



PERSIGO WASTEWATER TREATMENT PLANT Geotechnical Investigation

2145 River Road
Grand Junction, Colorado 81505



October 22, 2019
WJE No. 2019.3776

Prepared for:

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A handwritten signature in black ink, appearing to read 'Daniel Franco', written over a horizontal line.

Daniel Franco, PE

Peter A. Stauffer, PE

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PURPOSE AND SCOPE

At the request of the City of Grand Junction (CGJ), Wiss, Janney, Elstner Associates, Inc. (WJE) has completed a geotechnical investigation at the Persigo Wastewater Treatment Plant (herein referred to as PWWTP) located at 2145 River Road in Grand Junction, Colorado. The geotechnical investigation is part of the full scope of work for the PWWTP Structural Assessment as outlined in RFP-4653-19-DH, dated June 21, 2019. WJE has not been provided results of prior geotechnical investigations at the site, as it is our understanding that none exist. The objectives of our work are: characterize the subsurface conditions; including soils, bedrock, and groundwater levels for use in the engineering evaluation of the existing facilities; provide preliminary geotechnical recommendations for use in rehabilitation, modification, or improvement of existing facilities as needed; and provide preliminary recommendations for potential new construction at the PWWTP. The specific structures/facilities at the PWWTP to be assessed and evaluated by WJE for this current study include the Raw Sewage Pump Station, Primary Clarifiers, Aeration Basin, Aerobic Digesters, Sludge Processing Unit, and the Anaerobic Digesters.

The scope of work for the geotechnical investigation included:

- Review of available geologic and background information at the PWWTP
- Drilling and sampling 7 boreholes at the PWWTP, near the existing structures that are being assessed and evaluated by WJE
- Installation of 2 piezometers for future monitoring of groundwater levels
- Laboratory testing of selected soil samples
- Engineering evaluation of the results of the field investigation and laboratory testing programs
- Preparation of this report, summarizing our findings and providing preliminary geotechnical recommendations

Included with this report are Table 1: Summary of Laboratory Test Results; Table 2: Equivalent Fluid Unit Weights for “Active” and “At Rest” Conditions; Figure 1: Geologic Map; Figure 2: Borehole Location Map; Figure 3: Summarized Borehole Logs; and Figure 4: Borehole Log Legend. Detailed borehole and piezometer construction diagrams are provided in Appendix I; and laboratory test result sheets are included in Appendix II.

SITE CONDITIONS AND BACKGROUND

The PWWTP site encompasses approximately 50 acres and is located roughly 1.5 miles west of the intersection of U.S Route 6 and Interstate I-70, and 0.8 miles north of the Colorado River. The site gently slopes down to the southwest toward the Colorado River. The preconstruction topographic relief at PWWTP was approximately 12 feet. The post construction topographic relief, including the built-up areas, is approximately 20 feet. Groundwater conditions are expected to be relatively shallow due to the proximity of the site to the Colorado River and nearby gravel pits, where standing water is observed in the pits.

Construction of the PWWTP was completed in 1984, after which the plant has been in service for 35 years. The design capacity of the plant is 25 million gallons per day. Construction drawings indicate that the

PWWTP was designed to allow for future expansion of selected plant facilities. The main facilities that comprise the existing PWWTP include:

- Operation Building
- Headworks
- Grit Removal Units
- Raw Sewage Pump Station
- Primary Clarifier 1 and 2
- Primary Sludge Pump Station
- Aeration Basin
- Aeration Basin Control Unit
- Final Clarifier 1, 2, and 3
- Chlorine Unit
- Chlorine Contact Basins
- Plant Water Pump Station
- Anaerobic Digester 1 and 2
- Sludge Processing Unit
- Aerobic Digester
- Sludge Drying Beds
- Flow Equalization Basins

There are two existing piezometers that we understand have been used to monitor groundwater levels, one of which is located approximately 15 feet west of the Operations Building, and the other is located approximately 50 feet east of the Final Clarifiers. There are two additional piezometers located on the east side of the Flow Equalization Basin that could provide groundwater information; however, PWWTP site personnel were uncertain about the details regarding construction of these piezometers.

The foundation for the Raw Sewage Pump Station is located approximately 20 feet below the ground surface. This foundation is the deepest of any of the structures at the site. The Primary Clarifiers, Aeration Basin, and sections of the Anaerobic Digesters are built on pads. Grade around these facilities was built up with fill.

The foundation types for the structures included in our structural assessment are mat foundations and spread footings, according to “as-built” drawings. During the course of the field work completed for this study, WJE personnel observed the structural foundation at only two core holes located within the Raw Sewage Pump Station, in which no cracking was observed. According to the “as-built” drawings, the mat foundations for the structures are up to 2 feet thick and typically have a 3 to 4 inch sub-slab with a waterproofing membrane, and/or a 3 inch topping slab. The dimensions of the spread footing foundations vary. Of the structures WJE evaluated for this study, the Sludge Processing Unit and the Aerobic Digester have spread footing foundations, while the Raw Sewage Pump Station, Primary Clarifiers, Aeration Basins, and the Anaerobic Digesters have mat foundations.

SITE GEOLOGY

The project site is located in the Colorado Grand Valley near the Colorado River, and is situated between The Colorado National Monument approximately 2.5 miles to the south, and the Book Cliffs approximately 10 miles to the northeast (Figure 1A). A series of regional faults, including the Redlands Fault, are located 2.4 miles southwest of the PWWTP. Bedrock gently dips at approximately 3 to 11 degrees to the northeast at the project site. The site is underlain by the Mancos Shale, which is covered by contemporary overburden

soils containing gravels, sands, silts, and clays. Geological units that underlie the site range from Holocene to Upper Cretaceous in age.

Geologic mapping by Scott and Harding (2001) indicates the southern portion of the site, nearest to the Colorado River, consists of “*chiefly gravel in a sand matrix (Qfp)*” that is part of the Colorado River floodplain and stream channels. The northern portion of the site consists of a “*light-gray sandy clay and silty clay (Qsw) deposited on very gentle slopes north of the Colorado River, derived from the Mancos Shale,*” (Scott and Harding, 2001). The Mancos Shale outcrops approximately 5 miles northeast of the PWWTP site. Bedrock underlying overburden soils is the Mancos Shale, which is described as “*chiefly medium-dark-gray, dark-gray, brownish-gray, and brownish-black fissile shale that weathers to light gray*”. Based on subsurface profiles provided with the geological mapping (Figure 1B), the Mancos Shale is expected to be 15 to 30 feet below the ground surface at the project site. The Mancos Shale was encountered at approximately 20 feet below the ground surface at one of the boreholes completed for the subsurface investigation. In general, descriptions provided with the geological mapping (Scott and Harding, 2001) are consistent with the materials encountered during the subsurface investigation.

SITE INVESTIGATION

Drilling Program

The 2019 drilling program at the PWWTP was designed to generally define soil, bedrock, and groundwater conditions at and around the existing PWWTP structures. A total of 7 boreholes were drilled for the investigation at locations shown on Figure 2. Boreholes B-2 and B-5 were completed as piezometers, while the remaining boreholes were backfilled with soil cuttings. The summary borehole logs are provided in Figure 3, with the legend and notes provided on Figure 4. Detailed borehole logs and piezometer construction diagrams are provided in Appendix I.

The boreholes were drilled by HRL Compliance Solutions between September 11 and 13, 2019, using a track mounted Diedrich D90 drill rig. The boreholes were advanced using two methods: 4-inch diameter solid stem auger, and 6-inch diameter ODEX casing. Borehole depths ranged from 14-1/2 to 27 feet below the existing ground surface. Each borehole was logged by a WJE geotechnical engineer.

Subsurface materials were typically sampled at 5 foot intervals using a 2-inch inner diameter California split-barrel sampler. The sampler was driven with a 140-pound hammer falling a vertical distance of 30 inches. The hammer blows were provided by an automatic hammer. The number of blows required to advance the sampler 12 inches was recorded as the penetration resistance or N value. The N values provided in this report were not corrected to account for the diameter of the California sampler. Penetration resistance values provide an indication of the consistency or relative density of the subsurface materials encountered. Sampling was done in general accordance with the Standard Penetration Test (SPT) as described in ASTM D1586, *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*. When using the ODEX drilling method, grab samples were collected at selected depths. The groundwater levels were recorded during drilling for all boreholes, and Borehole B-1 was checked 24 hours after drilling before the hole was backfilled. Water level in Borehole B-5 was measured again approximately 24 hours after the piezometer was installed. Water level in Borehole B-2 was measured after the piezometer was installed.

Piezometers were installed in Boreholes B-2 and B-5 to permit monitoring of groundwater levels. The bottoms of Piezometers B-2 and B-5 are 17 and 20 feet 7 inches below the ground surface, respectively. The piezometers were constructed with 2-inch inner diameter schedule 40 PVC pipe. The lower 10 feet of

the piezometer pipe is machine slotted (10 slot), which is connected to the solid PVC pipe which extends 3 feet above ground surface. A clean 10-20 silica sand was placed in the annulus around the entire slotted PVC pipe section and extending approximately 2 feet above the slotted section. Bentonite chips were placed above the 10-20 silica sand to seal off the screened interval, and were placed up to about 2 feet below the ground surface. Concrete was placed from the top of the bentonite seal to the ground surface, and a circular lockable steel protective cover which extends approximately 3 feet above ground surface was placed in the concrete. As-built construction diagrams of Piezometers B-2 and B-5 are included in Appendix I with the detailed borehole logs.

Laboratory Testing

Laboratory testing was performed on selected samples obtained from the boreholes to characterize the physical and engineering properties of soil and bedrock materials at the PWWTP. Laboratory tests were conducted by Advanced Terra Testing, Inc. (ATT), of Lakewood, Colorado, in general accordance with ASTM procedures. Laboratory testing included:

- Water Content (ASTM D2216)
- Density (ASTM D7263)
- Atterberg Limits (ASTM D4318)
- Grain Size Distribution (ASTM D6913)
- Swell/Consolidation (Denver Swell)
- Unconfined Compressive Strength (ASTM D2166)

Laboratory test results are summarized on Table 1 on the following page, and are shown on the summary logs on Figure 3 and the detailed logs in Appendix I. Test result sheets are provided in Appendix II.

Table 1 - Summary of Laboratory Test Results

Borehole	Sample Depth (ft)	In situ Moisture Content (%)	In situ Dry Density (pcf)	Gradation			Atterberg Limits		Swell/Consolidation			Unconfined Compression Strength Test		Material Type
				Gravel (%)	Sand (%)	Fines (%)	Liquid Limit (%)	Plasticity Index (%)	Inundation Pressure (psf)	Swell/Cons. (%)	Swell Pressure (psf)	Axial Strain at Peak Stress(%)	Peak Stress (psf)	
B-1	0	14.2	-											
	4	14.5	113	4	41	55	28	14						CL - Sandy lean CLAY, trace gravel
	7	12.8	121											
	15.5	9.4	116											
	20			7	89	4								SP - poorly graded SAND, trace gravel
	26			20	76	4								SP - poorly graded SAND with gravel
B-2	0	7.1	105											
	3	11.5	113	0	1	99	41	23						CL - Lean CLAY, trace sand
	7	29.6	92	0	17	83								*CL - Lean CLAY with sand
	12	8.1	121											
B-3	0	9.9	126											
	4	19.8	108	0	1	99	38	20						CL - Lean CLAY, trace sand
	9	28.7	94	0	2	98	34	17	1080	-1.5	N/A	13	410	CL - Lean CLAY, trace sand
B-4	0	6.8	117											
	4	20.5	102	0	1	99	45	27						CL - Lean CLAY, trace sand
	9	21.8	103	0	51	49								*SC - Clayey SAND
B-5	0	14.8	112	0	9	91	38	21						CL - Lean CLAY, trace sand
	6	18.4	92	0	82	18								*SC - Clayey SAND
	20	9.2	122						2400	0.4	4680			
B-6	0	11.7	100											
	4	16.1	112	2	18	80	36	20						CL - Lean CLAY with sand
	9	16.6	115	0	1	99	36	19	1080	0.1	1830	12	4350	CL- Lean CLAY, trace sand
	14	28.3	95	0	0	100	34	18						CL- Lean CLAY
	19	8.2	125	37	52	11								SW-SC - Well graded SAND with clay and gravel
B-7	0	6.5	115											
	4	15.3	113	0	22	78	30	14						CL - Lean CLAY with sand
	9	28.3	92											

Notes:
(1) Laboratory testing completed by Advanced Terra Testing, Inc. Lakewood, Colorado.
(2) (*) denotes estimated soil classification.

SUBSURFACE CONDITIONS

Following are descriptions of the different materials encountered during the September 2019 geotechnical investigation as presented in this report. The borehole logs (Figures 3 and 4 and Appendix I) and laboratory test result sheets (Appendix II) should be referred to for detailed information.

Topsoil

Topsoil material was encountered in all boreholes ranging from the ground surface to about 1-1/2 feet below the ground surface. The topsoil was a clay soil with trace amounts of sand and gravel, with organic material including grass roots. The moisture of the topsoil ranged from dry to moist, and the color was dark brown.

Lean Clay

The predominant near-surface material encountered at the site is a lean clay with varying amounts of sand and gravel. Lean clay was encountered in all of the boreholes extending from just below the topsoil to depths ranging from 0.5 to 20 feet. Dry unit weights (dry densities) ranged from 92 to 126 pounds per cubic foot (pcf). Moisture contents ranged from 6.5 to 29.6 percent (%). N values ranged from 2 to 44, indicating the material consistency ranges from soft to hard. The lower blow counts were typically obtained in the lean clays below the groundwater level. Plasticity index values range from 14 to 27. Unconfined compressive strength tests on two samples provided strengths of 410 and 4,350 pounds per square foot (psf), respectively. Volumetric changes measured when test specimens were wetted at an applied stress corresponding to overburden stress ranged from 1.5% compression to 0.1% swell. The material color ranged from tan to light and dark brown.

Poorly Graded Sand

Sand with varying amounts of gravel underlies the lean clay, extending to the bottom of the boreholes at depths 27 and 17 feet in Boreholes B-1 and B-2, respectively. Due to difficulties drilling and sampling this material, just one drive sample was obtained using the California split-sampler, and several grab samples were obtained. The drive sample was found to have a moisture content of 8.1 %, and a dry unit weight of 121 pcf. The N value recorded for the one drive sample was 48, indicating the material relative density is dense. The material color was gray to brown.

Clayey Sand

Clayey sand underlies the lean clay in Boreholes B-4, B-5, and B-7, extending to depths of 14, 8-1/2, and 15-1/2 feet, respectively. Dry unit weights ranged from 92 to 103 pcf, and moisture contents ranged from 18.4 to 21.8 %. N values ranged from 15 to 24, indicating the material consistency is medium dense. The material color was light to dark brown.

Gravel and Cobble

Gravel and cobble materials were encountered in Boreholes B-4 and B-5 beneath lean clay and clayey sand, extending to depths of 17-1/2 and 20 feet, respectively. Gravel and cobble sizes and percentages by weight could not be determined accurately due to difficulty drilling and sampling these materials. Nearby fill materials containing native gravel and cobbles indicate that the maximum cobble size is likely approximately 3 to 4 inches. Gravel and cobble cuttings were collected during drilling, but no laboratory testing was performed on these samples due to crushing of the material that resulted from drilling with the ODEX system.

Well Graded Sand with Clay and Gravel

Well graded sand with clay and gravel underlies the lean clay in Borehole B-6, and extends to the bottom of the borehole at 23 feet depth. One sample of this material was obtained using the California split-sampler. The moisture content was determined to be 8.2 %, and the dry unit weight 125 pcf. The N value recorded for the one sample is 45, indicating the material relative density is medium dense. The material color was gray and brown.

Mancos Shale

A dark olive gray shale bedrock was encountered during drilling in Borehole B-5 at an approximate depth of 20 feet bgs. The N value was 50 blows to achieve 1 inch of sampler penetration, indicating the material consistency is very hard. Laboratory test results for dry unit weight and moisture content were 122 pcf and 9.2 %, respectively. The volumetric change measured when the test specimen was wetted at an applied stress corresponding to overburden was 0.4% swell.

Groundwater

Groundwater was encountered in Boreholes B-1, B-2, B-3, B-4, and B-5 at 5-1/2 to 8 feet depth below ground surface (bgs). At Boreholes B-6 and B-7, which were drilled in areas that had been built up by placement of fill, groundwater was encountered at 15 and 9 feet bgs, respectively. These groundwater levels were measured during drilling and shortly after drilling was completed. Groundwater levels may fluctuate significantly in response to numerous factors such as seasonal irrigation and climatic variations.

Groundwater readings were measured on September 13, 2019, at the four existing piezometers and the two new piezometers installed at Boreholes B-2 and B-5. Groundwater levels measured at existing and new piezometers on September 13, 2019 are consistent with one another and ranged from 7 to 9 feet bgs. The groundwater level measured at the existing piezometer west of the operations building was 7-1/2 feet bgs. The groundwater level for the existing piezometer east of the final clarifier was measured at 7 feet bgs. Groundwater levels measured at the existing piezometers east of the flow equalization basin were 7-1/2 and 9 feet bgs. Groundwater levels measured at the new piezometers, Piezometer B-2 (Borehole B-2) and Piezometer B-5 (Borehole B-5), were 8 and 7 feet bgs, respectively.

GEOTECHNICAL ENGINEERING DISCUSSION AND RECOMMENDATIONS

Lateral Earth Pressures

The majority of the facilities at the PWWTP extend below the ground surface and thereby have lateral earth pressures acting against them. The lateral earth pressures will depend on the type of subsurface material present, as well as drainage and groundwater conditions. Where foundations extend below the groundwater level, the lateral pressures acting on the wall increase as a result of the water pressure. In addition, the lateral earth pressure acting on a foundation wall will vary depending on whether or not the wall is restrained from moving. Where a foundation or retaining wall deflects in response to lateral earth pressures, this is referred to as active conditions. Where a foundation wall is restrained and does not deflect due to the lateral earth pressures, this is referred to as the at-rest conditions. At rest earth pressures will be greater than active earth pressures.

Lateral earth pressures are typically estimated using an “equivalent fluid pressure.” The lateral earth pressure acting on a wall at a particular depth is calculated as the depth below the ground surface times the

equivalent fluid unit weight. Where the wall extends below the groundwater level, the lateral earth pressure is calculated as the lateral pressure at the groundwater level, calculated as described above, plus the depth below the groundwater level times the equivalent fluid unit weight corresponding to conditions below the groundwater level.

Table 2, below, provides equivalent unit weights for active and at rest conditions and for conditions above and below the groundwater level. These values apply to the case where lean clay soils as described in this report bear against the foundation walls. For the existing PWWTP facilities, the boreholes completed for this study indicate that lean clay materials extend to depths below the bottom or to very near the bottom of all of the foundation walls.

Table 2 - Equivalent Fluid Unit Weights for “Active” and “At Rest” Conditions

Condition	Equivalent Fluid Unit Weight, pcf
Active - Above Groundwater Level	37
Active - Below Groundwater Level	80
At Rest - Above Groundwater Level	57
At Rest - Below Groundwater Level	91

Groundwater Conditions

The depth to groundwater ranged from 7 to 9 feet below the ground surface, except in areas that have been built up with fill. This groundwater range is based on depths measured during drilling, and readings obtained in the existing and new piezometers measured on September 11 to 13, 2019. Groundwater levels measured in the existing four piezometers agree with groundwater levels measured during the drilling program and with measurements in Piezometers B-2 and B-5. It is likely that groundwater levels have varied due to seasonal irrigation and changes in climatic conditions. In order to develop an understanding of how the groundwater level varies, WJE recommends that PWWTP site personnel obtain and record readings at the existing and new piezometers on a monthly basis for a period of 1 to 2 years.

Subgrade Foundation Performance

Considering that it has been approximately 35 years since construction of the PWWTP, and given the subsurface conditions as described in this report, we expect there will be minimal new distress due to foundation or slab-on-ground movement at the facility. Minor structure movement may have occurred during initial loading and soon thereafter. It is also possible that very minor structure movement has occurred due to changing loading conditions and large fluctuations in the groundwater level. Swell/consolidation testing indicates that subsurface materials at the site exhibit minimal volume change when wetted.

Details regarding the performance of the structures WJE evaluated for this study are provided in the WJE Structural Assessment Report.

Preliminary Recommendations for Additional Facilities

We understand that enlargement of the PWWTP could be undertaken in the future and could involve construction of new facilities including Anaerobic Digesters, Primary Clarifiers, Aeration Basins, and Final Clarifiers. Locations for the new facilities are shown on the “Overall Site Plan” drawing. Subsurface investigations completed for this study included boreholes located in the vicinity of these proposed

facilities. In the following sections we provide preliminary recommendations for foundation design and construction of these facilities based the findings of the geotechnical investigation as described in this report. Final geotechnical investigations should be completed for these facilities once the new facility locations have been selected and details of the proposed structures are known. We also provide preliminary geotechnical recommendations for these facilities based on where the future structures are shown on the drawings, and the results of this study.

Primary Clarifiers

The existing Primary Clarifiers are located in the central portion of the plant site. The existing structures measure approximately 118 feet at their outer diameter. The structures consist of a conventionally reinforced 8-inch thick concrete mat foundation, with a 2-inch thick grout layer, both of which have a 1:12 slope downwards towards the center of the clarifier. The perimeter walls consist of conventionally reinforced 10-inch thick concrete with two mats of reinforcing. The concrete structure extends approximately 2 feet above grade, and approximately 9 feet below grade. Borehole B-3 was drilled near where it appears that the additional Primary Clarifiers may be constructed. Based on the condition encountered in Borehole B-3, we offer the following preliminary comments and recommendations:

- Foundations similar to those constructed for the existing Primary Clarifiers appear to be a reasonable alternative for new Primary Clarifiers should they be constructed in this area. Design criteria for the foundation should be developed as part of the final geotechnical investigation work. Lateral earth pressures for preliminary design can be estimated using the equivalent fluid unit weights provided in this report. A relatively low N value (2/12) was obtained at 9 feet depth in Borehole B-3. Final geotechnical investigations should further investigate this depth interval to evaluate the potential affect soft lean clays could have on foundation design and construction. It may be prudent to “over-excavate” and replace soft clay if present at or near the mat bearing elevation.
- Excavations for the foundations may extend below the groundwater table. This should be confirmed based on monitoring of piezometer water levels as recommended in this report. Should it be determined that construction dewatering will be required, final geotechnical investigations should include slug testing to evaluate permeability characteristics of the lean clay soils for estimation of dewatering quantities, and for evaluation and design of dewatering alternatives if needed. In addition, final geotechnical investigation work should include development of design and construction recommendations for excavation support alternatives.
- If settlement of these structures is critical, final geotechnical investigations should include Shelby-tube sampling of the lean clay materials and consolidation testing, including time rate measurements for each load increment. However, it is possible, depending on the geometry and other details of the new clarifiers, that these structures *could* be considered to have what is sometimes called a “compensated foundation.” This means that the Clarifier, even when full of effluent, weighs the same or less than any soil excavated to allow its construction. If so, settlement concerns may be less crucial. Nevertheless, soft conditions at bearing elevations may introduce constructability issues, which must be considered in design and construction.

Anaerobic Digesters

The existing Anaerobic Digesters are located on the west side of the plant, west of the Primary Clarifiers. The existing circular structures measure approximately 70 feet at their outer diameter. The structures extend approximately 20 feet above grade, and approximately 10 feet below grade. The structures consist of a

conventionally reinforced 12-inch thick concrete mat foundation within the digesters, with a conventionally reinforced 14-inch thick concrete slab and 3-inch thick topping within the pump room located between the two tanks. Borehole B-4 was drilled near where it appears that additional Anaerobic Digesters may be constructed. Based on the condition encountered in Borehole B-4, we offer the following preliminary comments and recommendations:

- Mat foundations, similar to the foundations constructed for the existing facilities are a reasonable alternative for new Anaerobic Digesters should they be constructed in this area. Design criteria for the new mat foundation should be developed as part of the final geotechnical investigation work. Lateral earth pressures for preliminary design can be estimated using the equivalent fluid unit weights provided in this report.
- Excavations for the foundations for new Anaerobic Digesters are expected to extend slightly below the groundwater table. This should be confirmed based on monitoring of piezometer water levels as recommended in this report. Should it be determined that construction dewatering will be required, final geotechnical investigations should include slug testing to evaluate permeability characteristics of the lean clay soils for estimation of dewatering quantities, and for evaluation and design of dewatering alternatives if appropriate. In addition, final geotechnical investigation work should include development of design and construction recommendations for excavation support alternatives.
- If total or differential settlement of these structures is critical, final geotechnical investigations should include Shelby-tube sampling of the lean clay materials and consolidation testing including time rate measurements for each load increment. Since the Anaerobic Digesters extend significantly above grade, it is unlikely that these foundations can be considered to be “compensated.”

Aeration Basins

The existing Aeration Basins are located in the south central portion of the plant site. The existing aeration basins measure approximately 123 feet in the north-south direction, and 275 feet in the east-west direction. The aeration basin blower room is situated at the center of the structure (oriented in the north-south direction), and is approximately 30 feet in width. The basin walls extend approximately 2 feet above grade, and approximately 19 feet below grade. To the east and west of the basin blower room, the structure is split equally in the east-west direction by interior basin baffle walls, such that four individual open-air basins are present. The structure of the aeration basin consists of a conventionally reinforced 16-inch thick concrete slab foundation, with a 3-inch thick topping slab. The slab is thickened to 24-inches over an area that is six feet square below the 12-inch square interior columns. The exterior face of the foundation slab is waterproofed with continuous waterproofing that extends up the full height of the perimeter walls. The perimeter walls primarily consist of conventionally reinforced 12-inch thick concrete. Borehole B-6 was drilled near where it appears that the additional Aeration Basins may be constructed. Based on the condition encountered in Borehole B-6, we offer the following preliminary comments and recommendations:

- Mat foundations, similar to the foundations constructed for the existing basins, are likely a reasonable alternative for new Aeration Basins should they be constructed in this area to a similar bearing elevation. Allowable bearing pressures should be developed as part of the final geotechnical investigation work. Lateral earth pressures for preliminary design can be estimated using the equivalent fluid unit weights provided in this report.

- Excavations for foundations for new Aeration Basins, if similar to the existing basins, will extend below the groundwater table, and will likely bottom in lean clay. Final geotechnical investigations should include slug testing in this area to evaluate permeability characteristics of the lean clay soils for estimation of dewatering quantities that will be required, and for evaluation and design of dewatering alternatives. In addition, final geotechnical investigations should include development of design and construction recommendations for excavation support alternatives.
- If settlement of these structures is critical, final geotechnical investigations should include assessment of the compressibility of the deep clayey sand materials including time rate measurements for each load increment. As with the Clarifiers, it is possible that the Aeration Basins may be considered to have “compensated foundations.” This should be evaluated when final layout and details are determined.

Final Clarifiers

The existing Final Clarifiers are located at the south end of the plant site. The existing structures are approximately 118 feet at their outer diameter. The structures consist of a conventionally reinforced 12-inch thick concrete mat foundation, which has a 1:12 slope downwards towards the center of the clarifier. The concrete structure extends approximately 2 feet above grade, and approximately 15 feet below grade. Borehole B-7 was drilled near where it appears that the additional Final Clarifiers may be constructed. Based on the condition encountered in Borehole B-7, we offer the following preliminary comments and recommendations:

- Foundations similar to the foundations constructed for the existing clarifiers are likely a reasonable alternative for new Final Clarifiers should they be constructed in this area. Design criteria for the foundation should be developed as part of the final geotechnical investigation work. Lateral earth pressures for preliminary design can be estimated using the equivalent fluid unit weights provided in this report.
- Excavations for new Final Clarifiers, if similar to the existing clarifiers, will extend well below the groundwater table, and will extend into clayey sand that underlies the lean clay encountered at Borehole B-7. Furthermore, it appears that Borehole B-7 did not extend to the bottom of the existing Final Clarifiers. Final geotechnical investigations should extend below the bottom of the new clarifiers and should include slug testing to evaluate permeability characteristics for estimation of dewatering quantities that will be required, and for evaluation and design of dewatering alternatives. In addition, final geotechnical investigations should include development of design and construction recommendations for excavation support alternatives.
- If settlement of these structures is critical, final geotechnical investigations should include assessment of the compressibility of the lean clay and deep clayey sand materials including time rate measurements for each load increment. As with the Clarifiers and Aeration Basins, it is possible that the Final Clarifiers may be considered to have “compensated foundations.” This should be evaluated when final layout and details are determined.

