Appendix A. Construction Verification Data
Contents

NOTE: Appendices A1 and A3 through A7 are not included as they are not relevant to the period covered in this Addendum.

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 167	RRM # 505	12/08/16	12/19/16	107.6	18.5	Light brown sandy clay. Drying bed 4, E-1
	RRM # 506	12/08/16	12/19/16	110.3	18.0	Light brown sandy clay. Drying bed 4, E-3
	RRM # 507	12/08/16	12/19/16	109.4	18.5	Light brown sandy clay. Drying bed 4, E-2
SET 168	RRM # 508	12/08/16	12/19/16	113.0	15.7	Light brown sandy clay. Drying bed 4, W-1
	RRM # 509	12/08/16	12/19/16	114.0	14.6	Light brown sandy clay. Drying bed 4, W-2
	RRM # 510	12/08/16	12/19/16	115.8	14.8	Light brown sandy clay. Drying bed 4, W-3
SET 169	RRM # 511	03/02/17	03/20/17	108.8	17.0	Drying bed # 5. Light brown sandy clay.
	RRM # 512	03/02/17	03/20/17	111.4	17.1	Drying bed # 5. Light brown sandy clay.
	RRM # 513	03/02/17	03/20/17	112.7	17.8	Drying bed # 5. Light brown sandy clay.
SET 170	RRM # 514	06/27/17	07/25/17	110.6	18.8	Drying bed # 3 west. Brown sandy clay.
	RRM # 515	06/27/17	07/25/17	107.7	18.2	Drying bed # 3 mid. Brown sandy clay.
	RRM # 516	06/27/17	07/25/17	112.2	16.5	Drying bed # 3 east. Brown sandy clay.
SET 171	RRM # 517	06/27/17	07/25/17	112.5	16.9	Drying bed # 6 south. Brown sandy clay.
	RRM # 518	06/27/17	07/25/17	111.2	16.5	Drying bed # 6 north. Brown sandy clay.
	RRM # 519	06/27/17	07/25/17	106.4	18.3	Drying bed # 6 mid. Brown sandy clay.

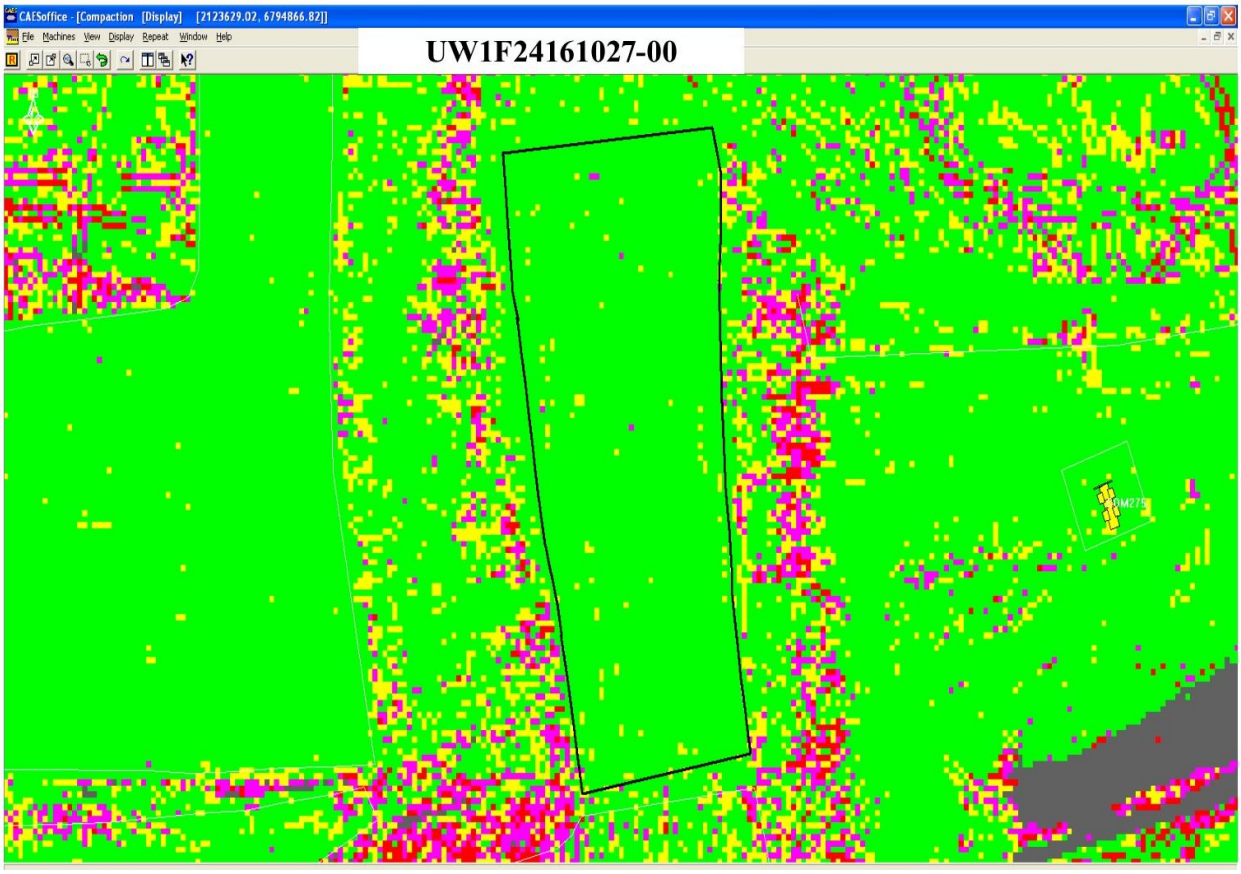
Appendix A2. RRM Lift Approval Summaries

October 2016										
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 (%)
10/3/16	UWY27160927-00	1	610	610	99.6	0.7	489	0	0	N/A
10/5/16	UWY27161004-00	2	858	1,468	98.4	1.0	489	0	0	N/A
10/6/16	UWY24161004-00	1	2,342	3,810	97.4	1.0	489	0	0	N/A
10/6/16	UWY27161006-00	1	773	4,583	98.8	0.9	489	0	0	N/A
10/11/16	UWY24161006-00	0	2,108	6,691	99.7	0.9	N/A	0	0	N/A
10/11/16	UW1F24161011-00	1	1,406	8,097	99.7	0.9	489	0	0	N/A
10/17/16	UWY24161011-00	1	2,745	10,842	99.1	0.9	489	0	0	N/A
10/18/16	UW1F24161016-00	1	1,657	12,499	99.5	1.0	489	0	0	N/A
10/19/16	UWY24161018-00	1	3,050	15,549	99.6	1.0	489	0	0	N/A
10/20/16	UW1F24161020-00	1	1,607	17,156	99.6	1.0	489	0	0	N/A
10/24/16	UW1E30161020-00	0	660	17,816	99.1	0.7	N/A	0	0	N/A
10/31/16	UWY24161020-00	1	2,749	20,565	99.2	0.9	489	0	0	N/A
10/31/16	UW1F24161027-00	1	1,285	21,850	97.6	0.8	489	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.0
Total Quantity Approved (yd^3) = 21,850
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 1,821
Total Average Thickness (ft)= 0.9

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

CAES compaction screen example from October 2016. 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.



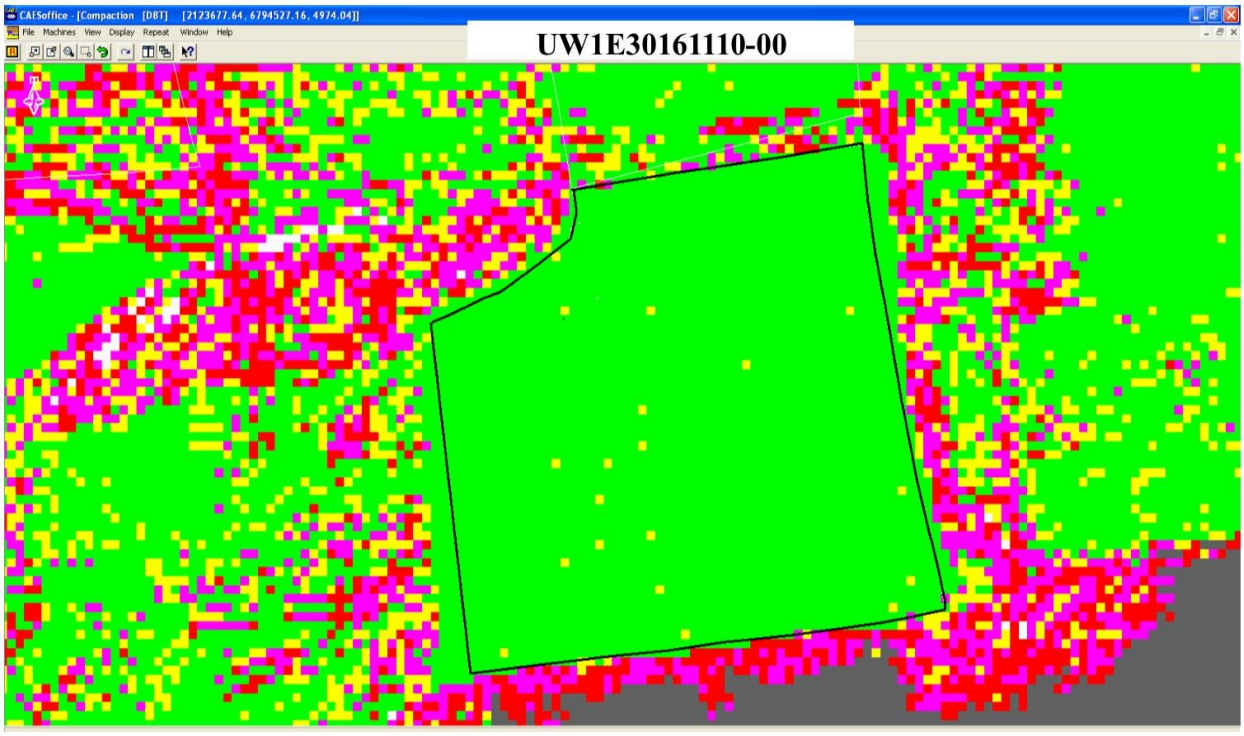
Appendix A2. RRM Lift Approval Summaries (*continued)*

November 2016										
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 (%)
11/2/16	UW1E30161031-00	1	625	625	98.4	0.6	489	0	0	N/A
11/2/16	UWY24161101-00	1	2,681	3,306	99.7	0.9	489	0	0	N/A
11/3/16	UW1F24161101-00	0	1,575	4,881	99.3	0.9	N/A	0	0	N/A
11/7/16	UWY24161103-00	1	2,085	6,966	99.1	0.7	489	0	0	N/A
11/9/16	UWY24161108-00	1	2,681	9,647	99.5	0.9	489	0	0	N/A
11/10/16	UW1E30161110-00	0	833	10,480	99.2	0.8	N/A	0	0	N/A
11/18/16	UWY24161110-00	3	3,132	13,612	N/A	1.0	489	2	0	92.4
11/18/16	UW1F24161115-00	2	1,784	15,396	N/A	1.0	489	1	0	93.8
11/29/16	UWY24161118-00	3	2,506	17,902	N/A	0.8	489	0	2	97.4

Average CAES Screen Passing Pixels (%)= 99.2
Total Quantity Approved (yd^3) = 17,902
Total # of Nuclear Density Gauge Tests = 3
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 1,492
Total Average Thickness (ft)= 0.8

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

CAES compaction screen example from November 2016. 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



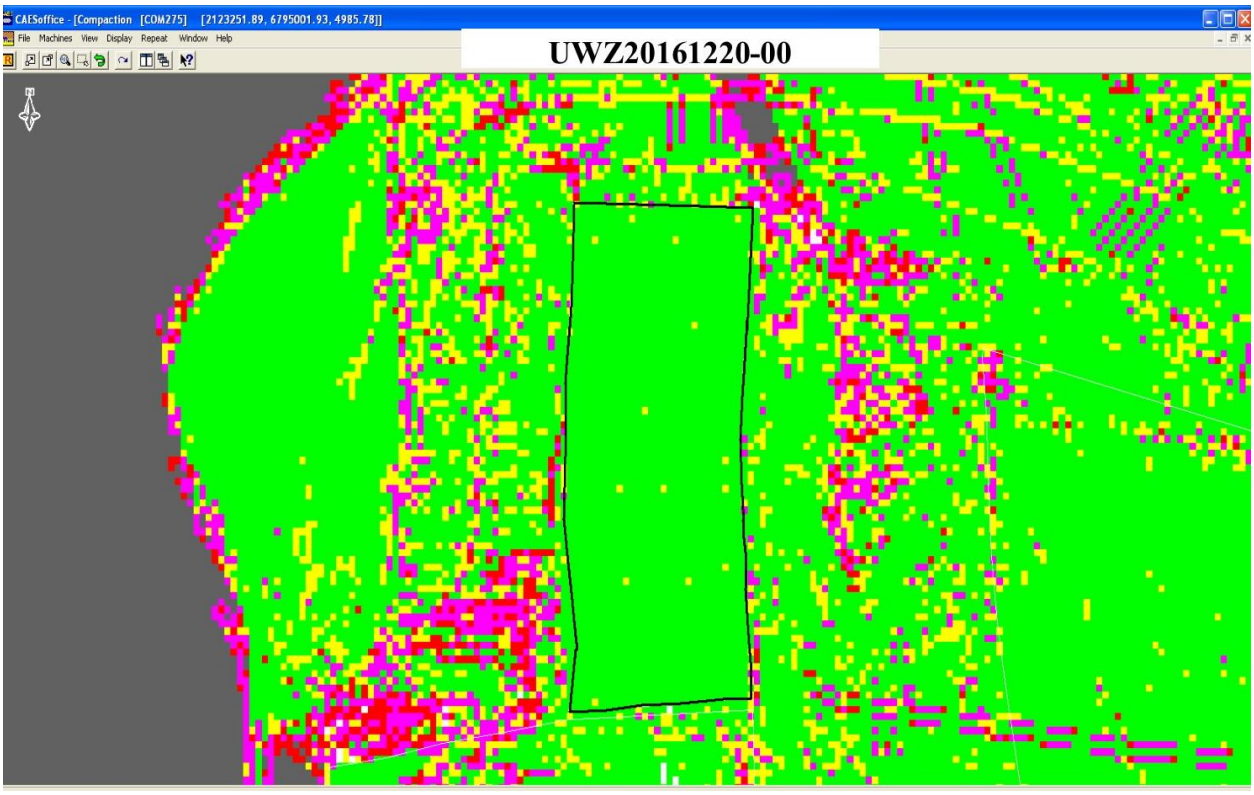
Appendix A2. RRM Lift Approval Summaries (*continued*)

