CITY OF Grand Junction COLORADO

Hallenbeck No. 1 Reservoir Downstream Slope Repair Project

Final Construction Report

Prepared for:

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INTRODUCTION

The City of Grand Junction (City) owns and operates Hallenbeck No. 1 Reservoir (aka Purdy Mesa Reservoir). The reservoir is located in Mesa County, Colorado, and is about 21 miles southeast of the City. The reservoir is an off-stream reservoir with inflows delivered from the City's largest reservoir Juniata Reservoir. Juniata Reservoir is located immediately upstream from Hallenbeck No. 1 Reservoir.

The Hallenbeck dam is a homogenous earth-fill structure and includes a low-level outlet pipe and a spillway located at the north end of the reservoir. Previously, the reservoir had a high-level outlet structure and pipe, however, the City decided to remove the high-level outlet structure and abandon the high-level outlet pipe utilizing a cellular cement grout in June, 2016. Hallenbeck No. 1 Reservoir is classified as a high hazard structure by the Colorado Division of Water Resources (DWR).

PROJECT SUMMARY

The primary purpose of this project was to replace the old toe-drain system that had stopped collecting seepage water. The dam rehabilitation project replaced the old toe-drain system with a new chimney filter and toe-drain system, and placed new buttress material on the downstream slope to protect against unfiltered seepage exits.

For unknown reasons, the old toe-drain system stopped collecting seepage water and essentially dried up in year 2014. In the summer of 2014, the downstream slope of the dam structure developed surface cracks towards the center of the dam, possibly due to the increase in hydrostatic pressure within the dam structure, because the old toe-drain was no longer able to collect the seepage water and convey the water out away from the structure. The reservoir pool was immediately drained upon discovering the cracks.

The City contracted with engineering design consultant, AECOM, to investigate the cause of the cracks and to design a proper toe-drain system for the downstream face of the dam. AECOM also developed the necessary construction plans and the project specifications.

CONSTRUCTION SUMMARY

The Hallenbeck No. 1 Reservoir project was a very successful project, and the City opened construction bids on July 21, 2016. The apparent low bidder was M.A. Concrete Construction, Inc. of Grand Junction, Colorado and they were awarded a construction contract that began on August 29, 2016 with final acceptance being issued to the Contractor on December 20, 2016. In general, the project conformed to the approved plans, specifications, and project documents. Construction photos placed in chronological order are provided in Appendix B.

Problems encountered during construction were minimal, and the largest problem that resulted in a change to the construction plans was encountering soft and saturated subgrade soils in the toe-drain excavation between station 2+50 to 3+25 +/- and also in the location of the concrete retaining wall. The soft subgrade soils wouldn't allow the contractor to successfully install the new toe-drain system, and the soft subgrade didn't provide a firm platform to allow proper compaction of the filter sand media, and wasn't an acceptable foundation for the retaining wall to be constructed on. The soft and saturated soils

were located at the foundation of the dam elevation where the existing natural drainage channel once existed.

The City met with the DWR regarding possible solutions to the soft subgrade material. The idea of using a thick layer of crushed stabilization rock underneath the toe-drain to provide a stable platform for the construction of the toe-drain system on was proposed. The City generated a stabilization rock detail and it was presented to the DWR, and was approved on September 20, 2016. The installed stabilization detail is shown in the as-built construction plans on sheet C-4.

During the placement of the filter sand and the embankment fill, the City requested a Field Change to the DWR to increase the lift thickness of both the sand and the embankment material. The purpose was for constructability to keep the lift thickness uniform for both materials, and for compaction of the filter sand.

The project specifications specified the filter sand to be installed in 9-inch loose-lift thickness, and for the embankment fill to be installed in an 8-inch loose-lift thickness. These different lift thicknesses proved challenging for the contractor's material placement operations. The City wrote the DWR an email on October 4, 2016 requesting permission to increase the loose-lift thickness for both the filter sand, and the embankment fill, to 12-inch loose-lift thicknesses, in order for the contractor to build up the downstream face of the dam in uniform lift thicknesses for both materials. Also, by increasing the filter sand thickness to 12-inches, it reduced the likelihood of the contractor over-compacting the sand and breaking down the sand particles. The DWR authorized the 12-inch loose-lift thicknesses for the project in an email dated October 4, 2016.

The final deviation from the construction plans, was the orientation of the new toe-drain where it crossed the reservoir's low-level outlet pipe. The construction plans on sheet C-8 show the new toe-drain being installed above the low-level outlet pipe. During construction it was believed that the new toe-drain would work more effectively if located underneath the low-level outlet pipe. With the toe-drain underneath the outlet pipe, the toe-drain is able to collect any seepage water that travels along the outside of the low-level outlet pipe. The as-built construction plans on sheet C-8 show the new orientation of the toe-drain pipe in relation to the low-level outlet pipe.

The City provided project inspection and worked with the contractor and the Quality Control subcontractor, to verify that the project was being constructed per the approved plans and specifications. The City's construction inspection reports are provided in Appendix C.

The final inspection with the DWR took place on December 1, 2016, however, the contractor was not complete with construction, and there were still a few minor construction items that needed to be completed. The DWR final inspection report noted these incomplete construction items as punch-list items. After all of the punch-list items were complete, the City issued final acceptance to the contractor on December 20, 2016.

GEOLOGIC OBSERVATIONS SUMMARY

The materials excavated for the installation of the new toe-drain system were consistent. However, during excavation for the south toe-drain, the contractor encountered a small native seam of Mancos shale around toe-drain station 0+25 +/-. The seam of Mancos shale was relatively small, and was approximately 15-ft long.

During the scheduled weekly on-site meeting with the DWR on September 12, 2016, the Mancos shale layer was observed. The City and the DWR office informed the contractor that the Mancos shale excavated out of the trench could not be used as embankment fill later in the project. The contractor disposed of the shale that was excavated from the toe-drain excavation in a disposal site located on the eastside of the reservoir out of the reservoir pool area.

Per note #3 on sheet C-4 within the construction plans, the cobble rocks encountered in the vicinity of toe-drain station 3+00 and also in Test Pit #5, were removed during construction. The excavated material with cobble rocks was removed and stockpiled in the north area of the reservoir pool. This stockpiled material was then processed through the contractor's large sieve machine to screen out the larger rocks, and the material was later used as embankment fill. Embankment fill material, meeting the project specifications, was used to backfill this excavation where the cobble rocks were removed. The bulk of cobble rocks encountered in this area were located on the downstream side of the new toe-drain alignment.

All of the material excavated as part of the toe-drain excavation, was stockpiled in the north area of the reservoir pool area, where it was then processed through the contractor's large sieve machine to meet the embankment fill specification for later use on the project. The over-sized screened rock unacceptable for use in the embankment fill material, was disposed of within the reservoir pool area.

The borrow site for generating the majority of embankment fill, differed from what was shown in the original construction plans. The original borrow site shown in the plans was located approximately halfway between Hallenbeck Reservoir and Juniata Reservoir, up on elevated ground above Hallenbeck Reservoir. This proposed borrow site showed signs of having a high concentration of large rocks and required screening to meet the gradation specification, and also showed evidence of low moisture content (very dry material) that would require an additional amount of water for moisture conditioning.

During the Pre-Bid meeting for the project in June 2016, the City and the bidders discussed the option of using the material within Hallenbeck's reservoir pool as the source for embankment fill material. The City's design consultant did investigate the possibility of using the material within the reservoir pool area as embankment fill, however, at the time of digging the test pit and taking samples in year 2015, the design consultant deemed this material too wet to be used as embankment fill. The reservoir was drained in the summer of 2014, and in year 2015 the soils were remained saturated when the design consultant excavated the test pit within the reservoir.

Following the Pre-Bid meeting, the City excavated test pits within the south area of the reservoir pool area to determine the soil characteristics. The City found that the material in the south area had dried out substantially, and the soil appeared to be acceptable sandy-clay material with adequate moisture. It was determined that this material within the reservoir pool area was adequate for embankment fill. The City discussed using this material for embankment fill with the design consultant and the DWR, and after sampling the material, and having a local geotechnical engineering company perform a series of

tests on the material, the design consultant approved the use of the material within the southern reservoir pool area as an approved borrow source. The borrow site provided material that was generally classified as lean clay and sandy lean clay (CL) with some sand and gravel.

MATERIAL TESTING SUMMARY

The contractor provided the quality control (QC) testing on this project, and there was no quality assurance testing required on this project. The QC testing outfit for this project was Huddleston-Berry Engineering and Testing, LLC of Grand Junction, Colorado. All material testing was completed per specifications. The components of construction that needed QC testing included: embankment fill, concrete, filter sand, drain gravel, and rebar inspection.

During the course of the project there were two failing tests. First, a relative compaction test performed on September 23, 2016 for the embankment fill didn't meet the minimum compaction requirement of 95%. The failing test showed a relative compaction of 93%. The QC tester notified the contractor's on-site foreman of the failing test and the location of the failing test, and the contractor was able to make a few more passes utilizing the sheeps-foot roller compactor, ultimately resulting in a passing test. Moisture levels in the embankment fill material did not propose an issue, as the contractor was able to control moisture in the conditioning processes of the embankment fill.

The second failing tests occurred on the project with the filter sand compaction testing. On October 5, 2016, the QC tests showed failing relative density (%) tests of 48% and 45% near station 1+00. The filter sand specification required the sand be compacted to 65-70 percent relative density.

The contractor and the QC testing firm recognized difficulty with consistency on achieving 65-70 percent relative density on the sand. On October 6, 2016, the DWR met with the contractor and the QC staff to discuss the possibility of using a different testing method to determine the sands compaction. It was suggested by the DWR that a one-point standard proctor test be run on the filter sand at the Saturated Surface Dry (SSD) condition to determine the dry density in pounds per cubic foot (pcf). The SSD condition was determined by ASTM C128. The result of the one-point proctor test at SSD was 106.3 pcf dry density at 3.9% moisture. As a result, it was determined that a passing compaction test on the filter sand shall be within plus or minus 1 pcf of the 106.3 pcf dry density. This method for determining the filter sands compaction was used for the remainder of the project starting on October 6, 2016.

All QC test reports are provided in Appendix E.

RESERVOIR STAGE-STORAGE CAPACITY CURVE SUMMARY

With Hallenbeck No. 1 Reservoir drained due to the crack(s) on the downstream dam face, the City hired Cartographic Edge, Inc. in the summer of 2015 to produce a topographic map of the reservoir bottom using aerial methods. Cartographic Edge, Inc. had the reservoir flown on July 27, 2015. With a new surface model of the reservoir bottom produced by Cartographic Edge, Inc., the City was able to produce a current stage-storage capacity curve for the reservoir.

The project utilized material from within the reservoir pool area as the borrow source for the embankment fill material on the downstream dam face. The borrow material was primarily excavated from the southern end of the reservoir pool area near the channel inlet into Hallenbeck.

As a result of removing borrow material from within the reservoir pool area, a new stage-storage capacity curve needed to be generated. Once the contractor was finished excavating the borrow material, the City surveyor performed a topographic survey of only the borrow area that the contractor used during construction to get as-built conditions. The City survey information was integrated into the Cartographic Edge, Inc. information to create a surface model that represented the true shape of the reservoir bottom. With an as-built surface model of the reservoir bottom, the City created a new reservoir stage-storage capacity curve. This new capacity curve is provided in Appendix A, as well as, on sheet G-2 within the as-built construction plans.

PIEZOMETER SUMMARY

Huddleston-Berry Engineering and Testing, LLC abandoned the six (6) original piezometers using a cement-bentonite slurry mixture. The abandonment of the original piezometers occurred on September 3, 2016.

Huddleston-Berry also installed the ten (10) new piezometers per plan. The contractor surveyed the top of each piezometer casing pipe and the ground level to established real elevations for each piezometer. The new piezometer information is provided in Appendix D.

CLOSED CAPTIONING TV (CCTV) INSPECTION VIDEOS

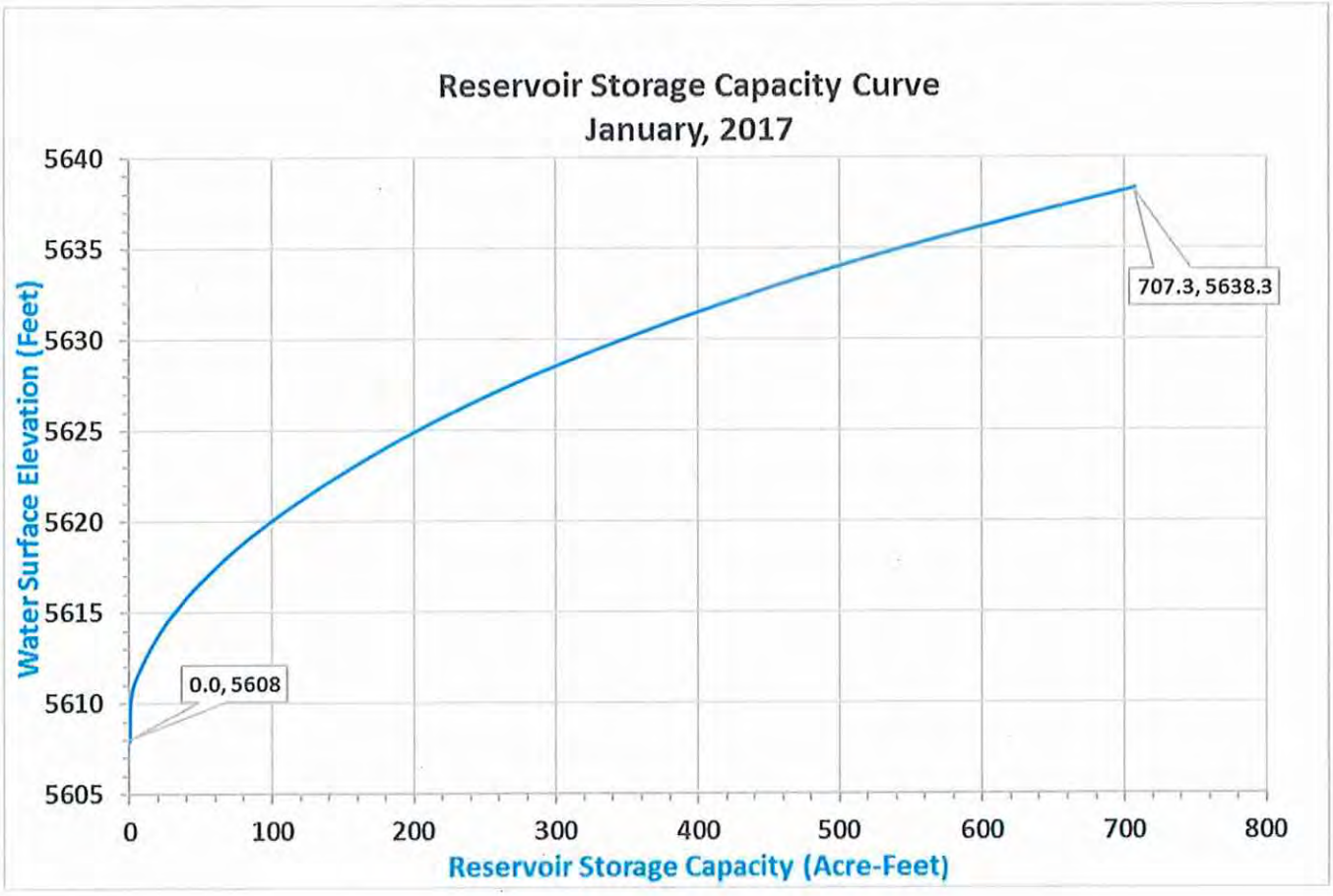
The project specifications required the contractor to inspect the as-built toe-drain pipe using camera inspection. The reasons for inspecting the toe-drain pipe using camera equipment was to verify that the pipe had not been damaged during installation, the pipe joints were together properly, and the pipe was free of debris (dirt, rocks, etc.). The contractor hired a private CCTV pipe inspection company to inspect the toe-drain pipe. Unfortunately, the private CCTV inspection company was unable to inspect the pipe because their camera equipment was too large to fit through the 8-inch diameter elbow fittings.

As a result, the City inspected the toe-drain pipes using a small CCTV inspection camera that was able to fit through the toe-drains elbow fittings. During initial video inspections, the City found that the toe-drain did have filter sand debris and other dirt debris inside the pipe. The contractor was notified to flush the north and south toe-drain pipes with water to try and remove the debris out of the pipe. The City video inspected the pipes again after the contractor flushed the pipes and found that all of the debris was removed within the perforated sections of pipe but the flushing moved the majority of debris into the toe-drain outfall pipes. At this point, the City used its own jetting truck to pull out the remaining debris from inside the toe-drain outfall pipes.

The final as-built CCTV inspection videos for the north and south toe-drain took place on February 14, 2017 and are provided in Appendix G.

Appendix A – Stage-Storage Capacity Curve

Stage Storage At Hallenbeck No. 1 Reservoir					
Contour Elevation AMSL	**Volume (cu yds)**	**Total Volume (cu yds)**	**Volume (cu ft)**	**Total Volume (cu ft)**	**Capacity (ac-ft)**
5608	4.16	4.16	112.32	112.32	0.0
5609	88.84	93.00	2,398.68	2,511.00	0.1
5610	497.73	590.73	13,438.71	15,949.71	0.4
5611	3,435.25	4,025.98	92,751.75	108,701.46	2.5
5612	8,461.52	12,487.50	228,461.04	337,162.50	7.7
5613	10,155.07	22,642.57	274,186.89	611,349.39	14.0
5614	12,252.81	34,895.38	330,825.87	942,175.26	21.6
5615	14,650.64	49,546.02	395,567.28	1,337,742.54	30.7
5616	16,927.46	66,473.48	457,041.42	1,794,783.96	41.2
5617	19,603.09	86,076.57	529,283.43	2,324,067.39	53.4
5618	21,763.38	107,839.95	587,611.26	2,911,678.65	66.8
5619	24,053.85	131,893.80	649,453.95	3,561,132.60	81.8
5620	26,826.03	158,719.83	724,302.81	4,285,435.41	98.4
5621	29,128.53	187,848.36	786,470.31	5,071,905.72	116.4
5622	31,051.50	218,899.86	838,390.50	5,910,296.22	135.7
5623	33,115.44	252,015.30	894,116.88	6,804,413.10	156.2
5624	35,281.08	287,296.38	952,589.16	7,757,002.26	178.1
5625	37,817.68	325,114.06	1,021,077.36	8,778,079.62	201.5
5626	40,575.40	365,689.46	1,095,535.80	9,873,615.42	226.7
5627	43,372.58	409,062.04	1,171,059.66	11,044,675.08	253.6
5628	46,585.02	455,647.06	1,257,795.54	12,302,470.62	282.4
5629	49,904.36	505,551.42	1,347,417.72	13,649,888.34	313.4
5630	53,173.27	558,724.69	1,435,678.29	15,085,566.63	346.3
5631	56,284.42	615,009.11	1,519,679.34	16,605,245.97	381.2
5632	59,371.51	674,380.62	1,603,030.77	18,208,276.74	418.0
5633	62,829.48	737,210.10	1,696,395.96	19,904,672.70	456.9
5634	66,861.48	804,071.58	1,805,259.96	21,709,932.66	498.4
5635	71,259.42	875,331.00	1,924,004.34	23,633,937.00	542.6
5636	75,999.12	951,330.12	2,051,976.24	25,685,913.24	589.7
5637	79,884.04	1,031,214.16	2,156,869.08	27,842,782.32	639.2
5638	83,947.53	1,115,161.69	2,266,583.31	30,109,365.63	691.2
5638.3	25,916.31	1,141,078.00	699,740.37	30,809,106.00	707.3


Reservoir Storage Capacity Curve
January, 2017
Water Surface Elevation (Feet)
5640
5635
5630
5625
5620
5615
5610
5605
0.0, 5608
707.3, 5638.3
0
100
200
300
400
500
600
700
800
Reservoir Storage Capacity (Acre-Feet)

Appendix B – Construction Photos

Photo #1: August 10, 2016 – Installation of new 18" dia. HDPE Corrugated pipe for the reservoirs low-level outlet pipe. The wood form boards are for the concrete thrust-blocks. Work completed by the City of Grand Junction.

Photo #2: August 17, 2016 – Thrust-blocks poured and backfill operations ready to start. New HDPE pipe was bedded in ¾" minus pipe bedding rock. Backfill material came from the borrow site within the reservoir pool area. Walk behind sheeps-foot roller was used to compact backfill material. Work completed by the City of Grand Junction.

Photo #3: September 3, 2016 – Subcontractor, Huddleston-Berry Engineering, abandoning the dams old piezometers using a cement-bentonite grout.

Photo #4: September 8, 2016 – Photo showing the over-excavation completed at the north end of the dam to accommodate the filter sand layer and the embankment fill. The same was done at the south end of the dam as well. This was done so the new embankment fill would tie into the existing dam grades at each end.

Photo #5: September 9, 2016 – Photo looking at the 2-ft deep over-excavation of the dam slope (Sta. 2+89 to 3+79). This area corresponds to the area of the dam that developed the downstream crack(s).

Photo #6: September 14, 2016 – Excavation begins on the south toe-drain.

Photo #7: September 15, 2016 – The 8" dia. HDPE perforated toe-drain pipe is delivered and stockpiled on-site.

Photo #8: September 15, 2016 – Photo showing the south toe-drain excavation looking north along the dam face.

Photo #9: September 20, 2016 – The toe-drain excavation encountered wet and soft subgrade conditions between toe-drain stations 2+50 to 3+25 +/-. Stabilization rock and geogrid would be used to stabilize this area for placement of the filter sand, drain gravel and toe-drain pipe. Photo shows contractor pumping out the ground water/seepage water.

Photo #10: September 21, 2016 – Contractor processing the proposed embankment fill to get rid of rocks that are larger than 4-inches per specification.

Photo #11: September 21, 2016 – Installation of the stabilization rock and geogrid in the toe-drain excavation between stations 2+50 to 3+25 +/-. Stabilization rock was a 1-1/2" crushed rock and a 2-foot thick layer of rock was placed above the soft subgrade material. Geogrid was placed in the middle of the 2-foot thick rock layer.

Photo #12: September 22, 2016 – Photo showing completion of the rock stabilization zone with the contractor's bypass pumping equipment set up. Filter sand would be placed on top of this stabilization rock.

Photo #13: September 22, 2016 – Concrete retaining wall excavation. Soft subgrade conditions existed here as well. Photo shows a separation fabric placed directly on the soft subgrade with geogrid and stabilization rock placed on top. As-built detail of retaining wall subgrade shown within the As-Built set of construction plans.

Photo #14: September 22, 2016 – North and south toe-drain outfall pipes daylighting out into the drainage. Pipes shown above the toe-drain pipes are the City's 4-inch domestic water supply line, the future 6-inch domestic water supply line and a 2-inch electrical conduit.

Photo #15: September 27, 2016 – Contractor's quality control subcontractor performing compaction/density tests on the filter sand. A smooth drum roller and the application of clean water was used to compact the filter sand.

Photo #16: September 27, 2016 – Photo shows the south toe-drain being installed. Filter sand and drain gravel encapsulate the 8-inch diameter HDPE toe-drain pipe. The toe-drain pipe can be seen in this photo to the right of the smooth drum roller.

Photo #17: September 27, 2016 – Photo shows the contractor's operations for installing the toe-drain. Water is being applied to the filter sand to keep it wet while the smooth drum roller compacts the sand. Drain gravel is surrounding the pipe.

Photo #18: September 30, 2016 – South toe-drain pipe installed and encapsulated in the filter sand and drain gravel. Ready for embankment fill to be placed on top of the filter sand.

Photo #19: October 3, 2016 – Photos shows the smooth drum roller compacting the filter sand chimney drain, while to the right of the filter sand the embankment fill is being compacted using a large sheeps-foot roller compactor. Indentations from the sheeps-foot roller can be seen in the embankment fill.

Photo #20: October 5, 2016 – Excavation of the north toe-drain. This photo shows the contractor excavating around the reservoir's low-level outlet pipe. The toe-drain would be installed underneath the low-level outlet pipe. Installation details are shown in the As-Built construction plans.

Photo #21: October 10, 2016 – Steel reinforcement for the footer of the concrete retaining wall.

Photo #22: October 17, 2016 – Photo showing the 3-ft wide filter sand chimney and the embankment fill to the right.

Photo #23: October 17, 2016 – Photo showing the borrow area within the reservoir pool area. The borrow area was towards the south end of the reservoir.

Photo #24: October 18, 2016 – Embankment fill operations.

Photo #25: October 18, 2016 – Placement operations of the Embankment fill and filter sand.

Photo #26: October 20, 2016 – Grading and compaction operations of the embankment fill.

Photo #27: October 20, 2016 – Completed concrete retaining wall. Embankment fill will be placed and compacted around the wall.

Photo #28: October 21, 2016 – Photo shows contractor's method for placing the filter sand. Side dump trailers were used to place the filter sand. The contractor then used a grader to level the filter sand and then the smooth drum roller compactor would compact the filter sand. A water truck was used to keep the sand wet.

Photo #29: October 27, 2016 – Embankment fill operations in relation to the existing dam crest.

Photo #30: October 28, 2016 – Filter sand and embankment fill operations.

Photo #31: October 28, 2016 – Subcontractor installing the new piezometers along the downstream face of the dam.

Photo #32: November 2, 2016 – Contractor stripping and prepping the upstream face of the dam crest for the placement of drain gravel and riprap.

Photo #33: November 15, 2016 – Drain gravel placement along the upstream face of the dam. Riprap protection will be placed on top of the drain gravel.

Photo #34: November 15, 2016 – Riprap placement along the upstream face of the dam.

Photo #35: November 28, 2016 – Subcontractor installing the new piezometers along the crest of the dam.

Photo #36: December 15, 2016 – Photo shows the completed retaining wall, pipe bollards, recycled asphalt millings placed on the dam service roads, and seed, fertilizer, mulching operations. Photo is looking south.

Photo #37: December 15, 2016 – Photo shows the installed piezometers, dam crest station markers, movement monuments set in concrete, and the seeding, fertilizing, mulching operations.

Photo #38: December 15, 2016 – Subcontractor raking the downstream dam face prior to broadcasting native seed, fertilizing and applying mulching.

Photo #39: December 27, 2016 – Aluminum hand railing installed along the top of the retaining wall.

Appendix C – City Inspection Reports (08/29/16 – 10/13/16)

City of Grand Junction, Dept. of Public Works & Utilities PROJECT DIARY	Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair Date: **08/29/16**

Calendar days: 68	Working days:	Hours worked: ~
Approximate number of employees: N/A	Weather: Sunny, Warm	Temperature Range: 70-80ish
Time lost and reason: No time lost		Project Engineer: Lee Cooper State Engineer: Garrett Jackson Superintendent: Josh Jackson

The contractor: M.A. Concrete Construction, Inc.

City of GJ Personnel Onsite: Lee Cooper & John Eklund

Subcontractors Onsite: N/A

Equipment Onsite: Track-hoe and sheep's foot compactor

Equipment Operating: No equipment was operating today. MA Concrete starting mobilizing equipment onto the construction site. By 3:30 pm, a track-hoe and a sheep's foot compactor were on-site.

Work Completed: No actual work, other than mobilizing a couple pieces of equipment to the jobsite, was completed today. No stripping or earth moving operations occurred.

Signing and barricading: N/A

Traveled roadway condition: Dry

City of Grand Junction, Dept. of Public Works & Utilities PROJECT DIARY	Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair Date: **08/30/16**

Calendar days: 68	Working days: 2	Hours worked: ~
Approximate number of employees: N/A	Weather: Sunny, Warm	Temperature Range: 70-80ish
Time lost and reason: No time lost		Project Engineer: Lee Cooper State Engineer: Garrett Jackson Superintendent: Josh Jackson

The contractor: M.A. Concrete Construction, Inc.

City of GJ Personnel Onsite: Lee Cooper

Subcontractors Onsite: N/A

Equipment Onsite: Track-hoe, sheep's foot compactor, Blade

Equipment Operating: No equipment was operating today. MA Concrete continues to mobilize equipment onto the construction site.

Work Completed: No actual work, other than mobilizing a blade to the jobsite, was completed today. No stripping or earth moving operations occurred today.

Signing and barricading: N/A

Traveled roadway condition: Dry

City of Grand Junction, Dept. of Public Works & Utilities PROJECT DIARY	Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair Date: **08/31/16**

Calendar days: 68	Working days: **3**	Hours worked: ~
Approximate number of employees: N/A	Weather: Sunny, Warm	Temperature Range: 70-80ish
Time lost and reason: No time lost		Project Engineer: Lee Cooper State Engineer: Garrett Jackson Superintendent: Josh Jackson

The contractor: M.A. Concrete Construction, Inc.

City of GJ Personnel Onsite: Lee Cooper

Subcontractors Onsite: N/A

Equipment Onsite: Track-hoe, sheep's foot compactor, Blade

Equipment Operating: No equipment was operating today. MA Concrete continues to mobilize equipment onto the construction site.

Work Completed: No actual work was completed today. No stripping or earth moving operations occurred today.

Signing and barricading: N/A

Traveled roadway condition: Dry

City of Grand Junction, Dept. of Public Works & Utilities PROJECT DIARY	Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair Date: **09/01/16**

Calendar days: 68	Working days: **4**	Hours worked: ~
Approximate number of employees: 3	Weather: Sunny, Warm	Temperature Range: 70-80ish
Time lost and reason: No time lost		Project Engineer: Lee Cooper State Engineer: Garrett Jackson Superintendent: Josh Jackson

The contractor: M.A. Concrete Construction, Inc.

City of GJ Personnel Onsite: Lee Cooper

Subcontractors Onsite: N/A

Equipment Onsite: Track-hoe, sheep's foot compactor, Blades (2), front end loader, 6 wheel dump truck

Equipment Operating: Track-hoe being used to strip 6" topsoil from downstream face of reservoir. One blade being used for clearing and grubbing in borrow area. Front end loader being used to dam up channel in borrow area.

Work Completed: I arrived on-site around 2 pm. MA Concrete was working on the track-hoe due to an oil leak or breakdown. At 2 pm, half of the downstream face of the dam was stripped of topsoil. Topsoil was being stockpiled at the toe of the dam face.

MA Concrete also built a perimeter road that will be used for hauling material from the borrow site to the dam location. MA Concrete also dammed up the inlet channel of Hallenbeck Reservoir to start working on creating a water pond to be used for moisture conditioning and dust control.

Signing and barricading: N/A

Traveled roadway condition: Dry

City of Grand Junction, Dept. of Public Works & Utilities PROJECT DIARY	Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair Date: **09/06/16**

Calendar days: 68	Working days: **9**	Hours worked: ~
Approximate number of employees: 5	Weather: Sunny, Warm	Temperature Range: 70-80ish
Time lost and reason: No time lost		Project Engineer: Lee Cooper State Engineer: Garrett Jackson Superintendent: Josh Jackson

The contractor: M.A. Concrete Construction, Inc.

City of GJ Personnel Onsite: Lee Cooper

Subcontractors Onsite: N/A

Equipment Onsite: Track-hoe (2), sheep's foot compactor, Blades (2), front end loader (2), 6-wheel dump truck, scrapper

Equipment Operating: The scrapper, a front end loader, and the 6-wheel dump truck were working in the borrow area grubbing out the vegetation. Grubbed vegetation was being placed outside of the reservoir pool area on the east side of the natural clay hill.

One track-hoe and one front end loader were being used to remove and stockpile the topsoil stripped from the downstream face of the dam.

Work Completed: I arrived on-site around 1:30 pm. MA Concrete continues to grub the borrow site. Dams are built in the borrow site and are ready for more water to be released from Juniata Reservoir.

Surveyor has completed half of the subgrade staking. MA Concrete was stockpiling the topsoil stripped from the face of the dam.

Signing and barricading: N/A

Traveled roadway condition: Dry

City of Grand Junction, Dept. of Public Works & Utilities PROJECT DIARY	Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair Date: **09/09/16**

Calendar days: 68	Working days: **12**	Hours worked: ~
Approximate number of employees: 4 or 5	Weather: Sunny, Warm	Temperature Range: 70-80ish
Time lost and reason: No time lost		Project Engineer: Lee Cooper State Engineer: Garrett Jackson Superintendent: Josh Jackson

The contractor: M.A. Concrete Construction, Inc.

City of GJ Personnel Onsite: Lee Cooper and John Eklund

Subcontractors Onsite: N/A

Equipment Onsite: Track-hoe (2), sheep's foot compactor, Blades (2), front end loader (2), 6-wheel dump truck, scrapper, track mounted skid steer, water truck

Equipment Operating: Water truck was watering the lower face of the downstream dam face and watering the haul roads.

The track mounted skid steer was smoothing out the downstream dam face and trying to get the material more consolidated than before when the topsoil was stripped way with the track-hoe.

Work Completed: John and I arrived on-site around 9:00 am. MA Concrete was smoothing out the downstream face of the dam with a skid steer. MA Concrete was watering the lower portions of the dam face with their water truck. Their water truck is only able to sprays 1/3 of the way up the dam face from the bottom (if that). Unable to water from the dam crest due to survey stakes and the crest being too narrow now for the water truck.

The watering pond seems to be working good for now. MA Concrete has a generator and a pump next to the pond and the water appears to be pretty clean and not much sediment in it. MA Concrete has been using the teeth of the blade to scarify the borrow areas and create troughs (rows) in the ground. The contractor is then flooding these areas with the pumped water to try and start moisture conditioning the soil. Trying to get water to percolate down into the soil for preliminary moisture conditioning. I told Josh to try and keep the water to a minimum from getting into the existing wetlands area. We don't want to rest making the wetland area too wet and the water somehow making its way into the downstream dam excavations that MA Concrete will be starting the week of Sept. 12th.

MA Concrete has completed the over-excavations in the three areas called out for on sheet C-4. The north and south excavations had cuts of 5-feet. The City told MA Concrete to excavate out 2-feet of material in the dam crack zone even though the survey stakes didn't show a 2-foot cut.

Next week (week of Sept. 12th), MA Concrete plans to start excavating out the toe-drain area.

Signing and barricading: N/A

Traveled roadway condition: Dry

City of Grand Junction, Dept. of Public Works & Utilities PROJECT DIARY	Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair Date: **09/12/16**

Calendar days: 68	Working days: **15**	Hours worked: ~
Approximate number of employees: 3	Weather: Sunny, Warm	Temperature Range: 70-80ish
Time lost and reason: No time lost		Project Engineer: Lee Cooper State Engineer: Garrett Jackson Superintendent: Josh Jackson

The contractor: M.A. Concrete Construction, Inc.

