GEOTECHNICAL REPORT

Turlock Water Distribution System Project

Turlock, California

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May 2021

Prepared for:

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May 25, 2021
CAInc File No. 20-642.1

Mr. Darren Baune, PE
Carollo Engineers, Inc.
2795 Mitchell Drive
Walnut Creek, CA 94598

Subject: **GEOTECHNICAL REPORT**
Turlock Surface Water Distribution System Improvements Project
Turlock, California

Dear Mr. Baune,

Attached is our Geotechnical Report for the Turlock Surface Water Distribution System Improvements Project in Turlock, California. We prepared this report to provide geotechnical data, conclusions, and recommendations for advancing the project to final design. Crawford & Associates, Inc. (CAInc) completed this report in accordance with our agreements dated August 19, 2020 and March 8, 2021.

Please call if you have questions or require additional information.

Sincerely,

Crawford & Associates, Inc.,

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Project Engineer

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Principal Geotechnical Engineer

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1 INTRODUCTION

1.1 PURPOSE

Crawford & Associates, Inc. (CAInc) prepared this Geotechnical Report for the Turlock Water Distribution System Project in Turlock, California. This report is to provide geotechnical and geologic data and provide conclusions and recommendations for design aspects of the project.

1.2 SCOPE OF SERVICES

To prepare this report, CAInc:

- Reviewed geologic, soils, and seismic maps pertaining to the site;
- Discussed the project with Carollo engineers Darren Baune, P.E., and Jon Marshall, P.E.;
- Reviewed available historical subsurface data;
- Drilled, logged, and sampled 11 exploratory borings along the proposed pipeline alignment in August and November, 2020;
- Drilled, logged, and sampled 3 exploratory borings and 5 hand auger borings at and near the currently planned tank and pump station locations in April, 2021, and to a maximum depth of about 91.5 feet below ground surface (bgs);
- Drilled, logged, and sampled 3 exploratory borings at the previously planned tank and pump station locations in November, 2020, and to a maximum depth of about 86.5 feet below ground surface (bgs);
- Preformed two percolation tests within the currently planned drainage basin location in April, 2021;
- Performed three percolation tests within the previously planned drainage basin location in November, 2020;
- Performed laboratory testing on soil samples recovered from the borings;
- Reviewed the “95% City of Turlock Surface Water Distribution System Improvements Project Plans,” prepared by Carollo dated April 2021; and
- Developed conclusions and recommendations based on the data and test results.

2 PROJECT DESCRIPTION

The City of Turlock plans to implement infrastructure to supplement the Stanislaus Regional Water Authority (SRWA) Surface Water Pipeline Project. We understand that the project will collect and store surface water for distribution to residents, institutions, industries and businesses. The project vicinity and approximate alignment is shown on Figure 1 in Appendix I.

Key project components include:

- 2.5 MG concrete storage tank (approximately 129 feet in diameter and 30 ft tall), supported on a perimeter ring foundation and concrete slab-on-grade;
- Pump station supported on spread foundations and concrete slab-on-grade;
- 10 ft deep detention basin with 3:1 (horizontal to vertical) side slopes;

- Valve stations will be installed at the terminus of three of the pipeline alignments (PRV Chirstofferson, PRV Monte Vista, and PRV Quincy) referred to as PRV 1, PRV 2 and PRV 3; respectively. The PRV stations are designed to be approximately 9 feet bgs; and
- About 11,500 lineal feet of open-cut trench along N Quincy Road, E Zeerling Road, E Monte Vista Ave, and along the private access road leading to the tank site. The pipeline is planned to be constructed with a minimum of 4 to 6 feet of cover with pipe diameters ranging from 16 to 54 inches in diameter. Figure 2A in Appendix I shows the pipeline alignment with stationing.

The concrete storage tank, pump station and drainage basin were originally located about 800 feet east from its current identified location. Therefore, CAInc performed additional explorations and updated our analyses and recommendations to address the new concrete storage tank, pump station and drainage basin locations.

3 SITE GEOLOGY

Published geologic mapping[1] shows surface materials at the project site as Quaternary aged Modesto Formation that generally consist of alluvial materials with interbedded layers of silts and sands. The site is located in the southern portion of the Great Valley geomorphic province, a structural trough approximately 400 miles long and 50 miles wide in central California bordered by the Sierra Nevada mountains on the east and Coast Ranges on the west. This southern part of the province is known as the San Joaquin Valley, as it is drained by the San Joaquin River. The project is located near the eastern edge of the valley and sits approximately 20 miles east of The San Joaquin Fault. We present a Geologic Map as Figure 3 in Appendix I.

4 FIELD EXPLORATION AND TESTING PROGRAM

CAInc performed 17 explorations in August and November, 2020 and performed 10 explorations in April, 2021. Our explorations were supplemented by one 2018 exploration completed for the Stanislaus Regional Water Authority (SRWA) Water Treatment project. Table 1 provides a subsurface exploration summary.

[1] D.L. Wagner, E.J. Bortugno, and R.D. McJunkin, Geologic Map of the San Francisco - San Jose Quadrangle California Geological Survey, Regional Geologic Map No. 5A, 1:250,000 scale, 1991

Table 1: Subsurface Exploration Summary

Boring Number	Completion Date	Drill Rig Type/ Drilling Equipment Type	Hammer Type	Hammer Efficiency (%)	Approx. Ground Surface Elevation (ft)	Boring Depth (ft)
CAInc Exploratory Borings (2020)						
R-20-001	11/10/2020	CME 75 (Truck Mounted)	Automatic	89.5[1]	115.1	86.5
R-20-002	11/11/2020				115.1	51.5
R-20-003	11/09/2020				115.1	86.5
A-20-004	11/10/2020				116.2	21.5
A-20-005	11/11/2020				115.3	23.0
A-20-006	08/25/2020	CME 75 (Track Mounted)		89.1[2]	114.3	21.5
R-20-008	08/26/2020				112.4	31.5
A-20-009	08/24/2020				113.6	21.5
A-20-010	08/26/2020				116.1	21.5
A-20-011	08/26/2020				114.1	21.5
A-20-012	08/25/2020				113.3	31.0
A-20-013	08/24/2020				111.8	21.5
A-20-014	08/24/2020				110.9	31.5
A-20-015	08/25/2020				114.6	26.5
P-20-001	11/10/2020	CME 75 (Truck Mounted)		89.5[1]	115.1	13.5
P-20-002	11/10/2020				115.2	13.5
P-20-003	11/10/2020				115.0	13.5
CAInc Exploratory Borings (2021)						
R-21-001	04/26/2021	CME 55 (Truck Mounted)	Automatic	89.3[3]	114.8	86.5
R-21-002	04/28/2021				114.7	91.5
R-21-003	04/27/2021				114.5	51.5
P-21-001	04/27/2021				114.6	14.0
P-21-002	04/27/2021				114.5	13.5
HA-21-001	04/27/2021	Hand Auger	N/A	N/A	114.8	5.0
HA-21-002	04/27/2021				114.7	5.0
HA-21-003	04/27/2021				114.5	5.0
HA-21-004	04/29/2021				114.6	5.0
HA-21-005	04/29/2021				114.5	5.0
Stanislaus Regional Water Authority (SRWA) Borings (2018)						
B23	02/02/2018	CME 55 (Truck Mounted)	Automatic	77.3[4]	119.0	18.0

1. A hammer energy calibration test was not performed specifically for this project/site; however, a previous hammer energy testing result (08/03/2020) provided by GS found the hammer to have an energy efficiency of 89.5%.
2. A hammer energy calibration test was not performed specifically for this project/site; however, a previous hammer energy testing result (12/18/2020) provided by GeoEx found the hammer to have an energy efficiency of 89.1%.
3. A hammer energy calibration test was not performed specifically for this project/site; however, a previous

hammer energy testing result (12/01/2019) provided by GeoEx found the hammer to have an energy efficiency of 89.3%.

4. A hammer energy calibration test was not performed specifically for this project/site; however, a previous hammer energy testing result (10/16/2015) provided by GeoEx found the hammer to have an energy efficiency of 77.3%.

1.1 EXPLORATORY BORINGS (2018) – SRWA

CAInc previously completed a boring within this project's vicinity as part of the SRWA Water Treatment project. Boring B23 was drilled by GeoEx Subsurface Exploration (GeoEx) in 2018 using 4-inch solid stem auger drilling methods. The 2018 boring extended to the maximum depth of 16.0 ft bgs (elev. ~103.0±ft). Details and locations of the exploratory boring are shown on Figure 2A in Appendix I and LOTB attached in Appendix II.

1.2 EXPLORATORY BORINGS (2020 AND 2021)

CAInc retained GeoEx in 2020 to drill and sample a total of nine borings (A-19-006, and R-20-008 through A-20-015) to a maximum depth of 31.5±ft bgs. GeoEx used a CME 75 track mounted drill rig to complete the borings with 4.5-inch solid-stem auger and 4-inch mud-rotary drilling equipment utilizing a side discharge bit. See Figures 2A and 2B in Appendix I for boring locations.

CAInc retained Gulf Shores (GS) in 2020 to drill and sample a total of five borings (A-20-001 through A-20-005) to a maximum depth of 86.5±ft bgs. The test borings were drilled between November 9 and 11, 2020. GS used a CME 75 truck mounted drill rig to complete the borings with 4.5-inch solid-stem auger and 4-inch mud-rotary drilling equipment utilizing a side discharge bit. See Figures 2A and 2B in Appendix I for boring locations.

CAInc retained GeoEx in 2021 to drill and sample a total of three borings (R-21-001, through R-21-003) to a maximum depth of 91.5±ft bgs. GeoEx used a CME 75 truck mounted drill rig to complete the borings with 4.5-inch solid-stem auger and 4-inch mud-rotary drilling equipment utilizing a side discharge bit. Additionally, CAInc performed five hand augers adjacent to each of our 2021 boring locations to a maximum depth of 5±ft bgs. See Figures 2A and 2B in Appendix I for boring locations.

Soil samples were recovered by means of a 2.0-inch O.D. "Standard Penetration" (SPT) split-spoon sampler with liners and a 3.0-inch O.D. "Modified California" split-spoon sampler with liners. Both samplers were advanced with standard 350 ft-lb striking force using an auto-hammer. Sampler penetration resistance was recorded to provide a field measure of relative densities and can be correlated to soils strength and bearing characteristics. Consistency of cohesive soils were obtained in the field by means of pocket penetrometer and torvane testing. The field-recorded (uncorrected) blow counts are shown on the boring logs attached in Appendix II.

CAInc's project engineers Kennedy Hauder, Steve Carter, and Marah Caculba logged the test borings consistent with the Unified Soil Classification System (USCS) and the Caltrans 2010 Logging Manual. Selected portions of recovered soil drive samples were retained in sealed containers for laboratory testing and reference. Bulk soil samples were retained in sealed bags for laboratory testing and reference. Groundwater observations were recorded during drilling operations when encountered. At completion, the test borings were backfilled with cement grout at the completion of the field study and capped with cement and dyed black in asphalt areas.

The boring locations were measured in the field with respect to existing site features. The boring elevations are referenced to project datum provided by Carollo. The location of test borings are shown on Figures 2A and 2B in Appendix I. The details of the test borings are shown on the boring logs in Appendix II.

1.3 PERCOLATION TEST BORINGS

In 2020, GS performed three shallow borings to perform percolation testing (P-20-001 through P-20-003). GS used a CME 75-Truck to complete the borings with 8-inch diameter hollow stem augers on November 10, 2020 to a depth of 13.5±ft bgs.

In 2021, Geo-Ex performed two shallow borings to perform percolation testing (P-21-001 and P-21-002). Geo-Ex used a CME 55-Truck to complete the borings with 4.5-inch solid-stem augers on April 27, 2021 to a maximum depth of 14.0±ft bgs.

The test borings were logged consistent with the Unified Soil Classification System (USCS) and the Caltrans 2010 Logging Manual. Soil samples were recovered by means of a 3.0-inch O.D. "Modified California" split-spoon sampler with liners. Samplers were advanced with standard 350 ft-lb striking force using an auto-hammer. Sampler penetration resistance was recorded to provide a field measure of relative densities and can be correlated to soils strength and bearing characteristics. The field-recorded (uncorrected) blow counts are shown on the attached boring logs. At completion of testing, the borings were backfilled with native soil.

The boring locations were measured in the field with respect to existing site features. The location of test borings are shown on Figure 2B in Appendix I. The details of the test borings are shown on the boring logs in Appendix II.

5 SURFACE AND SUBSURFACE CONDITIONS

5.1 EXISTING PAVEMENT THICKNESSES

CAInc measured the pavement sections at various locations along the pipeline alignment. We present pavement section data below.

Table 2: Existing Pavement Conditions

Boring Number	Alignment[1]	Approximate Station[1]	Asphalt Concrete Thickness (in)	Aggregate Base Thickness (in)
R-20-008	C	C201+4.3 Rt 33'	4	5
A-20-009	B	B147+12.5 Lt 0.5'	3	3
A-20-012	D	D305+98.4 Lt 0.5'	3	4
A-20-013	B	B155+62.1 Rt 4'	3	3
A-20-014	B2	B2:401+18.4 Rt 11'	1	1
A-20-015	B	B136+47.3 Rt 3.5'	2	3

[1]Alignment and Stations correlate with Carollo's 75% Plans 12/04/2020.

5.2 SOIL CONDITIONS

We summarize soil descriptions below. Refer to the Boring Logs in Appendix II for more detailed soil conditions.

5.2.1 OPEN CUT PIPELINE ALIGNMENT AND VALVE STATIONS

The soils encountered in the exploratory borings for the pipeline alignment and valve stations for this study are consistent with the 2018 boring and published mapping. Earth materials encountered in these borings are separated into two units considered significant to the proposed project.

Unit 1 – This unit was penetrated in eleven of the twelve pipeline borings (including existing B23) from ground surface to a depth of about 10 ft bgs. Materials of this unit generally consist of loose silty sand, clayey sand, poorly graded sand with silt, and poorly graded sand with clay. The remaining boring (A-20-009) encountered very dense materials at the surface.

Unit 2 – This unit was encountered below Unit 1 to the maximum depth of exploration (elev. 79.4 ft). It consists of medium dense to very dense silt, silty sand, clayey sand, and poorly graded sand with varying degrees of silt and clay. Borings B23, A-20-004 and A-20-005 encountered medium stiff to hard clay in this unit.

5.2.2 WATER TANK AND PUMP STATION

The soils encountered in the exploratory borings for the tank and pump station for this study are consistent with published mapping. Earth materials encountered in these borings are separated into 4 units considered significant to the proposed project.

Unit 1 – This unit was penetrated from ground surface to a depth of about 8 feet bgs. Materials of this unit generally consist of loose to medium dense silty sand.

Unit 2 – This unit was encountered below Unit 1 to a depth of about 18 to 21 feet bgs. Materials of this unit generally consist of medium dense to very dense clayey-silt, sandy silt, silt with sand, silt, silty sand, and clayey sand. Borings R-21-001, R-21-002 and R-21-003 encountered a very dense sandy silt to clayey sand layer at about 10 feet bgs.

Unit 3 – This unit was encountered below Unit 2 to a depth of about 28 to 35 feet bgs in borings R-21-001, R-21-002 and R-21-003. Materials of this unit generally consist of medium dense to very dense sand.

Unit 4 – This unit was encountered below Unit 3 to the maximum depth of exploration (about elev. 23.2 ft). It consists of dense to very dense sand with varying isolated layers of hard lean clay with sand and sandy lean clay, dense to very dense sandy silt to silt.

5.3 ORGANICS

To identify the approximate depth of organic material, we performed five hand augers adjacent to each of our 2021 boring locations. We encountered rrganic material within approximately the upper 13 to 15 inches. Refer to the Boring Logs in Appendix II for more detailed soil conditions.

5.4 GROUNDWATER

Table 3 depicts the groundwater conditions observed in the field and available from California Department of Water Resources (DWR) wells in the vicinity. DWR elevations reference NAVD88.

Table 3: Groundwater Conditions

Consultant/ Source	Boring/Well Number	Date Measured	Approximate Location	Groundwater Depth (ft)	Groundwater Elevation (ft)
CAInc[1]	R-20-001	11/10/2020	Previous Water Tank and Pump Station	20.0	95.1
CAInc	R-20-002	11/11/2020	Previous Water Tank and Pump Station	25.0	90.1
CAInc	R-20-003	11/09/2020	Previous Water Tank and Pump Station	20.0	95.1
CAInc	A-20-004	11/10/2020	A 18+46.2 Lt 39.8	20.8	95.4
CAInc	A-20-005	11/11/2020	A 10+59.7 Lt 28.2	21.3	94.0
CAInc	A-20-006	08/25/2020	B 119+96.1 Rt 2.8	11.2	103.1
CAInc	R-20-008	08/26/2020	C 201+4.3 Rt 33.1	9.5	102.9
CAInc	A-20-012	08/25/2020	D 305+98.4 Lt 0.3	22.6	90.7
CAInc	A-20-014	08/24/2020	B2 401+18.4 Rt 11.1	22.0	88.9
CAInc	R-21-001	04/26/2021	Current Water Tank and Pump Station	18.2	96.6
CAInc	R-21-002	04/28/2021	Current Water Tank and Pump Station	20.8	93.9
CAInc	R-21-003	04/27/2021	Current Water Tank and Pump Station	19.0	95.5
DWR[2]	375318N1208257W001	02/01/1967	(37.5318, -120.8257)	12.4	105.9
DWR	375213N1208296W001	02/05/1980	(37.5213, -120.8296)	7.7	106.6
DWR	375213N1208127W001	02/05/1980	(37.5213, -120.8127)	11.1	108.2
DWR	375066N1208282W001	02/05/1980	(37.5066, -120.8282)	11.1	99.2
DWR	375077N1208127W001	02/05/1980	(37.5077, -120.8127)	12.3	103.0

[1]Survey data provided by Carollo Engineering.
[2]Using the Department of Water Resources; http://wdl.water.ca.gov/waterdatalibrary/. Accessed November 30, 2020.

Groundwater conditions will fluctuate with seasonal precipitation and land use. The above data indicates that groundwater likely will not adversely impact the majority of pipeline construction but may adversely impact the construction of PRV 1. Due to expected fluctuations in the groundwater elevation, buoyancy forces should be considered along the bottom portion of PRV 1. Dewatering is discussed in Section 9.5.1 of this report.

6 PERCOLATION TESTS

Three percolation tests were performed in 2020 at the previously identified drainage basin located approximately 500 feet east of the current identified drainage basin location. Two percolation

tests were performed in 2021 at the current identified proposed basin location. Based on the planned finished grade of the deep basin (approximately 13 feet bgs), infiltration at the current identified site is expected to be within Sandy Silt and Silty Sand soil materials. A dense, possibly hardpan layer, was encountered in P-21-001 from about 12 to 12.5 feet bgs. To field test infiltration rates, CAInc completed in-situ falling head tests in uncased boreholes. We used infiltration test methods and calculations based on the U.S. Department of Interior Bureau of Reclamation field manual for gravity testing[2]. The following summarizes the general test method:

1. Drilled a 4.5-inch or 8-inch diameter hole to test depth;
2. Clean the boring/excavation;
3. Place a two-inch layer of fine gravel at the bottom of the hole, and set a two-inch observation pipe and secured the perforated pipe with gravel to prevent movement during testing;
4. Saturated the bottom of the hole with water;
5. Begin measuring time necessary for water level to drop a set amount (generally 1-inch) with an electric water level indicator; and
6. Infiltration rates are considered stable after four consecutive readings show a consistent water level drop rate.

In Table 4 below, we summarize the test data and infiltration rate values calculated.

Table 4: Infiltration Test Data Summary

Test Location	Test Hole No.	Test Depth (ft) bgs	Water Depth (ft) bgs	Infiltration Rate (inches/hr)	Soil Types at Test Depth
2021 Drainage Basin	P-21-001	14.0	20.0	5.0	ML
	P-21-002	13.5	20.0	5.5	SM
2020 Drainage Basin[1]	P-20-001	13.5	20.0	2.5	SC
	P-20-002	13.5	20.0	4.0	SC
	P-20-003	13.5	20.0	2.5	CL

[1] Previous drainage basin site. See Figure 2B for percolation test locations

The in-situ field tests at the planned drainage basin location show infiltration rates of approximately 5.0 and 5.5 inches per hour, at the locations/depths tested respectively in borings P-21-001, P-21-002. The USDA Web Soil Survey[3] data indicates that the upper four feet of sandy loam soil, and 1 foot of silt loam from 4-5 feet in the project area should generally yield infiltration rates between 0.2 and 0.66 inches per hour; however, Web Soil Survey data does not indicate infiltration rates for soils greater than 5 feet bgs.

Based on our experience, infiltration test methods can yield results that vary by as much as 90% between tested locations. Due to the alluvial nature of the soils underlying the sites, there can also be significant lateral and vertical variation in soil type and infiltration rates within relatively

[2] United States Department of the Interior Bureau of Reclamation, Engineering Geology Field Manual, Second Edition, Vol. 2, 2001.
[3] Using the United States Department of Agriculture – Natural Resources Conservation Service; https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed November 30, 2020.

short distances. Therefore, we typically recommend using a factor of safety of 4 or more to determine design infiltration rates which equates to about 1 in/hr.

7 LABORATORY TESTING

7.1 GEOTECHNICAL SOILS TESTING

We completed the following laboratory tests on representative soil samples obtained from the exploratory borings:

- Moisture Content / Dry Density (ASTM D2216 / D2937)
- Particle Size Analysis (ASTM D422)
- No. 200 Sieve Wash (ASTM D1140)
- Atterberg Limits (ASTM D4318)
- Unconfined Compressive Strength (ASTM D2166)
- Consolidation (ASTM D2435)
- R-value (CTM 301)

We show test results on the logs of the borings and in Appendix III.

7.2 CORROSION

Corrosion testing was completed by JDH Corrosion Consultants, Inc on samples obtained from our borings. Refer to their report for results and recommendations.

7.3 GROUNDWATER TESTING RESULTS

The following groundwater tests were completed on samples obtained from exploratory borings A-20-005 and A-20-014:

- Organochlorine Pesticides and PCB's (EPA Method 608.3)
- Volatile Organic Analysis (EPA Method 624.1)
- Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)
- Water Analysis (General Chemistry)
- Metal Analysis

We show test results in Appendix III.

8 SITE-SPECIFIC ANALYSIS

The following sections describe the site-specific ground motion analysis performed in accordance with ASCE 7-16 (with Supplement 1) and 2019 CBC.

8.1 SEISMIC HAZARD ANALYSIS

8.1.1 SEISMIC DESIGN CRITERIA

Seismic design criteria are included in Section 11 of ASCE 7-16 (Sections referenced hereafter refer to ASCE 7-16), including mapped acceleration parameters. These mapped parameters are available online through the SEAOC/OSHPD[4] Seismic Design website, which interpolates values form the ASCE 7-16 maps using the site location.

8.1.2 SITE CLASS AND RISK CATEGORY

The site was classified as Site Class D according to Section 20.3.3 based on the site shear wave velocity. The shear wave velocity of 273 meters per second (m/s) in the upper 30 meters or 100 feet (V_{S30}) used for the site was developed from borings R-20-001 and R-20-003. CAInc used correlations with SPT blow count N-values corrected for hammer efficiency. The Risk Category for the tank structure is IV.

8.1.3 MAPPED ACCELERATION PARAMETERS

CAInc ran the SEAOC/OSHPD Seismic Design Map website considering the site location latitude 37.524309°N and longitude -120.819236°W, Site Class D, and Risk Category II to determine the Mapped Maximum Considered Earthquake (MCE) Spectral Response Short Period (S_S), Mapped MCE Spectral Response at 1 second period (S_1), Long Period (T_L), and mapped risked coefficients (C_{RS} and C_{R1}). The S_S, S_1, T_L, C_{RS}, and C_{R1} are coordinate specific and are taken from ASCE 7-16 figures independently of site class. The mapped acceleration parameters are based on an MCE which is roughly equivalent to an earthquake with a 2% chance of exceedance in 50 years (2,475-year return period). Due to the Site Class D designation and a S_1, > 0.2, a site-specific analysis is required according to Section 11.4.8 for the acceleration parameters.

Table 5 summarizes the mapped acceleration parameters.

Table 5: Mapped Acceleration Parameters

Mapped Acceleration Parameter	Value	Source
Mapped MCE_R Spectral Response Short Period (S_S)	0.634	Figure 21-1
Mapped MCE_R Spectral Response at 1 Second Period (S_1)	0.256	Figure 21-2
Long Period (T_L)	12	Figure 21-14
Mapped Risk Coefficient at Short Period (C_{RS})	0.954	Figure 22-17
Mapped Risk Coefficient at 1 Second Period (C_{R1})	0.953	Figure 22-18

[4] https://seismicmaps.org

8.2 HORIZONTAL GROUND MOTION HAZARD ANALYSIS

A ground motion hazard analysis accounts for the regional tectonic setting, geology, and seismicity of a specific site as well as the expected recurrence of the maximum magnitudes of the earthquakes on known faults and source zones, considering ground motion attenuation and near source effects. The methodology included in ASCE 7-16 was used to determine the site-specific ground motions of the project site, generally consisting of the following steps:

- Determine the probabilistic MCE ground motions
- Determine the deterministic MCE ground motions
- Adjust probabilistic MCE ground motions to risk-targeted maximum considered earthquake ground motions (MCE_R)
- Compare and scale the site-specific deterministic MCE ground motion per ASCE 7-16 Supplement 1 Section 21.2.2
- Calculate design spectral response ground motion (2/3 of MCE_R)
- Compare the Section 21.2 design spectral response ground motion to the Section 11.4.6 design spectral response ground motion (cannot be lower than 80% Section 11.4.6 design spectral response ground motion)
- Determine the design spectral response spectrum and design acceleration parameters
- Calculate peak ground acceleration (PGA_M)

8.2.1 PROBABILISTIC MCER GROUND MOTION

The USGS Unified Hazard Tool was used to determine the rotated spectral response acceleration from a 5% damped response spectrum with a 2% in 50-year exceedance probability. The USGS Unified Hazard Tool was run using the Dynamic: Conterminous U.S. 2014 (v4.2.0) time history. Using scale factors provided in Section 21.2, the 2% in 50-year exceedance probabilistic spectrum was scaled to the mean maximum rotated horizontal response acceleration (MCE ground motion).

A. RISK COEFFICIENTS

Method 1 of Section 21.2 was used to determine the probabilistic MCE_R ground motion

Mapped risk coefficients (C_{RS} and C_{R1}) were used to adjust the response accelerations to a 1% chance of collapse in 50 years per Section 21.2.1.1. The risk coefficients are summarized in Table 1, along with the source figure from ASCE 7-16.

C_{RS} was applied to accelerations at spectral periods less than or equal to 0.2 seconds. C_{R1} was applied accelerations at spectral periods greater than or equal to 1 second. For spectral periods between 0.2 and 1 seconds, the C_R value was linearly interpolated.

B. PROBABILISTIC MCER GROUND MOTION

Figure 5 in Appendix IV shows the maximum rotated spectral response for the 2% in 50-year event (MCE). Also shown is the risk-adjusted response spectrum adjusting the response to a 1% in 50-year probability of collapse, which is equivalent to the site-specific probabilistic ground motion MCE_R.

8.2.2 DETERMINISTIC MCER GROUND MOTION

The 2014 NGA West2 – GMPEs worksheet from the Pacific Earthquake Engineering Research Center (PEER) was then used to calculate deterministic spectral response acceleration. We utilized equal weights of the Abrahamson & Silva & Kamai 2014, Campbell & Bozorgnia 2014, and Chiou & Youngs 2014 next generation attenuation (NGA) relationships for the nearby reverse fault. The controlling seismic source for the project site is the Great Valley 7 (Orestimba) fault. CAInc reviewed the USGS[5] website to determine the Great Valley 07 (Orestimba) fault data. The Great Valley 07 (Orestimba) fault is a reverse fault. Table 6 summarizes the inputs into the PEER worksheet

Table 6: PEER Worksheet Inputs

Input	Value
GMPE Averaging	Geometric
Abrahamson & Silva & Kamai 2014 NGA West-2 Model	0.33 Weight
Campbell & Bozorgnia 2014 NGA West-2 Model	0.33 Weight
Chiou & Youngs 2014 NGA West-2 Model	0.33 Weight
Number of standard deviations (σ)	1*
Damping ratio (%)	5
Moment magnitude (M)	6.31
R_{RUP}; closest distance to coseismic rupture (km)	26
R_{JB}; closest distance to surface project of coseismic rupture (km)	26
R_X; horizontal distance from top of rupture measured perpendicular to fault strike (km)	26
F_{RV}; reverse-faulting factor	1
F_N; normal-faulting factor	0
F_{HW}; hanging-wall factor	0
Dip; average dip of rupture plane (degrees)	20
Z_{TOR}; depth to top of coseismic rupture (km)	7
Z_{HYP}; hypocentral depth from the earthquake (km)	Default Value
$Z_{1.0}$; depth to 1.0 km/sec shear wave velocity (km)	0.33
$Z_{2.5}$; depth to 2.5 km/sec shear wave velocity (km)	1.7
W; fault rupture width (km)	2.6
V_{S30}; average shear wave velocity in top 30m of profile (m/s)	273
$V_{S30Flag}$; 1 for measured VS30	1
F_{AS}; aftershock effect	No
Region	California

*84th-percentile

The deterministic spectral response was taken as the largest amplitude of ground motion considering all sources using the weighted mean of NGA attenuation relationships. Using scale

[5] https://pubs.usgs.gov/of/2013/1165/, accessed November 12, 2020

factors provided in Section 21.2, the 84th-percentile 5% damped spectral response acceleration was scaled in the maximum horizontal direction. Figure 6 in Appendix IV shows the 84th-percentile 5% damped maximum spectral response in the horizontal plane for the NGA attenuation relationships.

A. GROUND MOTION COMPARISON TO 1.2FA

Per the Exception within ASCE 7-16 Supplement 1 Section 21.2.2, "the deterministic ground motion response spectrum need not be calculated when the largest spectral response acceleration of the probabilistic ground motion response spectrum of 21.2.1 is less than 1.2Fa". Fa was taken as 1.0 using Table 11.4.1 with a S_S of 1.5 according to Supplement 1 Section 21.2.2. Figure 7 in Appendix IV compares the 1.2Fa with the probabilistic ground motion from 21.2.1 (MCE_R ground motion). The largest response acceleration of the probabilistic ground motion (1.07g) is less than 1.2Fa (1.2), therefore, the deterministic ground motion response spectrum was not further calculated.

8.2.3 SITE-SPECIFIC SPECTRAL RESPONSE ACCELERATION MCER

The site-specific spectral response acceleration is defined as the lower of the probabilistic and deterministic ground motions in Section 21.2.3, however, per the Exemption within Supplement 1 Section 21.2.3, the site-specific MCE_R ground motion response spectrum was be taken as the probabilistic ground motion response spectrum of 21.2.1 since the largest spectral response acceleration is less than 1.2Fa.

8.2.4 DESIGN RESPONSE SPECTRUM

The design response spectrum is defined in Section 21.3 as the higher of two values:

- Two-thirds of the site-specific design spectral response acceleration per Section 21.2
- 80% of the design spectral response acceleration per Section 11.4.6 where F_a is calculated in Table 11.4-1 and F_v = 2.5 for S_1 > 1.0 for Site Class D

CAInc first calculated the design spectral response acceleration by taking 2/3 of the site-specific response acceleration MCE_R as shown in Figure 8 in Appendix IV.

CAInc then calculated the design response accelerations per Section 11.4.6 with F_a = 1.294 (using mapped S_S value of 0.633) and F_v = 2.5. We reduced the spectral accelerations by 80% to adjust for the minimum design spectral accelerations per Section 21.3 as shown in Figure 9 in Appendix IV. We then compared Section 11.4.6 design spectral accelerations for Site Class D with our site-specific design spectral response accelerations (Figure 10 in Appendix IV). The site-specific design spectral response accelerations controlled over all periods.

The design response spectrum is shown on Figure 10 in Appendix IV and Table 7.

Table 7: Design Response Spectrum

Period, s	Sa, g
0.005	0.26
0.1	0.48
0.2	0.66
0.3	0.72
0.5	0.68
0.75	0.56
1.0	0.46
2.0	0.25
3.0	0.17
4.0	0.13
5.0	0.10

8.2.5 DESIGN ACCELERATION PARAMETERS

Design acceleration parameters were calculated in accordance with Section 21.4. The S_{DS} value was taken as 90% the peak spectral acceleration value from periods 0.2 to 5 seconds. The S_{D1} value was taken as the maximum product of $T*S_a$ (period * spectral acceleration) from periods 1 to 5 seconds. Per Section 21.4, the S_{DS} and S_{D1} values cannot be less than 80% of the S_{DS} and S_{D1} calculated from Section 11.4.5. The S_{DS} and S_{D1} values in Section 11.4.5 was calculated from using F_a = 1.294 (mapped parameter) and F_v = 2.5 for a Site Class D as given in Section 21.3.

S_{MS} and S_{M1} were calculated as 1.5 times S_{DS} and S_{D1}, respectively. Per Section 21.4, the S_{MS} and S_{M1} values cannot be less than 80% of the S_{MS} and S_{M1} calculated from Section 11.4.3. The S_{MS} and S_{M1} values in Section 11.4.3 was calculated from using F_a = 1.294 (mapped parameter) and F_v = 2.5 for a Site Class D as given in Section 21.3.

The design acceleration parameters are summarized in Table 8.

Table 8: Horizontal Site-Specific Spectral Accelerations

Design Acceleration Parameter	Value (g)
Design Spectral Acceleration for Short Period (S_{DS})	0.64
Design Spectral Acceleration for 1 Second Period (S_{D1})	0.52
MCE Spectral Response Acceleration for Short Period (S_{MS})	0.97
MCE Spectral Response Acceleration for 1 Second Period (S_{M1})	0.77

8.2.6 MAXIMUM CONSIDERED EARTHQUAKE MCE_G PEAK GROUND ACCELERATION (PGA)

A. PROBABILISTIC MCE_G PGA

Per Section 21.5.1 the probabilistic geometric mean PGA shall be taken as geometric mean peak ground acceleration with a 2% probability of exceedance within a 50-year period. The probabilistic MCE_G PGA is 0.41g.

B. DETERMINISTIC MCE_G PGA

Per Section 21.5.2 the deterministic geometric mean PGA shall be taken as the largest 84th-percentile geometric mean peak PGA but not lower than $0.5*F_{PGA}$ where F_{PGA} is determined using ASCE 7-16 Table 11.8-1 and PGA is taken as 0.5g. The 84th-percentile geometric mean PGA is 0.25g and the minimum calculated PGA ($0.5*F_{PGA}$) was 0.55g, therefore, the deterministic MCE_G PGA was taken as 0.55g.

C. SITE-SPECIFIC MCE_G PGA

The site-specific MCE_G PGA (PGA_M) taken as the lesser of the probabilistic MCE_G PGA and deterministic MCE_G PGA but not less than 80% of the PGA_M determined from Equation 11.8-1 in ASCE 7-16. 80% of the PGA_M determined from Equation 11.8-1 was calculated as 0.28g, therefore, the site-specific PGA_M was taken as 0.41g.

8.3 FAULT RUPTURE

The site does not lie within an Alquist–Priolo Earthquake Fault Zone and no known active faults are mapped within or through the project area. The California Geologic Survey (CGS) considers a fault to be active if it has shown evidence of ground displacement during the Holocene period, defined as the last 11,700 years. According to the CGS, the closest active fault is the Ortigalita Fault Zone located about 34 miles southwest of the western-most edge of the project area.

8.4 LIQUEFACTION

Liquefaction can occur when saturated, loose to medium dense, granular soils (generally within 50 feet of the surface), or specifically defined cohesive soils, are subjected to ground shaking. Based on soil and groundwater conditions encountered and current industry accepted liquefaction evaluation methods, we present potential liquefaction throughout the project alignment below. We used a peak ground acceleration of 0.41 g and a maximum moment magnitude of 8.1 for our analysis. The maximum moment magnitude was determined using the USGS Deaggregation Unified Hazard Tool[6].

8.4.1 PIPELINE ALIGNMENT AND VALVE STATIONS

Based on the soil and groundwater conditions encountered the potential for liquefaction exists within the upper 30 feet of soils at the site in borings A-20-005, A-20-006, R-20-008, and A-20-014 in the saturated sands and silty sands. Our analysis shows that liquefaction induced

[6] https://earthquake.usgs.gov/hazards/interactive/ accessed December 1, 2020.

settlement on the order of 0.5 to 1.5 inches should be expected at the valve stations and along the pipeline alignment.

8.4.2 TANK AND PUMP STATION

Based on medium dense to dense soils, cementation and groundwater conditions encountered and current industry accepted liquefaction evaluation methods the potential for liquefaction at the tank and pump station site is low.

9 CONCLUSIONS AND RECOMMENDATIONS

We conclude that the site conditions are suitable for construction of the proposed tank, pump station, pipeline, and valve stations provided the recommendations presented below are included in design and construction. Key geotechnical considerations associated with design and construction of this project included presence of sandy soils along the alignment which may cause caving, heavy tank loads and the potential for excess settlement, potential for liquefaction settlement at the PRV station sites, and groundwater at PRV station 1.

9.1 FOUNDATION RECOMMENDATIONS

9.1.1 TANK

We understand the tank will be supported by perimeter ring foundations, and concrete slab-on-grade floor. Based on the information provided by DN Tanks (loading distribution dated October 2, 2020), we understand tank loading will result in design bearing capacities of 2,100 psf uniformly distributed along the belly of the tank and a bearing capacity ranging from 4,300 psf to 1,100 psf along the inner and outer perimeter ring foundation; respectively. In general, the site is capable of supporting the tank design loads provided. However, some improvement will be necessary to reduce the settlement of the underlaying soils to within the tank tolerances.

CAInc performed settlement analysis using RocScience 3D Settlement computer program and the provided bearing capacities, a tank diameter of 130-foot (based “75% Design Submittal,” December 2020), tank bottom installed near an elevation of 119 feet (about 4 to 5 feet above existing grade), perimeter foundations embedded a minimum of 12 inches below lowest adjacent grade and 5 ft wide. We provide results of our settlement analysis in Appendix V. In general, our analysis shows that an 8-foot (down to about elevation 106.5 ft) overexcavation of the tank pad is required to limit the settlement to approximately 3.25 inches of total settlement (3.25 inches of immediate and 0 inches of consolidation) and approximately 1.75 inches of differential settlement from the center of the tank to the perimeter (about 65 feet). Based on the nature of the onsite soils we expect 50% to 65% of the settlement to occur during construction. The overexcavation recommendations are provided in Section 9.2.3. As an alternative to thev overexcavation thickness required above, the design team and tank manufacture could consider partially burying the concrete tank to reduce the amount of settlement and overexcavation required (this would require updating this report and our analysis).

Lateral forces may be resisted by friction developed between the base of the footing and the underlying soil. Use a coefficient of friction of 0.70 for concrete cast against cohesionless soil to resist sliding. Additional lateral resistance may be provided by assuming a passive pressure

based on an equivalent fluid weight of 220 pcf. The passive capacity reduces to an equivalent fluid weight of 205 pcf during a seismic event. In designing the structure to resist lateral loads, the upper 12 inches of soil should be ignored.

9.1.2 PUMP STATION BUILDING

Based on our review of the 75% design plans we understand the pump station building foundation dimensions and loads are still being determined, however support for the new pump station building is available using spread foundations provided they are a minimum 12 inches wide and extend a minimum of 18 inches below lowest adjacent grade. Provided that the recommendations in this report are followed an allowable bearing capacity of 2,500 psf may be used for design of the foundations. The bearing capacity value may be increased by one-third if wind and/or seismic loads are included. Total and differential foundation settlement is expected to be less than 1 inch and ½ inch, respectively.

Lateral forces may be resisted by friction developed between the base of the footing and the underlying soil. Use a coefficient of friction of 0.70 for concrete cast against cohesionless soil to resist sliding. Additional lateral resistance may be provided by assuming a passive pressure based on an equivalent fluid weight of 220 pcf. The passive capacity reduces to an equivalent fluid weight of 205 pcf during a seismic event. In designing the structure to resist lateral loads, the upper 12 inches of soil should be ignored.

9.1.3 VALVE STATIONS

Support for PRV Stations 1, 2 and 3 is available using a mat foundation (plans generally show the PRV structures 9 feet below grade, elevations not show currently). Provided that the mat foundations re designed to evenly distribute the pump station contents, equipment, and structure an allowable bearing capacity of 1000 psf may be used for design. The bearing capacity value may be increased by one-third if wind and/or seismic loads are included. Total and differential foundation settlement is expected to be less than 1 inch and ½ inch, respectively.

Lateral forces may be resisted by friction developed between the base of the footing and the underlying soil. Use a coefficient of friction of 0.70 for concrete cast against cohesionless soil to resist sliding. Additional lateral resistance may be provided by assuming a passive pressure based on an equivalent fluid weight of 220 pcf. The passive capacity reduces to an equivalent fluid weight of 205 pcf during a seismic event. In designing the structure to resist lateral loads, the upper 12 inches of soil should be ignored.

9.1.4 BUOYANCY FORCES

We expect buoyancy uplift will be a design consideration at PRV 1 depending on the final design elevation of the structure. Buoyancy forces can be counter balanced using thickened slabs and skin friction. If base extensions are used, uplift resistance is provided by the effective unit weight of the soil column directly above the base extension and wedge of soil extending outward and upward at a rate of 1:2 (H:V) from the edge of the base extension. Assume an effective unit weight of 63 pcf for base extension uplift resistance below groundwater and 125 pcf above groundwater.

9.1.5 LATERAL EARTH PRESSURES

PRV 1

We present equivalent fluid weights (EFWs) in the tables below for the buried structures. These values assume fully drained and level backfill conditions. The applicability of the buoyancy forces should be revisited once the design elevations of PRV 1 are better defined.

Table 9: Recommended Equivalent Fluid Weight (EFW)

	Above Groundwater (pcf)	Below Groundwater (pcf)	Below Groundwater (Buoyant + Hydrostatic) (pcf)
Active	33	16	79
At-rest	52	25	88

Table 10: Additional Seismic Equivalent Fluid Weights (EFW)

	Above Groundwater (pcf)	Below Groundwater (pcf)
At-rest	13	7
Active	8	4

The EFW values shown above assume:

- Level backfill condition;
- Structure Backfill with soil unit weight (γ) = 120 pcf and minimum angle of internal friction (ϕ) = 35°. This is considered to be achievable from the native silty sands;
- Horizontal seismic acceleration coefficient (k_h) ≤ 0.2; and
- Vertical seismic acceleration coefficient (k_v) = 0.0.

The passive fluid weight is only applicable if the retained earth is allowed to strain at least 0.02H.

For *static design*, apply the resultant of the static earth pressure at a depth of 0.33H from the base of the wall where H equals the wall height. Include full hydrostatic pressure (i.e., buoyant + hydrostatic) for walls designed to be in service below the water table. At-rest and Active earth pressures do not include a factor of safety. Use a static passive earth pressure of 220 pcf above groundwater and 105 pcf below groundwater (168 pcf when including buoyant and hydrostatic). The passive earth pressure has been reduced by a factor of safety of 2.0 and use a coefficient of friction of 0.70 for lateral restraint.

For *seismic design*, calculate the resultant of incremental/additional lateral soil pressure due to seismic loading based on the equivalent fluid weights above and apply the magnitude of the resultant at 0.66H from the base of the wall where H equals the wall height. Add the resultant of the seismic earth pressure to the resultant of the static active or “at-rest” earth pressure. Reduce the static passive pressure to 205 pcf for a seismic event above groundwater and 90 pcf below groundwater (160 pcf when including buoyant and hydrostatic).

