2	17.9	Light brown, very fine to medium, subround, moderately graded, clay w/ some sand.
	RRM#452	10/9/14	12/5/14	109.9	18.1	Light brown, very fine to medium, subround, moderately graded, clay w/ some sand.
	RRM#453	10/9/14	12/5/14	108.8	18.0	Light brown, very fine to medium, subround, moderately graded, clay w/ some sand.
Set # 150	RRM#454	10/23/14	12/5/14	111.1	17.3	Light brown, very fine to fine, subround, moderately graded clay w/ some sand.
	RRM#455	10/23/14	12/5/14	110.7	17.1	Light brown, very fine to fine, subround, moderately graded clay w/ some sand.
	RRM#456	10/23/14	12/5/14	110.4	17.7	Light brown, very fine to fine, subround, moderately graded clay w/ some sand.
Set # 151	RRM#457	11/12/14	12/5/14	106.2	11.8	Yellow red, medium to coarse, subangular poorly graded, sand.
	RRM#458	11/12/14	12/5/14	106.4	11.5	Yellow red, medium to coarse, subangular poorly graded, sand.
	RRM#459	11/12/14	12/5/14	108.7	11.2	Yellow red, medium to coarse, subangular poorly graded, sand.
Set # 152	RRM#460	1/15/15	1/28/15	105.2	13.5	Very pale brown. Very fine to fine, subangular, poorly graded, sand.
	RRM#461	1/15/15	1/28/15	103.2	11.9	Very pale brown. Very fine to fine, subangular, poorly graded, sand.
	RRM#462	1/15/15	1/28/15	105.8	12.0	Very pale brown. Very fine to fine, subangular, poorly graded, sand.
Set # 153	RRM#463	1/26/15	3/5/15	117.5	14.6	Light brown, very fine to fine, subangular, poorly graded sand with some clay.
	RRM#464	1/26/15	3/5/15	117.3	13.6	Light brown, very fine to fine, subangular, poorly graded sand with some clay.
	RRM#465	1/26/15	3/5/15	118.0	14.0	Light brown, very fine to fine, subangular, poorly graded sand with some clay.
Set # 154	RRM#466	2/4/15	3/17/15	122.9	10.0	Light reddish brown, very fine to meduim, moderatley graded, sand with some clay.
	RRM#467	2/4/15	3/17/15	115.9	11.7	Light reddish brown, very fine to meduim, moderatley graded, sand with some clay.
	RRM#468	2/4/15	3/17/15	117.4	11.4	Light reddish brown, very fine to meduim, moderatley graded, sand with some clay.
Set # 155	RRM#469	2/26/15	3/24/15	105.8	13.9	Light brown very fine to fine, subangular, moderately graded, sand.
	RRM#470	2/26/15	3/24/15	104.6	15.0	Light brown very fine to fine, subangular, moderately graded, sand.
	RRM#471	2/26/15	3/24/15	102.7	15.2	Light brown very fine to fine, subangular, moderately graded, sand.
Set # 156	RRM#472	3/11/15	5/13/15	106.1	12.9	Very pale brown. Very fine to medium, subangular, poorly graded, sand.
	RRM#473	3/11/15	5/13/15	106.1	14.1	Very pale brown. Very fine to medium, subangular, poorly graded, sand.
	RRM#474	3/11/15	5/13/15	105.8	13.7	Very pale brown. Very fine to medium, subangular, poorly graded, sand.
Set # 157	RRM#475	4/2/15	5/13/15	103.7	22.1	Light brown, very fine to fine, subround, moderately graded clay.
	RRM#476	4/2/15	5/13/15	102.2	22.6	Light brown, very fine to fine, subround, moderately graded clay.
	RRM#477	4/2/15	5/13/15	103.4	22.5	Light brown, very fine to fine, subround, moderately graded clay.

lb/ft^3 = pounds per cubic foot

Appendix A2. RRM Lift Approval Summaries

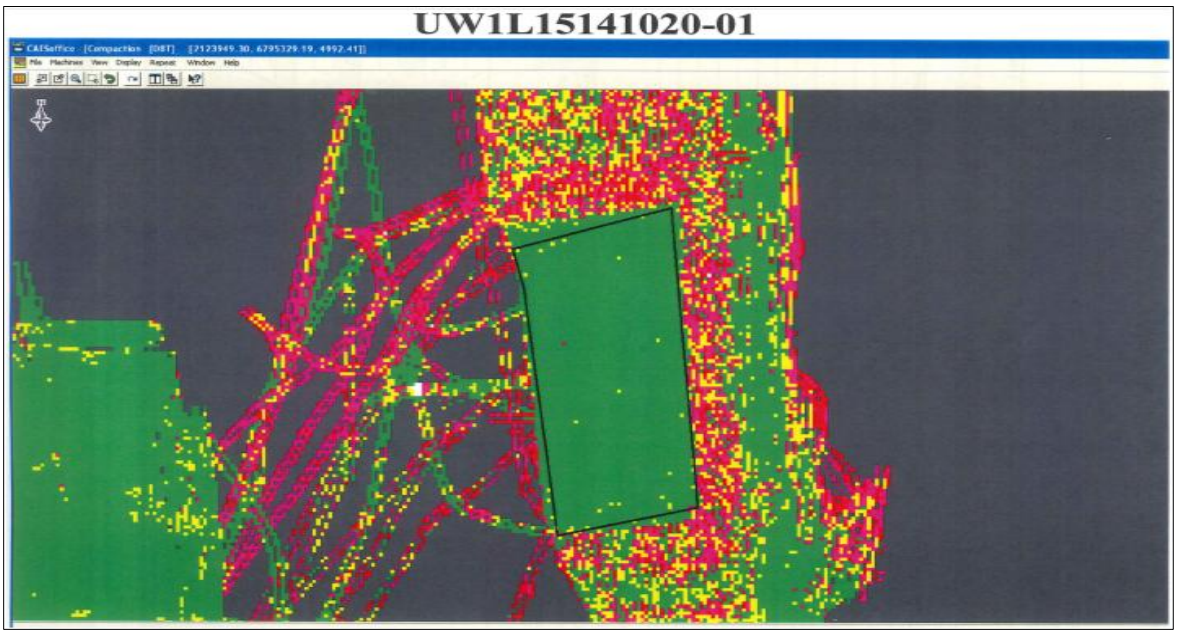
October 2014										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
10/2/14	UW1L15141002-00	1	0	0	98.9	0.0	419	0	0	N/A
10/6/14	UW1M01140919-00	2	1182	1,182	99.4	0.9	396	0	0	N/A
10/6/14	UW1L15141006-00	1	1295	2,477	99.3	1.0	413	0	0	N/A
10/7/14	UW1L04141006-00	1	944	3,421	99.4	0.8	396	0	0	N/A
10/7/14	UW1L08140925-00	2	1192	4,613	99.8	0.7	413, 396	0	0	N/A
10/7/14	UW1L15141007-00	1	1157	5,770	99.5	0.9	413	0	0	N/A
10/8/14	UW1M01141007-00	0	1309	7,079	99.5	1.0	N/A	0	0	N/A
10/8/14	UW1L15141007-01	0	1157	8,236	98.5	0.9	N/A	0	0	N/A
10/9/14	UW1L08141008-00	1	1505	9,741	99.3	0.9	396	0	0	N/A
10/9/14	UW1L04141008-00	0	1062	10,803	98.4	0.9	N/A	0	0	N/A
10/10/14	UW1L08141009-00	0	1580	12,383	99.1	0.9	N/A	0	0	N/A
10/10/14	UW1L15141009-00	0	1224	13,607	99.2	0.9	N/A	0	0	N/A
10/10/14	UW1M01141009-00	1	1309	14,916	99.4	1.0	396	0	0	N/A
10/13/14	UW1M01141010-00	0	1160	16,076	99.3	0.9	N/A	0	0	N/A
10/13/14	UW1L04141010-00	1	1029	17,105	99.9	0.9	396	0	0	N/A
10/13/14	UW1L15141013-00	0	1088	18,193	99.0	0.8	N/A	0	0	N/A
10/14/14	UW1L08141013-00	1	1404	19,597	99.5	0.8	396	0	0	N/A
10/14/14	UW1L04141014-00	0	1029	20,626	98.7	0.9	N/A	0	0	N/A
10/15/14	UW1M01141014-00	1	1160	21,786	98.8	0.9	419	0	0	N/A
10/15/14	UW1L15141014-00	0	1191	22,977	98.9	0.8	N/A	0	0	N/A
10/15/14	UW1L08141014-00	0	1305	24,282	99.1	0.7	N/A	0	0	N/A
10/15/14	UW1L04141015-00	1	1078	25,360	98.9	0.9	396	0	0	N/A
10/15/14	UW1M01141015-00	0	750	26,110	99.9	0.7	N/A	0	0	N/A
10/16/14	UW1L15141015-00	0	1226	27,336	97.5	0.9	N/A	0	0	N/A
10/16/14	UW1L08141016-00	0	1542	28,878	96.9	0.9	N/A	0	0	N/A
10/20/14	UW1L04141016-00	1	958	29,836	99.3	0.8	396	0	0	N/A
10/20/14	UW1M01141016-00	0	964	30,800	99.4	0.9	N/A	0	0	N/A
10/20/14	UW1L15141016-00	0	1090	31,890	99.0	0.8	N/A	0	0	N/A
10/20/14	UW1L15141020-00	0	1288	33,178	98.8	1.0	N/A	0	0	N/A
10/20/14	UW1L08141020-00	1	1536	34,714	97.9	0.9	396	0	0	N/A
10/21/14	UW1L04141020-00	0	930	35,644	98.7	1.0	N/A	0	0	N/A
10/21/14	UW1M01141020-00	0	582	36,226	98.1	0.6	N/A	0	0	N/A
10/21/14	UW1L15141020-01	0	901	37,127	98.8	0.7	N/A	0	0	N/A
10/21/14	UW1L08141021-00	0	1707	38,834	98.2	1.0	N/A	0	0	N/A
10/21/14	UW1M01141021-00	0	873	39,707	98.6	0.9	N/A	0	0	N/A
10/21/14	UW1L04141021-00	1	837	40,544	98.7	0.9	396	0	0	N/A
10/22/14	UW1L15141021-00	0	1,159	41,703	99.1	0.9	N/A	0	0	N/A
10/22/14	UW1L08141022-00	0	1,558	43,261	98.3	0.9	N/A	0	0	N/A
10/23/14	UW1M01141022-00	1	679	43,940	97.5	0.7	396	0	0	N/A
10/23/14	UW1L04141022-00	0	651	44,591	98.1	0.7	N/A	0	0	N/A
10/23/14	UW1L15141022-00	0	889	45,480	99.2	0.7	N/A	0	0	N/A
10/23/14	UW1L08141023-00	1	1,385	46,865	99.0	0.8	396	0	0	N/A
10/27/14	UW1M01141023-00	0	1,377	48,242	99.2	0.8	N/A	0	0	N/A
10/27/14	UW1L15141023-00	0	1,269	49,511	99.0	1.0	N/A	0	0	N/A
10/27/14	UW1L08141027-00	0	1,558	51,069	98.4	0.9	N/A	0	0	N/A

Appendix A2. RRM Lift Approval Summaries (*continued*)

October 2014										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
10/28/14	UW1M01141027-00	1	985	52,054	99.0	0.8	419	0	0	N/A
10/28/14	UW1L15141027-00	0	1,342	53,396	98.6	1.0	N/A	0	0	N/A
10/28/14	UW1L08141028-00	1	1,530	54,926	98.6	0.9	419	0	0	N/A
10/29/14	UW1M01141028-00	0	985	55,911	99.2	0.8	N/A	0	0	N/A
10/29/14	UW1L15141028-00	0	1,073	56,984	99.7	0.8	N/A	0	0	N/A
10/29/14	UW1L08141029-00	0	1,700	58,684	99.4	1.0	N/A	0	0	N/A
10/29/14	UW1M01141029-00	0	985	59,669	99.0	0.8	N/A	0	0	N/A
10/30/14	UW1L15141029-00	1	1,342	61,011	99.6	1.0	419	0	0	N/A
10/30/14	UW1L08141029-01	0	850	61,861	98.9	0.5	N/A	0	0	N/A
10/30/14	UW1M01141030-00	0	595	62,456	98.5	0.8	N/A	0	0	N/A
10/30/14	UW1L15141030-00	1	1,198	63,654	99.1	0.9	417	0	0	N/A

Average CAES Screen Passing Pixels (%)= 98.9%
Total Quantity Approved (yd^3) = 63,654
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 23
Quantity per Moisture Test (yd^3) = 2,768
Total Average Thickness (ft)= 0.8

CAES compaction screen example from October 2014. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.



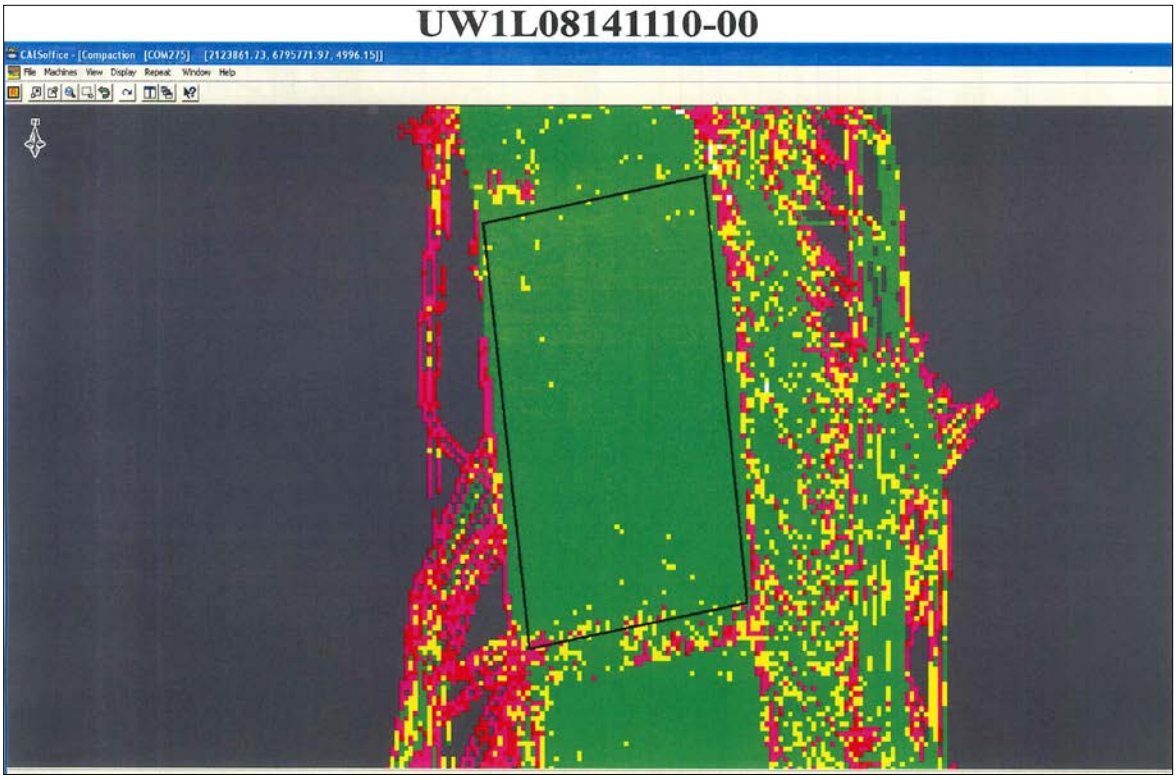
Appendix A2. RRM Lift Approval Summaries (*continued*)

November 2014										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
11/3/14	UW1L08141030-00	0	1373	1,373	99.2	0.8	N/A	0	0	N/A
11/3/14	UW1M01141103-00	0	670	2,043	99.2	0.9	N/A	0	0	N/A
11/3/14	UW1L15141103-00	0	1198	3,241	98.5	0.9	N/A	0	0	N/A
11/4/14	UW1L08141103-00	1	1202	4,443	98.4	0.7	419	0	0	N/A
11/4/14	UW1M01141104-00	0	595	5,038	97.4	0.8	N/A	0	0	N/A
11/4/14	UW1L15141104-00	0	973	6,011	99.5	0.7	N/A	0	0	N/A
11/5/14	UW1L08141104-00	1	1388	7,399	99.0	0.9	430	0	0	N/A
11/5/14	UW1L15141105-00	0	1251	8,650	99.6	0.9	N/A	0	0	N/A
11/6/14	UW1M01141105-00	0	219	8,869	98.3	0.5	396	1	0	93.4
11/6/14	UW1L08141105-00	1	1542	10,411	99.3	1.0	396	1	0	N/A
11/6/14	UW1L15141106-00	1	1251	11,662	99.1	0.9	419	0	0	N/A
11/10/14	UW1L15141110-00	1	1110	12,772	99.3	0.7	413	0	0	N/A
11/10/14	UW1L08141106-00	0	1328	14,100	98.3	0.8	N/A	0	0	N/A
11/11/14	UW1L08141110-00	0	1328	15,428	97.6	0.8	N/A	0	0	N/A
11/11/14	UW1L15141111-00	1	1269	16,697	99.5	0.8	392	0	0	N/A
11/12/14	UW1L08141111-00	0	1494	18,191	98.2	0.9	N/A	0	0	N/A
11/13/14	UW1L15141112-00	1	1456	19,647	99.5	0.9	392	0	0	N/A
11/13/14	UW1L08141112-00	0	1532	21,179	99.6	0.9	N/A	0	0	N/A
11/17/14	UW1L15141113-00	1	1618	22,797	99.9	1.0	413	0	0	N/A
11/17/14	UW1L08141117-00	1	1702	24,499	99.7	1.0	430	0	0	N/A
11/18/14	UW1L15141117-00	1	1326	25,825	99.5	0.8	435	0	0	N/A
11/18/14	UW1L08141118-00	0	1657	27,482	99.7	0.9	N/A	0	0	N/A
11/20/14	UW1L15141118-00	1	1491	28,973	99.5	0.9	429	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.0%
Total Quantity Approved (yd^3) = 28,973
Total # of Nuclear Density Gauge Tests = 2
Total # of Moisture Tests = 11
Quantity per Moisture Test (yd^3) = 2,634
Total Average Thickness (ft)= 0.8

Appendix A2. RRM Lift Approval Summaries (*continued*)

CAES compaction screen example from November 2014. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been

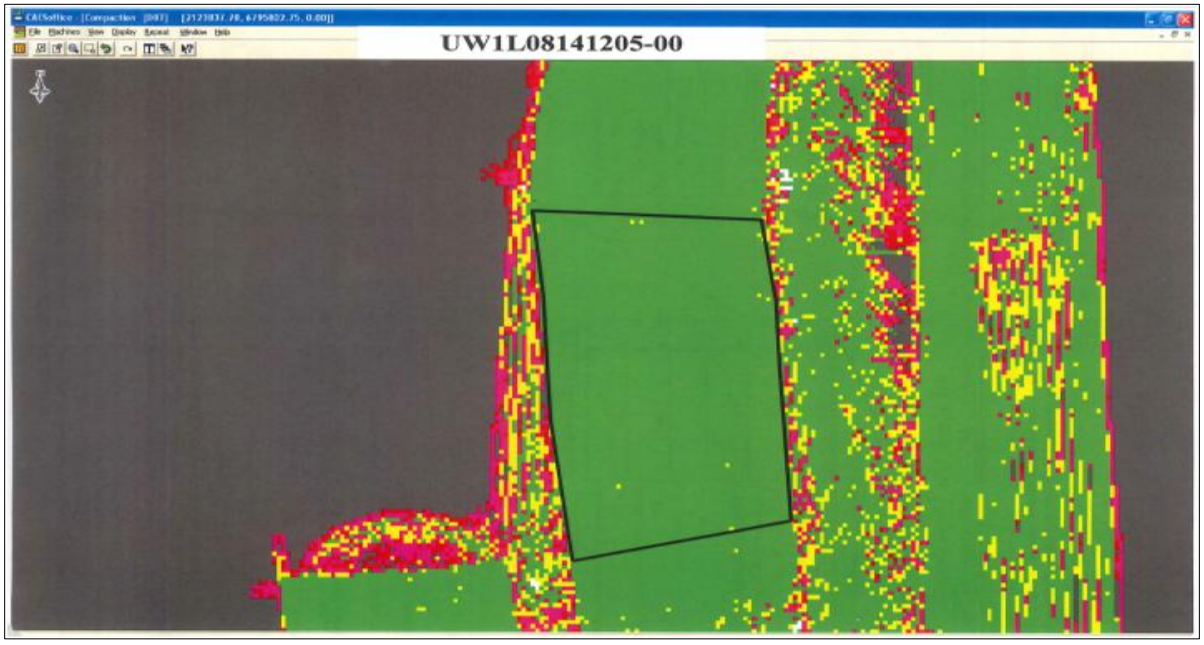


Appendix A2. RRM Lift Approval Summaries (*continued*)

December 2014										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
12/4/14	UW1L08141120-00	1	1657	1,657	99.7	0.9	430	0	0	N/A
12/5/14	UW1L15141204-00	1	1160	2,817	99.8	0.7	136	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.8%
Total Quantity Approved (yd^3) = 2,817
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 2
Quantity per Moisture Test (yd^3) = 1,409
Total Average Thickness (ft)= 0.8

CAES compaction screen example from December 2014. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.