City of GJ Personnel Onsite: Lee Cooper, John Eklund and Slade Connell

Subcontractors Onsite: N/A

Equipment Onsite: Track-hoe (2), sheep's foot compactor, Blades (2), front end loader (2), 6-wheel dump truck, scrapper, track mounted skid steer, water truck

Equipment Operating: Water truck was watering the lower face of the downstream dam face and watering the haul roads.

The track-hoe was being used for the toe-drain excavation. Front end loader was being used to stockpile good material from the toe-drain excavation for future use as embankment fill.

Work Completed: John and I arrived on-site around 9:55 am. Today held the weekly progress meeting on-site. Garrett Jackson attended the meeting, as well as, Slade Connell. Topics of the weekly meeting are shown below:

1. **Shale excavated from the toe-drain excavation shall not be used as embankment fill. All mancos shall excavated shall be disposed of in the waste area behind the eastside of the reservoir pool area.**
2. **It was suggested that the contractor pothole a couple areas along the toe-drain alignment to see if there are any variations in the soil layers or if the soil is somewhat consistent across the toe-drain alignment.**
3. **The City is going to look into a topography survey of the existing reservoir pool surface in the borrow area. The City will survey before and after borrow material is removed. The original capacity of Hallenbeck Reservoir was about 800 ac-ft. The current capacity estimate for Hallenbeck is about 686 ac-ft.**
4. **The Contractor may need to temporarily support the existing 16" dia. Steel flowline that will be next to the retaining wall excavation. It appears the existing 16" pipe is welded pipe and not jointed. This will need to be verified.**
5. **It appears the contractor will work the toe-drain in three separate segments. The first segment is the southern half of the toe-drain. The second segment will be the northern half of the toe-drain, and the final segment will be where the retaining wall is. All in attendance thought this was a good idea for construction sequencing.**
6. **It was agreed upon at today's meeting that the 1:1 slope on the downstream side of the toe-drain detail (Detail 1 on sheet C-7) can be eliminated. The soil is very tight and with the shale layer the existing soil can be left almost vertical. This will save a substantial amount of time not needing to excavate this material.**
7. **All loose cobble rocks, 4" and larger in the final subgrade surface, need to be removed prior to subgrade compaction and filter sand being placed.**
8. **The City is going to verify that the 2' over excavation zone, where the dam crack developed, is in the proper location per the plans. The City needs to show Garrett that the excavation zone is correct or needs to be enlarged.**

MA Concrete started today on excavating the toe-drain. They started excavation at the south end of the dam and are working north.

MA Concrete was watering the lower portions of the dam face with their water truck.

Signing and barricading: N/A

Traveled roadway condition: Dry

City of Grand Junction, Dept. of Public Works & Utilities PROJECT DIARY	Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair Date: **09/14/16**

Calendar days: 68	Working days: **17**	Hours worked: ~
Approximate number of employees: 3	Weather: Cloudy, Warm	Temperature Range: 70-80ish
Time lost and reason: No time lost		Project Engineer: Lee Cooper State Engineer: Garrett Jackson Superintendent: Josh Jackson

The contractor: M.A. Concrete Construction, Inc.

City of GJ Personnel Onsite: Lee Cooper, Bret Guillory, Mike Grinzenko

Subcontractors Onsite: N/A

Equipment Onsite: Track-hoe (2), sheep's foot compactor, Blades (2), front end loader (2), 6-wheel dump truck, scrapper, track mounted skid steer, water truck

Equipment Operating: Two (2) track-hoes, the large 6-wheel dump truck, and the track mounted skid-steer.

One track-hoe was being used for the toe-drain excavation. The other track-hoe was being used to stockpile good material from the toe-drain excavation for future use as embankment fill.

The skid-steer was in the bottom of the toe-drain excavation and was fine tuning the subgrade and smoothing out the subgrade. The subgrade appears to be pretty solid.

Work Completed: Bret and I arrived on-site around 9:15 am.

MA Concrete was working on the toe-drain excavation. To date, MA Concrete has excavated around 200-LF of toe-drain trench. They started excavation at the south end of the dam and are working north. They anticipate the toe-drain excavation will take about 2-weeks to complete.

MA Concrete is loading the 6-wheel dump truck and hauling good excavation material from the toe-drain to a stockpile zone within the reservoir pool southeast of the reservoir's spillway structure.

MA Concrete will continue excavating the toe-drain.

The City surveyor was on-site today to topo the existing ground surface of the borrow site. This info will be used at a later date to help determine how much borrow material was used and help determine the new capacity of the reservoir.

Signing and barricading: N/A

Traveled roadway condition: Dry

City of Grand Junction, Dept. of Public Works, Utilities, & Planning PROJECT DIARY	**Project**: Hallenbeck No. 1 Reservoir Downstream Slope Repair **Date**: 9/22/2016

Calendar days: Unknown	**Working days:** Unknown	**Inspection times**: 09:10 – 12:00 & 12:30 – 16:00	**Hours worked:** ~ 08:00 – 12:00 & 12:30 – 16:00
Approximate number of employees: 7 - 15		**Weather:** Mostly sunny (0 – 20 mph Winds)	**Temperature range:** 50 – 80's °F
Time lost and reason: None			**Project Engineer:** Lee Cooper **Superintendent:** Andy A.

City of GJ Personnel Onsite: Dan Blumberg, Lee Cooper, John Eklund, Slaid Connell
Subcontractors Onsite: None known
Other Onsite: Garrett Jackson: Dam Safety Engineer CO Division of Water Resources
Equipment Onsite: 1 Wacker Neuson RTSC2 walk-behind sheepsfoot roller, 1 Link Belt 460 trackhoe, 2 Link Belt 210X trackhoes, 1 John Deer 250D 6-wheel dump truck, 1 Volvo A40D 6-wheel dump truck, 1 tandem end dump truck, 1 side dump truck (7 axles), 1 end dump truck (7 axles), 2 John Deer 744H front end loaders, 1 Bobcat T650 track-driven skid steer, 1 rock box, 1 Wacker G25 pump, 1 mobile Grizzly screen unit, 1 jumping jack tamper
Equipment Operating: All equipment onsite

I met Lee Cooper, John Eklund & Garrett Jackson onsite as Josh Jackson (MA) was about midway through the process of over-excavating for the construction of the concrete wall footer. MA over-excavated about 2 – 3' of mucky saturated dark brown to black clays which were being loaded onto their dump trucks and hauled to the top of the dam area. MA was then installing a layer of separation fabric, a layer of BX1200 geogrid and then a little over 2' of 1-1/2" minus crushed gravels. I inquired about the lack of excavation for the toe wall of the wall. Josh said that he planned to dig it out once the concrete crew formed the wall. Josh indicated that they had moved the alignment of the wall about 5' on the N end to the E., which he got approval for however I was unable to confirm this at this time.

Throughout the day, MA imported and stockpiled moist sand to be placed around the toe drain lines. Lee, John, Garrett, Slaid, Josh & I discussed the installation of the outlet drain line, sand and gravel placement & compaction, which Josh indicated would begin on Monday Sept. 26. Garrett indicated that the sand needs to be in the saturated state when placed & compacted in order to prevent it from being over-compacted. Lee reiterated that the specified compaction is 65 – 70 % of relative density determined by ASTM D4253 & D4254, which Garrett said should be checked with a nuclear gauge after about the 3rd vertical foot of fill is placed. Josh said that they would be bringing in a small smooth drum roller to compact the sand and also indicated that they would be watering the material heavily during and after placement. expressed concern that the smooth drum roller would compact the material too tightly with 4 passes and placed in 9" lifts, as specified. He suggested that a roller pass and placement pattern study be performed with a nuclear gauge to determine that the specified compaction is being achieved. I inquired if a sample of the material had been tested and indicated that the testers would need a maximum / minimum density to determine the percent compaction. Garrett said indicated that a 1 pt. standard proctor could be run in the field to determine the maximum wet density of the material. Garrett to send Lee a procedure, which he was to forward to me. I collected a 5-gallon sample for testing, if deemed necessary.

Josh expressed concern over where the drain outlet was staked at which was to the S. of a pair of gate valves and did not match up with the existing drainage way. Lee approved Josh to relocate the drain line just to the N of the valves to orient it with the drainage way but to have the outlet angled towards the bank of the existing drainage way.

Garrett also expressed concern that the drain outlet was to consist of plastic ADS pipe, which he worried would be damaged by wildlife of slope collapse. He requested that Lee add a solid end section be added. Lee to look into this.

MA reported that on the previous day they had completed a 2' over-excavation of the toe drain where they had installed separation fabric and geogrid.

Josh removed additional native soils from between the toe drain and the wall for equipment access primarily and also over-excavated 1 – 2 vertical feet to remove large cobbles from the embankment fill area.

In the PM, MA worked to install the drain outlet line from the outlet at the ditch towards the toe drain. MA used their trackhoe to carefully dig around and expose the 18-inch diameter cast iron water line towards the E. as well as two 6-inch diameter PVC water lines & a grey ~ 2-inch diameter PVC conduit line. No damage was observed. MA informed me that there was no requirement for pipe bedding. MA installed a pair of 8-inch diameter ADS corrugated drain pipe, overhanging in the ditch, which they intend to shorten at a later time. MA angled the pipe outlet towards the bank of the ditch as requested to slow the outlet waters. MA then installed a pair of 8-inch diameter 22-1/2 degree elbow fittings just to the W. of the PVC pipe crossings and then another pair of 20 LF joints of ADS brand HDPE solid pipe. The pair of pipes were installed with a minimum of a foot of separation. MA used their level & transit to check and determine pipe grades which they reported was being constructed to match the plans by coming up at a rate of 0.10' / 20 LF of pipe installed to meet the planned 0.50 % design slope. MA then installed screened native moist brown sandy silty clays to about the top of the pipe (8" lift) which they compacted to spring line of the pipe using their jumping jack tamper. MA then installed about an addition 1' lift of the native soils and used their walk-behind sheepsfoot roller with vibration to compact the additional material. Additional fill was later placed & compacted in the same manner. MA continued to excavate & install another pair of 20 LF joints towards the dam in the same manner, which they backfilled. MA began the excavation & removal of cobbly soils towards the dam with the intention of installing the sweeps to the toe drain line on the following day. Josh indicated that they would be installing a small amount of sand to construct the connections to the toe drain and that he had scheduled their QC testing firm, Huddleston-Berry to be onsite to perform testing.

When I returned to the office I reported my observations of the day to Lee Cooper, PE.

Materials used today:
54.44 SY BX1200 geogrid: wall footer stabilization
54.44 SY of separation fabric: wall footer stabilization
~ 35 LF x 14' wide x 2' deep of 1-1/2" minus crushed gravel placed to stabilize the concrete wall
~ 12 loads of sand imported from the Whitewater Coffman Road pit & stockpiled onsite
120 LF of 8-inch diameter solid ADS corrugated exterior HDPE drain pipe installed from the ditch outlet towards the dam (2 pipes side by side). **~ 10 LF of pipe to be later cut & removed from ends.**
2 8-inch diameter 22-1/2 degree elbow fittings installed ~ 12 LF E of ADS drain outlet

Signing and barricading:

Traveled roadway condition: Dry

Signed: DANIEL BENGOCHEA	**Title:** Construction Inspector

City of Grand Junction, Dept. of Public Works, Utilities, & Planning

PROJECT DIARY

Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair

Date: 9/23/2016

Calendar days: Unknown	**Working days:** Unknown	**Inspection times**: 08:00 – 13:10	**Hours worked:** ~ 08:00 – 12:00 & 12:30 - ???
Approximate number of employees: 7 - 15		**Weather:** Mostly cloudy with scattered Am showers (0 – 20 mph Winds)	**Temperature range:** 40 – 60's °F
Time lost and reason: None			**Project Engineer:** Lee Cooper **Superintendent:** Andy A.

City of GJ Personnel Onsite: Dan Blumberg, Lee Cooper, John Eklund, Slade Connell
Subcontractors Onsite: Huddleston-Berry (QC)
Other Onsite: None known
Equipment Onsite: 1 Wacker Neuson RTSC2 walk-behind sheepsfoot roller, 1 Link Belt 460 trackhoe, 2 Link Belt 210X trackhoes, 1 John Deer 250D 6-wheel dump truck, 1 Volvo A40D 6-wheel dump truck, 1 tandem end dump truck, 1 side dump truck (7 axles), 1 end dump truck (7 axles), 2 John Deer 744H front end loaders, 1 Bobcat T650 track-driven skid steer, 1 rock box, 1 Wacker G25 pump, 1 mobile Grizzly screen unit, 1 jumping jack tamper, 1 water truck,
Equipment Operating: All equipment onsite minus 1 skid steer
Site conditions were muddy following rains last night.

MA primarily worked towards installing the drain outlet line towards the toe drain (sweeps) from where they left off yesterday, backfilling the pipe line and grading for construction access to the retaining wall which May Concrete is scheduled to begin forming on Monday Sept. 26.

~ 10 – 20' W. of the toe drain to drain outlet connection, Josh (MA) used a trackhoe to remove additional wet native brown sandy silty clays underlain by a ~ 1 – 2' layer of cobbles which were also removed, loaded onto a dump truck and stockpiled onsite at the top of the dam. MA replaced the wet soils with about a 6 – 12" of somewhat dry native soils which had been screened (-4"). MA then placed about 12" of filter sand about 2' W. of where they intended on switching to perforated HDPE pipe to connect to the toe drain, which they compacted using a vibratory plate compactor. MA then added a pair of 20 LF 8-inch diameter ADS corrugated drain pipe to where they had left of yesterday, which they backfilled using the processed material which appeared as moist brown sandy silty clays with gravels. MA used their jumping jack tamper to compact the material adjacent to the pipe and then their walk-behind sheepsoot roller once about 12" of cover was built over the pipe.

Brian Rabe (Huddleston-Berry) visited mid-AM to perform compaction testing. Brian reported that they had sent in samples of the filter sand to a company in Arizona to determine the relative density tests per ASTM D4253 & D4254, however they did not have results yet but expected them on the following Monday Sept. 26. Brian tested the filter sand with a nuclear gauge and reported that it ranged from about 103 – 109 PCF at ~ 9 % moisture content, which he thought might be over compacted since the material did not appear saturated. MA scarified the compacted sand which was then re-tested and reported to be about 95 – 105 PCF. Since the results are unknown to meet the specified 65 – 70 % relative density, the contractor might have to re-moisture condition / compact the material placed. Brian also tested the moisture / density of the drain outlet backfill that was placed yesterday at about 3' above the top of pipe, adjacent to the wall. Brian reported that the soil was too wet and was only about 88 % compacted (95 % specified). MA reprocessed and re-compacted the material using their sheepsfoot roller and a trackhoe with a shaker head attachment after Brian had left the site. MA added additional embankment fill and were to pothole the failing area to retest with the understanding that if it failed again that they would have to remove & re-compact the majority of the backfill.

I informed Josh (MA) that the PE was concerned that their water source (small pond built by a creek, above the dam) was not going to be clean enough to be used to moisture condition the filter sands and that Juniata Reservoir was a preferred source. Josh moved their pump and water truck from the creek to the reservoir which they reported was also dirty, following last night's precipitation. Later in the day, Josh (MA) made arrangements with Slaid (GJ Water Dept.) to utilize the 4-inch diameter valve to draw domestic water being pumped from the GJ water treatment plant to the Kannah Creek line for a few hours each day when demand is low enough not to disrupt service in order to further water the filter sands being placed onsite.

I had to leave the site for a meeting in the early afternoon. Josh reported that for the remainder of the day, he intended on excavating out for the toe wall of the wall which he had neglected to do on the previous day, further backfill / grade the embankment fill over the drain outlet pipe to provide site access for May's Concrete to begin forming the wall.

When I returned to the office I reported my observations of the day to Lee Cooper, PE.

Materials used today:
40 LF of 8-inch diameter solid ADS corrugated exterior drain pipe (2 pipes side by side) installed towards the dam to ~ 15' W of to drain line

Signing and barricading: None

Site conditions: Muddy

Signed: DANIEL BLUMBERG **Title:** Construction Inspector

City of Grand Junction, Dept. of Public Works, Utilities, & Planning PROJECT DIARY	Project: Hallenbeck #1 Downstream Slope Repair Date 9/26/16 thru 9/3016

Calendar days: N/A	Working days: N/A	Hours worked: 8
Approximate number of employees: 5/2drivers	Weather: varies	Temperature Range: 60's-80's
Time lost and reason: N/A		Project Engineer: Jerod Timothy Superintendent: Andy A. (M.A.)

City of GJ Personnel Onsite: R. Gunther
Subcontractors Onsite: M.A. Construction: (4) toe drain placement, (1) screening embankment (2) material transport drivers
Utility Companies Onsite: 0
Equipment Onsite: (3) Linkbelt Track-hoes, Bobcat track skidster, John Deere 744D Loader, Volvo A40D 6-wheel dump truck, J.Deere 250D 6-wheel dump truck, All-Screen Shaker CV-95, Kawasaki 90 Loader, Wacker-Neuson RD12 smooth drum roller, plate compactor, (2) side dump transports, Yan-Mar track Mini-Excavator
Equipment Operating: see above

9/26/16:
0915 Contractor starts placing 8" slotted outward to a solid wye at the previously placed 8" solid toe drain outfall (sta 3+15), see sheet 9 of 17, 3/C-6, with plans to head south and construct left toe drain.
1000-1045 Weekly Meeting On-site. John Eklund, Trent Prall, Slade and myself (City), Andy Azcarraga Josh Jackson (M.A.) Brian Rabe (H-B) Brian said Huddleston-Berry was unable to perform the Relative Density test on the filter sand and they sent it to Phoenix, AZ; should have results this afternoon.
1240 Yan-Mar Mini-Ex arrives on-site.
1300-1500 Filter sand test section prep, near sta 3+15, see above.
1510 Contractor loads out a few 6-wheels and starts excavating material in the right toe drain as we continue to wait for the filter sand relative density results.
1545-1630 Brian (H-B) arrives with density results and the process of determining a roller pattern begins and ends in agreement that one pass of the mini-ex which is needed to transport, determine grade and place sand and 5 vibratory passes of the W-N RD12 smooth drum, in addition to continuous wetting, would achieve the 65-70% relative density compaction requirements of the filter sand. Brian recorded @ 109.9 gauge reading which equates to 67% relative density in a couple of areas in the test section.

9/27/16
0850 Left toe drain cleanout constructed- **15' slotted 8", solid 8" wye, 8' solid 8" vertical.**
900-1045 Hi- Desert on-site performing comprehensive site grade and staking verification, including outfall area, left toe drain and dam slope.
1045-1545 Construction of left toe drain begins and ends: **60' slotted 8" placed** in a wider excavation 21'W x 65'l x 3.8', sta 2+65 to 3+15, see toe drain typical, pg 9 of 17, 1/C-5.

9/28/16
0830 On-site. Sunny. 55-80 degrees. Left toe drain placement continues south. Garden hose connected to 4" Juniata Res fed pipe with hopes it saves time in moisture conditioning the filter sand during placement. No screening operations, out of material, moisture conditioning screened embankment. Constant moisture conditioning to keep sand wet. Contractor has done well by making sure the drain gravel and filter sand remain separated during placement and that native trench sidewall material is picked out of the placement when it sloves off from the bank.
1540 Stopped @ station 1+01. **146' slotted 8" placed** in a trench 12.5'(avg)W x 146' x 3.8'

9/29/16
0900 on-site. Light overnight precipitation, overcast.
1035 **66' slotted 8" placed to sta 0+36**, left toe drain clean-out started: **1 separate 10' solid to sta 0+26, 22.5, 10' 8" solid another 22.5 to vertical postion.**
1045 Site visit Garrett Jackson, Trent Prall, Rick Brinkman, Ron Key
1300-1500 Top 1' filter sand layer toe drain cap begins/ends loose. Moisture conditioning & compaction planned for tomorrow.

9/30/16
0925 on-site. Cool. Sunny. 65 degrees. Chance of rain. Contractor digging out 3.5'x1.3' toe wall of retaining wall, see pg 17, B/S-2 in preparation of Mays form crew scheduled for 10/3/16.
0925-1200 Moisture conditioning 1' filter sand top layer, 5 vibratory passes with the Smooth Drum Roller. Digging starts on excavating right toe drain section.
1200-100 Dan Blumberg arrives. He will monitor the project the rest of the day and M-W next week.

Signing and barricading: N/A	
Traveled roadway condition: N/A	
	Title: Construction Inspector : Rick Gunther

City of Grand Junction, Dept. of Public Works, Utilities, & Planning PROJECT DIARY	**Project**: Hallenbeck No. 1 Reservoir Downstream Slope Repair **Date**: 9/30/2016

Calendar days: Unknown	**Working days:** Unknown	**Inspection times:** 12:15 – 15:15	**Hours worked:** ~ 08:00 – 12:00 & 12:30 – 16:00
Approximate number of employees: 7 - 10		**Weather:** Mostly sunny (0 – 10 mph Winds)	**Temperature range:** 50 – 70's °F
Time lost and reason: None			**Project Engineer:** Lee Cooper **Superintendent:** Andy A.

City of GJ Personnel Onsite: Dan Blumberg, Rick Gunther
Subcontractors Onsite: None known
Other Onsite: None known
Equipment Onsite: 1 Wacker Neuson RTSC2 walk-behind sheepsfoot roller, 1 Link Belt 460 trackhoe, 2 Link Belt 210X trackhoes, 1 John Deer 250D 6-wheel dump truck, 1 Volvo A40D 6-wheel dump truck, 2 John Deer 744H front end loaders, 1 Bobcat T650 track-driven skid steer, 1 rock box, 1 Wacker G25 pump, 1 mobile Grizzly screen unit, 1 jumping jack tamper, 1 water truck, 1 smooth drum roller, 1 Yanmar mini excavator
Equipment Operating: 1 trackhoe, 2 front end loaders, 2 dump trucks, 1 mobile Grizzly screen unit,

I arrived onsite in the early PM to take over inspection duties for Rick Gunther for the remainder of the day through the following Thursday Oct. 6.

MA primarily worked on excavating out for the toe drain installation from the center of the dam to the NE. Throughout the PM, MA used their trackhoe to excavate and load their large end dump trucks with the native moist to wet brown sandy silty clays with occasional cobbles which was transported up to the top of the dam and then screened through a grizzly to remove the +4" cobbles and processed with the addition of water, as needed using their loader. During the excavation, MA also removed the 4-inch diameter toe drain and sand bedding materials. The excavation was ~ 15' wide and to a depth of ~ 10' to match the grade stakes which were along the slope of the dam. MA checked grade using a transit & grade stake at one point, however at this point they appeared to be simply rough grading the area.

During the PM, MA also removed the sump pump which they had temporarily used to dewater the site for the toe drain outlet, which has been installed.

MA reported that May's Concrete would be onsite in the AM of Monday Oct. 3. To begin forming the concrete wall, however they did not know when they intended on pouring concrete.

MA also began installing the embankment fill over the filter sand overlying the toe drain from the center of the dam towards the SW. MA used a dump truck to place processed embankment fill which they spread out using their front end loader across the cut, insuring that they did not place embankment fill within 3' of the slope of the dam for the later placement of filter sand which is specified. MA was still in the process of spreading the material out prior to my leave, but it appeared to be installed ~ 6 – 12" thick. MA reported that they would compact the material at a later time once they had installed the sands and with Huddleston-Berry onsite to test the moisture / density of the material.

Materials used today:
None known

Signing and barricading: None

Site conditions: Dry

Signed: Daniel Blumberg	**Title:** Construction Inspector

City of Grand Junction, Dept. of Public Works, Utilities, & Planning

PROJECT DIARY

Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair

Date: 10/3/2016

Calendar days: Unknown	**Working days:** Unknown	**Inspection times:** 09:00 – 16:00	**Hours worked:** ~ 08:00 – 12:00 & 12:30 – 16:00
Approximate number of employees: 7 - 10		**Weather:** Mostly cloudy with scattered showers (0 – 10 mph Winds)	**Temperature range:** 40 – 60's °F
Time lost and reason: None			**Project Engineer:** Lee Cooper **Superintendent:** Andy A.

City of GJ Personnel Onsite: Dan Blumberg, Trent Prall, Slade Connell
Subcontractors Onsite: Brian Rabe (Huddleston-Berry)
Other Onsite: None known
Equipment Onsite: 1 Wacker Neuson RTSC2 walk-behind sheepsfoot roller, 1 Link Belt 460 trackhoe, 2 Link Belt 210X trackhoes, 1 John Deer 250D 6-wheel dump truck, 1 Volvo A40D 6-wheel dump truck, 2 John Deer 744H front end loaders, 1 Bobcat T650 track-driven skid steer, 1 rock box, 1 Wacker G25 pump, 1 mobile Grizzly screen unit, 1 jumping jack tamper, 1 vibratory plate compactor, 1 water truck, 1 Yanmar ViO50 mini excavator, 1 CAT CP-565E sheepsfoot roller, 1 Wacker-Neuson RD12 smooth drum roller,
Equipment Operating: 1 trackhoe, 2 front end loaders, 3 dump trucks, 1 mobile Grizzly screen unit, 1 sheepsfoot roller, 1 smooth drum roller, 1 water truck

Upon arrival, MA was continuing to use a trackhoe to excavate the native brown sandy silty clays with occasional cobbles for the toe drain installation from about STA 5+00 to the NE, ~ STA 7+00. MA loaded their large end dump trucks with the native soils which were transported up to the top of the dam and then screened through a grizzly to remove the +4" cobbles and processed with the addition of water, as needed using their loader. During the excavation, MA also removed the 4-inch diameter toe drain and sand bedding materials. The excavation was ~ 15' wide and to a depth of ~ 10 - 15' to match the grade stakes which were along the slope of the dam. MA checked grade using a transit & a grade stick throughout the day to insure the excavation was to grade.

MA also continued installing about 6 – 12" of embankment fill over the previously installed filter sand overlying the toe drain from the center of the dam towards the SW. MA used a front end loader and skid steer to place processed embankment fill which they spread out using their skid steer across the cut, insuring that they did not place embankment fill within 3' of the slope of the dam. MA then used their equipment to place filter sands at least 3' wide adjacent to the excavation slope. MA then used their large sheepsfoot roller to vibrate & compact the embankment fill by making about 4 passes across the fill, which was subsequently tested in the AM by Brian Rabe for moisture / density which he reported was adequate.

MA attempted to use their water truck to saturate the filter sands installed adjacent to the embankment fill however due to slippery conditions and equipment difficulties, they used a garden hose to moisture condition the material which they then compacted with 5 passes with their small smooth drum roller.

In the PM, MA installed another 6 – 12" lift (2nd lift) of embankment fill across the toe drain to the SE of the drain outlet using their dump truck, skid steer and loader, which they compacted using their sheepsfoot roller with about 4 vibratory passes. MA then used their loader and skid steer to install the adjacent filter sand to the E of the fill.

I asked Josh (MA) about the 4-inch relief valve from the 6-inch line to be installed through the concrete wall according to Note #3 on plan sheet C-3. Josh said that they had moved the 6-inch line to the W. of the wall and therefore did not need to install the line through the wall.

The weekly meeting was held today with Slade Connell, Trent Prall, Andy Azcarugra, Josh Jackson, Brian Rabe & myself in attendance. MA reported that May's Concrete would be onsite Tuesday or Wednesday of this week to begin the concrete construction of the wall. I asked MA to ensure that May's provide concrete blankets in anticipation of cold weather forecasted. We also discussed how Huddleston-Berry will be required to perform concrete testing that they may want to cast additional cylinders to prove that the concrete structure is strong enough to support adjacent backfilling operations. It was uncertain at this point to what strength was needed for adjacent backfill, however I later reviewed the specifications and found that 100 % of the design strength (4500 PSI) is required. I also informed Brian Rabe of the slump, air & temperature requirements for the concrete as well as the need to have an additional cylinder casted for a field cure if temperatures are below 40 degrees. Other discussions included that it is uncertain at this point whether the City of GJ would be adding the replacement of the existing waterline from the treatment plant to the project. Slade indicated that the city was possibly hoping to utilize additional funds to clear and grub the reservoir to improve water quality. MA expressed concern that they should be tolerated to increase the lift thickness of the embankment material from 8 inches (specified) to 12 inches in order to match the lift size of the adjacent filter sand as long as they can demonstrate adequate compaction. Trent said that it would have to be approved by Garrett Jackson (State of CO dam inspector), who he would contact to discuss the matter.

Throughout the day, MA also imported loads of sand which was stockpiled onsite using an end dump truck.

Materials used today:
None known

Signing and barricading: None

Site conditions: Dry

Signed: Daniel Blumberg **Title:** Construction Inspector

City of Grand Junction, Dept. of Public Works, Utilities, & Planning PROJECT DIARY	**Project**: Hallenbeck No. 1 Reservoir Downstream Slope Repair **Date**: 10/4/2016

Calendar days: Unknown	**Working days:** Unknown	**Inspection times:** 09:00 – 16:30	**Hours worked:** ~ 08:00 – 12:00 & 12:30 – 16:45
Approximate number of employees: 10 - 15		**Weather:** Mostly sunny (0 – 10 mph Winds)	**Temperature range:** 30 – 60's °F
Time lost and reason: None			**Project Engineer:** Lee Cooper **Superintendent:** Andy A.

City of GJ Personnel Onsite: Dan Blumberg, Ron Key & Mike States (GJ Water Dept.)
Subcontractors Onsite: Brian Rabe (Huddleston-Berry)
Other Onsite: None known
Equipment Onsite: 1 Wacker Neuson RTSC2 walk-behind sheepsfoot roller, 1 Link Belt 460 trackhoe, 2 Link Belt 210X trackhoes, 1 John Deer 250D 6-wheel dump truck, 1 Volvo A40D 6-wheel dump truck, 1 John Deer 744H front end loaders, 1 Kawasaki KCM 90 front end loader, 1 Bobcat T650 track-driven skid steer, 1 rock box, 1 Wacker G25 pump, 1 mobile vibrating Grizzly screen unit, 1 jumping jack tamper, 1 vibratory plate compactor, 2 water trucks, 1 Yanmar ViO50 mini excavator, 1 CAT CP-565E sheepsfoot roller, 1 Wacker-Neuson RD12 smooth drum roller,
Equipment Operating: 1 trackhoe, 2 front end loaders, 2 large 6-wheel dump trucks, 1 mobile Grizzly screen unit, 1 sheepsfoot roller, 1 smooth drum roller, 1 water truck, 1 tandem end dump truck, 1 side dump truck, 1 motor grader

Throughout the day, MA primarily worked to excavate for the N. toe drain while also installing filter sand along the E face of the toe drain excavation and placing embankment fill over the newly installed S. toe drain.

MA continued to use a trackhoe to excavate the native brown sandy silty clays with occasional cobbles for the toe drain installation from about STA 5+50 to the NE. MA loaded their large end dump trucks with the native soils which were transported up to the top of the dam and then screened through a grizzly to remove the +4" cobbles and processed with the addition of water, as needed using their loader. In areas where suitable fill without cobbles and at near the optimal moisture content, MA separated out any remaining cobbles and processed the material using their trackhoe and loaded the excavated material into their tandem end dump truck or used their loader to place the fill as embankment for the toe drain backfill operation. During the excavation, MA also removed the 4-inch diameter toe drain and sand bedding materials. The excavation was dug ~ 15 – 20' wide and to a depth of ~ 10 - 15' to match the grade stakes which were along the slope of the dam. MA final graded the bottom of the excavation using their skid steer and routinely checked grade using a transit & a grade stick throughout the day to insure the excavation was to grade. MA to have High Desert Survey shoot the excavation to confirm accordance with plans.

Throughout the day, MA used a loader to place excavated materials through their vibratory grizzly screen to separate the cobbles to use the remaining as embankment fill. A water truck was used to moisture condition the material as needed.

In the late PM, the material excavated contained wet clays which were hauled to the SW corner of the site and stockpiled for the time being. Josh indicated that he planned to mix the wet soils with dry soils found on that area of the site and once processed and screened as necessary, would be used as embankment fill. Towards the end of the day MA was using a trackhoe to process the soils, however were not placing any of the soils at this time.

MA also continued installing about 9 – 12" lifts of embankment fill over the previously installed 2 lifts of embankment fill overlying the toe drain from the center of the dam (~ STA 3+00) towards the SW (~ STA 0+00). MA used a front end loader and skid steer to place imported filter sands against the slope of the dam to at least 3' wide. MA then used processed embankment fill which they spread out using their skid steer, loader & motor grader across the cut, insuring that they did not place embankment fill within 3' of the slope of the dam where the sands were placed. MA then used their large sheepsfoot roller to vibrate & compact the embankment fill by making about 4 passes across the fill, which was subsequently tested in the PM by Brian Rabe for moisture / density which he reported was adequate.

To widen their haul road access to the toe drain backfill operations to facilitate the use of bigger equipment, MA also worked to install & backfill the S. cleanout pipe, connected to the previously installed N. drain outlet pipe. MA used their trackhoe to excavate around the exposed pipes and area and then installed the layer of sand and then gravel bedding. MA added a 22-1/2 degree elbow fitting to the end of the previously installed N. drain outlet pipe to bend the outlet towards the N with another section of 8-inch diameter perforated HDPE pipe to a full body wye, which they added 7 LF of HDPE to another 22-1/2 degree elbow fitting to bring the clean out pipe upward with an added 8 LF section of HDPE where they ended the clean out. MA then installed additional gravels to haunch the pipe assembly, topped with the sand layer. Embankment fill was placed on top of the area and subsequently compacted using their sheepsfoot roller.