For permanent surcharge loads, apply a uniform load to the wall equal to 0.45-times the surcharge load. Apply an additional 200 psf to accommodate transient and construction surcharge loading (comparable with AASHTO H-20).

PRV 2 AND 3

We present equivalent fluid weights (EFWs) in the table below for the buried structures. These values assume fully drained and level backfill conditions.

Table 11: Recommended Equivalent Fluid Weight (EFW)

Condition	Static	Incremental Seismic
	EFW (pcf)	ΔEFW_{EQ} (pcf)
Active	33	8
At-Rest	52	13

The EFW values shown above assume:

- Level backfill condition;
- Structure Backfill with soil unit weight (γ) = 120 pcf and minimum angle of internal friction (ϕ) = 35°. This is considered to be achievable from the native silty sands;
- Horizontal seismic acceleration coefficient (k_h) ≤ 0.2; and
- Vertical seismic acceleration coefficient (k_v) = 0.0.

The passive fluid weight is only applicable if the retained earth is allowed to strain at least 0.02H.

For *static design*, apply the resultant of the static earth pressure at a depth of 0.33H from the base of the wall where H equals the wall height. At-rest and Active earth pressures do not include a factor of safety. Use a static passive earth pressure of 220 pcf which has been reduced by a factor of safety of 2.0 and a coefficient of friction of 0.70 for lateral restraint.

For *seismic design*, calculate the resultant of incremental/additional lateral soil pressure due to seismic loading based on the equivalent fluid weights above and apply the magnitude of the resultant at 0.66H from the base of the wall where H equals the wall height. Add the resultant of the seismic earth pressure to the resultant of the static active or “at-rest” earth pressure. Reduce the static passive pressure to 210 pcf for a seismic event.

For permanent surcharge loads, apply a uniform load to the wall equal to 0.45-times the surcharge load. Apply an additional 200 psf to accommodate transient and construction surcharge loading (comparable with AASHTO H-20).

9.2 GRADING

9.2.1 CLEARING

Prior to grading, demolish and clear the site to remove structures, fences, vegetation, tree roots, debris, abandoned utilities, soft or unstable areas, and other deleterious materials.

9.2.2 SUBGRADE

Scarify and compact the upper 10 inches of soil in areas to receive fill (outside of the tank pad) to at least 90 percent relative compaction with at least optimum moisture content per ASTM D1557. The excavation bottom must be firm and unyielding prior to placing concrete.

Place fill in maximum 8-inch-thick loose lifts, moisture condition to within 2% of optimum moisture content and compact to a minimum 90% relative compaction per ASTM D1557. Increase the relative compaction to 95% in the upper 6-inches beneath the pavement areas.

Native materials, minus organics, debris, and other deleterious materials, are suitable for engineered fill with a maximum particle size of 4 inches. Excavated materials unsuitable for use as structural fill should be placed outside the structure limits.

9.2.3 OVEREXCAVATION – TANK PAD

To reduce the amount of settlement to within the required tolerances provided by DN Tanks, the near surface soils will need to be removed, processed and recompacted below the planned tank. Our analysis shows that an overexcavation to a depth of 8 feet below existing grade (to an elevation of approximately 106.5 ft) is required. Extend the overexcavation to a minimum of 5 feet laterally beyond the tank and foundation footprint in all directions.

Scarify the exposed subgrade to a depth of 10 inches and compact to at least 95% percent relative compaction with at least optimum moisture content per ASTM D1557. The excavation bottom must be firm and unyielding prior to placing concrete. Place and compact fill per Section 9.2.5 below.

9.2.4 OVER-OPTIMUM SOIL MOISTURE

Excessively over-optimum (wet) soil conditions can make proper compaction difficult or impossible.

In general, wet soil can be mitigated by:

- Discing the soil during prolonged periods of dry weather,
- Over-excavating and replacing with drier material,
- Stabilization using aggregate and stabilization fabric or grid.

CAInc should be consulted for further recommendations if these conditions are encountered during grading.

9.2.5 BACKFILL

Native silty sands or select import can be used as backfill. Moisture condition backfill to within 2 percent of optimum and place in maximum 8-inch thick, horizontal, loose lifts. Compact backfill to a minimum 95 percent relative compaction based on the ASTM D 1557 test procedure.

In order to minimize the residual lateral earth pressures on structure walls, compaction equipment used behind the walls should be restricted (by load and distance from wall) so that wall design values are not exceeded. For this reason, we recommend compaction within a horizontal distance

equal to one-half of the wall height, up to a distance of 5 feet, to be completed with hand-operated equipment (i.e., jumping jack).

9.2.6 IMPORT MATERIAL

Import fill shall be granular soil, free of organic material and debris, have an Expansion Index (per ASTM D 4829) of less than 25, an R-value greater than 50, and conform to the following gradation:

Sieve Size	Percentage Passing
2-inch	100
No. 4	35 -100
No. 30	20 -100
No. 200	10 - 45

Caltrans Class 2 aggregate base is considered acceptable and does not need to meet these gradation requirements. Import fill must be observed and tested by CAInc prior to its approval.

9.3 OPEN-CUT PIPELINE RECOMMENDATIONS

Generally, the open-cut portions of the pipeline will have a minimum of 4 feet of cover along the all the segments of the pipeline.

9.3.1 SOIL LOADS ON RIGID BURIED PIPES

Due to the lack of ductility of rigid pipelines, the dead loads and associated strain are important to analyze. The soil deadload (W_D) on the rigid pipeline in a trench may be evaluated by Marston's Formula:

$$W_D = C_d \gamma {B_d}^2$$

Where:

C_d = load coefficient based on ${K_\mu}'$
γ = moist unit weight of backfill material (pcf)
B_d = width of trench at top of pipe (ft)

Use a moist unit weight of 125 pcf for the above calculation.

Similar to Composite Modulus of Soil Reaction, the backfill material and compaction, trench width, and installation depth are components to designing the pipeline. For an open cut installation with a ratio of the backfill depth to trench width at the top of the pipe (H/B_d) of at least 1 (i.e. backfill depth is greater than the trench width) and for a trench width at top of pipe no greater than 3 times the pipe diameter, C_d[7] may be calculated by:

$$C_d = \frac{1 - e^{-2K\mu' \frac{H}{B}}}{2K\mu'}$$

[7] American Concrete Pipe Association (2000)

Where:

K = rankine's lateral earth pressure coefficient
μ' = friction coefficient between fill material and sides of trench
H = backfill height above the pipe crown (feet)

The combined $K\mu'$ value is dependent on backfill type, compaction, and moisture content. Using the backfill recommendations in this report, the estimated $K\mu'$ values are 0.120 for clay, 0.130 for silt, and 0.150 for sands and aggregate base.

9.3.2 THRUST RESTRAINT

Unbalanced thrust forces develop in a pipeline due to internal pressures, particularly around change of direction in the pipeline alignment. For large diameter pipelines, these thrust forces are typically counteracted by frictional resistance along the pipe and restrained joints.

Restrained joints resist thrust forces through friction between the pipe and the soil surrounding it. Per AWWA M11, the length of pipeline required to restrain each side of an alignment bend is:

$$L = \frac{PA(cos\Delta)}{\mu(W_e + W_w + W_p)}$$

Where:

L = length of restrained or harnessed joints on each side of the bend or elbow (ft)
P = internal pressure (psi)
A = cross-sectional area of the pipe (in^2)
Δ = bend or elbow deflection (degrees), 0° to 90°
μ = coefficient of friction between the pipe and the soil
W_e = horizontal bends: two times the weight of the prism of soil over the pipe (lb/ft of pipe length)
= vertical bends: weight of the prism of soil over the pipe (lb/ft of pipe length)
W_p = weight of the pipe (lb/ft)
W_w = weight of the contained water (lb/ft)

The coefficient of friction between a concrete pipe and the surrounding soil is modeled as: $\mu = tan\,(0.6\phi)$, where ϕ is the soil friction angle. Assuming a soil friction angle of 36° for compacted coarse grained, angular backfill soil, we recommend using a coefficient of friction of 0.40.

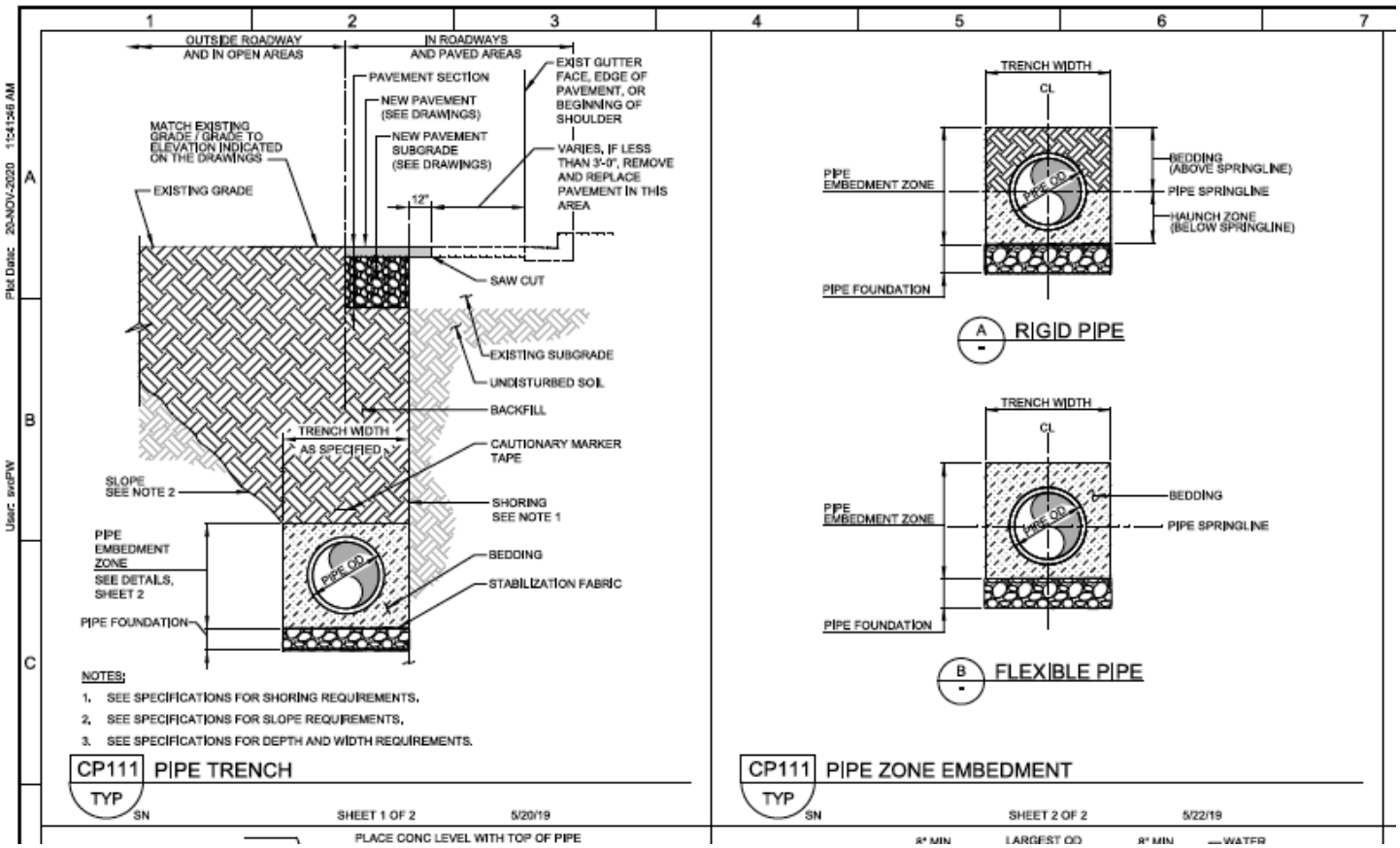
Although likely unnecessary for the majority of this project, thrust blocks may also be used if additional thrust resistance is needed. Thrust block design is governed by two factors – the total thrust force and the allowable passive pressure of the soil. Allowable passive pressure will be variable throughout the alignment due to varying soil conditions. We calculated passive pressures at each of our boring locations to assess trending values along the alignment. The range of values was 170-275 pcf. Based on this trend, we recommend a passive pressure of 215 pcf for the borings classified with sandy and silty materials for thrust block design. The upper 12 inches of soil should be ignored.

9.3.3 COMPOSITE MODULUS OF SOIL REACTION

Semi-rigid and flexible pipes are designed to withstand a certain amount of deflection from applied earth loads. One of the input parameters to pipe deflection equations is the Composite Modulus of Soil Reaction (CMSR). The CMSR value is influenced by native soil properties, backfill soil properties, and trench/pipe geometry. We calculated composite modulus of soil reaction values using the Howard (2011) and AWWA M11 and M45 method. This approach multiplies the modulus of soil reaction for the embedment soil (i.e. trench backfill) by a soil support combining factor, S. Using the above parameters, we selected our S values from Table 1 of "Amster Howard, TECH NOTE, A supplement to Pipeline Installation," dated October 3, 2011. For these calculations, we assume the trench specifications provided by Carollo Engineers in the December 2020 plans page 00TC04. We provide a brief summary of the specifications below:

- Trench Geometry
  - From conversations with Andrew Coulter (Carollo); for all pipe diameters, the trench width will be 24-inches greater than the pipe diameter. We calculated the CMSR using a minimum trench width equal to 24-inches wider (12-inches per side) than the pipe diameter.
- Backfill Material
  - Sand or aggregate base course
- Compaction
  - Pipe bedding will have a relative compaction (per ASTM D1557) greater than or equal to 90%
  - Trench backfill will have a relative compaction (per ASTM D1557) greater than or equal to 95%

Below is the pipe trench profile geometry as provided by Carollo.



Using these assumptions, pipe depth, size, installation type, and the geotechnical information presented herein, we calculated Composite Modulus of Soil Reaction values at each exploration location. We present our CMSR values in Table 12.

Table 12: Composite Modulus of Soil Reaction Values

Boring Number	Pipe Outer Diameter (in)	Alignment[1]	Approximate Station[1]	CMSR (psi)
A-20-004	54	A	18+46.2 Lt 39.8	950
A-20-005	54	A	10+59.7 Lt 28.2	1,700
A-20-006	24	B	119+96.1 Rt 2.8	1,550
R-20-008	16	C	201+4.3 Rt 33.1	2,100
A-20-009	42	B	147+12.5 Lt 0.6	1,550
A-20-010	42	B	127+2.2 Lt 34.9	2,100
A-20-011	16	D	317+23.5 Rt 23.4	1,450
A-20-012	16	D	305+98.4 Lt 0.3	1,600
A-20-013	42	B	155+62.1 Rt 3.9	2,300
A-20-014	42	B2	401+18.4 Rt 11.1	1,550
A-20-015	42	B	136+47.3 Rt 3.5	1,550
B23	16	B	100+2.6 Rt 0.6	1,600

[1]Alignment and stations are from Carollo's 75% Plans Dated 12/04/2020.

To calculate the above results, we assumed a sand backfill and applied an E_b' (trench backfill Modulus of Soil Reaction) value of 1,600 psi. Native Moduli of Soil Reaction varied from 700 in loose clayey sand to 5,000 in very dense poorly graded sand with silt along the pipeline. Final design values should be calculated based on actual backfill Modulus of Soil Reaction and trench/pipe dimensions.

9.4 PAVEMENT

We completed three R-Value tests (CTM 301) on bulk samples of near surface soil. Test results indicate R-values of 55, 59 and 65 by stabilometer. Therefore, we recommend using R-Value 50 for project pavement design based on the Caltrans Highway Design Manual maximum allowed.

Using varying Traffic Indices and Chapter 600 of the Caltrans Highway Design Manual (CHDM), 6th Edition, we recommend the sections shown in Table 13 below for pavement design.

Table 13: Pavement Sections

Traffic Index	Pavement Sections R-Value 50	
	Hot Mix Asphalt (ft)	Aggregate Base (ft)
5.0	0.20	0.30
5.5	0.25	0.30
6.0	0.25	0.35
6.5	0.30	0.35
7.0	0.30	0.45
7.5	0.35	0.45

8.0	0.40	0.45
8.5	0.40	0.55
9.0	0.45	0.55

*The upper 0.2 feet of HMA may be replaced with rubberized hot mix asphalt.

Design by the Caltrans method presumes materials and construction in accordance with Caltrans "Standard Specifications", including 95% relative compaction on all materials within 30-inches of finished grade. Inability to achieve the required compaction on the scarified materials may be used as a field criterion to identify areas requiring additional removal and/or re-compaction.

The subgrade soils should be field reviewed with respect to uniformity and suitability by the soils engineer. Any loose, disturbed or otherwise unsuitable materials should be removed to full depth and replaced with imported fill meeting the requirements of the Standard Specifications or Class 2 Aggregate Base compacted to at least 90% relative compaction.

The above pavement design assumes that free water will be absent from the structural section. Suitable surface drainage is of particular importance to limit subgrade saturation and excess free water.

9.5 CONSTRUCTION CONSIDERATIONS

9.5.1 DEWATERING

Based on our observed groundwater levels in Fall 2020, we encountered groundwater within the PRV station excavation limits in boring R-20-008 (depending on final elevations, currently not shown on the 75% design plans). In addition, groundwater will adversely affect construction of portions of the pipeline located near this boring. Isolated areas of groundwater seepage are likely to be encountered along other portions of the alignment.

Groundwater was encountered approximately 11 feet bgs in boring A-20-006 in an area with a possible hard pan layer encountered throughout the borings approximately between 9 and 11 feet bgs. The contractor may encounter perched groundwater at hardpan layers.

The contractor will be responsible for designing and implementing a dewatering system to meet the requirements of the project. Dewatering operations will need to draw down the groundwater down to a minimum of 3 feet below the planned excavation during construction. Dewatering operations may enter into layers of sandy material that may yield significant water.

9.5.2 EXCAVATABILITY

Based on the conditions observed in our subsurface explorations and our experience, the on-site soil should be excavatable with typical equipment such as backhoes and excavators. Depending on county easement dimensions and pavement configurations, the contractor may need to shore the existing roadway to accommodate traffic if there is insufficient room to properly slope the trench excavation.

CAInc was unable to remove a PVC pipe that was used as part of our 2021 field percolation testing at the current drainage basin site. The PVC pipe is about 5 ft in length and at a depth of

approximately 10 to 15 ft bgs, and will most likely be encountered during the excavation of the drainage basin site and should be able to be removed with typical equipment such as backhoes and excavators.

9.5.3 SHORING AND TEMPORARY CONSTRUCTION SLOPES

At a minimum, all shoring and temporary construction slopes should be in accordance with current OSHA requirements. Our data indicates Cal OSHA Soil Type C will be encountered throughout the project alignment with the exception of the stiff fine-grained soil layers we encountered. Isolated locations of unstable sandy soils should be expected, particularly where the trench is adjacent to existing utilities or other improvements. Traffic and construction vibrations need to be considered in shoring applications.

The contractor is responsible for all shoring and temporary slope design based on actual excavation conditions encountered during construction. Shoring will need to be conducive to the contractor's approach to managing groundwater (where needed) and the excavation.

10 LIMITATIONS

CAInc performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. Do not use this report for different locations and/or projects without the written consent of CAInc. Where referenced, we used ASTM or Caltrans standards as a general (not strict) *guideline* only.

CAInc based this report on the current site conditions. We assumed the soil and groundwater conditions are representative of the subsurface conditions on the site. Actual conditions between explorations will vary along the project alignment.

Our scope did not include evaluation of on-site hazardous materials.

Logs of our explorations are presented as Appendix II. The lines designating the interface between soil types are approximate. The transition between soil types may be abrupt or gradual. Our recommendations are based on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geological conditions

APPENDIX I - FIGURES

Figure 1: Vicinity Map
Figure 2A/2B: Exploration Location Map
Figure 3: Geologic Map
Figure 4: Fault Activity Map

North

Source:
USGS 7.5' Topographic Maps, Denair, Stanislaus County, California, 2018, Scale: 1:24,000.

USGS 7.5' Topographic Maps, Turlock, Stanislaus County, California, 2018, Scale: 1:24,000.

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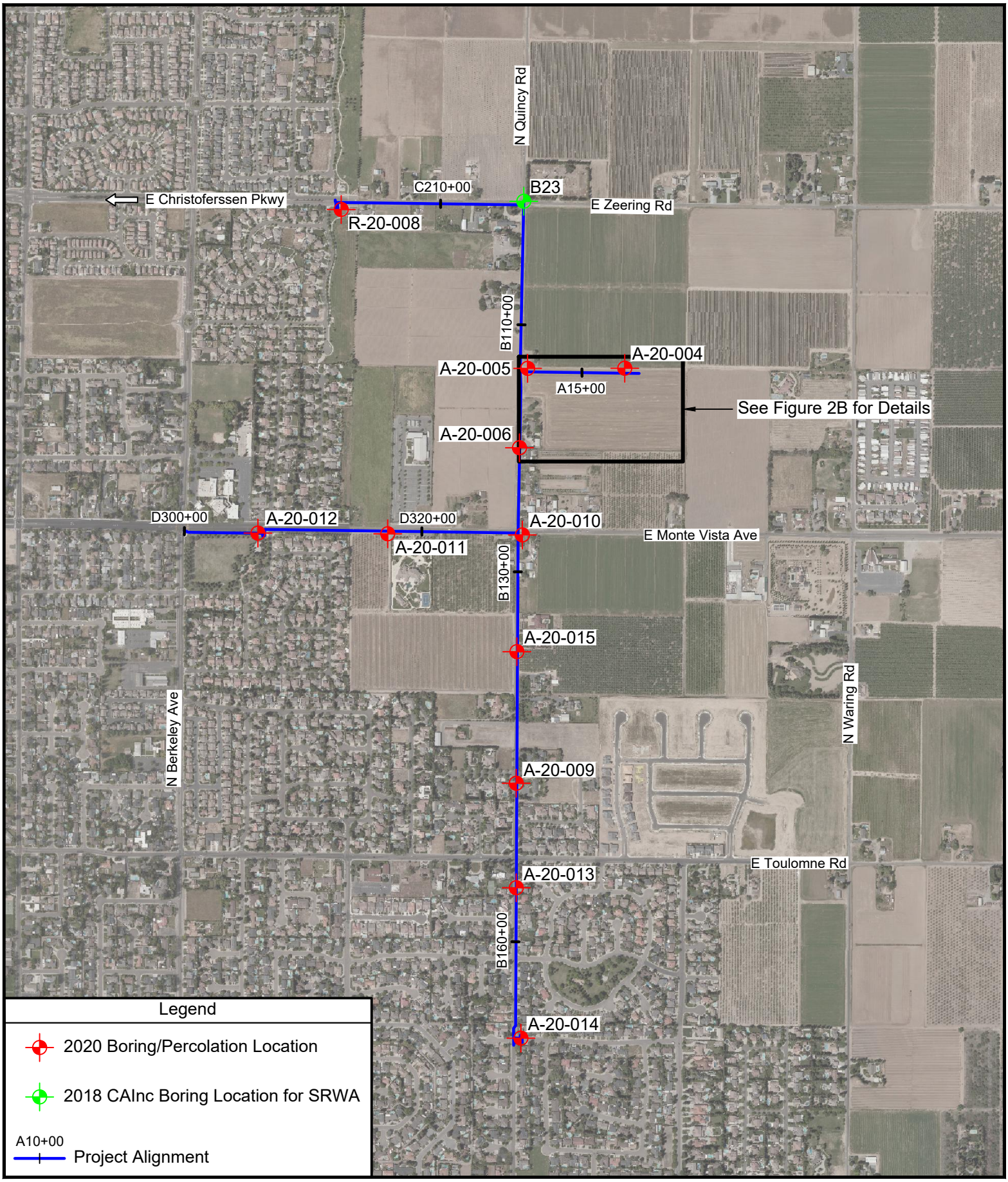
Turlock Water Distribution System Project

Turlock, CA

Figure 1
Vicinity Map

Proj. No: 20-642.1
Scale: 1"=3,000'
Date: 05/10/21



North

Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps

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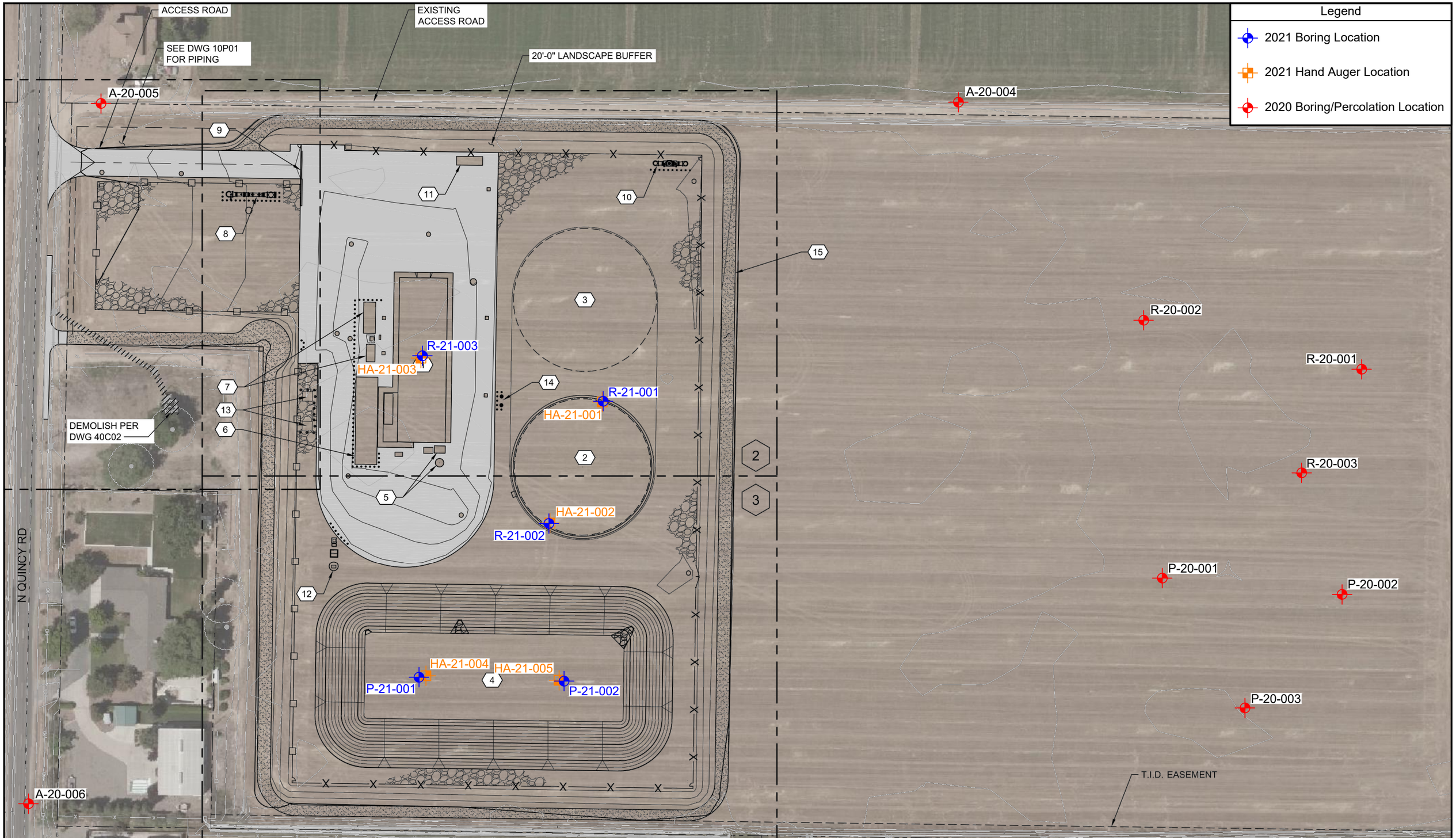
Turlock Water Distribution System Project

Turlock, CA

Figure 2A
Exploration Location Map

Proj. No: 20-642.1
Scale: 1" = 1,000'
Date: 05/07/21



North

Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps

Plan details provided by Carollo via electronic transfer on 04/22/21

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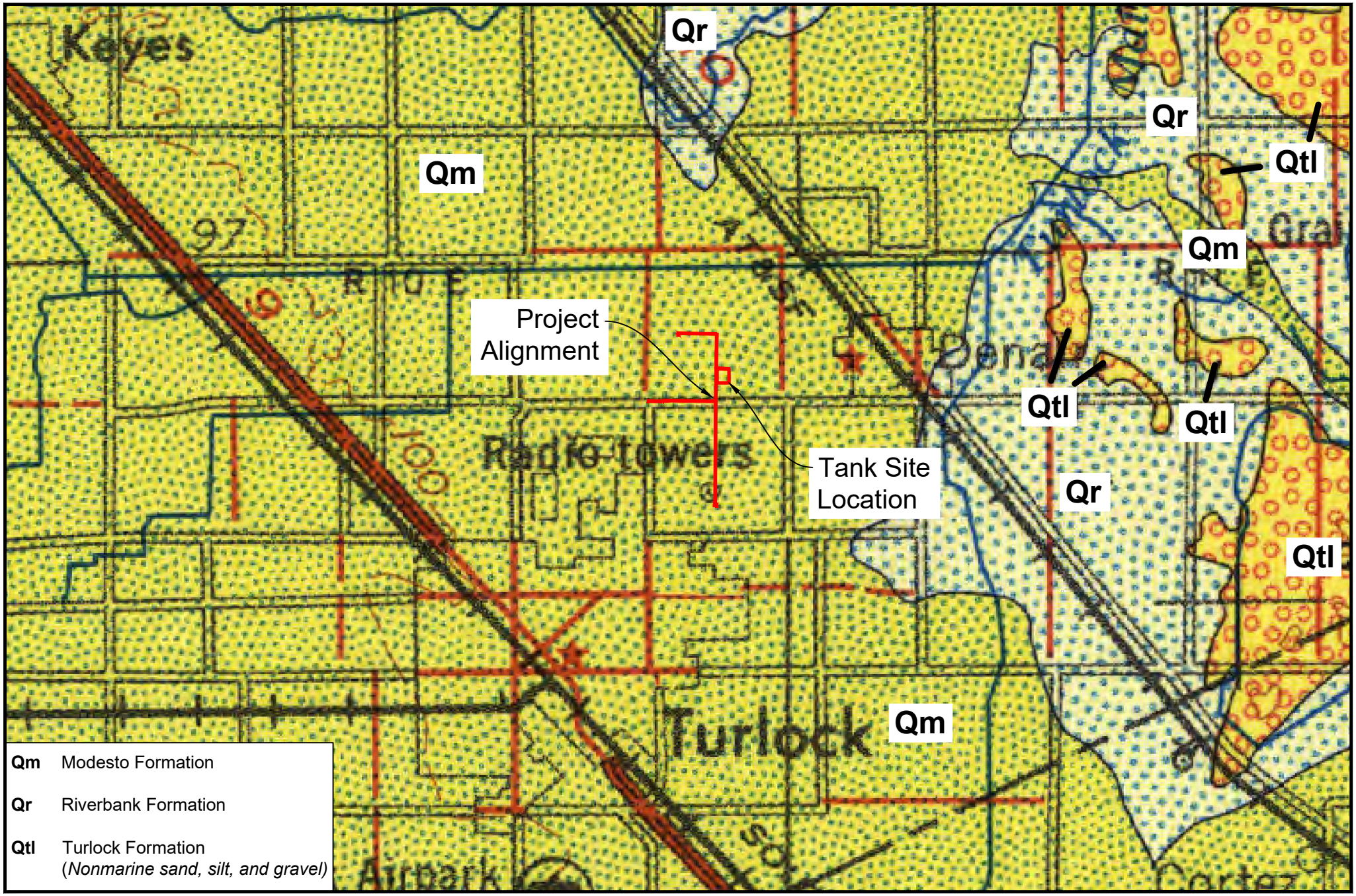
Turlock, CA

Figure 2B
Exploration Location Map

Proj. No:	20-642.1
Scale:	1" = 80'
Date:	05/11/21



North

Source: Wagner, D.L., and Bortugno, E.J., Geologic map of Santa Rosa quadrangle, California 1:250,000. Plave of publication: California Division of Mines and Geology, 1991.

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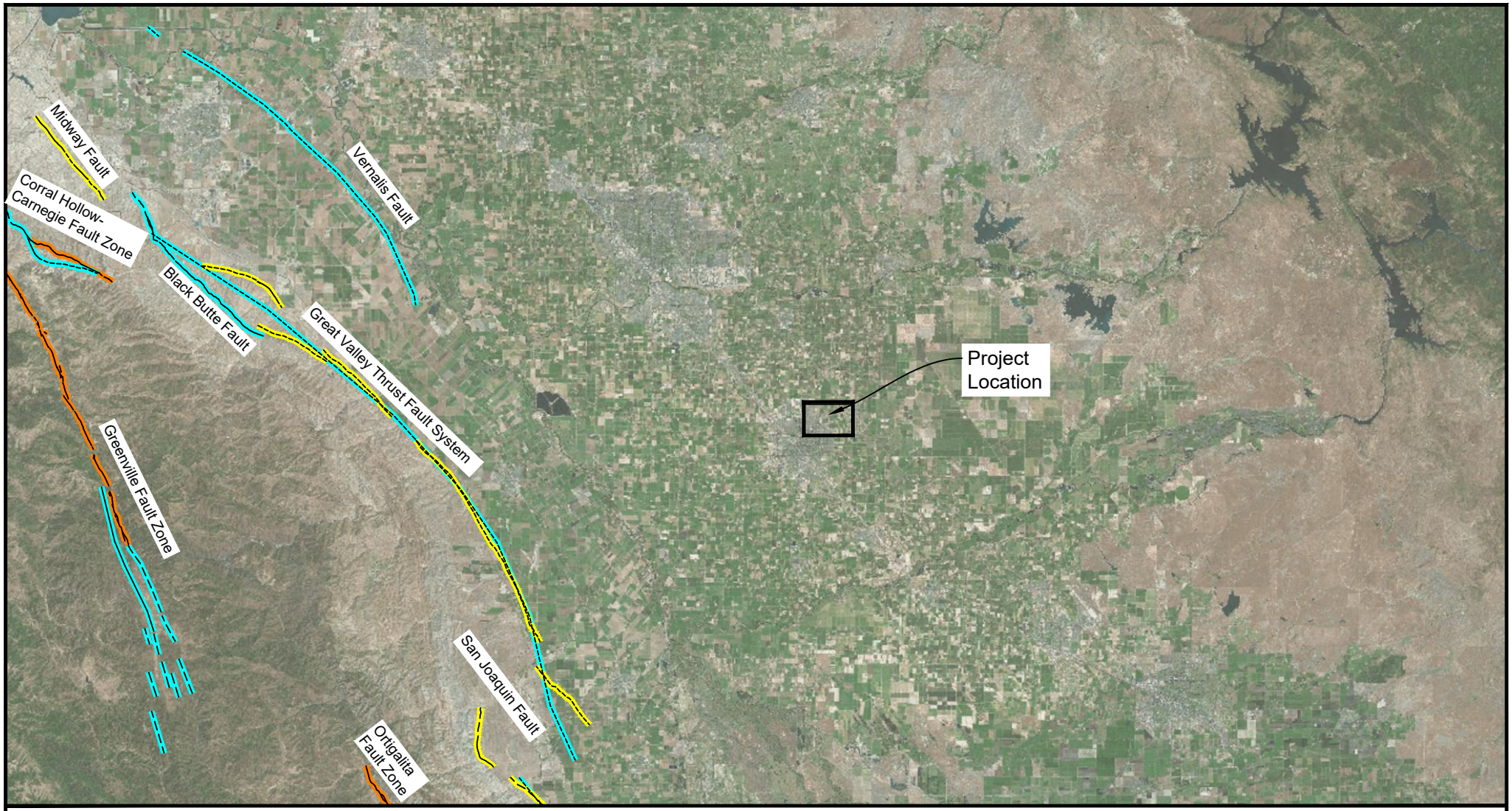
Turlock Water Distribution System Project

Turlock, CA

Figure 3
Geologic Map

Proj. No:	20-642.1
Scale:	1"=5,000'
Date:	05/10/21



LEGEND

Quaternary Fault (Age)	Quaternary Fault (Age)	Location
<150 years	<750,000 years	Well Constrained
<15,000 years	<1.6 million years	Moderately Constrained
<130,000 years		Inferred

North

Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps

Fault Data: USGS GIS Data

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Turlock Water Distribution System Project

Turlock, CA

Figure 4
Fault Activity Map

Proj. No: 20-642.1
Scale: 1"=40,000'
Date: 1/5/21

APPENDIX II

Boring Log Legend
Boring Logs
Existing Boring Data (SRWA)

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435)
CL	Collapse Potential (ASTM D 4546)
CP	Compaction Curve (CTM 216)
CR	Corrosion, Sulfates, Chlorides, pH, Minimum Resistivity (CTM 643, CTM 417, CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
DR	Drained Residual Shear Strength (ASTM D 6467)
DS	Direct Shear (ASTM D 3080)
EI	Expansion Index (ASTM D 4829)
M	Moisture Content (ASTM D 2216)
OC	Organic Content (ASTM D 2974)
P	Permeability (CTM 220)
PA	Particle Size Analysis (ASTM D6913)
PI	Liquid Limit, Plastic Limit, Plasticity Index (ASTM D4318)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T 100)
SW	Swell Potential (ASTM D 4546)
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 7012-C)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 7263)

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler (ID 2.0 in.)
- Modified California Sampler (ID 2.5 in.)
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010) with Errata Sheet (2015).

