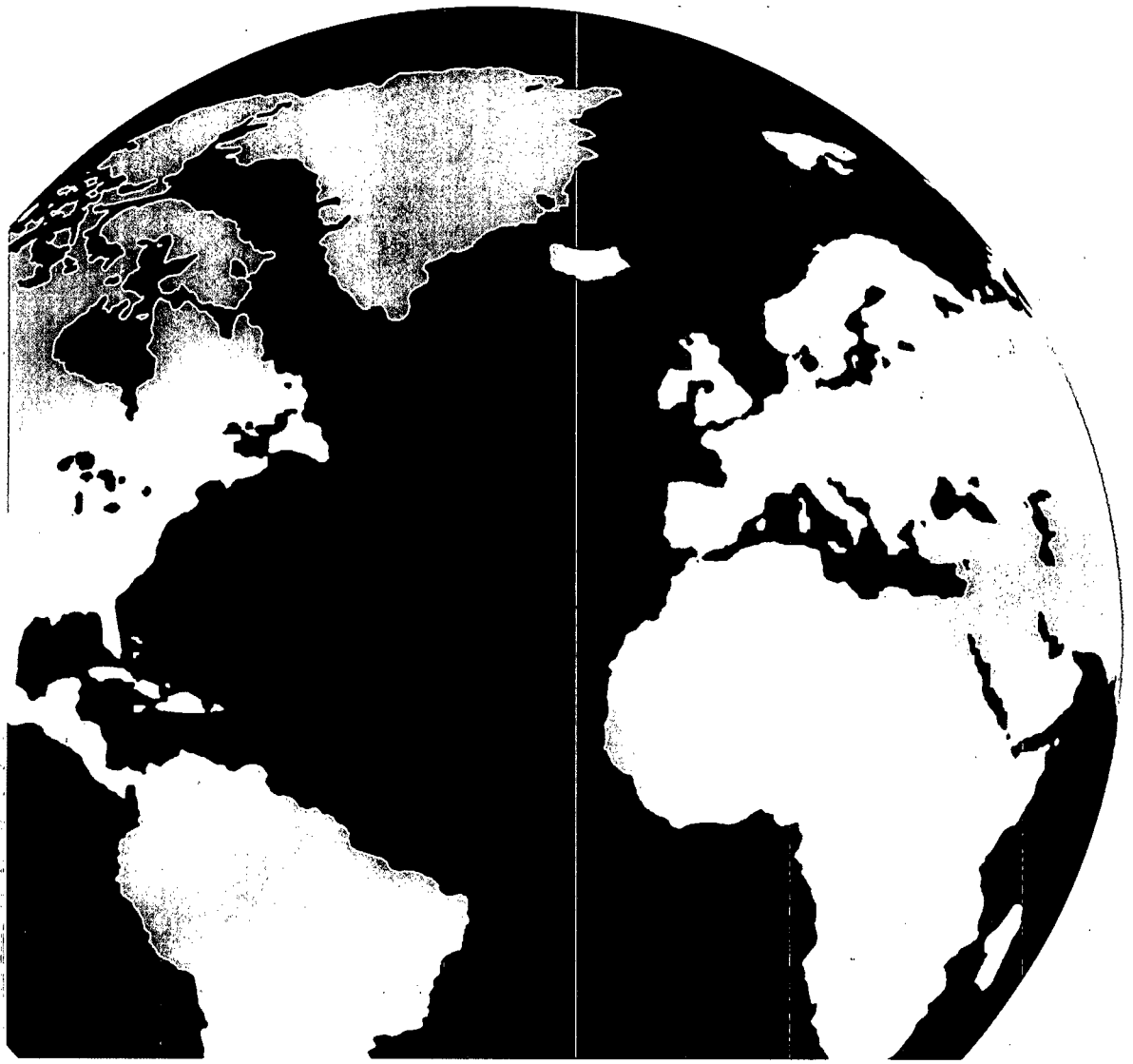
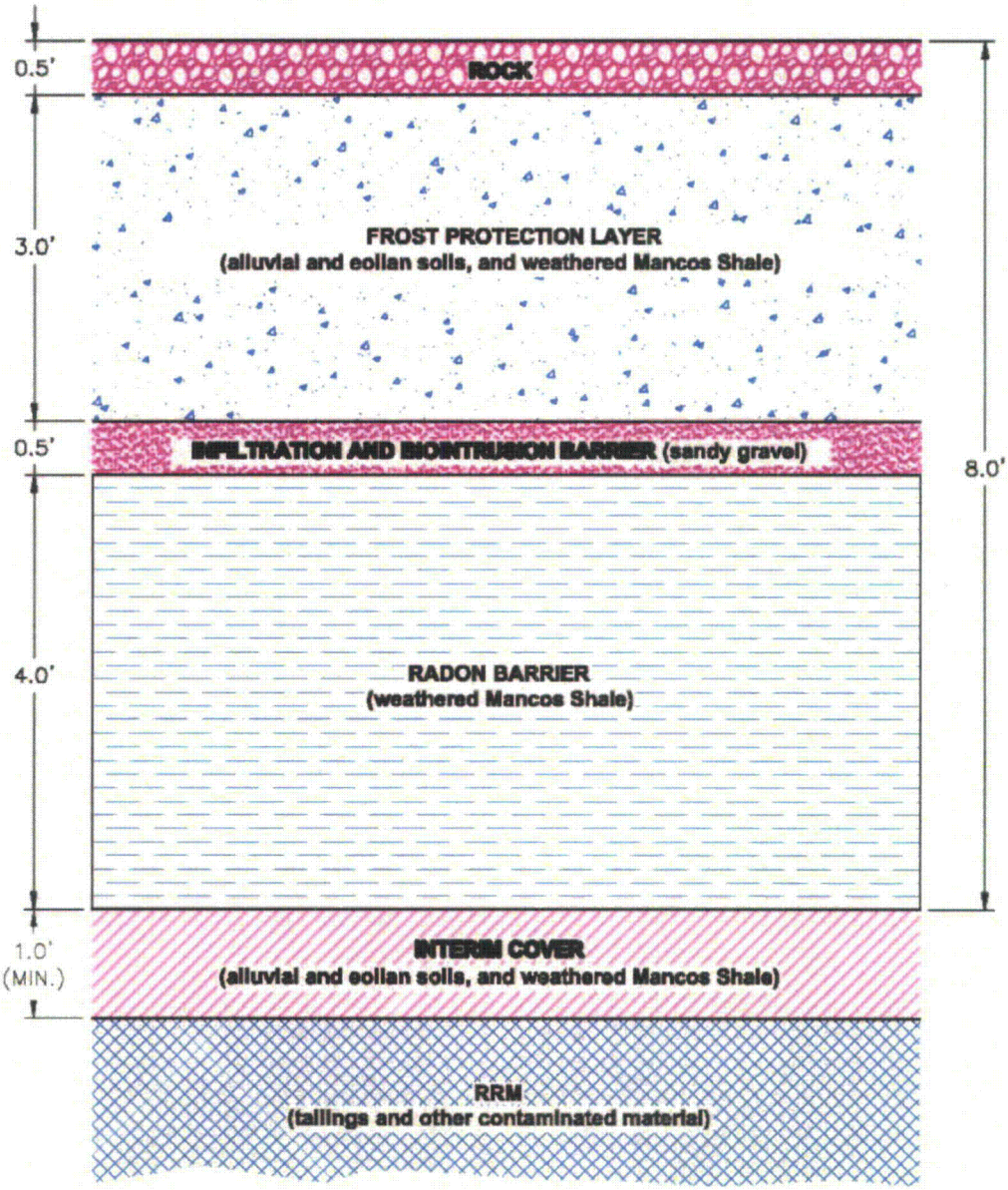
ENERGYSOLUTIONS

Moab UMTRA Project
Cell Placement





UMTRA COVER DESIGN

- ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating
- ASTM D 4944 - Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Gas Pressure Tester
- ASTM D 4959 - Determination of Water (Moisture) Content of Soil by Direct Heating
- During unstable weather, perform tests as dictated by local conditions and approved by the Construction Manager.

6.4 RESIDUAL RADIOACTIVE MATERIAL (RRM)

The objective is to place and compact the RRM in the waste cell to create a stable waste mass. The QC Inspector shall visually inspect the material preparation, ground preparation, and RRM placement operations, and shall perform in-place density tests with companion moisture tests for the CAES to verify that RRM compaction meets the compaction requirements. The QC Inspector shall verify that the RRM placement is performed in accordance with Plans and Specifications, and that the top of the placed waste matches the final grades identified in Section 6.4.5. RRM shall not be placed when frozen or over frozen subgrade. If rain water ponding has occurred, placement of RRM waste shall only be performed after the area is dewatered and approval of Construction Manager, QC Inspector or designee to place is obtained.

6.4.1 Moisture Modification

RRM material should be shipped from Moab at or near optimum moisture for compaction. Some RRM may require minor moisture modification when received at Crescent Junction.

6.4.2 RRM Placement

Scarify the top one inch of subsoil or preceding RRM lift using a footed roller or a dozer prior to placement of subsequent RRM layers. Fill materials shall be placed in continuous and approximately horizontal lifts. The method of dumping and spreading RRM shall result in loose lifts of nearly uniform thickness, not to exceed 12". Compaction equipment shall consist of footed rollers or dozers. Footed rollers shall have a minimum weight of 45,000 pounds and at least one tamping foot shall be provided for each 110 square inches of drum surface. The length of each tamping foot from the outside surface of the drum shall be at least 6 inches. During compaction operations, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping foot rollers. Dozers shall have a minimum ground pressure of 1,650 lbs per sq ft. The CAES shall be used to direct fill placement, monitor compaction, and record the location and thickness of each soil layer being placed.

6.4.3 Inspection and Testing

The Quality Control (QC) Inspector shall visually inspect the ground preparation and fill placement operations. RRM shall be compacted to meet 90% of the laboratory determined maximum dry density as determined by (ASTM D 698). The QC Inspector shall verify that the RRM placement is constructed in accordance with Design Plans and Specifications by checking and confirming:

- Assessment tests shall be performed on RRM to assure compliance with specified requirements and to develop compaction requirements for placement. A minimum of three tests for maximum dry density (ASTM D 698) and optimum moisture content (optimum moisture plus or minus 3%) (ASTM D 2216) shall be performed for each type of RRM soil observed.
- Fill material is properly moisture conditioned, one moisture content quick test will be performed each day material is placed in accordance with (ASTM D 4643, ASTM D 4944, or ASTM D 4959) until a sufficient number have been performed to demonstrate a clear correlation allowing a reduction in testing.
- Fill material is placed in continuous and approximately horizontal lifts. The method of dumping and spreading RRM shall result in loose lifts of nearly uniform thickness, not to exceed 12".
- Compaction meets specifications.
- Compaction by CAES – the QC inspector shall monitor CAES compaction by visually inspecting the process and reviewing the computer records for each layer of soil placed.
- Verification tests of in-place density shall be performed on the initial layer of RRM and on any layers in which the CAES indicates that problems occurred obtaining compaction. In-place density will be taken every six months to verify the performance of the CAES.

Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

If CAES is not used the following testing requirements shall be followed:

- Compaction Verification Tests – Perform in-place density and moisture content tests on compacted fill material in accordance with the following requirements:
    - When verification a representative sample from each principal type or combination of blended RRM materials shall be tested to establish compaction curves using ASTM D 698. A minimum of one set of compaction curves shall be developed per 10,000 cubic yards of RRM material. In-place density and moisture content tests are performed on a soil layer; a minimum of two tests shall be performed per 5,000 cubic yards of fill material placed.

- Compaction and moisture content tests shall be performed in accordance with the following methods:
    - ASTM D 1556 - Density and Unit Weight of Soil in Place by the Sand-Cone Method
    - ASTM D 2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (Oven Moisture)
    - ASTM D 6938 - In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
    - ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating
- After lift placement, moisture content shall be maintained until the next lift is placed.
- Erosion that occurs in the RRM layers shall be repaired and grades re-established.
- Freezing and desiccation of the RRM soil shall be prevented. If freezing or desiccation occurs, the affected soil shall be reconditioned as directed.
- Areas that have been repaired shall be retested as directed. Repairs to the RRM layers shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

6.4.4 Demolition Debris

Demolition debris will be placed in the waste cell along with RRM material. Each container of demolition debris shall be spread in a single layer, not stacked, and placed in a manner that results in a minimum of voids around the debris. The following materials will be placed in the waste cell:

- Wood, Concrete, Masonry: Cut or break up to a maximum 3-foot size measured in any dimension.
- Structural Steel Member, Pipes, Ducts, Other Long Items: Cut into maximum 10-foot lengths.
- Concrete, Clay Tile, and Other Pipes: Crush concrete and clay tile pipes. Crush other pipes and ducts that are 6 inches or greater in diameter or, if crushing is impractical, cut pipes and ducts in half longitudinally. Do not crush asbestos-cement pipe.
- Rubber Tires Excavated at the Site: Cut into two halves around the circumference.
- Geomembranes and Other Sheet Material: Cut into strips a maximum of 4 feet wide by 4 feet long.
- Tree Limbs 4 inches in Diameter and Larger: Cut into lengths of 8 feet or less.

6.4.5 Final RRM Geometry

The top surface of the RRM shall be no greater than 2 inches above the lines and grades shown on the drawings and verified by survey or the use of the CAES. No minus tolerance will be permitted.

Perform Laboratory laboratory Density density and Moisture moisture Content content tests (ASTM D 698 and ASTM D 2216) for each type of fill material to determine the optimum moisture (optimum moisture content plus or minus 5%) and laboratory maximum density values. One representative density test per material type and every 20,000 cubic yards there after or when any change in material occurs which may affect the optimum moisture content or laboratory maximum dry density. One correlation test for moistures every 10 tests per ASTM D6938 will be performed in accordance to ASTM D 4643 or ASTM D 2216.

In the stockpile, excavations, or borrow areas, perform moisture tests to control the moisture content of material being placed as fill. Control of moisture content of fill shall be performed by conducting routine testing of moisture content by one of the following tests:

- ASTM D 2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (Oven Moisture)
- ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating
- ASTM D 4944 - Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Gas Pressure Tester
- ASTM D 4959 - Determination of Water (Moisture) Content of Soil by Direct Heating
- During unstable weather, perform tests as dictated by local conditions and approved by the Construction Manager.

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The objective is to place and compact the RRM in the waste cell to create a stable waste mass. The QC Inspector shall visually inspect the material preparation, ground preparation, and RRM placement operations, and shall perform in-place density tests with companion moisture tests for the CAES to verify that RRM compaction meets the compaction requirements. The QC Inspector shall verify that the RRM placement is performed in accordance with Plans and Specifications, and that the top of the placed waste matches the final grades identified in Section 6.4.5. RRM shall not be placed when frozen or over frozen subgrade. If rain water ponding has occurred, placement of RRM waste shall only be performed after the area is dewatered and approval of the Construction Manager, and QC Inspector or designee to place is obtained.

6.4.1 Moisture Modification

RRM material should be shipped from the Moab site at or near optimum moisture for compaction. Some RRM may require minor moisture modification when received at Crescent Junction site.

6.4.2 RRM Placement

Scarify at a minimum the top one inch of subsoil or preceding RRM lift using a footed roller or a dozer prior to placement of subsequent RRM layers. Fill materials shall be placed in continuous and approximately horizontal planar lifts. The method of dumping and spreading RRM shall result in loose lifts of nearly uniform thickness, average thickness not to exceed 12". Compaction equipment shall consist of footed rollers or dozers. Footed rollers shall have a minimum weight of 45,000 pounds and at least one tamping foot shall be provided for each 110 square inches of drum surface. The length of each tamping foot from the outside surface of the drum shall be at least 6 inches. During compaction operations, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping foot rollers. Dozers shall have a minimum ground pressure of 1,650 lbs per sq ft. The CAES shallmay be used to direct fill placement, monitor compaction, and record the location and thickness of each soil layer being placed.

6.4.3 Inspection and Testing

The Quality Control (QC) Inspector shall visually inspect the ground preparation and fill placement operations. RRM shall be compacted to meet 90% of the laboratory determined maximum dry density as determined by (ASTM D 698). The QC Inspector shall verify that the RRM placement is constructed in accordance with Design Plans and Specifications by checking and confirming:

- Assessment tests shall be performed on RRM to assure compliance with specified requirements and to develop compaction requirements for placement. A minimum of three tests for maximum dry density (ASTM D 698) and optimum moisture content (optimum moisture plus or minus 3%) (ASTM D 2216) shall be performed for each type of RRM soil observed.
- Fill material is properly moisture conditioned, one moisture content quick test will be performed each day material is placed in accordance with (ASTM D 4643, ASTM D 4944, or ASTM D 4959) until a sufficient number have been performed to demonstrate a clear correlation allowing a reduction in testing.
- Fill material is placed in continuous and approximately horizontalplanar lifts. The method of dumping and spreading RRM shall result in loose lifts of nearly uniform thickness, average thickness of fill area not to exceed 12".
- Compaction meets specifications.
- Compaction by CAES – the QC inspector shall monitor CAES compaction by visually inspecting the process and reviewing the computer records for each layer of soil placed.
- Verification tests of in-place density shall be performed on the initial layer of RRM and on any layers in which the CAES indicates that problems occurred obtaining compaction. In-place density will be taken every six months to verify the performance of the CAES.

Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

If CAES is not used the following testing requirements shall be followed:

- Compaction Verification Tests – Perform in-place density and moisture content tests on compacted fill material in accordance with the following requirements:
    - When verification a representative sample from each principal type or combination of blended RRM materials shall be tested to establish compaction curves using ASTM D 698. A minimum of one set of compaction curves shall be developed per 10,000 cubic yards of RRM material. In-place density and moisture content tests are performed on a soil layer; a minimum of two tests shall be performed per 5,000 cubic yards or 135,000 square feet of fill material placed.

- Compaction and moisture content tests shall be performed in accordance with the following methods:
    - ASTM D 1556 - Density and Unit Weight of Soil in Place by the Sand-Cone Method
    - ASTM D 2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (Oven Moisture)
    - ASTM D 6938 - In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
    - ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating
- After lift placement, moisture content shall be maintained until the next lift is placed.
- Erosion that occurs in the RRM layers shall be repaired and grades re-established.
- Freezing and desiccation of the RRM soil shall be prevented. If freezing or desiccation occurs, the affected soil shall be reconditioned as directed.
- Areas that have been repaired shall be retested as directed. Repairs to the RRM layers shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

6.4.4 Demolition Debris

Demolition debris will be placed in the waste cell along with RRM material. Each container of demolition debris shall be spread in a single layer, not stacked, and placed in a manner that results in a minimum of voids around the debris. The following materials will be placed in the waste cell:

- Wood, Concrete, Masonry: Cut or break up to a maximum 3-foot size measured in any dimension.

- Structural Steel Member, Pipes, Ducts, Other Long Items: Cut into maximum 10-foot lengths.
- Concrete, Clay Tile, and Other Pipes: Crush concrete and clay tile pipes. Crush other pipes and ducts that are 6 inches or greater in diameter or, if crushing is impractical, cut pipes and ducts in half longitudinally. Do not crush asbestos-cement pipe.
- Rubber Tires Excavated at the Site: Cut into two halves around the circumference.
- Geomembranes and Other Sheet Material: Cut into strips a maximum of 4 feet wide by 4 feet long.
- Tree Limbs 4 inches in Diameter and Larger: Cut into lengths of 8 feet or less.

6.4.5 Final RRM Geometry

The top surface of the RRM shall be no greater than 2 inches above the lines and grades shown on the drawings and verified by survey or the use of the CAES. No minus tolerance will be permitted.

6.5 INTERIM COVER

After a section the RRM have been placed in the waste cell to final grade and verified by survey, an interim cover consisting of 1 ft of clean, compacted soil shall be placed over the RRM. Interim cover material will be placed and compacted directly on top of RRM to provide a buffer of uncontaminated soil prior to the placement of the final multi-layer cap.

6.5.1 Material

Interim Cover Soil will be soil from the excavation of the Crescent Junction waste cell. It will be material that has been produced on site by modifying the existing overburden soil and weathered Mancos Shale excavated on site. Overburden and weathered Mancos Shale shall be excavated, pulverized, wetted, and mixed to produce a uniform fine-grained soil near optimum moisture content for compaction. Soil shall be free of roots, debris, and organic or frozen material., and shall have a maximum clod size of 2 inch based on visual at the time of compaction.

6.5.2 Ground Preparation

The RRM beneath the proposed interim cover shall be prepared by scarifying to a minimum depth of one inch prior to the placement of the initial lift of interim cover soil.

6.5.3 Lift Placement and Thickness

The interim cover shall be constructed of fill materials placed in continuous lifts of uniform thickness. The method of dumping and spreading Interim Cover Soil over the RRM shall result in loose lifts average thickness not to exceed 12". ~~The CAES shall be~~

ENERGY*SOLUTIONS*

DAILY CONSTRUCTION REPORT

PROJECT: MOAB UMTRA Site: Cresent Junction Shift: Day

DATE: 10/29/2010

WEATHER: Fair: X Cloudy: ____ Warm: ____ Rain: ____ Snow: ____ Wind: ____ Other: ____

CONSTRUCTION OPERATIONS: Waste Placement X Cell Excavation ____ Interim Cover ____

Radon Barrier ____ Rock Placement ____ Other ____

Others ____

EQUIPMENT USED:

Rock trucks X	Track hoes ____	Loaders X	Dozers X
Locomotives ____	Forklifts ____	Graders ____	Backhoes ____
Sheepsfoot X	Scrapers ____	Tillers ____	Rollers ____
CAT 815 ____	Water trucks ____	CAT 825 X	Other ____

DAILY PROGRESS MEETING: Yes X No ____

LIFTS TESTED: UWM12101020-00, UWK28101029-00, UWP30101029-00, UWI24101029-00, UWJ21101028-00, UWK28101029-01

LIFTS APPROVED: UWM12101020-00, UWK28101029-00, UWP30101029-00

EXPLANATIONS:

RRM: A total of 3 lifts were approved today. Approximately 2,053 yds³ of RRM was approved today. A daily moisture test was performed with failing results due to high moisture. QC surveyed a control point and verified the GPS accuracy was within tolerance for the shift.

Cell Cap: No activities were performed today.

Spoils Wedge: No activities were performed today.

QA/QC Representative [signature]

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LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

NW CORNER DATE: 10/29/2010

See attached for lift map.

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

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: UWP30101029-00 NW CORNER: 6794466 N 2122817 E

THICKNESS: UNC: ≤ 12" COM: N/A ELEV: N/A Debris Insp. By: N/A Date: N/A Time: N/A

Comments: QC verified that the under lying lift was scarified prior to placement of RRM. This lift is approximately 24,461 ft² with approximately 634 yds³ of RRM approved on this lift. Due to a rain strom from 10-25-10. QC performed a moisture test on 10-29-10 dayshift with satisfactory results. THIS MOISTURE TEST WAS FROM THE UNDERLYING LIFT. MH 10.29.10

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

LIFT APPROVED BY: Mitch Hogan/ DATE: 10/29/2010 TIME: 1635

QC APPROVAL DATE 11/02/2010

Slope Elevation Survey

Average lift thickness=	0.7	Bounding Box	Northing	Easting
Grid Size=	30'	Lower Left	N	
Lift ID:	UWP30101029-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6794313	2122841	4936.2	6794313	2122841	4936.7	0.5	OK
6794343	2122841	4936.1	6794343	2122841	4937.0	0.9	OK
6794373	2122841	4936.4	6794373	2122841	4937.3	0.9	OK
6794403	2122841	4937.0	6794403	2122841	4938.1	1.0	OK
6794433	2122841	4938.1	6794433	2122841	4938.8	0.7	OK
6794283	2122871	4935.0	6794283	2122871	4935.6	0.6	OK
6794313	2122871	4935.4	6794313	2122871	4936.0	0.6	OK
6794343	2122871	4935.7	6794343	2122871	4936.8	1.0	OK
6794373	2122871	4936.4	6794373	2122871	4937.4	1.0	OK
6794403	2122871	4937.0	6794403	2122871	4937.8	0.8	OK
6794433	2122871	4937.7	6794433	2122871	4938.1	0.4	OK
6794283	2122901	4934.3	6794283	2122901	4934.9	0.6	OK
6794313	2122901	4934.8	6794313	2122901	4935.7	0.9	OK
6794343	2122901	4935.3	6794343	2122901	4936.1	0.8	OK
6794373	2122901	4936.2	6794373	2122901	4937.1	1.0	OK
6794403	2122901	4936.7	6794403	2122901	4937.6	0.9	OK
6794433	2122901	4937.3	6794433	2122901	4938.0	0.8	OK
6794283	2122931	4933.5	6794283	2122931	4933.6	0.1	OK
6794313	2122931	4934.0	6794313	2122931	4934.3	0.4	OK
6794343	2122931	4934.6	6794343	2122931	4935.0	0.4	OK
6794373	2122931	4935.5	6794373	2122931	4936.0	0.5	OK
6794403	2122931	4936.0	6794403	2122931	4936.4	0.4	OK
6794433	2122931	4936.5	6794433	2122931	4937.0	0.5	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
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						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

N/A

% =6	95.0%
Elevation Avg	4936.6
Total =6	1833
Total Lines	1929

Pass

Minimum Number of Machine Passes
3

Lift ID: UWP30101029-00

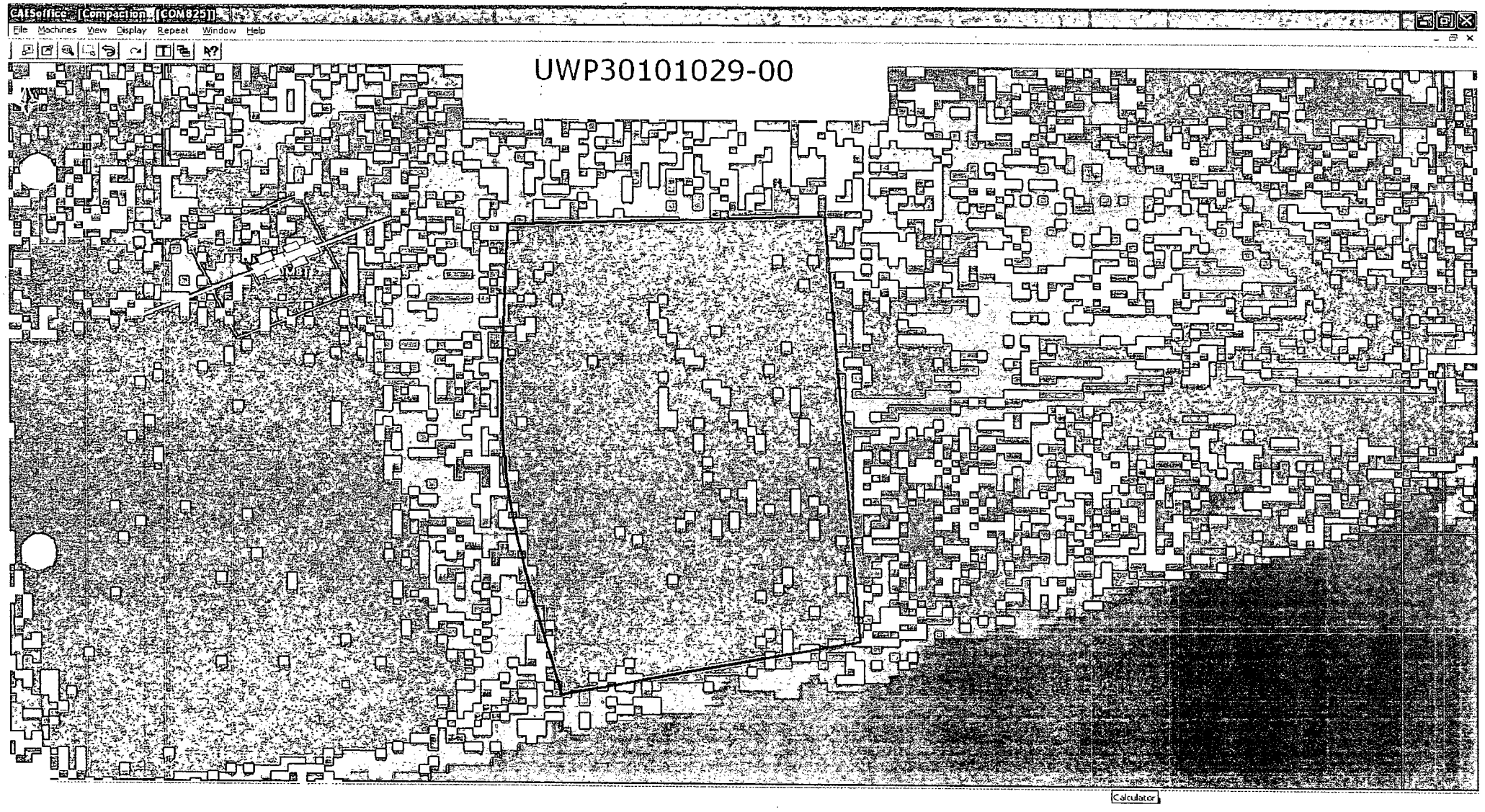
Northing	Easting	Elevation	# of Passes	Passes =6	Count
6794355	2122828	4937.0	6	1	1
6794358	2122828	4937.0	6	1	1
6794361	2122828	4937.1	6	1	1
6794365	2122828	4937.1	6	1	1
6794368	2122828	4937.1	6	1	1
6794371	2122828	4937.1	6	1	1
6794375	2122828	4937.1	5		1
6794378	2122828	4937.2	6	1	1
6794381	2122828	4937.2	6	1	1
6794384	2122828	4937.2	6	1	1
6794388	2122828	4937.3	6	1	1
6794391	2122828	4937.3	6	1	1
6794394	2122828	4937.4	6	1	1
6794398	2122828	4937.5	6	1	1
6794401	2122828	4937.6	6	1	1
6794404	2122828	4937.7	6	1	1
6794335	2122831	4936.9	6	1	1
6794339	2122831	4936.9	6	1	1
6794342	2122831	4936.9	6	1	1
6794345	2122831	4937.0	6	1	1
6794348	2122831	4937.0	6	1	1
6794352	2122831	4937.0	6	1	1
6794355	2122831	4937.0	6	1	1
6794358	2122831	4937.1	6	1	1
6794361	2122831	4937.1	6	1	1
6794365	2122831	4937.1	6	1	1
6794368	2122831	4937.1	6	1	1
6794371	2122831	4937.1	6	1	1
6794375	2122831	4937.2	6	1	1
6794378	2122831	4937.2	6	1	1
6794381	2122831	4937.3	6	1	1
6794384	2122831	4937.4	6	1	1
6794388	2122831	4937.5	6	1	1
6794391	2122831	4937.5	6	1	1
6794394	2122831	4937.6	6	1	1
6794398	2122831	4937.7	6	1	1
6794401	2122831	4937.8	6	1	1
6794404	2122831	4937.8	6	1	1
6794407	2122831	4937.9	6	1	1
6794411	2122831	4937.9	6	1	1
6794414	2122831	4938.0	5		1
6794417	2122831	4937.9	4		1
6794421	2122831	4938.0	6	1	1
6794424	2122831	4938.2	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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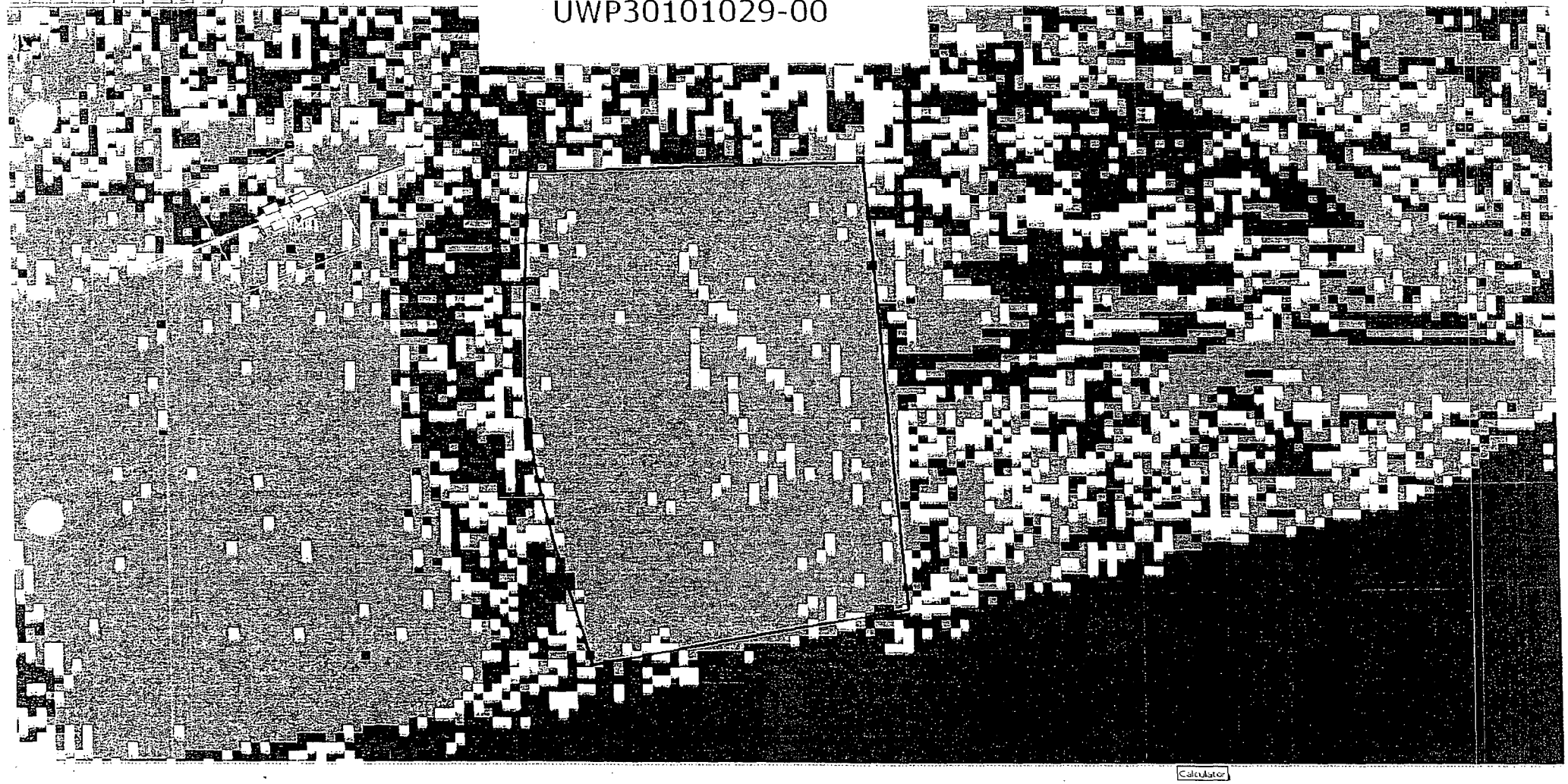
UWP30101029-00
Calculator

Print 4 of 5

AESoffice [Compaction [COM825]]

File Machines View Display Repeat Window Help

UWP30101029-00



Calculator

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: UWP30101029-00 DATE: 10/29/2010

TEST ID NUMBER(S): Moisture test #1

TEST LOCATION: UNDERLYING Lift area TEST METHOD: N/A D1556 N/A D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: N/A

Daily Standard Counts:

Density _____ Moisture _____

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

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

Moisture Count _____ Density Count _____

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

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

N A

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

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

Dry Denisty

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

Dry Unit Weight

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

N A

MOISTURE DETERMINATION

ASTM D4643

Container ID D-4

Mass of container & wet specimen (M_{cms})	519.2	g
Mass of container & dry specimen (M_{cds})	481.6	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	37.6	g
Mass of container (M_c)	211.1	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	270.5	g
Moisture content (w) $w = (M_w / M_s) \times 100$	13.9	%

Soil Description: reddish brown very fine to medium, well graded, subangular to subround, slightly SILTY SAND MH 10-29-10

Proctor ID: RRM# 140

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 119.9 (lbs/ft^3)

Optimum Moisture (w_{opt}) 12.7 (%)

Required Moisture: 9.7 % to 15.7 %

Required Percent Compaction: 90.0 (%)

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

$pd = (100 \times$ ##### $) / (100 +$ 13.9 $) =$ 0.0 lbs/ft^3

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

N A

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

0.0 / 119.9 x 100 = 0.0 %

Comments:

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

TEST RESULTS:

X Pass Date: 10/29/10

_____ Failed Moisture

_____ Failed Compaction Time: 1025

By: Beachem Bosh (print) (signature)

QA/QC APPROVAL 11.01.2010 DATE

ENERGY SOLUTIONS

LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

NW CORNER DATE: 10/20/2010

See attached for lift map.

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

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: UWM12101020-00 NW CORNER: 6795427 N. 2122746 E.

THICKNESS: UNC: ≤ 12" COM: N/A ELEV: N/A Debris Insp. By: N/A Date: N/A Time: N/A

Comments: QC verified that the under lying lift was scarified prior to placement of RRM. This lift is approximately 63,702 ft² with approximately 1,180 yds³ of RRM approved on it. Operations began placing this lift on 10-20-10 but did not get it approved until 10-29-10 this is the reasoning for the differnce in the lift ID and approval date. The daily moisture test for 10/22/2010 night shift was performed on this lift and passed with satisfactory results. A second moisture test was performed on the underlying lift due to excessive rains. This test failed due to high moisture. On 10-25-10 nightshift, QC performed another moisture test with failing results due to high moisture. Operations reworked the material with a CAT 825 in efforts to dry the material. On 10-29-10 QC performed two moisture test, one on the underflying lift and one on the material placed, that passed with satisfactory results. QC also performed a denstiy correlation with the Troxler gague and a Sandcone. These tests were satisfctory. PROCTORS USED WERE FROM THE UNDERLYING LIFT AND MATERIAL BEING PLACED, THIS IS WHY THERE IS DIFFERENT PROCTORS BEING USED. MH 10/29/10

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

LIFT APPROVED BY: Mitch Hogan/ DATE: 10/29/2010 TIME: 1545

David Shepherd 11/2/2010

QC APPROVAL DATE

ENERGY*SOLUTIONS*

Slope Elevation Survey

Average lift thickness=	0.5	Bounding Box	Northing	Easting
Grid Size=	45'	Lower Left	N	
Lift ID:	UWM12101020-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795084	2122770	4961.3	6795084	2122770	4961.1	-0.2	OK
6795129	2122770	4961.7	6795129	2122770	4961.7	0.0	OK
6795174	2122770	4962.5	6795174	2122770	4962.9	0.5	OK
6795219	2122770	4963.2	6795219	2122770	4963.8	0.7	OK
6795264	2122770	4964.0	6795264	2122770	4964.8	0.8	OK
6795309	2122770	4965.0	6795309	2122770	4965.6	0.6	OK
6795354	2122770	4965.9	6795354	2122770	4966.6	0.8	OK
6795399	2122770	4966.7	6795399	2122770	4967.5	0.8	OK
6794994	2122815	4958.4	6794994	2122815	4958.4	0.0	OK
6795039	2122815	4958.9	6795039	2122815	4958.9	0.1	OK
6795084	2122815	4959.7	6795084	2122815	4959.7	0.1	OK
6795129	2122815	4960.8	6795129	2122815	4961.0	0.1	OK
6795174	2122815	4962.0	6795174	2122815	4962.9	0.9	OK
6795219	2122815	4962.9	6795219	2122815	4963.8	0.9	OK
6795264	2122815	4963.7	6795264	2122815	4964.7	1.0	OK
6795309	2122815	4964.9	6795309	2122815	4965.7	0.8	OK
6795354	2122815	4966.2	6795354	2122815	4967.0	0.8	OK
6795399	2122815	4967.3	6795399	2122815	4968.2	0.9	OK
6794994	2122860	4957.9	6794994	2122860	4957.9	0.0	OK
6795039	2122860	4958.7	6795039	2122860	4958.7	0.0	OK
6795084	2122860	4959.6	6795084	2122860	4959.6	0.0	OK
6795129	2122860	4961.0	6795129	2122860	4961.1	0.1	OK
6795174	2122860	4962.2	6795174	2122860	4963.1	0.9	OK
6795219	2122860	4963.1	6795219	2122860	4963.9	0.8	OK
6795264	2122860	4964.0	6795264	2122860	4964.7	0.8	OK
6795309	2122860	4965.1	6795309	2122860	4965.8	0.6	OK
6795354	2122860	4966.4	6795354	2122860	4967.2	0.8	OK
6795399	2122860	4967.4	6795399	2122860	4968.4	1.0	OK
6794994	2122905	4956.7	6794994	2122905	4956.7	-0.1	OK
6795039	2122905	4958.5	6795039	2122905	4958.4	-0.1	OK
6795084	2122905	4959.2	6795084	2122905	4959.2	0.0	OK
6795129	2122905	4960.3	6795129	2122905	4960.4	0.1	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

% =6	98.4%
Elevation Avg	4965.0
Total =6	3865
Total Lines	3929

Pass

Minimum Number of Machine Passes
3

Lift ID: UWM12101020-00

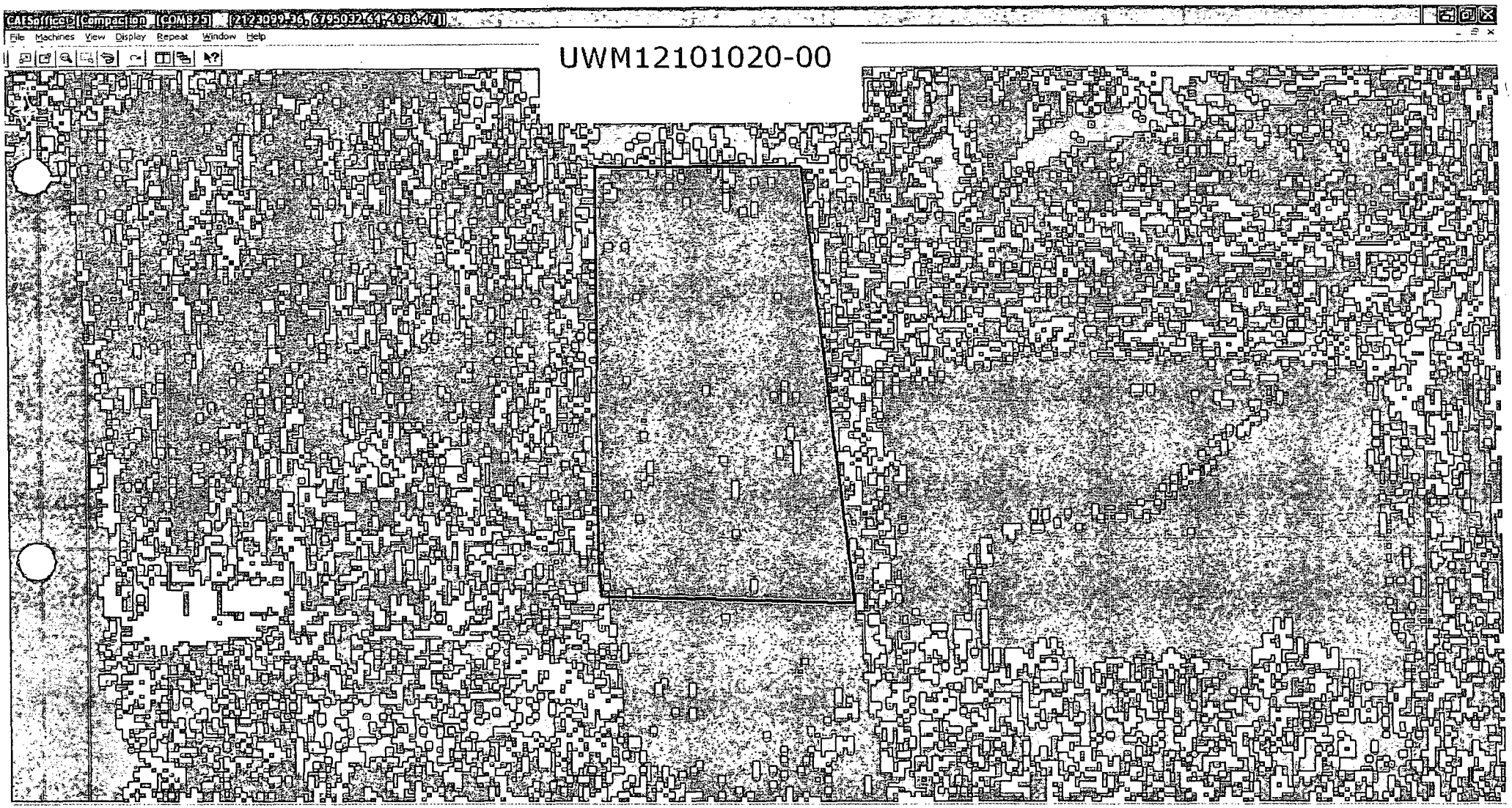
Northing	Easting	Elevation	# of Passes	Passes =6	Count
6795195	2122749	4963.6	6	1	1
6795198	2122749	4963.6	6	1	1
6795202	2122749	4963.6	6	1	1
6795205	2122749	4963.6	6	1	1
6795208	2122749	4963.7	6	1	1
6795212	2122749	4963.7	6	1	1
6795215	2122749	4963.8	6	1	1
6795218	2122749	4963.8	6	1	1
6795221	2122749	4963.9	6	1	1
6795225	2122749	4964.0	6	1	1
6795228	2122749	4964.1	6	1	1
6795231	2122749	4964.1	6	1	1
6795234	2122749	4964.2	6	1	1
6795238	2122749	4964.4	6	1	1
6795241	2122749	4964.5	6	1	1
6795244	2122749	4964.6	6	1	1
6795248	2122749	4964.4	6	1	1
6795251	2122749	4964.7	6	1	1
6795254	2122749	4964.8	5		1
6795257	2122749	4964.6	6	1	1
6795261	2122749	4964.7	6	1	1
6795264	2122749	4964.8	6	1	1
6795267	2122749	4964.8	6	1	1
6795271	2122749	4964.9	6	1	1
6795274	2122749	4964.9	6	1	1
6795277	2122749	4965.0	6	1	1
6795280	2122749	4965.0	6	1	1
6795284	2122749	4965.0	6	1	1
6795287	2122749	4965.2	6	1	1
6795290	2122749	4965.3	6	1	1
6795294	2122749	4965.4	6	1	1
6795297	2122749	4965.5	6	1	1
6795300	2122749	4965.6	6	1	1
6795303	2122749	4965.7	6	1	1
6795307	2122749	4965.8	6	1	1
6795310	2122749	4965.8	6	1	1
6795313	2122749	4965.9	6	1	1
6795316	2122749	4966.0	6	1	1
6795320	2122749	4966.1	6	1	1
6795323	2122749	4966.2	6	1	1
6795326	2122749	4966.2	6	1	1
6795330	2122749	4966.2	6	1	1
6795333	2122749	4966.3	6	1	1
6795336	2122749	4966.4	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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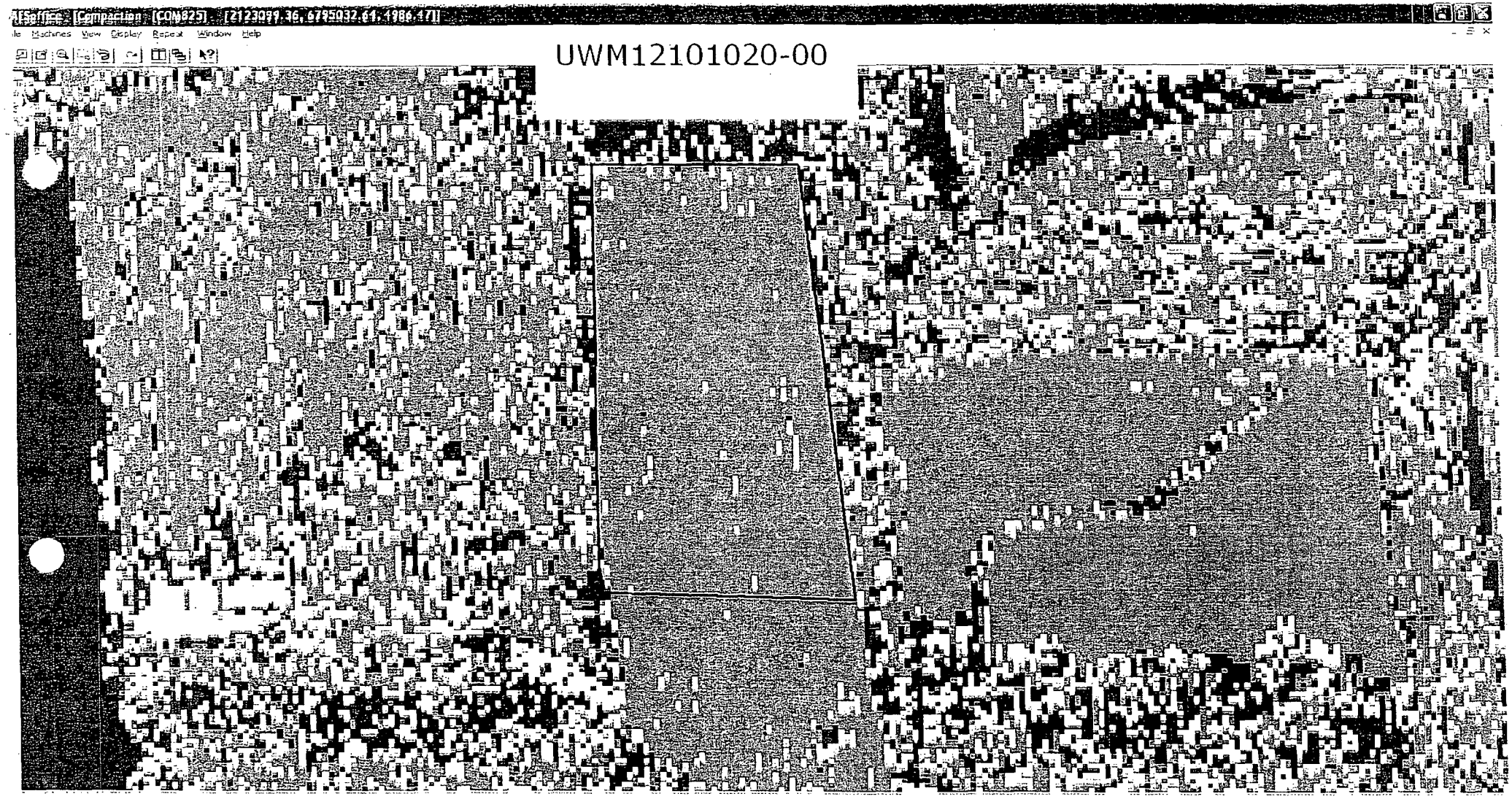
File Machines View Display Repeat Window Help
UWM12101020-00


AESoffice - [Compaction - [CON825] - [2123099.36, 6795032.61, 1986.17]]
File Machines View Display Repeat Window Help
UWM12101020-00

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: UWM12101020-00 DATE: 10/22/2010

TEST ID NUMBER(S): 1

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

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: N/A

Daily Standard Counts:

Density _____ Moisture _____

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

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

Moisture Count _____ Density Count _____

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

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

N A

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

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

Dry Denisty

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

Dry Unit Weight

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

N A

MOISTURE DETERMINATION

ASTM D4643

Container ID D-2

Mass of container & wet specimen (M_{cms})	465.4	g
Mass of container & dry specimen (M_{cds})	431.2	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	34.2	g
Mass of container (M_c)	163.3	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	267.9	g
Moisture content (w) $w = (M_w / M_s) \times 100$	12.8	%

Soil Description: **Pale brown very fine to medium well graded sub round to sub angular sand with minor silt.**

Proctor ID: **RRM # 123**

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 114.8 (lbs/ft^3)

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

Required Moisture: 9.0 % to 15.0 %

Required Percent Compaction: 90.0 (%)

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

$\rho d = (100 \times$ ##### $) / (100 +$ 12.8 $) =$ 0.0 lbs/ft^3

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

N A

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

0.0 / 114.8 x 100 = 0.0 %

Comments:

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

TEST RESULTS:

X Pass Date: 10/22/10

_____ Failed Moisture

_____ Failed Compaction Time: 2020

By: Nate Abrams / _____

(print) (signature)

_____ 11-4-10

QA/QC APPROVAL DATE

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: UWM12101020-00 DATE: 10/22/2010

TEST ID NUMBER(S): 2

TEST LOCATION: Underlying 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

Dry Mass of soil

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

Wet Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID D-5

Mass of container & wet specimen (M_{cms})	584.3	g
Mass of container & dry specimen (M_{cds})	515.4	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	68.9	g
Mass of container (M_c)	211.1	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	304.3	g
Moisture content (w) $w = (M_w / M_s) \times 100$	22.6	%

Soil Description: Red, Very fine to fine sand.