MA used their water truck to side spray the in-place sand, which was then compacted using their small smooth drum roller with 5 passes, which had been established as an adequate amount of compaction during a test section performed last week. By the time Brian Rabe had arrived in the PM, MA had installed another lift of sand by backing their side dump truck up the compacted embankment fill and unloading the sands as they came down the excavation. MA then used their motor grader to windrow the sands against the side of the cut. As requested, Brian attempted to perform a nuclear density test on the sand, however the areas that were suspected as compacted adequately were already covered by loose sand. Brian was able to test a small area near the N. end of the installed sand, which he reported was low in dry density (~ 103 pcf) however it was agreed that this area may not be representative of the majority of the compacted sand since it was within ~ 10' of the end of the roller pattern previously established. I informed Brian & Josh that I was concerned that the change in their method of placing the sand might be changing the rate of compaction since they were running over part of the sand with the wheels of the motor grader while pushing it towards the edge of the excavation. I also expressed concern that the roller pattern that they reportedly established on flat level ground might not be applicable for the slope (~ 10 – 15 %) of the backfill that they were placing. I requested that they have Brian test the sand once compacted to insure compliance with the density requirements which they agreed to do the following day. I also expressed concern that they were leaving a thin layer of sand across much of the embankment fill by using this method of placement. Josh stated that this was not a concern of the engineers as long as the 3' of sand was kept free of soils but either way he agreed to blade the sand back towards the sand placement without contaminating the area within 3' of the slope, however I was not there at the time to observe if they did this.

In the late PM, MA installed another 6 – 12" lift (4th lift) of embankment fill across the toe drain to the SE of the drain outlet using their dump truck, skid steer and loader, which they compacted using their sheepsfoot roller with about 4 vibratory passes. MA then used their water truck to moisture condition the sand which they subsequently compacted using their smooth drum roller with 5 vibratory passes.

Throughout the day, MA also imported loads of sand & gravel which was stockpiled onsite using a side dump truck.

During the day, Ron Key & Mike States (GJ Water Dept.) visited and overlooked some of the construction activities.

Materials used today:
2: 8-inch diameter 22-1/2 degree elbow fittings installed for the N. drain outline line & the cleanout for the N. toe drain
13 LF of perforated 8-inch diameter HDPE pipe from the 22-1/2 degree elbow to the full body wye installed on the N. toe
1: 8-inch diameter full body wye installed for the N toe drain cleanout
15 LF of 8-inch diameter HDPE pipe installed from, the full body wye to the top of the cleanout for the N. toe drain.

Signing and barricading: None

Site conditions: Dry

Signed: DANIEL BLUMBERG	**Title:** Construction Inspector

City of Grand Junction, Dept. of Public Works, Utilities, & Planning

PROJECT DIARY

Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair

Date: 10/5/2016

Calendar days: Unknown	**Working days:** Unknown	**Inspection times**: 08:00 – 15:30	**Hours worked:** ~ 08:00 – 12:00 & 12:30 – 16:00
Approximate number of employees: 10 - 15		**Weather:** Mostly sunny (0 – 10 mph Winds)	**Temperature range:** 30 – 60's °F
Time lost and reason: None			**Project Engineer:** Lee Cooper **Superintendent:** Andy A.

City of GJ Personnel Onsite: Dan Blumberg, John Eklund
Subcontractors Onsite: Brian Rabe (Huddleston-Berry), Mays Concrete
Other Onsite: None known
Equipment Onsite: 1 Wacker Neuson RTSC2 walk-behind sheepsfoot roller, 1 Link Belt 460 trackhoe, 2 Link Belt 210X trackhoes, 1 John Deer 250D 6-wheel dump truck, 1 Volvo A40D 6-wheel dump truck, 1 John Deer 744H front end loaders, 1 Kawasaki KCM 90 front end loader, 1 Bobcat T650 track-driven skid steer, 1 rock box, 1 Wacker G25 pump, 1 mobile vibrating Grizzly screen unit, 1 jumping jack tamper, 1 vibratory plate compactor, 2 water trucks, 1 Yanmar ViO50 mini excavator, 1 CAT CP-565E sheepsfoot roller, 1 Wacker-Neuson RD12 smooth drum roller,
Equipment Operating: 2 trackhoes, 2 front end loaders, 2 large 6-wheel dump trucks, 1 mobile Grizzly screen unit, 1 sheepsfoot roller, 1 smooth drum roller, 2 water trucks, 1 side dump truck, 1 motor grader

Throughout the day, MA primarily worked to excavate for the N. toe drain while also installing filter sand along the E face of the toe drain excavation and placing embankment fill over the newly installed S. toe drain.

When I arrived onsite, I immediately asked Josh (MA) when Huddleston-Berry would be onsite to perform compaction testing of the filter sands installed along the E. slope of the S. toe drain excavation, which I had requested be in the early AM. Josh indicated that they would not be onsite until noon, however that they were going to continue to install additional fill until their arrival, without having any confirmation of the in-place density which hadn't been tested since they had performed a "test section" to establish a roller pattern of 5 vibratory passes (up & back). I did not observe the "test section" and also felt that the process had changed after observing the material break up and cause ripple marks as it initially being rolled on the steep slope of the toe drain backfill as well as a change in compaction effort as they drove their motor grader tires over the sand after they had used their side dump truck to place the sands along the excavation slope. I had brought a nuclear gauge to test the material in the event that QC testing was not going to be onsite soon to test the material and performed several tests at various depths, throughout the backfill areas and determined that the dry density readings ranged from about 101 – 107 PCF which was well below the specified relative density specifications of 65 – 70 %. MA attempted to improve the densities by adding additional water and re-compacting it with additional vibratory passes with their roller, however subsequent testing did not result in higher densities. MA attempted to increase the density tests by using their motor grader to wheel roll the sands which I subsequently tested and determined that it made the results much lower (~ 98 – 102 PCF), which then they rolled again with about 7 additional vibratory passes with their roller however only achieved about (104 – 107 PCF). I expressed concern that this many passes could be breaking the sand particles down, which might be more detrimental to the project. I had MA spray the areas with additional water to observe if the material was still allowing water to percolate through it, which appeared to drain well still. I asked that MA discontinue installing additional filter sand until Huddleston-Berry could demonstrate that they had achieved the specified density. Brian Rabe (Huddleston-Berry) arrived at noon and tested the areas and obtained similar results which indicated that the density was low compared to results obtained during the test section. Brian also reported that the material did not appear different from what he had observed during the test section but agreed with me that the conditions had changed with the increase in slope and use of other equipment. Brian offered to run gradation tests to determine whether the material broke down too much, which the contractor declined due to possible delays. MA requested that Garrett Jackson be contacted and brought in to determine if they could reduce the lower end of the tight relative density test specification, which they were having difficulty obtaining. In the meantime they reported that they were going to install an additional lift of material at their risk. I requested that Brian be onsite when they compact the next lift of sand to perform QC testing which they agreed to have Brian return in the mid-PM, once they had completed it. I tested the compaction of the sand after they had watered it and were in the process of rolling it after 3 – 5 vibratory passes and did not see a significant increase from 3 - 5 passes and reported that the results appeared low and between ~104 – 106 PCF. When Brian visited later he confirmed that the tests indicated that the density of the sand was low.

During the day, MA also installed two new ~ 9 – 12" lifts of embankment fill overlying the toe drain excavation from just S. of the toe drain outlet (~ STA 3+00) towards the SW (~ STA 0+00). They obtained embankment fill from material previously screened through their vibratory grizzly screen to remove the +4" cobbles and processed with the addition of water, as needed using their loader. Fill was placed using their large dump trucks spread out using their skid steer, loader & motor grader across the cut, insuring that they did not place embankment fill within 3' of the slope of the dam where the sands were placed. MA then used their large sheepsfoot roller to vibrate & compact the embankment fill by making about 4 passes across the fill. Brian Rabe tested the embankment fill for moisture / density in the PM and reported that it met the project speicifications.

Throughout the day, MA continued to use a trackhoe to excavate the existing brown sandy silty clays with occasional cobbles for the toe drain installation from about STA 6+50 to the NE. The material excavated contained very wet clays which MA loaded their large end dump trucks and hauled them to an area within the SW corner of the site and stockpiled, where another trackhoe was staged and using the surrounding dry soils to mix with the wet material excavating in order to hopefully achieve an optimal moisture content, which would later be used as embankment fill. To my knowledge at no time was MA using this material as embankment fill on this date. Although very little oversize rock was observed in the excavation or stockpiles, it is to be determined if the material will also require additional processing through their grizzly screen.

During the excavation, MA also removed the 4-inch diameter toe drain and sand bedding materials. The excavation was dug ~ 10 – 15' wide and to a depth of ~ 10 - 15' to match the grade stakes which were along the slope of the dam. MA final graded the bottom of the excavation using their skid steer and routinely checked grade using a transit & a grade stick throughout the day to insure the excavation was to grade. MA was to have High Desert Survey shoot the excavation to confirm accordance with plans and were scheduled to be there during the day according to Josh (MA). MA excavated down and potholed the top of the existing low outflow line and then expressed concern that with the stake elevations given to them by High Desert Survey, Josh indicated that he would have to increase the slope by about 3' to cross over the line with the planned 9" of vertical separation. I notified Trent Prall of the suspected conflict and discussed the option of crossing under the line. Trent was going to get a hold of Garrett Jackson and have John Eklund to investigate the matter further, while onsite the surveyors would be able to confirm or help resolve the constructed grade issues. While awaiting a resolution, Josh (MA) reviewed the staking and determined that they did not appear to match up with the vertical grade breaks and that he had miscalculated the amount of bedding specified on the plans and felt that there likely would not be a grade issue to cross over the top and provide the planned separation. After he continued excavating and exposed the remainder of the existing corrugated metal pipe it was apparent that there was water leaking from a coupler which appeared rusty. I was previously informed that the line had been lined recently. It is unknown at this time what the source of water was considering that the reservoir has been empty and there has not been any significant recent rain events. When John Eklund visited the site in the PM, we investigated the inlet and observed that it was very dry. Given the circumstances, the engineers will need to determine if the best course of action would be to construct the toe drain under the existing CMP line or possibly repair the leaky line before constructing the toe drain over the top. MA to discontinue excavating since it was close to the end of their workday and to allow the engineers to assess the situation.

Throughout the day, MA also imported loads of sand & gravel which was stockpiled onsite using a side dump truck.

During the day, two workers from May's Concrete visited the site to assess the area where they were construct the concrete retaining wall. They left shortly after and did not discuss anything with me. Josh reported that they planned to begin forming the footer & toe wall on the following day (the same as he reported to me on the previous day). Josh also reported that they were going to construct the wall 16" wide vs. 15" wide planned since they're forms were allegedly set up better for 16" widths and that they would pay for the additional concrete used. I told Josh about the planned control joint specified going through the center of the length of the wall and possibly footer, which I was unsure from the plans how it was supposed to be constructed due to a lack of detail. I suggested that he also discuss the matter with the contractor to determine how they intend to construct it while I discuss the matter with the engineers for clarification.

Signing and barricading: None

Site conditions: Dry

Signed: Daniel Blumberg **Title:** Construction Inspector

City of Grand Junction, Dept. of Public Works, Utilities, & Planning PROJECT DIARY	Project: Hallenbeck #1 Downstream Slope Repair Date 10/6/16 thru 10/10/16

Calendar days: N/A	Working days: N/A	Hours worked: 8
Approximate number of employees: 8/2drivers	Weather: varies	Temperature Range: 60's-80's
Time lost and reason: N/A		Project Engineer: Lee Cooper Superintendent: Andy A. (M.A.)

City of GJ Personnel Onsite: R. Gunther
Subcontractors Onsite: M.A. Construction: (4) toe drain placement, (1) screening embankment (2) material transport drivers
Utility Companies Onsite: 0
Equipment Onsite: (3) Linkbelt Track-hoes, Bobcat track skidster, John Deere 744D Loader, Volvo A40D 6-wheel dump truck, J.Deere 250D 6-wheel dump truck, All-Screen Shaker CV-95, Kawasaki 90 Loader, Wacker-Neuson RD12 smooth drum roller, plate compactor, (2) side dump transports, Yan-Mar track Mini-Excavator
Equipment Operating: see above

10/6/16
0825 on-site. 0700 meeting occurred, result of difficulty achieving density on the filter sand, yesterday, according to Dan Blumberg; averaged 104-106 pds/cf. I was not present. Garrett instructed Brian to run a 1 point standard proctor at saturated-surface dry condition and gradation for comparison to the relative density that was sent to be tested, to establish a gauge reading that relates to field conditions. Brian is unlikely to have results today. Josh said Garrett was visually pleased and to continue as-is with left toe drain backfill and right toe drain excavation. Toe drain is now scheduled to go under leaking 24" CMP low-level outlet, per discussion with Garrett. 2 6-wheels, a loader placing embankment, a loader mixing/screening; Mays on-site at retaining wall constructing formwork.
1130 Right toe drain excavation to SG complete.
1300-1555 Hi-Desert surveyors on-site staking right toe drain.
1430 Mays (3) completed retaining wall footer formwork.
1600 2 lifts complete on left toe drain, started 3rd lift, left loose.

10/7/16
0920 on-site. 45 degrees, sunny. MA placing 8" pipe north in the right toe drain area. Mays (3) placing re-bar in the wall footer. 2 track-hoes, smooth drum roller, loader. 3 lifts in the left toe drain complete, Embankment/3' filter sand.
1015 1st stick of pipe north now has more fall, .42 design, now .62; outfall pipe placed 1 foot lower, see plan grade, adjustment made to design grade in 2nd joint of pipe.
1030 Brian arrives with filter sand proctor results. He ran a point and had another at H-B run a point, avg 106 dry density at 3.6% moisture. He took 4 reading average at sta 3+15 and 2+50, the average of all gauge readings were nearly identical, 105.1 @ 6%. Brian said he would run a couple other proctor points to confirm his gauge readings. Brian believes approximately 6 lifts have been placed in the left toe drain. Embankment tests have been good as well.
1300 58 degrees, breezy
1315-1435 Hi-Desert surveyors on-site to get shots on the top of pipe placed, stationing in right toe drain area. Re-bar complete in retaining wall footer. Re-bar checked. Engineer J. Eklund scheduled for re-bar inspection 10/11/16 @ noon.
1550 **8" slotted pipe placed 160' x 13'w x 3.8, (no 1' sand cap) right toe drain.**

10/10/16
0930 on-site. MA is out of 8" pipe, on order, maybe a week out according to Josh (MA). **Placed 60' 8" slotted pipe, right toe drain.**
1000 Weekly site meeting. John and Slade and I (City), Josh (MA) Brian (H-B). Brian gave me proctor and gradation results, final proctor indicates 106.3 @ 3.9% moisture, all tests Brian has taken since the 10/6/16 appear to be within a pound of that dry density gauge reading. It is my understanding that is what Garrett wanted to see in the filter sand compaction.
1100 Josh will place the 1' sand cap in the right toe drain area and continue placing embankment/sand in 12" loose lifts thereafter until more pipe arrives.
1200 J. Eklund performed re-bar inspection on the retaining wall footer, 0700 pour scheduled for 10/12/16.
1500 2 lifts embankment/sand placed in (N) right toe drain area. **20' solid 8" and 2 8" elbows brought up in clean-out area, sta 3+15.**

Signing and barricading: N/A	
Traveled roadway condition: N/A	
	Title: Construction Inspector : Rick Gunther

City of Grand Junction, Dept. of Public Works, Utilities, & Planning

PROJECT DIARY

Project: Hallenbeck No. 1 Reservoir Downstream Slope Repair

Date: 10/6/2016

Calendar days: Unknown	**Working days:** Unknown	**Inspection times**: None by me	**Hours worked:** Unknown to me
Approximate number of employees: Unknown to me		**Weather:** Mostly sunny (0 – 10 mph Winds)	**Temperature range:** 30 – 60's °F
Time lost and reason: None			**Project Engineer:** Lee Cooper **Superintendent:** Andy A.

City of GJ Personnel Onsite: Rick Gunther, John Eklund
Subcontractors Onsite: Brian Rabe (Huddleston-Berry), Mays Concrete
Other Onsite: Garrett Jackson (State of CO Division of Water Resources Dam Safety Engineer)
Equipment Onsite: 1 Wacker Neuson RTSC2 walk-behind sheepsfoot roller, 1 Link Belt 460 trackhoe, 2 Link Belt 210X trackhoes, 1 John Deer 250D 6-wheel dump truck, 1 Volvo A40D 6-wheel dump truck, 1 John Deer 744H front end loaders, 1 Kawasaki KCM 90 front end loader, 1 Bobcat T650 track-driven skid steer, 1 rock box, 1 Wacker G25 pump, 1 mobile vibrating Grizzly screen unit, 1 jumping jack tamper, 1 vibratory plate compactor, 2 water trucks, 1 Yanmar ViO50 mini excavator, 1 CAT CP-565E sheepsfoot roller, 1 Wacker-Neuson RD12 smooth drum roller,
Equipment Operating: Not known

I was not onsite to inspect any of the construction activities, however had several discussions with Rick Gunther, who was onsite throughout the day to inspect the construction, and John Eklund who was acting PE in Lee Cooper's absence.

John Eklund informed me that he had met onsite with Garrett Jackson, Brian Rabe (Huddleston-Berry) & Josh Jackson (MA) to discuss the installation & suspected lack of compaction of the filter sand along the slope of the dam excavation for the left toe drain. John informed me that Garrett requested that Huddleston-Berry run a calibration test, which he would provide the procedure in order to determine if the nuclear field density tests performed yesterday were accurate or needed to be corrected or to determine if the low end of the specified compaction range of relative density (65 – 70 %) needed to be reduced. John indicated that Brian collected a sand sample and would immediately begin the laboratory testing. Rick Gunther later reported to me that he had discussed the procedure with Brian as it was explained to him by Garrett and that it was a 1 point standard proctor test (ASTM 698) using the sand in a saturated-semi dry state. John indicated that he would issue a field change order for Garrett to approve regarding the compaction testing, as needed / determined as a result of the laboratory testing.

John, Rick & I also discussed the control joint specified going through the concrete retaining wall, which was unclear in the plans / specifications of how it is to be constructed. John discussed the matter with another GJ City engineer who questioned the need for it at all. John called and left a voice mail with the design engineers to determine if it could be eliminated.

Materials used today:
None known

Signing and barricading: None

Site conditions: Dry

Signed: Daniel Bellegarde

Title: Construction Inspector

City of Grand Junction, Dept. of Public Works, Utilities, & Planning PROJECT DIARY	Project: Hallenbeck #1 Downstream Slope Repair Date 10/11/16 thru 10/13/16

Calendar days: N/A	Working days: N/A	Hours worked: 8
Approximate number of employees: 8/2drivers	Weather: varies	Temperature Range: 60's-80's
Time lost and reason: N/A		Project Engineer: Lee Cooper Superintendent: Andy A. (M.A.)

City of GJ Personnel Onsite: R. Gunther
Subcontractors Onsite: M.A. Construction: (4) toe drain placement, (1) screening embankment (3) material transport drivers
(3) Mays Concrete @ retaining wall
Utility Companies Onsite: 0
Equipment Onsite: (3) Linkbelt Track-hoes, Bobcat track skidster, John Deere 744D Loader, Volvo A40D 6-wheel dump truck, J.Deere 250D 6-wheel dump truck, All-Screen Shaker CV-95, Kawasaki 90 Loader, Wacker-Neuson RD12 smooth drum roller, plate compactor, (3) side dump transports, Yan-Mar track Mini-Excavator CAT-56 sheepsfoot , 140H CAT Blade, water truck

Equipment Operating: see above

10/11/16
Am- Brian (H-B) on-site performing compaction tests. He had passing tests. MA placed a two lifts of embankment/3' sand in the center outfall area an effort to build up the center toe drain outfall area. Noon -overcast, 65 degrees.
20' solid 8" placed in the center clean-out, 60' slotted pipe placed in right toe drain.
Pm-Usable embankment spread from a stockpile near the proposed downstream toe area. Will not place anymore until the surveyors can provide toe stakes. MA has a trackhoe in the reservoir digging a channel mixing/conditioning borrow material.

10/12/16
Am- Concrete footer pour with a pumper truck. All concrete test results within design specification. 8" pipe delivered.
PM-**Josh made design changes in the right toe drain in order to place the toe drain under the leaky 24" CMP lower outfall line. Note: From sta 5+78 to 6+36- 7.1%, from sta 6+36 to 7+01, 6.6%. New toe drain placed approximately 7" under leaky 24" CMP pipe.**
190' 8" slotted pipe + 30' solid pipe @ right clean-out installed. 1' sand cap to toe drain

10/13/16
Am- Mays (3) stripping forms. Would like inspection on wall bar this afternoon. Placement of embankment/3' chimney drain in the right toe drain area. A loader, 2 6-wheels and a tandem, CAT-563 sheepsfoot and water truck also in use. Josh (MA) cleaning left toe drain slope free of loose material prior to placement so it doesn't break loose and end up falling into the sand when the small smooth completes its 5 vibratory passes. MA has started hauling previously conditioned borrow material from southeast section of the reservoir. H-B was on-site to look at it and it was deemed suitable for use.
1050-1145 Garrett Jackson, Trent and John Eklund were on-site conducting an inspection. Garrett instructed Josh to 1) Prevent lamination by ripping haul road area using a blade and sheepsfoot 2) Continue to keep a watchful eye on the sand placement, continue roller pattern and watch for the easy dissipation of water through the sand when wetting 3) When building the chimney filter up the slope, make sure your means and methods prevent cross-contamination of sand spilling into the embankment.
Pm- MA continues to place material in the right toe drain in 12" loose lifts. Re-bar inspection on the wall completed. 10/18/16 pour schedule at 10 am with a conveyor.

Signing and barricading: N/A	
Traveled roadway condition: N/A	
	Title: Construction Inspector : Rick Gunther

Appendix D – Piezometer Information

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER PZ-1/2

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO
DATE STARTED 11/28/16 **COMPLETED** 11/30/16
GROUND ELEVATION 5641.30 ft **HOLE SIZE** 8-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 3000 Truck
▽ **AT TIME OF DRILLING** 43.5 ft / Elev 5597.8 ft
LOGGED BY CM **CHECKED BY** MAB
▼ **AT END OF DRILLING** 43.5 ft / Elev 5597.8 ft
NOTES
▼ **24hrs AFTER DRILLING** 43.5 ft / Elev 5597.8 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY (FILL), trace gravel, trace shale, brown to gray, moist, stiff to hard										
			SS 1	67	12-16-17 (33)							
			SS 2	78	6-7-10 (17)							
			SS 3	100	4-5-7 (12)							
		Lean CLAY with Sand, Gravel, and Cobbles (cl), brown to gray, moist to wet, stiff to very stiff	SS 4	83	5-5-7 (12)							
			SS 5	100	5-6-8 (14)							
			SS 6	0	8-10-11 (21)							
			SS 7	100	5-6-6 (12)							
			SS 8	100	5-7-9 (16)							
60		SHALE, brown to gray, soft, highly weathered										
			SS 9	100	10-18-25 (43)							
		Bottom of hole at 61.5 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER PZ-3

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO
DATE STARTED 10/27/16 **COMPLETED** 11/30/16
GROUND ELEVATION 5623.31 ft **HOLE SIZE** 8-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 3000 Track
AT TIME OF DRILLING 29.0 ft / Elev 5594.3 ft
LOGGED BY CM **CHECKED BY** MAB
AT END OF DRILLING 29.0 ft / Elev 5594.3 ft
NOTES
24hrs AFTER DRILLING 29.0 ft / Elev 5594.3 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY (FILL), trace gravel, trace shale, brown to gray, moist, stiff to very stiff										
			SS 1	78	6-8-12 (20)							
			SS 2	67	4-2-4 (6)							
			SS 3	44	8-7-9 (16)							
		Lean CLAY with Sand, Gravel, and Cobbles (cl), brown to gray, moist to wet, stiff to very stiff										
			SS 4	89	4-4-5 (9)							
			SS 5	94	6-9-10 (19)							
			SS 6	89	3-4-5 (9)							
			SS 7	44	4-3-5 (8)							
		SHALE, brown to gray, soft, highly weathered										
			SS 8	61	6-8-15 (23)							
		Bottom of hole at 44.5 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER PZ-4/5

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO
DATE STARTED 11/29/16 **COMPLETED** 11/30/16
GROUND ELEVATION 5641.67 ft **HOLE SIZE** 8-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 3000 Truck
▽ **AT TIME OF DRILLING** 44.0 ft / Elev 5597.7 ft
LOGGED BY CM **CHECKED BY** MAB
▼ **AT END OF DRILLING** 44.0 ft / Elev 5597.7 ft
NOTES
▼ **24hrs AFTER DRILLING** 44.0 ft / Elev 5597.7 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY (FILL), trace gravel, trace shale, ocaissional boulders, brown to gray, moist, stiff to very stiff										
			SS 1	89	7-9-10 (19)							
			SS 2	89	4-6-7 (13)							
		Lean CLAY with Sand, Gravel, and Cobbles (cl), occaisional boulders, brown to gray, moist to wet, stiff to hard	SS 3	94	3-5-7 (12)							
			SS 4	100	4-7-15 (22)							
			SS 5	89	10-16-21 (37)							
		SHALE, brown to gray, soft, highly weathered										
		Bottom of hole at 58.5 feet.	SS 6	50	50							

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER PZ-6

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO
DATE STARTED 10/27/16 **COMPLETED** 11/30/16
GROUND ELEVATION 5626.03 ft **HOLE SIZE** 8-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 3000 Track
▽ **AT TIME OF DRILLING** 30.0 ft / Elev 5596.0 ft
LOGGED BY CM **CHECKED BY** MAB
▼ **AT END OF DRILLING** 30.0 ft / Elev 5596.0 ft
NOTES
▼ **24hrs AFTER DRILLING** 30.0 ft / Elev 5596.0 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY (FILL), trace gravel, trace shale, brown to gray, moist, stiff to very stiff										
10			SS 1	56	11-11-13 (24)							
			SS 2	56	9-10-12 (22)							
20			SS 3	61	4-8-12 (20)							
		Lean CLAY with Sand, Gravel, and Cobbles (cl), occaisional boulders, brown to gray, moist to wet, stiff to hard	SS 4	61	7-10-12 (22)							
30	▼		SS 5	100	4-7-21 (28)							
			SS 6	83	10-19-19 (38)							
40			SS 7	61	4-5-8 (13)							
		SHALE, brown to gray, soft, highly weathered	SS 8	17	21-34-50 (84)							
50		Bottom of hole at 56.5 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER PZ-7/8

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO
DATE STARTED 11/30/16 **COMPLETED** 11/30/16
GROUND ELEVATION 5641.62 ft **HOLE SIZE** 8-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 3000 Truck
▽ **AT TIME OF DRILLING** 35.0 ft / Elev 5606.6 ft
LOGGED BY CM **CHECKED BY** MAB
▼ **AT END OF DRILLING** 35.0 ft / Elev 5606.6 ft
NOTES
▼ **24hrs AFTER DRILLING** 35.0 ft / Elev 5606.6 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY (FILL), trace gravel, trace shale, brown to gray, moist, stiff to very stiff										
5												
10												
15												
20			SS 1	56	12-12-13 (25)							
25												
30			SS 2	94	5-7-7 (14)							
35		Lean CLAY with Sand, Gravel, and Cobbles (cl), brown to gray, moist to wet, stiff to very stiff ▼	SS 3	100	5-7-9 (16)							
40		SHALE, brown to gray, soft, highly weathered	SS 4	67	39-50							
		Bottom of hole at 41.0 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER PZ-9

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO
DATE STARTED 10/28/16 **COMPLETED** 11/30/16
GROUND ELEVATION 5626.68 ft **HOLE SIZE** 8-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 3000 Track
▽ **AT TIME OF DRILLING** 23.5 ft / Elev 5603.2 ft
LOGGED BY CM **CHECKED BY** MAB
▼ **AT END OF DRILLING** 23.5 ft / Elev 5603.2 ft
NOTES
▼ **24hrs AFTER DRILLING** 23.5 ft / Elev 5603.2 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY (FILL), trace gravel, trace shale, brown to gray, moist, very stiff to hard										
10			SS 1	72	7-9-10 (19)							
15			SS 2	72	5-8-23 (31)							
20		Lean CLAY with Sand, Gravel, and Cobbles (cl), occaisional boulders, brown to gray, stiff to very stiff	SS 3	61	4-4-5 (9)							
25		SHALE, brown to gray, soft, highly weathered	SS 4	61	19-17-31 (48)							
		Bottom of hole at 26.5 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER PZ-10

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO
DATE STARTED 11/30/16 **COMPLETED** 11/30/16
GROUND ELEVATION 5642.26 ft **HOLE SIZE** 8-inch
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 3000 Truck
AT TIME OF DRILLING dry
LOGGED BY CM **CHECKED BY** MAB
AT END OF DRILLING dry
NOTES
24hrs AFTER DRILLING dry

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Lean CLAY (FILL), trace gravel, trace shale, brown to gray, moist, stiff to very stiff										
20		Lean CLAY with Sand, Gravel, and Cobbles (cl), brown to gray, moist, stiff to very stiff	SS 1	56	14-10-13 (23)							
25		SHALE, brown to gray, soft, highly weathered	SS 2	83	31-50							
		Bottom of hole at 26.0 feet.										

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 1032 ft. from ☒ N or ☐ S section line and 2224 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-1
Easting: 734463
Northing: 4316743

STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION 5641.30 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 27 feet DEPTH COMPLETED 27 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-27 ft	Lean CLAY	fine	brown	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	27

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.75	2.25
2	PVC	Sch 40	+3.57	16

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	16	26

8. FILTER PACK:

Material	Sand
Size	10-20
Interval	14-27 ft

9. PACKER PLACEMENT:

Type _____

Depth _____

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	4 bags	15 gal	2-14 ft	poured
Cement	2 bags	5 gal	0-2 ft	poured

Remarks: Nested with Permit: 56186, Designation: PZ-2

11. DISINFECTION: Type _____ Amt. Used _____

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD _____

Static Level_____ ft. Date/Time measured:_____, Production Rate_____ gpm.

Pumping Level_____ ft. Date/Time measured_____, Test Length (hrs)_____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 1032 ft. from ☒ N or ☐ S section line and 2224 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-2

Easting: 734463

STREET ADDRESS AT WELL LOCATION:

Northing: 4316743

4. GROUND SURFACE ELEVATION 5641.30 feet

DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 61.5 feet DEPTH COMPLETED 53 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-35 ft	Lean CLAY	fine	brown	
35-58 ft	Lean CLAY with	fine-coarse	brown to	43.5 ft
	Sand, Gravel,		gray	
	and Cobbles			
58-61.5 ft	SHALE	fine	brown to	
			gray	

Remarks: Nested with Permit: 56186, Designation: PZ-1

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	60

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.75	2.25
2	PVC	Sch 40	+3.58	41

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	41	51

8. FILTER PACK:

Material Sand
Size 10-20
Interval 39-53 ft

9. PACKER PLACEMENT:

Type _____
Depth _____

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	4 bags	15 gal	27-39 ft	poured
Cement	2 bags	5 gal	0-2 ft	poured

11. DISINFECTION: Type _____ Amt. Used _____

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD _____

Static Level_____ ft. Date/Time measured:_____, Production Rate_____ gpm.

Pumping Level_____ ft. Date/Time measured_____, Test Length (hrs)_____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 1039 ft. from ☒ N or ☐ S section line and 2276 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-3

Easting: 734447

STREET ADDRESS AT WELL LOCATION:

Northing: 4316741

4. GROUND SURFACE ELEVATION 5623.31 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 44.5 feet DEPTH COMPLETED 39 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-20 ft	Lean CLAY	fine	brown	
20-42 ft	Lean CLAY with Sand, Gravel, and Cobbles	fine-coarse	brown to gray	29 ft
42-44.5 ft	SHALE	fine	brown to gray	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	44.5

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.25	2.75
2	PVC	Sch 40	+3.0	27

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	27	37

8. FILTER PACK:

Material Sand
Size 10-20
Interval 24-39 ft

9. PACKER PLACEMENT:

Type _____
Depth _____

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	6 bags	25 gal	2.5-24 ft	poured
Cement	2 bags	5 gal	0-2.5 ft	poured

Remarks: _____

11. DISINFECTION: Type _____ Amt. Used _____

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD _____

Static Level_____ ft. Date/Time measured:_____, Production Rate_____ gpm.

Pumping Level_____ ft. Date/Time measured_____, Test Length (hrs)_____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 816 ft. from ☒ N or ☐ S section line and 2249 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-4
Easting: 734454
Northing: 4316809

STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION 5641.67 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 28 feet DEPTH COMPLETED 28 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-28 ft	Lean CLAY	fine	brown	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	28

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.5	2.5
2	PVC	Sch 40	+3.43	17

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	17	27

8. FILTER PACK:
Material: Sand
Size: 10-20
Interval: 15-28 ft

9. PACKER PLACEMENT:
Type
Depth

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	4 bags	15 gal	2.25-15 ft	poured
Cement	2 bags	5 gal	0-2.25 ft	poured

Remarks: Nested with Permit: 56186; Designation: PZ-5

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD

Static Level ____ ft. Date/Time measured: _____, Production Rate ____ gpm.

Pumping Level ____ ft. Date/Time measured _____, Test Length (hrs) ____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 816 ft. from ☒ N or ☐ S section line and 2249 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-5
Easting: 734454
Northing: 4316809

STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION 5641.67 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 58.5 feet DEPTH COMPLETED 51 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-35 ft	Lean CLAY	fine	brown	
35-56 ft	Lean CLAY with Sand, Gravel, and Cobbles	fine-coarse	brown to gray	44 ft
56-58.5 ft	SHALE	fine	brown to gray	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	58.5

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.5	2.5
2	PVC	Sch 40	+3.45	40

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	40	50

8. FILTER PACK:
Material: Sand
Size: 10-20
Interval: 38-51 ft

9. PACKER PLACEMENT:
Type
Depth

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	4 bags	15 gal	28-38 ft	poured
Cement	2 bags	5 gal	0-2.25 ft	poured

Remarks: Nested with Permit: 56186, Designation: PZ-4

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD

Static Level____ ft. Date/Time measured:____, Production Rate____ gpm.

Pumping Level____ ft. Date/Time measured____, Test Length (hrs)____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 820 ft. from ☒ N or ☐ S section line and 2297 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-6

Easting: 734439

STREET ADDRESS AT WELL LOCATION:

Northing: 4316807

4. GROUND SURFACE ELEVATION 5626.03 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 46.5 feet DEPTH COMPLETED 39 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-21 ft	Lean CLAY	fine	brown	
21-43 ft	Lean CLAY with Sand, Gravel, and Cobbles	fine-coarse	brown to gray	30 ft
43-46.5 ft	SHALE	fine	brown to gray	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	46.5

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.3	2.7
2	PVC	Sch 40	+3.26	27

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	27	37

8. FILTER PACK:

Material Sand
Size 10-20
Interval 24-39 ft

9. PACKER PLACEMENT:

Type
Depth

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	6 bags	25 gal	2.5-24 ft	poured
Cement	2 bags	5 gal	0-2.5 ft	poured

Remarks:

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD

Static Level ____ ft. Date/Time measured: _____, Production Rate ____ gpm.