Additional Recommendations for Final Geotechnical Investigation

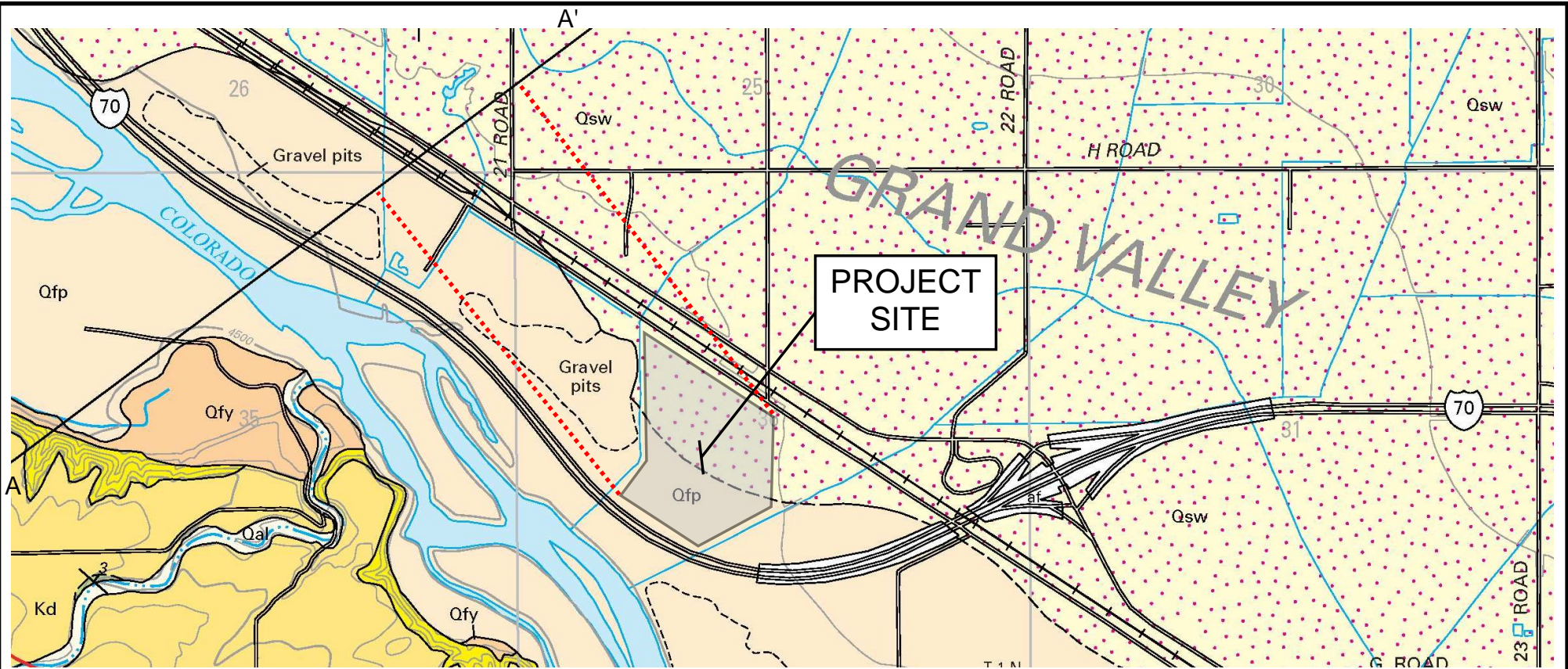
Final geotechnical investigations for new facilities at the PWWTP should be planned when the layout and details of the proposed new facilities have been reasonably defined. As noted above, some of the existing, as well as some of the new facilities, may be considered to have “compensated foundations.” However, facilities that cannot be considered to have compensated foundations should be investigated and designed

to address potential deep seated settlement. The fact that the existing facilities have generally performed adequately suggests that settlement has not been a significant problem. Nevertheless, we recommend that final investigations for new facilities that cannot reasonably be considered to have a “compensated foundation” include at least one boring to Mancos Shale bedrock for each structure.

GENERAL INFORMATION

Information in this report is intended to provide a geotechnical assessment of the site subsurface conditions, and to provide preliminary recommendations for geotechnical design and construction criteria based on these conditions; no other use is intended or authorized. Additional final geotechnical investigations will be required to support the design and construction of additions to existing facilities or for construction of new structures at the site. The report is based on the subsurface investigation, laboratory test results, site observations, analyses as described herein, and past experience with similar conditions. Variations can and do occur in geological materials, and departures from conditions portrayed in this report are possible. The conclusions and recommendations presented in this report are subject to the limitations and explanations contained herein.

FIGURES



DESCRIPTION OF MAP UNITS

Qfp	Flood-plain and stream-channel deposits (Holocene and late Pleistocene) —Chiefly gravel in a sand matrix
Qsw	Sheetwash deposits (Holocene and late Pleistocene) —Light-gray sandy clay and silty clay deposited on very gentle slope north of the Colorado River, derived from the Mancos Shale
Km	Mancos Shale (Upper Cretaceous) —Chiefly medium-dark-gray, dark-gray, brownish-gray, and brownish-black fissile shale that weathers light gray

NOTES:

1. THE GEOLOGIC MAP SHOWN IS TAKEN FROM GEOLOGIC MAPPING BY SCOTT AND HARDING, 2001.
2. SEE FIGURE 1B FOR SUBSURFACE PROFILE ALONG A-A'.

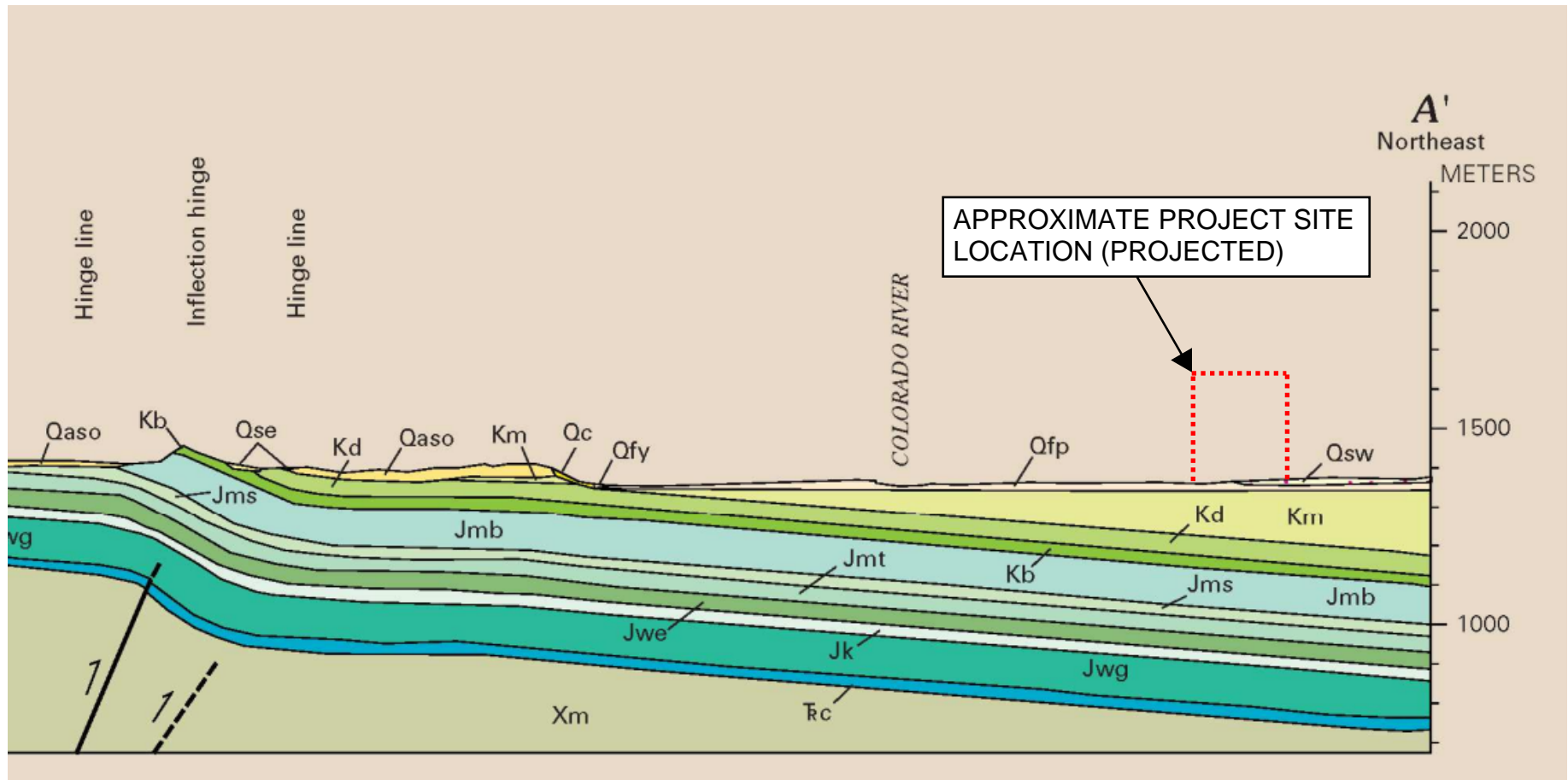
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Project	PERSIGO WASTE WATER TREATMENT PLANT 2145 RIVER ROAD, GRAND JUNCTION, CO
Sheet Title	GEOLOGIC MAP OF COLORADO NATIONAL MONUMENT AND ADJACENT AREAS, MESA COUNTY, COLORADO

Proj. No.	
Date	
Drawn	
Checked	
Scale	

FIGURE 1A



DESCRIPTION OF MAP UNITS

Qfp	Flood-plain and stream-channel deposits (Holocene and late Pleistocene) —Chiefly gravel in a sand matrix
Qsw	Sheetwash deposits (Holocene and late Pleistocene) —Light-gray sandy clay and silty clay deposited on very gentle slope north of the Colorado River, derived from the Mancos Shale
Km	Mancos Shale (Upper Cretaceous) —Chiefly medium-dark-gray, dark-gray, brownish-gray, and brownish-black fissile shale that weathers light gray

NOTES:

1. THE GEOLOGIC SUBSURFACE PROFILE SHOWN IS TAKEN FROM GEOLOGIC MAPPING BY SCOTT AND HARDING, 2001.
2. SEE FIGURE 1A FOR GEOLOGIC MAP.

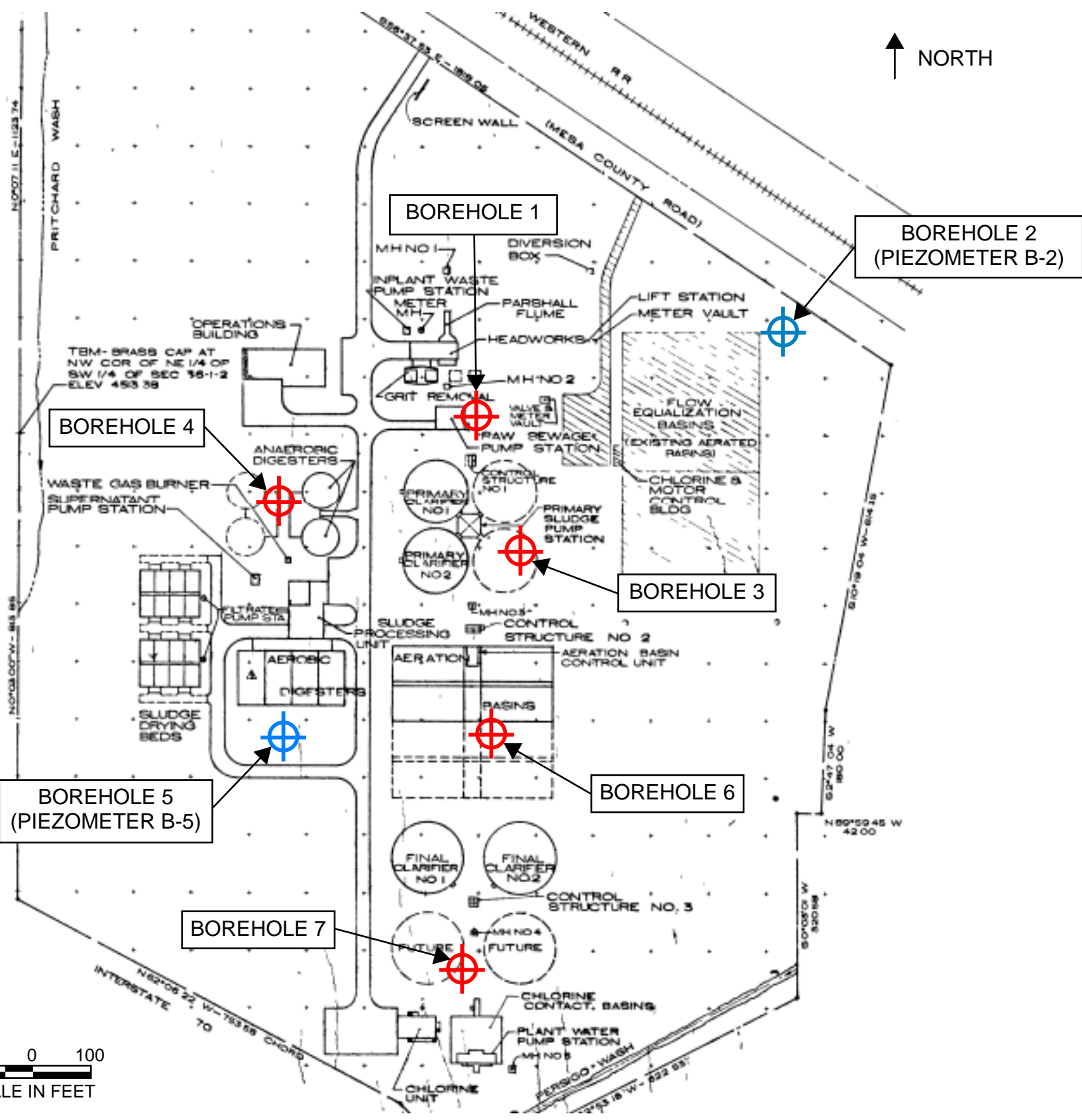
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Project	PERSIGO WASTE WATER TREATMENT PLANT 2145 RIVER ROAD, GRAND JUNCTION, CO
Sheet Title	GEOLOGIC MAP OF COLORADO NATIONAL MONUMENT AND ADJACENT AREAS, MESA COUNTY, COLORADO



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FIGURE 1B



NORTH

LEGEND:

-  APPROXIMATE BOREHOLE LOCATION.
-  APPROXIMATE BOREHOLE LOCATION COMPLETED AS A PIEZOMETER.

NOTE:

1. BASEMAP TAKEN FROM PLAN SHEET "PERSIGO WASH WASTEWATER TREATMENT PLANT - OVERALL SITE PLAN" BY HDR DATED MARCH 18, 1981.



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Project	PERSIGO WASTE WATER TREATMENT PLANT 2145 RIVER ROAD, GRANDO JUNCTION, CO
Sheet Title	BOREHOLE AND PIEZOMETER LOCATION MAP



Proj. No.	2019.3776.0			
Date	OCTOBER 22, 2019			
Drawn	DF			
Checked	PAS/TMM			
Scale	SEE SCALE BAR	Revision	Date	Description

FIGURE 2



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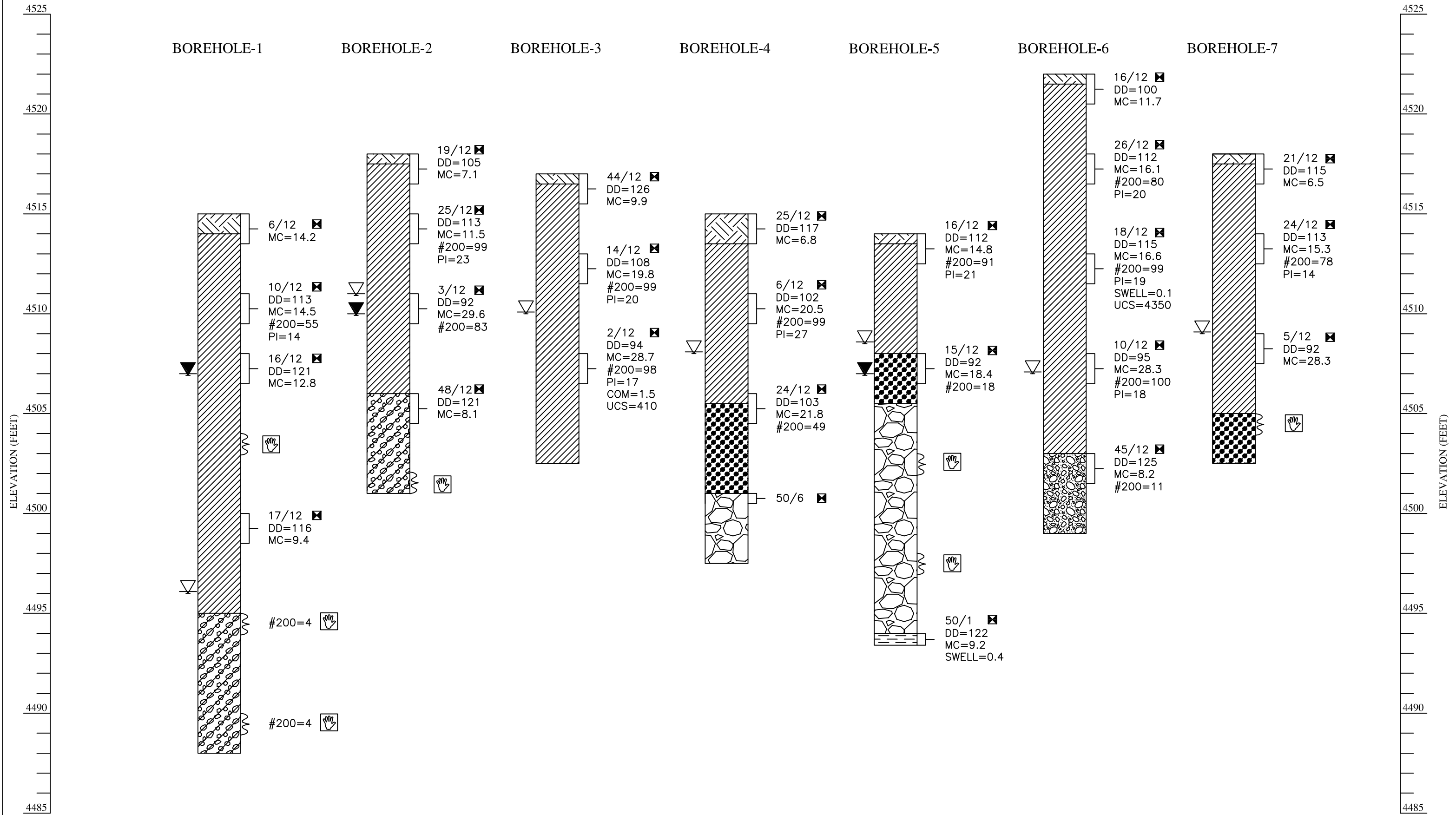
CLIENT: CITY OF GRAND JUNCTION
PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT
PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO
WJE PROJECT NO.: 2019.3776.0

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.
DRILLING STARTED: 09/11/2019 COMPLETE: 09/13/2019
DRILLING RIG TYPE: DRIEDRICH D90
LOGGED BY: DANIEL FRANCO

BOREHOLE SUMMARY LOG

PAGE 1 OF 1

FIGURE 3



P:\2019\2019.3xxx\2019.3776.0 - PERSIGO WASTEWATER TREATMENT PLANT (TMM)\2B - Geotech\Soil Boreholes (CAD)\Detailed\Summarized Borings, Constructed Piezometer Diagrams, Legend.dwg



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PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

CLIENT: CITY OF GRAND JUNCTION

WJE PROJECT NO.: 2019.3776.0

BOREHOLE SUMMARY LOG LEGEND

SAMPLE TYPE



Modified California Sampler (MC)



Approximate Depth Interval of Grab Sample (GS)

MATERIAL



TOPSOIL, CLAY, trace amounts of sand and gravel, dark brown, dry to moist, organics present.



CL-LEAN CLAY, varying amounts of sand and gravel, tan to light to dark brown, dry to wet, low plasticity, soft to hard.



SP-POORLY GRADED SAND, varying amounts of gravel, gray to brown, wet, non-plastic, dense.



SC-CLAYEY SAND, light to dark brown, wet, non-plastic, medium dense.



GRAVEL AND COBBLE, gray, wet, non-plastic.



SW-SC-WELL GRADED SAND WITH CLAY AND GRAVEL, gray to brown, wet, non-plastic, medium dense.



BEDROCK-MANCOS SHALE, dark olive gray, moist, low plasticity, very hard.



Groundwater depth during drilling.



Groundwater depth after 24 hours or piezometer installation.

15/12 indicates 15 blows were required to drive a Modified California sampler 12 inches using a 140 pound hammer falling 30 inches.

LABORATORY TEST

DD= Dry Density (lbs/ft³)

MC= Moisture Content (%)

#200= Fines Passing No. 200 sieve (%)

PI= Plasticity Index

SWELL= Swell upon wetting (%)

COM= Compression upon wetting (%)

UCS= Unconfined Compressive Strength (lbs/ft²)

NOTES

1. The boreholes were drilled from September 11 to 13, 2019. A 4-inch diameter solid stem auger and a 6-inch diameter ODEX drill stem powered by a Diedrich D90 were used to advance the boreholes.
2. The lines between materials represent the approximate contact between materials and transitions may be gradual.
3. Groundwater was encountered during drilling. Refer to borehole logs for groundwater information.
4. Borehole locations are approximate as shown on Figure 2. Borehole locations are based on measurements from existing structures. The latitude and longitude coordinates listed in the detailed borehole logs were obtained from Google Earth.
5. Borehole elevations are based on "as recorded" drawings titled "Site Layout & Grading Plan South Half" and "Site Layout & Grading Plan North Half," dated on May 1985, by Henningson, Durham, & Richardson (HDR).

FIGURE 4

P:\2019\2019.3xxx\2019.3776.0 - PERSIGO WASTEWATER TREATMENT PLANT (TMM)\2B - Geotech\Soil Boreholes (CAD)\Detailed, Summarized Borings, Constructed Piezometer Diagrams, Legend.dwg

APPENDIX I - DETAILED BOREHOLE LOGS AND PIEZOMETER AS-BUILTS



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BOREHOLE: B-1

PAGE 1 OF 1

CLIENT: CITY OF GRAND JUNCTION

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

WJE PROJECT NO.: 2019.3776.0

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/12/2019 COMPLETE: 09/12/2019

GROUND ELEVATION (FT): 4515

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

COORDINATES: 39.113650°N 108.656613°W

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 6

DEPTH TO BEDROCK (FT): NOT ENCOUNTERED

LOGGED BY: DANIEL FRANCO

DEPTH TO GROUNDWATER: 19 FEET DURING DRILLING

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N VALUE	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	GRAIN SIZE DISTRIBUTION (%)			ATTERBERG LIMITS			COM/SWELL (%)	UCS PEAK STRESS, (PSF)
							GRAVEL	SAND	FINES	PL	LL	PI		
0		TOPSOIL												
0-4		CL - sandy lean CLAY, trace gravel, brown, moist, low plasticity, medium stiff		6 12	14.2	-								
4-6		stiff		10 12	14.5	113	4	41	55	14	28	14		
6-10		stiff		16 12	12.8	121								
10-15		increasing gravel content in cuttings												
15-20		stiff		17 12	9.4	116								
20-25		SP - poorly graded SAND, trace gravel, brown, wet, non-plastic					7	89	4					
25-27		with gravel					20	76	4					
27-30		Bottom of borehole at 27.0 feet.												

COMMENTS: 24 hours after drilling, depth to groundwater was 8 feet.



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BOREHOLE: B-2

PAGE 1 OF 1

CLIENT: CITY OF GRAND JUNCTION

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

WJE PROJECT NO.: 2019.3776.0

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/13/2019 COMPLETE: 09/13/2019

GROUND ELEVATION (FT): 4518

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

COORDINATES: 39.114518°N 108.654717°W

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 6

DEPTH TO BEDROCK (FT): NOT ENCOUNTERED

LOGGED BY: DANIEL FRANCO

▽DEPTH TO GROUNDWATER: 7 FEET DURING DRILLING

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N VALUE	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	GRAIN SIZE DISTRIBUTION (%)			ATTERBERG LIMITS			COM/SWELL (%)	UCS PEAK STRESS, (PSF)
							GRAVEL	SAND	FINES	PL	LL	PI		
0		TOPSOIL												
0-1		CL - lean CLAY, trace sand, tan to light brown, dry, low plasticity, stiff		19 12	7.1	105								
1-5		very stiff		25 12	11.5	113	0	1	99	18	41	23		
5-10		with sand, wet, soft		3 12	29.6	92	0	17	83					
10-15		increasing gravel content in cuttings		48 12	8.1	121								
15-17		SP - poorly graded SAND with gravel, brown, wet, non-plastic, dense												
17.0		Bottom of borehole at 17.0 feet.												
20														
25														

COMMENTS: After piezometer installation, depth to groundwater was 8 feet.



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BOREHOLE: B-3

PAGE 1 OF 1

CLIENT: CITY OF GRAND JUNCTION

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

WJE PROJECT NO.: 2019.3776.0

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/13/2019 COMPLETE: 09/13/2019

GROUND ELEVATION (FT): 4517

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

COORDINATES: 39.112971°N 108.656259°W

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 4

DEPTH TO BEDROCK (FT): NOT ENCOUNTERED

LOGGED BY: DANIEL FRANCO

▽DEPTH TO GROUNDWATER: 7 FEET DURING DRILLING

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N VALUE	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	GRAIN SIZE DISTRIBUTION (%)			ATTERBERG LIMITS			COM/SWELL (%)	UCS PEAK STRESS, (PSF)
							GRAVEL	SAND	FINES	PL	LL	PI		
0		TOPSOIL												
0 - 4.4		CL - lean CLAY, tan to light brown, dry, low plasticity, hard	44	12	9.9	126								
4.4 - 5.0		trace sand, stiff	14	12	19.8	108	0	1	99	18	38	20		
5.0 - 10.0														
10.0 - 14.5		moist, soft	2	12	28.7	94	0	2	98	17	34	17	-1.5	410
14.5 - 25		Bottom of borehole at 14.5 feet.												

COMMENTS:



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BOREHOLE: B-4

PAGE 1 OF 1

CLIENT: CITY OF GRAND JUNCTION

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

WJE PROJECT NO.: 2019.3776.0

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/11/2019 COMPLETE: 09/11/2019

GROUND ELEVATION (FT): 4515

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

COORDINATES: 39.113219°N 108.657758°W

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 6

DEPTH TO BEDROCK (FT): NOT ENCOUNTERED

LOGGED BY: DANIEL FRANCO

▽DEPTH TO GROUNDWATER: 7 FEET DURING DRILLING

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N VALUE	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	GRAIN SIZE DISTRIBUTION (%)			ATTERBERG LIMITS			COM/SWELL (%)	UCS PEAK STRESS, (PSF)
							GRAVEL	SAND	FINES	PL	LL	PI		
0		TOPSOIL very stiff		25 12	6.8	117								
		CL - lean CLAY, trace sand, light brown, dry, low plasticity												
5		medium stiff		6 12	20.5	102	0	1	99	18	45	27		
10		SC - clayey SAND, light brown, wet, non-plastic, medium dense		24 12	21.8	103	0	51	49					
15		GRAVEL and COBBLE, gray, wet, non-plastic, dense		50 6										
		Bottom of borehole at 17.5 feet.												
20														
25														

COMMENTS:



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BOREHOLE: B-5

PAGE 1 OF 1

CLIENT: CITY OF GRAND JUNCTION

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

WJE PROJECT NO.: 2019.3776.0

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/11/2019 COMPLETE: 09/11/2019

GROUND ELEVATION (FT): 4514

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

COORDINATES: 39.112053°N 108.657756°W

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 6

DEPTH TO BEDROCK (FT): 20

LOGGED BY: DANIEL FRANCO

▽DEPTH TO GROUNDWATER: 5.5 FEET DURING DRILLING

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N VALUE	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	GRAIN SIZE DISTRIBUTION (%)			ATTERBERG LIMITS			COM/SWELL (%)	UCS PEAK STRESS, (PSF)
							GRAVEL	SAND	FINES	PL	LL	PI		
0		TOPSOIL												
0 - 4.5		CL - lean CLAY, trace sand, light brown, dry, low plasticity, stiff	16 12	14.8	112	0	9	91	17	38	21			
4.5 - 7.5		SC - clayey SAND, light brown, wet, non-plastic, medium dense	15 12	18.4	92	0	82	18						
7.5 - 20.6		GRAVEL and COBBLE, gray, wet, non-plastic												
20.6		BEDROCK - SHALE, dark olive gray, moist, low plasticity, very hard	50 1	9.2	122							0.4		
20.6		Bottom of borehole at 20.6 feet.												