Proctor ID: RRM # 82

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 114.2 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.5 (%)

Required Moisture: 8.5 % to 14.5 %

Required Percent Compaction: 90.0 (%)

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

$\rho d = (\ 100 \times$ ##### $\ ) / (100 +$ 22.6 $) =$ 0.0 lbs/ft^3

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

N/A

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

0.0 / 114.2 x 100 = 0.0 %

Comments:

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

TEST RESULTS:

_____ Pass Date: 10/22/10

X Failed Moisture

_____ Failed Compaction Time: 2005

By: Nate Abrams / _____

(print) (signature)

_____ 11-4-10

QA/QC APPROVAL DATE

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: UWM12101020-00 DATE: 10/22/2010

TEST ID NUMBER(S): 3

TEST LOCATION: Underlying lift area TEST METHOD: N/A D1556 N/A D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: N/A

Daily Standard Counts:

Density _____ Moisture _____

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

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

Moisture Count _____ Density Count _____

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

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

N A

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

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

Dry Denisty

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

Dry Unit Weight

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

N A

MOISTURE DETERMINATION

ASTM D4643

Container ID D-2

Mass of container & wet specimen (M_{cms})	484.9	g
Mass of container & dry specimen (M_{cds})	438.1	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	46.8	g
Mass of container (M_c)	163.6	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	274.5	g
Moisture content (w) $w = (M_w / M_s) \times 100$	17.0	%

Soil Description: Red, Very fine to fine sand.

Proctor ID: RRM # 82

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 114.2 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.5 (%)

Required Moisture: 8.5 % to 14.5 %

Required Percent Compaction: 90.0 (%)

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

$\rho d = (100 \times$ ##### $) / (100 +$ 17.0 $) =$ 0.0 lbs/ft^3

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

N A

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

0.0 / 114.2 x 100 = 0.0 %

Comments:

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

TEST RESULTS:

_____ Pass Date: 10/25/10

X Failed Moisture

_____ Failed Compaction Time: 2100

By: Nate Abrams / _____

(print) (signature)

_____ _____

QA/QC APPROVAL DATE

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project. **OTHER** _____

LIFT IDENTIFICATION: UWM12101020-00 DATE: 10/29/2010

TEST ID NUMBER(S): 4

TEST LOCATION: Underlying Lift area TEST METHOD: X D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: _____

Daily Standard Counts:

Density _____, Moisture _____

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

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

Moisture Count _____ Density Count _____

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

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

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

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 Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID D-7

Mass of container & wet specimen (M_{cms})	479.8	g
Mass of container & dry specimen (M_{cds})	451.8	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	28.0	g
Mass of container (M_c)	211.3	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	240.5	g
Moisture content (w) $w = (M_w / M_s) \times 100$	11.6	%

Soil Description: Red, Very fine to fine sand.

Proctor ID: RRM # 82

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 114.2 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.5 (%)

Required Moisture: 8.5 % to 14.5 %

Required Percent Compaction: 90.0 (%)

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

$\rho d = (\ 100 \times$ _____ $) / (100 +$ 11.6 $=$ _____ *lbs/ft^3*

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

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

_____ / _____ x 100 = _____ %

Comments:

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

TEST RESULTS:

X Pass Date: 10/29/10

_____ Failed Moisture

_____ Failed Compaction Time: 0950

By: Beachem Bosh / _____

(print) *(signature)*

_____ 11-01-2010

QA/QC APPROVAL DATE

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER

LIFT IDENTIFICATION: UWM12101020-00 DATE: 10/29/2010

TEST ID NUMBER(S): 5

TEST LOCATION: Lift area TEST METHOD: X D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model 3430 Gauge Serial # 27523

Last Calibration Date: N/A

Daily Standard Counts:

Density ON/2208-OFF/2476 Moisture ON/671-OFF/668

Method A (Direct Transmission)

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

Moisture Count 126 Density Count 1551

Wet Density (ρ_m) 122.8 *(lbs/ft^3)* Dry Density 112.3 *(lbs/ft^3)*

Moisture Density 10.6 *(lbs/ft^3)* Moisture Fraction 9.4 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus Ω Calibrated Vol. *(lbs/ft^3)* 0.04079

Bulk Density of sand (ρ_1) 1.57 *g/cm^3* 97.8 *lbs/ft^3*

Mass of Sand to Fill Cone & Plate (M_2) 1809.7 *g*

Mass of bottle & cone **before** filling cone, plate & hole	6891.9	g
Mass of bottle & cone **after** filling cone, plate & hole	2802.7	g
Mass of sand to fill cone, plate, & hole (M_1)	4089.2	g
Mass of sand to fill hole	2279.5	g
Mass of wet soil & container	2815.2	g
Mass of container	9.0	g
Mass of wet soil (M_3)	2806.2	g

Test Hole Volume

$V = (M_1 - M_2) / \rho_1$ 1455 *cm^3*

Dry Mass of soil

$M_4 = 100\ M_3 / (w + 100)$ 2564.6 *g*

Wet Denisty

$\rho_m = (M_3 / V) \times 62.43$ 120.4 *lbs/ft^3*

Dry Denisty

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

Dry Unit Weight

$\gamma_d = \rho_d \times 62.43$ 110.0 *lbs/ft^3*

MOISTURE DETERMINATION

ASTM D4643

Container ID D-7

Mass of container & wet specimen (M_{cms})	481.9	g
Mass of container & dry specimen (M_{cds})	458.6	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	23.3	g
Mass of container (M_c)	211.3	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	247.3	g
Moisture content (w) $w = (M_w / M_s) \times 100$	9.4	%

Soil Description: Red, Very fine to fine sand.

Proctor ID: RRM # 82

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 114.2 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.5 (%)

Required Moisture: 8.5 % to 14.5 %

Required Percent Compaction: 90.0 (%)

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

$\rho d = (100 \times 120.4) / (100 + 9.4 = 110.0$ *lbs/ft^3*

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

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

110.0 / 114.2 x 100 = 96.3 %

Comments:

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

TEST RESULTS:

X Pass Date: 10/29/10

____ Failed Moisture

____ Failed Compaction Time: 1140

By: Beachem Bosh

(print) *(signature)*

QA/QC APPROVAL 11-01-2010 DATE

ENERGYSOLUTIONS

LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

NW CORNER DATE: 10/29/2010

See attached for lift map.

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

N/A

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: UWK28101029-00 NW CORNER: 6794451 N. 2122606 E.

THICKNESS: UNC: ≤ 12" COM: N/A ELEV: N/A Debris Insp. By: N/A Date: N/A Time: N/A

Comments: QC verified that the lift area was scarified prior to placement. Due to weather on 10-25-10, QC performed a moisture test on the underlying lift prior to any placement. This moisture test failed due to high moisture. Operations worked the lift area and let air dry. On 9-29-10 dayshift, QC performed a moisture test with satisfactory results. Operations placed material thin to level the lift area. This is 32,303 ft². There is approximately 239 yds³ of RRM on this lift LIFT

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

LIFT APPROVED BY: Mitch Hogan/ DATE: 10/29/2010 TIME: 1600

QA/QC APPROVAL 11/02/2010 DATE

ENERGYSOLUTIONS

Slope Elevation Survey

Average lift thickness=	0.2	Bounding Box	Northing	Easting
Grid Size=	30'	Lower Left	N	
Lift ID:	UWK28101029-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6794384	2122622	4946.2	6794384	2122622	4946.2	0.1	OK
6794414	2122622	4947.2	6794414	2122622	4947.6	0.4	OK
6794444	2122622	4947.9	6794444	2122622	4948.8	0.9	OK
6794264	2122652	4944.3	6794264	2122652	4944.2	-0.1	OK
6794294	2122652	4944.5	6794294	2122652	4944.5	0.0	OK
6794324	2122652	4945.0	6794324	2122652	4945.1	0.1	OK
6794354	2122652	4945.7	6794354	2122652	4945.8	0.1	OK
6794384	2122652	4946.7	6794384	2122652	4946.7	0.0	OK
6794414	2122652	4947.5	6794414	2122652	4948.0	0.5	OK
6794444	2122652	4948.3	6794444	2122652	4949.3	1.0	OK
6794234	2122682	4943.2	6794234	2122682	4943.5	0.3	OK
6794264	2122682	4943.7	6794264	2122682	4943.7	0.0	OK
6794294	2122682	4944.4	6794294	2122682	4944.3	-0.1	OK
6794324	2122682	4945.1	6794324	2122682	4945.1	-0.1	OK
6794354	2122682	4945.9	6794354	2122682	4945.9	-0.1	OK
6794384	2122682	4946.7	6794384	2122682	4946.7	0.0	OK
6794414	2122682	4947.4	6794414	2122682	4947.7	0.3	OK
6794444	2122682	4948.2	6794444	2122682	4949.2	1.0	OK
6794234	2122712	4943.3	6794234	2122712	4943.2	0.0	OK
6794264	2122712	4943.7	6794264	2122712	4943.6	-0.1	OK
6794294	2122712	4944.3	6794294	2122712	4944.2	-0.1	OK
6794324	2122712	4945.1	6794324	2122712	4945.0	-0.1	OK
6794354	2122712	4945.6	6794354	2122712	4945.6	-0.1	OK
6794384	2122712	4946.2	6794384	2122712	4946.1	-0.1	OK
6794414	2122712	4946.8	6794414	2122712	4947.1	0.2	OK
6794444	2122712	4947.7	6794444	2122712	4948.8	1.0	OK
6794234	2122742	4943.0	6794234	2122742	4943.1	0.1	OK
6794264	2122742	4943.5	6794264	2122742	4943.5	0.0	OK
6794294	2122742	4944.1	6794294	2122742	4944.0	-0.1	OK
6794324	2122742	4944.8	6794324	2122742	4944.8	0.0	OK
6794354	2122742	4945.4	6794354	2122742	4945.4	0.0	OK
6794384	2122742	4946.1	6794384	2122742	4946.1	0.0	OK
6794414	2122742	4946.7	6794414	2122742	4946.8	0.1	OK
6794444	2122742	4947.5	6794444	2122742	4948.4	1.0	OK
6794264	2122772	4943.1	6794264	2122772	4943.2	0.1	OK
6794294	2122772	4943.9	6794294	2122772	4943.8	0.0	OK
6794324	2122772	4944.6	6794324	2122772	4944.6	0.0	OK
6794354	2122772	4945.3	6794354	2122772	4945.3	0.0	OK
6794384	2122772	4945.8	6794384	2122772	4945.8	0.0	OK
6794474	2122772	4947.7	6794474	2122772	4948.7	1.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

% =6	93.3%
Elevation Avg	4945.7
Total =6	3153
Total Lines	3378

Pass

Minimum Number of Machine Passes
3

Lift ID: UWK28101029-00

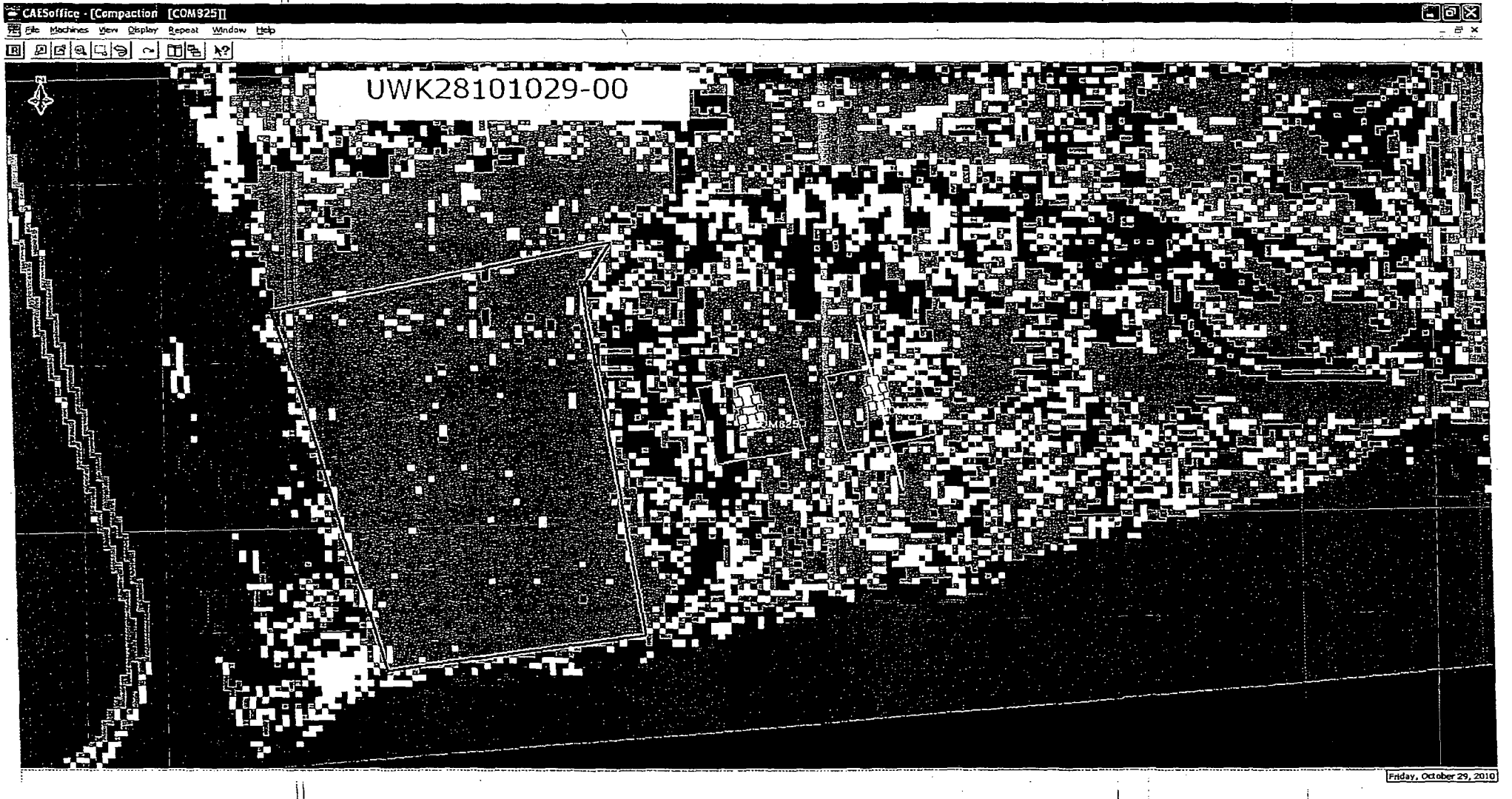
Northing	Easting	Elevation	# of Passes	Passes =6	Count
6794444	2122609	4948.6	6	1	1
6794447	2122609	4948.8	6	1	1
6794451	2122609	4948.8	6	1	1
6794428	2122612	4947.9	4		1
6794431	2122612	4948.0	2		1
6794434	2122612	4948.0	4		1
6794437	2122612	4948.3	4		1
6794441	2122612	4948.4	6	1	1
6794444	2122612	4948.7	6	1	1
6794447	2122612	4948.7	6	1	1
6794451	2122612	4948.9	6	1	1
6794411	2122615	4947.1	2		1
6794414	2122615	4947.3	4		1
6794418	2122615	4947.4	4		1
6794421	2122615	4947.5	6	1	1
6794424	2122615	4947.6	6	1	1
6794428	2122615	4947.8	6	1	1
6794431	2122615	4947.9	6	1	1
6794434	2122615	4948.1	6	1	1
6794437	2122615	4948.2	6	1	1
6794441	2122615	4948.3	6	1	1
6794444	2122615	4948.5	6	1	1
6794447	2122615	4948.7	6	1	1
6794451	2122615	4948.9	6	1	1
6794398	2122618	4947.0	6	1	1
6794401	2122618	4947.1	2		1
6794405	2122618	4947.2	4		1
6794408	2122618	4947.4	4		1
6794411	2122618	4947.5	6	1	1
6794414	2122618	4947.5	5		1
6794418	2122618	4947.8	2		1
6794421	2122618	4947.9	1		1
6794424	2122618	4947.9	4		1
6794428	2122618	4948.0	4		1
6794431	2122618	4948.1	6	1	1
6794434	2122618	4948.2	6	1	1
6794437	2122618	4948.3	6	1	1
6794441	2122618	4948.4	6	1	1
6794444	2122618	4948.6	6	1	1
6794447	2122618	4948.9	6	1	1
6794451	2122618	4949.1	6	1	1
6794382	2122622	4946.3	4		1
6794385	2122622	4946.5	6	1	1
6794388	2122622	4946.5	3		1

Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6


CAESoffice - [Compaction [COM925]]
File Machines View Display Repeat Window Help
UWK28101029-00
Friday, October 29, 2010

ENERGYSOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: UWK28101029-00 DATE: 10/25/2010

TEST ID NUMBER(S): Moisture test #1

TEST LOCATION: ~~Lift area~~ UNDERLYING LIFT TEST METHOD: N/A D1556 N/A D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: N/A

Daily Standard Counts:

Density _____ Moisture _____

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

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

Moisture Count _____ Density Count _____

Wet Density (ρ_m) _____ *(lbs/ft³)* Dry Density _____ *(lbs/ft³)*

Moisture Density _____ *(lbs/ft³)* Moisture Fraction _____ *(%)*

N A

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

N A

Test Hole Volume

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

Dry Mass of soil

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

Wet Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID D-1

Mass of container & wet specimen (M_{cms})	377.7	g
Mass of container & dry specimen (M_{cds})	344.3	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	33.4	g
Mass of container (M_c)	164.2	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	180.1	g
Moisture content (w) $w = (M_w / M_s) \times 100$	18.5	%

Soil Description: Reddish brown very fine to medium, well graded, subround to sunangular silty SAND MH 11-04-10

Proctor ID: RRM# 152

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 108.6 (lbs/ft^3)

Optimum Moisture (w_{opt}) 15.1 (%)

Required Moisture: 12.1 % to 18.1 %

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

$pd = (100 \times$ ##### $) / (100 +$ 18.5 $) =$ 0.0 lbs/ft^3

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

N A

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

0.0 / 108.6 x 100 = 0.0 %

Required Percent Compaction: 90.0 (%)

Comments:

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

TEST RESULTS:

[X] Pass Date: 10/25/10

[X] Failed Moisture

[ ] Failed Compaction Time: 1420

By: Beachem Bosh / _____

(print) *(signature)*

_____ 11.01.2010

QA/QC APPROVAL DATE

ENERGYSOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: UWK28101029-00 DATE: 10/29/2010

TEST ID NUMBER(S): Moisture test #2

TEST LOCATION: Under lying lift TEST METHOD: N/A D1556 N/A D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: N/A

Daily Standard Counts:

Density _____ Moisture _____

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

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

Moisture Count _____ Density Count _____

Wet Density (ρ_m) _____ *(lbs/ft³)* Dry Density _____ *(lbs/ft³)*

Moisture Density _____ *(lbs/ft³)* Moisture Fraction _____ *(%)*

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

Test Hole Volume

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

Dry Mass of soil

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

Wet Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID D-2

Mass of container & wet specimen (M_{cms})	369.1	g
Mass of container & dry specimen (M_{cds})	341.7	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	27.4	g
Mass of container (M_c)	163.7	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	178.0	g
Moisture content (w) $w = (M_w / M_s) \times 100$	15.4	%

Soil Description: Reddish brown very fine to medium, well graded, subround to subangular silty SAND

Proctor ID: RRM #152

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 108.6 (lbs/ft³)

Optimum Moisture (w_{opt}) 15.1 (%)

Required Moisture: 12.1 % to 18.1 %

Required Percent Compaction: 90.0 (%)

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

$\rho d = (\ 100 \times$ ##### $\ ) / (100 +$ 15.4 $) =$ 0.0 *lbs/ft³*

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

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

0.0 / 108.6 x 100 = 0.0 %

Comments:

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

TEST RESULTS:

[X] Pass Date: 10/29/10

[ ] Failed Moisture

[ ] Failed Compaction Time: 0920

By: Beachem Bosh / _____

(print) *(signature)*

_____ 11.01.2010

QA/QC APPROVAL DATE

% =6	93.3%
Elevation Avg	4945.7
Total =6	3153
Total Lines	3378

Pass

Minimum Number of Machine Passes
3

Lift ID: UWK28101029-00

Northing	Easting	Elevation	# of Passes	Passes =6	Count
6794444	2122609	4948.6	6	1	1
6794447	2122609	4948.8	6	1	1
6794451	2122609	4948.8	6	1	1
6794428	2122612	4947.9	4		1
6794431	2122612	4948.0	2		1
6794434	2122612	4948.0	4		1
6794437	2122612	4948.3	4		1
6794441	2122612	4948.4	6	1	1
6794444	2122612	4948.7	6	1	1
6794447	2122612	4948.7	6	1	1
6794451	2122612	4948.9	6	1	1
6794411	2122615	4947.1	2		1
6794414	2122615	4947.3	4		1
6794418	2122615	4947.4	4		1
6794421	2122615	4947.5	6	1	1
6794424	2122615	4947.6	6	1	1
6794428	2122615	4947.8	6	1	1
6794431	2122615	4947.9	6	1	1
6794434	2122615	4948.1	6	1	1
6794437	2122615	4948.2	6	1	1
6794441	2122615	4948.3	6	1	1
6794444	2122615	4948.5	6	1	1
6794447	2122615	4948.7	6	1	1
6794451	2122615	4948.9	6	1	1
6794398	2122618	4947.0	6	1	1
6794401	2122618	4947.1	2		1
6794405	2122618	4947.2	4		1
6794408	2122618	4947.4	4		1
6794411	2122618	4947.5	6	1	1
6794414	2122618	4947.5	5		1
6794418	2122618	4947.8	2		1
6794421	2122618	4947.9	1		1
6794424	2122618	4947.9	4		1
6794428	2122618	4948.0	4		1
6794431	2122618	4948.1	6	1	1
6794434	2122618	4948.2	6	1	1
6794437	2122618	4948.3	6	1	1
6794441	2122618	4948.4	6	1	1
6794444	2122618	4948.6	6	1	1
6794447	2122618	4948.9	6	1	1
6794451	2122618	4949.1	6	1	1
6794382	2122622	4946.3	4		1
6794385	2122622	4946.5	6	1	1
6794388	2122622	4946.5	3		1

Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6

6794444	2122609	4948.579	6
6794447	2122609	4948.776	6
6794451	2122609	4948.842	6
6794428	2122612	4947.923	4
6794431	2122612	4948.022	2
6794434	2122612	4948.022	4
6794437	2122612	4948.251	4
6794441	2122612	4948.415	6
6794444	2122612	4948.678	6
6794447	2122612	4948.711	6
6794451	2122612	4948.875	6
6794411	2122615	4947.136	2
6794414	2122615	4947.333	4
6794418	2122615	4947.398	4
6794421	2122615	4947.464	6
6794424	2122615	4947.628	6
6794428	2122615	4947.792	6
6794431	2122615	4947.923	6
6794434	2122615	4948.087	6
6794437	2122615	4948.218	6
6794441	2122615	4948.35	6
6794444	2122615	4948.514	6
6794447	2122615	4948.743	6
6794451	2122615	4948.907	6
6794398	2122618	4947.037	6
6794401	2122618	4947.136	2
6794405	2122618	4947.234	4
6794408	2122618	4947.365	4
6794411	2122618	4947.464	6
6794414	2122618	4947.497	5
6794418	2122618	4947.759	2
6794421	2122618	4947.858	1
6794424	2122618	4947.923	4
6794428	2122618	4948.022	4
6794431	2122618	4948.087	6
6794434	2122618	4948.153	6
6794437	2122618	4948.251	6
6794441	2122618	4948.415	6
6794444	2122618	4948.579	6
6794447	2122618	4948.907	6
6794451	2122618	4949.104	6
6794382	2122622	4946.348	4
6794385	2122622	4946.48	6
6794388	2122622	4946.512	3
6794391	2122622	4946.611	4
6794395	2122622	4946.775	4
6794398	2122622	4946.972	4
6794401	2122622	4947.333	5
6794405	2122622	4947.333	2
6794408	2122622	4947.431	5
6794411	2122622	4947.595	6
6794414	2122622	4947.694	6

Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6

6794418	2122622	4947.825	6
6794421	2122622	4947.956	3
6794424	2122622	4947.956	6
6794428	2122622	4948.054	4
6794431	2122622	4948.12	6
6794434	2122622	4948.251	6
6794437	2122622	4948.35	6
6794441	2122622	4948.514	6
6794444	2122622	4948.678	6
6794447	2122622	4948.875	6
6794451	2122622	4949.071	6
6794454	2122622	4949.203	6
6794365	2122625	4945.561	6
6794368	2122625	4945.725	6
6794372	2122625	4945.856	4
6794375	2122625	4946.02	3
6794378	2122625	4946.152	4
6794382	2122625	4946.283	4
6794385	2122625	4946.381	6
6794388	2122625	4946.709	6
6794391	2122625	4946.841	6
6794395	2122625	4946.972	6
6794398	2122625	4947.103	6
6794401	2122625	4947.234	6
6794405	2122625	4947.398	6
6794408	2122625	4947.497	6
6794411	2122625	4947.661	6
6794414	2122625	4947.759	6
6794418	2122625	4947.858	6
6794421	2122625	4947.956	6
6794424	2122625	4948.022	6
6794428	2122625	4947.89	5
6794431	2122625	4948.284	4
6794434	2122625	4948.382	6
6794437	2122625	4948.481	6
6794441	2122625	4948.579	6
6794444	2122625	4948.743	6
6794447	2122625	4948.94	6
6794451	2122625	4949.17	6
6794454	2122625	4949.432	6
6794352	2122628	4945.266	6
6794355	2122628	4945.331	4
6794359	2122628	4945.397	4
6794362	2122628	4945.495	4
6794365	2122628	4945.627	4
6794368	2122628	4945.791	4
6794372	2122628	4945.889	6
6794375	2122628	4946.152	6
6794378	2122628	4946.283	6
6794382	2122628	4946.447	6
6794385	2122628	4946.512	6
6794388	2122628	4946.709	6

6794391	2122628	4946.873	6
6794395	2122628	4947.005	6
6794398	2122628	4947.136	6
6794401	2122628	4947.267	6
6794405	2122628	4947.431	6
6794408	2122628	4947.595	6
6794411	2122628	4947.726	6
6794414	2122628	4947.858	6
6794418	2122628	4947.956	6
6794421	2122628	4948.054	6
6794424	2122628	4948.12	6
6794428	2122628	4948.284	4
6794431	2122628	4948.284	6
6794434	2122628	4948.382	6
6794437	2122628	4948.547	6
6794441	2122628	4948.645	6
6794444	2122628	4949.104	6
6794447	2122628	4949.137	6
6794451	2122628	4949.334	6
6794454	2122628	4949.498	6
6794336	2122631	4945.003	6
6794339	2122631	4945.036	6
6794342	2122631	4945.069	3
6794346	2122631	4945.134	4
6794349	2122631	4945.2	4
6794352	2122631	4945.299	5
6794355	2122631	4945.364	6
6794359	2122631	4945.495	6
6794362	2122631	4945.594	6
6794365	2122631	4945.725	6
6794368	2122631	4945.889	6
6794372	2122631	4946.02	6
6794375	2122631	4946.152	6
6794378	2122631	4946.316	6
6794382	2122631	4946.48	6
6794385	2122631	4946.578	6
6794388	2122631	4946.709	6
6794391	2122631	4946.841	6
6794395	2122631	4946.972	6
6794398	2122631	4947.136	6
6794401	2122631	4947.3	6
6794405	2122631	4947.464	6
6794408	2122631	4947.628	6
6794411	2122631	4947.759	6
6794414	2122631	4947.825	6
6794418	2122631	4947.956	6
6794421	2122631	4948.087	6
6794424	2122631	4948.153	6
6794428	2122631	4948.251	6
6794431	2122631	4948.35	6
6794434	2122631	4948.382	6
6794437	2122631	4948.579	6

6794441	2122631	4948.743	6
6794444	2122631	4949.203	6
6794447	2122631	4949.334	6
6794451	2122631	4949.531	6
6794454	2122631	4949.596	6
6794319	2122635	4944.872	6
6794323	2122635	4944.806	6
6794326	2122635	4944.938	2
6794329	2122635	4944.905	4
6794332	2122635	4944.97	5
6794336	2122635	4945.003	4
6794339	2122635	4945.069	4
6794342	2122635	4945.134	6
6794346	2122635	4945.102	6
6794349	2122635	4945.43	6
6794352	2122635	4945.364	6
6794355	2122635	4945.43	6
6794359	2122635	4945.528	6
6794362	2122635	4945.659	6
6794365	2122635	4945.758	6
6794368	2122635	4945.856	6
6794372	2122635	4945.987	6
6794375	2122635	4946.119	6
6794378	2122635	4946.283	6
6794382	2122635	4946.414	6
6794385	2122635	4946.545	6
6794388	2122635	4946.676	6
6794391	2122635	4946.873	6
6794395	2122635	4947.103	6
6794398	2122635	4947.267	6
6794401	2122635	4947.398	6
6794405	2122635	4947.497	6
6794408	2122635	4947.628	6
6794411	2122635	4947.759	6
6794414	2122635	4947.825	6
6794418	2122635	4947.923	6
6794421	2122635	4948.022	6
6794424	2122635	4948.12	6
6794428	2122635	4948.251	6
6794431	2122635	4948.317	6
6794434	2122635	4948.35	6
6794437	2122635	4948.743	6
6794441	2122635	4948.973	6
6794444	2122635	4949.137	6
6794447	2122635	4949.334	6
6794451	2122635	4949.498	6
6794454	2122635	4949.662	6
6794306	2122638	4944.642	6
6794309	2122638	4944.675	6
6794313	2122638	4944.741	2
6794316	2122638	4944.741	4
6794319	2122638	4944.774	4

6794323	2122638	4944.839	4
6794326	2122638	4944.905	4
6794329	2122638	4944.938	6
6794332	2122638	4945.2	6
6794336	2122638	4945.2	6
6794339	2122638	4945.069	6
6794342	2122638	4945.167	6
6794346	2122638	4945.233	6
6794349	2122638	4945.299	6
6794352	2122638	4945.43	6
6794355	2122638	4945.561	6
6794359	2122638	4945.659	6
6794362	2122638	4945.725	6
6794365	2122638	4945.856	6
6794368	2122638	4945.856	6
6794372	2122638	4946.053	6
6794375	2122638	4946.086	6
6794378	2122638	4946.316	6
6794382	2122638	4946.447	6
6794385	2122638	4946.611	6
6794388	2122638	4946.775	6
6794391	2122638	4946.939	6
6794395	2122638	4947.103	6
6794398	2122638	4947.3	6
6794401	2122638	4947.398	6
6794405	2122638	4947.562	6
6794408	2122638	4947.726	6
6794411	2122638	4947.858	6
6794414	2122638	4947.89	6
6794418	2122638	4947.989	6
6794421	2122638	4947.89	6
6794424	2122638	4948.087	6
6794428	2122638	4948.218	6
6794431	2122638	4948.415	6
6794434	2122638	4948.612	6
6794437	2122638	4948.809	6
6794441	2122638	4948.973	6
6794444	2122638	4949.104	6
6794447	2122638	4949.367	6
6794451	2122638	4949.564	6
6794454	2122638	4949.859	6
6794293	2122641	4944.478	6
6794296	2122641	4944.511	6
6794300	2122641	4944.413	6
6794303	2122641	4944.511	4
6794306	2122641	4944.577	4
6794309	2122641	4944.642	4
6794313	2122641	4944.708	6
6794316	2122641	4944.741	6
6794319	2122641	4944.905	6
6794323	2122641	4944.905	6
6794326	2122641	4944.97	6

6794329	2122641	4945.036	6
6794332	2122641	4945.134	6
6794336	2122641	4945.036	6
6794339	2122641	4945.134	6
6794342	2122641	4945.331	6
6794346	2122641	4945.397	6
6794349	2122641	4945.463	6
6794352	2122641	4945.528	6
6794355	2122641	4945.627	6
6794359	2122641	4945.659	6
6794362	2122641	4945.791	6
6794365	2122641	4945.856	6
6794368	2122641	4945.987	6
6794372	2122641	4946.119	6
6794375	2122641	4946.217	6
6794378	2122641	4946.381	6
6794382	2122641	4946.48	6
6794385	2122641	4946.644	6
6794388	2122641	4946.742	6
6794391	2122641	4946.939	6
6794395	2122641	4947.103	6
6794398	2122641	4947.267	6
6794401	2122641	4947.464	6
6794405	2122641	4947.562	6
6794408	2122641	4947.661	6
6794411	2122641	4947.825	6
6794414	2122641	4947.858	6
6794418	2122641	4947.923	6
6794421	2122641	4948.022	6
6794424	2122641	4948.12	6
6794428	2122641	4948.35	4
6794431	2122641	4948.579	6
6794434	2122641	4948.711	5
6794437	2122641	4948.776	6
6794441	2122641	4948.973	5
6794444	2122641	4949.17	6
6794447	2122641	4949.465	6
6794451	2122641	4949.662	6
6794454	2122641	4949.826	6
6794457	2122641	4949.957	6
6794280	2122645	4944.117	5
6794283	2122645	4944.085	6
6794286	2122645	4944.15	6
6794290	2122645	4944.216	6
6794293	2122645	4944.38	4
6794296	2122645	4944.38	4
6794300	2122645	4944.478	4
6794303	2122645	4944.544	6
6794306	2122645	4944.675	6
6794309	2122645	4944.61	6
6794313	2122645	4944.708	6
6794316	2122645	4944.774	6

6794319	2122645	4944.872	6
6794323	2122645	4945.003	6
6794326	2122645	4945.036	6
6794329	2122645	4945.134	6
6794332	2122645	4945.2	6
6794336	2122645	4945.233	6
6794339	2122645	4945.299	6
6794342	2122645	4945.364	6
6794346	2122645	4945.331	6
6794349	2122645	4945.43	6
6794352	2122645	4945.463	6
6794355	2122645	4945.594	6
6794359	2122645	4945.725	6
6794362	2122645	4945.823	6
6794365	2122645	4945.889	6
6794368	2122645	4945.987	6
6794372	2122645	4946.152	6
6794375	2122645	4946.25	6
6794378	2122645	4946.381	6
6794382	2122645	4946.512	6
6794385	2122645	4946.709	6
6794388	2122645	4946.841	6
6794391	2122645	4947.037	6
6794395	2122645	4947.07	6
6794398	2122645	4947.234	6
6794401	2122645	4947.365	6
6794405	2122645	4947.562	6
6794408	2122645	4947.661	6
6794411	2122645	4947.759	6
6794414	2122645	4947.89	6
6794418	2122645	4947.792	6
6794421	2122645	4948.186	6
6794424	2122645	4948.087	6
6794428	2122645	4948.382	6
6794431	2122645	4948.547	6
6794434	2122645	4948.678	6
6794437	2122645	4948.94	4
6794441	2122645	4949.137	4
6794444	2122645	4949.367	6
6794447	2122645	4949.432	6
6794451	2122645	4949.662	6
6794454	2122645	4949.859	6
6794457	2122645	4950.089	6
6794264	2122648	4943.822	6
6794267	2122648	4943.855	6
6794270	2122648	4943.855	6
6794273	2122648	4943.888	1
6794277	2122648	4943.986	1
6794280	2122648	4944.085	5
6794283	2122648	4944.15	4
6794286	2122648	4944.216	6
6794290	2122648	4944.314	6

6794293	2122648	4944.38	6
6794296	2122648	4944.347	6
6794300	2122648	4944.445	6
6794303	2122648	4944.511	6
6794306	2122648	4944.61	6
6794309	2122648	4944.675	6
6794313	2122648	4944.774	6
6794316	2122648	4944.839	6
6794319	2122648	4944.938	6
6794323	2122648	4945.003	6
6794326	2122648	4945.036	6
6794329	2122648	4945.134	6
6794332	2122648	4945.2	6
6794336	2122648	4945.299	6
6794339	2122648	4945.233	6
6794342	2122648	4945.331	6
6794346	2122648	4945.331	6
6794349	2122648	4945.43	6
6794352	2122648	4945.528	6
6794355	2122648	4945.692	6
6794359	2122648	4945.823	6
6794362	2122648	4945.856	6
6794365	2122648	4945.955	6
6794368	2122648	4945.987	6
6794372	2122648	4946.184	6
6794375	2122648	4946.316	6
6794378	2122648	4946.447	6
6794382	2122648	4946.512	6
6794385	2122648	4946.676	6
6794388	2122648	4946.808	6
6794391	2122648	4946.972	6
6794395	2122648	4947.103	6
6794398	2122648	4947.398	6
6794401	2122648	4947.464	6
6794405	2122648	4947.562	6
6794408	2122648	4947.726	6
6794411	2122648	4947.923	6
6794414	2122648	4948.054	6
6794418	2122648	4948.054	6
6794421	2122648	4948.186	6
6794424	2122648	4948.284	6
6794428	2122648	4948.448	6
6794431	2122648	4948.547	5
6794434	2122648	4948.678	6
6794437	2122648	4949.039	6
6794441	2122648	4949.071	6
6794444	2122648	4949.301	6
6794447	2122648	4949.498	6
6794451	2122648	4949.662	6
6794454	2122648	4949.924	6
6794457	2122648	4950.023	6
6794250	2122651	4942.707	2

6794254	2122651	4944.216	1
6794257	2122651	4944.216	1
6794260	2122651	4942.608	4
6794264	2122651	4943.658	5
6794267	2122651	4943.724	5
6794270	2122651	4943.822	6
6794273	2122651	4943.888	6
6794277	2122651	4943.953	6
6794280	2122651	4944.052	6
6794283	2122651	4944.052	6
6794286	2122651	4944.117	6
6794290	2122651	4944.183	6
6794293	2122651	4944.281	6
6794296	2122651	4944.38	6
6794300	2122651	4944.445	6
6794303	2122651	4944.544	6
6794306	2122651	4944.61	6
6794309	2122651	4944.708	6
6794313	2122651	4944.774	6
6794316	2122651	4944.839	6
6794319	2122651	4944.905	6
6794323	2122651	4945.003	6
6794326	2122651	4945.069	6
6794329	2122651	4945.102	6
6794332	2122651	4945.2	6
6794336	2122651	4945.134	6
6794339	2122651	4945.2	6
6794342	2122651	4945.299	6
6794346	2122651	4945.397	6
6794349	2122651	4945.528	6
6794352	2122651	4945.627	6
6794355	2122651	4945.725	6
6794359	2122651	4945.758	6
6794362	2122651	4945.889	6
6794365	2122651	4945.987	6
6794368	2122651	4946.119	6
6794372	2122651	4946.217	6
6794375	2122651	4946.316	6
6794378	2122651	4946.447	6
6794382	2122651	4946.545	6
6794385	2122651	4946.808	6
6794388	2122651	4946.939	6
6794391	2122651	4946.972	6
6794395	2122651	4947.201	6
6794398	2122651	4947.333	6
6794401	2122651	4947.431	6
6794405	2122651	4947.595	6
6794408	2122651	4947.694	6
6794411	2122651	4947.825	6
6794414	2122651	4947.89	6
6794418	2122651	4948.022	6
6794421	2122651	4948.251	5

6794424	2122651	4948.087	6
6794428	2122651	4948.645	6
6794431	2122651	4948.776	6
6794434	2122651	4948.809	6
6794437	2122651	4948.973	6
6794441	2122651	4949.137	6
6794444	2122651	4949.334	6
6794447	2122651	4949.531	6
6794451	2122651	4949.728	6
6794454	2122651	4949.892	6
6794457	2122651	4950.089	6
6794237	2122654	4943.625	6
6794241	2122654	4943.297	6
6794244	2122654	4943.56	6
6794247	2122654	4943.789	4
6794250	2122654	4943.625	6
6794254	2122654	4943.527	3
6794257	2122654	4943.56	5
6794260	2122654	4943.592	4
6794264	2122654	4943.658	4
6794267	2122654	4943.527	5
6794270	2122654	4943.691	6
6794273	2122654	4943.789	6
6794277	2122654	4943.855	6
6794280	2122654	4943.953	6
6794283	2122654	4944.052	6
6794286	2122654	4944.15	6
6794290	2122654	4944.249	6
6794293	2122654	4944.347	6
6794296	2122654	4944.413	6
6794300	2122654	4944.478	6
6794303	2122654	4944.544	6
6794306	2122654	4944.642	6
6794309	2122654	4944.708	6
6794313	2122654	4944.806	6
6794316	2122654	4944.872	6
6794319	2122654	4944.938	6
6794323	2122654	4944.97	6
6794326	2122654	4945.036	6
6794329	2122654	4945.003	6
6794332	2122654	4945.069	6
6794336	2122654	4945.167	6
6794339	2122654	4945.299	6
6794342	2122654	4945.364	6
6794346	2122654	4945.495	6
6794349	2122654	4945.495	6
6794352	2122654	4945.594	6
6794355	2122654	4945.659	6
6794359	2122654	4945.791	6
6794362	2122654	4945.922	6
6794365	2122654	4946.053	6
6794368	2122654	4946.152	6

6794372	2122654	4946.381	6
6794375	2122654	4946.512	6
6794378	2122654	4946.611	6
6794382	2122654	4946.742	6
6794385	2122654	4946.906	6
6794388	2122654	4946.906	6
6794391	2122654	4947.103	6
6794395	2122654	4947.201	6
6794398	2122654	4947.333	6
6794401	2122654	4947.497	6
6794405	2122654	4947.628	6
6794408	2122654	4947.726	6
6794411	2122654	4947.825	6
6794414	2122654	4947.923	6
6794418	2122654	4948.186	6
6794421	2122654	4948.317	6
6794424	2122654	4948.481	6
6794428	2122654	4948.579	6
6794431	2122654	4948.776	6
6794434	2122654	4948.907	6
6794437	2122654	4949.006	6
6794441	2122654	4949.137	6
6794444	2122654	4949.301	6
6794447	2122654	4949.531	6
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6794323	2122769	4944.413	6
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6794329	2122769	4944.544	6
6794332	2122769	4944.642	6
6794336	2122769	4944.741	6
6794339	2122769	4944.839	6
6794342	2122769	4944.97	6
6794346	2122769	4945.102	6
6794349	2122769	4945.233	6
6794352	2122769	4945.331	6
6794355	2122769	4945.331	6
6794359	2122769	4945.397	6
6794362	2122769	4945.463	6
6794365	2122769	4945.528	6
6794368	2122769	4945.594	6
6794372	2122769	4945.692	6
6794375	2122769	4945.758	6
6794378	2122769	4945.823	6
6794382	2122769	4945.856	6
6794385	2122769	4945.922	6
6794388	2122769	4946.02	6
6794391	2122769	4946.119	6
6794395	2122769	4946.184	6
6794398	2122769	4946.316	6
6794401	2122769	4946.348	6
6794405	2122769	4946.414	6
6794408	2122769	4946.512	6
6794411	2122769	4946.676	6
6794414	2122769	4946.808	6
6794418	2122769	4946.906	4
6794421	2122769	4946.742	6
6794441	2122769	4947.005	1
6794444	2122769	4947.333	2
6794447	2122769	4947.365	3
6794451	2122769	4947.792	5
6794454	2122769	4948.153	4
6794457	2122769	4947.956	6
6794460	2122769	4948.12	6
6794464	2122769	4948.514	4
6794467	2122769	4948.809	6
6794470	2122769	4948.711	6
6794473	2122769	4948.94	6
6794237	2122773	4942.936	6
6794241	2122773	4942.969	6
6794244	2122773	4942.969	6

6794247	2122773	4943.035	6
6794250	2122773	4943.068	6
6794254	2122773	4943.1	6
6794257	2122773	4943.1	6
6794260	2122773	4943.1	6
6794264	2122773	4943.1	6
6794267	2122773	4943.166	6
6794270	2122773	4943.199	6
6794273	2122773	4943.264	6
6794277	2122773	4943.33	6
6794280	2122773	4943.461	6
6794283	2122773	4943.527	6
6794286	2122773	4943.461	6
6794290	2122773	4943.592	6
6794293	2122773	4943.658	6
6794296	2122773	4943.757	6
6794300	2122773	4943.757	6
6794303	2122773	4943.986	6
6794306	2122773	4944.019	6
6794309	2122773	4944.117	6
6794313	2122773	4944.216	6
6794316	2122773	4944.281	6
6794319	2122773	4944.347	6
6794323	2122773	4944.38	6
6794326	2122773	4944.478	6
6794329	2122773	4944.544	6
6794332	2122773	4944.642	6
6794336	2122773	4944.741	6
6794339	2122773	4944.872	6
6794342	2122773	4944.938	6
6794346	2122773	4945.069	6
6794349	2122773	4945.167	6
6794352	2122773	4945.266	6
6794355	2122773	4945.331	6
6794359	2122773	4945.364	6
6794362	2122773	4945.495	6
6794365	2122773	4945.561	6
6794368	2122773	4945.594	6
6794372	2122773	4945.627	6
6794375	2122773	4945.692	6
6794378	2122773	4945.791	6
6794382	2122773	4945.758	6
6794385	2122773	4945.856	6
6794388	2122773	4945.922	6
6794391	2122773	4946.053	6
6794457	2122773	4947.956	6
6794460	2122773	4948.054	6
6794464	2122773	4948.317	6
6794467	2122773	4948.382	6
6794470	2122773	4948.481	6
6794473	2122773	4948.711	6
6794237	2122776	4942.936	6

6794241	2122776	4942.936	6
6794244	2122776	4943.002	6
6794247	2122776	4943.068	6
6794250	2122776	4943.1	6
6794254	2122776	4943.133	6
6794257	2122776	4943.068	6
6794260	2122776	4943.1	6
6794264	2122776	4943.133	6
6794267	2122776	4943.133	6
6794270	2122776	4943.232	6
6794273	2122776	4943.264	4
6794277	2122776	4943.297	6
6794280	2122776	4943.232	6
6794283	2122776	4943.494	6
6794286	2122776	4943.527	6
6794290	2122776	4943.56	6
6794293	2122776	4943.625	6
6794296	2122776	4943.724	6
6794300	2122776	4943.888	6
6794303	2122776	4943.953	6
6794306	2122776	4944.052	6
6794309	2122776	4944.117	6
6794313	2122776	4944.183	6
6794316	2122776	4944.249	6
6794319	2122776	4944.347	6
6794323	2122776	4944.413	6
6794326	2122776	4944.478	6
6794329	2122776	4944.544	6
6794332	2122776	4944.675	6
6794336	2122776	4944.774	6
6794339	2122776	4944.905	6
6794342	2122776	4944.872	6
6794346	2122776	4945.036	6
6794349	2122776	4945.134	6
6794352	2122776	4945.2	6
6794355	2122776	4945.299	6
6794359	2122776	4945.331	6
6794362	2122776	4945.364	6
6794365	2122776	4945.397	6
6794470	2122776	4948.218	6
6794473	2122776	4948.415	5
6794237	2122779	4943.068	3
6794241	2122779	4942.904	6
6794244	2122779	4942.969	6
6794247	2122779	4943.1	6
6794250	2122779	4943.068	6
6794254	2122779	4943.1	6
6794257	2122779	4943.068	6
6794260	2122779	4943.1	6
6794264	2122779	4943.068	6
6794267	2122779	4943.133	6
6794270	2122779	4943.1	6

6794273	2122779	4943.297	6
6794277	2122779	4943.33	6
6794280	2122779	4943.363	6
6794283	2122779	4943.428	6
6794286	2122779	4943.494	6
6794290	2122779	4943.428	6
6794293	2122779	4943.658	6
6794296	2122779	4943.757	6
6794300	2122779	4943.855	6
6794303	2122779	4943.953	6
6794306	2122779	4944.052	6
6794309	2122779	4944.15	6
6794313	2122779	4944.15	6
6794316	2122779	4944.216	6
6794319	2122779	4944.314	4
6794323	2122779	4944.413	2
6794326	2122779	4944.511	6
6794329	2122779	4944.577	6
6794332	2122779	4944.642	6
6794336	2122779	4944.774	6
6794339	2122779	4944.872	6
6794342	2122779	4944.905	6
6794346	2122779	4945.003	6
6794349	2122779	4945.069	6
6794237	2122782	4943.002	5
6794241	2122782	4942.772	6
6794244	2122782	4942.904	6
6794247	2122782	4943.002	6
6794250	2122782	4943.068	6
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6794257	2122782	4943.1	6
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6794264	2122782	4943.1	6
6794267	2122782	4943.1	6
6794270	2122782	4943.232	6
6794273	2122782	4943.232	6
6794277	2122782	4943.264	6
6794280	2122782	4943.297	6
6794283	2122782	4943.363	6
6794286	2122782	4943.363	6
6794290	2122782	4943.592	6
6794293	2122782	4943.592	6
6794296	2122782	4943.724	6
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6794303	2122782	4943.921	4
6794306	2122782	4943.986	4
6794309	2122782	4944.052	6
6794313	2122782	4944.15	6
6794316	2122782	4944.216	6
6794319	2122782	4944.249	6
6794323	2122782	4944.314	6
6794326	2122782	4944.413	6