December 2016										
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 (%)
12/1/16	UW1I24161123-00	1	1,315	1,315	98.9	0.7	489	0	0	N/A
12/1/16	UWY27161129-00	1	915	2,230	99.1	0.7	489	1	0	93.4
12/5/16	UWZ20161201-00	0	618	2,848	98.5	0.8	N/A	0	0	N/A
12/5/16	UWY24161201-00	1	1,206	4,054	99.2	0.6	489	0	0	N/A
12/5/16	UW1I24161201-00	1	2,195	6,249	99.1	1.0	489	0	0	N/A
12/7/16	UW1E30161115-00	1	1,069	7,318	98.2	0.9	489	0	0	N/A
12/7/16	UW1F24161121-00	1	1,488	8,806	98.7	0.8	489	0	0	N/A
12/8/16	UWZ20161208-00	1	1,488	10,294	99.6	0.8	489	0	0	N/A
12/8/16	UWY24161206-00	0	2,010	12,304	99.2	1.0	N/A	0	0	N/A
12/12/16	UW1E30161208-00	0	1,069	13,373	98.8	0.9	N/A	0	0	N/A
12/12/16	UWY27161205-00	1	996	14,369	98.2	0.9	489	0	0	N/A
12/14/16	UW1F24161208-00	0	1,674	16,043	98.0	0.9	N/A	0	0	N/A
12/15/16	UW1E30161213-00	0	950	16,993	98.8	0.8	N/A	0	0	N/A
12/15/16	UWY27161213-00	1	775	17,768	98.8	0.7	450	0	0	N/A
12/19/16	UWY24161215-00	0	2,010	19,778	99.8	1.0	N/A	0	0	N/A
12/19/16	UWZ20161215-00	0	772	20,550	99.7	1.0	N/A	0	0	N/A
12/20/16	UWZ20161220-00	1	716	21,266	98.8	0.9	489	0	0	N/A
12/22/16	UWY24161220-00	0	2,066	23,332	99.0	1.0	N/A	0	0	N/A
12/28/16	UWY27161222-00	1	1,144	24,476	98.0	1.0	489	0	0	N/A
12/29/16	UW1F24161222-00	3	2,084	26,560	N/A	1.0	489, 508	1	0	93.2
12/29/16	UW1E30161228-00	1	1,415	27,975	N/A	1.0	508	1	0	90.8

Average CAES Screen Passing Pixels (%)= 98.9
Total Quantity Approved (yd^3) = 27,975
Total # of Nuclear Density Gauge Tests = 3
Total # of Moisture Tests = 15
Quantity per Moisture Test (yd^3) = 1,865
Total Average Thickness (ft)= 0.9

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

CAES compaction screen example from December 2016. 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 2017

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 (%)
1/5/17	UWY27170103-00	1	885	885	N/A	0.8	489	1	0	97.9
1/5/17	UWY24161230-00	1	1,809	2,694	N/A	0.9	489	1	0	99.1
1/5/17	UWZ20161230-00	1	772	3,466	N/A	1.0	508	1	0	90.6
1/11/17	UW1F24170104-00	2	1,674	5,140	96.7	0.9	508	0	0	N/A
1/18/17	UW1F24170112-00	3	1,839	6,979	97.1	0.8	489, 508	0	0	N/A

Average CAES Screen Passing Pixels (%)= 96.9
Total Quantity Approved (yd^3) = 6,979
Total # of Nuclear Density Gauge Tests = 3
Total # of Moisture Tests = 8
Quantity per Moisture Test (yd^3) = 872
Total Average Thickness (ft)= 0.9

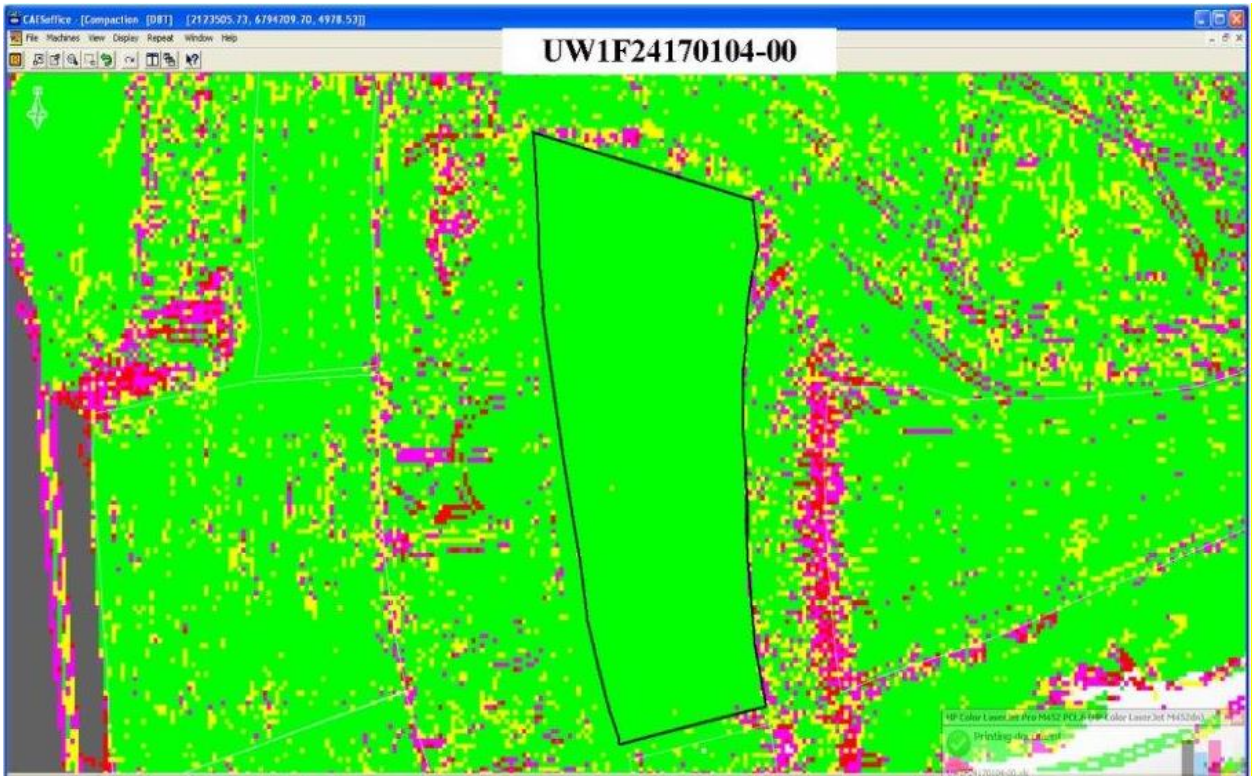
February 2017

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 (%)
2/1/17	UW1R02170131-00	1	1,272	1,272	98.3	0.8	508	0	0	N/A
2/6/17	UW1R02170202-00	1	1,272	2,544	96.5	0.8	505	0	0	N/A
2/7/17	UW1F24170207-00	0	149	2,693	98.5	0.8	N/A	0	0	N/A
2/8/17	UW1R02170207-00	1	1,395	4,088	98.7	0.9	505	0	0	N/A
2/13/17	UW1R02170209-00	1	1,395	5,483	96.7	0.9	505	0	0	N/A
2/14/17	UW1F24170207-01	0	93	5,576	96.2	0.5	505	0	0	N/A
2/14/17	UW1F24170119-00	3	1,380	6,956	98.1	0.6	505	0	0	N/A
2/15/17	UW1R02170214-00	1	1,258	8,214	98.4	0.8	508	0	0	N/A
2/23/17	UW1R02170216-00	2	1,258	9,472	97.5	0.8	505	0	0	N/A
2/28/17	UW1R02170224-00	1	1,199	10,671	94.7	0.9	505	0	0	N/A
2/28/17	UW1R02170228-00	1	1,332	12,003	98.3	1.0	505	0	0	N/A

Average CAES Screen Passing Pixels (%)= 97.4
Total Quantity Approved (yd^3) = 12,003
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 1,000
Total Average Thickness (ft)= 0.8

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

CAES compaction screen example from January 2017. 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.



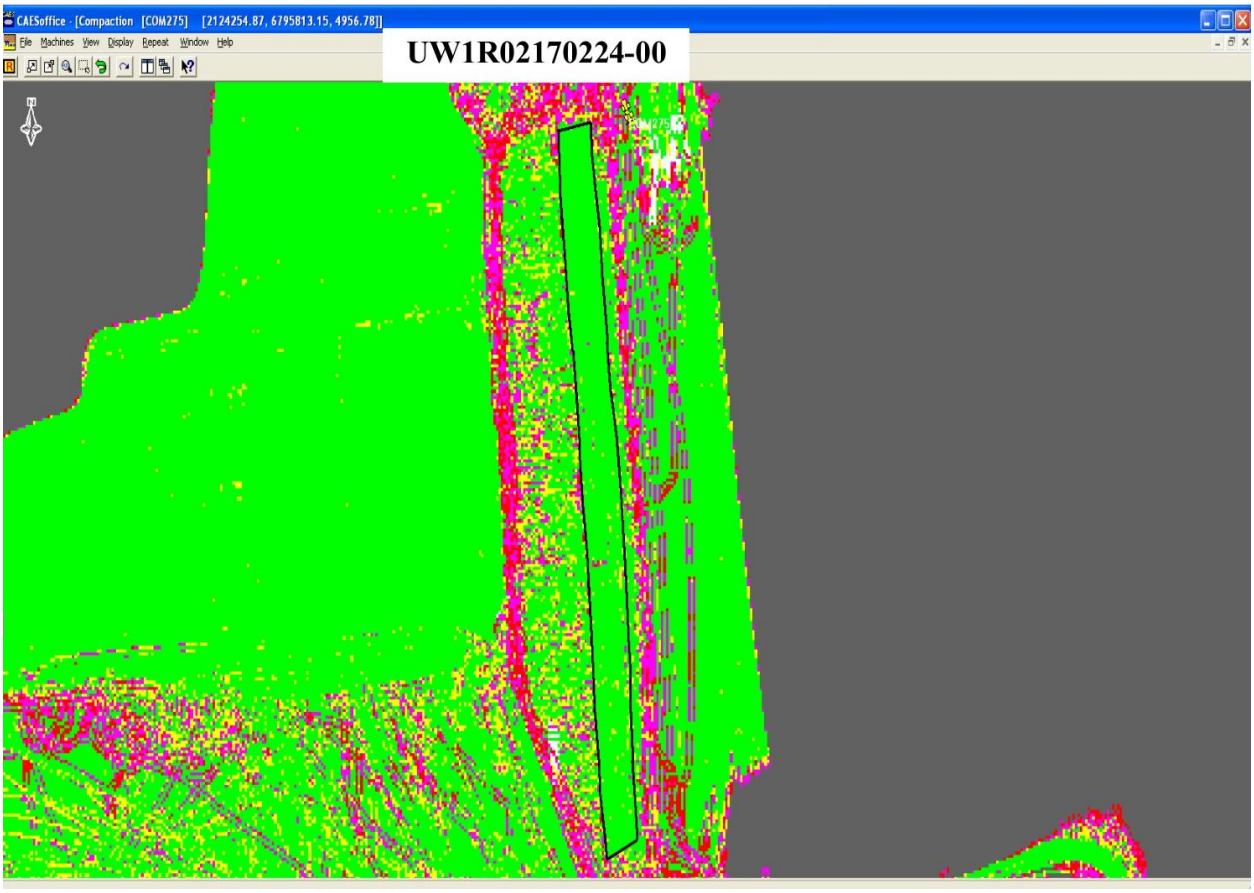
Appendix A2. RRM Lift Approval Summaries (*continued*)

February 2017										
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 (%)
2/1/17	UW1R02170131-00	1	1,272	1,272	98.3	0.8	508	0	0	N/A
2/6/17	UW1R02170202-00	1	1,272	2,544	96.5	0.8	505	0	0	N/A
2/7/17	UW1F24170207-00	0	149	2,693	98.5	0.8	N/A	0	0	N/A
2/8/17	UW1R02170207-00	1	1,395	4,088	98.7	0.9	505	0	0	N/A
2/13/17	UW1R02170209-00	1	1,395	5,483	96.7	0.9	505	0	0	N/A
2/14/17	UW1F24170207-01	0	93	5,576	96.2	0.5	505	0	0	N/A
2/14/17	UW1F24170119-00	3	1,380	6,956	98.1	0.6	505	0	0	N/A
2/15/17	UW1R02170214-00	1	1,258	8,214	98.4	0.8	508	0	0	N/A
2/23/17	UW1R02170216-00	2	1,258	9,472	97.5	0.8	505	0	0	N/A
2/28/17	UW1R02170224-00	1	1,199	10,671	94.7	0.9	505	0	0	N/A
2/28/17	UW1R02170228-00	1	1,332	12,003	98.3	1.0	505	0	0	N/A

Average CAES Screen Passing Pixels (%)= 97.4
Total Quantity Approved (yd^3) = 12,003
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 1,000
Total Average Thickness (ft)= 0.8

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

CAES compaction screen example from February 2017. 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.



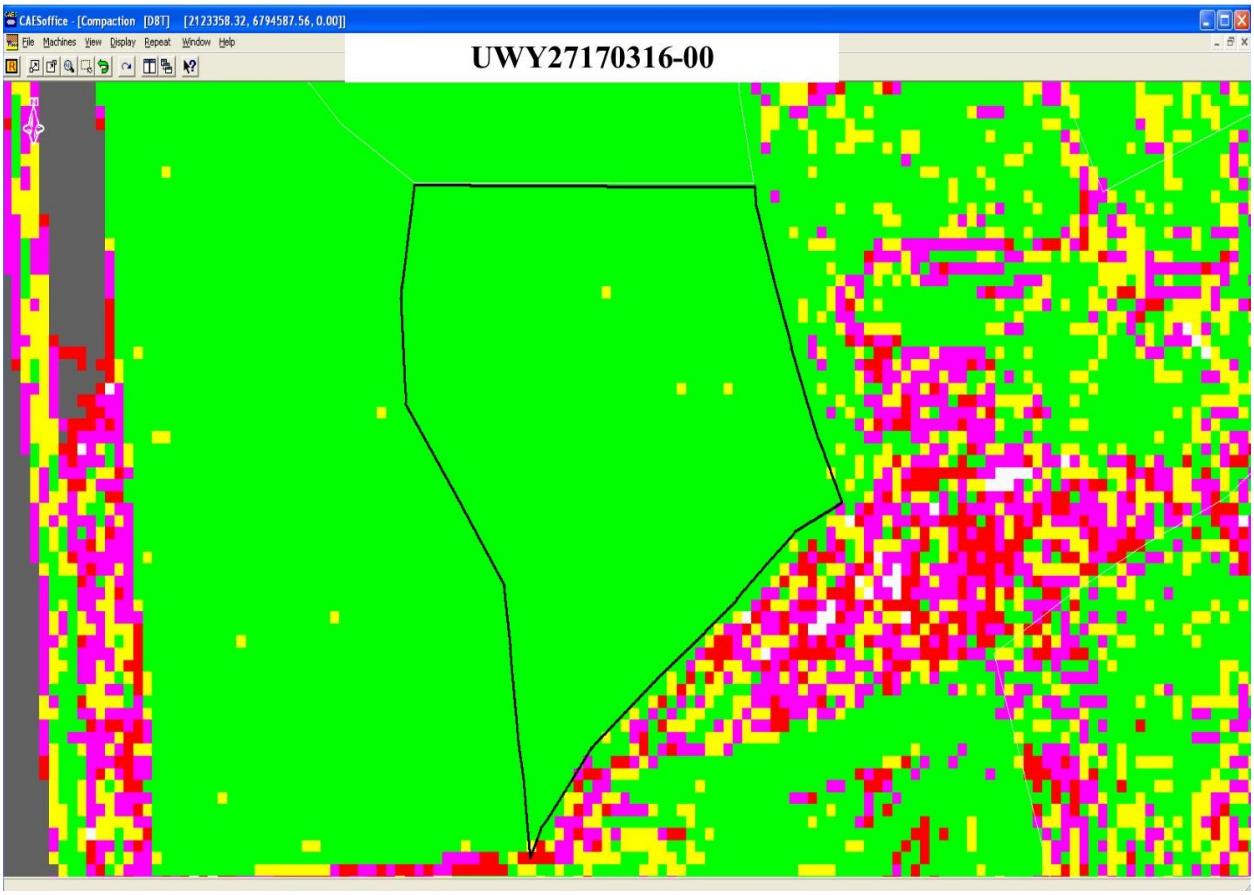
Appendix A2. RRM Lift Approval Summaries (*continued*)