Pumping Level ____ ft. Date/Time measured _____, Test Length (hrs) ____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 691 ft. from ☒ N or ☐ S section line and 2269 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-7

Easting: 734447

STREET ADDRESS AT WELL LOCATION:

Northing: 4316847

4. GROUND SURFACE ELEVATION 5641.62 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 25 feet DEPTH COMPLETED 25 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-25 ft	Lean CLAY	fine	brown	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	25

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.4	2.6
2	PVC	Sch 40	+3.22	14

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	14	24

8. FILTER PACK:

Material: Sand
Size: 10-20
Interval: 12-25 ft

9. PACKER PLACEMENT:

Type:
Depth:

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	4 bags	15 gal	2.5-12 ft	poured
Cement	2 bags	5 gal	0-2.5 ft	poured

Remarks: Nested with Permit: 56186; Designation: PZ-8

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD

Static Level ____ ft. Date/Time measured: _____, Production Rate ____ gpm.

Pumping Level ____ ft. Date/Time measured _____, Test Length (hrs) ____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 691 ft. from ☒ N or ☐ S section line and 2269 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-8

Easting: 734447

STREET ADDRESS AT WELL LOCATION:

Northing: 4316847

4. GROUND SURFACE ELEVATION 5641.62 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 41 feet DEPTH COMPLETED 41 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-33 ft	Lean CLAY	fine	brown	
33-39 ft	Lean CLAY with Sand, Gravel, and Cobbles	fine-coarse	brown to gray	35 ft
39-41 ft	SHALE	fine	brown to gray	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	41

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.4	2.7
2	PVC	Sch 40	+3.23	29

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	29	39

8. FILTER PACK:

Material Sand
Size 10-20
Interval 27-41 ft

9. PACKER PLACEMENT:

Type _____
Depth _____

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	1 bag	4 gal	25-27 ft	poured
Cement	2 bags	5 gal	0-2.5 ft	poured

Remarks: Nested with Permit: 56186, Designation: PZ-7

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD

Static Level ____ ft. Date/Time measured: _____, Production Rate ____ gpm.

Pumping Level ____ ft. Date/Time measured _____, Test Length (hrs) ____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

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STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56186

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: NW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 706 ft. from ☒ N or ☐ S section line and 2316 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-9

Easting: 734432

STREET ADDRESS AT WELL LOCATION:

Northing: 4316842

4. GROUND SURFACE ELEVATION 5626.68 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 26.5 feet DEPTH COMPLETED 26.5 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-18 ft	Lean CLAY	fine	brown	
18-24 ft	Lean CLAY with	fine-coarse	brown to	23.5 ft
	Sand, Gravel,		gray	
	and Cobbles			
24-26.5 ft	SHALE	fine	brown to	
			gray	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	26.5

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.7	2.3
2	PVC	Sch 40	+3.55	13

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	13	23

8. FILTER PACK:

Material Sand
Size 10-20
Interval 11-26.5 ft

9. PACKER PLACEMENT:

Type _____
Depth _____

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	4 bags	15 gal	2-11 ft	poured
Cement	2 bags	5 gal	0-2 ft	poured

Remarks: _____

11. DISINFECTION: Type _____ Amt. Used _____

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD _____

Static Level_____ ft. Date/Time measured:_____, Production Rate_____ gpm.

Pumping Level_____ ft. Date/Time measured_____, Test Length (hrs)_____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

FORM NO. GWS-31 4/2012

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Ste 821, Denver, CO 80203
Main (303) 866-3581 Fax (303) 866-3589 www.water.state.co.us

For Office Use Only

1. WELL PERMIT NUMBER: 56185

2. WELL OWNER INFORMATION

NAME OF WELL OWNER: City of Grand Junction, Colorado

MAILING ADDRESS: 250 N. 5th Street

CITY: Grand Junction STATE: CO ZIP CODE: 81501

TELEPHONE NUMBER w/area code: 970-244-1554

3. WELL LOCATION AS DRILLED: SW 1/4, NE 1/4, Sec., 036 Twp 12 ☐ N or S, ☒ Range 98 ☐ E or W ☒

DISTANCES FROM SEC. LINES: 1656 ft. from ☒ N or ☐ S section line and 2023 ft. from ☒ E or ☐ W section line.

SUBDIVISION: _____, LOT____, BLOCK____, FILING (UNIT) ____

Optional GPS Location: GPS Unit must use the following settings: Format must be **UTM**, Units must be **meters**, Datum must be **NAD83**, Unit must be set to **true N**, ☒ Zone 12 or ☐ Zone 13

Owner's Well Designation: PZ-10

Easting: 734530

STREET ADDRESS AT WELL LOCATION:

Northing: 4316555

4. GROUND SURFACE ELEVATION 5642.26 feet DRILLING METHOD Hollow Stem Augers

DATE COMPLETED 11/30/2016 TOTAL DEPTH 26 feet DEPTH COMPLETED 26 feet

5. GEOLOGIC LOG:

Depth	Type	Grain Size	Color	Water Loc.
0-20 ft	Lean CLAY	fine	brown	
20-24 ft	Lean CLAY with Sand, Gravel, and Cobbles	fine-coarse	brown to gray	
24-26 ft	SHALE	fine	brown to gray	

6. HOLE DIAM (in.)

	From (ft)	To (ft)
8	0	26

7. PLAIN CASING:

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
6	Steel	0.125	+3.4	2.6
2	PVC	Sch 40	+2.80	12

PERFORATED CASING: Screen Slot Size (in): 0.020

2	PVC	Sch 40	12	22

8. FILTER PACK:

Material Sand
Size 10-20
Interval 10-26 ft

9. PACKER PLACEMENT:

Type _____
Depth _____

10. GROUTING RECORD

Material	Amount	Density	Interval	Placement
Bent.	4 bags	12 gal	2.25-10 ft	poured
Cement	2 bags	5 gal	0-2.25 ft	poured

Remarks: _____

11. DISINFECTION: Type _____ Amt. Used _____

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.

TESTING METHOD _____

Static Level_____ ft. Date/Time measured:_____, Production Rate_____ gpm.

Pumping Level_____ ft. Date/Time measured_____, Test Length (hrs)_____.

Remarks:

13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $5000 and/or revocation of the contracting license. If filing online the State Engineer considers entering of licensed contractor name to be compliance with Rule 17.4

Company Name:	Phone w/area code:	License Number:
Huddleston-Berry Engineering & Testing, LLC	970-255-8005	PE39010

Mailing Address: 640 White Avenue Grand Junction, CO 81501

Sign (or enter name if filing online)	Print Name and Title	Date
Michael A. Berry	Michael A. Berry, P.E. Vice President of Engineering	12/21/2016

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304022 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
1032 Ft. from North Section Line
2224 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56185, and known as PZ-1.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by
State Engineer

By

Receipt No. 3677622A DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304023 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
1032 Ft. from North Section Line
2224 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56186, and known as PZ-2.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by
State Engineer

By

Receipt No. 3677622B DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304024 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
1039 Ft. from North Section Line
2276 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56186, and known as PZ-3.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by
State Engineer

By

Receipt No. 3677622C DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304025 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
816 Ft. from North Section Line
2249 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56186, and known as PZ-4.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by _____ State Engineer

By _____

Receipt No. 3677622D DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304026 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
816 Ft. from North Section Line
2249 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56186, and known as PZ-5.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by
State Engineer

By

Receipt No. 3677622E DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304027 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
820 Ft. from North Section Line
2297 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56186, and known as PZ-6.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by
State Engineer

By

Receipt No. 3677622F DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304028 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
691 Ft. from North Section Line
2269 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56186, and known as PZ-7.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by
State Engineer

By

Receipt No. 3677622G DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304029 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
691 Ft. from North Section Line
2269 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56186, and known as PZ-8.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by _____
State Engineer

_____
By

Receipt No. 3677622H DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304030 - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
NW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
706 Ft. from North Section Line
2316 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56186, and known as PZ-9.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

APPROVED
JPM

Dick Wolfe by
State Engineer

By

Receipt No. 3677622I DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Form No.
GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

EXST

WELL PERMIT NUMBER 304031 - - -
DIV. 4 WD 42 DES. BASIN MD

APPLICANT

CITY OF GRAND JUNCTION
250 N 5TH ST
GRAND JUNCTION, CO 81501-

(970) 244-1554

APPROVED WELL LOCATION
MESA COUNTY
SW 1/4 NE 1/4 Section 36
Township 12 S Range 98 W Sixth P.M.

DISTANCES FROM SECTION LINES
1656 Ft. from North Section Line
2023 Ft. from East Section Line

UTM COORDINATES (Meters,Zone:13,NAD83)
Easting: Northing:

PERMIT TO USE AN EXISTING WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice MH-56185, and known as PZ-10.
5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
8) The owner shall mark the well in a conspicuous place with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
10) This well must be located not more than 200 feet from the location specified on this permit.

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APPROVED
JPM

Dick Wolfe by
State Engineer

By

Receipt No. 3677622J DATE ISSUED 12-27-2016 EXPIRATION DATE N/A

Appendix E – Material Testing Reports (Embankment Fill, Filter Sand, Drain Gravel, Concrete, Proctor Curves, Sandcone)

Huddleston-Berry
Engineering & Testing, LLC

SANDCONE DENSITY WORKSHEET

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Installation Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/27/16
Work Order No: 43449
Authorized By: Client **Date:** 10/27/16
Reviewed By: BJR **Date:** 10/28/16

Test & Record Number	16-0642	16-0643				
Test Location	~sta 3+50, ele 5634	~sta 5+50, ele 5634				
Wet Density						
Initial Mass of Apparatus (g) (A)	5006.9	5229.4				
Final Mass of Apparatus (g) (B)	2861.2	2970.3				
Difference (lbs) (C) = (A-B)/453.54	4.73	4.98				
Volume of Cone (cf) (D)	0.038	0.038				
Density of Sand (pcf) (E)	80.00	80.00				
Volume of Soil (cf) (F) = (C/E)-D	0.021	0.024				
Total Mass of Soil (g) (G)	1226.9	1419.8				
Wet Density (pcf) (H) = (G/453.54)/F	126.3	129.0				
Moisture Content						
Wet Mass & Tare (g) (J)	1464.7	1653.2				
Dry Mass & Tare (g) (K)	1296.8	1451.3				
Mass of Tare (g) (L)	237.8	233.4				
Moisture Content (%) (M) = 100*(J-K)/(K-L)	15.9%	16.6%				
Dry Density						
Dry Density (pcf) (N) = H/(1+M/100)	109.0	110.7				
Nuclear Density Correction						
Nuclear Dry Density (pcf) (P)	110.2	111.2				
Dry Density Difference (pcf) (R) = (N-P)	-1.2	-0.5				

Record No. 2 SC

Huddleston-Berry
Engineering & Testing, LLC

SANDCONE DENSITY WORKSHEET

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Installation Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/26/16
Work Order No: 43426
Authorized By: Client **Date:** 10/26/16
Reviewed By: BJR **Date:** 10/28/16

Test & Record Number	16-0627	16-0628				
Test Location	~sta 2+00, ele 5630	~sta 3+00, ele 5630				
Wet Density						
Initial Mass of Apparatus (g) (A)	5312.2	5139.9				
Final Mass of Apparatus (g) (B)	3033.0	3029.3				
Difference (lbs) (C) = (A-B)/453.54	5.03	4.65				
Volume of Cone (cf) (D)	0.038	0.038				
Density of Sand (pcf) (E)	80.00	80.00				
Volume of Soil (cf) (F) = (C/E)-D	0.025	0.020				
Total Mass of Soil (g) (G)	1343.9	1110.9				
Wet Density (pcf) (H) = (G/453.54)/F	118.1	121.4				
Moisture Content						
Wet Mass & Tare (g) (J)	1657.7	1300.0				
Dry Mass & Tare (g) (K)	1474.8	1148.9				
Mass of Tare (g) (L)	313.8	189.1				
Moisture Content (%) (M) = 100*(J-K)/(K-L)	15.8%	15.7%				
Dry Density						
Dry Density (pcf) (N) = H/(1+M/100)	102.0	104.9				
Nuclear Density Correction						
Nuclear Dry Density (pcf) (P)	102.6	104.8				
Dry Density Difference (pcf) (R) = (N-P)	-0.6	0.1				

Record No. 1 SC

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 11/1/16
Work Order No: 43523
Authorized By: Client **Date:** 11/1/16
Reviewed By: BJR **Date:** 11/1/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 3+00	~5640	16-0500	112.0	14.5	110.5	13.1	99	Y	
2	~STA 5+00	~5640	16-0500	112.0	14.5	111.8	12.7	100	Y	
3	~STA 7+00	~5638	16-0500	112.0	14.5	108.4	15.3	97	Y	
4	Top of uphill side of retaining wall	~5603	16-0500	112.0	14.5	110.4	12.8	99	Y	
5	Top of downhill side of retaining wall	~5598	16-0500	112.0	14.5	109.3	13.1	98	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2001 Moisture Counts: 655 **Record No.** 21 **21 S**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/31/16
Work Order No: 43508
Authorized By: Client **Date:** 10/31/16
Reviewed By: BJR **Date:** 10/31/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 0+50	~5640	16-0498	108.5	17.5	104.2	15.7	96	Y	
2	~STA 1+50	~5640	16-0500	112.0	14.5	111.5	13.2	100	Y	
3	~STA 4+00	~5638	16-0500	112.0	14.5	110.4	13.1	99	Y	
4	Uphill side of retaining wall backfill	~5697	16-0500	112.0	14.5	110.1	14.1	98	Y	
5	Downhill side of retaining wall backfill	~5695	16-0500	112.0	14.5	108.5	14.8	97	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 1995 Moisture Counts: 651 **Record No.** 20 20 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/28/16
Work Order No: 43471
Authorized By: Client **Date:** 10/28/16
Reviewed By: BJR **Date:** 10/28/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 1+00	~5638	16-0498	108.5	17.5	103.8	15.8	96	Y	
2	~STA 3+00	~5638	16-0498	108.5	17.5	105.8	19.3	98	Y	
3	~STA 5+00	~5636	16-0498	108.5	17.5	105.2	16.1	97	Y	
4	~STA 7+00	~5638	16-0498	108.5	17.5	104.4	17.4	96	Y	
5	~STA 8+00	~5640	16-0498	108.5	17.5	107.1	18.2	99	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 1996 Moisture Counts: 649 **Record No.** 19 19 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/27/16
Work Order No: 43449
Authorized By: Client **Date:** 10/27/16
Reviewed By: BJR **Date:** 10/27/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 1+50	~5634	16-0500	112.0	14.5	111.3	16.1	99	Y	
2	~STA 3+50	~5634	16-0500	112.0	14.5	110.2	16.3	98	Y	Sandcone & Lab Moisture
3	~STA 5+50	~5634	16-0500	112.0	14.5	111.2	16.0	99	Y	Sandcone & Lab Moisture
4	~STA 1+00	~5636	16-0498	108.5	17.5	108.3	16.3	100	Y	
5	~STA 8+00	~5636	16-0498	108.5	17.5	108.1	16.9	100	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:** Elevations are approximate and may be subject to change.

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 1995 Moisture Counts: 645 **Record No.** 18 **18 S**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/26/16
Work Order No: 43426
Authorized By: Client **Date:** 10/26/16
Reviewed By: BJR **Date:** 10/26/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 3+00	~5630	16-0500	108.5	17.5	102.6	15.7	95	Y	Sandcone & Lab Moisture
2	~STA 5+00	~5630	16-0498	108.5	17.5	104.8	15.9	97	Y	Sandcone & Lab Moisture
3	~STA 2+00	~5632	16-0498	108.5	17.5	106.5	16.3	98	Y	
4	~STA 4+00	~5632	16-0498	108.5	17.5	105.9	16.8	98	Y	
5	~STA 6+00	~5632	16-0498	108.5	17.5	107.2	16.5	99	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 2000 Moisture Counts: 648 **Record No.** 17 **17 S**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/25/16
Work Order No: 43409
Authorized By: Client **Date:** 10/25/16
Reviewed By: BJR **Date:** 10/25/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 1+00	~5628	16-0500	108.5	17.5	105.4	16.8	97	Y	
2	~STA 1+00	~5626	16-0500	112.0	14.5	110.3	13.7	98	Y	
3	~STA 3+00	~5628	16-0498	108.5	17.5	108.0	15.7	100	Y	
4	~STA 3+00	~5626	16-0498	108.5	17.5	104.9	16.3	97	Y	
5	~STA 5+00	~5628	16-0498	108.5	17.5	104.2	16.9	96	Y	
6	~STA 5+00	~5626	16-0500	112.0	14.5	108.2	12.8	97	Y	
7	~STA 7+00	~5628	16-0498	108.5	17.5	106.7	16.2	98	Y	
8	~STA 7+00	~5626	16-0498	108.5	17.5	105.4	16.7	97	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2003 Moisture Counts: 650 **Record No.** 16 16 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/24/16
Work Order No: 43382
Authorized By: Client **Date:** 10/24/16
Reviewed By: BJR **Date:** 10/24/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 6+00	~5624	16-0500	108.5	17.5	103.4	16.8	95	Y	
2	~STA 6+00	~5622	16-0500	112.0	14.5	111.4	13.2	99	Y	
3	~STA 5+00	~5624	16-0498	108.5	17.5	106.8	15.8	98	Y	
4	~STA 5+00	~5622	16-0498	108.5	17.5	105.9	15.8	98	Y	
5	~STA 3+00	~5624	16-0498	108.5	17.5	107.2	16.7	99	Y	
6	~STA 3+00	~5622	16-0498	108.5	17.5	106.9	15.5	99	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 1999 Moisture Counts: 652 **Record No.** 15 **15 S**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/21/16
Work Order No: 43365
Authorized By: Client **Date:** 10/21/16
Reviewed By: BJR **Date:** 10/21/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 3+00	~5620	16-0500	108.5	17.5	103.7	17.3	96	Y	
2	~STA 5+00	~5620	16-0498	108.5	17.5	103.5	16.3	95	Y	
3	~STA 7+00	~5620	16-0498	108.5	17.5	105.1	16.1	97	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 1995 Moisture Counts: 651 **Record No.** 14 14 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/20/16
Work Order No: 43344
Authorized By: Client **Date:** 10/20/16
Reviewed By: BJR **Date:** 10/20/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 3+80, ~40' East of retaining wall	~5609	16-0500	108.5	17.5	105.4	16.4	97	Y	
2	~STA 5+00	~5616	16-0500	112.0	14.5	111.8	16.2	100	Y	
3	~STA 7+00	~5615	16-0498	108.5	17.5	104.3	17.8	96	Y	
4	~STA 1+00	~5618	16-0498	112.0	14.5	110.4	16.2	99	Y	
5	~STA 3+00	~5617	16-0498	108.5	17.5	106.2	17.5	98	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 1998 Moisture Counts: 647 **Record No.** 13 13 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/19/16
Work Order No: 43324
Authorized By: Client **Date:** 10/19/16
Reviewed By: BJR **Date:** 10/19/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 3+50	~5614	16-0500	108.5	17.5	107.9	16.6	99	Y	
2	~STA 2+50	~5612	16-0500	108.5	17.5	108.5	17.1	100	Y	
3	~STA 1+50	~5610	16-0498	112.0	14.5	109.3	15.6	98	Y	
4	~STA 3+75, ~20' East of retaining wall	~5607	16-0498	112.0	14.5	110.8	16.5	99	Y	
5	~STA 4+00	~5613	16-0498	112.0	14.5	111.3	15.3	99	Y	
6	~STA 4+50	~5611	16-0500	108.5	17.5	105.3	15.5	97	Y	
7	~STA 5+00	~5609	16-0500	108.5	17.5	102.7	15.7	95	Y	
8	~STA 5+50	~5613	16-0500	108.5	17.5	104.7	16.3	96	Y	
9	~STA 6+00	~5611	16-0498	112.0	14.5	108.2	16.2	97	Y	
10	~STA 6+50	~5609	16-0498	112.0	14.5	110.2	16.1	98	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 1998 Moisture Counts: 647 **Record No.** 12 12 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/18/16
Work Order No: 43301
Authorized By: Client **Date:** 10/18/16
Reviewed By: BJR **Date:** 10/18/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	~STA 5+00	~5605	16-0500	108.5	17.5	106.4	16.0	98	Y	
2	~STA 5+00	~5607	16-0498	112.0	14.5	110.3	13.8	98	Y	
3	~STA 2+00	~5606	16-0500	108.5	17.5	108.0	15.9	100	Y	
4	~STA 2+00	~5608	16-0500	108.5	17.5	107.0	15.7	99	Y	
5	~STA 3+85, ~15' East of retaining wall	~5601	16-0500	108.5	17.5	106.2	16.3	98	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 1995 Moisture Counts: 651 **Record No.** 11 **11 S**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/17/16
Work Order No: 43283
Authorized By: Client **Date:** 10/17/16
Reviewed By: BJR **Date:** 10/17/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Embankment Fill, ~STA 5+00	~5601	16-0500	108.5	17.5	107.8	16.2	99	Y	
2	Embankment Fill ~STA 3+00	~5602	16-0498	112.0	14.5	107.7	13.2	96	Y	
3	Embankment Fill ~STA 7+00	~5603	16-0500	108.5	17.5	105.9	15.8	98	Y	
4	Embankment Fill ~STA 2+00	~5604	16-0500	108.5	17.5	106.2	15.7	98	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.
Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**
Gauge Number: 28972 Density Counts: 1997 Moisture Counts: 648 **Record No.** 10 10 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/14/16
Work Order No: 43262
Authorized By: Client **Date:** 10/14/16
Reviewed By: BJR **Date:** 10/14/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Embankment Fill, ~STA 4+00	~5600	16-0497	107.5	17.5	107.3	16.3	100	Y	
2	Embankment Fill ~STA 3+50	~5600	16-0497	107.5	17.5	107.4	15.9	100	Y	
3	Embankment Fill ~STA 2+50	~5600	16-0498	112.0	14.5	111.2	13.2	99	Y	
4	Embankment Fill ~STA 7+00	~5600	16-0497	107.5	17.5	106.9	16.5	99	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor
Remarks: Elevations are approximate and may be subject to change.

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2003 Moisture Counts: 651 **Record No.** 9 9 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/12/16
Work Order No: 43214
Authorized By: Client **Date:** 10/12/16
Reviewed By: BJR **Date:** 10/12/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	7th lift of Embankment Fill ~STA 2+00	-	16-0500	108.5	17.5	102.9	16.5	95	Y	
2	4th lift of Embankment Fill ~STA 4+00	-	16-0500	108.5	17.5	102.6	16.3	95	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:**

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 1995 Moisture Counts: 653 **Record No.** 8 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/11/16
Work Order No: 43189
Authorized By: Client **Date:** 10/11/16
Reviewed By: BJR **Date:** 10/11/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	1st lift of Embankment Fill ~STA 5+00	-	16-0520	111.5	16.0	108.9	15.4	98	Y	
2	2nd lift of Embankment Fill ~STA 4+00	-	16-0520	111.5	16.0	109.4	15.1	98	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:**

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 1997 Moisture Counts: 652 **Record No.** 7 7 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/7/16
Work Order No: 43128
Authorized By: Client **Date:** 10/7/16
Reviewed By: BJR **Date:** 10/7/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	6th lift of Embankment Fill ~STA 1+75	-	16-0520	111.5	16.0	110.2	14.8	99	Y	
2	6th lift of Embankment Fill ~STA 0+75	-	16-0520	111.5	16.0	109.7	14.5	98	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:**

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2003 Moisture Counts: 648 **Record No.** 6 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/5/16
Work Order No: 43074
Authorized By: Client **Date:** 10/5/16
Reviewed By: BJR **Date:** 10/5/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	4th lift of Embankment Fill ~STA 2+25	-	16-0520	111.5	16.0	110.3	14.1	99	Y	
2	4th lift of Embankment Fill ~STA 1+25	-	16-0520	111.5	16.0	109.8	14.9	98	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:**

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2001 Moisture Counts: 653 **Record No.** 5 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/4/16
Work Order No: 43037
Authorized By: Client **Date:** 10/4/16
Reviewed By: BJR **Date:** 10/4/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Third lift of Embankment Fill ~STA 2+25	-	16-0520	111.5	16.0	106.2	14.5	95	Y	
2	Third lift of Embankment Fill ~STA 1+25	-	16-0520	111.5	16.0	107.5	15.1	96	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:**

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2002 Moisture Counts: 650 **Record No.** 4 4 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/3/16
Work Order No: 43013
Authorized By: Client **Date:** 10/3/16
Reviewed By: BJR **Date:** 10/3/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	First lift of Embankment Fill ~STA 2+00	-	16-0520	111.5	16.0	111.3	14.0	100	Y	
2	First lift of Embankment Fill ~STA 1+00	-	16-0520	111.5	16.0	111.1	14.2	100	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:**

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2009 Moisture Counts: 653 **Record No.** 3 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 9/26/16
Work Order No: 42922
Authorized By: Client **Date:** 9/26/16
Reviewed By: BJR **Date:** 9/26/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Solid pipe Toe drain backfill ~4' above pipe	4.0	16-0520	111.5	16.0	110.6	14.5	99	Y	RETET R1T1
2	Access Road ~ 10' South of Solid toe drain pipe ~4' above the pipe	4.0	16-0520	111.5	16.0	111.4	14.0	100	Y	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:**

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2003 Moisture Counts: 655 **Record No.** 2 **2 S**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Embankment Fill

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 9/23/16
Work Order No: 42914
Authorized By: Client **Date:** 9/23/16
Reviewed By: BJR **Date:** 9/23/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Relative Comp. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Solid Toe drain backfill ~4' above pipe	4.0	16-0520	111.5	16.0	103.2	18.5	93	N	

Compaction / Proof Equipment: Sheepsfoot Compactor **Remarks:**

Material Type: Native **Minimum Density:** 95 % **Within -** 2 **and +** 2 **% of Optimum Moisture Content**

Gauge Number: 28972 Density Counts: 2006 Moisture Counts: 651 **Record No.** 1 S

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/28/16
Work Order No: 43471
Authorized By: Client **Date:** 10/28/16
Reviewed By: BJR **Date:** 10/28/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	SSD Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 1+00	~5638	16-0554	106.3	3.9	105.8	6.7	-0.5	Y	
2	Filter sand at ~STA 3+00	~5638	16-0554	106.3	3.9	105.4	6.2	-0.9	Y	
3	Filter sand at ~STA 5+00	~5636	16-0554	106.3	3.9	105.5	6.8	-0.8	Y	
4	Filter sand at ~STA 7+00	~5638	16-0554	106.3	3.9	106.1	5.9	-0.2	Y	
5	Filter sand at ~STA 8+00	~5640	16-0554	106.3	3.9	105.3	6.3	-1.0	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1996 Moisture Counts: 649 **Record No.** 15 **15 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/27/16
Work Order No: 43449
Authorized By: Client **Date:** 10/27/16
Reviewed By: BJR **Date:** 10/27/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	SSD Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 1+50	~5630	16-0554	106.3	3.9	105.7	5.9	-0.6	Y	
2	Filter sand at ~STA 3+50	~5630	16-0554	106.3	3.9	106.4	6.4	0.1	Y	
3	Filter sand at ~STA 5+50	~5630	16-0554	106.3	3.9	105.3	6.5	-1.0	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1995 Moisture Counts: 645 **Record No.** 14 **14 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/26/16
Work Order No: 43426
Authorized By: Client **Date:** 10/26/16
Reviewed By: BJR **Date:** 10/26/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	SSD Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 1+00	~5630	16-0554	106.3	3.9	105.9	5.9	-0.4	Y	
2	Filter sand at ~STA 3+00	~5630	16-0554	106.3	3.9	106.2	6.2	-0.1	Y	
3	Filter sand at ~STA 7+00	~5632	16-0554	106.3	3.9	106.5	5.7	0.2	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 2000 Moisture Counts: 648 **Record No.** 13 13 Fs

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/25/16
Work Order No: 43409
Authorized By: Client **Date:** 10/25/16
Reviewed By: BJR **Date:** 10/25/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	SSD Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 1+00	~5628	16-0554	106.3	3.9	105.3	6.9	-1.0	Y	
2	Filter sand at ~STA 3+00	~5628	16-0554	106.3	3.9	106.1	7.4	-0.2	Y	
3	Filter sand at ~STA 7+00	~5628	16-0554	106.3	3.9	105.5	6.5	-0.8	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 2003 Moisture Counts: 650 **Record No.** 12 **12 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/24/16
Work Order No: 43382
Authorized By: Client **Date:** 10/24/16
Reviewed By: BJR **Date:** 10/24/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	SSD Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 6+00	~5624	16-0554	106.3	3.9	107.1	4.8	0.8	Y	
2	Filter sand at ~STA 5+00	~5624	16-0554	106.3	3.9	107.0	6.3	0.7	Y	
3	Filter sand at ~STA 3+00	~5624	16-0554	106.3	3.9	106.5	5.1	0.2	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1999 Moisture Counts: 652 **Record No.** 11 **11 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/21/16
Work Order No: 43365
Authorized By: Client **Date:** 10/21/16
Reviewed By: BJR **Date:** 10/21/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	SSD Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 3+00	~5620	16-0554	106.3	3.9	105.8	5.8	-0.5	Y	
2	Filter sand at ~STA 5+00	~5620	16-0554	106.3	3.9	105.3	5.5	-1.0	Y	
3	Filter sand at ~STA 7+00	~5620	16-0554	106.3	3.9	105.4	6.3	-0.9	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1995 Moisture Counts: 651 **Record No.** 10 **10 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/20/16
Work Order No: 43344
Authorized By: Client **Date:** 10/20/16
Reviewed By: BJR **Date:** 10/20/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 3+00	~5618	16-0554	106.3	3.9	105.5	8.9	-0.8	Y	
2	Filter sand at ~STA 6+00	~5618	16-0554	106.3	3.9	105.5	8.5	-0.8	Y	
3	Filter sand at ~STA 2+00	~5618	16-0554	106.3	3.9	105.9	8.2	-0.4	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1998 Moisture Counts: 647 **Record No.** 9 9 Fs

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/19/16
Work Order No: 43324
Authorized By: Client **Date:** 10/19/16
Reviewed By: BJR **Date:** 10/19/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 3+00	~5614	16-0554	106.3	3.9	105.8	9.6	-0.5	Y	
2	Filter sand at ~STA 6+00	~5614	16-0554	106.3	3.9	105.4	9.8	-0.9	Y	
3	Filter sand at ~STA 2+00	~5614	16-0554	106.3	3.9	106.8	9.6	0.5	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1998 Moisture Counts: 647 **Record No.** 8 **8 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/18/16
Work Order No: 43301
Authorized By: Client **Date:** 10/18/16
Reviewed By: BJR **Date:** 10/18/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 5+00	~5607	16-0554	106.3	3.9	106.1	9.3	-0.2	Y	
2	Filter sand at ~STA 2+00	~5608	16-0554	106.3	3.9	105.8	9.5	-0.5	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1998 Moisture Counts: 647 **Record No.** 7 Fs

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/14/16
Work Order No: 43262
Authorized By: Client **Date:** 10/14/16
Reviewed By: BJR **Date:** 10/14/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Filter sand at ~STA 3+00	~5600	16-0554	106.3	3.9	105.8	7.5	-0.5	Y	
2	Filter sand at ~STA 5+00	~5602	16-0554	106.3	3.9	105.4	6.9	-0.9	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1993 Moisture Counts: 648 **Record No.** 6 6 Fs

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/7/16
Work Order No: 43128
Authorized By: Client **Date:** 10/7/16
Reviewed By: BJR **Date:** 10/7/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	6th lift of Sand above toe drain at ~STA 1+00	-	16-0554	106.3	3.9	105.6	-	-0.7	Y	
2	6th lift of Sand above toe drain at ~STA 1+00	-	16-0554	106.3	3.9	107.3	-	1.0	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1998 Moisture Counts: 645 **Record No.** 5 **5 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/7/16
Work Order No: 43128
Authorized By: Client **Date:** 10/7/16
Reviewed By: BJR **Date:** 10/7/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	6th lift of Sand above toe drain at ~STA 1+00	-	16-0554	106.3	3.9	105.6	-	-0.7	Y	
2	6th lift of Sand above toe drain at ~STA 1+00	-	16-0554	106.3	3.9	107.3	-	1.0	Y	

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 1998 Moisture Counts: 645 **Record No.** 5 **5 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/5/16
Work Order No: 43074
Authorized By: Client **Date:** 10/5/16
Reviewed By: BJR **Date:** 10/5/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Number of Passes / Dry Density (pcf)	Moisture Content (%)	Variation from target (lb)	Meets Spec.	Remarks Deflection / Pumping Noted
1	3rd lift of Sand above toe drain at ~STA 1+00	-	16-0554	106.3	3.9	106.0	-	-0.3	Y	Same test as report 3 but with new specification
2	4th lift of Sand above toe drain at ~STA 1+00	-	16-0554	106.3	3.9	105.5	-	-0.8	Y	Same test as report 3 but with new specification

Compaction / Proof Equipment: Smooth drum compactor **Remarks:**

Material Type: Filter Sand **Target Dry Density** 106.3 **Within -** 1 **and +** 1 **pcf of target**

Gauge Number: 28972 Density Counts: 2003 Moisture Counts: 648 **Record No.** 4 **4 Fs**

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 10/5/16
Work Order No: 43074
Authorized By: Client **Date:** 10/5/16
Reviewed By: BJR **Date:** 10/5/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Min. Dry Density (pcf)	Max. Dry Density (pcf)	Dry Density (pcf)	Number of Passes	Relative Density. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	3rd lift of Sand above toe drain at ~STA 1+00	-	16-0501	97.5	117.1	106.0	+5	48	N	
2	4th lift of Sand above toe drain at ~STA 1+00	-	16-0501	97.5	117.1	105.5	+5	45	N	