COMMENTS: After piezometer installation, depth to groundwater was 7 feet.



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BOREHOLE: B-6

PAGE 1 OF 1

CLIENT: CITY OF GRAND JUNCTION

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

WJE PROJECT NO.: 2019.3776.0

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/12/2019 COMPLETE: 09/12/2019

GROUND ELEVATION (FT): 4522

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

COORDINATES: 39.112133°N 108.656501°W

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 4

DEPTH TO BEDROCK (FT): NOT ENCOUNTERED

LOGGED BY: DANIEL FRANCO

DEPTH TO GROUNDWATER: 15 FEET DURING DRILLING

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N VALUE	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	GRAIN SIZE DISTRIBUTION (%)			ATTERBERG LIMITS			COM/SWELL (%)	UCS PEAK STRESS, (PSF)
							GRAVEL	SAND	FINES	PL	LL	PI		
0		TOPSOIL												
0 - 4.5		CL - lean CLAY, light brown, dry, low plasticity, stiff		16 12	11.7	100								
4.5 - 10		with sand, brown, dry to slightly moist, very stiff		26 12	16.1	112	2	18	80	16	36	20		
10 - 14.5		trace sand, moist, stiff		18 12	16.6	115	0	1	99	17	36	19	0.1	4350
14.5 - 20		brown and gray, wet, stiff		10 12	28.3	95	0	0	100	16	34	18		
20 - 23		SW-SC - well graded SAND with clay and gravel, gray and brown, wet, non-plastic, medium dense		45 12	8.2	125	37	52	11					
23 - 25		Bottom of borehole at 23.0 feet.												

COMMENTS:



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BOREHOLE: B-7

PAGE 1 OF 1

CLIENT: CITY OF GRAND JUNCTION

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

WJE PROJECT NO.: 2019.3776.0

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/13/2019 COMPLETE: 09/13/2019

GROUND ELEVATION (FT): 4518

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

COORDINATES: 39.110957°N 108.656657°W

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 4

DEPTH TO BEDROCK (FT): NOT ENCOUNTERED

LOGGED BY: DANIEL FRANCO

▽DEPTH TO GROUNDWATER: 9 FEET DURING DRILLING

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N VALUE	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	GRAIN SIZE DISTRIBUTION (%)			ATTERBERG LIMITS			COM/SWELL (%)	UCS PEAK STRESS, (PSF)
							GRAVEL	SAND	FINES	PL	LL	PI		
0		TOPSOIL												
0 - 2.1		CL - lean CLAY with sand, brown, dry, low plasticity, very stiff		21 12	6.5	115								
2.1 - 5		moist, very stiff		24 12	15.3	113	0	22	78	16	30	14		
5 - 10		wet, soft		5 12	28.3	92								
10 - 15.5		SC - clayey SAND, dark brown, wet, non-plastic												
15.5 - 25		Bottom of borehole at 15.5 feet.												

COMMENTS:



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PIEZOMETER AS-BUILT: B-2

PAGE 1 OF 1

CLIENT: CITY OF GRAND JUNCTION

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

WJE PROJECT NO.: 2019.3776.0

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/13/2019 COMPLETE: 09/13/2019

GROUND ELEVATION (FT): 4518

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

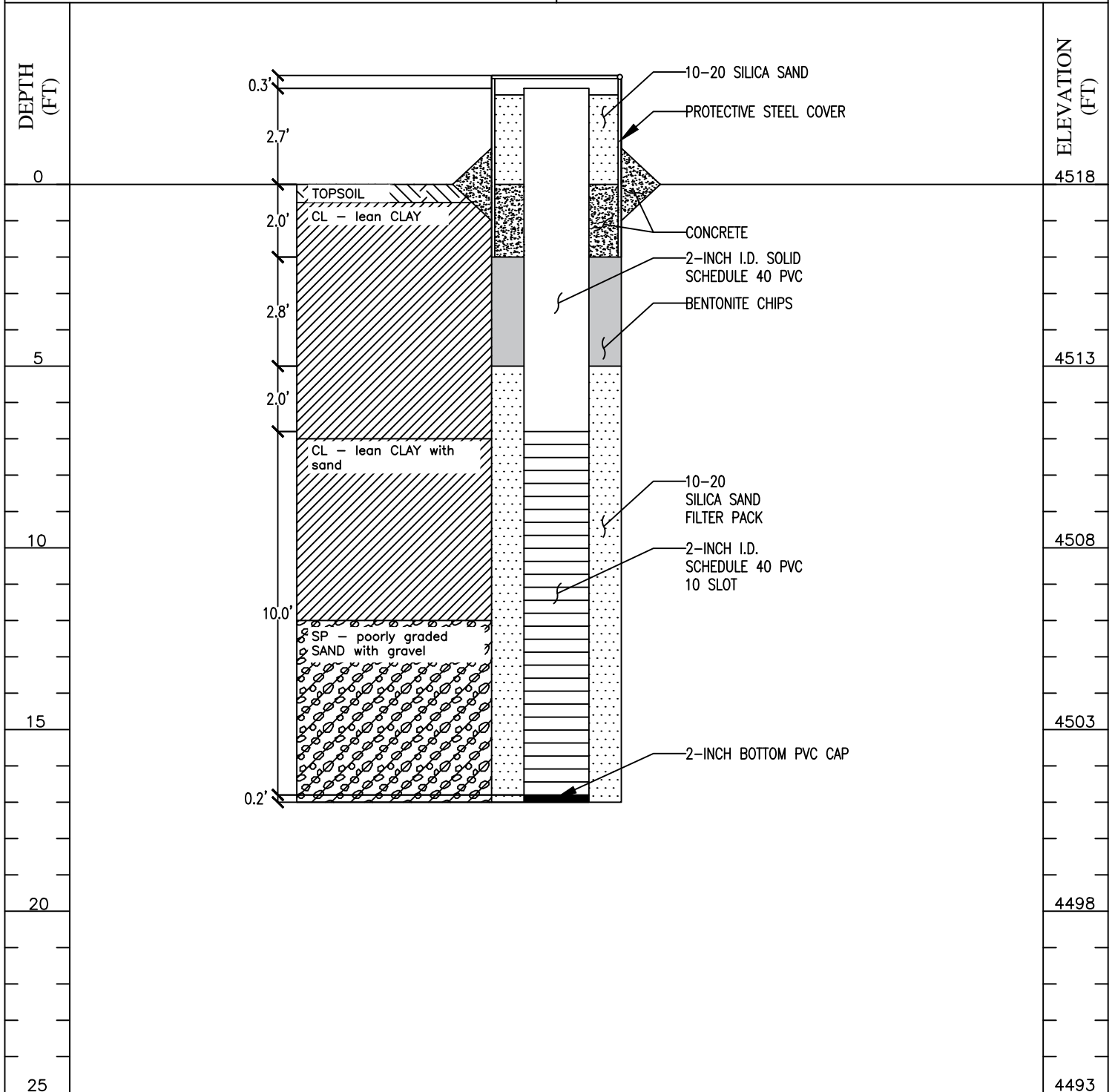
COORDINATES: 39.114518°N 108.654717°W

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 6

DEPTH TO BEDROCK (FT): NOT ENCOUNTERED

LOGGED BY: DANIEL FRANCO

▽DEPTH TO GROUNDWATER: 7 FEET DURING DRILLING



COMMENTS:



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CLIENT: CITY OF GRAND JUNCTION

WJE PROJECT NO.: 2019.3776.0

PIEZOMETER AS-BUILT: B-5

PAGE 1 OF 1

PROJECT NAME: PERSIGO WASTE WATER TREATMENT PLANT

PROJECT LOCATION: 2145 RIVER ROAD, GRAND JUNCTION, CO

DRILLING STARTED: 09/11/2019 COMPLETE: 09/11/2019

DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS, INC.

DRILLING RIG TYPE: DIEDRICH D90 HOLE DIAMETER(IN.): 6

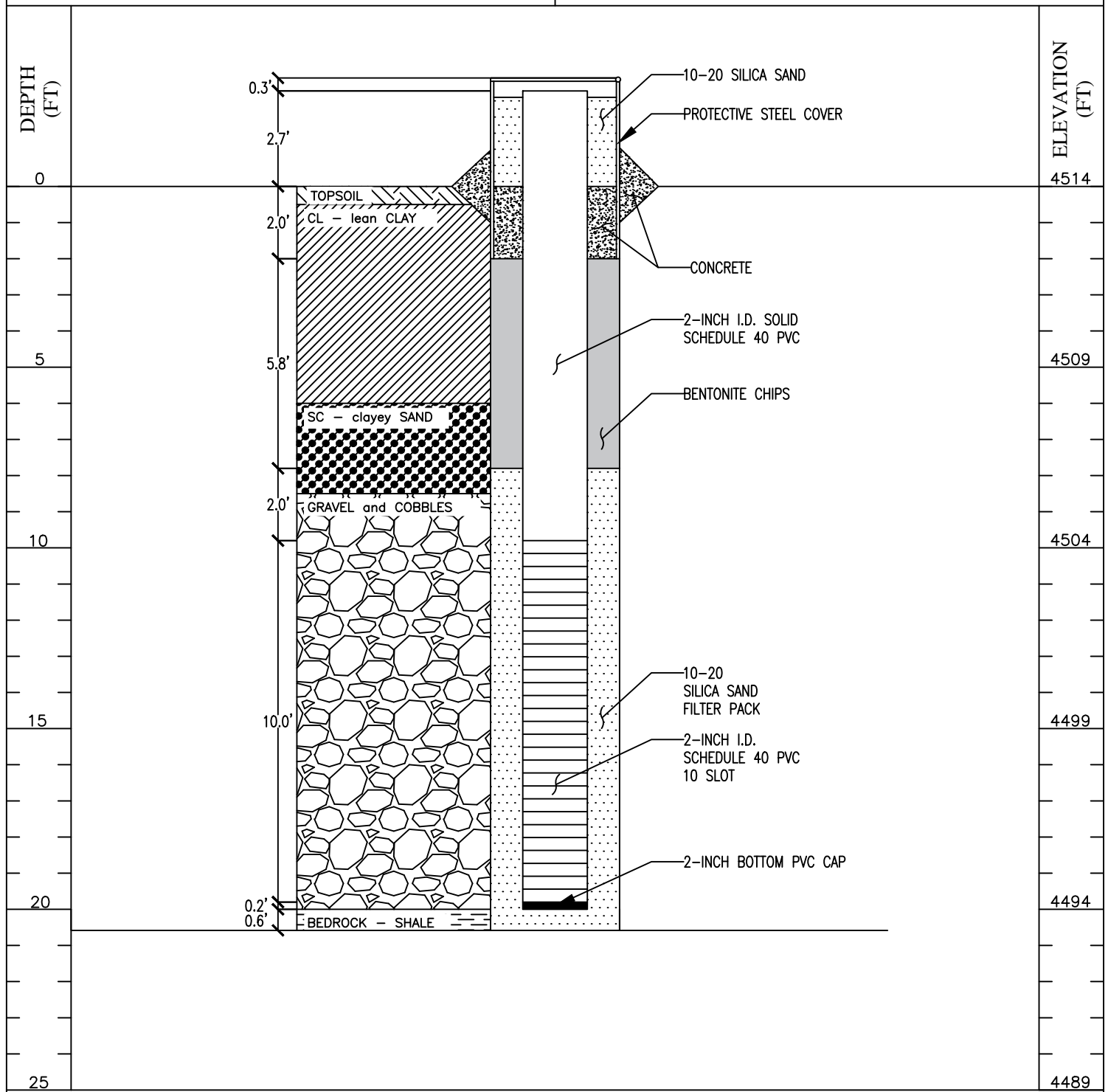
LOGGED BY: DANIEL FRANCO

GROUND ELEVATION (FT): 4514

COORDINATES: 39.112053°N 108.657756°W

DEPTH TO BEDROCK (FT): 20

▽DEPTH TO GROUNDWATER: 5.5 FEET DURING DRILLING



COMMENTS:

C:\WJE Work\AcPublish_15168\Detailed\Summarized Borings, Constructed Piezometer Diagrams, Legend.dwg

APPENDIX II - LAB TEST RESULTS



**Moisture and Density
ASTM D 2216 and ASTM D 7263**

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner			JOB NO.	3020-012
PROJECT	Persigo WWTP			LOCATION	Grand Junction CO
PROJECT NO.	--				
BORING NO.	B-1	B-2	B-2	B-3	
DEPTH	4'	3'	7'	4'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	09/30/19	09/30/19	09/30/19	09/30/19	
TECHNICIAN	CT	ALH	TAF	CT	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	273.19	546.03	95.52	365.24	
Mass of Dry Soil and Pan (g):	260.48	506.58	74.41	348.60	
Mass of Pan (g):	172.73	163.99	3.12	264.74	
Moisture (%):	14.5	11.5	29.6	19.8	
Diameter (in):	1.94	1.94	1.94	1.94	
Height (in):	1.00	3.92	1.00	1.00	
Mass of Wet Soil and Ring (g):	128.54	490.77	120.52	128.53	
Mass of Ring (g):	27.99	108.37	27.99	27.99	
Wet Density (lbs/ft ³):	129.9	126.1	119.5	129.9	
Dry Density (lbs/ft ³):	113.4	113.1	92.2	108.4	
Wet Density (kg/m ³):	2080	2020	1914	2080	
Dry Density (kg/m ³):	1817	1811	1477	1736	
BORING NO.	B-4	B-4	B-6	B-7	
DEPTH	4'	9'	19'	4'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	09/30/19	09/30/19	09/30/19	09/30/19	
TECHNICIAN	TAF	TAF	TAF	ALH	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	97.69	100.02	107.32	272.67	
Mass of Dry Soil and Pan (g):	81.60	82.65	99.41	259.27	
Mass of Pan (g):	3.09	3.10	3.09	171.78	
Moisture (%):	20.5	21.8	8.2	15.3	
Diameter (in):	1.94	1.94	1.94	1.94	
Height (in):	1.00	1.00	1.00	1.00	
Mass of Wet Soil and Ring (g):	122.59	125.00	132.36	128.93	
Mass of Ring (g):	27.49	27.99	27.99	27.99	
Wet Density (lbs/ft ³):	122.8	125.3	134.8	130.4	
Dry Density (lbs/ft ³):	101.9	102.8	124.6	113.0	
Wet Density (kg/m ³):	1967	2007	2159	2088	
Dry Density (kg/m ³):	1633	1647	1995	1811	
NOTES					
Data entry by:	SPH	Date:	10/1/2019		
Checked by:	<u>KMS</u>	Date:	<u>10/2/19</u>		
File name:	3020012_Moisture and Density ASTM D7236_0.xls				



**Moisture and Density
ASTM D 2216 and ASTM D 7263**

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner			JOB NO.	3020-012
PROJECT	Persigo WWTP			LOCATION	Grand Junction CO
PROJECT NO.	--				
BORING NO.	B-1	B-1	B-1	B-2	
DEPTH	0'	7'	15.5'	0'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	10/01/19	10/01/19	10/01/19	10/01/19	
TECHNICIAN	CAL	CAL	CAL	CAL	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	345.19	427.22	309.00	351.20	
Mass of Dry Soil and Pan (g):	303.17	379.47	283.02	328.49	
Mass of Pan (g):	6.66	6.54	6.73	6.67	
Moisture (%):	14.2	12.8	9.4	7.1	
Diameter (in):	Density	1.93	1.93	1.94	
Height (in):	Not	3.99	3.12	3.98	
Mass of Wet Soil and Ring (g):	Possible	420.64	302.44	344.67	
Mass of Ring (g):		0.00	0.00	0.00	
Wet Density (lbs/ft ³):		137.0	126.9	112.1	
Dry Density (lbs/ft ³):		121.4	116.0	104.7	
Wet Density (kg/m ³):		2194	2033	1796	
Dry Density (kg/m ³):		1945	1858	1678	
BORING NO.	B-2	B-3	B-4	B-6	
DEPTH	12'	0'	0'	0'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	10/01/19	10/01/19	10/01/19	10/01/19	
TECHNICIAN	CAL	CAL	CAL	CAL	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	288.62	435.67	353.73	249.74	
Mass of Dry Soil and Pan (g):	267.38	397.17	331.71	224.22	
Mass of Pan (g):	6.68	6.72	6.50	6.41	
Moisture (%):	8.1	9.9	6.8	11.7	
Diameter (in):	1.93	1.93	1.93	1.93	
Height (in):	2.80	4.04	3.61	2.85	
Mass of Wet Soil and Ring (g):	386.36	429.14	347.37	243.38	
Mass of Ring (g):	104.00	0.00	0.13	0.00	
Wet Density (lbs/ft ³):	131.1	138.1	124.8	111.7	
Dry Density (lbs/ft ³):	121.2	125.7	116.9	100.0	
Wet Density (kg/m ³):	2100	2212	1999	1790	
Dry Density (kg/m ³):	1942	2014	1872	1602	
NOTES	* filing required due to gravel, side wall voids due to gravel				
Data entry by:	KMS	Date:	10/2/2019		
Checked by:	<u>CAL</u>	Date:	<u>10-3-2019</u>		
File name:	3020012 Moisture and Density ASTM D7236_1.xls				



**Moisture and Density
ASTM D 2216 and ASTM D 7263**

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner		JOB NO.	3020-012	
PROJECT	Persigo WWTP		LOCATION	Grand Junction CO	
PROJECT NO.	--				
BORING NO.	B-5	B-5	B-6	B-6	
DEPTH	0'	6'	4'	14'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	10/01/19	10/01/19	10/01/19	10/01/19	
TECHNICIAN	TAF	TAF	TAF	TAF	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	516.09	223.75	273.34	267.45	
Mass of Dry Soil and Pan (g):	465.41	210.64	259.36	246.55	
Mass of Pan (g):	123.24	139.49	172.36	172.73	
Moisture (%):	14.8	18.4	16.1	28.3	
Diameter (in):	1.94	1.94	1.94	1.94	
Height (in):	3.96	1.00	1.00	1.00	
Mass of Wet Soil and Ring (g):	502.47	112.38	129.18	123.29	
Mass of Ring (g):	109.33	27.98	27.98	27.98	
Wet Density (lbs/ft³):	128.0	108.3	129.9	122.3	
Dry Density (lbs/ft³):	111.5	91.5	111.9	95.4	
Wet Density (kg/m³):	2051	1735	2081	1960	
Dry Density (kg/m³):	1786	1465	1793	1527	
BORING NO.					
DEPTH					
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED					
TECHNICIAN					
DESCRIPTION					
Mass of Wet Soil and Pan (g):					
Mass of Dry Soil and Pan (g):					
Mass of Pan (g):					
Moisture (%):					
Diameter (in):					
Height (in):					
Mass of Wet Soil and Ring (g):					
Mass of Ring (g):					
Wet Density (lbs/ft³):					
Dry Density (lbs/ft³):					
Wet Density (kg/m³):					
Dry Density (kg/m³):					
NOTES					
Data entry by:	CAL	Date:	10/3/2019		
Checked by:	<u>KMS</u>	Date:	<u>10/4/19</u>		
File name:	3020012 Moisture and Density ASTM D7236_3.xls				



**Moisture and Density
ASTM D 2216 and ASTM D 7263**

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	JOB NO.	3020-012
PROJECT	Persigo WWTP	LOCATION	Grand Junction CO
PROJECT NO.	--		
BORING NO.	B-7	B-7	
DEPTH	0'	9'	
SAMPLE NO.			
DATE SAMPLED			
DATE TESTED	10/01/19	10/01/19	
TECHNICIAN	CAL	CAL	
DESCRIPTION	*		
Mass of Wet Soil and Pan (g):	365.04	351.51	
Mass of Dry Soil and Pan (g):	343.20	275.52	
Mass of Pan (g):	6.68	6.73	
Moisture (%):	6.5	28.3	
Diameter (in):	1.93	1.92	
Height (in):	3.81	3.84	
Mass of Wet Soil and Ring (g):	358.50	345.08	
Mass of Ring (g):	0.00	0.00	
Wet Density (lbs/ft ³):	122.4	117.8	
Dry Density (lbs/ft ³):	114.9	91.8	
Wet Density (kg/m ³):	1961	1887	
Dry Density (kg/m ³):	1841	1471	
BORING NO.			
DEPTH			
SAMPLE NO.			
DATE SAMPLED			
DATE TESTED			
TECHNICIAN			
DESCRIPTION			
Mass of Wet Soil and Pan (g):			
Mass of Dry Soil and Pan (g):			
Mass of Pan (g):			
Moisture (%):			
Diameter (in):			
Height (in):			
Mass of Wet Soil and Ring (g):			
Mass of Ring (g):			
Wet Density (lbs/ft ³):			
Dry Density (lbs/ft ³):			
Wet Density (kg/m ³):			
Dry Density (kg/m ³):			
NOTES	*B-7 @ 0' Filling required due to gravel.		
Data entry by:	KMS	Date:	10/2/2019
Checked by:	<u>CAL</u>	Date:	<u>10/3/2019</u>
File name:	3020012_Moisture and Density ASTM D7236_2.xls		

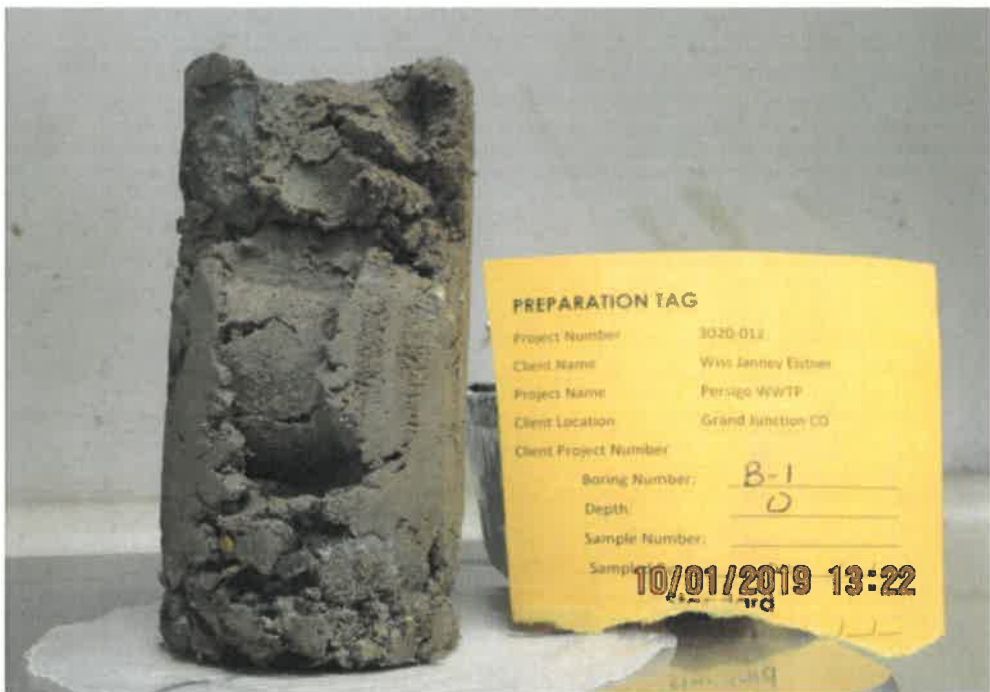


Image Attachment

ADVANCED TERRA TESTING

CLIENT Wiss Janney Elstner
JOB NO. 3020-012
PROJECT Persigo WWTP
PROJECT NO. --
LOCATION Grand Junction CO

BORING NO. B-1
DEPTH 0'
SAMPLE NO.
DATE SAMPLED
DESCRIPTION liner



NOTES

Density Not Possible



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-1
JOB NO.	3020-012	DEPTH	4'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	SAMPLED BY	--
DATE TESTED	10/08/19	DESCRIPTION	--
TECHNICIAN	TAF		

Plastic Limits

Mass of Wet Pan and Soil (g):	7.79	6.86
Mass of Dry Pan and Soil (g):	6.97	6.17
Mass of Pan (g):	1.07	1.17
Moisture (%)	13.9	13.8

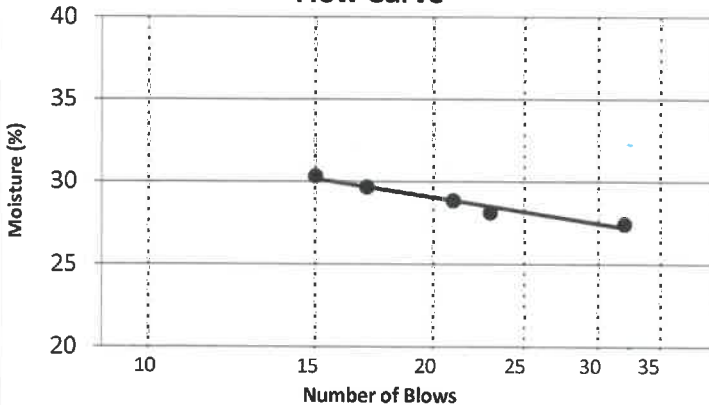
Liquid Limits

Number of Blows	15	17	21	23	32
Mass of Wet Pan and Soil (g):	7.92	8.03	8.05	8.27	7.58
Mass of Dry Pan and Soil (g):	6.34	6.46	6.49	6.70	6.19
Mass of Pan (g):	1.13	1.16	1.10	1.14	1.11
Moisture (%)	30.3	29.7	28.9	28.1	27.4

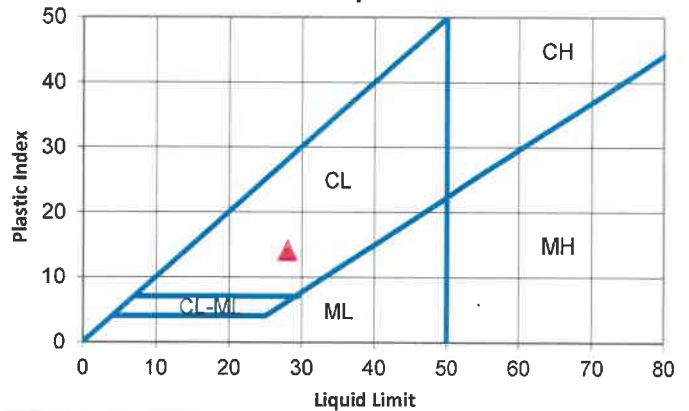
Plastic Index

Plastic Limit:	14	Atterberg Classification:	CL
Liquid Limit:	28	Method:	A
Plastic Index:	14		

Flow Curve



Plasticity Chart



NOTES

Data entry by: CAL
 Checked by: KMS
 File name: 3020012 Atterberg ASTM D4318_6.xlsm

Date: 10/9/2019
 Date: 10/9/19



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/04/19
 TECHNICIAN: CAL

BORING NO.: B-2
 DEPTH: 3'
 SAMPLE NO.: --
 DATE SAMPLED: --
 SAMPLED BY: --
 DESCRIPTION: --

Plastic Limits

Mass of Wet Pan and Soil (g):	6.64	7.43
Mass of Dry Pan and Soil (g):	5.81	6.50
Mass of Pan (g):	1.14	1.14
Moisture (%)	17.8	17.3

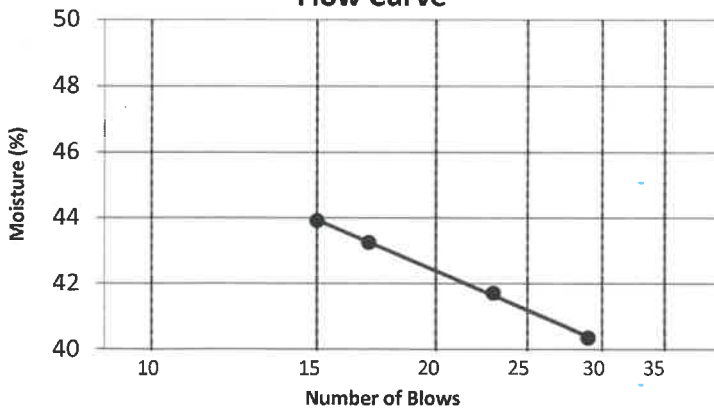
Liquid Limits

Number of Blows	15	17	23	29
Mass of Wet Pan and Soil (g):	10.40	9.77	10.05	9.21
Mass of Dry Pan and Soil (g):	7.58	7.15	7.44	6.87
Mass of Pan (g):	1.15	1.09	1.17	1.07
Moisture (%)	43.9	43.2	41.7	40.4