March 2017										
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 (%)
3/2/17	UW1F24170214-00	1	2,678	2,678	98.8	0.9	505	0	0	N/A
3/7/17	UW1R02170302-00	1	1,042	3,720	99.6	0.8	505	0	0	N/A
3/9/17	UW1F24170302-00	1	2,976	6,696	98.9	1.0	505	0	0	N/A
3/9/17	UWY24170309-00	1	0	6,696	99.4	0.0	505	0	0	N/A
3/9/17	UWZ20170309-00	0	0	6,696	98.8	0.0	NA	0	0	N/A
3/14/17	UW1R02170307-00	0	1,302	7,998	97.9	1.0	NA	0	0	N/A
3/14/17	UWY27170314-00	0	0	7,998	98.2	0.0	NA	0	0	N/A
3/16/17	UW1F24170309-00	1	2,678	10,676	99.4	0.9	508	0	0	N/A
3/16/17	UWZ20170314-00	1	991	11,667	98.8	1.0	508	0	0	N/A
3/20/17	UWY27170316-00	1	556	12,223	99.5	0.9	508	0	0	N/A
3/20/17	UWY24170314-00	0	1,087	13,310	98.9	0.7	NA	0	0	N/A
3/16/17	UW1F24170316-00	0	2,400	15,710	99.8	0.8	NA	0	0	N/A
3/21/17	UWZ20170321-00	1	892	16,602	99.8	0.9	508	0	0	N/A
3/21/17	UWY24170321-00	0	1,398	18,000	99.1	0.9	N/A	0	0	N/A
3/21/17	UWY27170321-00	0	556	18,556	96.9	0.9	N/A	0	0	N/A
3/23/17	UW1E30170323-00	1	0	18,556	99.3	0.1	489	0	0	N/A
3/23/17	UWZ20170323-00	1	998	19,554	99.7	0.9	508	0	0	N/A
3/23/17	UWY24170323-00	0	929	20,483	97.6	0.8	N/A	0	0	N/A
3/23/17	UWY27170323-00	0	130	20,613	94	0.5	N/A	0	0	N/A
3/28/17	UWZ20170328-00	0	1,200	21,813	97.5	1.0	N/A	0	0	N/A
3/28/17	UWY24170328-00	1	813	22,626	99.1	0.7	512	0	0	N/A
3/30/17	UW1F24170323-00	0	2,944	25,570	99.4	0.9	N/A	0	0	N/A
3/29/17	UW1E30170329-00	0	1,298	26,868	99.8	0.9	N/A	0	0	N/A
3/30/17	UWZ20170330-00	1	1,442	28,310	99.5	0.9	512	0	0	N/A

Average CAES Screen Passing Pixels (%)= 98.7
Total Quantity Approved (yd^3) = 28,310
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 2,359
Total Average Thickness (ft)= 0.7

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

CAES compaction screen example from March 2017. 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.



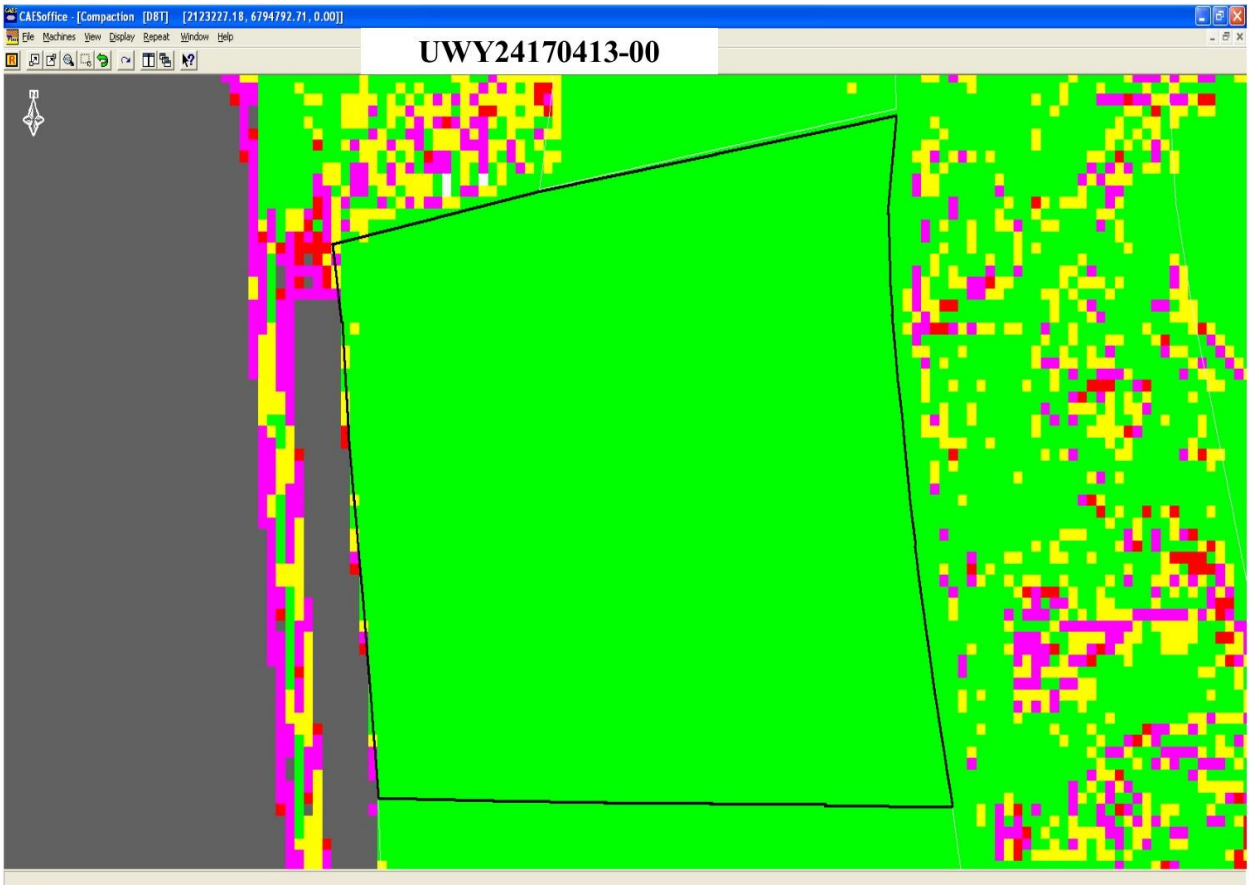
Appendix A2. RRM Lift Approval Summaries (*continued*)

April 2017										
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 (%)
4/3/17	UW1E30170330-00	0	1,298	1,298	99	0.9	NA	0	0	N/A
4/3/17	UWZ20170403-00	1	1,281	2,579	98.6	0.8	505	0	0	N/A
4/4/17	UW1E30170403-00	0	1,443	4,022	99.6	1.0	NA	0	0	N/A
4/4/17	UWZ20170404-00	1	1,448	5,470	99.8	0.8	505	0	0	N/A
4/6/17	UW1E30170404-00	0	1,743	7,213	98	1.0	NA	0	0	N/A
4/6/17	UWZ20170406-00	0	1,188	8,401	99.4	0.9	NA	0	0	N/A
4/10/17	UWY24170406-00	1	1,128	9,529	99.7	0.9	468	0	0	N/A
4/11/17	UW1F24170405-00	0	3,235	12,764	99.5	1.0	NA	0	0	N/A
4/13/17	UWY27170411-00	1	1,636	14,400	99.5	0.9	468	0	0	N/A
4/13/17	UWZ20170411-00	0	1,320	15,720	99.2	1.0	NA	0	0	N/A
4/17/17	UWY24170413-00	0	1,187	16,907	99.6	0.9	N/A	0	0	N/A
4/17/17	UWY27170413-00	2	1,616	18,523	99.6	1.0	468	0	0	N/A
4/18/17	UWY1E30170412-00	0	1,568	20,091	99.5	0.9	NA	0	0	N/A
4/18/17	UWZ20170418-00	1	1,410	21,501	99.8	1.0	468	0	0	N/A
4/20/17	UWY24170418-00	0	1,319	22,820	99.9	1.0	NA	0	0	N/A
4/20/17	UWY27170420-00	1	1,616	24,436	99.9	1.0	468	0	0	N/A
4/20/17	UWY29170420-00	0	665	25,101	99.8	0.8	N/A	0	0	N/A
4/24/17	UWZ20170420-00	0	1,410	26,511	99.1	1.0	N/A	0	0	N/A
4/24/17	UW1E30170419-00	0	1,568	28,079	98.1	0.9	N/A	0	0	N/A
4/26/17	UWY24170425-00	2	1,368	29,447	99.3	1.0	468	1	0	90.8
4/26/17	UWY27170425-00	0	1,456	30,903	99.5	0.9	N/A	0	0	N/A
4/26/17	UWY29170425-00	0	764	31,667	97.9	0.9	N/A	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.3
Total Quantity Approved (yd^3) = 31,667
Total # of Nuclear Density Gauge Tests = 1
Total # of Moisture Tests = 10
Quantity per Moisture Test (yd^3) = 3,167
Total Average Thickness (ft)= 0.9

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

CAES compaction screen example from April 2017. 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.



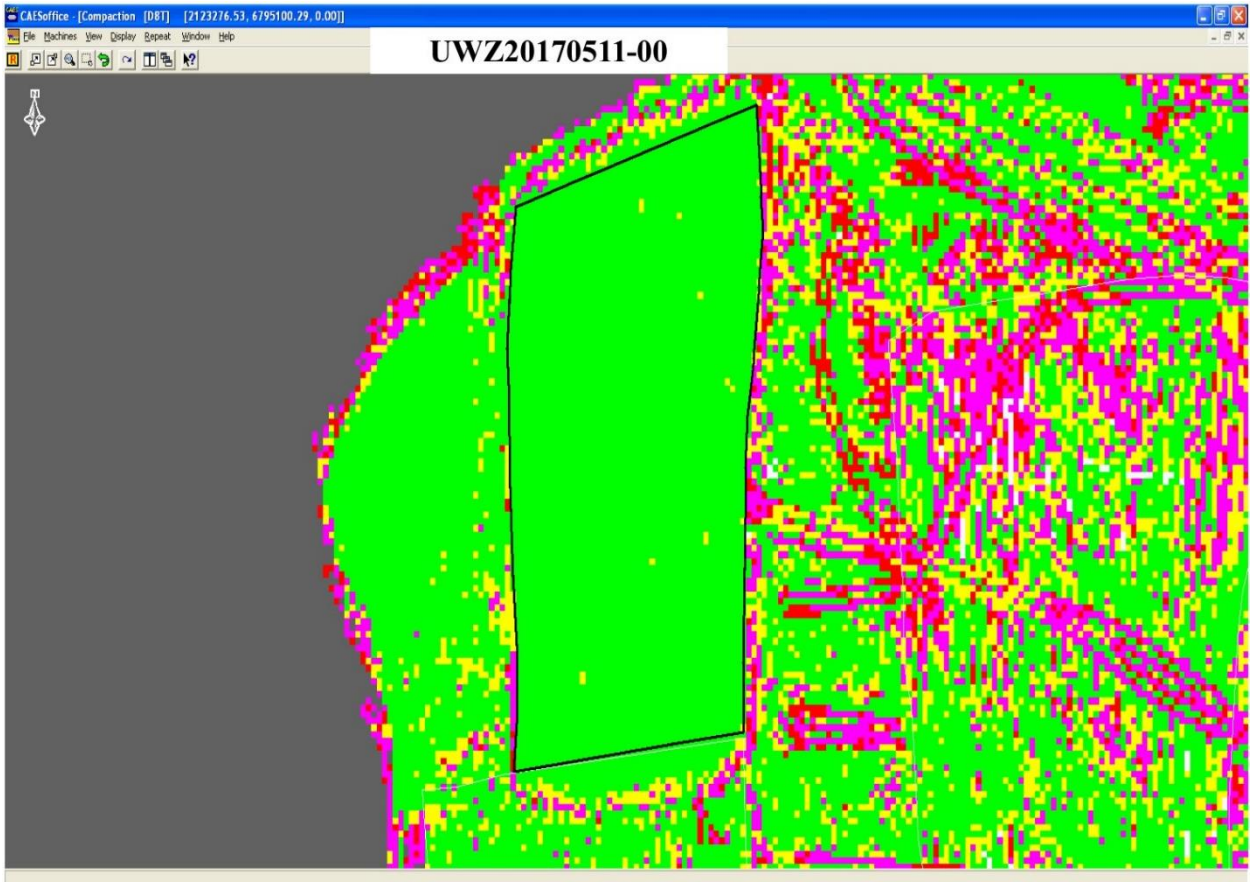
Appendix A2. RRM Lift Approval Summaries (*continued*)

MAY 2017										
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 (%)
5/1/17	UWZ20170425-00	0	1,519	1,519	99.6	1.0	NA	0	0	N/A
5/1/17	UWY24170427-00	1	1,232	2,751	99.5	0.9	417	0	0	N/A
5/2/17	UWY27170427-00	0	1,597	4,348	99.8	1.0	NA	0	0	N/A
5/3/17	UWY29170502-00	1	780	5,128	99.2	0.9	468	0	0	N/A
5/3/17	UWZ20170502-00	0	1,581	6,709	99.9	1.0	NA	0	0	N/A
5/4/17	UW1E30170425-00	0	1,905	8,614	99.1	0.9	NA	0	0	N/A
5/8/17	UWY27170504-00	1	1,597	10,211	99.8	1.0	468	0	0	N/A
5/8/17	UWY24170504-00	0	1,391	11,602	99.7	1.0	NA	0	0	N/A
5/9/17	UWY29170508-00	0	780	12,382	98.4	0.9	NA	0	0	N/A
5/10/17	UWZ20170509-00	0	1,265	13,647	99.3	0.8	NA	0	0	N/A
5/10/17	UWY24170509-00	1	1,391	15,038	99.1	1.0	468	0	0	N/A
5/11/17	UWY27170511-00	0	1,413	16,451	98.4	1.0	NA	0	0	N/A
5/15/17	UWY29170511-00	0	694	17,145	98.3	0.8	N/A	0	0	N/A
5/16/17	UWZ20170511-00	1	1,431	18,576	99.2	0.9	294	0	0	N/A
5/17/17	UWY24170516-00	1	1,391	19,967	99.8	1.0	468	0	0	N/A
5/17/17	UW1F24170501-00	0	3,310	23,277	99.5	1.0	N/A	0	0	N/A
5/18/17	UWY29170516-00	0	622	23,899	98.7	0.6	N/A	0	0	N/A
5/18/17	UWY27170516-00	0	1,272	25,171	99.3	0.9	N/A	0	0	N/A
5/18/17	UW1E30170518-00	0	1,905	27,076	99.6	0.9	N/A	0	0	N/A
5/23/17	UW1F24170518-00	1	2,979	30,055	99.2	0.9	505	0	0	N/A
5/24/17	UW1E30170523-00	1	2,117	32,172	99.2	1.0	512	0	0	N/A
5/24/17	UW1I24170522-00	2	0	32,172	96.2	0.0	489	0	0	N/A
5/25/17	UW1F24170523-00	0	3,117	35,289	99.6	0.9	N/A	0	0	N/A
5/31/17	UW1E30170525-00	1	2,468	37,757	99.3	1.0	512	0	0	N/A
5/31/17	UW1I24170530-00	1	2,016	39,773	99.5	0.9	512	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.2
Total Quantity Approved (yd^3) = 39,773
Total # of Nuclear Density Gauge Tests = 3
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 3,314
Total Average Thickness (ft)= 0.9

Appendix A2. RRM Lift Approval Summaries *continued*)

CAES compaction screen example from May 2017. 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.