6794329	2122782	4944.511	5
6794332	2122782	4944.577	4
6794336	2122782	4944.675	4
6794237	2122786	4942.969	2
6794241	2122786	4942.772	6
6794244	2122786	4942.936	6
6794247	2122786	4942.936	6
6794250	2122786	4943.035	6
6794254	2122786	4943.068	6
6794257	2122786	4943.068	6
6794260	2122786	4943.068	6
6794264	2122786	4943.035	6
6794267	2122786	4943.068	6
6794270	2122786	4943.133	6
6794273	2122786	4943.199	6
6794277	2122786	4942.969	6
6794280	2122786	4943.297	6
6794283	2122786	4943.396	6
6794286	2122786	4943.461	4
6794290	2122786	4943.592	4
6794293	2122786	4943.625	6
6794296	2122786	4943.691	6
6794300	2122786	4943.789	6
6794303	2122786	4943.855	6
6794306	2122786	4943.855	6
6794309	2122786	4943.921	6
6794313	2122786	4944.019	6
6794316	2122786	4944.117	4
6794319	2122786	4944.216	2
6794323	2122786	4944.314	6
6794241	2122789	4942.772	5
6794244	2122789	4942.838	6
6794247	2122789	4942.904	6
6794250	2122789	4942.936	6
6794254	2122789	4942.969	6
6794257	2122789	4943.002	6
6794260	2122789	4943.068	6
6794264	2122789	4943.035	6
6794267	2122789	4943.035	6
6794270	2122789	4943.068	6
6794273	2122789	4943.166	6
6794277	2122789	4943.232	6
6794280	2122789	4943.264	6
6794283	2122789	4943.396	6
6794286	2122789	4943.494	6
6794290	2122789	4943.527	6
6794293	2122789	4943.494	6
6794296	2122789	4943.56	6
6794300	2122789	4943.658	6
6794303	2122789	4943.724	3
6794306	2122789	4943.953	6
6794309	2122789	4944.019	6

6794241	2122792	4942.969	5
6794244	2122792	4942.838	6
6794247	2122792	4942.838	6
6794250	2122792	4942.936	6
6794254	2122792	4942.969	6
6794257	2122792	4943.002	6
6794260	2122792	4943.002	6
6794264	2122792	4943.035	6
6794267	2122792	4943.166	6
6794270	2122792	4942.969	6
6794273	2122792	4943.068	6
6794277	2122792	4943.1	6
6794280	2122792	4943.133	6
6794283	2122792	4943.199	6
6794286	2122792	4943.297	6
6794290	2122792	4943.33	6
6794293	2122792	4943.428	6
6794296	2122792	4943.494	6
6794241	2122796	4942.969	6
6794244	2122796	4942.739	5
6794247	2122796	4942.805	6
6794250	2122796	4942.871	6
6794254	2122796	4942.871	6
6794257	2122796	4942.904	6
6794260	2122796	4942.904	6
6794264	2122796	4942.904	6
6794267	2122796	4942.871	6
6794270	2122796	4943.035	6
6794273	2122796	4943.068	6
6794277	2122796	4943.133	6
6794280	2122796	4943.396	6
6794283	2122796	4943.494	6
6794241	2122799	4942.969	3
6794244	2122799	4943.494	2
6794247	2122799	4942.772	5
6794250	2122799	4942.805	6
6794254	2122799	4942.936	6
6794257	2122799	4942.969	5
6794260	2122799	4942.805	6
6794264	2122799	4942.969	6
6794267	2122799	4942.904	6
6794270	2122799	4943.199	6
6794241	2122802	4942.28	6
6794244	2122802	4942.707	5
6794247	2122802	4942.772	3
6794250	2122802	4942.739	4
6794254	2122802	4942.805	6
6794257	2122802	4942.477	6
6794241	2122805	4942.215	6
6794244	2122805	4942.543	2

Number of white pixels 0

UWK28101029-00

ENERGYSOLUTIONS

STANDARD PROCTOR FORM
(Graph)

PROJECT: ____ CAN ____ MW ____ 11E.(2) ____ CLASS A OTHER UMTRA

SAMPLE NAME: RADON BARRIER # 5 (B) DATE: 8/4/2010

ASTM D-698 METHOD: A **B** C

P_C = 1.6 % P_F = 98 %

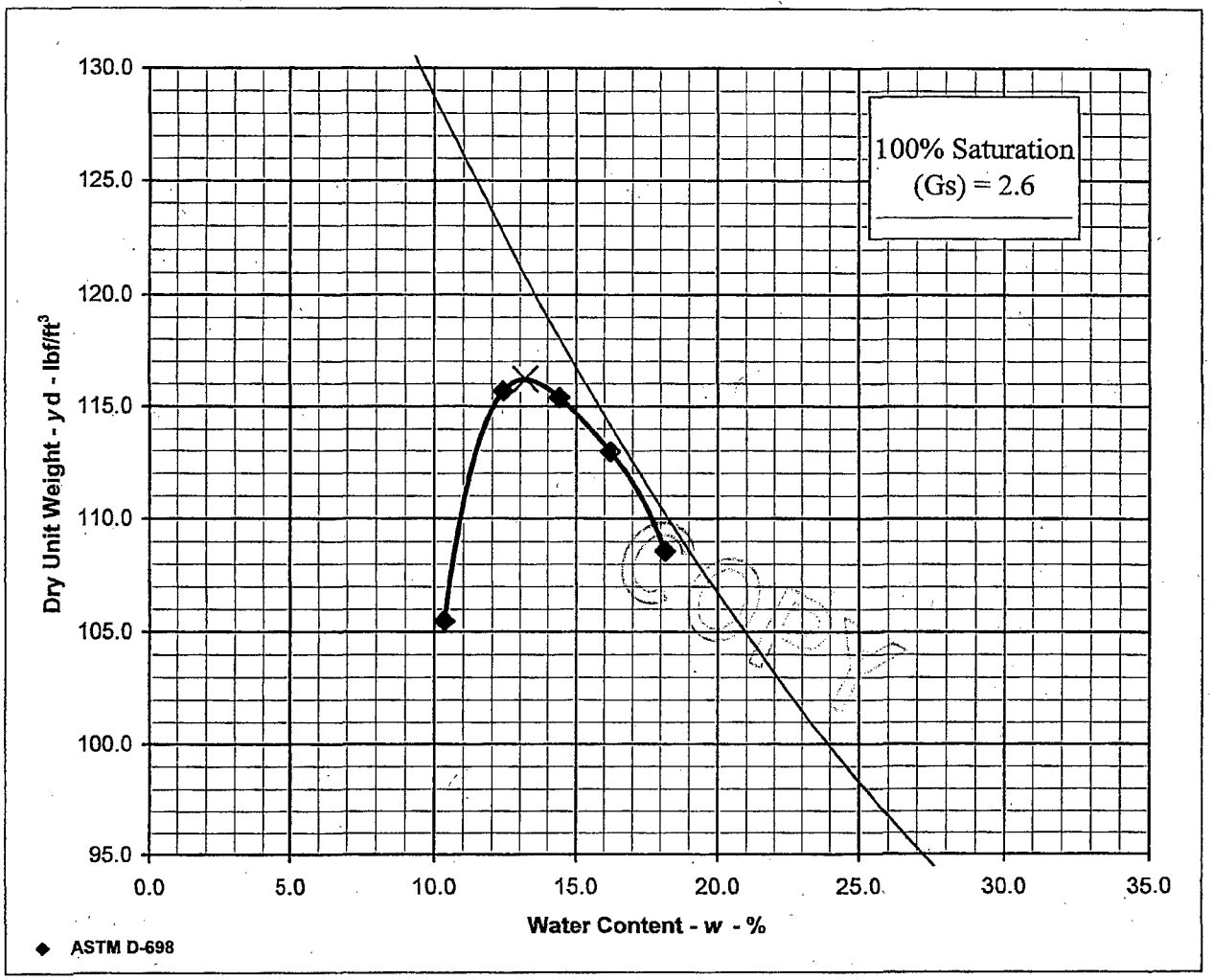
STANDARD MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): 116.2 lbf/ft^3

STANDARD OPTIMUM WATER CONTENT (Std-w^{opt}): 13.2 %

OVERSIZED CORRECTION

CORR. MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): N/A lbf/ft^3

CORR. OPTIMUM WATER CONTENT (Std-w^{opt}): N/A %



TESTED BY: Lyn Smith DATE: 8/4/2010

QA/QC APPROVAL 8.30.10 DATE

ENERGYSOLUTIONS

STANDARD PROCTOR FORM

(Calculations)

PROJECT: ___ CAN ___ MW ___ 11E.(2) ___ CLASS A OTHER UMTRA

SAMPLE NAME: RADON BARRIER # 5 (B) DATE: 8/4/2010

ASTM D-698 METHOD: A **B** C Estimated Specific Gravity = **2.60** (G_S)

Type of Rammer: **Manual** Preparation Method: **Dry** As Received Water Content **4** %

Test Number	1	2	3	4	5	6	7
Water Added	**2%**	**4%**	**6%**	**8%**	**10%**		
Cylinder & Soil Wt.	**6023**	**6229**	**6259**	**6248**	**6203**		
Cylinder Wt.	**4263**	**4263**	**4263**	**4263**	**4263**		
Wet Soil Wt.	**1760**	**1966**	**1996**	**1985**	**1940**		
Wet Density (lbs/ft^3)	**116.4**	**130.0**	**132.0**	**131.3**	**128.3**		

ASTM D2216 *(110° C ± 5° C)*

Container Number	**1**	**2**	**3**	**4**	**5**		
Container & Wet Soil Weight (g)	**487.6**	**498.5**	**514.4**	**445.5**	**463.0**		
Container & Dry Soil Weight (g)	**446.8**	**449.3**	**456.0**	**390.6**	**399.8**		
Water Weight (g)	**40.8**	**49.2**	**58.4**	**54.9**	**63.2**		
Container & Dry Soil Weight (g)	**446.8**	**449.3**	**456.0**	**390.6**	**399.8**		
Container Weight (g)	**52.7**	**52.7**	**50.5**	**52.1**	**51.8**		
Dry Soil Weight	**394.1**	**396.6**	**405.5**	**338.5**	**348.0**		
Moisture Content (% of Dry Weight)	**10.4**	**12.4**	**14.4**	**16.2**	**18.2**		
Dry Density (lbs/ft^3)	**105.5**	**115.7**	**115.4**	**113.0**	**108.6**		

$$\text{Wet Density} = \frac{\text{Wet Soil Weight}}{\text{Volume of the mold}} \qquad \text{Dry Density} = \frac{\text{Wet Density x 100}}{\text{100 + \% moisture}}$$

TESTED BY: [signature] DATE: 8/4/2010

[signature] 8·30·10

QA/QC APPROVAL DATE

ENERGYSOLUTIONS

EC-1908
Revision 5

SOIL CLASSIFICATION FORM

PROJECT:	CAN	MW	11e.(2)	CLASS A	Other	UMTRA
SAMPLE NAME:	radon barrier # 5 (B)			DATE:	8/4/2010	

GRADATION AS RECEIVED			
SCREEN SIZE	WEIGHT DRY (g)	PERCENT RETAINED	PERCENT PASSING
3"			
1-1 / 2"			
1"			
3 / 4"			
3 / 8"	86.0	2	98
#4	1001.0	29	68
-#4	2,361.0	68	
TOTAL DRY MASS	3,448.0	100	
#8			
#16			
#30			
#40			
#100			
#200			
-#200			
TOTAL MASS			

AS TESTED MOISTURE DETERMINATION		
	+#4	-#4
CONTAINER & WT. AGGREGATE (g)	N/A	N/A
CONTAINER & DRY AGGREGATE	N/A	N/A
CONTAINER MASS (g)	N/A	N/A
PERCENT MOISTURE	N/A	N/A

GRADATION TEST	
PERCENT GRAVEL	32
PERCENT SAND	N/A
PERCENT FINE SAND	N/A
PERCENT SILT & CLAY	N/A

ATTERBERG LIMITS	
LIQUID LIMIT	~~#REF!~~ 32.1
PLASTIC LIMIT	~~#REF!~~ 18.8
PLASTIC INDEX	~~#REF!~~ 13.3
CLASSIFICATION	CL w GRAVEL

GREY IN COLOR AND CONSISTS OF MOSTLY FINES

TEST RESULTS: (PASS) FAIL By: Lynn Tuttle Date 8/4/2010

QA/QC APPROVAL 8.30.10 DATE

JOHANSEN AND TUTTLE ENG.
SIEVE ANALYSIS

Project: UMTRA Date: 8/4/2010

Material Source: RADON BARRIER # 5B Test #: R.B 5B

Test Method: ASTM C-136

Dry Wt: 2397

sieve size	weight + material	weight of sieve	material weight	percent retained	percent passing	specs
1/4"	1368	1368	0	0.00%	**100.0**	
NO.4	1306	1280	26	1.08%	**98.9**	
NO.10	1043	1010	33	1.38%	**97.5**	
NO.40	913	888	25	1.04%	**96.5**	
NO.200	709	678	31	1.29%	**95.20**	

*note: all weights are in grams.

Remarks:

Tested By: Lynn Tuttle

Lynn Tuttle

Johansen and Tuttle Engineering
Atterberg Limits

Date: 8-8-10

Project: UMTRA

Material Source: Radon Barrier

Location: Radon Barrier

Sample No.: 5 (B)

Tested by: Lynn Tuttle

Liquid Limit

1. Trial No.	1	2
2. Dish No.	1	4
3. No. of blows (N)	23	26
4. Wt. Dish + Wet Soil	29.08	31.51
5. Wt. Dish + Dry Soil	25.44	27.65
6. Wt. Dish	14.22	15.58
7. Wt. Water 4-5	3.64	3.86
8. Wt Dry Soil 5-6	11.22	12.07
9. % Moisture 7/8	32.44	31.98
10. Wn (line # 9)	32.4	32.0
11. Fn (No. of blows)	0.99	1.005
12. Average Liquid Limit	32.1	32.1

N	FN
20	0.974
21	0.979
22	0.985
23	0.99
24	0.995
25	1
26	1.005
27	1.009
28	1.014
29	1.018
30	1.022

Plastic Limit

1. Trial No.	1	2
2. Dish No.	1	3
3. Wt Dish + Wet Soil	20.77	21.18
4. Wt. Dish + Dry Soil	19.51	19.87
5. Wt. Dish	12.81	12.89
6. Wt. Water 3-4	1.26	1.31
7. Wt. Dry Soil 4-5	6.70	6.98
8. % Moisture 6/7	18.8	18.76
9. Average Plastic Limit	18.8	18.8

LL = (Fn)(Wn)

Fn = N/25

WN = % moisture

Note: this formula used only with one point method.

Liquid Limit (LL) = 32.1

Plastic Limit (PL) = 18.8

Plastic Index (PI) = 13.3

Unified Classification = CL

Remarks:

ENERGYSOLUTIONS

STANDARD PROCTOR FORM
(Graph)

PROJECT: ____ CAN ____ MW ____ 11E.(2) ____ CLASS A OTHER UMTRA

SAMPLE NAME: RADON BARRIER # 6 (B) DATE: 8/4/2010

ASTM D-698 METHOD: A **B** C

P_C = 3.4 % P_F = 97 %

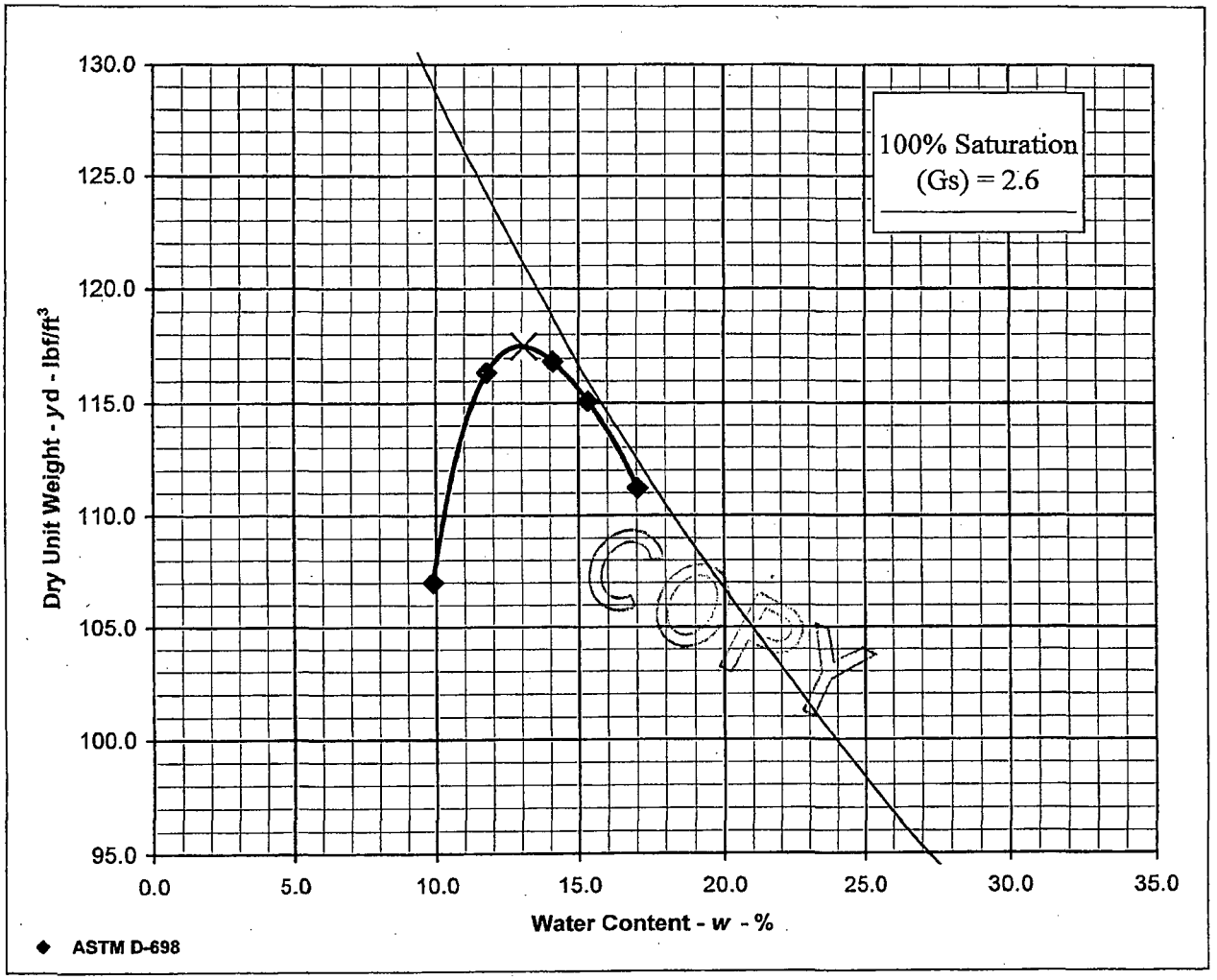
STANDARD MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): 117.5 lbf/ft^3

STANDARD OPTIMUM WATER CONTENT (Std-w_{opt}): 13.1 %

OVERSIZED CORRECTION

CORR. MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): N/A lbf/ft^3

CORR. OPTIMUM WATER CONTENT (Std-w_{opt}): N/A %



TESTED BY: [signature] DATE: 8/4/2010

[signature] 8.30.10
QA/QC APPROVAL DATE

ENERGYSOLUTIONS

EC-1909
Revision 6

STANDARD PROCTOR FORM

(Calculations)

PROJECT: CAN | MW | 11E.(2) | CLASS A | OTHER UMTRA

SAMPLE NAME: RADON BARRIER # 6 (B) DATE: 8/4/2010

ASTM D-698 METHOD: A **B** C Estimated Specific Gravity = 2.60 (G_S)

Type of Rammer: Manual Preparation Method: Dry As Received Water Content 4 %

Test Number	1	2	3	4	5	6	7
Water Added	2%	4%	6%	8%	10%		
Cylinder & Soil Wt.	6041	6230	6279	6270	6231		
Cylinder Wt.	4263	4263	4263	4263	4263		
Wet Soil Wt.	1778	1967	2016	2007	1968		
Wet Density (lbs/ft^3)	117.6	130.1	133.3	132.7	130.2		

ASTM D2216 (110° C ± 5° C)

Container Number	1	2	3	4	5		
Container & Wet Soil Weight (g)	493.6	502.5	498.5	404.4	471.0		
Container & Dry Soil Weight (g)	453.8	455.0	443.4	357.3	410.2		
Water Weight (g)	39.8	47.5	55.1	47.1	60.8		
Container & Dry Soil Weight (g)	453.8	455.0	443.4	357.3	410.2		
Container Weight (g)	51.4	52.1	52.9	50.1	53.1		
Dry Soil Weight	402.4	402.9	390.5	307.2	357.1		
Moisture Content (% of Dry Weight)	9.9	11.8	14.1	15.3	17.0		
Dry Density (lbs/ft^3)	107.0	116.4	116.8	115.1	111.2		

$$\text{Wet Density} = \frac{\text{Wet Soil Weight}}{\text{Volume of the mold}} \qquad \text{Dry Density} = \frac{\text{Wet Density x 100}}{\text{100 + \% moisture}}$$

TESTED BY: [signature] DATE: 8/4/2010

[signature] 8.30.10

QA/QC APPROVAL DATE

ENERGYSOLUTIONS

SOIL CLASSIFICATION FORM

PROJECT:	CAN	MW	11e.(2)	CLASS A	Other	UMTRA
SAMPLE NAME:	RADON BARRIER 6 (B)			DATE:	8/4/2010	

GRADATION AS RECEIVED			
SCREEN SIZE	WEIGHT DRY (g)	PERCENT RETAINED	PERCENT PASSING
3"			
1-1 / 2"			
1"			
3 / 4"			
3 / 8"	148.0	3	97
#4	1425.0	33	64
-#4	2,789.0	64	
TOTAL DRY MASS	4,362.0	100	
#8			
#16			
#30			
#40			
#100			
#200			
-#200			
TOTAL MASS			

AS TESTED MOISTURE DETERMINATION		
	+#4	-#4
CONTAINER & WT. AGGREGATE (g)	N/A	N/A
CONTAINER & DRY AGGREGATE	N/A	N/A
CONTAINER MASS (g)	N/A	N/A
PERCENT MOISTURE	N/A	N/A

GRADATION TEST	
PERCENT GRAVEL	36
PERCENT SAND	N/A
PERCENT FINE SAND	N/A
PERCENT SILT & CLAY	N/A

ATTERBERG LIMITS	
LIQUID LIMIT	~~#REF!~~ 30.8
PLASTIC LIMIT	~~#REF!~~ 16.9
PLASTIC INDEX	~~#REF!~~ 13.9
CLASSIFICATION	CL w GRAVEL

GREY IN COLOR AND CONSISTS OF MOSTLY FINES

TEST RESULTS: (PASS) FAIL By: Lynn Artz Date 8/4/2010

QA/QC APPROVAL 8.30.10 DATE

JOHANSEN AND TUTTLE ENG.
SIEVE ANALYSIS

Project: UMTRA

Date: 8/4/2010

Material Source: RADON BARRIER # 6B

Test #: R.B. 6B

Test Method: ASTM C-136

Dry Wt: 1568

sieve size	weight + material	weight of sieve	material weight	percent retained	percent passing	specs
1/4"	1368	1368	0	0.00%	**100.0**	
NO.4	1288	1280	8	0.51%	**99.5**	
NO.10	1024	1010	14	0.89%	**98.6**	
NO.40	914	888	26	1.66%	**96.9**	
NO.200	726	678	48	3.06%	**93.88**	

*note: all weights are in grams.

Remarks:

Tested By: Lynn Tuttle

Lynn Tuttle

Johansen and Tuttle Engineering
Atterberg Limits

Date: 8-8-10

Project: UMTRA

Material Source: Radon Barrier

Location: Radon Barrier

Sample No.: 6(B)

Tested by: [signature]

Liquid Limit

1. Trial No.	1	2
2. Dish No.	#1	#7
3. No. of blows (N)	27	22
4. Wt. Dish + Wet Soil	32.63	31.90
5. Wt. Dish + Dry Soil	28.50	27.88
6. Wt. Dish	15.07	14.96
7. Wt. Water 4-5	4.13	4.02
8. Wt Dry Soil 5-6	13.43	12.92
9. % Moisture 7/8	30.75	31.1
10. Wn (line # 9)	30.8	31.1
11. Fn (No. of blows)	1.009	0.985
12. Average Liquid Limit	31.0	30.6

N	FN
20	0.974
21	0.979
22	0.985
23	0.99
24	0.995
25	1
26	1.005
27	1.009
28	1.014
29	1.018
30	1.022

Plastic Limit

1. Trial No.	1	2
2. Dish No.	#5	#4
3. Wt Dish + Wet Soil	21.40	21.49
4. Wt. Dish + Dry Soil	20.26	20.34
5. Wt. Dish	13.47	13.56
6. Wt. Water 3-4	1.14	1.15
7. Wt. Dry Soil 4-5	6.79	6.78
8. % Moisture 6/7	16.78	16.96
9. Average Plastic Limit	16.8	17.0

LL = (Fn)(Wn)

Fn = N/25

WN = % moisture

Note: this formula used only with one point method.

Liquid Limit (LL) = 30.8

Plastic Limit (PL) = 16.9

Plastic Index (PI) = 13.9

Unified Classification = CL

Remarks:

ENERGYSOLUTIONS

STANDARD PROCTOR FORM

(Graph)

PROJECT: ____ CAN ____ MW ____ 11E.(2) ____ CLASS A **OTHER** UMTRA

SAMPLE NAME: **RADON BARRIER # 7 (B)** DATE: **8/4/2010**

ASTM D-698 METHOD: A **B** C

P_C = 1.6 % P_F = 98 %

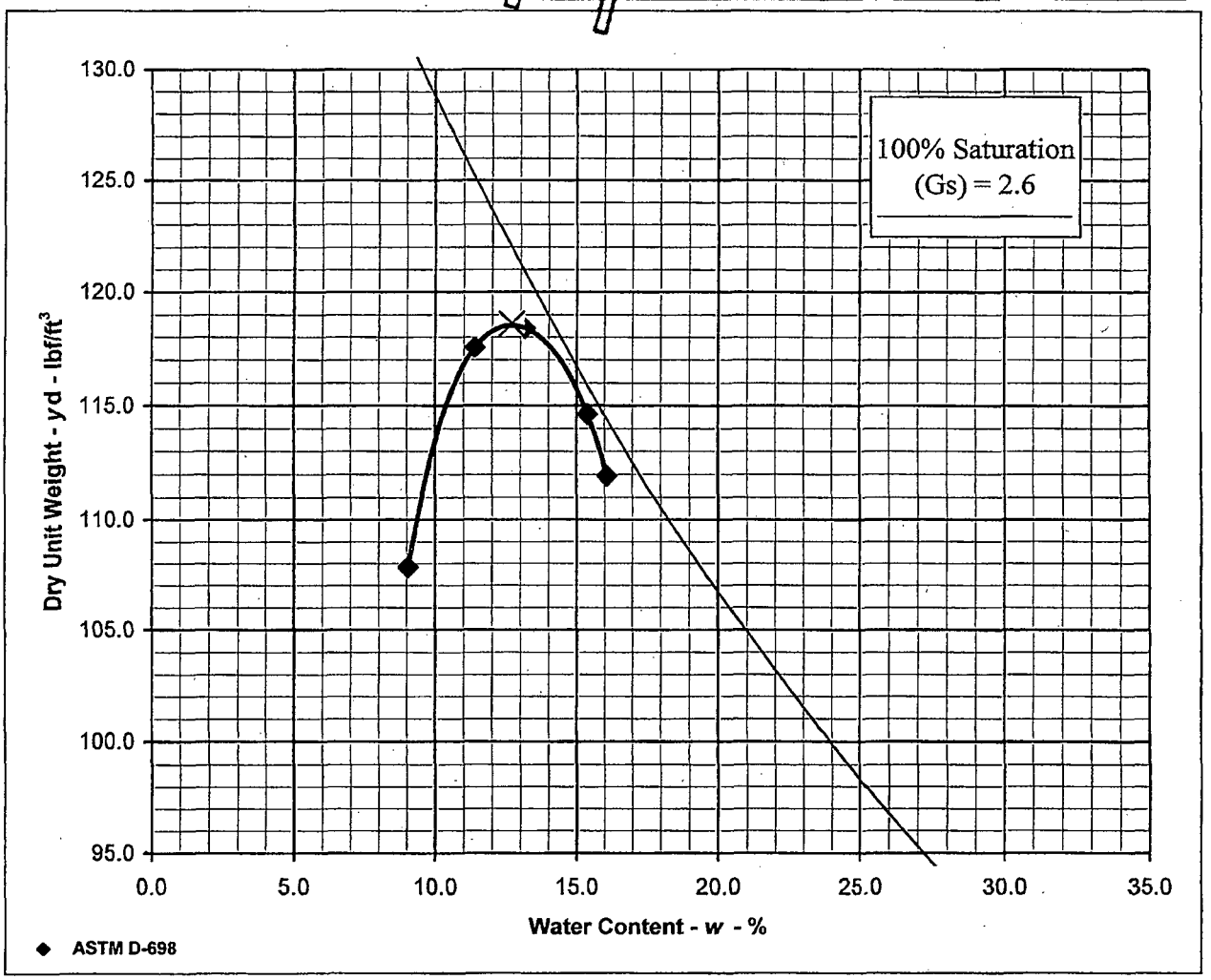
STANDARD MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): **118.6** lbf/ft^3

STANDARD OPTIMUM WATER CONTENT (Std-w^{opt}): **12.7** %

OVERSIZED CORRECTION

CORR. MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): N/A lbf/ft^3

CORR. OPTIMUM WATER CONTENT (Std-w^{opt}): N/A %



TESTED BY: [signature] DATE: 8/4/2010

[signature] 8.30.10

QA/QC APPROVAL DATE

ENERGYSOLUTIONS

STANDARD PROCTOR FORM

(Calculations)

PROJECT: | | CAN | | MW | | 11E.(2) | | CLASS A | OTHER | UMTRA

SAMPLE NAME: RADON BARRIER # 7 (B) DATE: 8/4/2010

ASTM D-698 METHOD: A | B | C Estimated Specific Gravity = 2.60 (G_s)

Type of Rammer: Manual Preparation Method: Dry As Received Water Content 4 %

Test Number	1	2	3	4	5	6	7
Water Added	2%	4%	6%	8%	10%		
Cylinder & Soil Wt.	6041	6243	6289	6263	6228		
Cylinder Wt.	4263	4263	4263	4263	4263		
Wet Soil Wt.	1778	1980	2026	2000	1965		
Wet Density (lbs/ft^3)	117.6	131.0	134.0	132.3	130.0		

ASTM D2216 *(110° C ± 5° C)*

Container Number	1	2	3	4	5		
Container & Wet Soil Weight (g)	511.3	502.3	545.2	500.2	517.3		
Container & Dry Soil Weight (g)	473.1	456.0	487.6	440.3	452.6		
Water Weight (g)	38.2	46.3	57.6	59.9	64.7		
Container & Dry Soil Weight (g)	473.1	456.0	487.6	440.3	452.6		
Container Weight (g)	50.9	49.8	50.4	51.0	50.6		
Dry Soil Weight	422.2	406.2	437.2	389.3	402.0		
Moisture Content (% of Dry Weight)	9.0	11.4	13.2	15.4	16.1		
Dry Density (lbs/ft^3)	107.8	117.6	118.4	114.6	111.9		

$$\text{Wet Density} = \frac{\text{Wet Soil Weight}}{\text{Volume of the mold}}$$

$$\text{Dry Density} = \frac{\text{Wet Density x 100}}{\text{100 + \% moisture}}$$

TESTED BY: Lynn Dutt DATE: 8/4/2010

QA/QC APPROVAL 8-30-10 DATE

ENERGYSOLUTIONS

SOIL CLASSIFICATION FORM

PROJECT:	CAN	MW	11e.(2)	CLASS A	Other	UMTRA
SAMPLE NAME:	radon barrier 7 (b)				DATE:	8/4/2010

GRADATION AS RECEIVED			
SCREEN SIZE	WEIGHT DRY (g)	PERCENT RETAINED	PERCENT PASSING
3"			
1-1 / 2"			
1"			
3 / 4"			
3 / 8"	56.0	2	98
#4	986.0	28	70
-#4	2,483.0	70	
TOTAL DRY MASS	3,525.0	100	
#8			
#16			
#30			
#40			
#100			
#200			
-#200			
TOTAL MASS			

AS TESTED MOISTURE DETERMINATION		
	+#4	-#4
CONTAINER & WT. AGGREGATE (g)	N/A	N/A
CONTAINER & DRY AGGREGATE	N/A	N/A
CONTAINER MASS (g)	N/A	N/A
PERCENT MOISTURE	N/A	N/A

GRADATION TEST	
PERCENT GRAVEL	30
PERCENT SAND	N/A
PERCENT FINE SAND	N/A
PERCENT SILT & CLAY	N/A

ATTERBERG LIMITS	
LIQUID LIMIT	~~#REF!~~ ~~32~~
PLASTIC LIMIT	~~#REF!~~ 17.6
PLASTIC INDEX	~~#REF!~~ 14.4
CLASSIFICATION	~~CL~~ CL

GREY IN COLOR AND CONSISTS OF MOSTLY FINES

TEST RESULTS: (PASS) FAIL By: [signature] Date 8/4/2010

[signature]
QA/QC APPROVAL

8.30.10
DATE

JOHANSEN AND TUTTLE ENG.
SIEVE ANALYSIS

Project: UMTRA Date: 8/4/2010

Material Source: RADON BARRIER # 7B Test #: R.B. 7B

Test Method: ASTM C-136

Dry Wt: 1923

sieve size	weight + material	weight of sieve	material weight	percent retained	percent passing	specs
1/4"	1368	1368	0	0.00%	**100.0**	
NO.4	1291	1280	11	0.57%	**99.4**	
NO.10	1038	1010	28	1.46%	**98.0**	
NO.40	929	888	41	2.13%	**95.8**	
NO.200	736	678	58	3.02%	**92.82**	

*note: all weights are in grams.

Remarks:

Tested By: Lynn Tuttle

Lynn Tuttle

8.20.10 BB

Johansen and Tuttle Engineering
Atterberg Limits

Date: 8-8-10

Project: UMTRA

Material Source: Radon Barrier

Location: Radon Barrier

Sample No.: 7(B)

Tested by: Lynn Tuttle

Liquid Limit

1. Trial No.	1	2
2. Dish No.	5	8
3. No. of blows (N)	24	26
4. Wt. Dish + Wet Soil	30.72	31.18
5. Wt. Dish + Dry Soil	26.88	27.25
6. Wt. Dish	15.03	14.95
7. Wt. Water 4-5	3.84	3.93
8. Wt Dry Soil 5-6	11.85	12.30
9. % Moisture 7/8	32.4	31.95
10. Wn (line # 9)	32.4	32.0
11. Fn (No. of blows)	0.995	1.005
12. Average Liquid Limit	32.2	32.1

N	FN
20	0.974
21	0.979
22	0.985
23	0.99
24	0.995
25	1
26	1.005
27	1.009
28	1.014
29	1.018
30	1.022

Plastic Limit

1. Trial No.	1	2
2. Dish No.	3	6
3. Wt Dish + Wet Soil	20.43	21.11
4. Wt. Dish + Dry Soil	19.29	19.89
5. Wt. Dish	12.91	12.97
6. Wt. Water 3-4	1.14	1.22
7. Wt. Dry Soil 4-5	6.38	6.92
8. % Moisture 6/7	17.86	17.63
9. Average Plastic Limit	17.9	17.6

LL = (Fn)(Wn)

Fn = N/25

WN = % moisture

Note: this formula used only with one point method.

Liquid Limit (LL) = 32.2

Plastic Limit (PL) = 17.8

Plastic Index (PI) = 14.4

Unified Classification = CL

Remarks:

J&J 7 MH 10.5.10

ENERGY SOLUTIONS

EC-1909
Revision 6

STANDARD PROCTOR FORM

(Graph)

PROJECT: ____ CAN ____ MW ____ 11E.(2) ____ CLASS A **OTHER** UMTRA

SAMPLE NAME: **RADON BARRIER 17 H** DATE: **9/10/2010**

ASTM D-698 METHOD: A **B** C

P_C = ~~7.9~~ 6.1 % (MH 10.5.10) P_F = ~~92~~ 93.9 % (MH 10.5.10)

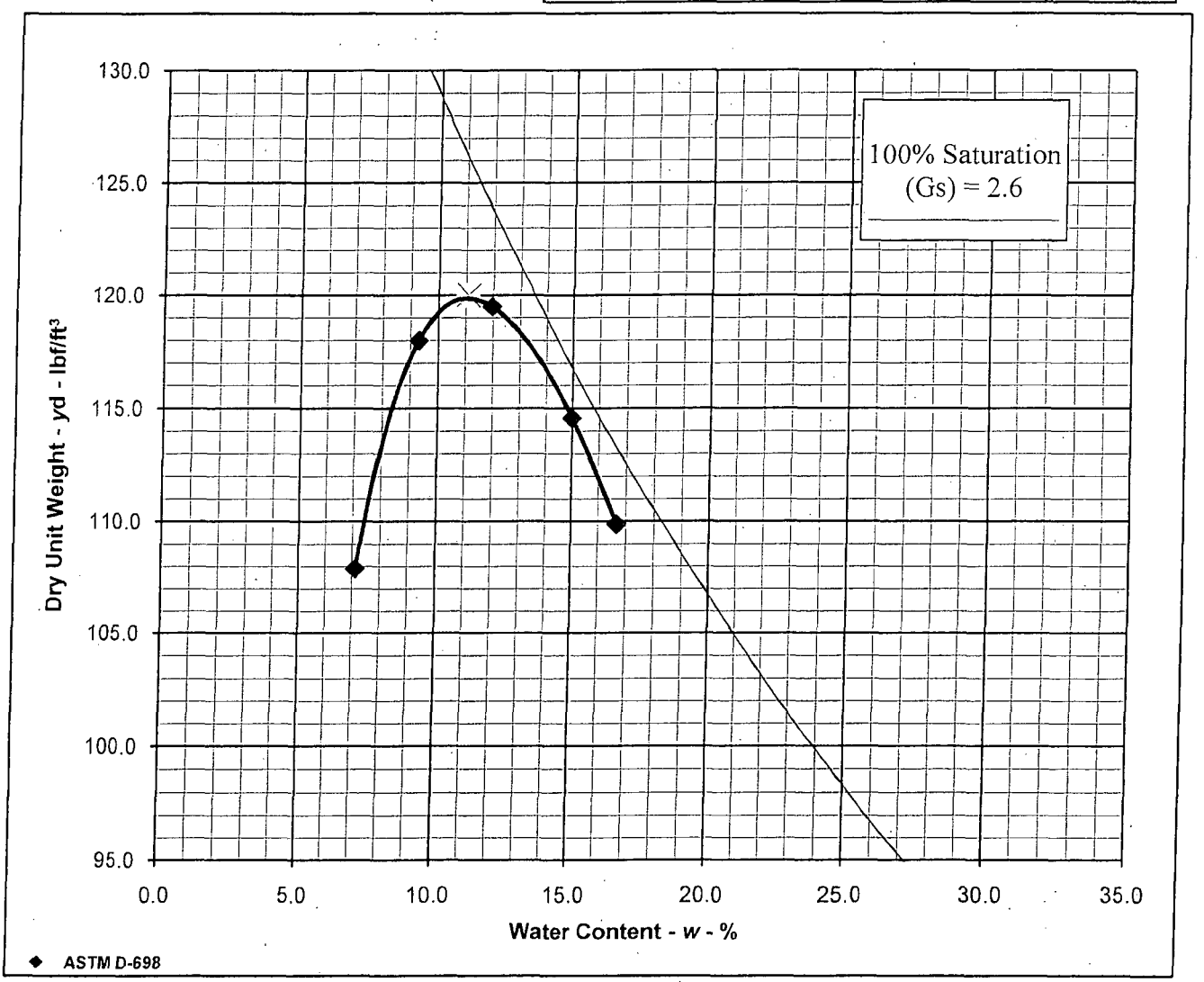
STANDARD MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): **120.0** lbf/ft^3

STANDARD OPTIMUM WATER CONTENT (Std-w^{opt}): **11.1** %

OVERSIZED CORRECTION

CORR. MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): **N/A** lbf/ft^3

CORR. OPTIMUM WATER CONTENT (Std-w^{opt}): **N/A** %



TESTED BY: [signature] DATE: 9/10/2010

* THIS PROCTOR IS ACCEPTED FOR MAX DRY DENSITY AND MOISTURE BUT CLASSIFICATION IS REJECTED. SEE PAGE 5 COMMENTS. MH 10.5.10

[signature] 10.05.2010

QA/QC APPROVAL [signature] DATE 10.5.10 DH HBF 10-18-10

ENERGY SOLUTIONS

STANDARD PROCTOR FORM

(Calculations)

PROJECT: ___ CAN ___ MW ___ 11E.(2) ___ CLASS A OTHER UMTRA

SAMPLE NAME: RADON BARRIER 17 H DATE: 9/10/2010

ASTM D-698 METHOD: A **B** C Estimated Specific Gravity = 2.60 (G_S)

Type of Rammer: Manual Preparation Method: Dry As Received Water Content 6 %

Test Number	1	2	3	4	5	6	7
Water Added	2%	4%	6%	8%	10%		
Cylinder & Soil Wt.	6011	6213	6286	6255	6201		
Cylinder Wt.	4263	4263	4263	4263	4263		
Wet Soil Wt.	1748	1950	2023	1992	1938		
Wet Density (lbs/ft^3)	115.6	129.0	133.8	131.7	128.2		

ASTM D2216 (110°C ± 5°C)

Container Number	1	2	3	4	5		
Container & Wet Soil Weight (g)	475.3	538.1	526.5	538.2	522.1		
Container & Dry Soil Weight (g)	447.1	496.8	475.8	474.6	455.0		
Water Weight (g)	28.2	41.3	50.7	63.6	67.1		
Container & Dry Soil Weight (g)	447.1	496.8	475.8	474.6	455.0		
Container Weight (g)	51.8	52.9	52.2	50.3	52.4		
Dry Soil Weight	395.3	443.9	423.6	424.3	402.6		
Moisture Content (% of Dry Weight)	7.1	9.3	12.0	15.0	16.7		
Dry Density (lbs/ft^3)	107.9	118.0	119.5	114.6	109.9		

$$\text{Wet Density} = \frac{\text{Wet Soil Weight}}{\text{Volume of the mold}} \qquad \text{Dry Density} = \frac{\text{Wet Density x 100}}{100 + \%\ \text{moisture}}$$

TESTED BY: Lynn Smith 10.5.10 DATE: 9/10/2010

QA/QC APPROVAL 10.05.2010 DATE

JET 10/8/10

ENERGY SOLUTIONS

EC-1908
Revision 5

SOIL CLASSIFICATION FORM

PROJECT: ____ CAN ____ MW ____ 11e.(2) ____ CLASS A Other UMTRA

SAMPLE NAME: RADON BARRIER 17 H DATE: 9/10/2010

GRADATION AS RECEIVED			
SCREEN SIZE	WEIGHT DRY (g)	PERCENT RETAINED	PERCENT PASSING
3"			
1-1 / 2"			
1"			
3 / 4"	15.0	0	100
3 / 8"	415.0	8	92
#4	2152.0	39	53
-#4	2,891.0	53	
TOTAL DRY MASS	5,473.0	100	
#8			
#16			
#30			
#40			
#100			
#200			
-#200			
TOTAL MASS			

AS TESTED MOISTURE DETERMINATION		
	+#4	-#4
CONTAINER & WT. AGGREGATE (g)	N/A	N/A
CONTAINER & DRY AGGREGATE	N/A	N/A
CONTAINER MASS (g)	N/A	N/A
PERCENT MOISTURE	N/A	N/A

GRADATION TEST	
PERCENT GRAVEL	47
PERCENT SAND	N/A
PERCENT FINE SAND	N/A
PERCENT SILT & CLAY	N/A

ATTERBERG LIMITS	
LIQUID LIMIT	30
PLASTIC LIMIT	16
PLASTIC INDEX	14
CLASSIFICATION	CL

GREY IN COLOR AND CONSISTS OF MOSTLY FINES

TEST RESULTS: PASS FAIL By: Lynn Smith Date 9/10/2010

QA/QC APPROVAL 10.5.10 DATE

10.05.2010 DATE

JOHANSEN AND TUTTLE ENG.
SIEVE ANALYSIS

Project: UMTRA

Date: 9/10/2010

Material Source: RADON BARRIER 17 H

Test #: R.B. 17H

Test Method: ASTM C-136

Dry Wt: 1023

sieve size	weight + material	weight of sieve	material weight	percent retained	percent passing	specs
3/8"			0	0.00%	**100.0**	
NO.4			62	6.06%	**93.9**	
NO.10			66	6.45%	**87.5**	
NO.40			53	5.18%	**82.3**	
NO.200			44	4.30%	**78.01**	

*note: all weights are in grams.

Remarks: material run as per astm c 136, performed to verify soil properties were within project specifications.

Tested By: Lynn Tuttle

Lynn Tuttle

Johansen and Tuttle Engineering
Atterberg Limits

Date: 9-10-10

Project: UMTRA

Material Source: Native

Location: Radon Barrier 17 DS 9-14-10 18 4

Sample No.: Radon Barr. 18 (4)

Liquid Limit

Tested by: Lynn Tuttle

1. Trial No.	1	2
2. Dish No.	1	4
3. No. of blows (N)	23	27
4. Wt. Dish + Wet Soil	31.27	33.66
5. Wt. Dish + Dry Soil	27.34	29.53
6. Wt. Dish	14.43	15.89
7. Wt. Water 4-5	3.93	4.13
8. Wt Dry Soil 5-6	12.91	13.64
9. % Moisture 7/8	30.44	30.28
10. Wn (line # 9)	30.4	30.3
11. Fn (No. of blows)	0.99	1.009
12. Average Liquid Limit	30.1	30.6

N	FN
20	0.974
21	0.979
22	0.985
23	0.99
24	0.995
25	1
26	1.005
27	1.009
28	1.014
29	1.018
30	1.022

Plastic Limit

1. Trial No.	1	2
2. Dish No.	3	4
3. Wt Dish + Wet Soil	20.70	21.48
4. Wt. Dish + Dry Soil	19.61	20.37
5. Wt. Dish	12.88	13.54
6. Wt. Water 3-4	1.09	1.11
7. Wt. Dry Soil 4-5	6.73	6.83
8. % Moisture 6/7	16.19	16.25
9. Average Plastic Limit	16.2	16.3

LL = (Fn)(Wn)

Fn = N/25

WN = % moisture

Note: this formula used only with one point method.