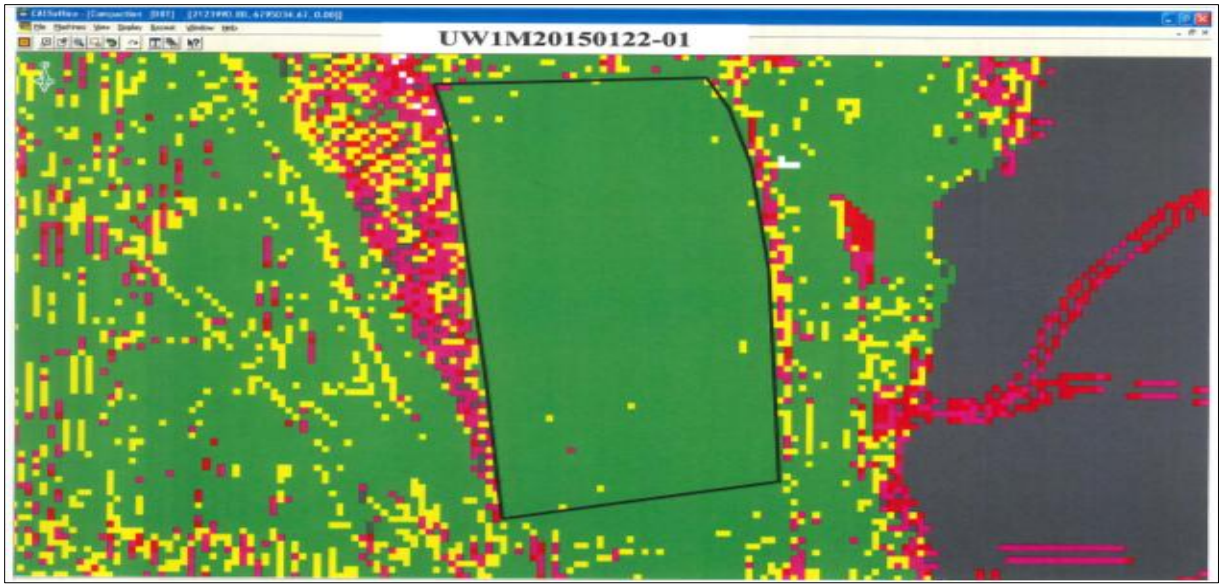


Appendix A2. RRM Lift Approval Summaries (*continued*)

January 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
1/20/15	UW1M20150116-00	1	531	531	99.3	0.6	425	0	0	N/A
1/20/15	UW1M20150120-00	1	796	1,327	99.2	0.9	425	0	0	N/A
1/21/15	UW1M20150120-01	1	652	1,979	97.2	0.7	425	0	0	N/A
1/21/15	UW1M20150121-00	0	745	2,724	98.4	0.8	N/A	0	0	N/A
1/22/15	UW1M20150121-01	0	652	3,376	98.9	0.7	N/A	0	0	N/A
1/22/15	UW1M20150122-00	1	745	4,121	99.3	0.8	425	0	0	N/A
1/23/15	UW1M201150122-01	1	796	4,917	99.2	0.8	425	0	0	N/A
1/23/15	UW1M20150123-00	0	796	5,713	99.8	0.8	N/A	0	0	N/A
1/27/15	UW1M20150127-00	1	994	6,707	98.6	1.0	425	0	0	N/A
1/28/15	UW1M20150127-01	1	934	7,641	99.4	0.9	425	0	0	N/A
1/29/15	UW1I16150128-00	1	0	7,641	99.6	0.0	396	0	0	N/A
1/29/15	UW1M20150128-00	0	934	8,575	99.6	0.9	N/A	0	0	N/A
1/29/15	UW1L08150127-00	1	0	8,575	99.2	0.0	430	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.1%
Total Quantity Approved (yd^3) = 8,575
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 9
Quantity per Moisture Test (yd^3) = 953
Total Average Thickness (ft)= 0.7

CAES compaction screen example from January 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.

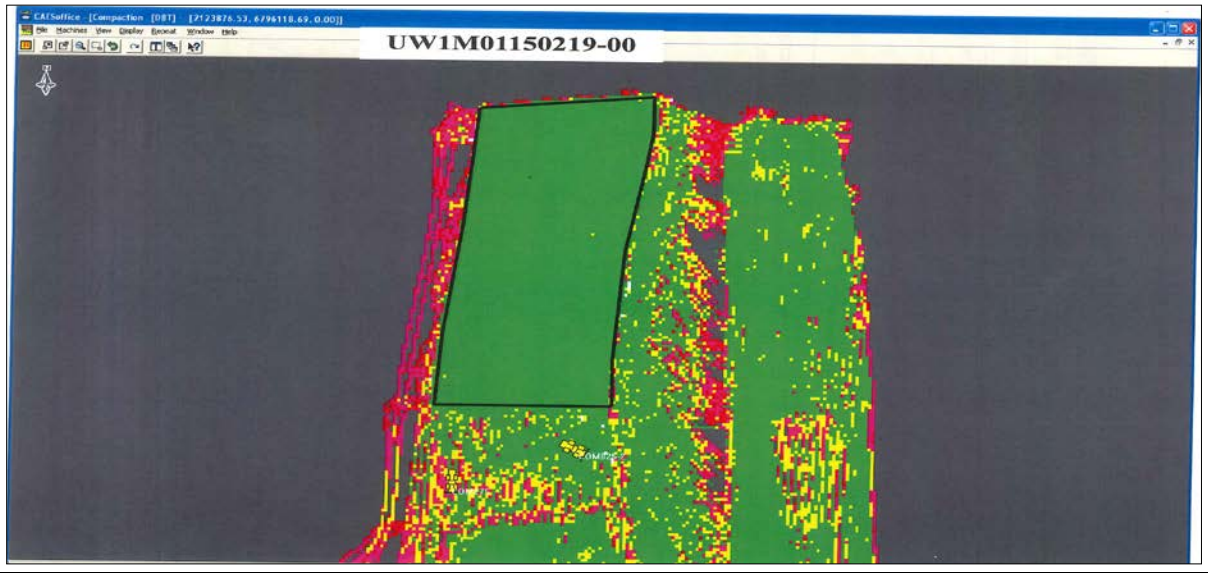


Appendix A2. RRM Lift Approval Summaries (*continued*)

February 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd³)	Cumulative Quantity Approved (yd³)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
2/3/15	UW1I16150129-00	3	1817	1,817	98.0	0.9	425	0	0	N/A
2/3/15	UW1M20150203-00	2	831	2,648	99.6	0.8	425	0	0	N/A
2/5/15	UW1I16150203-00	1	2037	4,685	97.3	1.0	425	0	0	N/A
2/6/15	UW1L08141205-00	2	1289	5,974	99.2	0.7	396, 425	0	0	N/A
2/6/15	UW1L15150205-00	1	1341	7,315	99.9	0.8	425	0	0	N/A
2/11/15	UW1I16150206-00	1	2037	9,352	99.5	1.0	425	0	0	N/A
2/12/15	UW1I16150211-00	2	2056	11,408	98.8	1.0	425	0	0	N/A
2/13/15	UW1L08150211-00	0	1359	12,767	99.7	0.9	N/A	0	0	N/A
2/18/15	UW1I16150213-00	1	1850	14,617	99.7	0.9	425	0	0	N/A
2/18/15	UW1L15150212-00	0	1677	16,294	99.4	1.0	N/A	0	0	N/A
2/19/15	UW1I16150218-00	2	1845	18,139	99.8	0.9	425	0	0	N/A
2/20/15	UW1M01150219-00	1	1592	19,731	99.9	0.8	425	0	0	N/A
2/24/15	UW1L08150220-00	0	1377	21,108	99.7	1.0	N/A	0	0	N/A
2/25/15	UW1I16150224-00	1	1845	22,953	97.1	0.9	435	0	0	N/A
2/26/15	UW1M01150225-00	1	1791	24,744	99.3	0.9	425	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.1%
Total Quantity Approved (yd³) = 24,744
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 18
Quantity per Moisture Test (yd³) = 1,375
Total Average Thickness (ft)= 0.9

CAES compaction screen example from February 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.



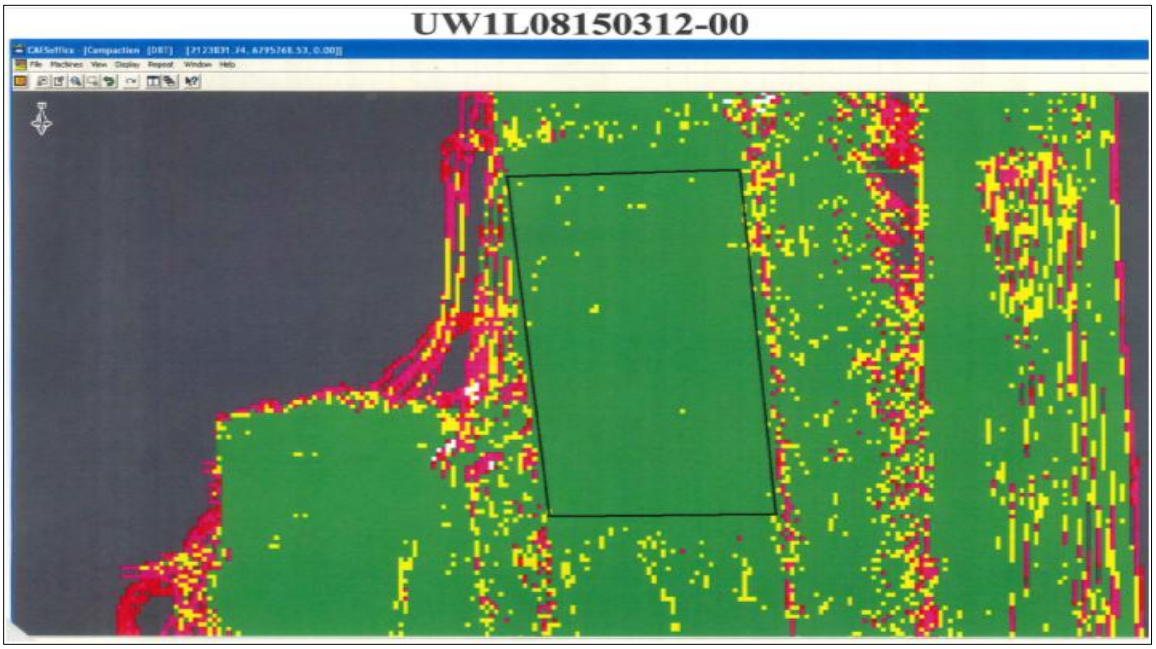
Appendix A2. RRM Lift Approval Summaries (*continued*)

March 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
3/3/15	UW1M01150227-00	2	1971	1,971	99.3	1.0	425, 435	0	0	N/A
3/3/15	UW1I16150226-00	1	1533	3,504	99.3	0.8	425	0	0	N/A
3/4/15	UW1M01150303-00	0	1774	5,278	100.0	0.9	N/A	0	0	N/A
3/4/15	UW1L15150226-00	3	1760	7,038	99.6	1.0	425	0	0	N/A
3/5/15	UW1L08150304-00	0	1059	8,097	99.1	0.8	N/A	0	0	N/A
3/6/15	UW1M01150305-00	1	1841	9,938	98.0	1.0	425	0	0	N/A
3/10/15	UW1L15150305-00	1	1760	11,698	96.3	1.0	425	0	0	N/A
3/11/15	UW1M01150306-00	1	1841	13,539	98.9	1.0	425	0	0	N/A
3/11/15	UW1M20150310-00	0	1105	14,644	98.9	1.0	N/A	0	0	N/A
3/12/15	UW1L15150311-00	1	1314	15,958	99.8	1.0	425	0	0	N/A
3/13/15	UW1M01150312-00	1	1841	17,799	98.1	1.0	425	0	0	N/A
3/13/15	UW1L08150312-00	0	1421	19,220	99.1	0.9	N/A	0	0	N/A
3/17/15	UW1M01150313-00	1	1526	20,746	98.4	0.9	425	0	0	N/A
3/18/15	UW1L15150317-00	1	1073	21,819	99.2	1.0	425	0	0	N/A
3/18/15	UW1L08150317-00	0	1421	23,240	98.8	0.9	N/A	0	0	N/A
3/19/15	UW1L15150318-00	1	1203	24,443	99.7	0.9	425	0	0	N/A
3/20/15	UW1L08150319-00	1	1421	25,864	99.3	0.9	452	0	0	N/A
3/20/15	UW1M20150319-00	0	963	26,827	99.8	0.9	N/A	0	0	N/A
3/20/15	UW1L15150320-00	1	1084	27,911	99.3	0.9	436	0	0	N/A
3/24/15	UW1L08150320-00	0	941	28,852	99.7	0.7	N/A	0	0	N/A
3/24/15	UW1M20150324-00	0	856	29,708	99.6	0.8	N/A	0	0	N/A
3/25/15	UW1L15150324-00	1	963	30,671	99.4	0.8	455	0	0	N/A
3/25/15	UW1L08150325-00	0	1076	31,747	99.0	0.8	N/A	0	0	N/A
3/26/15	UW1M20150325-00	1	864	32,611	99.7	0.8	436	0	0	N/A
3/27/15	UW1M20150327-00	1	1080	33,691	98.9	1.0	455	0	0	N/A
3/31/15	UW1L15150326-00	1	1144	34,835	99.2	1	455	0	0	N/A
3/31/15	UW1L08150326-00	0	853	35,688	99.2	0.7	N/A	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.1%
Total Quantity Approved (yd^3) = 35,688
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 20
Quantity per Moisture Test (yd^3) = 1,784
Total Average Thickness (ft)= 0.9

Appendix A2. RRM Lift Approval Summaries (*continued*)

CAES compaction screen example from March 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.



Appendix A2. RRM Lift Approval Summaries (*continued*)

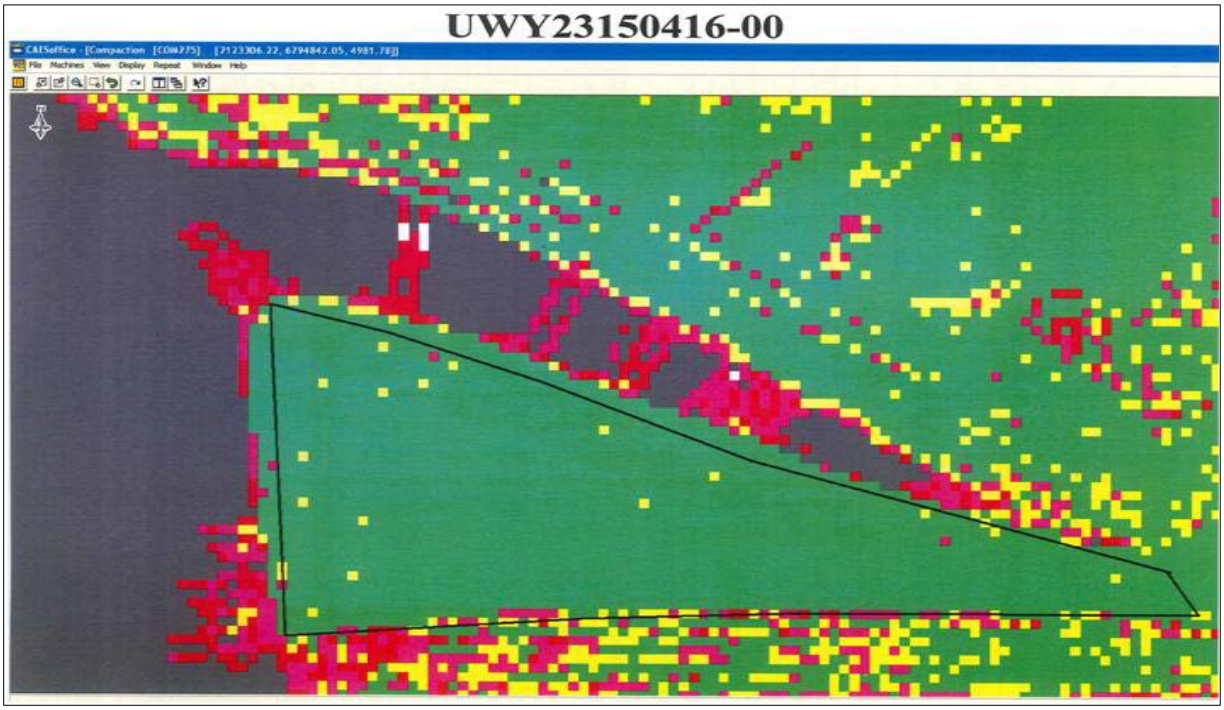
April 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
4/1/15	UW1M20150331-00	1	1080	1,080	96.0	1.0	452	0	0	N/A
4/1/15	UW1L15150331-00	0	1144	2,224	99.4	1.0	N/A	0	0	N/A
4/1/15	UW1L08150401-00	0	965	3,189	99.4	1.0	N/A	0	0	N/A
4/2/15	UW1M20150401-00	1	888	4,077	99.2	0.8	396	0	0	N/A
4/2/15	UW1L15150401-00	0	1002	5,079	99.1	0.9	N/A	0	0	N/A
4/2/15	UW1L08150402-00	0	676	5,755	99.4	0.7	N/A	0	0	N/A
4/6/15	UW1M20150402-00	1	1000	6,755	97.7	0.9	396	0	0	N/A
4/6/15	UW1L15150402-00	1	1002	7,757	97.8	0.9	455	0	0	N/A
4/6/15	UW1L08150406-00	0	779	8,536	97.4	0.7	N/A	0	0	N/A
4/7/15	UW1M20150406-00	0	1040	9,576	98.6	0.9	N/A	0	0	N/A
4/7/15	UW1L15150407-00	1	432	10,008	99.1	0.9	455	0	0	N/A
4/7/15	UW1L08150407-00	0	1045	11,053	98.6	0.8	N/A	0	0	N/A
4/8/15	UW1M20150407-00	0	1040	12,093	98.7	0.9	N/A	0	0	N/A
4/8/15	UW1L15150408-00	1	432	12,525	99.1	0.9	455	0	0	N/A
4/8/15	UW1L08150408-00	0	1045	13,570	98.4	0.8	N/A	0	0	N/A
4/9/15	UW1M20150408-00	0	1078	14,648	97.3	0.9	N/A	0	0	N/A
4/9/15	UW1L15150409-00	1	421	15,069	99.7	0.9	455	0	0	N/A
4/9/15	UW1L08150409-00	0	733	15,802	98.4	0.7	N/A	0	0	N/A
4/13/15	UW1M20150409-00	0	958	16,760	99.1	0.8	N/A	0	0	N/A
4/13/15	UW1L15150413-00	0	421	17,181	98.7	0.9	N/A	0	0	N/A
4/13/15	UW1L08150413-00	0	372	17,553	99.0	0.7	N/A	0	0	N/A
4/14/15	UW1M20150413-00	1	937	18,490	98.7	0.8	455	0	0	N/A
4/14/15	UW1L15150414-00	1	790	19,280	98.7	0.7	452	0	0	N/A
4/14/15	UW1L15150414-01	0	452	19,732	98.7	0.4	N/A	0	0	N/A
4/14/15	UW1M20150414-00	0	937	20,669	98.5	0.8	N/A	0	0	N/A
4/15/15	UWY23150414-00	0	493	21,162	99.0	0.8	N/A	0	0	N/A
4/15/15	UW1M20150415-00	1	937	22,099	98.6	0.8	452	0	0	N/A
4/16/15	UWY23150416-00	0	632	22,731	97.9	0.9	N/A	0	0	N/A
4/16/15	UW1M20150416-00	1	1152	23,883	98.1	0.9	452	0	0	N/A
4/16/15	UWY23150415-00	0	616	24,499	96.5	1.0	N/A	0	0	N/A
4/20/15	UW1M20150416-01	0	1280	25,779	98.0	1.0	N/A	0	0	N/A
4/20/15	UWY23150420-00	0	561	26,340	97.2	0.8	N/A	0	0	N/A
4/21/15	UW1O01150420-00	1	506	26,846	99.1	0.7	452	0	0	N/A
4/21/15	UW1M20150420-00	0	1127	27,973	99.5	0.9	N/A	0	0	N/A
4/21/15	UWY23150421-00	0	619	28,592	97.1	0.8	N/A	0	0	N/A
4/22/15	UW1O01150421-00	1	613	29,205	98.4	0.9	452	0	0	N/A
4/22/15	UW1M20150422-00	0	1,252	30,457	99.3	1.0	N/A	0	0	N/A
4/22/15	UWY23150422-00	1	671	31,128	95.9	0.9	400	0	0	N/A
4/23/15	UW1M20150422-01	0	1,127	32,255	98.7	0.9	N/A	0	0	N/A
4/23/15	UWY23150423-00	1	671	32,926	98.5	0.9	400	0	0	N/A
4/27/15	UWY23150427-00	0	754	33,680	97.8	1.0	N/A	0	0	N/A
4/27/15	UW1M20150423-00	0	1,218	34,898	99.0	1.0	N/A	0	0	N/A

Appendix A2. RRM Lift Approval Summaries (*continued*)

April 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
4/28/15	UW1M20150427-00	1	1,096	35,994	98.7	0.9	413	0	0	N/A
4/28/15	UWY23150428-00	1	840	36,834	97.7	1.0	452	0	0	N/A
4/28/15	UW1M20150428-00	0	1,111	37,945	99.0	0.9	N/A	0	0	N/A
4/29/15	UWY23150428-01	0	811	38,756	98.0	0.9	N/A	0	0	N/A
4/29/15	UW1M20150429-00	0	1,109	39,865	98.1	0.9	N/A	0	0	N/A
4/30/15	UWY23150429-00	1	885	40,750	98.9	1.0	452	0	0	N/A
4/30/15	UW1M20150430-00	0	955	41,705	98.3	0.9	N/A	0	0	N/A

Average CAES Screen Passing Pixels (%)= 98.4%
Total Quantity Approved (yd^3) = 41,705
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 18
Quantity per Moisture Test (yd^3) = 2,317
Total Average Thickness (ft)= 0.9

CAES compaction screen example from April 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.