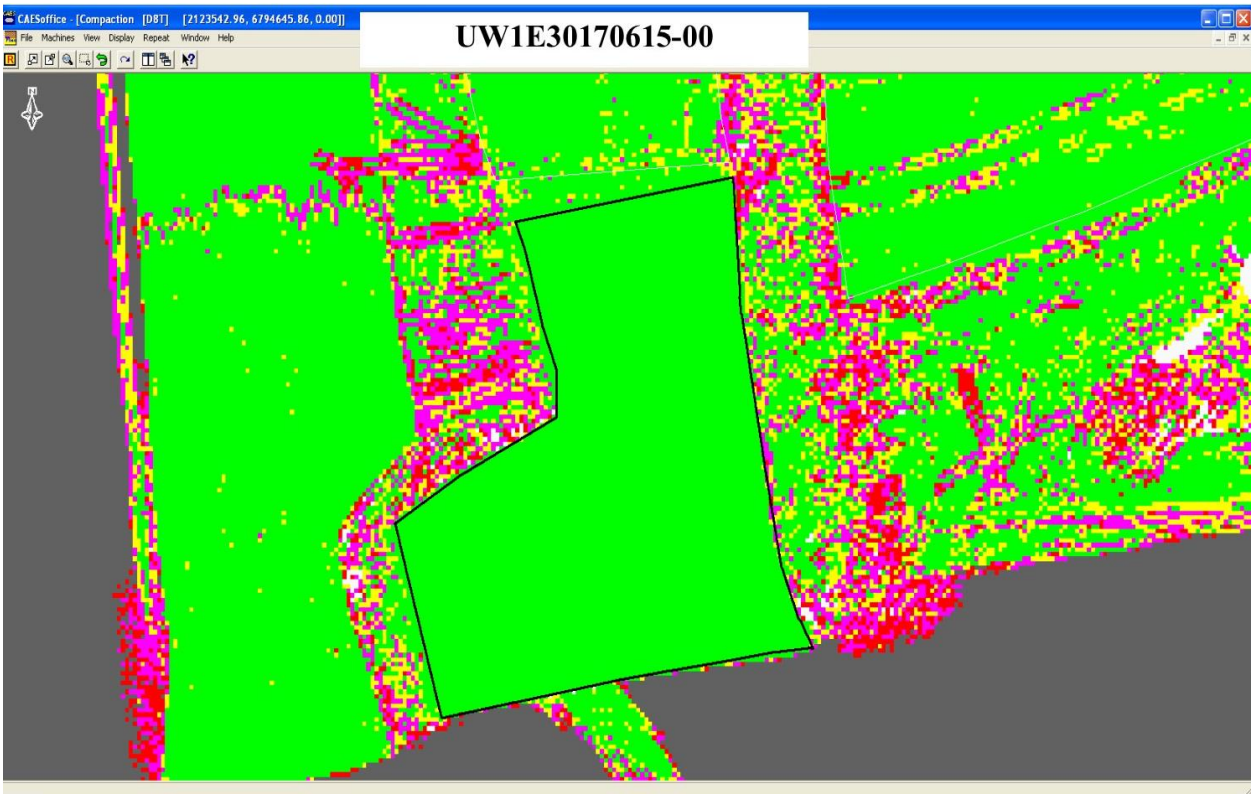
Appendix A2. RRM Lift Approval Summaries (*continued*)

June 2017										
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 (%)
6/5/17	UW1F24170602-00	1	2,771	2,771	98.8	0.8	512	0	0	N/A
6/6/17	UW1E30170531-00	0	1,792	4,563	99	0.8	N/A	0	0	N/A
6/7/17	UW1F24170606-00	1	1,997	6,560	99.6	0.6	512	0	0	N/A
6/12/17	UW1E30170608-00	1	2,421	8,981	99.8	0.9	512	0	0	N/A
6/12/17	UW1I24170608-00	2	2,240	11,221	99.6	1.0	505, 512	0	0	N/A
6/14/17	UW1E30170613-00	0	2,421	13,642	98.1	0.9	N/A	0	0	N/A
6/15/17	UW1I24170613-00	1	1,778	15,420	99.5	0.7	512	0	0	N/A
6/19/17	UW1E30170615-00	1	2,341	17,761	99.1	0.8	429	0	0	N/A
6/22/17	UW1F24170620-00	1	3,508	21,269	99.7	1.0	512	0	0	N/A
6/26/17	UW1E30170622-00	1	2,341	23,610	99.6	0.8	512	0	0	N/A
6/29/17	UW1I24170627-00	1	2,286	25,896	99.2	0.9	512	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.3
Total Quantity Approved (yd^3) = 25,896
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 10
Quantity per Moisture Test (yd^3) = 2,590
Total Average Thickness (ft)= 0.8

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

CAES compaction screen example from June 2017. 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.



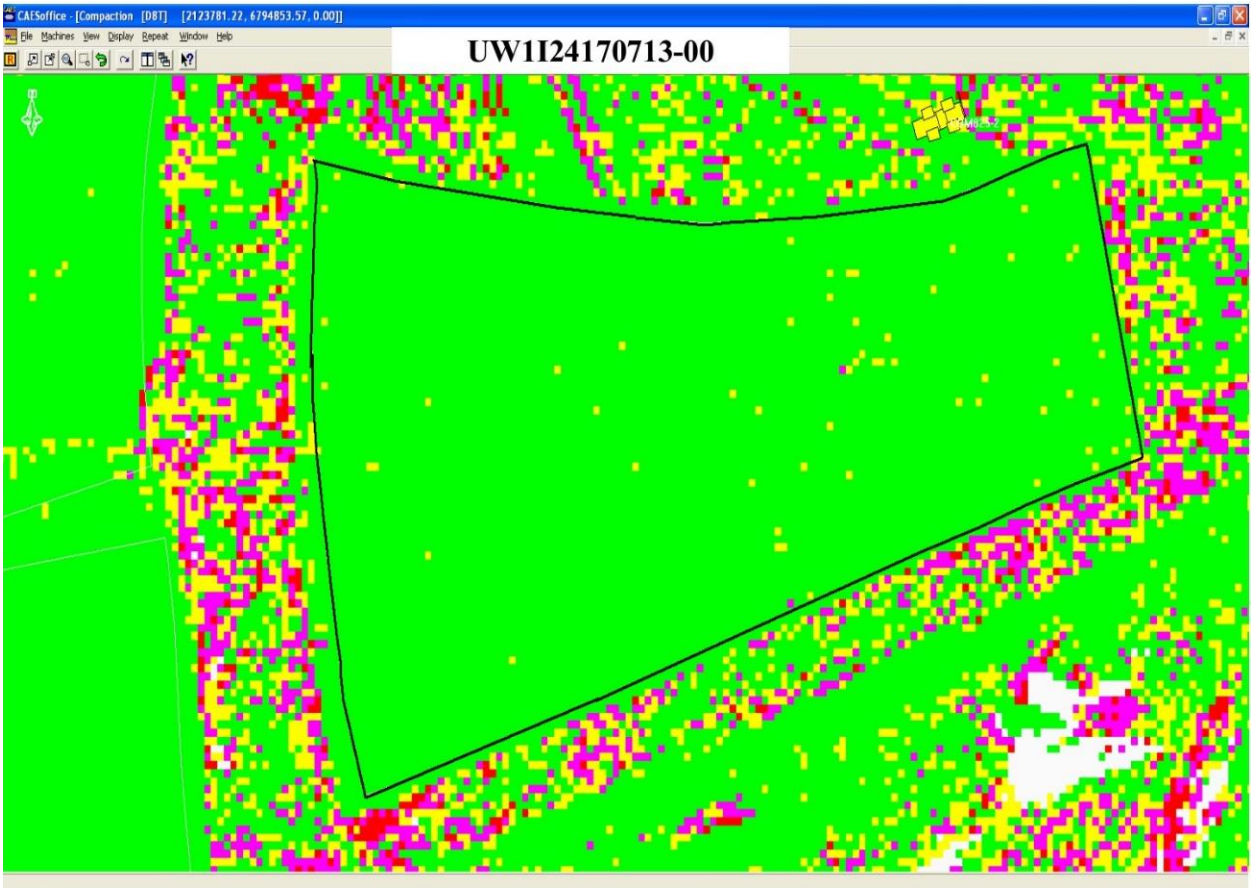
Appendix A2. RRM Lift Approval Summaries (*continued*)

July 2017										
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 (%)
7/11/17	UW1I24170711-00	1	0	0	99.1	0.0	512	0	0	N/A
7/17/17	UW1I24170713-00	1	2,414	2,414	99	0.9	512	0	0	N/A
7/17/17	UW1E30170713-00	1	0	2,414	99.7	0.0	512	0	0	N/A
7/20/17	UW1E30170627-00	1	3,243	5,657	99.6	1.0	512	0	0	N/A
7/24/17	UW1I24170718-00	1	2,733	8,390	99.7	0.9	505	0	0	N/A
7/26/17	UW1E30170721-00	3	3,088	11,478	99	0.9	512	0	0	N/A
7/31/17	UW1I24170726-00	1	3,036	14,514	99.5	1.0	512	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.4
Total Quantity Approved (yd^3) = 14,514
Total # of Nuclear Density Gauge Tests = 0
Total # of Moisture Tests = 9
Quantity per Moisture Test (yd^3) = 2,073
Total Average Thickness (ft)= 0.9

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

CAES compaction screen example from July 2017. 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.



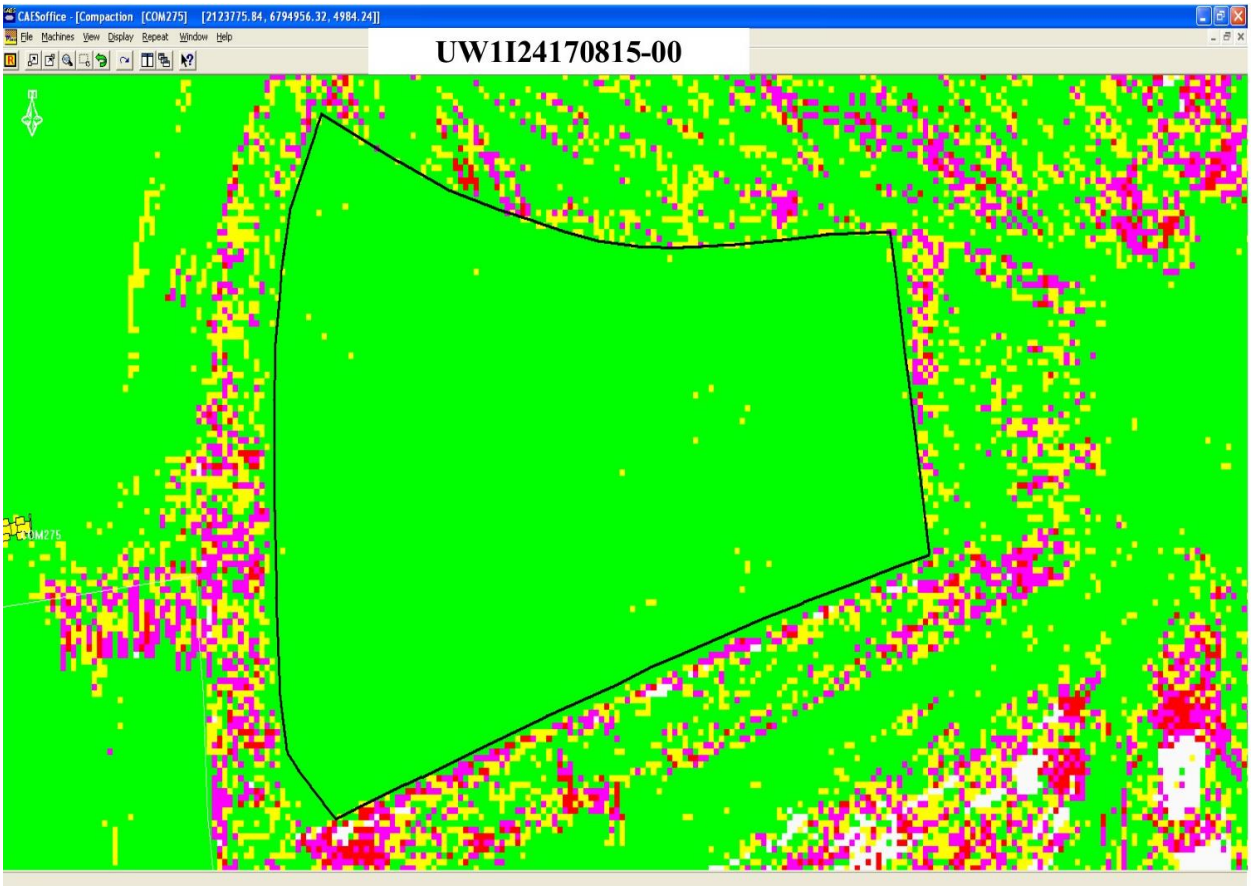
Appendix A2. RRM Lift Approval Summaries (*continued*)

August 2017										
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 (%)
8/1/17	UW1E30170728-00	1	2,438	2,438	99.6	0.7	512	0	0	N/A
8/2/17	UW1I24170801-00	1	2,406	4,844	99.7	0.8	512	0	0	N/A
8/8/17	UW1E30170803-00	1	2,786	7,630	99.9	0.8	512	0	0	N/A
8/9/17	UW1I24170808-00	1	2,493	10,123	98.8	0.7	512	0	0	N/A
8/15/17	UW1I24170810-00	1	3,206	13,329	99.6	0.9	512	0	0	N/A
8/16/17	UW1E30170814-00	1	3,352	16,681	99.4	0.9	515	0	0	N/A
8/21/17	UW1E30170817-00	0	1,247	17,928	99.9	0.9	N/A	0	0	N/A
8/22/17	UW1A31170822-00	1	2,160	20,088	99.4	1.0	515	0	0	N/A
8/22/17	UW1I24170815-00	2	3,567	23,655	99.5	1.0	512, 515	0	0	N/A
8/23/17	UW1E30170822-00	0	1,247	24,902	99.4	0.9	N/A	0	0	N/A
8/24/17	UW1A31170824-00	1	1,944	26,846	99.7	0.9	515	0	0	N/A
8/28/17	UW1E30170824-00	1	1,042	27,888	93.6	0.9	515	1	0	90.7
8/29/17	UW1A31170829-00	1	1,857	29,745	99.7	0.9	515	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.1
Total Quantity Approved (yd^3) = 29,745
Total # of Nuclear Density Gauge Tests = 1
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 2,479
Total Average Thickness (ft)= 0.9

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

CAES compaction screen example from August 2017. 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.