Liquid Limit (LL) = 30.4

Plastic Limit (PL) = 16.3

Plastic Index (PI) = 13.8

Unified Classification = CL

Remarks: CLASSIFICATION REJECTED DUE TO LL OUT OF SPEC. ASTM D4318 STANDARD MH 10.5.10

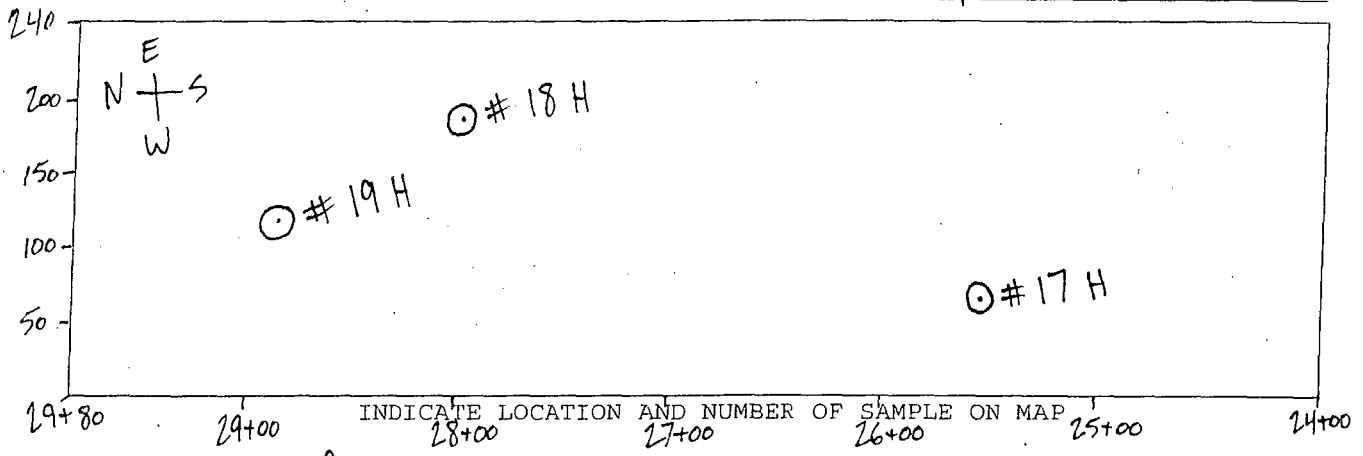
Pg 5/6 MH 10.5.10

Johansen and Tuttle

SAMPLING LOG

PROJECT: UMTRA Crescent Junction OTHER

DATE: 9-10-10



INDICATE LOCATION AND NUMBER OF SAMPLE ON MAP

SAMPLE NUMBER: Radon Barrier # 17 H MATERIAL TYPE: SOIL X ROCK

LOCATION: ~~Radon Barrier stockpile in the northeast corner of the cell (Phase 1)~~ KK 9-10-10
Cell - Radon Barrier URA01100909-00 (Lift ID)

TEST(S) TO BE PERFORMED: SAMPLED BY: Kevin Keele

PROCTOR: X CLASSIFICATION: X LABORATORY PERMEABILITY:

NA SOUNDNESS: LA ABRASION: ABSORPTION:

SPECIFIC GRAVITY: GRADATION: X

COMMENTS:

SAMPLE NUMBER: Radon Barrier # 18 H MATERIAL TYPE: SOIL ROCK

LOCATION: ~~Radon Barrier stockpile in the northeast corner of t~~ KK 9-10-10
Cell - Radon Barrier URA01100909-00 (Lift ID)

TEST(S) TO BE PERFORMED: SAMPLED BY: Kevin Keele

PROCTOR: X CLASSIFICATION: X LABORATORY PERMEABILITY:

NA SOUNDNESS: LA ABRASION: ABSORPTION:

SPECIFIC GRAVITY: GRADATION: X

COMMENTS:

SAMPLE NUMBER: Radon Barrier # 19 H MATERIAL TYPE: SOIL ROCK

LOCATION: Cell - Radon Barrier URA01100909-00 (Lift ID)

TEST(S) TO BE PERFORMED: SAMPLED BY: Kevin Keele

PROCTOR: X CLASSIFICATION: X LABORATORY PERMEABILITY:

NA SOUNDNESS: LA ABRASION: ABSORPTION:

SPECIFIC GRAVITY: GRADATION: X

COMMENTS:

Kevin Keele	9-10-10		10-05-2010
Sampled by	DATE	QA/QC APPROVAL	DATE

J27 MH 10-6-10

ENERGYSOLUTIONS

EC-1909
Revision 6

STANDARD PROCTOR FORM
(Graph)

PROJECT: ____ CAN ____ MW ____ 11E.(2) ____ CLASS A **OTHER** UMTRA

SAMPLE NAME: **RADON BARRIER 18 H** DATE: **9/10/2010**

ASTM D-698 METHOD: A **B** C

P_C = ~~2.4~~ 5.7 MH 10/8/10 % P_F = ~~98~~ 94.3 MH 10/5/10 %

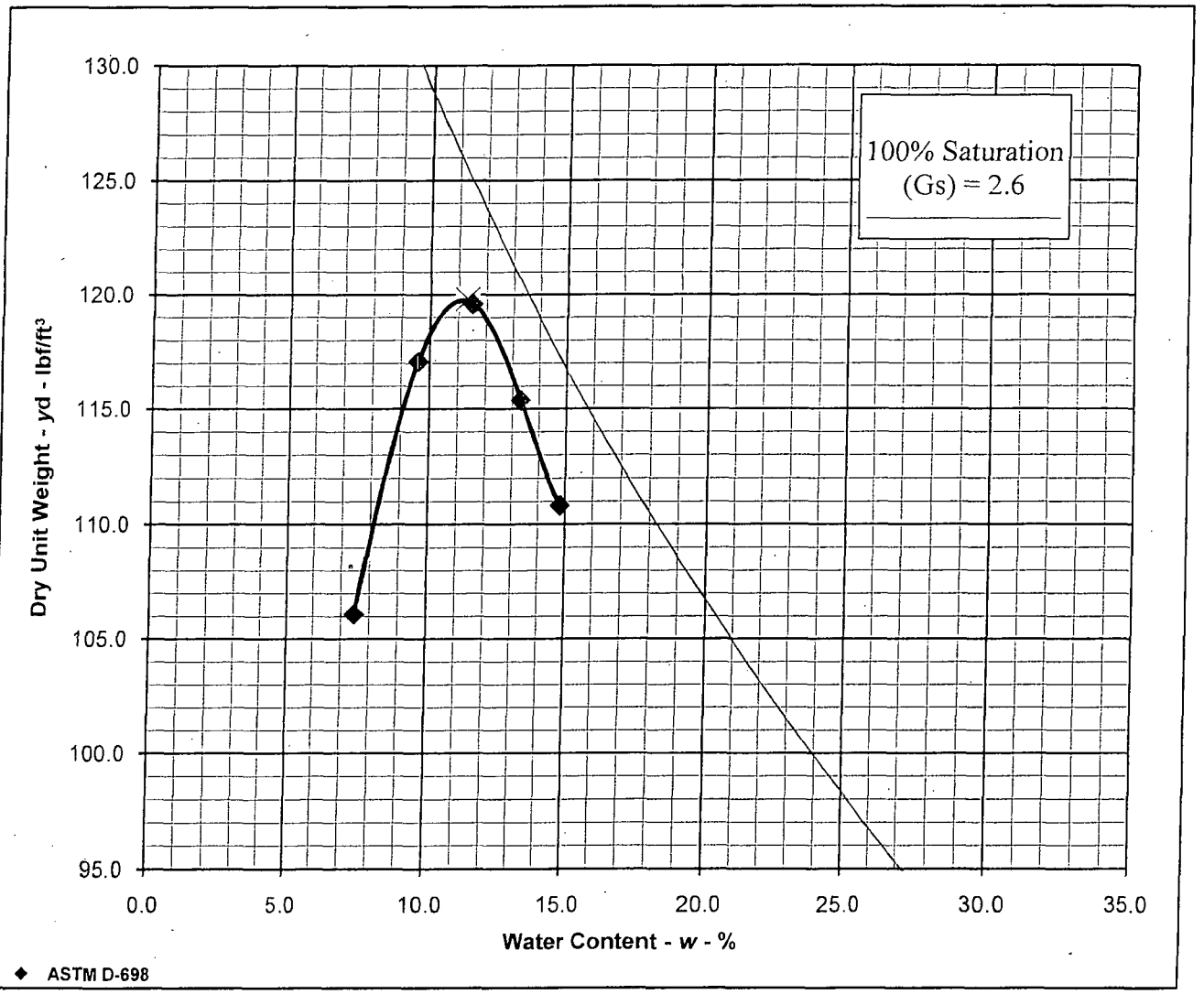
STANDARD MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): **119.8** lbf/ft^3

STANDARD OPTIMUM WATER CONTENT (Std-w^{opt}): **11.3** %

OVERSIZED CORRECTION

CORR. MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): **N/A** lbf/ft^3

CORR. OPTIMUM WATER CONTENT (Std-w^{opt}): **N/A** %



TESTED BY: Lynn Smith DATE: 9/10/2010

QA/QC APPROVAL DA: HGF 10-18-10 10.05.2010 DATE

STANDARD PROCTOR FORM

(Calculations)

PROJECT: ___ CAN ___ MW ___ 11E.(2) ___ CLASS A **OTHER** UMTRA

SAMPLE NAME: **RADON BARRIER 18 H** DATE: **9/10/2010**

ASTM D-698 METHOD: A **B** C Estimated Specific Gravity = **2.60** (G_S)

Type of Rammer: **Manual** Preparation Method: **Dry** As Received Water Content **6** %

Test Number	1	2	3	4	5	6	7
Water Added	**2%**	**4%**	**6%**	**8%**	**10%**		
Cylinder & Soil Wt.	**5987**	**6203**	**6279**	**6240**	**6187**		
Cylinder Wt.	**4263**	**4263**	**4263**	**4263**	**4263**		
Wet Soil Wt.	**1724**	**1940**	**2016**	**1977**	**1924**		
Wet Density (lbs/ft^3)	**114.0**	**128.3**	**133.3**	**130.8**	**127.2**		

ASTM D2216 (110°C ± 5°C)

Container Number	1	2	3	4	5		
Container & Wet Soil Weight (g)	**511.3**	**488.6**	**502.3**	**544.2**	**477.3**		
Container & Dry Soil Weight (g)	**479.2**	**450.2**	**455.7**	**486.4**	**422.1**		
Water Weight (g)	**32.1**	**38.4**	**46.6**	**57.8**	**55.2**		
Container & Dry Soil Weight (g)	**479.2**	**450.2**	**455.7**	**486.4**	**422.1**		
Container Weight (g)	**49.9**	**50.1**	**50.3**	**52.6**	**49.7**		
Dry Soil Weight	**429.3**	**400.1**	**405.4**	**433.8**	**372.4**		
Moisture Content (% of Dry Weight)	**7.5**	**9.6**	**11.5**	**13.3**	**14.8**		
Dry Density (lbs/ft^3)	**106.1**	**117.1**	**119.6**	**115.4**	**110.8**		

$$\text{Wet Density} = \frac{\text{Wet Soil Weight}}{\text{Volume of the mold}} \qquad \text{Dry Density} = \frac{\text{Wet Density x 100}}{\text{100 + \% moisture}}$$

TESTED BY: Lynn Jewett DATE: 9/10/2010

QA/QC APPROVAL 10.05.2010 DATE

J & T

MA 10.6.10

ENERGY SOLUTIONS

EC-1908
Revision 5

SOIL CLASSIFICATION FORM

PROJECT: ____ CAN ____ MW ____ 11e.(2) ____ CLASS A Other UMTRA

SAMPLE NAME: RADON BARRIER 18 H DATE: 9/10/2010

GRADATION AS RECEIVED			
SCREEN SIZE	WEIGHT DRY (g)	PERCENT RETAINED	PERCENT PASSING
3"			
1-1 / 2"			
1"			
3 / 4"			
3 / 8"	87.0	2	98
#4	1253.0	35	63
-#4	2,236.0	63	
TOTAL DRY MASS	3,576.0	100	
#8			
#16			
#30			
#40			
#100			
#200			
-#200			
TOTAL MASS			

AS TESTED MOISTURE DETERMINATION		
	+#4	-#4
CONTAINER & WT. AGGREGATE (g)	N/A	N/A
CONTAINER & DRY AGGREGATE	N/A	N/A
CONTAINER MASS (g)	N/A	N/A
PERCENT MOISTURE	N/A	N/A

GRADATION TEST	
PERCENT GRAVEL	37
PERCENT SAND	N/A
PERCENT FINE SAND	N/A
PERCENT SILT & CLAY	N/A

ATTERBERG LIMITS	
LIQUID LIMIT	30
PLASTIC LIMIT	16
PLASTIC INDEX	14
CLASSIFICATION	CL

GREY IN COLOR AND CONSISTS OF MOSTLY FINES

TEST RESULTS: (PASS) FAIL By: Lynn Tuttle Date 9/10/2010

QA/QC APPROVAL

10.05.2010
DATE

JOHANSEN AND TUTTLE ENG.
SIEVE ANALYSIS

Project: UMTRA

Date: 9/10/2010

Material Source: RADON BARRIER 18 H

Test #: R.B. 18H

Test Method: ASTM C-136

Dry Wt: 1365

sieve size	weight + material	weight of sieve	material weight	percent retained	percent passing	specs
3/8"			0	0.00%	**100.0**	
NO.4			78	5.71%	**94.3**	
NO.10			83	6.08%	**88.2**	
NO.40			78	5.71%	**82.5**	
NO.200			62	4.54%	**77.96**	

*note: all weights are in grams.

Remarks: *material run as per astm c 136, performed to verify soil properties were* within project specifications.

Tested By: Lynn Tuttle

Lynn Tuttle

Johansen and Tuttle Engineering
Atterberg Limits

Date: 9-10-10

Project: LUMTRA

Material Source: Radon Barrier

Location: Radon Barrier 18 DS 9-14-10 19(H)

Sample No.: Radon Barr. 19(H)

Tested by: Lynn Auld

Liquid Limit

1. Trial No.	1	2
2. Dish No.	#1	#7
3. No. of blows (N)	24	26
4. Wt. Dish + Wet Soil	32.09	31.05
5. Wt. Dish + Dry Soil	28.15	27.36
6. Wt. Dish	15.08	14.96
7. Wt. Water 4-5	3.94	3.69
8. Wt Dry Soil 5-6	13.07	12.4
9. % Moisture 7/8	30.15	29.76
10. Wn (line # 9)	30.2	29.8
11. Fn (No. of blows)	0.995	1.005
12. Average Liquid Limit	30.0	29.9

N	FN
20	0.974
21	0.979
22	0.985
23	0.99
24	0.995
25	1
26	1.005
27	1.009
28	1.014
29	1.018
30	1.022

Plastic Limit

1. Trial No.	1	2
2. Dish No.	5	2
3. Wt Dish + Wet Soil	20.56 ~~12.94~~ 9-10 Lmt	20.81 ~~13.03~~ 9-10 Lmt
4. Wt. Dish + Dry Soil	19.50	19.75
5. Wt. Dish	12.94	13.03
6. Wt. Water 3-4	1.06	1.06
7. Wt. Dry Soil 4-5	6.56	6.72
8. % Moisture 6/7	16.15	15.77
9. Average Plastic Limit	16.2	15.8

LL = (Fn)(Wn)

Fn = N/25

WN = % moisture

Note: this formula used only with one point method.

Liquid Limit (LL) = 30.0

Plastic Limit (PL) = 16.0

Plastic Index (PI) = 14.0

Unified Classification = CL

Remarks:

pg 5/5

J 27 MH 10.5.10

ENERGY SOLUTIONS

EC-1909
Revision 6

STANDARD PROCTOR FORM
(Graph)

PROJECT: ____ CAN ____ MW ____ 11E.(2) ____ CLASS A **OTHER** UMTRA

SAMPLE NAME: **RADON BARRIER 19 H** DATE: **9/10/2010**

ASTM D-698 METHOD: A **B** C

P_C = ~~13.3~~ 7.1 MH 10.5.10 % P_F = ~~87~~ 92.9 MH 10.5.10 %

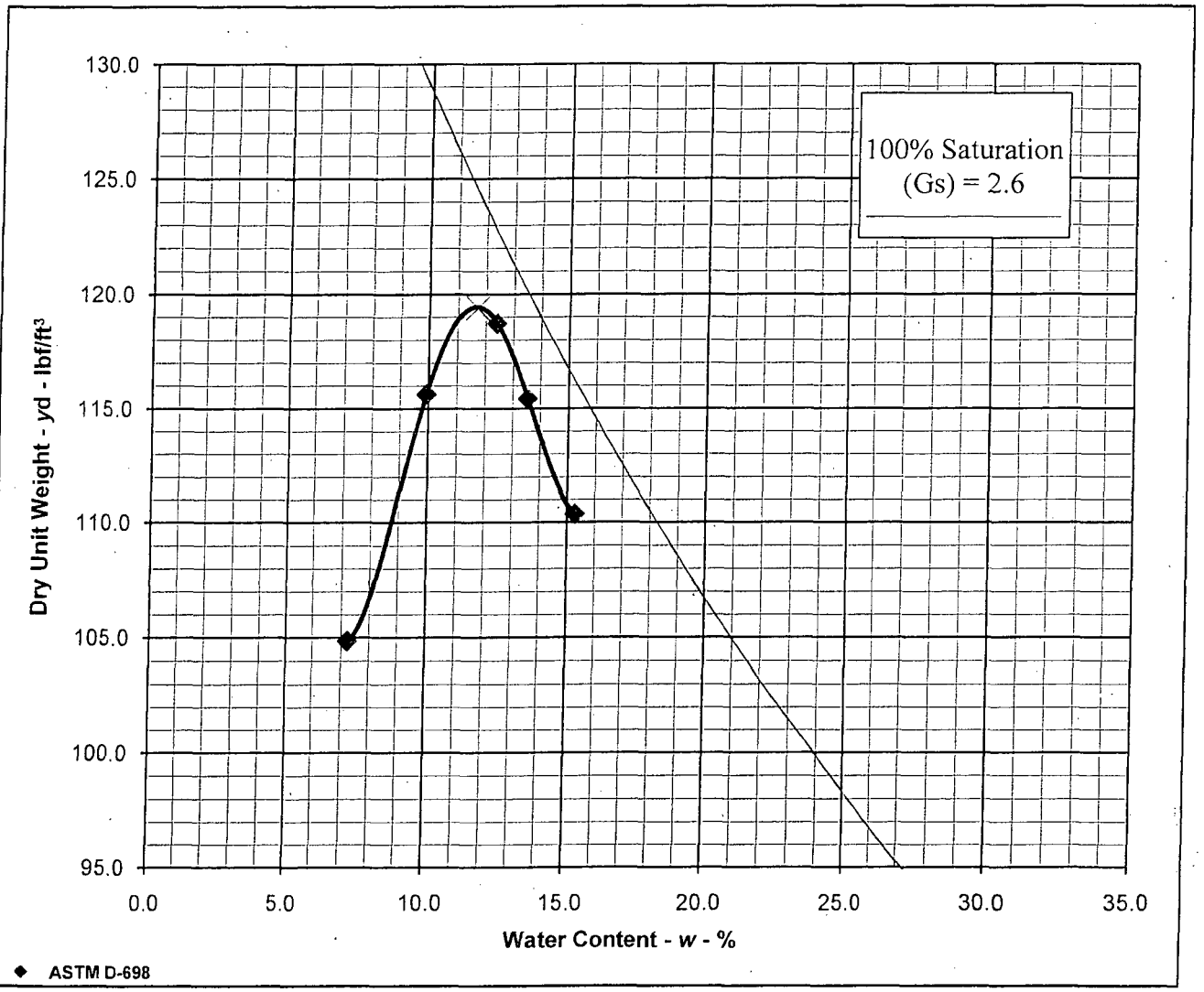
STANDARD MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): **119.4** lbf/ft^3

STANDARD OPTIMUM WATER CONTENT (Std-w^{opt}): **11.7** %

OVERSIZED CORRECTION

CORR. MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): **N/A** lbf/ft^3

CORR. OPTIMUM WATER CONTENT (Std-w^{opt}): **N/A** %



TESTED BY: Lynn Tuttle DATE: 9/10/2010

QA/QC APPROVAL 10.05.2010 DATE

QA MH 10-18-10

* THIS PROCTOR IS ACCEPTED FOR MAX DRY DENSITY AND MOISTURE, BUT REJECTED FOR THE CLASSIFICATION. SEE PAGE 5 COMMENTS MH 10.5.10

STANDARD PROCTOR FORM

(Calculations)

PROJECT: ___ CAN ___ MW ___ 11E.(2) ___ CLASS A OTHER UMTRA

SAMPLE NAME: RADON BARRIER 19 H DATE: 9/10/2010

ASTM D-698 METHOD: A **B** C Estimated Specific Gravity = 2.60 (G_S)

Type of Rammer: Manual Preparation Method: Dry As Received Water Content 6 %

Test Number	1	2	3	4	5	6	7
Water Added	2%	4%	6%	8%	10%		
Cylinder & Soil Wt.	5963	6185	6281	6245	6187		
Cylinder Wt.	4263	4263	4263	4263	4263		
Wet Soil Wt.	1700	1922	2018	1982	1924		
Wet Density (lbs/ft^3)	112.4	127.1	133.5	131.1	127.2		

ASTM D2216 (110°C ± 5°C)

Container Number	1	2	3	4	5		
Container & Wet Soil Weight (g)	478.3	469.3	500.3	485.7	496.7		
Container & Dry Soil Weight (g)	449.6	431.4	450.6	433.7	437.4		
Water Weight (g)	28.7	37.9	49.7	52.0	59.3		
Container & Dry Soil Weight (g)	449.6	431.4	450.6	433.7	437.4		
Container Weight (g)	52.4	49.7	50.1	50.0	49.6		
Dry Soil Weight	397.2	381.7	400.5	383.7	387.8		
Moisture Content (% of Dry Weight)	7.2	9.9	12.4	13.6	15.3		
Dry Density (lbs/ft^3)	104.9	115.6	118.7	115.4	110.4		

$$\text{Wet Density} = \frac{\text{Wet Soil Weight}}{\text{Volume of the mold}} \qquad \text{Dry Density} = \frac{\text{Wet Density x 100}}{\text{100 + \% moisture}}$$

TESTED BY: Lynn Tuttle DATE: 9/10/2010

10.05.2010

QA/QC APPROVAL DATE

J&T MM 10-5-10

EC-1908
Revision 5

ENERGY SOLUTIONS

SOIL CLASSIFICATION FORM

PROJECT: ____ CAN ____ MW ____ 11e.(2) ____ CLASS A Other UMTRA

SAMPLE NAME: RADON BARRIER 19 H DATE: 9/10/2010

GRADATION AS RECEIVED			
SCREEN SIZE	WEIGHT DRY (g)	PERCENT RETAINED	PERCENT PASSING
3"			
1-1 / 2"			
1"			
3 / 4"			
3 / 8"	456.0	13	87
#4	998.0	29	57
-#4	1,963.0	57	
TOTAL DRY MASS	3,417.0	100	
#8			
#16			
#30			
#40			
#100			
#200			
-#200			
TOTAL MASS			

AS TESTED MOISTURE DETERMINATION		
	+#4	-#4
CONTAINER & WT. AGGREGATE (g)	N/A	N/A
CONTAINER & DRY AGGREGATE	N/A	N/A
CONTAINER MASS (g)	N/A	N/A
PERCENT MOISTURE	N/A	N/A

GRADATION TEST	
PERCENT GRAVEL	43
PERCENT SAND	N/A
PERCENT FINE SAND	N/A
PERCENT SILT & CLAY	N/A

ATTERBERG LIMITS	
LIQUID LIMIT	31
PLASTIC LIMIT	16
PLASTIC INDEX	15
CLASSIFICATION	CL

GREY IN COLOR AND CONSISTS OF MOSTLY FINES

TEST RESULTS: (PASS) FAIL By: [signature] Date 9/10/2010

[signature]
QA/QC APPROVAL

10.05.2010
DATE

JOHANSEN AND TUTTLE ENG.
SIEVE ANALYSIS

Project: UMTRA Date: 9/10/2010

Material Source: RADON BARRIER 19 H Test #: R.B. 19 H

Test Method: ASTM C-136

Dry Wt: 1287

sieve size	weight + material	weight of sieve	material weight	percent retained	percent passing	specs
3/8"			0	0.00%	**100.0**	
NO.4			91	7.07%	**92.9**	
NO.10			75	5.83%	**87.1**	
NO.40			77	5.98%	**81.1**	
NO.200			75	5.83%	**75.29**	

*note: all weights are in grams.

Remarks: material run as per astm c 136, performed to verify soil properties were within project specifications.

Tested By: Lynn Tuttle

Lynn Tuttle

Johansen and Tuttle Engineering
Atterberg Limits

Date: 9-10-10

Project: UNITEA

Material Source: Native

Location: Radon Barr. 20 (H) 19 05 9-14-10

Sample No.: Radon Barrier 20 (H)

Tested by: Lynn Tuttle

Liquid Limit

1. Trial No.	1	2
2. Dish No.	A	B
3. No. of blows (N)	23	28
4. Wt. Dish + Wet Soil	32.18	30.92
5. Wt. Dish + Dry Soil	28.10	27.11
6. Wt. Dish	15.03	14.70
7. Wt. Water 4-5	4.08	3.81
8. Wt Dry Soil 5-6	13.07	12.41
9. % Moisture 7/8	31.22	30.7
10. Wn (line # 9)	31.22	30.7
11. Fn (No. of blows)	0.99	1.014
12. Average Liquid Limit	30.9	31.1

N	FN
20	0.974
21	0.979
22	0.985
23	0.99
24	0.995
25	1
26	1.005
27	1.009
28	1.014
29	1.018
30	1.022

Plastic Limit

1. Trial No.	1	2
2. Dish No.	A	B
3. Wt Dish + Wet Soil	20.44	20.73
4. Wt. Dish + Dry Soil	19.36	19.61
5. Wt. Dish	12.86	12.69
6. Wt. Water 3-4	1.08	1.12
7. Wt. Dry Soil 4-5	6.50	6.92
8. % Moisture 6/7	16.62	16.19
9. Average Plastic Limit	16.6	16.2

LL = (Fn)(Wn)

Fn = N/25

WN = % moisture

Note: this formula used only with one point method.

Liquid Limit (LL) = 31

Plastic Limit (PL) = 16.4

Plastic Index (PI) = 14.6

Unified Classification = CL

Remarks: CLASSIFICATION REJECTED DUE TO LL BEING OUT OF STANDARD. ASTM D 4318 MN 10-5-10

Pg 4/5 5 MN 10-5-10

6.7 RADON BARRIER LAYER

The initial cap layer is a 4 ft thick Radon Barrier Layer constructed of compacted clay soil. The Radon Barrier will be a low-permeability clay layer that limits radon emissions from the RRM and limits the infiltration of water from above.

6.7.1 Material

The Radon Barrier Layer will be constructed of processed Mancos Shale soil. The clay soil will be produced on site by processing excavated Mancos Shale into a fine-grained soil and adding water to bring the Mancos Shale soil to near optimum moisture content for compaction.

Assessment tests shall be performed on radon barrier material to assure compliance with specified requirements and to develop compaction requirements for placement. A minimum of three tests for maximum dry density (ASTM D 698), optimum moisture content (ASTM D 2216) shall be performed for each type of soil observed to establish the optimum moisture for radon barrier material placement. Mancos Shale soil produced for Radon Barrier fill shall be tested to determine its maximum dry density and the optimum moisture content. The moisture content shall be modified to bring the fill to optimum for compaction. As a minimum, perform the following soil tests on each 10,000 cu yds of soil:

ASTM D 4318, Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 1140, Amount of Material in Soils Finer than the No. 200 Sieve
ASTM D 422, Standard Test Method for Particle-Size Analysis in Soil
ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
ASTM D 2216, Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass and/or ASTM D 4643, Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating

6.7.2 Ground Preparation

The interim cover layer beneath the proposed Radon Barrier Layer shall be prepared by scarifying to a depth of one inch prior to the placement of the initial lift of Radon Barrier soil.

6.7.3 Lift Placement and Thickness

The Radon Barrier shall be constructed of fill materials placed in continuous lifts of uniform thickness. The method of dumping and spreading radon barrier shall result in loose lifts not to exceed 12". The CAES shall be used to direct fill placement, monitor compaction, and record the location and thickness of each soil layer being placed. Compaction equipment shall consist of footed rollers which have a minimum weight of 45,000 pounds and at least one foot for each 110 square inches of drum surface. The length of each tamping foot shall be at least 6 inches, from the outside surface of the

drum. During compaction operations, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping foot rollers.

6.7.4 Inspection and Testing

The Quality Control (QC) Inspector shall visually inspect the processing of Mancos Shale into clay soil, ground preparation, and fill placement operations. The QC Inspector shall perform in-place density tests with companion moisture tests (optimum moisture plus or minus 3%) to verify that the CAES compaction results in a density of at least 95% of the material's maximum dry density according to ASTM D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort. The QC Inspector shall verify that the Radon Barrier is constructed in accordance with Plans and Specifications by checking and confirming:

- Fill material is properly moisture conditioned, one moisture content test will be performed each day material is placed in accordance with (ASTM D 4643, ASTM D 4944, or ASTM D 4959);
- Material is placed in continuous uniform thickness lifts. The method of dumping and spreading radon barrier shall result in loose lifts not to exceed 12".
- Radon Barrier soil is processed Mancos Shale;
- Tests have been performed on the processed shale soil to determine its maximum dry density and optimum moisture content.
- Compaction – Radon Barrier fill is spread and compacted with a footed roller. The compactor shall be equipped with a Computer Aided Earthmoving System and soil placement and compaction shall be controlled by the CAES.
- Compaction by CAES – the QC inspector shall monitor CAES compaction by visually inspecting the process and reviewing the computer records for each layer of soil placed.
- Compaction Verification Tests – Perform in-place density and moisture content tests on compacted fill material in accordance with the following requirements:
    - Verification tests of in-place density shall be performed on initial layer of radon barrier placed, and on any layers in which the CAES indicates that problems occurred obtaining compaction.
    - When verification in-place density and moisture content tests are performed on a soil layer, a minimum of one test shall be preformed a minimum of 2 tests per 5,000 cubic yards of material placed.
    - Compaction and moisture content tests shall be performed in accordance with the following methods:
        - ASTM D 1556 – Density and Unit Weight of Soil in Place by the Sand-Cone Method

- ASTM D 2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D 6938 - In-Place Density and Water content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth
- ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating

Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

- After placement, moisture content shall be maintained or adjusted to meet criteria.
- Erosion that occurs in the fill layers shall be repaired and grades re-established.
- Freezing and desiccation of the Radon Barrier layer shall be prevented. If freezing or desiccation occurs, the affected soil shall be removed or reconditioned as directed.
- Areas that have been repaired shall be retested as directed. Repairs to the Radon Barrier layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

6.7.5 Initial and Confirmatory Surveys

Verification of the thickness of the Radon Barrier Layer will be performed by comparing before and after surveys of the Layer by surveying or using CAES. Prior to placement of the Radon Barrier Layer, an initial survey shall be performed of the section to be capped. The initial survey will document the pre-cap geometry of the site. After the Radon Barrier Layer has been installed, a post-installation survey will be performed on the top of the Radon Barrier fill to confirm that the total fill thickness is in accordance with the plans and specifications.

6.8 INFILTRATION AND BIOINTRUSION BARRIER (GRAVEL)

Above the Radon Barrier layer, a 6 inch thick Infiltration and Biointrusion Layer of gravel will be placed to provide a barrier to burrowing animals, and a pathway for drainage of water that has infiltrated through upper layers of the cap. The gravel will be a sandy gravel with a gradation in accordance with project plans and specifications. Rock shall be spread to the thickness indicated on the drawings or in accordance with oversizing due to scoring criteria. Rock placement shall be guided by the Computer Aided Earthmoving System to ensure that the appropriate thickness has been placed at all locations. Stone with a D50 of 2 inches or less shall be compacted with a vibratory steel drum.

6.7 RADON BARRIER LAYER

The initial cap layer is a 4 ft thick Radon Barrier Layer constructed of compacted clay soil. The Radon Barrier will be a low-permeability clay layer that limits radon emissions from the RRM and limits the infiltration of water from above.

6.7.1 Material

The Radon Barrier Layer will be constructed of processed Mancos Shale soil. The clay soil will be produced on site by processing excavated Mancos Shale into a fine-grained soil and adding water to bring the Mancos Shale soil to near optimum moisture content for compaction.

Assessment tests shall be performed on radon barrier material to assure compliance with specified requirements and to develop compaction requirements for placement. A minimum of three tests for maximum dry density (ASTM D 698), optimum moisture content (ASTM D 2216) shall be performed for each type of soil observed to establish the optimum moisture for radon barrier material placement. Mancos Shale soil produced for Radon Barrier fill shall be tested to determine its maximum dry density and the optimum moisture content. The moisture content shall be modified to bring the fill to optimum for compaction. As a minimum, perform the following soil tests on each 10,000 cu yds of soil:

ASTM D 4318, Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 1140, Amount of Material in Soils Finer than the No. 200 Sieve
ASTM D 422, Standard Test Method for Particle-Size Analysis in Soil
ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
ASTM D 2216, Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass and/or ASTM D 4643, Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating

6.7.2 Ground Preparation

The Iinterim Ccover layer beneath the proposed Radon Barrier Layer shall be prepared by scarifying to a minimum depth of one inch prior to the placement of the initial lift of Radon Barrier soil.

6.7.3 Lift Placement and Thickness

The Radon Barrier Layer shall be constructed of fill materials placed in continuous lifts of uniform thickness. The method of dumping and spreading radon barrier shall result in loose lifts not to exceed 12". Compaction equipment shall consist of rubber tired or footed rollers compaction equipment which have a minimum weight of 45,000 pounds. and at least one foot for each 110 square inches of drum surface. The length of each tamping foot shall be at least 6 inches, from the outside surface of the drum. During compaction operations, the spaces between the tamping feet shall be maintained clear of

materials which would impair the effectiveness of the tamping foot rollers. The in-place material may contain particles up to four inches.

Placement of mancos shale will be visually inspected to make sure there are no locations where rock type particles accumulate in a concentrated location. Particles found in a concentrated location will be removed or reworked per QC direction.

6.7.4 Inspection and Testing

The Quality Control (QC) Inspector shall visually inspect the processing of Mancos Shale into clay soil, ground preparation, and fill placement operations. The QC Inspector shall perform in-place density tests with companion moisture tests (to verify optimum moisture plus or minus 3% and of at least 95% of the material's maximum dry density according to ASTM D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort. The QC Inspector shall verify that the Radon Barrier is constructed in accordance with Plans and Specifications by checking and confirming:

- Fill material is properly moisture conditioned, one moisture content test will be performed each day material is placed in accordance with (ASTM D 4643, ASTM D 4944, or ASTM D 4959);) moisture content plus or minus 3%.
- Material is placed in continuous uniform thickness lifts. The method of dumping and spreading radon barrier shall result in loose lifts not to exceed 12".
- Radon Barrier soil is processed Mancos Shale;
- Tests have been performed on the processed shale soil to determine its maximum dry density and optimum moisture content.
- Compaction – Radon Barrier fill is spread and compacted with rubber tired ora footed roller compaction equipment.
- Compaction by CAES – the QC inspector shall monitor CAES compaction by visually inspecting the process and reviewing the computer records for each layer of soil placed.
- Verification tests of in-place density shall be performed on initial layer of radon barrier placed, and on any layers in which the CAES indicates that problems occurred obtaining compaction.
- Maximum particle size in the fill material shall be 4 inches
- Placement of mancos shale will be visually inspected to make sure there are no locations where rock type particles accumulate in a concentrated location

Note: Companion sand cone tests and moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

If CAES is not used the following testing requirements shall be followed:

- Compaction Verification Tests – Perform in-place density and moisture content tests on compacted fill material in accordance with the following requirements:
    - When verification a representative sample from each principal type or combination of blended Radon Barrier materials shall be tested to establish compaction curves using ASTM D 698. A minimum of one set of compaction curves shall be developed per 10,000 cubic yards of Radon Barrier material.
    - In-place density and moisture content tests are performed on a soil layer; a minimum of two tests shall be performed per 5,000 cubic yards or 135, 000 square feet of fill material placed.
    - Fill material is properly moisture conditioned, one moisture content test will be performed each day material is placed in accordance with (ASTM D 4643, ASTM D 4944, or ASTM D 4959) moisture content plus or minus 3%.;
    - Material is placed in continuous uniform thickness lifts. The method of dumping and spreading radon barrier shall result in loose lifts not to exceed 12".
    - Radon Barrier soil is processed Mancos Shale;
    - Tests have been performed on the processed shale soil to determine its maximum dry density and optimum moisture content.
    - Compaction – Radon Barrier fill is compacted with rubber tired or footed roller compaction equipment.
    - Maximum particle size in the fill material shall be 4 inches
    - Placement of mancos shale will be visually inspected to make sure there are no locations where rock type particles accumulate in a concentrated location

- Compaction Verification Tests – Perform in-place density and moisture content tests on compacted fill material in accordance with the following requirements:

    - Verification tests of in-place density shall be performed on initial layer of radon barrier placed, and on any layers in which the CAES indicates that problems occurred obtaining compaction.
    - When verification in-place density and moisture content tests are performed on a soil layer, a minimum of one test shall be preformed a minimum of 2 tests per 5,000 cubic yards of material placed.
    - Compaction and moisture content tests shall be performed in accordance with the following methods:
        - ASTM D 1556 – Density and Unit Weight of Soil in Place by the Sand-Cone Method
        - ASTM D 2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
        - ASTM D 6938 - In-Place Density and Water content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth

- ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating
- ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

- After placement, moisture content shall be maintained or adjusted to meet criteria.
- Erosion that occurs in the fill layers shall be repaired and grades re-established.
- Freezing and desiccation of the Radon Barrier lLayer shall be prevented. If freezing or desiccation occurs, the affected soil shall be removed or reconditioned as directed.
- Areas that have been repaired shall be retested as directed. Repairs to the Radon Barrier lLayer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

6.7.5 Initial and Confirmatory Surveys

Verification of the thickness of the Radon Barrier Layer will be performed by comparing before and after surveys of the Layer by surveying or using CAES. Prior to placement of the Radon Barrier Layer, an initial survey shall be performed of the section to be capped. The initial survey will document the pre-cap geometry of the site. After the Radon Barrier Layer has been installed, a post-installation survey will be performed on the top of the Radon Barrier fill to confirm that the total fill thickness is in accordance with the plans and specifications.

6.8 INFILTRATION AND BIOINTRUSION BARRIER (GRAVEL)

Above the Radon Barrier lLayer, a 6 inch thick Infiltration and Biointrusion Layer of gravel will be placed to provide a barrier to burrowing animals, and a pathway for drainage of water that has infiltrated through upper layers of the cap. The gravel will be a sandy gravel with a gradation in accordance with project plans and specifications. Rock shall be spread to the thickness indicated on the drawings or in accordance with oversizing due to scoring criteria. Rock placement shall be guided by the Computer Aided Earthmoving System GPS grade control to ensure that the appropriate thickness has been placed at all locations. Stone with a D50 of 2 inches or lessThe Biointrustion Layer shall be compacted with a vibratory steel drum.

6.8.1 Erosion Protection Materials Testing

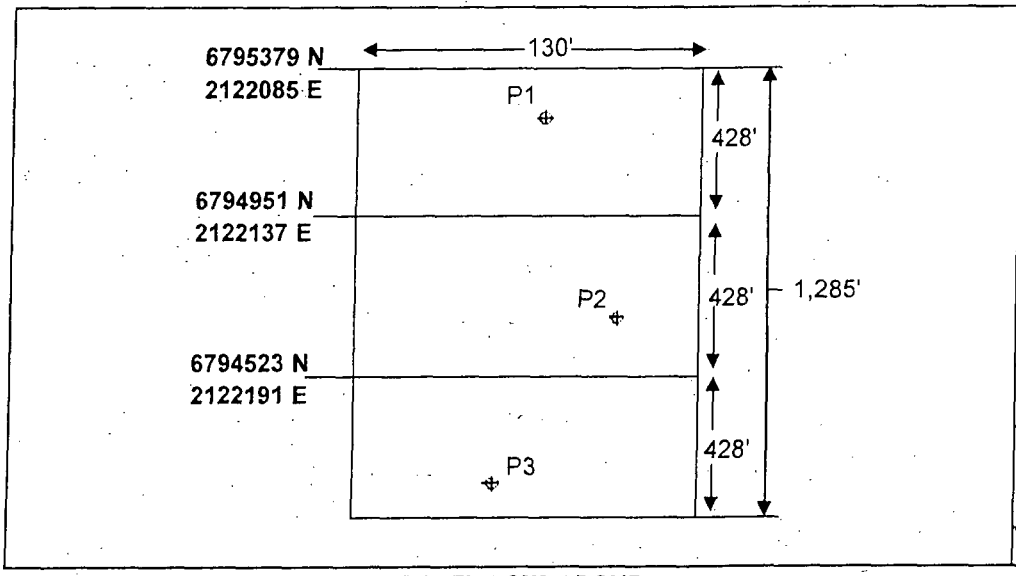
Rock for the infiltration and biointrusion barrier layer shall be tested by a commercial testing laboratory during production in accordance with the following:

ENERGY SOLUTIONS

RADON BARRIER LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

NW CORNER DATE: 8/11/2010



P 1	6795284 N 2122160 E				
EW:	130	X	0.557	=	72
NS:	428	X	0.221	=	95
P 2	6794613 N 2122238 E				
EW:	130	X	0.776	=	101
NS:	428	X	0.789	=	338
P 3	6794143 N 2122251 E				
EW:	130	X	0.459	=	60
NS:	428	X	0.887	=	380
P 4					
EW:		X		=	
NS:		X	N / A	=	
P 5					
EW:		X		=	
NS:		X		=	

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: URA11100811-00 NW CORNER: 6795379 N 2122085 E

THICKNESS: UNC: ≤ 12" COM: N/A ELEV: N/A Scarification Insp: YES Date: 8/11/10 Time: 0800

Material Inspection by: B.B. Partical Size: ≤4": X ≥4": ___ Nesting: Y: ___ N: X Processed Mancos Shale Material: Y: X N: ___

Comments: This lift is approximately ~~172,358~~ 167,050 ft², with an approximate total of ~~3,192~~ 3,094 yds³ of RRM approved on this lift. On 8/11/2010 a baseline ~~th~~e survey was performed for this new lift area. QC visually inspected the area and found that it was scarified prior to placement and that the lift areas moisture content was maintained. QC observed placement throughout the day and picked a few rocks out of the material, material processing is not finished therefore final inspection was not performed. QC observed that moisture was applied to underlying lift and material being placed throughout the day. Moisture test was taken from this lift area with satisfactory results. On 8/12/2010 QC observed work on the Radon Barrier throughout the day and removed some rock form the material. At approximately 1000 hours QC performed an inspection on the material because operations felt it was ready and the material was not approved for compaction due to the material being over 4" and needing more processing. Operations continued disking, pulverizing and adding moisture to the material and at approximately 1500 hours a second inspection on the material was done and it was found to be satisfactory according to the RAIP. On 8/13/2010 QC observed operations adding moisture to the lift and compacting. Lift was not verified for compaction with the CAES due to it not being completed with compaction. QC observed operations adding moisture to the lift area on 8/16/2010 after the weekend. QC performed in place density tests for correlation with the CAES, as well as companion oven moisture tests to correlation with the Nuclear Density Gauge on this lift area. AFTER OPERATIONS COMPLETED COMPACTION ON ENTIRE LIFT AREA.

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

LIFT APPROVED BY: Dave Stewart DATE: 8/16/2010 TIME: 1102

QA/QC APPROVAL 8.25.10 8.20.2010 DATE

ENERGY*SOLUTIONS*

Slope Elevation Survey

Average lift thickness=	0.5	Bounding Box	Northing	Easting
Grid Size=	50'	Lower Left	N	
Lift ID:	URA11100811-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795180	2122110	4991.0	6795180	2122110	4991.5	0.5	OK
6795230	2122110	4992.3	6795230	2122110	4992.8	0.5	OK
6795280	2122110	4993.6	6795280	2122110	4994.2	0.5	OK
6795330	2122110	4995.0	6795330	2122110	4995.5	0.5	OK
6795380	2122110	4995.9	6795380	2122110	4996.2	0.4	OK
6794780	2122160	4981.3	6794780	2122160	4981.7	0.4	OK
6794830	2122160	4982.6	6794830	2122160	4982.9	0.3	OK
6794880	2122160	4983.9	6794880	2122160	4984.3	0.4	OK
6794930	2122160	4985.4	6794930	2122160	4985.8	0.5	OK
6794980	2122160	4986.6	6794980	2122160	4987.2	0.6	OK
6795030	2122160	4987.9	6795030	2122160	4988.4	0.6	OK
6795080	2122160	4989.1	6795080	2122160	4989.6	0.6	OK
6795130	2122160	4990.3	6795130	2122160	4990.9	0.6	OK
6795180	2122160	4991.5	6795180	2122160	4992.1	0.6	OK
6795230	2122160	4992.7	6795230	2122160	4993.2	0.5	OK
6795280	2122160	4993.9	6795280	2122160	4994.4	0.5	OK
6795330	2122160	4995.0	6795330	2122160	4995.7	0.7	OK
6795380	2122160	4995.9	6795380	2122160	4996.3	0.5	OK
6794380	2122210	4971.2	6794380	2122210	4971.7	0.5	OK
6794430	2122210	4972.4	6794430	2122210	4972.9	0.5	OK
6794480	2122210	4973.7	6794480	2122210	4974.2	0.5	OK
6794530	2122210	4975.1	6794530	2122210	4975.6	0.5	OK
6794580	2122210	4976.4	6794580	2122210	4977.1	0.7	OK
6794630	2122210	4977.8	6794630	2122210	4978.5	0.7	OK
6794680	2122210	4979.1	6794680	2122210	4979.7	0.6	OK
6794730	2122210	4980.3	6794730	2122210	4980.9	0.6	OK
6794780	2122210	4981.7	6794780	2122210	4982.2	0.5	OK
6794830	2122210	4983.0	6794830	2122210	4983.4	0.4	OK
6794880	2122210	4984.1	6794880	2122210	4984.6	0.5	OK
6794930	2122210	4985.2	6794930	2122210	4985.8	0.6	OK
6794980	2122210	4986.6	6794980	2122210	4987.1	0.5	OK
6795030	2122210	4987.8	6795030	2122210	4988.3	0.5	OK
6795080	2122210	4989.0	6795080	2122210	4989.7	0.6	OK
6795130	2122210	4990.3	6795130	2122210	4990.9	0.5	OK
6795180	2122210	4991.5	6795180	2122210	4992.0	0.5	OK
6795230	2122210	4992.8	6795230	2122210	4993.4	0.6	OK
6795280	2122210	4994.1	6795280	2122210	4994.5	0.5	OK
6795330	2122210	4995.1	6795330	2122210	4995.6	0.5	OK
6794130	2122260	4965.6	6794130	2122260	4966.1	0.5	OK
6794180	2122260	4966.4	6794180	2122260	4967.1	0.7	OK
6794230	2122260	4967.4	6794230	2122260	4968.1	0.6	OK
6794280	2122260	4968.7	6794280	2122260	4969.3	0.6	OK
6794330	2122260	4970.1	6794330	2122260	4970.6	0.5	OK
6794380	2122260	4971.5	6794380	2122260	4972.0	0.5	OK
6794430	2122260	4972.9	6794430	2122260	4973.3	0.5	OK
6794480	2122260	4974.0	6794480	2122260	4974.5	0.6	OK
6794530	2122260	4975.2	6794530	2122260	4975.7	0.5	OK
6794580	2122260	4976.6	6794580	2122260	4977.1	0.4	OK
6794630	2122260	4977.9	6794630	2122260	4978.2	0.3	OK
6794680	2122260	4979.1	6794680	2122260	4979.5	0.4	OK

6794730	2122260	4980.4	6794730	2122260	4980.7	0.4	OK
6794780	2122260	4981.7	6794780	2122260	4982.1	0.4	OK
6794830	2122260	4983.1	6794830	2122260	4983.5	0.4	OK
6794880	2122260	4984.1	6794880	2122260	4984.6	0.5	OK
6794930	2122260	4985.3	6794930	2122260	4985.7	0.4	OK
6794980	2122260	4986.6	6794980	2122260	4987.0	0.4	OK
6794130	2122310	4965.3	6794130	2122310	4965.5	0.2	OK
6794180	2122310	4966.3	6794180	2122310	4966.8	0.5	OK
6794230	2122310	4967.4	6794230	2122310	4967.9	0.5	OK
6794280	2122310	4968.8	6794280	2122310	4969.2	0.4	OK
6794330	2122310	4970.0	6794330	2122310	4970.4	0.4	OK
6794380	2122310	4971.4	6794380	2122310	4971.9	0.5	OK
6794430	2122310	4972.7	6794430	2122310	4973.3	0.6	OK
6794480	2122310	4974.0	6794480	2122310	4974.5	0.5	OK
6794530	2122310	4975.2	6794530	2122310	4975.6	0.5	OK
6794580	2122310	4976.5	6794580	2122310	4976.9	0.3	OK
6794630	2122310	4977.9	6794630	2122310	4978.2	0.4	OK
6794130	2122360	4965.3	6794130	2122360	4965.5	0.2	OK
6794180	2122360	4966.3	6794180	2122360	4966.8	0.5	OK
6794230	2122360	4967.6	6794230	2122360	4967.9	0.3	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
			N/A			0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

Number of Data Points	Sum of Point Thickness	# of Thick Points
70	33.95662	0.0

% =6	95.6%
Elevation Avg	5248.8
Total =6	14335
Total Lines	14995

Pass

Minimum Number of Machine Passes
3

Lift ID: URA11100811-00

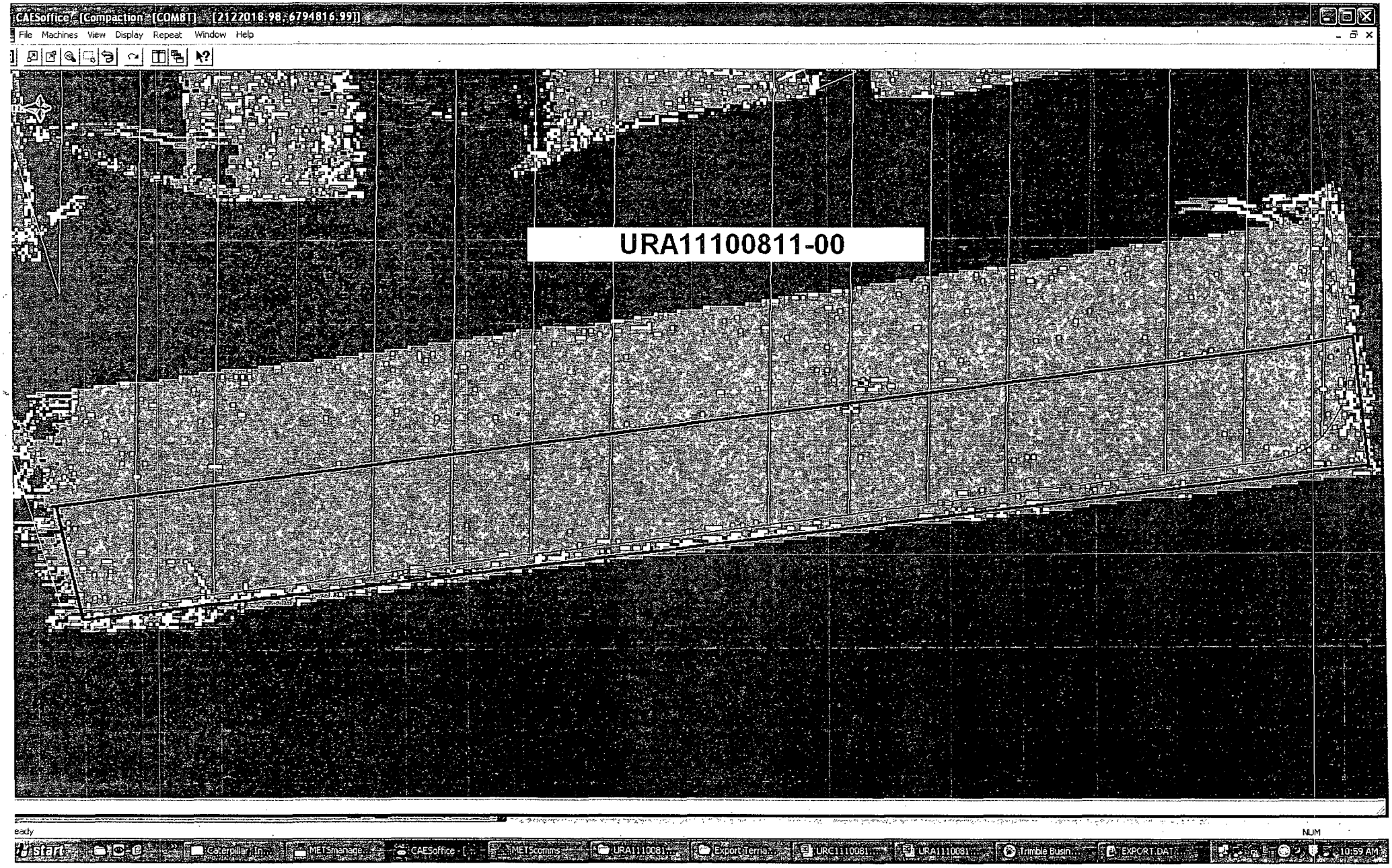
Northing	Easting	Elevation	# of Passes	Passes =6	Count
6795366	2122087	4996.4	5		1
6795370	2122087	4996.5	5		1
6795373	2122087	4996.6	3		1
6795376	2122087	4996.6	6	1	1
6795379	2122087	4996.6	5		1
6795337	2122090	4996.0	6	1	1
6795340	2122090	4996.1	6	1	1
6795343	2122090	4996.1	6	1	1
6795347	2122090	4996.4	6	1	1
6795350	2122090	4996.6	5		1
6795353	2122090	4996.7	5		1
6795356	2122090	4996.7	4		1
6795360	2122090	4996.8	4		1
6795363	2122090	4997.0	4		1
6795366	2122090	4997.1	2		1
6795370	2122090	4997.1	2		1
6795373	2122090	4997.4	1		1
6795376	2122090	4997.6	1		1
6795379	2122090	4996.6	4		1
6795297	2122093	4994.7	4		1
6795301	2122093	4994.9	4		1
6795304	2122093	4995.0	3		1
6795307	2122093	4995.6	3		1
6795310	2122093	4995.8	3		1
6795314	2122093	4996.0	3		1
6795317	2122093	4996.1	5		1
6795320	2122093	4996.2	5		1
6795324	2122093	4996.2	2		1
6795327	2122093	4996.3	4		1
6795330	2122093	4996.3	4		1
6795333	2122093	4996.4	3		1
6795337	2122093	4996.5	4		1
6795340	2122093	4996.6	1		1
6795343	2122093	4996.4	3		1
6795347	2122093	4996.2	4		1
6795350	2122093	4996.2	4		1
6795353	2122093	4996.3	4		1
6795356	2122093	4996.3	5		1
6795360	2122093	4996.4	6	1	1
6795363	2122093	4996.5	6	1	1
6795366	2122093	4996.5	6	1	1
6795370	2122093	4996.5	6	1	1
6795373	2122093	4996.6	6	1	1
6795376	2122093	4996.6	6	1	1

Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6


CAESoffice - [Compaction - [COMBT] [2122018.98, 6794816.99]]
File Machines View Display Repeat Window Help
URA11100811-00
eady
NUM
start
Caterpillar In...
METSmanage...
CAESoffice - [...
METScomms
URA1110081...
Export Terra...
URC1110081...
URA1110081...
Trimble Busin...
EXPORT.DAT...
10:59 AM

ENERGYSOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER 15 of 16 6/20/10

LIFT IDENTIFICATION: URA11100811-00 DATE: 8/12/2010

TEST ID NUMBER(S): 1

TEST LOCATION: 6795284 N 2122160 E 57 MH 1-11-11 TEST METHOD: ____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 31674

Last Calibration Date: 3/4/10

Daily Standard Counts: *On-Cell Standard*

Density 2518 Moisture 708

Method A (Direct Transmission)