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60} (blows / 12 inches)
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

LOG OF BORING R-21-001

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 86.50 (ft)

BEGIN DATE: 04/26/2021
COMPLETION DATE: 04/26/2021
SURFACE ELEVATION: 114.80 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 18.2 ft
READING TAKEN: 04/26/21
HAMMER EFFICIENCY: 89.3 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA, 4 in Mud Rotary
DRILL RIG: CME 55 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.0 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1		Bulk					SILTY SAND (SM); medium dense; light brown; moist to dry; mostly medium to fine SAND; some low plasticity fines.	100								
113	2																
112	3		1	8 9 9	18				83								
111	4																
110	5																
109	6		2	4 5 6	11			loose	100				8.2	114.0			
108	7																
107	8		3	50/6				very dense	0								
106	9																
105	10																
104	11		4	11 50/5				CLAYEY SAND (SC); very dense; brown; moist; mostly medium to fine SAND; some low to medium plasticity fines; moderate to strong cementation.	100								
103	12																
102	13																
101	14																
100	15																
99	16		5	25 24 45	69	+4.5		SANDY SILT (ML); dense; light olive brown; dry; mostly low plasticity fines; some fine SAND; strong cementation.	100		22	25	18.6	108.2	48 56		
98	17																
97	18							SILT (ML); dense; gray; wet; mostly low plasticity fines; trace fine SAND.									
96	19																
95	20																Driller notes hard drilling
94	21		6	15 11 14	25	1.00			100								
93	22							Poorly-graded SAND (SP); dense; white and gray; wet; mostly subrounded to subangular SAND; trace fines.									Switched to mud rotary at 21.5 ft
92	23																
91	24							SILTY SAND (SM); very dense; brown; moist; mostly medium to fine SAND; some low plasticity fines.									
90	25																
89	26		7	11 16 26	42				94				14.4	120.0	31		
88	27																
87	28																

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(916) 455-4225

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-21-001
ENTRY BY: HFW
CHECKED BY: HFW/JJW

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD CASING DEPTH	REMARKS
								SILTY SAND (SM) *(continued).*									
85	30																
84	31		8	10 11 16	27			mostly coarse to fine SAND; little fines	67								
83	32																
82	33																
81	34																
80	35		9	7 11 15	26	+4.5			83								
79	36							LEAN CLAY with SAND (CL); dense; brown; wet; mostly low plasticity fines; little fine SAND.			22	34	28.0	95.9	78		
78	37																
77	38							Poorly-graded SAND (SP); very dense; light brown; wet; mostly angular to subangualr, coarse to fine SAND; trace fines.									
76	39																
75	40		10	20 28 36	64				67								
74	41																
73	42																
72	43							SILTY SAND (SM); very dense; light brown; wet; mostly subrounded to subangular SAND; little fines.									
71	44																
70	45		11	17 23 27	50				50								
69	46																
68	47																
67	48																
66	49																
65	50		12	36 30 36	66	+4.5			67								
64	51							SANDY lean CLAY (CL); hard; light brown; moist to dry; mostly medium plasticity fines; some fine SAND; moderate cementation.			19	30					
63	52																
62	53							SANDY SILT (ML); very dense; grayish brown; moist to dry; mostly low plasticity fines; some fine SAND; weak to moderate cementation.									
61	54																
60	55		13	15 31 41	72	+4.5			100								
59	56																
58	57																
57	58							SILT (ML); very dense; grayish brown; moist to dry; mostly low plasticity fines; few fine SAND; weak cementation.									
56	59																
55	60		14	19 28 50/5		+4.5			88								
54	61																
53	62																
52	63																

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
								SILT (ML) *(continued).*										
50	65																	
49	66		15	18 34 50/6		+4.5		weak to moderate cementation	94									
48	67																	
47	68																	
46	69																	
45	70																	
44	71		16	19 35 50/5		+4.5			100									
43	72																	
42	73							SILTY SAND (SM); very dense; grayish brown; moist to dry; mostly fine SAND; little fines.										
41	74																	
40	75																	
39	76		17	13 22 36	58				83									
38	77							SILT with SAND (ML); very dense; grayish brown; moist to dry; mostly low plasticity fines; little fine SAND; weak cementation.										
37	78							SILT (ML); dense; grayish brown; moist to dry; mostly low plasticity fines; trace fine SAND; weak cementation.										
36	79																	
35	80																	
34	81		18	12 20 26	46	4.00			83									
33	82																	
32	83																	
31	84																	
30	85																	
29	86		19	11 16 23	39	3.50		dense	89									
28	87							Bottom of borehole at 86.5 ft bgs										
27	88																	
26	89																	
25	90																	
24	91																	
23	92																	
22	93																	
21	94																	
20	95																	
19	96																	
18	97																	
17	98																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-21-001
ENTRY BY: HFW
CHECKED BY: HFW/JJW

LOG OF BORING R-21-002

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 91.50 (ft)

BEGIN DATE: 04/28/2021
COMPLETION DATE: 04/28/2021
SURFACE ELEVATION: 114.70 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 20.8 ft
READING TAKEN: 04/27/21
HAMMER EFFICIENCY: 89.3 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA, 4 in Mud Rotary
DRILL RIG: CME 55 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1		Bulk 1					SILTY SAND (SM); medium dense; strong brown; moist; mostly medium to fine SAND; some fines.									
113	2																
112	3		1	10 9 10	19				100								
111	4																
110	5																
109	6		2	6 5 4	9			loose; little fines	100				7.9	111.1	22		
108	7		3	2 2 4	6				100								
107	8							SANDY SILT (ML); loose; grayish brown; wet to moist; mostly low plasticity fines; some fine SAND.									
106	9																
105	10																
104	11		4	28 23 50/4		+4.5		very dense; medium to fine SAND; moderate to strong cementation	100								
103	12																
102	13																
101	14							SILTY SAND (SM); medium dense; mostly medium to fine SAND; some low plasticity fines; moderate to strong cementation.									
100	15							medium dense									
99	16		5	3 8 8	16	2.50		SILTY CLAY (CL-ML); very stiff; gray; dry; mostly low plasticity fines; trace SAND; strong cementation.	83		16	23	24.5	106.2	45 58		
98	17																
97	18							Poorly-graded SAND with SILT (SP-SM); dense; light brown; moist to wet; mostly subrounded to subangular, medium to fine SAND; few fines.									
96	19																
95	20																
94	21		6	15 24 28	52				100				15.1	118.9	13		
93	22																
92	23																
91	24																
90	25																
89	26		7	11 26 34	60			wet	100								
88	27																Switched to mud rotary at 26.5 ft.
87	28							SILTY SAND (SM); medium dense; olive brown; wet; mostly fine SAND; some low plasticity fines.									
86																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-21-002
ENTRY BY: HFW
CHECKED BY: HFW/JJW

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD CASING DEPTH	REMARKS
85	30							SILTY SAND (SM) *(continued)*.									
84	31		8	23 19 25	44				94				16.9	115.0			
83	32																
82	33							SANDY SILT (ML); medium dense; grayish brown; moist; mostly low plasticity fines; some fine SAND.									
81	34																
80	35																
79	36		9	13 17 18	35	2.50			72		NP	NP			63		
78	37																
77	38							Poorly-graded SAND (SP); very dense; multicolored: white, light brown, and black; wet; mostly rounded to subangular, coarse to fine SAND; trace fines.									
76	39																
75	40																Driller notes hard drilling
74	41		10	28 38 46	84				67								
73	42																
72	43							SANDY lean CLAY (CL); har; reddish brown; moist; mostly medium to high plasticity fines; some medium to fine SAND; strong cementation.									
71	44																
70	45																
69	46		11	19 26 50/5		+4.5			94								
68	47																
67	48							SILTY SAND (SM); very dense; reddish brown; moist; mostly subrounded to subangualr, coarse to fine SAND; some low plasticity fines.									
66	49																
65	50																
64	51		12	27 43 50/5		+4.5			100								
63	52							SILT (ML); very dense; grayish brown; moist; mostly low to medium plasticity fines; trace fine SAND; strong cementation.									
62	53																
61	54																
60	55																
59	56		13	17 22 41	63	+4.5		dense; moderate cementation no to low plasticity	100								
58	57																
57	58																
56	59																
55	60																
54	61		14	13 25 20	45	+4.5		medium dense	100								
53	62																
52	63																
51																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-21-002
ENTRY BY: HFW
CHECKED BY: HFW/JJW

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD CASING DEPTH	REMARKS
								SILT (ML) *(continued)*.									
50	65																
49	66		15	18 31 47	78	+4.5		very dense; moderate to strong cementation	100								
48	67																
47	68																
46	69																
45	70																
44	71		16	14 24 44	68	+4.5		moderate cementation	100								
43	72																
42	73							Poorly-graded SAND with SILT (SP-SM); very dense; grayish brown; moist; mostly fine SAND; few fines; weak cementation.									
41	74																
40	75																
39	76		17	10 19 37	56	3.50			89								
38	77							SILT (ML); very dense; grayish brown; moist; mostly low plasticity fines; trace fine SAND.									
37	78																
36	79							SILTY SAND (SM); dense; grayish brown; moist; mostly fine SAND; some low plasticity fines; weak cementation.									
35	80																
34	81		18	10 16 24	40				100								
33	82																
32	83							SILT (ML); dense; grayish brown; moist; mostly low plasticity fines; some fine SAND; weak cementation.									
31	84																
30	85																
29	86		19	12 19 26	45	+4.5			100								
28	87																
27	88																
26	89																
25	90																
24	91		20	13 19 30	49	+4.5			100								
23	92							Bottom of borehole at 91.5 ft bgs									
22	93																
21	94																
20	95																
19	96																
18	97																
17	98																
16																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-21-002
ENTRY BY: HFW
CHECKED BY: HFW/JJW

LOG OF BORING R-21-003

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 51.50 (ft)

BEGIN DATE: 04/27/2021
COMPLETION DATE: 04/27/2021
SURFACE ELEVATION: 114.50 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 19.0 ft
READING TAKEN: 04/27/21
HAMMER EFFICIENCY: 89.3 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA, 4 in Mud Rotary
DRILL RIG: CME 55 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1		Bulk					SILTY SAND (SM); medium dense; strong brown; moist to dry; mostly fine SAND; some low plasticity fines; weak cementation.	100								
113	2																
112	3		1	9 12 11	23			medium to fine SAND	100								
111	4																
110	5																
109	6		2	4 2 3	5			very loose	100				7.8	113.5	22		
108	7																
107	8		3	6 37 50/3				very dense; fine SAND	100								driller notes hard drilling
106	9							SANDY SILT (ML); very dense; reddish brown; moist; mostly low to medium plasticity fines; some fine SAND; strong cementation.									
105	10																
104	11		4	23 32 50/6		+4.5			100								Auger chatter approx. between 11 and 15 ft
103	12																
102	13																
101	14																
100	15																
99	16		5	10 11 16	27				100								
98	17							Poorly-graded SAND with GRAVEL (SP); dense; reddish brown; dry; mostly subrounded to subangular, coarse to fine SAND; little subrounded to subanular, fine GRAVEL.									
97	18																
96	19							SILT with SAND (ML); very dense; white; dry; mostly low plasticity fines; little subrounded, coarse to fine SAND; strong cementation.									
95	20																
94	21		6	19 21 26	47				100								driller notes hard drilling
93	22							Poorly-graded SAND (SP); very dense; light brown; wet; mostly medium to fine SAND; trace fines.									
92	23																
91	24							SILTY SAND (SM); medium dense; reddish brown; wet; mostly subangular, medium to fine SAND; some low plasticity fines.									
90	25																
89	26		7	12 13 15	28				100								
88	27																
87	28							SANDY SILT (ML); dense; reddish brown; moist; mostly low plasticity fines; some fine SAND; strong cementation.									
86																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-21-003
ENTRY BY: HFW
CHECKED BY: HFW/JJW

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD CASING DEPTH	REMARKS
85								SANDY SILT (ML) *(continued)*.									
84	30		8	41 30 19	49				72								
83	31																
82	32																
81	33							SILT (ML); dense; multicolored: grayish brown, and reddish brown; mostly low plasticity fines; trace fine SAND.									
80	34																
79	35		9	26 38 40	78	+4.5			78								
78	36																
77	37							Poorly-graded SAND with SILT (SP-SM); dense; multicolored: yellowish brown, and reddish brown; moist to dry; mostly fine SAND; few fines.									
76	38																
75	39							Poorly-graded SAND (SP); dense; light brown; wet; mostly subangular, coarse to fine SAND; trace fines.									
74	40		10	35 32 35	67				67								
73	41																
72	42																
71	43							SANDY SILT (ML); dense; reddish brown; moist; mostly low plasticity fines; some medium to fine SAND; strong cementation.									
70	44																
69	45		11	20 30 37	67	+4.5			89								
68	46																
67	47																
66	48							SILTY SAND (SM); very dense; reddish brown; moist to dry; mostly subrounded to subangular SAND; little fines; weak to moderate cementation.									
65	49																
64	50		12	28 42 50/6					100								
63	51																
62	52							Bottom of borehole at 51.5 ft bgs									
61	53																
60	54																
59	55																
58	56																
57	57																
56	58																
55	59																
54	60																
53	61																
52	62																
51	63																

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-21-003
ENTRY BY: HFW
CHECKED BY: HFW/JJW SHEET # 2 of 2

LOG OF BORING R-20-001

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: S. Carter
DEPTH OF BORING: 86.50 (ft)

BEGIN DATE: 11/10/2020
COMPLETION DATE: 11/10/2020
SURFACE ELEVATION: 115.10 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 20.0 ft
READING TAKEN: 11/10/20
HAMMER EFFICIENCY: 89.5 (%)

DRILLING CONTRACTOR: Gulf Shore
DRILLING METHOD: 8 in HSA, 3.5 in rotary drag bit
DRILL RIG: CME 75 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 8.0 in.
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1							Lean CLAY with SAND (CL); hard; light yellowish brown; moist; little fine SAND; mostly low to medium plasticity, high dry strength, medium toughness fines.									
113	2																
112	3		1	3 6 6	12				83								
111	4					4.50					20	29					torvane = 4 tsf
110	5							CLAYEY SAND (SC); medium dense; dark yellowish brown; moist; mostly fine SAND; little fines.									
109	6		2	3 5 13	18				100				7	111			
108	7							Poorly-graded SAND with CLAY (SP-SC); medium dense; brown; moist; mostly medium to fine SAND; few fines.Lean CLAY with SAND as at 2.5 feet.									
107	8		3	5 15 17	32				100								
106	9							CLAYEY SAND (SC); dense; very pale brown, grading downward to brown; moist; mostly fine SAND; little fines.									
105	10																
104	11		4	9 17 18	35				83				10	120	31		
103	12																
102	13							SILT with SAND (ML); medium dense; strong brown; moist; little medium to fine SAND; mostly nonplastic, medium dry strength, rapid dilatancy fines.									
101	14																
100	15		5	4 8 8	16				100								
99	16												34	90			
98	17																
97	18							Poorly-graded SAND with CLAY (SP-SC); dense; brown; wet; mostly fine SAND; few fines.									
96	19																
95	20		6	12 20 12	32				100								
94	21							CLAYEY SAND (SC); dense; brown; wet; mostly fine SAND; little fines.							35		
93	22																
92	23																
91	24																
90	25		7	10 15 23	38				83								Switch to rotary drilling at 25 ft; no casing.
89	26							SANDY SILT (ML); dense; light olive brown; moist; some fine SAND; mostly nonplastic, high dry strength, rapid dilatancy fines.					23	108			
88	27																
87	28							SILTY SAND (SM); dense; strong brown; wet; mostly fine SAND; little fines.									

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-001
ENTRY BY: SJC
CHECKED BY: HFW

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
								SILTY SAND (SM); dense; strong brown; wet; mostly fine SAND; little fines.										
85	30																	
			8	10 23 25	48				78									
84	31																	
83	32																	Harder drilling reported at 32 ft.
82	33																	
81	34																	
80	35							medium to fine SAND; little fines										
			9	11 17 24	41				72				16	117	13			
79	36																	
78	37																	
77	38																	
76	39							Well-graded SAND with SILT (SW-SM); dense; strong brown; wet; mostly coarse to fine SAND; few fines.										
75	40																	
			10	13 20 19	39				50									No recovery on first sampling attempt; added catcher to retrieve sample.
74	41																	
73	42																	
72	43																	
71	44							CLAYEY SAND (SC); very dense; strong brown; moist; some fine SAND; some low plasticity, high dry strength, no dilatancy, none to low toughness fines.										
70	45																	
			11	17 34 36	70				67									
69	46																	
68	47																	
67	48																	
66	49							SANDY SILT (ML); very dense; light brownish gray; moist; some fine SAND; mostly nonplastic, medium dry strength, rapid dilatancy fines.										
65	50																	
			12	12 22 32	54				100									
64	51																	
63	52																	
62	53																	
61	54																	
60	55																	
			13	13 21 29	50				100									
59	56							dense										
58	57																	
57	58																	
56	59																	
55	60																	
			14	14 34 40	74			very dense	100									
54	61																	
53	62																	
52	63																	

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PROJECT NUMBER: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-001
ENTRY BY: SJC
CHECKED BY: HFW

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
								SANDY SILT (ML); very dense; light brownish gray; moist; some fine SAND; mostly nonplastic, medium dry strength, rapid dilatancy fines.									
50	65		15	12 23 31	54				100								
49	66																
48	67																
47	68																
46	69																
45	70		16	18 30 38	68				78								
44	71							Poorly-graded SAND with CLAY (SP-SC); very dense; dark brown; moist; mostly fine SAND; few fines.									
43	72																
42	73																
41	74							SANDY SILT (ML); dense; grayish brown; moist; some fine SAND; mostly nonplastic, medium dry strength, rapid dilatancy fines.									
40	75		17	18 20 26	46				100								
39	76																
38	77																
37	78																
36	79																
35	80		18	9 15 24	39				83								
34	81																
33	82																
32	83																
31	84																
30	85		19	10 12 22	34				100								
29	86																
28	87							Bottom of borehole at 86.5 ft bgs									
27	88																
26	89																
25	90																
24	91																
23	92																
22	93																
21	94																
20	95																
19	96																
18	97																
17	98																

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PROJECT NUMBER: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-001
ENTRY BY: SJC
CHECKED BY: HFW

LOG OF BORING R-20-002

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: S. Carter
DEPTH OF BORING: 51.50 (ft)

BEGIN DATE: 11/11/2020
COMPLETION DATE: 11/11/2020
SURFACE ELEVATION: 115.10 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 25.0 ft
READING TAKEN: 11/11/20
HAMMER EFFICIENCY: 89.5 (%)

DRILLING CONTRACTOR: Gulf Shore
DRILLING METHOD: 8 in HSA, 3.5 in rotary drag bit
DRILL RIG: CME 75 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 8.0 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1							Poorly-graded SAND with CLAY (SP-SC); loose; dark yellowish brown; moist; mostly medium to fine SAND; few fines.									
113	2																
112	3		1	2 3 6	9				89								
111	4																
110	5		2	2 3 3	6				100								
109	6							reddish brown					7	102			
108	7							SANDY lean CLAY (CL); hard; strong brown; moist; some fine SAND; mostly low plasticity, high dry strength, low toughness fines; weak cementation.									
107	8		3	10 36 50/2	86/8	>4.5			100		19	24					torvane = 3.75 tsf
106	9																
105	10		4	17 22 24	46	>4.5			100								
104	11												16	117			torvane = 4 tsf Unconfined Compressive Strength: 2794 psf Shear Strength: 1397 psf Strain at Failure: 4.8%
103	12																
102	13							CLAYEY SAND (SC); medium dense; moist; yellowish brown; mostly medium to fine SAND; some fines.									
101	14																
100	15		5	3 4 6	10				100								
99	16							SILT with SAND (ML); medium dense; yellowish brown; moist; little fine SAND; mostly nonplastic to low plasticity, very high dry strength, slow to rapid dilatancy, low toughness fines.					32	91			
98	17																
97	18																
96	19																
95	20		6	17 28 29	57			very dense; little SAND; mostly nonplastic, medium dry strength, rapid dilatancy fines	100								
94	21							CLAYEY SAND (SC); very dense; strong brown; moist; mostly medium to fine; some fines.					14	126	50		
93	22																
92	23																
91	24							SANDY SILT (ML); medium dense; light gray; moist; some fine SAND; mostly nonplastic, high dry strength, rapid dilatancy fines.									
90	25		7	3 5 11	16				78								Switch to rotary drilling at 25 ft; no casing.
89	26							grayish brown			23	25	27	101			
88	27							Poorly-graded SAND with SILT (SP-SM); medium dense; gray; wet; mostly medium to fine SAND; few fines; cemented lithic fragments.									
87	28																

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-002
ENTRY BY: SJC
CHECKED BY: HFW

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
85	30							Poorly-graded SAND with SILT (SP-SM); medium dense; gray; wet; mostly medium to fine SAND; few fines; cemented lithic fragments.									
84	31		8	11 14 16	30				0								
83	32																
82	33																
81	34							SANDY SILT (ML); very dense; grayish brown; moist; some medium to fine SAND; mostly nonplastic, rapid dilatancy, high dry strength fines.									
80	35		9	12 27 40	67				83								
79	36																
78	37							Poorly-graded SAND with SILT (SP-SM); very dense; dark yellowish brown; wet; mostly fine SAND; few fines.									
77	38																
76	39																
75	40		10	20 35 32	67				78								
74	41																
73	42																
72	43																
71	44							SILTY SAND (SM); very dense; yellowish brown; moist; mostly medium to fine SAND; some fines.									
70	45		11	20 50/6	50/6				100								
69	46																
68	47																
67	48																
66	49							SANDY SILT (ML); very dense; yellowish brown; moist; some fine SAND; mostly nonplastic, medium dry strength, rapid dilatancy fines.									
65	50		12	20 29 37	66				100								
64	51																
63	52							Bottom of borehole at 51.5 ft bgs									
62	53																
61	54																
60	55																
59	56																
58	57																
57	58																
56	59																
55	60																
54	61																
53	62																
52	63																

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PROJECT NUMBER: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-002
ENTRY BY: SJC
CHECKED BY: HFW

LOG OF BORING R-20-003

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: S. Carter
DEPTH OF BORING: 86.50 (ft)

BEGIN DATE: 11/09/2020
COMPLETION DATE: 11/09/2020
SURFACE ELEVATION: 115.10 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 20.0 ft
READING TAKEN: 11/09/20
HAMMER EFFICIENCY: 89.5 (%)

DRILLING CONTRACTOR: Gulf Shore
DRILLING METHOD: 8 in HSA, 3.5 in rotary drag bit
DRILL RIG: CME 75 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 8.0 in.
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
114	1							CLAYEY SAND (SC); medium dense; dark brown; moist; mostly medium to fine SAND; some fines.										
113	2																	
112	3		1	14 9 7	16				78									
111	4																	
110	5		2	3 4 9	13	2.50		Lean CLAY with SAND (CL); very stiff; olive brown; moist; little fine SAND; mostly medium plasticity, very high dry strength, medium toughness fines.	94				11	106				torvane=1 tsf
109	6																	
108	7							CLAYEY SAND (SC); medium dense; dark brown; moist; mostly medium to fine SAND; some fines.										
107	8		3	10 29 33	62			very dense; light gray; mostly fine SAND; little fines	67									
106	9																	
105	10		4	11 16 16	32			dense; brown; mostly medium to fine SAND; little fines; weak cementation	100									
104	11												9	116	30			
103	12																	
102	13																	
101	14																	
100	15		5	7 14 22	36			strong brown	100									
99	16					4.50		Lean CLAY with SAND (CL); stiff; brown; moist; little fine SAND; mostly medium plasticity, high dry strength, slow dilatancy, medium toughness fines.					23	104				torvane=3 tsf Unconfined Compressive Strength: 2606 psf Shear Strength: 1303 psf Strain at Failure: 5.0%
98	17																	
97	18																	
96	19							CLAYEY SAND (SC); dense; dark yellowish brown; wet; mostly medium to fine SAND; some fines.										
95	20		6	4 9 22	31				100									
94	21														40			
93	22																	
92	23																	
91	24							SILTY CLAY with SAND (CL); stiff; reddish brown; wet; little fine SAND; mostly medium plasticity, high dry strength, slow to rapid dilatancy, medium toughness fines; weak cementation.										Switch to rotary drilling at 25 ft; no casing.
90	25		7	6 8 8	16				94									
89	26					1.75							31	90				Consolidation Test torvane=2 tsf
88	27							SANDY lean CLAY (CL); hard; strong brown; moist; some fine SAND; mostly medium plasticity, very high dry strength, no dilatancy, medium toughness fines.; weak cementation.										
87	28																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-003
ENTRY BY: SJC
CHECKED BY: HFW

FIELD								LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
85	30							SANDY lean CLAY (CL); hard; strong brown; moist; some fine SAND; mostly medium plasticity, very high dry strength, no dilatancy, medium toughness fines.; weak cementation.									
84	31		8	10 14 21	35	>4.5			94		22	43	21	110			torvane=2.5 tsf
83	32																
82	33																
81	34							SANDY SILT (ML); dense; light olive brown; moist; little to some fine sand; mostly nonplastic, medium to high dry strength, rapid dilatancy fines.									
80	35		9	5 14 25	39				94								
79	36												25	103			
78	37																
77	38																
76	39							SILTY SAND (SM); very dense; brown; wet; mostly medium to fine sand; some fines.									
75	40		10	15 33 26	59				94								
74	41																
73	42																
72	43																
71	44							SANDY lean CLAY (CL); hard; brown; wet; some medium to fine SAND; mostly low plasticity, high dry strength, slow dilatancy, low toughness fines.									
70	45		11	20 31 50/5	81/11	>4.5			88								
69	46																torvane=4.75 tsf
68	47																
67	48																
66	49							SILT (ML); very dense; light olive gray; wet to moist; few fine SAND; mostly nonplastic to low plasticity, medium to high dry strength, rapid dilatancy, low toughness fines.									
65	50		12	18 25 38	63				100								
64	51																
63	52																
62	53																
61	54																
60	55		13	18 20 34	54			moist	100								
59	56																
58	57																
57	58																
56	59																
55	60		14	14 26 38	64			oxide stains	100								
54	61																
53	62							Lean CLAY (CL); hard; light yellowish brown; moist; few fine SAND; mostly medium plasticity, high dry strength, no dilatancy, low toughness fines; oxide stains.									
52	63																

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PROJECT NUMBER: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-003
ENTRY BY: SJC
CHECKED BY: HFW

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
50	65							Lean CLAY (CL); hard; light yellowish brown; moist; few fine SAND; mostly medium plasticity, high dry strength, no dilatancy, low toughness fines; oxide stains.									
49	66		15	17 22 32	54	>4.5			100								torvane=4 tsf
48	67																
47	68																
46	69																
45	70		16	13 30 34	64				89								
44	71																
43	72							Poorly-graded SAND with CLAY (SP-SC); very dense; very dark grayish brown; wet; mostly fine SAND; few fines.									
42	73																
41	74							SANDY SILT (ML); dense; dark brown; wet; some fine SAND; mostly nonplastic, medium dry strength, rapid dilatancy fines.									
40	75		17	11 21 24	45	4.00			100								torvane=3.75 tsf
39	76							Lean CLAY (CL); hard; light yellowish brown; moist; few fine SAND; mostly medium plasticity, high dry strength, no dilatancy, low toughness fines.									
38	77																
37	78																
36	79							Lean CLAY with SAND (CL); hard; brown; wet; little fine SAND; mostly low plasticity, medium to high dry strength, no dilatancy, low toughness fines.									
35	80		18	12 18 29	47	>4.5			100								torvane=4.5 tsf
34	81																
33	82																
32	83																
31	84							Lean CLAY (CL); hard; light yellowish brown; few fine SAND; mostly low to medium plasticity, high dry strength, no dilatancy, low toughness fines.									
30	85		19	13 15 21	36	>4.5			100								torvane=3.75 tsf
29	86																
28	87							Bottom of borehole at 86.5 ft bgs									
27	88																
26	89																
25	90																
24	91																
23	92																
22	93																
21	94																
20	95																
19	96																
18	97																
17	98																

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PROJECT NUMBER: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-003
ENTRY BY: SJC
CHECKED BY: HFW

LOG OF BORING A-20-004

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: S. Carter
DEPTH OF BORING: 21.50 (ft)

BEGIN DATE: 11/10/2020
COMPLETION DATE: 11/10/2010
SURFACE ELEVATION: 116.20 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 20.8 ft
READING TAKEN: 11/10/20
HAMMER EFFICIENCY: 89.5 (%)

DRILLING CONTRACTOR: Gulf Shore
DRILLING METHOD: 8 in HSA
DRILL RIG: CME 75 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 8.0 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY									
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
115	1							CLAYEY SAND (SC); medium dense; brown; moist; mostly fine SAND; little fines.										
114	2																	
113	3		1	3 6 7	13				100				5	106				
112	4																	
111	5		2	3 3 4	7			loose	100									
110	6																	
109	7																	
108	8		3	3 3 5	8				100				7	106	16			
107	9																	
106	10		4	19 50/6"	50/6"				100				17	112	38			
105	11							brown; very dense; some medium plasticity, medium too high dry strength, medium toughness fines; weak cementation										
104	12																	
103	13																	
102	14																	
101	15		5	8 8 10	18				100									
100	16							medium dense; yellowish brown grading downward toward light gray at 16 ft; little fines					14	111				
99	17																	
98	18																	
97	19							SILTY CLAY (CL); medium stiff; gray; moist; few fine SAND; mostly medium plasticity, high dry strength, slow dilatancy, medium toughness fines.										
96	20		6	15 20 24	44	1.75			89									torvane=1.75 tsf
95	21							Poorly-graded SAND with CLAY (SP-SC); dense; brown; wet; mostly medium to fine SAND; few fines.										
94	22							Bottom of borehole at 21.5 ft bgs										
93	23																	
92	24																	
91	25																	
90	26																	
89	27																	
88	28																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-004
ENTRY BY: SJC
CHECKED BY: HFW

LOG OF BORING A-20-005

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: S. Carter
DEPTH OF BORING: 23.00 (ft)

BEGIN DATE: 11/11/2020
COMPLETION DATE: 11/11/2020
SURFACE ELEVATION: 115.30 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 21.5 ft
READING TAKEN: 11/11/20
HAMMER EFFICIENCY: 89.5 (%)

DRILLING CONTRACTOR: Gulf Shore
DRILLING METHOD: 8 in HSA
DRILL RIG: CME 75 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 8.0 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY									
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
115								Poorly-graded SAND with CLAY (SP-SC); medium dense; dark grayish brown; moist; mostly fine SAND; few fines.										
114	1																	
113	2																	
112	3		1	2 4 6	10				83									
111	4																	
110	5		2	4 4 4	8			CLAYEY SAND (SC); loose; yellowish brown; moist; mostly fine SAND; little fines.	89									
109	6												12	104				
108	7							SANDY SILT (ML); very dense; light olive brown; moist; some medium to fine SAND; mostly fines.										
107	8		3	8 22 31	53				67									
106	9							fine SAND			23	28	22	99	77			
105	10		4	15 50/6"	50/6"			CLAYEY SAND (SC); very dense; reddish yellow; moist; mostly medium to fine SAND; little fines.	100									
104	11																	
103	12																	
102	13																	
101	14																	
100	15		5	5 12 20	32			dense; brown	94									
99	16																	
98	17																	
97	18																	
96	19							Lean CLAY with SAND (CL); stiff; strong brown; moist to wet; little fine SAND; mostly low to medium plasticity, no dilatancy, medium toughness fines.										
95	20		6	7 18 20	38				50									
94	21	▽				1.00												torvane=3.25
93	22		7	5 7 15	22			Poorly-graded SAND (SP); medium dense; yellowish brown; wet; mostly fine SAND; few fines; grades downward to become trace coarse SAND, mostly medium to fine SAND, few fines.	67									
92	23																	
91	24							Bottom of borehole at 23.0 ft bgs										
90	25																	
89	26																	
88	27																	
87	28																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-005
ENTRY BY: SJC
CHECKED BY: HFW

LOG OF BORING A-20-006

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 21.50 (ft)

BEGIN DATE: 08/25/2020
COMPLETION DATE: 08/25/2020
SURFACE ELEVATION: 114.30 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: 11.2 ft
READING TAKEN: 08/25/20
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY									
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
114			Bulk					Poorly-graded SAND with SILT (SP-SM); light brown; dry; few fines.	100									
113	1																	
112	2																	
111	3		1	8 6 6	12			medium dense; brown	100									
110	4																	
109	5		2	5 5 6	11			SILTY SAND (SM); medium dense; light brown; dry to moist; mostly fine SAND; little fines.	100									
108	6							Poorly-graded SAND with SILT (SP-SM); medium dense; orangish brown; dry; mostly coarse to fine SAND; few fines.					5	112	12			
107	7																	
106	8		3	8 15 30	45			SANDY SILT (ML); dense; brown; dry to moist; some fine SAND; mostly fines.	100				16	88				
105	9																	
104	10		4	50/6	REF			SILTY SAND (SM); dense; brown; moist; mostly fine SAND; little low plasticity fines. very dense; orangish brown; medium to fine SAND	100									
103	11																	
102	12																	
101	13							SILT with SAND (ML); dense; brown; moist to wet; little fine SAND; mostly fines.										
100	14																	
99	15		5	7 14 22	36				100									Driller notes soft drilling 15-20'
98	16												17	111				
97	17																	
96	18							Poorly-graded SAND with SILT (SP-SM); dense; light brown; wet; mostly coarse to fine SAND; few fines.										
95	19																	
94	20		6	4 11 20	31				72									
93	21																	
92	22							Bottom of borehole at 21.5 ft bgs										
91	23																	
90	24																	
89	25																	
88	26																	
87	27																	
86	28																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-006
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING R-20-008

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 31.50 (ft)

BEGIN DATE: 08/26/2020
COMPLETION DATE: 08/26/2020
SURFACE ELEVATION: 112.40 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: 9.5 ft
READING TAKEN: 08/26/20
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA, 4 in Mud Rotary
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
112			Bulk					ASPHALT .	100									AC=4"
111	1							AGGREGATE BASE .										AB=5"
110	2							CLAYEY SAND (SC); medium dense; brown; mostly fine SAND; little fines.										R value = 59
109	3		1	7 6 8	14				100									
108	4							Poorly-graded SAND with SILT (SP-SM); medium dense; brown; trace fine GRAVEL; mostly medium to fine SAND; few fines.										
107	5		2	9 22 32	54				100									
106	6							very dense										
105	7							SILTY SAND (SM); very dense; brown; mostly medium to fine SAND; little fines.										
104	8		3	17 30 47	77				100									
103	9																	
102	10		4	15 25 20	45			dense; brown variegated with orange; trace micas	100									
101	11												23	104				
100	12																	
99	13		5	6 9 12	21			medium dense; tan	100									
98	14							brown mottled with orange					22	110	21			
97	15		6	4 8 12	20			dense; tan	83									Switched to mud rotary; add 8.5' of 4.5" diameter casing
96	16							brown; medium to fine SAND										
95	17																	
94	18							SILT (ML); very dense; brown; some medium to fine SAND; mostly fines.										
93	19																	
92	20		7	21 40 50	90				100									
91	21														60			
90	22																	
89	23																	
88	24																	
87	25		8	17 20 26	46				72									
86	26							dense										
85	27																	
84	28							Poorly-graded SAND with SILT (SP-SM); very dense; brown; mostly coarse to fine SAND; few fines; trace micas.										
83	29																	
82	30		9	21 37 50	87				94									
81	31																	
80	32							Bottom of borehole at 31.5 ft bgs										

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: R-20-008
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING A-20-009

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 21.50 (ft)

BEGIN DATE: 08/24/2020
COMPLETION DATE: 08/24/2020
SURFACE ELEVATION: 113.60 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD											LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
113			Bulk					ASPHALT .	100									AC=3"
	1							AGGREGATE BASE .										AB=3"
112								SILTY SAND (SM); very dense; brown; dry to moist; mostly medium to fine SAND; little fines.										
	2																	Driller notes hard drilling 0-7'
111			1	11 35 50/5	85/11			grayish brown; fine SAND	100		25	28	17	99	21			
	3																	
110																		
	4																	
109																		
	5		2	50/6	REF				100									
108								Poorly-graded SAND (SP); very dense; tan variegated with orange; dry; mostly fine SAND; trace fines.										
	6																	
107																		
	7		3	10 9 20	29			SILT (ML); medium dense; brown; dry; mostly low plasticity, low toughness fines.	100				5	111	1			
106																		
	8																	
105								Poorly-graded SAND (SP); medium dense; tan; dry; mostly coarse to fine SAND; trace fines.										
	9																	
104																		
	10		4	13 21 45	66			Poorly-graded SAND with SILT (SP-SM); very dense; tan; mostly fine SAND; few fines.	100									
103																		
	11							SILTY SAND (SM); very dense; orange mottled with white; mostly coarse to fine SAND; little fines; weak cementation.										
102																		
	12																	
101																		
	13																	
100																		
	14																	
99																		
	15		5	25 45 50/3	95/9			orangish brown; moist	100				10	123				
98																		
	16																	
97																		
	17																	
96																		
	18																	
95																		
	19																	
94																		
	20		6	13 29 30	59			light brown; fine SAND; some fines; trace micas	100									
93																		
	21																	
92								Bottom of borehole at 21.5 ft bgs										
	22																	
91																		
	23																	
90																		
	24																	
89																		
	25																	
88																		
	26																	
87																		
	27																	
86																		
	28																	
85																		

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-009
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING A-20-010

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 21.50 (ft)

BEGIN DATE: 08/26/2020
COMPLETION DATE: 08/26/2020
SURFACE ELEVATION: 116.10 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY									
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
115	1							SILTY SAND (SM); brown; dry to moisy; mostly medium to fine SAND; little fines.										
114	2																	
113	3		1	6 4 7	11			medium dense	100									
112	4																	
111	5		2	9 11 18	29			SANDY SILT (ML); medium dense; brown variegated with orange; moist; some medium to fine SAND; mostly low plasticity fines.	100				16 7	103 116				
110	6																	
109	7		3	14 12 16	28			SILTY SAND (SM); medium dense; brown variegated with orange; dry to moist; mostly fine SAND; little fines; trace micas.	100									
108	8							Poorly-graded SAND with SILT (SP-SM); medium dense; brown; dry to moist; mostly medium to fine SAND; few fines.					7	112	17			
107	9																	
106	10		4	10 19 36	55			SILTY SAND (SM); medium dense; brown; trace fine GRAVEL; moist; mostly coarse to fine SAND; little fines. very dense; reddish brown; dry to moist; medium to fine SAND; weak cementation	100									
105	11																	
104	12																	
103	13																	
102	14																	
101	15		5	20 30 37	67			SANDY SILT (ML); very dense; orangish brown; dry to moist; some medium to fine SAND; mostly low plasticity fines.	100				14	119	63			
100	16																	
99	17																	
98	18							SILTY SAND (SM); medium dense; brown; moist; mostly fine SAND; some low plasticity fines.										
97	19																	
96	20		6	6 10 13	23				100									
95	21																	
94	22							Bottom of borehole at 21.5 ft bgs										
	23																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-010
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING A-20-011

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 21.50 (ft)

BEGIN DATE: 08/26/2020
COMPLETION DATE: 08/26/2020
SURFACE ELEVATION: 114.10 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
113	1							SILTY SAND (SM); brown; dry; mostly medium to fine SAND; little fines.										R value = 65
112	2																	
111	3		1	5 4 5	9			loose	100									
110	4																	
109	5		2	5 4 5	9				100									
108	6							Poorly-graded SAND with SILT (SP-SM); loose; brown; dry to moist; mostly fine SAND; few fines; trace micas.					4	109				
107	7																	
106	8		3	6 5 5	10			SILTY SAND (SM); medium dense; brown; dry to moist; mostly fine SAND; little fines.	100									
105	9							Poorly-graded SAND with SILT (SP-SM); medium dense; orangish brown; dry to moist; mostly medium to fine SAND; few fines.										
104	10		4	6 13 7	20				100									
103	11							brown; fine SAND; nonplastic fines					7	113				
102	12																	
101	13							SILTY SAND (SM); dense; brown variegated with orange; moist; mostly fine SAND; little nonplastic fines.										
100	14																	
99	15		5	7 14 21	35				100									
98	16										0	0	10	117	22			
97	17																	
96	18							Poorly-graded SAND with SILT (SP-SM); very dense; brown; moist; mostly medium to fine SAND; few fines.										
95	19																	
94	20		6	28 46 50/5	96/1				100									
93	21							SILTY SAND (SM); very dense; tan; moist; mostly fine SAND; little fines.										
92	22							Bottom of borehole at 21.5 ft bgs										
91	23																	
90	24																	
89	25																	
88	26																	
87	27																	
86	28																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-011
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING A-20-012

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 31.00 (ft)

BEGIN DATE: 08/25/2020
COMPLETION DATE: 08/25/2020
SURFACE ELEVATION: 113.30 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: 22.6 ft
READING TAKEN: 08/25/20
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
113			Bulk					ASPHALT .	100									AC=3"
112	1							AGGREGATE BASE .										AB=4"
111	2							Poorly-graded SAND with SILT (SP-SM); brown; dry to moist; mostly medium to fine SAND; few fines.										
110	3		1	8 7 7	14			medium dense	100									
109	4																	
108	5		2	6 6 6	12			orangish brown; dry	100									
107	6												6	113				
106	7																	
105	8		3	16 50	50/6			very dense; light brown variegated with orange; moist	100									
104	9							SILTY SAND (SM); very dense; light brown; dry; mostly fine SAND; little fines.										
103	10		4	12 28 50	78				100									
102	11							Poorly-graded SAND with SILT (SP-SM); very dense; orangish brown; dry to moist; mostly medium to fine SAND; few fines.					6	116				
101	12																	
100	13		5	3 25 50	75			SILTY SAND (SM); very dense; brown; dry; mostly fine SAND; some fines.	100									
99	14							medium to fine SAND; little fines										
98	15		6	2 13 34	47				100									
97	16							dense; light brown; dry to moist; trace micas					15	113	44			
96	17																	
95	18																	
94	19																	
93	20		7	19 25 43	68			moist	100									
92	21							very dense; orangish brown; wet										
91	22																	
90	23																	
89	24																	
88	25		8	35 50/5	50/5				100									
87	26																	
86	27																	
85	28																	
84	29																	
83	30		9	25 50	50/6				83									
82	31							Bottom of borehole at 31.0 ft bgs										
81	32																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-012
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING A-20-013

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 21.50 (ft)

BEGIN DATE: 08/24/2020
COMPLETION DATE: 08/24/2020
SURFACE ELEVATION: 111.80 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
			Bulk					ASPHALT .	100								AC=3"
111	1							AGGREGATE BASE .									AB=3"
110	2							Poorly-graded SAND with CLAY (SP-SC); brown; dry to moist; mostly medium to fine SAND; few fines.									R value = 55
109	3		1	6 6 6	12			medium dense	100								
108	4																Driller notes harder drilling 4-5'
107	5		2	50/4	REF			SILTY SAND (SM); very dense; brown; moist; mostly medium to fine SAND; little fines.	0								
106	6		3	50	REF				100				15				
105	7							Lean CLAY with SAND (CL); hard; orangish brown; moist; little fine SAND; mostly medium plasticity, low to medium toughness fines.									
104	8		4	20 29 40	69	+4.5			100		15	26			83		
103	9							CLAYEY SAND (SC); very dense; orangish brown; moist; mostly medium to fine SAND; little fines.									
102	10																Driller notes harder drilling 10-15' and had to add water
101	11		5	19 27 45	72				100				11	126			
100	12																
99	13							Poorly-graded SAND with SILT (SP-SM); very dense; orangish brown; dry to moist; mostly coarse to fine SAND; few fines.									
98	14																
97	15																
96	16		6	16 20 23	43				100				5	113			
95	17																
94	18																
93	19																
92	20																
91	21		7	22 29 32	61			medium to fine SAND	89								
90	22							Poorly-graded SAND (SP); very dense; orange; dry; mostly coarse to fine SAND; trace fines.									
89	23							Bottom of borehole at 21.5 ft bgs									
88	24																

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-013
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING A-20-014

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 31.50 (ft)

BEGIN DATE: 08/24/2020
COMPLETION DATE: 08/24/2020
SURFACE ELEVATION: 110.90 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: 22.0 ft
READING TAKEN: 08/24/20
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY									
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
			Bulk					ASPHALT .	100									
110	1							AGGREGATE BASE .										
109	2							Poorly-graded SAND with CLAY (SP-SC); light brown; dry to moist; mostly medium to fine SAND; few fines.										
108	3		1	8 6 8	14			medium dense; orangish brown	100				6	115				
107	4																	
106	5		2	28 46	96/11			very dense; moist	100									
105	6							Poorly-graded SAND (SP); very dense; tan; dry; mostly medium to fine SAND; trace fines.										
104	7							SILTY SAND (SM); medium dense; light brown; dry; mostly fine SAND; little low plasticity fines; weak cementation.										
103	8		3	13 11 9	20				100									
102	9							Poorly-graded SAND with SILT (SP-SM); medium dense; orangish light brown; mostly medium to fine SAND; few fines.										
101	10		4	50/5	REF			very dense	100									Sampler rebounding
100	11							SILTY SAND (SM); very dense; tan; dry; mostly fine SAND; little low plasticity fines.										
99	12																	
98	13																	
97	14																	
96	15		5	12 23 19	42			mostly coarse to fine SAND; some fines	100						45			
95	16																	
94	17																	
93	18																	
92	19																	
91	20		6	29 44 38	82			brown variegated with orange; moist	100				12	127				Driller notes very easy drilling 20-25'
90	21																	
89	22																	
88	23																	
87	24																	
86	25		7	6 21 23	44			dense; moist to wet	100				13	128				Driller had to add water during drilling
85	26																	
84	27																	
83	28																	
82	29																	
81	30		8	42 20 13	33			tannish brown; wet; weak cementation	100									
80	31																	
79	32							Bottom of borehole at 31.5 ft bgs										

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-014
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING A-20-015

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: KBH
DEPTH OF BORING: 26.50 (ft)

BEGIN DATE: 08/25/2020
COMPLETION DATE: 08/25/2020
SURFACE ELEVATION: 116.90 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.1 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 75 (Track)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY									
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
			Bulk					ASPHALT .	100									AC=2"
116	1							AGGREGATE BASE .										AB=3"
115	2							Poorly-graded SAND with SILT (SP-SM); brown; dry to moist; mostly medium to fine SAND; few fines; trace micas.										
114	3		1	5 5 6	11			medium dense	100									
113	4																	
112	5																	
111	6		2	5 5 5	10			dry	100				5	112				
110	7							SILTY SAND (SM); medium dense; brown; dry to moist; mostly medium to fine SAND; little fines.										
109	8		3	5 4 7	11				100				5	109	19			
108	9																	
107	10																	
106	11		4	17 26 33	59				100									
105	12							very dense; light brown mottled with orange oxidization; dry										
104	13							SILT with SAND (ML); dense; light brown variegated with orange; dry to moist; little fine SAND; mostly low plasticity, low toughness fines.										
103	14																	
102	15																	
101	16		5	7 13 18	31				100				22	97				
100	17																	
99	18							SILTY SAND (SM); very dense; brown; dry to moist; mostly fine SAND; little fines.										
98	19																	
97	20																	
96	21		6	15 50/5	50/5				100									Lenses of SP
95	22							Poorly-graded SAND with SILT (SP-SM); very dense; tan; dry to moist; mostly medium to fine SAND; few fines.										
94	23							SILTY SAND (SM); very dense; brown; moist; mostly medium to fine SAND; little fines.										
93	24																	
92	25																	
91	26		7	12 30 50/5	80/11				100									
90	27							tan mottled with orange; fine SAND; some low plasticity, low toughness fines										
89	28							Bottom of borehole at 26.5 ft bgs										

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: A-20-015
ENTRY BY: KBH
CHECKED BY: HFW

LOG OF BORING P-21-001

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 14.00 (ft)

BEGIN DATE: 04/27/2021
COMPLETION DATE: 04/27/2021
SURFACE ELEVATION: 114.60 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.3 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 55 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Native Cuttings

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
114	1							SILTY SAND (SM); olive brown; dry; mostly fine SAND; some low plasticity fines.										
113	2																	
112	3																	
111	4																	
110	5							SANDY SILT (ML); olive brown; moist; mostly low plasticity fines; some subrounded, medium to fine SAND.										
109	6																	
108	7																	
107	8																	
106	9							SILT (ML); reddish brown; moist; mostly low to medium plasticity fines; trace SAND; strong.										
105	10																	
104	11																	
103	12		1	50/6					100									
102	13		2	20 20	40			dense; some SAND	100						70			
101	14							Bottom of borehole at 14.0 ft bgs										
100	15																	
99	16																	
98	17																	
97	18																	
96	19																	
95	20																	
94	21																	
93	22																	
92	23																	
91	24																	
90	25																	
89	26																	
88	27																	
87	28																	
86																		

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: P-21-001
ENTRY BY: HFW
CHECKED BY: HFW/JJW
SHEET # 1 of 1

LOG OF BORING P-21-002

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 13.50 (ft)

BEGIN DATE: 04/27/2021
COMPLETION DATE: 04/27/2021
SURFACE ELEVATION: 114.50 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.3 (%)

DRILLING CONTRACTOR: GeoEx Subsurface Exploration
DRILLING METHOD: 4.5 in SSA
DRILL RIG: CME 55 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.5 in.
BACKFILL METHOD: Neat Cement Grout

FIELD								LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114								SILTY SAND (SM); brown; moist; mostly fine SAND; some low plasticity; low toughness fines.									
113	1																
112	2																from cuttings
111	3																
110	4							SANDY SILT (ML); brown; moist to wet; mostly fines; some fine SAND; low plasticity fines; low toughness fines.									
109	5																
108	6																from cuttings
107	7																
106	8							SILTY SAND (SM); light brown; moist; mostly fine SAND; some low plasticity fines; low toughness fines; strong cementation.									
105	9																
104	10																
103	11																
102	12		1	15	41			medium dense	100								
101	13			18 23											48		
100	14							Bottom of borehole at 13.5 ft bgs									
99	15																
98	16																
97	17																
96	18																
95	19																
94	20																
93	21																
92	22																
91	23																
90	24																
89	25																
88	26																
87	27																
86	28																