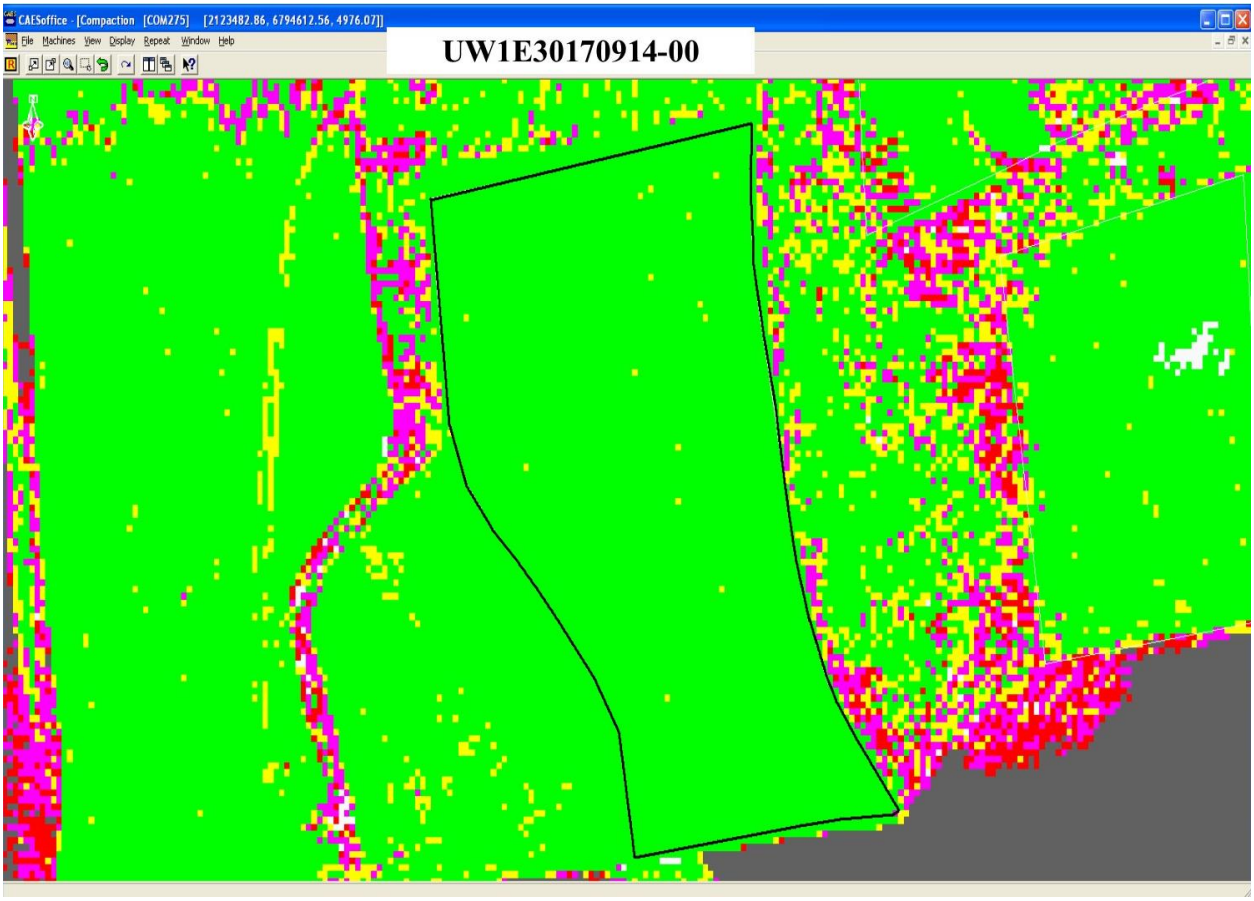
Appendix A2. RRM Lift Approval Summaries (*continued*)

September 2017										
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 (%)
9/5/17	UW1A31170905-00	1	1,516	1,516	99.3	1.0	515	0	0	N/A
9/5/17	UW1E30170905-00	0	1,252	2,768	99.2	0.9	N/A	0	0	N/A
9/6/17	UW1E30170906-00	0	1,113	3,881	99.7	0.8	N/A	0	0	N/A
9/8/17	UW1A31170906-00	1	1,364	5,245	99.8	0.9	515	0	0	N/A
9/8/17	UW1I24170829-00	1	2,893	8,138	98.3	0.8	515	0	0	N/A
9/11/17	UW1E30170906-01	0	2,349	10,487	99.7	0.9	N/A	0	0	N/A
9/13/17	UW1F24170912-00	1	0	10,487	99.9	0.0	512	0	0	N/A
9/13/17	UW1E30170912-00	1	2,610	13,097	99.7	1.0	515	0	0	N/A
9/14/17	UW1E30170914-00	1	2,106	15,203	99.7	1.0	515	0	0	N/A
9/19/17	UW1B18170914-00	1	1,821	17,024	99.9	1.0	514	0	0	N/A
9/20/17	UW1I24170908-00	2	3,294	20,318	99.5	0.9	515, 477	0	0	N/A
9/21/17	UW1F24170919-00	1	1,459	21,777	99.4	0.9	515	1	1	94.5
9/21/17	UW1E30170919-00	0	1,866	23,643	98.1	1.0	N/A	0	0	N/A
9/26/17	UW1B18170921-00	1	1,821	25,464	99.4	1.0	515	0	0	N/A
9/27/17	UW1F24170926-00	1	1,459	26,923	99.5	0.9	515	1	1	94.4
9/27/17	UW1E30170926-00	0	1,866	28,789	98.3	1.0	N/A	0	0	N/A

Average CAES Screen Passing Pixels (%)= 99.3
Total Quantity Approved (yd^3) = 28,789
Total # of Nuclear Density Gauge Tests = 3
Total # of Moisture Tests = 12
Quantity per Moisture Test (yd^3) = 2,617
Total Average Thickness (ft)= 0.9

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

CAES compaction screen example from September 2017. 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

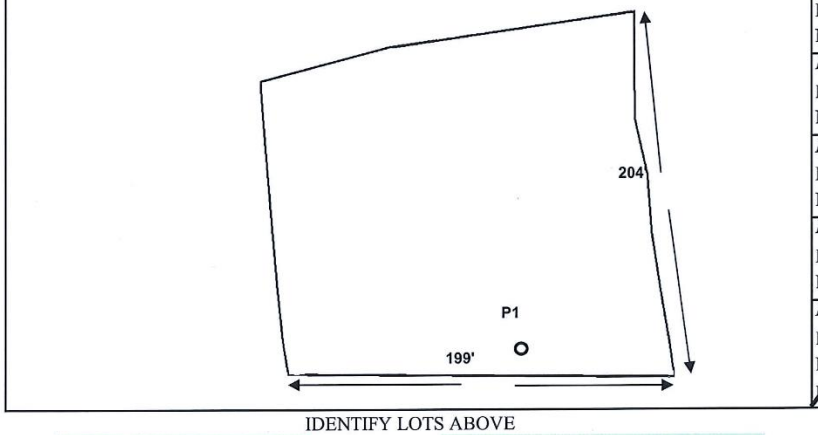


Appendix A2. RRM Lift Approval Package

LIFT APPROVAL FORM

PROJECT: Moab UMTRA **OTHER**

NW CORNER **DATE:** 4/25/2017



P 1	6794603 N. 2123364E.				
EW:	199	X	0.689	=	137
NS:	204	X	0.939	=	192
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: UWY24170425-00 NW CORNER: 6794795 N. 2123227 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): 36,946 Lift Volume (yd³): 1,368

Comments: This is the fourth lift placed in the last seven feet of design grade. QC verified that the lift area was scarified prior to placement. The daily moisture test for 4/25/2017 was performed on this lift with satisfactory results. On 4/26/2017 QC performed an in place moisture/ density test in correlation with CAES. This test was satisfactory.

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, 2

LIFT APPROVED BY: Mitch Hogan/ DATE: 4/26/2017 TIME: 1431

Kathy Ivy 5/31/17
QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783
Rev. 1

QC-F-001
File index No. 43.8.2
Page 1 of 6

Slope Elevation Survey

	Average lift thickness=		1.0	Bounding Box	Northing	Easting	
	Grid Size=	45'		Lower Left	N		
Lift ID:	UWY24170425-00			Upper Right		A	
Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6794654	2123250	4972.3	6794654	2123250	4973.3	1.0	OK
6794699	2123250	4973.4	6794699	2123250	4974.3	0.9	OK
6794744	2123250	4974.4	6794744	2123250	4975.4	1.0	OK
6794789	2123250	4976.3	6794789	2123250	4977.0	0.7	OK
6794654	2123295	4972.4	6794654	2123295	4973.5	1.1	OK
6794699	2123295	4973.2	6794699	2123295	4974.3	1.1	OK
6794744	2123295	4974.2	6794744	2123295	4975.3	1.1	OK
6794789	2123295	4975.9	6794789	2123295	4976.7	0.8	OK
6794654	2123340	4972.4	6794654	2123340	4973.5	1.1	OK
6794699	2123340	4973.3	6794699	2123340	4974.4	1.1	OK
6794744	2123340	4974.4	6794744	2123340	4975.5	1.2	OK
6794789	2123340	4975.9	6794789	2123340	4977.0	1.0	OK
6794654	2123385	4972.5	6794654	2123385	4973.5	1.0	OK
6794699	2123385	4973.4	6794699	2123385	4974.5	1.1	OK
6794744	2123385	4974.4	6794744	2123385	4975.5	1.1	OK
6794789	2123385	4975.7	6794789	2123385	4976.9	1.2	OK
6794654	2123430	4972.5	6794654	2123430	4973.4	0.9	OK
6794699	2123430	4973.3	6794699	2123430	4974.1	0.8	OK
6794744	2123430	4974.1	6794744	2123430	4974.8	0.7	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
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						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

MH 4/26/17

Page 2 of 6

% =6	99.3%
Elevation Avg	4974.9
Total =6	3411
Total Lines	3434

Pass

Minimum Number of Machine Passes
3

Lift ID: UWY24170425-00

Northing	Easting	Elevation	# of Passes	Passes =6	Count
6794771	2123229	4975.9	6	1	1
6794774	2123229	4976.0	6	1	1
6794777	2123229	4976.1	6	1	1
6794780	2123229	4976.3	4		1
6794784	2123229	4976.3	5		1
6794787	2123229	4976.5	4		1
6794790	2123229	4976.7	6	1	1
6794793	2123229	4977.0	5		1
6794728	2123232	4974.8	6	1	1
6794731	2123232	4974.8	6	1	1
6794734	2123232	4975.0	5		1
6794738	2123232	4975.0	5		1
6794741	2123232	4975.2	4		1
6794744	2123232	4975.2	4		1
6794748	2123232	4975.3	5		1
6794751	2123232	4975.4	6	1	1
6794754	2123232	4975.4	6	1	1
6794757	2123232	4975.5	6	1	1
6794761	2123232	4975.6	6	1	1
6794764	2123232	4975.7	6	1	1
6794767	2123232	4975.8	6	1	1
6794771	2123232	4975.9	6	1	1
6794774	2123232	4976.1	6	1	1
6794777	2123232	4976.0	6	1	1
6794780	2123232	4976.2	6	1	1
6794784	2123232	4976.4	5		1
6794787	2123232	4976.6	6	1	1
6794790	2123232	4976.8	6	1	1
6794793	2123232	4977.0	4		1
6794797	2123232	4977.3	2		1
6794685	2123236	4973.7	6	1	1
6794689	2123236	4973.8	6	1	1
6794692	2123236	4973.8	6	1	1
6794695	2123236	4973.9	6	1	1
6794698	2123236	4974.0	6	1	1
6794702	2123236	4974.1	6	1	1
6794705	2123236	4974.2	6	1	1
6794708	2123236	4974.3	6	1	1
6794711	2123236	4974.2	6	1	1
6794715	2123236	4974.3	6	1	1
6794718	2123236	4974.4	6	1	1
6794721	2123236	4974.5	6	1	1
6794725	2123236	4974.6	6	1	1
6794728	2123236	4974.7	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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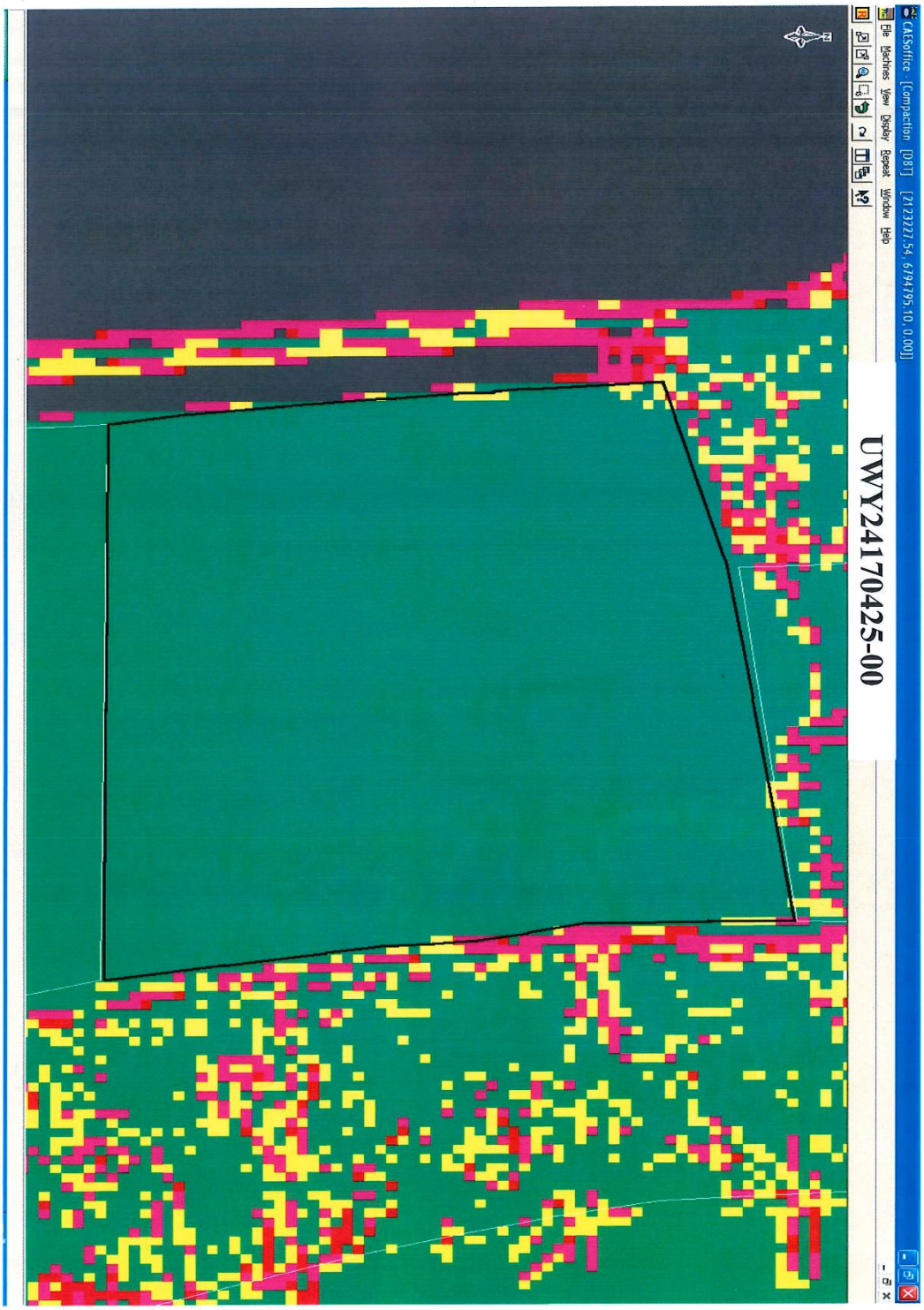
CATSoffice - [Compaction [D8T] [2123227.54, 6794795.10, 0.00]]
File Machines View Display Repeat Window Help
UWY24170425-00

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

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: UWY24170425-00 DATE: 4/25/2017

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 _____

N/A

_____ 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 _____ (%)

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

N/A

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

MOISTURE DETERMINATION

ASTM D4643

Container ID 211

Scale Serial # 14725064 Last Calibration Date: 1/5/17

Mass of container & wet specimen (M_{cms})	561.9	g
Mass of container & dry specimen (M_{cds})	532.5	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	29.4	g
Mass of container (M_c)	210.8	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	321.7	g
Moisture content (w) $w = (M_w / M_s) \times 100$	9.1	%

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

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

$\rho d = (100 \times$ ##### $) / (100 +$ 9.1 $) =$ 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 / 117.4 x 100 = 0.0 %

Soil Description: Light reddish brown, very fine to medium, moderately graded sand with some clay.