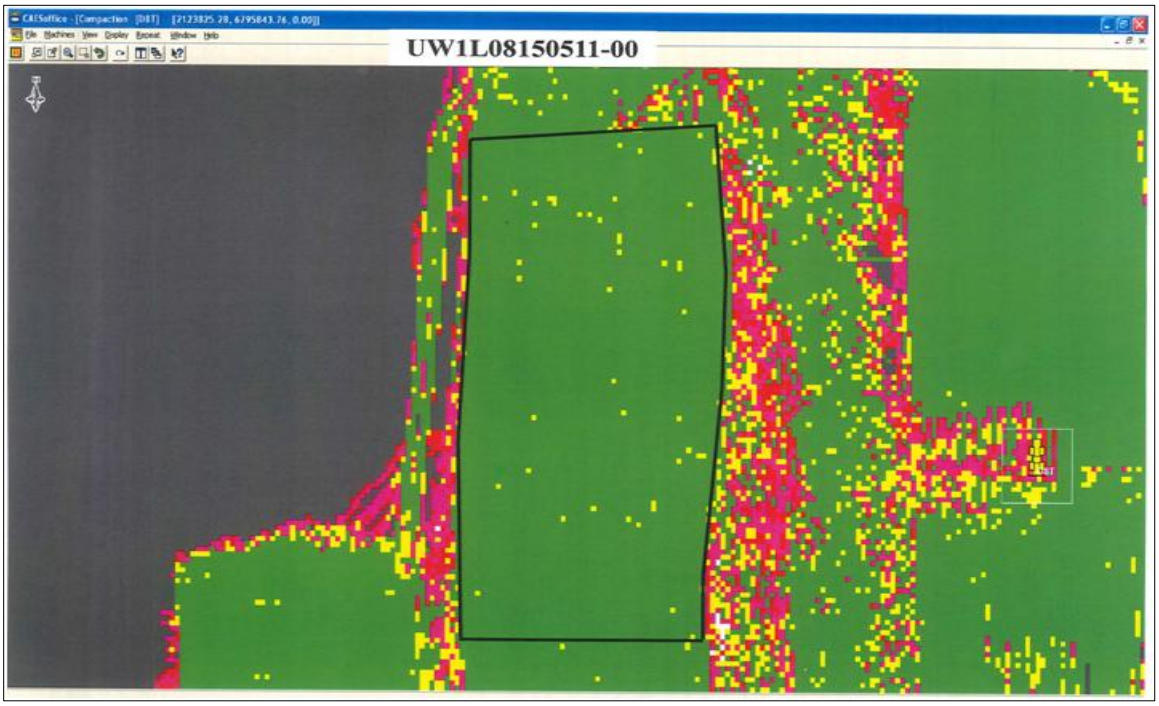
Appendix A2. RRM Lift Approval Summaries (*continued*)

May 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
5/4/15	UWY23150430-00	1	906	906	99.8	0.9	452	0	0	N/A
5/4/15	UW1M20150504-00	0	849	1,755	98.8	0.8	N/A	0	0	N/A
5/4/15	UWY23150504-00	0	1020	2,775	98.2	0.9	N/A	0	0	N/A
5/5/14	UW1M20150504-01	2	546	3,321	99.5	0.7	452	1	0	90.5
5/7/15	UW1L15150507-00	1	1129	4,450	99.5	1.0	458	0	0	N/A
5/11/15	UW1O02150506-00	1	1371	5,821	98.5	0.8	452	0	0	N/A
5/11/15	UW1O01150505-00	0	633	6,454	99.1	1.0	N/A	0	0	N/A
5/11/15	UW1M20150511-00	0	411	6,865	97.4	0.6	N/A	0	0	N/A
5/11/15	UW1L08150507-00	0	1341	8,206	98.8	0.9	N/A	0	0	N/A
5/11/15	UW1L15150511-00	0	952	9,158	99.5	0.7	N/A	0	0	N/A
5/11/15	UW1M20150511-01	1	411	9,569	98.8	0.6	458	0	0	N/A
5/12/15	UW1L08150511-00	0	1706	11,275	99.0	0.9	N/A	0	0	N/A
5/12/15	UW1M20150512-00	0	129	11,404	98.9	0.3	N/A	0	0	N/A
5/12/15	UWY23150505-00	1	990	12,394	99.6	0.9	452	0	0	N/A
5/13/15	UW1O02150512-00	0	1418	13,812	98.9	0.9	N/A	0	0	N/A
5/13/15	UW1O01150513-00	0	665	14,477	99.0	0.9	N/A	0	0	N/A
5/13/15	UWY23150513-00	1	990	15,467	99.5	0.9	477	0	0	N/A
5/18/15	UW1O02150513-00	0	1234	16,701	99.8	0.9	N/A	0	0	N/A
5/18/15	UW1O01150514-00	1	764	17,465	99.8	1.0	477	0	0	N/A
5/18/15	UWY23150518-00	0	1156	18,621	99.7	1.0	N/A	0	0	N/A
5/18/15	UW1O02150518-00	1	1371	19,992	99.5	1.0	452	0	0	N/A
5/27/15	UW1O01150518-00	0	688	20,680	99.7	0.9	N/A	0	0	N/A
5/27/15	UW1O02150527-00	1	1234	21,914	98.9	0.9	452	0	0	N/A
5/27/15	UW1O01150527-00	0	688	22,602	99.1	0.9	N/A	0	0	N/A
5/28/15	UW1O01150528-00	1	810	23,412	97.3	1.0	468	0	0	N/A
5/28/15	UW1O02150527-01	0	806	24,218	98.9	0.8	N/A	0	0	N/A
5/28/15	UWY23150527-00	0	1069	25,287	98.2	0.9	N/A	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.0%
Total Quantity Approved (yd^3) = 25,287
Total # of Nuclear Density Gauge Tests = 1
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 2,107
Total Average Thickness (ft)= 0.9

Appendix A2. RRM Lift Approval Summaries (*continued*)

CAES compaction screen example from May 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.



Appendix A2. RRM Lift Approval Summaries (*continued*)

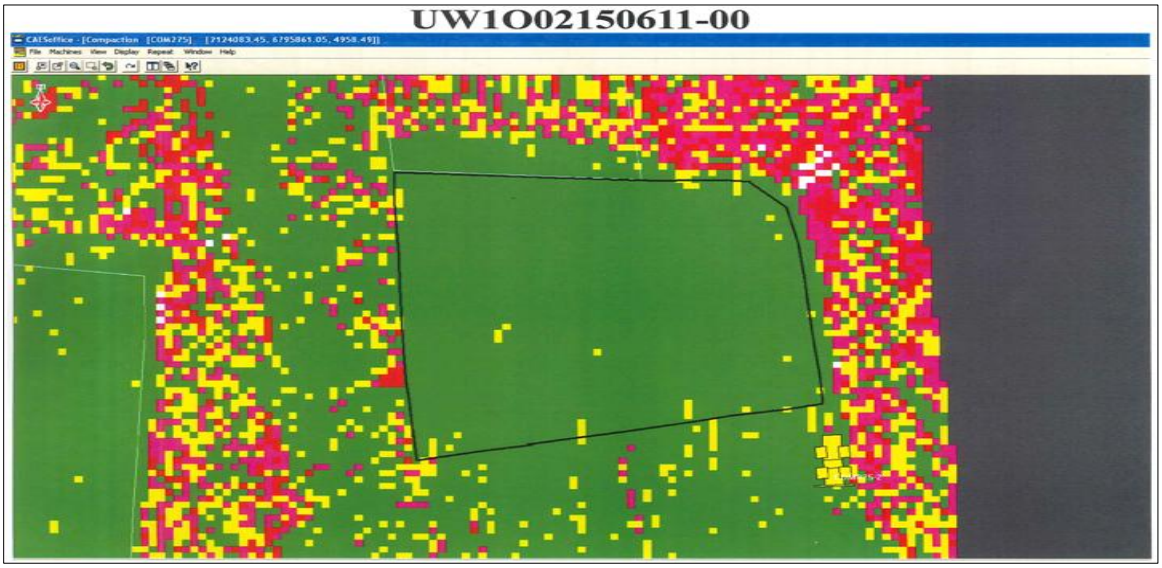
June 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
6/1/15	UW1O01150528-01	0	729	729	98.9	0.9	N/A	0	0	N/A
6/1/15	UW1O02150601-00	0	1008	1,737	97.5	1.0	N/A	0	0	N/A
6/1/15	UW1O01150601-00	0	810	2,547	97.2	1.0	N/A	0	0	N/A
6/2/15	UW1M20150602-00	1	860	3,407	99.0	1.0	465	0	0	N/A
6/2/15	UW1L15150602-00	0	1083	4,490	99.5	1.0	N/A	0	0	N/A
6/3/15	UW1L08150602-00	0	1757	6,247	98.5	0.9	N/A	0	0	N/A
6/3/15	UW1M20150603-00	1	666	6,913	99.6	1.0	465	0	0	N/A
6/4/15	UW1L15150603-00	1	1087	8,000	99.9	1.0	468	0	0	N/A
6/4/15	UW1L08150604-00	0	1562	9,562	99.0	0.8	N/A	0	0	N/A
6/8/15	UWY23150601-00	1	1188	10,750	97.9	1.0	465	0	0	N/A
6/8/15	UW1M20150608-00	0	600	11,350	98.8	0.9	N/A	0	0	N/A
6/8/15	UW1L15150608-00	1	1087	12,437	97.9	1.0	465	0	0	N/A
6/9/15	UW1O02150608-00	1	882	13,319	98.7	0.9	465	0	0	N/A
6/9/15	UW1M20150609-00	0	444	13,763	99.8	0.8	N/A	0	0	N/A
6/9/15	UW1L15150609-00	0	839	14,602	99.8	0.8	N/A	0	0	N/A
6/10/15	UW1O01150609-00	0	841	15,443	99.3	1.0	N/A	0	0	N/A
6/10/15	UW1L08150610-00	1	1508	16,951	99.4	0.9	465	0	0	N/A
6/10/15	UW1M20150610-00	0	500	17,451	99.5	0.9	N/A	0	0	N/A
6/15/15	UW1L15150610-00	1	1049	18,500	99.7	1.0	458	0	0	N/A
6/15/15	UW1L08150615-00	1	1675	20,175	98.9	1.0	465	0	0	N/A
6/15/15	UW1M20150615-00	0	500	20,675	98.9	0.9	N/A	0	0	N/A
6/16/15	UW1L15150615-00	0	944	21,619	99.1	0.9	N/A	0	0	N/A
6/16/15	UW1O02150611-00	0	698	22,317	98.5	0.9	N/A	0	0	N/A
6/16/15	UW1O01150616-00	1	805	23,122	99.3	0.9	465	0	0	N/A
6/16/15	UWY23150616-00	0	1248	24,370	98.5	1.0	N/A	0	0	N/A
6/17/15	UW1O02150616-00	1	775	25,145	98.2	1.0	452	0	0	N/A
6/17/15	UW1O01150617-00	0	805	25,950	98.7	0.9	N/A	0	0	N/A
6/18/15	UWY23150617-00	0	1121	27,071	98.8	0.9	N/A	0	0	N/A
6/18/15	UW1L08150618-00	0	1797	28,868	99.2	1.0	N/A	0	0	N/A
6/22/15	UW1O02150618-00	1	812	29,680	98.0	1.0	465	0	0	N/A
6/22/15	UW1O010618-00	0	775	30,455	99.0	0.9	N/A	0	0	N/A
6/22/15	UWY23150622-00	1	1245	31,700	98.3	1.0	458	0	0	N/A
6/23/15	UW1O02150622-00	0	812	32,512	98.7	1.0	N/A	0	0	N/A
6/23/15	UW1O01150623-00	1	775	33,287	99.6	0.9	465	0	0	N/A
6/23/15	UWY23150623-00	0	1,121	34,408	98.8	0.9	N/A	0	0	N/A
6/24/15	UW1O01150624-00	0	820	35,228	99.6	0.9	N/A	0	0	N/A
6/24/15	UW1O02150623-00	1	649	35,877	99.6	0.8	455	0	0	N/A
6/25/15	UW1O02150625-00	0	562	36,439	99.5	0.9	N/A	0	0	N/A
6/25/15	UW1O07150624-00	1	1,774	38,213	99.3	0.8	455	0	0	N/A

Appendix A2. RRM Lift Approval Summaries (*continued*)

June 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
6/29/15	UW1O01150625-00	0	729	38,942	98.6	0.8	N/A	0	0	N/A
6/29/15	UWY23150629-00	1	1,126	40,068	97.0	0.9	455	0	0	N/A
6/30/15	UW1O07150629-00	1	1,877	41,945	98.9	0.9	455	0	0	N/A
6/30/15	UW1O02150630-00	0	515	42,460	98.0	0.9	N/A	0	0	N/A

Average CAES Screen Passing Pixels (%)= 98.9%
Total Quantity Approved (yd^3) = 42,460
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 18
Quantity per Moisture Test (yd^3) = 2,359
Total Average Thickness (ft)= 0.9

CAES compaction screen example from June 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.



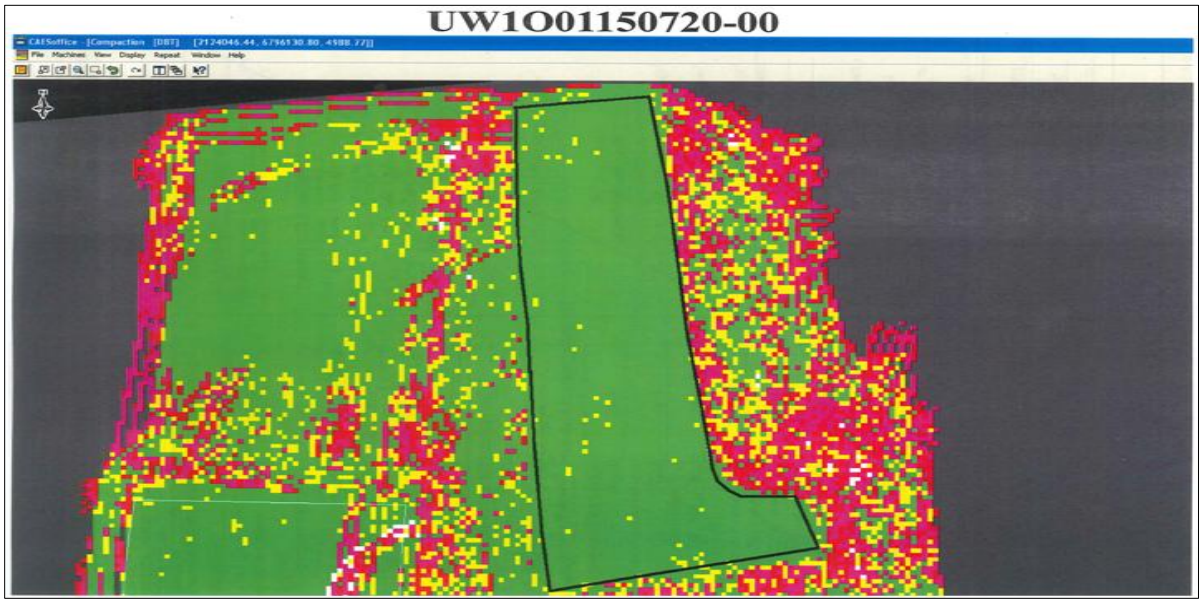
Appendix A2. RRM Lift Approval Summaries (*continued*)

July 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
7/1/15	UW1O01150630-00	0	739	739	99.4	0.8	N/A	0	0	N/A
7/1/15	UWY23150701-00	1	1154	1,893	97.7	0.9	455	0	0	N/A
7/6/15	UW1O07150701-00	1	1900	3,793	99.7	0.9	455	0	0	N/A
7/6/15	UW1O02150706-00	0	457	4,250	99.7	0.9	N/A	0	0	N/A
7/7/15	UW1O01150706-00	0	877	5,127	99.7	0.9	N/A	0	0	N/A
7/7/15	UWY23150707-00	1	1158	6,285	98.7	0.9	455	0	0	N/A
7/8/15	UW1O07150707-00	1	1900	8,185	99.6	0.9	465	0	0	N/A
7/9/15	UW1O02150708-00	0	457	8,642	99.4	0.9	N/A	0	0	N/A
7/9/15	UW1O01150708-00	1	877	9,519	99.7	0.9	465	0	0	N/A
7/9/15	UWY23150709-00	0	956	10,475	98.9	0.8	N/A	0	0	N/A
7/13/15	UW1O01150713-00	0	1345	11,820	98.6	1.0	N/A	0	0	N/A
7/13/15	UW1O07150709-00	1	1904	13,724	99.2	0.9	455	0	0	N/A
7/14/15	UWY23150714-00	1	1076	14,800	98.2	0.9	465	0	0	N/A
7/15/15	UW1O07150714-00	1	1987	16,787	99.4	0.9	455	0	0	N/A
7/15/15	UW1O01150715-00	0	1061	17,848	98.7	0.8	N/A	0	0	N/A
7/16/15	UWY23150715-00	0	1165	19,013	98.8	1.0	N/A	0	0	N/A
7/20/15	UW1O07150716-00	1	2208	21,221	98.8	1.0	455	0	0	N/A
7/20/15	UW1O01150720-00	1	1193	22,414	98.7	0.9	477	0	0	N/A
7/20/15	UWY23150720-00	0	1049	23,463	98.7	0.9	N/A	0	0	N/A
7/22/15	UW1O07150721-00	1	1987	25,450	97.6	0.9	455	0	0	N/A
7/22/15	UWY23150722-00	1	1130	26,580	96.7	0.9	452	0	0	N/A
7/22/15	UW1O01150722-00	0	1076	27,656	97.6	0.9	N/A	0	0	N/A
7/27/15	UW1O07150722-00	1	1967	29,623	99.3	0.9	452	0	0	N/A
7/27/15	UW1O01150723-00	0	971	30,594	98.8	0.9	N/A	0	0	N/A
7/28/15	UWY23150727-00	1	1193	31,787	99.0	1.0	452	0	0	N/A
7/29/15	UW1O07150727-00	1	2250	34,037	98.3	1.0	452	0	0	N/A
7/29/15	UW1O01150728-00	0	944	34,981	98.8	0.9	N/A	0	0	N/A
7/30/15	UW1O07150729-00	0	2250	37,231	99.4	1.0	N/A	0	0	N/A
7/30/15	UWY23150729-00	1	1256	38,487	98.4	1.0	452	0	0	N/A

Average CAES Screen Passing Pixels (%)= 98.8%
Total Quantity Approved (yd^3) = 38,487
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 16
Quantity per Moisture Test (yd^3) = 2,405
Total Average Thickness (ft)= 0.9

Appendix A2. RRM Lift Approval Summaries (*continued*)

CAES compaction screen example from July 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.



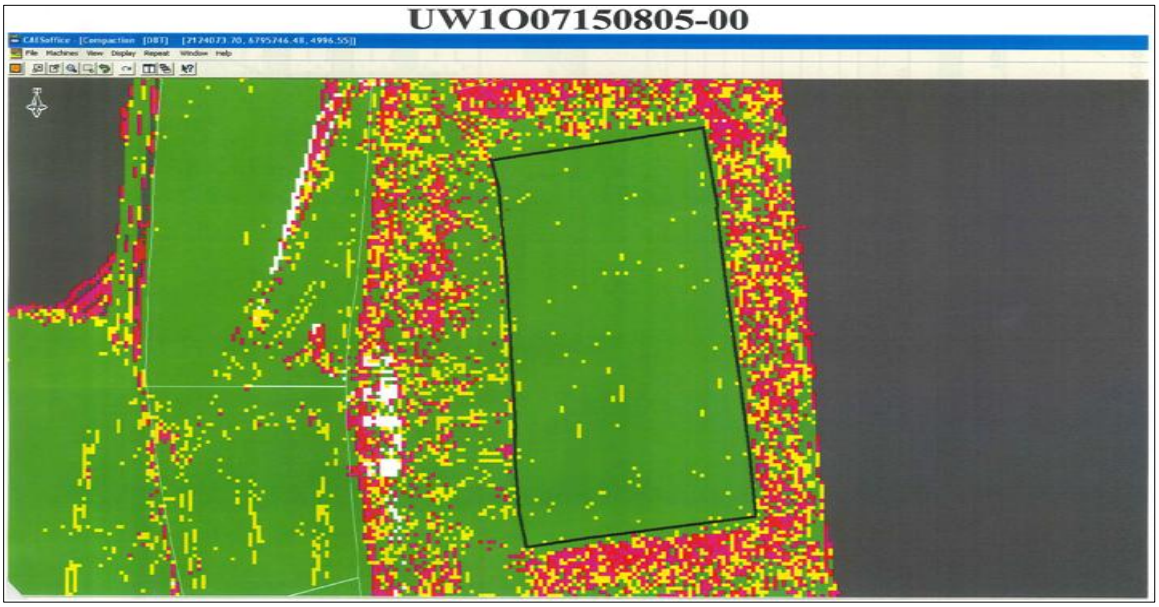
Appendix A2. RRM Lift Approval Summaries (*continued*)

August 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
8/3/15	UW1O01150730-00	1	839	839	98.7	0.8	452	0	0	N/A
8/3/15	UWY23150803-00	1	1130	1,969	97.1	0.9	452	0	0	N/A
8/4/15	UW1O07150803-00	1	2310	4,279	99.1	1.0	%	0	0	N/A
8/4/15	UW1O01150804-00	0	758	5,037	98.8	0.9	N/A	0	0	N/A
8/5/15	UWY23150804-00	1	1204	6,241	97.2	1.0	452	0	0	N/A
8/6/15	UW1O07150805-00	0	2079	8,320	98.3	0.9	N/A	0	0	N/A
8/6/15	UW1O01150806-00	1	674	8,994	97.1	0.8	452	0	0	N/A
8/10/15	UWY23150806-00	0	1084	10,078	98.7	0.9	N/A	0	0	N/A
8/10/15	UW1O07150810-00	1	1854	11,932	98.2	0.8	452	0	0	N/A
8/11/15	UW1O01150810-00	0	539	12,471	99.6	0.7	N/A	0	0	N/A
8/11/15	UWY23150811-00	1	1047	13,518	99.4	0.9	452	0	0	N/A
8/12/15	UW1O07150811-00	1	2317	15,835	99.3	1.0	452	0	0	N/A
8/12/15	UW1O01150812-00	0	616	16,451	97.8	0.8	N/A	0	0	N/A
8/13/15	UWY23150812-00	0	1047	17,498	97.7	0.9	N/A	0	0	N/A
8/17/15	UW1O07150813-00	1	2444	19,942	97.8	1.0	452	0	0	N/A
8/18/15	UW1O01150817-00	0	454	20,396	97.1	0.8	N/A	0	0	N/A
8/18/15	UWY23150817-00	0	1100	21,496	98.3	0.9	N/A	0	0	N/A
8/19/15	UW1O07150817-00	2	2444	23,940	98.5	1.0	452	0	0	N/A
8/20/15	UW1O01150818-00	0	257	24,197	94.0	0.7	N/A	0	0	N/A
8/20/15	UWY23150818-00	0	1004	25,201	97.6	0.9	N/A	0	0	N/A
8/25/15	UW1O14150819-00	2	2867	28,068	99.8	0.9	452	0	0	N/A
8/25/15	UW1O07150824-00	1	1969	30,037	99.2	0.8	452	0	0	N/A
8/26/15	UW1O14150825-00	1	2889	32,926	99.2	0.9	452	0	0	N/A
8/26/15	UWY23150825-00	1	989	33,915	99.2	0.9	452	0	0	N/A
8/27/15	UW1O01150824-00	0	210	34,125	100.0	0.8	N/A	0	0	N/A

Average CAES Screen Passing Pixels (%)= 98.3%
Total Quantity Approved (yd^3) = 34,125
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 16
Quantity per Moisture Test (yd^3) = 2,133
Total Average Thickness (ft)= 0.9

Appendix A2. RRM Lift Approval Summaries (*continued*)

CAES compaction screen example from August 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been recorded.