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: P-21-002
ENTRY BY: OMR
CHECKED BY: HFW/JJW
SHEET # 1 of 1

LOG OF BORING P-20-001

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: S.Carter
DEPTH OF BORING: 13.50 (ft)

BEGIN DATE: 11/10/2020
COMPLETION DATE: 11/10/2020
SURFACE ELEVATION: 115.10 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.5 (%)

DRILLING CONTRACTOR: Gulf Shore
DRILLING METHOD: 8 in HSA
DRILL RIG: CME 75 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 8.0 in.
BACKFILL METHOD: Native Cuttings

FIELD									LABORATORY									
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
								Poorly-graded SAND with CLAY (SP-SC); reddish brown; moist; mostly fine SAND; few fines.										from cuttings
114	1																	
113	2																	
112	3																	
111	4							olive brown										from cuttings
110	5																	
109	6																	
108	7																	
107	8																	
106	9							CLAYEY SAND (SC); dense; yellowish brown; moist; mostly fine SAND; some fines.										
105	10																	
104	11																	
103	12		1	8					100									
102	13			20	44													
				24											33			
								Bottom of borehole at 13.5 ft bgs										
101	14																	
100	15																	
99	16																	
98	17																	
97	18																	
96	19																	
95	20																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: P-20-001
ENTRY BY: SJC
CHECKED BY: HFW

LOG OF BORING P-20-002

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: S. Carter
DEPTH OF BORING: 13.50 (ft)

BEGIN DATE: 11/10/2020
COMPLETION DATE: 11/10/2020
SURFACE ELEVATION: 115.20 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.5 (%)

DRILLING CONTRACTOR: Gulf Shore
DRILLING METHOD: 8 in HSA
DRILL RIG: CME 75 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 8.0 in.
BACKFILL METHOD: Native Cuttings

FIELD								LABORATORY									
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1							Poorly-graded SAND with CLAY (SP-SC); reddish brown; moist; mostly fine SAND; few fines.									from cuttings
113	2																
112	3																
111	4							greenish gray									from cuttings
110	5																
109	6							yellowish brown									from cuttings
108	7																
107	8																
106	9							CLAYEY SAND (SC); reddish brown; moist; mostly fine SAND; little fines.									
105	10																
104	11																
103	12		1	10	26			medium dense; brown; medium to fine SAND	100								
102	13			12 14											15		
101	14							Bottom of borehole at 13.5 ft bgs									
100	15																
99	16																
98	17																
97	18																
96	19																
95	20																
94	21																
93	22																
92	23																
91	24																
90	25																
89	26																
88	27																
87	28																

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: P-20-002
ENTRY BY: SJC
CHECKED BY: HFW

LOG OF BORING P-20-003

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: S. Carter
DEPTH OF BORING: 13.50 (ft)

BEGIN DATE: 11/10/2020
COMPLETION DATE: 11/10/2020
SURFACE ELEVATION: 115.30 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 89.5 (%)

DRILLING CONTRACTOR: Gulf Shore
DRILLING METHOD: 8 in HSA
DRILL RIG: CME 75 (truck)
HAMMER TYPE: Automatic; 140 lbs; 30 in drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID)
BOREHOLE DIAMETER: 8.0 in.
BACKFILL METHOD: Native Cuttings

FIELD									LABORATORY								
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
115								CLAYEY SAND (SC); reddish brown; moist; mostly fine SAND; little fines.									from cuttings
114	1																
113	2																
112	3																
111	4																
110	5																
109	6																
108	7							olive brown									from cuttings
107	8																
106	9																
105	10																fine gravel in cuttings starting at 10.5 ft
104	11																
103	12		1	7	46	4.25		dense; reddish brown; few fine, subround GRAVEL, max. dia. 0.75 in	100								
102	13			22 24				SANDY Lean CLAY (CL); hard; brown; moist; some fine SAND; mostly fines.							52		
101	14							Bottom of borehole at 13.5 ft bgs									
100	15																
99	16																
98	17																
97	18																
96	19																
95	20																
94	21																
93	22																
92	23																
91	24																
90	25																
89	26																
88	27																
87	28																

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: P-20-003
ENTRY BY: SJC
CHECKED BY: HFW

LOG OF BORING HA-21-001

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 5.00 (ft)

BEGIN DATE: 04/27/2020
COMPLETION DATE: 04/27/2021
SURFACE ELEVATION: 114.80 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: N/A

DRILLING CONTRACTOR: N/A
DRILLING METHOD: 4 in HA
DRILL RIG: Hand Auger
HAMMER TYPE: N/A
SAMPLER TYPE & SIZE: Bulk
BOREHOLE DIAMETER: 4.0 in.
BACKFILL METHOD: Native Cuttings

FIELD											LABORATORY						
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1		Bulk 1					SILTY SAND (SM); grayish brown; dry; mostly fine SAND; little low plasticity, low toughness fines; trace rootlets. (organic material).	100								
			Bulk 2					brown; moist; some fines.	100								
113	2																
112	3																
111	4																
110	5							Bottom of borehole at 5.0 ft bgs									
109	6																
108	7																
107	8																
106	9																
105	10																
104	11																
103	12																
102	13																
101	14																
100																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: HA-21-001
ENTRY BY: MCC
CHECKED BY:

LOG OF BORING HA-21-002

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 5.00 (ft)

BEGIN DATE: 04/27/2021
COMPLETION DATE: 04/27/2021
SURFACE ELEVATION: 114.70 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: N/A

DRILLING CONTRACTOR: N/A
DRILLING METHOD: 4 in HA
DRILL RIG: Hand Auger
HAMMER TYPE: N/A
SAMPLER TYPE & SIZE: Bulk
BOREHOLE DIAMETER: 4.0 in.
BACKFILL METHOD: Native Cuttings

FIELD									LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1		Bulk 1					SILTY SAND (SM); grayish brown; dry; mostly fine SAND; little fines; (organic material).	100								
113	2		Bulk 2					reddish brown; moist; some low plasticity, low toughness fines.	100								
112	3																
111	4																
110	5							Bottom of borehole at 5.0 ft bgs									
109	6																
108	7																
107	8																
106	9																
105	10																
104	11																
103	12																
102	13																
101	14																
100																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: HA-21-002
ENTRY BY: MCC
CHECKED BY:

LOG OF BORING HA-21-003

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 5.00 (ft)

BEGIN DATE: 04/27/2021
COMPLETION DATE: 04/27/2021
SURFACE ELEVATION: 114.50 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: N/A

DRILLING CONTRACTOR: N/A
DRILLING METHOD: 4 in HA
DRILL RIG: Hand Auger
HAMMER TYPE: N/A
SAMPLER TYPE & SIZE: Bulk
BOREHOLE DIAMETER: 4.0 in.
BACKFILL METHOD: Native Cuttings

FIELD									LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114			Bulk 1					SILTY SAND (SM); grayish brown; dry; mostly fine SAND; little low plasticity, low toughness fines; (organic material).	100								
	1																
113			Bulk 2					reddish brown; moist; some fines.	100								
	2																
112																	
	3																
111																	
	4																
110																	
	5							Bottom of borehole at 5.0 ft bgs									
109																	
	6																
108																	
	7																
107																	
	8																
106																	
	9																
105																	
	10																
104																	
	11																
103																	
	12																
102																	
	13																
101																	
	14																
100																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: HA-21-003
ENTRY BY: MCC
CHECKED BY:

LOG OF BORING HA-21-004

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 5.00 (ft)

BEGIN DATE: 04/29/2021
COMPLETION DATE: 04/29/2021
SURFACE ELEVATION: 114.60 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: N/A

DRILLING CONTRACTOR: N/A
DRILLING METHOD: 4 in HA
DRILL RIG: Hand Auger
HAMMER TYPE: N/A
SAMPLER TYPE & SIZE: Bulk
BOREHOLE DIAMETER: 4.0 in.
BACKFILL METHOD: Native Cuttings

FIELD									LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114			Bulk 1					SILTY SAND (SM); grayish brown; dry; mostly fine SAND; little fines; trace rootlets. (organic material).	100								
	1																
113			Bulk 2					olive brown; moist; some low plasticity, low toughness fines.	100								
	2																
112																	
	3																
111																	
	4																
110																	
	5							Bottom of borehole at 5.0 ft bgs									
109																	
	6																
108																	
	7																
107																	
	8																
106																	
	9																
105																	
	10																
104																	
	11																
103																	
	12																
102																	
	13																
101																	
	14																
100																	

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PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: HA-21-004
ENTRY BY: MCC
CHECKED BY:

LOG OF BORING HA-21-005

PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
LOCATION: Denair, CA
COUNTY: Stanislaus
CLIENT: Carollo Engineering
LOGGED BY: MCC
DEPTH OF BORING: 5.00 (ft)

BEGIN DATE: 04/29/2021
COMPLETION DATE: 04/29/2021
SURFACE ELEVATION: 114.50 (ft)
SURFACE CONDITION: unpaved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: N/A

DRILLING CONTRACTOR: N/A
DRILLING METHOD: 4 in HA
DRILL RIG: Hand Auger
HAMMER TYPE: N/A
SAMPLER TYPE & SIZE: Bulk
BOREHOLE DIAMETER: 4.0 in.
BACKFILL METHOD: Native Cuttings

FIELD									LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
114	1		Bulk 1					SILTY SAND (SM); grayish brown; dry; mostly fine SAND; little low plasticity, low toughness fines; trace rootlets. (organic material).	100								
113	2		Bulk 2					brown; moist; some fines.	100								
112	3																
111	4																
110	5							Bottom of borehole at 5.0 ft bgs									
109	6																
108	7																
107	8																
106	9																
105	10																
104	11																
103	12																
102	13																
101	14																
100																	

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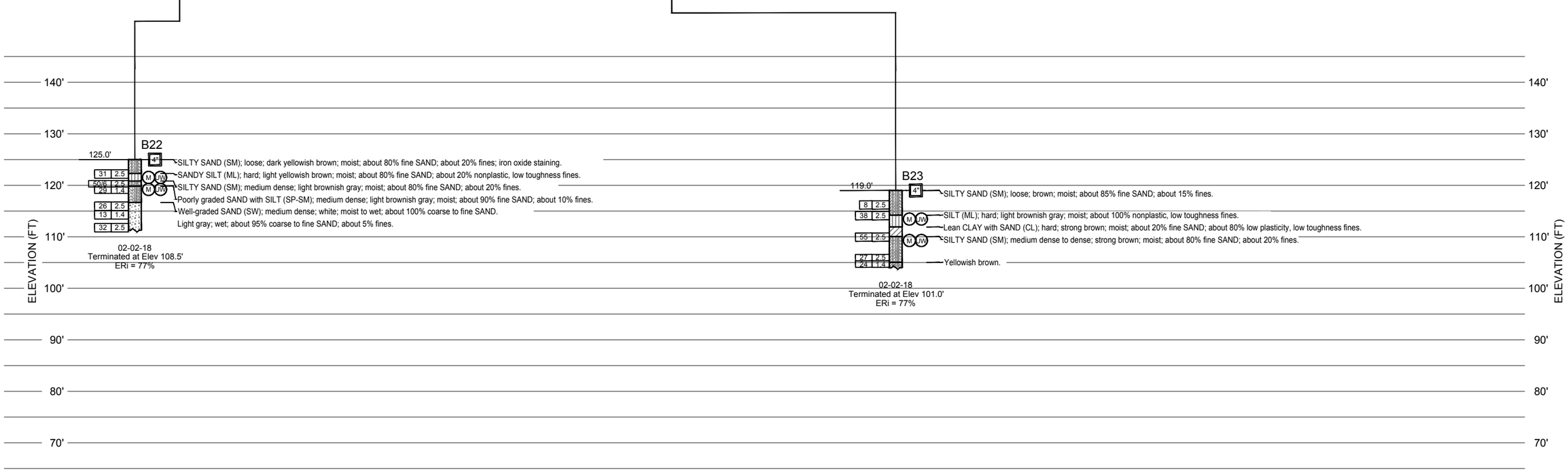
PROJECT NO: 20-642.1
PROJECT: Turlock Water Distribution System
BORING: HA-21-005
ENTRY BY: MCC
CHECKED BY:

PLAN

SCALE: 1"=500'

North



NOTE: ALL BORING ELEVATIONS APPROXIMATED BASED ON GOOGLE EARTH.

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Geotechnical Engineering, Design and Construction Services
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1165 Scenic Drive
Suite B
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Project Mgr.	BDC	3/15/18
Project Eng.	RCG	3/15/18
Checked By	BDC	3/15/18
Drawn By	SJC	3/15/18
	By	Date

Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 12 of 12

Project No.	16-268.2
Scale	1"=5,000'
Date	3/15/18

APPENDIX III

Laboratory Summary
Laboratory Test Results

Project Name: **Turlock Water Distribution System**
Project No: **20-642.1**
Date: **5/19/21**

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Laboratory and Field Test Summary

							Moisture/Density			Classification							Strength									Chemical Analysis			
										Atterberg Limits											Direct Shear		Triaxial-UU	Triaxial-UU (Staged)					
	Boring I.D.	Sample I.D.	Sample Type (inch)	Sampled Depth (ft)	Retained Sample Depth (ft)	USCS	Dry Density (pcf)	Moist. Content (%)	In-Situ Density (pcf)	Liquid Limit	Plastic Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Organic Content (%)	Pocket Pent. (tsf)	R-Value (dim)	Uncon. Comp. (psf)	Point Load (psf)	φ (deg)	c (psf)	c (psf)	φ (deg)	c (psf)	pH	Minimum Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
Tank Site Borings	R-21-001	2	CAL (2.5)	5.0 - 6.5	5.5 - 6.0	SM	114.0	8.2	123.3																				
	R-21-001	5	CAL (2.5)	15.0 - 16.5	15.5 - 15.7	SC									48														
	R-21-001	5	CAL (2.5)	15.0 - 16.5	15.7 - 16.0	ML	108.2	18.6	128.3	25	22	3			56														
	R-21-001	7	SPT (1.4)	25.0 - 26.5	26.0 - 26.5	SM	120.0	14.4	137.3						31														
	R-21-001	9	SPT (1.4)	35.0 - 36.5	36.0 - 36.5	CL	95.9	28.0	122.8	34	22	12			78														
	R-21-001	12	SPT (1.4)	50.0 - 51.5	51.0 - 51.5	CL				30	19	11																	
	R-21-002	2	CAL (2.5)	5.0 - 6.5	5.5 - 6.0	SM	111.1	7.9	119.9						22														
	R-21-002	5	CAL (2.5)	15.0 - 16.5	15.5 - 15.7	SM									45														
	R-21-002	5	CAL (2.5)	15.0 - 16.5	15.7 - 16.0	CL-ML	106.2	24.5	132.2	23	16	7			58														
	R-21-002	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SP-SM	118.9	15.1	136.9																				
	R-21-002	8	CAL (2.5)	30.0 31.5	31.0 31.5	SM	115.0	16.9	134.4																				
	R-21-002	9	CAL (2.5)	35.0 - 36.5	36.0 - 36.5	ML				NP	NP				63														
	R-21-003	2	CAL (2.5)	5.0 - 6.5	6.0 56.5	ML	113.5	7.8	122.4						22														
	P-21-001	2	SPT (1.4)	12.5 - 14.0	13.5 - 14.0	ML									70														
	P-21-002	2	CAL (2.5)	12.5 - 14.0	13.5 - 14.0	SM									48														

Project Name: **Turlock Water Distribution System**
Project No: **20-642.1**
Date: **1/11/20**

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Laboratory and Field Test Summary

	Boring I.D.	Sample I.D.	Sample Type (inch)	Sampled Depth (ft)	Retained Sample Depth (ft)	USCS	Moisture/Density: Dry Density (pcf)	Moisture/Density: Moist. Content (%)	Moisture/Density: In-Situ Density (pcf)	Classification: Atterberg Limits: Liquid Limit	Classification: Atterberg Limits: Plastic Limit	Classification: Atterberg Limits: Plasticity Index	Classification: Gravel (%)	Classification: Sand (%)	Classification: Fines (%)	Classification: Organic Content (%)	Strength: Pocket Pent. (tsf)	Strength: R-Value (dim)	Strength: Uncon. Comp. (psf)	Strength: Point Load (psf)	Strength: Direct Shear: φ (deg)	Strength: Direct Shear: c (psf)	Strength: Triaxial-UU: c (psf)	Strength: Triaxial-UU (Staged): φ (deg)	Strength: Triaxial-UU (Staged): c (psf)	Chemical Analysis: pH	Chemical Analysis: Minimum Resistivity (ohm-cm)	Chemical Analysis: Chloride Content (ppm)	Chemical Analysis: Sulfate Content (ppm)
Pipeline Borings	A-20-006	1	CAL (2.5)	2.5 - 4.0	6.0 - 6.5	SP-SM																							
	A-20-006	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SP-SM	111.9	4.7	117.2						12														
	A-20-006	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	ML	87.5	16.3	101.8																				
	A-20-006	4	CAL (2.5)	10.0 - 10.5	10.0 - 10.5	SM																							
	A-20-006	5	CAL (2.5)	15.0 - 15.5	16.0 - 16.5	ML	110.9	16.8	129.5																				
	A-20-006	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SP-SM																							
	A-20-008	BULK	BULK	0.0 - 5.0	0.0 - 5.0	SC												59											
	A-20-008	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SP-SM																							
	A-20-008	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SP-SM																							
	A-20-008	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	SC																							
	A-20-008	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SM	104.1	22.6	127.6																				
	A-20-008	5	CAL (2.5)	12.5 - 14.0	13.5 - 14.0	SM	110.4	21.5	134.1						21														
	A-20-008	6	SPT (1.4)	15.0 - 16.5	16.0 - 16.5	SC																							
	A-20-008	7	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	ML									60														
	A-20-008	8	CAL (2.5)	25.0 - 26.5	26.0 - 26.5	ML																							
	A-20-008	9	CAL (2.5)	30.0 - 31.5	31.0 - 31.5	SP-SM																							
	A-20-009	BULK	BULK	0.0 - 5.0	0.0 - 5.0	SM																							
	A-20-009	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SM	99.2	16.8	115.9	28	25	3			21														
	A-20-009	2	CAL (2.5)	5.0 - 5.5	5.0 - 5.5	SP																							
	A-20-009	3	CAL (2.5)	7.0 - 8.5	8.0 - 8.5	SP	110.6	5.4	116.6						1														
	A-20-009	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SM																							
	A-20-009	5	CAL (2.5)	15.0 - 16.3	16.0 - 16.3	SM	123.1	10.1	135.5																				
	A-20-009	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SM																							
	A-20-010	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SM																							
	A-20-010	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SM/SP-SM	116.3	6.8	124.2																				
	A-20-010	3	CAL (2.5)	7.0 - 8.5	8.0 - 8.5	SM	112.0	7.3	120.2				1	82	17														
	A-20-010	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SM																							
	A-20-010	5	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	ML	119.1	14.5	136.4						63														
	A-20-010	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SM																							
	A-20-011	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SM				NP	NP	NP						65											
	A-20-011	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SP-SM	108.7	4.4	113.5																				
	A-20-011	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	SP-SM																							
	A-20-011	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SP-SM	113.0	6.7	120.6																				
	A-20-011	5	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	SM	117.7	10.1	129.6						22														
	A-20-011	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SM																							
	A-20-012	BULK	BULK	0.0 - 5.0	0.0 - 5.0	SP-SM																							
	A-20-012	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SP-SM																							
	A-20-012	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SP-SM	112.9	6.5	120.2																				
	A-20-012	3	CAL (2.5)	7.5 - 8.5	8.0 - 8.5	SP-SM																							
	A-20-012	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SP-SM	116.4	6.5	124.0																				
	A-20-012	5	CAL (2.5)	12.5 - 14.0	13.5 - 14.0	SM																							
	A-20-012	6	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	SM	113.0	15.0	130.0						44														
	A-20-012	7	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SM																							
	A-20-012	8	CAL (2.5)	25.0 - 26.0	25.5 - 26.0	SM																							
	A-20-012	9	CAL (2.5)	30.0 - 31.0	30.5 - 31.0	SM																							
	A-20-013	BULK	BULK	0.0 - 5.0	0.0 - 5.0	SP-SC												55											
	A-20-013	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SM																							
	A-20-013	2	CAL (2.5)	5.0 - 5.5	- - -	SM																							
	A-20-013	3	SPT (1.4)	5.5 - 6.0	5.5 - 6.0	SM		15.0																					
	A-20-013	4	CAL (2.5)	7.0 - 8.5	8.0 - 8.5	CL				26	15	11			83														
	A-20-013	5	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SC	125.5	11.4	139.8																				

Project Name: **Turlock Water Distribution System**
Project No: **20-642.1**
Date: **1/11/20**

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Laboratory and Field Test Summary

Pipeline Borings

Boring I.D.	Sample I.D.	Sample Type (inch)	Sampled Depth (ft)	Retained Sample Depth (ft)	USCS	Moisture/Density: Dry Density (pcf)	Moisture/Density: Moist. Content (%)	Moisture/Density: In-Situ Density (pcf)	Classification: Atterberg Limits: Liquid Limit	Classification: Atterberg Limits: Plastic Limit	Classification: Atterberg Limits: Plasticity Index	Classification: Gravel (%)	Classification: Sand (%)	Classification: Fines (%)	Classification: Organic Content (%)	Strength: Pocket Pent. (tsf)	Strength: R-Value (dim)	Strength: Uncon. Comp. (psf)	Strength: Point Load (psf)	Strength: Direct Shear: φ (deg)	Strength: Direct Shear: c (psf)	Strength: Triaxial-UU: c (psf)	Strength: Triaxial-UU (Staged): φ (deg)	Strength: Triaxial-UU (Staged): c (psf)	Chemical Analysis: pH	Chemical Analysis: Minimum Resistivity (ohm-cm)	Chemical Analysis: Chloride Content (ppm)	Chemical Analysis: Sulfate Content (ppm)
A-20-013	6	SPT (1.4)	15.0 - 16.5	16.0 - 16.5	SP-SM	113.0	5.3	119.0																				
A-20-013	7	SPT (1.4)	20.0 - 21.5	21.0 - 21.5	SP																							
A-20-014	BULK	BULK	0.0 - 5.0	0.0 - 5.0	SP-SC																							
A-20-014	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SP-SC	115.2	6.5	122.7																				
A-20-014	2	CAL (2.5)	5.0 - 6.0	5.5 - 6.0	SP																							
A-20-014	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	SP-SM																							
A-20-014	4	CAL (2.5)	10.0 - 10.5	10.0 - 10.5	SM																							
A-20-014	5	SPT (1.4)	15.0 - 16.5	16.0 - 16.5	SM							0	55	45														
A-20-014	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SM	126.9	11.5	141.5																				
A-20-014	7	CAL (2.5)	25.0 - 26.5	26.0 - 26.5	SM	127.6	13.0	144.2																				
A-20-014	8	CAL (2.5)	30.0 - 31.5	31.0 - 31.5	SM																							
A-20-015	BULK	BULK	0.0 - 5.0	0.0 - 5.0	SP-SM																							
A-20-015	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SP-SM																							
A-20-015	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SP-SM	111.8	4.6	116.9																				
A-20-015	3	CAL (2.5)	7.0 - 8.5	8.0 - 8.5	SM	109.0	5.0	114.5						19														
A-20-015	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SM																							
A-20-015	5	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	ML	96.8	22.4	118.5																				
A-20-015	6	CAL (2.5)	20.0 - 21.0	20.5 - 21.0	SP-SM																							
A-20-015	7	CAL (2.5)	25.0 - 26.5	26.0 - 26.5	SM																							

Project Name: **Turlock Water Distribution System**
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Laboratory and Field Test Summary

						Moisture/Density			Classification							Strength									Chemical Analysis			
									Atterberg Limits											Direct Shear		Triaxial-UU	Triaxial-UU (Staged)					
Boring I.D.	Sample I.D.	Sample Type (inch)	Sampled Depth (ft)	Retained Sample Depth (ft)	USCS	Dry Density (pcf)	Moist. Content (%)	In-Situ Density (pcf)	Liquid Limit	Plastic Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Organic Content (%)	Pocket Pent. (tsf)	R-Value (dim)	Uncon. Comp. (psf)	Point Load (psf)	φ (deg)	c (psf)	c (psf)	φ (deg)	c (psf)	pH	Minimum Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
R-20-001	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	CL				29	20	9																	
R-20-001	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SP-SC	110.9	7.1	118.8																				
R-20-001	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	SC																							
R-20-001	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SC	120.2	10.4	132.7						31														
R-20-001	5	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	ML	90.2	34.3	121.1																				
R-20-001	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SC									35														
R-20-001	7	CAL (2.5)	25.0 - 26.5	26.0 - 26.5	ML	108.1	22.9	132.9																				
R-20-001	8	CAL (2.5)	30.0 - 31.5	31.0 - 31.5	SM																							
R-20-001	9	CAL (2.5)	35.0 - 36.5	36.0 - 36.5	SM	117.0	16.3	136.1				0	87	13														
R-20-001	10	CAL (2.5)	40.0 - 41.5	41.0 - 41.5	SW-SM																							
R-20-001	11	CAL (2.5)	45.0 - 46.5	46.5 - 46.5	SC																							
R-20-001	12	CAL (2.5)	50.0 - 51.5	51.5 - 51.5	ML																							
R-20-001	13	CAL (2.5)	55.0 - 56.5	56.0 - 56.5	ML																							
R-20-001	14	CAL (2.5)	60.0 - 61.5	61.0 - 61.5	ML																							
R-20-001	15	CAL (2.5)	65.0 - 66.5	66.0 - 66.5	ML																							
R-20-001	16	CAL (2.5)	70.0 - 71.5	71.0 - 71.5	SP-SC																							
R-20-001	17	CAL (2.5)	75.0 - 76.5	76.0 - 76.5	ML																							
R-20-001	18	CAL (2.5)	80.0 - 81.5	81.0 - 81.5	ML																							
R-20-001	19	CAL (2.5)	85.0 - 86.5	86.0 - 86.0	ML																							
R-20-002	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SP-SC																							
R-20-002	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SP-SC	102.5	6.7	109.4																				
R-20-002	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	CL				24	19	5																	
R-20-002	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	CL	117.1	16.1	136.0										2,794										
R-20-002	5	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	ML	91.0	32.4	120.5																				
R-20-002	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SC	125.6	14.1	143.3						50														
R-20-002	7	CAL (2.5)	25.0 - 26.5	26.0 - 26.5	ML	101.0	26.8	128.1	25	23	2																	
R-20-002	8	CAL (2.5)	30.0 - 31.5	No Recovery	SP-SM																							
R-20-002	9	CAL (2.5)	35.0 - 36.5	36.0 - 36.5	SP-SM																							
R-20-002	10	CAL (2.5)	40.0 - 41.5	41.0 - 41.5	SP-SM																							
R-20-002	11	CAL (2.5)	45.0 - 46.0	46.5 - 46.0	SM																							
R-20-002	12	CAL (2.5)	50.0 - 51.5	51.5 - 51.5	SM																							
R-20-003	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SC																							
R-20-003	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SC	106.2	11.4	118.3																				
R-20-003	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	SC																							
R-20-003	4	CAL (2.5)	10.0 - 11.5	11.0 - 11.5	SC	116.4	9.1	127.0				0	70	30														
R-20-003	5	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	CL	104.1	23.2	128.3										2,606										
R-20-003	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SC									40														
R-20-003	7	CAL (2.5)	25.0 - 26.5	26.0 - 26.5	CL	89.8	31.3	117.9																				
R-20-003	8	CAL (2.5)	30.0 - 31.5	31.0 - 31.5	CL	110.2	20.9	133.2	43	22	21																	
R-20-003	9	CAL (2.5)	35.0 - 36.5	36.0 - 36.5	ML	102.9	24.7	128.3																				
R-20-003	10	CAL (2.5)	40.0 - 41.5	41.0 - 41.5	SM																							
R-20-003	11	CAL (2.5)	45.0 - 46.5	46.5 - 46.5	ML																							
R-20-003	12	CAL (2.5)	50.0 - 51.5	51.5 - 51.5	ML																							
R-20-003	13	CAL (2.5)	55.0 - 56.5	56.0 - 56.5	ML																							
R-20-003	14	CAL (2.5)	60.0 - 61.5	61.0 - 61.5	ML																							
R-20-003	15	CAL (2.5)	65.0 - 66.5	66.0 - 66.5	CL																							
R-20-003	16	CAL (2.5)	70.0 - 71.5	71.0 - 71.5	SP-SC																							
R-20-003	17	CAL (2.5)	75.0 - 76.5	76.0 - 76.5	CL																							
R-20-003	18	CAL (2.5)	80.0 - 81.5	81.0 - 81.5	CL																							
R-20-003	19	CAL (2.5)	85.0 - 86.5	86.0 - 86.0	CL																							

Project Name: **Turlock Water Distribution System**
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Laboratory and Field Test Summary

Pipeline Test Borings

Boring I.D.	Sample I.D.	Sample Type (inch)	Sampled Depth (ft)	Retained Sample Depth (ft)	USCS	Moisture/Density: Dry Density (pcf)	Moisture/Density: Moist. Content (%)	Moisture/Density: In-Situ Density (pcf)	Classification: Atterberg Limits: Liquid Limit	Classification: Atterberg Limits: Plastic Limit	Classification: Atterberg Limits: Plasticity Index	Classification: Gravel (%)	Classification: Sand (%)	Classification: Fines (%)	Classification: Organic Content (%)	Strength: Pocket Pent. (tsf)	Strength: R-Value (dim)	Strength: Uncon. Comp. (psf)	Strength: Point Load (psf)	Strength: Direct Shear: φ (deg)	Strength: Direct Shear: c (psf)	Strength: Triaxial-UU: c (psf)	Strength: Triaxial-UU (Staged): φ (deg)	Strength: Triaxial-UU (Staged): c (psf)	Chemical Analysis: pH	Chemical Analysis: Minimum Resistivity (ohm-cm)	Chemical Analysis: Chloride Content (ppm)	Chemical Analysis: Sulfate Content (ppm)
A-20-004	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SC	106.5	4.9	111.7																				
A-20-004	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SC																							
A-20-004	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	SC	106.2	6.8	113.4				0	84	16														
A-20-004	4	CAL (2.5)	10.0 - 11.0	10.5 - 11.0	SC	112.0	16.6	130.6						38														
A-20-004	5	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	SC	110.6	14.4	126.5																				
A-20-004	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	SP-SC																							
A-20-005	1	CAL (2.5)	2.5 - 4.0	3.5 - 4.0	SP-SC																							
A-20-005	2	CAL (2.5)	5.0 - 6.5	6.0 - 6.5	SC	104.3	12.4	117.2																				
A-20-005	3	CAL (2.5)	7.5 - 9.0	8.5 - 9.0	ML	99.4	21.6	120.9	28	23	5			77														
A-20-005	4	CAL (2.5)	10.0 - 11.0	10.5 - 11.0	SC																							
A-20-005	5	CAL (2.5)	15.0 - 16.5	16.0 - 16.5	SC																							
A-20-005	6	CAL (2.5)	20.0 - 21.5	21.0 - 21.5	CL/SP																							
A-20-005	7	CAL (2.5)	21.5 - 23.0	22.5 - 23.0	SP																							
P-20-001	1	CAL (2.5)	12.0 - 13.5	13.0 - 13.5	SC									33														
P-20-002	1	CAL (2.5)	12.0 - 13.5	13.0 - 13.5	SC									15														
P-20-003	1	CAL (2.5)	12.0 - 13.5	13.0 - 13.5	CL									52														

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 5/14/21
Technician: MCC

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	R-21-001-2B	R-21-001-5B(bottom)	R-21-001-7A	R-21-001-9A	R-21-002-2A
USCS Symbol	SM	ML	SM	CL	SM
Depth (ft.)	5.5	15.9	26	36	5.5
Sample Length (in.)	5.556	1.700	5.785	5.758	4.483
Diameter (in.)	2.396	2.401	1.430	1.421	2.402
Sample Volume (ft^3)	0.01450	0.00445	0.00538	0.00528	0.01176
Total Mass Soil+Tube (g)	1084.9	538.4	454.3	413.3	912.2
Mass of Tube (g)	274.1	279.1	119.4	119.1	273.0
Tare No.	K14	R3	X2	X9	X8
Tare (g)	13.5	127.6	152.3	150.9	150.5
Wet Soil + Tare (g)	83.4	308.3	399.7	345.3	450.9
Dry Soil + Tare (g)	78.1	279.9	368.5	302.8	428.9
Dry Soil (g)	64.6	152.3	216.2	151.9	278.4
Water (g)	5.3	28.4	31.2	42.5	22.0
Moisture (%)	**8.2**	**18.6**	**14.4**	**28.0**	**7.9**
Dry Density (pcf)	**114.0**	**108.2**	**120.0**	**95.9**	**111.1**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 5/14/21
Technician: MCC

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	R-21-002-5B(bottom)	R-21-002-6A	R-21-002-8A	R-21-003-2A	
USCS Symbol	CL-ML	SP-SM	SM	SM	
Depth (ft.)	15.9	21	31	6	
Sample Length (in.)	1.294	5.852	5.639	5.661	
Diameter (in.)	2.399	2.382	2.403	2.390	
Sample Volume (ft^3)	0.00338	0.01509	0.01480	0.01470	
Total Mass Soil+Tube (g)	481.8	1221.4	1178.2	1094.7	
Mass of Tube (g)	278.8	284.6	275.8	278.7	
Tare No.	X4	X7	J10	X1	
Tare (g)	151.4	148.0	13.5	152.3	
Wet Soil + Tare (g)	369.3	565.1	61.0	523.3	
Dry Soil + Tare (g)	326.4	510.3	54.1	496.4	
Dry Soil (g)	175.0	362.3	40.6	344.1	
Water (g)	42.9	54.8	6.9	26.9	
Moisture (%)	**24.5**	**15.1**	**16.9**	**7.8**	
Dry Density (pcf)	**106.2**	**118.9**	**115.0**	**113.5**	

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: MNA

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	R-20-001-2A	R-20-001-4A	R-20-001-5A	R-20-001-7A	R-20-001-9A
USCS Symbol	SP-SC	SC	ML	ML	SM
Depth (ft.)	6	11	16	26	36
Sample Length (in.)	5.555	5.637	5.409	4.840	5.738
Diameter (in.)	2.374	2.370	2.366	2.386	2.363
Sample Volume (ft^3)	0.01423	0.01439	0.01376	0.01253	0.01456
Total Mass Soil+Tube (g)	1037.5	1139.2	1029.9	993.3	1183.8
Mass of Tube (g)	270.8	273.0	274.0	238.5	284.9
Tare No.	A16	2025	G11	D13	2009
Tare (g)	13.7	126.0	13.4	13.8	123.0
Wet Soil + Tare (g)	83.9	425.0	82.4	82.7	494.5
Dry Soil + Tare (g)	79.2	396.9	64.8	69.9	442.3
Dry Soil (g)	65.5	270.9	51.3	56.1	319.3
Water (g)	4.7	28.1	17.6	12.9	52.2
Moisture (%)	**7.1**	**10.4**	**34.3**	**22.9**	**16.3**
Dry Density (pcf)	**110.9**	**120.2**	**90.2**	**108.1**	**117.0**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: MNA

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	R-20-002-2A	R-20-002-4A	R-20-002-5A	R-20-002-6A	R-20-002-7A
USCS Symbol	SP-SC	CL	ML	SC	ML
Depth (ft.)	6	11	16	21	26
Sample Length (in.)	5.683	5.410	5.281	5.580	5.080
Diameter (in.)	2.383	2.378	2.374	2.361	2.357
Sample Volume (ft^3)	0.01467	0.01391	0.01353	0.01414	0.01283
Total Mass Soil+Tube (g)	1006.3	1135.3	999.8	1199.3	1024.2
Mass of Tube (g)	278.6	278.0	260.6	280.1	279.5
Tare No.	F7	140.0	A13	2019	G7
Tare (g)	13.8	14.2	13.8	124.5	13.4
Wet Soil + Tare (g)	91.5	89.6	84.5	491.1	73.5
Dry Soil + Tare (g)	86.6	79.2	67.2	445.7	60.8
Dry Soil (g)	72.8	65.0	53.4	321.2	47.4
Water (g)	4.9	10.4	17.3	45.4	12.7
Moisture (%)	**6.7**	**16.1**	**32.4**	**14.1**	**26.8**
Dry Density (pcf)	**102.5**	**117.1**	**91.0**	**125.6**	**101.0**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: MNA/OMR

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	R-20-003-2A	R-20-003-4A	R-20-003-5A	R-20-003-8A	R-20-003-9A
USCS Symbol	SC	SC	CL	CL	ML
Depth (ft.)	6	11	16	31	36
Sample Length (in.)	4.997	4.790	5.333	5.627	4.724
Diameter (in.)	2.391	2.375	2.373	2.367	2.390
Sample Volume (ft^3)	0.01298	0.01228	0.01364	0.01433	0.01226
Total Mass Soil+Tube (g)	971.3	982.4	793.6	1155.3	988.5
Mass of Tube (g)	274.9	275.0	0.0	289.0	274.5
Tare No.	D4	1001	108.0	126	141
Tare (g)	13.7	125.1	14.3	14.3	13.9
Wet Soil + Tare (g)	67.9	398.2	89.7	89.2	58.2
Dry Soil + Tare (g)	62.3	375.4	75.5	76.3	49.4
Dry Soil (g)	48.6	250.3	61.2	62.0	35.5
Water (g)	5.5	22.8	14.2	13.0	8.8
Moisture (%)	**11.4**	**9.1**	**23.2**	**20.9**	**24.7**
Dry Density (pcf)	**106.2**	**116.4**	**104.1**	**110.2**	**102.9**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 1/12/21
Technician: LAD

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-20-004-1A	A-20-004-3A	A-20-004-4A	A-20-004-5A	A-20-005-2A
USCS Symbol	SC	SC	SC	SC	SC
Depth (ft.)	3.5	8.5	10.5	16	6
Sample Length (in.)	5.761	5.346	4.781	5.308	5.659
Diameter (in.)	2.419	2.378	2.398	2.370	2.382
Sample Volume (ft^3)	0.01532	0.01374	0.01250	0.01355	0.01459
Total Mass Soil+Tube (g)	992.4	987.5	1010.0	1056.7	1055.7
Mass of Tube (g)	215.8	280.7	269.9	279.3	279.1
Tare No.	F9	1020	2020	G11	139
Tare (g)	13.7	126.5	124.4	13.4	14.0
Wet Soil + Tare (g)	69.2	333.5	338.0	75.2	71.7
Dry Soil + Tare (g)	66.6	320.3	307.6	67.4	65.3
Dry Soil (g)	52.9	193.8	183.2	54.0	51.3
Water (g)	2.6	13.2	30.4	7.8	6.4
Moisture (%)	**4.9**	**6.8**	**16.6**	**14.4**	**12.4**
Dry Density (pcf)	**106.5**	**106.2**	**112.0**	**110.6**	**104.3**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 1/12/21
Technician: LAD

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-20-005-3A				
USCS Symbol	ML				
Depth (ft.)	8.5				
Sample Length (in.)	5.293				
Diameter (in.)	2.379				
Sample Volume (ft^3)	0.01362				
Total Mass Soil+Tube (g)	1019.5				
Mass of Tube (g)	273.3				
Tare No.	2035				
Tare (g)	127.8				
Wet Soil + Tare (g)	377.2				
Dry Soil + Tare (g)	332.9				
Dry Soil (g)	205.1				
Water (g)	44.3				
Moisture (%)	**21.6**				
Dry Density (pcf)	**99.4**				

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distubution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: CAP/LAD/MNA

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-20-006-2A	A-20-006-3A	A-20-006-5A	R-20-008-4A	R-20-008-5A
USCS Symbol	SP-SM	ML	ML	SM	SM
Depth (ft.)	6	8.5	16	11	13.5
Sample Length (in.)	6.002	4.021	5.258	5.937	5.334
Diameter (in.)	2.383	2.388	2.398	2.384	2.330
Sample Volume (ft^3)	0.01548	0.01042	0.01374	0.01534	0.01316
Total Mass Soil+Tube (g)	1101.4	759.4	1087.2	1166.9	1083.6
Mass of Tube (g)	278.2	278.2	279.9	279.1	282.5
Tare No.	2016	106	156	130	1006
Tare (g)	123.0	21.5	21.7	14.2	125.1
Wet Soil + Tare (g)	392.8	71.6	131.0	59.1	425.7
Dry Soil + Tare (g)	380.7	64.6	115.3	50.8	372.5
Dry Soil (g)	257.7	43.0	93.6	36.6	247.4
Water (g)	12.1	7.0	15.7	8.3	53.2
Moisture (%)	**4.7**	**16.3**	**16.8**	**22.6**	**21.5**
Dry Density (pcf)	**111.9**	**87.5**	**110.9**	**104.1**	**110.4**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distubution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: CAP/LAD/MNA

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-20-009-1A	A-20-009-3A	A-20-009-5A	A-20-010-2A(top)	A-20-010-2A(bottom)
USCS Symbol	SM	SP	SM	SM	SP-SM
Depth (ft.)	3.5	8.5	16	6	6.1
Sample Length (in.)	5.964	5.952	5.980	1.351	4.648
Diameter (in.)	2.399	2.316	2.395	2.391	2.391
Sample Volume (ft^3)	0.01560	0.01450	0.01558	0.00351	0.01208
Total Mass Soil+Tube (g)	1099.9	1046.9	1237.0	190.1	680.0
Mass of Tube (g)	279.9	280.0	279.1	0.0	0.0
Tare No.	R8	2008	113	D12	110
Tare (g)	130.7	122.9	14.2	13.7	14.0
Wet Soil + Tare (g)	402.5	358.1	80.5	58.9	64.3
Dry Soil + Tare (g)	363.5	346.1	74.4	52.6	61.1
Dry Soil (g)	232.8	223.2	60.3	38.9	47.1
Water (g)	39.0	12.0	6.1	6.4	3.2
Moisture (%)	**16.8**	**5.4**	**10.1**	**16.3**	**6.8**
Dry Density (pcf)	**99.2**	**110.6**	**123.1**	**102.6**	**116.3**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distubution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: CAP/LAD/MNA

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-20-010-3A	A-20-010-5A	A-20-011-2A	A-20-011-4A	A-20-011-5A
USCS Symbol	SM	ML	SP-SM	SP-SM	SM
Depth (ft.)	8	16	6	11	16
Sample Length (in.)	4.977	5.576	5.988	6.005	6.007
Diameter (in.)	2.381	2.392	2.379	2.384	2.408
Sample Volume (ft^3)	0.01282	0.01450	0.01540	0.01551	0.01583
Total Mass Soil+Tube (g)	698.9	1175.0	1069.9	1102.6	1167.2
Mass of Tube (g)	0.0	278.5	277.0	254.4	236.0
Tare No.	2017	2001	G22	H24	2012
Tare (g)	123.4	125.8	13.6	13.5	122.2
Wet Soil + Tare (g)	354.1	367.0	58.0	76.0	364.4
Dry Soil + Tare (g)	338.4	336.5	56.2	72.1	342.1
Dry Soil (g)	215.0	210.7	42.6	58.6	219.9
Water (g)	15.7	30.5	1.9	3.9	22.3
Moisture (%)	**7.3**	**14.5**	**4.4**	**6.7**	**10.1**
Dry Density (pcf)	**112.0**	**119.1**	**108.7**	**113.0**	**117.7**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distubution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: CAP/LAD/MNA