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

Moisture Count 156 Density Count 2256

Wet Density (ρ_m) 129.5 *(lbs/ft^3)* Dry Density 117.3 *(lbs/ft^3)*

Moisture Density 12.2 *(lbs/ft^3)* Moisture Fraction 10.4 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID D-1

Mass of container & wet specimen (M_{cms})	413.9	g
Mass of container & dry specimen (M_{cds})	384.5	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	29.4	g
Mass of container (M_c)	164.3	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	220.2	g
Moisture content (w) $w = (M_w / M_s) \times 100$	13.4	%

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

$\rho d = (100 \times 129.5) / (100 + 13.4 = 114.2$ *lbs/ft^3*

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

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

114.2 / 118.2 x 100 = 96.7 %

Soil Description: **Gray in color and consists of mostly fines.**

Proctor ID: **Radon Barrier # 8 C**

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.2 (lbs/ft^3)

Optimum Moisture (w_{opt}) 13.3 (%)

Required Moisture: 10.3 % to 16.3 %

Required Percent Compaction: 95.0 (%)

Comments:

Johanson and Tuttle Eng. personnel performed the in place density tests. Also an EnergySolutions QC Technichian performed the companion oven moisture tests. 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: 8/16/10

____ Failed Moisture

____ Failed Compaction Time: 10:00

By: Kevin Keele/Kyler Edgehouse / Kevin Keele/Kyler Edgehouse (print) J and T (signature)

QA/QC APPROVAL 8.20.2010 DATE

ENERGYSOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER 16 DS 8/20/10

LIFT IDENTIFICATION: URA11100811-00 DATE: 8/12/2010

TEST ID NUMBER(S): 2

TEST LOCATION: 6794613 N 2122186 E TEST METHOD: ____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 31674

Last Calibration Date: 3/4/10

Daily Standard Counts: *On-Cell Standard*

Density 2518 Moisture 708

Method A (Direct Transmission)

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

Moisture Count 144 Density Count 2065

Wet Density (ρ_m) 133.5 *(lbs/ft^3)* Dry Density 122.4 *(lbs/ft^3)*

Moisture Density 11.1 *(lbs/ft^3)* Moisture Fraction 9.1 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID D-3

Mass of container & wet specimen (M_{cms})	368.5	g
Mass of container & dry specimen (M_{cds})	343.1	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	25.4	g
Mass of container (M_c)	164.4	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	178.7	g
Moisture content (w) $w = (M_w / M_s) \times 100$	14.2	%

Soil Description: **Gray in color and consists of mostly fines.**

Proctor ID: **Radon Barrier # 8 C**

Standard Proctor (ASTM D698)

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

$\rho d = (100 \times 133.5) / (100 + 14.2 =$ **116.9** *lbs/ft^3*

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

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

116.9 / 118.2 x 100 = **98.9** %

Maximum Dry Density ($\gamma_d max$) 118.2 (lbs/ft^3)

Optimum Moisture (w_{opt}) 13.3 (%)

Required Moisture: 10.3 % to 16.3 %

Required Percent Compaction: 95.0 (%)

Comments:

Johanson and Tuttle Eng. personnel performed the in place density tests. Also an EnergySolutions QC Technichian performed the companion oven moisture tests. 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: 8/16/10

____ Failed Moisture

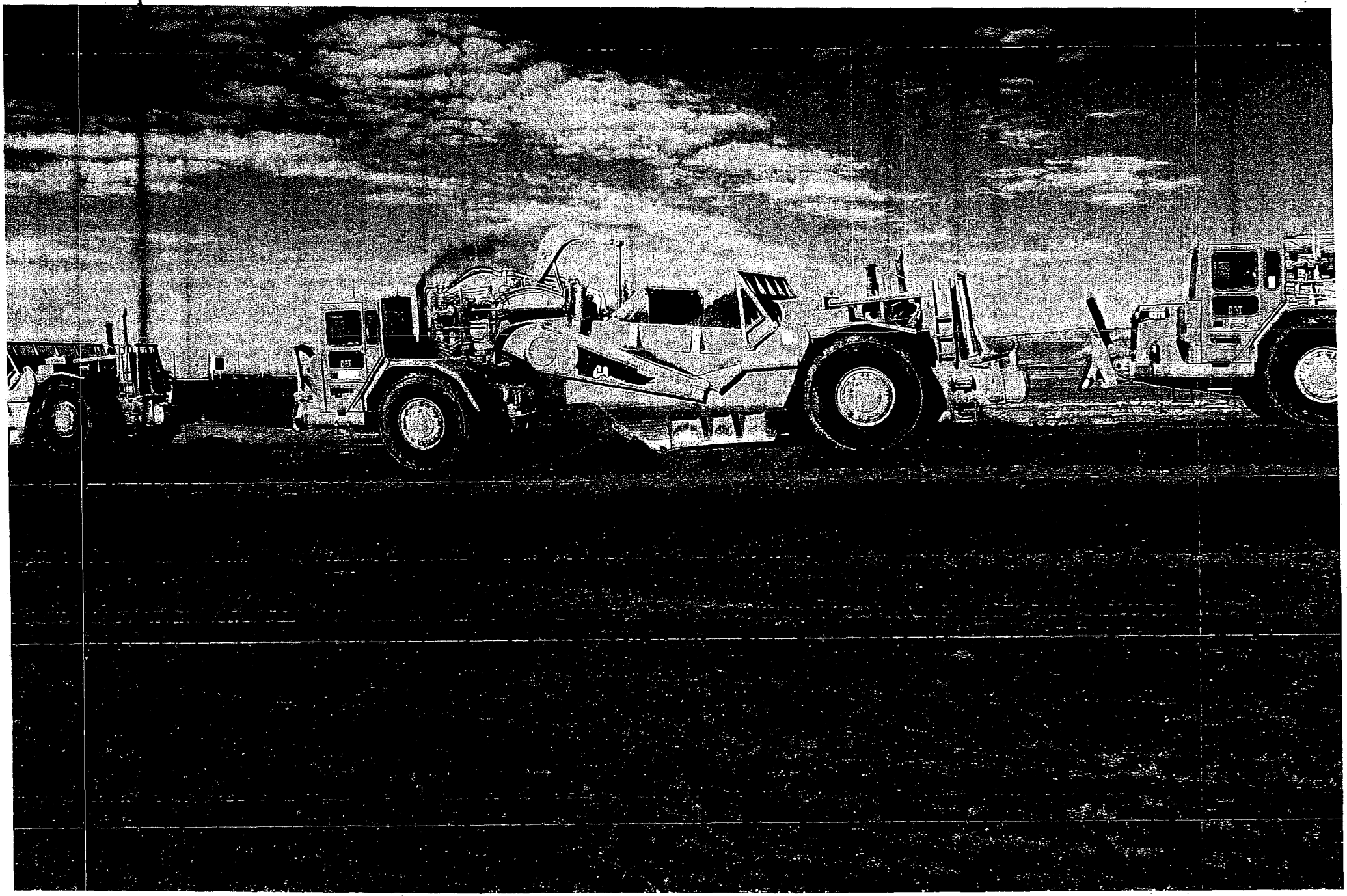
____ Failed Compaction Time: 10:00

By: Kevin Keele/Kyler Edgehouse / Kevin Keele / Kyler Edgehouse

(print) Jand T *(signature)*

QA/QC APPROVAL 8.20.2010 DATE

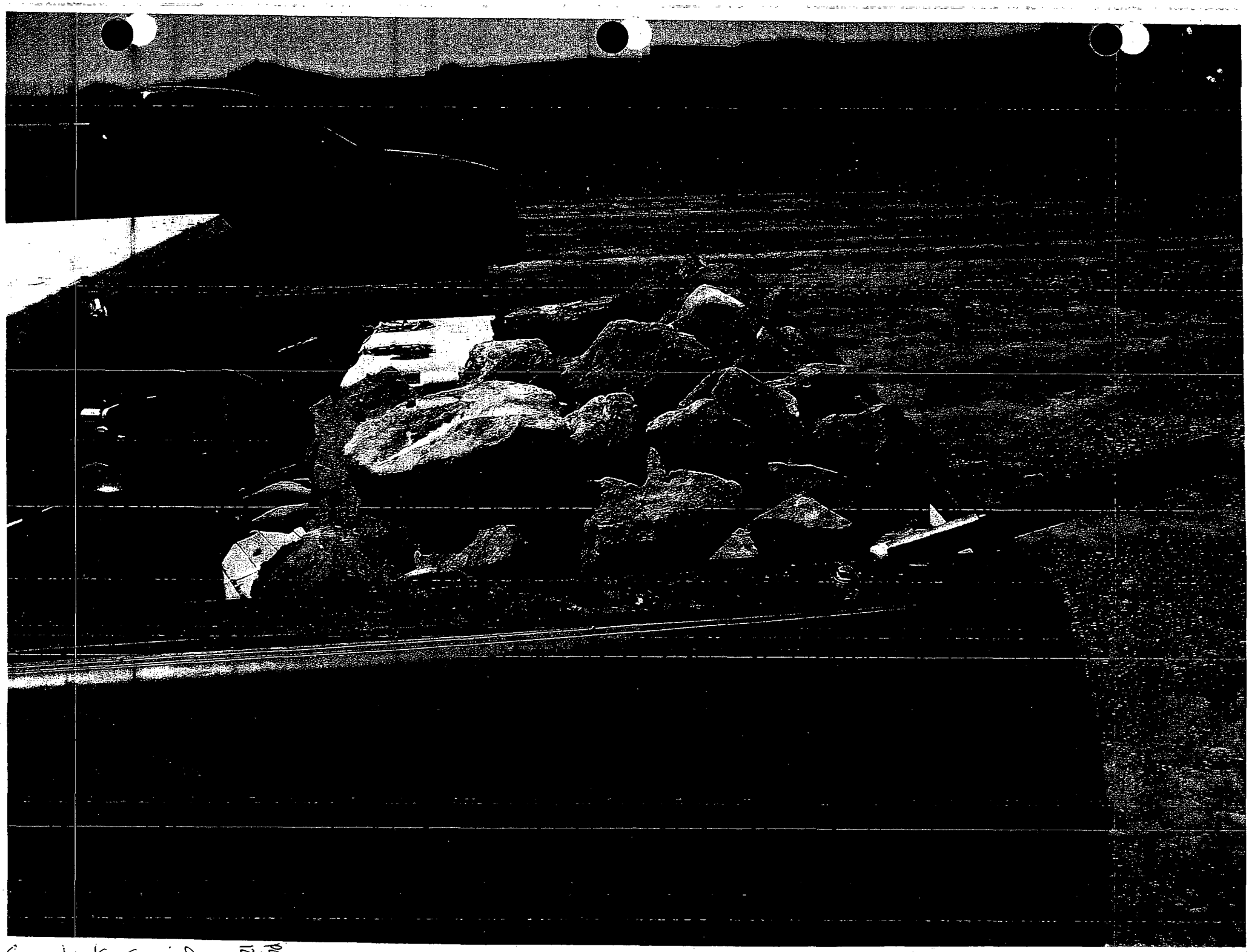
See Back For Info 9/16 SW



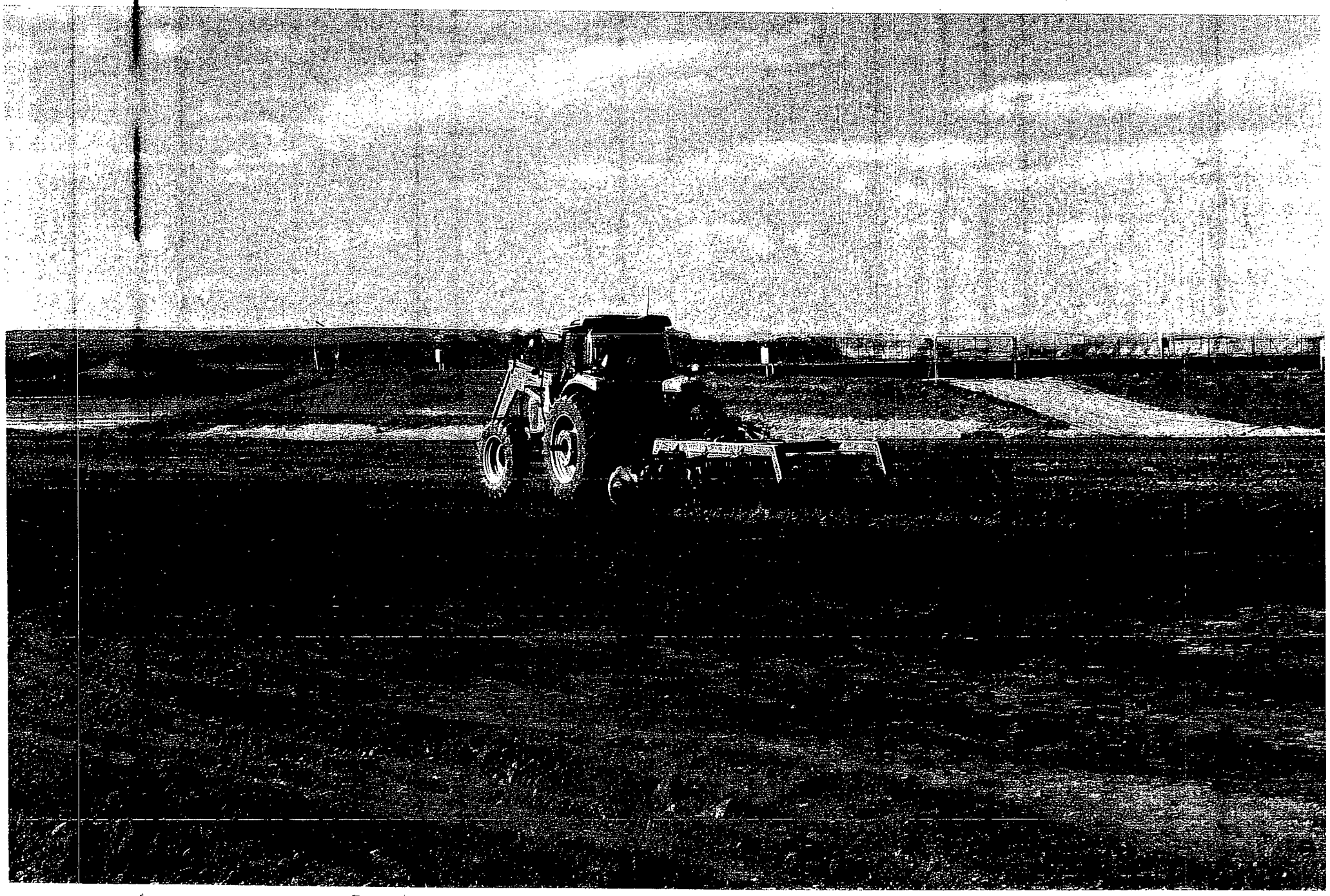
See back For Info RS 10/18

see back For Info

9/11/96



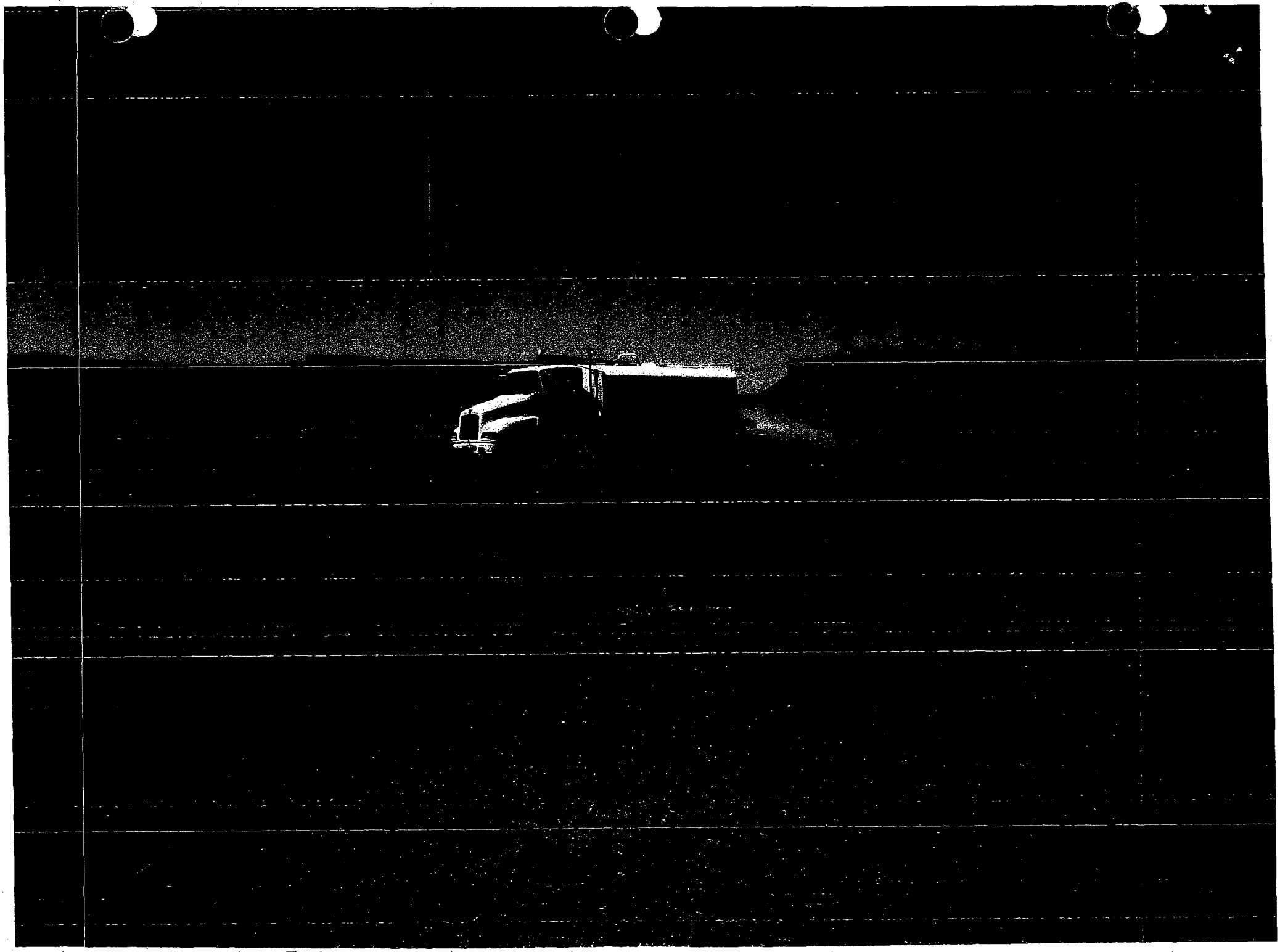
See back for info 1/2 size



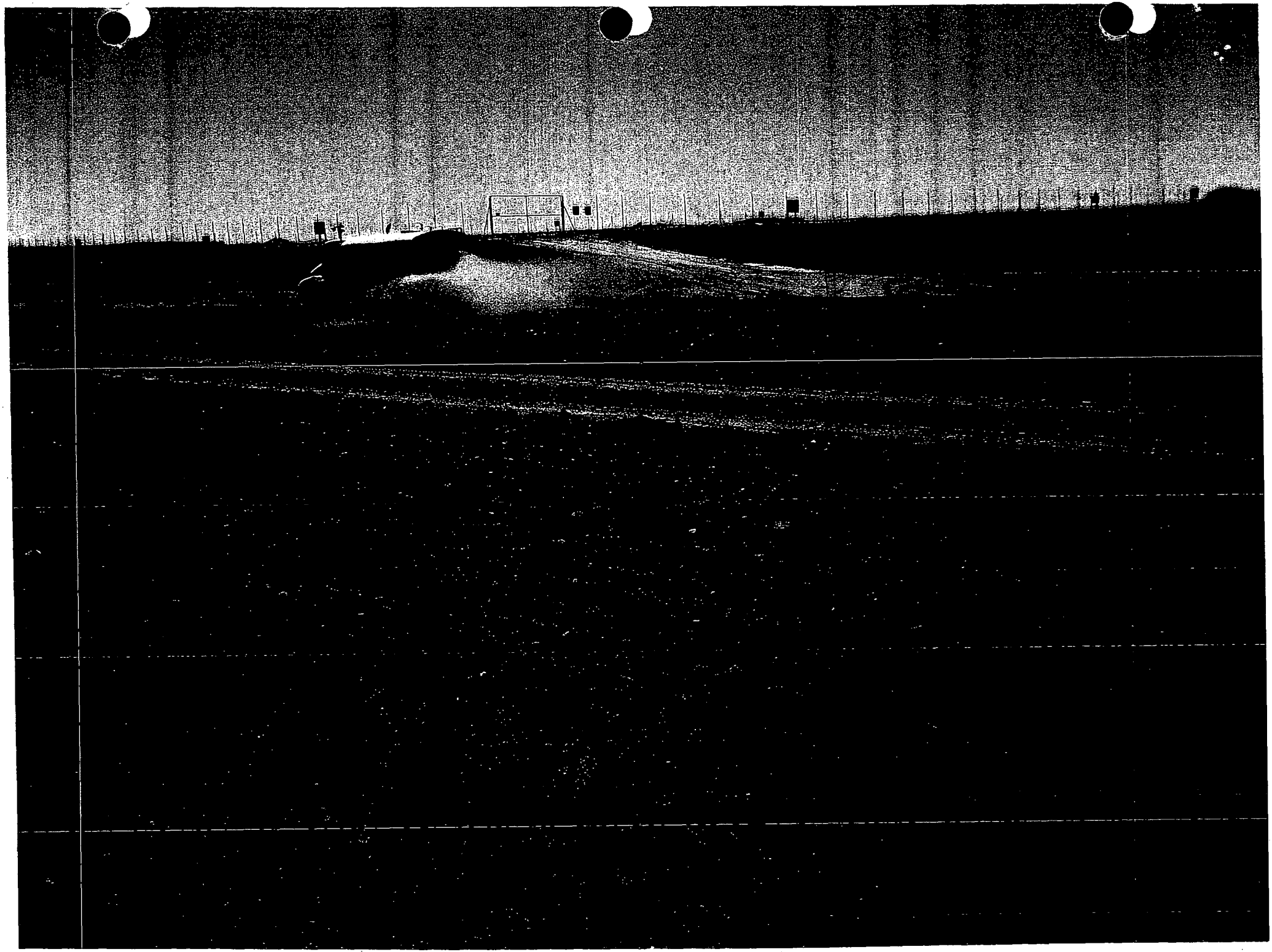
See back for Info

3/12

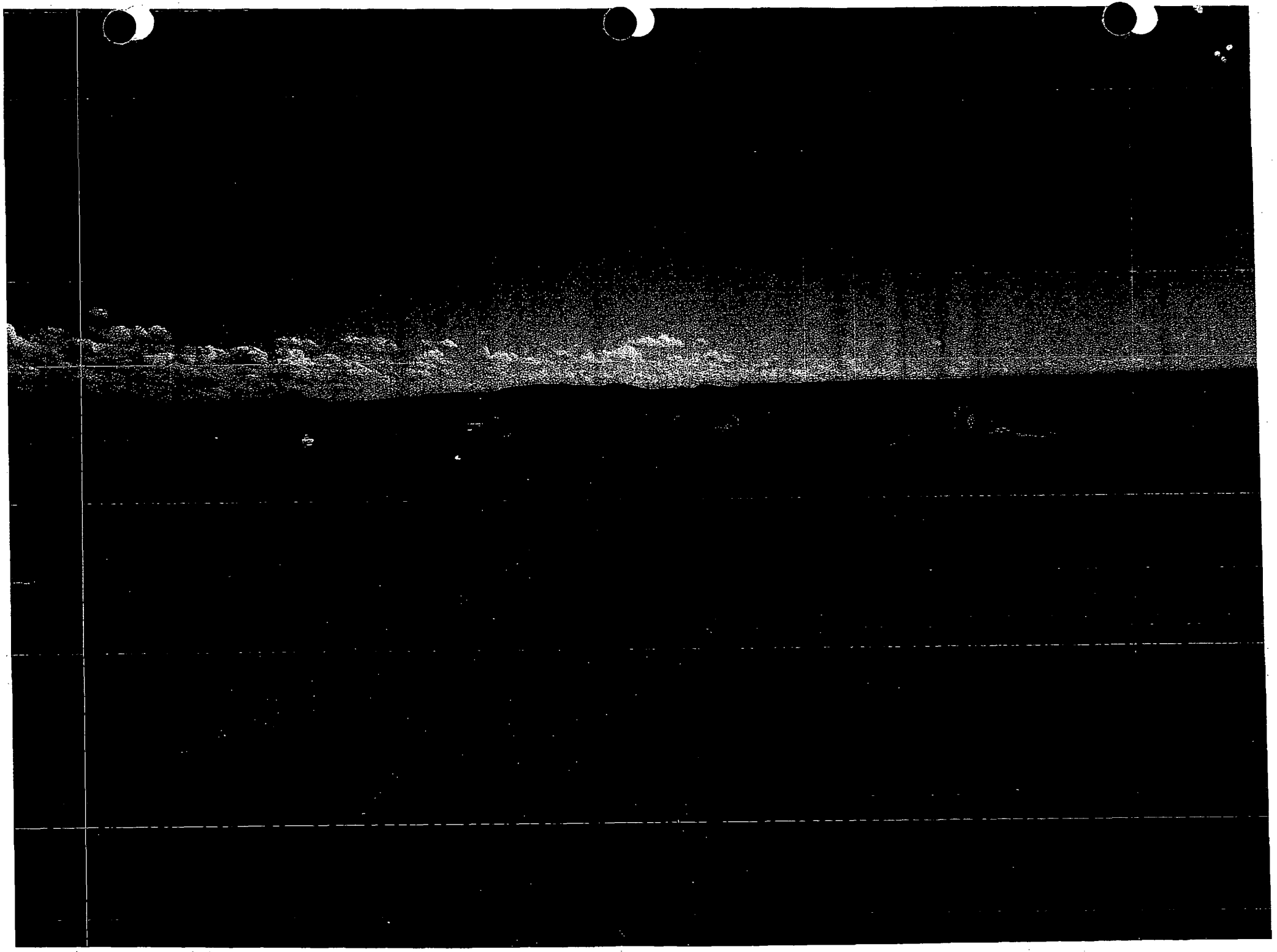
See back for info



See Look For Today 11/5/98



See back for info



See Trick For info 11/4 50

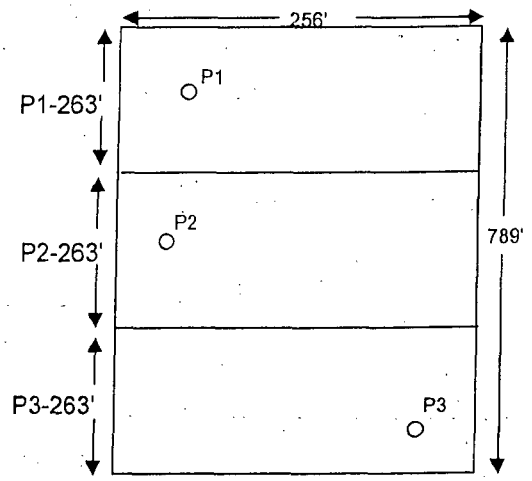
See back For Info

ENERGY*SOLUTIONS*

LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project **OTHER**

NW CORNER **DATE:** 8/10/2010



P 1	6795258 N. 2122149 E.			
EW:	256	X 0.254	=	65
NS:	263	X 0.459	=	121
P 2	6794968 N. 2122124 E.			
EW:	256	X 0.156	=	40
NS:	263	X 0.563	=	148
P 3	6794646 N. 2122292 E.			
EW:	256	X 0.811	=	208
NS:	263	X 0.786	=	207
P 4				
EW:		X	=	
NS:		X N/A	=	
P 5				
EW:		X	=	
NS:		X	=	

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: URA11100810-00 NW CORNER: 6795379 N 2122084 E

THICKNESS: UNC: ≤12" COM: N/A ELEV: N/A Scarification Insp: YES Date: 8/2/10 Time: 1000

Material Inspection by: D.S. Partical Size: ≤4": X ≥4": ___ Nesting: Y: ___ N: X Processed Mancos Shale Material: Y: X N: ___

Comments: This lift is approximately 201,984 ft². There is approximately 5,237 yds³ of Radon material on this lift. This is the first lift of Radon Barrier material in this area. QC took pictures during processing, conditioning, and compaction of this lift area, see attached. QC performed a survey to identify the boundary line for the lift area. QC verified that the area was scarified and a baseline survey was performed prior to placement. QC verified with satisfactory results that the Interim Cover moisture was maintained until covered with Radon Barrier. Nielsons began placing the material as well as disking and adding moisture to the soil. QC performed a visual inspection on the material and found some material with particle size exceeding 4". QC performed multiple visual inspections during processing of material. material was reworked and some was removed form this lift area. A final inspection was performed on 8/10/2010 with satisfactory results. QC observed compaction and performed 3 density tests in correlation with the CAES with satisfactory results. QC also performed companion moisture tests and a companion sandcone test in correlation with the nuclear density gauge. Test #1 had high compaction results, due to test location was in a haul route for material placement.

KEYING IN NOTES: N E S W N/A DENSITY TESTS ID # (S): 1, 2 and 3

LIFT APPROVED BY: Dave Stewart DATE: 8/10/2010 TIME: 1830

QA/QC APPROVAL 8-25-10 DATE 8-11-10

ENERGYSOLUTIONS

Slope Elevation Survey

Average lift thickness=	0.7	Bounding Box	Northing	Easting
Grid Size=	50'	Lower Left	N	
Lift ID:	URA11100810-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6794794	2122165	4980.7	6794794	2122165	4981.7	1.0	OK
6794844	2122165	4982.1	6794844	2122165	4983.1	1.0	OK
6794894	2122165	4983.5	6794894	2122165	4984.5	1.0	OK
6794944	2122165	4984.9	6794944	2122165	4985.8	0.9	OK
6794994	2122165	4986.2	6794994	2122165	4987.0	0.9	OK
6795044	2122165	4987.2	6795044	2122165	4988.1	1.0	OK
6794644	2122215	4977.3	6794644	2122215	4978.2	0.9	OK
6794694	2122215	4978.6	6794694	2122215	4979.5	0.9	OK
6794744	2122215	4979.8	6794744	2122215	4980.8	0.9	OK
6794794	2122215	4981.1	6794794	2122215	4982.1	1.0	OK
6794844	2122215	4982.3	6794844	2122215	4983.3	1.0	OK
6794894	2122215	4983.6	6794894	2122215	4984.3	0.8	OK
6794944	2122215	4985.0	6794944	2122215	4985.7	0.7	OK
6794994	2122215	4986.1	6794994	2122215	4987.0	0.9	OK
6795044	2122215	4987.3	6795044	2122215	4988.2	0.9	OK
6794644	2122265	4977.4	6794644	2122265	4978.2	0.8	OK
6794694	2122265	4978.5	6794694	2122265	4979.5	0.9	OK
6794744	2122265	4979.9	6794744	2122265	4980.8	0.9	OK
6794794	2122265	4981.3	6794794	2122265	4982.1	0.9	OK
6794844	2122265	4982.3	6794844	2122265	4983.4	1.0	OK
6794894	2122265	4983.5	6794894	2122265	4984.4	1.0	OK
6794944	2122265	4984.7	6794944	2122265	4985.7	1.0	OK
6794994	2122265	4986.1	6794994	2122265	4987.0	1.0	OK
6795044	2122265	4987.3	6795044	2122265	4988.3	1.0	OK
6794644	2122315	4977.3	6794644	2122315	4978.2	1.0	OK
6794694	2122315	4978.5	6794694	2122315	4979.4	0.9	OK
6794744	2122315	4979.9	6794744	2122315	4980.7	0.8	OK
6794794	2122315	4981.4	6794794	2122315	4982.1	0.8	OK
6794844	2122315	4982.5	6794844	2122315	4983.4	0.9	OK
6794894	2122315	4983.6	6794894	2122315	4984.7	1.0	OK
6794944	2122315	4984.9	6794944	2122315	4985.9	1.0	OK
6794994	2122315	4986.3	6794994	2122315	4987.2	0.9	OK
6795044	2122315	4987.6	6795044	2122315	4988.5	0.9	OK
6794644	2122365	4977.4	6794644	2122365	4978.0	0.7	OK
6794694	2122365	4978.7	6794694	2122365	4979.3	0.7	OK
6794744	2122365	4980.0	6794744	2122365	4980.9	0.9	OK
6794794	2122365	4981.4	6794794	2122365	4982.2	0.9	OK
6794844	2122365	4982.6	6794844	2122365	4983.4	0.8	OK
6794894	2122365	4983.7	6794894	2122365	4984.6	0.9	OK
6794944	2122365	4985.1	6794944	2122365	4985.9	0.8	OK
6794994	2122365	4986.4	6794994	2122365	4987.0	0.6	OK
6795044	2122365	4987.5	6795044	2122365	4988.0	0.6	OK
6794644	2122415	4977.5	6794644	2122415	4977.8	0.3	OK
6794694	2122415	4978.6	6794694	2122415	4978.9	0.3	OK
6794744	2122415	4980.0	6794744	2122415	4980.2	0.2	OK
6794794	2122415	4981.3	6794794	2122415	4981.4	0.1	OK
6794844	2122415	4982.4	6794844	2122415	4982.4	0.0	OK
6794894	2122415	4983.4	6794894	2122415	4983.4	0.0	OK
6794944	2122415	4984.7	6794944	2122415	4984.7	0.0	OK
6795052	2122119	4987.6	6795052	2122119	4988.1	0.5	OK

6795102	2122119	4988.7	6795102	2122119	4989.4	0.6	OK
6795152	2122119	4989.8	6795152	2122119	4990.5	0.7	OK
6795202	2122119	4991.1	6795202	2122119	4991.7	0.6	OK
6795252	2122119	4992.5	6795252	2122119	4993.1	0.6	OK
6795302	2122119	4993.7	6795302	2122119	4994.4	0.8	OK
6795352	2122119	4994.9	6795352	2122119	4995.6	0.7	OK
6795402	2122119	4995.4	6795402	2122119	4995.8	0.5	OK
6795052	2122169	4987.4	6795052	2122169	4988.3	1.0	OK
6795102	2122169	4988.7	6795102	2122169	4989.6	0.9	OK
6795152	2122169	4990.1	6795152	2122169	4990.9	0.8	OK
6795202	2122169	4991.3	6795202	2122169	4992.0	0.7	OK
6795252	2122169	4992.6	6795252	2122169	4993.2	0.7	OK
6795302	2122169	4993.8	6795302	2122169	4994.4	0.7	OK
6795352	2122169	4994.9	6795352	2122169	4995.5	0.5	OK
6795402	2122169	4995.6	6795402	2122169	4996.1	0.4	OK
6795452	2122169	4995.0	6795452	2122169	4995.1	0.1	OK
6795102	2122219	4988.8	6795102	2122219	4989.7	0.9	OK
6795152	2122219	4990.1	6795152	2122219	4990.9	0.8	OK
6795202	2122219	4991.3	6795202	2122219	4992.0	0.8	OK
6795252	2122219	4992.6	6795252	2122219	4993.4	0.8	OK
6795302	2122219	4993.9	6795302	2122219	4994.6	0.7	OK
6795352	2122219	4995.0	6795352	2122219	4995.6	0.6	OK
6795402	2122219	4995.8	6795402	2122219	4996.2	0.4	OK
6795452	2122219	4995.4	6795452	2122219	4995.6	0.2	OK
6795152	2122269	4990.1	6795152	2122269	4990.7	0.6	OK
6795202	2122269	4991.3	6795202	2122269	4992.0	0.6	OK
6795252	2122269	4992.6	6795252	2122269	4993.4	0.7	OK
6795302	2122269	4993.8	6795302	2122269	4994.6	0.8	OK
6795352	2122269	4995.0	6795352	2122269	4995.6	0.6	OK
6795402	2122269	4995.8	6795402	2122269	4996.4	0.6	OK
6795452	2122269	4995.3	6795452	2122269	4995.6	0.3	OK
6795152	2122319	4990.1	6795152	2122319	4991.0	0.8	OK
6795202	2122319	4991.4	6795202	2122319	4992.2	0.9	OK
6795252	2122319	4992.6	6795252	2122319	4993.4	0.8	OK
6795302	2122319	4993.8	6795302	2122319	4994.6	0.8	OK
6795352	2122319	4995.1	6795352	2122319	4995.8	0.7	OK
6795402	2122319	4995.8	6795402	2122319	4996.3	0.5	OK
6795452	2122319	4995.7	6795452	2122319	4995.9	0.2	OK
6795152	2122369	4990.0	6795152	2122369	4990.3	0.3	OK
6795202	2122369	4991.2	6795202	2122369	4991.4	0.2	OK
6795252	2122369	4992.2	6795252	2122369	4992.3	0.1	OK
						0.0	OK

Number of Data Points	Sum of Point Thickness
91	62.827956

# of Thick Points
0.0

% =6	98.1%
Elevation Avg	5987.5
Total =6	14714
Total Lines	14995

Pass

Minimum Number of Machine Passes
3

Lift ID: URA11100810-00

Northing	Easting	Elevation	# of Passes	Passes =6	Count
6795366	2122087	4995.1	6	1	1
6795370	2122087	4995.1	6	1	1
6795373	2122087	4995.2	6	1	1
6795376	2122087	4995.2	6	1	1
6795337	2122090	4994.6	6	1	1
6795340	2122090	4994.8	6	1	1
6795343	2122090	4994.9	6	1	1
6795347	2122090	4995.0	6	1	1
6795350	2122090	4995.1	6	1	1
6795353	2122090	4995.2	6	1	1
6795357	2122090	4995.3	6	1	1
6795360	2122090	4995.4	6	1	1
6795363	2122090	4995.4	6	1	1
6795366	2122090	4995.4	6	1	1
6795370	2122090	4995.5	6	1	1
6795373	2122090	4995.6	6	1	1
6795376	2122090	4995.6	6	1	1
6795380	2122090	4995.7	6	1	1
6795298	2122093	4993.7	6	1	1
6795301	2122093	4993.8	6	1	1
6795304	2122093	4993.9	6	1	1
6795307	2122093	4994.1	6	1	1
6795311	2122093	4994.2	6	1	1
6795314	2122093	4994.3	6	1	1
6795317	2122093	4994.4	6	1	1
6795320	2122093	4994.5	6	1	1
6795324	2122093	4994.6	6	1	1
6795327	2122093	4994.6	6	1	1
6795330	2122093	4994.7	6	1	1
6795334	2122093	4994.8	6	1	1
6795337	2122093	4994.9	6	1	1
6795340	2122093	4995.0	6	1	1
6795343	2122093	4995.1	6	1	1
6795347	2122093	4995.1	6	1	1
6795350	2122093	4995.3	6	1	1
6795353	2122093	4995.4	6	1	1
6795357	2122093	4995.5	6	1	1
6795360	2122093	4995.6	6	1	1
6795363	2122093	4995.6	6	1	1
6795366	2122093	4995.6	6	1	1
6795370	2122093	4995.7	6	1	1
6795373	2122093	4995.8	6	1	1
6795376	2122093	4995.8	6	1	1
6795380	2122093	4996.3	4		1

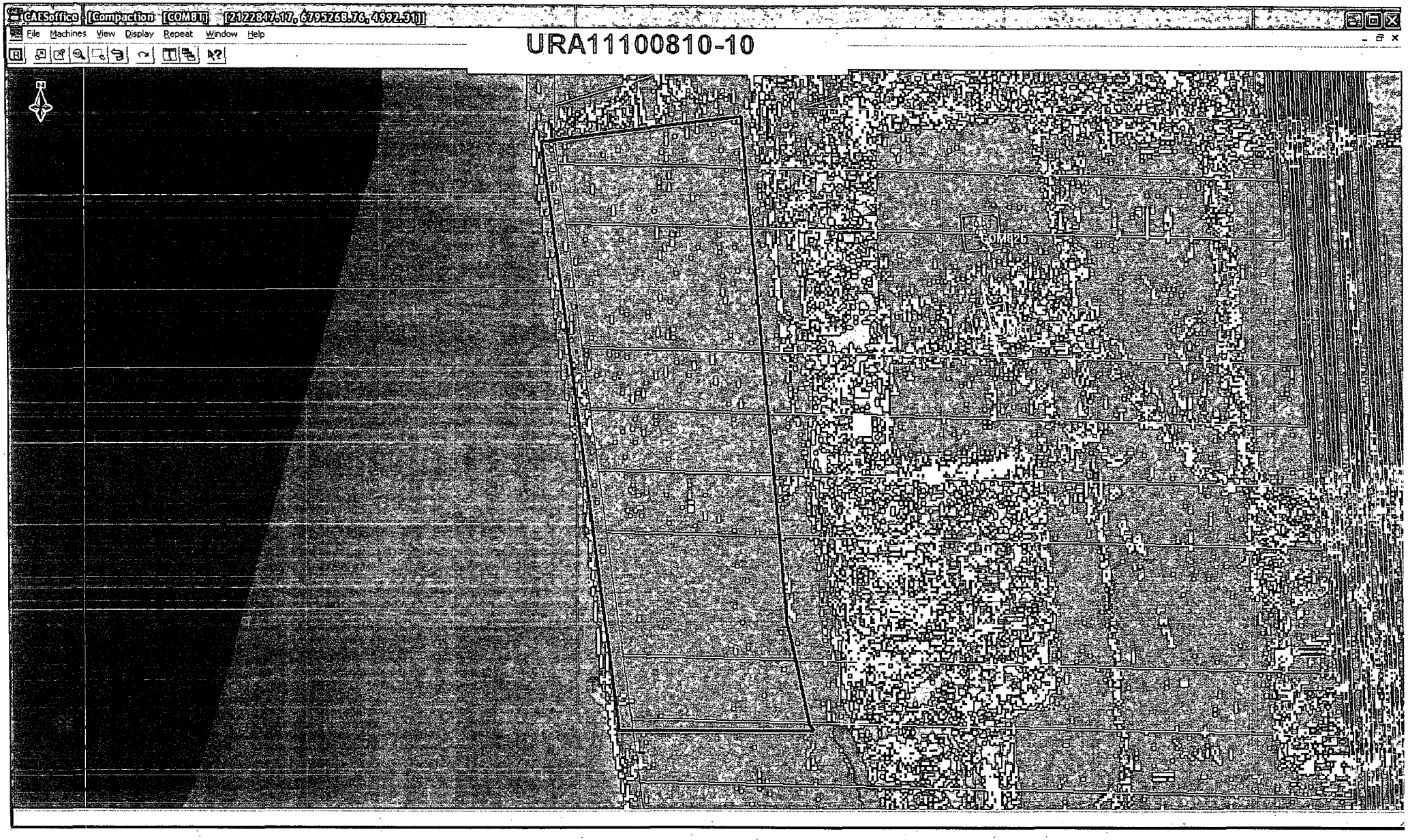
Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6

DS 6/13


CAESoffice [Compaction [COMBI] [2122847.17, 6795268.76, 4992.31]]
File Machines View Display Repeat Window Help
URA11100810-10

Sht 12

ENERGY*SOLUTIONS*

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: URA11100810-00 DATE: 8/10/2010

TEST ID NUMBER(S): # 1

TEST LOCATION: 6795258 N. 2122149 E. TEST METHOD: ____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model 3430 Gauge Serial # 27523

Last Calibration Date: 8/21/09

Daily Standard Counts: *Off-Cell Standard*

Density 2217 Moisture 666

Method A (Direct Transmission)

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

Moisture Count 171 Density Count 935

Wet Density (ρ_m) 137.8 *(lbs/ft^3)* Dry Density 123.2 *(lbs/ft^3)*

Moisture Density 14.7 *(lbs/ft^3)* Moisture Fraction 11.9 *(%)*

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

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 Denisty

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

Dry Denisty

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

Dry Unit Weight

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

N/A

MOISTURE DETERMINATION

ASTM D4643

Container ID D3

Mass of container & wet specimen (M_{cms})	384.0	g
Mass of container & dry specimen (M_{cds})	358.3	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	25.7	g
Mass of container (M_c)	164.4	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	193.9	g
Moisture content (w) $w = (M_w / M_s) \times 100$	13.3	%

Soil Description: **Yellowish in color, mostly consists of fines.**

Proctor ID: **Radon Barrier # 3**

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.4 (lbs/ft^3)

Optimum Moisture (w_{opt}) 13.2 (%)

Required Moisture: 10.2 % to 16.2 %

Required Percent Compaction: 95.0 (%)

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

$\rho d = (\ 100 \times 137.8\ ) / (100 + 13.3 = 121.7$ *lbs/ft^3*

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

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

121.7 / 118.4 x 100 = 102.8 %

Comments:

This test area had higher compaction results because it was used as a haul route during placement. 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: 8/10/10

____ Failed Moisture

____ Failed Compaction Time: 1410

By: Kyler Edgehouse / *(print)* *(signature)*

QA/QC APPROVAL 8/17/2010 DATE

ENERGYSOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER

LIFT IDENTIFICATION: URA11100810-00 DATE: 8/10/2010

TEST ID NUMBER(S): # 2

TEST LOCATION: 6794968 N. 2122124 E. TEST METHOD: x D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 27523

Last Calibration Date: 8/21/09

Daily Standard Counts: *Off-Cell Standard*

Density 2217 Moisture 666

Method A (Direct Transmission)

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

Moisture Count 187 Density Count 1102

Wet Density (ρ_m) 131.3 *(lbs/ft^3)* Dry Density 115.1 *(lbs/ft^3)*

Moisture Density 16.2 *(lbs/ft^3)* Moisture Fraction 14.1 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus Ω Calibrated Vol. *(lbs/ft^3)* 0.04113

Bulk Density of sand (ρ_1) 1.57 *g/cm^3* 97.8 *lbs/ft^3*

Mass of Sand to Fill Cone & Plate (M_2) 1824.6 *g*

Mass of bottle & cone **before** filling cone, plate & hole	6114.6	g
Mass of bottle & cone **after** filling cone, plate & hole	2418.7	g
Mass of sand to fill cone, plate, & hole (M_1)	3695.9	g
Mass of sand to fill hole	1871.3	g
Mass of wet soil & container	2500.0	g
Mass of container	16.2	g
Mass of wet soil (M_3)	2483.8	g

Test Hole Volume

$V = (M_1 - M_2) / \rho_1$ 1195 *cm^3*

Dry Mass of soil

$M_4 = 100\ M_3 / (w + 100)$ 2209.0 *g*

Wet Denisty

$\rho_m = (M_3 / V) \times 62.43$ 129.8 *lbs/ft^3*

Dry Denisty

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

Dry Unit Weight

$\gamma_d = \rho_d \times 62.43$ 115.5 *lbs/ft^3*

MOISTURE DETERMINATION

ASTM D4643

Container ID D-3

Mass of container & wet specimen (M_{cms})	418.3	g
Mass of container & dry specimen (M_{cds})	390.2	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	28.1	g
Mass of container (M_c)	164.3	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	225.9	g
Moisture content (w) $w = (M_w / M_s) \times 100$	12.4	%

Soil Description: Yellowish is color , mostly consists of fines.

Proctor ID: Radon Barrier # 3

Standard Proctor (ASTM D698)

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

$\rho d = (\ 100\ \times\ 129.8\ )\ /\ (100 +\ 12.4\ =\ 115.5$ *lbs/ft^3*

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

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

115.5 / 118.4 x 100 = 97.5 %

Maximum Dry Density ($\gamma_d max$) 118.4 (lbs/ft^3)

Optimum Moisture (w_{opt}) 13.2 (%)

Required Moisture: 10.2 % to 16.2 %

Required Percent Compaction: ~~90.0~~ 95.0 (%)

Comments:

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

TEST RESULTS:

X Pass Date: 8/10/10

Failed Moisture

Failed Compaction Time: 1425

By: Kyler Edgehouse / *(print)* *(signature)*

QA/QC APPROVAL 8-17-2010 DATE

ENERGYSOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: URA11100810-00 DATE: 8/10/2010

TEST ID NUMBER(S): # 3

TEST LOCATION: 6794646 N. 2122292 E. TEST METHOD: ____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 27523

Last Calibration Date: 8/21/10

Daily Standard Counts: *Off-Cell Standard*

Density 2217 Moisture 666

Method A (Direct Transmission)

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

Moisture Count 190 Density Count 1062

Wet Density (ρ_m) 132.8 *(lbs/ft^3)* Dry Density 116.3 *(lbs/ft^3)*

Moisture Density 16.5 *(lbs/ft^3)* Moisture Fraction 14.2 *(%)*

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 Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID D-1

Mass of container & wet specimen (M_{cms})	380.0	g
Mass of container & dry specimen (M_{cds})	356.7	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	23.3	g
Mass of container (M_c)	164.4	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	192.3	g
Moisture content (w) $w = (M_w / M_s) \times 100$	12.1	%

Soil Description: Yellowish in color, mostly consists of fines.