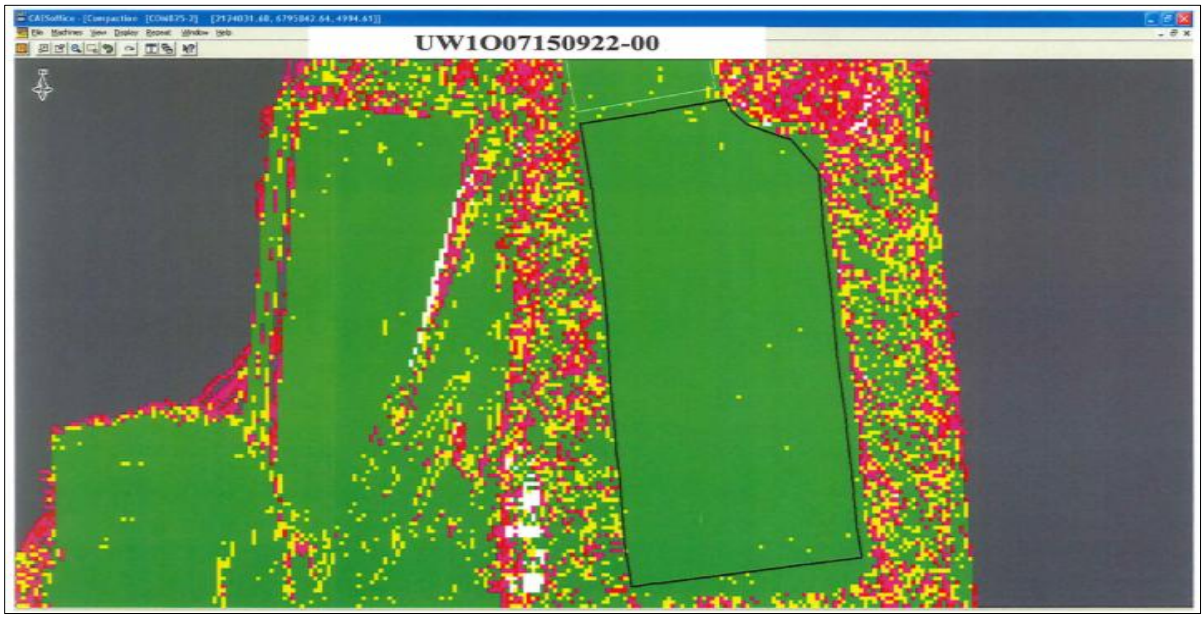
Appendix A2. RRM Lift Approval Summaries (*continued*)

September 2015										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
9/1/15	UW1O14150827-00	1	2763	2,763	98.3	0.9	452	0	0	N/A
9/2/15	UW1O07150901-00	1	1698	4,461	99.1	0.7	452	0	0	N/A
9/2/15	UWY23150902-00	1	1054	5,515	95.8	1.0	452	0	0	N/A
9/8/15	UW1O014150902-00	1	2926	8,441	99.2	0.9	452	0	0	N/A
9/8/15	UWY23150908-00	1	923	9,364	98.2	0.9	452	0	0	N/A
9/10/15	UW1O07150908-00	1	1881	11,245	99.2	0.8	452	0	0	N/A
9/14/15	UW1O14140909-00	1	3211	14,456	98.5	1.0	452	0	0	N/A
9/14/15	UW1O07150914-00	1	2116	16,572	98.6	0.9	452	0	0	N/A
9/17/15	UW1O14150915-00	2	2954	19,526	99.4	0.9	452/468	0	0	N/A
9/17/15	UWY23150917-00	1	841	20,367	96.8	0.8	468	0	0	N/A
9/21/15	UW1O07150916-00	1	2167	22,534	98.8	0.9	452	0	0	N/A
9/21/15	UW1O01150917-00	0	951	23,485	98.4	0.9	N/A	0	0	N/A
9/22/15	UW1O14150921-00	1	2954	26,439	99.0	0.9	452	0	0	N/A
9/23/15	UW1O07150922-00	1	1926	28,365	99.6	0.8	452	0	0	N/A
9/28/15	UW1O14150923-00	1	2886	31,251	98.0	0.9	452	0	0	N/A
9/29/15	UW1O07150928-00	1	2167	33,418	99.2	0.9	452	0	0	N/A
9/30/15	UW1O14150929-00	1	2886	36,304	99.7	0.9	452	0	0	N/A

Average CAES Screen Passing Pixels (%)= 98.6%
Total Quantity Approved (yd^3) = 36,304
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 17
Quantity per Moisture Test (yd^3) = 2,136
Total Average Thickness (ft)= 0.9

Appendix A2. RRM Lift Approval Summaries (*continued*)

CAES compaction screen example from September 2015. There are compaction screens for each lift approved on record. The number of passing pixels reported refers to the percentage of the lift which has green pixels. A green pixel verifies that the minimum of six wheel passes with the compactor has been



Appendix A2. RRM Lift Approval Package

LIFT APPROVAL FORM

PROJECT: Moab UMTRA OTHER

NW CORNER DATE: 9/28/2015

See attached for lift map

P 1			
EW:		X	=
NS:		X	=
P 2			
EW:		X	=
NS:		X	=
P 3	N		
EW:		X	=
NS:		X	=
P 4	A		
EW:		X	=
NS:		X	=
P 5			
EW:		X	=
NS:		X	=

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: UW1O07150928-00 NW CORNER: 6795842 N. 2124031 E.

Uncompacted Thickness: 0.9 Compacted Thickness: N/A Debris Insp. By: N/A Date: N/A Time: N/A

NW CORNER of debris placement: N/A EW Dimension N/A NS Dimension N/A

Lift Area (ft²): 64,998 Lift Volume (yd³): 2,167

Comments: QC verified that the lift area was scarified prior to placement. QC performed the daily moisture content test for 09/28/2015 on this lift w/satisfactory results.

Attached Forms: Grid Slope X Compaction Macro X Print Screen X Moisture/ Density X

KEYING IN NOTES: [N] E S [W] Satisfactory MOISTURE/ DENSITY TESTS ID # (S): 1

LIFT APPROVED BY: Mitch Hogan/ DATE: 9/29/2015 TIME: 1132

QA/QC APPROVAL 9/30/15 DATE

Density Testing
DOE-EM/GJRAC1783
Rev. 1

QC-F-001
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Slope Elevation Survey

Average lift thickness=	0.9	Bounding Box	Northing	Easting	
Grid Size=	50'	Lower Left	N		
Lift ID:	UW1O07150928-00	Upper Right		A	

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795632	2124057	4974.5	6795632	2124057	4975.1	0.5	OK
6795682	2124057	4975.9	6795682	2124057	4976.7	0.8	OK
6795732	2124057	4977.4	6795732	2124057	4978.1	0.7	OK
6795782	2124057	4979.1	6795782	2124057	4980.0	1.0	OK
6795832	2124057	4981.3	6795832	2124057	4982.1	0.9	OK
6795482	2124107	4968.7	6795482	2124107	4969.6	0.9	OK
6795532	2124107	4970.0	6795532	2124107	4971.0	0.9	OK
6795582	2124107	4971.3	6795582	2124107	4972.3	1.0	OK
6795632	2124107	4972.8	6795632	2124107	4973.9	1.1	OK
6795682	2124107	4974.7	6795682	2124107	4975.9	1.2	OK
6795732	2124107	4976.7	6795732	2124107	4977.6	1.0	OK
6795782	2124107	4978.7	6795782	2124107	4979.8	1.1	OK
6795832	2124107	4981.0	6795832	2124107	4981.7	0.6	OK
6795482	2124157	4968.6	6795482	2124157	4969.6	1.0	OK
6795532	2124157	4969.9	6795532	2124157	4970.9	1.0	OK
6795582	2124157	4971.0	6795582	2124157	4971.9	0.9	OK
6795632	2124157	4972.6	6795632	2124157	4973.8	1.1	OK
6795682	2124157	4974.5	6795682	2124157	4975.6	1.1	OK
6795732	2124157	4976.1	6795732	2124157	4977.1	1.0	OK
6795782	2124157	4977.8	6795782	2124157	4978.7	0.9	OK
6795832	2124157	4979.6	6795832	2124157	4980.2	0.6	OK
6795482	2124207	4968.3	6795482	2124207	4969.1	0.9	OK
6795532	2124207	4969.3	6795532	2124207	4970.1	0.8	OK
6795582	2124207	4970.3	6795582	2124207	4971.3	1.0	OK
6795632	2124207	4971.7	6795632	2124207	4972.7	1.0	OK
6795682	2124207	4973.5	6795682	2124207	4974.5	1.0	OK
6795732	2124207	4975.0	6795732	2124207	4975.7	0.7	OK
6795782	2124207	4976.4	6795782	2124207	4977.0	0.6	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

N/A

MH 9.29.15

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% =6	99.2%
Elevation Avg	4974.6
Total =6	5987
Total Lines	6036

Pass

Minimum Number of Machine Passes
3

Lift ID: UW1O07150928-00

Northing	Easting	Elevation	# of Passes	Passes =6	Count
6795833	2124033	4982.4	6	1	1
6795836	2124033	4982.6	6	1	1
6795839	2124033	4982.8	6	1	1
6795813	2124037	4981.4	5		1
6795816	2124037	4981.5	6	1	1
6795820	2124037	4981.7	6	1	1
6795823	2124037	4981.8	6	1	1
6795826	2124037	4982.0	6	1	1
6795829	2124037	4982.2	6	1	1
6795833	2124037	4982.4	6	1	1
6795836	2124037	4982.5	6	1	1
6795839	2124037	4982.7	6	1	1
6795843	2124037	4982.9	6	1	1
6795790	2124040	4980.1	6	1	1
6795793	2124040	4980.2	6	1	1
6795797	2124040	4980.3	6	1	1
6795800	2124040	4980.5	6	1	1
6795803	2124040	4980.7	6	1	1
6795806	2124040	4980.9	6	1	1
6795810	2124040	4981.1	6	1	1
6795813	2124040	4981.3	6	1	1
6795816	2124040	4981.5	6	1	1
6795820	2124040	4981.6	6	1	1
6795823	2124040	4981.7	6	1	1
6795826	2124040	4981.9	6	1	1
6795829	2124040	4982.1	6	1	1
6795833	2124040	4982.3	6	1	1
6795836	2124040	4982.5	6	1	1
6795839	2124040	4982.7	6	1	1
6795843	2124040	4982.8	6	1	1
6795764	2124043	4978.9	6	1	1
6795767	2124043	4979.1	6	1	1
6795770	2124043	4979.1	6	1	1
6795774	2124043	4979.3	6	1	1
6795777	2124043	4979.4	6	1	1
6795780	2124043	4979.6	6	1	1
6795784	2124043	4979.7	6	1	1
6795787	2124043	4979.8	6	1	1
6795790	2124043	4980.0	6	1	1
6795793	2124043	4980.2	6	1	1
6795797	2124043	4980.3	6	1	1
6795800	2124043	4980.5	6	1	1
6795803	2124043	4980.7	6	1	1
6795806	2124043	4980.8	6	1	1

Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6

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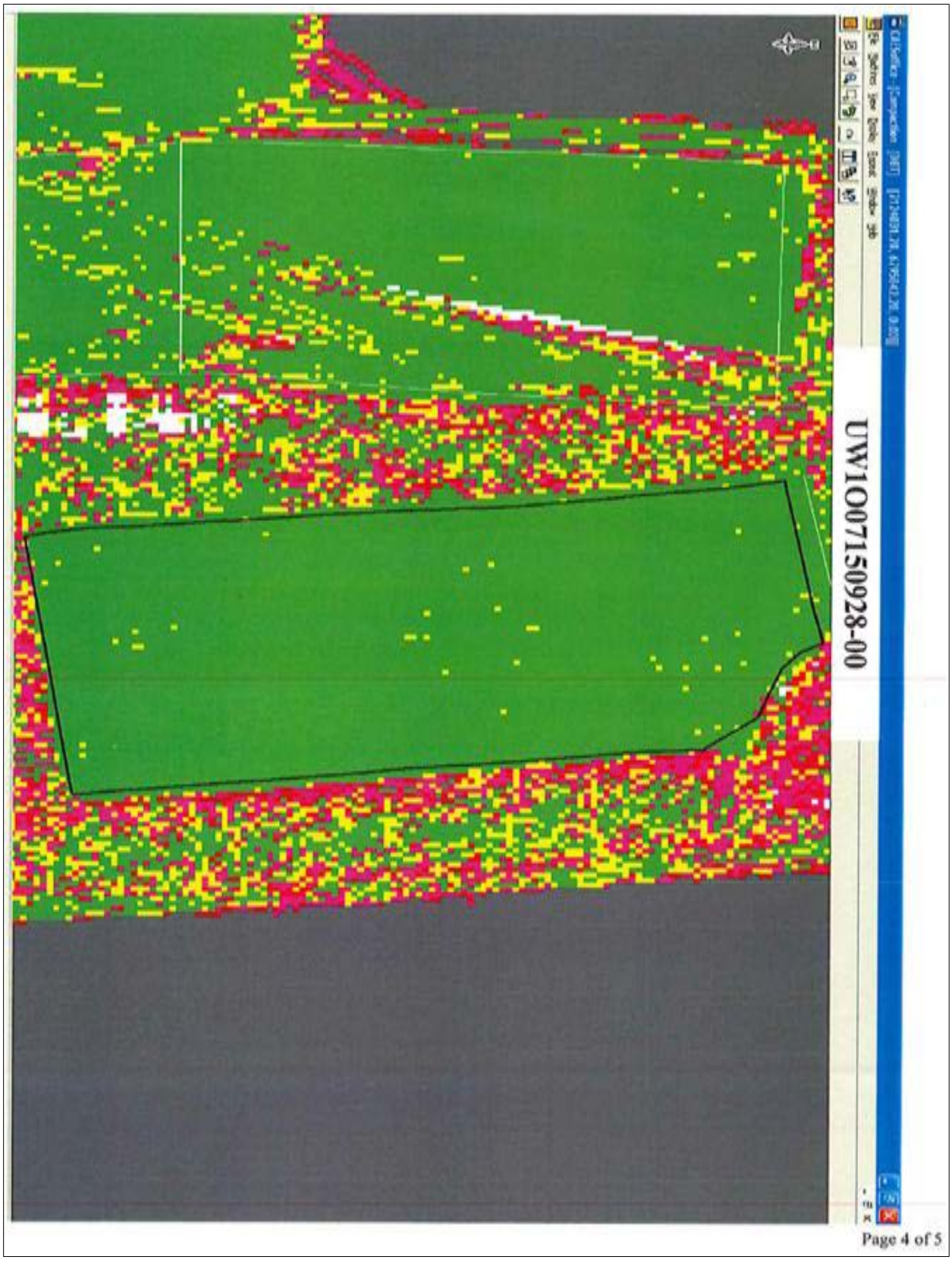
UW1O071509 28-00
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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER

LIFT IDENTIFICATION: UW1O07150928-00 DATE: 9/28/2015

TEST ID NUMBER(S): # 1

TEST LOCATION: Lift Area TEST METHOD: N/A D1556 N/A D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: N/A

Daily Standard Counts:

Density _____ Moisture _____

_____ Method A (Direct Transmission) or _____ Method B (Backscatter)

Depth Setting _____ (inches) Count Time _____ (minutes)

Moisture Count _____ Density Count _____

Wet Density (ρ_m) _____ (lbs/ft^3) Dry Density _____ (lbs/ft^3)

Moisture Density _____ (lbs/ft^3) Moisture Fraction _____ (%)

N A

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus _____ Calibrated Vol. (lbs/ft^3) _____

Bulk Density of sand (ρ_1) _____ g/cm^3 _____ lbs/ft^3

Mass of Sand to Fill Cone & Plate (M_2) _____ g

Mass of bottle & cone **before** filling cone, plate & hole		g
Mass of bottle & cone **after** filling cone, plate & hole		g
Mass of sand to fill cone, plate, & hole (M_1)		g
Mass of sand to fill hole		g
Mass of wet soil & container		g
Mass of container		g
Mass of wet soil (M_s)		g

Test Hole Volume

$V = (M_1 - M_2) / \rho_1$ _____ cm^3

Dry Mass of soil

$M_4 = 100\ M_3 / (w + 100)$ _____ g

Wet Density

$\rho_m = (M_3 / V) \times 62.43$ _____ lbs/ft^3

Dry Density

$\rho_d = M_4 / V$ _____ g/cm^3

Dry Unit Weight

$\gamma_d = \rho_d \times 62.43$ _____ lbs/ft^3

N A

MOISTURE DETERMINATION

ASTM D4643

Container ID D-7

Scale Serial # 14715630 Last Calibration Date: 12/2/14

Mass of container & wet specimen (M_{cms})	510.2	g
Mass of container & dry specimen (M_{cds})	463.4	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	46.8	g
Mass of container (M_c)	214.2	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	249.2	g
Moisture content (w) $w = (M_w / M_s) \times 100$	18.8	%

Soil Description: Light brown, very fine to medium, subround, moderately graded, clay w/ some sand.

Proctor ID: RRM # 452

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 109.9 (lbs/ft^3)

Optimum Moisture (w_{opt}) 18.0 (%)

Required Moisture: 15.0 % to 21.0 %

Required Percent Compaction: 90.0 (%)

Dry Density (ρ_d) = $(100 \times \rho_m)/(100 + w)$

$\rho d = (100 \times$ ##### $) / (100 +$ 18.8 $) =$ 0.0 lbs/ft^3

Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)

N A

Percent Compaction = ρ_d / $\gamma_d max \times 100$

0.0 / 109.9 x 100 = 0.0 %

Comments:

Microwave oven power setting on HIGH. Initial time setting of 3 minutes and subsequent incremental drying periods of 1 minute until a change of 0.1 % or less of the initial wet mass of the soil.

TEST RESULTS:

X Pass Date: 9/28/15

Failed Moisture

Failed Compaction Time: 1325

By: Mitch Hogan / *Mitch Hogan*

(print) (signature)

QA/QC APPROVAL 9/30/15 DATE

Density Testing
DOE-EM/GJRAC1783

QC-F-002
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Appendix A4.
Radon Barrier

Buyoff Survey

Appendix A4. Radon Barrier Buyoff Survey

Environmental Management - Grand Junction Office
MOAB
UMTRA Project

Radon Barrier Buyoff Form

Client: Department of Energy
Project: Moab UMTRA Project
Date: 10/06/2014

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

Lift Area	Lift Area
URR01	

Approver Name/Title	Signature	Sign Date
Beachem Bosh / QA/QC Representative		10-6-2014
Kirk Briscoe / Operations Manager		10-6-2014
Comments		
This Buyoff includes URQ10 lift area.		
Total Buyoff area = 269,514 ft²		

OP-F-012
Rev 0, August 2010

File Index No. 43.1.1
Page 1 of 1

Appendix A4. Radon Barrier Buyoff Survey (*continued*)

Moab UMTRA Crescent Junction Disposal Cell
Radon Barrier Survey
Measured by Beachem Bosh 10/06/2014
Checked by Mitch Hogan
October, 06 2014

Point #	Northing	Easting	Design Elevation	Measured Elevation	Difference (feet)	Difference (inches)	Pre-Installation Elevation	Thickness
361	6794988	2122956	4990.3	4990.5	0.23	2.7	4986.3	4.23
362	6794994	2123006	4990.5	4990.6	0.13	1.6	4986.5	4.13
363	6795000	2123056	4990.7	4990.9	0.19	2.3	4986.7	4.17
392	6795348	2123012	4999.4	4999.6	0.16	2.0	4995.5	4.13
393	6795341	2122962	4999.2	4999.4	0.17	2.1	4995.3	4.12
404	6795292	2122968	4998.0	4998.1	0.16	1.9	4994.0	4.12
405	6795298	2123018	4998.2	4998.3	0.12	1.4	4994.2	4.04
406	6795248	2123024	4996.9	4997.1	0.19	2.3	4993.0	4.13
407	6795242	2122975	4996.7	4996.9	0.15	1.8	4992.8	4.09
408	6795236	2122925	4996.5	4996.7	0.11	1.4	4992.6	4.07
417	6795186	2122931	4995.3	4995.4	0.06	0.8	4991.3	4.06
418	6795192	2122981	4995.5	4995.6	0.11	1.3	4991.6	4.04
419	6795199	2123031	4995.7	4995.9	0.22	2.6	4991.7	4.22
420	6795149	2123037	4994.4	4994.6	0.17	2.1	4990.5	4.10
421	6795143	2122987	4994.2	4994.4	0.18	2.2	4990.2	4.17
422	6795137	2122938	4994.0	4994.2	0.13	1.6	4990.1	4.12
433	6795087	2122944	4992.8	4993.0	0.18	2.1	4988.8	4.15
434	6795037	2122950	4991.5	4991.8	0.23	2.8	4987.6	4.22
435	6795044	2123000	4991.7	4991.9	0.14	1.6	4987.8	4.10
436	6795093	2122993	4993.0	4993.1	0.14	1.6	4989.0	4.07
437	6795099	2123043	4993.2	4993.3	0.17	2.0	4989.3	4.05
438	6795050	2123049	4991.9	4992.1	0.17	2.0	4988.0	4.11
8654	6795689	2122919	4999.0	4999.1	0.13	1.5	4995.1	4.01
8655	6795639	2122925	5000.0	5000.2	0.25	3.0	4996.0	4.23
8656	6795589	2122931	5001.0	5001.2	0.17	2.1	4997.1	4.05
8657	6795540	2122937	5002.0	5002.2	0.24	2.9	4998.0	4.22
8658	6795490	2122944	5003.0	5003.1	0.14	1.7	4999.0	4.12
8659	6795441	2122950	5001.7	5001.9	0.17	2.1	4997.7	4.20
8660	6795391	2122956	5000.5	5000.7	0.19	2.3	4996.5	4.17
8685	6796019	2122927	4992.6	4992.8	0.18	2.2	4988.7	4.10
8686	6795992	2122931	4993.2	4993.3	0.15	1.8	4989.2	4.11
8687	6795943	2122937	4994.2	4994.3	0.15	1.8	4990.2	4.11
8688	6795893	2122943	4995.2	4995.4	0.23	2.7	4991.2	4.19
8689	6795844	2122949	4996.2	4996.3	0.15	1.9	4992.2	4.11
8690	6795794	2122956	4997.2	4997.4	0.19	2.3	4993.2	4.15
8691	6795744	2122962	4998.2	4998.4	0.25	3.0	4994.2	4.21
8692	6795695	2122968	4999.2	4999.3	0.16	1.9	4995.2	4.12
8693	6795645	2122974	5000.2	5000.3	0.18	2.1	4996.3	4.04
8694	6795596	2122981	5001.2	5001.3	0.15	1.8	4997.2	4.11
8695	6795546	2122987	5002.2	5002.3	0.15	1.7	4998.2	4.11
8696	6795496	2122993	5003.2	5003.2	0.07	0.9	4999.2	4.03
8697	6795447	2122999	5001.9	5002.1	0.22	2.7	4997.9	4.23
8698	6795397	2123006	5000.7	5000.9	0.21	2.5	4996.7	4.17
8723	6796025	2122977	4992.8	4993.0	0.15	1.8	4988.8	4.16
8724	6795999	2122980	4993.4	4993.5	0.19	2.3	4989.5	4.04
8725	6795949	2122987	4994.4	4994.5	0.16	2.0	4990.4	4.11
8726	6795899	2122993	4995.4	4995.5	0.15	1.8	4991.4	4.10

Appendix A4. Radon Barrier Buyoff Survey (*continued*)