Proctor ID: RRM # 468

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.4 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.4 (%)

Required Moisture: 8.4 % to 14.4 %

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: 4/25/17

Failed Moisture

Failed Compaction Time: 1418

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

Kathy Ley 5/31/17

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783

QC-F-002
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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER**

LIFT IDENTIFICATION: UWY24170425-00 DATE: 4/26/2017

TEST ID NUMBER(S): # 2

TEST LOCATION: P1 TEST METHOD: ____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 36262

Last Calibration Date: 12/1/16

Daily Standard Counts: *On-Cell Standard*

Density 2667 Moisture 505

Method A (Direct Transmission)

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

Moisture Count 111 Density Count 2123

Wet Density (ρ_m) 118.4 *(lbs/ft^3)* Dry Density 106.7 *(lbs/ft^3)*

Moisture Density 11.6 *(lbs/ft^3)* Moisture Fraction 10.9 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 211

Scale Serial # 14725064 Last Calibration Date: 1/5/17

Mass of container & wet specimen (M_{cms})	485.5	g
Mass of container & dry specimen (M_{cds})	458.2	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	27.3	g
Mass of container (M_c)	210.8	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	247.4	g
Moisture content (w) $w = (M_w / M_s) \times 100$	11.0	%

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

$\rho d = (100 \times 118.4) / (100 + 11.0) = 106.6$ *lbs/ft^3*

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

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

106.6 / 117.4 x 100 = 90.8 %

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_3)	g

N A

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: **Light reddish brown, very fine to medium, moderately graded sand with some clay.**

Proctor ID: **RRM # 468**

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.4 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.4 (%)

Required Moisture: 8.4 % to 14.4 %

Required Percent Compaction: 90.0 (%)

Comments:

Off cell standard: DS- 2351 MS- 500. 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: 4/26/17

Failed Moisture

Failed Compaction Time: 1014

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

Kathy Ivey QA/QC APPROVAL 9/31/17 DATE

Density Testing
DOE-EM/GJRAC1783

QC-F-002
File Index No. 43.8.2
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Appendix A8.
Spoils Embankment

Standard Proctor Test Results Summary
Lift Approval Summaries
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 %	Proctor Description
Spoils #1 (2017)	3/15/17	4/20/17	112.6	14.7	Greyish in color and consists of mostly fines.
Spoils #2 (2017)	3/15/17	4/20/17	113.2	13.2	Greyish in color and consists of mostly fines.
Spoils #3 (2017)	3/16/17	4/20/17	114.0	13.6	Greyish in color and consists of mostly fines.
Spoils #4 (2017)	3/24/17	4/20/17	118.5	11.5	Greyish in color and consists of mostly fines.
Spoils #5 (2017)	3/24/17	4/20/17	120.2	11.0	Greyish in color and consists of mostly fines mixed with some shale.
Spoils #6 (2017)	3/31/17	4/20/17	114.3	13.2	Top Soil, Greyish in color and consists of mostly fines.
Spoils #7 (2017)	3/31/17	4/20/17	117.8	12.0	Tannish in color and consists of mostly fines.
Spoils #8 (2017)	4/1/16	4/20/17	121.0	10.5	Greyish in color and consists of mostly fines mixed with shale.
Spoils #9 (2017)	4/4/17	4/20/17	118.0	11.7	Tannish in color and consists of mostly fines. Also contains a small amount of shale.
Spoils #10 (2017)	4/5/17	4/20/17	122.0	10.2	Greyish in color and consists of a good amount of shale.
Spoils #11 (2017)	4/6/17	4/20/17	121.0	10.3	Greyish in color and consists of a good amount of shale.
Spoils #12 (2017)	4/10/17	6/1/17	122.3	10.1	Tannish in color and consists of fines mixed with shale.
Spoils #13 (2017)	4/11/17	6/1/17	124.5	9.8	Tannish in color and consists of fines mixed with shale.
Spoils #14 (2017)	4/12/17	6/1/17	118.7	11.4	Grey in color and consists of fines mixed with a small amount of shale.
Spoils #15 (2017)	4/13/17	6/1/17	120.9	12.0	Tannish in color and consists of fines mixed with shale.
Spoils #16 (2017)	4/18/17	6/1/17	119.3	11.9	Tannish in color and consists of fines and mixed with a small amount of shale.
Spoils #17 (2017)	4/19/17	6/1/17	120.0	11.4	Grey in color and consists of fines and shale.
Spoils #18 (2017)	4/20/17	6/1/17	121.8	11.6	Tannish in color and consists of fines mixed with shale.
Spoils #19 (2017)	4/25/17	6/1/17	123.8	9.7	Grey in color and consists of fines mixed with shale.
Spoils #20 (2017)	4/26/17	6/1/17	119.3	11.8	Grey in color and consists of fines mixed with a small amount of shale.
Spoils #21 (2017)	4/27/17	6/1/17	123.0	10.0	Tannish in color and consists of fines mixed with shale.

Appendix A8. Spoils Embankment Standard Proctor Test Results Summary *(continued)*

Proctor ID #	Date Sampled	Date Approved	Maximum Dry Density (lb/ft^3)	Optimum Moisture Content %	Proctor Description
Spoils #22 (2017)	5/2/17	6/1/17	121.4	10.1	Grey in color and consists of fines mixed with shale.
Spoils #23 (2017)	5/3/17	6/1/17	118.7	11.6	Grey in color and consists of fines mixed with a small amount of shale.
Spoils #24 (2017)	5/4/17	6/1/17	121.7	10.0	Tan in color and consists of fines mixed with a large amount of shale.
Spoils #25 (2017)	5/10/17	6/1/17	119.8	10.8	Tannish/Grey in color and consists of fines mixed with shale.

lb/ft^3 = pounds per cubic foot

Appendix A8. Spoils Embankment Lift Approval Summary

March 2017										
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 (%)
3/20/17	USA88170320-00	0	4,815	4,815	N/A	0.8	Spoils #3 (2017)	3	0	96.0
3/21/17	USA88170321-00	0	4,815	9,630	N/A	0.8	Spoils #3 (2017)	3	0	90.6
3/21/17	USA88170321-01	0	5,778	15,408	N/A	1.0	Spoils #3 (2017)	4	0	93.2
3/21/17	USA88170321-02	1	5,778	21,186	N/A	1.0	Spoils #3 (2017)	4	0	94.2
3/21/17	USA88170321-03	1	4,815	26,001	N/A	0.8	Spoils #3 (2017)	3	0	94.2
3/22/17	USA88170322-00	0	5,296	31,297	N/A	0.9	Spoils #3 (2017)	3	0	98.9
3/22/17	USA88170322-01	1	3,752	35,048	N/A	0.9	Spoils #3 (2017)	3	1	94.3
3/22/17	USA88170322-02	0	3,752	38,800	N/A	0.9	Spoils #3 (2017)	3	0	97.6
3/23/17	USA88170323-00	1	3,752	42,552	N/A	0.9	Spoils #3 (2017)	3	0	97.2
3/23/17	USA88170323-01	0	3,752	46,304	N/A	0.9	Spoils #3 (2017)	3	0	94.6
3/23/17	USA88170323-02	0	2,207	48,511	N/A	0.8	Spoils #3 (2017)	3	0	96.3
3/23/17	USA88170323-03	0	2,207	50,718	N/A	0.8	Spoils #3 (2017)	3	0	95.3
3/27/17	USA88170327-00	1	2,648	53,366	N/A	1.0	Spoils #4 (2017)	3	1	91.3
3/27/17	USA88170327-01	1	11,556	64,922	N/A	1.0	Spoils #4 (2017)	7	0	92.7
3/28/17	USA88170328-00	0	11,000	75,922	N/A	0.9	Spoils #4 (2017)	7	0	94.4
3/29/17	USA88170329-00	1	11,000	86,922	N/A	0.9	Spoils #4 (2017)	7	0	96.1
3/29/17	USA88170329-01	1	11,000	97,922	N/A	0.9	Spoils #3 (2017)	7	0	95.5
3/30/17	USA88170330-00	0	16,875	114,797	N/A	0.8	Spoils #4 (2017)	10	1	94.1

Average of Inplace Density (%)=	94.8
Total Quantity Approved (yd^3) =	114,797
Total # of Nuclear Density Gauge Tests =	79
Total # of Moisture Tests =	8
Quantity per Moisture Test (yd^3) =	14,350
Total Average Thickness (ft)=	0.9

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

April 2017										
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 (%)
4/3/17	USA88170403-00	1	3,667	3,667	N/A	0.9	Spoils #7 (2017)	3	0	91.7
4/3/17	USA88170403-01	0	4,000	7,667	N/A	1.0	Spoils #7 (2017)	3	0	91.2
4/3/17	USA88170403-02	0	6,667	14,334	N/A	1.0	Spoils #7 (2017)	4	0	94.5
4/3/17	USA88170403-03	1	5,556	19,890	N/A	0.8	Spoils #7 (2017)	4	1	93.7
4/4/17	USA88170404-00	0	6,111	26,001	N/A	0.9	Spoils #7 (2017)	4	0	96.1
4/4/17	USA88170404-01	1	6,667	32,668	N/A	1.0	Spoils #7 (2017)	4	0	93.5
4/4/17	USA88170404-02	0	5,556	38,224	N/A	0.8	Spoils #7 (2017)	4	0	93.3
4/4/17	USA88170404-03	0	6,111	44,335	N/A	0.9	Spoils #7 (2017)	4	0	97.0
4/5/17	USA88170405-00	2	26,813	71,148	N/A	0.9	Spoils #7 & 8 (2017)	18	1	94.4
4/10/17	USA88170410-00	2	29,028	100,176	N/A	0.9	Spoils #10 (2017)	16	1	93.9
4/11/17	USA88170411-00	1	16,636	116,812	N/A	0.9	Spoils #10 (2017)	10	1	95.5
4/12/17	USA88170412-00	1	11,728	128,540	N/A	0.8	Spoils #10 (2017)	7	0	94.1
4/12/17	USA88170412-01	1	12,901	141,441	N/A	0.9	Spoils #10 (2017)	8	1	94.0
4/13/17	USA88170413-00	1	15,278	156,719	N/A	0.9	Spoils #10 (2017)	9	0	94.1
4/17/17	USA88170417-00	1	17,037	173,756	N/A	1.0	Spoils #12 (2017)	10	1	96.0
4/18/17	USA88170418-00	1	17,037	190,793	N/A	1.0	Spoils #12 (2017)	10	0	96.0
4/19/17	USA88170419-00	1	18,056	208,849	N/A	1.0	Spoils #12 (2017)	10	1	95.8
4/20/17	USA88170420-00	1	16,551	225,400	N/A	0.9	Spoils #12 (2017)	10	0	94.6
4/24/17	USA88170424-00	1	18,472	243,872	N/A	1.0	Spoils #12 (2017)	10	1	94.9
4/25/17	USA88170425-00	1	16,975	260,847	N/A	0.9	Spoils #12 (2017)	10	0	94.6
4/26/17	USA88170426-00	1	18,206	279,053	N/A	0.9	Spoils #12 (2017)	10	1	92.9
4/27/17	USA88170427-00	1	16,806	295,859	N/A	0.9	Spoils #12 (2017)	10	0	93.6
4/18/17	USA88170418-00[1]	0		295,859			Spoils #12 (2017)	1	0	98.4

Average of Inplace Density (%)= 94.3
Total Quantity Approved (yd^3) = 295,859
Total # of Nuclear Density Gauge Tests = 178
Total # of Moisture Tests = 19
Quantity per Moisture Test (yd^3) = 15,572
Total Average Thickness (ft)= 0.9

[1]This was a correlation test with Johanson and Tuttle

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

May 2017										
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 (%)
5/1/17	USA88170501-00	1	26,481	26,481	N/A	0.9	Spoils #19 (2017)	15	1	93.6
5/2/17	USA88170502-00	1	18,334	44,815	N/A	1.0	Spoils #19 (2017)	10	1	95.1
5/3/17	USA88170503-00	1	16,611	61,426	N/A	1.0	Spoils #19 (2017)	9	1	95.0
5/4/17	USA88170504-00	1	15,833	77,259	N/A	1.0	Spoils #19 (2017)	9	0	92.0
5/8/17	USA88170508-00	1	18,333	95,592	N/A	0.9	Spoils #21 (2017)	10	1	93.9
5/9/17	USA88170509-00	1	18,333	113,925	N/A	0.9	Spoils #21 (2017)	10	0	92.7
5/10/17	USA88170510-00	1	7,833	121,758	N/A	1.0	Spoils #21 (2017)	4	1	94.1
5/10/17	USA88170510-01	0	7,333	129,091	N/A	1.0	Spoils #21 (2017)	4	0	93.2
5/11/17	USA88170511-00	1	13,889	142,980	N/A	1.0	Spoils #21 (2017)	8	0	93.8
5/15/17	USA88170515-00	1	10,000	152,980	N/A	1.0	Spoils #21 (2017)	6	1	92.5
5/16/17	USA88170516-00	0	7,130	160,110	N/A	0.9	Spoils #21 (2017)	5	0	92.2
5/17/17	USA88170517-00	1	10,694	170,804	N/A	0.9	Spoils #21 (2017)	6	1	97.4
5/18/17	USA88170518-00	0	9,167	179,971	N/A	0.9	Spoils #21 (2017)	5	0	91.6