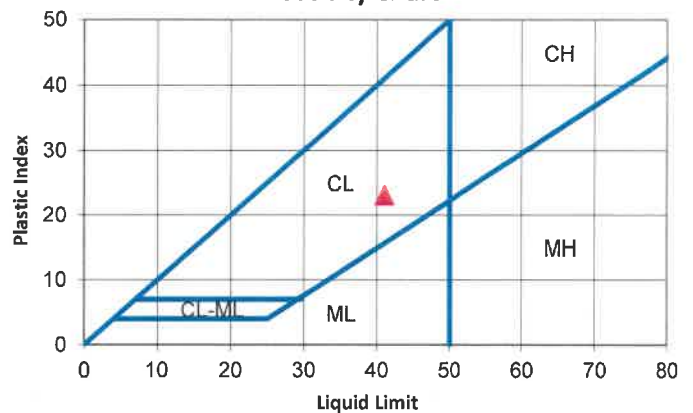
Plastic Index

Plastic Limit:	18	Atterberg Classification:	CL
Liquid Limit:	41	Method:	A
Plastic Index:	23		

Flow Curve



Plasticity Chart



NOTES

Data entry by: CAL
 Checked by: SPH
 File name: 3020012_Atterberg ASTM D4318_1.xlsm

Date: 10/7/2019
 Date: 10-7-19



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT Wiss Janney Elstner
 JOB NO. 3020-012
 PROJECT Persigo WWTP
 PROJECT NO. --
 LOCATION Grand Junction CO
 DATE TESTED 10/08/19
 TECHNICIAN ALH

BORING NO. B-3
 DEPTH 4'
 SAMPLE NO. --
 DATE SAMPLED --
 SAMPLED BY --
 DESCRIPTION --

Plastic Limits

Mass of Wet Pan and Soil (g):	8.36	8.32
Mass of Dry Pan and Soil (g):	7.25	7.21
Mass of Pan (g):	1.17	1.15
Moisture (%)	18.3	18.2

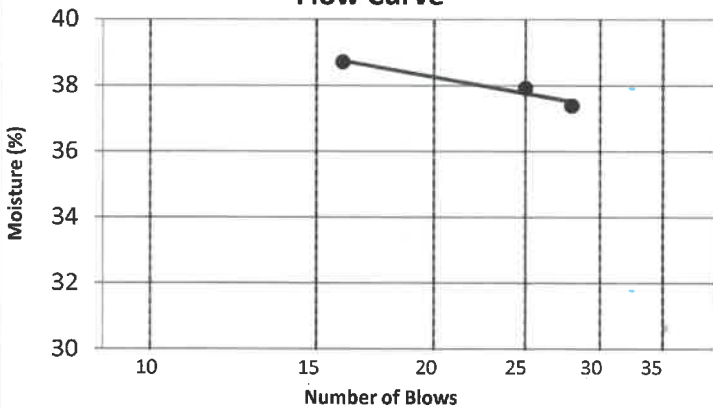
Liquid Limits

Number of Blows	16	25	28
Mass of Wet Pan and Soil (g):	7.63	9.36	11.01
Mass of Dry Pan and Soil (g):	5.79	7.10	8.32
Mass of Pan (g):	1.04	1.14	1.13
Moisture (%)	38.7	37.9	37.4

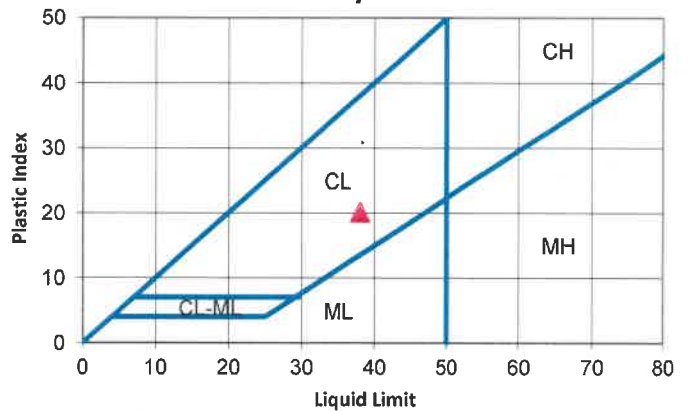
Plastic Index

Plastic Limit:	18	Atterberg Classification:	CL
Liquid Limit:	38	Method:	A
Plastic Index:	20		

Flow Curve



Plasticity Chart



NOTES

Data entry by: CAL
 Checked by: KMS
 File name: 3020012_Atterberg ASTM D4318_7.xlsm

Date: 10/9/2019
 Date: 10/9/19



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/04/19
 TECHNICIAN: BDF

BORING NO.: B-3
 DEPTH: 9'
 SAMPLE NO.: --
 DATE SAMPLED: --
 SAMPLED BY: --
 DESCRIPTION: --

Plastic Limits

Mass of Wet Pan and Soil (g):	7.94	7.89
Mass of Dry Pan and Soil (g):	6.95	6.92
Mass of Pan (g):	1.09	1.13
Moisture (%)	16.9	16.8

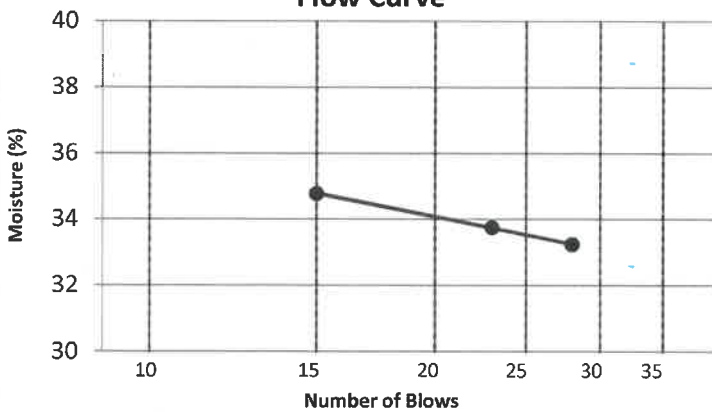
Liquid Limits

Number of Blows	15	23	28
Mass of Wet Pan and Soil (g):	8.96	9.38	8.71
Mass of Dry Pan and Soil (g):	6.94	7.30	6.82
Mass of Pan (g):	1.15	1.14	1.13
Moisture (%)	34.8	33.8	33.2

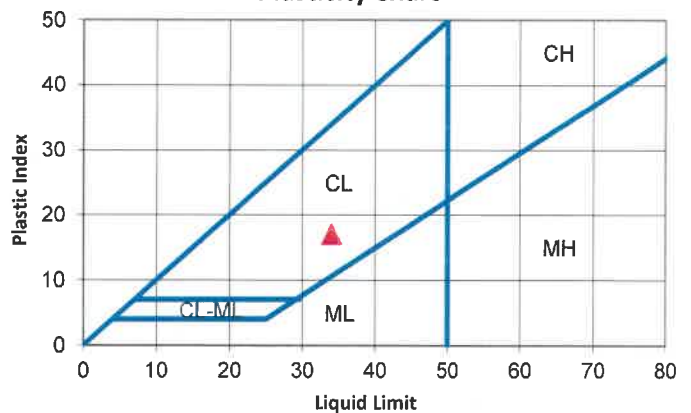
Plastic Index

Plastic Limit:	17	Atterberg Classification:	CL
Liquid Limit:	34	Method:	A
Plastic Index:	17		

Flow Curve



Plasticity Chart



NOTES

Data entry by: CAL
 Checked by: SPH
 File name: 3020012__ Atterberg ASTM D4318_2.xlsm

Date: 10/7/2019
 Date: 10-7-19



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/04/19
 TECHNICIAN: BDF

BORING NO.: B-4
 DEPTH: 4'
 SAMPLE NO.: --
 DATE SAMPLED: --
 SAMPLED BY: --
 DESCRIPTION: --

Plastic Limits

Mass of Wet Pan and Soil (g):	8.20	8.22
Mass of Dry Pan and Soil (g):	7.14	7.17
Mass of Pan (g):	1.15	1.15
Moisture (%)	17.7	17.4

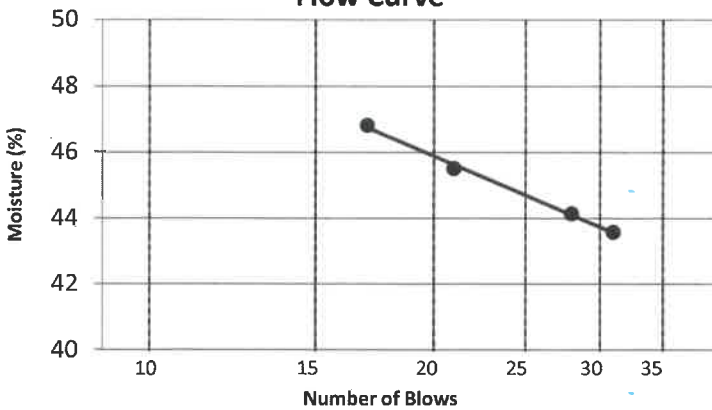
Liquid Limits

Number of Blows	17	21	28	31
Mass of Wet Pan and Soil (g):	11.27	10.55	8.80	9.94
Mass of Dry Pan and Soil (g):	8.03	7.59	6.44	7.26
Mass of Pan (g):	1.09	1.09	1.11	1.10
Moisture (%)	46.8	45.5	44.1	43.6

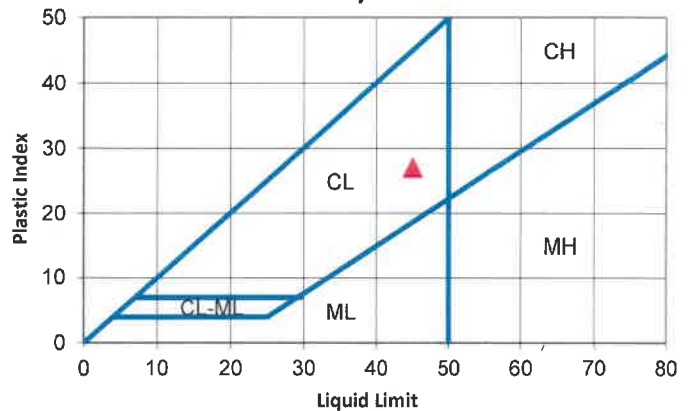
Plastic Index

Plastic Limit:	18	Atterberg Classification:	CL
Liquid Limit:	45	Method:	A
Plastic Index:	27		

Flow Curve



Plasticity Chart



NOTES

Data entry by: CAL
 Checked by: SPH
 File name: 3020012_Atterberg ASTM D4318_3.xlsm

Date: 10/7/2019
 Date: 10-7-19



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-5
JOB NO.	3020-012	DEPTH	0'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	SAMPLED BY	--
DATE TESTED	10/09/19	DESCRIPTION	--
TECHNICIAN	TAF		

Plastic Limits

Mass of Wet Pan and Soil (g):	5.95	6.89	7.16
Mass of Dry Pan and Soil (g):	5.26	6.09	6.33
Mass of Pan (g):	1.13	1.32	1.32
Moisture (%)	16.8	16.7	16.6

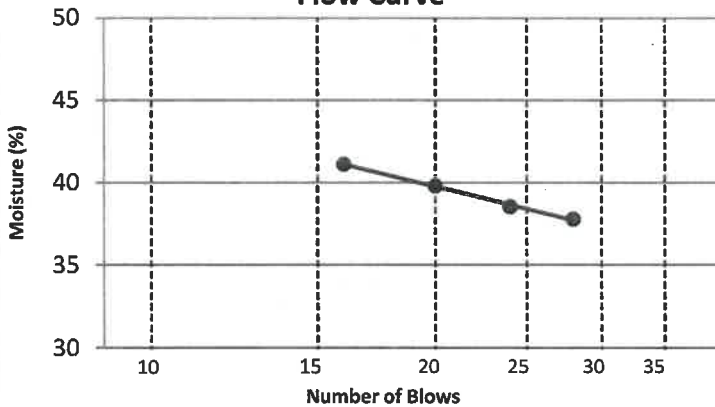
Liquid Limits

Number of Blows	16	20	24	28
Mass of Wet Pan and Soil (g):	7.52	7.45	6.23	4.95
Mass of Dry Pan and Soil (g):	5.72	5.71	4.80	3.92
Mass of Pan (g):	1.32	1.32	1.10	1.17
Moisture (%)	41.1	39.8	38.5	37.8

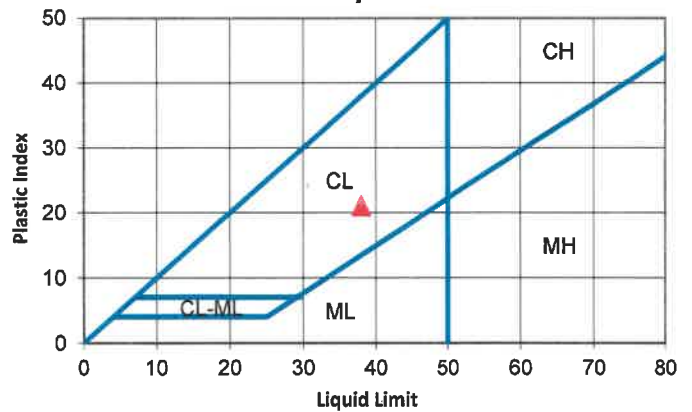
Plastic Index

Plastic Limit:	17	Atterberg Classification:	CL
Liquid Limit:	38	Method:	A
Plastic Index:	21		

Flow Curve



Plasticity Chart



NOTES

Data entry by: CAL	Date: 10/10/2019
Checked by: <u>KMS</u>	Date: <u>10/10/19</u>
File name: 3020012_Atterberg ASTM D4318_9.xlsm	



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT Wiss Janney Elstner
 JOB NO. 3020-012
 PROJECT Persigo WWTP
 PROJECT NO. --
 LOCATION Grand Junction CO
 DATE TESTED 10/09/19
 TECHNICIAN ALH

BORING NO. B-6
 DEPTH 4'
 SAMPLE NO. --
 DATE SAMPLED --
 SAMPLED BY --
 DESCRIPTION --

Plastic Limits

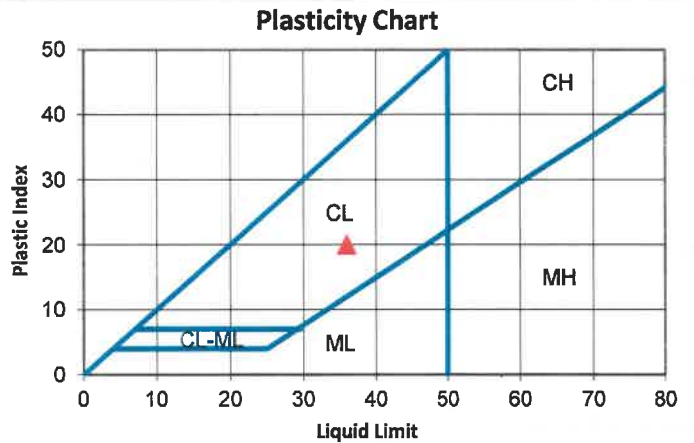
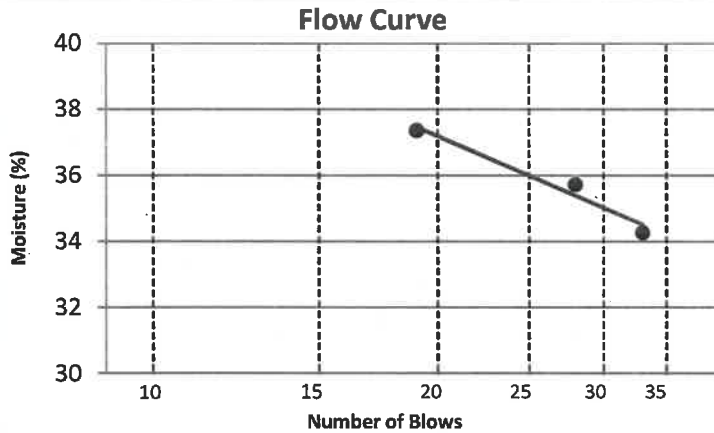
Mass of Wet Pan and Soil (g):	8.44	8.44
Mass of Dry Pan and Soil (g):	7.42	7.42
Mass of Pan (g):	1.16	1.09
Moisture (%)	16.3	16.1

Liquid Limits

Number of Blows	19	28	33
Mass of Wet Pan and Soil (g):	11.71	12.64	11.43
Mass of Dry Pan and Soil (g):	8.83	9.62	8.79
Mass of Pan (g):	1.12	1.17	1.10
Moisture (%)	37.4	35.7	34.3

Plastic Index

Plastic Limit: 16	Atterberg Classification: CL
Liquid Limit: 36	Method: A
Plastic Index: 20	



NOTES

Data entry by: CAL
 Checked by: KMS
 File name: 3020012_Atterberg ASTM D4318_8.xlsxm

Date: 10/10/2019
 Date: 10/10/19



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/03/19
 TECHNICIAN: BDF

BORING NO.: B-6
 DEPTH: 9'
 SAMPLE NO.: --
 DATE SAMPLED: --
 SAMPLED BY: --
 DESCRIPTION: --

Plastic Limits

Mass of Wet Pan and Soil (g):	8.04	7.91
Mass of Dry Pan and Soil (g):	7.02	6.92
Mass of Pan (g):	1.14	1.14
Moisture (%)	17.3	17.1

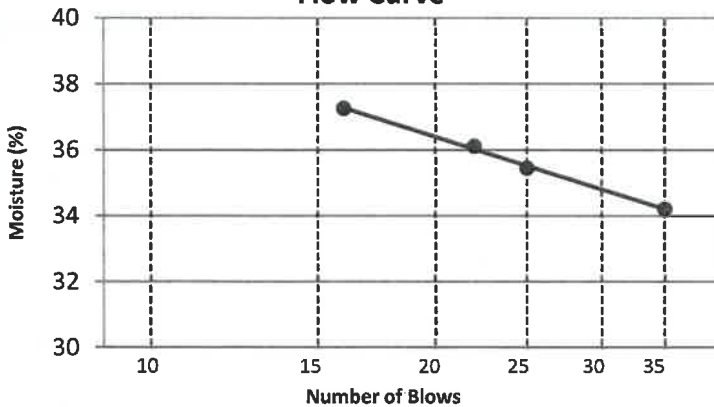
Liquid Limits

Number of Blows	16	22	25	35
Mass of Wet Pan and Soil (g):	10.65	7.66	10.25	9.53
Mass of Dry Pan and Soil (g):	8.07	5.91	7.87	7.39
Mass of Pan (g):	1.14	1.08	1.13	1.14
Moisture (%)	37.3	36.1	35.5	34.2

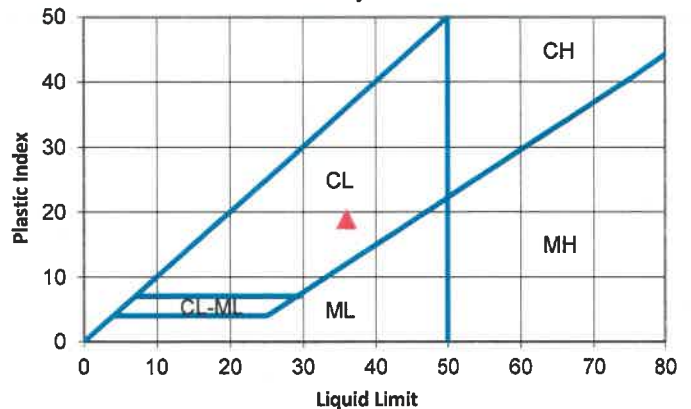
Plastic Index

Plastic Limit: 17	Atterberg Classification: CL
Liquid Limit: 36	Method: A
Plastic Index: 19	

Flow Curve



Plasticity Chart



NOTES

Data entry by: KMS
 Checked by: SPH
 File name: 3020012_Atterberg ASTM D4318_0.xlsm

Date: 10/4/2019
 Date: 10-7-19



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT Wiss Janney Elstner
 JOB NO. 3020-012
 PROJECT Persigo WWTP
 PROJECT NO. --
 LOCATION Grand Junction CO
 DATE TESTED 10/08/19
 TECHNICIAN TAF

BORING NO. B-6
 DEPTH 14'
 SAMPLE NO. --
 DATE SAMPLED --
 SAMPLED BY --
 DESCRIPTION --

Plastic Limits

Mass of Wet Pan and Soil (g):	8.77	8.63
Mass of Dry Pan and Soil (g):	7.73	7.66
Mass of Pan (g):	1.13	1.33
Moisture (%)	15.9	15.4

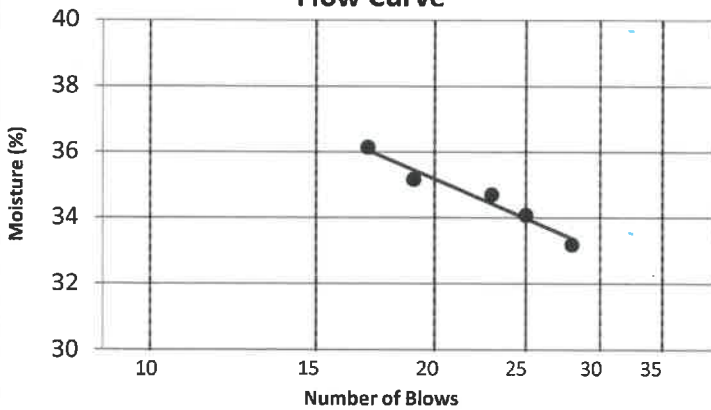
Liquid Limits

Number of Blows	17	19	23	25	28
Mass of Wet Pan and Soil (g):	7.72	7.29	7.86	7.86	7.86
Mass of Dry Pan and Soil (g):	5.97	5.70	6.12	6.13	6.19
Mass of Pan (g):	1.15	1.15	1.12	1.08	1.15
Moisture (%)	36.1	35.2	34.7	34.1	33.2

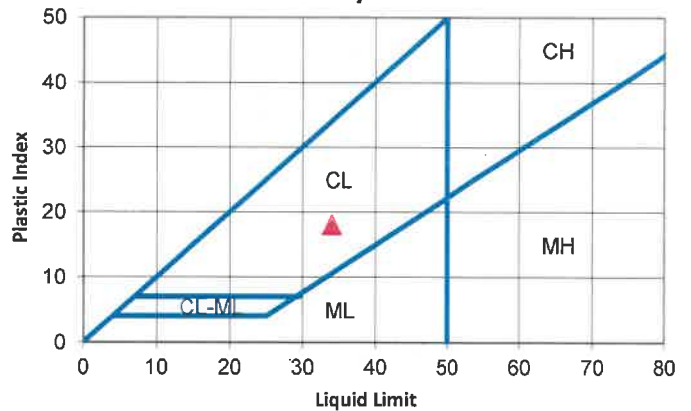
Plastic Index

Plastic Limit: 16	Atterberg Classification: CL
Liquid Limit: 34	Method: A
Plastic Index: 18	

Flow Curve



Plasticity Chart



NOTES

Data entry by: CAL
 Checked by: KMS
 File name: 3020012__Atterberg ASTM D4318_5.xlsm

Date: 10/9/2019
 Date: 10/9/19



Atterberg Limits ASTM D 4318

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/08/19
 TECHNICIAN: ALH

BORING NO.: B-7
 DEPTH: 4'
 SAMPLE NO.: --
 DATE SAMPLED: --
 SAMPLED BY: --
 DESCRIPTION: --

Plastic Limits

Mass of Wet Pan and Soil (g):	8.52	8.72
Mass of Dry Pan and Soil (g):	7.50	7.70
Mass of Pan (g):	0.97	1.15
Moisture (%)	15.7	15.5

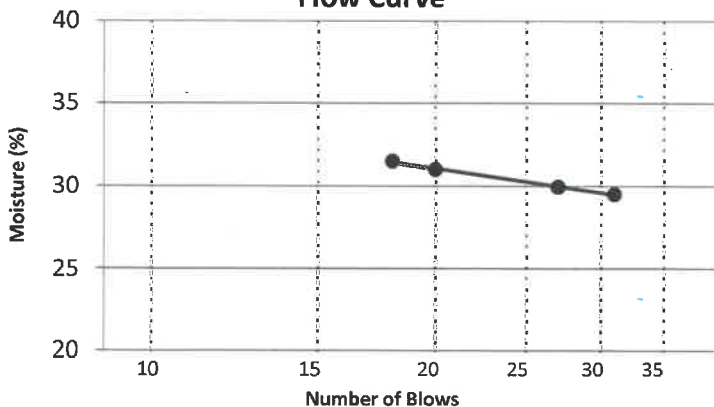
Liquid Limits

Number of Blows	18	20	27	31
Mass of Wet Pan and Soil (g):	11.75	11.98	11.38	11.36
Mass of Dry Pan and Soil (g):	9.20	9.40	9.02	9.03
Mass of Pan (g):	1.11	1.08	1.14	1.13
Moisture (%)	31.5	31.0	30.0	29.5

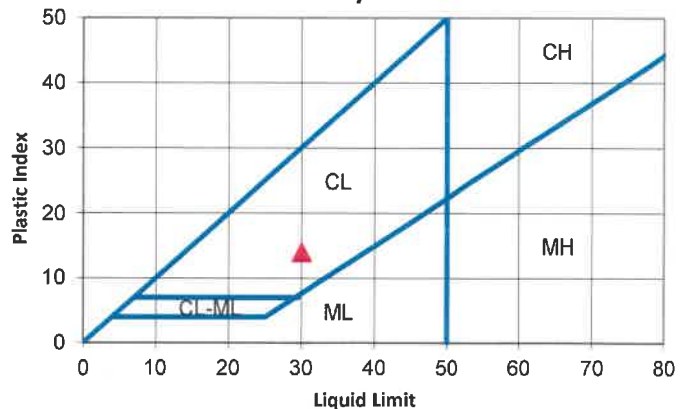
Plastic Index

Plastic Limit: 16	Atterberg Classification: CL
Liquid Limit: 30	Method: A
Plastic Index: 14	

Flow Curve



Plasticity Chart



NOTES

Data entry by: CAL
 Checked by: KMS
 File name: 3020012_Atterberg ASTM D4318_4.xlsm

Date: 10/9/2019
 Date: 10/9/19



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-1
JOB NO.	3020-012	DEPTH	4'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/01/19		
TECHNICIAN	ALH		

Hygroscopic Moisture

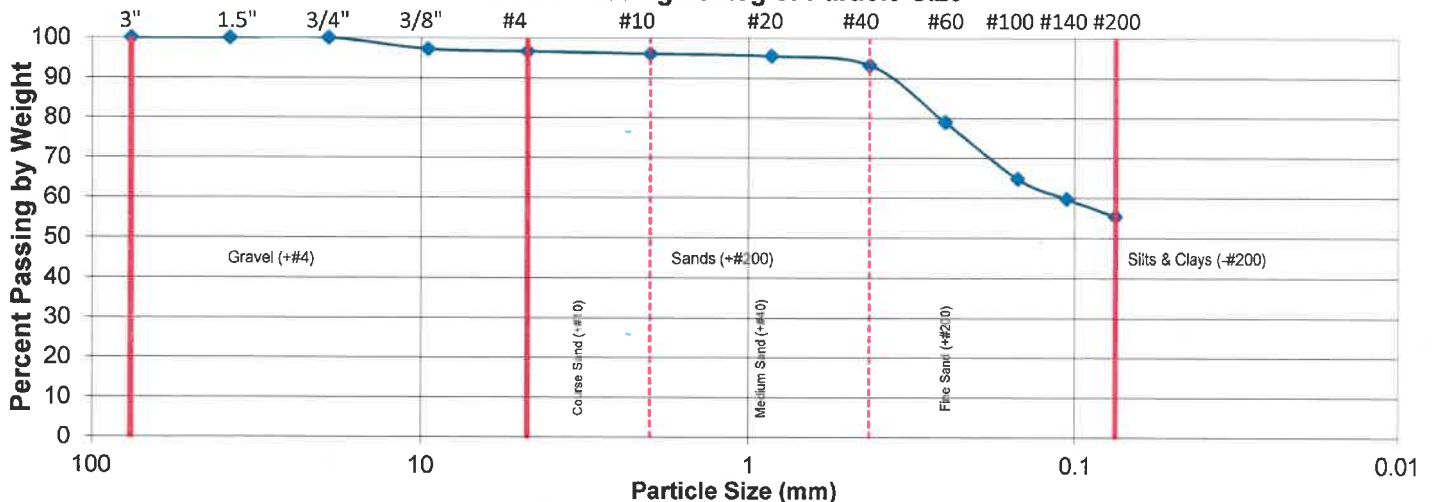
Mass Wet Pan and Soil (g): 273.19
 Mass Dry Pan and Soil (g): 260.48
 Mass of Pan (g): 172.73
 Moisture (%): **14.5**