8727	6795850	2122999	4996.4	4996.5	0.19	2.3	4992.4	4.15
8728	6795800	2123005	4997.4	4997.4	0.07	0.9	4993.4	4.02
8729	6795751	2123012	4998.4	4998.5	0.15	1.8	4994.5	4.00
8730	6795701	2123018	4999.4	4999.5	0.15	1.8	4995.5	4.00
8731	6795651	2123024	5000.4	5000.5	0.17	2.0	4996.5	4.02
8732	6795602	2123030	5001.4	5001.6	0.22	2.7	4997.5	4.07
8733	6795552	2123036	5002.4	5002.6	0.21	2.5	4998.5	4.06
8734	6795503	2123043	5003.4	5003.5	0.14	1.7	4999.4	4.09
8735	6795453	2123049	5002.1	5002.3	0.16	1.9	4998.2	4.06
8736	6795403	2123055	5000.9	5001.1	0.22	2.6	4997.0	4.07
8737	6795354	2123061	4999.6	4999.8	0.15	1.9	4995.7	4.06
8738	6795304	2123068	4998.4	4998.5	0.17	2.1	4994.5	4.02
8739	6795255	2123074	4997.1	4997.2	0.13	1.6	4993.2	4.03
8740	6795205	2123080	4995.9	4996.1	0.21	2.5	4992.0	4.06
8741	6795155	2123086	4994.6	4994.7	0.15	1.8	4990.7	4.05
8742	6795106	2123093	4993.4	4993.6	0.24	2.9	4989.5	4.10
8743	6795056	2123099	4992.1	4992.3	0.17	2.0	4988.2	4.07
8744	6795006	2123105	4990.9	4991.0	0.16	1.9	4987.0	4.01
8761	6796032	2123027	4993.0	4993.1	0.14	1.7	4989.1	4.04
8762	6796005	2123030	4993.5	4993.8	0.21	2.6	4989.6	4.15
8763	6795955	2123036	4994.5	4994.7	0.18	2.2	4990.6	4.12
8764	6795906	2123042	4995.5	4995.7	0.18	2.1	4991.7	4.02
8765	6795856	2123049	4996.5	4996.8	0.22	2.7	4992.7	4.06
8766	6795807	2123055	4997.5	4997.7	0.14	1.6	4993.6	4.08
8767	6795757	2123061	4998.5	4998.7	0.18	2.1	4994.6	4.12
8768	6795707	2123067	4999.5	4999.8	0.24	2.9	4995.5	4.28
8769	6795658	2123074	5000.5	5000.7	0.18	2.2	4996.6	4.12
8770	6795608	2123080	5001.5	5001.8	0.23	2.7	4997.6	4.17
8771	6795558	2123086	5002.5	5002.7	0.21	2.5	4998.7	4.05
8772	6795509	2123092	5003.5	5003.6	0.10	1.2	4999.5	4.13
8773	6795459	2123099	5002.3	5002.5	0.17	2.1	4998.4	4.05
8774	6795410	2123105	5001.0	5001.2	0.21	2.5	4997.2	4.04
8775	6795360	2123111	4999.8	5000.0	0.18	2.2	4995.9	4.06
8776	6795310	2123117	4998.5	4998.7	0.14	1.7	4994.6	4.07
8777	6795261	2123124	4997.3	4997.4	0.13	1.5	4993.4	4.01
8778	6795211	2123130	4996.0	4996.2	0.22	2.6	4992.1	4.15
8779	6795162	2123136	4994.8	4994.9	0.16	1.9	4990.9	4.04
8780	6795112	2123142	4993.5	4993.7	0.20	2.4	4989.7	4.03
8799	6796038	2123076	4993.2	4993.4	0.22	2.6	4989.2	4.20
8800	6796011	2123080	4993.7	4993.9	0.15	1.8	4989.8	4.07
8801	6795962	2123086	4994.7	4994.9	0.20	2.4	4990.8	4.12
8802	6795912	2123092	4995.7	4995.9	0.17	2.0	4991.7	4.19
8803	6795862	2123098	4996.7	4996.9	0.18	2.1	4992.8	4.10
8804	6795813	2123104	4997.7	4997.9	0.17	2.1	4993.8	4.09
8805	6795763	2123111	4998.7	4998.9	0.21	2.5	4994.7	4.23
8806	6795714	2123117	4999.7	4999.9	0.18	2.2	4995.8	4.10
8807	6795664	2123123	5000.7	5000.9	0.19	2.3	4996.8	4.11
8808	6795614	2123129	5001.7	5001.9	0.17	2.0	4997.7	4.19
8809	6795565	2123136	5002.7	5002.9	0.20	2.5	4998.8	4.13
8810	6795515	2123142	5003.7	5003.9	0.17	2.1	4999.7	4.19
8811	6795465	2123148	5002.5	5002.6	0.12	1.4	4998.5	4.09
8812	6795416	2123154	5001.2	5001.4	0.19	2.3	4997.3	4.11
8813	6795366	2123161	5000.0	5000.2	0.18	2.2	4996.1	4.05
8814	6795317	2123167	4998.7	4998.9	0.18	2.2	4994.9	4.01
8815	6795267	2123173	4997.5	4997.6	0.14	1.7	4993.5	4.11
8837	6796044	2123126	4993.4	4993.6	0.22	2.6	4989.4	4.19

Appendix A4. Radon Barrier Buyoff Survey (*continued*)

8838	6796017	2123129	4993.9	4994.1	0.21	2.6	4989.9	4.22
8839	6795968	2123136	4994.9	4995.1	0.15	1.8	4990.9	4.16
8840	6795918	2123142	4995.9	4996.1	0.24	2.8	4992.0	4.15
8841	6795869	2123148	4996.9	4997.2	0.24	2.9	4993.0	4.15
8842	6795819	2123154	4997.9	4998.1	0.20	2.4	4994.0	4.11
8843	6795769	2123160	4998.9	4999.1	0.23	2.7	4994.9	4.24
8875	6796050	2123175	4993.6	4993.7	0.19	2.3	4989.7	4.04
8876	6796024	2123179	4994.1	4994.3	0.21	2.5	4990.1	4.20

Appendix A5.
Infiltration and Biointrusion Barrier

Lift Approval Summary
Lift Approval Package
Buyoff Surveys
Durability and Gradation Tests

Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Summary

October 2014								
Date	Lift ID #	# of Passing Gradation Tests	# of Passing Durability Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	Average Thickness (ft)	Area (ft^2)	Notes
10/13/14	UBY01141009-00	1	1	2,953	2,953	0.5	159,444	1
10/20/14	UBR01141009-00	1	1	4,261	7,214	0.6	191,749	1

Total # of Gradation Tests = 2

Total # of Durability Tests = 2

Total Quantity Approved (yd^3) = 7,214

Quantity per Gradation Test (yd^3) = 3,607

Quantity per Durability Test (yd^3) = 3,607

Total Average Thickness (ft) = 0.6

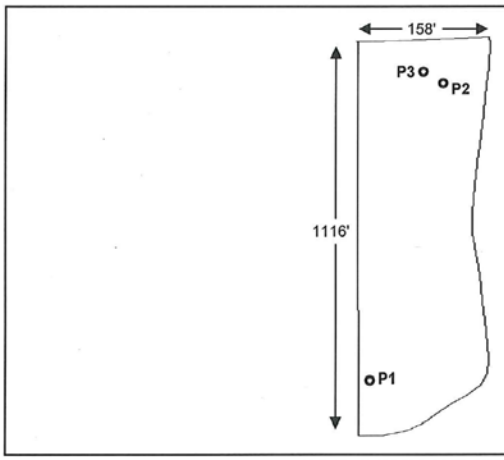
1. To access durability and gradation test information, please view lift approval packages.

Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package

LIFT APPROVAL FORM

PROJECT: Moab UMTRA **OTHER**

NW CORNER **DATE:** 10/9/2014



P 1	6795220 N. 2123037 E.				
EW:	158	X	0.092	=	15
NS:	1116	X	0.772	=	862
P 2	6795882 N. 2123136 E.				
EW:	158	X	0.723	=	114
NS:	1116	X	0.179	=	200
P 3	6795912 N. 2123092 E.				
EW:	158	X	0.446	=	70
NS:	1116	X	0.152	=	170
P 4					
EW:		X		=	
NS:		X	N	=	
P 5			A		
EW:		X		=	
NS:		X		=	

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: UBY01141009-00 NW CORNER: 6796082 N. 2123022 E.

Uncompacted Thickness: N/A Compacted Thickness: 0.5 Debris Insp. By: N/A Date: N/A Time: N/A

NW CORNER of debris placement: N/A EW Dimension N/A NS Dimension N/A

Lift Area (ft²): 159,444 Lift Volume (yd³): 2,953

Comments: QC verified that final grade and thickness of the underlying Radon Barrier had been bought off and that the final surface of Radon Barrier was satisfactory prior to placement of Infiltration and Biointrusion Barrier material. QC verified that the aggregate used was the correct material source. QC verified that the rock layer was spread to a near uniform thickness of ≥0.5' with satisfactory results. QC verified that the material had an even blend. QC verified that the underlying Radon Barrier was not damaged during placement operations. QC verified that a minimum a two passes were performed with a smooth-drum roller over the entire lift area during compaction efforts. QC verified that samples collected for Sieve Analysis were in accordance with the current version of ASTM D75, and project specifications.

Attached Forms: Grid Slope X Compaction Macro N/A Print Screen N/A Moisture/ Density N/A

KEYING IN NOTES: N E S W Satsifactory MOISTURE/ DENSITY TESTS ID # (S): N/A

LIFT APPROVED BY: Mitch Hogan/ DATE: 10/13/2014 TIME: 1240

11/20/2014

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783
Rev. 1

QC-F-001
File index No. 43.8.2
Page 1 of 9

Slope Elevation Survey

	Average lift thickness=	0.5	Bounding Box	Northing	Easting		
	Grid Size=	N/A	Lower Left	N			
Lift ID:	UBY01141009-00		Upper Right		A		
Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795000	2123056	4990.9	6795000	2123056	4991.4	0.6	OK
6795248	2123024	4997.1	6795248	2123024	4997.7	0.6	OK
6795199	2123031	4995.9	6795199	2123031	4996.4	0.6	OK
6795149	2123037	4994.6	6795149	2123037	4995.1	0.5	OK
6795099	2123043	4993.3	6795099	2123043	4993.8	0.5	OK
6795050	2123049	4992.1	6795050	2123049	4992.6	0.5	OK
6795651	2123024	5000.5	6795651	2123024	5001.0	0.5	OK
6795602	2123030	5001.6	6795602	2123030	5002.1	0.6	OK
6795552	2123036	5002.6	6795552	2123036	5003.1	0.6	OK
6795503	2123043	5003.5	6795503	2123043	5004.0	0.5	OK
6795453	2123049	5002.3	6795453	2123049	5002.8	0.6	OK
6795403	2123055	5001.1	6795403	2123055	5001.6	0.6	OK
6795354	2123061	4999.8	6795354	2123061	5000.3	0.6	OK
6795304	2123068	4998.5	6795304	2123068	4999.1	0.5	OK
6795255	2123074	4997.2	6795255	2123074	4997.7	0.5	OK
6795205	2123080	4996.1	6795205	2123080	4996.6	0.5	OK
6795155	2123086	4994.7	6795155	2123086	4995.3	0.5	OK
6795106	2123093	4993.6	6795106	2123093	4994.1	0.5	OK
6795056	2123099	4992.3	6795056	2123099	4992.8	0.6	OK
6795006	2123105	4991.0	6795006	2123105	4991.6	0.6	OK
6796032	2123027	4993.1	6796032	2123027	4993.7	0.5	OK
6796005	2123030	4993.8	6796005	2123030	4994.3	0.5	OK
6795955	2123036	4994.7	6795955	2123036	4995.3	0.5	OK
6795906	2123042	4995.7	6795906	2123042	4996.2	0.5	OK
6795856	2123049	4996.8	6795856	2123049	4997.3	0.6	OK
6795807	2123055	4997.7	6795807	2123055	4998.2	0.5	OK
6795757	2123061	4998.7	6795757	2123061	4999.2	0.5	OK
6795707	2123067	4999.8	6795707	2123067	5000.3	0.6	OK
6795658	2123074	5000.7	6795658	2123074	5001.2	0.5	OK
6795608	2123080	5001.8	6795608	2123080	5002.3	0.6	OK
6795558	2123086	5002.7	6795558	2123086	5003.2	0.5	OK
6795509	2123092	5003.6	6795509	2123092	5004.1	0.5	OK
6795459	2123099	5002.5	6795459	2123099	5003.0	0.6	OK
6795410	2123105	5001.2	6795410	2123105	5001.7	0.5	OK
6795360	2123111	5000.0	6795360	2123111	5000.5	0.6	OK
6795310	2123117	4998.7	6795310	2123117	4999.2	0.6	OK
6795261	2123124	4997.4	6795261	2123124	4998.0	0.6	OK
6795211	2123130	4996.2	6795211	2123130	4996.7	0.5	OK
6795162	2123136	4994.9	6795162	2123136	4995.4	0.5	OK
6795112	2123142	4993.7	6795112	2123142	4994.2	0.5	OK
6796038	2123076	4993.4	6796038	2123076	4993.9	0.5	OK
6796011	2123080	4993.9	6796011	2123080	4994.4	0.6	OK
6795962	2123086	4994.9	6795962	2123086	4995.4	0.5	OK
6795912	2123092	4995.9	6795912	2123092	4996.4	0.5	OK
6795862	2123098	4996.9	6795862	2123098	4997.4	0.5	OK
6795813	2123104	4997.9	6795813	2123104	4998.4	0.5	OK
6795763	2123111	4998.9	6795763	2123111	4999.4	0.5	OK
6795714	2123117	4999.9	6795714	2123117	5000.4	0.5	OK
6795664	2123123	5000.9	6795664	2123123	5001.5	0.6	OK
6795614	2123129	5001.9	6795614	2123129	5002.4	0.6	OK

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6795565	2123136	5002.9	6795565	2123136	5003.4	0.5	OK
6795515	2123142	5003.9	6795515	2123142	5004.5	0.6	OK
6795465	2123148	5002.6	6795465	2123148	5003.1	0.5	OK
6795416	2123154	5001.4	6795416	2123154	5001.9	0.5	OK
6795366	2123161	5000.2	6795366	2123161	5000.7	0.6	OK
6795317	2123167	4998.9	6795317	2123167	4999.4	0.5	OK
6795267	2123173	4997.6	6795267	2123173	4998.1	0.5	OK
6796044	2123126	4993.6	6796044	2123126	4994.1	0.5	OK
6796017	2123129	4994.1	6796017	2123129	4994.6	0.5	OK
6795968	2123136	4995.1	6795968	2123136	4995.6	0.6	OK
6795918	2123142	4996.1	6795918	2123142	4996.6	0.5	OK
6795869	2123148	4997.2	6795869	2123148	4997.7	0.6	OK
6795819	2123154	4998.1	6795819	2123154	4998.6	0.5	OK
6795769	2123160	4999.1	6795769	2123160	4999.6	0.5	OK
6796050	2123175	4993.7	6796050	2123175	4994.2	0.5	OK
6796024	2123179	4994.3	6796024	2123179	4994.8	0.5	OK

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CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-CURRENT AASHTO T27-CURRENT)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-CURRENT AASHTO T11-CURRENT)

CLIENT: PORTAGE JOB#: 1467 DATE: 10/09/14
PROJECT: MOAB UMTRA
SAMPLE LOCATION: UB02 IN-PLACE SAMPLE
MATERIAL TYPE: COVER BIOBARRIER
TESTED BY: JC SAMPLED BY: CLIENT LAB #: 8125

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
8 in. (200mm)		0.0	100.0	
6 in. (150mm)		0.0	100.0	
4 in. (100mm)		0.0	100.0	100
3 in. (75mm)	6454.1	2.3	97.7	
2 in. (50mm)	60990.4	21.5	76.2	50 - 100
1 1/2 in. (37.5mm)	47917.0	16.9	59.3	40 - 60
1 in. (25mm)	45701.0	16.1	43.2	20 - 40
3/4 in. (19mm)	23975.1	8.5	34.8	
1/2 in. (12.5mm)	1063.0	7.0	27.7	15 - 25
3/8 in. (9.5mm)	611.8	4.1	23.7	
# 4 (4.75mm)	905.3	6.0	17.7	10 - 20
# 8 (2.36mm)	529.7	3.5	14.1	5 - 15
# 16 (1.18mm)	410.2	2.7	11.4	5 - 10
# 30 (600um)	248.7	1.6	9.8	
# 50 (300um)	240.8	1.6	8.2	
#100 (150um)	250.9	1.7	6.5	
#200 (75um)	252.7	1.7	4.8	0 - 5
-#200 (-75um)	59.1			

Total Sample Aggregate Weight: 283594.2
- 3/4" Aggregate Weight: 5244.2 - 3/4" After Wash Weight: 4572.2

REMARKS: Inplace tolerance +#4 is 5%. -#4 is 3%. mh 10-13-14

I certify that this test was performed in accordance with the current version(s) of ASTM C117 & C136/AASHTO T11 & T27 John Christensen

909 W FARMERS FREEWAY GUNNISON, UT 84634 (435) 201-1533 FAX (866) 469-2718

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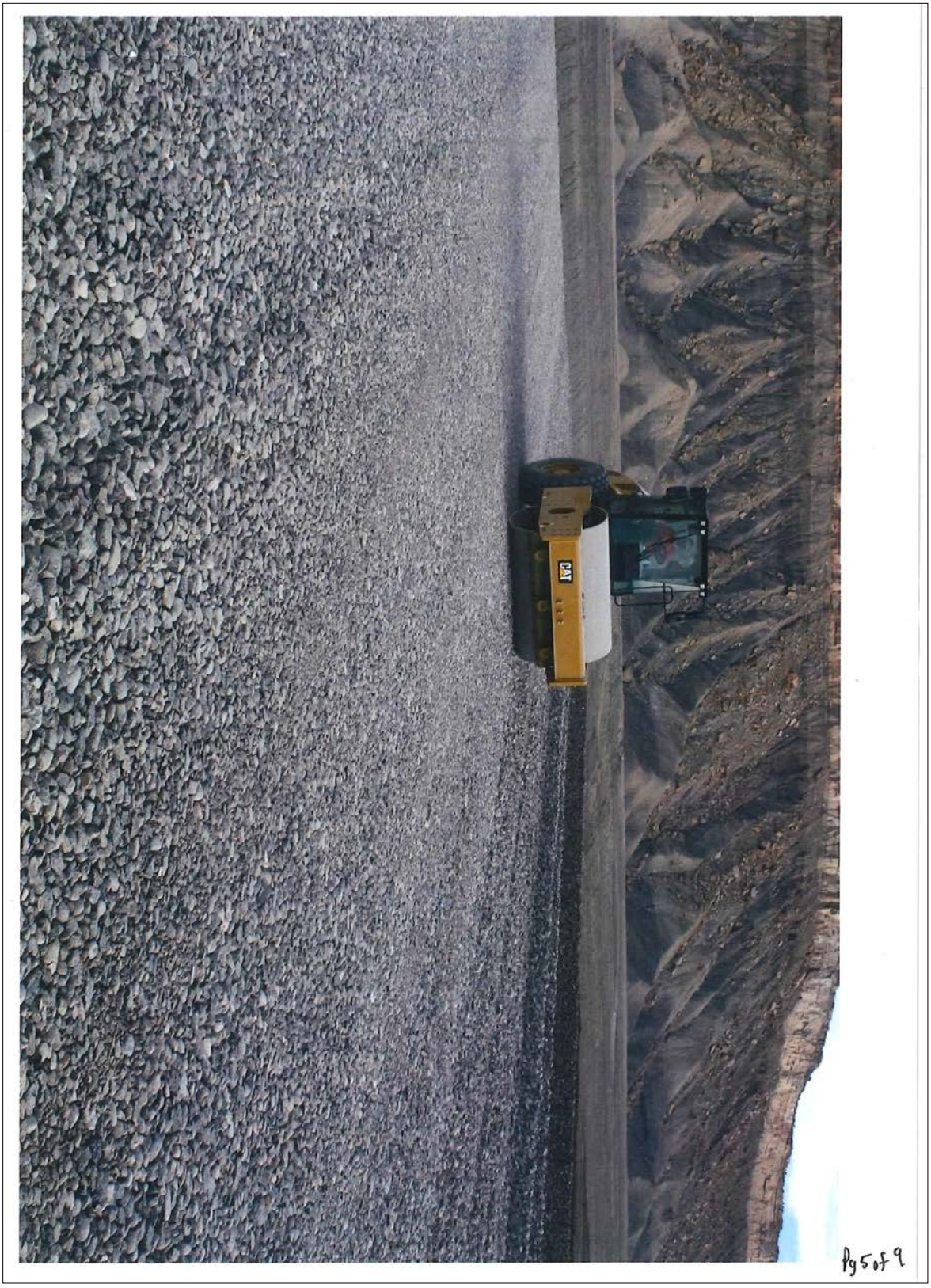
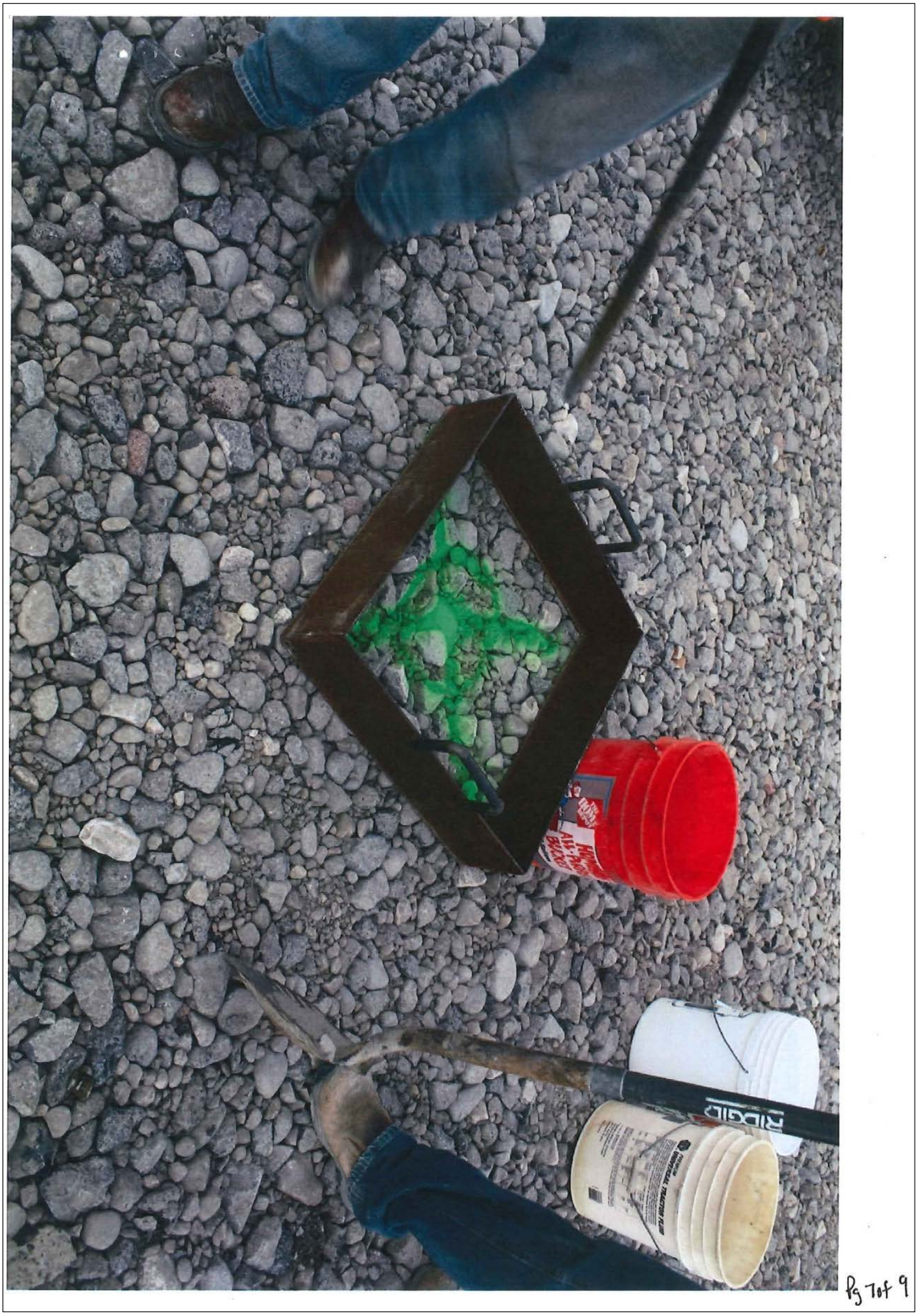
Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package (*continued*)