Compaction / Proof Equipment: Vibrating Plate **Remarks:**

Material Type: Filter Sand **Relative Density Specification:** 65 to 70 Percent

Gauge Number: 28972 Density Counts: 1996 Moisture Counts: 647 **Record No.** 3 3 Fs

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 9/27/16
Work Order No: 42945
Authorized By: Client **Date:** 9/27/16
Reviewed By: BJR **Date:** 9/27/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Min. Dry Density (pcf)	Max. Dry Density (pcf)	Dry Density (pcf)	Number of Passes	Relative Density. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Sand below toe drain at ~STA 3+50	-	16-0501	97.5	117.1	109.4	5.0	65	Y	

Compaction / Proof Equipment: Vibrating Plate **Remarks:**

Material Type: Filter Sand **Relative Density Specification:** 65 to 70 Percent

Gauge Number: 28972 Density Counts: 2003 Moisture Counts: 651 **Record No.** 2 2 Fs

Huddleston-Berry
Engineering & Testing, LLC

SOIL COMPACTION TEST REPORT

Task: Filter Sand

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
Placement Contractor: M.A. Concrete
Contractor Representative: Josh Jackson

Tested By: BJR **Date:** 9/23/16
Work Order No: 42914
Authorized By: Client **Date:** 9/23/16
Reviewed By: BJR **Date:** 9/23/16

No.	Test Location / Observation Area	Elevation (ft)*	Lab No.	Min. Dry Density (pcf)	Max. Dry Density (pcf)	Dry Density (pcf)	Number of Passes	Relative Density. (%)	Meets Spec.	Remarks Deflection / Pumping Noted
1	Sand below toe drain at ~STA 3+20	-	16-0501	97.5	117.1	109.9	67.4	67	Y	

Compaction / Proof Equipment: Vibrating Plate **Remarks:**

Material Type: Filter Sand **Relative Density Specification:** 65 to 70 Percent

Gauge Number: 28972 Density Counts: 2006 Moisture Counts: 653 **Record No.** 1 Fs

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(-) 200 WASH & SIEVE ANALYSIS
CP- 31

Project Name: 2016 Kannah Creek Lab Testing — **Project #:** 00228-0072
Sample Location: Stockpile — **Sample #:** 16-0501
Type of Material: Filter Sand — **Washed By:** LAB — **Sampled By:** BJR
Comments: Whitewater Coffman Rd. Pit — **Gradation Tested By:** LAB — **Sample Date:** 9/6/16

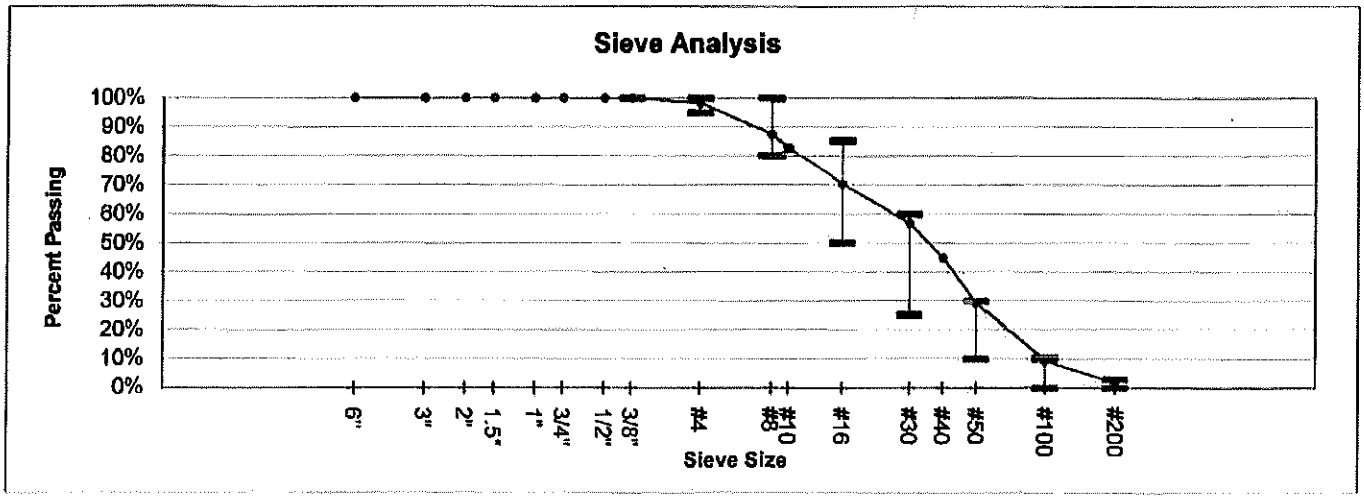
Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	-	-
3/8"	9.5	0.0	Cum. Wt.	100%	100%	100%
#4	4.75	11.8	Cum. Wt.	98%	95%	100%
#8	2.36	83.7	Cum. Wt.	87%	80%	100%
#10	2.00	118.3	Cum. Wt.	82%	-	-
#16	1.180	197.4	Cum. Wt.	70%	50%	85%
#30	0.600	288.9	Cum. Wt.	57%	25%	60%
#40	0.425	367.8	Cum. Wt.	45%	-	-
#50	0.300	472.9	Cum. Wt.	29%	10%	30%
#100	0.150	606.2	Cum. Wt.	9%	0%	10%
#200	0.075	655.6	Cum. Wt.	1.8%	0.0%	3.0%
Pan		657.6	Cum. Wt.			

Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index:
Sample:	NV	NP
Specification:	NV	NP

Split Sieve (mm):	-	
	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	298.8	-
Wet & Tare Wt. (g):	989.3	-
Dry & Tare Wt. (g):	966.4	-
Dry Weight (g):	667.6	-
Moisture (%):	3.43%	-
Post Wash & TareWt. (g):	955.6	



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(-) 200 WASH & SIEVE ANALYSIS
CP- 31

Project Name: Hallenback Reservoir — **Project #:** 00228-0072
Sample Location: Stockpile — **Sample #:** 16-0533
Type of Material: Filter Sand (STOCKPILED ON SITE) — **Washed By:** LAB — **Sampled By:** BJR
Comments: Whitewater Coffman Rd. Pit — **Gradation Tested By:** LAB — **Sample Date:** 9/23/16

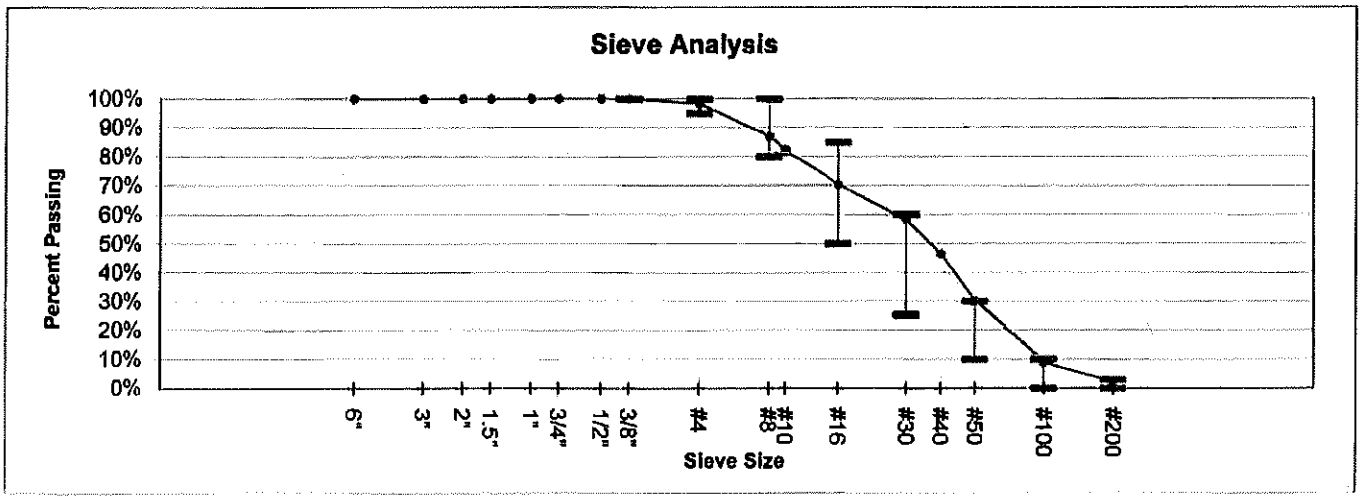
Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	-	-
3/8"	9.5	0.0	Cum. Wt.	100%	100%	100%
#4	4.75	20.2	Cum. Wt.	98%	95%	100%
#8	2.36	149.5	Cum. Wt.	87%	80%	100%
#10	2.00	206.5	Cum. Wt.	82%	-	-
#16	1.180	338.0	Cum. Wt.	70%	50%	85%
#30	0.600	476.6	Cum. Wt.	58%	25%	60%
#40	0.425	610.7	Cum. Wt.	46%	-	-
#50	0.300	794.6	Cum. Wt.	30%	10%	30%
#100	0.150	1038.9	Cum. Wt.	9%	0%	10%
#200	0.075	1114.1	Cum. Wt.	2.2%	0.0%	3.0%
Pan		1122.5	Cum. Wt.			

Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index:
Sample:	NV	NP
Specification:	NV	NP

Split Sieve (mm):	-	
	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	388.5	388.3
Wet & Tare Wt. (g):	1547.5	1492.9
Dry & Tare Wt. (g):		1473.8
Dry Weight (g):	1139.0	1085.5
Moisture (%):	1.76%	1.76%
Post Wash & TareWt. (g):	1509.2	



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(-) 200 WASH & SIEVE ANALYSIS
CP- 31

Project Name: Hallenback Reservoir — **Project #:** 00228-0072
Sample Location: SAMPLED FROM ON SITE STOCKPILE — **Sample #:** 16-0554
Type of Material: Filter Sand — **Washed By:** LAB — **Sampled By:** BJR
Comments: Whitewater Coffman Rd. Pit — **Gradation Tested By:** LAB — **Sample Date:** 10/6/16

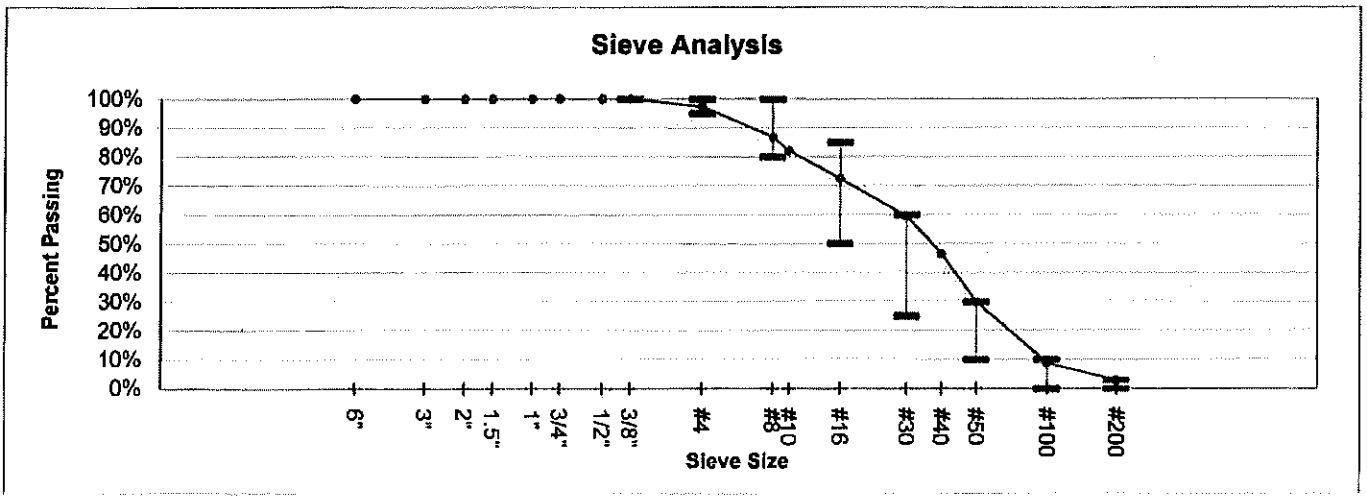
Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	-	-
3/8"	9.5	0.0	Cum. Wt.	100%	100%	100%
#4	4.75	15.1	Cum. Wt.	97%	95%	100%
#8	2.36	74.9	Cum. Wt.	87%	80%	100%
#10	2.00	101.8	Cum. Wt.	82%	-	-
#16	1.180	157.0	Cum. Wt.	72%	50%	85%
#30	0.600	230.1	Cum. Wt.	59%	25%	60%
#40	0.425	303.8	Cum. Wt.	46%	-	-
#50	0.300	398.2	Cum. Wt.	30%	10%	30%
#100	0.150	518.0	Cum. Wt.	9%	0%	10%
#200	0.075	551.3	Cum. Wt.	2.9%	0.0%	3.0%
Pan		552.0	Cum. Wt.			

Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index
Sample:	NV	NP
Specification:	NV	NP

Split Sieve (mm):	-	
	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	274.1	384.8
Wet & Tare Wt. (g):	861.7	1481.1
Dry & Tare Wt. (g):		1443.9
Dry Weight (g):	567.7	1059.1
Moisture (%):	3.51%	3.51%
Post Wash & TareWt. (g):	825.6	



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(-) 200 WASH & SIEVE ANALYSIS
CP- 31

Project Name: Hallenback Reservoir — **Project #:** 00228-0072
Sample Location: SAMPLED AFTER COMPACTION — **Sample #:** 16-0537
Type of Material: Filter Sand — **Washed By:** LAB — **Sampled By:** BJR
Comments: Whitewater Coffman Rd. Pit — **Gradation Tested By:** LAB — **Sample Date:** 9/26/16

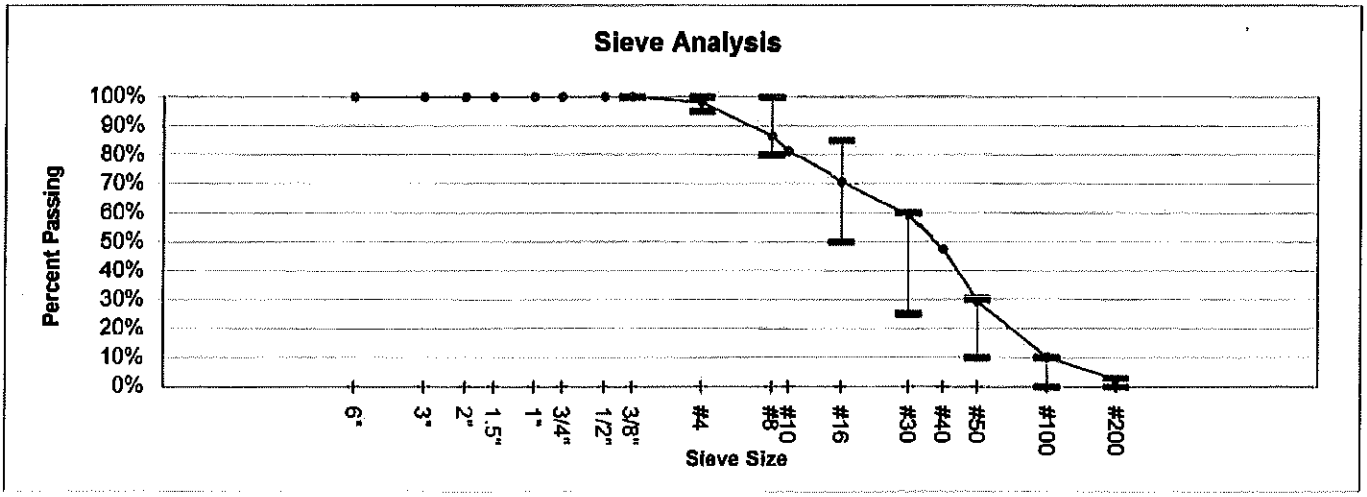
Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	-	-
3/8"	9.5	0.0	Cum. Wt.	100%	100%	100%
#4	4.75	11.4	Cum. Wt.	98%	95%	100%
#8	2.36	81.5	Cum. Wt.	86%	80%	100%
#10	2.00	112.1	Cum. Wt.	81%	-	-
#16	1.180	175.4	Cum. Wt.	71%	50%	85%
#30	0.600	244.5	Cum. Wt.	59%	25%	60%
#40	0.425	315.5	Cum. Wt.	47%	-	-
#50	0.300	423.5	Cum. Wt.	29%	10%	30%
#100	0.150	537.4	Cum. Wt.	10%	0%	10%
#200	0.075	582.4	Cum. Wt.	2.6%	0.0%	3.0%
Pan		585.8	Cum. Wt.			

Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index
Sample:	NV	NP
Specification:	NV	NP

Split Sieve (mm):	-	
	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	497.8	446.2
Wet & Tare Wt. (g):	1119.1	1475.9
Dry & Tare Wt. (g):		1436.9
Dry Weight (g):	597.8	990.7
Moisture (%):	3.94%	3.94%
Post Wash & TareWt. (g):	1082.2	



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(-) 200 WASH & SIEVE ANALYSIS

CP- 31

Project Name: Hallenback Reservoir — **Project #:** 00228-0072
Sample Location: SAMPLED AFTER PLACEMENT AND COMPACTION — **Sample #:** 16-0636
Type of Material: Filter Sand — **Washed By:** LAB — **Sampled By:** BJR
Comments: Whitewater Coffman Rd. Pit — **Gradation Tested By:** LAB — **Sample Date:** 10/28/16

Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	-	-
3/8"	9.5	0.0	Cum. Wt.	100%	100%	100%
#4	4.75	15.5	Cum. Wt.	98%	95%	100%
#8	2.36	117.8	Cum. Wt.	87%	80%	100%
#10	2.00	161.1	Cum. Wt.	82%	-	-
#16	1.180	256.2	Cum. Wt.	71%	50%	85%
#30	0.600	356.4	Cum. Wt.	59%	25%	60%
#40	0.425	464.9	Cum. Wt.	47%	-	-
#50	0.300	625.5	Cum. Wt.	29%	10%	30%
#100	0.150	787.5	Cum. Wt.	10%	0%	10%
#200	0.075	856.1	Cum. Wt.	2.2%	0.0%	3.0%
Pan		859.8	Cum. Wt.			

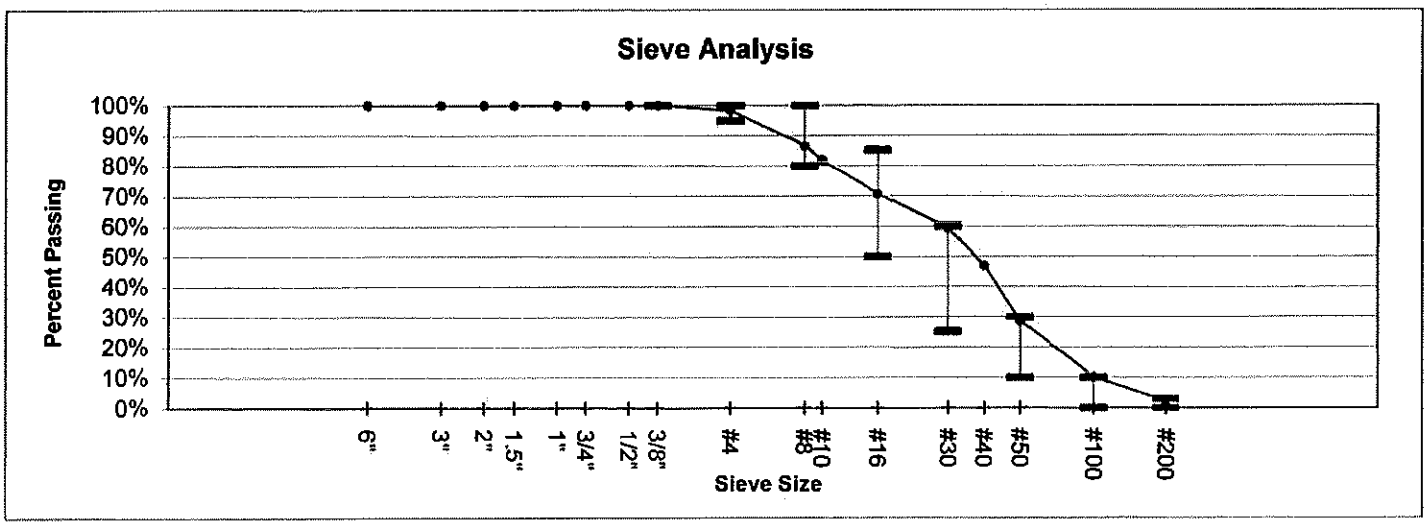
Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index
Sample:	NV	NP
Specification:	NV	NP

Split Sieve (mm): -

	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	387.4	-
Wet & Tare Wt. (g):	1309.3	-
Dry & Tare Wt. (g):	1262.8	-
Dry Weight (g):	875.4	-
Moisture (%):	5.31%	-
Post Wash & TareWt. (g):	1247.4	



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(-) 200 WASH & SIEVE ANALYSIS

CP- 31

Project Name: Hallenbeck Reservoir — **Project #:** 00228-0072
Sample Location: On site Stockpile — **Sample #:** 16-0517
Type of Material: Drain Gravel — **Washed By:** LAB — **Sampled By:** JDC
Comments: Whitewater Building Materials — **Gradation Tested By:** LAB — **Sample Date:** 9/15/16

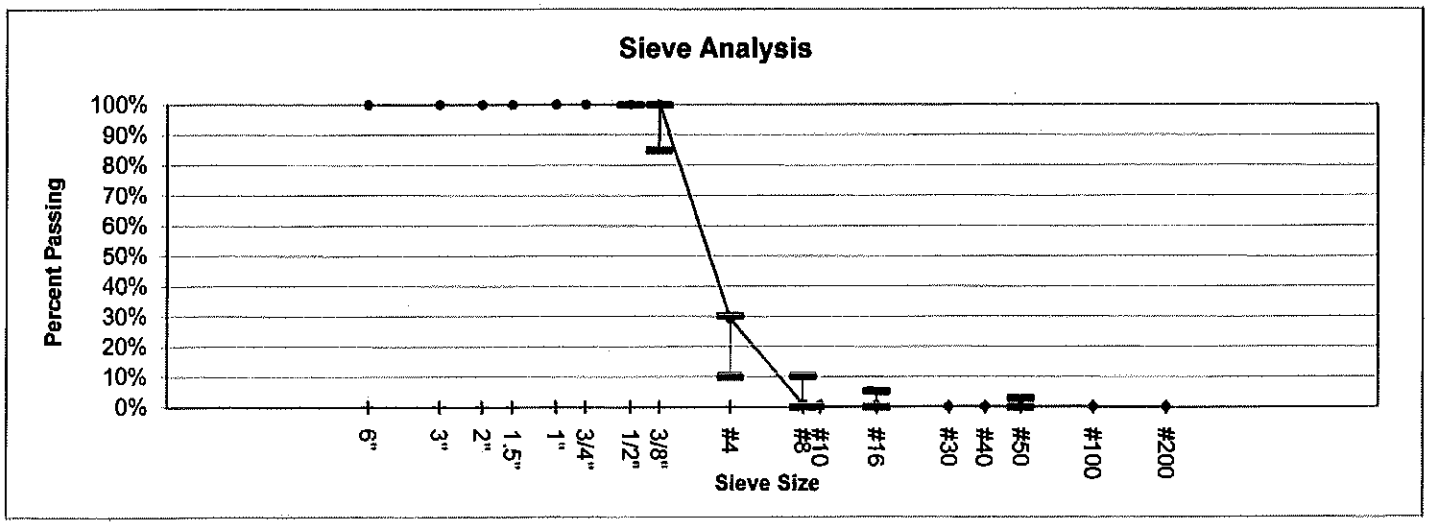
Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	100%	100%
3/8"	9.5	0.0	Cum. Wt.	100%	85%	100%
#4	4.75	894.3	Cum. Wt.	29%	10%	30%
#8	2.36	1250.1	Cum. Wt.	1%	0%	10%
#10	2.00	1255.6	Cum. Wt.	0%	-	-
#16	1.180	1256.5	Cum. Wt.	0%	0%	5%
#30	0.600	1257.0	Cum. Wt.	0%	-	-
#40	0.425	1257.2	Cum. Wt.	0%	-	-
#50	0.300	1257.3	Cum. Wt.	0%	0%	3%
#100	0.150	1257.3	Cum. Wt.	0%	-	-
#200	0.075	1257.8	Cum. Wt.	0.1%	-	-
Pan		1258.2	Cum. Wt.			

Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index
Sample:	-	-
Specification:	-	-

Split Sieve (mm):	-	
	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	388.5	-
Wet & Tare Wt. (g):	1683.0	-
Dry & Tare Wt. (g):	1647.3	-
Dry Weight (g):	1258.8	-
Moisture (%):	2.84%	-
Post Wash & TareWt. (g):	1647.3	



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(-) 200 WASH & SIEVE ANALYSIS

CP- 31

Project Name: Hallenbeck Reservoir — **Project #:** 00228-0072
Sample Location: On Site Stockpile — **Sample #:** 16-0639
Type of Material: Drain Gravel — **Washed By:** LAB — **Sampled By:** BJR
Comments: — **Gradation Tested By:** LAB — **Sample Date:** 10/12/16

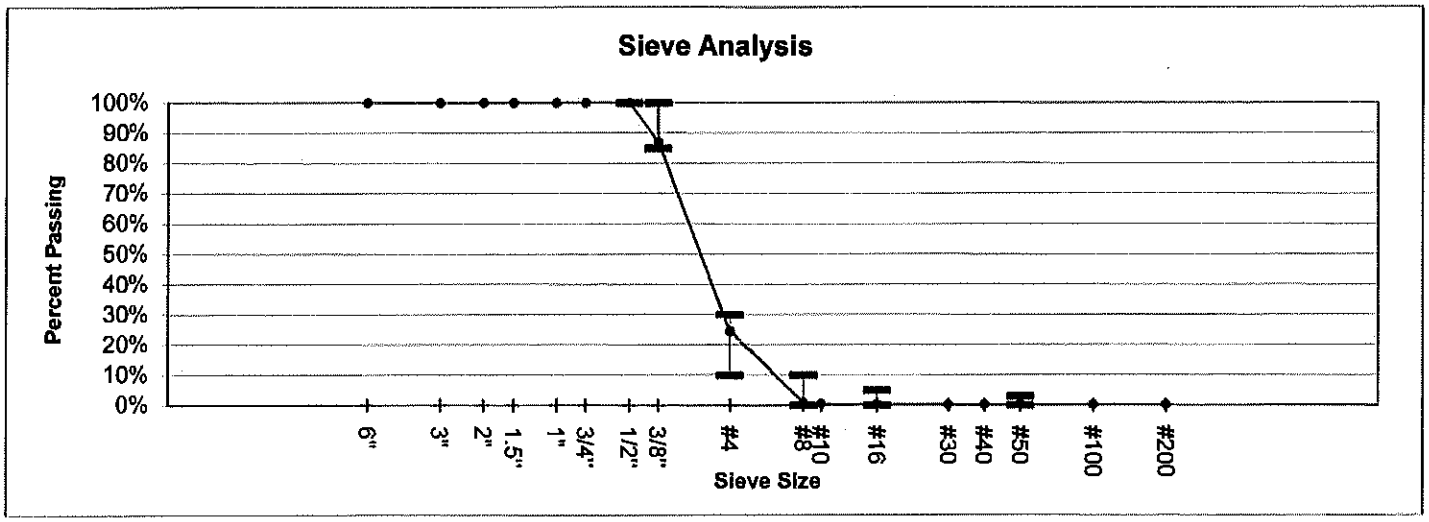
Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	100%	100%
3/8"	9.5	133.0	Cum. Wt.	87%	85%	100%
#4	4.75	770.5	Cum. Wt.	24%	10%	30%
#8	2.36	1009.2	Cum. Wt.	1%	0%	10%
#10	2.00	1013.5	Cum. Wt.	0%	-	-
#16	1.180	1015.2	Cum. Wt.	0%	0%	5%
#30	0.600	1015.8	Cum. Wt.	0%	-	-
#40	0.425	1016.1	Cum. Wt.	0%	-	-
#50	0.300	1016.4	Cum. Wt.	0%	0%	3%
#100	0.150	1016.5	Cum. Wt.	0%	-	-
#200	0.075	1016.6	Cum. Wt.	0.2%	-	-
Pan		1016.8	Cum. Wt.			

Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index
Sample:	-	-
Specification:	-	-

Split Sieve (mm):	-	
	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	229.4	237.8
Wet & Tare Wt. (g):	1262.5	584.3
Dry & Tare Wt. (g):		579.3
Dry Weight (g):	1018.2	341.5
Moisture (%):	1.46%	1.46%
Post Wash & TareWt. (g):	1244.5	



Huddleston-Berry
Engineering & Testing, LLC

(-) 200 WASH & SIEVE ANALYSIS

CP- 31

Project Name: Hallenbeck Reservoir — **Project #:** 00228-0072
Sample Location: After placement and compaction — **Sample #:** 16-0640
Type of Material: Drain Gravel — **Washed By:** LAB — **Sampled By:** BJR
Comments: — **Gradation Tested By:** LAB — **Sample Date:** 10/12/16

Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	100%	100%
3/8"	9.5	125.2	Cum. Wt.	88%	85%	100%
#4	4.75	770.3	Cum. Wt.	24%	10%	30%
#8	2.36	1000.4	Cum. Wt.	1%	0%	10%
#10	2.00	1002.0	Cum. Wt.	1%	-	-
#16	1.180	1002.8	Cum. Wt.	1%	0%	5%
#30	0.600	1003.9	Cum. Wt.	1%	-	-
#40	0.425	1004.7	Cum. Wt.	1%	-	-
#50	0.300	1004.7	Cum. Wt.	1%	0%	3%
#100	0.150	1004.9	Cum. Wt.	1%	-	-
#200	0.075	1005.1	Cum. Wt.	0.5%	-	-
Pan		1005.3	Cum. Wt.			

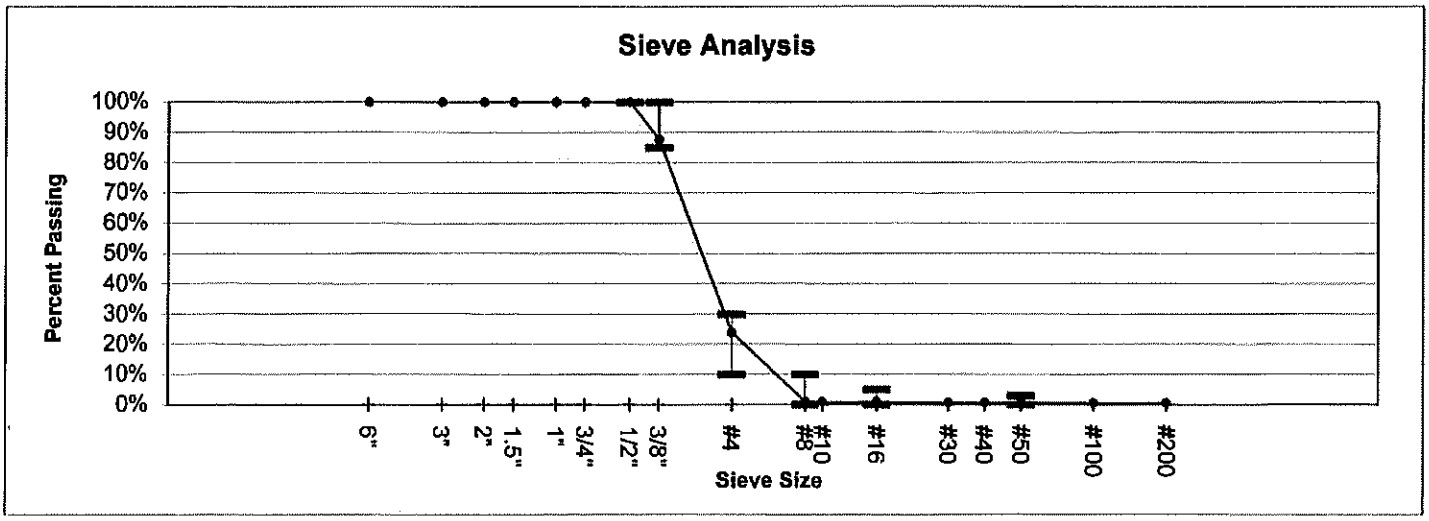
Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index
Sample:	-	-
Specification:	-	-

Split Sieve (mm): -

	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	237.8	231.5
Wet & Tare Wt. (g):	1262.5	674.2
Dry & Tare Wt. (g):		668.1
Dry Weight (g):	1010.6	436.6
Moisture (%):	1.40%	1.40%
Post Wash & TareWt. (g):	1243.7	



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(-) 200 WASH & SIEVE ANALYSIS

CP- 31

Project Name: Hallenbeck Reservoir — **Project #:** 00228-0072
Sample Location: After placement and compaction — **Sample #:** 16-0641
Type of Material: Drain Gravel — **Washed By:** LAB — **Sampled By:** BJR
Comments: — **Gradation Tested By:** LAB — **Sample Date:** 10/11/16

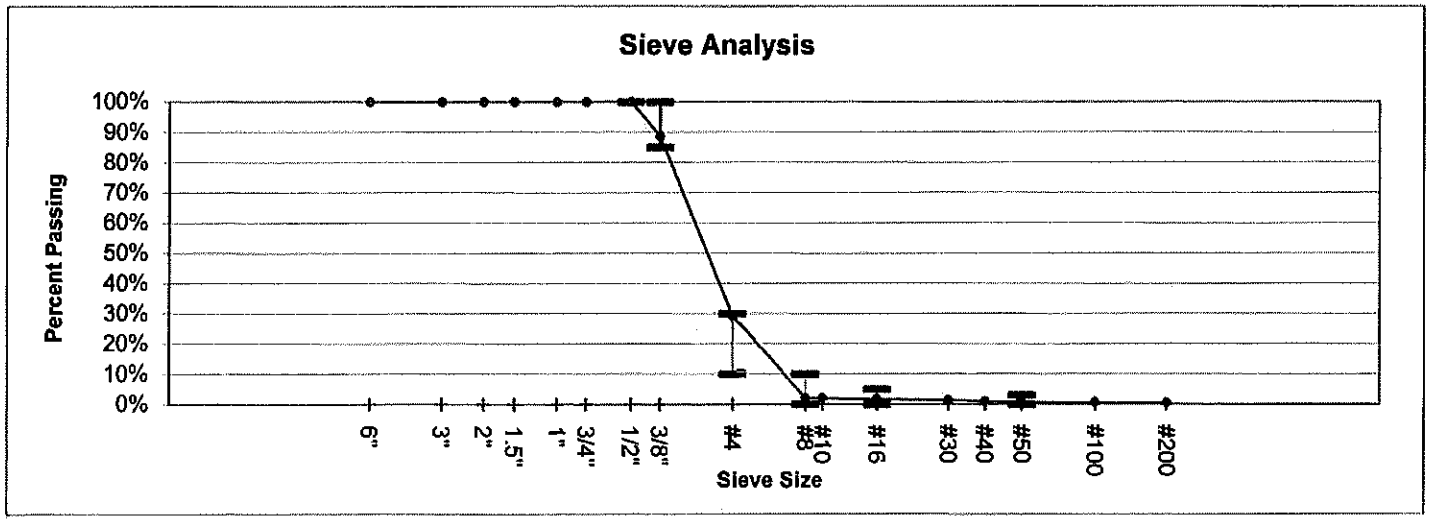
Sieve Size #	Sieve Size mm	Weight Retained (g)		Cumulative Percent Passing	Specification Min.	Specification Max.
6"	150.0	0.0	Cum. Wt.	100%	-	-
3"	75.0	0.0	Cum. Wt.	100%	-	-
2"	50.0	0.0	Cum. Wt.	100%	-	-
1.5"	37.5	0.0	Cum. Wt.	100%	-	-
1"	25.0	0.0	Cum. Wt.	100%	-	-
3/4"	19.0	0.0	Cum. Wt.	100%	-	-
1/2"	12.5	0.0	Cum. Wt.	100%	100%	100%
3/8"	9.5	123.9	Cum. Wt.	89%	85%	100%
#4	4.75	768.2	Cum. Wt.	29%	10%	30%
#8	2.36	1061.3	Cum. Wt.	2%	0%	10%
#10	2.00	1061.9	Cum. Wt.	2%	-	-
#16	1.180	1065.2	Cum. Wt.	2%	0%	5%
#30	0.600	1068.9	Cum. Wt.	1%	-	-
#40	0.425	1073.5	Cum. Wt.	1%	-	-
#50	0.300	1075.2	Cum. Wt.	1%	0%	3%
#100	0.150	1077.2	Cum. Wt.	1%	-	-
#200	0.075	1078.0	Cum. Wt.	0.5%	-	-
Pan		1079.8	Cum. Wt.			