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-20-012-2A	A-20-012-4A	A-20-012-6A	A-20-013-3A	A-20-013-5A
USCS Symbol	SP-SM	SP-SM	SM	SM	SC
Depth (ft.)	6	11	15.5	5.5	10
Sample Length (in.)	6.012	6.000	5.659	-	6.001
Diameter (in.)	2.388	2.390	2.388	-	2.395
Sample Volume (ft^3)	0.01558	0.01557	0.01467	-	0.01565
Total Mass Soil+Tube (g)	1128.1	1155.4	1142.2	-	1271.7
Mass of Tube (g)	278.8	279.3	277.9	-	279.5
Tare No.	125	123	P2	105	H4
Tare (g)	14.3	13.9	126.7	14.0	13.4
Wet Soil + Tare (g)	72.9	83.2	358.5	57.5	75.1
Dry Soil + Tare (g)	69.3	79.0	328.3	51.8	68.8
Dry Soil (g)	55.0	65.1	201.6	37.8	55.4
Water (g)	3.6	4.3	30.2	5.7	6.3
Moisture (%)	**6.5**	**6.5**	**15.0**	**15.0**	**11.4**
Dry Density (pcf)	**112.9**	**116.4**	**113.0**	**-**	**125.5**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distubution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: CAP/LAD/MNA

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-20-013-6A	A-20-014-1A	A-20-014-6A	A-20-014-7A	A-20-015-2A
USCS Symbol	SP-SM	SP-SC	SM	SM	SP-SM
Depth (ft.)	16	3.5	21	26	6
Sample Length (in.)	6.004	5.972	5.989	5.960	5.997
Diameter (in.)	1.405	2.375	2.384	2.364	2.391
Sample Volume (ft^3)	0.00539	0.01531	0.01547	0.01514	0.01558
Total Mass Soil+Tube (g)	409.3	1132.4	1275.0	1269.7	1104.8
Mass of Tube (g)	118.7	280.4	281.7	279.6	278.0
Tare No.	158	B3	134	144	142
Tare (g)	14.1	13.8	14.0	14.1	13.9
Wet Soil + Tare (g)	56.5	85.9	84.7	86.3	60.8
Dry Soil + Tare (g)	54.4	81.5	77.4	78.0	58.7
Dry Soil (g)	40.3	67.7	63.4	63.9	44.7
Water (g)	2.1	4.4	7.3	8.3	2.1
Moisture (%)	**5.3**	**6.5**	**11.5**	**13.0**	**4.6**
Dry Density (pcf)	**113.0**	**115.2**	**126.9**	**127.6**	**111.8**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distubution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: CAP/LAD/MNA

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-20-015-3A	A-20-015-5A			
USCS Symbol	SM	ML			
Depth (ft.)	8	16			
Sample Length (in.)	5.989	5.992			
Diameter (in.)	2.403	2.398			
Sample Volume (ft^3)	0.01572	0.01566			
Total Mass Soil+Tube (g)	1094.2	1119.9			
Mass of Tube (g)	278.0	278.4			
Tare No.	1009	154			
Tare (g)	126.0	14.1			
Wet Soil + Tare (g)	420.4	73.9			
Dry Soil + Tare (g)	406.4	62.9			
Dry Soil (g)	280.4	48.9			
Water (g)	14.0	11.0			
Moisture (%)	**5.0**	**22.4**			
Dry Density (pcf)	**109.0**	**96.8**			

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 5/14/21
Technician: MCC

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	R-21-001-5B(T)	R-21-001-5B(B)	R-21-001-7A	R-21-001-9A	R-21-002-2A
USCS Symbol	SC	ML	SM	CL	SM
Depth (ft.)	15.5	15.9	26	36	5.5
Tare No.	Q2	R3	X2	X9	X8
Tare (g)	126.6	127.6	152.3	150.9	150.5
Dry Soil + Tare (g)	329.4	279.9	368.5	302.8	428.9
Dry Mass before (g)	202.8	152.3	216.2	151.9	278.4
Dry Mass after (g)	104.6	66.4	149.1	33.9	217.0
Percent Fines (%)	48	56	31	78	22

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20.642.1
Date: 5/17/21
Technician: MCC

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	R-21-002-5B(T)	R-21-002-5B(B)	R-21-002-6A	R-21-002-9B	R-21-003-2A
USCS Symbol	SM	CL-ML	SP-SM	ML	SM
Depth (ft.)	15.5	15.9	21	35.5	6
Tare No.	Q6	X4	X7	X5	X1
Tare (g)	125.5	151.4	148	149.3	152.3
Dry Soil + Tare (g)	279.9	326.4	510.3	422.9	496.4
Dry Mass before (g)	154.4	175.0	362.3	273.6	344.1
Dry Mass after (g)	84.8	74.1	314.0	101.3	266.9
Percent Fines (%)	45	58	13	63	22

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 5/18/21
Technician: MCC

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	P-21-001-2A	P-21-002-1A			
USCS Symbol	ML	SM			
Depth (ft.)	13.5	13			
Tare No.	Q5	Q7			
Tare (g)	126.6	125.4			
Dry Soil + Tare (g)	308.6	415.6			
Dry Mass before (g)	182.0	290.2			
Dry Mass after (g)	53.9	150.4			
Percent Fines (%)	70	48			

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/15/20
Technician: MNA

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	R-20-001-4A	R-20-001-6A	R-20-002-6A	R-20-003-6A	
USCS Symbol	SC	SC	SC	SC	
Depth (ft.)	11	21	21	21	
Tare No.	2025	2036	2019	R5	
Tare (g)	126	124.1	124.5	126.2	
Dry Soil + Tare (g)	396.9	439.3	445.7	419.9	
Dry Mass before (g)	270.9	315.2	321.2	293.7	
Dry Mass after (g)	187.2	203.5	161.9	175.2	
Percent Fines (%)	31	35	50	40	

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 1/12/21
Technician: MNA/LAD

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	A-20-004-4A	A-20-005-3A	P-20-001-1	P-20-002-1	P-20-003-1
USCS Symbol	SC	ML	SC	SC	CL
Depth (ft.)	10.5	8.5	13	13	13
Tare No.	2020	2035	2037	1008	R18
Tare (g)	124.4	127.8	120.3	126.3	129.7
Dry Soil + Tare (g)	307.6	332.9	428.1	376.7	384.5
Dry Mass before (g)	183.2	205.1	307.8	250.4	254.8
Dry Mass after (g)	113.7	46.8	205.0	213.0	123.3
Percent Fines (%)	38	77	33	15	52

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/14/20
Technician: CAP/LAD

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	A-20-006-2A	R-20-008-5A	R-20-008-7A	A-20-009-1A	A-20-009-3A
USCS Symbol	SP-SM	SM	ML	SM	SP
Depth (ft.)	6	13.5	21	3.5	8.5
Tare No.	2016	1006	P10	R8	2008
Tare (g)	123	125.1	130.8	130.7	122.8
Dry Soil + Tare (g)	380.7	372.5	385.3	363.5	328.2
Dry Mass before (g)	257.7	247.4	254.5	232.8	205.4
Dry Mass after (g)	228.0	195.2	101.5	183.1	203.3
Percent Fines (%)	12	21	60	21	1

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/14/20
Technician: CAP/LAD

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

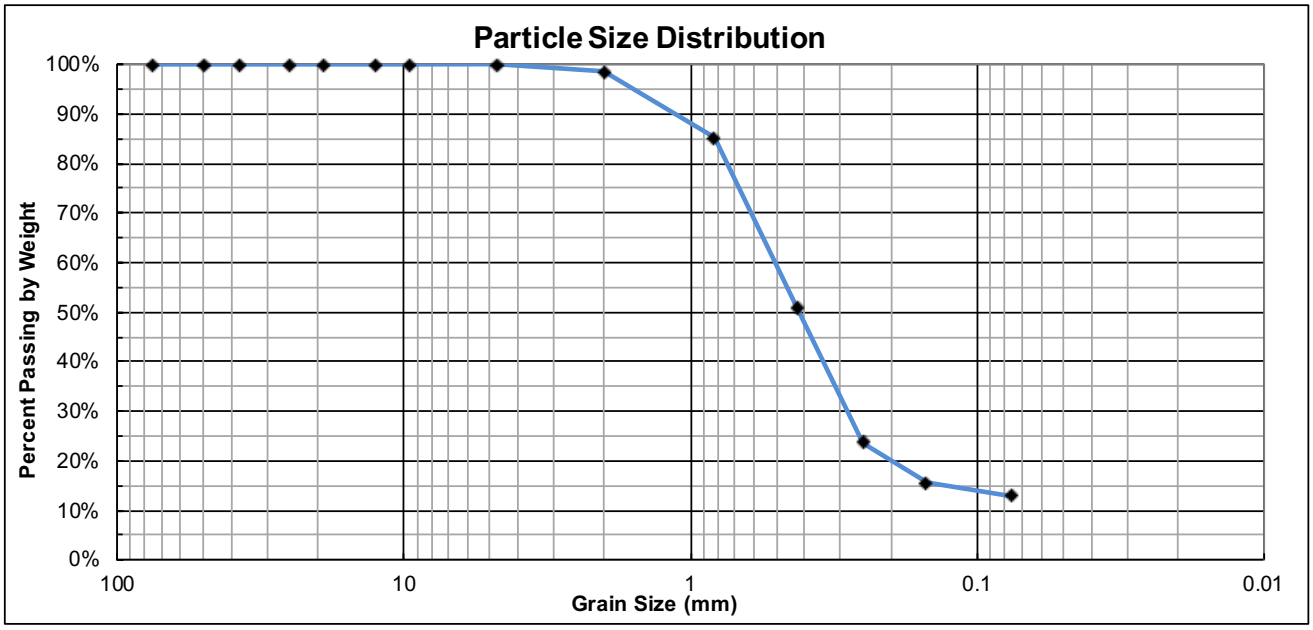
Sample No.	A-20-010-5A	A-20-011-5A	A-20-12-6A	A-20-013-4A	A-20-015-3A
USCS Symbol	ML	SM	SM	CL	SM
Depth (ft.)	16	16	15.5	8	8
Tare No.	2001	2012	P2	P5	1007
Tare (g)	125.8	122.2	126.7	131.6	126.6
Dry Soil + Tare (g)	336.5	342.1	328.3	332.8	406.4
Dry Mass before (g)	210.7	219.9	201.6	201.2	279.8
Dry Mass after (g)	77.4	170.9	112.7	34.9	228.0
Percent Fines (%)	63	22	44	83	19

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/17/20
Technician: MNA
Sample ID: R-20-001-9A
Depth (ft): 36
USCS Classification: Silty Sand (SM)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt/Clay
	0	0	1	48	38	
0	**0**		**87**			**13**

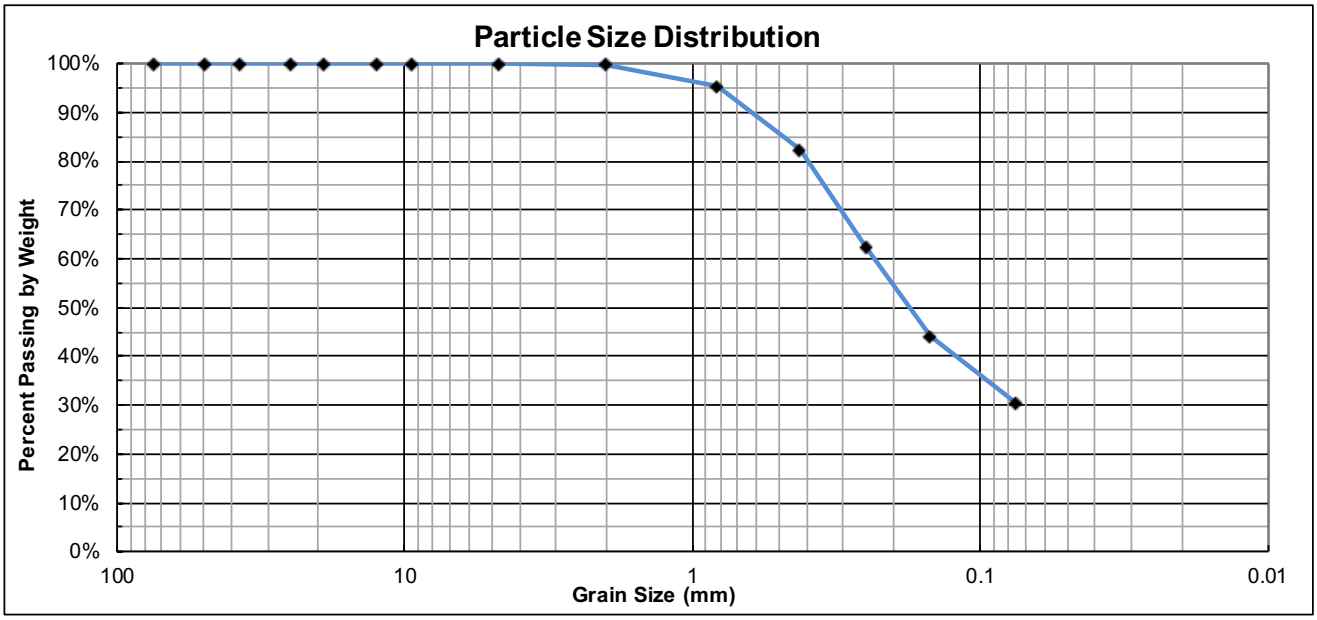
		Sieve #	Opening mm	Cummulative Mass Retained (g)	% Passing %
Cobbles		**3"**	75	0.0	100%
Gravel	Coarse	**2"**	50	0.0	100%
		1-1/2"	37.5	0.0	100%
		1"	25.0	0.0	100%
		3/4"	19.0	0.0	100%
	Fine	**1/2"**	12.5	0.0	100%
		3/8"	9.50	0.0	100%
		#4	4.75	0.3	100%
Sand	Coarse	**#10**	2.00	4.6	99%
	Medium	**#20**	0.825	47.6	85%
		#40	0.425	156.6	51%
	Fine	**#60**	0.250	243.7	24%
		#100	0.150	269.5	16%
		#200	0.075	278.4	13%

Coefficient of Uniformity	Coefficient of Curvature
Cu = NA	Cc = NA

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/17/20
Technician: MNA
Sample ID: R-20-003-4A
Depth (ft): 11
USCS Classification: Clayey Sand (SC)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt/Clay
	0	0	0	18	52	
0	**0**		**70**			**30**

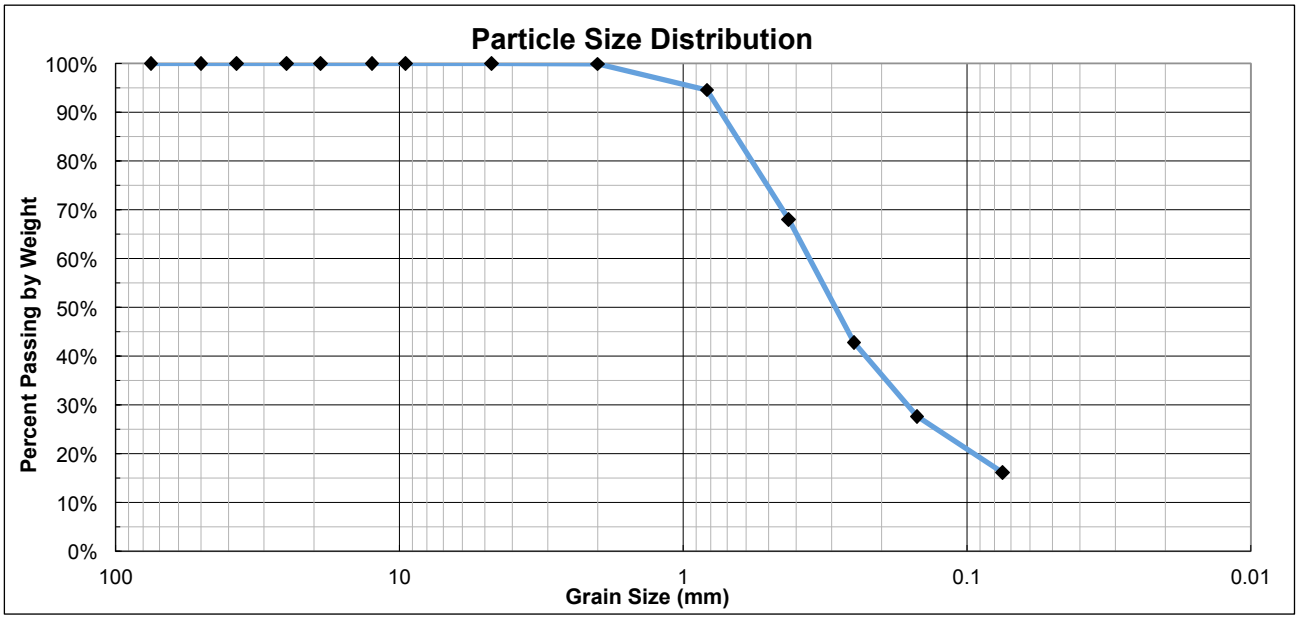
		Sieve #	Opening mm	Cummulative Mass Retained (g)	% Passing %
Cobbles		**3"**	75	0.0	100%
Gravel	Coarse	**2"**	50	0.0	100%
		1-1/2"	37.5	0.0	100%
		1"	25.0	0.0	100%
		3/4"	19.0	0.0	100%
	Fine	**1/2"**	12.5	0.0	100%
		3/8"	9.50	0.0	100%
		#4	4.75	0.0	100%
Sand	Coarse	**#10**	2.00	0.8	100%
	Medium	**#20**	0.825	11.8	95%
		#40	0.425	44.5	82%
	Fine	**#60**	0.250	94.1	62%
		#100	0.150	140.2	44%
		#200	0.075	174.3	30%

Coefficient of Uniformity	Coefficient of Curvature
Cu = NA	Cc = NA

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 1/13/21
Technician: MNA
Sample ID: A-20-004-3A
Depth (ft): 8.5
USCS Classification: CLAYEY SAND (SC)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt/Clay
	0	0	0	32	52	
0	**0**		**84**			**16**

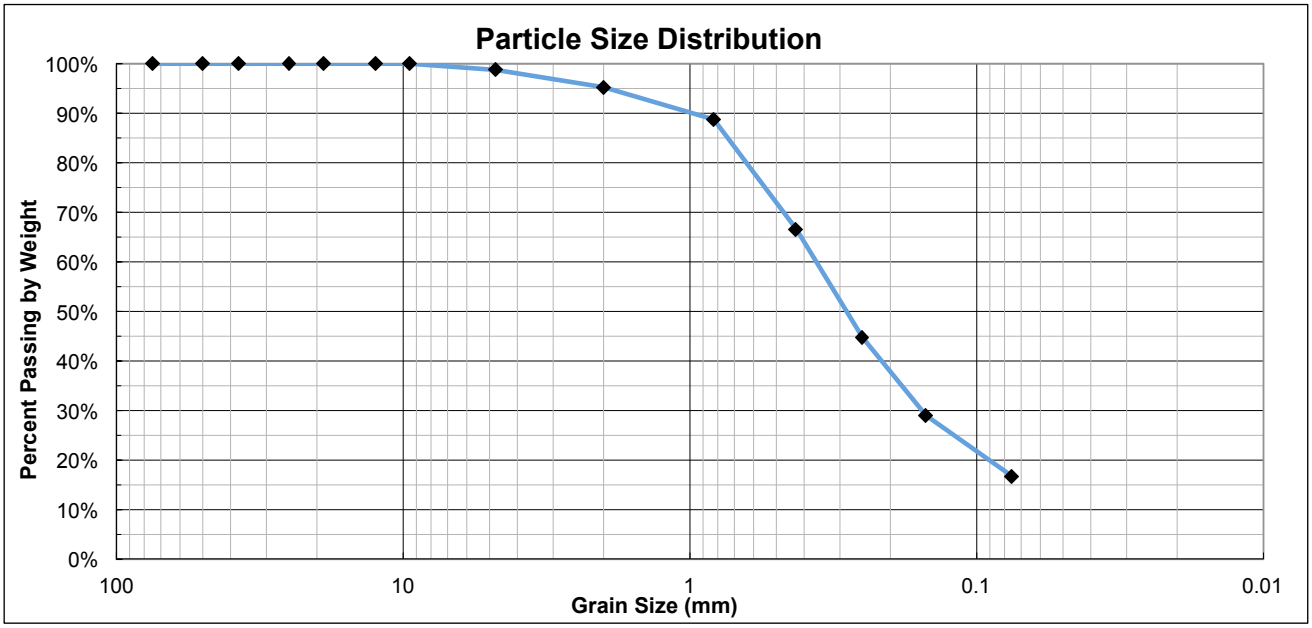
		Sieve #	Opening mm	Cummulative Mass Retained (g)	% Passing %
Cobbles		**3"**	75	0.0	100%
Gravel	Coarse	**2"**	50	0.0	100%
		1-1/2"	37.5	0.0	100%
		1"	25.0	0.0	100%
		3/4"	19.0	0.0	100%
	Fine	**1/2"**	12.5	0.0	100%
		3/8"	9.50	0.0	100%
		#4	4.75	0.0	100%
Sand	Coarse	**#10**	2.00	0.2	100%
	Medium	**#20**	0.825	10.6	95%
		#40	0.425	61.9	68%
	Fine	**#60**	0.250	110.9	43%
		#100	0.150	140.2	28%
		#200	0.075	162.5	16%

Coefficient of Uniformity	Coefficient of Curvature
Cu = NA	Cc = NA

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/3/20
Technician: OMR
Sample ID: A-20-010-3A
Depth (ft): 8
USCS Classification: Silty Sand (SM)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt/Clay
	0	1	4	28	50	
0	**1**		**82**			**17**

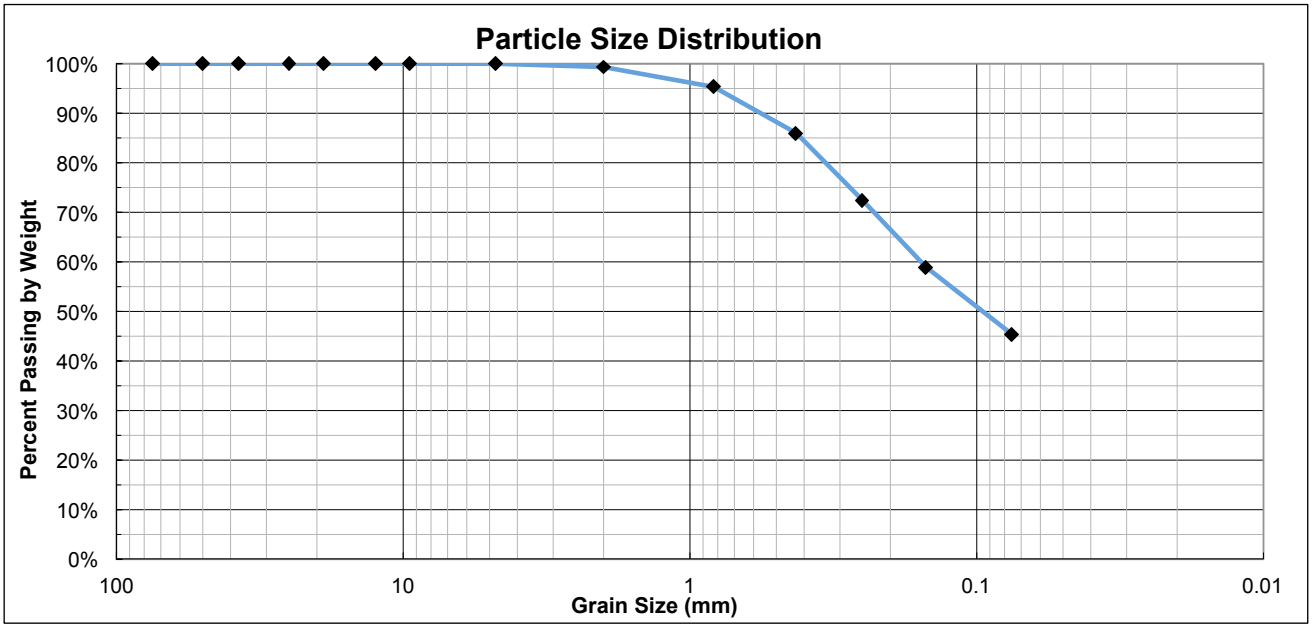
		Sieve #	Opening mm	Cummulative Mass Retained (g)	% Passing %
Cobbles		**3"**	75	0.0	100%
Gravel	Coarse	**2"**	50	0.0	100%
		1-1/2"	37.5	0.0	100%
		1"	25.0	0.0	100%
		3/4"	19.0	0.0	100%
	Fine	**1/2"**	12.5	0.0	100%
		3/8"	9.50	0.0	100%
		#4	4.75	2.7	99%
Sand	Coarse	**#10**	2.00	10.2	95%
	Medium	**#20**	0.825	24.2	89%
		#40	0.425	71.9	67%
	Fine	**#60**	0.250	118.8	45%
		#100	0.150	152.7	29%
		#200	0.075	179.1	17%

Coefficient of Uniformity	Coefficient of Curvature
Cu = NA	Cc = NA

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/3/20
Technician: OMR
Sample ID: A-20-014-5A
Depth (ft): 16
USCS Classification: Silty Sand(SM)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt/Clay
	0	0	1	13	41	
0	**0**		**55**			**45**

		Sieve #	Opening mm	Cummulative Mass Retained (g)	% Passing %
Cobbles		**3"**	75	0.0	100%
Gravel	Coarse	**2"**	50	0.0	100%
		1-1/2"	37.5	0.0	100%
		1"	25.0	0.0	100%
		3/4"	19.0	0.0	100%
	Fine	**1/2"**	12.5	0.0	100%
		3/8"	9.50	0.0	100%
		#4	4.75	0.0	100%
Sand	Coarse	**#10**	2.00	1.7	99%
	Medium	**#20**	0.825	11.8	95%
		#40	0.425	35.2	86%
	Fine	**#60**	0.250	69.1	72%
		#100	0.150	103.0	59%
		#200	0.075	137.1	45%

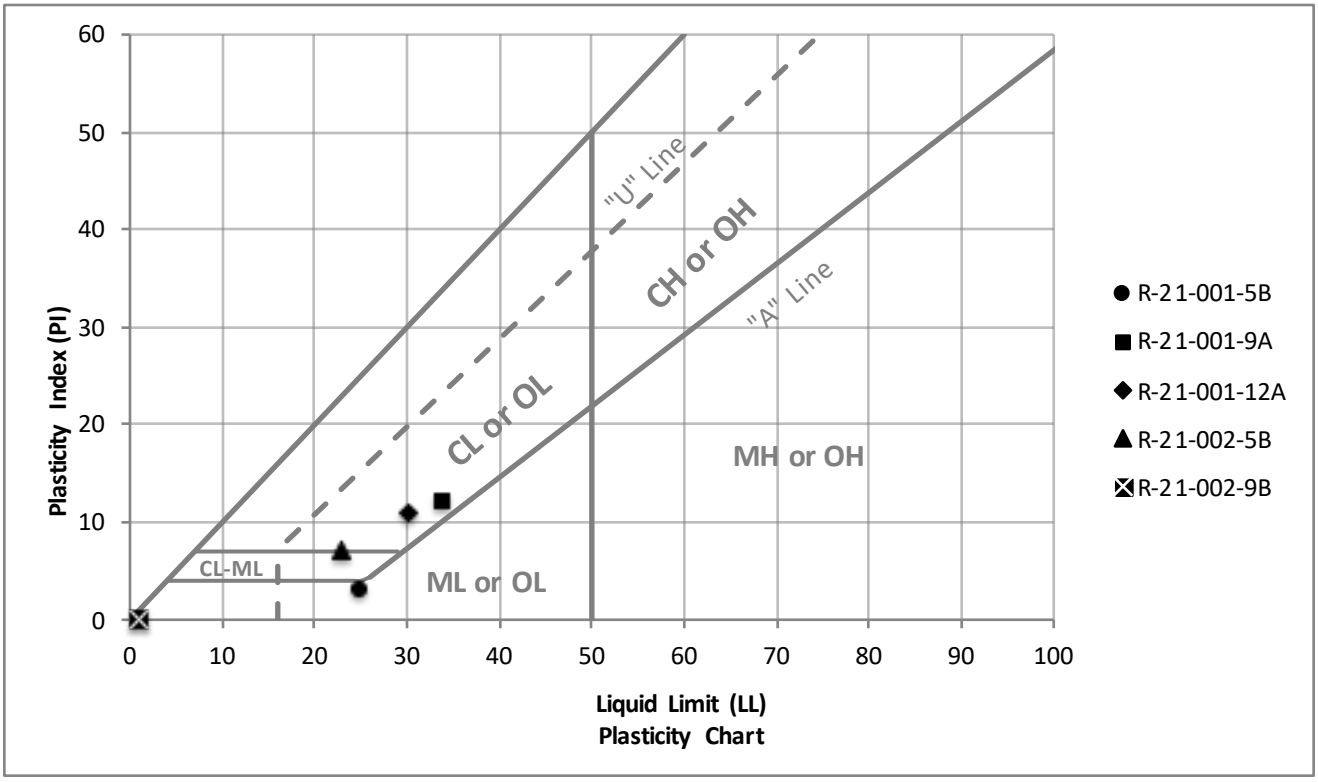
Coefficient of Uniformity	Coefficient of Curvature
Cu = NA	Cc = NA

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlovk Water Distribution System
CAInc File No: 20-642.1
Date: 5/18/21
Technician: MCC

Plastic Index - ASTM D4318

Sample ID	Depth (ft)	Liquid Limit	Plastic Limit	PI
R-21-001-5B	15.9	25	22	3
R-21-001-9A	36-36.5	34	22	12
R-21-001-12A	51-51.5	30	19	11
R-21-002-5B	15.5-16	23	16	7
R-21-002-9B	35.5-36	NP	NP	NP

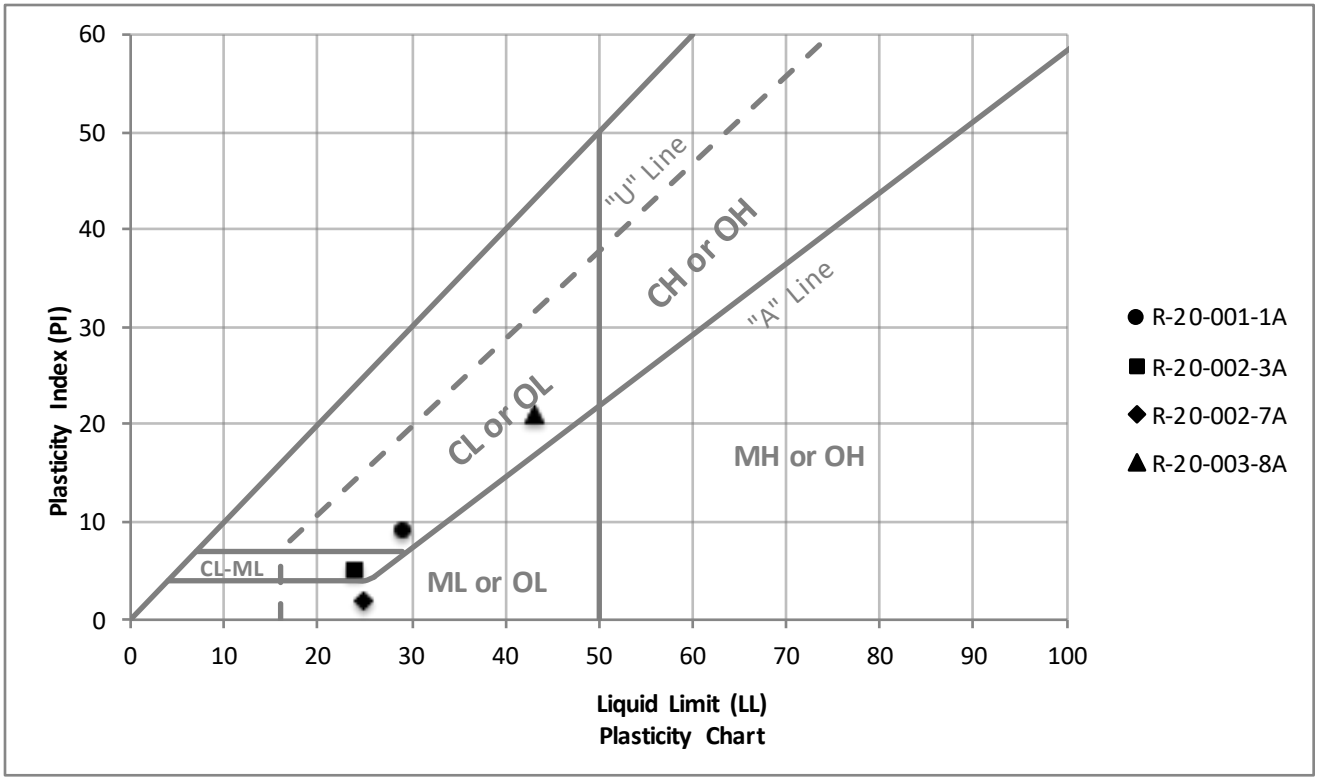


Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/23/20
Technician: MNA/LAD

Plastic Index - ASTM D4318

Sample ID	Depth (ft)	Liquid Limit	Plastic Limit	PI
R-20-001-1A	3.5	29	20	9
R-20-002-3A	8.5	24	19	5
R-20-002-7A	26	25	23	2
R-20-003-8A	31	43	22	21

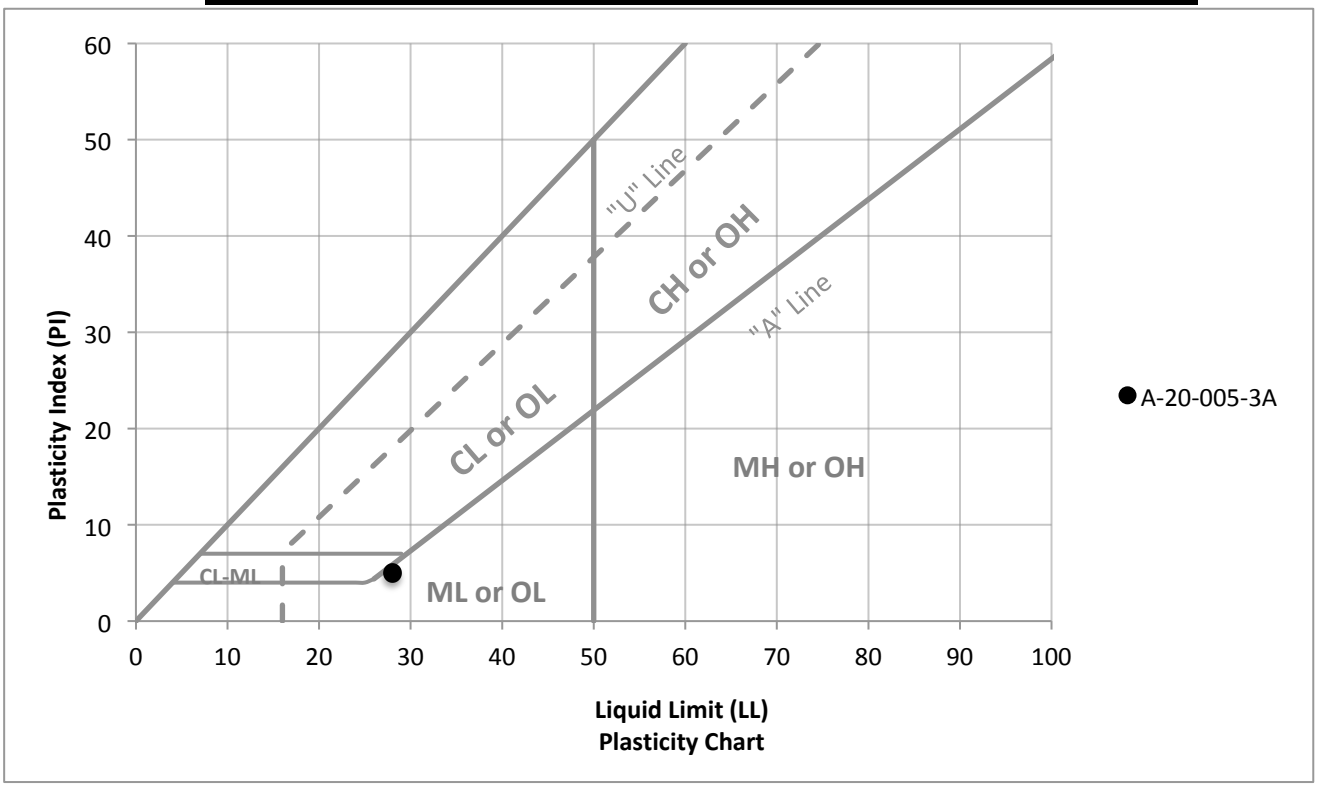


Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 1/12/21
Technician: MNA/LAD

Plastic Index - ASTM D4318

Sample ID	Depth (ft)	Liquid Limit	Plastic Limit	PI
A-20-005-3A	8.5	28	23	5

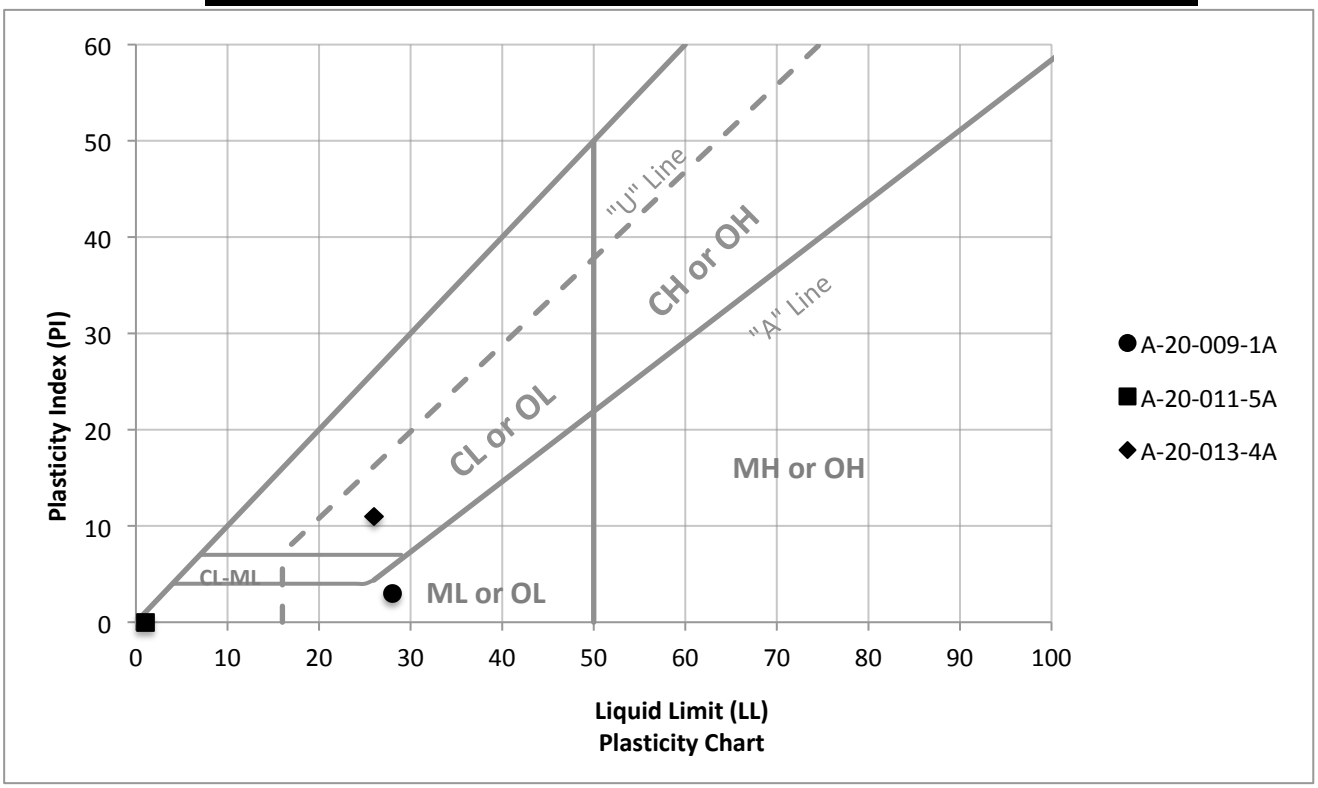


Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 11/23/20
Technician: LAD/MCC/MNA

Plastic Index - ASTM D4318

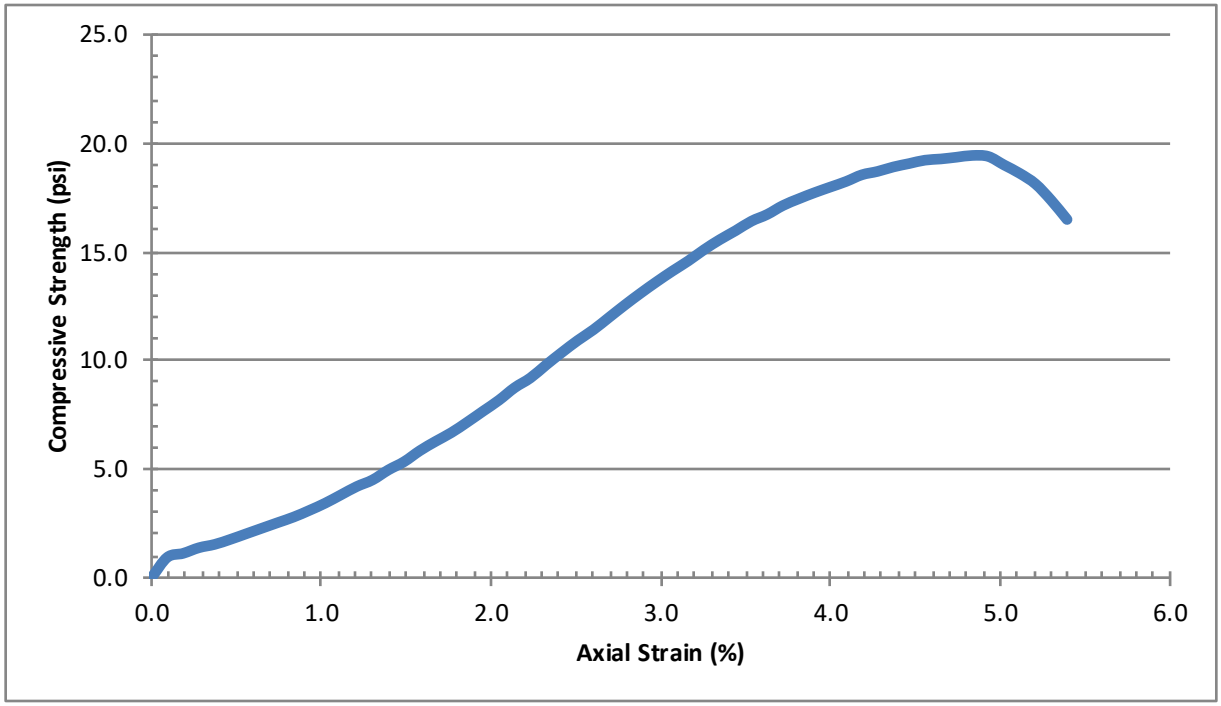
Sample ID	Depth (ft)	Liquid Limit	Plastic Limit	PI
A-20-009-1A	3.5	28	25	3
A-20-011-5A	16	NP	NP	NP
A-20-013-4A	8	26	15	11



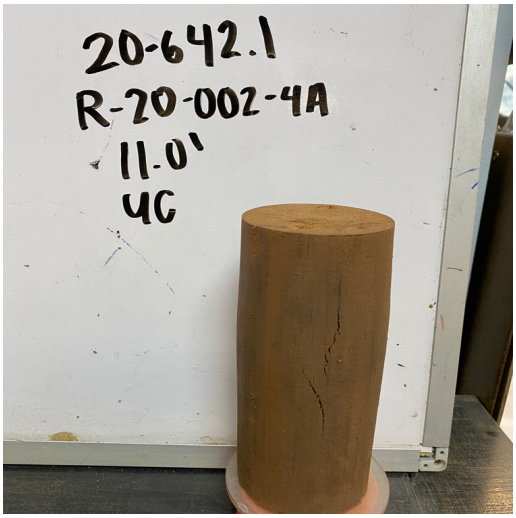
Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/23/20
Technician: LAD
Sample ID: R-20-002-4A Depth (ft): 11.0
USCS Classification: CL