Sample Data

Total Wet Mass of Sample (g): 100.5
 Total Dry Mass of Sample (g): 87.8

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	100.0
3/8"	9.53	2.5	--	2.5	1.00	97.2
#4	4.75	0.51	--	0.51	1.00	96.6
#10	2.00	0.49	--	0.49	1.00	96.0
#20	0.850	0.50	--	0.50	1.00	95.5
#40	0.425	2.0	--	2.0	1.00	93.2
#60	0.250	12.5	--	12.5	1.00	78.9
#100	0.150	12.5	--	12.5	1.00	64.7
#140	0.106	4.4	--	4.4	1.00	59.7
#200	0.075	3.8	--	3.8	1.00	55.3

Percent Passing vs Log of Particle Size



USCS Classification ASTM D 2487

Atterberg Classification: CL	Coefficient of Curvature - C _c : --
Group Symbol: CL	Coefficient of Uniformity - C _u : --
USCS Classification: Sandy Lean Clay	

Data entry by: CAL	Date: 10/9/2019
Checked by: <u>KMS</u>	Date: <u>10/9/19</u>
File name: 3020012_Grain Size Analysis ASTM D6913_12.xlsm	



**Grain Size Analysis
ASTM D 6913**

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-1
JOB NO.	3020-012	DEPTH	20'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/01/19		
TECHNICIAN	BNF		

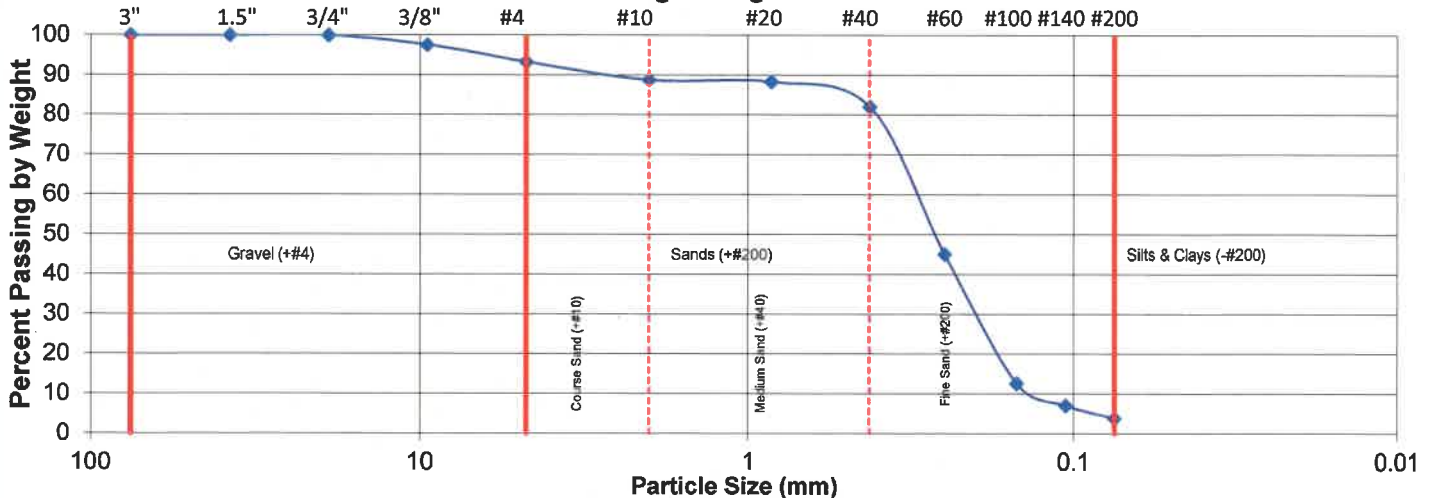
Hygroscopic Moisture of Fines

Sample Data

Mass Wet Pan and Soil (g): 303.08	Total Wet Mass of Sample (g): 1437.8
Mass Dry Pan and Soil (g): 302.45	Total Dry Mass of Sample (g): 1433.1
Mass of Pan (g): 124.06	Split Fraction: #4
Moisture (%): 0.4	Mass of Sub-Sample Fraction (g): 179.02

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	0.0	--	--	--	--
1.5"	38.1	0.0	--	--	--	--
3/4"	19.05	0.0	--	--	--	100.0
3/8"	9.53	33.7	--	33.7	1.00	97.6
#4	4.75	61.2	--	61.2	1.00	93.4
#10	2.00	8.66	--	8.66	0.93	88.8
#20	0.850	0.87	--	0.87	0.93	88.4
#40	0.425	11.9	--	11.9	0.93	82.2
#60	0.250	70.8	--	70.8	0.93	45.1
#100	0.150	61.9	--	61.9	0.93	12.7
#140	0.106	10.7	--	10.7	0.93	7.2
#200	0.075	6.15	--	6.15	0.93	3.9

Percent Passing vs Log of Particle Size



USCS Classification ASTM D 2487

Atterberg Classification: --	Coefficient of Curvature - C _c : 1.01
Group Symbol: --	Coefficient of Uniformity - C _u : 2.50
USCS Classification: --	

Data entry by:	KMS	Date:	10/2/2019
Checked by:	<u>cn</u>	Date:	<u>10/3/2019</u>
File name:	3020012_Grain Size Analysis ASTM D6913_4.xlsm		



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/01/19
 TECHNICIAN: BNF

BORING NO.: B-1
 DEPTH: 26'
 SAMPLE NO.: --
 DATE SAMPLED: --
 DESCRIPTION: --

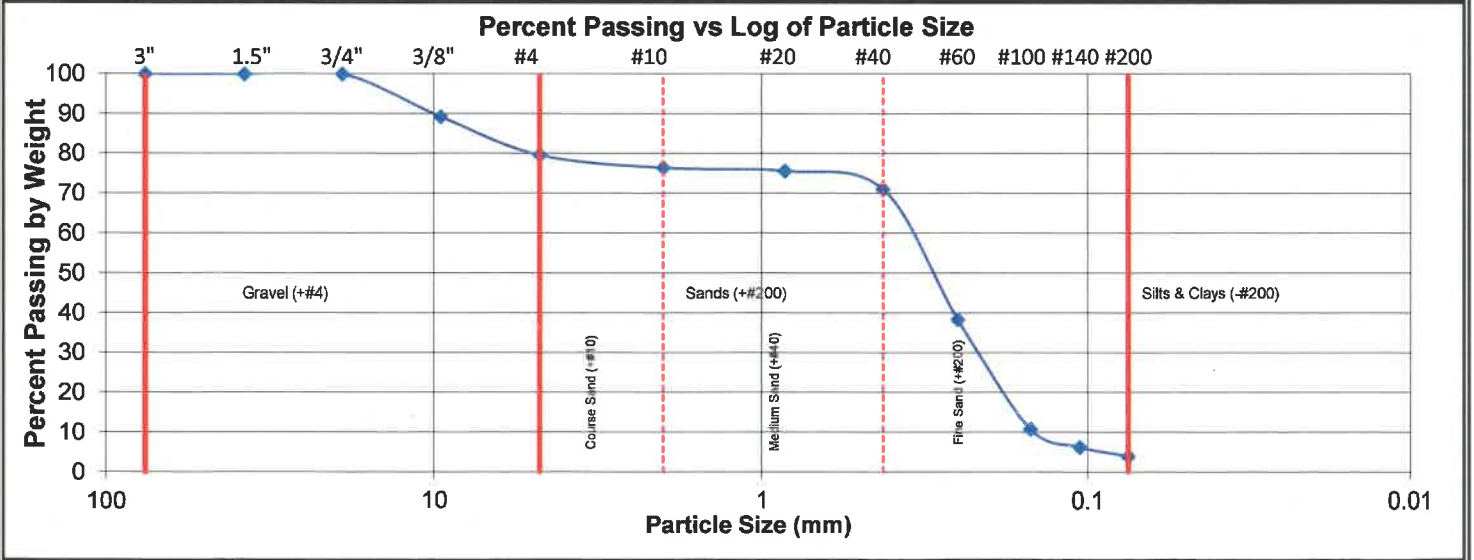
Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 333.58
 Mass Dry Pan and Soil (g): 332.90
 Mass of Pan (g): 123.12
 Moisture (%): **0.3**

Sample Data

Total Wet Mass of Sample (g): 1086.7
 Total Dry Mass of Sample (g): 1083.9
 Split Fraction: #4
 Mass of Sub-Sample Fraction (g): 210.46

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	0.0	--	--	--	--
1.5"	38.1	0.0	--	--	--	--
3/4"	19.05	0.0	--	--	--	100.0
3/8"	9.53	116.1	--	116.1	1.00	89.3
#4	4.75	104.4	--	104.4	1.00	79.7
#10	2.00	8.40	--	8.40	0.80	76.5
#20	0.850	2.03	--	2.03	0.80	75.7
#40	0.425	12.1	--	12.1	0.80	71.1
#60	0.250	86.1	--	86.1	0.80	38.4
#100	0.150	72.6	--	72.6	0.80	10.8
#140	0.106	11.9	--	11.9	0.80	6.3
#200	0.075	6.10	--	6.10	0.80	4.0



USCS Classification ASTM D 2487

Atterberg Classification: -- Coefficient of Curvature - C_c : 0.93
 Group Symbol: -- Coefficient of Uniformity - C_u : 2.58
 USCS Classification: --

Data entry by: KMS Date: 10/2/2019
 Checked by: Date: 10/3/19
 File name: 3020012_Grain Size Analysis ASTM D6913_3.xlsm



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

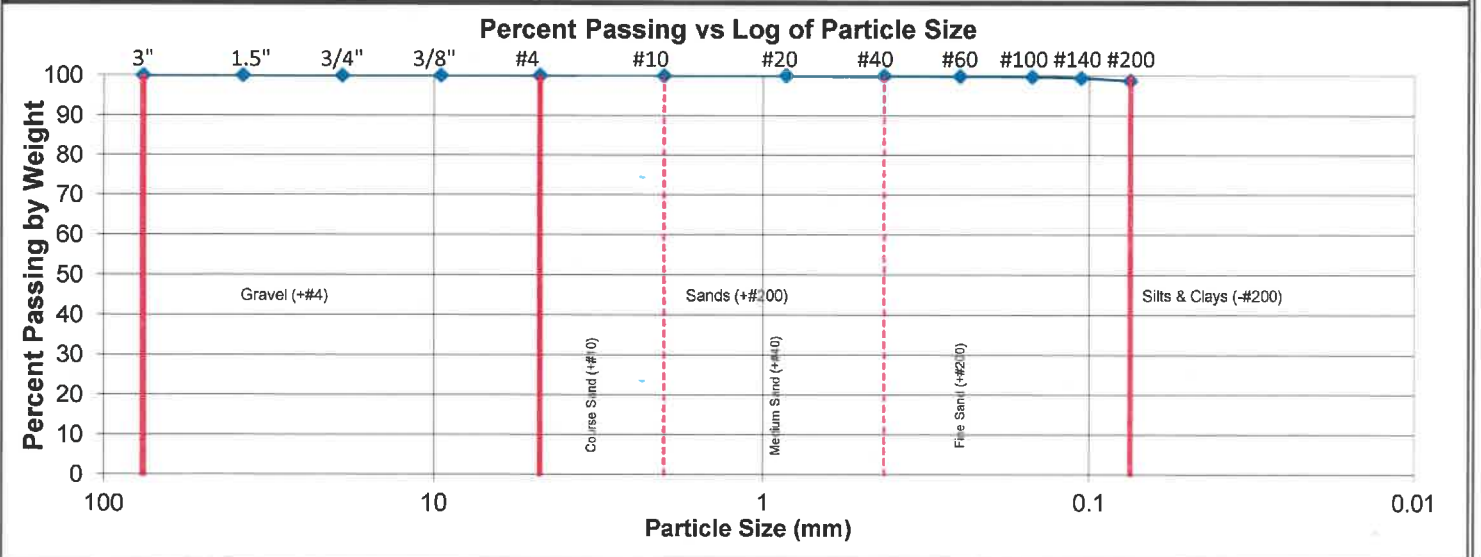
CLIENT	Wiss Janney Elstner	BORING NO.	B-2
JOB NO.	3020-012	DEPTH	3'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/01/19		
TECHNICIAN	ALH		

Hygroscopic Moisture

Sample Data

Mass Wet Pan and Soil (g): 546.03	Total Wet Mass of Sample (g): 382.0
Mass Dry Pan and Soil (g): 506.58	Total Dry Mass of Sample (g): 342.6
Mass of Pan (g): 163.99	
Moisture (%): 11.5	

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	--
3/8"	9.53	--	--	--	--	--
#4	4.75	--	--	--	--	--
#10	2.00	0.0	0.0	--	--	100.0
#20	0.850	0.17	0.0	0.17	1.00	100.0
#40	0.425	0.26	0.0	0.26	1.00	99.9
#60	0.250	0.19	0.0	0.19	1.00	99.8
#100	0.150	0.45	0.0	0.45	1.00	99.7
#140	0.106	0.87	0.0	0.87	1.00	99.4
#200	0.075	2.54	0.0	2.54	1.00	98.7



USCS Classification ASTM D 2487

Atterberg Classification: CL	Coefficient of Curvature - C _c : --
Group Symbol: CL	Coefficient of Uniformity - C _u : --
USCS Classification: Lean Clay	

Data entry by:	CAL	Date:	10/7/2019
Checked by:	<u>SPH</u>	Date:	<u>10-7-19</u>
File name:	3020012_Grain Size Analysis ASTM D6913_6.xlsm		



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/01/19
 TECHNICIAN: BNF

BORING NO.: B-2
 DEPTH: 7'
 SAMPLE NO.: --
 DATE SAMPLED: --
 DESCRIPTION: --

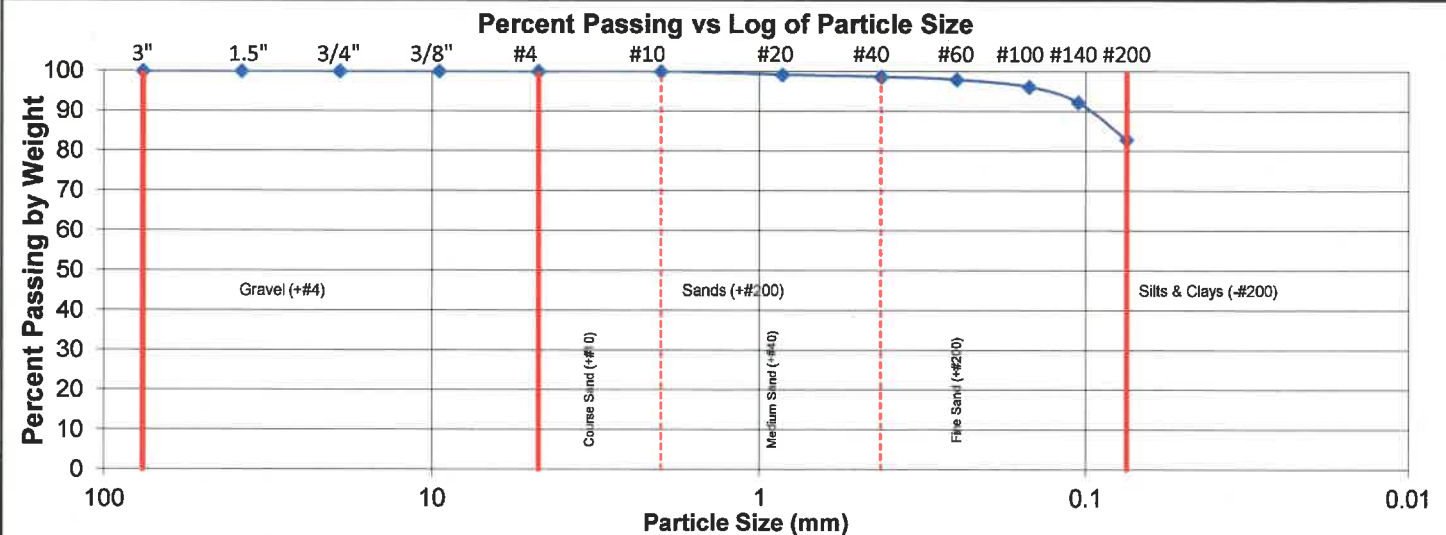
Hygroscopic Moisture

Mass Wet Pan and Soil (g): 95.52
 Mass Dry Pan and Soil (g): 74.41
 Mass of Pan (g): 3.12
 Moisture (%): **29.6**

Sample Data

Total Wet Mass of Sample (g): 92.4
 Total Dry Mass of Sample (g): 71.3

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	0.0	--	--	--	--
1.5"	38.1	0.0	--	--	--	--
3/4"	19.05	0.0	--	--	--	--
3/8"	9.53	0.0	--	--	--	--
#4	4.75	0.0	--	--	--	--
#10	2.00	0.0	--	--	--	100.0
#20	0.850	0.54	--	0.54	1.00	99.2
#40	0.425	0.39	--	0.39	1.00	98.7
#60	0.250	0.50	--	0.50	1.00	98.0
#100	0.150	1.29	--	1.29	1.00	96.2
#140	0.106	2.76	--	2.76	1.00	92.3
#200	0.075	6.67	--	6.67	1.00	83.0



USCS Classification ASTM D 2487

Atterberg Classification: -- Coefficient of Curvature - C_c: --
 Group Symbol: -- Coefficient of Uniformity - C_u: --
 USCS Classification: --

Data entry by: KMS Date: 10/2/2019
 Checked by: CN Date: 10/3/2019
 File name: 3020012__Grain Size Analysis ASTM D6913_2.xlsm



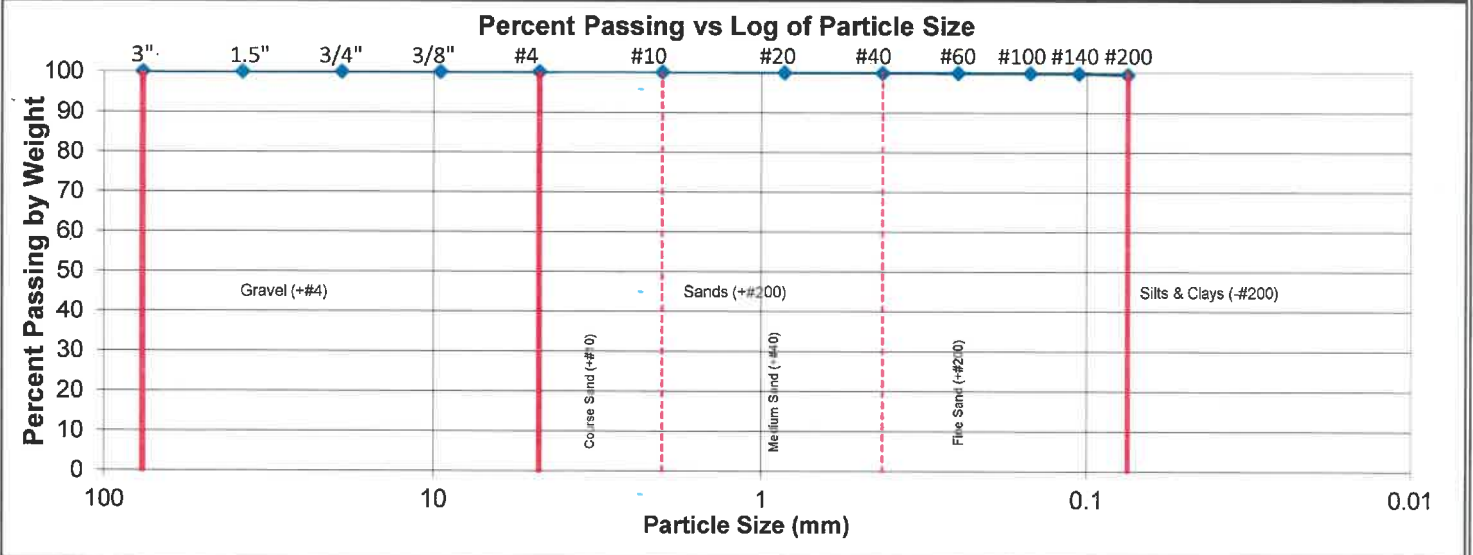
Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-3
JOB NO.	3020-012	DEPTH	4'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/01/19		
TECHNICIAN	ALH		

Hygroscopic Moisture	Sample Data
Mass Wet Pan and Soil (g): 365.24	Total Wet Mass of Sample (g): 100.5
Mass Dry Pan and Soil (g): 348.60	Total Dry Mass of Sample (g): 83.9
Mass of Pan (g): 264.74	
Moisture (%): 19.8	

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	--
3/8"	9.53	--	--	--	--	--
#4	4.75	--	--	--	--	--
#10	2.00	0.00	--	--	--	100.0
#20	0.850	0.13	--	0.13	1.00	99.8
#40	0.425	0.05	--	0.05	1.00	99.8
#60	0.250	0.03	--	0.03	1.00	99.7
#100	0.150	0.06	--	0.06	1.00	99.7
#140	0.106	0.05	--	0.05	1.00	99.6
#200	0.075	0.22	--	0.22	1.00	99.4



USCS Classification ASTM D 2487	
Atterberg Classification: CL	Coefficient of Curvature - C_c : --
Group Symbol: CL	Coefficient of Uniformity - C_u : --
USCS Classification: Lean Clay	

Data entry by: CAL	Date: 10/9/2019
Checked by: <u>KMS</u>	Date: <u>10/9/19</u>
File name: 3020012 Grain Size Analysis ASTM D6913_13.xlsm	



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/01/19
 TECHNICIAN: ALH

BORING NO.: B-3
 DEPTH: 9'
 SAMPLE NO.: --
 DATE SAMPLED: --
 DESCRIPTION: --

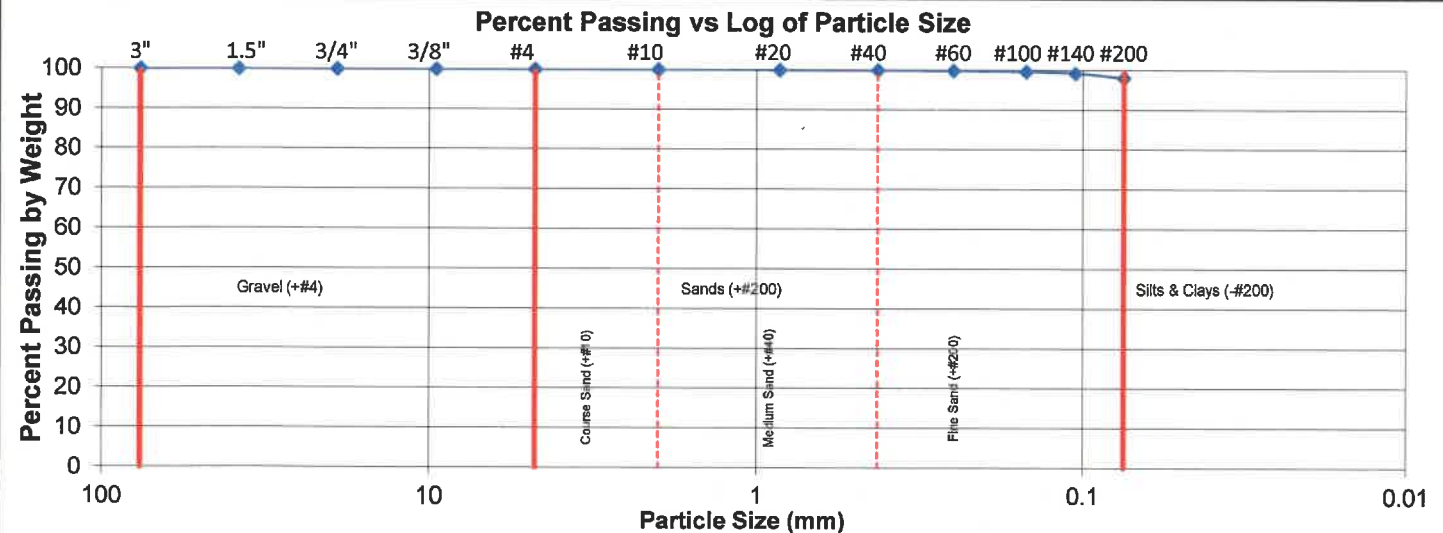
Hygroscopic Moisture

Mass Wet Pan and Soil (g): 245.35
 Mass Dry Pan and Soil (g): 243.43
 Mass of Pan (g): 139.91
 Moisture (%): **1.9**

Sample Data

Total Wet Mass of Sample (g): 105.4
 Total Dry Mass of Sample (g): 103.5

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	--
3/8"	9.53	--	--	--	--	--
#4	4.75	--	--	--	--	--
#10	2.00	0.0	0.0	--	--	--
#20	0.850	0.04	0.0	0.04	1.00	100.0
#40	0.425	0.04	0.0	0.04	1.00	99.9
#60	0.250	0.09	0.0	0.09	1.00	99.8
#100	0.150	0.18	0.0	0.18	1.00	99.7
#140	0.106	0.43	0.0	0.43	1.00	99.2
#200	0.075	1.21	0.0	1.21	1.00	98.1



USCS Classification ASTM D 2487

Atterberg Classification: CL Coefficient of Curvature - C_c: --
 Group Symbol: CL Coefficient of Uniformity - C_u: --
 USCS Classification: Lean Clay

Data entry by: CAL Date: 10/7/2019
 Checked by: KMS Date: 10/7/19
 File name: 3020012_Grain Size Analysis ASTM D6913_7.xlsm



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

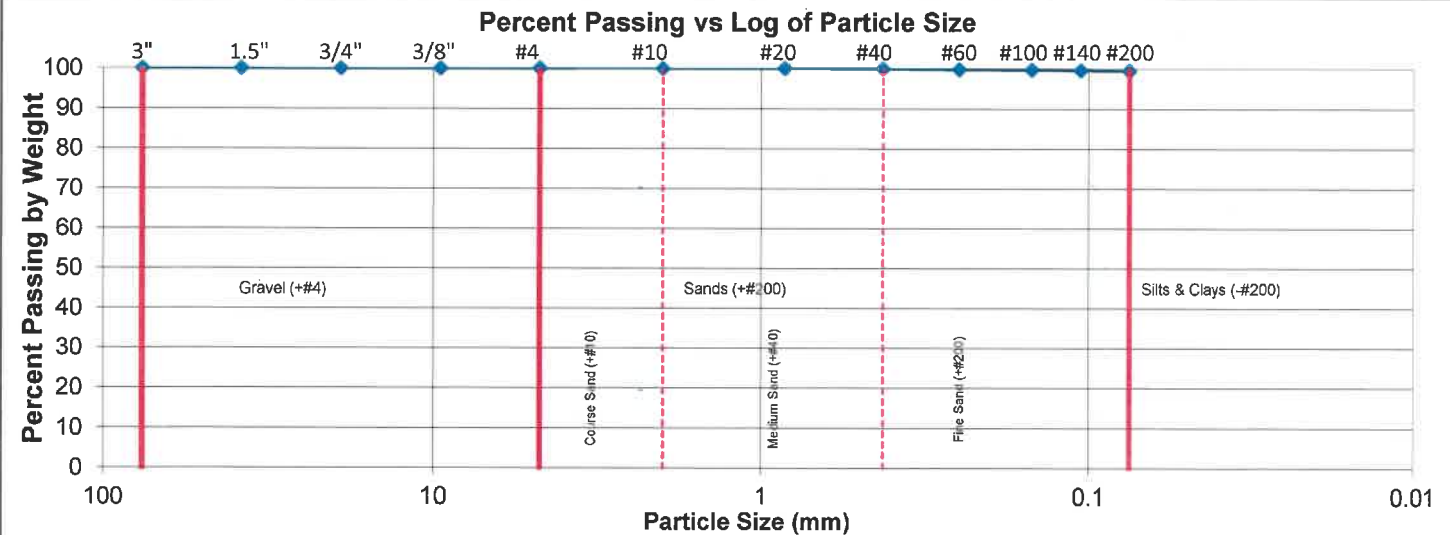
CLIENT	Wiss Janney Elstner	BORING NO.	B-4
JOB NO.	3020-012	DEPTH	4'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/01/19		
TECHNICIAN	ALH		

Hygroscopic Moisture

Sample Data

Mass Wet Pan and Soil (g): 97.49	Total Wet Mass of Sample (g): 94.4
Mass Dry Pan and Soil (g): 81.60	Total Dry Mass of Sample (g): 78.5
Mass of Pan (g): 3.09	
Moisture (%): 20.2	