Moisture of Rock	
Tare #:	-
Tare Wt. (g)	-
Wet & Tare Wt. (g)	-
Dry & Tare Wt. (g)	-
Moisture (%):	-

	Liquid Limit:	Plasticity Index
Sample:	-	-
Specification:	-	-

Split Sieve (mm):	-	
	Wet	Dry
Wt. Retained (g):	-	-
Wt. Passing (g):	-	-
Total Sample Wt. (g):	-	-

	Wash:	Moisture:
Tare #:	-	-
Tare Wt. (g):	235.4	229.7
Wet & Tare Wt. (g):	1330.3	897.4
Dry & Tare Wt. (g):		890.5
Dry Weight (g):	1083.6	660.8
Moisture (%):	1.04%	1.04%
Post Wash & TareWt. (g):	1315.2	



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PHYSICAL PROPERTIES AND COMPRESSIVE STRENGTH TEST REPORT

Task / Material Tested: Footing

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
General Contractor: M.A. Concrete
Placement Contractor: Mays Concrete
Contractor Representative: Don
Location of Placement: Footing for retaining wall at ~STA 3+75

Authorized By: Client **Date:** 10/12/16
Sampled By: BJR **Date:** 10/12/16
Work Order No.: 43205
Picked Up By: BJR **Date:** 10/13/16
Work Order No.: 43217
Reviewed By: BJR **Date:** 11/09/16

Sample Location: South end of placement
Cylinder Storage Location: Insulated cure box for standard cure cylinders. 1 Field cure cylinder stored on site.
Weather Conditions: Clear and Calm **Ambient Temperature (°F):** 50s

Number of Samples Casted/Molded

Concrete: 4 ***Grout Cyl:** 0 ****Grout Prism:** 0 **Mortar Cyl:** 0 **Mortar Cube:** 0 **Soils:** 0

Mix Data		Specifications		Measured Properties	
Supplier:	Whitewater	Temp., C1064 (deg. F):	50-80	Temp., C1064 (deg. F):	71
Mix ID/Brand:	C18	Slump, C143 (in.):	2+4	Slump, C143 (in.):	2 1/2
Ticket No.:	356641	Air Content, C231 (%):	4-7	Air Cont., C231 (%):	4.3
Batch Time (MIL):	6:23	*Flow Rate:	-	*Flow Rate:	-
Sample Time (MIL):	7:15	Unit Weight, C138 (pcf):	-	Unit Weight, C138 (pcf):	143.8
Water Added (gal.):	-	Time in Mixer (min):	90 max	Time in Mixer (min):	52
Load Number:	2 of 3	Additional Water (gal.):		Mold Dims:	4X8
Initial W:C Ratio:	not supplied	Max W:C Ratio:	0.45	Final W:C Ratio:	-
Batch Size:	10	Compressive Str. (psi):	4500	Avg. Cap Thickess, C42:	-

Tare Volume (cf): 0.25 Tare Weight (lbs): - Tare & Concrete Weight (lbs): 35.95
Soil Weight (gm): - Admixture Weight (gm): - Admixture Percent (%): - Moisture Content (%): -

Sample No.	Break Date	Age (days)	Avg. Dia. (in.)	Avg. Hght. (in.)	Avg. Area (in.)	Weight (g)	Unit Wt. (pcf)	Break Information, C39					
								Cap*	Load (lbs)	Strength (psi)	(psi) Ratio	Break Type	Tech.
16-03116	10/19/16	7	4.00	8.00	12.57	3841	145.6	U	59565	4740	105%	3	TH
16-03117	10/19/16	7				3839	145.5	U	59375	4720	105%	5	TH
16-03118	11/09/16	28				3819	144.7	U	72675	5780	128%	5	TH
16-03119	11/09/16	28				3860	146.3	U	75015	5970	133%	3	TH
16-03120	11/09/16	28				3841	145.6	U	75040	5970	133%	5	TH
16-03121	11/09/16	H				3834	145.3	U	75600	6020	134%	5	TH
16-03122	11/09/16	H				3831	145.2	U	74045	5890	131%	5	TH
CONCRETE FIELD CURES (if applicable), Cores, Grout Prisms, or Mortar Cubes													
16-03123	11/09/16	28	4.00	8.00	12.57	3824	144.9	U	64280	5120	114%	3	TH

Cap Type*: S=Sulfur G=Gypsum C=Neat Cement U=Unbonded Neoprene O=None

Remarks: Extra "Hold" cylinder was cast per Client request for early break if necessary.
8th cylinder is a field cure cylinder.

Field Set Number: of *Flow Cone No.: Compression Machine: F-502
Field Scale No.: **Cube Mold No.: Lab Scale: L129

Building Permit Number: **Record No.** 1 C

Huddleston-Berry
Engineering & Testing, LLC

PHYSICAL PROPERTIES AND COMPRESSIVE STRENGTH TEST REPORT

Task / Material Tested: Retaining Wall

Project No.: 00228 - 0072
Project Name: Hallenbeck Reservoir
Client Name: M.A. Concrete
General Contractor: M.A. Concrete
Placement Contractor: Mays Concrete
Contractor Representative: Don

Authorized By: Client **Date:** 10/14/16
Sampled By: KC **Date:** 10/17/16
Work Order No.: 43282
Picked Up By: BJR **Date:** 10/18/16
Work Order No.: 43300
Reviewed By: BJR **Date:** 11/14/16

Location of Placement: retaining wall at ~STA 3+75

Sample Location: South end of placement
Cylinder Storage Location: Insulated cure box for standard cure cylinders. 1 Field cure cylinder stored on site.
Weather Conditions: cloudy and windy **Ambient Temperature (°F):** 75

Number of Samples Casted/Molded

Concrete: 4 ***Grout Cyl:** 0 ****Grout Prism:** 0 **Mortar Cyl:** 0 **Mortar Cube:** 0 **Soils:** 0

Mix Data		Specifications		Measured Properties	
Supplier:	Whitewater	Temp., C1064 (deg. F):	50-80	Temp., C1064 (deg. F):	72
Mix ID/Brand:	C18	Slump, C143 (in.):	2+4	Slump, C143 (in.):	3 1/2
Ticket No.:	356869	Air Content, C231 (%):	4-7	Air Cont., C231 (%):	5.3
Batch Time (MIL):	11:47	*Flow Rate:	-	*Flow Rate:	-
Sample Time (MIL):	12:45	Unit Weight, C138 (pcf):	-	Unit Weight, C138 (pcf):	141.8
Water Added (gal.):	-	Time in Mixer (min):	90 max	Time in Mixer (min):	58
Load Number:	1 of 2	Additional Water (gal.):		Mold Dims:	4X8
Initial W:C Ratio:	0.380	Max W:C Ratio:	0.45	Final W:C Ratio:	0.380
Batch Size:	10	Compressive Str. (psi):	4500	Avg. Cap Thickess, C42:	-

Tare Volume (cf): 0.25 Tare Weight (lbs): - Tare & Concrete Weight (lbs):

Soil Weight (gm): - Admixture Weight (gm): - Admixture Percent (%): - Moisture Content (%): -

Sample No.	Break Date	Age (days)	Avg. Dia. (in.)	Avg. Hght. (in.)	Avg. Area (in.)	Weight (g)	Unit Wt. (pcf)	Break Information, C39					
								Cap*	Load (lbs)	Strength (psi)	(psi) Ratio	Break Type	Tech.
16-03166	10/24/16	7	4.00	8.02	12.57	3820	144.4	U	47545	3780	84%	2	BJR
16-03167	10/24/16	7				3783	143.0	U	51270	4080	91%	4	BJR
16-03168	11/14/16	28				3805	143.8	U	66790	5310	118%	5	TH
16-03169	11/14/16	28				3799	143.6	U	66705	5310	118%	5	TH
16-03170	11/14/16	28				3808	144.0	U	63885	5080	113%	5	TH
16-03171	10/26/16	9				3814	144.2	U	54420	4330	96%	5	BJR
16-03172	10/31/16	14				3819	144.4	U	58870	4680	104%	5	BJR
CONCRETE FIELD CURES (if applicable), Cores, Grout Prisms, or Mortar Cubes													
16-03173	11/14/16	28	4.00	8.02	12.57	3804	143.8	U	59920	4770	106%	5	TH

Cap Type*: S=Sulfur G=Gypsum C=Neat Cement U=Unbonded Neoprene O=None

Remarks: Extra "Hold" cylinder was cast per Client request for early break if necessary.
8th cylinder is a field cure cylinder.

Field Set Number: 1 of 1 *Flow Cone No.: Compression Machine: F-502
Field Scale No.: **Cube Mold No.: Lab Scale: L129

Building Permit Number: **Record No.** 2 C

Huddleston-Berry
Engineering & Testing, LLC

REVIEW

Project No.: 00228 - 0072 **Observed By:** BJR **Date:** 10/6/16
Project Name: Hallenbeck Reservoir **Work Order No:** 43096
Client Name: M.A. Concrete **Authorized By:** Client **Date:** 10/6/16
Installation Contractor: M.A. Concrete **Reviewed By:** JAL **Date:** 10/6/16
Contractor Representative: Josh Jackson

Physical Address:
Installation Equipment: **Datum:**

A representative of Huddleston Berry Engineering and Testing (HBET) arrived on site as requested to meet with Josh Jackson with M.A. and Garret Jackson with the State. The difficulty achieving the 65 to 70 percent relative density specification was discussed. Because the range of dry densities that correspond to a range of 65 to 70 percent relative density is so tight (1.1 pcf), any slight change in gradation could have a large effect on the density. It was suggested by Garret Jackson that a one-point standard proctor be run at the Saturated Surface Dry (SSD) condition, and that the field dry density should be within a pound of this number. This method will allow the target dry density to be more quickly determined than the reletive density test if further variances in gradation are suspected. A sample of this material was collected from the on site stockpile after the meeting. A sieve analysis and a one-point standard proctor (ASTM D698) were run on this material. The SSD condition was determined by ASTM C128. The sieve analysis showed the gradation to be within specification but with slightly more material passing the #200 sieve. The result of theone point proctor at SSD was 106.3 pcf dry density at 3.9% moisture. It is understood that 106.3 plus or minus 1 pound should be the new target dry density for the filter sand unless the gradation changes again. Then a new one point proctor would be determined.

General Remarks:

Record No. 1 RW

Huddleston-Berry
Engineering & Testing, LLC

REVIEW

Project No.: 00228 - 0072 **Observed By:** BJR **Date:** 10/17/16
Project Name: Hallenbeck Reservoir **Work Order No:** 43283
Client Name: M.A. Concrete **Authorized By:** Client **Date:** 10/17/16
Installation Contractor: M.A. Concrete **Reviewed By:** BJR **Date:** 10/17/16
Contractor Representative: Josh Jackson

Physical Address:
Installation Equipment: **Datum:**

A representative of Huddleston Berry Engineering and Testing (HBET) arrived on site as requested to attend the weekly meeting. Lee Cooper, John Eklund, Josh Jackson and Andy Azcarraga were also present. During the meeting the test frequency spec for the embankment fill was clarified. It was decided by Lee Cooper that as long as the frequency spec of 1 test per 500 cubic yards was being met the notes regarding 1 test per day or lift could be disregarded. Andy Azcarraga said that enough fill would be placed this week to warrant a daily visit. He also requested 2 additional cylinders to be cast for the retaining wall.

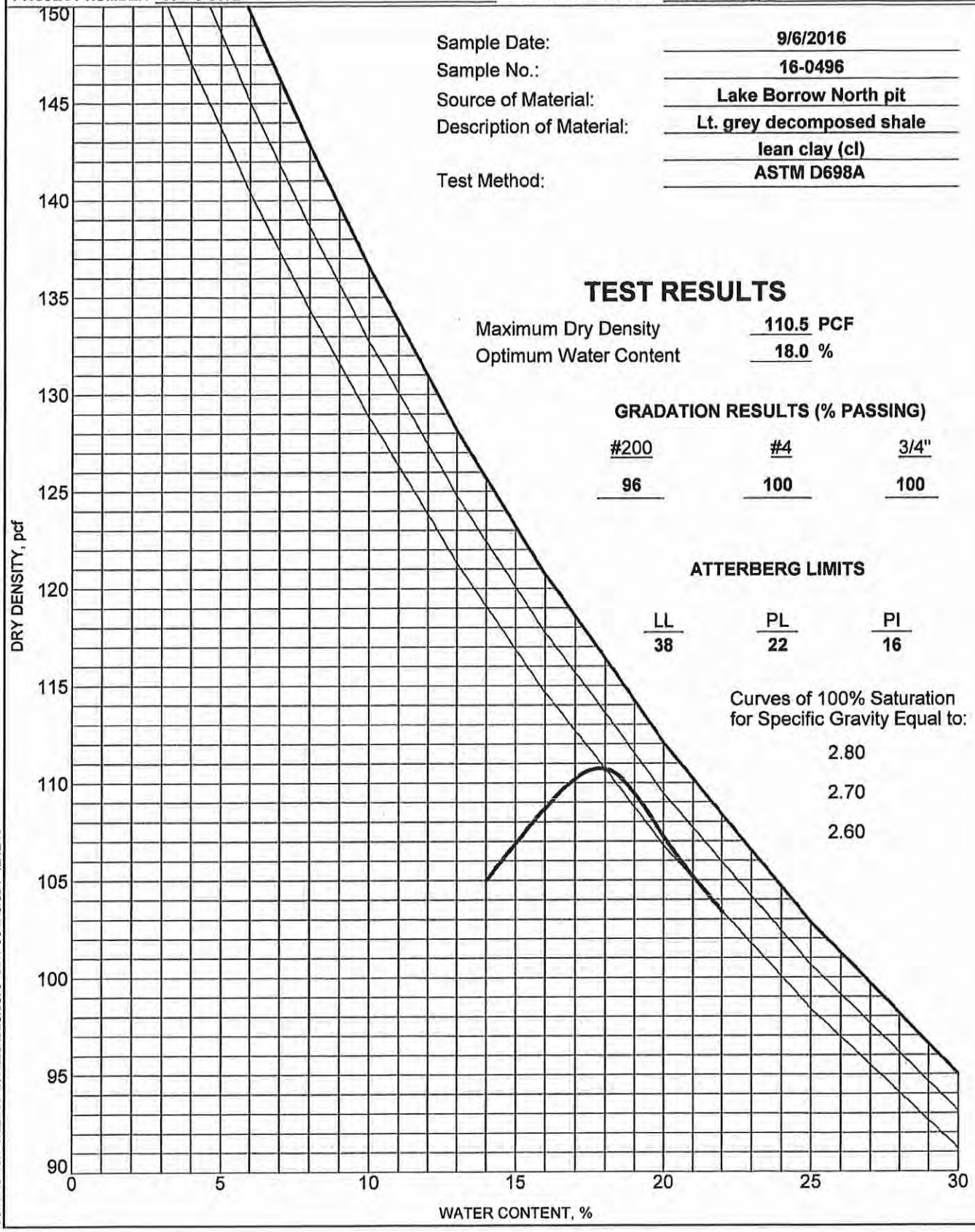
General Remarks:

Record No. 2 RW

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

MOISTURE-DENSITY RELATIONSHIP

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO



Sample Date:	9/6/2016
Sample No.:	16-0496
Source of Material:	Lake Borrow North pit
Description of Material:	Lt. grey decomposed shale lean clay (cl)
Test Method:	ASTM D698A

TEST RESULTS

Maximum Dry Density	110.5 PCF
Optimum Water Content	18.0 %

GRADATION RESULTS (% PASSING)

#200	#4	3/4"
96	100	100

ATTERBERG LIMITS

LL	PL	PI
38	22	16

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

COMPACTION 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

Huddleston-Berry Engineering & Testing, LLC
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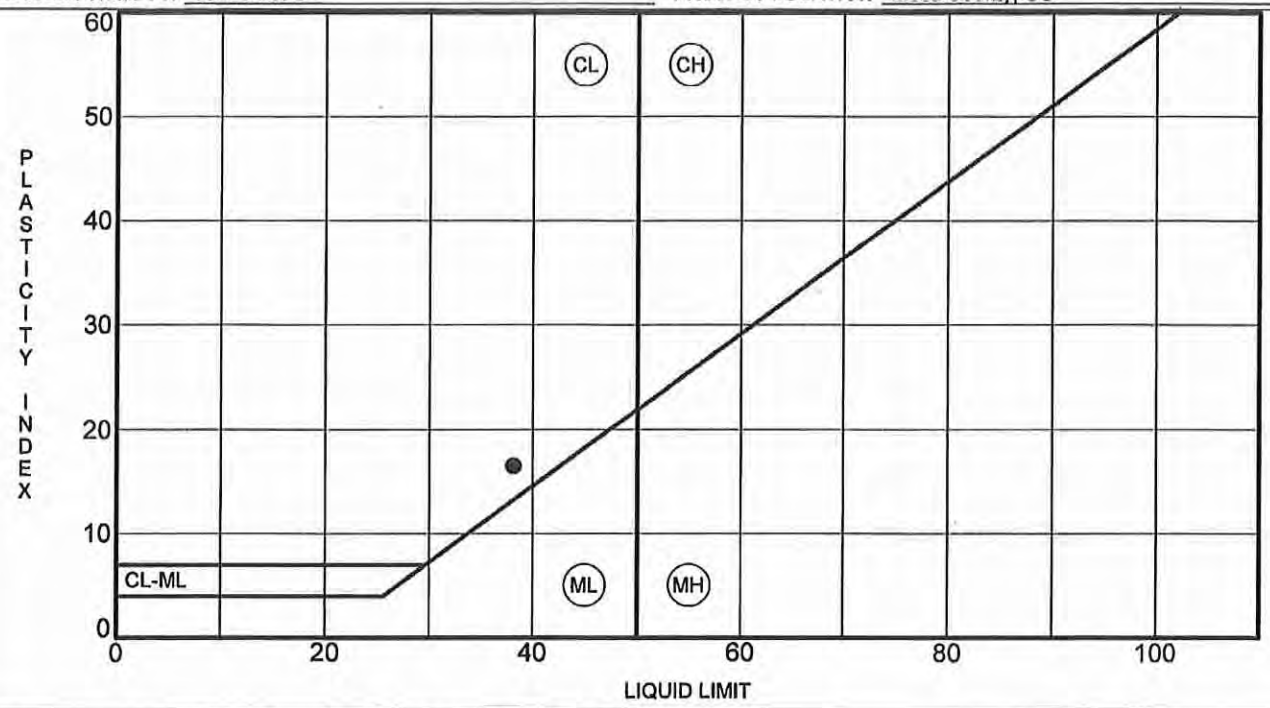
Grand Junction, CO 81501
970-255-8005
970-255-6818

ATTERBERG LIMITS' RESULTS

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



	Specimen Identification		LL	PL	PI	#200	Classification	
●	**16-0496**	**9/6/2016**	**38**	**22**	**16**	**96**	**Lt. grey decomposed shale**	**lean clay (cl)**

ATTERBERG LIMITS 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

Huddleston-Berry Engineering & Testing, LLC
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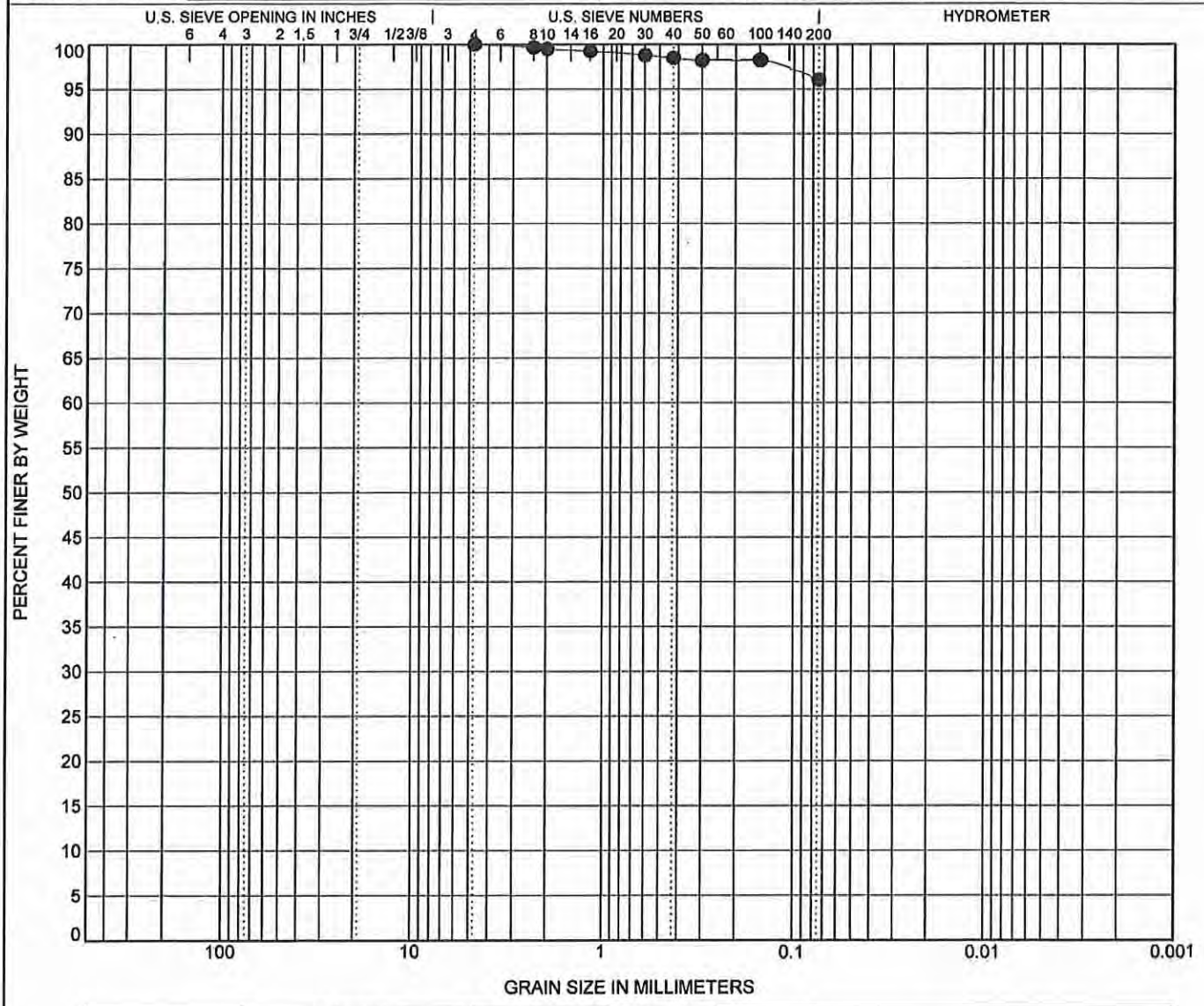
970-255-6818

GRAIN SIZE DISTRIBUTION

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	16-0496 9/6/2016	Lt. grey decomposed shale lean clay (cl)	38	22	16		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	16-0496 9/6/2016	4.75				0.0	3.9	96.1	

GRAIN SIZE 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

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640 White Avenue, Unit B
Grand Junction, CO 81501
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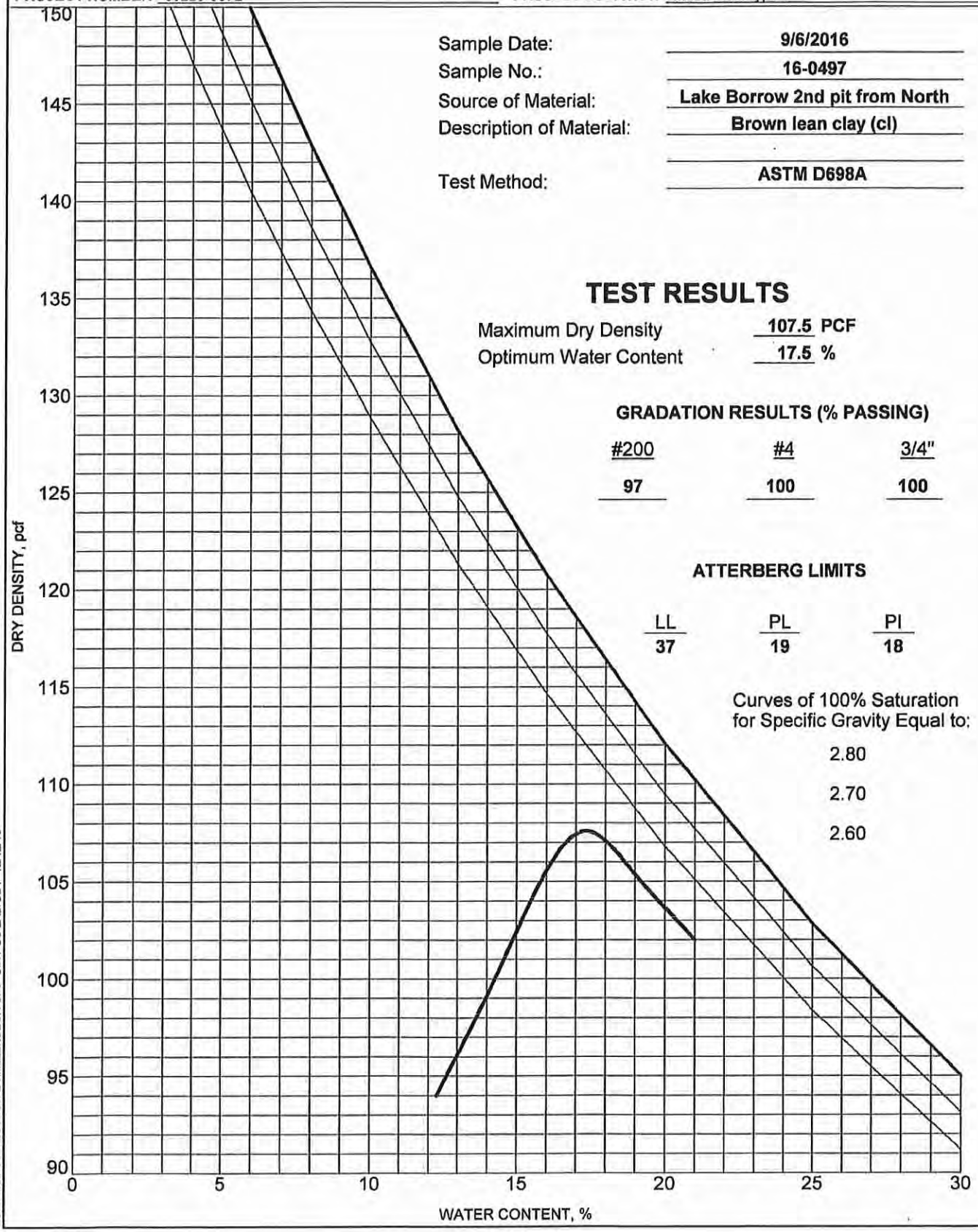
970-255-6818

MOISTURE-DENSITY RELATIONSHIP

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO



Sample Date:	9/6/2016
Sample No.:	16-0497
Source of Material:	Lake Borrow 2nd pit from North
Description of Material:	Brown lean clay (cl)
Test Method:	ASTM D698A

TEST RESULTS

Maximum Dry Density	107.5 PCF
Optimum Water Content	17.5 %

GRADATION RESULTS (% PASSING)

#200	#4	3/4"
97	100	100

ATTERBERG LIMITS

LL	PL	PI
37	19	18

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

COMPACTION 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

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Grand Junction, CO 81501
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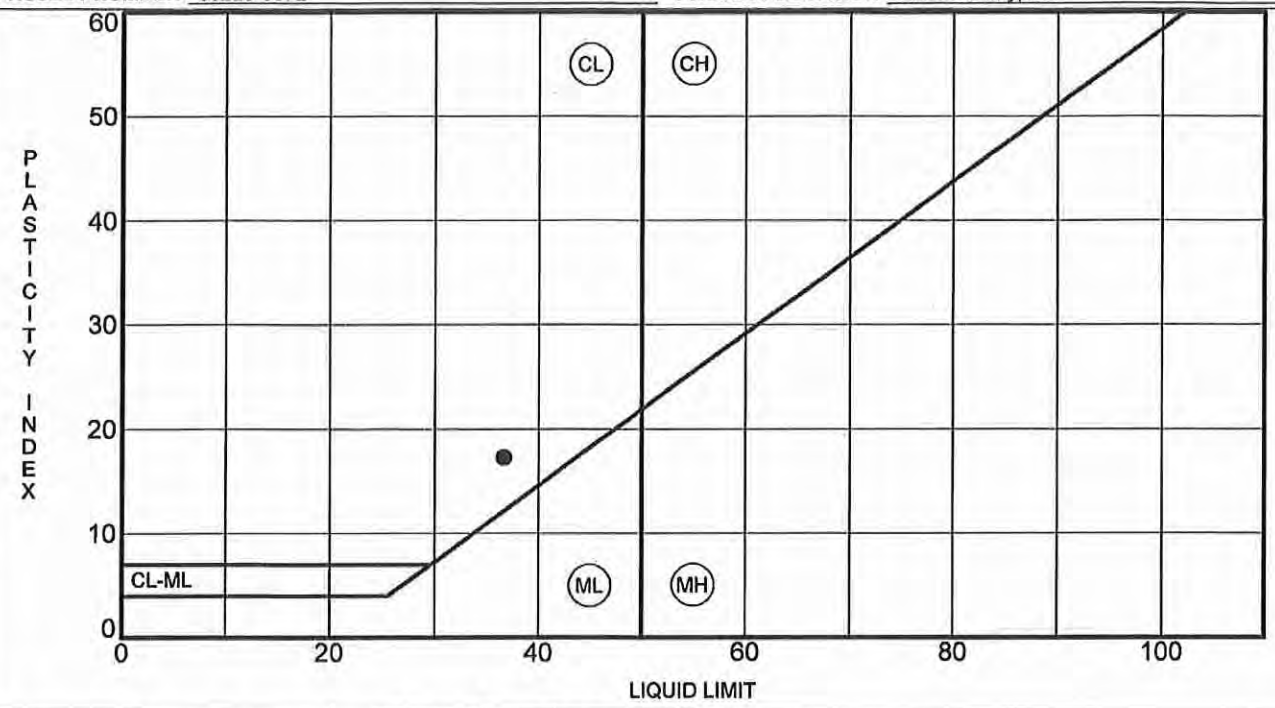
970-255-6818

ATTERBERG LIMITS' RESULTS

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



	Specimen Identification		LL	PL	PI	#200	Classification
●	**16-0497**	**9/6/2016**	**37**	**19**	**18**	**97**	**Brown lean clay (cl)**