Proctor ID: Radon Barrier # 3

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.4 (lbs/ft^3)

Optimum Moisture (w_{opt}) 13.2 (%)

Required Moisture: 10.2 % to 16.2 %

Required Percent Compaction: 95.0 (%)

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

$\rho d = (100 \times 132.8) / (100 + 12.1 = 118.4$ *lbs/ft^3*

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

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

118.4 / 118.4 x 100 = 100.0 %

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: 8/10/10

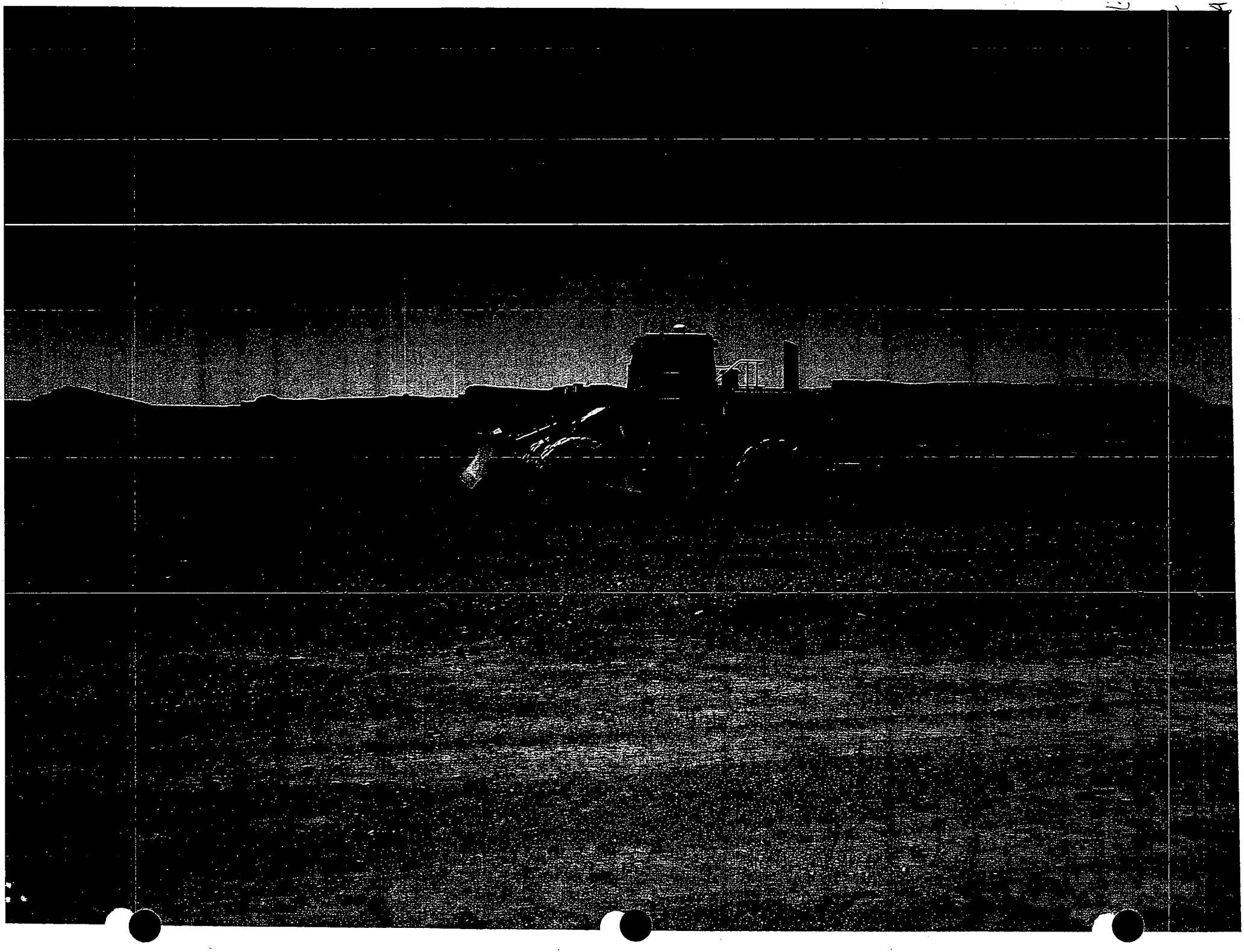
____ Failed Moisture

____ Failed Compaction Time: 1450

By: Kyler Edgehouse / *(print)* *(signature)*

QA/QC APPROVAL 8/17/2010 DATE

DS
8/13
9/12
9/24

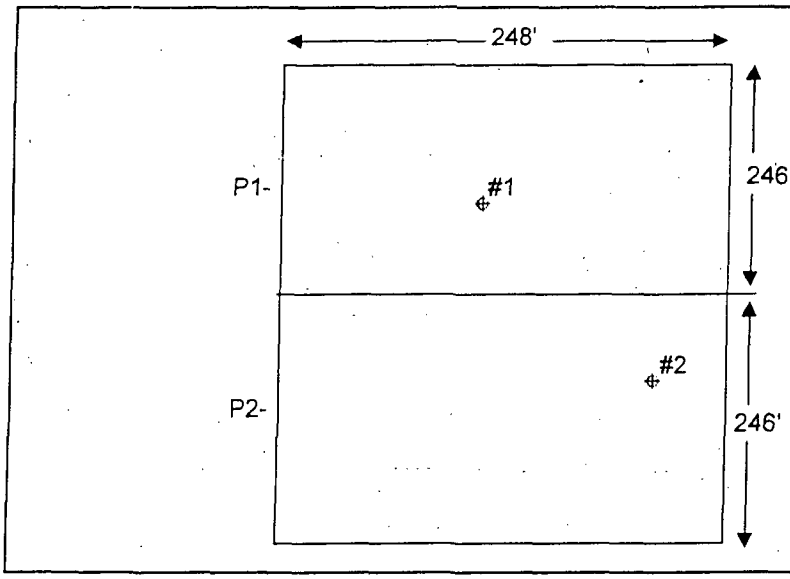


ENERGYSOLUTIONS

LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

NW CORNER DATE: 8/10/2010



P 1	6794448 N 2122297 E			
EW:	248	X 0.488	=	121
NS:	246	X 0.678	=	167
P 2	6794301 N 2122385 E			
EW:	248	X 0.844	=	209
NS:	246	X 0.277	=	68
P 3				
EW:		X	=	
NS:		X	=	
P 4	N			
EW:		X	=	
NS:		X A	=	
P 5				
EW:		X	=	
NS:		X	=	
Page 2 attached:		Y	N	

IDENTIFY LOTS ABOVE

LIFT ID: URB27100810-00 NW CORNER: 6794615 N 2122176 E

THICKNESS: UNC: ≤ 12" COM: N/A ELEV: N/A Scarification Insp: YES Date: 8/2/10 Time: 0800

Material Inspection by: D.S. Partical Size: ≤4": X ≥4": __ Nesting: Y: __ N: X Processed Mancos Shale Material: Y: X N: __

Comments: This lift is approximately 122,016 ft², with an approximate total of 2,711 yds³ of Radon Barrier material approved on this lift. This is the first lift of Radon material in this area. QC verified that the area was scarified and a baseline survey was performed prior to placement. QC verified with satisfactory results that the Interim Cover moisture was maintained until covered with Radon Barrier. Nielsons began placing the material as well as disking and adding moisture to the soil. QC performed a visual inspection on the material and found particle size exceeding 4". QC performed multiple visual inspections during processing of material, material was reworked and some was removed form this lift area. A final inspection was performed on 8/10/2010 with satisfactory results. QC observed compaction and performed 2 density tests in correlation with the CAES with satisfactory results. QC also performed companion moisture tests and a companion sandcone test in correlation with the nuclear density gauge. QC took pictures during processing, conditioning, and compaction of this lift area, see attached. QC performed a survey to identify the boundary line for this lift area.

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

LIFT APPROVED BY: Dave Stewart Dave Stewart DATE: 8/10/2010 TIME: 1711

QA/QC APPROVAL 8-31-10 DATE 8.11.10

ENERGYSOLUTIONS

Slope Elevation Survey

Average lift thickness=	0.6	Bounding Box	Northing	Easting
Grid Size=	50'	Lower Left	N	
Lift ID:	URB27100810-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6794524	2122215	4974.2	6794524	2122215	4975.0	0.9	OK
6794574	2122215	4975.5	6794574	2122215	4976.3	0.8	OK
6794224	2122265	4966.4	6794224	2122265	4967.3	0.9	OK
6794274	2122265	4967.8	6794274	2122265	4968.5	0.7	OK
6794324	2122265	4969.3	6794324	2122265	4970.0	0.8	OK
6794374	2122265	4970.4	6794374	2122265	4971.3	0.9	OK
6794424	2122265	4971.7	6794424	2122265	4972.7	1.0	OK
6794474	2122265	4972.8	6794474	2122265	4973.8	1.0	OK
6794524	2122265	4974.3	6794524	2122265	4975.1	0.8	OK
6794574	2122265	4975.6	6794574	2122265	4976.4	0.8	OK
6794174	2122315	4965.5	6794174	2122315	4966.1	0.6	OK
6794224	2122315	4966.7	6794224	2122315	4967.3	0.6	OK
6794274	2122315	4967.9	6794274	2122315	4968.6	0.7	OK
6794324	2122315	4969.2	6794324	2122315	4970.0	0.8	OK
6794374	2122315	4970.4	6794374	2122315	4971.2	0.8	OK
6794424	2122315	4971.8	6794424	2122315	4972.5	0.8	OK
6794474	2122315	4972.9	6794474	2122315	4973.8	0.9	OK
6794524	2122315	4974.3	6794524	2122315	4975.1	0.7	OK
6794574	2122315	4975.6	6794574	2122315	4976.3	0.8	OK
6794174	2122365	4965.4	6794174	2122365	4966.2	0.8	OK
6794224	2122365	4966.8	6794224	2122365	4967.4	0.6	OK
6794274	2122365	4968.0	6794274	2122365	4968.7	0.7	OK
6794324	2122365	4969.2	6794324	2122365	4970.0	0.8	OK
6794374	2122365	4970.6	6794374	2122365	4971.2	0.7	OK
6794424	2122365	4971.7	6794424	2122365	4972.5	0.8	OK
6794474	2122365	4973.0	6794474	2122365	4973.8	0.8	OK
6794524	2122365	4974.2	6794524	2122365	4975.1	0.9	OK
6794574	2122365	4975.5	6794574	2122365	4976.3	0.8	OK
6794174	2122415	4965.4	6794174	2122415	4966.3	0.9	OK
6794224	2122415	4966.7	6794224	2122415	4967.4	0.7	OK
6794274	2122415	4968.0	6794274	2122415	4968.7	0.6	OK
6794324	2122415	4969.2	6794324	2122415	4970.0	0.8	OK
6794374	2122415	4970.5	6794374	2122415	4971.2	0.8	OK
6794424	2122415	4971.9	6794424	2122415	4972.6	0.7	OK
6794474	2122415	4973.3	6794474	2122415	4973.8	0.5	OK
6794524	2122415	4974.4	6794524	2122415	4975.0	0.6	OK
6794574	2122415	4975.5	6794574	2122415	4976.2	0.6	OK
6794174	2122465	4965.4	6794174	2122465	4966.3	0.9	OK
6794224	2122465	4966.8	6794224	2122465	4967.4	0.6	OK
6794274	2122465	4968.0	6794274	2122465	4968.5	0.6	OK
6794324	2122465	4969.3	6794324	2122465	4969.7	0.4	OK
6794374	2122465	4970.6	6794374	2122465	4970.9	0.3	OK
6794424	2122465	4971.8	6794424	2122465	4971.9	0.2	OK
6794474	2122465	4973.0	6794474	2122465	4973.0	0.0	OK
6794524	2122465	4974.3	6794524	2122465	4974.3	0.0	OK
6794574	2122465	4975.5	6794574	2122465	4975.5	0.0	OK
6794174	2122515	4965.6	6794174	2122515	4965.7	0.1	OK
6794224	2122515	4966.8	6794224	2122515	4966.8	0.0	OK
6794274	2122515	4968.0	6794274	2122515	4968.0	0.0	OK
6794324	2122515	4969.3	6794324	2122515	4969.3	0.0	OK
6794374	2122515	4970.6	6794374	2122515	4970.6	0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

8/12 DS 8/13

% =6	98.2%
Elevation Avg	4970.9
Total =6	11836
Total Lines	12055

Pass

Minimum Number of Machine Passes
3

Lift ID: URB27100810-00

Northing	Easting	Elevation	# of Passes	Passes =6	Count
6794608	2122178	4977.1	6	1	1
6794612	2122178	4977.2	4		1
6794615	2122178	4977.3	6	1	1
6794582	2122181	4976.3	5		1
6794585	2122181	4976.4	4		1
6794589	2122181	4976.5	3		1
6794592	2122181	4976.6	6	1	1
6794595	2122181	4976.7	6	1	1
6794599	2122181	4976.8	6	1	1
6794602	2122181	4976.9	6	1	1
6794605	2122181	4977.0	6	1	1
6794608	2122181	4977.1	6	1	1
6794612	2122181	4977.2	6	1	1
6794615	2122181	4977.3	6	1	1
6794559	2122184	4975.6	5		1
6794562	2122184	4976.3	3		1
6794566	2122184	4976.2	6	1	1
6794569	2122184	4976.3	6	1	1
6794572	2122184	4976.3	5		1
6794576	2122184	4976.4	6	1	1
6794579	2122184	4976.4	5		1
6794582	2122184	4976.3	6	1	1
6794585	2122184	4976.4	6	1	1
6794589	2122184	4976.6	6	1	1
6794592	2122184	4976.7	6	1	1
6794595	2122184	4976.8	6	1	1
6794599	2122184	4976.8	6	1	1
6794602	2122184	4976.9	6	1	1
6794605	2122184	4977.0	6	1	1
6794608	2122184	4977.1	6	1	1
6794612	2122184	4977.2	6	1	1
6794615	2122184	4977.4	6	1	1
6794533	2122188	4975.7	2		1
6794536	2122188	4975.5	4		1
6794539	2122188	4975.6	4		1
6794543	2122188	4975.6	4		1
6794546	2122188	4975.7	5		1
6794549	2122188	4975.7	5		1
6794553	2122188	4975.7	6	1	1
6794556	2122188	4975.8	6	1	1
6794559	2122188	4975.9	6	1	1
6794562	2122188	4976.0	4		1
6794566	2122188	4976.0	6	1	1
6794569	2122188	4976.3	6	1	1

Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6

8/13


CAESoffice [Compaction [COM825 2] [2122455.43, 6794178.96, 4964.56]]
File Machines View Display Repeat Window Help
URB27100810-00
Snap: US Survey Foot 0 1954.523 ft, 3761.112 ft
start
CAESoffice - [Compa...
Caterpillar, Inc - FTP...
METScomms
Trimble Business Cent...
URB27 Lift Approval...
URA02 Lift Approval...
METSmanager - Mess...
3:56 PM

ENERGYSOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: URB27100810-00 DATE: 8/10/2010

TEST ID NUMBER(S): 1

TEST LOCATION: 6794448 N 2122311 E 297 MU 9/13/10 TEST METHOD: X D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 27523

Last Calibration Date: 8/21/09

Daily Standard Counts: *On-Cell Standard*

Density 2217 Moisture 666

Method A (Direct Transmission)

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

Moisture Count 142 Density Count 1222

Wet Density (ρ_m) 127.5 *(lbs/ft^3)* Dry Density 115.5 *(lbs/ft^3)*

Moisture Density 12.0 *(lbs/ft^3)* Moisture Fraction 10.4 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID D-2

Mass of container & wet specimen (M_{cms})	467.7	g
Mass of container & dry specimen (M_{cds})	436.5	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	31.2	g
Mass of container (M_c)	163.5	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	273.0	g
Moisture content (w) $w = (M_w / M_s) \times 100$	11.4	%

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

$\rho d = (100 \times 131.3) / (100 + 11.4 = 117.9$ *lbs/ft^3*

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

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

117.9 / 118.4 x 100 = 99.5 %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus Ω Calibrated Vol. *(lbs/ft^3)* 0.04113

Bulk Density of sand (ρ_1) 1.57 *g/cm^3* 97.8 *lbs/ft^3*

Mass of Sand to Fill Cone & Plate (M_2) 1824.6 g

Mass of bottle & cone **before** filling cone, plate & hole	6363.2	g
Mass of bottle & cone **after** filling cone, plate & hole	3022.6	g
Mass of sand to fill cone, plate, & hole (M_1)	3340.6	g
Mass of sand to fill hole	1516.0	g
Mass of wet soil & container	2052.0	g
Mass of container	16.2	g
Mass of wet soil (M_3)	2035.8	g

Test Hole Volume

$V = (M_1 - M_2) / \rho_1$ 968 *cm^3*

Dry Mass of soil

$M_4 = 100\ M_3 / (w + 100)$ 1827.0 g

Wet Denisty

$\rho_m = (M_3 / V) \times 62.43$ 131.3 *lbs/ft^3*

Dry Denisty

$\rho_d = M_4 / V$ 1.9 *g/cm^3*

Dry Unit Weight

$\gamma_d = \rho_d \times 62.43$ 117.9 *lbs/ft^3*

Soil Description: Yellowish in color and consists of mostly fines.

Proctor ID: Radon Barrier #3

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.4 (lbs/ft^3)

Optimum Moisture (w_{opt}) 13.2 (%)

Required Moisture: 10.2 % to 16.2 %

Required Percent Compaction: 95.0 (%)

Comments:

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

TEST RESULTS:

X Pass Date: 8/10/10

_____ Failed Moisture

_____ Failed Compaction Time: 1330

By: Beachem Bosh / _____

(print) *(signature)*

_____ 8.17.2010

QA/QC APPROVAL DATE

12 DB 8/13

ENERGYSOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: URB27100810-00 DATE: 8/10/2010

TEST ID NUMBER(S): 2

TEST LOCATION: 6794301 N 2122399 E 85 MH 9-17-10 TEST METHOD: ____ D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 27523

Last Calibration Date: 8/21/09

Daily Standard Counts: *On-Cell Standard*

Density 2217 Moisture 666

Method A (Direct Transmission)

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

Moisture Count 156 Density Count 1234

Wet Density (ρ_m) 127.1 *(lbs/ft^3)* Dry Density 114.5 *(lbs/ft^3)*

Moisture Density 12.7 *(lbs/ft^3)* Moisture Fraction 11.1 *(%)*

MOISTURE DETERMINATION

ASTM D4643

Container ID D-1

Mass of container & wet specimen (M_{cms})	396.1	g
Mass of container & dry specimen (M_{cds})	372.0	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	24.1	g
Mass of container (M_c)	164.4	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	207.6	g
Moisture content (w) $w = (M_w / M_s) \times 100$	11.6	%

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

$\rho d = (100 \times 127.1) / (100 + 11.6 = 113.9$ *lbs/ft^3*

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

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

113.9 / 118.4 x 100 = 96.2 %

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

Mass of bottle & cone **before** filling cone, plate & hole		g
Mass of bottle & cone **after** filling cone, plate & hole		g
Mass of sand to fill cone, plate, & hole (M_1)		g
Mass of sand to fill hole		g
Mass of wet soil & container	N/A	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 Denisty $\rho_m = (M_3 / V) \times 62.43$ ____ *lbs/ft^3*

Dry Denisty $\rho_d = M_4 / V$ ____ *g/cm^3*

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

Soil Description: **Yellowish in color and consists of mostly fines.**

Proctor ID: **Radon Barrier #3**

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.4 (lbs/ft^3)

Optimum Moisture (w_{opt}) 13.2 (%)

Required Moisture: 10.2 % to 16.2 %

Required Percent Compaction: 95.0 (%)

Comments:

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

TEST RESULTS:

X Pass Date: 8/10/10

____ Failed Moisture

____ Failed Compaction Time: 1350

By: Dave Stewart / Dave Stewart
(print) *(signature)*

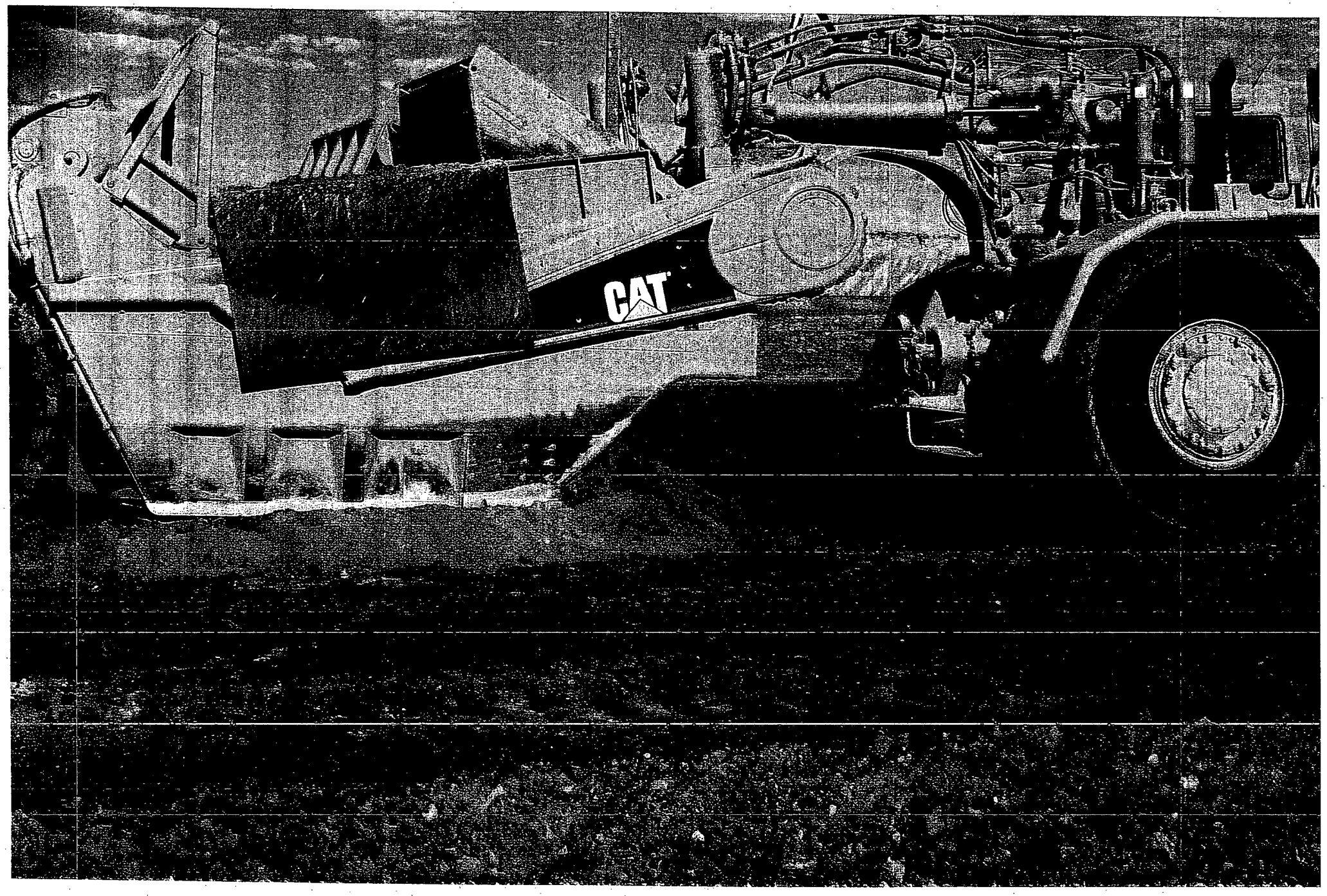
QA/QC APPROVAL 8.19.2010 DATE

7/12
DS
6/13

DS
8/13
8/12

9/13/82

8/13
10/18/12



11/8/12

12/8/21
AP

CMT ENGINEERING LABORATORIES
Construction • Materials • Technologies
Geotechnical, Environmental, & Materials Engineering/Testing/Research

April 15, 2010

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions, Crescent Junction
Project#: 3022
Material: Bio-Intrusion
Source: Crescent Junction #1

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.656	8.0	9	72	90
Absorption %	1.0%	5.0	2	10	20
Sodium Sulfate %	0.0%	10	11	110	110
LA Abrasion	6.8	7.0	1	7.0	10
Schmidt Hammer	42	5.2	3	15.6	30
Total Score				**214.6**	**260**

Rating = 82.5

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 202575

Relative Density (oven Dry) = 2.656
Relative Density (SSD) = 2.682
Relative Density (apparent) = 2.728
Absorption (%) = 1.0 %

Los Angeles Abrasion ASTM C-131
Lab # 202574

100 Revolutions Grading A
12 Spheres

% Wear = 6.8 %

Sodium Soundness ASTM C-88
Lab # 202576

% Loss = 0.0 %

Schmitt Hammer
203967

Rebound Number 42,40,44

Average = 42

Sincerely,

Susan Arnold

CMT ENGINEERING LABORATORIES
Construction • Materials • Technologies
Geotechnical, Environmental, & Materials Engineering/Testing/Research

April 15, 2010

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions, Crescent Junction
Project#: 3022
Material: Bio-Intrusion
Source: Crescent Junction #2

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.653	8.0	9	72	90
Absorption %	1.0%	5.0	2	10	20
Sodium Sulfate %	0.0%	10	11	110	110
LA Abrasion	7.8	6.4	1	6.4	10
Schmidt Hammer	36	4.5	3	13.5	30
Total Score				**211.9**	**260**

Rating = 81.5

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 202572

Relative Density (oven Dry) = 2.653
Relative Density (SSD) = 2.678
Relative Density (apparent) = 2.722
Absorption (%) = 1.0 %

Los Angeles Abrasion ASTM C-131
Lab # 202571

100 Revolutions — Grading A
12 Spheres

% Wear = 7.8 %

Sodium Soundness ASTM C-88
Lab # 202573

% Loss = 0.0 %

Schmitt Hammer
203967

Rebound Number		35,37,35
Average	=	36

Sincerely,

Susan Arnold

CMT ENGINEERING LABORATORIES
Construction • Materials • Technologies
Geotechnical, Environmental, & Materials Engineering/Testing/Research

April 15, 2010

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions, Crescent Junction
Project#: 3022
Material: Bio-Intrusion
Source: Freemont Junction #1

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.691	8.9	9	80.1	90
Absorption %	1.0%	5.0	2	10	20
Sodium Sulfate %	0.0%	10	11	110	110
LA Abrasion	8.1	6.2	1	6.2	10
Schmidt Hammer	58	7.8	3	23.4	30
Total Score				**229.7**	**260**

Rating = 88.3

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 202579

Relative Density (oven Dry) = 2.691
Relative Density (SSD) = 2.721
Relative Density (apparent) = 2.775
Absorption (%) = 1.2 %

Los Angeles Abrasion ASTM C-131
Lab # 202577

100 Revolutions Grading A
12 Spheres
% Wear = 8.1 %

Sodium Soundness ASTM C-88
Lab # 202578

% Loss = 0.0 %

Schmitt Hammer
203967

Rebound Number 60,60,54

Average = 58

Sincerely,

Susan Arnold

CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 08/20/09
PROJECT: MISC. QC
SAMPLE LOCATION: FREMONT PIT - OFF BELT
MATERIAL TYPE: RIPRAP
TESTED BY: DB SAMPLED BY: CLIENT LAB #: 5020

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	2517.2	4.3	96	
2 in. (50mm)	19271.3	32.7	63	50 - 100
1 1/2 in. (37.5mm)	9618.5	16.3	47	40 - 50
1 in. (25mm)	7572.8	12.8	34	20 - 40
3/4 in. (19mm)	3922.7	6.6	27	
1/2 in. (12.5mm)	3115.6	5.3	22	15 - 25
3/8 in. (9.5mm)	452.6	6.3	16	
# 4 (4.75mm)	279.8	3.9	12	10 - 20
# 8 (2.36mm)	189.5	2.7	9	5 - 15
# 16 (1.18mm)	125.8	1.8	7	5 - 10
# 30 (600um)	102.3	1.4	6	
# 50 (300um)	84.1	1.2	5	
#100 (150um)	89.8	1.3	3	
#200 (75um)	79.5	1.1	2.4	0 - 5
-#200 (-75um)	13.3			

Total Sample Aggregate Weight: 58988.3
- 1/2" Aggregate Weight: 1571.5 - 1/2" After Wash Weight: 1416.7

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93. John Christensen

P.O. BOX 427 CENTERFIELD, UT. 84622 (435) 528-5711 FAX (435) 528-5710

CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 08/27/09

PROJECT: MISC. QC

SAMPLE LOCATION: FREMONT PIT - OFF BELT

MATERIAL TYPE: RIPRAP

TESTED BY: DB SAMPLED BY: CLIENT LAB #: 5021

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	3025.9	4.5	95	
2 in. (50mm)	21156.6	31.8	64	50 - 100
1 1/2 in. (37.5mm)	12225.8	18.4	45	40 - 50
1 in. (25mm)	9035.9	13.6	32	20 - 40
3/4 in. (19mm)	4266.5	6.4	25	
1/2 in. (12.5mm)	4108.7	6.2	19	15 - 25
3/8 in. (9.5mm)	498.5	5.9	13	
# 4 (4.75mm)	285.3	3.4	10	10 - 20
# 8 (2.36mm)	208.7	2.5	7	5 - 15
# 16 (1.18mm)	174.2	2.1	5	5 - 10
# 30 (600um)	98.7	1.2	4	
# 50 (300um)	90.2	1.1	3	
#100 (150um)	76.5	0.9	2	
#200 (75um)	72.1	0.9	1.3	0 - 5
-#200 (-75um)	14.9			

Total Sample Aggregate Weight: 66548.7

- 1/2" Aggregate Weight: 1613.7 - 1/2" After Wash Weight: 1519.1

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93.

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CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 09/02/09
PROJECT: MISC. QC
SAMPLE LOCATION: FREMONT PIT - OFF BELT
MATERIAL TYPE: RIPRAP
TESTED BY: DB SAMPLED BY: CLIENT LAB #: 5042

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	4025.2	6.4	94	
2 in. (50mm)	17997.0	28.8	65	50 - 100
1 1/2 in. (37.5mm)	10229.9	16.4	48	40 - 50
1 in. (25mm)	9231.1	14.8	34	20 - 40
3/4 in. (19mm)	4936.8	7.9	26	
1/2 in. (12.5mm)	3811.4	6.1	20	15 - 25
3/8 in. (9.5mm)	611.7	7.0	13	
# 4 (4.75mm)	215.9	2.5	10	10 - 20
# 8 (2.36mm)	234.6	2.7	8	5 - 15
# 16 (1.18mm)	197.1	2.2	5	5 - 10
# 30 (600um)	68.5	0.8	5	
# 50 (300um)	63.1	0.7	4	
#100 (150um)	76.8	0.9	3	
#200 (75um)	80.0	0.9	2.1	0 - 5
-#200 (-75um)	12.0			

Total Sample Aggregate Weight: 62553.1
- 1/2" Aggregate Weight: 1732.6 - 1/2" After Wash Weight: 1559.7

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93.

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CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 09/10/09

PROJECT: MISC. QC

SAMPLE LOCATION: FREMONT PIT - OFF BELT

MATERIAL TYPE: RIPRAP

TESTED BY: DB SAMPLED BY: CLIENT LAB #: 5058

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	2325.4	4.5	95	
2 in. (50mm)	16165.1	31.6	64	50 - 100
1 1/2 in. (37.5mm)	9579.3	18.7	45	40 - 50
1 in. (25mm)	7016.1	13.7	31	20 - 40
3/4 in. (19mm)	3470.1	6.8	25	
1/2 in. (12.5mm)	3053.9	6.0	19	15 - 25
3/8 in. (9.5mm)	505.0	5.5	13	
# 4 (4.75mm)	303.7	3.3	10	10 - 20
# 8 (2.36mm)	213.7	2.3	7	5 - 15
# 16 (1.18mm)	119.6	1.3	6	5 - 10
# 30 (600um)	95.9	1.1	5	
# 50 (300um)	78.3	0.9	4	
#100 (150um)	90.4	1.0	3	
#200 (75um)	92.9	1.0	2.2	0 - 5
-#200 (-75um)	16.1			

Total Sample Aggregate Weight: 51140.0

- 1/2" Aggregate Weight: 1695.9 - 1/2" After Wash Weight: 1515.6

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93. John Christensen

P.O. BOX 427 CENTERFIELD, UT. 84622 (435) 528-5711 FAX (435) 528-5710

- ASTM D 2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D 6938 - In-Place Density and Water content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth
- ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating

Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

- After placement, moisture content shall be maintained or adjusted to meet criteria.
- Erosion that occurs in the fill layers shall be repaired and grades re-established.
- Freezing and desiccation of the Radon Barrier layer shall be prevented. If freezing or desiccation occurs, the affected soil shall be removed or reconditioned as directed.
- Areas that have been repaired shall be retested as directed. Repairs to the Radon Barrier layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

6.7.5 Initial and Confirmatory Surveys

Verification of the thickness of the Radon Barrier Layer will be performed by comparing before and after surveys of the Layer by surveying or using CAES. Prior to placement of the Radon Barrier Layer, an initial survey shall be performed of the section to be capped. The initial survey will document the pre-cap geometry of the site. After the Radon Barrier Layer has been installed, a post-installation survey will be performed on the top of the Radon Barrier fill to confirm that the total fill thickness is in accordance with the plans and specifications.

6.8 INFILTRATION AND BIOINTRUSION BARRIER (GRAVEL)

Above the Radon Barrier layer, a 6 inch thick Infiltration and Biointrusion Layer of gravel will be placed to provide a barrier to burrowing animals, and a pathway for drainage of water that has infiltrated through upper layers of the cap. The gravel will be a sandy gravel with a gradation in accordance with project plans and specifications. Rock shall be spread to the thickness indicated on the drawings or in accordance with oversizing due to scoring criteria. Rock placement shall be guided by the Computer Aided Earthmoving System to ensure that the appropriate thickness has been placed at all locations. Stone with a D50 of 2 inches or less shall be compacted with a vibratory steel drum.

6.8.1 Biointrusion Layer Materials Testing

Rock for the infiltration and biointrusion barrier layer shall be tested by a commercial testing laboratory during production in accordance with the following:

Biointrusion Layer Material	Reference
Specific Gravity (SSD)	ASTM C-127
Absorption	ASTM C-127
Sodium Sulfate Soundness (5 cycles)	ASTM C-88 (course aggregate)
L.A. Abrasion (100 cycles)	ASTM C-131
Schmidt Rebound Hardness	ISRM Method

Test samples shall be submitted to a commercial testing lab for analysis and subsequent acceptance or rejection or the material represented by the test results, based on engineering calculations.

Rock for the infiltration and biointrusion barrier layer shall be tested for gradation in accordance with ASTMs C-117 and C-136, and other approved testing methods. Test results shall be in accordance with the Design Specification.

Rock for the infiltration and biointrusion barrier layer shall be tested a minimum of four times. The materials shall be tested initially prior to the delivery of any of the materials to the site and at the beginning of placement. Thereafter, the tests shall be performed at a minimum frequency of one test for each 10,000 cubic yards or fractions thereof produced/placed (durability tests for materials produced/gradation tests for materials placed). A final set of durability tests shall be performed near completion of production for each type material. A final gradation test shall be performed near completion of placement for each type material.

Rock for the infiltration and biointrusion barrier layer shall be material that has long-term chemical and physical durability. The material shall achieve an acceptable score for its intended use, in accordance with the rock scoring and acceptance criteria.

6.8.2 Rock Acceptance Criteria

An acceptable rock score depends on the intended use of the rock. The rock's score must meet the following criteria:

- For occasionally saturated areas, which include the top and sides of the final cover, the rock must score at least 50% or the rock is rejected. If the rock scores between 50%

and 80% the rock may be used, but a larger D50 must be provided (oversizing). If the rock score is 80% or greater, no oversizing is required.

- For frequently saturated areas, which include all channels and buried slope toes, the rock must score 65% or the rock is rejected. If the rock scores between 65% and 80%, the rock may be used, but must be oversized. If the rock score is 80% or greater, no oversizing is required.

Oversize rock as follows:

- Subtract the rock score from 80% to determine the amount of oversizing required. For example, a rock with a rating of 70% will require oversizing of 10 percent (80% - 70% = 10%).
- The D50 of the stone shall be increased by the oversizing percent. For example, a stone with a 10% oversizing factor and a D50 of 12 inches will increase to a D50 of 13.2 inches.
- The final thickness of the stone layer shall increase proportionately to the increased D50 rock size. For example, a layer thickness equals twice the D50, such as when the plans call for 24 inches of stone with a D50 of 12 inches, if the stone D50 increases to 13.2, the thickness of the layer of stone with a D50 of 13.2 should be increased to 26.4 inches.

QC Inspector shall verify that the Infiltration and Biointrusion Layer is installed in accordance with Plans and Specifications by checking and confirming:

- Gravel material gradation matches the gradation required in the specifications.
- Gravel material is placed and compacted to produce a continuous uniform thickness of at least 6 inches. As a minimum depth verification will be performed every 10,000 cu yds.
- Compaction is performed by a vibratory steel drum roller, and that the roller makes a minimum of 2 passes over the placed gravel fill.

6.9 FROST PROTECTION LAYER

Above the Infiltration and Biointrusion Layer a 3 feet thick Frost Protection Layer will be installed. This soil layer will provide protection for the low-permeability Radon Barrier Layer beneath. The Frost Protection Layer will consist of 3 ft of clean, compacted soil shall be placed directly on the gravel Infiltration and Biointrusion Layer.

6.9.1 Material

The Frost Protection Layer will be constructed of common fill. The fill shall be produced from stockpiled excavated common fill from the cell excavation, tested to determine its maximum dry density, and the moisture content modified to bring the fill to optimum for compaction in accordance with ASTM D 698.

- ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating
- ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

- After placement, moisture content shall be maintained or adjusted to meet criteria.
- Erosion that occurs in the fill layers shall be repaired and grades re-established.
- Freezing and desiccation of the Radon Barrier lLayer shall be prevented. If freezing or desiccation occurs, the affected soil shall be removed or reconditioned as directed.
- Areas that have been repaired shall be retested as directed. Repairs to the Radon Barrier lLayer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

6.7.5 Initial and Confirmatory Surveys

Verification of the thickness of the Radon Barrier Layer will be performed by comparing before and after surveys of the Layer by surveying or using CAES. Prior to placement of the Radon Barrier Layer, an initial survey shall be performed of the section to be capped. The initial survey will document the pre-cap geometry of the site. After the Radon Barrier Layer has been installed, a post-installation survey will be performed on the top of the Radon Barrier fill to confirm that the total fill thickness is in accordance with the plans and specifications.

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Above the Radon Barrier lLayer, a 6 inch thick Infiltration and Biointrusion Layer of gravel will be placed to provide a barrier to burrowing animals, and a pathway for drainage of water that has infiltrated through upper layers of the cap. The gravel will be a sandy gravel with a gradation in accordance with project plans and specifications. Rock shall be spread to the thickness indicated on the drawings or in accordance with oversizing due to scoring criteria. Rock placement shall be guided by the Computer Aided Earthmoving System GPS grade control to ensure that the appropriate thickness has been placed at all locations. Stone with a D50 of 2 inches or lessThe Biointrustion Layer shall be compacted with a vibratory steel drum.

6.8.1 Erosion Protection Materials Testing

Rock for the infiltration and biointrusion barrier layer shall be tested by a commercial testing laboratory during production in accordance with the following:

Riprap Type A and B, and Bedding Material	Reference
Specific Gravity (SSD)	ASTM C-127
Absorption	ASTM C-127
Sodium Sulfate Soundness (5 cycles)	ASTM C-88 (course aggregate)
L.A. Abrasion (100 cycles)	ASTM C-131

Riprap Type C and D	Reference
Schmidt Rebound Hardness	ISRM Method
Splitting Tensile Strength	ISRM Method

Test results shall be submitted to MK-Environmental Servicesa commercial testing lab for analysis and subsequent acceptance or rejection or the material represented by the test results, based on engineering calculations.

Rock for the infiltration and biointrusion barrier layer shall be tested for gradation in accordance with ASTMs C-117 and C-136, and other approved testing methods. Test results shall be in accordance with the Design Specification.

Rock for the infiltration and biointrusion barrier layer shall be tested a minimum of four times. The materials shall be tested initially prior to the delivery of any of the materials to the site and at the beginning of placement. Thereafter, the tests shall be performed in place at a minimum frequency of one test for each 105,000 cubic yards or fractions thereof produced/placed (durability tests for materials produced/gradation tests for materials placed). A final set of durability tests shall be performed near completion of production for each type material. A final gradation test shall be performed near completion of placement for each type material.

Rock for the infiltration and biointrusion barrier layer shall be material that has long-term chemical and physical durability. The material shall achieve an acceptable score for its intended use, in accordance with the rock scoring and acceptance criteria.

6.8.2 Rock Acceptance Criteria

An acceptable rock score depends on the intended use of the rock. The rock's score must meet the following criteria:

- For occasionally saturated areas, which include the top and sides of the final cover, the rock must score at least 50% or the rock is rejected. If the rock scores between 50% and 80% the rock may be used, but a larger D50 must be provided (oversizing). If the rock score is 80% or greater, no oversizing is required.
- For frequently saturated areas, which include all channels and buried slope toes, the rock must score 65% or the rock is rejected. If the rock scores between 65% and 80%,

the rock may be used, but must be oversized. If the rock score is 80% or greater, no oversizing is required.

Oversize rock as follows:

- Subtract the rock score from 80% to determine the amount of oversizing required. For example, a rock with a rating of 70% will require oversizing of 10 percent (80% - 70% = 10%).
- The D50 of the stone shall be increased by the oversizing percent. For example, a stone with a 10% oversizing factor and a D50 of 12 inches will increase to a D50 of 13.2 inches.
- The final thickness of the stone layer shall increase proportionately to the increased D50 rock size. For example, a layer thickness equals twice the D50, such as when the plans call for 24 inches of stone with a D50 of 12 inches, if the stone D50 increases to 13.2, the thickness of the layer of stone with a D50 of 13.2 should be increased to 26.4 inches.

QC Inspector shall verify that the Infiltration and Biointrusion Layer is installed in accordance with Plans and Specifications by checking and confirming:

- Gravel material gradation matches the gradation required in the specifications.
- Gravel material is placed and compacted to produce a continuous uniform thickness of at least 6 inches.
- Compaction is performed by a vibratory steel drum roller, and that the roller makes a minimum of 2 passes over the placed gravel fill.

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Above the Infiltration and Biointrusion Layer a 3 feet thick Frost Protection Layer will be installed. This soil layer will provide protection for the low-permeability Radon Barrier Layer beneath. The Frost Protection Layer will consist of 3 ft of clean, compacted soil shall be placed directly on the gravel Infiltration and Biointrusion Layer.

6.9.1 Material

The Frost Protection Layer will be constructed of common fill. The fill shall be produced from stockpiled excavated common fillcome from the cell excavation, tested to determine its maximum dry density, and the moisture content modified to bring the fill to optimum for compaction in accordance with ASTM D 698.

6.9.2 Ground Preparation

ENERGY*SOLUTIONS*

DAILY CONSTRUCTION REPORT

PROJECT: MOAB UMTRA Site: Cresent Junction Shift: Day

DATE: 10/20/2010

WEATHER: Fair: X Cloudy: ____ Warm: ____ Rain: ____ Snow: ____ Wind: ____ Other: ____

CONSTRUCTION OPERATIONS: Waste Placement X Cell Excavation X Interim Cover ____

Radon Barrier ____ Rock Placement ____ Other **Frost Protection Layer**

Others ____

EQUIPMENT USED:

Rock trucks X	Track hoes ____	Loaders X	Dozers X
Locomotives ____	Forklifts ____	Graders X	Backhoes ____
Sheepsfoot ____	Scrapers X	Tillers ____	Rollers ____
CAT 815 X	Water trucks X	CAT 825 X	Other ____

DAILY PROGRESS MEETING: Yes X No ____

LIFTS TESTED: UBA11101004-00,UWH06101019-00,UWI12101020-00,UWN19100929-00, and UWP01101019-00,

LIFTS APPROVED: UBA11101004-00,UWH06101019-00 and UWN19100929-00

EXPLANATIONS:

RRM: Today there was a total of 2 lifts approved. A total of 2,783 yds³ of RRM approved today. The daily moisture test was taken on UWI12101020-00 that passed with satisfactory results. QC surveyed a control point and verified that the GPS was in tolerance for the dayshift.

Spoils Wedge:

Today the 68th lift was placed to 95%.

Frost Protection Layer:

Today the first lift of Frost Protection layer was started today but not finished.

Bio-Intrusion: UBA11101004-00 was approved today. Approximately 5,588 yds³ of material was approved. A Buyoff survey was preformed along with a visual inspection, both were satisfactory. This lift area was approved for Frost Protection Layer placement.

QA/QC Representative Kyler Edgehouse

Biointrusion Barrier Layer Buy Off Survey

		Buy off ID:	UBA11101004-00			Date:	10/20/2010	
Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Pre-Installation Elevation	Difference from Design	PreDifference from Pre-installation	Bio Layer Thickness
1259	6795350	2122150	4999.6	4999.5	4999.1	0.1	0.5	0.5
1257	6795350	2122250	4999.6	4999.5	4999.1	0.0	0.5	0.5
1341	6795150	2122250	4994.5	4994.5	4994.0	0.0	0.5	0.5
1343	6795150	2122150	4994.5	4994.4	4994.0	0.0	0.5	0.5
1426	6794950	2122200	4989.5	4989.4	4989.0	0.1	0.5	0.5
1424	6794950	2122300	4989.5	4989.5	4989.0	0.0	0.5	0.5
1508	6794750	2122300	4984.5	4984.4	4984.0	0.1	0.5	0.5
1510	6794750	2122200	4984.4	4984.3	4983.9	0.1	0.5	0.5
1593	6794550	2122250	4979.4	4979.3	4978.9	0.1	0.5	0.5
1591	6794550	2122350	4979.4	4979.4	4978.9	0.0	0.5	0.5
1674	6794350	2122350	4974.3	4974.3	4973.8	0.0	0.5	0.5
1676	6794350	2122250	4974.3	4974.3	4973.8	0.0	0.5	0.5
1733	6794150	2122300	4969.4	4969.2	4968.8	0.1	0.5	0.5
1731	6794150	2122400	4969.3	4969.3	4968.9	0.0	0.5	0.5
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00
						0.0	0.0	0.00

N/A

Comments:

Approval Date: 10/20/2010 | Total Square Feet: 251,428 ft²

QC Signature: Beachem Bosh [signature] | Reviewed By: Mitch Hogan [signature] 10.20.2010

ENERGY SOLUTIONS

LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

W CORNER DATE: 10/4/2010

See attached for lift map.

P 1		#1		
EW:	210	X 0.997	=	209
NS:	1260	X 0.633	=	798
P 2		#2		
EW:	210	X 0.779	=	164
NS:	1260	X 0.864	=	1088
P 3		#3		
EW:	210	X 0.736	=	155
NS:	1260	X 0.229	=	289
P 4				
EW:		X	=	
NS:		X	=	
P 5				
EW:		X	=	
NS:		X	=	
Page 2 attached:		Y	N	

IDENTIFY LOTS ABOVE

LIFT ID: UBA11101004-00 NW CORNER: 6795375 N. 2122097 E.

THICKNESS: UNC: N/A COM: 6". ELEV: N/A Debris Insp. By: N/A Date: N/A Time: N/A

Comments: QC verified that the final surface of Radon Barrier was satisfactory prior to placement of Infiltration and Bio-Intrusion material. QC verified that the rock used was the correct material source. QC verified that the rock layer was spread to a near uniform thickness of ≥ 6" with satisfactory results. QC verified that the material had a even blend. Johansen and Tuttle personnel verified that a mimimum of two passes were performed with a smooth-drum roller on the entire lift area during compaction efforts. This lift is approximately 251,478 ft² with approximately ~~2588~~ 9657 yds³ of Bio-Intrussion approved on it. Operations began placing this lift on 10-4-10 but did not get it approved until 10-20-10. this is the reason for the difference between the lift ID and approval date. QC verified that samples collected for Sieve Analysis were collected in accordance with the current version of ASTM D75 and project specifications.. Sample's were then transported to lab for testing. See attached. 10-25-10 BB

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

LIFT APPROVED BY: Kyler Edgehouse DATE: 10/20/2010 TIME: 1310

10.25.10

QC APPROVAL DATE

ENERGY*SOLUTIONS*

Slope Elevation Survey

Average lift thickness=	0.5	Bounding Box	Northing	Easting
Grid Size=	N/A	Lower Left	N	
Lift ID:	UBA11101004-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795350	2122150	4999.1	6795350	2122150	4999.6	0.5	OK
6795350	2122250	4999.1	6795350	2122250	4999.6	0.5	OK
6795150	2122250	4994.0	6795150	2122250	4994.5	0.5	OK
6795150	2122150	4994.0	6795150	2122150	4994.5	0.5	OK
6794950	2122200	4989.0	6794950	2122200	4989.5	0.5	OK
6794950	2122300	4989.0	6794950	2122300	4989.5	0.5	OK
6794750	2122300	4984.0	6794750	2122300	4984.5	0.5	OK
6794750	2122200	4983.9	6794750	2122200	4984.4	0.5	OK
6794550	2122250	4978.9	6794550	2122250	4979.4	0.5	OK
6794550	2122350	4978.9	6794550	2122350	4979.4	0.5	OK
6794350	2122350	4973.8	6794350	2122350	4974.3	0.5	OK
6794350	2122250	4973.8	6794350	2122250	4974.3	0.5	OK
6794150	2122300	4968.8	6794150	2122300	4969.4	0.5	OK
6794150	2122400	4968.9	6794150	2122400	4969.3	0.5	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

N/A

ENERGYSOLUTIONS

SAMPLING LOG

PROJECT: Moab UMTRA Project OTHER

DATE: 10-12-10

SAMPLE NUMBER: 1 MATERIAL TYPE: SOIL ROCK X
LOCATION: UBA1101004-00

TEST(S) TO BE PERFORMED: SAMPLED BY: John Christensen
PROCTOR: CLASSIFICATION: LABORATORY PERMEABILITY:
NA SOUNDNESS: X LA ABRASION: X ABSORPTION: X
SPECIFIC GRAVITY: X GRADATION: X
COMMENTS: Samples were collected w/EnergySolutions QA/QC department to ensure a complete understanding of sampling procedure.

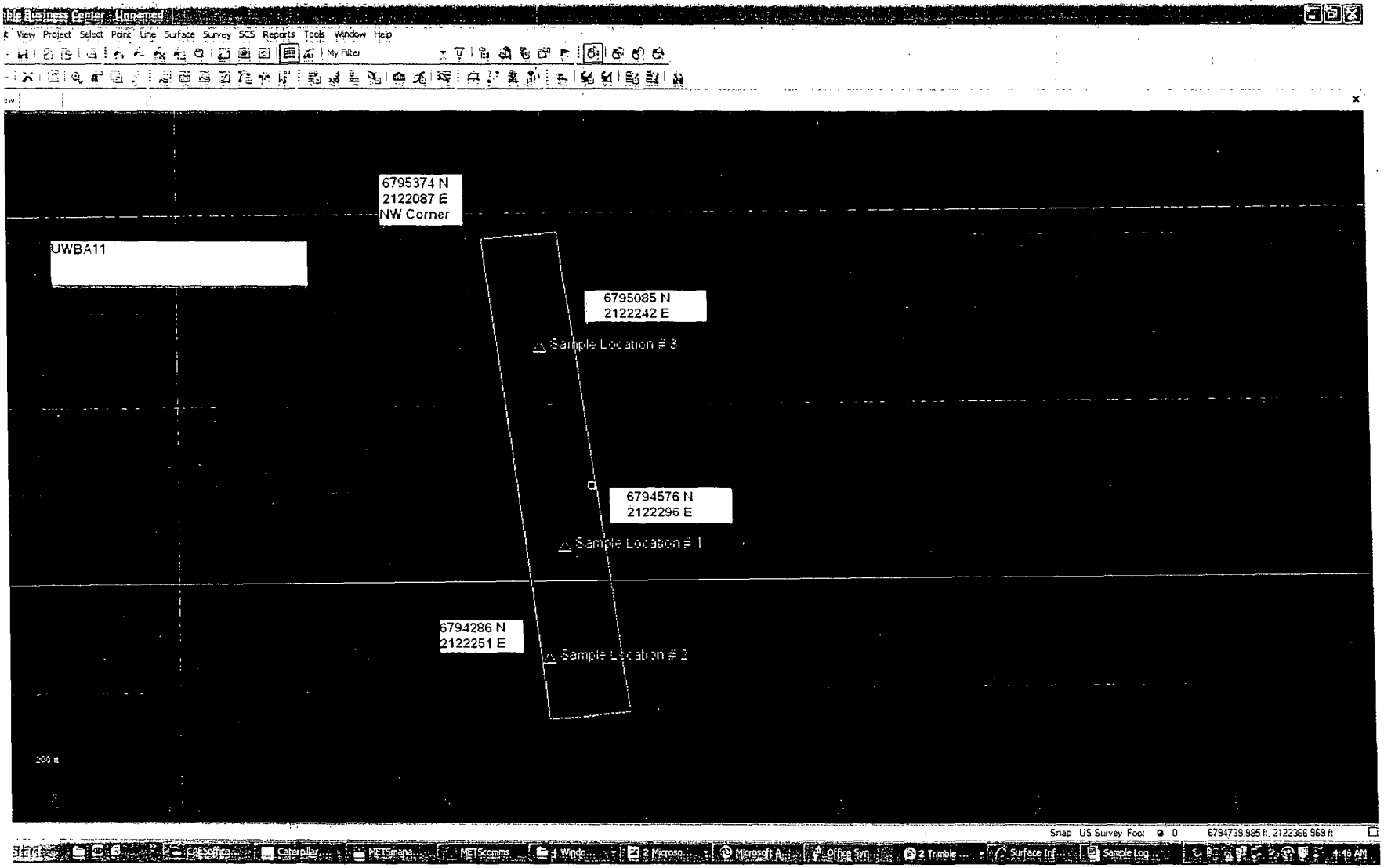
SAMPLE NUMBER: 2 MATERIAL TYPE: SOIL ROCK X
LOCATION: UBA1101004-00

TEST(S) TO BE PERFORMED: SAMPLED BY: John Christensen
PROCTOR: CLASSIFICATION: LABORATORY PERMEABILITY:
NA SOUNDNESS: X LA ABRASION: X ABSORPTION: X
SPECIFIC GRAVITY: X GRADATION: X
COMMENTS:

SAMPLE NUMBER: 3 MATERIAL TYPE: SOIL ROCK X
LOCATION: UBA1101004-00

TEST(S) TO BE PERFORMED: SAMPLED BY: John Christensen
PROCTOR: CLASSIFICATION: LABORATORY PERMEABILITY:
NA SOUNDNESS: X LA ABRASION: X ABSORPTION: X
SPECIFIC GRAVITY: X GRADATION: X
COMMENTS: Samples were obtained in accordance w/ current revision ASTM D75 & Standard pratice For sampling ~~10-12-10~~ 10-27-10 KC DOE-EM/GJ RAC 1933. All three samples combined into one ~~sample~~ 10-25-10 composite sample. See ASTM D75 & sampling procedure. Sample is Bio-intrusion Layer in place sample #1.