UNCONFINED COMPRESSION TEST - D2166



Dry Density (pcf)	**117.1**
Water Content (%)	**16.1**
Unconfined Compressive Strength (psi)	**19.4**
Unconfined Compressive Strength (psf)	**2794**
Shear Strength (psf)	**1397**
Average Height (in)	5.410
Average Diameter (in)	2.378
Rate of strain (%)	0.5
Strain at Failure (%)	4.8

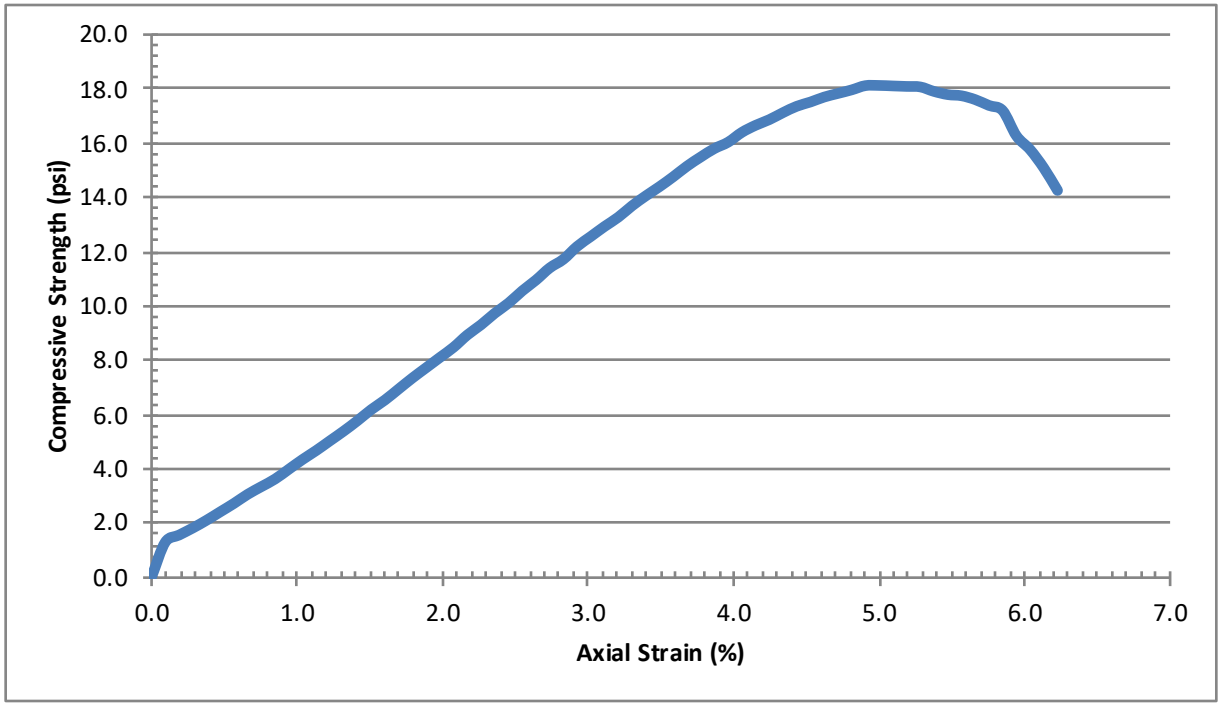


Notes:

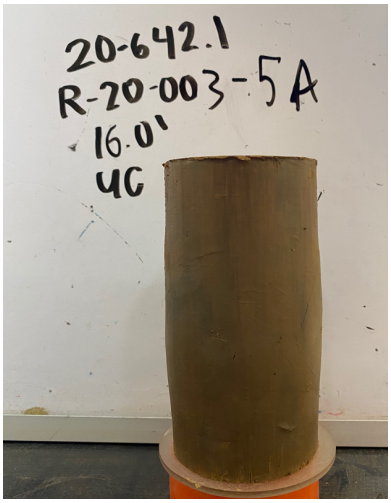
Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Turlock Water Distribution System
CAInc File No: 20-642.1
Date: 12/23/20
Technician: CAP
Sample ID: R-20-003-5A Depth (ft): 16.0
USCS Classification: CL

UNCONFINED COMPRESSION TEST - D2166



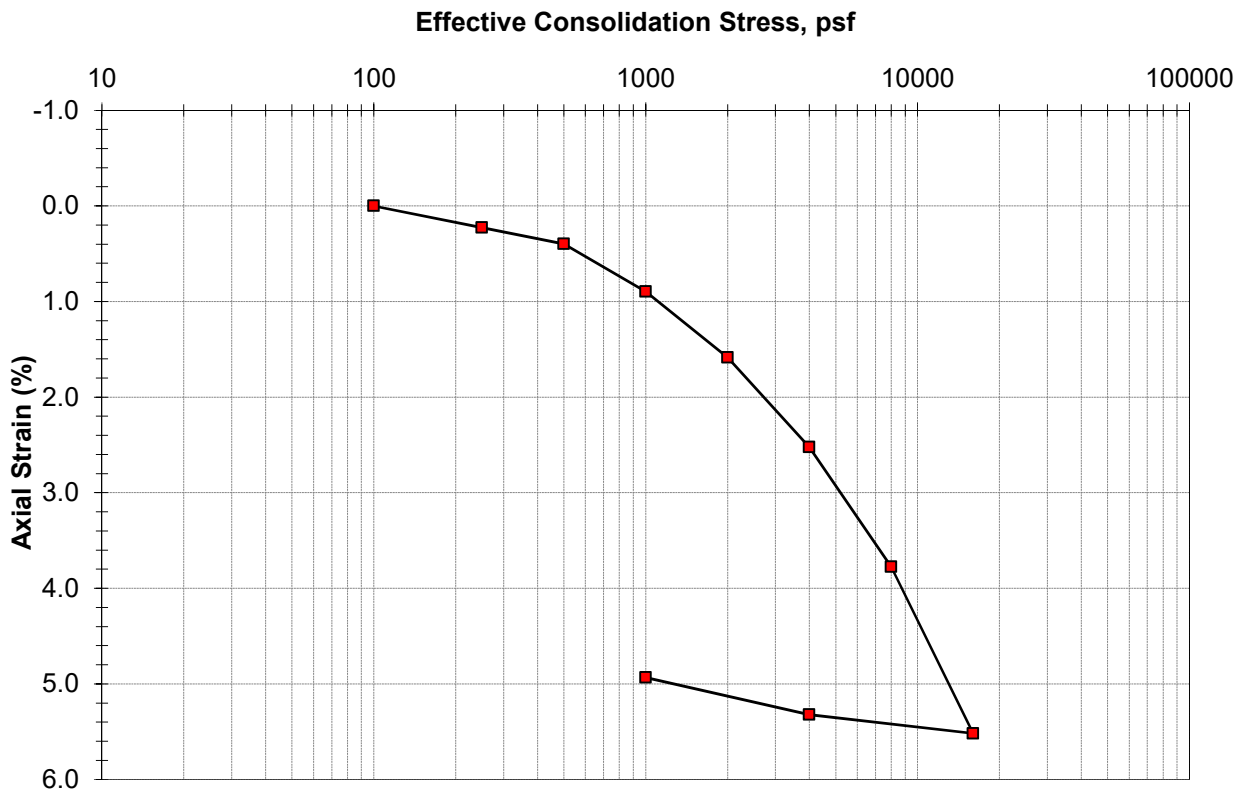
Dry Density (pcf)	**104.1**
Water Content (%)	**23.2**
Unconfined Compressive Strength (psi)	**18.1**
Unconfined Compressive Strength (psf)	**2606**
Shear Strength (psf)	**1303**
Average Height (in)	5.333
Average Diameter (in)	2.373
Rate of strain (%)	0.5
Strain at Failure (%)	5.0



Notes:

CONSOLIDATION TEST - ASTM D2435
STRESS VERSUS STRAIN

Project Name	Turlock Water District
Geocon Project Number	S9763-05-214
Boring Number	R-20-003
Sample Number	7A-26'
Sample Description	Light brown SILT/Lean CLAY



Axial Load, psf	Void Ratio	Axial Strain, %
initial	0.926	0.00
100	0.926	0.00
250	0.922	0.23
500	0.919	0.40
1000	0.909	0.90
2000	0.896	1.59
4000	0.878	2.52
8000	0.854	3.77
16000	0.820	5.52
4000	0.824	5.32
1000	0.831	4.93

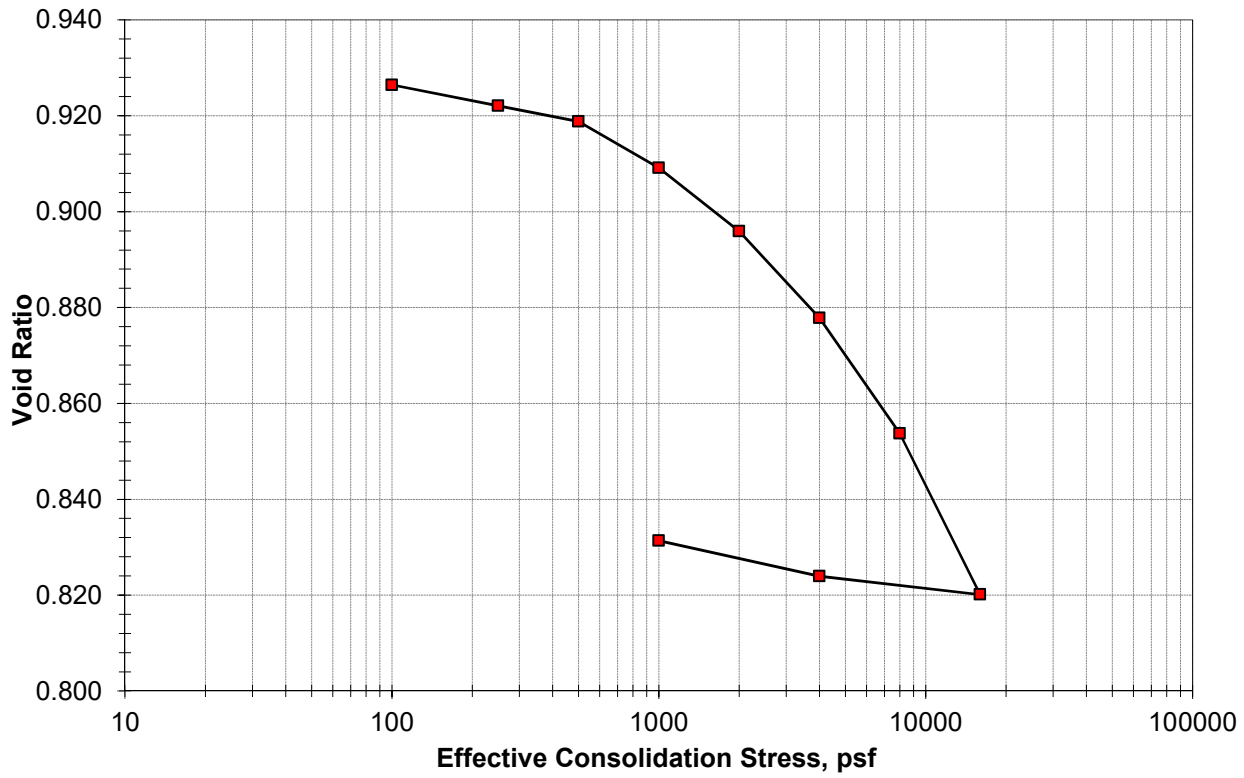
Measurement	Initial	Final
Height (in.)	0.750	0.709
Moisture Content (%)	31.3	29.4
Dry Density (pcf)	89.8	95.0
Saturation (%)	94	100

Note:
Gs = 2.77 (assumed)

GEOCON
CONSULTANTS, INC.
3160 Gold Valley Drive, Suite 800
Rancho Cordova, CA 95742
tel. 916.852-9118 fax. 916.852.9132

CONSOLIDATION TEST - ASTM D2435
STRESS VERSUS VOID RATIO

Project Name	Turlock Water District
Geocon Project Number	S9763-05-214
Boring Number	R-20-003
Sample Number	7A-26'
Sample Description	Light brown SILT/Lean CLAY



Axial Load, psf	Void Ratio	Axial Strain, %
initial	0.926	0.00
100	0.926	0.00
250	0.922	0.23
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Moisture Content (%)	31.3	29.4
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Note:
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GEOCON
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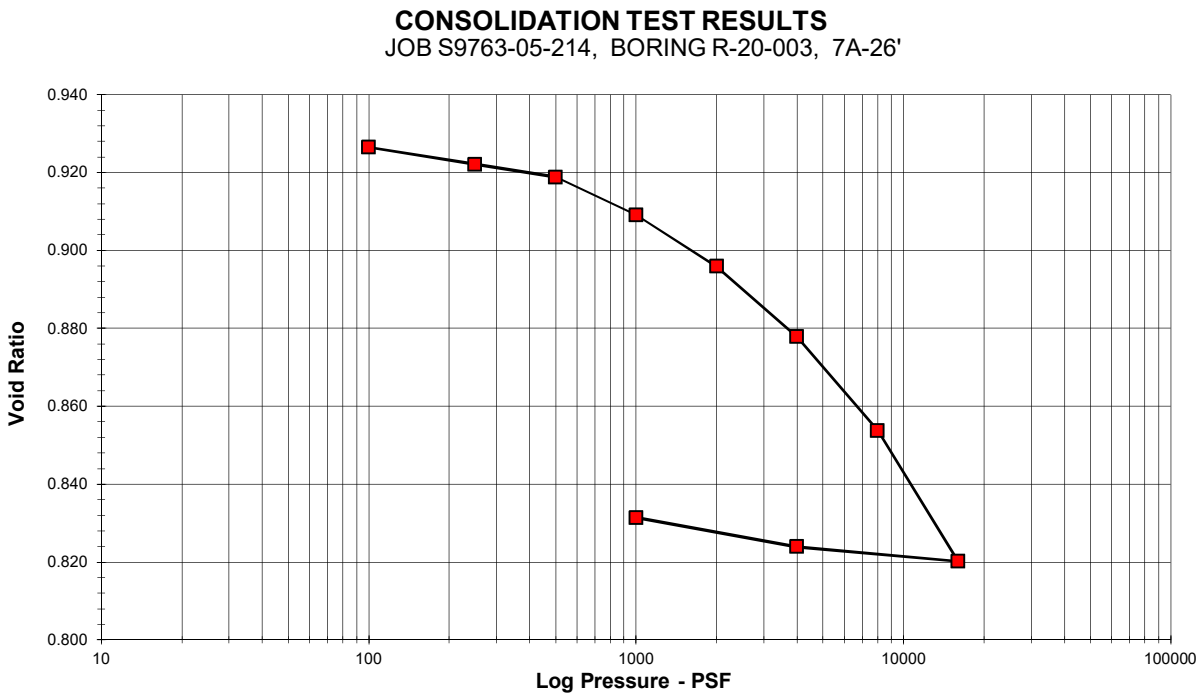
Rancho Cordova, CA 95742
tel. 916.852-9118 fax. 916.852.9132

CONSOLIDATION TEST - ASTM D2435

Project Name: Turlock Water District
Project Number: S9763-05-214 Sample Number: R-20-003 7A-26'



Axial Load (psf)	Void Ratio	Axial Strain (%)	m_V, coef of vol Compres (in^2/lb)	c_C, Comp Index	50% Consolidation t_{50}, Time to Consol (min)	50% Consolidation C_V, Coeff of Consol (ft^2/yr)	90% Consolidation t_{90}, Time to Consol (min)	90% Consolidation C_V, Coeff of Consol (ft^2/yr)
initial	0.926	0.00						
100	0.926	0.00						
250	0.922	0.23	0.0000	0.000	0.00	0.00	0.00	0.00
500	0.919	0.40	0.0010	0.011	0.02	4446.68	0.10	4472.36
1000	0.909	0.90	0.0014	0.032	0.03	3318.67	0.13	3337.84
2000	0.896	1.59	0.0010	0.044	0.02	4346.81	0.10	4371.92
4000	0.878	2.52	0.0007	0.060	0.05	1862.33	0.22	1873.08
8000	0.854	3.77	0.0005	0.080	0.16	585.34	0.69	588.72
16000	0.820	5.52	0.0003	0.112	0.14	669.34	0.59	673.21
4000	0.824	5.32						
1000	0.831	4.93						

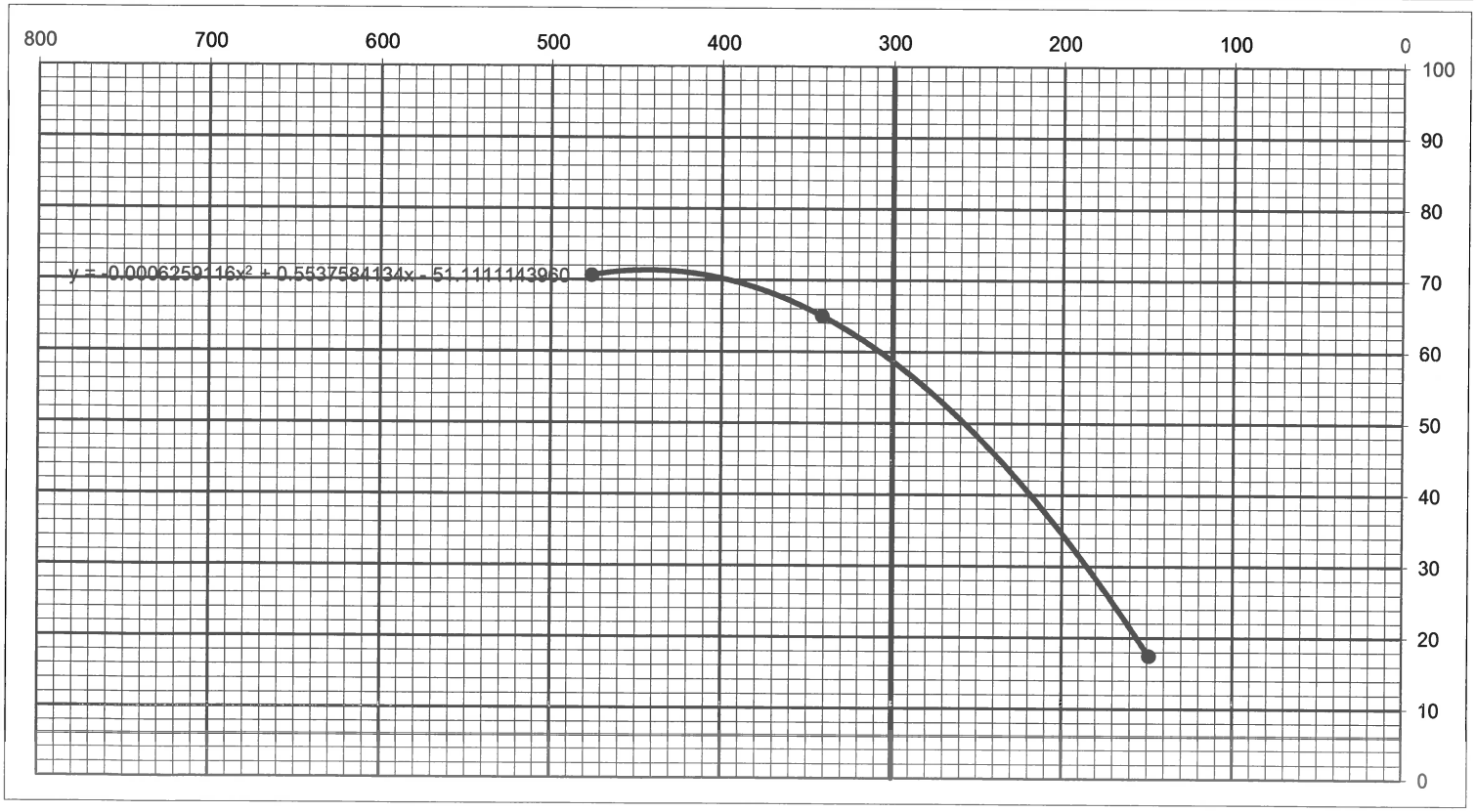
G_s = 2.77 (assumed)	COND AT START OF TEST	COND AT END OF TEST
HEIGHT (in.)	0.7500	0.7086
MOISTURE CONTENT (%)	31.3	29.4
DRY DENSITY (pcf):	89.8	95.0
SATURATION (%)	93.7	99.6

GEOCON CONSULTANTS, INC.
3160 Gold Valley Drive, Suite 800
Rancho Cordova, CA 95742
tel. 916.852-9118 fax. 916.852.9132

RESISTANCE VALUE

California Test Method No. 301

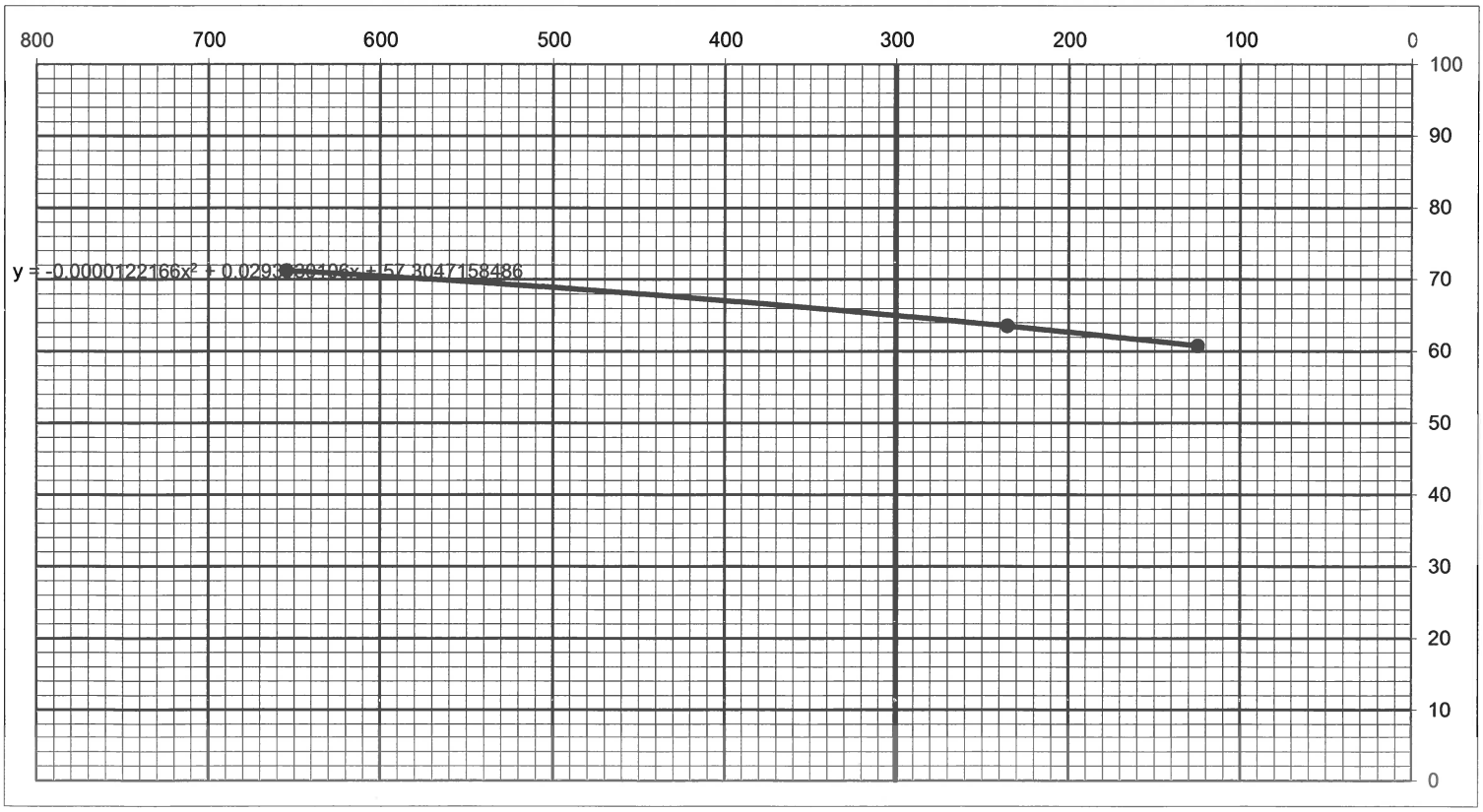
Job Number:	**4151-001.00**	**Date Tested:** 11/2/2020		**R-value:**	**59**
Project:	Crawford (Turlock Water 20-642.1)			**Sample :**	R-20-008-Bulk
Classification of Material:	SM, Silty Fine Sand, Tan, 7.9% Gravel			**Technician:**	KM
Initial Sample Weight	1150	1150	1150		
Mold Number	C	B	A		
Air Pressure-PSI	350	350	350		
Initial Moisture %	6.5	6.5	6.5		
Water Added ml/g	12	20	30		
Water Added %	1.1	1.9	2.8		
Final Moist %	7.6	8.3	9.3		
Soil + Mold Weight-Grams	3243	3252	3262		
Mold Weight-Grams	2084	2086	2088		
Soil Weight-Grams	1159	1166	1174		
Height of Sample-Inches	2.52	2.52	2.53		
Density-PCF	129.5	129.4	128.7		
Dial Reading (x.0001 inches)	0	0	0		
Expansion Pressure (psf)	0	0	0		
Stabilometer at 1000 lbs.	15	19	53		
2000 lbs.	29	38	108		
Displacement	4.69	4.32	5.69		
Exudation Pressure-Lbs	5980	4290	1870		
Exudation-PSI	476	342	149		
R-Value Calculated	71	65	17		
Corrected R-Value	71	65	17		



RESISTANCE VALUE

California Test Method No. 301

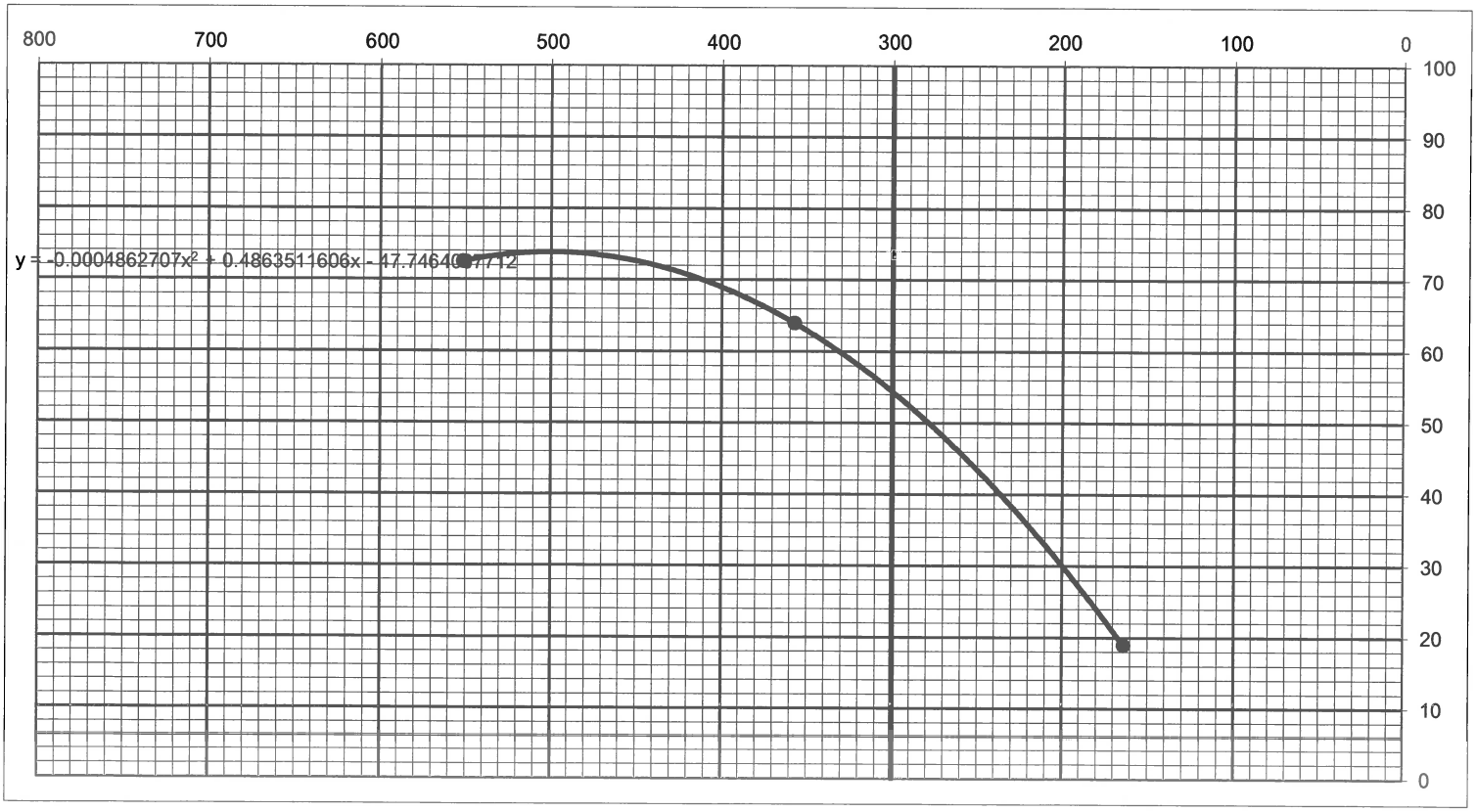
Job Number:	**4151-001.00**	**Date Tested:** 11/2/2020		**R-value:**	**65**
Project:	Crawford (Turlock Water 20-642.1)			**Sample :**	**A-20-011-Bulk**
Classification of Material:	SM, Silty Fine to Medium Sand, Brown, 5.1% Gravel			**Technician:**	KM
Initial Sample Weight	1080	1080	1080		
Mold Number	E	F	D		
Air Pressure-PSI	350	350	350		
Initial Moisture %	3.9	3.9	3.9		
Water Added ml/g	50	55	60		
Water Added %	4.8	5.3	5.8		
Final Moist %	8.7	9.2	9.7		
Soil + Mold Weight-Grams	3149	3190	3198		
Mold Weight-Grams	2029	2067	2073		
Soil Weight-Grams	1120	1123	1125		
Height of Sample-Inches	2.51	2.52	2.54		
Density-PCF	124.3	123.6	122.3		
Dial Reading (x.0001 inches)	0	0	0		
Expansion Pressure (psf)	0	0	0		
Stabilometer at 1000 lbs.	17	20	23		
2000 lbs.	30	37	40		
Displacement	4.37	4.77	4.84		
Exudation Pressure-Lbs	8220	2960	1570		
Exudation-PSI	654	236	125		
R-Value Calculated	71	64	61		
Corrected R-Value	71	64	61		



RESISTANCE VALUE

California Test Method No. 301

Job Number:	**4151-001.00**	**Date Tested:**		**R-value:**	**55**
Project:	Crawford (Turlock Water 20-642.1)			**Sample :**	**A-20-013 Bulk**
Classification of Material:	SM, Silty Fine to Medium Sand, Brown			**Technician:**	KM
Initial Sample Weight	1130	1130	1150		
Mold Number	B	C	A		
Air Pressure-PSI	350	350	350		
Initial Moisture %	5.6	5.6	5.6		
Water Added ml/g	20	25	30		
Water Added %	1.9	2.3	2.8		
Final Moist %	7.4	7.9	8.3		
Soil + Mold Weight-Grams	3227	3241	3265		
Mold Weight-Grams	2086	2084	2088		
Soil Weight-Grams	1141	1157	1177		
Height of Sample-Inches	2.47	2.50	2.55		
Density-PCF	130.3	130.0	129.1		
Dial Reading (x.0001 inches)	0	0	0		
Expansion Pressure (psf)	0	0	0		
Stabilometer at 1000 lbs.	16	21	50		
2000 lbs.	29	38	101		
Displacement	4.27	4.52	6.25		
Exudation Pressure-Lbs	6930	4490	2060		
Exudation-PSI	552	357	164		
R-Value Calculated	73	64	19		
Corrected R-Value	73	64	19		



Date of Report: 12/03/2020

Steve Carter

Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Client Project:	20-642.1Turlock Water Distrib. Sys
BCL Project:	Turloc NVRWP Pipeline
BCL Work Order:	2033532
Invoice ID:	B399617

Enclosed are the results of analyses for samples received by the laboratory on 11/13/2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Contact Person: Felicia Johnson
Client Service Rep

Stuart Buttram
Technical Director

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BC LABORATORIES

4100 Atlas Court Bakersfield, Ca. 93308
(661) 327-4911 • FAX (661) 327-1918 • www.bclabs.com

Steve.Carter@crawford-inc.com

Chain of Custody

20-33532

* Required Fields

TEMP: _____

Client/Company Name *: Crawford & Assoc. Inc.

Report Attention *: Steve Carter

Phone * #: 916-813-3778 FAX * #:
E-mail: steve.carter@crawford-inc.com

Address *: 1100 Corporate Way #230 City *: Sacramento State *: CA Zip *: 95831

Project Information: 20-642.1 Turlock Water Distrib. Sys.

PO #
BCL Quote #

How would you like your completed results sent? ☑ E-Mail ☐ Fax ☐ EDD ☐ Mail Only

Sampler Name Printed / Signature: Steve Carter

QC Request: ☑ STD ☐ Level II

Result Request ** Surcharge: ☑ STD ☐ 5 Day** ☐ 2 Day** ☐ 1 Day**

Carbon Copies: CDHS ☐ Fresno Co ☐ EPA ☐ Merced Co ☐ Tulare Co ☐ Other:

Regulatory Compliance: Electronic Data Transfer: Y ☐ N ☐
System No. *

ANALYSIS REQUESTED

Matrix Types: RSW = Raw Surface Water, RGW = Raw Ground Water, CFW = Chlorinated Finished Water, FW = Finished Water, WW = Waste Water, CWW = Chlorinated Waste Water, SW = Storm Water, BW = Bottled Water, DW = Drinking Water, SO = Solid

Sample #	# Bottles	Sampled Date	Sampled Time	Sample Description / Location *	Matrix *	Comments / Station Code	Organochlorine pest. & PCB - EPA 608	VOCs - EPA 624	SVOCs - EPA 625	cyanide - EPA 335.4	CAM 17 metals	TDS - EPA 160.1			
1		11/11/20	13:50	A-20-005	RGW		✓	✓	✓	✓	✓	✓			

CHK BY BCL
DISTRIBUTION
SUB OUT ☐

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by (Signature and Print Name)	Company
[signature]	CA Inc	11/12/20	1716 PST	[signature] Mark Ellis	BCL
[signature] Mark Ellis	BCL	11/12/2020	1216	[signature] F Jackson	BCL 11-13-20 1000

Received for Lab by: (Signature and Printed Name) | Date | Time

Payment Received at Delivery: Date: Amount: Check/Cash/Card PIA # Init.

Shipping Method: CAO UPS GSO WALK-IN SJVC FED EX OTHER

Cooling Method: WET BLUE NONE

Packing Material:

SW-FL-9812-00 Revised

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Chain of Custody and Cooler Receipt Form for 2033532 Page 2 of 2

BC LABORATORIES INC. COOLER RECEIPT FORM Page 1 Of 1

Submission #: 20-33532

SHIPPING INFORMATION: Fed Ex ☐ UPS ☐ Ontrac ☐ Hand Delivery ☐ BC Lab Field Service ☐ Other ☒ (Specify) GLS

SHIPPING CONTAINER: Ice Chest ☒ None ☐ Box ☐ Other ☐ (Specify)

FREE LIQUID: YES ☐ NO ☐ W / S

Refrigerant: Ice ☒ Blue Ice ☐ None ☐ Other ☐ Comments:

Custody Seals: Ice Chest ☐ Intact? Yes ☐ No ☐ Containers ☐ Intact? Yes ☐ No ☐ None ☒ Comments:

All samples received? Yes ☑ No ☐ All samples containers intact? Yes ☑ No ☐ Description(s) match COC? Yes ☑ No ☐

COC Received ☒ YES ☐ NO

Emissivity: .97 Container: PE Thermometer ID: 274 Date/Time 11-13-20 1000

Temperature: (A) 1.0 °C / (C) 0.8 °C Analyst Init TKJ

SAMPLE CONTAINERS		SAMPLE NUMBERS 1	2	3	4	5	6	7	8	9	10
QT PE UNPRES	x48	I									
4oz / 8oz / 16oz PE UNPRES	x44	JK									
2oz Cr^{+6}	I06	GH									
QT INORGANIC CHEMICAL METALS											
INORGANIC CHEMICAL METALS 4oz / 8oz / 16oz	x64	LM									
PT CYANIDE	I08	N									
PT NITROGEN FORMS											
PT TOTAL SULFIDE											
2oz. NITRATE / NITRITE											
PT TOTAL ORGANIC CARBON											
PT CHEMICAL OXYGEN DEMAND											
PIA PHENOLICS											
40ml VOA VIAL TRAVEL BLANK											
40ml VOA VIAL		A-F									
QT EPA 1664											
PT ODOR											
RADIOLOGICAL											
BACTERIOLOGICAL											
40 ml VOA VIAL 504											
QT EPA 505/508/508B	020	OP									
QT EPA 515.1/8150											
QT EPA 525											
QT EPA 525 TRAVEL BLANK											
40ml EPA 547											
40ml EPA 531.1											
8oz EPA 548											
QT EPA 549											
QT EPA 8015M											
QT EPA 8270											
8oz / 16oz / 32oz AMBER	052	QR									
8oz / 16oz / 32oz JAR											
SOIL SLEEVE											
PCB VIAL											
PLASTIC BAG											
TEDLAR BAG											
FERROUS IRON											
ENCORE											
SMART KIT											
SUMMA CANISTER											

Comments:

Sample Numbering Completed By: RRE Date/Time: 11/13/2020 1815

A = Actual / C = Corrected

Rev 21 05/23/2016

Crawford & Associates, Inc. 1100 Corporate Way, Suite 230 Sacramento, CA 95831	**Reported:** 12/03/2020 9:13 Project: Turloc NVRWP Pipeline Project Number: 20-642.1Turlock Water Distrib. Sys Project Manager: Steve Carter

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
2033532-01	**COC Number:**	---	**Receive Date:**	11/13/2020 10:00
	Project Number:	---	**Sampling Date:**	11/11/2020 13:50
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	A-20-005	**Lab Matrix:**	Water
	Sampled By:	Steve Carter	**Sample Type:**	Groundwater

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Organochlorine Pesticides and PCB's (EPA Method 608.3)

BCL Sample ID: 2033532-01 | **Client Sample Name:** A-20-005, 11/11/2020 1:50:00PM, Steve Carter

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Aldrin	ND	ug/L	0.0050	0.00097	EPA-608.3	ND		1
alpha-BHC	ND	ug/L	0.0050	0.0014	EPA-608.3	ND		1
beta-BHC	ND	ug/L	0.0050	0.0016	EPA-608.3	ND		1
delta-BHC	ND	ug/L	0.0050	0.0012	EPA-608.3	ND		1
gamma-BHC (Lindane)	ND	ug/L	0.0050	0.0013	EPA-608.3	ND		1
Chlordane (Technical)	ND	ug/L	0.50	0.060	EPA-608.3	ND		1
4,4'-DDD	ND	ug/L	0.0050	0.0011	EPA-608.3	ND		1
4,4'-DDE	ND	ug/L	0.0050	0.00071	EPA-608.3	ND		1
4,4'-DDT	ND	ug/L	0.0050	0.00072	EPA-608.3	ND		1
Dieldrin	ND	ug/L	0.0050	0.00069	EPA-608.3	ND		1
Endosulfan I	ND	ug/L	0.0050	0.00071	EPA-608.3	ND		1
Endosulfan II	ND	ug/L	0.0050	0.0012	EPA-608.3	ND		1
Endosulfan sulfate	ND	ug/L	0.0050	0.00092	EPA-608.3	ND		1
Endrin	ND	ug/L	0.0050	0.00082	EPA-608.3	ND		1
Endrin aldehyde	ND	ug/L	0.010	0.00088	EPA-608.3	ND		1
Heptachlor	ND	ug/L	0.0050	0.00084	EPA-608.3	ND		1
Heptachlor epoxide	ND	ug/L	0.0050	0.0014	EPA-608.3	ND		1
Methoxychlor	ND	ug/L	0.0050	0.0018	EPA-608.3	ND		1
Toxaphene	ND	ug/L	2.0	0.50	EPA-608.3	ND		1
PCB-1016	ND	ug/L	0.20	0.066	EPA-608.3	ND		1
PCB-1221	ND	ug/L	0.20	0.063	EPA-608.3	ND		1
PCB-1232	ND	ug/L	0.20	0.059	EPA-608.3	ND		1
PCB-1242	ND	ug/L	0.20	0.037	EPA-608.3	ND		1
PCB-1248	ND	ug/L	0.20	0.044	EPA-608.3	ND		1
PCB-1254	ND	ug/L	0.20	0.037	EPA-608.3	ND		1
PCB-1260	ND	ug/L	0.20	0.089	EPA-608.3	ND		1
Total PCB's (Summation)	ND	ug/L	0.20	0.10	EPA-608.3	ND		1
TCMX (Surrogate)	67.2	%	40 - 140 (LCL - UCL)		EPA-608.3			1
Decachlorobiphenyl (Surrogate)	56.9	%	40 - 130 (LCL - UCL)		EPA-608.3			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-608.3	11/18/20 19:00	11/20/20 02:06	HKS	GC-17	1	B093238	EPA 608.3

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

BCL Sample ID: 2033532-01 | **Client Sample Name:** A-20-005, 11/11/2020 1:50:00PM, Steve Carter

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Benzene	ND	ug/L	0.50	0.062	EPA-624.1	ND		1
Bromodichloromethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Bromoform	ND	ug/L	0.50	0.067	EPA-624.1	ND		1
Bromomethane	ND	ug/L	1.0	0.077	EPA-624.1	ND		1
Carbon tetrachloride	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Chlorobenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Chloroethane	ND	ug/L	0.50	0.057	EPA-624.1	ND		1
Chloroform	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Chloromethane	ND	ug/L	0.50	0.055	EPA-624.1	ND		1
Dibromochloromethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,2-Dichlorobenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,3-Dichlorobenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,4-Dichlorobenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,1-Dichloroethane	ND	ug/L	0.50	0.051	EPA-624.1	ND		1
1,2-Dichloroethane	ND	ug/L	0.50	0.068	EPA-624.1	ND		1
1,1-Dichloroethene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
cis-1,2-Dichloroethene	ND	ug/L	0.50	0.060	EPA-624.1	ND		1
trans-1,2-Dichloroethene	ND	ug/L	0.50	0.056	EPA-624.1	ND		1
1,2-Dichloropropane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
cis-1,3-Dichloropropene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
trans-1,3-Dichloropropene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Ethylbenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Methylene chloride	ND	ug/L	1.0	0.055	EPA-624.1	ND		1
Methyl t-butyl ether	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,1,2,2-Tetrachloroethane	ND	ug/L	0.50	0.066	EPA-624.1	ND		1
Tetrachloroethene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Toluene	ND	ug/L	0.50	0.051	EPA-624.1	ND		1
1,1,1-Trichloroethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,1,2-Trichloroethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Trichloroethene	ND	ug/L	0.50	0.081	EPA-624.1	ND		1
Trichlorofluoromethane	ND	ug/L	0.50	0.080	EPA-624.1	ND		1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Vinyl chloride	ND	ug/L	0.50	0.059	EPA-624.1	ND		1

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Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

BCL Sample ID: 2033532-01 | **Client Sample Name:** A-20-005, 11/11/2020 1:50:00PM, Steve Carter