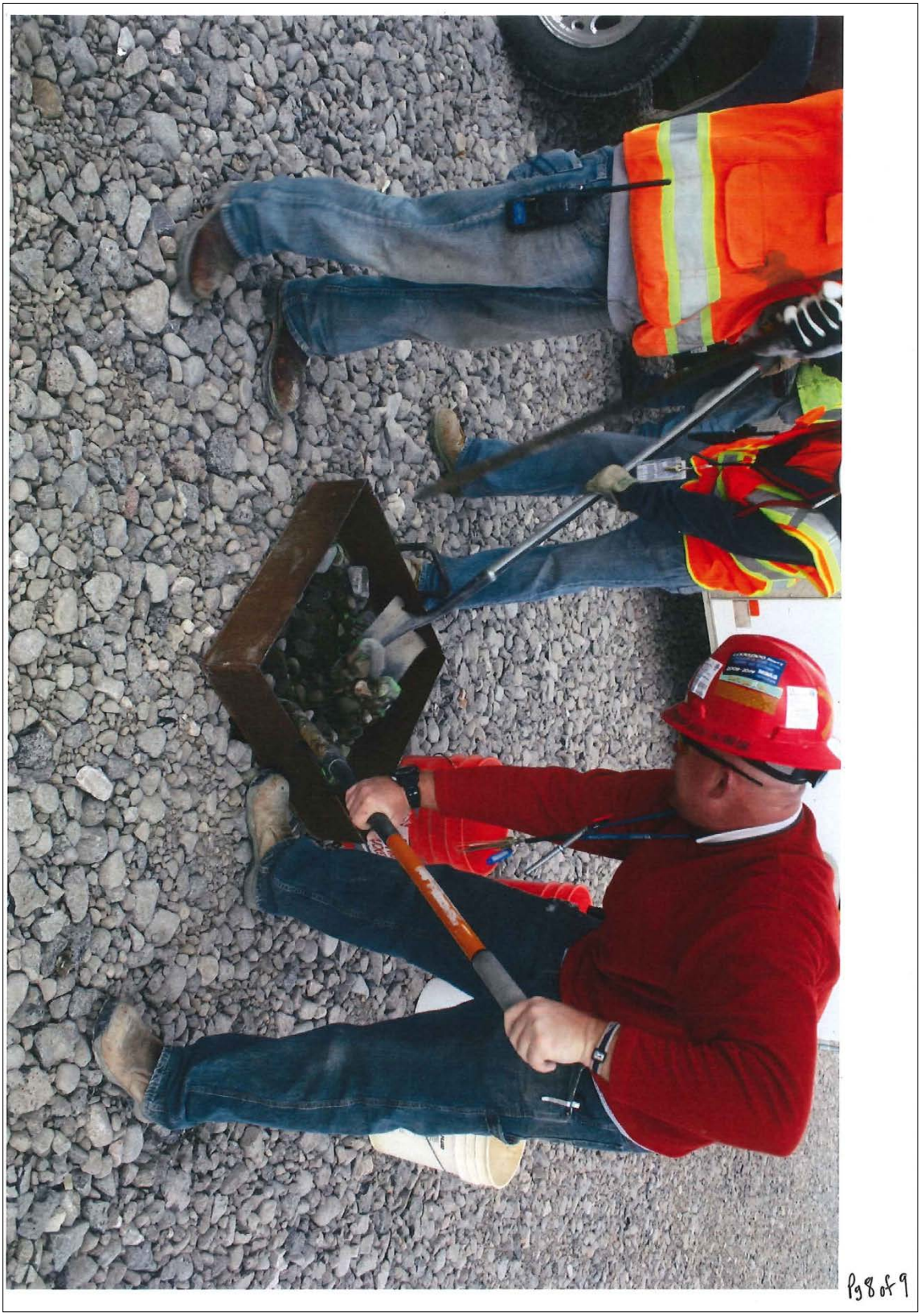


Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package (*continued*)

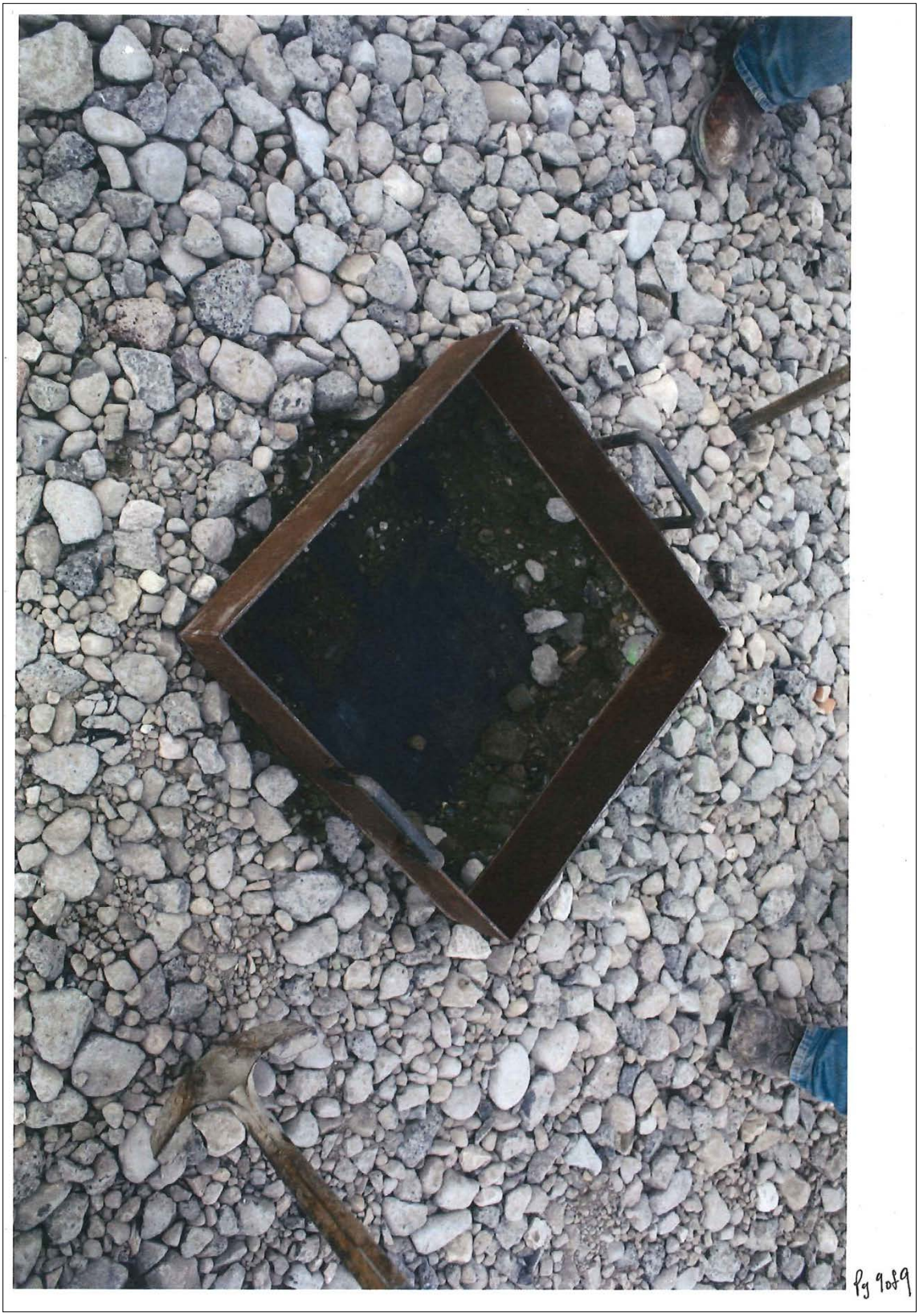
Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package (*continued*)



Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package (*continued*)



Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package (*continued*)



Appendix A5. Infiltration and Biointrusion Barrier Buyoff Surveys

Moab UMTRA Project
Biointrusion Barrier Buyoff Form

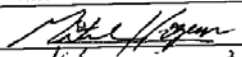
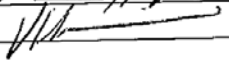
CLIENT: Department of Energy

PROJECT: Moab UMTRA Project

DATE: 10-13-2014

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

LIFT AREA	LIFT AREA
UBY01	

APPROVER NAME/TITLE	SIGNATURE	SIGN DATE
Mitch Hogan		10-13-2014
Kirk Briscoe		10-13-2014

COMMENTS		

OP-F-020
Rev 0, June 2011

File Code Index No: 10.1.3
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Appendix A5. Infiltration and Biointrusion Barrier Buyoff Surveys (*continued*)

Infiltration and Biointrusion Buyoff Survey

Lift Area Buyoff ID:			UBY01		Date:	10/13/2014
Point #	Northing	Easting	Surveyed Elevation	Pre-Instillation Elevations	Difference in feet	Difference in inches
363	6795000	2123055	4991.4	4990.9	0.6	6.7
406	6795248	2123024	4997.7	4997.1	0.6	6.8
419	6795199	2123031	4996.4	4995.9	0.6	6.7
420	6795149	2123037	4995.1	4994.6	0.5	6.3
437	6795100	2123043	4993.8	4993.3	0.5	6.0
438	6795050	2123049	4992.6	4992.1	0.5	6.4
8731	6795651	2123024	5001.0	5000.5	0.5	6.1
8732	6795602	2123030	5002.1	5001.6	0.6	6.6
8733	6795552	2123036	5003.1	5002.6	0.6	6.7
8734	6795503	2123043	5004.0	5003.5	0.5	6.4
8735	6795453	2123049	5002.8	5002.3	0.6	6.7
8736	6795403	2123055	5001.6	5001.1	0.6	6.7
8737	6795354	2123061	5000.3	4999.8	0.6	6.7
8738	6795304	2123068	4999.1	4998.5	0.5	6.5
8739	6795255	2123074	4997.7	4997.2	0.5	6.0
8740	6795205	2123080	4996.6	4996.1	0.5	6.5
8741	6795155	2123086	4995.3	4994.7	0.5	6.3
8742	6795106	2123093	4994.1	4993.6	0.5	6.2
8743	6795056	2123099	4992.8	4992.3	0.6	6.7
8744	6795006	2123105	4991.6	4991.0	0.6	7.6
8761	6796032	2123027	4993.7	4993.1	0.5	6.5
8762	6796005	2123030	4994.3	4993.8	0.5	6.6
8763	6795955	2123036	4995.3	4994.7	0.5	6.4
8764	6795906	2123042	4996.2	4995.7	0.5	6.3
8765	6795856	2123049	4997.3	4996.8	0.6	6.8
8766	6795807	2123055	4998.2	4997.7	0.5	6.4
8767	6795757	2123061	4999.2	4998.7	0.5	6.1
8768	6795707	2123067	5000.3	4999.8	0.6	6.7
8769	6795658	2123074	5001.2	5000.7	0.5	6.0
8770	6795608	2123080	5002.3	5001.8	0.6	6.7
8771	6795558	2123086	5003.2	5002.7	0.5	6.0
8772	6795509	2123092	5004.1	5003.6	0.5	6.0
8773	6795459	2123099	5003.0	5002.5	0.6	6.7
8774	6795410	2123105	5001.7	5001.2	0.5	6.0
8775	6795360	2123111	5000.5	5000.0	0.6	6.8
8776	6795310	2123117	4999.2	4998.7	0.6	6.8
8777	6795261	2123124	4998.0	4997.4	0.6	6.8
8778	6795211	2123130	4996.7	4996.2	0.5	6.0
8779	6795162	2123136	4995.4	4994.9	0.5	6.0
8780	6795112	2123142	4994.2	4993.7	0.5	6.0
8799	6796038	2123076	4993.9	4993.4	0.5	6.1
8800	6796011	2123080	4994.4	4993.9	0.6	6.9
8801	6795962	2123086	4995.4	4994.9	0.5	6.1
8802	6795912	2123092	4996.4	4995.9	0.5	6.3
8803	6795862	2123098	4997.4	4996.9	0.5	6.2
8804	6795813	2123104	4998.4	4997.9	0.5	6.4
8805	6795763	2123111	4999.4	4998.9	0.5	6.0
8806	6795714	2123117	5000.4	4999.9	0.5	6.3
8807	6795664	2123123	5001.5	5000.9	0.6	6.8
8808	6795614	2123129	5002.4	5001.9	0.6	6.7
8809	6795565	2123136	5003.4	5002.9	0.5	6.0
8810	6795515	2123142	5004.5	5003.9	0.6	6.7
8811	6795465	2123148	5003.1	5002.6	0.5	6.6
8812	6795416	2123154	5001.9	5001.4	0.5	6.0
8813	6795366	2123161	5000.7	5000.2	0.6	6.6
8814	6795317	2123167	4999.4	4998.9	0.5	6.1
8815	6795267	2123173	4998.1	4997.6	0.5	6.0
8837	6796044	2123126	4994.1	4993.6	0.5	6.4
8838	6796017	2123129	4994.6	4994.1	0.5	6.1
8839	6795968	2123136	4995.6	4995.1	0.6	6.7
8840	6795918	2123142	4996.7	4996.1	0.5	6.1
8841	6795869	2123148	4997.7	4997.2	0.6	6.7

Appendix A5. Infiltration and Biointrusion Barrier Buyoff Surveys (*continued*)

8842	6795819	2123154	4998.6	4998.1	0.5	6.0
8843	6795769	2123160	4999.6	4999.1	0.5	6.0
8875	6796050	2123175	4994.2	4993.7	0.5	6.0
8876	6796024	2123179	4994.8	4994.3	0.5	6.4

Comments:	QC performed a visual inspection of the final surface with satisfactory results. Visual inspection notes: The area was free of humping, thickened edges and defects. The layer uniform thickness was satisfactory see above survey results for layer thickness.
Approval Date:	10/13/2014
Total Square Feet:	160,277
North West Corner: 6796082 N. 2123022 E.	
QC Signature:Mitch Hogan/	Reviewed By:Beachem Bosh/

Moab UMTRA Project
Biointrusion Barrier Buyoff Form

CLIENT: Department of Energy

PROJECT: Moab UMTRA Project

DATE: 10-20-2014

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

LIFT AREA	LIFT AREA
UBR01	

APPROVER NAME/TITLE	SIGNATURE	SIGN DATE
Kirk Briscoe / Operations Manager		10-20-2014
Beachem Bosh / QA/QC Representative		10-20-2014

COMMENTS		
Buyoff area is 145,276 ft²		

OP-F-020
Rev 0, June 2011

File Code Index No: 10.1.3
Page 1 of 1

Appendix A5. Infiltration and Biointrusion Barrier Buyoff Surveys (*continued*)

Infiltration and Biointrusion Buyoff Survey

Lift Area Buyoff ID:			UBR01		Date:	10/20/2014
Point #	Northing	Easting	Surveyed Elevation	Pre-Instillation Elevations	Difference in feet	Difference in Inches
362	6794994	2123006	4991.3	4990.6	0.7	8.1
361	6794988	2122956	4991.0	4990.5	0.5	6.2
434	6795037	2122950	4992.3	4991.8	0.5	6.5
435	6795044	2123000	4992.5	4991.9	0.6	7.6
436	6795093	2122993	4993.8	4993.1	0.7	7.8
433	6795087	2122944	4993.5	4993.0	0.5	6.2
422	6795137	2122938	4994.8	4994.2	0.6	7.3
421	6795143	2122987	4995.1	4994.4	0.7	8.0
420	6795149	2123037	4995.2	4994.6	0.6	7.8
419	6795199	2123031	4996.4	4995.9	0.5	6.2
418	6795192	2122981	4996.3	4995.6	0.7	8.1
417	6795186	2122931	4996.0	4995.4	0.6	7.4
408	6795236	2122925	4997.2	4996.7	0.5	6.4
407	6795242	2122975	4997.5	4996.9	0.6	7.6
406	6795248	2123024	4997.8	4997.1	0.7	8.2
405	6795298	2123018	4999.0	4998.3	0.7	8.7
404	6795292	2122968	4998.8	4998.1	0.7	8.0
393	6795341	2122962	5000.0	4999.4	0.6	6.7
392	6795348	2123012	5000.2	4999.6	0.6	7.2
8698	6795397	2123006	5001.5	5000.9	0.6	7.0
8660	6795391	2122956	5001.3	5000.7	0.6	7.1
8659	6795441	2122950	5002.4	5001.9	0.5	6.1
8697	6795447	2122999	5002.7	5002.1	0.6	7.2
8696	6795496	2122993	5003.9	5003.2	0.7	8.1
8658	6795490	2122944	5003.7	5003.1	0.6	7.0
8657	6795540	2122937	5002.7	5002.2	0.5	6.2
8695	6795546	2122987	5003.0	5002.3	0.7	8.2
8732	6795602	2123030	5002.2	5001.6	0.6	6.8
8694	6795596	2122981	5001.9	5001.3	0.6	7.4
8656	6795589	2122931	5001.7	5001.2	0.5	6.6
8655	6795639	2122925	5000.7	5000.2	0.5	6.2
8693	6795645	2122974	5000.9	5000.3	0.6	7.3
8731	6795651	2123024	5001.2	5000.5	0.7	8.8
8730	6795701	2123018	5000.2	4999.5	0.7	8.6
8692	6795695	2122968	4999.9	4999.3	0.6	7.7
8654	6795689	2122919	4999.7	4999.1	0.6	6.9
8691	6795744	2122962	4999.0	4998.4	0.6	6.7
8729	6795751	2123012	4999.1	4998.5	0.6	7.7
8728	6795800	2123005	4998.1	4997.4	0.7	9.0
8690	6795794	2122956	4997.9	4997.4	0.5	6.5
8689	6795844	2122949	4996.8	4996.3	0.5	6.3
8727	6795850	2122999	4997.1	4996.5	0.6	7.3
8726	6795899	2122993	4996.3	4995.5	0.8	9.1
8688	6795893	2122943	4996.0	4995.4	0.6	7.5
8687	6795943	2122937	4994.9	4994.3	0.6	6.9
8725	6795949	2122987	4995.2	4994.5	0.7	7.9
8762	6796005	2123030	4994.5	4993.8	0.7	8.3
8724	6795999	2122980	4994.1	4993.5	0.6	6.9
8686	6795992	2122931	4993.9	4993.3	0.6	6.9
8685	6796019	2122927	4993.4	4992.8	0.6	7.0
8723	6796025	2122977	4993.6	4993.0	0.6	7.8
8761	6796032	2123027	4993.9	4993.1	0.8	9.6

Comments: QC performed a visual inspection of the final surface with satisfactory results. Visual inspection notes: The area was free of humping, thickened edges and defects. The layer uniform thickness was satisfactory see above survey results for layer thickness.

Approval Date: 10/20/2014 **Total Square Feet:** 145,276

North West Corner: 6796062 N. 2122900 E.

QC Signature:Beachem Bosh/ **Reviewed By:Mitch Hogan/**

Appendix A5. Infiltration and Biointrusion Barrier Durability and Gradation Tests

CENTRAL UTAH TESTING & INSPECTION

909 West Farmer's Freeway
Gunnison, Utah 84634
Phone (435) 201-1533 Fax (866) 469-2718

November 19, 2014

Portage, Inc.
1075 South Utah Ave., Suite 200
Idaho Falls, Idaho 83402

Project: Moab UMTRA
Material: Cover Biobarrier
Rock Source: Freemont Junction
Sample/Test Date: 10/17/2014
Sample Location: UB01 In-Place Sample

ROCK SCORE

Criteria	Avg. Test Value	Rock Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.675	8.5	9	76.5	90
Absorption, %	0.65	8.1	2	16.2	20
Sodium Sulfate Loss, %	0.59	10.0	11	110.0	110
LA Abrasion, %	6.7	7.0	1	7.0	10
Schmidt Hammer	48	6.1	3	18.3	30
Total Score				228.0	260
Rock Score					87.7

TEST SUMMARY

Laboratory Test	Test Method	Average Test Value
Specific Gravity, Oven Dry	ASTM C-127	2.675
Specific Gravity, SSD	ASTM C-127	2.692
Specific Gravity, Apparent	ASTM C-127	2.722
Absorption, %	ASTM C-127	0.65
Sodium Sulfate Loss, %	ASTM C-88, Sodium Sulfate, 5 Cycles	0.59
LA Abrasion Loss, %	ASTM C-131, Grading A, 100 Revolutions	6.7
Schmidt Hammer, Rebound #	ISRM Method	48

It has been a pleasure to have been of service. If any additional information is needed, please feel free to contact our office at (435) 201-1533.