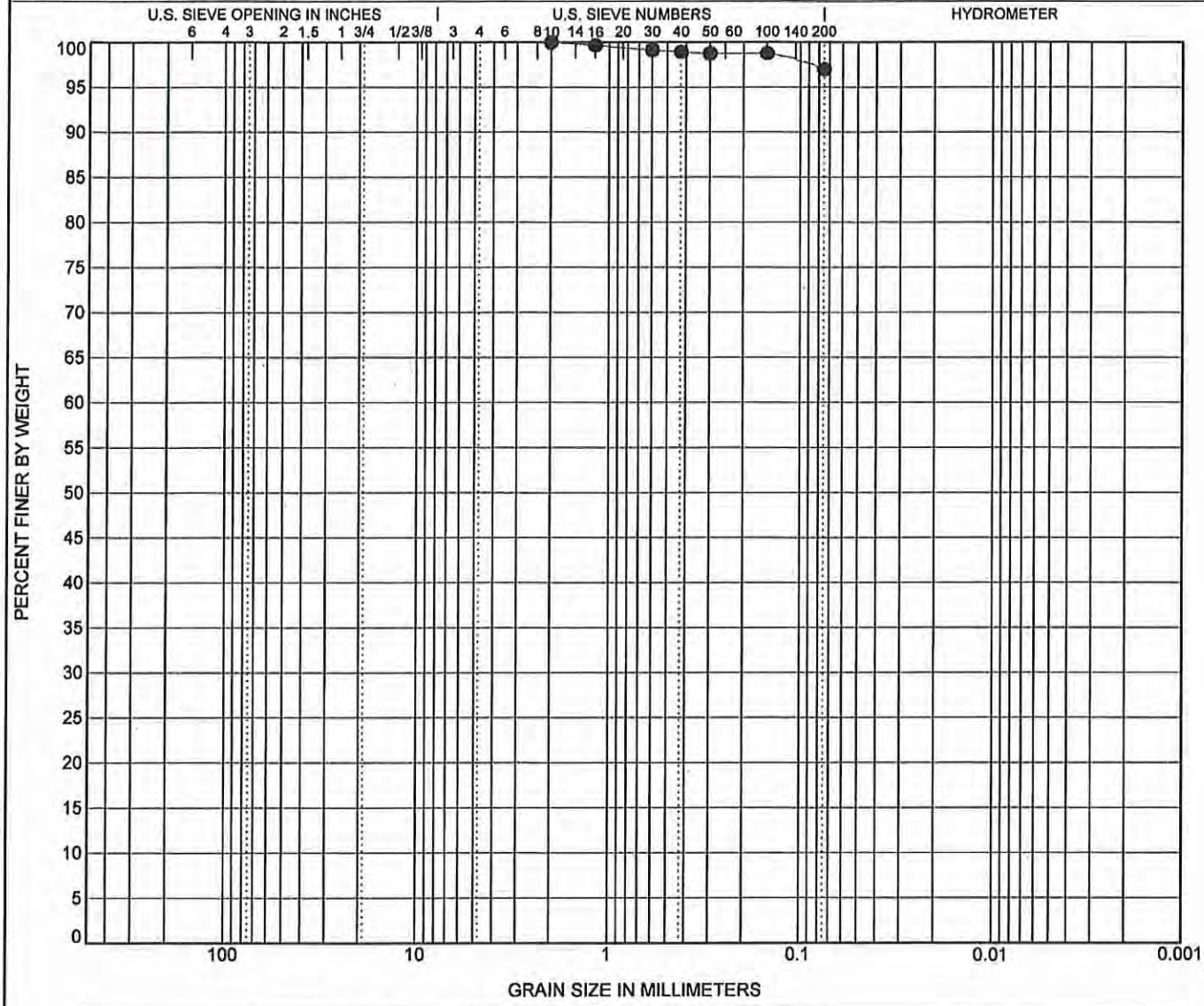
ATTERBERG LIMITS 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

GRAIN SIZE DISTRIBUTION

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	16-0497 9/6/2016	Brown lean clay (cl)	37	19	18		

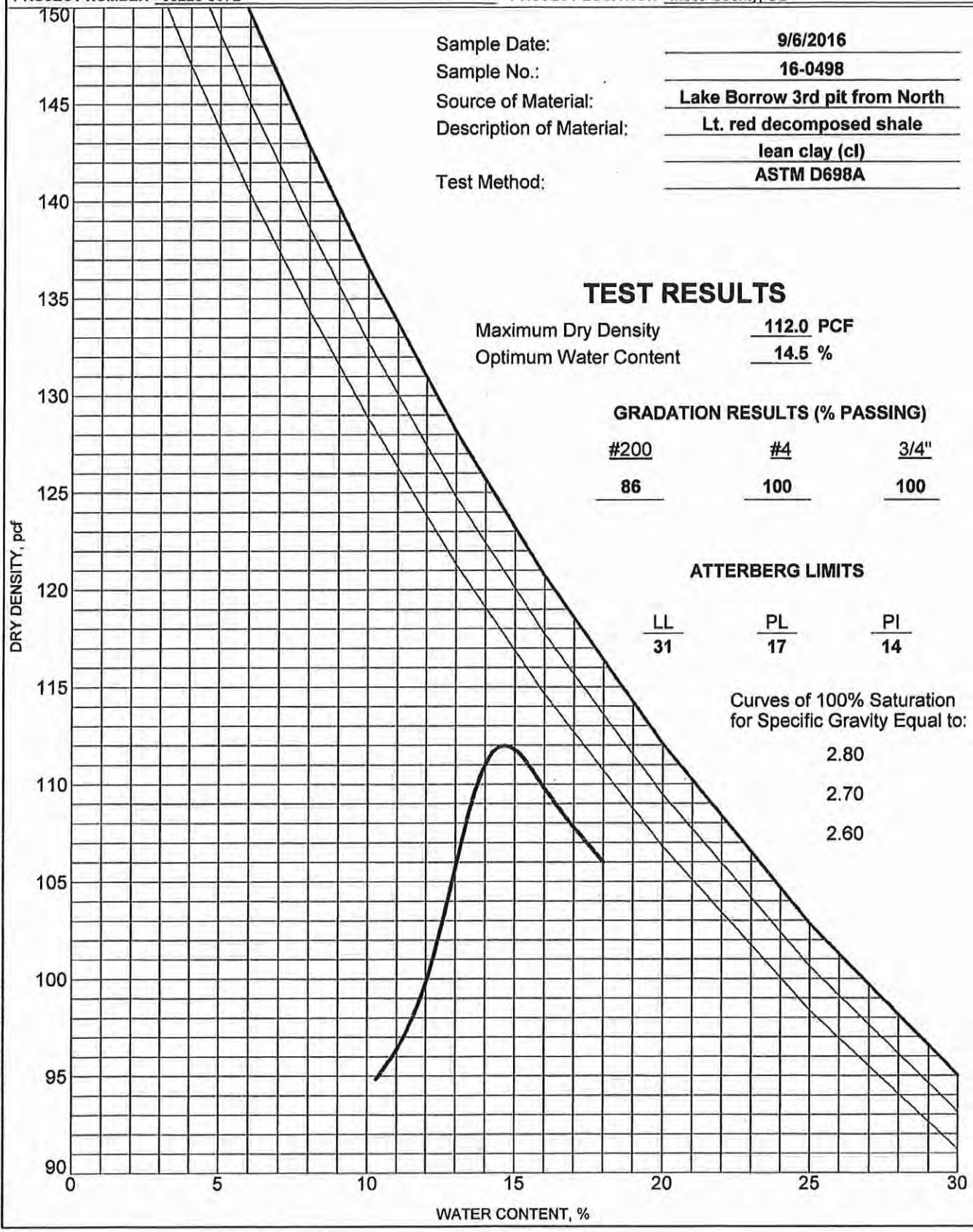
	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	16-0497 9/6/2016	2				0.0	3.0	97.0	

GRAIN SIZE 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

MOISTURE-DENSITY RELATIONSHIP

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO



Sample Date:	9/6/2016
Sample No.:	16-0498
Source of Material:	Lake Borrow 3rd pit from North
Description of Material:	Lt. red decomposed shale lean clay (cl)
Test Method:	ASTM D698A

TEST RESULTS

Maximum Dry Density	112.0 PCF
Optimum Water Content	14.5 %

GRADATION RESULTS (% PASSING)

#200	#4	3/4"
86	100	100

ATTERBERG LIMITS

LL	PL	PI
31	17	14

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

COMPACTION 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

Huddleston-Berry Engineering & Testing, LLC
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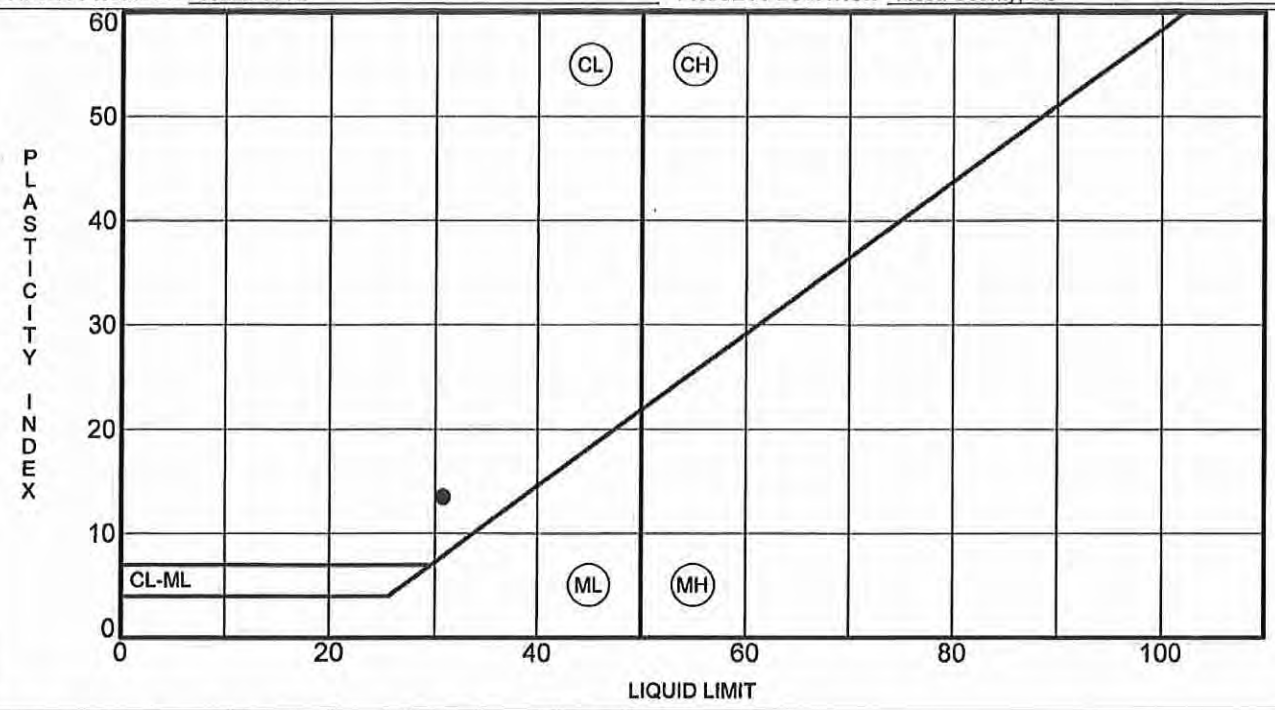
Grand Junction, CO 81501
970-255-8005
970-255-6818

ATTERBERG LIMITS' RESULTS

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



	Specimen Identification		LL	PL	PI	#200	Classification	
●	**16-0498**	**9/6/2016**	**31**	**17**	**14**	**86**	**Lt. red decomposed shale**	**lean clay (cl)**

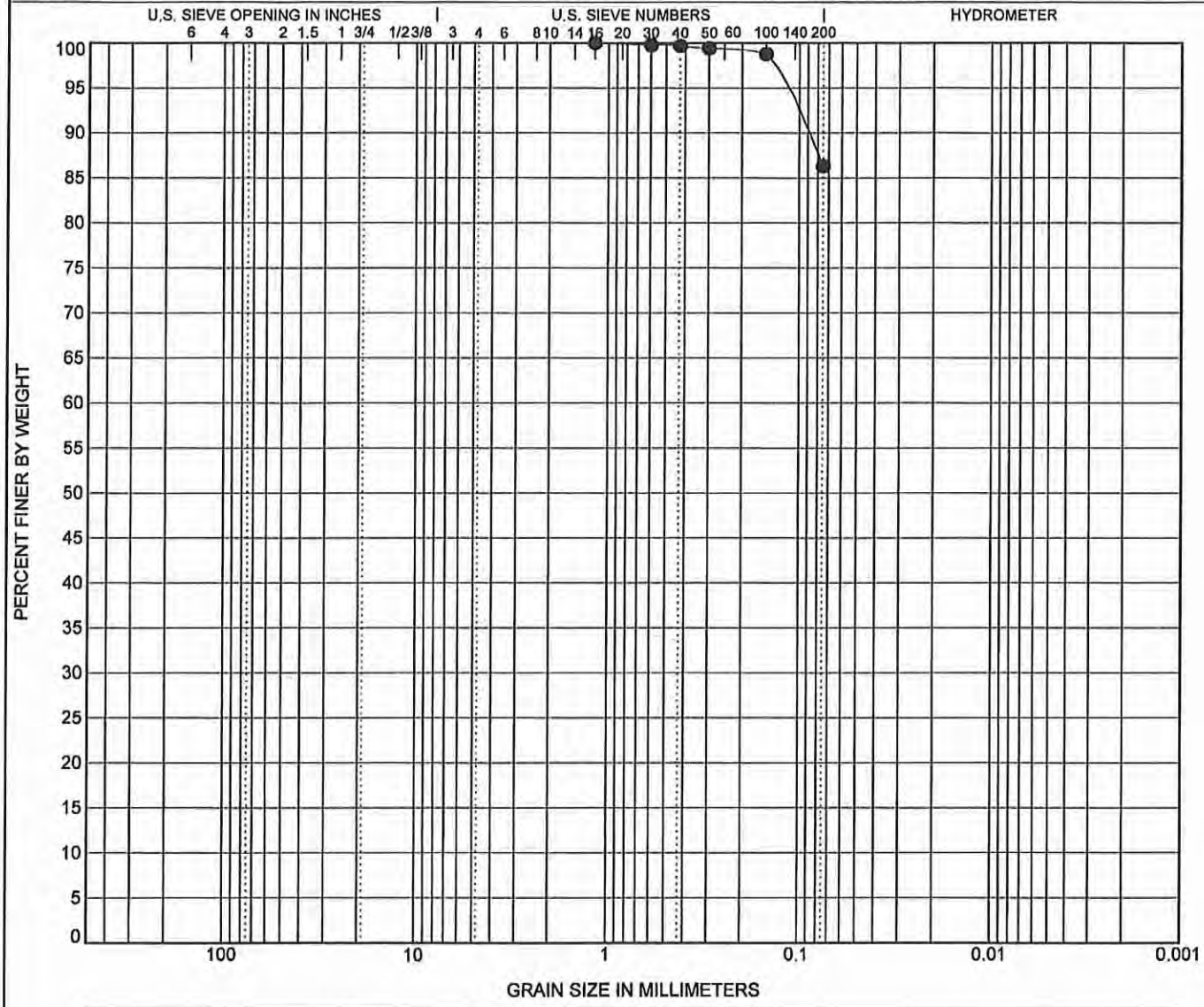
ATTERBERG LIMITS 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

GRAIN SIZE DISTRIBUTION

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● 16-0498 9/6/2016	Lt. red decomposed shale lean clay (cl)	31	17	14		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 16-0498 9/6/2016	1.18				0.0	13.7	86.3	

GRAIN SIZE 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 12/12/16

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Grand Junction, CO 81501
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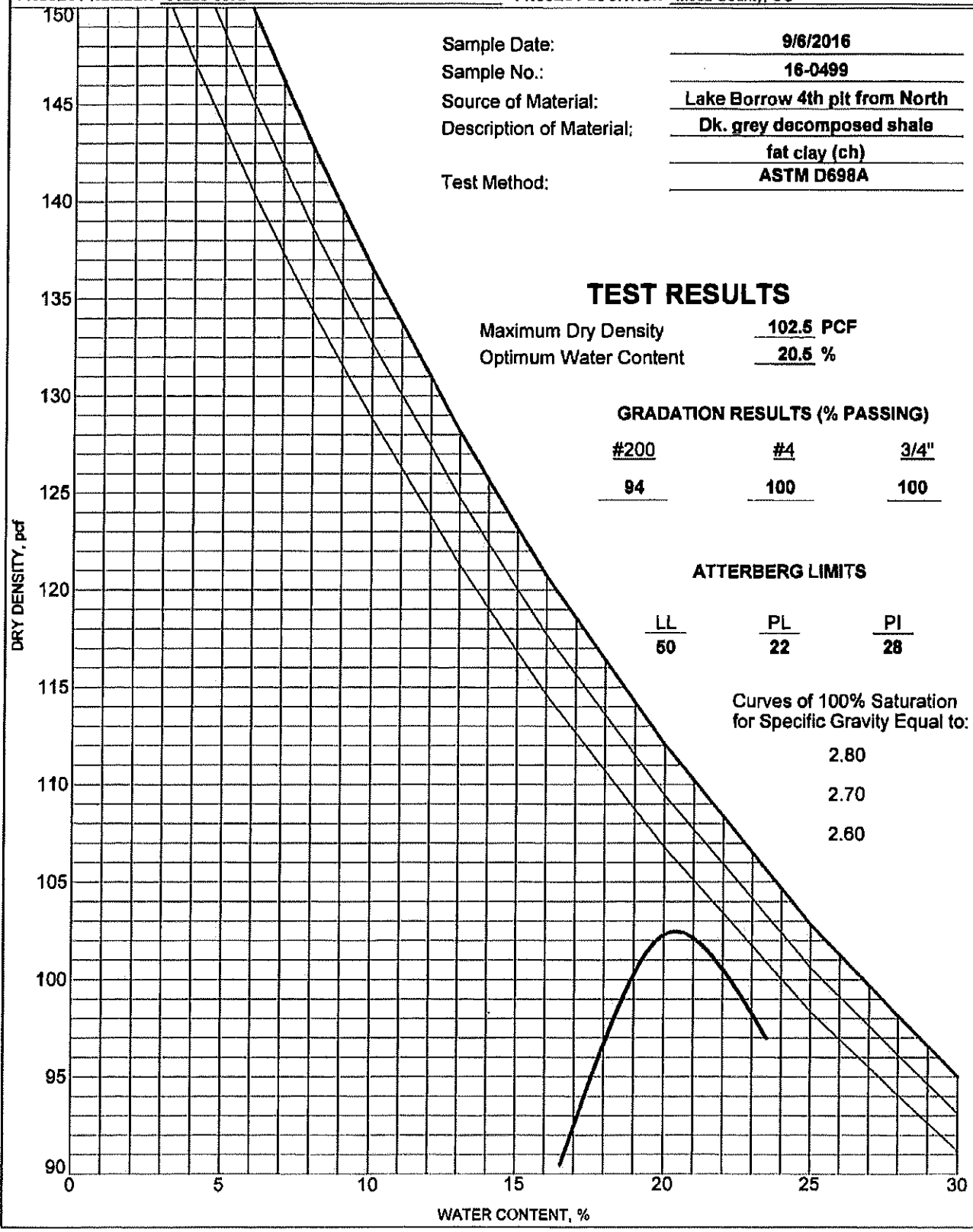
970-255-6818

MOISTURE-DENSITY RELATIONSHIP

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO



Sample Date:	9/6/2016
Sample No.:	16-0499
Source of Material:	Lake Borrow 4th pit from North
Description of Material:	Dk. grey decomposed shale fat clay (ch)
Test Method:	ASTM D698A

TEST RESULTS

Maximum Dry Density	102.5 PCF
Optimum Water Content	20.5 %

GRADATION RESULTS (% PASSING)

#200	#4	3/4"
94	100	100

ATTERBERG LIMITS

LL	PL	PI
50	22	28

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

COMPACTION 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/14/16

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Grand Junction, CO 81501
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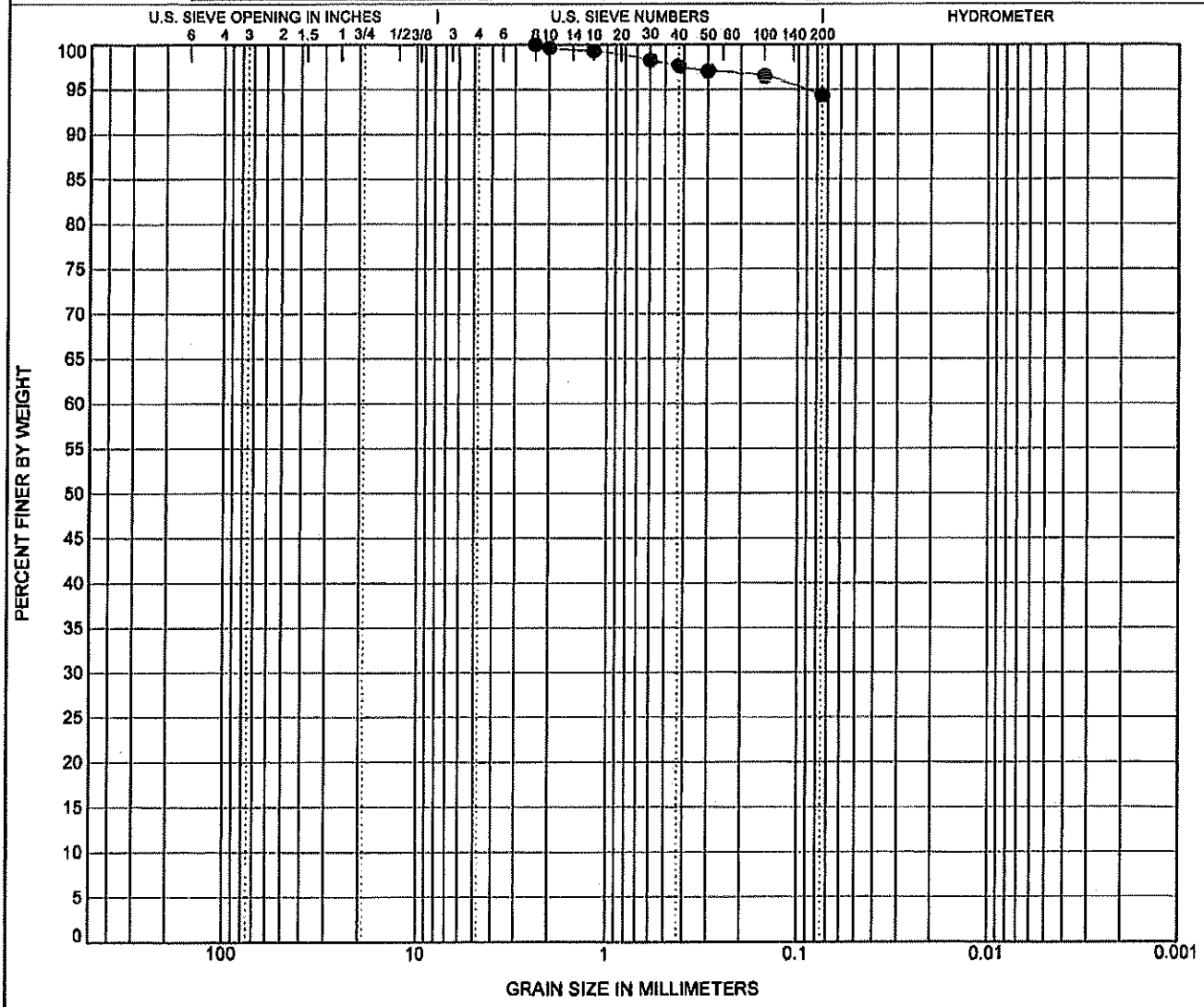
970-255-6818

GRAIN SIZE DISTRIBUTION

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	16-0499 9/6/2016	Dk. grey decomposed shale fat clay (ch)	50	22	28		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	16-0499 9/6/2016	2.36				0.0	5.6	94.4	

GRAIN SIZE 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/14/16

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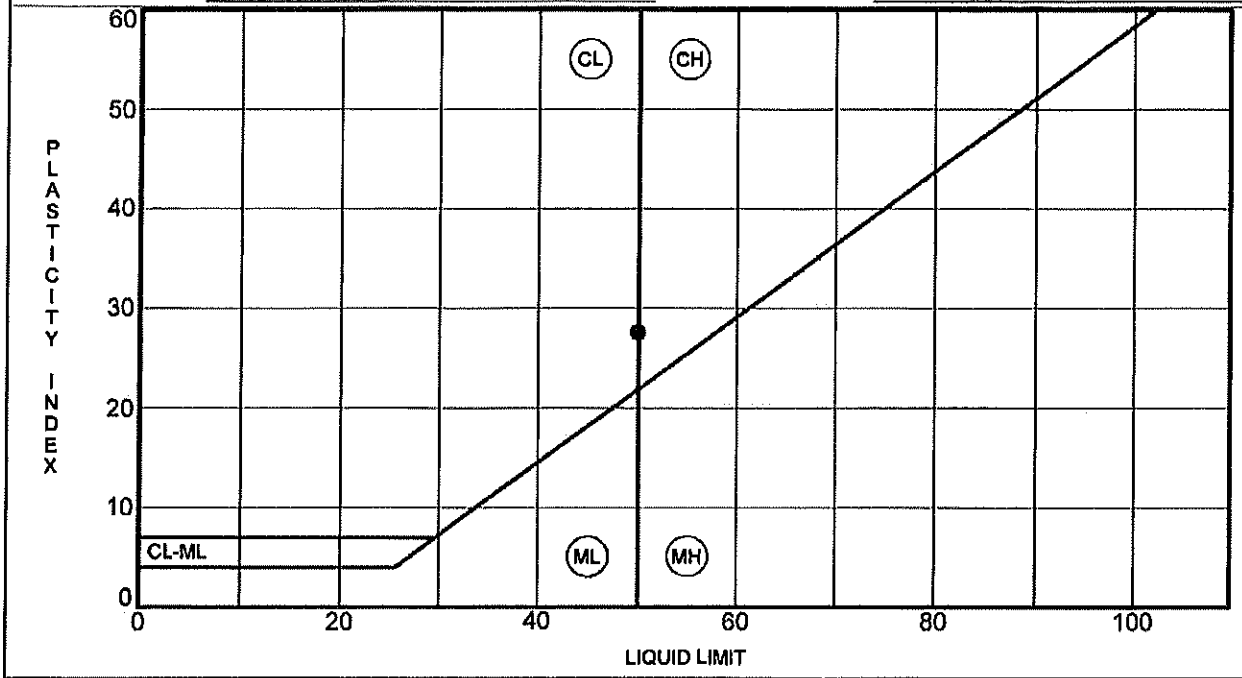
970-255-6818

ATTERBERG LIMITS' RESULTS

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



	Specimen Identification		LL	PL	PI	#200	Classification	
●	16-0499	9/6/2016	50	22	28	94	Dk. grey decomposed shale	fat clay (ch)

ATTERBERG LIMITS 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/14/16

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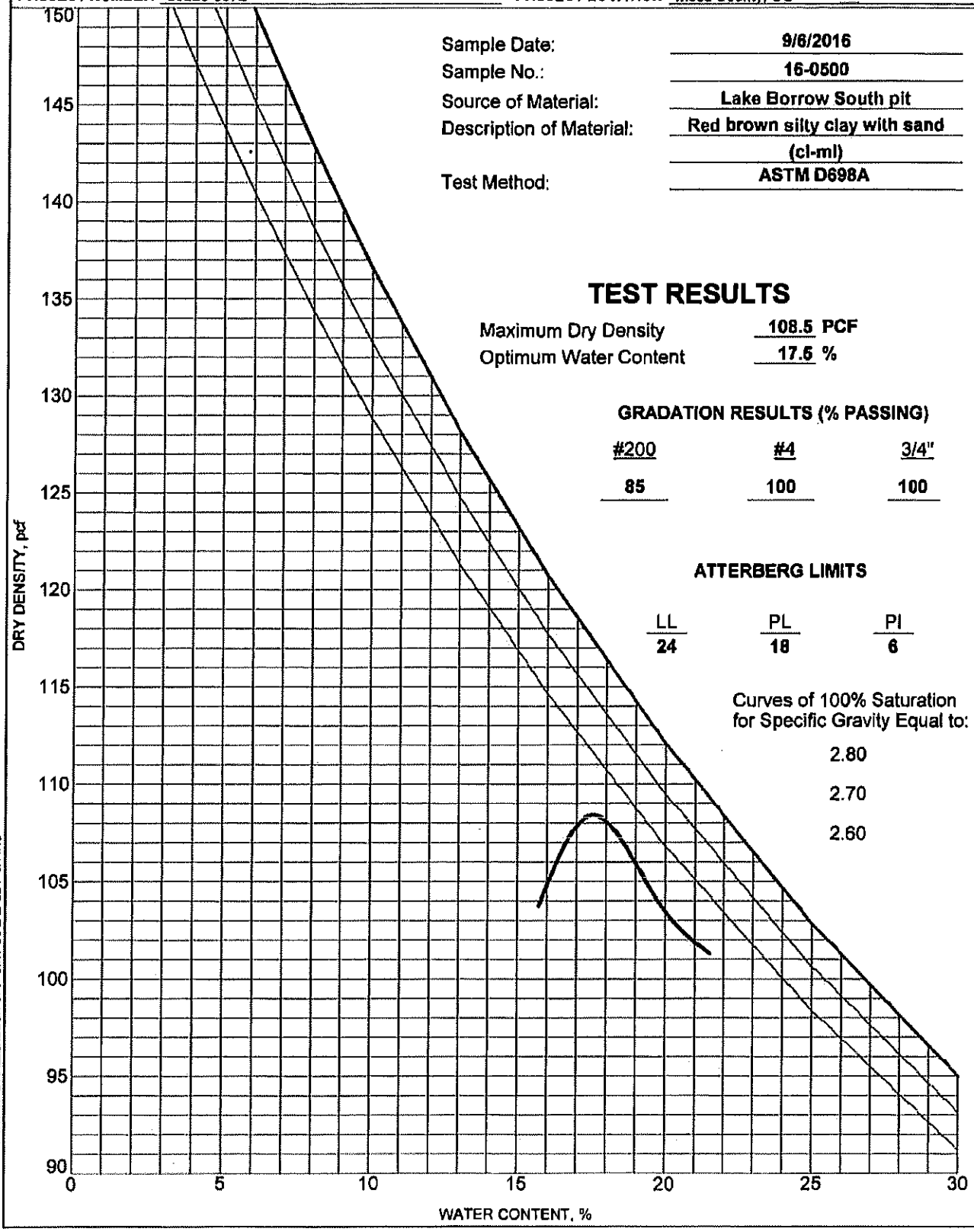
MOISTURE-DENSITY RELATIONSHIP

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



Sample Date: **9/6/2016**

Sample No.: **16-0500**

Source of Material: **Lake Borrow South pit**

Description of Material: **Red brown silty clay with sand (cl-ml)**

Test Method: **ASTM D698A**

TEST RESULTS

Maximum Dry Density **108.5** PCF

Optimum Water Content **17.6** %

GRADATION RESULTS (% PASSING)

#200	#4	3/4"
85	100	100

ATTERBERG LIMITS

LL	PL	PI
24	18	6

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

COMPACTION 00228-0072 HALLENBECK GPJ GINT US LAB GDT 9/14/16

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
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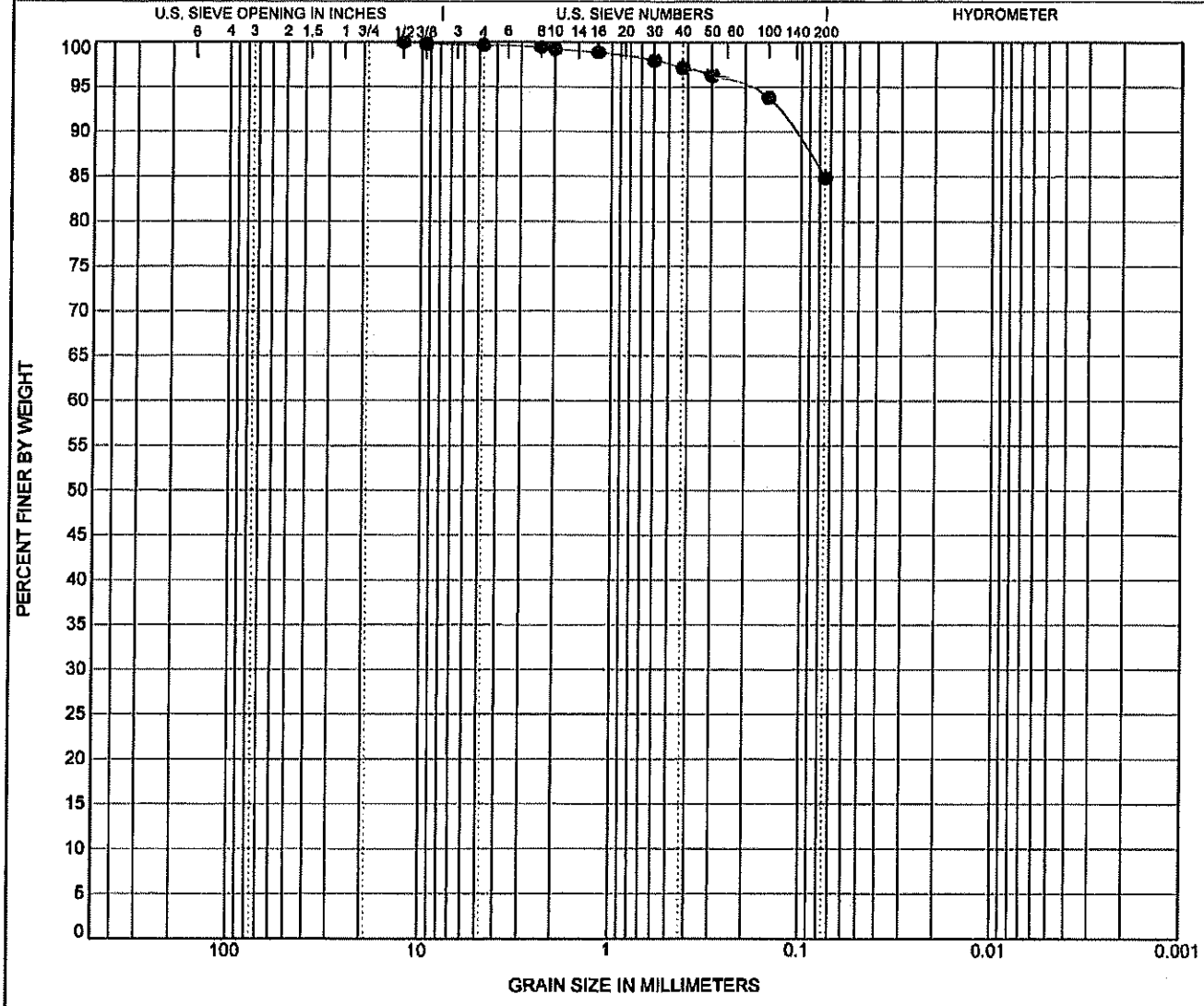
970-255-6818

GRAIN SIZE DISTRIBUTION

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	16-0500 9/6/2016	Red brown silty clay with sand (cl-ml)	24	18	8		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	16-0500 9/6/2016	12.5				0.3	14.8	84.8	