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Total Xylenes	ND	ug/L	0.50	0.15	EPA-624.1	ND		1
p- & m-Xylenes	ND	ug/L	0.50	0.10	EPA-624.1	ND		1
o-Xylene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,2-Dichloroethane-d4 (Surrogate)	99.9	%	75 - 125 (LCL - UCL)		EPA-624.1			1
Toluene-d8 (Surrogate)	101	%	80 - 120 (LCL - UCL)		EPA-624.1			1
4-Bromofluorobenzene (Surrogate)	102	%	80 - 120 (LCL - UCL)		EPA-624.1			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-624.1	11/17/20 06:00	11/17/20 12:25	MGC	MS-V7	1	B092870	EPA 624.1

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

BCL Sample ID: 2033532-01 | **Client Sample Name:** A-20-005, 11/11/2020 1:50:00PM, Steve Carter

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Acenaphthene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Acenaphthylene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Aldrin	ND	ug/L	2.4	0.28	EPA-625.1	ND		1
Aniline	ND	ug/L	6.0	0.34	EPA-625.1	ND		1
Anthracene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Benzidine	ND	ug/L	24	1.9	EPA-625.1	ND		1
Benzo[a]anthracene	ND	ug/L	2.4	0.25	EPA-625.1	ND		1
Benzo[b]fluoranthene	ND	ug/L	2.4	0.29	EPA-625.1	ND		1
Benzo[k]fluoranthene	ND	ug/L	2.4	0.36	EPA-625.1	ND		1
Benzo[a]pyrene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Benzo[g,h,i]perylene	ND	ug/L	2.4	0.40	EPA-625.1	ND		1
Benzoic acid	**82**	**ug/L**	**12**	**0.62**	**EPA-625.1**	ND		1
Benzyl alcohol	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Benzyl butyl phthalate	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
alpha-BHC	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
beta-BHC	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
delta-BHC	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
gamma-BHC (Lindane)	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
bis(2-Chloroethoxy)methane	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
bis(2-Chloroethyl) ether	ND	ug/L	2.4	0.37	EPA-625.1	ND		1
bis(2-Chloroisopropyl)ether	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
bis(2-Ethylhexyl)phthalate	ND	ug/L	6.0	0.24	EPA-625.1	ND		1
4-Bromophenyl phenyl ether	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
4-Chloroaniline	ND	ug/L	2.4	1.3	EPA-625.1	ND		1
2-Chloronaphthalene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
4-Chlorophenyl phenyl ether	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Chrysene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
4,4'-DDD	ND	ug/L	2.4	0.31	EPA-625.1	ND		1
4,4'-DDE	ND	ug/L	3.6	0.29	EPA-625.1	ND		1
4,4'-DDT	ND	ug/L	2.4	0.26	EPA-625.1	ND		1
Dibenzo[a,h]anthracene	ND	ug/L	3.6	0.41	EPA-625.1	ND		1
Dibenzofuran	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
1,2-Dichlorobenzene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

BCL Sample ID: 2033532-01 | **Client Sample Name:** A-20-005, 11/11/2020 1:50:00PM, Steve Carter

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
1,3-Dichlorobenzene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
1,4-Dichlorobenzene	ND	ug/L	2.4	0.32	EPA-625.1	ND		1
3,3-Dichlorobenzidine	ND	ug/L	12	0.64	EPA-625.1	ND		1
Dieldrin	ND	ug/L	3.6	0.47	EPA-625.1	ND		1
Diethyl phthalate	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Dimethyl phthalate	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Di-n-butyl phthalate	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
2,4-Dinitrotoluene	ND	ug/L	2.4	0.48	EPA-625.1	ND		1
2,6-Dinitrotoluene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Di-n-octyl phthalate	ND	ug/L	2.4	0.25	EPA-625.1	ND		1
1,2-Diphenylhydrazine	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Endosulfan I	ND	ug/L	12	0.37	EPA-625.1	ND		1
Endosulfan II	ND	ug/L	12	0.36	EPA-625.1	ND		1
Endosulfan sulfate	ND	ug/L	3.6	0.28	EPA-625.1	ND		1
Endrin	ND	ug/L	2.4	0.46	EPA-625.1	ND		1
Endrin aldehyde	ND	ug/L	12	0.53	EPA-625.1	ND		1
Fluoranthene	ND	ug/L	2.4	0.34	EPA-625.1	ND		1
Fluorene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Heptachlor	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Heptachlor epoxide	ND	ug/L	2.4	0.31	EPA-625.1	ND		1
Hexachlorobenzene	ND	ug/L	2.4	0.30	EPA-625.1	ND		1
Hexachlorobutadiene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Hexachlorocyclopentadiene	ND	ug/L	2.4	0.37	EPA-625.1	ND		1
Hexachloroethane	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Indeno[1,2,3-cd]pyrene	ND	ug/L	2.4	0.35	EPA-625.1	ND		1
Isophorone	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
2-Methylnaphthalene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Naphthalene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
2-Naphthylamine	ND	ug/L	24	1.6	EPA-625.1	ND		1
2-Nitroaniline	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
3-Nitroaniline	ND	ug/L	2.4	0.26	EPA-625.1	ND		1
4-Nitroaniline	ND	ug/L	6.0	0.46	EPA-625.1	ND		1
Nitrobenzene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1

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1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

BCL Sample ID: 2033532-01 | **Client Sample Name:** A-20-005, 11/11/2020 1:50:00PM, Steve Carter

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
N-Nitrosodimethylamine	ND	ug/L	2.4	1.4	EPA-625.1	ND		1
N-Nitrosodi-N-propylamine	ND	ug/L	2.4	0.25	EPA-625.1	ND		1
N-Nitrosodiphenylamine	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Phenanthrene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
Pyrene	ND	ug/L	2.4	0.26	EPA-625.1	ND		1
1,2,4-Trichlorobenzene	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
4-Chloro-3-methylphenol	ND	ug/L	6.0	0.24	EPA-625.1	ND		1
2-Chlorophenol	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
2,4-Dichlorophenol	ND	ug/L	2.4	0.28	EPA-625.1	ND		1
2,4-Dimethylphenol	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
4,6-Dinitro-2-methylphenol	ND	ug/L	12	0.29	EPA-625.1	ND		1
2,4-Dinitrophenol	ND	ug/L	12	0.24	EPA-625.1	ND		1
2-Methylphenol	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
3- & 4-Methylphenol	ND	ug/L	2.4	0.48	EPA-625.1	ND		1
2-Nitrophenol	ND	ug/L	2.4	0.24	EPA-625.1	ND		1
4-Nitrophenol	ND	ug/L	2.4	0.36	EPA-625.1	ND		1
Pentachlorophenol	ND	ug/L	12	0.48	EPA-625.1	ND		1
Phenol	ND	ug/L	2.4	0.25	EPA-625.1	ND		1
2,4,5-Trichlorophenol	ND	ug/L	6.0	0.24	EPA-625.1	ND		1
2,4,6-Trichlorophenol	ND	ug/L	6.0	0.24	EPA-625.1	ND		1
2-Fluorophenol (Surrogate)	29.7	%	30 - 120 (LCL - UCL)		EPA-625.1		S09	1
Phenol-d5 (Surrogate)	23.0	%	12 - 110 (LCL - UCL)		EPA-625.1			1
Nitrobenzene-d5 (Surrogate)	68.6	%	50 - 130 (LCL - UCL)		EPA-625.1			1
2-Fluorobiphenyl (Surrogate)	76.2	%	55 - 125 (LCL - UCL)		EPA-625.1			1
2,4,6-Tribromophenol (Surrogate)	109	%	40 - 150 (LCL - UCL)		EPA-625.1			1
p-Terphenyl-d14 (Surrogate)	41.8	%	40 - 150 (LCL - UCL)		EPA-625.1			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-625.1	11/17/20 18:30	11/19/20 15:02	MK1	MS-B2	1.200	B093059	EPA 625.1

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Water Analysis (General Chemistry)

BCL Sample ID: 2033532-01 | **Client Sample Name:** A-20-005, 11/11/2020 1:50:00PM, Steve Carter

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Total Dissolved Solids @ 180 C	**580**	**mg/L**	**33**	**17**	**EPA-160.1**	ND	**A07**	1
Total Cyanide	ND	ug/L	5.0	1.7	EPA-335.4	ND		2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-160.1	11/17/20 13:00	11/17/20 13:00	CAD	MANUAL	3.333	B092883	No Prep
2	EPA-335.4	11/19/20 08:39	11/19/20 12:06	MC1	KONE-1	1	B093099	EPA 335.4 Total

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Metals Analysis

BCL Sample ID: 2033532-01 | **Client Sample Name:** A-20-005, 11/11/2020 1:50:00PM, Steve Carter

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Total Recoverable Antimony	ND	ug/L	10	0.55	EPA-200.8	ND	A07	1
Total Recoverable Arsenic	**110**	**ug/L**	**10**	**3.5**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Barium	**5600**	**ug/L**	**5.0**	**1.0**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Beryllium	**16**	**ug/L**	**5.0**	**0.70**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Cadmium	**5.0**	**ug/L**	**5.0**	**0.55**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Chromium	**340**	**ug/L**	**15**	**2.5**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Cobalt	**360**	**ug/L**	**5.0**	**0.50**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Copper	**840**	**ug/L**	**10**	**1.1**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Lead	**190**	**ug/L**	**5.0**	**0.50**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Mercury	**0.037**	**ug/L**	**0.20**	**0.022**	**EPA-245.1**	ND	**J**	2
Total Recoverable Molybdenum	**5.4**	**ug/L**	**5.0**	**0.55**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Nickel	**450**	**ug/L**	**10**	**0.95**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Selenium	ND	ug/L	10	0.95	EPA-200.8	ND	A07	1
Total Recoverable Silver	**1.8**	**ug/L**	**5.0**	**0.50**	**EPA-200.8**	ND	**J,A07**	1
Total Recoverable Thallium	**8.9**	**ug/L**	**5.0**	**0.50**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Vanadium	**1200**	**ug/L**	**15**	**3.9**	**EPA-200.8**	ND	**A07**	1
Total Recoverable Zinc	**8200**	**ug/L**	**100**	**17**	**EPA-200.8**	ND	**A07**	3

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-200.8	11/18/20 20:10	11/19/20 13:51	ARD	PE-EL2	5	B093075	EPA 200.2
2	EPA-245.1	12/01/20 15:00	12/02/20 11:57	TMT	CETAC3	1	B093916	EPA 245.1
3	EPA-200.8	11/20/20 08:00	11/20/20 15:14	EAR	PE-EL2	10	B093243	EPA 200.2

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Organochlorine Pesticides and PCB's (EPA Method 608.3)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B093238						
Aldrin	B093238-BLK1	ND	ug/L	0.0050	0.00097	
alpha-BHC	B093238-BLK1	ND	ug/L	0.0050	0.0014	
beta-BHC	B093238-BLK1	ND	ug/L	0.0050	0.0016	
delta-BHC	B093238-BLK1	ND	ug/L	0.0050	0.0012	
gamma-BHC (Lindane)	B093238-BLK1	ND	ug/L	0.0050	0.0013	
Chlordane (Technical)	B093238-BLK1	ND	ug/L	0.50	0.060	
4,4'-DDD	B093238-BLK1	ND	ug/L	0.0050	0.0011	
4,4'-DDE	B093238-BLK1	ND	ug/L	0.0050	0.00071	
4,4'-DDT	B093238-BLK1	ND	ug/L	0.0050	0.00072	
Dieldrin	B093238-BLK1	ND	ug/L	0.0050	0.00069	
Endosulfan I	B093238-BLK1	ND	ug/L	0.0050	0.00071	
Endosulfan II	B093238-BLK1	ND	ug/L	0.0050	0.0012	
Endosulfan sulfate	B093238-BLK1	ND	ug/L	0.0050	0.00092	
Endrin	B093238-BLK1	ND	ug/L	0.0050	0.00082	
Endrin aldehyde	B093238-BLK1	ND	ug/L	0.010	0.00088	
Heptachlor	B093238-BLK1	ND	ug/L	0.0050	0.00084	
Heptachlor epoxide	B093238-BLK1	ND	ug/L	0.0050	0.0014	
Methoxychlor	B093238-BLK1	ND	ug/L	0.0050	0.0018	
Toxaphene	B093238-BLK1	ND	ug/L	2.0	0.50	
PCB-1016	B093238-BLK1	ND	ug/L	0.20	0.066	
PCB-1221	B093238-BLK1	ND	ug/L	0.20	0.063	
PCB-1232	B093238-BLK1	ND	ug/L	0.20	0.059	
PCB-1242	B093238-BLK1	ND	ug/L	0.20	0.037	
PCB-1248	B093238-BLK1	ND	ug/L	0.20	0.044	
PCB-1254	B093238-BLK1	ND	ug/L	0.20	0.037	
PCB-1260	B093238-BLK1	ND	ug/L	0.20	0.089	
Total PCB's (Summation)	B093238-BLK1	ND	ug/L	0.20	0.10	
TCMX (Surrogate)	**B093238-BLK1**	**101**	%	**40 - 140 (LCL - UCL)**		
Decachlorobiphenyl (Surrogate)	**B093238-BLK1**	**63.1**	%	**40 - 130 (LCL - UCL)**		

Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Organochlorine Pesticides and PCB's (EPA Method 608.3)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B093238										
Aldrin	B093238-BS1	LCS	0.11446	0.15000	ug/L	76.3		50 - 130		
gamma-BHC (Lindane)	B093238-BS1	LCS	0.14478	0.15000	ug/L	96.5		60 - 130		
4,4'-DDT	B093238-BS1	LCS	0.13920	0.15000	ug/L	92.8		60 - 130		
Dieldrin	B093238-BS1	LCS	0.13074	0.15000	ug/L	87.2		60 - 130		
Endrin	B093238-BS1	LCS	0.13787	0.15000	ug/L	91.9		60 - 130		
Heptachlor	B093238-BS1	LCS	0.12575	0.15000	ug/L	83.8		60 - 130		
TCMX (Surrogate)	B093238-BS1	LCS	0.24630	0.30000	ug/L	82.1		40 - 140		
Decachlorobiphenyl (Surrogate)	B093238-BS1	LCS	0.39112	0.60000	ug/L	65.2		40 - 130		

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1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Organochlorine Pesticides and PCB's (EPA Method 608.3)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B093238	Used client sample: N										
Aldrin	MS	2032744-89	ND	0.12030	0.15000	ug/L		80.2		50 - 130	
	MSD	2032744-89	ND	0.11840	0.15000	ug/L	1.6	78.9	30	50 - 130	
gamma-BHC (Lindane)	MS	2032744-89	ND	0.15157	0.15000	ug/L		101		60 - 130	
	MSD	2032744-89	ND	0.14933	0.15000	ug/L	1.5	99.6	30	60 - 130	
4,4'-DDT	MS	2032744-89	ND	0.14292	0.15000	ug/L		95.3		60 - 130	
	MSD	2032744-89	ND	0.14170	0.15000	ug/L	0.9	94.5	30	60 - 130	
Dieldrin	MS	2032744-89	ND	0.13650	0.15000	ug/L		91.0		60 - 130	
	MSD	2032744-89	ND	0.13319	0.15000	ug/L	2.5	88.8	30	60 - 130	
Endrin	MS	2032744-89	ND	0.14240	0.15000	ug/L		94.9		60 - 130	
	MSD	2032744-89	ND	0.13893	0.15000	ug/L	2.5	92.6	30	60 - 130	
Heptachlor	MS	2032744-89	ND	0.13223	0.15000	ug/L		88.2		50 - 130	
	MSD	2032744-89	ND	0.12973	0.15000	ug/L	1.9	86.5	30	50 - 130	
TCMX (Surrogate)	MS	2032744-89	ND	0.25658	0.30000	ug/L		85.5		40 - 140	
	MSD	2032744-89	ND	0.25241	0.30000	ug/L	1.6	84.1		40 - 140	
Decachlorobiphenyl (Surrogate)	MS	2032744-89	ND	0.39206	0.60000	ug/L		65.3		40 - 130	
	MSD	2032744-89	ND	0.39073	0.60000	ug/L	0.3	65.1		40 - 130	

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B092870						
Benzene	B092870-BLK1	ND	ug/L	0.50	0.062	
Bromodichloromethane	B092870-BLK1	ND	ug/L	0.50	0.050	
Bromoform	B092870-BLK1	ND	ug/L	0.50	0.067	
Bromomethane	B092870-BLK1	ND	ug/L	1.0	0.077	
Carbon tetrachloride	B092870-BLK1	ND	ug/L	0.50	0.050	
Chlorobenzene	B092870-BLK1	ND	ug/L	0.50	0.050	
Chloroethane	B092870-BLK1	ND	ug/L	0.50	0.057	
Chloroform	B092870-BLK1	ND	ug/L	0.50	0.050	
Chloromethane	B092870-BLK1	ND	ug/L	0.50	0.055	
Dibromochloromethane	B092870-BLK1	ND	ug/L	0.50	0.050	
1,2-Dichlorobenzene	B092870-BLK1	ND	ug/L	0.50	0.050	
1,3-Dichlorobenzene	B092870-BLK1	ND	ug/L	0.50	0.050	
1,4-Dichlorobenzene	B092870-BLK1	ND	ug/L	0.50	0.050	
1,1-Dichloroethane	B092870-BLK1	ND	ug/L	0.50	0.051	
1,2-Dichloroethane	B092870-BLK1	ND	ug/L	0.50	0.068	
1,1-Dichloroethene	B092870-BLK1	ND	ug/L	0.50	0.050	
cis-1,2-Dichloroethene	B092870-BLK1	ND	ug/L	0.50	0.060	
trans-1,2-Dichloroethene	B092870-BLK1	ND	ug/L	0.50	0.056	
1,2-Dichloropropane	B092870-BLK1	ND	ug/L	0.50	0.050	
cis-1,3-Dichloropropene	B092870-BLK1	ND	ug/L	0.50	0.050	
trans-1,3-Dichloropropene	B092870-BLK1	ND	ug/L	0.50	0.050	
Ethylbenzene	B092870-BLK1	ND	ug/L	0.50	0.050	
Methylene chloride	B092870-BLK1	ND	ug/L	1.0	0.055	
Methyl t-butyl ether	B092870-BLK1	ND	ug/L	0.50	0.050	
1,1,2,2-Tetrachloroethane	B092870-BLK1	ND	ug/L	0.50	0.066	
Tetrachloroethene	B092870-BLK1	ND	ug/L	0.50	0.050	
Toluene	B092870-BLK1	ND	ug/L	0.50	0.051	
1,1,1-Trichloroethane	B092870-BLK1	ND	ug/L	0.50	0.050	
1,1,2-Trichloroethane	B092870-BLK1	ND	ug/L	0.50	0.050	
Trichloroethene	B092870-BLK1	ND	ug/L	0.50	0.081	
Trichlorofluoromethane	B092870-BLK1	ND	ug/L	0.50	0.080	
1,1,2-Trichloro-1,2,2-trifluoroethane	B092870-BLK1	ND	ug/L	0.50	0.050	
Vinyl chloride	B092870-BLK1	ND	ug/L	0.50	0.059	
Total Xylenes	B092870-BLK1	ND	ug/L	0.50	0.15	

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Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B092870						
p- & m-Xylenes	B092870-BLK1	ND	ug/L	0.50	0.10	
o-Xylene	B092870-BLK1	ND	ug/L	0.50	0.050	
1,2-Dichloroethane-d4 (Surrogate)	**B092870-BLK1**	**97.8**	%	**75 - 125 (LCL - UCL)**		
Toluene-d8 (Surrogate)	**B092870-BLK1**	**101**	%	**80 - 120 (LCL - UCL)**		
4-Bromofluorobenzene (Surrogate)	**B092870-BLK1**	**99.7**	%	**80 - 120 (LCL - UCL)**		

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B092870										
Benzene	B092870-BS1	LCS	22.880	25.000	ug/L	91.5		79 - 120		
Bromodichloromethane	B092870-BS1	LCS	24.200	25.000	ug/L	96.8		79 - 125		
Bromoform	B092870-BS1	LCS	26.140	25.000	ug/L	105		66 - 130		
Bromomethane	B092870-BS1	LCS	22.110	25.000	ug/L	88.4		53 - 141		
Carbon tetrachloride	B092870-BS1	LCS	23.890	25.000	ug/L	95.6		72 - 136		
Chlorobenzene	B092870-BS1	LCS	23.930	25.000	ug/L	95.7		82 - 118		
Chloroethane	B092870-BS1	LCS	24.850	25.000	ug/L	99.4		60 - 138		
Chloroform	B092870-BS1	LCS	22.560	25.000	ug/L	90.2		79 - 124		
Chloromethane	B092870-BS1	LCS	23.680	25.000	ug/L	94.7		50 - 139		
Dibromochloromethane	B092870-BS1	LCS	25.840	25.000	ug/L	103		74 - 126		
1,2-Dichlorobenzene	B092870-BS1	LCS	25.050	25.000	ug/L	100		80 - 119		
1,3-Dichlorobenzene	B092870-BS1	LCS	24.760	25.000	ug/L	99.0		80 - 119		
1,4-Dichlorobenzene	B092870-BS1	LCS	24.560	25.000	ug/L	98.2		79 - 118		
1,1-Dichloroethane	B092870-BS1	LCS	23.220	25.000	ug/L	92.9		77 - 125		
1,2-Dichloroethane	B092870-BS1	LCS	21.990	25.000	ug/L	88.0		73 - 128		
1,1-Dichloroethene	B092870-BS1	LCS	24.380	25.000	ug/L	97.5		71 - 131		
cis-1,2-Dichloroethene	B092870-BS1	LCS	23.210	25.000	ug/L	92.8		78 - 123		
trans-1,2-Dichloroethene	B092870-BS1	LCS	23.600	25.000	ug/L	94.4		75 - 124		
1,2-Dichloropropane	B092870-BS1	LCS	23.870	25.000	ug/L	95.5		78 - 122		
cis-1,3-Dichloropropene	B092870-BS1	LCS	24.190	25.000	ug/L	96.8		75 - 124		
trans-1,3-Dichloropropene	B092870-BS1	LCS	25.610	25.000	ug/L	102		73 - 127		
Ethylbenzene	B092870-BS1	LCS	25.550	25.000	ug/L	102		79 - 121		
Methylene chloride	B092870-BS1	LCS	23.110	25.000	ug/L	92.4		74 - 124		
Methyl t-butyl ether	B092870-BS1	LCS	22.880	25.000	ug/L	91.5		71 - 124		
1,1,2,2-Tetrachloroethane	B092870-BS1	LCS	25.190	25.000	ug/L	101		71 - 121		
Tetrachloroethene	B092870-BS1	LCS	24.110	25.000	ug/L	96.4		74 - 129		
Toluene	B092870-BS1	LCS	25.500	25.000	ug/L	102		80 - 121		
1,1,1-Trichloroethane	B092870-BS1	LCS	22.650	25.000	ug/L	90.6		74 - 131		
1,1,2-Trichloroethane	B092870-BS1	LCS	24.950	25.000	ug/L	99.8		80 - 119		
Trichloroethene	B092870-BS1	LCS	23.890	25.000	ug/L	95.6		79 - 123		
Trichlorofluoromethane	B092870-BS1	LCS	23.950	25.000	ug/L	95.8		65 - 141		
1,1,2-Trichloro-1,2,2-trifluoroethane	B092870-BS1	LCS	26.860	25.000	ug/L	107		70 - 136		
Vinyl chloride	B092870-BS1	LCS	25.080	25.000	ug/L	100		58 - 137		

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1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B092870										
Total Xylenes	B092870-BS1	LCS	75.210	75.000	ug/L	100		79 - 121		
p- & m-Xylenes	B092870-BS1	LCS	50.470	50.000	ug/L	101		80 - 121		
o-Xylene	B092870-BS1	LCS	24.740	25.000	ug/L	99.0		78 - 122		
1,2-Dichloroethane-d4 (Surrogate)	B092870-BS1	LCS	9.7900	10.000	ug/L	97.9		75 - 125		
Toluene-d8 (Surrogate)	B092870-BS1	LCS	10.190	10.000	ug/L	102		80 - 120		
4-Bromofluorobenzene (Surrogate)	B092870-BS1	LCS	10.180	10.000	ug/L	102		80 - 120		

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B092870	Used client sample: N										
Benzene	MS	2033670-01	ND	23.880	25.000	ug/L		95.5		79 - 120	
	MSD	2033670-01	ND	23.550	25.000	ug/L	1.4	94.2	30	79 - 120	
Bromodichloromethane	MS	2033670-01	ND	24.680	25.000	ug/L		98.7		79 - 125	
	MSD	2033670-01	ND	24.620	25.000	ug/L	0.2	98.5	30	79 - 125	
Bromoform	MS	2033670-01	ND	26.150	25.000	ug/L		105		66 - 130	
	MSD	2033670-01	ND	25.760	25.000	ug/L	1.5	103	30	66 - 130	
Bromomethane	MS	2033670-01	ND	28.740	25.000	ug/L		115		53 - 141	
	MSD	2033670-01	ND	29.930	25.000	ug/L	4.1	120	30	53 - 141	
Carbon tetrachloride	MS	2033670-01	ND	24.790	25.000	ug/L		99.2		72 - 136	
	MSD	2033670-01	ND	24.330	25.000	ug/L	1.9	97.3	30	72 - 136	
Chlorobenzene	MS	2033670-01	ND	24.350	25.000	ug/L		97.4		82 - 118	
	MSD	2033670-01	ND	24.420	25.000	ug/L	0.3	97.7	30	82 - 118	
Chloroethane	MS	2033670-01	ND	26.090	25.000	ug/L		104		60 - 138	
	MSD	2033670-01	ND	25.430	25.000	ug/L	2.6	102	30	60 - 138	
Chloroform	MS	2033670-01	ND	23.760	25.000	ug/L		95.0		79 - 124	
	MSD	2033670-01	ND	23.300	25.000	ug/L	2.0	93.2	30	79 - 124	
Chloromethane	MS	2033670-01	ND	24.950	25.000	ug/L		99.8		50 - 139	
	MSD	2033670-01	ND	24.840	25.000	ug/L	0.4	99.4	30	50 - 139	
Dibromochloromethane	MS	2033670-01	ND	26.280	25.000	ug/L		105		74 - 126	
	MSD	2033670-01	ND	26.000	25.000	ug/L	1.1	104	30	74 - 126	
1,2-Dichlorobenzene	MS	2033670-01	ND	25.640	25.000	ug/L		103		80 - 119	
	MSD	2033670-01	ND	26.040	25.000	ug/L	1.5	104	30	80 - 119	
1,3-Dichlorobenzene	MS	2033670-01	ND	25.720	25.000	ug/L		103		80 - 119	
	MSD	2033670-01	ND	25.760	25.000	ug/L	0.2	103	30	80 - 119	
1,4-Dichlorobenzene	MS	2033670-01	ND	25.210	25.000	ug/L		101		79 - 118	
	MSD	2033670-01	ND	25.470	25.000	ug/L	1.0	102	30	79 - 118	
1,1-Dichloroethane	MS	2033670-01	ND	24.350	25.000	ug/L		97.4		77 - 125	
	MSD	2033670-01	ND	23.880	25.000	ug/L	1.9	95.5	30	77 - 125	
1,2-Dichloroethane	MS	2033670-01	ND	22.690	25.000	ug/L		90.8		73 - 128	
	MSD	2033670-01	ND	22.180	25.000	ug/L	2.3	88.7	30	73 - 128	
1,1-Dichloroethene	MS	2033670-01	ND	25.650	25.000	ug/L		103		71 - 131	
	MSD	2033670-01	ND	25.110	25.000	ug/L	2.1	100	30	71 - 131	
cis-1,2-Dichloroethene	MS	2033670-01	ND	24.440	25.000	ug/L		97.8		78 - 123	
	MSD	2033670-01	ND	23.980	25.000	ug/L	1.9	95.9	30	78 - 123	
trans-1,2-Dichloroethene	MS	2033670-01	ND	24.790	25.000	ug/L		99.2		75 - 124	
	MSD	2033670-01	ND	24.490	25.000	ug/L	1.2	98.0	30	75 - 124	

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1100 Corporate Way, Suite 230
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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B092870	Used client sample: N										
1,2-Dichloropropane	MS	2033670-01	ND	24.480	25.000	ug/L		97.9		78 - 122	
	MSD	2033670-01	ND	24.290	25.000	ug/L	0.8	97.2	30	78 - 122	
cis-1,3-Dichloropropene	MS	2033670-01	ND	25.000	25.000	ug/L		100		75 - 124	
	MSD	2033670-01	ND	25.210	25.000	ug/L	0.8	101	30	75 - 124	
trans-1,3-Dichloropropene	MS	2033670-01	ND	26.020	25.000	ug/L		104		73 - 127	
	MSD	2033670-01	ND	25.820	25.000	ug/L	0.8	103	30	73 - 127	
Ethylbenzene	MS	2033670-01	ND	25.910	25.000	ug/L		104		79 - 121	
	MSD	2033670-01	ND	25.780	25.000	ug/L	0.5	103	30	79 - 121	
Methylene chloride	MS	2033670-01	ND	23.590	25.000	ug/L		94.4		74 - 124	
	MSD	2033670-01	ND	23.230	25.000	ug/L	1.5	92.9	30	74 - 124	
Methyl t-butyl ether	MS	2033670-01	ND	23.870	25.000	ug/L		95.5		71 - 124	
	MSD	2033670-01	ND	23.490	25.000	ug/L	1.6	94.0	30	71 - 124	
1,1,2,2-Tetrachloroethane	MS	2033670-01	ND	25.010	25.000	ug/L		100		71 - 121	
	MSD	2033670-01	ND	25.470	25.000	ug/L	1.8	102	30	71 - 121	
Tetrachloroethene	MS	2033670-01	ND	24.790	25.000	ug/L		99.2		74 - 129	
	MSD	2033670-01	ND	24.330	25.000	ug/L	1.9	97.3	30	74 - 129	
Toluene	MS	2033670-01	ND	25.970	25.000	ug/L		104		80 - 121	
	MSD	2033670-01	ND	25.630	25.000	ug/L	1.3	103	30	80 - 121	
1,1,1-Trichloroethane	MS	2033670-01	ND	23.850	25.000	ug/L		95.4		74 - 131	
	MSD	2033670-01	ND	23.310	25.000	ug/L	2.3	93.2	30	74 - 131	
1,1,2-Trichloroethane	MS	2033670-01	ND	24.920	25.000	ug/L		99.7		80 - 119	
	MSD	2033670-01	ND	24.780	25.000	ug/L	0.6	99.1	30	80 - 119	
Trichloroethene	MS	2033670-01	ND	24.260	25.000	ug/L		97.0		79 - 123	
	MSD	2033670-01	ND	24.000	25.000	ug/L	1.1	96.0	30	79 - 123	
Trichlorofluoromethane	MS	2033670-01	ND	24.950	25.000	ug/L		99.8		65 - 141	
	MSD	2033670-01	ND	24.700	25.000	ug/L	1.0	98.8	30	65 - 141	
1,1,2-Trichloro-1,2,2-trifluoroethane	MS	2033670-01	ND	27.700	25.000	ug/L		111		70 - 136	
	MSD	2033670-01	ND	27.140	25.000	ug/L	2.0	109	30	70 - 136	
Vinyl chloride	MS	2033670-01	ND	26.020	25.000	ug/L		104		58 - 137	
	MSD	2033670-01	ND	25.630	25.000	ug/L	1.5	103	30	58 - 137	
Total Xylenes	MS	2033670-01	ND	76.380	75.000	ug/L		102		79 - 121	
	MSD	2033670-01	ND	76.340	75.000	ug/L	0.1	102	30	79 - 121	
p- & m-Xylenes	MS	2033670-01	ND	51.420	50.000	ug/L		103		80 - 121	
	MSD	2033670-01	ND	51.380	50.000	ug/L	0.1	103	30	80 - 121	
o-Xylene	MS	2033670-01	ND	24.960	25.000	ug/L		99.8		78 - 122	
	MSD	2033670-01	ND	24.960	25.000	ug/L	0	99.8	30	78 - 122	

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Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B092870	Used client sample: N										
1,2-Dichloroethane-d4 (Surrogate)	MS	2033670-01	ND	9.9200	10.000	ug/L		99.2		75 - 125	
	MSD	2033670-01	ND	9.7500	10.000	ug/L	1.7	97.5		75 - 125	
Toluene-d8 (Surrogate)	MS	2033670-01	ND	10.160	10.000	ug/L		102		80 - 120	
	MSD	2033670-01	ND	10.160	10.000	ug/L	0	102		80 - 120	
4-Bromofluorobenzene (Surrogate)	MS	2033670-01	ND	10.140	10.000	ug/L		101		80 - 120	
	MSD	2033670-01	ND	10.200	10.000	ug/L	0.6	102		80 - 120	

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Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B093059						
Acenaphthene	B093059-BLK1	ND	ug/L	2.0	0.20	
Acenaphthylene	B093059-BLK1	ND	ug/L	2.0	0.20	
Aldrin	B093059-BLK1	ND	ug/L	2.0	0.23	
Aniline	B093059-BLK1	ND	ug/L	5.0	0.28	
Anthracene	B093059-BLK1	ND	ug/L	2.0	0.20	
Benzidine	B093059-BLK1	ND	ug/L	20	1.6	
Benzo[a]anthracene	B093059-BLK1	ND	ug/L	2.0	0.21	
Benzo[b]fluoranthene	B093059-BLK1	ND	ug/L	2.0	0.24	
Benzo[k]fluoranthene	B093059-BLK1	ND	ug/L	2.0	0.30	
Benzo[a]pyrene	B093059-BLK1	ND	ug/L	2.0	0.20	
Benzo[g,h,i]perylene	B093059-BLK1	ND	ug/L	2.0	0.33	
Benzoic acid	B093059-BLK1	ND	ug/L	10	0.52	
Benzyl alcohol	B093059-BLK1	ND	ug/L	2.0	0.20	
Benzyl butyl phthalate	B093059-BLK1	ND	ug/L	2.0	0.20	
alpha-BHC	B093059-BLK1	ND	ug/L	2.0	0.20	
beta-BHC	B093059-BLK1	ND	ug/L	2.0	0.20	
delta-BHC	B093059-BLK1	ND	ug/L	2.0	0.20	
gamma-BHC (Lindane)	B093059-BLK1	ND	ug/L	2.0	0.20	
bis(2-Chloroethoxy)methane	B093059-BLK1	ND	ug/L	2.0	0.20	
bis(2-Chloroethyl) ether	B093059-BLK1	ND	ug/L	2.0	0.31	
bis(2-Chloroisopropyl)ether	B093059-BLK1	ND	ug/L	2.0	0.20	
bis(2-Ethylhexyl)phthalate	B093059-BLK1	ND	ug/L	5.0	0.20	
4-Bromophenyl phenyl ether	B093059-BLK1	ND	ug/L	2.0	0.20	
4-Chloroaniline	B093059-BLK1	ND	ug/L	2.0	1.1	
2-Chloronaphthalene	B093059-BLK1	ND	ug/L	2.0	0.20	
4-Chlorophenyl phenyl ether	B093059-BLK1	ND	ug/L	2.0	0.20	
Chrysene	B093059-BLK1	ND	ug/L	2.0	0.20	
4,4'-DDD	B093059-BLK1	ND	ug/L	2.0	0.26	
4,4'-DDE	B093059-BLK1	ND	ug/L	3.0	0.24	
4,4'-DDT	B093059-BLK1	ND	ug/L	2.0	0.22	
Dibenzo[a,h]anthracene	B093059-BLK1	ND	ug/L	3.0	0.34	
Dibenzofuran	B093059-BLK1	ND	ug/L	2.0	0.20	
1,2-Dichlorobenzene	B093059-BLK1	ND	ug/L	2.0	0.20	
1,3-Dichlorobenzene	B093059-BLK1	ND	ug/L	2.0	0.20	

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B093059						
1,4-Dichlorobenzene	B093059-BLK1	ND	ug/L	2.0	0.27	
3,3-Dichlorobenzidine	B093059-BLK1	ND	ug/L	10	0.53	
Dieldrin	B093059-BLK1	ND	ug/L	3.0	0.39	
Diethyl phthalate	B093059-BLK1	ND	ug/L	2.0	0.20	
Dimethyl phthalate	B093059-BLK1	ND	ug/L	2.0	0.20	
Di-n-butyl phthalate	B093059-BLK1	ND	ug/L	2.0	0.20	
2,4-Dinitrotoluene	B093059-BLK1	ND	ug/L	2.0	0.40	
2,6-Dinitrotoluene	B093059-BLK1	ND	ug/L	2.0	0.20	
Di-n-octyl phthalate	B093059-BLK1	ND	ug/L	2.0	0.21	
1,2-Diphenylhydrazine	B093059-BLK1	ND	ug/L	2.0	0.20	
Endosulfan I	B093059-BLK1	ND	ug/L	10	0.31	
Endosulfan II	B093059-BLK1	ND	ug/L	10	0.30	
Endosulfan sulfate	B093059-BLK1	ND	ug/L	3.0	0.23	
Endrin	B093059-BLK1	ND	ug/L	2.0	0.38	
Endrin aldehyde	B093059-BLK1	ND	ug/L	10	0.44	
Fluoranthene	B093059-BLK1	ND	ug/L	2.0	0.28	
Fluorene	B093059-BLK1	ND	ug/L	2.0	0.20	
Heptachlor	B093059-BLK1	ND	ug/L	2.0	0.20	
Heptachlor epoxide	B093059-BLK1	ND	ug/L	2.0	0.26	
Hexachlorobenzene	B093059-BLK1	ND	ug/L	2.0	0.25	
Hexachlorobutadiene	B093059-BLK1	ND	ug/L	2.0	0.20	
Hexachlorocyclopentadiene	B093059-BLK1	ND	ug/L	2.0	0.31	
Hexachloroethane	B093059-BLK1	ND	ug/L	2.0	0.20	
Indeno[1,2,3-cd]pyrene	B093059-BLK1	ND	ug/L	2.0	0.29	
Isophorone	B093059-BLK1	ND	ug/L	2.0	0.20	
2-Methylnaphthalene	B093059-BLK1	ND	ug/L	2.0	0.20	
Naphthalene	B093059-BLK1	ND	ug/L	2.0	0.20	
2-Naphthylamine	B093059-BLK1	ND	ug/L	20	1.3	
2-Nitroaniline	B093059-BLK1	ND	ug/L	2.0	0.20	
3-Nitroaniline	B093059-BLK1	ND	ug/L	2.0	0.22	
4-Nitroaniline	B093059-BLK1	ND	ug/L	5.0	0.38	
Nitrobenzene	B093059-BLK1	ND	ug/L	2.0	0.20	
N-Nitrosodimethylamine	B093059-BLK1	ND	ug/L	2.0	1.2	
N-Nitrosodi-N-propylamine	B093059-BLK1	ND	ug/L	2.0	0.21	

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B093059						
N-Nitrosodiphenylamine	B093059-BLK1	ND	ug/L	2.0	0.20	
Phenanthrene	B093059-BLK1	ND	ug/L	2.0	0.20	
Pyrene	B093059-BLK1	ND	ug/L	2.0	0.22	
1,2,4-Trichlorobenzene	B093059-BLK1	ND	ug/L	2.0	0.20	
4-Chloro-3-methylphenol	B093059-BLK1	ND	ug/L	5.0	0.20	
2-Chlorophenol	B093059-BLK1	ND	ug/L	2.0	0.20	
2,4-Dichlorophenol	B093059-BLK1	ND	ug/L	2.0	0.23	
2,4-Dimethylphenol	B093059-BLK1	ND	ug/L	2.0	0.20	
4,6-Dinitro-2-methylphenol	B093059-BLK1	ND	ug/L	10	0.24	
2,4-Dinitrophenol	B093059-BLK1	ND	ug/L	10	0.20	
2-Methylphenol	B093059-BLK1	ND	ug/L	2.0	0.20	
3- & 4-Methylphenol	B093059-BLK1	ND	ug/L	2.0	0.40	
2-Nitrophenol	B093059-BLK1	ND	ug/L	2.0	0.20	
4-Nitrophenol	B093059-BLK1	ND	ug/L	2.0	0.30	
Pentachlorophenol	B093059-BLK1	ND	ug/L	10	0.40	
Phenol	B093059-BLK1	ND	ug/L	2.0	0.21	
2,4,5-Trichlorophenol	B093059-BLK1	ND	ug/L	5.0	0.20	
2,4,6-Trichlorophenol	B093059-BLK1	ND	ug/L	5.0	0.20	
2-Fluorophenol (Surrogate)	**B093059-BLK1**	**54.0**	%	**30 - 120 (LCL - UCL)**		
Phenol-d5 (Surrogate)	**B093059-BLK1**	**40.8**	%	**12 - 110 (LCL - UCL)**		
Nitrobenzene-d5 (Surrogate)	**B093059-BLK1**	**104**	%	**50 - 130 (LCL - UCL)**		
2-Fluorobiphenyl (Surrogate)	**B093059-BLK1**	**89.7**	%	**55 - 125 (LCL - UCL)**		
2,4,6-Tribromophenol (Surrogate)	**B093059-BLK1**	**135**	%	**40 - 150 (LCL - UCL)**		
p-Terphenyl-d14 (Surrogate)	**B093059-BLK1**	**79.3**	%	**40 - 150 (LCL - UCL)**		

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B093059										
Acenaphthene	B093059-BS1	LCS	41.429	50.000	ug/L	82.9		50 - 120		
1,4-Dichlorobenzene	B093059-BS1	LCS	37.578	50.000	ug/L	75.2		50 - 120		
2,4-Dinitrotoluene	B093059-BS1	LCS	48.044	50.000	ug/L	96.1		50 - 120		
Hexachlorobenzene	B093059-BS1	LCS	49.295	50.000	ug/L	98.6		60 - 120		
Hexachlorobutadiene	B093059-BS1	LCS	44.135	50.000	ug/L	88.3		40 - 110		
Hexachloroethane	B093059-BS1	LCS	38.102	50.000	ug/L	76.2		40 - 120		
Nitrobenzene	B093059-BS1	LCS	51.410	50.000	ug/L	103		50 - 120		
N-Nitrosodi-N-propylamine	B093059-BS1	LCS	52.380	50.000	ug/L	105		50 - 120		
Pyrene	B093059-BS1	LCS	37.102	50.000	ug/L	74.2		40 - 140		
1,2,4-Trichlorobenzene	B093059-BS1	LCS	43.010	50.000	ug/L	86.0		45 - 120		
4-Chloro-3-methylphenol	B093059-BS1	LCS	47.520	50.000	ug/L	95.0		50 - 120		
2-Chlorophenol	B093059-BS1	LCS	40.721	50.000	ug/L	81.4		50 - 120		
2-Methylphenol	B093059-BS1	LCS	40.633	50.000	ug/L	81.3		40 - 110		
3- & 4-Methylphenol	B093059-BS1	LCS	102.95	100.00	ug/L	103		40 - 110		
4-Nitrophenol	B093059-BS1	LCS	23.736	50.000	ug/L	47.5		10 - 110		
Pentachlorophenol	B093059-BS1	LCS	41.700	50.000	ug/L	83.4		30 - 130		
Phenol	B093059-BS1	LCS	21.505	50.000	ug/L	43.0		20 - 110		
2,4,6-Trichlorophenol	B093059-BS1	LCS	45.920	50.000	ug/L	91.8		54 - 120		
2-Fluorophenol (Surrogate)	B093059-BS1	LCS	20.865	40.000	ug/L	52.2		30 - 120		
Phenol-d5 (Surrogate)	B093059-BS1	LCS	16.238	40.000	ug/L	40.6		12 - 110		
Nitrobenzene-d5 (Surrogate)	B093059-BS1	LCS	41.584	40.000	ug/L	104		50 - 130		
2-Fluorobiphenyl (Surrogate)	B093059-BS1	LCS	34.784	40.000	ug/L	87.0		55 - 125		
2,4,6-Tribromophenol (Surrogate)	B093059-BS1	LCS	55.048	40.000	ug/L	138		40 - 150		
p-Terphenyl-d14 (Surrogate)	B093059-BS1	LCS	12.930	20.000	ug/L	64.6		40 - 150		