Sincerely,

John Christensen

John Christensen
Laboratory Manager

CENTRAL UTAH TESTING & INSPECTION

909 West Farmer's Freeway
Gunnison, Utah 84634
Phone (435) 201-1533 Fax (866) 469-2718

November 19, 2014

Portage, Inc.
1075 South Utah Ave., Suite 200
Idaho Falls, Idaho 83402

Project: Moab UMTRA
Material: Cover Biobarrier
Rock Source: Freemont Junction
Sample/Test Date: 10/09/2014
Sample Location: UB02 In-Place Sample

ROCK SCORE

Criteria	Avg. Test Value	Rock Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.610	7.2	9	64.8	90
Absorption, %	0.93	5.4	2	10.8	20
Sodium Sulfate Loss, %	0.68	10.0	11	110.0	110
LA Abrasion, %	6.2	7.3	1	7.3	10
Schmidt Hammer	54	7.0	3	21.0	30
Total Score				213.9	260
Rock Score					82.3

TEST SUMMARY

Laboratory Test	Test Method	Average Test Value
Specific Gravity, Oven Dry	ASTM C-127	2.610
Specific Gravity, SSD	ASTM C-127	2.634
Specific Gravity, Apparent	ASTM C-127	2.675
Absorption, %	ASTM C-127	0.93
Sodium Sulfate Loss, %	ASTM C-88, Sodium Sulfate, 5 Cycles	0.68
LA Abrasion Loss, %	ASTM C-131, Grading A, 100 Revolutions	6.2
Schmidt Hammer, Rebound #	ISRM Method	54

It has been a pleasure to have been of service. If any additional information is needed, please feel free to contact our office at (435) 201-1533.

Sincerely,

John Christensen

John Christensen
Laboratory Manager

Appendix A6.
Frost Protection Layer

Standard Proctor Test Results Summary
Lift Approval Summary
Lift Approval Package
Buyoff Surveys

Appendix A6. Frost Protection Layer
Standard Proctor Test Results Summary

Proctor ID	Date Sampled	Date Approved	Maximum Dry Density (lb/ft^3)	Optimum Moisture Content (%)	Soils Description
Frost Protection # 4 (2014)	10/17/14	10/30/14	117.5	14	Tan Clay
Frost Protection # 5 (2014)	10/17/14	10/30/14	115	14.5	Brown Clay
Frost Protection # 6 (2014)	10/17/14	10/30/14	116.5	14.5	Lt Brown Clay

lb/ft^3 = pounds per cubic foot

Appendix A6. Frost Protection Layer Lift Approval Summaries

October 2014

Date	Lift ID #	# of Passing	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
10/06/14	UFL01141002-00	1	4198	4,198	N/A	0.7	Frost Protection # 3 (2014)	2	0	96.9
10/06/14	UFL10141002-00	0	3550	7,748	N/A	0.7	Frost Protection # 3 (2014)	2	0	98.7
10/13/14	UFL01141009-00	0	2998	10,746	N/A	0.5	Frost Protection # 1 / # 4 (2014)	2	0	92.2
10/13/14	UFL10141009-00	1	2029	12,775	N/A	0.4	Frost Protection # 1 / # 3 (2014)	2	0	94.5
10/16/14	UFY01141016-00	2	3562	16,337	N/A	0.6	Frost Protection # 3 (2014)	2	0	95.2
10/16/14	UFL01141014-00	0	2998	19,335	N/A	0.5	Frost Protection # 3 (2014)	2	0	95.0
10/16/14	UFL10141014-00	0	3043	22,378	N/A	0.6	Frost Protection # 3 (2014)	2	0	95.9
10/21/14	UFY01141021-00	0	4749	27,127	N/A	0.8	Frost Protection # 3 (2014)	2	0	99.5
10/22/14	UFR01141022-00	0	4843	31,970	N/A	0.9	Frost Protection # 3 (2014)	2	0	96.8
10/23/14	UFY01141022-00	2	4155	36,125	N/A	0.7	Frost Protection # 3 (2014)	2	0	96.7
10/27/14	UFR01141023-00	0	3766	39,891	N/A	0.7	Frost Protection # 3 (2014)	2	0	96.1
10/29/14	UFR01141028-00	0	3228	43,119	N/A	0.6	Frost Protection # 3 (2014)	2	0	94.5
10/29/14	UFY01141029-00	2	3562	46,681	N/A	0.6	Frost Protection # 3 (2014)	2	1	96.1
10/30/14	UFR01141030-00	0	2152	48,833	N/A	0.4	Frost Protection # 3 (2014)	2	0	98.4
10/30/14	UFY01141030-00	0	2968	51,801	N/A	0.5	Frost Protection # 3 (2014)	2	0	102.0

Average CAES Screen Passing Pixels (%) = 96.6
Total Quantity Approved (yd^3) = 51,801
Total # of Nuclear Density Gauge Tests = 30
Total # of Moisture Tests = 8
Quantity per Moisture Test (yd^3) = 6,475
Total Average Thickness (ft) = 0.6

Note: Frost Protection Proctors #1 and #3 are provided in the *Interim Completion Report Addendum D.*

November 2014

Date	Lift ID #	# of Passing Moisture	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
11/03/14	UFR01141103-00	0	2690	2,690	N/A	0.5	Frost Protection # 1 (2014)	2	0	98.8

Average CAES Screen Passing Pixels (%)= 98.8%
Total Quantity Approved (yd^3) = 2,690
Total # of Nuclear Density Gauge Tests = 2
Total # of Moisture Tests = 0
Quantity per Moisture Test (yd^3) = 0
Total Average Thickness (ft)= 0.5

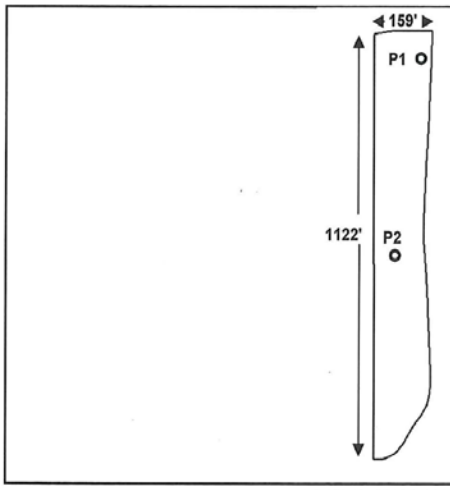
Note: Frost Protection Proctors #1 is provided in the *Interim Completion Report Addendum D.*

Appendix A6. Frost Protection Layer Lift Approval Package

LIFT APPROVAL FORM

PROJECT: Moab UMTRA OTHER

NW CORNER DATE: 10/30/2014



P 1	67895896 N. 2123167 E.			
EW:	159	X 0.919	=	146
NS:	1122	X 0.165	=	185
P 2	6795458 N. 2123087 E.			
EW:	159	X 0.414	=	66
NS:	1122	X 0.555	=	623
P 3				
EW:		X	=	
NS:		X	=	
P 4				
EW:		X	=	
NS:		X	=	
P 5				
EW:		X	=	
NS:		X	=	

N/A

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: UFY01141030-00 NW CORNER: 6796081 N. 2123021 E.

Uncompacted Thickness: 0.5 Compacted Thickness: N/A Debris Insp. By: N/A Date: N/A Time: N/A

NW CORNER of debris placement: N/A EW Dimension N/A NS Dimension N/A

Lift Area (ft²): 160,277 Lift Volume (yd³): 2,968

Comments: QC verified that the underlying lift was scarified prior to placement of this lift w/satisfactory results.

Attached Forms: Grid Slope X Compaction Macro N/A Print Screen N/A Moisture/ Density X

KEYING IN NOTES: N E [S] W Satisfactory MOISTURE/ DENSITY TESTS ID # (S): 1, 2

LIFT APPROVED BY: Mitch Hogan/ DATE: 10/30/2014 TIME: 1551

11/21/2014

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783
Rev. 1

QC-F-001
File index No. 43.8.2
Page 1 of 4

Appendix A6. Frost Protection Layer Lift Approval Package (*continued*)

Slope Elevation Survey

Average lift thickness=	0.5	Bounding Box	Northing	Easting
Grid Size=	N/A	Lower Left	N	
Lift ID:	UFY01141030-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795000	2123055	4993.9	6795000	2123055	4994.6	0.7	OK
6795050	2123052	4995.4	6795050	2123052	4995.9	0.5	OK
6795205	2123080	4999.4	6795205	2123080	4999.9	0.5	OK
6795658	2123074	5004.2	6795658	2123074	5005.0	0.8	OK
6795509	2123092	5006.9	6795509	2123092	5007.2	0.3	OK
6795211	2123130	4999.3	6795211	2123130	4999.9	0.6	OK
6796011	2123080	4997.2	6796011	2123080	4997.9	0.7	OK
6795664	2123123	5004.2	6795664	2123123	5004.7	0.5	OK
6795515	2123142	5007.2	6795515	2123142	5007.5	0.3	OK
6796017	2123129	4997.6	6796017	2123129	4997.9	0.3	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
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						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

N/A

MH 10.30.14

Page 2 of 4

Appendix A6. Frost Protection Layer Lift Approval Package (*continued*)

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: UFY01141030-00 DATE: 10/30/2014

TEST ID NUMBER(S): # 1

TEST LOCATION: P2 TEST METHOD: ____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 28098

Last Calibration Date: 2/14/14

Daily Standard Counts: *Off-Cell Standard*

Density 2275 Moisture 673

Method A (Direct Transmission)

Depth Setting 8 *(inches)* Count Time 1 *(minutes)*

Moisture Count 161 Density Count 1127

Wet Density (ρ_m) 130.9 *(lbs/ft^3)* Dry Density 117.4 *(lbs/ft^3)*

Moisture Density 13.5 *(lbs/ft^3)* Moisture Fraction 11.5 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID _____

Mass of container & wet specimen (M_{cms})	N	g
Mass of container & dry specimen (M_{cds})	A	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$		g
Mass of container (M_c)		g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$		g
Moisture content (w) $w = (M_w / M_s) \times 100$	0.0	%

Dry Density $(\rho_d) = (100 \times \rho_m)/(100 + w)$

$\rho d = (100 \times$ N/A $) / (100 +$ N/A $=$ 117.4 *lbs/ft^3*

Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)

Percent Compaction = ρ_d / $\gamma_d max \times 100$

117.4 / 115.5 x 100 = 101.6 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus ____ Calibrated Vol. *(lbs/ft^3)* ____

Bulk Density of sand (ρ_1) _____ *g/cm^3* _____ *lbs/ft^3*

Mass of Sand to Fill Cone & Plate (M_2) _____ g

Mass of bottle & cone **before** filling cone, plate & hole		g
Mass of bottle & cone **after** filling cone, plate & hole		g
Mass of sand to fill cone, plate, & hole (M_1)		g
Mass of sand to fill hole		g
Mass of wet soil & container	N	g
Mass of container	A	g
Mass of wet soil (M_3)		g

Test Hole Volume
$V = (M_1 - M_2) / \rho_1$ _____ *cm^3*

Dry Mass of soil
$M_4 = 100 M_3 / (w + 100)$ _____ g

Wet Density
$\rho_m = (M_3 / V) \times 62.43$ _____ *lbs/ft^3*

Dry Density
$\rho_d = M_4 / V$ _____ *g/cm^3*

Dry Unit Weight
$\gamma_d = \rho_d \times 62.43$ _____ *lbs/ft^3*

Soil Description: Brown Clay

Proctor ID: Frost Protection # 3 (2014)

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 115.5 (lbs/ft^3)

Optimum Moisture (w_{opt}) 14.0 (%)

Required Moisture: 9.0 % to 19.0 %

Required Percent Compaction: 90.0 (%)

Comments:

Microwave oven power setting on HIGH. Initial time setting of 3 minutes and subsequent incremental drying periods of 1 minute until a change of 0.1 % or less of the initial wet mass of the soil.

TEST RESULTS:

X Pass Date: 10/30/14

____ Failed Moisture

____ Failed Compaction Time: 1532

By: Mitch Hogan / *Mitch Hogan*
(print) *(signature)*

QA/QC APPROVAL 11/21/2014 DATE

Density Testing
DOE-EM/GJRAC1783
Rev. 0

QC-F-002
File Index No. 43.8.2
Page 3 of 4

Appendix A6. Frost Protection Layer Lift Approval Package (*continued*)

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: UFY01141030-00 DATE: 10/30/2014

TEST ID NUMBER(S): # 2

TEST LOCATION: P1 TEST METHOD: _____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 28098

Last Calibration Date: 2/14/14

Daily Standard Counts: *Off-Cell Standard*

Density 2275 Moisture 673

Method A (Direct Transmission)

Depth Setting 8 *(inches)* Count Time 1 *(minutes)*

Moisture Count 163 Density Count 1096

Wet Density (ρ_m) 132.0 *(lbs/ft³)* Dry Density 118.3 *(lbs/ft³)*

Moisture Density 13.7 *(lbs/ft³)* Moisture Fraction 11.5 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID _____

Mass of container & wet specimen (M_{cms})	N	g
Mass of container & dry specimen (M_{cds})	A	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$		g
Mass of container (M_c)		g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$		g
Moisture content (w) $w = (M_w / M_s) \times 100$	0.0	%

Dry Density $(\rho_d) = (100 \times \rho_m)/(100 + w)$

$\rho d = (100 \times$ N/A $) / (100 +$ N/A $) =$ 118.3 *lbs/ft³*

Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)

Percent Compaction = ρ_d / $\gamma_d max$ x 100

118.3 / 115.5 x 100 = 102.4 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus _____ Calibrated Vol. *(lbs/ft³)* _____

Bulk Density of sand (ρ_1) _____ *g/cm³* _____ *lbs/ft³*

Mass of Sand to Fill Cone & Plate (M_2) _____ *g*

Mass of bottle & cone **before** filling cone, plate & hole		g
Mass of bottle & cone **after** filling cone, plate & hole		g
Mass of sand to fill cone, plate, & hole (M_1)		g
Mass of sand to fill hole		g
Mass of wet soil & container	N	g
Mass of container	A	g
Mass of wet soil (M_3)		g

Test Hole Volume

$V = (M_1 - M_2) / \rho_1$ _____ cm^3

Dry Mass of soil

$M_4 = 100\ M_3 / (w + 100)$ _____ g

Wet Density

$\rho_m = (M_3 / V) \times 62.43$ _____ *lbs/ft³*

Dry Density

$\rho_d = M_4 / V$ _____ *g/cm³*

Dry Unit Weight

$\gamma_d = \rho_d \times 62.43$ _____ *lbs/ft³*

Soil Description: Brown Clay

Proctor ID: Frost Protection # 3 (2014)

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 115.5 (lbs/ft³)

Optimum Moisture (w_{opt}) 14.0 (%)

Required Moisture: 9.0 % to 19.0 %

Required Percent Compaction: 90.0 (%)

Comments:

Microwave oven power setting on HIGH. Initial time setting of 3 minutes and subsequent incremental drying periods of 1 minute until a change of 0.1 % or less of the initial wet mass of the soil.

TEST RESULTS:

X Pass Date: 10/30/14

_____ Failed Moisture

_____ Failed Compaction Time: 1536

By: Mitch Hogan / *(print)* *(signature)*

QA/QC APPROVAL 11/21/2015 DATE

Density Testing
DOE-EM/GJRAC1783
Rev. 0

QC-F-002
File Index No. 43.8.2
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Appendix A6. Frost Protection Layer Buyoff Surveys

Moab UMTRA Project
Frost Protection Buyoff Form

CLIENT: Department of Energy

PROJECT: Moab UMTRA

DATE: 10-16-2014

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

LIFT AREA	LIFT AREA
UFL01	

APPROVER NAME/TITLE	SIGNATURE	SIGN DATE
Kirk Briscoe / Operations Manager		10-16-2014
Beachem Bosh / QA/QC Representative		10-16-2014

COMMENTS		
Total buyoff area 297,469 ft²		

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File Code Index No: 10.1.3
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Appendix A6. Frost Protection Layer Buyoff Surveys (*continued*)

Frost Protection Layer Buy Off Survey

		Buy off ID:	UFL01			Date:	10/16/2014	
Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Pre-Installation Elevation	Difference in feet	Difference in inches	Frost Protection Thickness
8399	6795099	2122640	4996.7	4996.5	4993.6	0.2	2.9	3.1
8400	6795050	2122646	4995.5	4995.2	4992.4	0.3	3.4	3.1
8426	6795651	2122621	5001.7	5001.5	4998.7	0.3	3.1	3.1
8427	6795601	2122627	5002.6	5002.4	4999.6	0.2	2.8	3.0
8428	6795552	2122633	5003.7	5003.4	5000.7	0.3	3.2	3.0
8429	6795502	2122640	5004.7	5004.4	5001.6	0.2	2.9	3.1
8430	6795453	2122646	5005.6	5005.4	5002.5	0.2	2.1	3.0
8431	6795403	2122652	5004.4	5004.1	5001.4	0.3	3.6	3.0
8432	6795353	2122658	5003.2	5002.9	5000.2	0.3	3.4	3.0
8433	6795304	2122665	5001.9	5001.6	4998.8	0.3	3.5	3.1
8434	6795254	2122671	5000.7	5000.4	4997.6	0.3	3.9	3.1
8435	6795205	2122677	4999.4	4999.1	4996.3	0.3	3.0	3.1
8436	6795155	2122683	4998.1	4997.9	4995.1	0.3	3.0	3.0
8437	6795105	2122690	4996.9	4996.6	4993.8	0.3	3.1	3.1
8438	6795056	2122696	4995.6	4995.4	4992.5	0.2	2.9	3.1
8439	6795006	2122702	4994.4	4994.1	4991.3	0.3	3.6	3.1
8459	6795905	2122639	4996.9	4996.6	4993.8	0.3	3.7	3.1
8460	6795856	2122646	4997.8	4997.6	4994.8	0.3	3.2	3.0
8461	6795806	2122652	4998.8	4998.6	4995.8	0.2	2.5	3.0
8462	6795757	2122658	4999.8	4999.6	4996.8	0.2	2.7	3.0
8463	6795707	2122664	5000.8	5000.6	4997.8	0.2	2.1	3.0
8464	6795657	2122670	5001.8	5001.6	4998.8	0.3	3.4	3.0
8465	6795608	2122677	5002.8	5002.6	4999.8	0.2	2.7	3.0
8466	6795558	2122683	5003.8	5003.6	5000.8	0.2	3.0	3.0
8467	6795509	2122689	5004.8	5004.6	5001.8	0.3	3.3	3.1
8468	6795459	2122695	5005.7	5005.5	5002.7	0.2	2.5	3.0
8469	6795409	2122702	5004.5	5004.3	5001.5	0.2	2.4	3.0
8470	6795360	2122708	5003.3	5003.0	5000.3	0.3	3.7	3.0
8471	6795310	2122714	5002.2	5001.8	4999.0	0.3	3.9	3.1
8472	6795261	2122720	5000.8	5000.6	4997.8	0.2	2.5	3.1
8473	6795211	2122727	4999.6	4999.3	4996.6	0.3	3.0	3.0
8474	6795161	2122733	4998.3	4998.1	4995.3	0.2	3.0	3.0
8475	6795112	2122739	4997.1	4996.8	4994.0	0.3	3.3	3.1
8476	6795062	2122745	4995.9	4995.5	4992.8	0.3	3.7	3.1
8477	6795012	2122752	4994.6	4994.3	4991.5	0.3	3.8	3.1
8495	6795988	2122679	4995.5	4995.2	4992.5	0.3	3.7	3.0
8496	6795961	2122683	4996.1	4995.8	4993.0	0.3	3.6	3.1
8497	6795912	2122689	4997.0	4996.7	4994.0	0.3	3.4	3.0
8498	6795862	2122695	4998.0	4997.7	4995.0	0.3	3.2	3.0
8499	6795812	2122701	4999.0	4998.7	4995.9	0.3	3.3	3.1
8500	6795763	2122708	5000.0	4999.7	4996.9	0.3	3.1	3.0
8501	6795713	2122714	5001.0	5000.7	4998.0	0.3	3.5	3.1
8502	6795664	2122720	5002.0	5001.7	4999.0	0.2	2.9	3.0
8503	6795614	2122726	5003.0	5002.7	4999.9	0.3	3.1	3.1
8504	6795564	2122733	5004.0	5003.7	5001.0	0.2	3.0	3.0
8505	6795515	2122739	5005.0	5004.7	5001.9	0.3	3.4	3.1
8506	6795465	2122745	5005.9	5005.7	5002.9	0.2	2.3	3.0
8507	6795416	2122751	5004.7	5004.5	5001.7	0.3	3.2	3.1
8508	6795366	2122758	5003.5	5003.2	5000.4	0.3	3.1	3.1
8509	6795316	2122764	5002.2	5002.0	4999.2	0.2	2.6	3.0
8510	6795267	2122770	5001.0	5000.8	4998.0	0.2	2.9	3.0
8511	6795217	2122776	4999.8	4999.6	4996.8	0.1	1.5	3.0
8512	6795168	2122782	4998.5	4998.3	4995.5	0.2	2.6	3.0
8513	6795118	2122789	4997.2	4997.0	4994.2	0.2	2.4	3.1

Appendix A6. Frost Protection Layer Buyoff Surveys (*continued*)