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	--
3/8"	9.53	--	--	--	--	--
#4	4.75	--	--	--	--	--
#10	2.00	0.0	0.0	0.0	1.00	100.0
#20	0.850	0.04	0.0	0.0	1.00	99.9
#40	0.425	0.06	0.0	0.06	1.00	99.9
#60	0.250	0.10	0.0	0.10	1.00	99.7
#100	0.150	0.08	0.0	0.08	1.00	99.6
#140	0.106	0.05	0.0	0.05	1.00	99.6
#200	0.075	0.10	0.0	0.10	1.00	99.5



USCS Classification ASTM D 2487

Atterberg Classification: CL	Coefficient of Curvature - C _c : --
Group Symbol: CL	Coefficient of Uniformity - C _u : --
USCS Classification: Lean Clay	

Data entry by:	CAL	Date:	10/7/2019
Checked by:	SPH	Date:	10-7-19
File name:	3020012_Grain Size Analysis ASTM D6913_8.xlsm		



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-4
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/01/19		
TECHNICIAN	BNF		

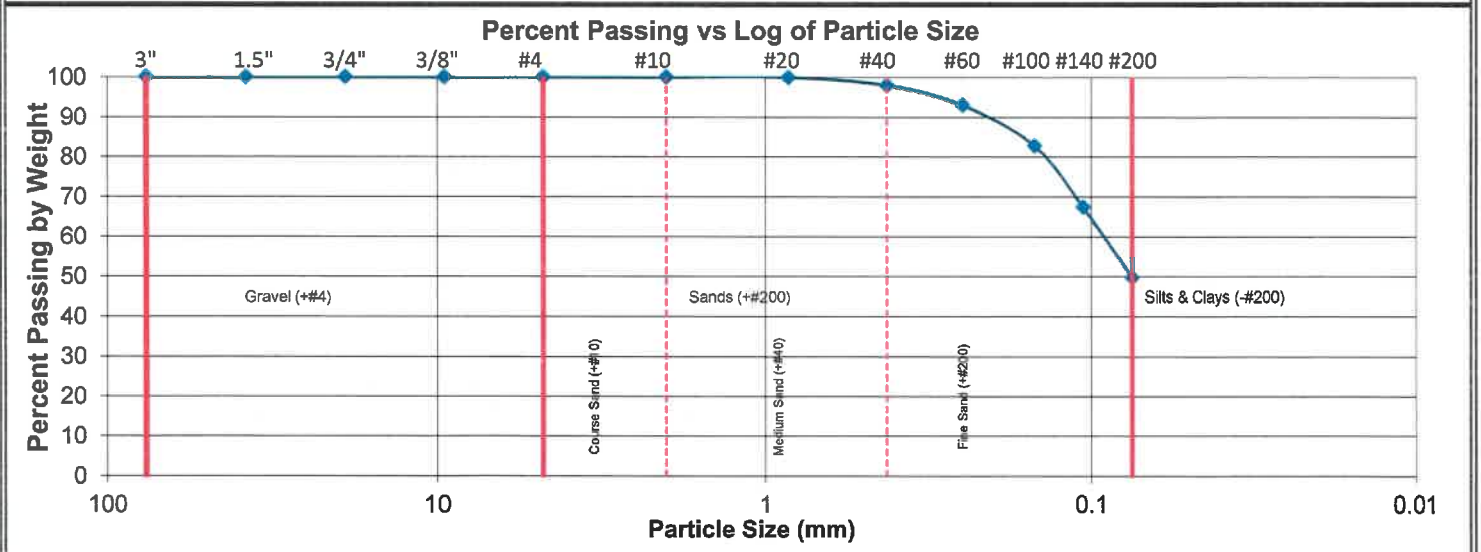
Hygroscopic Moisture

Mass Wet Pan and Soil (g): 100.02
 Mass Dry Pan and Soil (g): 82.65
 Mass of Pan (g): 3.10
 Moisture (%): **21.8**

Sample Data

Total Wet Mass of Sample (g): 96.9
 Total Dry Mass of Sample (g): 79.6

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	0.0	--	--	--	--
1.5"	38.1	0.0	--	--	--	--
3/4"	19.05	0.0	--	--	--	--
3/8"	9.53	0.0	--	--	--	--
#4	4.75	0.0	--	--	--	--
#10	2.00	0.0	--	0.0	1.00	100.0
#20	0.850	0.0	--	0.0	1.00	99.9
#40	0.425	1.6	--	1.6	1.00	97.9
#60	0.250	3.9	--	3.9	1.00	93.0
#100	0.150	8.1	--	8.1	1.00	82.8
#140	0.106	12.3	--	12.3	1.00	67.3
#200	0.075	14.1	--	14.1	1.00	49.6



USCS Classification ASTM D 2487

Atterberg Classification: --	Coefficient of Curvature - C _c : --
Group Symbol: --	Coefficient of Uniformity - C _u : --
USCS Classification: --	

Data entry by: KMS	Date: 10/2/2019
Checked by: <u>cat</u>	Date: <u>10/3/2019</u>
File name: 3020012_Grain Size Analysis ASTM D6913_1.xlsm	



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-5
JOB NO.	3020-012	DEPTH	0'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/03/19		
TECHNICIAN	ASE		

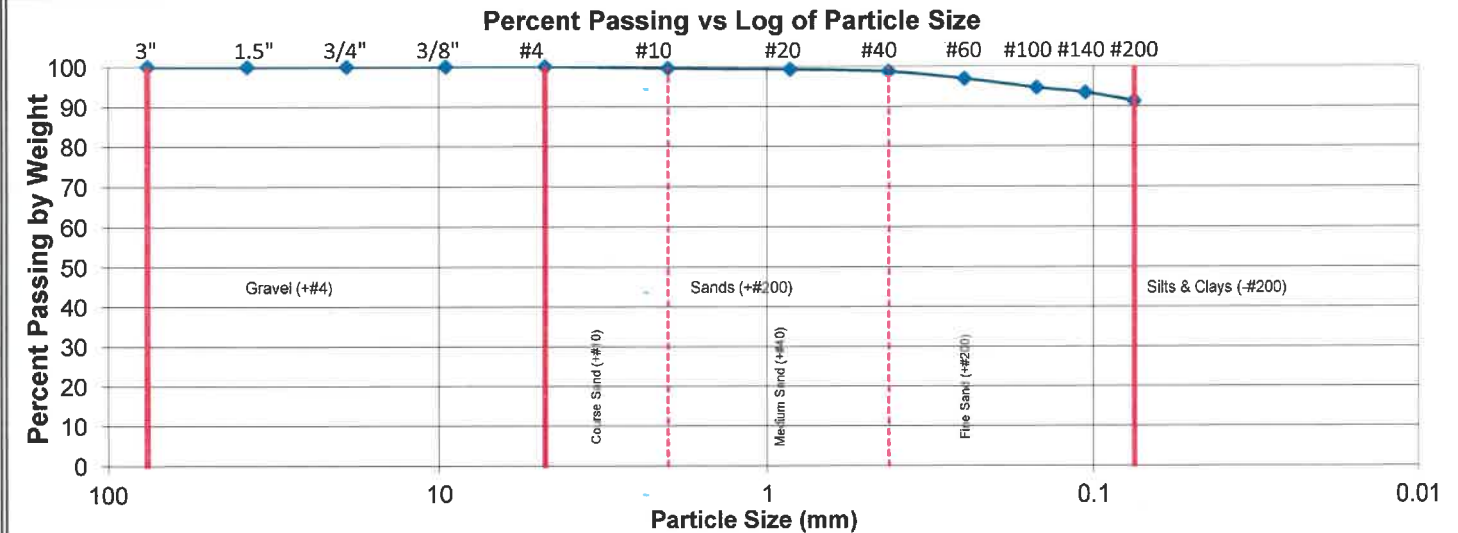
Hygroscopic Moisture

Mass Wet Pan and Soil (g): 516.09
 Mass Dry Pan and Soil (g): 465.41
 Mass of Pan (g): 123.24
 Moisture (%): **14.8**

Sample Data

Total Wet Mass of Sample (g): 392.9
 Total Dry Mass of Sample (g): 342.2

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	--
3/8"	9.53	--	--	--	--	--
#4	4.75	0.0	--	--	--	100.0
#10	2.00	1.4	--	1.4	1.00	99.6
#20	0.850	1.1	--	1.1	1.00	99.3
#40	0.425	2.1	--	2.1	1.00	98.7
#60	0.250	6.2	--	6.2	1.00	96.9
#100	0.150	7.7	--	7.7	1.00	94.6
#140	0.106	4.3	--	4.3	1.00	93.4
#200	0.075	7.1	--	7.1	1.00	91.3



USCS Classification ASTM D 2487

Atterberg Classification: CL	Coefficient of Curvature - C _c : --
Group Symbol: CL	Coefficient of Uniformity - C _u : --
USCS Classification: Lean Clay	

Data entry by:	CAL	Date:	10/10/2019
Checked by:	KMS	Date:	10/10/19
File name:	3020012_Grain Size Analysis ASTM D6913_15.xlsm		



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

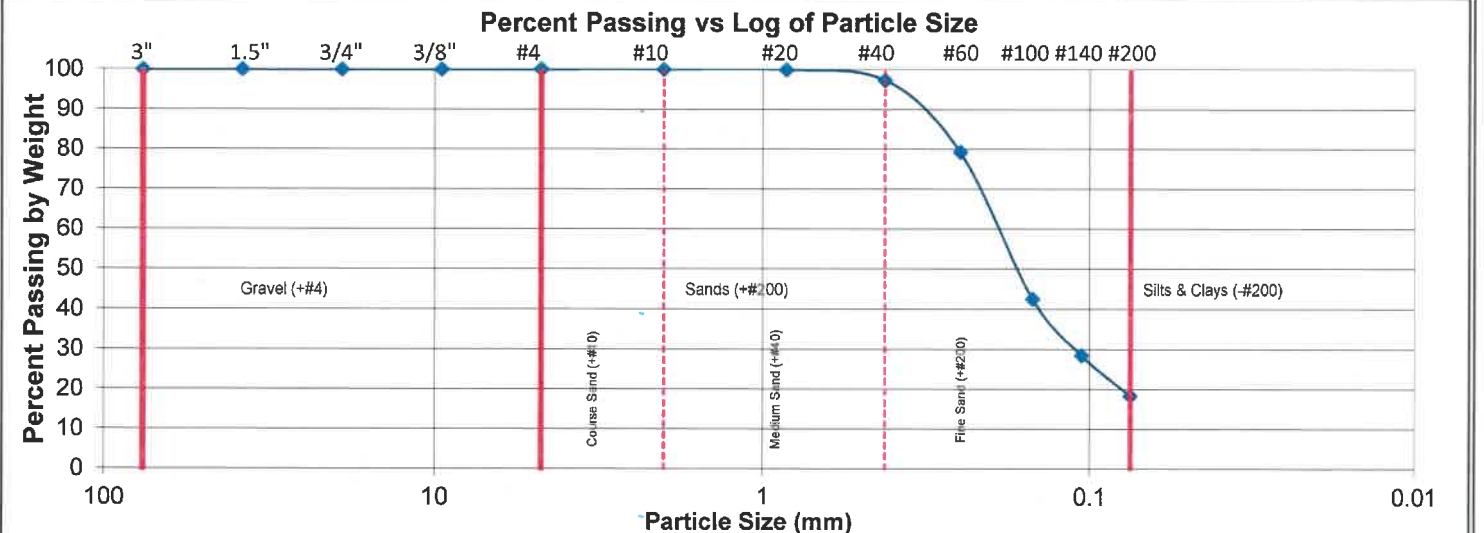
CLIENT	Wiss Janney Elstner	BORING NO.	B-5
JOB NO.	3020-012	DEPTH	6'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/03/19		
TECHNICIAN	ASE		

Hygroscopic Moisture

Sample Data

Mass Wet Pan and Soil (g): 223.75	Total Wet Mass of Sample (g): 84.3
Mass Dry Pan and Soil (g): 210.64	Total Dry Mass of Sample (g): 71.2
Mass of Pan (g): 139.49	
Moisture (%): 18.4	

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	0.0	--	--	--	--
1.5"	38.1	0.0	--	--	--	--
3/4"	19.05	0.0	--	--	--	--
3/8"	9.53	0.0	--	--	--	--
#4	4.75	0.0	--	--	--	--
#10	2.00	0.0	--	--	--	100.0
#20	0.850	0.0	--	0.0	1.00	99.9
#40	0.425	1.9	--	1.9	1.00	97.3
#60	0.250	12.9	--	12.9	1.00	79.2
#100	0.150	26.2	--	26.2	1.00	42.4
#140	0.106	9.9	--	9.9	1.00	28.4
#200	0.075	7.2	--	7.2	1.00	18.4



USCS Classification ASTM D 2487

Atterberg Classification: --	Coefficient of Curvature - C _c : --
Group Symbol: --	Coefficient of Uniformity - C _u : --
USCS Classification: --	

Data entry by:	KMS	Date:	10/7/2019
Checked by:	<i>ase</i>	Date:	10/8/2019
File name:	3020012_Grain Size Analysis ASTM D6913_9.xlsm		



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	4'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/03/19		
TECHNICIAN	ASE		

Hygroscopic Moisture

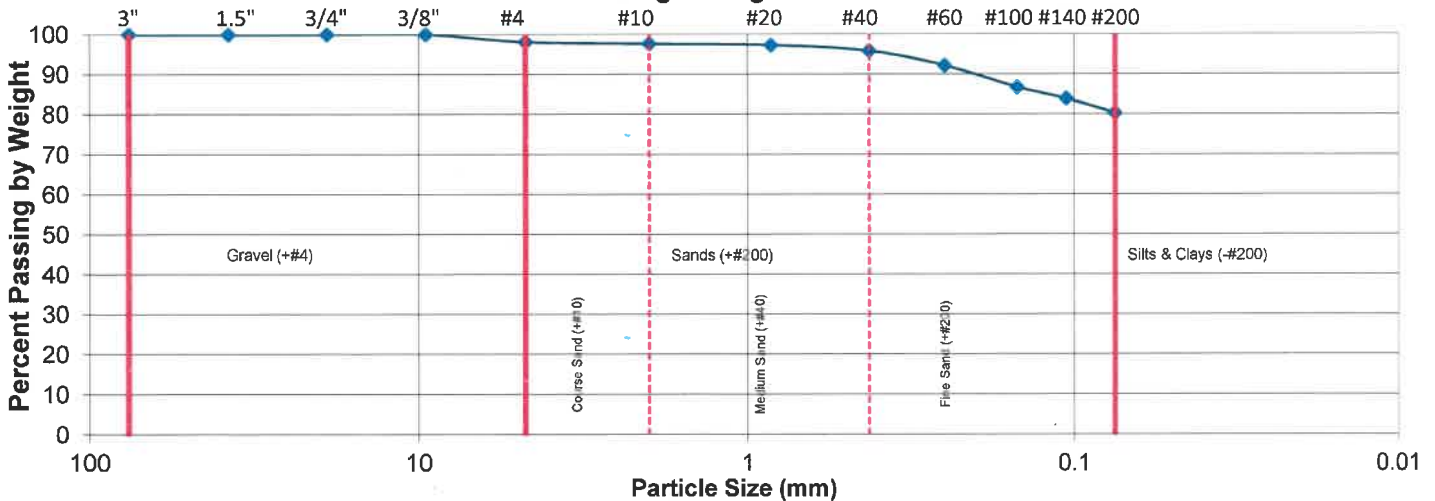
Mass Wet Pan and Soil (g): 273.35
 Mass Dry Pan and Soil (g): 259.36
 Mass of Pan (g): 172.36
 Moisture (%): **16.1**

Sample Data

Total Wet Mass of Sample (g): 101.0
 Total Dry Mass of Sample (g): 87.0

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	--
3/8"	9.53	0.0	--	--	--	100.0
#4	4.75	1.7	--	1.7	1.00	98.1
#10	2.00	0.38	--	0.4	1.00	97.6
#20	0.850	0.31	--	0.3	1.00	97.3
#40	0.425	1.3	--	1.3	1.00	95.8
#60	0.250	3.2	--	3.2	1.00	92.1
#100	0.150	4.7	--	4.7	1.00	86.7
#140	0.106	2.5	--	2.5	1.00	83.9
#200	0.075	3.1	--	3.1	1.00	80.3

Percent Passing vs Log of Particle Size



USCS Classification ASTM D 2487

Atterberg Classification: CL	Coefficient of Curvature - C _c : --
Group Symbol: CL	Coefficient of Uniformity - C _u : --
USCS Classification: Lean Clay With Sand	

Data entry by: CAL	Date: 10/10/2019
Checked by: <u>KMS</u>	Date: <u>10/10/19</u>
File name: 3020012__ Grain Size Analysis ASTM D6913_14.xlsm	



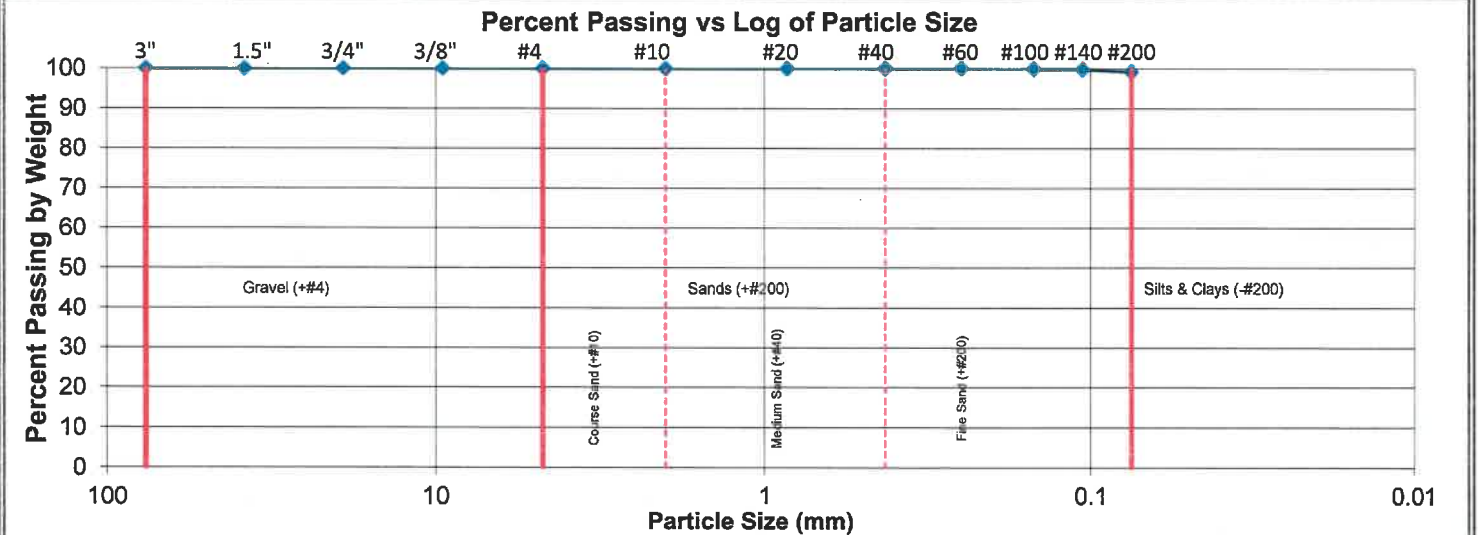
Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/01/19		
TECHNICIAN	WAR		

Hygroscopic Moisture of Fines	Sample Data
Mass Wet Pan and Soil (g): 248.91	Total Wet Mass of Sample (g): 259.6
Mass Dry Pan and Soil (g): 246.66	Total Dry Mass of Sample (g): 255.0
Mass of Pan (g): 123.51	Split Fraction: #4
Moisture (%): 1.8	Mass of Sub-Sample Fraction (g): 125.40

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	0.0	--	--	--	--
1.5"	38.1	0.0	--	--	--	--
3/4"	19.05	0.0	--	--	--	--
3/8"	9.53	0.0	--	--	--	--
#4	4.75	0.0	--	--	--	--
#10	2.00	0.0	--	--	--	--
#20	0.850	0.0	--	--	--	--
#40	0.425	0.0	--	--	--	--
#60	0.250	0.0	--	0.0	1.00	100.0
#100	0.150	0.1	--	0.1	1.00	99.9
#140	0.106	0.2	--	0.2	1.00	99.7
#200	0.075	0.8	--	0.8	1.00	99.1



USCS Classification ASTM D 2487

Atterberg Classification: CL	Coefficient of Curvature - C _c : --
Group Symbol: CL	Coefficient of Uniformity - C _u : --
USCS Classification: Lean Clay	

Data entry by: KMS	Date: 10/4/2019
Checked by: <u>SPH</u>	Date: <u>10-7-19</u>
File name: 3020012_Grain Size Analysis ASTM D6913_5.xlsm	



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	14'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	--
DATE TESTED	10/04/19		
TECHNICIAN	TAF		

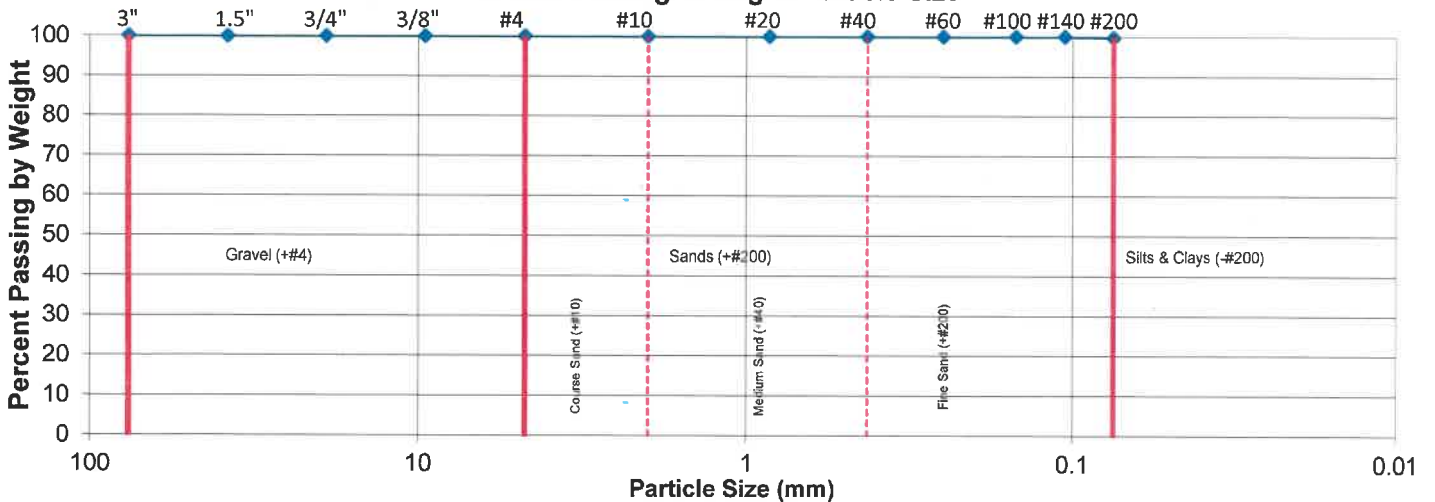
Hygroscopic Moisture

Sample Data

Mass Wet Pan and Soil (g): 267.95	Total Wet Mass of Sample (g): 95.2
Mass Dry Pan and Soil (g): 246.58	Total Dry Mass of Sample (g): 73.9
Mass of Pan (g): 172.73	
Moisture (%): 28.9	

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	--
3/8"	9.53	--	--	--	--	--
#4	4.75	--	--	--	--	--
#10	2.00	--	--	--	--	--
#20	0.850	--	--	--	--	--
#40	0.425	0.0	--	--	--	--
#60	0.250	0.0	--	0.0	1.00	100.0
#100	0.150	0.01	--	0.01	1.00	100.0
#140	0.106	0.01	--	0.01	1.00	100.0
#200	0.075	0.2	--	0.2	1.00	99.7

Percent Passing vs Log of Particle Size



USCS Classification ASTM D 2487

Atterberg Classification: CL	Coefficient of Curvature - C _c : --
Group Symbol: CL	Coefficient of Uniformity - C _u : --
USCS Classification: Lean Clay	

Data entry by:	CAL	Date:	10/9/2019
Checked by:	<u>KMS</u>	Date:	<u>10/9/19</u>
File name:	3020012_Grain Size Analysis ASTM D6913_11.xlsm		



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 10/01/19
 TECHNICIAN: BNF

BORING NO.: B-6
 DEPTH: 19'
 SAMPLE NO.: --
 DATE SAMPLED: --
 DESCRIPTION: --

Hygroscopic Moisture

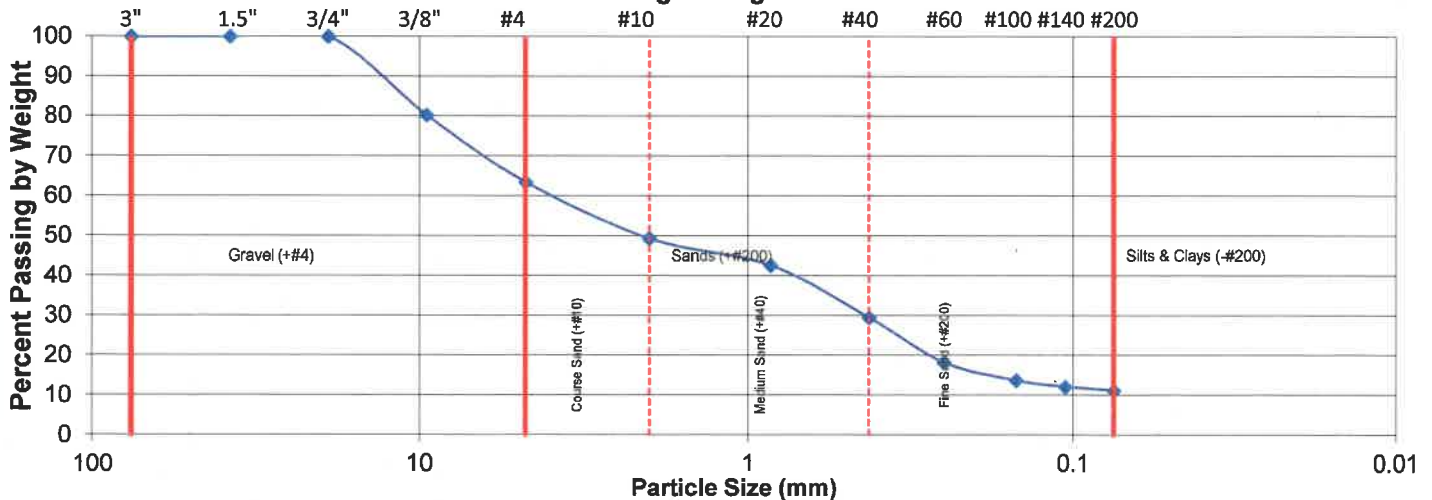
Mass Wet Pan and Soil (g): 107.32
 Mass Dry Pan and Soil (g): 99.41
 Mass of Pan (g): 3.09
 Moisture (%): **8.2**

Sample Data

Total Wet Mass of Sample (g): 104.2
 Total Dry Mass of Sample (g): 96.3

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	0.0	--	--	--	--
1.5"	38.1	0.0	--	--	--	--
3/4"	19.05	0.0	--	0.0	--	100.0
3/8"	9.53	19.0	--	19.0	1.00	80.3
#4	4.75	16.2	--	16.2	1.00	63.5
#10	2.00	13.6	--	13.6	1.00	49.4
#20	0.850	6.5	--	6.5	1.00	42.6
#40	0.425	12.6	--	12.6	1.00	29.5
#60	0.250	10.8	--	10.8	1.00	18.3
#100	0.150	4.4	--	4.4	1.00	13.7
#140	0.106	1.5	--	1.5	1.00	12.2
#200	0.075	0.9	--	0.9	1.00	11.2

Percent Passing vs Log of Particle Size



USCS Classification ASTM D 2487

Atterberg Classification: -- Coefficient of Curvature - C_c : 1.30
 Group Symbol: -- Coefficient of Uniformity - C_u : 110.74
 USCS Classification: --

Data entry by: KMS Date: 10/2/2019
 Checked by: Date: 10/2/19
 File name: 3020012_Grain Size Analysis ASTM D6913_0.xlsm



Grain Size Analysis ASTM D 6913

ADVANCED TERRA TESTING

CLIENT Wiss Janney Elstner
JOB NO. 3020-012
PROJECT Persigo WWTP
PROJECT NO. --
LOCATION Grand Junction CO
DATE TESTED 10/01/19
TECHNICIAN ALH