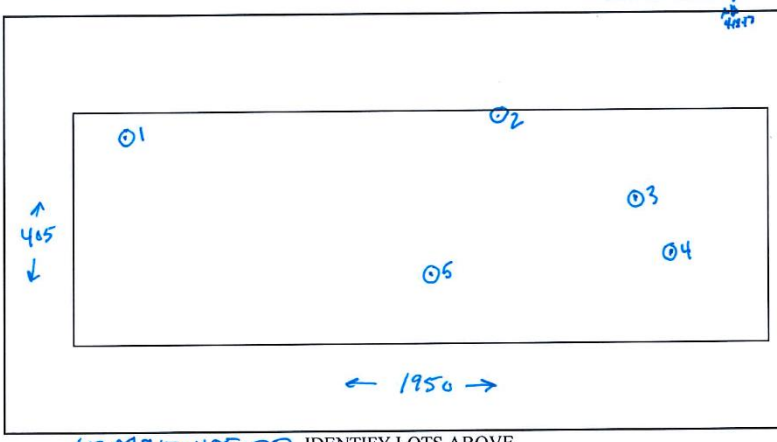
Average of Inplace Density (%)= 93.6
Total Quantity Approved (yd^3) = 179,971
Total # of Nuclear Density Gauge Tests = 101
Total # of Moisture Tests = 10
Quantity per Moisture Test (yd^3) = 17,997
Total Average Thickness (ft)= 1.0

Appendix A8. Spoils Embankment Lift Approval Package

LIFT APPROVAL FORM

PROJECT: Moab UMTRA **OTHER**

NW CORNER **DATE:** 4/6/2017



P 1	6797157 N. 2125524 E.			
EW:	1950	X 0.091	=	177
NS:	405	X 0.118	=	48
P 2	6797189 N. 2126540 E.			
EW:	1950	X 0.612	=	1193
NS:	405	X 0.039	=	16
P 3	6797038 N. 2126868 E.			
EW:	1950	X 0.780	=	1521
NS:	405	X 0.412	=	167
P 4	6796965 N. 2126987 E.			
EW:	1950	X 0.841	=	1640
NS:	405	X 0.592	=	240
P 5	6796892 N. 2126303 E.			
EW:	1950	X 0.490	=	956
NS:	405	X 0.773	=	313

Page 2 attached: Y N

USA88170405-00 IDENTIFY LOTS ABOVE

LIFT ID: 1st lift (1950' x 405') NW CORNER: 6797205 N. 2125347 E.

Uncompacted Thickness: 11" 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): 789,750 Lift Volume (yd³): ~~N/A~~ 26,813

Comments:

Ames started getting into shale @ borrow area - SW #8 (121.0 & 10.5% moist) will be applied starting on Test #8 - prior to test 8, 117.8 & 12.0% moist was used because the material was Tan and consisted of mostly fines.

Sand Cone Taken @ Test site 1.

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): 1-5

LIFT APPROVED BY: [signature] DATE: 4/6/2017 TIME: 15:39

[signature] 04/20/2017

QA/QC APPROVAL DATE

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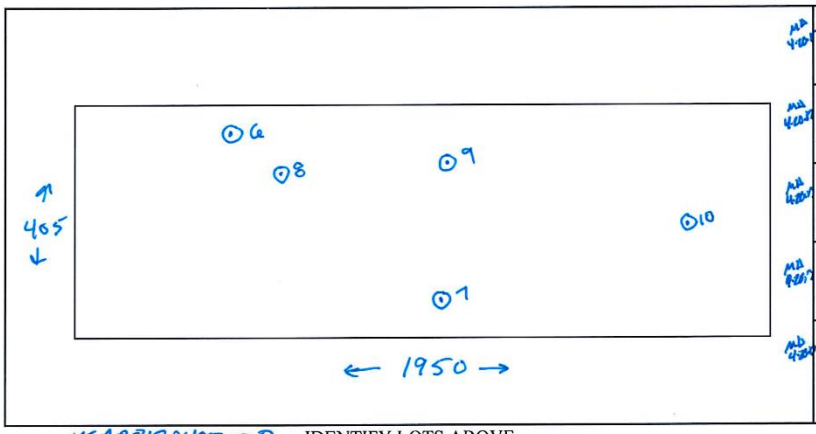
Appendix A8. Spoils Embankment Lift Approval Package (*continued*)

LIFT APPROVAL FORM

PROJECT: Moab UMTRA **OTHER**

NW CORNER **DATE:** 4/6/2017



P1	6797169 N. 2125842 E.				
	EW:	1950	X 0.254	=	495
	NS:	405	X 0.090	=	36
P2	6796830 N. 2126381 E.				
	EW:	1950	X 0.530	=	1034
	NS:	405	X 0.925	=	375
P3	6797098 N. 2125998 E.				
	EW:	1950	X 0.334	=	651
	NS:	405	X 0.265	=	107
P4	6797105 N. 2126441 E.				
	EW:	1950	X 0.561	=	1094
	NS:	405	X 0.239	=	97
P5	6796993 N. 2127164 E.				
	EW:	1950	X 0.932	=	1817
	NS:	405	X 0.524	=	212

Page 2 attached: Y N

USA88170405-00 IDENTIFY LOTS ABOVE

LIFT ID: 1st lift (1950' x 405') NW CORNER: 6797205 N. 2125347 E.

Uncompacted Thickness: 11" 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): 789,750 Lift Volume (yd³): N/A

Comments:

This page is a continuation of pg 1.

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): 6-10

LIFT APPROVED BY: [signature] DATE: 4/6/2017 TIME: 15:39

[signature] 04.20.2017

QA/QC APPROVAL DATE

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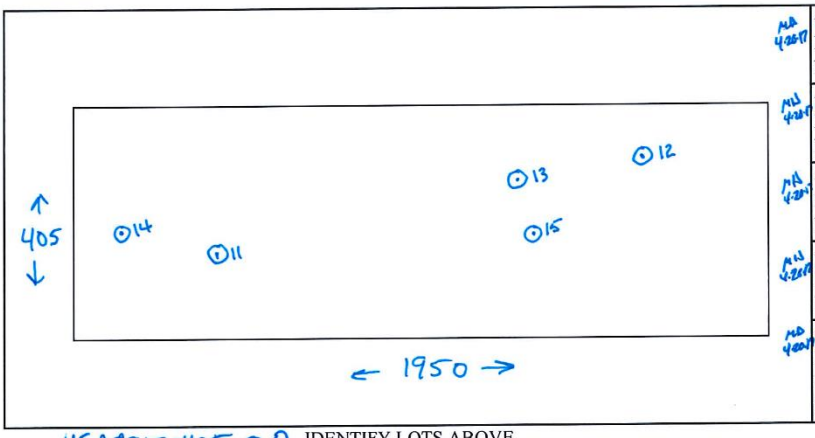
Appendix A8. Spoils Embankment Lift Approval Package (*continued*)

LIFT APPROVAL FORM

PROJECT: Moab UMTRA **OTHER**

NW CORNER **DATE:** 4/6/2017



P11	6796919 N. 2125836 E.			
EW:	1950	X 0.251	=	489
NS:	405	X 0.705	=	286
P12	6797135 N. 2127018 E.			
EW:	1950	X 0.852	=	1661
NS:	405	X 0.173	=	70
P13	6797091 N. 2126595 E.			
EW:	1950	X 0.640	=	1248
NS:	405	X 0.281	=	114
P14	6796978 N. 2125505 E.			
EW:	1950	X 0.081	=	158
NS:	405	X 0.510	=	207
P15	6797015 N. 2126657 E.			
EW:	1950	X 0.672	=	1310
NS:	405	X 0.468	=	190

Page 2 attached: Y N

USA88770405-00 IDENTIFY LOTS ABOVE

LIFT ID: 1st lift (1950' x 405') NW CORNER: 6797205 N. 2125347 E.

Uncompacted Thickness: 11" 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): 789,750 Lift Volume (yd³): N/A

Comments:

Moisture sample Taken on Test #11

This page is a continuation of pg 1.

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): 11-15

LIFT APPROVED BY: [signature] DATE: 4/6/2017 TIME: 15:39

[signature] 04-20-2017

QA/QC APPROVAL DATE

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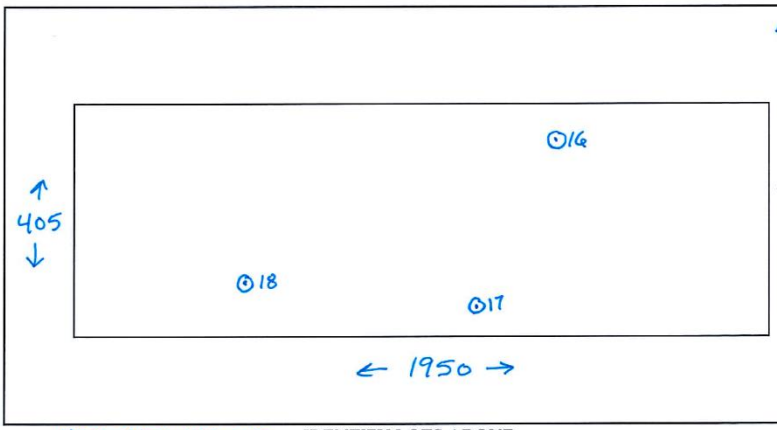
LIFT APPROVAL FORM

PROJECT: Moab UMTRA **OTHER**

NW CORNER **DATE:** 4/6/2017



P 1	6797154 N. 2126693 E.				
EW:	1950	X	0.690	=	1346
NS:	405	X	0.127	=	51
P 2	6797287 N. 6797177 N. 2126525 E.				
EW:	1950	X	0.604	=	1178
NS:	405	X	0.933	=	378
P 3	6797557 N. 6797857 N. 2125899 E.				
EW:	1950	X	0.283	=	552
NS:	405	X	0.859	=	348
P 4					
EW:		X		=	
NS:		X		=	
P 5					
EW:		X		=	
NS:		X		=	

Page 2 attached: Y N

USA88170405-00 IDENTIFY LOTS ABOVE

LIFT ID: 1st lift (1950' x 405') NW CORNER: 6797205 N. 2125347 E.

Uncompacted Thickness: 11" 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): 789,750 Lift Volume (yd³): N/A

Comments:

This pg is a continuation of pg 1

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): 16-18

LIFT APPROVED BY: [signature] DATE: 4/6/2017 TIME: 15:39

[signature] 04-22-2017

QA/QC APPROVAL DATE

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER**

LIFT IDENTIFICATION: USA8817040S-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/5/2017

TEST ID NUMBER(S): 1

TEST LOCATION: P1 TEST METHOD: x D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 103 Density Count 1575

Wet Density (ρ_m) 127.2 *(lbs/ft^3)* Dry Density 118.5 *(lbs/ft^3)*

Moisture Density 8.7 *(lbs/ft^3)* Moisture Fraction 7.4 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 Calibrated Vol. *(lbs/ft^3)* 0.03941

Bulk Density of sand (ρ_1) 1.27 *g/cm^3* 79.5 *lbs/ft^3*

Mass of Sand to Fill Cone & Plate (M_2) 1421.0 *g*

Mass of bottle & cone **before** filling cone, plate & hole	5500.1	g
Mass of bottle & cone **after** filling cone, plate & hole	1273.6	g
Mass of sand to fill cone, plate, & hole (M_1)	4226.5	g
Mass of sand to fill hole	2805.5	g
Mass of wet soil & container	4687.2	g
Mass of container	281.0	g
Mass of wet soil (M_3)	4406.2	g

Test Hole Volume

$V = (M_1 - M_2) / \rho_1$ 2203 *cm^3*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

Mass of container & wet specimen (M_{cms})	1904.7	g
Mass of container & dry specimen (M_{cds})	1853.3	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	51.4	g
Mass of container (M_c)	1235.6	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	617.7	g
Moisture content (w) $w = (M_w / M_s) \times 100$	8.3	%

Dry Mass of soil

$M_4 = 100\ M_3 / (w + 100)$ 4067.7 *g*

Wet Density

$\rho_m = (M_3 / V) \times 62.43$ 124.9 *lbs/ft^3*

Dry Density

$\rho_d = M_4 / V$ 1.8 *g/cm^3*

Dry Unit Weight

$\gamma_d = \rho_d \times 62.43$ 115.3 *lbs/ft^3*

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

$\rho d = (100 \times 124.9) / (100 + 8.3) =$ 115.3 *lbs/ft^3*

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

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

~~116.2~~ MD 4.20.17 / 117.8 x 100 = ~~98.6~~ 114.20.17 %

Soil Description: Tannish in color

Proctor ID: SW #7

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.8 (lbs/ft^3)

Optimum Moisture (w_{opt}) 12.0 (%)

Required Moisture: 7.0 % to 17.0 %

Required Percent Compaction: 90.0 (%)

Comments: 115.3 97.9

TEST RESULTS:

x Pass Date: 4/5/17

Failed Moisture

Failed Compaction Time: 10:23

By: Lynn Tuttle (print) (signature)

QA/QC APPROVAL 04.20.2017 DATE

Density Testing
DOE-EM/GJRAC1783

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER**

LIFT IDENTIFICATION: U3A9LT0405-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/5/2017

TEST ID NUMBER(S): 2

TEST LOCATION: P2 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 146 Density Count 1749

Wet Density (ρ_m) 122.3 *(lbs/ft^3)* Dry Density 109.1 *(lbs/ft^3)*

Moisture Density 13.2 *(lbs/ft^3)* Moisture Fraction 12.1 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MJL 4-20-17

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

$\rho d = (\ 100\ \times \_\_\_\_\ ) / (100 + \_\_\_\_\ ) = \_\_\_\_\_$ lbs/ft^3

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

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

109.1 / 117.8 x 100 = 92.6 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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

MJL 4-20-17

Soil Description: Tannish in color

Proctor ID: SW #7

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.8 (lbs/ft^3)

Optimum Moisture (w_{opt}) 12.0 (%)

Required Moisture: 7.0 % to 17.0 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/5/17

____ Failed Moisture

____ Failed Compaction Time: 10:48

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

Mike Hoppe 04.20.2017

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783

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

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: USA8470405-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/5/2017

TEST ID NUMBER(S): 3

TEST LOCATION: P3 TEST METHOD: _____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 115 Density Count 1905

Wet Density (ρ_m) 118.7 *(lbs/ft^3)* Dry Density 108.7 *(lbs/ft^3)*

Moisture Density 10.0 *(lbs/ft^3)* Moisture Fraction 9.2 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4-20-17

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

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

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

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

108.7 / 117.8 x 100 = 92.3 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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*

MH 4-20-17

Soil Description: Tannish in color

Proctor ID: SW #7

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.8 (lbs/ft^3)

Optimum Moisture (w_{opt}) 12.0 (%)

Required Moisture: 7.0 % to 17.0 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/5/17

_____ Failed Moisture

_____ Failed Compaction Time: 10:58

By: Lynn Tuttle (print) (signature)

QA/QC APPROVAL 04·20·2017 DATE

Density Testing
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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project USA8870405-00 **OTHER** _____