GRAIN SIZE 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/14/16

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Grand Junction, CO 81501
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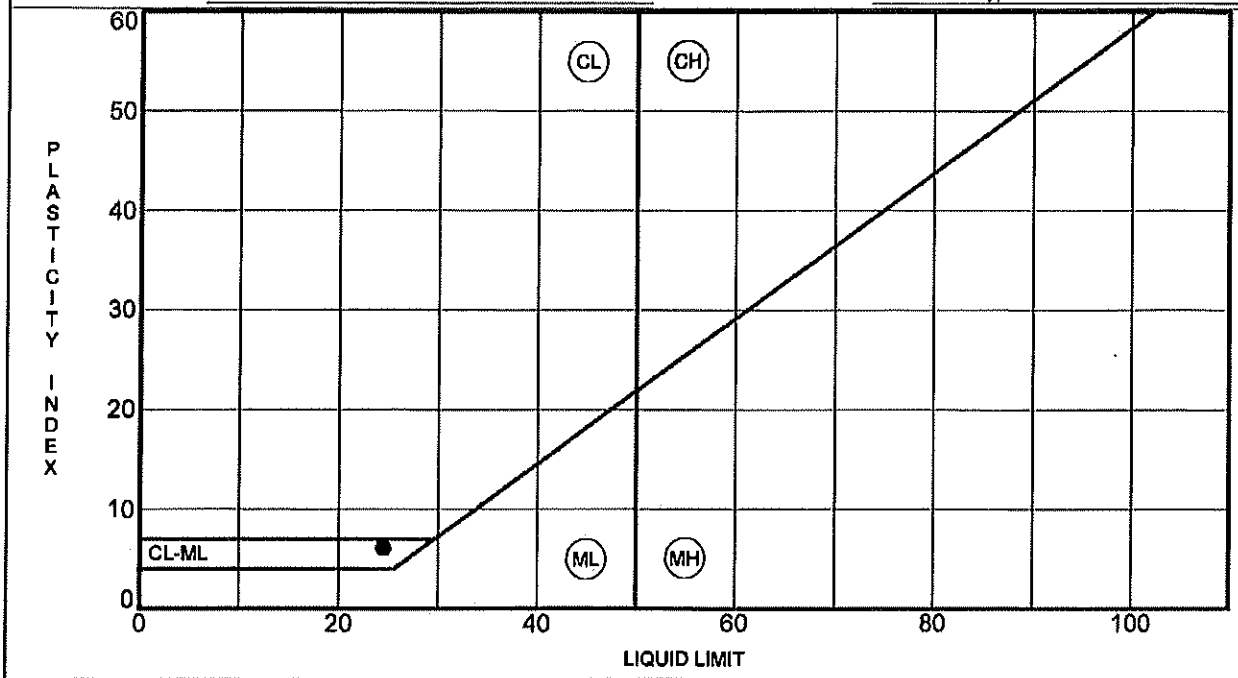
970-255-6818

ATTERBERG LIMITS' RESULTS

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



	Specimen Identification		LL	PL	PI	#200	Classification
●	**16-0500**	**9/6/2016**	**24**	**18**	**6**	**85**	**Red brown silty clay with sand (cl-ml)**

ATTERBERG LIMITS 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/14/16

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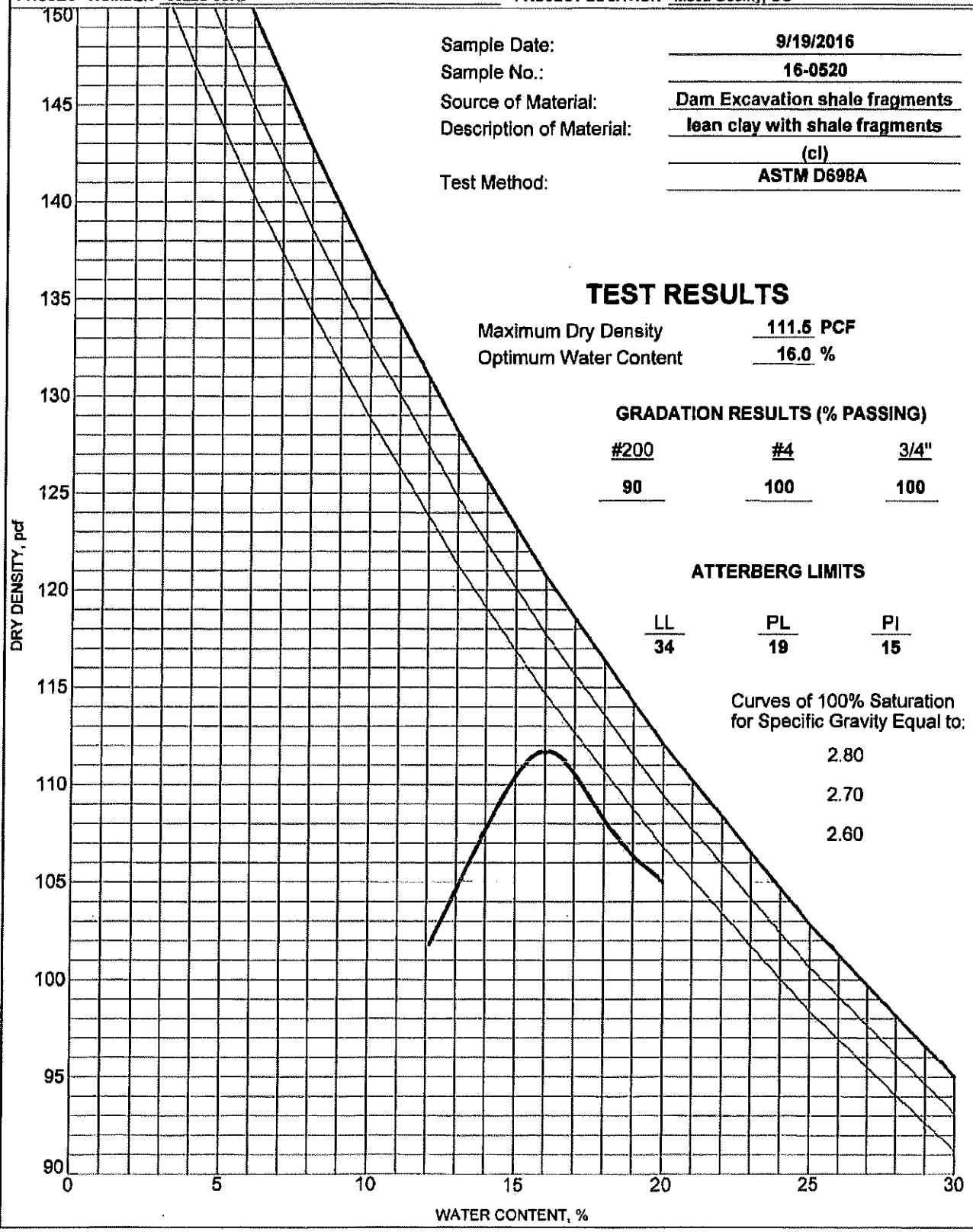
MOISTURE-DENSITY RELATIONSHIP

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO



Sample Date:	9/19/2016
Sample No.:	16-0520
Source of Material:	Dam Excavation shale fragments
Description of Material:	lean clay with shale fragments (cl)
Test Method:	ASTM D698A

TEST RESULTS

Maximum Dry Density	111.5 PCF
Optimum Water Content	16.0 %

GRADATION RESULTS (% PASSING)

#200	#4	3/4"
90	100	100

ATTERBERG LIMITS

LL	PL	PI
34	19	15

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

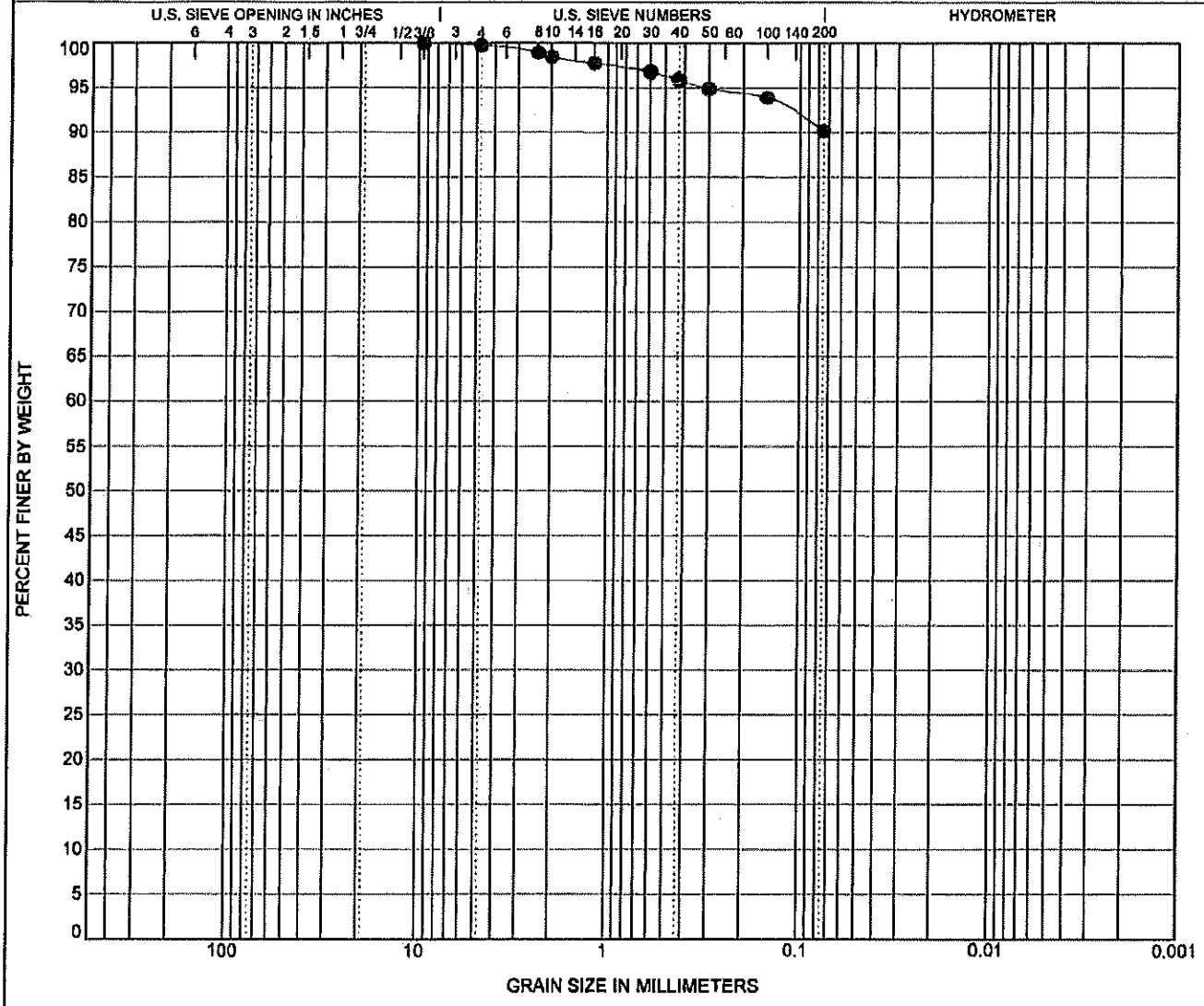
COMPACTION 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/26/16

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

GRAIN SIZE DISTRIBUTION

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	16-0520 9/19/2016	lean clay with shale fragments (cl)	34	19	15		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	16-0520 9/19/2016	9.5				0.3	9.5	90.2	

GRAIN SIZE 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/26/16

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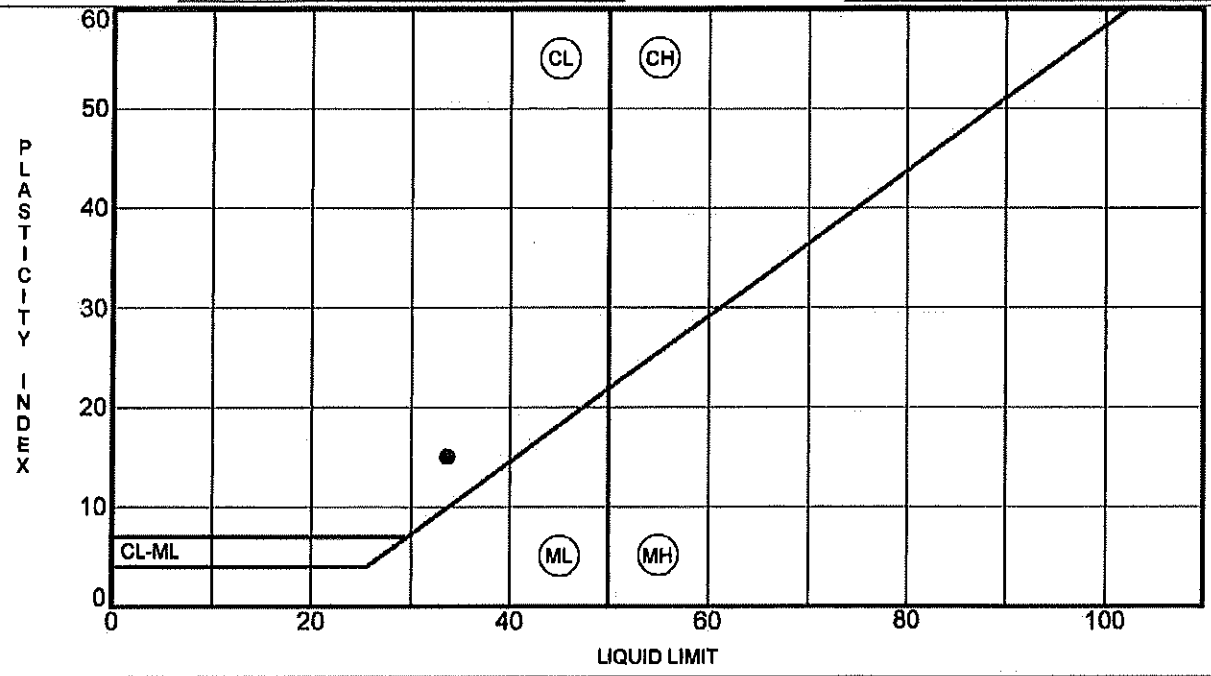
Grand Junction, CO 81501
970-255-8005
970-255-6818

ATTERBERG LIMITS' RESULTS

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



	Specimen Identification		LL	PL	PI	#200	Classification
●	**16-0520**	**9/19/2016**	**34**	**19**	**15**	**90**	**lean clay with shale fragments (cl)**

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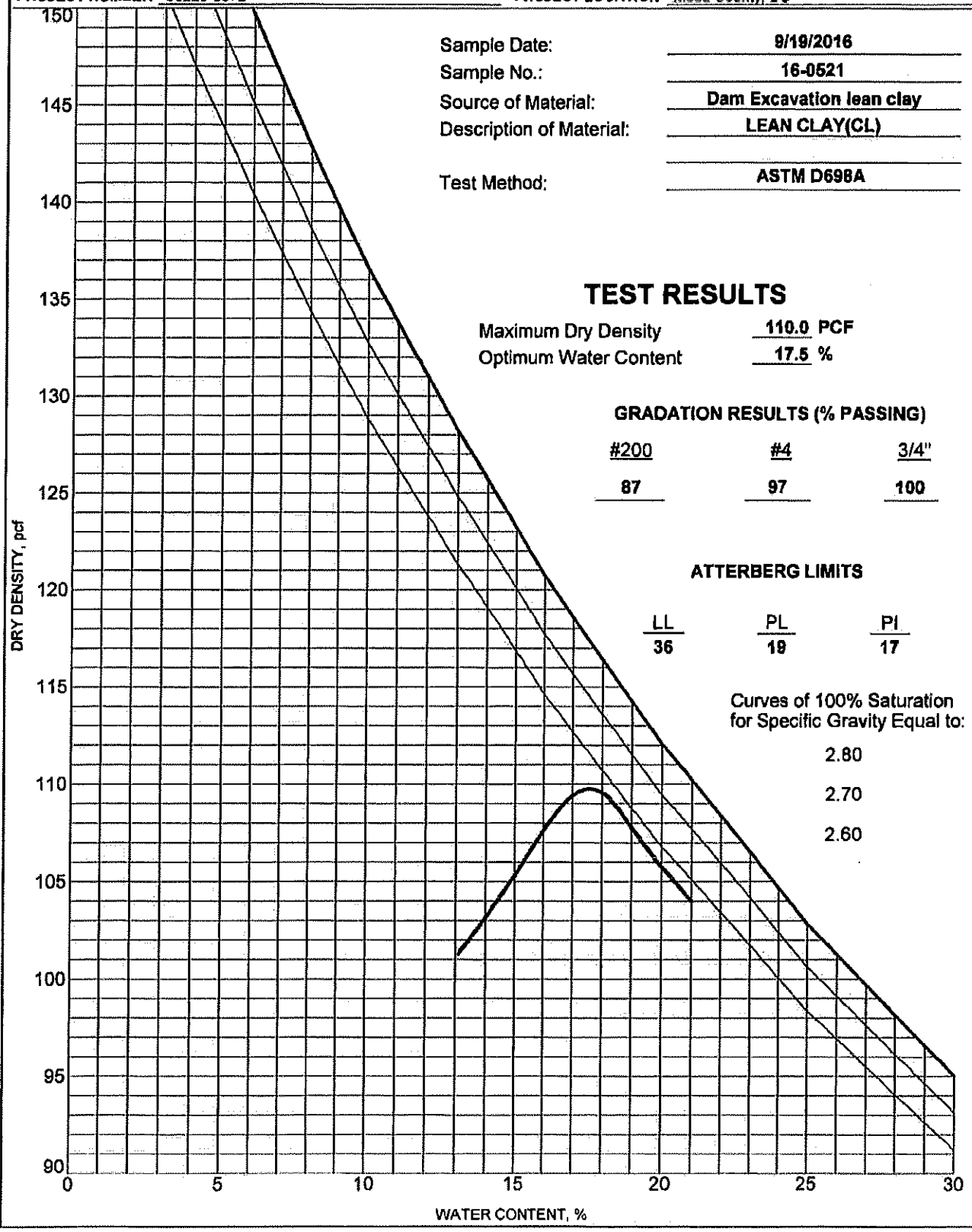
970-255-8005
970-255-6818

MOISTURE-DENSITY RELATIONSHIP

CLIENT M.A. Concrete
PROJECT NAME Hallenbeck Reservoir
PROJECT NUMBER 00228-0072
PROJECT LOCATION Mesa County, CO



Sample Date: 9/19/2016
Sample No.: 16-0521
Source of Material: Dam Excavation lean clay
Description of Material: LEAN CLAY(CL)

Test Method: ASTM D698A

TEST RESULTS

Maximum Dry Density 110.0 PCF
Optimum Water Content 17.5 %

GRADATION RESULTS (% PASSING)

#200	#4	3/4"
87	97	100

ATTERBERG LIMITS

LL	PL	PI
36	19	17

Curves of 100% Saturation for Specific Gravity Equal to:

2.80
2.70
2.60

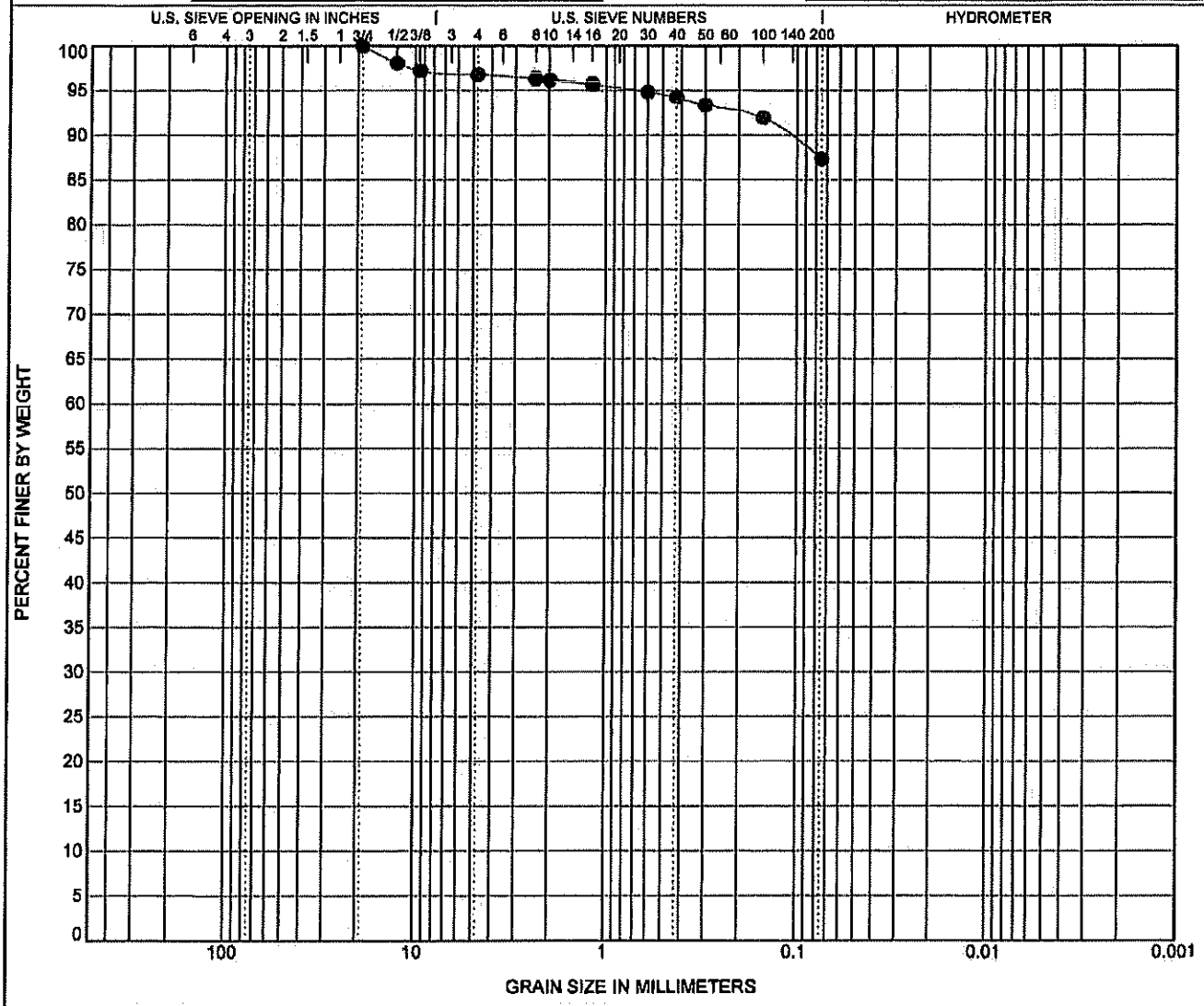
COMPACTION 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/26/16

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

GRAIN SIZE DISTRIBUTION

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	16-0521 9/19/2016	LEAN CLAY(CL)	36	19	17		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	16-0521 9/19/2016	19				3.2	9.5	87.3	

GRAIN SIZE 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/26/16

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Grand Junction, CO 81501
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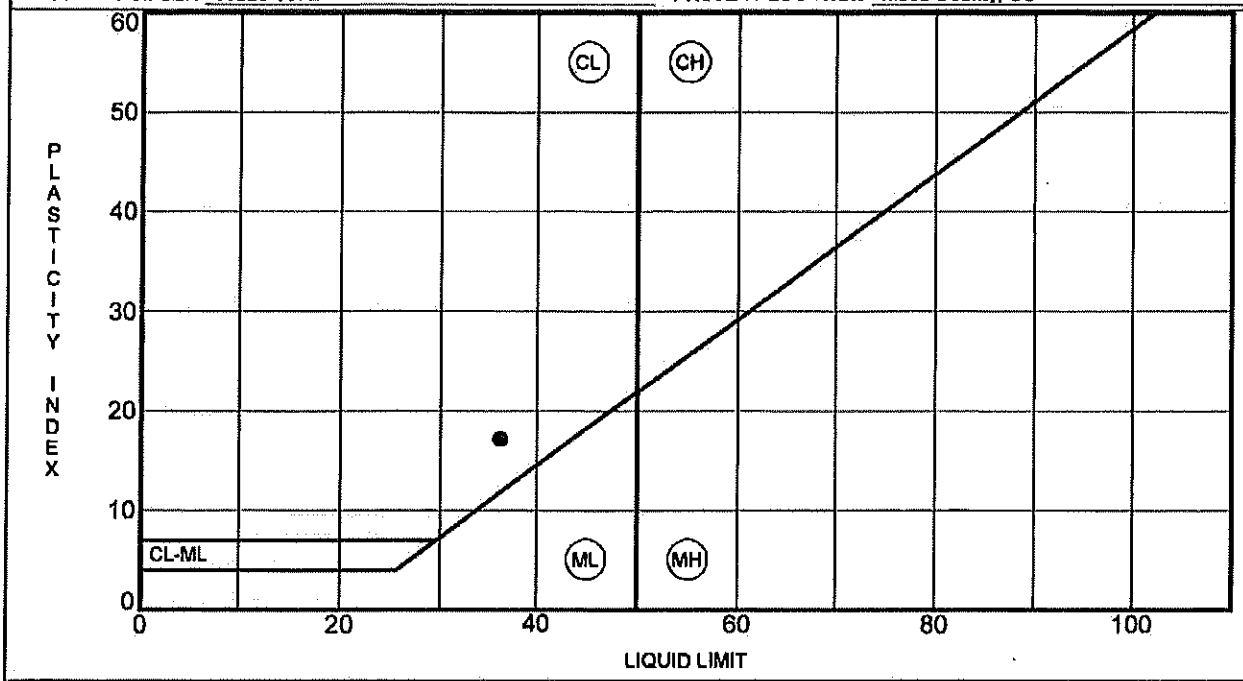
970-255-6818

ATTERBERG LIMITS' RESULTS

CLIENT M.A. Concrete **PROJECT NAME** Hallenbeck Reservoir

PROJECT NUMBER 00228-0072 **PROJECT LOCATION** Mesa County, CO



	Specimen Identification		LL	PL	PI	#200	Classification
●	16-0521	9/19/2016	36	19	17	87	LEAN CLAY(CL)

ATTERBERG LIMITS 00228-0072 HALLENBECK.GPJ GINT US LAB.GDT 9/26/16

Appendix F

Colorado Division of Water Resources
Final Construction Inspection Report

COLORADO
Division of Water Resources
Department of Natural Resources

FINAL CONSTRUCTION INSPECTION REPORT

PROJECT INFORMATION			
Dam Name:	Hallenbeck #1	Inspector:	Garrett Jackson
DAMID:	420125	Date:	12/1/2016
C-#:	C-0356F	Time on Site:	09:00-11:00
Dam Owner:	City of Grand Junction	Contact:	Lee Cooper
Engineer:	AECOM	Contact:	Christina Winckler
Contractor:	MA Construction	Contact:	Andy Azcarraga
Approved Plans & Specifications On-site? ☑ Yes ☐ No		Engineer Following Const. Obs. Plan? ☑ Yes ☐ No	

INSPECTION PARTICIPANTS	
Inspection Participants:	Garrett Jackson (DWR), Anna Mauss (CWCB) Lee Cooper, John Eklund, Trent Prall, Slade Connell (City) Andy Azcarraga (MAC)

CONDITIONS	
Reservoir:	Drained
Weather:	Clear, cool (40's-50's)
Equipment:	

CONSTRUCTION STATUS	
Work Completed to Date:	New blanket drain and toe drain have been completed, dam downstream shell and crest have been reconstructed, retaining wall at downstream toe is complete.
Work in Progress:	1. Concrete contractor will place concrete surface pads on toe drain cleanouts today. 2. Concrete contractor will fill protective bollards on retaining wall today.
Work Planned and est. Timeframe:	1. Movement monuments and station markers will be installed in the next few days. 2. Downstream slope will be mulched and planted later this fall. 3. City will inspect the toe drain piping with a video camera next week.

OBSERVATIONS AND DISCUSSION	
Purpose of Inspection:	Observe completed construction; develop punchlist of items necessary for final completion of the project.
Items Inspected:	1. Toe drain cleanouts. 2. Toe drain discharge points. 3. Retaining wall. 4. Installed piezometers. 5. Embankment slopes. 6. Embankment crest. 7. Outlet gate and operator.
Items not in compliance with approved plans/specs:	None.
Problems/Concerns:	Outlet gate will not close. It appears rust and/or debris has gotten inside the stem guide while the reservoir was drained for the past 2 years, and debris or corrosion is preventing the stem from moving freely within the guide. Water cannot be stored in the reservoir.

OBSERVATIONS AND DISCUSSION	
Change Orders:	--
Minor Changes:	--
Issues Discussed:	1. Piezometer casings should be permanently marked so water level measurements can be consistently measured at the same points on the casings. 2. City will document completion of the punchlist items via email and in the final construction report. 3. Rule 10 project completion documents will be completed and submitted by the City. EAP was updated in 2015. First fill and monitoring plan will not be useful until the outlet gate is operable.
Resolution of Deficiencies:	--
Action Items:	Punchlist: 1. Complete grading and surfacing of the dam crest for adequate drainage and erosion protection. 2. Complete revegetation of the downstream slope. 3. Install movement monuments and station markers on the dam crest. 4. Complete the placement of the concrete protection collars/pads on the toe drain cleanouts. 5. Inspect the toe drain pipes with a video camera, provide a copy of the video to SEO. 6. Make the outlet gate operable. 7. Submit the Rule 10 project completion documents.
Recommendations:	--

PHOTOGRAPHS

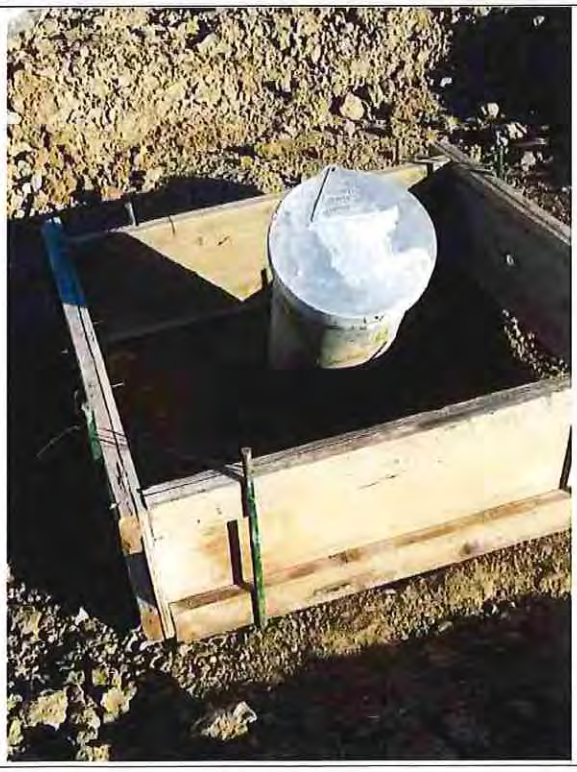
Toe drain pipe discharge points.

Valve on water line downstream of toe.

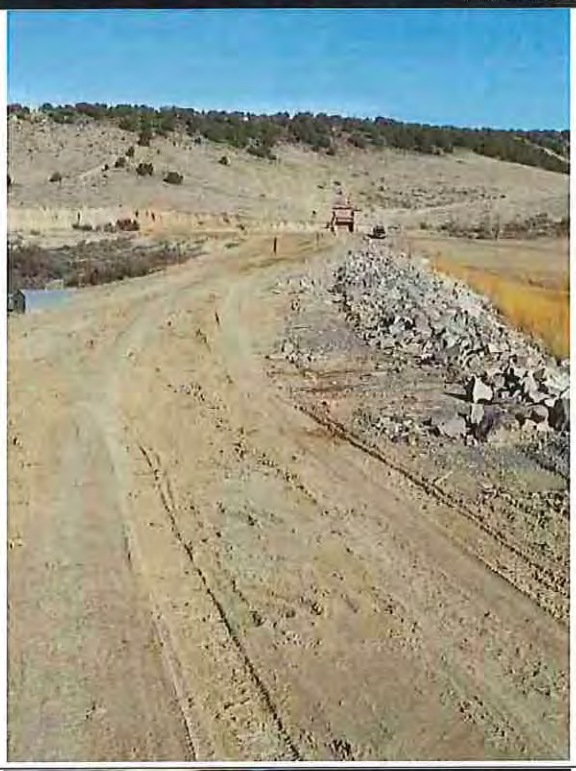
Water line valve box drain discharge.

Toe drain cleanout risers at maximum dam section.

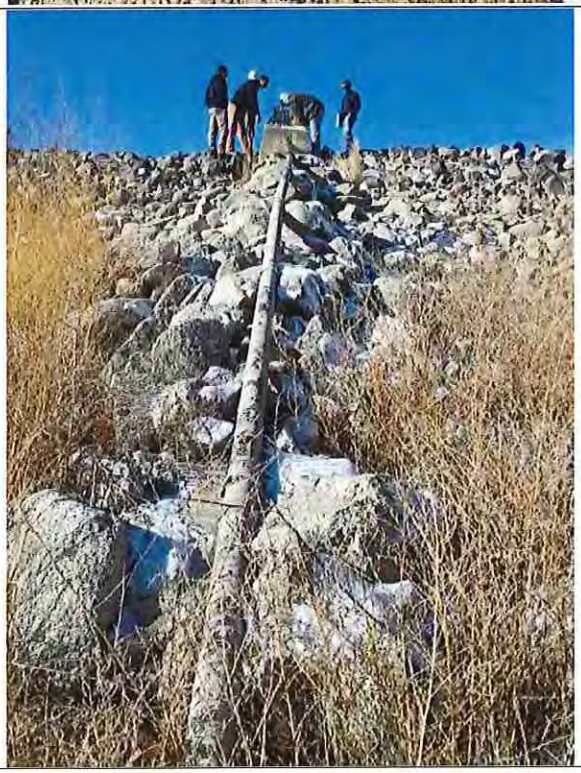
PHOTOGRAPHS

	Left toe drain cleanout riser at left (south) end of dam. Similar cleanout is located on the slope at the right (north) end of the dam.
	Toe drain riser with cap. Concrete surface protection has not been placed in forms yet.

PHOTOGRAPHS

	Dam crest from left end. Final grading for drainage and crest surfacing has not been completed.
	Piezometers 1 and 2 near the maximum section. Casings will be marked for consistent monitoring.

PHOTOGRAPHS

	Outlet gate operator on dam crest.
	Gate stem guide has been badly bent by ice, gate will not close.

Appendix G

CCTV Videos of North and South Toe Drains