8514	6795068	2122795	4995.9	4995.8	4992.9	0.1	1.2	3.0
8515	6795019	2122801	4994.8	4994.5	4991.7	0.3	3.4	3.0
8516	6794969	2122807	4993.6	4993.2	4990.5	0.3	3.9	3.1
8533	6795994	2122729	4995.8	4995.4	4992.5	0.4	4.5	3.2
8534	6795968	2122732	4996.2	4995.9	4993.2	0.3	3.3	3.0
8535	6795918	2122738	4997.2	4996.9	4994.1	0.3	3.2	3.1
8536	6795868	2122745	4998.2	4997.9	4995.1	0.3	3.3	3.1
8537	6795819	2122751	4999.1	4998.9	4996.1	0.2	2.2	3.0
8538	6795769	2122757	5000.2	4999.9	4997.1	0.3	3.2	3.1
8539	6795720	2122763	5001.2	5000.9	4998.2	0.3	3.8	3.1
8540	6795670	2122770	5002.1	5001.9	4999.1	0.2	2.5	3.0
8541	6795620	2122776	5003.2	5002.9	5000.1	0.3	3.0	3.1
8542	6795571	2122782	5004.2	5003.9	5001.2	0.2	3.0	3.0
8543	6795521	2122788	5005.2	5004.9	5002.1	0.3	3.7	3.1
8544	6795471	2122795	5006.2	5005.9	5003.2	0.3	3.0	3.0
8545	6795422	2122801	5004.9	5004.7	5001.9	0.2	2.7	3.0
8546	6795372	2122807	5003.7	5003.4	5000.6	0.3	3.2	3.1
8547	6795323	2122813	5002.4	5002.3	4999.4	0.1	1.6	3.0
8548	6795273	2122820	5001.2	5001.0	4998.2	0.2	2.4	3.0
8549	6795223	2122826	4999.9	4999.7	4996.9	0.2	2.5	3.0
8550	6795174	2122832	4998.7	4998.5	4995.6	0.2	2.4	3.0
8551	6795124	2122838	4997.4	4997.2	4994.4	0.2	2.9	3.1
8552	6795075	2122845	4996.2	4996.0	4993.1	0.2	3.0	3.1
8553	6795025	2122851	4995.0	4994.7	4991.8	0.2	2.7	3.1
8554	6794975	2122857	4993.6	4993.4	4990.6	0.2	2.7	3.0
8571	6796001	2122779	4995.8	4995.6	4992.8	0.3	3.2	3.0
8572	6795974	2122782	4996.4	4996.1	4993.3	0.3	3.3	3.1
8573	6795924	2122788	4997.3	4997.1	4994.3	0.2	2.5	3.0
8574	6795875	2122794	4998.3	4998.1	4995.3	0.2	2.8	3.1
8575	6795825	2122801	4999.4	4999.1	4996.3	0.3	3.5	3.1
8576	6795775	2122807	5000.4	5000.1	4997.3	0.3	3.1	3.0
8577	6795726	2122813	5001.4	5001.1	4998.3	0.3	3.2	3.0
8578	6795676	2122819	5002.4	5002.1	4999.3	0.3	3.3	3.1
8579	6795626	2122826	5003.4	5003.2	5000.3	0.2	2.6	3.0
8580	6795577	2122832	5004.4	5004.2	5001.3	0.2	2.7	3.1
8581	6795527	2122838	5005.4	5005.2	5002.4	0.3	3.1	3.1
8582	6795478	2122844	5006.3	5006.1	5003.2	0.2	2.0	3.1
8583	6795428	2122851	5005.1	5004.9	5002.1	0.2	2.5	3.0
8584	6795378	2122857	5003.9	5003.7	5000.9	0.2	2.2	3.0
8585	6795329	2122863	5002.6	5002.4	4999.5	0.3	3.2	3.1
8586	6795279	2122869	5001.4	5001.2	4998.3	0.2	1.9	3.0
8587	6795230	2122875	5000.2	4999.9	4997.1	0.3	3.1	3.1
8588	6795180	2122882	4998.9	4998.7	4995.8	0.2	2.6	3.1
8589	6795130	2122888	4997.6	4997.4	4994.6	0.2	2.9	3.0
8609	6796007	2122828	4996.0	4995.8	4993.0	0.2	2.8	3.0
8610	6795980	2122832	4996.6	4996.3	4993.5	0.3	3.2	3.0
8611	6795930	2122838	4997.5	4997.3	4994.5	0.3	3.1	3.0
8612	6795881	2122844	4998.6	4998.3	4995.5	0.3	3.2	3.1
8613	6795831	2122850	4999.5	4999.3	4996.5	0.2	2.5	3.0
8614	6795782	2122857	5000.6	5000.3	4997.5	0.3	3.4	3.0
8615	6795732	2122863	5001.6	5001.3	4998.6	0.3	3.7	3.0
8616	6795682	2122869	5002.6	5002.3	4999.6	0.3	4.1	3.0
8617	6795633	2122875	5003.6	5003.3	5000.6	0.3	4.0	3.1
8618	6795583	2122881	5004.6	5004.3	5001.5	0.3	3.4	3.1
8619	6795534	2122888	5005.5	5005.3	5002.5	0.3	3.1	3.0
8647	6796013	2122878	4996.2	4995.9	4993.2	0.3	3.4	3.0
8648	6795986	2122881	4996.7	4996.5	4993.7	0.2	2.6	3.0
8649	6795937	2122887	4997.7	4997.5	4994.7	0.2	3.0	3.1

Appendix A6. Frost Protection Layer Buyoff Surveys (*continued*)

8650	6795887	2122894	4998.7	4998.5	4995.7	0.2	2.7	3.0
Comments:	QC performed a visual inspection of the final surface with satisfactory results. Visual inspection notes: The area was free of humping, thickened edges and defects. The layer uniform thickness was satisfactory see above survey results for layer thickness.							
North West Corner: 6796008 N. 2122635 E.								
Approval Date: 10/16/2014				Total Square Feet:		297,469 ft²		
QC Signature: Beachem Bosh				Reviewed By: Mitch Hogan				

Moab UMTRA Project
Frost Protection Buyoff Form

CLIENT: Department of Energy

PROJECT: Moab UMTRA Project

DATE: 11-05-2014

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

LIFT AREA	LIFT AREA
UFR01	

APPROVER NAME/TITLE	SIGNATURE	SIGN DATE
Kirk Briscoe/ CJ Operations Manager		11-05-2014
Mitch Hogan/ QA/QC Representative		11-05-2014

COMMENTS		
This buyoff includes UFR01 and UFY01.		

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Appendix A6. Frost Protection Layer Buyoff Surveys (*continued*)

Frost Protection Buyoff Survey

Lift Area Buyoff ID:			UFR01		Date: 11/5/2014	
Point #	Northing	Easting	Surveyed Elevation	Pre Installation Elevation	Thickness in inches	Difference in feet
899	6794932	2122913	4992.7	4989.6	38.0	3.2
900	6794938	2122962	4992.9	4989.7	39.3	3.3
929	6794944	2123012	4993.1	4989.8	39.6	3.3
363	6795000	2123055	4994.5	4991.4	37.8	3.1
362	6794994	2123006	4994.3	4991.3	36.3	3.0
361	6794988	2122956	4994.2	4991.0	39.0	3.2
434	6795037	2122950	4995.5	4992.3	38.1	3.2
435	6795044	2123000	4995.6	4992.5	36.8	3.1
438	6795050	2123049	4995.8	4992.6	38.0	3.2
8743	6795056	2123099	4996.0	4992.8	38.4	3.2
8780	6795112	2123142	4997.4	4994.2	38.5	3.2
8742	6795106	2123093	4997.2	4994.1	36.8	3.1
437	6795100	2123043	4997.0	4993.8	38.6	3.2
436	6795093	2122993	4996.9	4993.8	36.9	3.1
433	6795087	2122944	4996.7	4993.5	38.7	3.2
422	6795137	2122938	4998.0	4994.8	37.9	3.2
421	6795143	2122887	4998.1	4995.1	36.1	3.0
420	6795149	2123037	4998.2	4995.1	37.6	3.1
8741	6795155	2123086	4998.4	4995.3	37.5	3.1
8779	6795162	2123136	4998.7	4995.4	39.3	3.3
8778	6795211	2123130	4999.8	4996.7	37.3	3.1
8740	6795205	2123080	4999.7	4996.6	37.6	3.1
419	6795199	2123031	4999.5	4996.4	37.6	3.1
418	6795192	2122981	4999.4	4996.3	36.7	3.1
417	6795186	2122931	4999.1	4996.0	37.4	3.1
408	6795236	2122925	5000.5	4997.2	39.4	3.3
407	6795242	2122975	5000.6	4997.5	37.5	3.1
406	6795248	2123024	5000.7	4997.7	36.0	3.0
8739	6795255	2123074	5000.9	4997.7	38.7	3.2
8777	6795261	2123124	5001.1	4998.0	37.2	3.1
8776	6795310	2123117	5002.4	4999.2	37.8	3.2
8736	6795304	2123068	5002.2	4999.1	36.9	3.1
405	6795298	2123018	5002.0	4999.0	36.2	3.0
404	6795292	2122968	5001.8	4998.8	36.6	3.0
393	6795341	2122962	5003.1	5000.0	37.7	3.1
392	6795348	2123012	5003.2	5000.2	36.4	3.0
8737	6795354	2123061	5003.4	5000.3	37.3	3.1
8775	6795360	2123111	5003.6	5000.5	37.5	3.1
8813	6795366	2123161	5003.7	5000.7	36.1	3.0
8812	6795416	2123154	5005.0	5001.9	36.7	3.1
8774	6795410	2123105	5004.9	5001.7	38.0	3.2
8736	6795403	2123055	5004.7	5001.6	37.1	3.1
8698	6795397	2123006	5004.5	5001.5	36.1	3.0
8660	6795391	2122956	5004.4	5001.3	37.0	3.1
8659	6795441	2122950	5005.7	5002.4	39.3	3.3
8697	6795447	2122999	5005.8	5002.7	37.6	3.1
8735	6795453	2123049	5005.9	5002.8	36.8	3.1
8773	6795459	2123099	5006.1	5003.0	37.2	3.1
8811	6795465	2123148	5006.3	5003.1	38.2	3.2
8810	6795515	2123142	5007.5	5004.5	36.2	3.0
8772	6795509	2123092	5007.3	5004.1	38.4	3.2
8734	6795503	2123043	5007.1	5004.0	36.9	3.1
8696	6795496	2122993	5007.0	5003.9	36.7	3.1
8658	6795490	2122944	5006.7	5003.7	36.6	3.0
8657	6795540	2122937	5005.9	5002.7	38.3	3.2
8695	6795546	2122987	5006.0	5003.0	36.5	3.0
8733	6795552	2123036	5006.1	5003.1	36.6	3.0
8771	6795558	2123086	5006.4	5003.2	38.3	3.2
8809	6795565	2123136	5006.5	5003.4	37.3	3.1
8808	6795614	2123129	5005.6	5002.4	38.4	3.2
8770	6795608	2123080	5005.4	5002.3	37.6	3.1
8732	6795602	2123030	5005.2	5002.2	36.1	3.0
8694	6795596	2122981	5005.1	5001.9	38.4	3.2
8656	6795589	2122931	5004.9	5001.7	38.9	3.2
8655	6795639	2122925	5003.9	5000.7	38.6	3.2
8693	6795645	2122974	5004.1	5000.9	38.1	3.2
8731	6795651	2123024	5004.2	5001.2	36.0	3.0
8769	6795658	2123074	5004.3	5001.2	37.6	3.1
8807	6795664	2123123	5004.5	5001.5	36.2	3.0
8806	6795714	2123117	5003.5	5000.4	37.5	3.1
8768	6795707	2123067	5003.4	5000.3	37.6	3.1
8730	6795701	2123018	5003.2	5000.2	36.3	3.0
8692	6795695	2122968	5003.1	4999.9	38.4	3.2
8654	6795689	2122919	5002.9	4999.7	37.9	3.2
8691	6795744	2122962	5002.1	4999.0	37.6	3.1
8729	6795751	2123012	5002.1	4999.1	36.2	3.0
8767	6795757	2123061	5002.4	4999.2	38.2	3.2
8805	6795763	2123111	5002.6	4999.4	38.3	3.2
8842	6795819	2123154	5001.8	4998.6	38.0	3.2
8804	6795813	2123104	5001.5	4998.4	37.6	3.1
8766	6795807	2123055	5001.4	4998.2	38.8	3.2
8728	6795800	2123005	5001.3	4998.1	38.0	3.2
8690	6795794	2122956	5001.0	4997.9	37.4	3.1
8689	6795844	2122949	5000.1	4996.8	39.8	3.3

Appendix A6. Frost Protection Layer Buyoff Surveys (*continued*)

8727	6795850	2122999	5000.3	4997.1	38.4	3.2
8765	6795856	2123049	5000.4	4997.3	37.6	3.1
8803	6795862	2123098	5000.5	4997.4	37.7	3.1
8841	6795869	2123148	5000.7	4997.7	36.3	3.0
8840	6795918	2123142	4999.7	4996.7	36.6	3.0
8802	6795912	2123092	4999.6	4996.4	38.6	3.2
8764	6795906	2123042	4999.4	4996.2	37.9	3.2
8726	6795899	2122993	4999.3	4996.3	36.2	3.0
8688	6795893	2122943	4999.1	4996.0	37.2	3.1
8687	6795943	2122937	4998.1	4994.9	38.8	3.2
8725	6795949	2122987	4998.3	4995.2	37.4	3.1
8763	6795955	2123036	4998.4	4995.3	37.2	3.1
8801	6795962	2123086	4998.6	4995.4	38.6	3.2
8839	6795968	2123136	4998.8	4995.6	38.3	3.2
8837	6796044	2123126	4997.4	4994.1	39.5	3.3
8838	6796017	2123129	4997.8	4994.6	38.7	3.2
8800	6796011	2123080	4997.5	4994.4	37.7	3.1
8799	6796038	2123076	4997.1	4993.9	38.4	3.2
8761	6796032	2123027	4996.9	4993.9	38.4	3.0
8762	6796005	2123030	4997.5	4994.5	36.0	3.0
8724	6795999	2122980	4997.3	4994.1	38.4	3.2
8723	6796025	2122977	4996.8	4993.6	37.9	3.2
8685	6796019	2122927	4996.5	4993.4	37.3	3.1
8686	6795992	2122931	4997.1	4993.9	38.1	3.2
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0
					0.0	0.0

Comments: QC performed a visual inspection of the final surface with satisfactory results. Visual inspection notes: The area was free of humping, thickened edges and defects. The layer uniform thickness was satisfactory see above survey results for layer thickness.

Approval Date: 11/5/2014 **Total Area:** 307,728

North West Corner: 6796043 N. 2122889 E.

QC Signature: Mitch Hogan/ Reviewed By: Rick Allred/

Appendix A8.
Spoils Embankment

Standard Proctor Test Results Summary
Lift Approval Summary
Lift Approval Package

Appendix A8. Spoils Embankment Standard Proctor Test Results Summary

Proctor ID	Date Sampled	Date Approved	Maximum Dry Density (lb/ft^3)	Optimum Moisture Content (%)	Soils Description
Spoils # 2 (2014)	10/17/14	10/30/14	114	15	Lt Brown Clay
Spoils # 3 (2014)	10/17/14	10/30/14	117.5	13.5	Brown Clay

lb/ft^3 = pounds per cubic foot

Appendix A8. Spoils Embankment Lift Approval Summary

October 2014										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd^3)	Cumulative Quantity Approved (yd^3)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
10/1/14	USG66141001-00	1	6519	6,519	N/A	1.0	FP # 2 (2014)	2	0	98.9
10/2/14	USE66141002-00	0	6777	13,296	N/A	1.0	FP # 1 (2014)	2	0	93.8
10/6/14	USG66141006-00	0	6519	19,815	N/A	1.0	Spoils # 1 (2014)	2	0	98.6

FP = Frost Protection

Average CAES Screen Passing Pixels (%) = N/A

Total Quantity Approved (yd^3) = 19,815

Total # of Nuclear Density Gauge Tests = 6

Total # of Moisture Tests = 1

Total # of Sandcone Tests = 0

Quantity per Moisture Test (yd^3) = 3,303

Total Average Thickness (ft) = 1.0

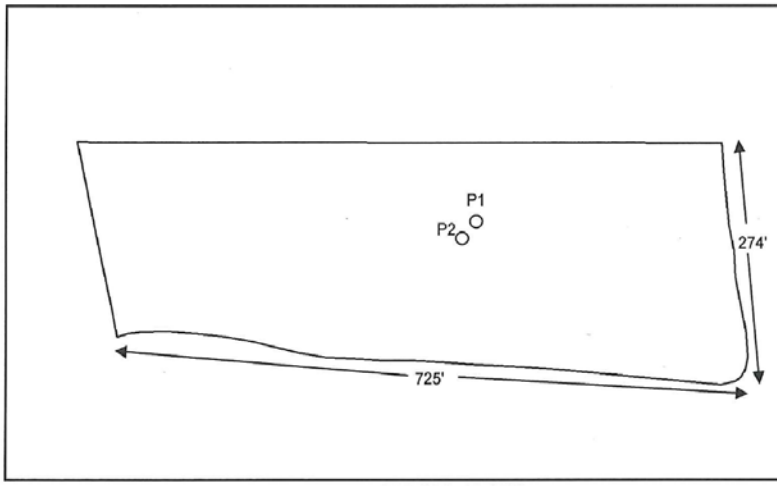
Note: Results of the Proctor IDs are provided in the *Interim Completion Report Addendum D.*

Appendix A8. Spoils Embankment Lift Approval Package

LIFT APPROVAL FORM

PROJECT: Moab UMTRA **OTHER**

NW CORNER **DATE:** 10/6/2014



P 1	6796725 N. 2124704 E.				
EW:	725	X	0.645	=	468
NS:	274	X	0.401	=	110
P 2	6796691 N. 2124683 E.				
EW:	725	X	0.616	=	447
NS:	274	X	0.524	=	144
P 3					
EW:		X		=	
NS:		X		=	
P 4					
EW:		X		=	
NS:		X		=	
P 5					
EW:		X		=	
NS:		X		=	

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: USG66141006-00 NW CORNER: 6796835 N. 2124236 E.

Uncompacted Thickness: ≤ 12" Compacted Thickness: N/A Debris Insp. By: N/A Date: N/A Time: N/A

NW CORNER of debris placement: N/A EW Dimension N/A NS Dimension N/A

Lift Area (ft²): 176,015 Lift Volume (yd³): 6,519

Comments: QC verified that the lift area was scarified prior to placement. QC performed a visual inspection and found the lift area to be less than or equal to 1' above the last approved lift. QC performed moisture/ density tests with satisfactory results.

Attached Forms: **Grid Slope** N/A **Compaction Macro** N/A **Print Screen** N/A **Moisture/ Density** X

KEYING IN NOTES: N E S W N/A MOISTURE/ DENSITY TESTS ID # (S): 1, 2

LIFT APPROVED BY: Beachem Bosh DATE: 10/6/2014 TIME: 1512

QA/QC APPROVAL 12.02.2014 DATE

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Appendix A8. Spoils Embankment Lift Approval Package (*continued*)

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: USG66141006-00 DATE: 10/6/2014

TEST ID NUMBER(S): # 1

TEST LOCATION: P1 TEST METHOD: _____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 28098

Last Calibration Date: 2/14/14

Daily Standard Counts: *Off-Cell Standard*

Density 2306 Moisture 668

Method A (Direct Transmission)

Depth Setting 8 *(inches)* Count Time 1 *(minutes)*

Moisture Count 145 Density Count 1295

Wet Density (ρ_m) 126.1 *(lbs/ft³)* Dry Density 114.1 *(lbs/ft³)*

Moisture Density 12.0 *(lbs/ft³)* Moisture Fraction 10.6 *(%)*

MOISTURE DETERMINATION

_____ASTM D2216 @ 110° C or _____ ASTM D4643

Container ID _____

Mass of container & wet specimen (M_{cms})		g
Mass of container & dry specimen (M_{cds})		g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$		g
Mass of container (M_c)		g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$		g
Moisture content (w) $w = (M_w / M_s) \times 100$	0.0	%

Dry Density $(\rho_d) = (100 \times \rho_m)/(100 + w)$

$pd = (100 \times$ N/A $) / (100 +$ N/A $) =$ 114.1 *lbs/ft³*

Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)

Percent Compaction = ρ_d / $\gamma_d max$ x 100

114.1 / 119.0 x 100 = 95.9 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus _____ Calibrated Vol. *(lbs/ft³)* _____

Bulk Density of sand (ρ_1) _____ *g/cm³* _____ *lbs/ft³*

Mass of Sand to Fill Cone & Plate (M_2) _____ g

Mass of bottle & cone **before** filling cone, plate & hole		g
Mass of bottle & cone **after** filling cone, plate & hole		g
Mass of sand to fill cone, plate, & hole (M_1)		g
Mass of sand to fill hole		g
Mass of wet soil & container		g
Mass of container		g
Mass of wet soil (M_3)		g

Test Hole Volume $V = (M_1 - M_2) / \rho_1$ _____ cm^3

Dry Mass of soil $M_4 = 100\ M_3 / (w + 100)$ _____ g

Wet Density $\rho_m = (M_3 / V) \times 62.43$ _____ *lbs/ft³*

Dry Density $\rho_d = M_4 / V$ _____ *g/cm³*

Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ _____ *lbs/ft³*

Soil Description: Tan Sandy Silt

Proctor ID: Spoils # 1 (2014)

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 119.0 (lbs/ft³)

Optimum Moisture (w_{opt}) 12.5 (%)

Required Moisture: 7.5 % to 17.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

X Pass Date: 10/6/14

_____ Failed Moisture

_____ Failed Compaction Time: 1437

By: Beachem Bosh / _____

(print) *(signature)*

_____ 12-02-2014

QA/QC APPROVAL DATE

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Appendix A8. Spoils Embankment Lift Approval Package (*continued*)

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: USG66141006-00 DATE: 10/6/2014

TEST ID NUMBER(S): # 2

TEST LOCATION: P2 TEST METHOD: N/A D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 28098

Last Calibration Date: 2/14/14

Daily Standard Counts: *Off-Cell Standard*

Density 2306 Moisture 668

Method A (Direct Transmission)

Depth Setting 8 *(inches)* Count Time 1 *(minutes)*

Moisture Count 123 Density Count 1157

Wet Density (ρ_m) 130.6 *(lbs/ft^3)* Dry Density 120.7 *(lbs/ft^3)*

Moisture Density 9.9 *(lbs/ft^3)* Moisture Fraction 8.2 *(%)*

MOISTURE DETERMINATION

_____ASTM D2216 @ 110° C or _____ ASTM D4643

Container ID _____

Mass of container & wet specimen (M_{cws})	N	g
Mass of container & dry specimen (M_{cds})	A	g
Mass of water (M_w) $M_w = M_{cws} - M_{cds}$		g
Mass of container (M_c)		g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$		g
Moisture content (w) $w = (M_w / M_s) \times 100$	0.0	%

Dry Density $(\rho_d) = (100 \times \rho_m)/(100 + w)$

$\rho d = (100 \times$ N/A $) / (100 +$ N/A $) =$ 120.7 lbs/ft^3

Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)

Percent Compaction = ρ_d / $\gamma_d max \times 100$

120.7 / 119.0 x 100 = 101.4 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus Ω Calibrated Vol. *(lbs/ft^3)* _____

Bulk Density of sand (ρ_1) _____ g/cm^3 _____ lbs/ft^3

Mass of Sand to Fill Cone & Plate (M_2) _____ g

Mass of bottle & cone **before** filling cone, plate & hole	N	g
Mass of bottle & cone **after** filling cone, plate & hole	A	g
Mass of sand to fill cone, plate, & hole (M_1)		g
Mass of sand to fill hole		g
Mass of wet soil & container		g
Mass of container		g
Mass of wet soil (M_3)		g

Test Hole Volume $V = (M_1 - M_2) / \rho_1$ _____ cm^3

Dry Mass of soil $M_4 = 100\ M_3 / (w + 100)$ _____ g

Wet Density $\rho_m = (M_3 / V) \times 62.43$ _____ lbs/ft^3

Dry Density $\rho_d = M_4 / V$ _____ g/cm^3

Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ _____ lbs/ft^3

Soil Description: Brown Clay.

Proctor ID: Soils # 1 (2014)

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 119.0 (lbs/ft^3)

Optimum Moisture (w_{opt}) 12.5 (%)

Required Moisture: 7.5 % to 17.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

X Pass Date: 10/6/14

_____ Failed Moisture

_____ Failed Compaction Time: 1440

By: Mitch hogan / _____

(print) *(signature)*

_____ 11/20/2014

QA/QC APPROVAL DATE

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