BORING NO. B-7
DEPTH 4'
SAMPLE NO. --
DATE SAMPLED --
DESCRIPTION --

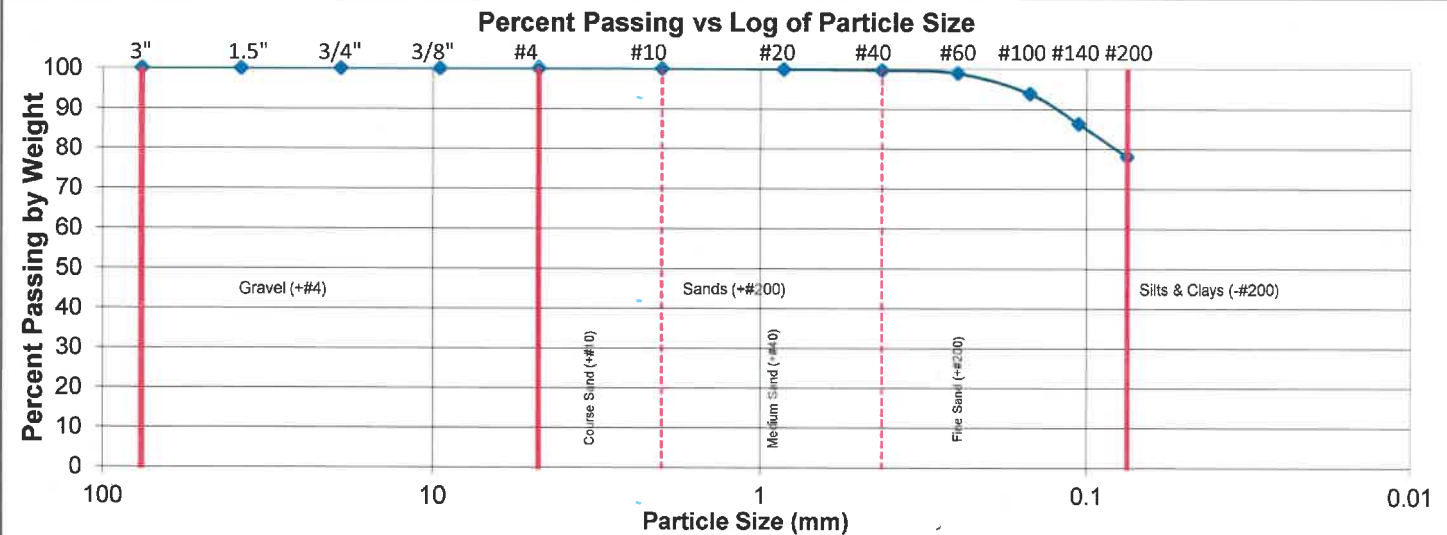
Hygroscopic Moisture

Mass Wet Pan and Soil (g): 272.67
Mass Dry Pan and Soil (g): 259.27
Mass of Pan (g): 171.78
Moisture (%): **15.3**

Sample Data

Total Wet Mass of Sample (g): 100.9
Total Dry Mass of Sample (g): 87.5

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
3"	76.2	--	--	--	--	--
1.5"	38.1	--	--	--	--	--
3/4"	19.05	--	--	--	--	--
3/8"	9.53	--	--	--	--	--
#4	4.75	--	--	--	--	--
#10	2.00	0.0	--	--	--	100.0
#20	0.850	0.13	--	0.13	1.00	99.9
#40	0.425	0.23	--	0.23	1.00	99.6
#60	0.250	0.66	--	0.66	1.00	98.8
#100	0.150	4.5	--	4.5	1.00	93.7
#140	0.106	6.6	--	6.6	1.00	86.2
#200	0.075	7.2	--	7.2	1.00	78.0



USCS Classification ASTM D 2487

Atterberg Classification: CL Coefficient of Curvature - C_c : --
Group Symbol: CL Coefficient of Uniformity - C_u : --
USCS Classification: Lean Clay With Sand

Data entry by: CAL Date: 10/9/2019
Checked by: KMS Date: 10/9/19
File name: 3020012_Grain Size Analysis ASTM D6913_10.xlsm



One Dimensional Swell / Collapse

Denver Swell

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 09/20/19
 TECHNICIAN: ALH

BORING NO.: B-3
 DEPTH: 9'
 SAMPLE NO.: --
 DATE SAMPLED: --
 SAMPLED BY: --
 DESCRIPTION: --

Sample Conditions

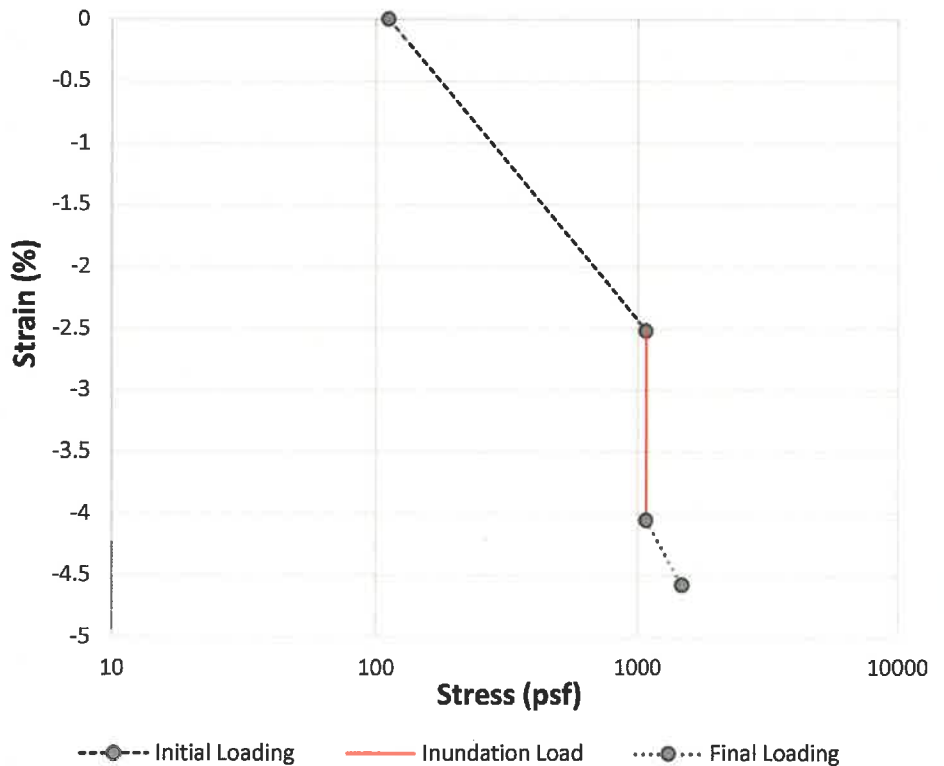
Before Test Mass of Wet Soil and Ring (g): 325.87	Initial Wet Density (pcf): 120.8
After Test Mass of Wet Soil and Ring (g): 324.92	Initial Dry Density (pcf): 93.9
Mass of Dry Soil, Ring, and Pan (g): 466.41	Initial Wet Density (kg/m ³): 1935
Diameter (in): 1.94	Initial Dry Density (kg/m ³): 1503
Initial Height (in): 0.90	Initial Moisture (%): 28.7
Mass of Ring (g): 241.69	Final Wet Density (pcf): 125.6
Mass of Pan (g): 159.32	Final Dry Density (pcf): 98.7
Inundation Load (psf): 1079	Final Wet Density (kg/m ³): 2012
Inundation Load (kPa): 52	Final Dry Density (kg/m ³): 1581
Oedometer ID: ATT-15	Final Moisture (%): 27.3

Swell / Collapse Data

Collapse (%): -1.53
 Swell Pressure (psf): --
 Swell Pressure (kPa): --

Load (psf)	Deformation (in)	Strain (%)
112	0.0000	0.00
1079	-0.0227	-2.52
Inudated	-0.0365	-4.06
1488	-0.0412	-4.58

Strain Versus Vertical Stress



Data entry by: SPH
 Checked by: CAE
 File name: 3020012 Swell Colapse ASTM D4546 2.xls

Date: 9/24/2019
 Date: 9/25/19



One Dimensional Swell / Collapse

Denver Swell

CLIENT: Wiss Janney Elstner
 JOB NO.: 3020-012
 PROJECT: Persigo WWTP
 PROJECT NO.: --
 LOCATION: Grand Junction CO
 DATE TESTED: 09/20/19
 TECHNICIAN: ALH

BORING NO.: B-5
 DEPTH: 20'
 SAMPLE NO.: --
 DATE SAMPLED: --
 SAMPLED BY: --
 DESCRIPTION: --

Sample Conditions

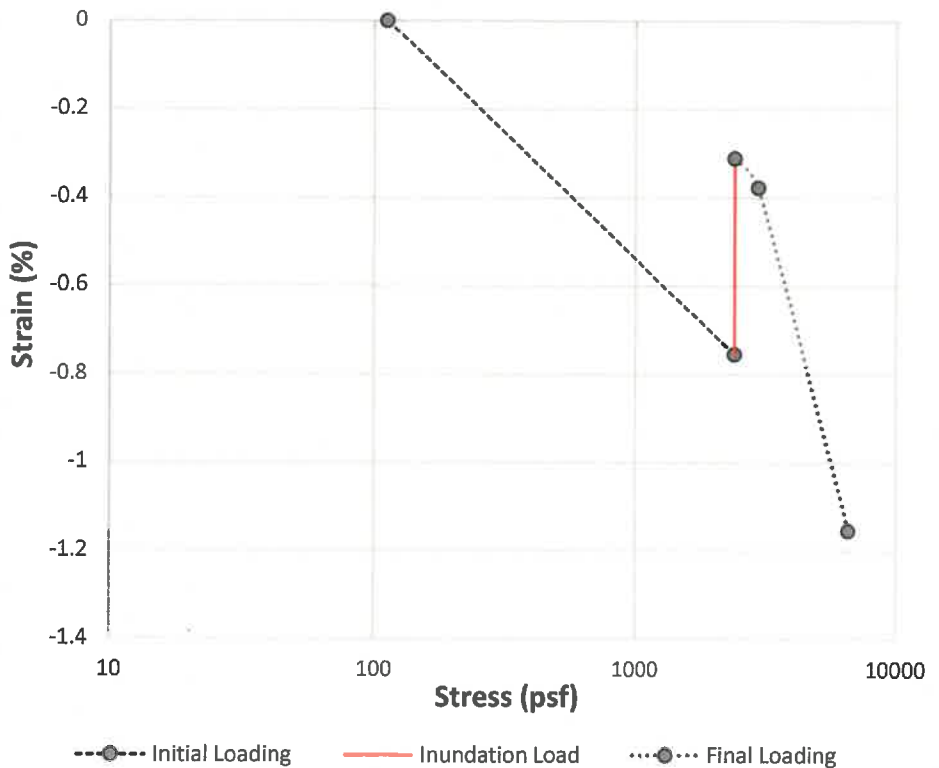
Before Test Mass of Wet Soil and Ring (g): 343.53	Initial Wet Density (pcf): 132.6
After Test Mass of Wet Soil and Ring (g): 346.92	Initial Dry Density (pcf): 121.5
Mass of Dry Soil, Ring, and Pan (g): 491.57	Initial Wet Density (kg/m ³): 2124
Diameter (in): 1.94	Initial Dry Density (kg/m ³): 1945
Initial Height (in): 0.90	Initial Moisture (%): 9.2
Mass of Ring (g): 251.12	Final Wet Density (pcf): 139.6
Mass of Pan (g): 155.81	Final Dry Density (pcf): 123.3
Inundation Load (psf): 2404	Final Wet Density (kg/m ³): 2236
Inundation Load (kPa): 115	Final Dry Density (kg/m ³): 1975
Oedometer ID: ATT-16	Final Moisture (%): 13.2

Swell / Collapse Data

Swell (%): 0.44 Swell Pressure (psf): 4682
 Swell Pressure (kPa): 224

Load (psf)	Deformation (in)	Strain (%)
112	0.0000	0.00
2404	-0.0068	-0.76
Inudated	-0.0028	-0.31
2953	-0.0034	-0.38
6513	-0.0104	-1.16

Strain Versus Vertical Stress



Data entry by: SPH Date: 9/24/2019
 Checked by: CAL Date: 9/25/2019
 File name: 3020012 Swell Collapse ASTM D4546_1.xls

One Dimensional Swell / Collapse

Denver Swell

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	SAMPLED BY	--
DATE TESTED	09/20/19	DESCRIPTION	--
TECHNICIAN	ALH		

Sample Conditions

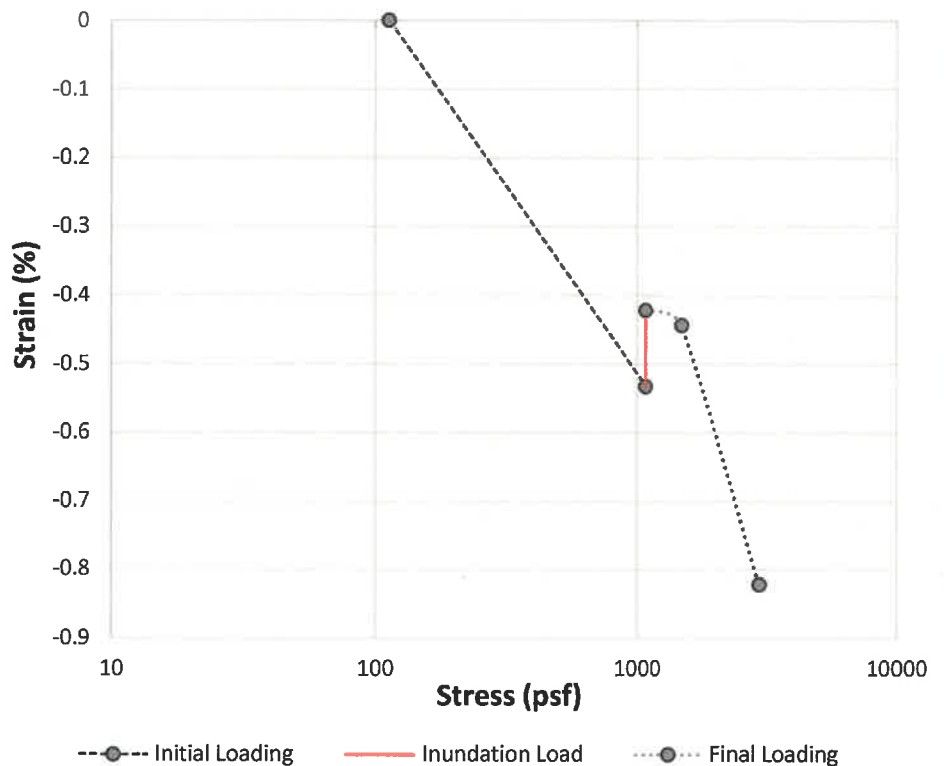
Before Test Mass of Wet Soil and Ring (g): 333.40	Initial Wet Density (pcf): 134.3
After Test Mass of Wet Soil and Ring (g): 334.05	Initial Dry Density (pcf): 115.2
Mass of Dry Soil, Ring, and Pan (g): 476.35	Initial Wet Density (kg/m ³): 2151
Diameter (in): 1.94	Initial Dry Density (kg/m ³): 1845
Initial Height (in): 0.90	Initial Moisture (%): 16.6
Mass of Ring (g): 239.80	Final Wet Density (pcf): 136.8
Mass of Pan (g): 156.28	Final Dry Density (pcf): 116.5
Inundation Load (psf): 1079	Final Wet Density (kg/m ³): 2192
Inundation Load (kPa): 52	Final Dry Density (kg/m ³): 1867
Oedometer ID: ATT-17	Final Moisture (%): 17.4

Swell / Collapse Data

Swell (%): 0.11	Swell Pressure (psf): 1833
	Swell Pressure (kPa): 88

Load (psf)	Deformation (in)	Strain (%)
113	0.0000	0.00
1079	-0.0048	-0.53
Inudated	-0.0038	-0.42
1488	-0.0040	-0.44
2954	-0.0074	-0.82

Strain Versus Vertical Stress



Data entry by: SPH	Date: 9/24/2019
Checked by: <u>CAJ</u>	Date: <u>9/25/2019</u>
File name: 3020012_Swell Colapse ASTM D4546_0.xls	



ADVANCED TERRA TESTING

Unconfined Compressive Strength

ASTM D 2166

CLIENT	Wiss Janney Elstner	BORING NO.	B-3
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/23/19		
TECHNICIAN	CAL		

Test Parameters

Strain Rate (in/min): 0.039167455
 Strain Rate (cm/min): 0.099485336

Raw Data Files: WJE_UCS_B-3_9_.txt

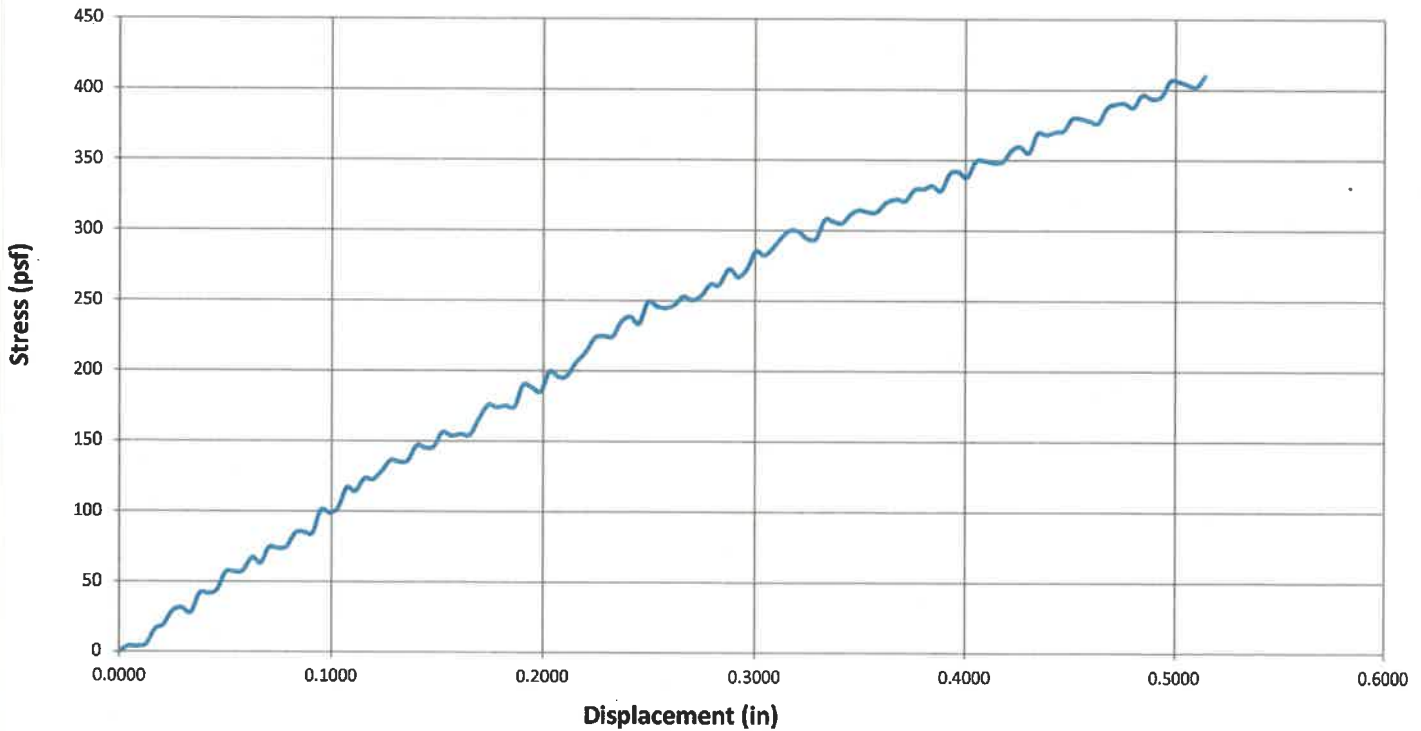
Moisture & Density Data

Mass of Wet Soil and Pan (g):	377.34	Initial Wet Density (pcf):	122.8
Mass of Dry Soil and Pan (g):	294.36	Initial Dry Density (pcf):	95.3
Mass of Pan (g):	6.94	Initial Wet Density (kg/m ³):	1967
Mass of Wet Soil (g):	370.4	Initial Dry Density (kg/m ³):	1526
Initial Diameter (in):	1.93	Initial Moisture (%):	28.9
Initial Height (in):	3.95		

Test Results

Peak Stress (psf):	410	Axial Strain at Peak Stress(%):	13.0
Peak Stress (kPa):	20	Height to Diameter Ratio:	2.0:1

Displacement vs. Stress



NOTES:

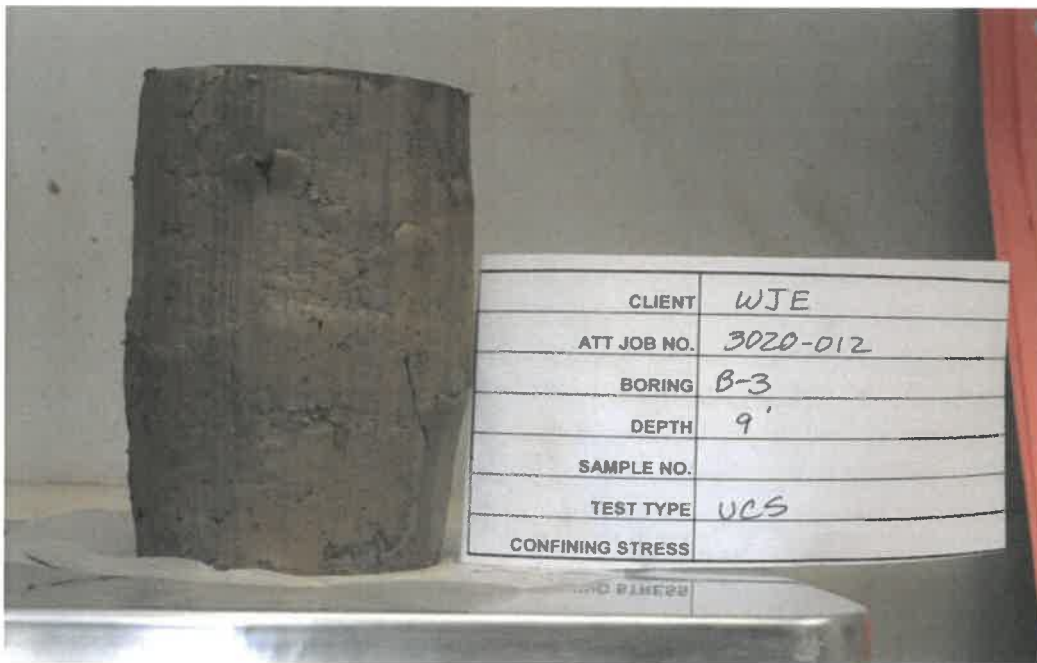
Data entry by:	CAL	Date:	9/24/2019
Checked by:	SPH	Date:	9-24-19
File name:	3020012_UCS ASTM D2166_0.xlsm		



Image Attachment

ADVANCED TERRA TESTING

CLIENT Wiss Janney Elstner
JOB NO. 3020-012
PROJECT Persigo WWTP
PROJECT NO. --
LOCATION Grand Junction CO



NOTES

File name: 3020012__Image_19_09_24_06_45_04

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-3
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/23/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.0000	0.000	0.00	2.91	0.0	0	0	0
0.0041	0.010	0.10	2.92	0.1	0.4	4.0	0.2
0.0085	0.022	0.22	2.92	0.1	0.4	3.9	0.2
0.0125	0.032	0.32	2.92	0.1	0.5	5.4	0.3
0.0166	0.042	0.42	2.93	0.3	1.4	16	0.8
0.0207	0.053	0.52	2.93	0.4	1.7	19	0.9
0.0248	0.063	0.63	2.93	0.6	2.6	29	1.4
0.0292	0.074	0.74	2.94	0.6	2.8	31	1.5
0.0335	0.085	0.85	2.94	0.6	2.5	28	1.3
0.0376	0.096	0.95	2.94	0.9	3.8	42	2.0
0.0418	0.106	1.06	2.94	0.9	3.8	42	2.0
0.0458	0.116	1.16	2.95	0.9	4.0	44	2.1
0.0498	0.126	1.26	2.95	1.2	5.2	57	2.7
0.0538	0.137	1.36	2.95	1.2	5.2	57	2.7
0.0579	0.147	1.47	2.96	1.2	5.2	57	2.8
0.0623	0.158	1.58	2.96	1.4	6.1	67	3.2
0.0663	0.168	1.68	2.96	1.3	5.8	63	3.0
0.0703	0.179	1.78	2.97	1.5	6.8	74	3.6
0.0744	0.189	1.89	2.97	1.5	6.8	74	3.5
0.0786	0.200	1.99	2.97	1.5	6.9	75	3.6
0.0829	0.211	2.10	2.98	1.8	7.8	85	4.1
0.0870	0.221	2.21	2.98	1.8	7.8	85	4.1
0.0910	0.231	2.31	2.98	1.8	7.8	85	4.0
0.0950	0.241	2.41	2.99	2.1	9.3	101	4.8
0.0991	0.252	2.51	2.99	2.1	9.1	99	4.7
0.1031	0.262	2.61	2.99	2.1	9.5	103	4.9
0.1073	0.273	2.72	2.99	2.4	11	117	5.6
0.1113	0.283	2.82	3.00	2.4	11	114	5.5
0.1155	0.293	2.93	3.00	2.6	11	123	5.9
0.1197	0.304	3.03	3.00	2.6	11	123	5.9
0.1238	0.314	3.14	3.01	2.7	12	129	6.2
0.1279	0.325	3.24	3.01	2.9	13	136	6.5
0.1319	0.335	3.34	3.01	2.8	13	135	6.5
0.1360	0.345	3.45	3.02	2.9	13	136	6.5
0.1402	0.356	3.55	3.02	3.1	14	147	7.0
0.1443	0.367	3.66	3.02	3.1	14	145	7.0
0.1484	0.377	3.76	3.03	3.1	14	146	7.0
0.1525	0.387	3.87	3.03	3.3	15	156	7.5
0.1568	0.398	3.97	3.03	3.2	14	154	7.4
0.1615	0.410	4.09	3.04	3.3	15	155	7.4
0.1655	0.420	4.20	3.04	3.3	15	154	7.4
0.1697	0.431	4.30	3.04	3.5	16	166	7.9
0.1742	0.442	4.42	3.05	3.7	17	176	8.4

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-3
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/23/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.1782	0.453	4.52	3.05	3.7	16	174	8.3
0.1822	0.463	4.62	3.05	3.7	17	175	8.4
0.1866	0.474	4.73	3.06	3.7	17	175	8.4
0.1906	0.484	4.83	3.06	4.0	18	190	9.1
0.1947	0.495	4.94	3.06	4.0	18	188	9.0
0.1989	0.505	5.04	3.07	4.0	18	185	8.9
0.2030	0.516	5.15	3.07	4.3	19	200	10
0.2072	0.526	5.25	3.07	4.2	19	196	9
0.2112	0.536	5.35	3.08	4.2	19	196	9
0.2156	0.548	5.47	3.08	4.4	20	206	10
0.2200	0.559	5.58	3.09	4.6	20	213	10
0.2245	0.570	5.69	3.09	4.8	21	224	11
0.2287	0.581	5.80	3.09	4.8	21	225	11
0.2328	0.591	5.90	3.10	4.8	21	225	11
0.2368	0.601	6.00	3.10	5.1	23	235	11
0.2412	0.613	6.11	3.10	5.1	23	239	11
0.2452	0.623	6.22	3.11	5.0	22	234	11
0.2494	0.633	6.32	3.11	5.4	24	249	12
0.2535	0.644	6.43	3.11	5.3	24	246	12
0.2576	0.654	6.53	3.12	5.3	24	245	12
0.2618	0.665	6.64	3.12	5.4	24	247	12
0.2661	0.676	6.75	3.12	5.5	24	253	12
0.2701	0.686	6.85	3.13	5.4	24	250	12
0.2744	0.697	6.96	3.13	5.5	25	253	12
0.2788	0.708	7.07	3.13	5.7	25	262	13
0.2828	0.718	7.17	3.14	5.7	25	261	13
0.2877	0.731	7.29	3.14	6.0	26	273	13
0.2919	0.741	7.40	3.15	5.8	26	267	13
0.2960	0.752	7.50	3.15	6.0	27	272	13
0.3002	0.763	7.61	3.15	6.3	28	285	14
0.3043	0.773	7.71	3.16	6.2	28	282	14
0.3084	0.783	7.82	3.16	6.3	28	288	14
0.3125	0.794	7.92	3.16	6.5	29	295	14
0.3165	0.804	8.02	3.17	6.6	29	300	14
0.3206	0.814	8.13	3.17	6.6	29	299	14
0.3246	0.824	8.23	3.17	6.5	29	294	14
0.3289	0.835	8.34	3.18	6.5	29	294	14
0.3331	0.846	8.44	3.18	6.8	30	308	15
0.3371	0.856	8.54	3.19	6.8	30	306	15
0.3413	0.867	8.65	3.19	6.8	30	305	15
0.3454	0.877	8.76	3.19	6.9	31	312	15
0.3494	0.887	8.86	3.20	7.0	31	314	15
0.3535	0.898	8.96	3.20	7.0	31	313	15