Sampled by DATE QA/QC APPROVAL DATE


6795374 N
2122087 E
NW Corner
UWBA11
6795085 N
2122242 E
Sample Location # 3
6794576 N
2122296 E
Sample Location # 1
6794286 N
2122251 E
Sample Location # 2
200 ft
Snap US Survey Foot 0
6794739.985 ft, 2122366.969 ft
1:16 AM

CENTRAL UTAH TESTING & INSPECTION

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

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 10/12/10
PROJECT: ~~MISC. QC~~ MOAB UMTRA PROJECT MH 10.20.10
SAMPLE LOCATION: BIOINTRUSION LAYER IN PLACE SAMPLE 1 Moab UBA111010004-00 MH 10.20.10
MATERIAL TYPE: COVER BIOBARRIER
TESTED BY: JC SAMPLED BY: JC LAB #: 5904

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
8 in. (200mm)		0.0	100.0	
6 in. (150mm)		0.0	100.0	
4 in. (100mm)		0.0	100.0	100
3 in. (75mm)	15542.4	2.3	97.7	
2 in. (50mm)	147765.5	22.3	75.3	50 - 100
1 1/2 in. (37.5mm)	128716.3	19.5	55.8	40 - 60
1 in. (25mm)	105454.9	15.9	39.9	20 - 40
3/4 in. (19mm)	50545.9	7.6	32.3	
1/2 in. (12.5mm)	1718.2	10.6	21.7	15 - 25
3/8 in. (9.5mm)	862.3	5.3	16.4	
# 4 (4.75mm)	887.1	5.5	10.9	10 - 20
# 8 (2.36mm)	318.8	2.0	8.9	5 - 15
# 16 (1.18mm)	193.0	1.2	7.7	5 - 10
# 30 (600um)	128.7	0.8	6.9	
# 50 (300um)	133.3	0.8	6.1	
#100 (150um)	164.7	1.0	5.1	
#200 (75um)	186.4	1.1	3.9	0 - 5
-#200 (-75um)	31.4			

Cement

40-50

Total Sample Aggregate Weight: 661403.4
- 3/4" Aggregate Weight: 5232.6 - 3/4" After Wash Weight: 4623.9

REMARKS:

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

P.O. BOX 220427 CENTERFIELD, UT. 84622 (435) 528-5711 FAX (435) 528-5710

CMT ENGINEERING LABORATORIES
Construction • Materials • Technologies
Geotechnical, Environmental, & Materials Engineering/Testing/Research

November 10, 2010

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions
Project#: 3022
Material: Bio-Intrusion Rock
Source: Freemont Junction (After Placement) Test were taken in place.

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.685	8.3	9	74.7	90
Absorption %	0.6%	7.5	2	15.0	20
Sodium Sulfate %	0.0%	10	11	110	110
LA Abrasion	6.6	7.1	1	7.1	10
Schmidt Hammer	56	7.3	3	21.9	30
Total Score				**228.7**	**260**

Rating = ***88.0***

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 233040

Relative Density (oven Dry)	=	2.685
Relative Density (SSD)	=	2.701
Relative Density (apparent)	=	2.728
Absorption (%)	=	0.6 %

Los Angeles Abrasion ASTM C-131
Lab # 233038

100 Revolutions	Grading A	
12 Spheres		
% Wear	=	6.6 %

Sodium Soundness ASTM C-88
Lab # 233039

% Loss	=	0.0 %

Schmitt Hammer
234317

Rebound Number		57,57,53
Average	=	56

- Schmitt Hammer test performed on sawed surface of 6" cobbles

Sincerely,

Susan Arnold

ENERGY*SOLUTIONS*

DAILY CONSTRUCTION REPORT

PROJECT: MOAB UMTRA Site: Cresent Junction Shift: Days

DATE: 10/25/2010

WEATHER: Fair: ____ Cloudy: X Warm: ____ Rain: X Snow: ____ Wind: X Other: ____

CONSTRUCTION OPERATIONS: Waste Placement X Cell Excavation ____ Interim Cover ____
Radon Barrier ____ Rock Placement ____ Other ____

Others ____

EQUIPMENT USED:

Rock trucks X	Track hoes ____	Loaders X	Dozers X
Locomotives ____	Forklifts ____	Graders ____	Backhoes ____
Sheepsfoot X	Scrapers ____	Tillers ____	Rollers ____
CAT 815 ____	Water trucks ____	CAT 825 ____	Other ____

DAILY PROGRESS MEETING: Yes X No ____

LIFTS TESTED: UBA01101004-00

LIFTS APPROVED: UBA01101004-00

EXPLANATIONS:

RRM:

There were no lifts approved in the cell today. Due to weather all material was stockpiled. QC performed a visual inspection of the lift areas in the cell and found standing water on all lifts. Operations removed all standing water and let dry.

Bio-Intrusion: UBA01101004-00 was approved today. Approximately 2,820 yds^3 of material was approved. A Buyoff survey was preformed along with a visual inspection. both were satisfactory. This lift area was approved for Frost Protection Layer placement.

QA/QC Representative Kyler Edgehouse

Biointrusion Barrier Layer Buy Off Survey

Buy off ID: UBA01 | Date: 10-25-2010

Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Pre-Installation Elevation	Difference in feet	Difference in inches	Radon Barrier Thickness
1039	6795900	2122150	4990.7	4990.6	4990.2	0.0	0.5	0.5
1037	6795900	2122250	4991.3	4991.2	4990.8	0.1	1.2	0.5
1118	6795700	2122150	4994.5	4994.5	4994.0	0.0	0.4	0.5
1116	6795700	2122250	4995.1	4995.1	4994.7	0.0	0.3	0.5
1198	6795500	2122150	4998.4	4998.4	4997.9	0.1	0.6	0.5
1196	6795500	2122250	4999.0	4999.0	4998.5	0.0	0.5	0.5
						0.0	0.0	0.0
						0.0	0.0	0.0
						0.0	0.0	0.0
						0.0	0.0	0.0
						0.0	0.0	0.0
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						0.0	0.0	0.0
						0.0	0.0	0.0
						0.0	0.0	0.0
						0.0	0.0	0.0
						0.0	0.0	0.0

Comments:

Approval Date: 10/25/2010 | Total Square Feet: 126921 ft²

QC Signature: Mitch Hogan [signature] | Reviewed By: ~~Beachem Bosh~~ RDK 10-26-10

Jared Knight [signature] 10-26-10

EnergySolutions

P. 2 of 2

ENERGY SOLUTIONS

LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

W CORNER DATE: 10/4/2010

See attached for lift map.

P_1	#1			
EW:	232	X 0.898	=	208
NS:	581	X 0.479	=	278
P_2	#2			
EW:	232	X 0.974	=	226
NS:	581	X 0.424	=	246
P_3	#3			
EW:	232	X 0.269	=	62
NS:	581	X 0.510	=	296
P_4				
EW:		X	=	
NS:		X	=	
P_5	N/A			
EW:		X	=	
NS:		X	=	
Page 2 attached:		Y		N

IDENTIFY LOTS ABOVE

LIFT ID: UBA01101004-00 NW CORNER: 6795932 N 2122072 E

THICKNESS: UNC: N/A COM: 6" ELEV: N/A Debris Insp. By: N/A Date: N/A Time: N/A

Comments: QC verified that the final surface of Radon Barrier was satisfactory prior to placement of Infiltration and Bio-Intrusion material. QC verified that the rock used was the correct material source. QC verified that the rock layer was spread to a near uniform thickness of ≥ 6" with satisfactory results. QC verified that the material had a even blend. Johansen and Tuttle personnel verified that a mimimum of two passes were performed with a smooth-drum roller over the entire lift area during compaction efforts. This lift is approximately 126,921 ft² with approximately 2,820 yds³ of Bio-Intrussion approved on it. Operations began placing this lift on 10-4-10 but did not get it approved until 10-25-10. this is the reason for the difference between the lift ID and approval date. QC verified that samples collected for Sieve Analysis were in accordance with the current version of ASTM D75. and project specification.
Samples were then transported to lab for testing purposes. 10-25-10 BB

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

LIFT APPROVED BY: Kyler Edgehouse DATE: 10/25/2010 TIME: 1420

QC APPROVAL 10-28-10 DATE

ENERGYSOLUTIONS

Slope Elevation Survey

Average lift thickness=	0.5	Bounding Box	Northing	Easting
Grid Size= N/A		Lower Left	N	
Lift ID: UBA01101004-00		Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795900	2122150	4990.2	6795900	2122150	4990.7	0.5	OK
6795900	2122250	4990.8	6795900	2122250	4991.3	0.5	OK
6795700	2122150	4994.0	6795700	2122150	4994.5	0.5	OK
6795700	2122250	4994.7	6795700	2122250	4995.1	0.5	OK
6795500	2122150	4997.9	6795500	2122150	4998.4	0.5	OK
6795500	2122250	4998.5	6795500	2122250	4999.0	0.5	OK
						0.0	OK
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						0.0	OK
						0.0	OK

N/A

ENERGY SOLUTIONS

SAMPLING LOG

PROJECT: Moab UMTRA Project OTHER

DATE: 10-12-10

See attached map for sample locations.

SAMPLE NUMBER: 1 MATERIAL TYPE: SOIL ROCK X

LOCATION: UBA01101004-00

TEST(S) TO BE PERFORMED: SAMPLED BY: John Christensen

PROCTOR: CLASSIFICATION: LABORATORY PERMEABILITY:

NA SOUNDNESS: X LA ABRASION: X ABSORPTION: X

SPECIFIC GRAVITY: X GRADATION: X

COMMENTS: Samples were collected w/ Energy Solutions QA/QC department to ensure a complete understanding of sampling procedure.

SAMPLE NUMBER: 2 MATERIAL TYPE: SOIL ROCK X

LOCATION: UBA01101004-00

TEST(S) TO BE PERFORMED: SAMPLED BY: John Christensen

PROCTOR: CLASSIFICATION: LABORATORY PERMEABILITY:

NA SOUNDNESS: X LA ABRASION: X ABSORPTION: X

SPECIFIC GRAVITY: X GRADATION: X

COMMENTS:

SAMPLE NUMBER: 3 MATERIAL TYPE: SOIL ROCK X

LOCATION: UBA01101004-00

TEST(S) TO BE PERFORMED: SAMPLED BY: John Christensen

PROCTOR: CLASSIFICATION: LABORATORY PERMEABILITY:

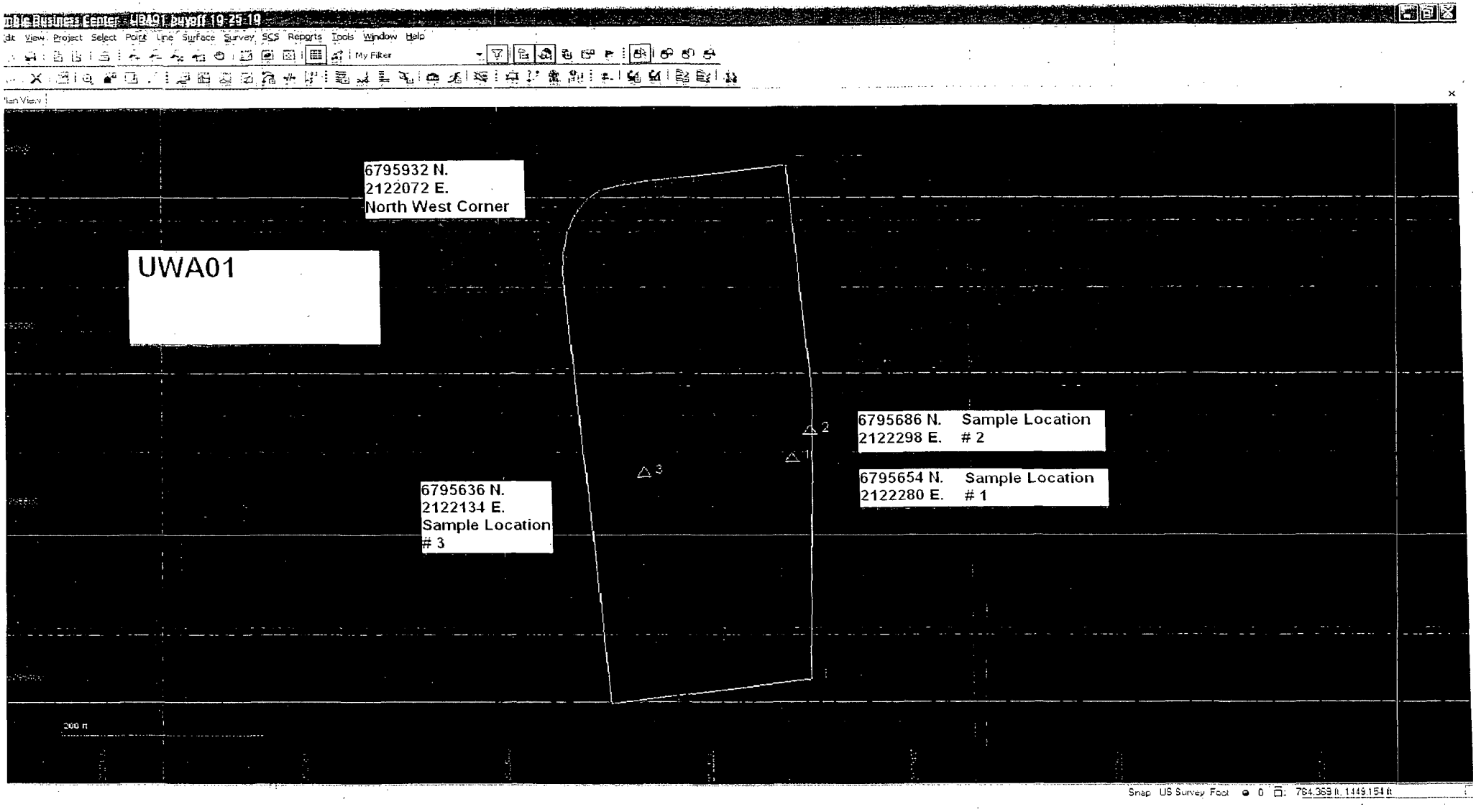
NA SOUNDNESS: X LA ABRASION: X ABSORPTION: X

SPECIFIC GRAVITY: X GRADATION: X

COMMENTS: Samples were obtained in accordance w/ current revision ASTM D75 & Standard practice for sampling ~~aggregates~~ 10-12-10 ~~OOE-EM/GJRAC~~ 10-12-10 BB OOE-EM/GJRAC 1933

All three samples combined into one aggregates composite sample, see ASTM D75 ; sampling procedure. Sample is Biointrusion layer in place sample #1.

Sampled by DATE QA/QC APPROVAL DATE


6795932 N.
2122072 E.
North West Corner
UWA01
6795686 N. Sample Location
2122298 E. # 2
6795654 N. Sample Location
2122280 E. # 1
6795636 N.
2122134 E.
Sample Location
3
200 ft

CENTRAL UTAH TESTING & INSPECTION

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

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 10/12/10
PROJECT: ~~MISC. QC~~ MOAB UMTRA PROJECT MH10040
SAMPLE LOCATION: BIOINTRUSION LAYER IN PLACE SAMPLE #1 UBAB101004-00. MH10040
MATERIAL TYPE: COVER BIOBARRIER
TESTED BY: JC SAMPLED BY: JC LAB #: 5907

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
8 in. (200mm)		0.0	100.0	
6 in. (150mm)		0.0	100.0	
4 in. (100mm)		0.0	100.0	100
3 in. (75mm)	9782.3	2.3	97.7	
2 in. (50mm)	83640.5	20.0	77.6	50 - 100
1 1/2 in. (37.5mm)	71367.2	17.1	60.5	40 - 60
1 in. (25mm)	78986.1	18.9	41.6	20 - 40
3/4 in. (19mm)	47751.8	11.4	30.2	
1/2 in. (12.5mm)	1604.1	9.7	20.5	15 - 25
3/8 in. (9.5mm)	699.7	4.2	16.3	
# 4 (4.75mm)	707.7	4.3	12.0	10 - 20
# 8 (2.36mm)	369.1	2.2	9.8	5 - 15
# 16 (1.18mm)	250.2	1.5	8.3	5 - 10
# 30 (600um)	164.6	1.0	7.3	
# 50 (300um)	168.5	1.0	6.3	
#100 (150um)	198.2	1.2	5.1	
#200 (75um)	205.9	1.2	3.8	0 - 5
-#200 (-75um)	38.3			

Current Spec

~~40~~ 40-50

Total Sample Aggregate Weight: 417387.0

- 3/4" Aggregate Weight: 5000.6 - 3/4" After Wash Weight: 4406.3

REMARKS:

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

P.O. BOX 220427 CENTERFIELD, UT. 84622 (435) 528-5711 FAX (435) 528-5710

55
PAGE 4 OF 4
10.28.10 BB

and 80% the rock may be used, but a larger D50 must be provided (oversizing). If the rock score is 80% or greater, no oversizing is required.

- For frequently saturated areas, which include all channels and buried slope toes, the rock must score 65% or the rock is rejected. If the rock scores between 65% and 80%, the rock may be used, but must be oversized. If the rock score is 80% or greater, no oversizing is required.

Oversize rock as follows:

- Subtract the rock score from 80% to determine the amount of oversizing required. For example, a rock with a rating of 70% will require oversizing of 10 percent (80% - 70% = 10%).
- The D50 of the stone shall be increased by the oversizing percent. For example, a stone with a 10% oversizing factor and a D50 of 12 inches will increase to a D50 of 13.2 inches.
- The final thickness of the stone layer shall increase proportionately to the increased D50 rock size. For example, a layer thickness equals twice the D50, such as when the plans call for 24 inches of stone with a D50 of 12 inches, if the stone D50 increases to 13.2, the thickness of the layer of stone with a D50 of 13.2 should be increased to 26.4 inches.

QC Inspector shall verify that the Infiltration and Biointrusion Layer is installed in accordance with Plans and Specifications by checking and confirming:

- Gravel material gradation matches the gradation required in the specifications.
- Gravel material is placed and compacted to produce a continuous uniform thickness of at least 6 inches. As a minimum depth verification will be performed every 10,000 cu yds.
- Compaction is performed by a vibratory steel drum roller, and that the roller makes a minimum of 2 passes over the placed gravel fill.

6.9 FROST PROTECTION LAYER

Above the Infiltration and Biointrusion Layer a 3 feet thick Frost Protection Layer will be installed. This soil layer will provide protection for the low-permeability Radon Barrier Layer beneath. The Frost Protection Layer will consist of 3 ft of clean, compacted soil shall be placed directly on the gravel Infiltration and Biointrusion Layer.

6.9.1 Material

The Frost Protection Layer will be constructed of common fill. The fill shall be produced from stockpiled excavated common fill from the cell excavation, tested to determine its maximum dry density, and the moisture content modified to bring the fill to optimum for compaction in accordance with ASTM D 698.

6.9.2 Ground Preparation

The Frost Protection Layer will be placed directly on the gravel Infiltration and Biointrusion Layer.

6.9.3 Lift Placement and Thickness

The Frost Protection Layer shall be constructed of fill materials placed in continuous lifts of uniform thickness. The method of dumping and spreading of the frost protection layer shall result in loose lifts not to exceed 12". Scarification shall be performed on all areas of the upper surface of each underlying soil layer prior to placement of the next lift. Scarification shall be accomplished with approved equipment. The final lift of soil shall not be scarified. The final lift shall be smooth rolled with at least 3 passes of the approved smooth steel wheeled roller weighing a minimum of 20,000 pounds.

6.9.4 Inspection and Testing

The Quality Control (QC) Inspector shall visually inspect the material preparation, ground preparation, and fill placement operations. The QC Inspector shall perform in-place density tests with companion moisture tests (optimum moisture plus or minus 5%) to verify that the CAES compaction results in a density of at least 90% of the material's maximum dry density according to ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort. The QC Inspector shall verify that the frost protection layer is constructed in accordance with Plans and Specifications by checking and confirming:

- Frost Protection Layer soil is common fill;
- Tests have been performed on the common fill to determine its maximum dry density and optimum moisture content per ASTM D 698.
- Fill material is properly moisture conditioned to near optimum moisture;
- Fill material is placed in continuous and approximately horizontal lifts. The method of dumping and spreading the frost protection layer shall result in loose lifts of nearly uniform thickness, not to exceed 12".
- Compaction is properly performed.
- Compaction – Fill shall be compacted with a minimum 45,000 lb static weight compactor. The compactor shall be a footed roller capable of kneading compaction, with feet a minimum of 6 inches in length. The compactor shall be equipped with a Computer Aided Earthmoving System and soil placement and compaction shall be controlled by the CAES.

- Compaction by CAES – the QC inspector shall monitor CAES compaction by visually inspecting the process and reviewing the computer records for each layer of soil placed.
- Compaction Verification Tests – Perform in-place density and moisture content tests on compacted fill material in accordance with the following requirements:
  - Verification tests of in-place density shall be performed on initial layers of soil placed, and on any layers in which the CAES indicates that problems occurred obtaining compaction.
  - When verification in-place density and moisture content tests are performed on a soil layer, a minimum of one test shall be preformed a minimum of 2 tests per 5,000 cubic yards of fill material placed.
  - Compaction and moisture content tests shall be performed in accordance with the following methods:
    - ASTM D 1556 – Density and Unit Weight of Soil in Place by the Sand-Cone Method
    - ASTM D 2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
    - ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
    - ASTM D 6938 - In-Place Density and Water content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
    - ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating

  Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

6.9.5 Initial and Confirmatory Surveys

Verification of the thickness of the Frost Protection Layer will be performed by comparing before and after surveys of the Layer. Prior to placement of the Frost protection Layer, an initial survey shall be performed of the section to be capped. The initial survey will document the geometry of the top of the Infiltration and Biointrusion Layer. After the Frost Protection Layer has been installed, a post-installation survey will be performed on the top of the Frost Protection Layer to confirm that the total fill thickness is in accordance with the plans and specifications.

6.10 ROCK ARMORING

The final cap layer is Rock Armoring, placed over the Frost Protection Layer. The Rock Armoring will vary in size and thickness at different locations on the cap, and shall be installed in accordance with the project plans and specifications Rock shall be spread to the thickness indicated on the drawings or in accordance with oversizing due to scoring criteria. Rock placement shall be guided by the Computer Aided Earthmoving System to

the rock may be used, but must be oversized. If the rock score is 80% or greater, no oversizing is required.

Oversize rock as follows:

- Subtract the rock score from 80% to determine the amount of oversizing required. For example, a rock with a rating of 70% will require oversizing of 10 percent (80% - 70% = 10%).
- The D50 of the stone shall be increased by the oversizing percent. For example, a stone with a 10% oversizing factor and a D50 of 12 inches will increase to a D50 of 13.2 inches.
- The final thickness of the stone layer shall increase proportionately to the increased D50 rock size. For example, a layer thickness equals twice the D50, such as when the plans call for 24 inches of stone with a D50 of 12 inches, if the stone D50 increases to 13.2, the thickness of the layer of stone with a D50 of 13.2 should be increased to 26.4 inches.

QC Inspector shall verify that the Infiltration and Biointrusion Layer is installed in accordance with Plans and Specifications by checking and confirming:

- Gravel material gradation matches the gradation required in the specifications.
- Gravel material is placed and compacted to produce a continuous uniform thickness of at least 6 inches.
- Compaction is performed by a vibratory steel drum roller, and that the roller makes a minimum of 2 passes over the placed gravel fill.

6.9 FROST PROTECTION LAYER

Above the Infiltration and Biointrusion Layer a 3 feet thick Frost Protection Layer will be installed. This soil layer will provide protection for the low-permeability Radon Barrier Layer beneath. The Frost Protection Layer will consist of 3 ft of clean, compacted soil shall be placed directly on the gravel Infiltration and Biointrusion Layer.

6.9.1 Material

The Frost Protection Layer will be constructed of common fill. The fill shall be produced from stockpiled excavated common fillcome from the cell excavation, tested to determine its maximum dry density, and the moisture content modified to bring the fill to optimum for compaction in accordance with ASTM D 698.

6.9.2 Ground Preparation

The Frost Protection Layer will be placed directly on the gravel Infiltration and Biointrusion Layer.

6.9.3 Lift Placement and Thickness

The Frost Protection Layer shall be constructed of fill materials placed in continuous lifts of uniform thickness. The method of dumping and spreading of the frost protection layer shall result in loose lifts average thickness not to exceed 12". Scarification shall be performed on all areas of the upper surface of each underlying soil layer prior to placement of the next lift. Scarification shall be accomplished with approved equipment. The final lift of soil shall not be scarified. The final lift shall be smooth rolled with at least 3 passes of the approved smooth steel wheeled roller weighing a minimum of 20,000 pounds.

6.9.4 Inspection and Testing

The Quality Control (QC) Inspector shall visually inspect the material preparation, ground preparation, and fill placement operations. The QC Inspector shall perform in-place density tests with companion moisture tests (optimum moisture plus or minus 5%) and at least 90% of the material's maximum dry density according to ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort on the initial layer. The QC Inspector shall verify that the frost protection layer is constructed in accordance with Plans and Specifications by checking and confirming:

- Frost Protection Layer soil is common fill;
- Tests have been performed on the common fill to determine its maximum dry density and optimum moisture content per ASTM D 698.
- Fill material is properly moisture conditioned to near optimum moisture;
- Fill material is placed in continuous and approximately horizontal lifts. The method of dumping and spreading the frost protection layer shall result in loose lifts of nearly uniform thickness, average thickness not to exceed 12".
- Compaction is properly performed.
- Compaction – Frost Protection fill will be compacted with rubber tired or footed roller compaction equipment.Fill shall be compacted with a minimum 45,000 lb static weight compactor. The compactor shall be a footed roller capable of kneading compaction, with feet a minimum of 6 inches in length. The compactor shall be equipped with a Computer Aided Earthmoving System and soil placement and compaction shall be controlled by the CAES.
- Compaction by CAES – the QC inspector shall monitor CAES compaction by visually inspecting the process and reviewing the computer records for each layer of soil placed.

- Verification tests of in-place density shall be performed on initial layers of soil placed, and on any layers in which the CAES indicates that problems occurred obtaining compaction.

Note: Companion sand cone tests and moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

If CAES is not used the following testing requirements shall be followed:

- Compaction Verification Tests – Perform in-place density and moisture content tests on compacted fill material in accordance with the following requirements:
  - Verification tests of in-place density shall be performed on initial layers of soil placed, and on any layers in which the CAES indicates that problems occurred obtaining compaction.
  - When verification in-place density and moisture content tests are performed on a soil layer, a minimum of one test shall be preformed a minimum of 2 tests per 5,000 cubic yards or 135,000 square feet of fill material placed.
  - Frost Protection Layer soil is common fill;
  - Tests have been performed on the common fill to determine its maximum dry density and optimum moisture content per ASTM D 698.
  - Fill material is properly moisture conditioned to near optimum moisture;
  - Fill material is placed in continuous and approximately horizontal lifts. The method of dumping and spreading the frost protection layer shall result in loose lifts of nearly uniform thickness, average thickness not to exceed 12".
  - Compaction is properly performed.
  - Compaction – Frost Protection fill will be compacted with rubber tired or footed roller compaction equipment.
  - Compaction and moisture content tests shall be performed in accordance with the following methods:
    - ASTM D 1556 – Density and Unit Weight of Soil in Place by the Sand-Cone Method
    - ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
    - ASTM D 2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
    - ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
    - ASTM D 6938 - In-Place Density and Water content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
    - ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating

Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

6.9.5 Initial and Confirmatory Surveys

Verification of the thickness of the Frost Protection Layer will be performed by comparing before and after surveys of the Layer. Prior to placement of the Frost protection Layer, an initial survey shall be performed of the section to be capped. The initial survey will document the geometry of the top of the Infiltration and Biointrusion Layer. After the Frost Protection Layer has been installed, a post-installation survey will be performed on the top of the Frost Protection Layer to confirm that the total fill thickness is in accordance with the plans and specifications.

6.10 ROCK ARMORING

The final cap layer is Rock Armoring, placed over the Frost Protection Layer. The Rock Armoring will vary in size and thickness at different locations on the cap, and shall be installed in accordance with the project plans and specifications Rock shall be spread to the thickness indicated on the drawings or in accordance with oversizing due to scoring criteria. Rock placement shall be guided by the a Computer Aided Earthmoving SystemGPS system to ensure that the appropriate thickness has been placed at all locations. Stone with a D50 of 2 inches or less shall be compacted with a vibratory steel drum.

6.10.1 Erosion Protection Materials Testing

Rock for the final cover layers shall be tested by a commercial testing laboratory during production in accordance with the following:

Rock Armoring	Reference
Specific Gravity (SSD)	ASTM C-127
Absorption	ASTM C-127
Sodium Sulfate Soundness (5 cycles)	ASTM C-88 (course aggregate)
L.A. Abrasion (100 cycles)	ASTM C-131
Schmidt Rebound Hardness	ISRM Method

ENERGY*SOLUTIONS*

DAILY CONSTRUCTION REPORT

PROJECT: MOAB UMTRA Site: Cresent Junction Shift: Days

DATE: 10/21/2010

WEATHER: Fair: X Cloudy: X Warm: ____ Rain: ____ Snow: ____ Wind: X Other: ____

CONSTRUCTION OPERATIONS: Waste Placement X Cell Excavation X Interim Cover ____

Radon Barrier ____ Rock Placement ____ Other **Frost Protection Layer**

Others ____

EQUIPMENT USED:

Rock trucks X	Track hoes ____	Loaders X	Dozers X
Locomotives ____	Forklifts ____	Graders X	Backhoes ____
Sheepsfoot ____	Scrapers X	Tillers ____	Rollers ____
CAT 815 X	Water trucks X	CAT 825 X	Other ____

DAILY PROGRESS MEETING: Yes X No ____

LIFTS TESTED: UWI12101021-00,UWP01101019-00,UFA11101021-00

LIFTS APPROVED: UFA11101021-00

EXPLANATIONS:

RRM:

There were no lifts approved in the cell toady. The daily moisture test was taken on UWI12101021-00 that passed with satisfactory sults. QC surveyed a control opoint and verified that the GPS was in tolerance for dayshift.

Spoils Wedge:

N/A

Frost Protection Layer:

UFA11101020-00 was tested and approved today with a total of 3,541 yds³ of Frost Protection.

THE SANDCONE #2 WAS CALIBRATED TODAY ALONG WITH THE SAND FOR TESTING PURPOSES KE 10-21-10

QA/QC Representative Kyler Edgehouse

ENERGYSOLUTIONS

Density Sand Calibration

Worksheet

Calibration Date: 10/21/10

Previous Calibration: 2/1/10

Cone and Plate Number: 2

Electronic Balance Used: 14714971
(Serial Number)

	A	B	C
1. Weight of sand, bottle and cone before filling cone and plate, g.	7051.8	5245.1	3433.6
2. Weight of sand, bottle and cone after filling cone and plate, g.	5245.1	3433.6	1622.6
3. Weight of sand to fill cone and plate, g.	1806.7	1811.5	1811.0
4. Weight of sand, bottle and cone before filling cone, plate and 0.075 ft^3 container, g.	6860.9	6692.2	6852.8
5. Weight of sand, bottle and cone after filling cone, plate and 0.075 ft^3 container, g.	1730.5	1551.4	1718.4
6. Weight of sand to fill cone, plate and 0.075 ft^3, g.	5130.4	5140.8	5134.4
7. Weight of sand to fill cone and plate (Line 11), g.	1809.7	1809.7	1809.7
8. Weight of sand to fill 0.075 ft^3 container, g.	3320.7	3331.1	3324.7

9. Average weight of sand to fill 0.075 ft^3 container = (Line 8, A+B+C)/3, g. = 3325.5 g.

10. Loose density of sand = (Line 9)/(0.075 ft^3)(453.6 g/lb), pcf. = **97.8** pcf.

11. Average weight of sand to fill cone and plate = (Line 3, A+B+C)/3, g. = **1809.7** g.

Comments: Equipment was inspected for damage with none found.

Performed by: Mitch Hogan / [signature]
(Printed Name/Signature)

Date: 10/21/2010

MH (Initial) The sand calibration is performed in accordance with the appropriate sections of ASTM D 1556 and found to be satisfactory.

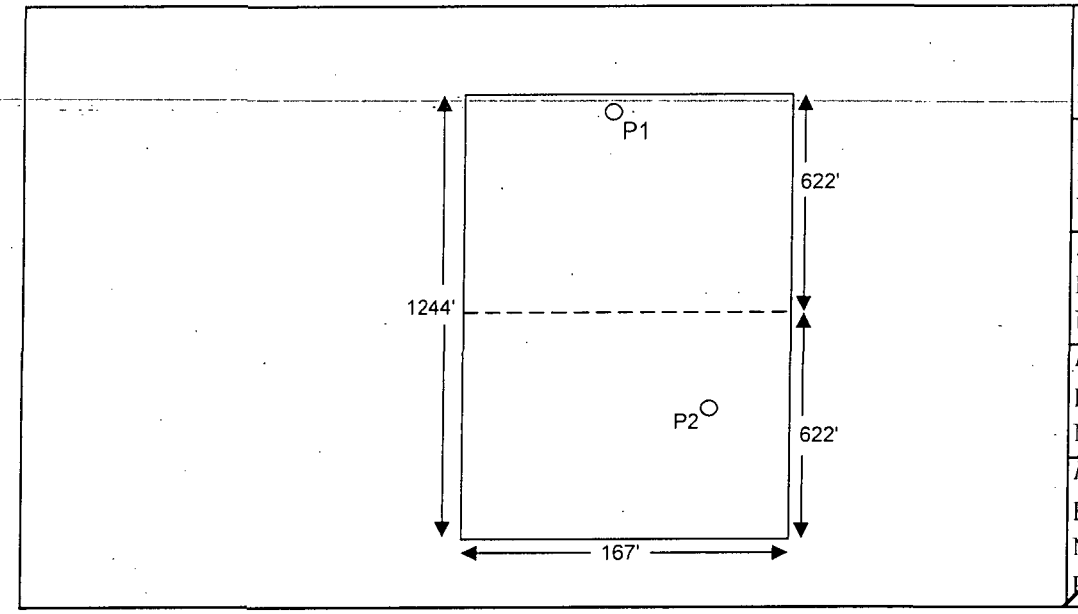
QA/QC Review [signature]
(initial/ date)

ENERGYSOLUTIONS

LIFT APPROVAL FORM

JECT: Moab UMTRA Project **OTHER**

W CORNER **DATE:** 10/20/2010



P 1				
EW:	167	X 0.456	=	76
NS:	622	X 0.156	=	97
P 2				
EW:	167	X 0.785	=	131
NS:	622	X 0.453	=	282
P 3				
EW:		X	=	
NS:		X	=	
P 4	N			
EW:		X	=	
NS:		X A	=	
P 5				
EW:		X	=	
NS:		X	=	

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: **UFA11101020-00** NW CORNER: **6795378 N. 2122096 E.**

CKNESS: UNC: **≤12"** COM: **N/A** ELEV: **N/A** Debris Insp. By: **N/A** Date: **N/A** Time: **N/A**

Comments:On 10/21/2010 Johansen and Tuttle personnel performed two random Troxler tests on this lift which were found to be satisfactory. Two companion moisture samples were pulled from the test locations which were found to be satisfactory as well. Nielsons completed compaction efforts of this lift at approximately 17:00. This is the first layer of Frost Protection in this area. QC verified that the Bio-Intrusion lift below had a smooth drum surface prior to placement. Compaction was verified using CAES and nuclear density gauge.

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

LIFT APPROVED BY: Kevin Keele/ Kyler Edgehouse DATE: **10/21/2010** TIME: **1720**

QC APPROVAL 10-27-10 DATE

ENERGYSOLUTIONS

Slope Elevation Survey

Average lift thickness=	0.4	Bounding Box	Northing	Easting
Grid Size=	N/A	Lower Left	N	
Lift ID:	UFA11101021-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795350	2122150	4999.6	6795350	2122150	4999.9	0.2	OK
6795150	2122150	4994.5	6795150	2122150	4994.6	0.1	OK
6794950	2122200	4989.5	6794950	2122200	4989.9	0.5	OK
6794950	2122300	4989.5	6794950	2122300	4990.0	0.5	OK
6794750	2122300	4984.5	6794750	2122300	4984.8	0.3	OK
6794750	2122200	4984.4	6794750	2122200	4984.8	0.4	OK
6794550	2122250	4979.4	6794550	2122250	4980.2	0.7	OK
6794550	2122350	4979.4	6794550	2122350	4979.8	0.4	OK
6794350	2122350	4974.3	6794350	2122350	4974.7	0.3	OK
6794350	2122250	4974.3	6794350	2122250	4974.6	0.3	OK
6794150	2122300	4969.4	6794150	2122300	4969.7	0.3	OK
6794150	2122400	4969.3	6794150	2122400	4969.6	0.3	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
			N/A			0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

% =6	94.2%
Elevation Avg	7304.3
Total =6	14132
Total Lines	14995

Pass

Minimum Number of Machine Passes
3

Lift ID: UFA11101021-00

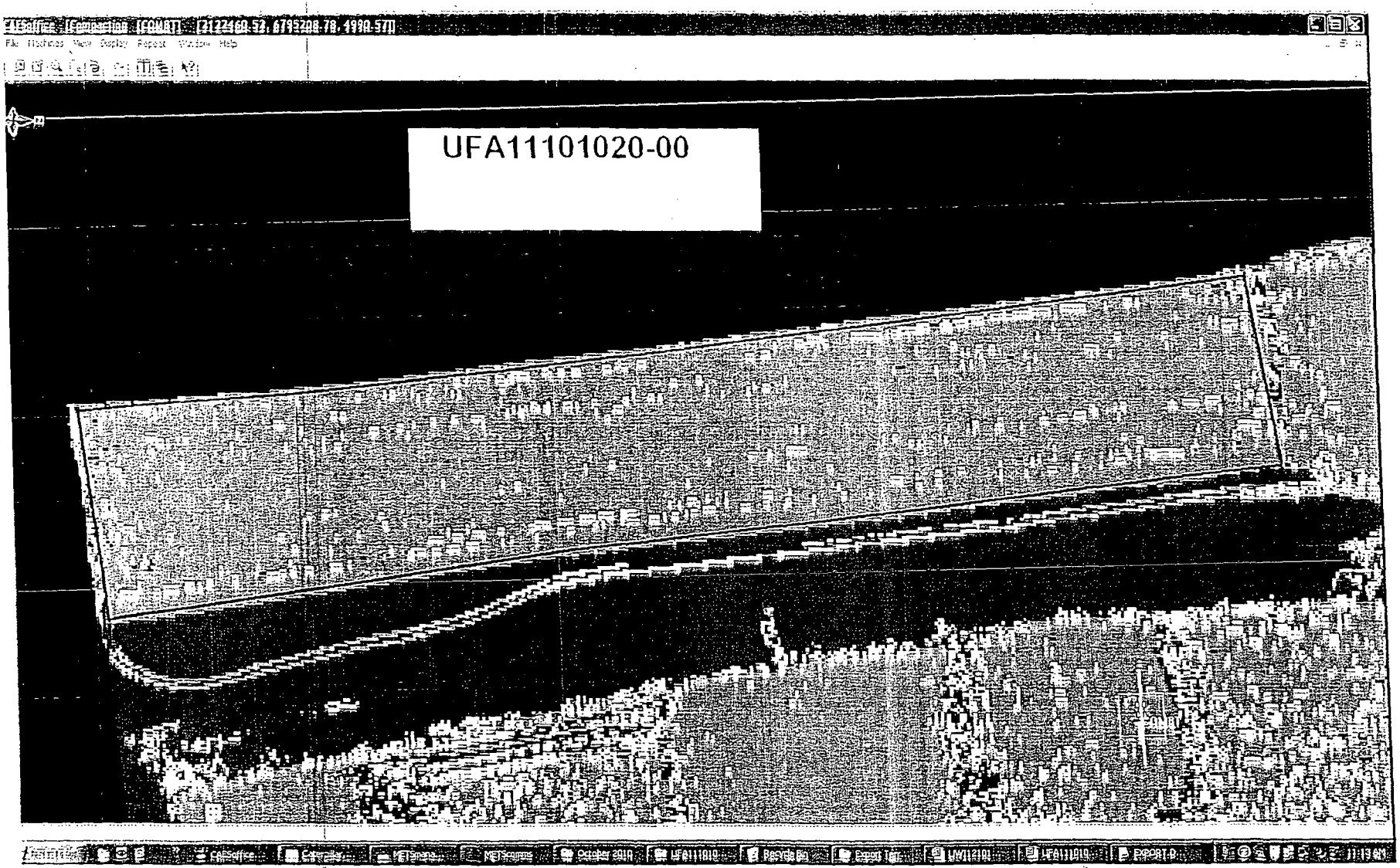
Northing	Easting	Elevation	# of Passes	Passes =6	Count
6795367	2122099	4999.2	3		1
6795371	2122099	4999.2	5		1
6795374	2122099	4999.3	6	1	1
6795377	2122099	4999.2	6	1	1
6795338	2122102	4998.3	6	1	1
6795341	2122102	4998.4	6	1	1
6795344	2122102	4998.6	6	1	1
6795348	2122102	4998.7	6	1	1
6795351	2122102	4998.8	6	1	1
6795354	2122102	4998.8	4		1
6795357	2122102	4999.1	2		1
6795361	2122102	4999.0	2		1
6795364	2122102	4999.1	3		1
6795367	2122102	4999.2	6	1	1
6795371	2122102	4999.2	6	1	1
6795374	2122102	4999.3	6	1	1
6795377	2122102	4999.3	6	1	1
6795321	2122105	4998.0	4		1
6795325	2122105	4998.1	6	1	1
6795328	2122105	4998.3	6	1	1
6795331	2122105	4998.4	6	1	1
6795334	2122105	4998.4	4		1
6795338	2122105	4998.5	6	1	1
6795341	2122105	4998.6	6	1	1
6795344	2122105	4998.7	5		1
6795348	2122105	4998.8	3		1
6795351	2122105	4999.2	6	1	1
6795354	2122105	4999.5	6	1	1
6795357	2122105	4999.6	5		1
6795361	2122105	4999.7	5		1
6795364	2122105	4999.8	5		1
6795367	2122105	4999.9	5		1
6795371	2122105	4999.4	6	1	1
6795374	2122105	4999.4	6	1	1
6795377	2122105	4999.5	6	1	1
6795302	2122108	4997.8	4		1
6795305	2122108	4997.9	6	1	1
6795308	2122108	4997.9	6	1	1
6795311	2122108	4998.0	5		1
6795315	2122108	4998.1	6	1	1
6795318	2122108	4998.4	5		1
6795321	2122108	4998.5	5		1
6795325	2122108	4998.6	6	1	1
6795328	2122108	4998.7	6	1	1

Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6


UFA11101020-00

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER

LIFT IDENTIFICATION: UFA11101020-00 DATE: 10/21/2010

TEST ID NUMBER(S): 1

TEST LOCATION: P1 TEST METHOD: N/A D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 31674

Last Calibration Date: 3/4/10

Daily Standard Counts: *On-Cell Standard*

Density 2532 Moisture 713

Method A (Direct Transmission)

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

Moisture Count 158 Density Count 2725

Wet Density (ρ_m) 121.3 *(lbs/ft^3)* Dry Density 109.0 *(lbs/ft^3)*

Moisture Density 12.3 *(lbs/ft^3)* Moisture Fraction 11.3 *(%)*

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 Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID 1263

Mass of container & wet specimen (M_{cms})	1520.4	g
Mass of container & dry specimen (M_{cds})	1493.4	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	27.0	g
Mass of container (M_c)	1263.0	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	230.4	g
Moisture content (w) $w = (M_w / M_s) \times 100$	11.7	%

Soil Description: **Grey in color consists of mostly fines**

Proctor ID: **Frost Protection #2**

Standard Proctor (ASTM D698)

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

$pd = (100 \times 121.3) / (100 + 11.7 = 108.6$ *lbs/ft^3*

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

Maximum Dry Density ($\gamma_d max$) 118.6 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.9 (%)

Required Moisture: 6.9 % to 16.9 %

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

108.6 / 118.6 x 100 = 91.5 %

Required Percent Compaction: 90.0 (%)

Comments:

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

TEST RESULTS:

x Pass Date: 10/21/10

_____ Failed Moisture

_____ Failed Compaction Time: 15:30

By: Kevin Keele / Kevin Keele

(print) *(signature)*

10.27.10

QA/QC APPROVAL DATE

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER

LIFT IDENTIFICATION: UFA1101020-00 DATE: 10/21/2010

TEST ID NUMBER(S): 2

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

ASTM D6938 (DENSITY DETERMINATION)

Make/Model: Troxler 3430 Gauge Serial #: 31674

Last Calibration Date: 3/4/10

Daily Standard Counts: *On-Cell Standard*

Density 2532 Moisture 713

Method A (Direct Transmission)

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

Moisture Count 185 Density Count 2481

Wet Density (ρ_m) 125.4 *(lbs/ft^3)* Dry Density 110.7 *(lbs/ft^3)*

Moisture Density 14.7 *(lbs/ft^3)* Moisture Fraction 13.3 *(%)*

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 Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID 1263

Mass of container & wet specimen (M_{cms})	1528.4	g
Mass of container & dry specimen (M_{cds})	1500.3	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	28.1	g
Mass of container (M_c)	1263.0	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	237.3	g
Moisture content (w) $w = (M_w / M_s) \times 100$	11.8	%

Soil Description: Grey in color consists of mostly fines

Proctor ID: Frost Protection #2

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.6 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.9 (%)

Required Moisture: 6.9 % to 16.9 %

Required Percent Compaction: 90.0 (%)

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

$pd = (100 \times 125.4) / (100 + 11.8) =$ 112.1 *lbs/ft^3*

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

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

112.1 / 118.6 x 100 = 94.5 %

Comments:

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

TEST RESULTS:

X Pass Date: 10/21/10

____ Failed Moisture

____ Failed Compaction Time: 17:30

By: Kevin Keele / Kevin Keele

(print) *(signature)*

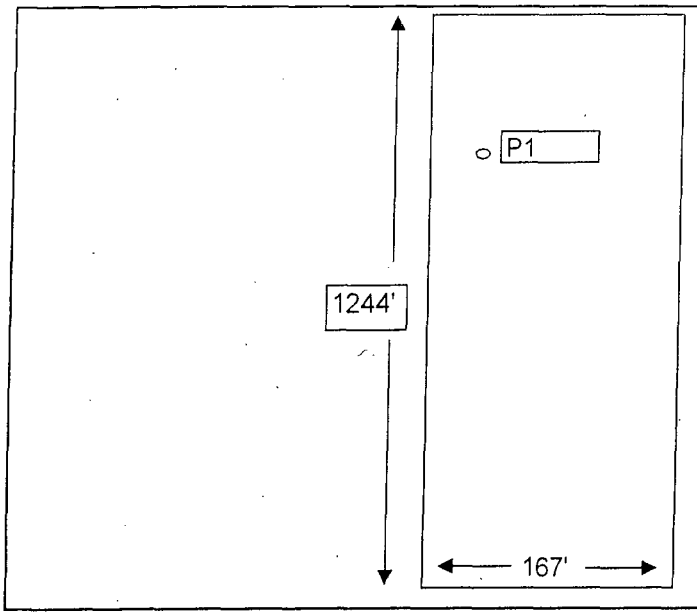
QA/QC APPROVAL 10.27.10 DATE

ENERGY SOLUTIONS

LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

NW CORNER DATE: 10/21/2010



P 1	6794512 N. 2122141 E.			
EW:	167	X 0.267	=	45
NS:	1244	X 0.696	=	866
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		

N/A

IDENTIFY LOTS ABOVE

LIFT ID: UFA11101021-00 NW CORNER: 6795378 N 2122096 E

THICKNESS: UNC: ≤ 12" COM: N/A ELEV: N/A Debris Insp. By: N/A Date: N/A Time: N/A

6,196 NM

Comments: This lift is 239,001 ft². There is approximatley ~~7,082~~ yds³ of frost protection on this lift.
On 10/21/2010 at 14:30 Johansen & Tuttle (J & T) personnel verified that the underlying lift area of Frost Protection material was scarified and that moisture content levels were satisfactory prior to placement of the new lift area. Nielsons then began placement and processing of this lift. Moisture conditioning efforts were found to be satisfactory.
On 10/26/2010 at 07:30 J & T personnel visually inspected the Frost Protection Layer and found that there was frost on the lift area and Nielsons was notified. J & T personnel pulled two moisture samples from the underlying lift area verifiying that the moisture was satisfactory. Moisture content was found to be within tolerance (see attached J & T moisture content forms) however, Nielsons decided to postpone placement of new material until after lunch. At 12:30 J & T personnel verified that the underlying lift area was scarified prior to placement of new material and all frost was removed. Nielsons then continued placement and processing of this lift. Moisture conditioning efforts were found to be satisfactory during placement and processing of this lift material on the lift area.
Compaction was verified using CAES 9 NM nuclear density testing.

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

LIFT APPROVED BY: Kevin Keele Kevin Keele (T47) DATE: 10/28/2010 TIME: 0910

QA/QC APPROVAL 11.01.2010 DATE

ENERGY*SOLUTIONS*

CONTINUATION SHEET

EXPLANATIONS:

On 10/27/2010 at 07:30 J & T personnel verified that there was not any frost or frozen material on this lift area and that it was scarified prior to placement of new material. Nielsons then continued placement and processing of this lift. Nielsons finished placement of this lift at approximately 11:30 and then began the process of verifying elevation. Elevation was verified at 14:00 and Nielsons then began compaction efforts. J & T personnel also pulled a moisture sample,# 1, from the east side of the lift which passed with satisfactory results. At 16:30 J & T personnel performed a density/moisture test along with a companion moisture sample, # 2, on the west side of the lift. Both passed with satisfactory results. In correlation with the CAES system the moisture density test was performed with satisfactory results.