LIFT IDENTIFICATION: Lift #1 on spoils wedge (1950 x 405) DATE: 4/5/2017

TEST ID NUMBER(S): 4

TEST LOCATION: P4 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 115 Density Count 1604

Wet Density (ρ_m) 126.3 *(lbs/ft^3)* Dry Density 116.3 *(lbs/ft^3)*

Moisture Density 10.0 *(lbs/ft^3)* Moisture Fraction 8.6 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4.20.17

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

$\rho d = (100 \times \_\_\_\_) / (100 + \_\_\_\_) = \_\_\_\_$ lbs/ft^3

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

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

116.3 / 117.8 x 100 = 98.8 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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

MH 4.20.17

Soil Description: Tannish in color

Proctor ID: SW #7

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.8 (lbs/ft^3)

Optimum Moisture (w_{opt}) 12.0 (%)

Required Moisture: 7.0 % to 17.0 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/5/17

____ Failed Moisture

____ Failed Compaction Time: 11:15

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

QA/QC APPROVAL 04.20.2017 DATE

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

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** ____

LIFT IDENTIFICATION: Lift #1 on spoils wedge (1950 x 405) USA8S170405-00 DATE: 4/5/2017

TEST ID NUMBER(S): 5

TEST LOCATION: P5 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 106 Density Count 1640

Wet Density (ρ_m) 125.4 *(lbs/ft³)* Dry Density 116.3 *(lbs/ft³)*

Moisture Density 9.0 *(lbs/ft³)* Moisture Fraction 7.8 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4.20.17

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

$\rho d = (100 \times$ ____ $)/(100 +$ ____ $=$ ____ lbs/ft³

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

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

116.3 / *117.8* x 100 = 98.8 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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

N/A

Test Hole Volume $V = (M_1 - M_2)/\rho_1$ ____ cm³

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

MH 4.20.17

Soil Description: Tannish in color

Proctor ID: SW #7

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.8 (lbs/ft³)

Optimum Moisture (w_{opt}) 12.0 (%)

Required Moisture: 7.0 % to 17.0 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/5/17

Failed Moisture

Failed Compaction Time: 11:50

By: Lynn Tuttle *(print)* / [signature] *(signature)*

[signature] QA/QC APPROVAL 04.20.2017 DATE

Density Testing
DOE-EM/GJRAC1783

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

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER**

LIFT IDENTIFICATION: USMS170405-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/5/2017

TEST ID NUMBER(S): 6

TEST LOCATION: P6 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 108 Density Count 1756

Wet Density (ρ_m) 122.3 *(lbs/ft^3)* Dry Density 113.3 *(lbs/ft^3)*

Moisture Density 9.3 *(lbs/ft^3)* Moisture Fraction 8.2 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4.20.17

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

$\rho d = (\ 100\ \times \_\_\_\_\ ) / (100 + \_\_\_\_\ ) = \_\_\_\_\_$ lbs/ft^3

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

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

113.3 / 117.8 x 100 = 96.0 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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

MH 4.20.17

Soil Description: Tannish in color

Proctor ID: SW #7

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.8 (lbs/ft^3)

Optimum Moisture (w_{opt}) 12.0 (%)

Required Moisture: 7.0 % to 17.0 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/5/17

____ Failed Moisture

____ Failed Compaction Time: 12:40

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

Mike Hogan 04.20.2017

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER

LIFT IDENTIFICATION: USA8170405-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/5/2017

TEST ID NUMBER(S): 7

TEST LOCATION: P7 TEST METHOD: ___ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 107 Density Count 1855

Wet Density (ρ_m) 119.9 *(lbs/ft^3)* Dry Density 110.8 *(lbs/ft^3)*

Moisture Density 9.2 *(lbs/ft^3)* Moisture Fraction 8.3 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4.20.17

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

ρd = (100 x ___) / (100 + ___) = ___ lbs/ft^3

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

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

110.8 / 117.8 x 100 = 94.0 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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

MH 4.20.17

Soil Description: Tannish in color

Proctor ID: SW #7

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 117.8 (lbs/ft^3)

Optimum Moisture (w_{opt}) 12.0 (%)

Required Moisture: 7.0 % to 17.0 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/5/17

___ Failed Moisture

___ Failed Compaction Time: 13:07

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

QA/QC APPROVAL 04.20.2017 DATE

Density Testing
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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: USA8170405-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/5/2017

TEST ID NUMBER(S): 8

TEST LOCATION: P8 TEST METHOD: ____ D1556 __x__ D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 108 Density Count 1521

Wet Density (ρ_m) 128.7 *(lbs/ft³)* Dry Density 119.5 *(lbs/ft³)*

Moisture Density 9.3 *(lbs/ft³)* Moisture Fraction 7.7 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4-20-17

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

$\rho d = (100 \times \_\_\_\_) / (100 + \_\_\_\_) = \_\_\_\_$ *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

119.5 / 121.0 x 100 = 98.8 %

MH 4.20.17

Comments:

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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*

MH 4.20.17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft³)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

TEST RESULTS:

x Pass Date: 4/5/17

___ Failed Moisture

___ Failed Compaction Time: 13:28

By: Lynn Tuttle *(print)* *(signature)*

QA/QC APPROVAL 04.20.2017 DATE

Density Testing
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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER**

LIFT IDENTIFICATION: USARR70405-03 Lift #1 on spoils wedge (1950 x 405) DATE: 4/5/2017

TEST ID NUMBER(S): 9

TEST LOCATION: P9 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 101 Density Count 1595

Wet Density (ρ_m) 126.6 *(lbs/ft^3)* Dry Density 118.1 *(lbs/ft^3)*

Moisture Density 8.5 *(lbs/ft^3)* Moisture Fraction 7.2 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4.20.17

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

$\rho d = (100 \times \_\_\_\_) / (100 + \_\_\_\_) = \_\_\_\_$ lbs/ft^3

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

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

118.1 / ~~117.8~~ 121.0 x 100 = 97.6 %

Comments: MH 4.20.17

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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

MH 4.20.17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft^3)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

TEST RESULTS:

x Pass Date: 4/5/17

____ Failed Moisture

____ Failed Compaction Time: 14:49

By: Lynn Tuttle *(print)* *(signature)*

QA/QC APPROVAL 04.20.2017 DATE

Density Testing
DOE-EM/GJRAC1783

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

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project — OTHER ____

LIFT IDENTIFICATION: Lift #1 on spoils wedge (1950 x 405) USA 1950405-C? — DATE: 4/5/2017

TEST ID NUMBER(S): 10

TEST LOCATION: P10 — TEST METHOD: ____ D1556 __x__ D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2127 Moisture 628

Method A (Direct Transmission)

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

Moisture Count 108 Density Count 1863

Wet Density (ρ_m) 119.7 *(lbs/ft³)* Dry Density 110.5 *(lbs/ft³)*

Moisture Density 9.3 *(lbs/ft³)* Moisture Fraction 8.4 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4-20-17

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

$\rho d = (100 \times$ ____ $)/(100 +$ ____ $=$ ____ lbs/ft³

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

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

110.5 / ~~117.8~~ 121.0 x 100 = 91.3 % MH 4-20-17

Comments:

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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 $V = (M_1 - M_2) / \rho_1$ ____ cm³

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

MH 4-20-17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft³)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

TEST RESULTS:

- x Pass
- Failed Moisture
- Failed Compaction

Date: 4/5/17

Time: 16:10

By: Lynn Tuttle / [signature]
(print) *(signature)*

[signature] 04-20-2017

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER 5

LIFT IDENTIFICATION: USA81704O5-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/6/2017

TEST ID NUMBER(S): 11

TEST LOCATION: P11 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 118 Density Count 1842

Wet Density (ρ_m) 120.2 *(lbs/ft^3)* Dry Density 109.9 *(lbs/ft^3)*

Moisture Density 10.3 *(lbs/ft^3)* Moisture Fraction 9.4 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

Mass of container & wet specimen (M_{cms})	2114.3	g
Mass of container & dry specimen (M_{cds})	2041.1	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	73.2	g
Mass of container (M_c)	1235.6	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	805.5	g
Moisture content (w) $w = (M_w / M_s) \times 100$	9.1	%

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

$\rho d = (100 \times 120.2) / (100 + 9.1 = 110.2$ lbs/ft^3

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

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

110.2 / ~~117.8~~ 121.0 x 100 = 91.1 %

MH 4/20/17

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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*

MH 4/20/17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft^3)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

[x] Pass Date: 4/6/17

[ ] Failed Moisture

[ ] Failed Compaction Time: 10:20

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

QA/QC APPROVAL 04.20.2017 DATE

Density Testing
DOE-EM/GJRAC1783

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** 5

LIFT IDENTIFICATION: USA8170405-0 D Lift #1 on spoils wedge (1950 x 405) DATE: 4/6/2017

TEST ID NUMBER(S): 12

TEST LOCATION: P12 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 114 Density Count 1640

Wet Density (ρ_m) 125.3 *(lbs/ft^3)* Dry Density 115.5 *(lbs/ft^3)*

Moisture Density 9.9 *(lbs/ft^3)* Moisture Fraction 8.6 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

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

$\rho d = (\ 100\ \times \_\_\_\_\ ) / (100 + \_\_\_\_\ ) = \_\_\_\_\_$ lbs/ft^3

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

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

115.5 / 121.0 x 100 = 95.4 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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

MH 4.20.17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft^3)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/6/17

____ Failed Moisture

____ Failed Compaction Time: 10:32

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

MH 04.20.2017

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** 5

LIFT IDENTIFICATION: USA8170405-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/6/2017

TEST ID NUMBER(S): 13

TEST LOCATION: P13 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 102 Density Count 1939

Wet Density (ρ_m) 118.0 *(lbs/ft^3)* Dry Density 109.4 *(lbs/ft^3)*

Moisture Density 8.6 *(lbs/ft^3)* Moisture Fraction 7.9 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4-20-17

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

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

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

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

109.4 / 121.0 x 100 = 90.4 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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*

MH 4-20-17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft^3)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/6/17

___ Failed Moisture

___ Failed Compaction Time: 10:40

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

QA/QC APPROVAL 04.20.2017 DATE

Density Testing
DOE-EM/GJRAC1783

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

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project — OTHER: 5

LIFT IDENTIFICATION: Lift #1 on spoils wedge (1950 x 405) USA98170405-00 — DATE: 4/6/2017

TEST ID NUMBER(S): 14

TEST LOCATION: P14 — TEST METHOD: ___ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 101 Density Count 1805

Wet Density (ρ_m) 121.2 *(lbs/ft³)* Dry Density 112.6 *(lbs/ft³)*

Moisture Density 8.5 *(lbs/ft³)* Moisture Fraction 7.6 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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 $V = (M_1 - M_2) / \rho_1$ ____ cm³

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

(N/A — MH 4-20-17)

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

(N/A — MH 4-20-17)

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

$\rho d = (100 \times$ ____ $) / (100 +$ ____ $) =$ ____ 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

112.6 / *121.0* x 100 = 93.1 %

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft³)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

- x Pass
- Failed Moisture
- Failed Compaction

Date: 4/6/17

Time: 10:56

By: Lynn Tuttle *(print)* / [signature] *(signature)*

[signature] QA/QC APPROVAL — 04-20-2017 DATE

Density Testing
DOE-EM/GJRAC1783

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** 5

LIFT IDENTIFICATION: USA8170405-CD Lift #1 on spoils wedge (1950 x 405) DATE: 4/6/2017

TEST ID NUMBER(S): 15

TEST LOCATION: P15 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 143 Density Count 1733

Wet Density (ρ_m) 122.7 *(lbs/ft³)* Dry Density 109.9 *(lbs/ft³)*

Moisture Density 12.9 *(lbs/ft³)* Moisture Fraction 11.7 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4-20-17

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

$\rho d = (\ 100\ \times \_\_\_\_\ ) / (100 + \_\_\_\_\ ) = \_\_\_\_\ lbs/ft^3$

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

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

109.9 / 121.0 x 100 = 90.8 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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/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

MH 4-20-17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft³)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/6/17

Failed Moisture

Failed Compaction Time: 12:20

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

QA/QC APPROVAL 04.20.2017 DATE

Density Testing
DOE-EM/GJRAC1783

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** 5

LIFT IDENTIFICATION: USA8170405-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/6/2017

TEST ID NUMBER(S): 16

TEST LOCATION: P16 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 116 Density Count 1683

Wet Density (ρ_m) 124.2 *(lbs/ft^3)* Dry Density 114.1 *(lbs/ft^3)*

Moisture Density 10.1 *(lbs/ft^3)* Moisture Fraction 8.1 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4-20-17

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

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

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

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

114.1 / 121.0 x 100 = 94.3 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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*

MH 4-20-17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft^3)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/6/17

____ Failed Moisture

____ Failed Compaction Time: 12:45

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

Mike Hogan 04.20.2017

QA/QC APPROVAL DATE

Density Testing
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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** 5

LIFT IDENTIFICATION: USA#5170405-00 Lift #1 on spoils wedge (1950 x 405) DATE: 4/6/2017

TEST ID NUMBER(S): 17

TEST LOCATION: P17 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 109 Density Count 1815

Wet Density (ρ_m) 120.9 *(lbs/ft^3)* Dry Density 111.5 *(lbs/ft^3)*

Moisture Density 9.4 *(lbs/ft^3)* Moisture Fraction 8.4 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4-20-17

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

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

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

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

111.5 / 121.0 x 100 = 92.2 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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*

MH 4-20-17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft^3)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/6/17

____ Failed Moisture

____ Failed Compaction Time: 15:07

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

QA/QC APPROVAL 04.20.2017 DATE

Density Testing
DOE-EM/GJRAC1783

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FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** S

LIFT IDENTIFICATION: USA(MOHDS-OD Lift #1 on spoils wedge (1950 x 405) DATE: 4/6/2017

TEST ID NUMBER(S): 18

TEST LOCATION: P18 TEST METHOD: ____ D1556 x D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 24445

Last Calibration Date: 3/14/17

Daily Standard Counts: *On-Cell Standard*

Density 2123 Moisture 630

Method A (Direct Transmission)

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

Moisture Count 126 Density Count 1650

Wet Density (ρ_m) 125.0 *(lbs/ft^3)* Dry Density 113.9 *(lbs/ft^3)*

Moisture Density 11.1 *(lbs/ft^3)* Moisture Fraction 9.8 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID 1235.6

Scale Serial # 5500jte-1 Last Calibration Date: 3/17/17

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) $w = (M_w / M_s) \times 100$		%

MH 4.20.17

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

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

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

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

113.9 / 121.0 x 100 = 94.1 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus 1 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_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*

MH 4.20.17

Soil Description: Grey and contains shale

Proctor ID: SW #8

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 121.0 (lbs/ft^3)

Optimum Moisture (w_{opt}) 10.5 (%)

Required Moisture: 5.5 % to 15.5 %

Required Percent Compaction: 90.0 (%)

Comments:

TEST RESULTS:

x Pass Date: 4/6/17

____ Failed Moisture

____ Failed Compaction Time: 15:39

By: Lynn Tuttle / Lynn Tuttle

(print) *(signature)*

Mitch Hogan 04.20.2017

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783

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