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-3
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/23/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.3578	0.909	9.07	3.20	7.0	31	313	15
0.3620	0.919	9.18	3.21	7.1	32	320	15
0.3672	0.933	9.31	3.21	7.2	32	322	15
0.3713	0.943	9.41	3.22	7.2	32	321	15
0.3758	0.955	9.53	3.22	7.4	33	329	16
0.3802	0.966	9.64	3.22	7.4	33	330	16
0.3842	0.976	9.74	3.23	7.4	33	332	16
0.3883	0.986	9.84	3.23	7.4	33	328	16
0.3925	0.997	9.95	3.24	7.7	34	340	16
0.3966	1.007	10.05	3.24	7.7	34	342	16
0.4006	1.018	10.15	3.24	7.6	34	338	16
0.4050	1.029	10.27	3.25	7.9	35	349	17
0.4091	1.039	10.37	3.25	7.9	35	350	17
0.4133	1.050	10.48	3.25	7.9	35	348	17
0.4175	1.060	10.58	3.26	7.9	35	349	17
0.4216	1.071	10.69	3.26	8.1	36	357	17
0.4256	1.081	10.79	3.27	8.2	36	360	17
0.4298	1.092	10.89	3.27	8.1	36	355	17
0.4339	1.102	11.00	3.27	8.4	37	369	18
0.4381	1.113	11.11	3.28	8.4	37	368	18
0.4422	1.123	11.21	3.28	8.4	37	370	18
0.4464	1.134	11.32	3.29	8.5	38	371	18
0.4504	1.144	11.42	3.29	8.7	39	380	18
0.4546	1.155	11.52	3.29	8.7	39	380	18
0.4588	1.165	11.63	3.30	8.7	38	378	18
0.4630	1.176	11.74	3.30	8.6	38	376	18
0.4670	1.186	11.84	3.30	8.9	40	387	19
0.4712	1.197	11.94	3.31	9.0	40	390	19
0.4756	1.208	12.06	3.31	9.0	40	390	19
0.4797	1.218	12.16	3.32	8.9	40	388	19
0.4840	1.229	12.27	3.32	9.1	41	396	19
0.4888	1.242	12.39	3.33	9.1	40	394	19
0.4933	1.253	12.50	3.33	9.2	41	396	19
0.4973	1.263	12.61	3.33	9.4	42	406	19
0.5015	1.274	12.71	3.34	9.4	42	406	19
0.5057	1.284	12.82	3.34	9.4	42	404	19
0.5099	1.295	12.93	3.35	9.4	42	402	19
0.5140	1.306	13.03	3.35	9.5	42	410	20

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/24/19		
TECHNICIAN	CAL		

Test Parameters

Strain Rate (in/min): 0.037
Strain Rate (cm/min): 0.09398

Raw Data Files: WJE_UCS_B-6_9_.txt

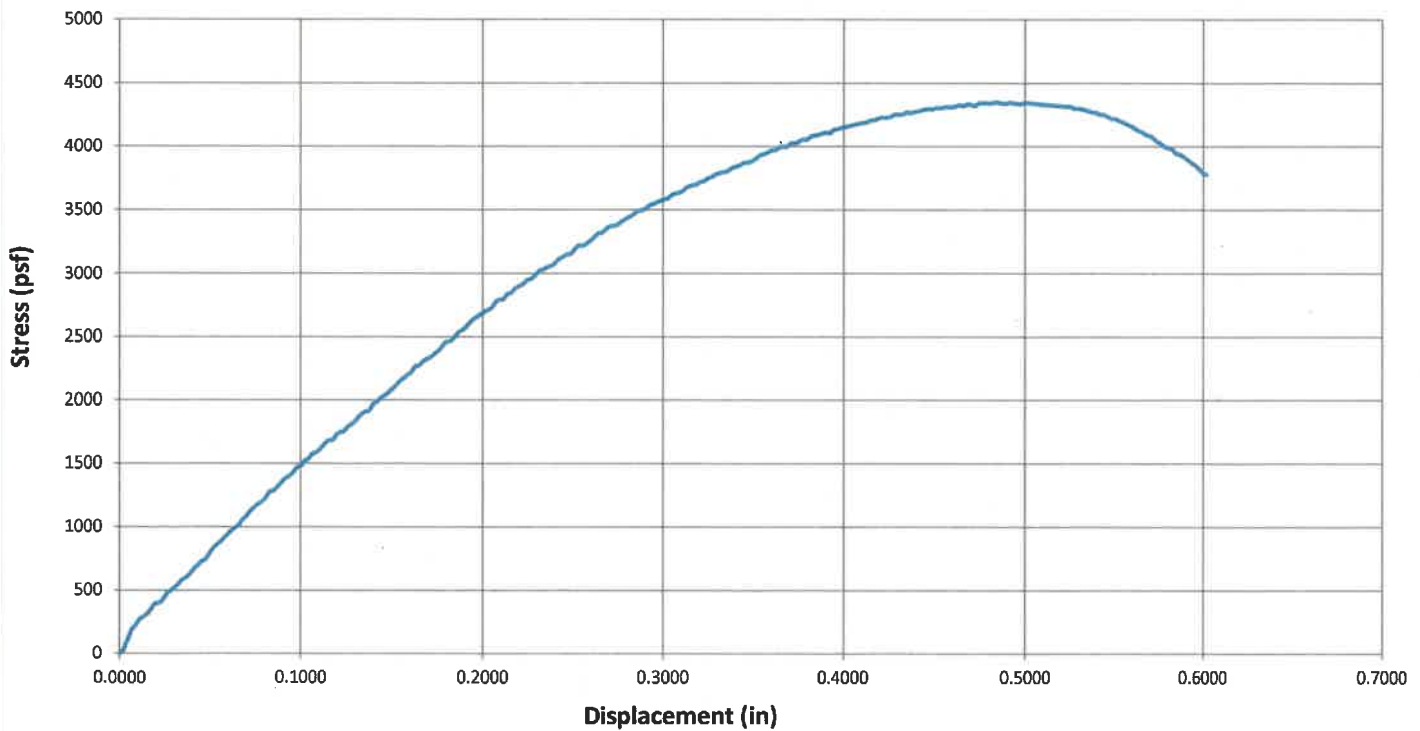
Moisture & Density Data

Mass of Wet Soil and Pan (g):	404.34	Initial Wet Density (pcf):	130.0
Mass of Dry Soil and Pan (g):	335.66	Initial Dry Density (pcf):	107.5
Mass of Pan (g):	6.74	Initial Wet Density (kg/m³):	2082
Mass of Wet Soil (g):	397.6	Initial Dry Density (kg/m³):	1722
Initial Diameter (in):	1.92	Initial Moisture (%):	20.9
Initial Height (in):	4.02		

Test Results

Peak Stress (psf):	4346	Axial Strain at Peak Stress(%):	12.0
Peak Stress (kPa):	208	Height to Diameter Ratio:	2.1:1

Displacement vs. Stress



NOTES:

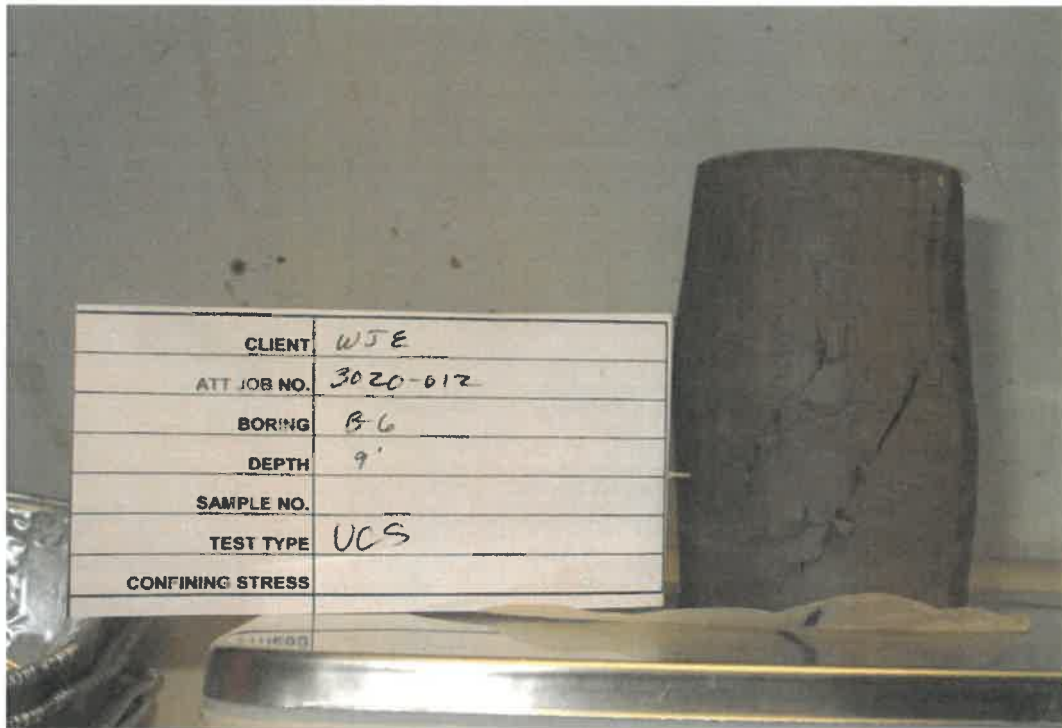
Data entry by:	CAL	Date:	9/25/2019
Checked by:	SPH	Date:	9-25-19
File name:	3020012_UCS ASTM D2166_1.xlsm		



Image Attachment

ADVANCED TERRA TESTING

CLIENT Wiss Janney Elstner
JOB NO. 3020-012
PROJECT Persigo WWTP
PROJECT NO. --
LOCATION Grand Junction CO



NOTES

File name: 3020012_Image_19_09_25_06_54_26

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	—
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/24/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.0000	0.000	0.00	2.90	0	0	0	0
0.0021	0.005	0.05	2.90	0.6	3	28	1
0.0042	0.011	0.10	2.90	2.1	9	103	5
0.0066	0.017	0.16	2.90	3.8	17	188	9
0.0087	0.022	0.22	2.90	4.5	20	221	11
0.0107	0.027	0.27	2.91	5.4	24	265	13
0.0130	0.033	0.32	2.91	5.9	26	290	14
0.0150	0.038	0.37	2.91	6.3	28	311	15
0.0173	0.044	0.43	2.91	7.1	31	350	17
0.0194	0.049	0.48	2.91	8.0	35	393	19
0.0215	0.055	0.53	2.91	8.1	36	399	19
0.0237	0.060	0.59	2.92	8.6	38	423	20
0.0257	0.065	0.64	2.92	9.5	42	468	22
0.0281	0.071	0.70	2.92	10	45	499	24
0.0304	0.077	0.76	2.92	11	47	525	25
0.0324	0.082	0.81	2.92	11	50	550	26
0.0344	0.087	0.86	2.92	12	53	582	28
0.0365	0.093	0.91	2.92	12	54	599	29
0.0389	0.099	0.97	2.93	13	57	632	30
0.0410	0.104	1.02	2.93	14	61	670	32
0.0430	0.109	1.07	2.93	14	63	695	33
0.0452	0.115	1.12	2.93	15	66	728	35
0.0473	0.120	1.18	2.93	15	67	742	36
0.0494	0.125	1.23	2.93	16	71	786	38
0.0514	0.131	1.28	2.94	17	75	827	40
0.0535	0.136	1.33	2.94	18	78	858	41
0.0556	0.141	1.38	2.94	18	80	881	42
0.0576	0.146	1.43	2.94	19	83	912	44
0.0597	0.152	1.48	2.94	19	86	942	45
0.0619	0.157	1.54	2.94	20	88	973	47
0.0639	0.162	1.59	2.95	20	91	995	48
0.0659	0.167	1.64	2.95	21	93	1018	49
0.0680	0.173	1.69	2.95	22	96	1059	51
0.0701	0.178	1.74	2.95	22	99	1085	52
0.0722	0.183	1.80	2.95	23	103	1127	54
0.0743	0.189	1.85	2.95	24	105	1155	55
0.0764	0.194	1.90	2.95	24	108	1180	56
0.0788	0.200	1.96	2.96	25	110	1201	58
0.0810	0.206	2.01	2.96	25	113	1234	59
0.0830	0.211	2.06	2.96	26	117	1278	61
0.0851	0.216	2.12	2.96	26	118	1286	62
0.0872	0.221	2.17	2.96	27	120	1315	63
0.0894	0.227	2.22	2.96	28	123	1349	65

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/24/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.0914	0.232	2.27	2.97	28	127	1381	66
0.0937	0.238	2.33	2.97	29	128	1400	67
0.0959	0.244	2.38	2.97	29	131	1430	68
0.0982	0.249	2.44	2.97	30	135	1469	70
0.1003	0.255	2.49	2.97	31	136	1482	71
0.1024	0.260	2.55	2.97	31	140	1522	73
0.1044	0.265	2.60	2.98	32	141	1536	74
0.1064	0.270	2.65	2.98	33	145	1573	75
0.1085	0.276	2.70	2.98	33	146	1586	76
0.1107	0.281	2.75	2.98	33	148	1610	77
0.1129	0.287	2.81	2.98	34	152	1647	79
0.1150	0.292	2.86	2.98	35	155	1677	80
0.1178	0.299	2.93	2.99	35	156	1688	81
0.1198	0.304	2.98	2.99	36	159	1726	83
0.1219	0.310	3.03	2.99	36	161	1746	84
0.1239	0.315	3.08	2.99	36	162	1754	84
0.1261	0.320	3.14	2.99	37	166	1792	86
0.1285	0.326	3.20	2.99	38	168	1813	87
0.1311	0.333	3.26	3.00	39	171	1851	89
0.1333	0.339	3.32	3.00	39	175	1886	90
0.1355	0.344	3.37	3.00	40	177	1908	91
0.1378	0.350	3.43	3.00	40	178	1918	92
0.1400	0.356	3.48	3.00	41	183	1969	94
0.1422	0.361	3.54	3.00	41	184	1986	95
0.1442	0.366	3.59	3.01	42	187	2019	97
0.1464	0.372	3.64	3.01	43	189	2037	98
0.1484	0.377	3.69	3.01	43	192	2060	99
0.1504	0.382	3.74	3.01	44	194	2089	100
0.1525	0.387	3.79	3.01	44	197	2119	101
0.1547	0.393	3.85	3.01	45	200	2152	103
0.1567	0.398	3.90	3.02	46	202	2173	104
0.1589	0.404	3.95	3.02	46	205	2199	105
0.1611	0.409	4.01	3.02	47	207	2223	106
0.1631	0.414	4.06	3.02	48	212	2268	109
0.1652	0.420	4.11	3.02	48	212	2272	109
0.1672	0.425	4.16	3.02	48	215	2302	110
0.1693	0.430	4.21	3.03	49	217	2324	111
0.1713	0.435	4.26	3.03	49	219	2338	112
0.1734	0.440	4.31	3.03	50	221	2360	113
0.1755	0.446	4.36	3.03	50	223	2386	114
0.1776	0.451	4.42	3.03	51	226	2418	116
0.1798	0.457	4.47	3.03	52	230	2454	118
0.1824	0.463	4.54	3.04	52	231	2465	118

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/24/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.1844	0.468	4.59	3.04	53	234	2496	120
0.1865	0.474	4.64	3.04	53	238	2531	121
0.1886	0.479	4.69	3.04	54	239	2548	122
0.1907	0.484	4.74	3.04	54	242	2571	123
0.1927	0.489	4.79	3.04	55	245	2605	125
0.1947	0.495	4.84	3.05	56	248	2633	126
0.1968	0.500	4.89	3.05	56	250	2653	127
0.1988	0.505	4.94	3.05	57	252	2674	128
0.2009	0.510	5.00	3.05	57	254	2694	129
0.2032	0.516	5.05	3.05	57	256	2712	130
0.2053	0.521	5.11	3.05	58	258	2733	131
0.2074	0.527	5.16	3.06	59	262	2778	133
0.2094	0.532	5.21	3.06	59	264	2790	134
0.2116	0.537	5.26	3.06	59	264	2797	134
0.2137	0.543	5.31	3.06	60	268	2836	136
0.2157	0.548	5.36	3.06	61	269	2845	136
0.2177	0.553	5.41	3.06	61	272	2876	138
0.2199	0.559	5.47	3.07	62	274	2896	139
0.2225	0.565	5.53	3.07	62	276	2916	140
0.2245	0.570	5.58	3.07	63	279	2945	141
0.2266	0.576	5.64	3.07	63	280	2954	141
0.2291	0.582	5.70	3.07	64	283	2982	143
0.2312	0.587	5.75	3.08	64	287	3016	144
0.2334	0.593	5.80	3.08	65	288	3031	145
0.2356	0.598	5.86	3.08	65	290	3045	146
0.2377	0.604	5.91	3.08	65	291	3059	146
0.2398	0.609	5.96	3.08	66	293	3078	147
0.2418	0.614	6.01	3.08	67	296	3110	149
0.2439	0.620	6.07	3.09	67	298	3125	150
0.2462	0.625	6.12	3.09	67	300	3146	151
0.2487	0.632	6.19	3.09	68	301	3154	151
0.2510	0.638	6.24	3.09	68	305	3190	153
0.2530	0.643	6.29	3.09	69	308	3219	154
0.2553	0.648	6.35	3.09	69	307	3216	154
0.2575	0.654	6.40	3.10	70	309	3233	155
0.2595	0.659	6.45	3.10	70	312	3257	156
0.2616	0.664	6.51	3.10	71	314	3283	157
0.2637	0.670	6.56	3.10	71	317	3312	159
0.2658	0.675	6.61	3.10	72	318	3318	159
0.2679	0.680	6.66	3.11	72	320	3341	160
0.2700	0.686	6.71	3.11	73	323	3367	161
0.2723	0.692	6.77	3.11	73	324	3372	161
0.2747	0.698	6.83	3.11	73	325	3381	162

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/24/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.2769	0.703	6.89	3.11	74	328	3408	163
0.2789	0.708	6.94	3.11	74	329	3422	164
0.2810	0.714	6.99	3.12	74	331	3440	165
0.2832	0.719	7.04	3.12	75	333	3460	166
0.2854	0.725	7.10	3.12	75	336	3484	167
0.2875	0.730	7.15	3.12	76	337	3494	167
0.2899	0.736	7.21	3.12	76	338	3506	168
0.2919	0.741	7.26	3.13	77	341	3528	169
0.2941	0.747	7.31	3.13	77	342	3545	170
0.2964	0.753	7.37	3.13	77	344	3558	170
0.2985	0.758	7.42	3.13	78	345	3570	171
0.3005	0.763	7.47	3.13	78	347	3581	171
0.3028	0.769	7.53	3.13	78	348	3592	172
0.3048	0.774	7.58	3.14	79	350	3616	173
0.3068	0.779	7.63	3.14	79	352	3627	174
0.3089	0.785	7.68	3.14	79	353	3635	174
0.3110	0.790	7.73	3.14	80	354	3649	175
0.3132	0.796	7.79	3.14	80	357	3678	176
0.3162	0.803	7.86	3.15	81	359	3693	177
0.3184	0.809	7.92	3.15	81	360	3698	177
0.3205	0.814	7.97	3.15	81	362	3719	178
0.3226	0.819	8.02	3.15	82	363	3724	178
0.3247	0.825	8.08	3.15	82	365	3746	179
0.3268	0.830	8.13	3.15	82	366	3757	180
0.3288	0.835	8.18	3.16	83	368	3778	181
0.3308	0.840	8.23	3.16	83	370	3788	181
0.3331	0.846	8.28	3.16	83	370	3795	182
0.3353	0.852	8.34	3.16	83	371	3802	182
0.3374	0.857	8.39	3.16	84	373	3821	183
0.3395	0.862	8.44	3.17	84	375	3837	184
0.3416	0.868	8.50	3.17	85	376	3844	184
0.3438	0.873	8.55	3.17	85	378	3862	185
0.3458	0.878	8.60	3.17	85	379	3870	185
0.3479	0.884	8.65	3.17	85	380	3875	186
0.3499	0.889	8.70	3.17	86	381	3888	186
0.3521	0.894	8.76	3.18	86	384	3911	187
0.3541	0.899	8.81	3.18	87	386	3933	188
0.3562	0.905	8.86	3.18	87	387	3939	189
0.3582	0.910	8.91	3.18	87	389	3954	189
0.3604	0.915	8.96	3.18	88	390	3969	190
0.3625	0.921	9.02	3.19	88	391	3973	190
0.3647	0.926	9.07	3.19	88	393	3996	191
0.3668	0.932	9.12	3.19	89	394	3997	191

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/24/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.3689	0.937	9.17	3.19	89	395	4003	192
0.3710	0.942	9.23	3.19	89	397	4026	193
0.3730	0.947	9.28	3.19	89	397	4022	193
0.3753	0.953	9.33	3.20	90	399	4040	193
0.3774	0.959	9.39	3.20	90	401	4056	194
0.3794	0.964	9.44	3.20	90	401	4053	194
0.3816	0.969	9.49	3.20	91	403	4078	195
0.3837	0.975	9.54	3.20	91	404	4086	196
0.3858	0.980	9.59	3.21	91	405	4092	196
0.3879	0.985	9.65	3.21	91	407	4103	196
0.3900	0.991	9.70	3.21	92	407	4110	197
0.3921	0.996	9.75	3.21	92	407	4105	197
0.3943	1.002	9.81	3.21	92	410	4133	198
0.3966	1.007	9.86	3.22	92	411	4137	198
0.3987	1.013	9.92	3.22	93	412	4148	199
0.4013	1.019	9.98	3.22	93	413	4156	199
0.4035	1.025	10.03	3.22	93	414	4163	199
0.4059	1.031	10.09	3.22	93	416	4173	200
0.4080	1.036	10.15	3.23	94	416	4178	200
0.4102	1.042	10.20	3.23	94	417	4185	200
0.4124	1.047	10.26	3.23	94	418	4191	201
0.4144	1.053	10.31	3.23	94	420	4204	201
0.4166	1.058	10.36	3.23	94	420	4208	201
0.4191	1.065	10.42	3.24	95	422	4220	202
0.4211	1.070	10.47	3.24	95	423	4229	202
0.4233	1.075	10.53	3.24	95	423	4226	202
0.4260	1.082	10.59	3.24	95	424	4235	203
0.4281	1.087	10.65	3.24	96	426	4253	204
0.4305	1.093	10.71	3.25	96	426	4251	204
0.4326	1.099	10.76	3.25	96	427	4255	204
0.4347	1.104	10.81	3.25	96	429	4270	204
0.4368	1.109	10.86	3.25	96	428	4264	204
0.4389	1.115	10.92	3.25	97	429	4272	205
0.4414	1.121	10.98	3.26	97	430	4281	205
0.4440	1.128	11.04	3.26	97	432	4291	205
0.4468	1.135	11.11	3.26	97	433	4296	206
0.4488	1.140	11.16	3.26	97	433	4294	206
0.4509	1.145	11.21	3.26	98	434	4305	206
0.4529	1.150	11.26	3.27	98	434	4301	206
0.4550	1.156	11.32	3.27	98	435	4308	206
0.4571	1.161	11.37	3.27	98	435	4311	206
0.4592	1.166	11.42	3.27	98	436	4309	206
0.4616	1.172	11.48	3.27	98	437	4316	207

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/24/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.4637	1.178	11.53	3.28	98	438	4326	207
0.4661	1.184	11.59	3.28	98	437	4320	207
0.4681	1.189	11.64	3.28	99	439	4333	207
0.4702	1.194	11.69	3.28	99	439	4329	207
0.4725	1.200	11.75	3.28	99	438	4321	207
0.4747	1.206	11.81	3.29	99	441	4341	208
0.4769	1.211	11.86	3.29	99	441	4343	208
0.4791	1.217	11.91	3.29	99	441	4341	208
0.4811	1.222	11.96	3.29	99	441	4340	208
0.4833	1.228	12.02	3.29	99	442	4346	208
0.4854	1.233	12.07	3.30	99	442	4345	208
0.4874	1.238	12.12	3.30	99	442	4340	208
0.4894	1.243	12.17	3.30	99	442	4337	208
0.4914	1.248	12.22	3.30	100	443	4344	208
0.4935	1.253	12.27	3.30	100	443	4343	208
0.4957	1.259	12.33	3.31	100	443	4338	208
0.4977	1.264	12.38	3.31	100	443	4335	208
0.5002	1.271	12.44	3.31	100	444	4345	208
0.5023	1.276	12.49	3.31	100	444	4341	208
0.5043	1.281	12.54	3.31	100	444	4339	208
0.5063	1.286	12.59	3.32	100	444	4337	208
0.5084	1.291	12.64	3.32	100	444	4332	207
0.5106	1.297	12.70	3.32	100	444	4331	207
0.5130	1.303	12.76	3.32	100	444	4328	207
0.5150	1.308	12.81	3.32	100	444	4325	207
0.5171	1.313	12.86	3.33	100	444	4323	207
0.5193	1.319	12.91	3.33	100	444	4321	207
0.5214	1.324	12.97	3.33	100	444	4318	207
0.5234	1.329	13.02	3.33	100	444	4314	207
0.5256	1.335	13.07	3.33	100	444	4312	206
0.5276	1.340	13.12	3.34	100	443	4299	206
0.5297	1.345	13.17	3.34	100	443	4299	206
0.5318	1.351	13.23	3.34	100	443	4295	206
0.5339	1.356	13.28	3.34	99	443	4287	205
0.5360	1.361	13.33	3.34	99	442	4279	205
0.5380	1.367	13.38	3.35	99	441	4269	204
0.5401	1.372	13.43	3.35	99	441	4264	204
0.5421	1.377	13.48	3.35	99	440	4252	204
0.5442	1.382	13.53	3.35	99	440	4250	203
0.5463	1.388	13.59	3.35	99	439	4234	203
0.5483	1.393	13.64	3.36	98	437	4219	202
0.5504	1.398	13.69	3.36	98	438	4218	202
0.5526	1.404	13.74	3.36	98	436	4204	201

**Unconfined Compressive Strength
ASTM D2166**

CLIENT	Wiss Janney Elstner	BORING NO.	B-6
JOB NO.	3020-012	DEPTH	9'
PROJECT	Persigo WWTP	SAMPLE NO.	--
PROJECT NO.	--	DATE SAMPLED	--
LOCATION	Grand Junction CO	DESCRIPTION	liner
DATE TESTED	09/24/19		
TECHNICIAN	CAL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in ²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.5549	1.409	13.80	3.36	98	435	4191	201
0.5570	1.415	13.85	3.36	98	434	4176	200
0.5591	1.420	13.90	3.37	97	433	4161	199
0.5611	1.425	13.95	3.37	97	431	4146	199
0.5632	1.431	14.01	3.37	97	430	4126	198
0.5652	1.436	14.06	3.37	96	429	4116	197
0.5672	1.441	14.11	3.37	96	427	4096	196
0.5693	1.446	14.16	3.38	96	426	4086	196
0.5713	1.451	14.21	3.38	96	425	4072	195
0.5738	1.457	14.27	3.38	95	422	4039	193
0.5759	1.463	14.32	3.38	95	421	4024	193
0.5780	1.468	14.37	3.38	94	418	3999	191
0.5802	1.474	14.43	3.39	94	417	3988	191
0.5824	1.479	14.48	3.39	94	416	3977	190
0.5844	1.484	14.53	3.39	93	413	3946	189
0.5865	1.490	14.59	3.39	93	413	3940	189
0.5889	1.496	14.65	3.40	92	411	3917	188
0.5910	1.501	14.70	3.40	92	409	3895	187
0.5932	1.507	14.75	3.40	91	407	3872	185
0.5956	1.513	14.81	3.40	91	405	3850	184
0.5977	1.518	14.86	3.40	90	402	3822	183
0.5999	1.524	14.92	3.41	90	399	3791	181
0.6020	1.529	14.97	3.41	89	398	3778	181