On 10/28/2010 at 07:45 Nielsons continued compaction efforts of this lift and finished compaction at 09:15.

FIELD ENGINEER/INSPECTOR Kevin Keele - Kevin Keele (J+T)

ENERGYSOLUTIONS

Slope Elevation Survey

Average lift thickness=	0.7	Bounding Box	Northing	Easting
Grid Size=	N/A	Lower Left	N	
Lift ID:	UFA11101021-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795350	2122150	4999.9	6795350	2122150	5000.4	0.5	OK
6795150	2122150	4994.6	6795150	2122150	4995.7	1.0	OK
6794950	2122200	4989.9	6794950	2122200	4990.5	0.6	OK
6794950	2122300	4990.0	6794950	2122300	4990.6	0.6	OK
6794750	2122300	4984.8	6794750	2122300	4985.5	0.7	OK
6794750	2122200	4984.8	6794750	2122200	4985.7	0.9	OK
6794550	2122250	4980.2	6794550	2122250	4980.3	0.2	OK
6794550	2122350	4979.8	6794550	2122350	4980.6	0.7	OK
6794350	2122350	4974.7	6794350	2122350	4975.4	0.8	OK
6794350	2122250	4974.6	6794350	2122250	4975.4	0.9	OK
6794150	2122300	4969.7	6794150	2122300	4970.6	0.9	OK
6794150	2122400	4969.6	6794150	2122400	4970.4	0.8	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

% =6	93.4%
Elevation Avg	7306.6
Total =6	14010
Total Lines	14995

Pass

Minimum Number of Machine Passes
3

Lift ID: UFA11101021-00

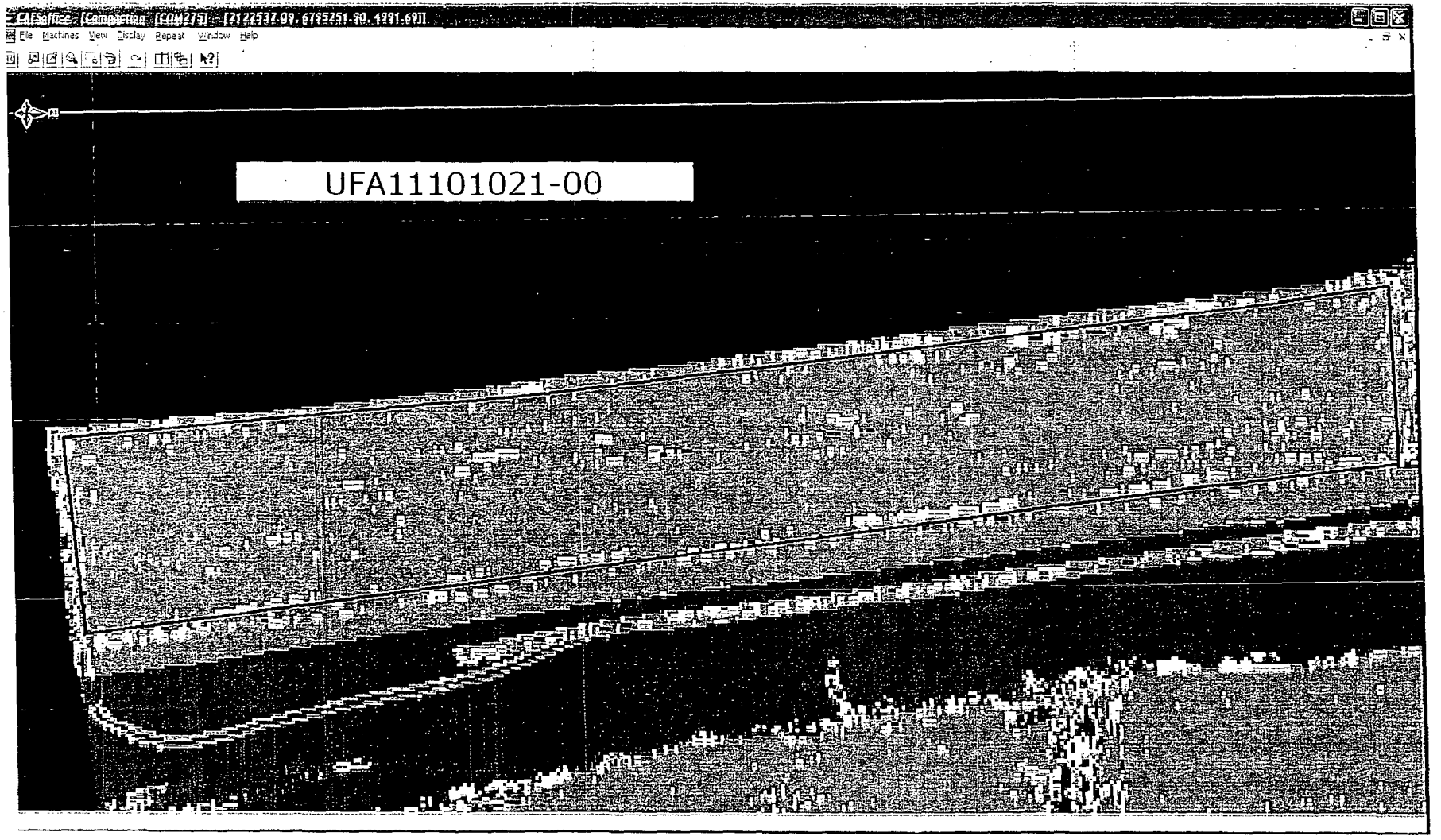
Northing	Easting	Elevation	# of Passes	Passes =6	Count
6795367	2122099	4999.2	3		1
6795371	2122099	4999.2	5		1
6795374	2122099	4999.3	6	1	1
6795377	2122099	4999.2	6	1	1
6795338	2122102	4998.3	6	1	1
6795341	2122102	4998.4	6	1	1
6795344	2122102	4998.6	6	1	1
6795348	2122102	4998.7	6	1	1
6795351	2122102	4998.8	6	1	1
6795354	2122102	4998.8	4		1
6795357	2122102	4999.1	2		1
6795361	2122102	4999.0	2		1
6795364	2122102	4999.1	3		1
6795367	2122102	4999.2	6	1	1
6795371	2122102	4999.2	6	1	1
6795374	2122102	4999.3	6	1	1
6795377	2122102	4999.3	6	1	1
6795321	2122105	4998.0	4		1
6795325	2122105	4998.1	6	1	1
6795328	2122105	4998.3	6	1	1
6795331	2122105	4998.4	6	1	1
6795334	2122105	4998.4	4		1
6795338	2122105	4998.5	6	1	1
6795341	2122105	4998.6	6	1	1
6795344	2122105	4998.7	5		1
6795348	2122105	4998.8	3		1
6795351	2122105	4999.2	6	1	1
6795354	2122105	4999.5	6	1	1
6795357	2122105	4999.6	5		1
6795361	2122105	4999.7	5		1
6795364	2122105	4999.8	5		1
6795367	2122105	4999.9	5		1
6795371	2122105	4999.4	6	1	1
6795374	2122105	4999.4	6	1	1
6795377	2122105	4999.5	6	1	1
6795302	2122108	4997.8	4		1
6795305	2122108	4997.9	6	1	1
6795308	2122108	4997.9	6	1	1
6795311	2122108	4998.0	5		1
6795315	2122108	4998.1	6	1	1
6795318	2122108	4998.4	5		1
6795321	2122108	4998.5	5		1
6795325	2122108	4998.6	6	1	1
6795328	2122108	4998.7	6	1	1

Lift Height
1' 0"

Thick Lift Threshold
2' 0"

Last Lift Elevation
N/A

Min. # of Wheel Passes
6


CATSurface - [Comparison (COM279) : [2127537.99, 6795251.90, 1991.69]]
File Machines View Display Repeat Window Help
UFA11101021-00

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: UFA11101021-00 DATE: 10/27/2010

TEST ID NUMBER(S): Moisture Sample # 1

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

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: 3/4/10

Daily Standard Counts:

Density _____ Moisture _____

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

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

Moisture Count _____ Density Count _____

Wet Density (ρ_m) _____ *(lbs/ft³)* Dry Density _____ *(lbs/ft³)*

Moisture Density _____ *(lbs/ft³)* Moisture Fraction _____ *(%)*

N A

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

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 Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID 1263

Mass of container & wet specimen (M_{cms})	1553.0	g
Mass of container & dry specimen (M_{cds})	1514.8	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	38.2	g
Mass of container (M_c)	1263.0	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	251.8	g
Moisture content (w) $w = (M_w / M_s) \times 100$	15.2	%

Soil Description: Grey in color consists of mostly fines.

Proctor ID: Frost Protection # 2

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.6 (lbs/ft³)

Optimum Moisture (w_{opt}) 11.9 (%)

Required Moisture: 6.9 % to 16.9 %

Required Percent Compaction: 90.0 (%)

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

$\rho d = (100 \times$ ##### $) / (100 +$ 15.2 $=$ 0.0 lbs/ft^3

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

N A

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

0.0 / 118.6 x 100 = 0.0 %

Comments:

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

TEST RESULTS:

X Pass Date: 10/27/10

_____ Failed Moisture

_____ Failed Compaction Time: 14:30

By: Kevin Keele / Kevin Keele

(print) *(signature)*

QA/QC APPROVAL 11.02.2010 DATE

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: UFA11101021-00 DATE: 10/27/2010

TEST ID NUMBER(S): Density Test # 1 and Moisture Sample # 2

TEST LOCATION: P1 TEST METHOD: N/A D1556 X D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 31674

Last Calibration Date: 3/4/10

Daily Standard Counts: *On-Cell Standard*

Density 2490 Moisture 704

Method A (Direct Transmission)

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

Moisture Count 151 Density Count 1700

Wet Density (ρ_m) 123.1 *(lbs/ft^3)* Dry Density 111.3 *(lbs/ft^3)*

Moisture Density 11.8 *(lbs/ft^3)* Moisture Fraction 10.6 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

Test Hole Volume

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

Dry Mass of soil

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

Wet Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID 1263

Mass of container & wet specimen (M_{cms})	1543.3	g
Mass of container & dry specimen (M_{cds})	1514.9	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	28.4	g
Mass of container (M_c)	1263.0	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	251.9	g
Moisture content (w) $w = (M_w / M_s) \times 100$	11.3	%

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

$\rho d = (\ 100\ \times$ 123.1 $)\ /\ (100 +$ 11.3 $) =$ 110.6 *lbs/ft^3*

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

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

110.6 / 118.6 x 100 = 93.3 %

Soil Description: Grey in color consists of mostly fines.

Proctor ID: Frost Protection # 2

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.6 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.9 (%)

Required Moisture: 6.9 % to 16.9 %

Required Percent Compaction: 90.0 (%)

Comments:

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

TEST RESULTS:

X Pass Date: 10/27/10

_____ Failed Moisture

_____ Failed Compaction Time: 17:00

By: Kevin Keele / Kevin Keele

(print) *(signature)*

QA/QC APPROVAL 11-01-10 DATE

Johansen & Tuttle Engineering, Inc.
90 South 100 East
PO Box 487
Castle Dale, Utah 84513

Moisture Content: AASHTO T-255 / ASTM D2216

Date: 10/26/2010

Project Name: UMTRA

Material Source: Frost Protection Layer, UNDERLYING, LIFT MIX

Test Number: Moisture Sample # 1

MOISTURE DETERMINATION

N/A ASTM D2216 @ 110° C or X ASTM D4643

Container ID 1263

Mass of container & wet specimen (M_{cms})	1558.2	g
Mass of container & dry specimen (M_{cds})	1522.4	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	35.8	g
Mass of container (M_c)	1263.0	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	259.4	g
Moisture content (w) $w = (M_w / M_s) \times 100$	13.8	%

Tested By: Kevin Keele Kevin Keele

8 of 12

PAGE ~~1 OF 1~~

Johansen & Tuttle Engineering, Inc.
90 South 100 East
PO Box 487
Castle Dale, Utah 84513

Moisture Content: AASHTO T-255 / ASTM D2216

Date: 10/26/2010

Project Name: UMTRA

Material Source: Frost Protection Layer UNDERLYING LIFT MATERIAL

Test Number: Moisture Sample # 2

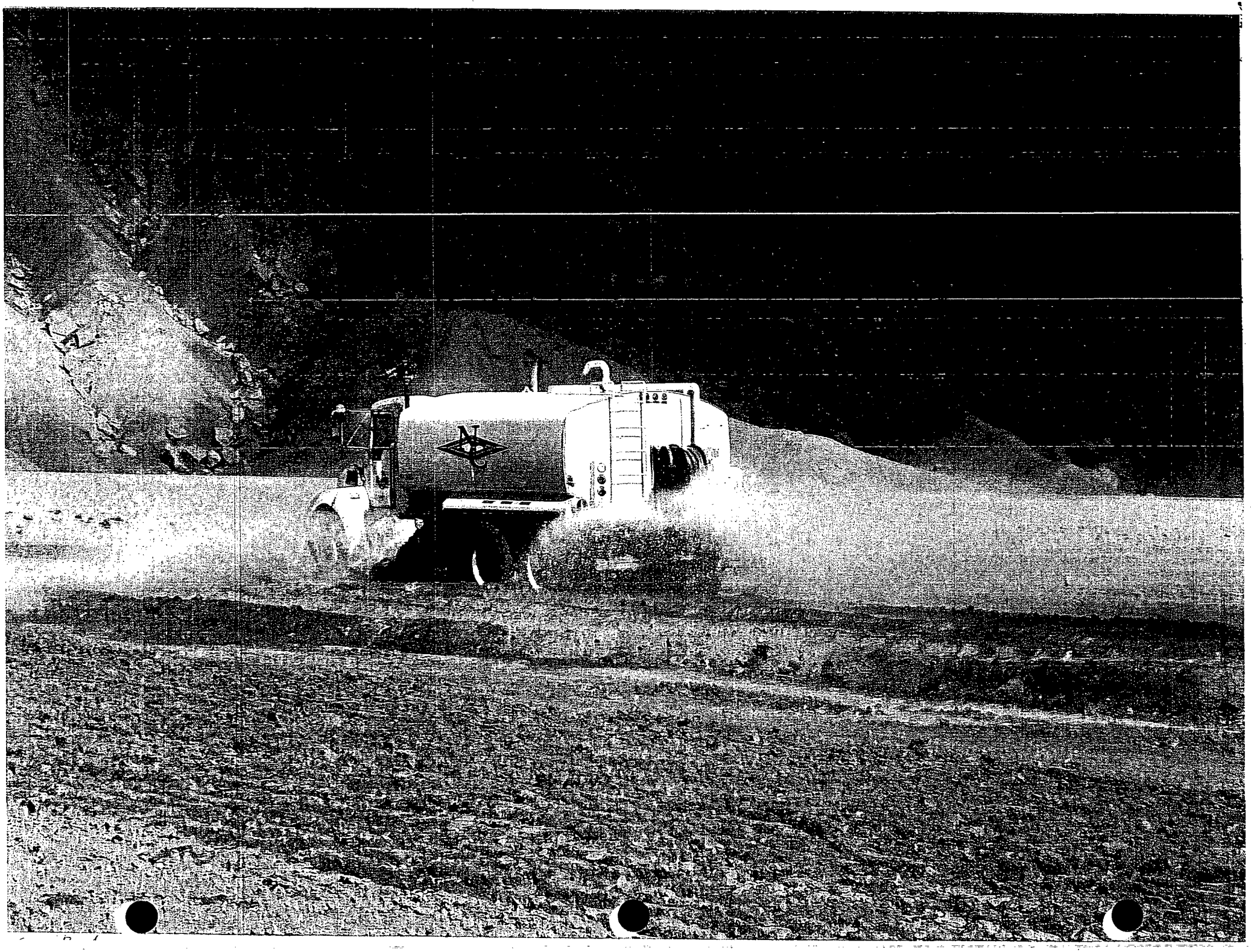
MOISTURE DETERMINATION

N/A ASTM D2216 @ 110° C or X ASTM D4643

Container ID 1263

Mass of container & wet specimen (M_{cms})	1538.3	g
Mass of container & dry specimen (M_{cds})	1503.3	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	35.0	g
Mass of container (M_c)	1263.0	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	240.3	g
Moisture content (w) $w = (M_w / M_s) \times 100$	14.6	%

Tested By: Kevin Keele Kevin Keele




CATERPILLAR


825H
CAT

ENERGY SOLUTIONS

LIFT APPROVAL FORM

PROJECT: Moab UMTRA Project OTHER

NW CORNER DATE: 10/28/2010

See attached for lift map.

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

IDENTIFY LOTS ABOVE

LIFT ID: UFA01101028-00 NW CORNER: 6795928 N 2122071 E

THICKNESS: UNC: ≤ 12" COM: N/A ELEV: N/A Debris Insp. By: N/A Date: N/A Time: N/A

Comments: On **10/28/2010** at 08:15 Nielsons began placement and processing of Frost Protection material. Johansen & Tuttle personnel observed this process and verified that moisture conditioning efforts were maintained during the placement and processing of this material. Nielsons finished placement of this lift at 16:00 at which time they began the process of verifying elevation. Elevation was verified at 17:00.

On **11/01/2010** at 07:45 Nielsons began compaction efforts on this lift. At 08:30 J & T personnel performed a Troxler test and pulled a moisture sample from the lift area. Both were found to be satisfactory. At 10:45 Nielsons completed compaction efforts on this lift at which time J & T personnel performed a second Troxler test and pulled a second moisture sample. Both tests were found to be satisfactory. At approximatley 1440 this lift was approved.

This lift is approximately 123,915 ft² with approximately 3,213 yds³ if Frost Protection approved on it.

Compaction was verified using 11-9-10 BB bot the CAES system & nuclear density testing.

QC verified that Bio layer was approved prior to any placement of frost protection. 11-9-10 BB

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

LIFT APPROVED BY: Kevin Keele/Kyler Edgehouse DATE: 11/1/2010 TIME: 1445

Kevin Keele (KK) Kyler Edgehouse

11-9-10

QC APPROVAL DATE

EnergySolutions

Slope Elevation Survey

Average lift thickness=	0.7	Bounding Box	Northing	Easting
Grid Size=	N/A	Lower Left	N	
Lift ID:	UFA01101028-00	Upper Right		A

Last Lift Elevations			Lift Approval Elevations			Lift Thickness	
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness	
6795900	2122150	4990.7	6795900	2122150	4991.3	0.6	OK
6795900	2122250	4991.3	6795900	2122250	4992.0	0.7	OK
6795700	2122150	4994.5	6795700	2122150	4995.6	1.0	OK
6795700	2122250	4995.1	6795700	2122250	4995.8	0.7	OK
6795500	2122150	4998.4	6795500	2122150	4999.1	0.7	OK
6795500	2122250	4999.0	6795500	2122250	4999.7	0.7	OK
6795600	2122250	4997.0	6795600	2122250	4997.6	0.6	OK
6795450	2122200	5000.6	6795451	2122201	5001.0	0.4	OK
6795800	2122200	4992.8	6795800	2122201	4993.4	0.6	OK
6795550	2122200	4997.7	6795550	2122201	4998.3	0.6	OK
6795650	2122250	4996.0	6795651	2122250	4996.7	0.7	OK
6795750	2122200	4993.8	6795751	2122201	4994.4	0.6	OK
6795850	2122250	4992.2	6795850	2122250	4993.1	0.9	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK
						0.0	OK

N/A

% =6	95.2%
Elevation Avg	4995.4
Total =6	10966
Total Lines	11519

Pass

Minimum Number of Machine Passes: 3

Lift ID: UFA01101028-00

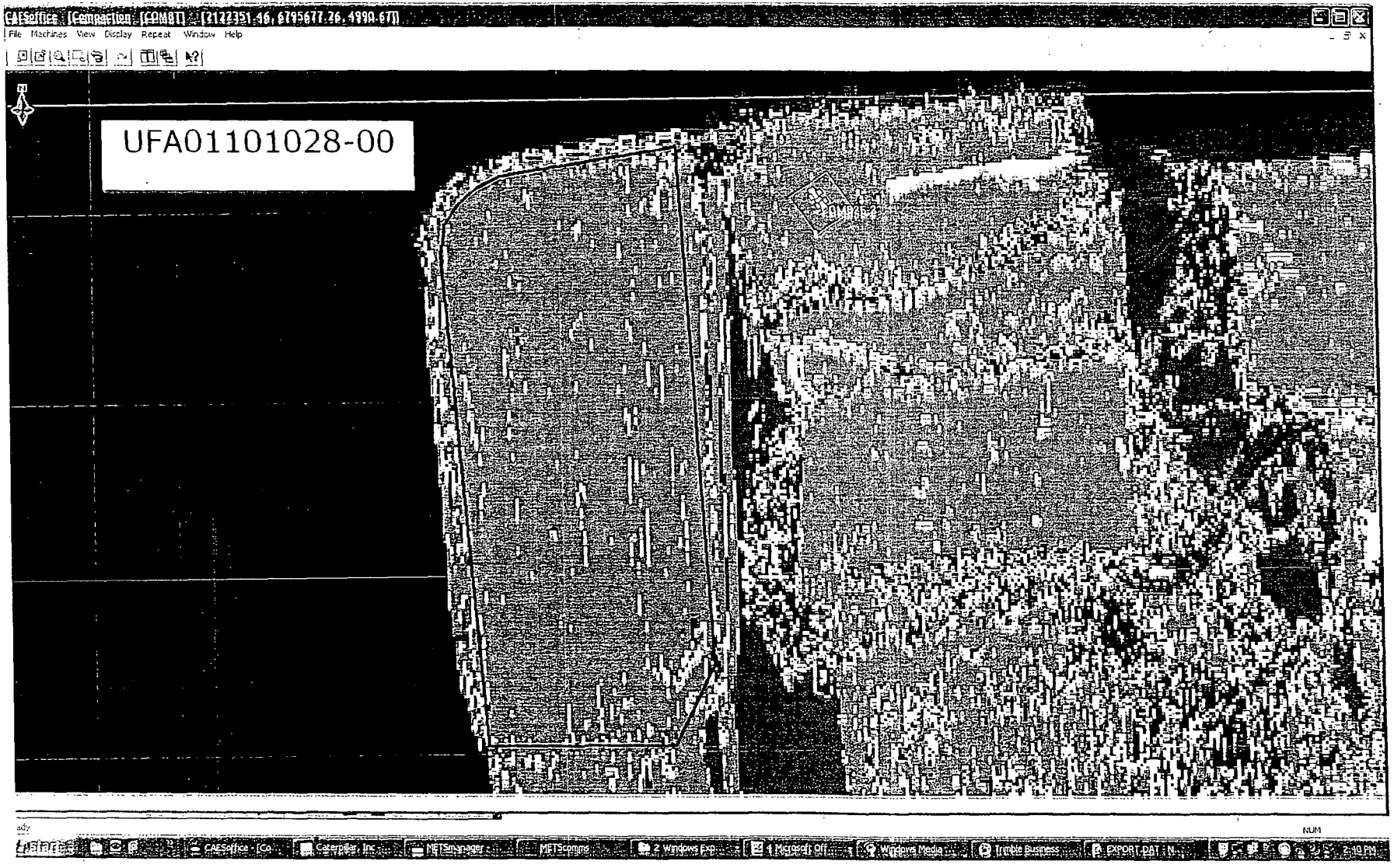
Northing	Easting	Elevation	# of Passes	Passes =6	Count
6795855	2122060	4990.2	6	1	1
6795858	2122060	4990.2	6	1	1
6795862	2122060	4990.1	6	1	1
6795865	2122060	4990.1	6	1	1
6795868	2122060	4990.0	6	1	1
6795871	2122060	4990.0	6	1	1
6795875	2122060	4989.9	6	1	1
6795878	2122060	4989.9	6	1	1
6795881	2122060	4989.8	6	1	1
6795885	2122060	4989.8	5		1
6795888	2122060	4989.7	5		1
6795809	2122064	4991.0	6	1	1
6795812	2122064	4991.0	6	1	1
6795816	2122064	4990.9	6	1	1
6795819	2122064	4990.9	6	1	1
6795822	2122064	4990.8	6	1	1
6795826	2122064	4990.8	6	1	1
6795829	2122064	4991.2	3		1
6795832	2122064	4991.1	5		1
6795835	2122064	4991.0	5		1
6795839	2122064	4991.0	6	1	1
6795842	2122064	4991.0	6	1	1
6795845	2122064	4990.9	6	1	1
6795849	2122064	4990.8	6	1	1
6795852	2122064	4990.7	6	1	1
6795855	2122064	4990.7	6	1	1
6795858	2122064	4990.6	6	1	1
6795862	2122064	4990.6	6	1	1
6795865	2122064	4990.5	6	1	1
6795868	2122064	4990.5	6	1	1
6795871	2122064	4990.4	5		1
6795875	2122064	4990.4	6	1	1
6795878	2122064	4990.3	5		1
6795881	2122064	4990.2	4		1
6795885	2122064	4990.1	4		1
6795888	2122064	4989.9	6	1	1
6795891	2122064	4989.8	6	1	1
6795894	2122064	4989.7	6	1	1
6795898	2122064	4989.7	6	1	1
6795901	2122064	4989.7	6	1	1
6795904	2122064	4989.4	6	1	1
6795908	2122064	4989.4	4		1
6795770	2122067	4991.9	6	1	1
6795773	2122067	4991.8	6	1	1

Lift Height: 1' 0"

Thick Lift Threshold: 2' 0"

Last Lift Elevation: N/A

Min. # of Wheel Passes: 6


UFA01101028-00

ENERGY*SOLUTIONS*

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____

LIFT IDENTIFICATION: UFA01101028-00 DATE: 11/1/2010

TEST ID NUMBER(S): 1

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

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 31674

Last Calibration Date: 3/4/10

Daily Standard Counts: *On-Cell Standard*

Density 2516 Moisture 703

Method A (Direct Transmission)

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

Moisture Count 134 Density Count 1944

Wet Density (ρ_m) 118.5 *(lbs/ft^3)* Dry Density 108.2 *(lbs/ft^3)*

Moisture Density 10.3 *(lbs/ft^3)* Moisture Fraction 9.5 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

Test Hole Volume

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

Dry Mass of soil

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

Wet Denisty

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID 1263

Mass of container & wet specimen (M_{cms})	1523.7	g
Mass of container & dry specimen (M_{cds})	1499.5	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	24.2	g
Mass of container (M_c)	1263.0	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	236.5	g
Moisture content (w) $w = (M_w / M_s) \times 100$	10.2	%

Soil Description: Grey in color consists of mostly fines.

Proctor ID: Frost Protection # 2

Standard Proctor (ASTM D698)

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

$\rho d = (100 \times 118.5) / (100 + 10.2 = 107.5$ *lbs/ft^3*

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

Maximum Dry Density ($\gamma_d max$) 118.6 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.9 (%)

Required Moisture: 6.9 % to 16.9 %

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

107.5 / 118.6 x 100 = 90.6 %

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: 11/1/10

_____ Failed Moisture

_____ Failed Compaction Time: 09:30

By: Kevin Keele / Kevin Keele

(print) *(signature)*

Kyle Gilman 11-4-10

QA/QC APPROVAL DATE

ENERGY SOLUTIONS

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER

LIFT IDENTIFICATION: UFA01101028-00 DATE: 11/1/2010

TEST ID NUMBER(S): 2

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

ASTM D6938 (DENSITY DETERMINATION)

Make/Model Troxler 3430 Gauge Serial # 31674

Last Calibration Date: 3/4/10

Daily Standard Counts: *On-Cell Standard*

Density 2516 Moisture 703

Method A (Direct Transmission)

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

Moisture Count 164 Density Count 1586

Wet Density (ρ_m) 126.1 *(lbs/ft^3)* Dry Density 113.0 *(lbs/ft^3)*

Moisture Density 13.1 *(lbs/ft^3)* Moisture Fraction 11.6 *(%)*

ASTM D1556 (DENSITY DETERMINATION)

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

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

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

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

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

Dry Denisty

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

Dry Unit Weight

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

MOISTURE DETERMINATION

ASTM D4643

Container ID 1263

Mass of container & wet specimen (M_{cms})	1544.3	g
Mass of container & dry specimen (M_{cds})	1512.0	g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	32.3	g
Mass of container (M_c)	1263.0	g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	249.0	g
Moisture content (w) $w = (M_w / M_s) \times 100$	13.0	%

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

$\rho d = (100 \times 126.1) / (100 + 13.0) =$ 111.6 *lbs/ft^3*

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

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

111.6 / 118.6 x 100 = 94.1 %

Soil Description: Grey in color consists of mostly fines.

Proctor ID: Frost Protection # 2

Standard Proctor (ASTM D698)

Maximum Dry Density ($\gamma_d max$) 118.6 (lbs/ft^3)

Optimum Moisture (w_{opt}) 11.9 (%)

Required Moisture: 6.9 % to 16.9 %

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: 11/1/10

____ Failed Moisture

____ Failed Compaction Time: 11:30

By: Kevin Keele / Kevin Keele

(print) *(signature)*

QA/QC APPROVAL 11-4-10 DATE

October 15, 2010

RB&G
ENGINEERING, INC.

Jason Whitman, Project Manager
Nielson Construction
P.O. Box 620
825 North Loop Road
Huntington, UT 84528

Re: Uranium Mill Tailings Remedial Action Project (UMTRA)
Disposal Cell near Crescent Junction

Dear Mr. Whitman:

On Friday, October 12, 2010, at the request of Mark Greenhalgh of Nielson Construction, a visit was made to the site of the Moab Uranium Mill Tailings Remedial Action Project (UMTRA) Disposal Cell near Crescent Junction, Utah, operated by Energy Solutions. The purpose of the visit was to evaluate the fill material being used as part of the cap layer which overlies the uranium tailing. We were asked to determine if the material being used contained less than 5 percent sandstone fragments. It is our understanding that this layer of the cap is referred to as the Biointrusion Infiltration Layer. At the time of this visit, the layer appeared to be approximately 6 to 8 inches thick. The material consisted predominately of cobble sized angular basalt with some rounded quartzite with some finer gravels. It is our understanding that this layer will be covered by additional layers of other materials.

The evaluation was conducted by randomly selecting an area 100 feet by 100 feet. The area was then systematically traversed while visually noting the number and size of the sandstone fragments within the given area. It should be noted that, in addition to the softer sandstone fragments, some relatively soft red volcanic scoria was also observed. These fragments appear to breakdown just as readily as the sandstone and have been included with the percent of sandstone. Most sandstone fragments ranged from 0.15 to 0.5 foot. Our calculated visual percentage within this area was less than 1% sandstone fragments. It is our opinion that, based on this visual inspection, this material meets the specification of containing less than 5% sandstone fragments.

If there are any questions regarding the information contained herein, please call.

Sincerely,

RB&G ENGINEERING, INC.

Michael N. Hansen

Michael N. Hansen, P.G.

REVIEWED BY:

Bradford E. Price

Bradford E. Price, P.E.

REGISTERED PROFESSIONAL ENGINEER
NO.162291
BRADFORD E. PRICE
STATE OF UTAH
1/6/10

1135 WEST 820 NORTH, PROVO, UTAH 84601-1343
PROVO 801-374-5771 SALT LAKE CITY 801-521-5771 FAX 801-374-5773

CMT ENGINEERING LABORATORIES
Construction • Materials • Technologies
Geotechnical, Environmental, & Materials Engineering/Testing/Research

June 30, 2010

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions
Project#: 3022
Material: 2" Cap Rock
Source: Freemont Junction #4

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.716	9.0	9	81.0	90
Absorption %	0.6%	7.3	2	14.6	20
Sodium Sulfate %	0.1%	10	11	110	110
LA Abrasion	7.3	6.5	1	6.5	10
Schmidt Hammer	43	5.3	3	15.9	30
Total Score				**228.0**	**260**

Rating = *87.9*

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 211613

Relative Density (oven Dry) = 2.716
Relative Density (SSD) = 2.731
Relative Density (apparent) = 2.758
Absorption (%) = 0.6 %

Los Angeles Abrasion ASTM C-131
Lab # 211611

100 Revolutions	Grading A	
12 Spheres		
% Wear	=	7.3 %

Sodium Soundness ASTM C-88
Lab # 211612

% Loss	=	0.1 %

Schmitt Hammer
213839

Rebound Number		42, 44
Average	=	43

- Schmitt Hammer test performed on sawed surface of 6" cobbles

Sincerely,

Susan Arnold

June 30, 2010

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions
Project#: 3022
Material: 2" Cap Rock
Source: Freemont Junction #3

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.650	8.0	9	72.0	90
Absorption %	0.8%	6.2	2	12.4	20
Sodium Sulfate %	0.1%	10	11	110	110
LA Abrasion	7.2	6.5	1	6.5	10
Schmidt Hammer	39	4.9	3	14.7	30
Total Score				**215.6**	**260**

Rating = ***82.9***

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 211610

Relative Density (oven Dry) = 2.650
Relative Density (SSD) = 2.670
Relative Density (apparent) = 2.704
Absorption (%) = 0.8 %

Los Angeles Abrasion ASTM C-131
Lab # 211608

100 Revolutions	Grading A	
12 Spheres		
% Wear	=	7.2 %

Sodium Soundness ASTM C-88
Lab # 211609

% Loss	=	0.1 %

Schmitt Hammer
213839

Rebound Number		40, 38
Average	=	39

- Schmitt Hammer test performed on sawed surface of 6" cobbles

Sincerely,

Susan Arnold

CMT ENGINEERING LABORATORIES
Construction • Materials • Technologies
Geotechnical, Environmental, & Materials Engineering/Testing/Research

June 30, 2010

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions
Project#: 3022
Material: 2" Cap Rock
Source: Freemont Junction #2

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.675	8.1	9	72.9	90
Absorption %	0.8%	6.2	2	12.4	20
Sodium Sulfate %	0.1%	10	11	110	110
LA Abrasion	6.7	7.0	1	7.0	10
Schmidt Hammer	39	4.9	3	14.7	30
Total Score				**217.0**	**260**

Rating = ***83.5***

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 211607

Relative Density (oven Dry) = 2.675
Relative Density (SSD) = 2.698
Relative Density (apparent) = 2.738
Absorption (%) = 0.8 %

Los Angeles Abrasion ASTM C-131
Lab # 211605

100 Revolutions	Grading A	
12 Spheres		
% Wear	=	6.7 %

Sodium Soundness ASTM C-88
Lab # 211606

% Loss	=	0.1 %

Schmitt Hammer
213839

Rebound Number		40, 38
Average	=	39

- Schmitt Hammer test performed on sawed surface of 6" cobbles

Sincerely,

Susan Arnold

CMT ENGINEERING LABORATORIES
Construction • Materials • Technologies
Geotechnical, Environmental, & Materials Engineering/Testing/Research

June 30, 2010

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions
Project#: 3022
Material: 2" Cap Rock
Source: Freemont Junction #1

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.677	8.1	9	72.9	90
Absorption %	0.5%	8.0	2	16	20
Sodium Sulfate %	0.1%	10	11	110	110
LA Abrasion	6.3	7.2	1	7.2	10
Schmidt Hammer	37	4.4	3	13.2	30
Total Score				**219.3**	**260**

Rating = *84.3*

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 211600

Relative Density (oven Dry)	=	2.677
Relative Density (SSD)	=	2.689
Relative Density (apparent)	=	2.711
Absorption (%)	=	0.5 %

Los Angeles Abrasion ASTM C-131
Lab # 211598

100 Revolutions	Grading A	
12 Spheres		
% Wear	=	6.3 %

Sodium Soundness ASTM C-88
Lab # 211599

% Loss	=	0.1 %

Schmitt Hammer
213839

Rebound Number		36, 38
Average	=	37

- *Schmitt Hammer test performed on sawed surface of 6" cobbles*

Sincerely,

Susan Arnold

September 22, 2009

Neilson Construction
P.O. Box 620
Huntington, Utah 84528

Project: Energy Solutions, Crescent Junction Disposal Cell Cap Rock
Project#: 3022
Material: Basalt
Source: Freemont Junction #3

Laboratory Test	Average Test Value	Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.670	8.1	9	72.9	90
Absorption %	0.8%	6.1	2	12.2	20
Sodium Sulfate %	0.0%	10	11	110	110
LA Abrasion	6.5	7.2	1	7.2	10
Schmidt Hammer	52	6.8	3	20.4	30
Total Score				**222.7**	**260**

Rating = ***85.7***

TEST RESULTS

Specific Gravity and Absorption ASTM C-127
Lab # 179332

Relative Density (oven Dry) = 2.670
Relative Density (SSD) = 2.691
Relative Density (apparent) = 2.727
Absorption (%) = 0.8 %

Los Angeles Abrasion ASTM C-131
Lab # 202571

100 Revolutions	Grading A	
12 Spheres		
% Wear	=	7.8 %

Sodium Soundness ASTM C-88
Lab # 202573

% Loss	=	0.0 %

Schmitt Hammer
203967

Rebound Number		35,37,35
Average	=	36

Sincerely,

Susan Arnold

CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 11/12/09
PROJECT: MISC. QC
SAMPLE LOCATION: FREMONT PIT - OFF BELT
MATERIAL TYPE: RIPRAP
TESTED BY: KC SAMPLED BY: CLIENT LAB #: 5181

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	9965.3	20.2	80	
2 in. (50mm)	16601.7	33.6	46	40 - 50
1 1/2 in. (37.5mm)	8744.1	17.7	28	20 - 30
1 in. (25mm)	5262.9	10.7	18	10 - 20
3/4 in. (19mm)	3868.1	7.8	10	
1/2 in. (12.5mm)	2416.5	4.9	5	5 - 25
3/8 in. (9.5mm)	219.7	0.7	4	
# 4 (4.75mm)	365.5	1.2	3	0 - 5
# 8 (2.36mm)	184.6	0.6	3	0 - 5
# 16 (1.18mm)	131.4	0.4	2	0 - 5
# 30 (600um)	88.8	0.3	2	
# 50 (300um)	85.8	0.3	1	
#100 (150um)	96.2	0.3	1	
#200 (75um)	80.9	0.3	0.9	0 - 5
-#200 (-75um)	12.6			

Total Sample Aggregate Weight: 49385.0
- 1/2" Aggregate Weight: 1510.1 - 1/2" After Wash Weight: 1265.5

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93. John Christian

P.O. BOX 427 CENTERFIELD, UT. 84622 (435) 528-5711 FAX (435) 528-5710

CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 11/16/09
PROJECT: MISC. QC
SAMPLE LOCATION: FREMONT PIT - OFF BELT
MATERIAL TYPE: RIPRAP
TESTED BY: KC SAMPLED BY: CLIENT LAB #: 5187

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	10428.6	19.6	80	
2 in. (50mm)	17511.9	32.9	48	40 - 50
1 1/2 in. (37.5mm)	9587.9	18.0	30	20 - 30
1 in. (25mm)	6144.2	11.5	18	10 - 20
3/4 in. (19mm)	4094.4	7.7	10	
1/2 in. (12.5mm)	2512.6	4.7	6	5 - 25
3/8 in. (9.5mm)	312.8	0.9	5	
# 4 (4.75mm)	404.6	1.2	3	0 - 5
# 8 (2.36mm)	270.2	0.8	3	0 - 5
# 16 (1.18mm)	184.4	0.5	2	0 - 5
# 30 (600um)	123.4	0.4	2	
# 50 (300um)	114.8	0.3	1	
#100 (150um)	122.4	0.4	1	
#200 (75um)	95.6	0.3	0.8	0 - 5
-#200 (-75um)	13.8			

Total Sample Aggregate Weight: 53251.4
- 1/2" Aggregate Weight: 1889.6 - 1/2" After Wash Weight: 1642.0

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93 John Christen

P.O. BOX 427 CENTERFIELD, UT. 84622 (435) 528-5711 FAX (435) 528-5710

CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 10/27/09
PROJECT: MISC. QC
SAMPLE LOCATION: FREMONT PIT - OFF BELT
MATERIAL TYPE: RIPRAP
TESTED BY: JC SAMPLED BY: CLIENT LAB #: 5149

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	18391.3	32.9	67	
2 in. (50mm)	12240.5	21.9	45	40 - 50
1 1/2 in. (37.5mm)	9224.1	16.5	29	20 - 30
1 in. (25mm)	6302.4	11.3	17	10 - 20
3/4 in. (19mm)	3488.2	6.2	11	
1/2 in. (12.5mm)	3034.6	5.4	6	5 - 25
3/8 in. (9.5mm)	278.7	1.0	5	
# 4 (4.75mm)	296.1	1.0	4	0 - 5
# 8 (2.36mm)	143.1	0.5	3	0 - 5
# 16 (1.18mm)	116.7	0.4	3	0 - 5
# 30 (600um)	93.5	0.3	2	
# 50 (300um)	90.4	0.3	2	
#100 (150um)	83.7	0.3	2	
#200 (75um)	83.4	0.3	1.5	0 - 5
-#200 (-75um)	15.1			

Total Sample Aggregate Weight: 55848.3

- 1/2" Aggregate Weight: 1622.7 - 1/2" After Wash Weight: 1200.7

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93. John Christensen

P.O. BOX 427 CENTERFIELD, UT. 84622 (435) 528-5711 FAX (435) 528-5710

CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 10/30/09

PROJECT: MISC. QC

SAMPLE LOCATION: FREMONT PIT - OFF BELT

MATERIAL TYPE: RIPRAP

TESTED BY: JC SAMPLED BY: CLIENT LAB #: 5150

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	15638.4	31.4	69	
2 in. (50mm)	11130.6	22.3	46	40 - 50
1 1/2 in. (37.5mm)	8288.6	16.6	30	20 - 30
1 in. (25mm)	5995.6	12.0	18	10 - 20
3/4 in. (19mm)	3312.4	6.6	11	
1/2 in. (12.5mm)	2692.1	5.4	6	5 - 25
3/8 in. (9.5mm)	308.4	0.9	5	
# 4 (4.75mm)	365.9	1.1	4	0 - 5
# 8 (2.36mm)	168.3	0.5	3	0 - 5
# 16 (1.18mm)	139.5	0.4	3	0 - 5
# 30 (600um)	119.2	0.4	2	
# 50 (300um)	112.9	0.3	2	
#100 (150um)	105.2	0.3	2	
#200 (75um)	92.9	0.3	1.3	0 - 5
-#200 (-75um)	16.3			

Total Sample Aggregate Weight: 49852.3

- 1/2" Aggregate Weight: 1858.3 - 1/2" After Wash Weight: 1428.6

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93. John Christensen

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CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 11/04/09

PROJECT: MISC. QC

SAMPLE LOCATION: FREMONT PIT - OFF BELT

MATERIAL TYPE: RIPRAP

TESTED BY: JC SAMPLED BY: CLIENT LAB #: 5159

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	16522.8	29.6	70	
2 in. (50mm)	11845.5	21.2	49	40 - 50
1 1/2 in. (37.5mm)	10787.4	19.3	30	20 - 30
1 in. (25mm)	5876.2	10.5	19	10 - 20
3/4 in. (19mm)	3618.9	6.5	13	
1/2 in. (12.5mm)	3344.9	6.0	7	5 - 25
3/8 in. (9.5mm)	277.6	1.2	6	
# 4 (4.75mm)	334.2	1.5	4	0 - 5
# 8 (2.36mm)	149.8	0.7	4	0 - 5
# 16 (1.18mm)	125.4	0.5	3	0 - 5
# 30 (600um)	101.4	0.4	3	
# 50 (300um)	98.7	0.4	2	
#100 (150um)	97.4	0.4	2	
#200 (75um)	88.5	0.4	1.4	0 - 5
-#200 (-75um)	12.7			

Total Sample Aggregate Weight: 55898.7

- 1/2" Aggregate Weight: 1597.8 - 1/2" After Wash Weight: 1285.7

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93. John Christensen

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CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-95 AASHTO T27-93)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-95 AASHTO T11-91)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 11/10/09

PROJECT: MISC. QC

SAMPLE LOCATION: FREMONT PIT - OFF BELT

MATERIAL TYPE: RIPRAP

TESTED BY: DB SAMPLED BY: CLIENT LAB #: 5175

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
4 in. (100mm)		0.0	100	100
3 in. (75mm)	23676.9	21.7	78	
2 in. (50mm)	32329.4	29.6	49	40 - 50
1 1/2 in. (37.5mm)	20629.6	18.9	30	20 - 30
1 in. (25mm)	14090.4	12.9	17	10 - 20
3/4 in. (19mm)	5309.9	4.9	12	
1/2 in. (12.5mm)	5537.1	5.1	7	5 - 25
3/8 in. (9.5mm)	253.2	1.1	6	
# 4 (4.75mm)	399.0	1.7	4	0 - 5
# 8 (2.36mm)	239.1	1.0	3	0 - 5
# 16 (1.18mm)	172.0	0.7	3	0 - 5
# 30 (600um)	117.6	0.5	2	
# 50 (300um)	101.0	0.4	2	
#100 (150um)	105.0	0.4	1	
#200 (75um)	84.9	0.4	0.8	0 - 5
-#200 (-75um)	15.8			

Total Sample Aggregate Weight: 109298.2

- 1/2" Aggregate Weight: 1653.7 - 1/2" After Wash Weight: 1487.8

REMARKS:

I certify that this test was performed in accordance with ASTM C117-95 & C136-95/AASHTO T11-91 & T27-93. John Christensen

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- Compaction by CAES – the QC inspector shall monitor CAES compaction by visually inspecting the process and reviewing the computer records for each layer of soil placed.
- Compaction Verification Tests – Perform in-place density and moisture content tests on compacted fill material in accordance with the following requirements:
    - Verification tests of in-place density shall be performed on initial layers of soil placed, and on any layers in which the CAES indicates that problems occurred obtaining compaction.
    - When verification in-place density and moisture content tests are performed on a soil layer, a minimum of one test shall be preformed a minimum of 2 tests per 5,000 cubic yards of fill material placed.
    - Compaction and moisture content tests shall be performed in accordance with the following methods:
        - ASTM D 1556 – Density and Unit Weight of Soil in Place by the Sand-Cone Method
        - ASTM D 2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
        - ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
        - ASTM D 6938 - In-Place Density and Water content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
        - ASTM D 4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating

    Note: Companion sand cone tests and oven moisture tests must be performed along with nuclear tests until a sufficient number have been performed to demonstrate a clear correlation.

6.9.5 Initial and Confirmatory Surveys

Verification of the thickness of the Frost Protection Layer will be performed by comparing before and after surveys of the Layer. Prior to placement of the Frost protection Layer, an initial survey shall be performed of the section to be capped. The initial survey will document the geometry of the top of the Infiltration and Biointrusion Layer. After the Frost Protection Layer has been installed, a post-installation survey will be performed on the top of the Frost Protection Layer to confirm that the total fill thickness is in accordance with the plans and specifications.

6.10 ROCK ARMORING

The final cap layer is Rock Armoring, placed over the Frost Protection Layer. The Rock Armoring will vary in size and thickness at different locations on the cap, and shall be installed in accordance with the project plans and specifications Rock shall be spread to the thickness indicated on the drawings or in accordance with oversizing due to scoring criteria. Rock placement shall be guided by the Computer Aided Earthmoving System to

ensure that the appropriate thickness has been placed at all locations. Stone with a D50 of 2 inches or less shall be compacted with a vibratory steel drum.

6.10.1 Erosion Protection Materials Testing

Rock for the final cover layers shall be tested by a commercial testing laboratory during production in accordance with the following:

Rock Armoring	Reference
Specific Gravity (SSD)	ASTM C-127
Absorption	ASTM C-127
Sodium Sulfate Soundness (5 cycles)	ASTM C-88 (course aggregate)
L.A. Abrasion (100 cycles)	ASTM C-131
Schmidt Rebound Hardness	ISRM Method

Test samples shall be submitted to a commercial testing lab for analysis and subsequent acceptance or rejection or the material represented by the test results, based on engineering calculations.

Rock for the final cover layers shall be tested for gradation in accordance with ASTMs C-117 and C-136, and other approved testing methods. Test results shall be in accordance with the Design Specification.

Rock for the final cover layers shall be tested a minimum of four times. The materials shall be tested initially prior to the delivery of any of the materials to the site and at the beginning of placement. Thereafter, the tests shall be performed prior to placement at a minimum frequency of one test for each 10,000 cubic yards or fractions thereof produced/placed (durability tests for materials produced/gradation tests for materials placed). Where the total volume is less than 30,000 cubic yards, the test frequency shall be one test for each type material when approximately one-third and two thirds of the total volume of material has been produced/placed. A final set of durability tests shall be performed near completion of production for each type material. A final gradation test shall be performed near completion of placement for each type material.

Rock for the final cover layers shall be rock material that has long-term chemical and physical durability. Rock for final cover layers shall achieve an acceptable score for its intended use, in accordance with the rock scoring and acceptance criteria.

At the quarry operations periodically a geologist will inspect the stockpiles to ensure the percent of other than grey basalt does not exceed 10% for rock for the final cover layers.

6.10.2 Rock Acceptance Criteria

An acceptable rock score depends on the intended use of the rock. The rock's score must meet the following criteria:

- For occasionally saturated areas, which include the top and sides of the final cover, the rock must score at least 50% or the rock is rejected. If the rock scores between 50% and 80% the rock may be used, but a larger D50 must be provided (oversizing). If the rock score is 80% or greater, no oversizing is required.
- For frequently saturated areas, which include all channels and buried slope toes, the rock must score 65% or the rock is rejected. If the rock scores between 65% and 80%, the rock may be used, but must be oversized. If the rock score is 80% or greater, no oversizing is required.

Oversize rock as follows:

- Subtract the rock score from 80% to determine the amount of oversizing required. For example, a rock with a rating of 70% will require oversizing of 10 percent (80% - 70% = 10%).
- The D50 of the stone shall be increased by the oversizing percent. For example, a stone with a 10% oversizing factor and a D50 of 12 inches will increase to a D50 of 13.2 inches.
- The final thickness of the stone layer shall increase proportionately to the increased D50 rock size. For example, a layer thickness equals twice the D50, such as when the plans call for 24 inches of stone with a D50 of 12 inches, if the stone D50 increases to 13.2, the thickness of the layer of stone with a D50 of 13.2 should be increased to 26.4 inches.

QC Inspector shall verify that the Rock Armoring is installed in accordance with Plans and Specifications by checking and confirming:

- Stone gradations match the gradation required in the specifications and based on visual verification, fines (material < 200 mesh) are dispersed evenly throughout the rock.
- Stone material is placed to produce the thickness required by the plans for each area. As a minimum, depth verification will be performed every 10,000 cu yds.

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- Stone material is placed to produce the thickness required by the plans for each area. As a minimum, depth verification will be performed every 10,000 cu yds.

Cell Component	Material of Construction	Compaction Requirements	Lift Thickness max./ approx loose / compact	Frequency of Verification Tests
Cell Excavation	N/A	N/A	N/A	N/A
Perimeter Embankment	Common Fill	95%	12" / 10"	Initial layer / Section 6.3.4
RRM Placement	RRM	90%	Average thickness 12" / 10"	Initial layer / Section 6.4.3