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B093059	Used client sample: N										
Acenaphthene	MS	2032744-12	ND	41.278	50.000	ug/L		82.6		50 - 120	
	MSD	2032744-12	ND	40.310	50.000	ug/L	2.4	80.6	30	50 - 120	
1,4-Dichlorobenzene	MS	2032744-12	ND	32.340	50.000	ug/L		64.7		47 - 120	
	MSD	2032744-12	ND	36.060	50.000	ug/L	10.9	72.1	30	47 - 120	
2,4-Dinitrotoluene	MS	2032744-12	ND	49.421	50.000	ug/L		98.8		50 - 130	
	MSD	2032744-12	ND	47.310	50.000	ug/L	4.4	94.6	30	50 - 130	
Hexachlorobenzene	MS	2032744-12	ND	51.656	50.000	ug/L		103		50 - 120	
	MSD	2032744-12	ND	49.830	50.000	ug/L	3.6	99.7	30	50 - 120	
Hexachlorobutadiene	MS	2032744-12	ND	37.407	50.000	ug/L		74.8		40 - 110	
	MSD	2032744-12	ND	42.870	50.000	ug/L	13.6	85.7	30	40 - 110	
Hexachloroethane	MS	2032744-12	ND	30.899	50.000	ug/L		61.8		40 - 120	
	MSD	2032744-12	ND	35.000	50.000	ug/L	12.4	70.0	30	40 - 120	
Nitrobenzene	MS	2032744-12	ND	52.695	50.000	ug/L		105		50 - 120	
	MSD	2032744-12	ND	51.470	50.000	ug/L	2.4	103	30	50 - 120	
N-Nitrosodi-N-propylamine	MS	2032744-12	ND	53.322	50.000	ug/L		107		50 - 120	
	MSD	2032744-12	ND	51.530	50.000	ug/L	3.4	103	30	50 - 120	
Pyrene	MS	2032744-12	ND	39.053	50.000	ug/L		78.1		40 - 140	
	MSD	2032744-12	ND	37.440	50.000	ug/L	4.2	74.9	30	40 - 140	
1,2,4-Trichlorobenzene	MS	2032744-12	ND	38.788	50.000	ug/L		77.6		43 - 120	
	MSD	2032744-12	ND	42.340	50.000	ug/L	8.8	84.7	30	43 - 120	
4-Chloro-3-methylphenol	MS	2032744-12	ND	49.960	50.000	ug/L		99.9		50 - 120	
	MSD	2032744-12	ND	46.090	50.000	ug/L	8.1	92.2	30	50 - 120	
2-Chlorophenol	MS	2032744-12	ND	42.395	50.000	ug/L		84.8		50 - 120	
	MSD	2032744-12	ND	39.070	50.000	ug/L	8.2	78.1	30	50 - 120	
2-Methylphenol	MS	2032744-12	ND	43.953	50.000	ug/L		87.9		40 - 110	
	MSD	2032744-12	ND	40.320	50.000	ug/L	8.6	80.6	30	40 - 110	
3- & 4-Methylphenol	MS	2032744-12	ND	108.02	100.00	ug/L		108		40 - 110	
	MSD	2032744-12	ND	98.080	100.00	ug/L	9.6	98.1	30	40 - 110	
4-Nitrophenol	MS	2032744-12	ND	27.558	50.000	ug/L		55.1		10 - 110	
	MSD	2032744-12	ND	24.580	50.000	ug/L	11.4	49.2	30	10 - 110	
Pentachlorophenol	MS	2032744-12	ND	43.904	50.000	ug/L		87.8		30 - 120	
	MSD	2032744-12	ND	41.490	50.000	ug/L	5.7	83.0	30	30 - 120	
Phenol	MS	2032744-12	ND	22.550	50.000	ug/L		45.1		20 - 110	
	MSD	2032744-12	ND	20.980	50.000	ug/L	7.2	42.0	30	20 - 110	
2,4,6-Trichlorophenol	MS	2032744-12	ND	48.784	50.000	ug/L		97.6		50 - 150	
	MSD	2032744-12	ND	46.010	50.000	ug/L	5.9	92.0	30	50 - 150	

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Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B093059	Used client sample: N										
2-Fluorophenol (Surrogate)	MS	2032744-12	ND	22.109	40.000	ug/L		55.3		30 - 120	
	MSD	2032744-12	ND	20.120	40.000	ug/L	9.4	50.3		30 - 120	
Phenol-d5 (Surrogate)	MS	2032744-12	ND	16.268	40.000	ug/L		40.7		12 - 110	
	MSD	2032744-12	ND	15.490	40.000	ug/L	4.9	38.7		12 - 110	
Nitrobenzene-d5 (Surrogate)	MS	2032744-12	ND	40.562	40.000	ug/L		101		50 - 130	
	MSD	2032744-12	ND	39.830	40.000	ug/L	1.8	99.6		50 - 130	
2-Fluorobiphenyl (Surrogate)	MS	2032744-12	ND	34.418	40.000	ug/L		86.0		55 - 125	
	MSD	2032744-12	ND	33.260	40.000	ug/L	3.4	83.2		55 - 125	
2,4,6-Tribromophenol (Surrogate)	MS	2032744-12	ND	56.664	40.000	ug/L		142		40 - 150	
	MSD	2032744-12	ND	53.700	40.000	ug/L	5.4	134		40 - 150	
p-Terphenyl-d14 (Surrogate)	MS	2032744-12	ND	14.367	20.000	ug/L		71.8		40 - 150	
	MSD	2032744-12	ND	13.040	20.000	ug/L	9.7	65.2		40 - 150	

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Crawford & Associates, Inc. 1100 Corporate Way, Suite 230 Sacramento, CA 95831	**Reported:** 12/03/2020 9:13 Project: Turloc NVRWP Pipeline Project Number: 20-642.1Turlock Water Distrib. Sys Project Manager: Steve Carter

Water Analysis (General Chemistry)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B092883						
Total Dissolved Solids @ 180 C	B092883-BLK1	ND	mg/L	6.7	3.3	
QC Batch ID: B093099						
Total Cyanide	B093099-BLK1	ND	ug/L	5.0	1.7	

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Water Analysis (General Chemistry)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B092883										
Total Dissolved Solids @ 180 C	B092883-BS1	LCS	585.00	586.00	mg/L	99.8		90 - 110		
QC Batch ID: B093099										
Total Cyanide	B093099-BS1	LCS	154.70	150.00	ug/L	103		90 - 110		

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Water Analysis (General Chemistry)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B092883	Used client sample: N										
Total Dissolved Solids @ 180 C	DUP	2033298-02	1130.0	1145.0		mg/L	1.3		10		
QC Batch ID: B093099	Used client sample: N										
Total Cyanide	DUP	2033427-01	3.4520	3.3600		ug/L	2.7		10		J
	MS	2033427-01	3.4520	96.674	100.00	ug/L		93.2		90 - 110	
	MSD	2033427-01	3.4520	103.53	100.00	ug/L	6.9	100	20	90 - 110	

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Metals Analysis

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B093075						
Total Recoverable Antimony	B093075-BLK1	ND	ug/L	2.0	0.11	
Total Recoverable Arsenic	B093075-BLK1	ND	ug/L	2.0	0.70	
Total Recoverable Barium	B093075-BLK1	ND	ug/L	1.0	0.21	
Total Recoverable Beryllium	B093075-BLK1	ND	ug/L	1.0	0.14	
Total Recoverable Cadmium	B093075-BLK1	ND	ug/L	1.0	0.11	
Total Recoverable Chromium	B093075-BLK1	ND	ug/L	3.0	0.50	
Total Recoverable Cobalt	B093075-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Copper	B093075-BLK1	ND	ug/L	2.0	0.22	
Total Recoverable Lead	B093075-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Molybdenum	B093075-BLK1	ND	ug/L	1.0	0.11	
Total Recoverable Nickel	B093075-BLK1	ND	ug/L	2.0	0.19	
Total Recoverable Selenium	B093075-BLK1	ND	ug/L	2.0	0.19	
Total Recoverable Silver	B093075-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Thallium	B093075-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Vanadium	B093075-BLK1	ND	ug/L	3.0	0.78	
QC Batch ID: B093243						
Total Recoverable Zinc	B093243-BLK1	ND	ug/L	10	1.7	
QC Batch ID: B093916						
Total Recoverable Mercury	B093916-BLK1	ND	ug/L	0.20	0.022	

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Metals Analysis

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B093075										
Total Recoverable Antimony	B093075-BS1	LCS	43.411	40.000	ug/L	109		85 - 115		
Total Recoverable Arsenic	B093075-BS1	LCS	107.83	100.00	ug/L	108		85 - 115		
Total Recoverable Barium	B093075-BS1	LCS	43.154	40.000	ug/L	108		85 - 115		
Total Recoverable Beryllium	B093075-BS1	LCS	43.325	40.000	ug/L	108		85 - 115		
Total Recoverable Cadmium	B093075-BS1	LCS	43.567	40.000	ug/L	109		85 - 115		
Total Recoverable Chromium	B093075-BS1	LCS	45.916	40.000	ug/L	115		85 - 115		
Total Recoverable Cobalt	B093075-BS1	LCS	41.490	40.000	ug/L	104		85 - 115		
Total Recoverable Copper	B093075-BS1	LCS	108.09	100.00	ug/L	108		85 - 115		
Total Recoverable Lead	B093075-BS1	LCS	110.87	100.00	ug/L	111		85 - 115		
Total Recoverable Molybdenum	B093075-BS1	LCS	38.943	40.000	ug/L	97.4		85 - 115		
Total Recoverable Nickel	B093075-BS1	LCS	108.53	100.00	ug/L	109		85 - 115		
Total Recoverable Selenium	B093075-BS1	LCS	113.17	100.00	ug/L	113		85 - 115		
Total Recoverable Silver	B093075-BS1	LCS	41.901	40.000	ug/L	105		85 - 115		
Total Recoverable Thallium	B093075-BS1	LCS	43.053	40.000	ug/L	108		85 - 115		
Total Recoverable Vanadium	B093075-BS1	LCS	41.797	40.000	ug/L	104		85 - 115		
QC Batch ID: B093243										
Total Recoverable Zinc	B093243-BS1	LCS	95.702	100.00	ug/L	95.7		85 - 115		
QC Batch ID: B093916										
Total Recoverable Mercury	B093916-BS1	LCS	0.95500	1.0000	ug/L	95.5		85 - 115		

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Metals Analysis

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B093075	Used client sample: N										
Total Recoverable Antimony	DUP	2033800-02	0.85100	0.81300		ug/L	4.6		20		J
	MS	2033800-02	0.85100	46.141	40.000	ug/L		113		70 - 130	
	MSD	2033800-02	0.85100	46.399	40.000	ug/L	0.6	114	20	70 - 130	
Total Recoverable Arsenic	DUP	**2033800-02**	**2.8980**	**2.1740**		**ug/L**	**28.5**		**20**		**A02**
	MS	**2033800-02**	**2.8980**	**114.62**	**100.00**	**ug/L**		**112**		**70 - 130**	
	MSD	**2033800-02**	**2.8980**	**115.33**	**100.00**	**ug/L**	**0.6**	**112**	**20**	**70 - 130**	
Total Recoverable Barium	DUP	2033800-02	92.114	91.870		ug/L	0.3		20		
	MS	2033800-02	92.114	129.64	40.000	ug/L		93.8		70 - 130	
	MSD	2033800-02	92.114	133.23	40.000	ug/L	2.7	103	20	70 - 130	
Total Recoverable Beryllium	DUP	2033800-02	ND	ND		ug/L			20		
	MS	2033800-02	ND	41.583	40.000	ug/L		104		70 - 130	
	MSD	2033800-02	ND	41.952	40.000	ug/L	0.9	105	20	70 - 130	
Total Recoverable Cadmium	DUP	**2033800-02**	**0.14700**	**0.22300**		**ug/L**	**41.1**		**20**		**J,A02**
	MS	**2033800-02**	**0.14700**	**43.813**	**40.000**	**ug/L**		**109**		**70 - 130**	
	MSD	**2033800-02**	**0.14700**	**43.818**	**40.000**	**ug/L**	**0.0**	**109**	**20**	**70 - 130**	
Total Recoverable Chromium	DUP	2033800-02	ND	ND		ug/L			20		
	MS	2033800-02	ND	39.615	40.000	ug/L		99.0		70 - 130	
	MSD	2033800-02	ND	40.295	40.000	ug/L	1.7	101	20	70 - 130	
Total Recoverable Cobalt	DUP	2033800-02	0.81900	0.84700		ug/L	3.4		20		J
	MS	2033800-02	0.81900	39.570	40.000	ug/L		96.9		70 - 130	
	MSD	2033800-02	0.81900	40.651	40.000	ug/L	2.7	99.6	20	70 - 130	
Total Recoverable Copper	DUP	**2033800-02**	**2.4540**	**1.1620**		**ug/L**	**71.5**		**20**		**J,A02**
	MS	**2033800-02**	**2.4540**	**102.28**	**100.00**	**ug/L**		**99.8**		**70 - 130**	
	MSD	**2033800-02**	**2.4540**	**103.21**	**100.00**	**ug/L**	**0.9**	**101**	**20**	**70 - 130**	
Total Recoverable Lead	DUP	2033800-02	0.10000	ND		ug/L			20		
	MS	2033800-02	0.10000	103.58	100.00	ug/L		103		70 - 130	
	MSD	2033800-02	0.10000	105.13	100.00	ug/L	1.5	105	20	70 - 130	
Total Recoverable Molybdenum	DUP	2033800-02	2.5610	2.2190		ug/L	14.3		20		
	MS	2033800-02	2.5610	43.723	40.000	ug/L		103		70 - 130	
	MSD	2033800-02	2.5610	45.723	40.000	ug/L	4.5	108	20	70 - 130	
Total Recoverable Nickel	DUP	2033800-02	8.1620	7.8780		ug/L	3.5		20		
	MS	2033800-02	8.1620	103.19	100.00	ug/L		95.0		70 - 130	
	MSD	2033800-02	8.1620	107.58	100.00	ug/L	4.2	99.4	20	70 - 130	
Total Recoverable Selenium	DUP	2033800-02	0.80800	ND		ug/L			20		
	MS	2033800-02	0.80800	115.58	100.00	ug/L		115		70 - 130	
	MSD	2033800-02	0.80800	114.66	100.00	ug/L	0.8	114	20	70 - 130	
Total Recoverable Silver	DUP	2033800-02	ND	ND		ug/L			20		
	MS	2033800-02	ND	41.710	40.000	ug/L		104		70 - 130	
	MSD	2033800-02	ND	42.190	40.000	ug/L	1.1	105	20	70 - 130	

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 12/03/2020 9:13
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1Turlock Water Distrib. Sys
Project Manager: Steve Carter

Metals Analysis

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B093075	Used client sample: N										
Total Recoverable Thallium	DUP	2033800-02	ND	ND		ug/L			20		
	MS	2033800-02	ND	40.952	40.000	ug/L		102		70 - 130	
	MSD	2033800-02	ND	41.270	40.000	ug/L	0.8	103	20	70 - 130	
Total Recoverable Vanadium	DUP	2033800-02	ND	1.0480		ug/L			20		J
	MS	2033800-02	ND	39.835	40.000	ug/L		99.6		70 - 130	
	MSD	2033800-02	ND	41.660	40.000	ug/L	4.5	104	20	70 - 130	
QC Batch ID: B093243	Used client sample: N										
Total Recoverable Zinc	DUP	2033563-01	139.27	140.45		ug/L	0.8		20		
	MS	2033563-01	139.27	233.32	100.00	ug/L		94.0		70 - 130	
	MSD	2033563-01	139.27	232.62	100.00	ug/L	0.3	93.4	20	70 - 130	
QC Batch ID: B093916	Used client sample: N										
Total Recoverable Mercury	DUP	2033763-01	ND	ND		ug/L			20		
	MS	2033763-01	ND	0.70750	1.0000	ug/L		70.8		70 - 130	
	MSD	2033763-01	ND	0.71750	1.0000	ug/L	1.4	71.8	20	70 - 130	

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Crawford & Associates, Inc. 1100 Corporate Way, Suite 230 Sacramento, CA 95831	**Reported:** 12/03/2020 9:13 Project: Turloc NVRWP Pipeline Project Number: 20-642.1Turlock Water Distrib. Sys Project Manager: Steve Carter

Notes And Definitions

J	Estimated Value (CLP Flag)
MDL	Method Detection Limit
ND	Analyte Not Detected
PQL	Practical Quantitation Limit
A02	The difference between duplicate readings is less than the quantitation limit.
A07	Detection and quantitation limits were raised due to sample dilution caused by high analyte concentration or matrix interference.
S09	The surrogate recovery for this compound was not within the control limits.

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Date of Report: 09/08/2020

Kennedy Hauder

Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Client Project:	20-642.1 Turlock Water Distribution System
BCL Project:	Turloc NVRWP Pipeline
BCL Work Order:	2024602
Invoice ID:	B391216

Enclosed are the results of analyses for samples received by the laboratory on 8/25/2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Contact Person: Felicia Johnson
Client Service Rep

Stuart Buttram
Technical Director

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BC LABORATORIES

4100 Atlas Court Bakersfield, Ca. 93308
(661) 327-4911 • FAX (661) 327-1918 • www.bclabs.com

Chain of Custody

* Required Fields 20-246 02 TEMP: _____

Client/Company Name *: Crawford & Assoc. Inc.
Report Attention *: Kennedy Hauder
Phone * #: 775-762-3315 FAX * #:
E-mail: kennedy.hauder@crawford-inc.com
Address *: 1100 Corporate Way #230 City *: Sacramento State *: CA Zip *: 95831
Project Information: 20-642.1 Turlock Water Distribution System
PO #
BCL Quote #
How would you like your completed results sent? ☑ E-Mail ☐ Fax ☐ EDD ☐ Mail Only
Sampler Name Printed / Signature: Kennedy Hauder
QC Request: ☑ STD ☐ Level II
Result Request ** Surcharge: ☑ STD ☐ 5 Day** ☐ 2 Day** ☐ 1 Day**
Carbon Copies: CDHS ☐ Fresno Co ☐ EPA ☐ Merced Co ☐ Tulare Co ☐ Other:
Regulatory Compliance: Electronic Data Transfer: Y ☐ N ☐ System No. *

Matrix Types: RSW = Raw Surface Water, CFW = Chorinated Finished Water, CWW = Chorinated Waste Water, BW = Bottled Water, RGW = Raw Ground Water, FW = Finished Water, WW = Waste Water, SW = Storm Water, DW = Drinking Water, SO = Solid

ANALYSIS REQUESTED

Sample #	# Bottles	Sampled Date	Sampled Time	Sample Description / Location *	Matrix *	Comments / Station Code	Organo chlorine pesticides, PCBs (EPA 608)	VOCs (EPA 624)	Semivolatiles (EPA 625)	Cyanide (EPA 335.4)	Total metals-CAM 17	TDS (EPA 160.1)	Hexavalent Chromium	Tri-valent Chrome
-1		8/24	9:50AM	A-20-014			X	X	X	X	X	X	X	X

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by (Signature and Print Name)	Company
Kennedy Hauder	Crawford & Associates, Inc	8/24/20	15:54	Mark Ellis	BCL
Mark Ellis	BCL	8/24/20	1610	Jackson	BCL 825-20945

Received for Lab by: (Signature and Printed Name) Date Time

Payment Received at Delivery: Date: Amount: Check/Cash/Card PIA # Init.

Shipping Method: CAO UPS GSO WALK-IN SJVC FED EX OTHER

Cooling Method:

Packing Material:

SHORT HOLDING TIME
Cr+6 NO2 NO3 OP SS
DO Cl2 BOD MBAS COT

CHK BY

DISTRIBUTION

SUB OUT ☐

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Chain of Custody and Cooler Receipt Form for 2024602 Page 2 of 2

BC LABORATORIES INC. COOLER RECEIPT FORM Page 1 Of 1

Submission #: 20-24602

SHIPPING INFORMATION
Fed Ex ☐ UPS ☐ Ontrac ☐ Hand Delivery ☐
BC Lab Field Service ☐ Other ☒ (Specify) GLS

SHIPPING CONTAINER
Ice Chest ☒ None ☐ Box ☐
Other ☐ (Specify)

FREE LIQUID
YES ☐ NO ☐
W / S

Refrigerant: Ice ☒ Blue Ice ☐ None ☐ Other ☐ Comments:

Custody Seals Ice Chest ☐ Intact? Yes ☐ No ☐ Containers ☐ Intact? Yes ☐ No ☐ None ☒ Comments:

All samples received? Yes ☑ No ☐ All samples containers intact? Yes ☑ No ☐ Description(s) match COC? Yes ☑ No ☐

COC Received ☒ YES ☐ NO

Emissivity: .95 Container: PE Thermometer ID: 274 Date/Time 8-25-20 945
Temperature: (A) 3.4 °C / (C) 3.3 °C Analyst Init JKJ

SAMPLE CONTAINERS	SAMPLE NUMBERS 1	2	3	4	5	6	7	8	9	10
QT PE UNPRES	D									
4oz / 8oz / 16oz PE UNPRES	E									
2oz Cr+6	F									
QT INORGANIC CHEMICAL METALS										
INORGANIC CHEMICAL METALS 4oz / 8oz / 16oz	G									
PT CYANIDE	H									
PT NITROGEN FORMS										
PT TOTAL SULFIDE										
2oz. NITRATE / NITRITE										
PT TOTAL ORGANIC CARBON										
PT CHEMICAL OXYGEN DEMAND										
PIA PHENOLICS										
40ml VOA VIAL TRAVEL BLANK										
40ml VOA VIAL	ABC									
QT EPA 1664										
PT ODOR										
RADIOLOGICAL										
BACTERIOLOGICAL										
40 ml VOA VIAL- 504										
QT EPA 508/608/8080										
QT EPA 515.1/8150										
QT EPA 525										
QT EPA 525 TRAVEL BLANK										
40ml EPA 547										
40ml EPA 531.1										
8oz EPA 548 1608 QNA	I									
QT EPA 549 625 QNA	J									
QT EPA 8015M										
QT EPA 8270										
8oz / 16oz / 32oz AMBER										
8oz / 16oz / 32oz JAR										
SOIL SLEEVE										
VOCB VIAL										
PLASTIC BAG										
TEDLAR BAG										
FERROUS IRON										
ENCORE										
SMART KIT										
SUMMA CANISTER										

Comments:
Sample Numbering Completed By: CMZ Date/Time: 8/25/20 1100 Rev 21 05/23/2016
A = Actual / C = Corrected

Crawford & Associates, Inc. 1100 Corporate Way, Suite 230 Sacramento, CA 95831	**Reported:** 09/08/2020 11:14 Project: Turloc NVRWP Pipeline Project Number: 20-642.1 Turlock Water Distribution System Project Manager: Kennedy Hauder

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
2024602-01	**COC Number:**	---	**Receive Date:**	08/25/2020 09:45
	Project Number:	---	**Sampling Date:**	08/24/2020 09:50
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	A-20-014	**Lab Matrix:**	Water
	Sampled By:	---	**Sample Type:**	Water

Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Organochlorine Pesticides and PCB's (EPA Method 608.3)

BCL Sample ID: 2024602-01 | **Client Sample Name:** A-20-014, 8/24/2020 9:50:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Aldrin	ND	ug/L	0.0062	0.0012	EPA-608.3	ND		1
alpha-BHC	ND	ug/L	0.0062	0.00062	EPA-608.3	ND		1
beta-BHC	ND	ug/L	0.0062	0.00079	EPA-608.3	ND		1
delta-BHC	ND	ug/L	0.0062	0.0019	EPA-608.3	ND		1
gamma-BHC (Lindane)	ND	ug/L	0.0062	0.00083	EPA-608.3	ND		1
Chlordane (Technical)	ND	ug/L	0.62	0.056	EPA-608.3	ND		1
4,4'-DDD	ND	ug/L	0.0062	0.0011	EPA-608.3	ND		1
4,4'-DDE	ND	ug/L	0.0062	0.0016	EPA-608.3	ND		1
4,4'-DDT	ND	ug/L	0.0062	0.0012	EPA-608.3	ND		1
Dieldrin	ND	ug/L	0.0062	0.0014	EPA-608.3	ND		1
Endosulfan I	ND	ug/L	0.0062	0.00084	EPA-608.3	ND		1
Endosulfan II	ND	ug/L	0.0062	0.0012	EPA-608.3	ND		1
Endosulfan sulfate	ND	ug/L	0.0062	0.00068	EPA-608.3	ND		1
Endrin	ND	ug/L	0.0062	0.00085	EPA-608.3	ND		1
Endrin aldehyde	ND	ug/L	0.012	0.00067	EPA-608.3	ND		1
Heptachlor	ND	ug/L	0.0062	0.0012	EPA-608.3	ND		1
Heptachlor epoxide	ND	ug/L	0.0062	0.00079	EPA-608.3	ND		1
Methoxychlor	ND	ug/L	0.0062	0.0046	EPA-608.3	ND		1
Toxaphene	ND	ug/L	2.5	0.25	EPA-608.3	ND		1
PCB-1016	ND	ug/L	0.25	0.081	EPA-608.3	ND		1
PCB-1221	ND	ug/L	0.25	0.078	EPA-608.3	ND		1
PCB-1232	ND	ug/L	0.25	0.073	EPA-608.3	ND		1
PCB-1242	ND	ug/L	0.25	0.046	EPA-608.3	ND		1
PCB-1248	ND	ug/L	0.25	0.054	EPA-608.3	ND		1
PCB-1254	ND	ug/L	0.25	0.046	EPA-608.3	ND		1
PCB-1260	ND	ug/L	0.25	0.11	EPA-608.3	ND		1
Total PCB's (Summation)	ND	ug/L	0.25	0.12	EPA-608.3	ND		1
TCMX (Surrogate)	37.8	%	40 - 140 (LCL - UCL)		EPA-608.3		A20	1
Decachlorobiphenyl (Surrogate)	78.6	%	40 - 130 (LCL - UCL)		EPA-608.3			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-608.3	08/27/20 20:00	08/29/20 12:46	HKS	GC-17	1.235	B086135	EPA 608.3

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Volatile Organic Analysis (EPA Method 624.1)

BCL Sample ID: 2024602-01 | **Client Sample Name:** A-20-014, 8/24/2020 9:50:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Benzene	ND	ug/L	0.50	0.062	EPA-624.1	ND		1
Bromodichloromethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Bromoform	ND	ug/L	0.50	0.067	EPA-624.1	ND		1
Bromomethane	ND	ug/L	1.0	0.077	EPA-624.1	ND		1
Carbon tetrachloride	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Chlorobenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Chloroethane	ND	ug/L	0.50	0.057	EPA-624.1	ND		1
Chloroform	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Chloromethane	ND	ug/L	0.50	0.055	EPA-624.1	ND		1
Dibromochloromethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,2-Dichlorobenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,3-Dichlorobenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,4-Dichlorobenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,1-Dichloroethane	ND	ug/L	0.50	0.051	EPA-624.1	ND		1
1,2-Dichloroethane	ND	ug/L	0.50	0.068	EPA-624.1	ND		1
1,1-Dichloroethene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
cis-1,2-Dichloroethene	ND	ug/L	0.50	0.060	EPA-624.1	ND		1
trans-1,2-Dichloroethene	ND	ug/L	0.50	0.056	EPA-624.1	ND		1
1,2-Dichloropropane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
cis-1,3-Dichloropropene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
trans-1,3-Dichloropropene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Ethylbenzene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Methylene chloride	ND	ug/L	1.0	0.055	EPA-624.1	ND		1
Methyl t-butyl ether	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,1,2,2-Tetrachloroethane	ND	ug/L	0.50	0.066	EPA-624.1	ND		1
Tetrachloroethene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Toluene	**0.13**	**ug/L**	**0.50**	**0.051**	**EPA-624.1**	ND	**J**	1
1,1,1-Trichloroethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,1,2-Trichloroethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Trichloroethene	ND	ug/L	0.50	0.081	EPA-624.1	ND		1
Trichlorofluoromethane	ND	ug/L	0.50	0.080	EPA-624.1	ND		1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
Vinyl chloride	ND	ug/L	0.50	0.059	EPA-624.1	ND		1

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Volatile Organic Analysis (EPA Method 624.1)

BCL Sample ID: 2024602-01 | **Client Sample Name:** A-20-014, 8/24/2020 9:50:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Total Xylenes	ND	ug/L	0.50	0.15	EPA-624.1	ND		1
p- & m-Xylenes	ND	ug/L	0.50	0.10	EPA-624.1	ND		1
o-Xylene	ND	ug/L	0.50	0.050	EPA-624.1	ND		1
1,2-Dichloroethane-d4 (Surrogate)	105	%	75 - 125 (LCL - UCL)		EPA-624.1			1
Toluene-d8 (Surrogate)	102	%	80 - 120 (LCL - UCL)		EPA-624.1			1
4-Bromofluorobenzene (Surrogate)	102	%	80 - 120 (LCL - UCL)		EPA-624.1			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-624.1	08/26/20 06:00	08/26/20 13:21	MGC	MS-V7	1	B085755	EPA 624.1

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

BCL Sample ID: 2024602-01 | **Client Sample Name:** A-20-014, 8/24/2020 9:50:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Acenaphthene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Acenaphthylene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Aldrin	ND	ug/L	3.3	0.38	EPA-625.1	ND		1
Aniline	ND	ug/L	8.3	0.47	EPA-625.1	ND		1
Anthracene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Benzidine	ND	ug/L	33	2.7	EPA-625.1	ND		1
Benzo[a]anthracene	ND	ug/L	3.3	0.35	EPA-625.1	ND		1
Benzo[b]fluoranthene	ND	ug/L	3.3	0.40	EPA-625.1	ND		1
Benzo[k]fluoranthene	ND	ug/L	3.3	0.50	EPA-625.1	ND		1
Benzo[a]pyrene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Benzo[g,h,i]perylene	ND	ug/L	3.3	0.55	EPA-625.1	ND		1
Benzoic acid	**68**	**ug/L**	**17**	**0.87**	**EPA-625.1**	ND		1
Benzyl alcohol	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Benzyl butyl phthalate	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
alpha-BHC	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
beta-BHC	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
delta-BHC	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
gamma-BHC (Lindane)	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
bis(2-Chloroethoxy)methane	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
bis(2-Chloroethyl) ether	ND	ug/L	3.3	0.52	EPA-625.1	ND		1
bis(2-Chloroisopropyl)ether	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
bis(2-Ethylhexyl)phthalate	ND	ug/L	8.3	0.33	EPA-625.1	ND		1
4-Bromophenyl phenyl ether	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
4-Chloroaniline	ND	ug/L	3.3	1.8	EPA-625.1	ND		1
2-Chloronaphthalene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
4-Chlorophenyl phenyl ether	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Chrysene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
4,4'-DDD	ND	ug/L	3.3	0.43	EPA-625.1	ND		1
4,4'-DDE	ND	ug/L	5.0	0.40	EPA-625.1	ND		1
4,4'-DDT	ND	ug/L	3.3	0.37	EPA-625.1	ND		1
Dibenzo[a,h]anthracene	ND	ug/L	5.0	0.57	EPA-625.1	ND		1
Dibenzofuran	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
1,2-Dichlorobenzene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

BCL Sample ID: 2024602-01 | **Client Sample Name:** A-20-014, 8/24/2020 9:50:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
1,3-Dichlorobenzene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
1,4-Dichlorobenzene	ND	ug/L	3.3	0.45	EPA-625.1	ND		1
3,3-Dichlorobenzidine	ND	ug/L	17	0.88	EPA-625.1	ND		1
Dieldrin	ND	ug/L	5.0	0.65	EPA-625.1	ND		1
Diethyl phthalate	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Dimethyl phthalate	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Di-n-butyl phthalate	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
2,4-Dinitrotoluene	ND	ug/L	3.3	0.67	EPA-625.1	ND		1
2,6-Dinitrotoluene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Di-n-octyl phthalate	ND	ug/L	3.3	0.35	EPA-625.1	ND		1
1,2-Diphenylhydrazine	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Endosulfan I	ND	ug/L	17	0.52	EPA-625.1	ND		1
Endosulfan II	ND	ug/L	17	0.50	EPA-625.1	ND		1
Endosulfan sulfate	ND	ug/L	5.0	0.38	EPA-625.1	ND		1
Endrin	ND	ug/L	3.3	0.63	EPA-625.1	ND		1
Endrin aldehyde	ND	ug/L	17	0.73	EPA-625.1	ND		1
Fluoranthene	ND	ug/L	3.3	0.47	EPA-625.1	ND		1
Fluorene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Heptachlor	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Heptachlor epoxide	ND	ug/L	3.3	0.43	EPA-625.1	ND		1
Hexachlorobenzene	ND	ug/L	3.3	0.42	EPA-625.1	ND		1
Hexachlorobutadiene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Hexachlorocyclopentadiene	ND	ug/L	3.3	0.52	EPA-625.1	ND		1
Hexachloroethane	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Indeno[1,2,3-cd]pyrene	ND	ug/L	3.3	0.48	EPA-625.1	ND		1
Isophorone	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
2-Methylnaphthalene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Naphthalene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
2-Naphthylamine	ND	ug/L	33	2.2	EPA-625.1	ND		1
2-Nitroaniline	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
3-Nitroaniline	ND	ug/L	3.3	0.37	EPA-625.1	ND		1
4-Nitroaniline	ND	ug/L	8.3	0.63	EPA-625.1	ND		1
Nitrobenzene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

BCL Sample ID: 2024602-01 | **Client Sample Name:** A-20-014, 8/24/2020 9:50:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
N-Nitrosodimethylamine	ND	ug/L	3.3	2.0	EPA-625.1	ND		1
N-Nitrosodi-N-propylamine	ND	ug/L	3.3	0.35	EPA-625.1	ND		1
N-Nitrosodiphenylamine	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Phenanthrene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
Pyrene	ND	ug/L	3.3	0.37	EPA-625.1	ND		1
1,2,4-Trichlorobenzene	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
4-Chloro-3-methylphenol	ND	ug/L	8.3	0.33	EPA-625.1	ND		1
2-Chlorophenol	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
2,4-Dichlorophenol	ND	ug/L	3.3	0.38	EPA-625.1	ND		1
2,4-Dimethylphenol	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
4,6-Dinitro-2-methylphenol	ND	ug/L	17	0.40	EPA-625.1	ND		1
2,4-Dinitrophenol	ND	ug/L	17	0.33	EPA-625.1	ND		1
2-Methylphenol	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
3- & 4-Methylphenol	ND	ug/L	3.3	0.67	EPA-625.1	ND		1
2-Nitrophenol	ND	ug/L	3.3	0.33	EPA-625.1	ND		1
4-Nitrophenol	ND	ug/L	3.3	0.50	EPA-625.1	ND		1
Pentachlorophenol	ND	ug/L	17	0.67	EPA-625.1	ND		1
Phenol	ND	ug/L	3.3	0.35	EPA-625.1	ND		1
2,4,5-Trichlorophenol	ND	ug/L	8.3	0.33	EPA-625.1	ND		1
2,4,6-Trichlorophenol	ND	ug/L	8.3	0.33	EPA-625.1	ND		1
2-Fluorophenol (Surrogate)	58.3	%	30 - 120 (LCL - UCL)		EPA-625.1			1
Phenol-d5 (Surrogate)	55.3	%	12 - 110 (LCL - UCL)		EPA-625.1			1
Nitrobenzene-d5 (Surrogate)	101	%	50 - 130 (LCL - UCL)		EPA-625.1			1
2-Fluorobiphenyl (Surrogate)	88.9	%	55 - 125 (LCL - UCL)		EPA-625.1			1
2,4,6-Tribromophenol (Surrogate)	119	%	40 - 150 (LCL - UCL)		EPA-625.1			1
p-Terphenyl-d14 (Surrogate)	106	%	40 - 150 (LCL - UCL)		EPA-625.1			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-625.1	08/28/20 11:40	09/01/20 03:26	MK1	MS-B2	1.667	B086222	EPA 625.1

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Water Analysis (General Chemistry)

BCL Sample ID: 2024602-01 | **Client Sample Name:** A-20-014, 8/24/2020 9:50:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Trivalent Chromium	**3200**	**ug/L**	**10**	**5.0**	**Calc**	ND		1
Total Dissolved Solids @ 180 C	**310**	**mg/L**	**20**	**10**	**EPA-160.1**	ND	**A07**	2
Total Cyanide	**3.3**	**ug/L**	**5.0**	**1.7**	**EPA-335.4**	ND	**J**	3

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	Calc	08/26/20 09:01	09/01/20 17:01	AMM	Calc	1	B^H0283	Calc
2	EPA-160.1	08/26/20 14:00	08/26/20 14:00	CAD	MANUAL	2	B085793	No Prep
3	EPA-335.4	08/27/20 08:41	08/27/20 11:18	MC1	KONE-1	1	B085864	EPA 335.4 Total

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Metals Analysis

BCL Sample ID: 2024602-01 | **Client Sample Name:** A-20-014, 8/24/2020 9:50:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Hexavalent Chromium	**0.65**	**ug/L**	**0.20**	**0.020**	**EPA-218.6**	ND		1
Total Recoverable Antimony	**1.3**	**ug/L**	**20**	**1.1**	**EPA-200.8**	ND	**J,A07**	2
Total Recoverable Arsenic	**320**	**ug/L**	**20**	**7.0**	**EPA-200.8**	ND	**A07**	2
Total Recoverable Barium	**25000**	**ug/L**	**10**	**2.1**	**EPA-200.8**	ND	**A07**	2
Total Recoverable Beryllium	**96**	**ug/L**	**100**	**14**	**EPA-200.8**	ND	**J,A07**	3
Total Recoverable Cadmium	**9.9**	**ug/L**	**10**	**1.1**	**EPA-200.8**	1.8	**J,A07**	2
Total Recoverable Chromium	**3200**	**ug/L**	**300**	**50**	**EPA-200.8**	ND	**A07**	3
Total Recoverable Cobalt	**1400**	**ug/L**	**100**	**10**	**EPA-200.8**	ND	**A07**	3
Total Recoverable Copper	**2500**	**ug/L**	**20**	**2.2**	**EPA-200.8**	2.3	**A07**	2
Total Recoverable Lead	**850**	**ug/L**	**10**	**1.0**	**EPA-200.8**	ND	**A07**	2
Total Recoverable Mercury	**5.4**	**ug/L**	**1.0**	**0.11**	**EPA-245.1**	ND	**A07**	4
Total Recoverable Molybdenum	**13**	**ug/L**	**10**	**1.1**	**EPA-200.8**	ND	**A07**	2
Total Recoverable Nickel	**2400**	**ug/L**	**200**	**19**	**EPA-200.8**	ND	**A07**	3
Total Recoverable Selenium	ND	ug/L	200	19	EPA-200.8	ND	A07	3
Total Recoverable Silver	**9.6**	**ug/L**	**10**	**1.0**	**EPA-200.8**	ND	**J,A07**	2
Total Recoverable Thallium	**34**	**ug/L**	**10**	**1.0**	**EPA-200.8**	ND	**A07**	2
Total Recoverable Vanadium	**4900**	**ug/L**	**300**	**78**	**EPA-200.8**	ND	**A07**	3
Total Recoverable Zinc	**8200**	**ug/L**	**1000**	**170**	**EPA-200.8**	ND	**A07**	3

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	Prep Method
1	EPA-218.6	08/25/20 19:00	08/26/20 11:27	KB1	IC-4	1	B085772	No Prep
2	EPA-200.8	08/27/20 07:30	08/27/20 23:35	JNC	PE-EL2	10	B085860	EPA 200.2
3	EPA-200.8	08/27/20 07:30	08/28/20 11:20	JNC	PE-EL2	100	B085860	EPA 200.2
4	EPA-245.1	08/31/20 08:45	08/31/20 15:00	TMT	CETAC3	5	B086101	EPA 245.1

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Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Organochlorine Pesticides and PCB's (EPA Method 608.3)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B086135						
Aldrin	B086135-BLK1	ND	ug/L	0.0050	0.00095	
alpha-BHC	B086135-BLK1	ND	ug/L	0.0050	0.00050	
beta-BHC	B086135-BLK1	ND	ug/L	0.0050	0.00064	
delta-BHC	B086135-BLK1	ND	ug/L	0.0050	0.0015	
gamma-BHC (Lindane)	B086135-BLK1	ND	ug/L	0.0050	0.00067	
Chlordane (Technical)	B086135-BLK1	ND	ug/L	0.50	0.045	
4,4'-DDD	B086135-BLK1	ND	ug/L	0.0050	0.00086	
4,4'-DDE	B086135-BLK1	ND	ug/L	0.0050	0.0013	
4,4'-DDT	B086135-BLK1	ND	ug/L	0.0050	0.00096	
Dieldrin	B086135-BLK1	ND	ug/L	0.0050	0.0011	
Endosulfan I	B086135-BLK1	ND	ug/L	0.0050	0.00068	
Endosulfan II	B086135-BLK1	ND	ug/L	0.0050	0.00098	
Endosulfan sulfate	B086135-BLK1	ND	ug/L	0.0050	0.00055	
Endrin	B086135-BLK1	ND	ug/L	0.0050	0.00069	
Endrin aldehyde	B086135-BLK1	ND	ug/L	0.010	0.00054	
Heptachlor	B086135-BLK1	ND	ug/L	0.0050	0.00094	
Heptachlor epoxide	B086135-BLK1	ND	ug/L	0.0050	0.00064	
Methoxychlor	B086135-BLK1	ND	ug/L	0.0050	0.0037	
Toxaphene	B086135-BLK1	ND	ug/L	2.0	0.20	
PCB-1016	B086135-BLK1	ND	ug/L	0.20	0.066	
PCB-1221	B086135-BLK1	ND	ug/L	0.20	0.063	
PCB-1232	B086135-BLK1	ND	ug/L	0.20	0.059	
PCB-1242	B086135-BLK1	ND	ug/L	0.20	0.037	
PCB-1248	B086135-BLK1	ND	ug/L	0.20	0.044	
PCB-1254	B086135-BLK1	ND	ug/L	0.20	0.037	
PCB-1260	B086135-BLK1	ND	ug/L	0.20	0.089	
Total PCB's (Summation)	B086135-BLK1	ND	ug/L	0.20	0.10	
TCMX (Surrogate)	**B086135-BLK1**	**69.9**	%	**40 - 140 (LCL - UCL)**		
Decachlorobiphenyl (Surrogate)	**B086135-BLK1**	**95.8**	%	**40 - 130 (LCL - UCL)**		

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Project Manager: Kennedy Hauder

Organochlorine Pesticides and PCB's (EPA Method 608.3)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B086135										
Aldrin	B086135-BS1	LCS	0.11009	0.15000	ug/L	73.4		50 - 130		
gamma-BHC (Lindane)	B086135-BS1	LCS	0.12355	0.15000	ug/L	82.4		60 - 130		
4,4'-DDT	B086135-BS1	LCS	0.13271	0.15000	ug/L	88.5		60 - 130		
Dieldrin	B086135-BS1	LCS	0.12146	0.15000	ug/L	81.0		60 - 130		
Endrin	B086135-BS1	LCS	0.13297	0.15000	ug/L	88.6		60 - 130		
Heptachlor	B086135-BS1	LCS	0.12762	0.15000	ug/L	85.1		60 - 130		
TCMX (Surrogate)	B086135-BS1	LCS	0.24803	0.30000	ug/L	82.7		40 - 140		
Decachlorobiphenyl (Surrogate)	B086135-BS1	LCS	0.60666	0.60000	ug/L	101		40 - 130		

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Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Organochlorine Pesticides and PCB's (EPA Method 608.3)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B086135	Used client sample: N										
Aldrin	MS	2024089-57	ND	0.11624	0.15000	ug/L		77.5		50 - 130	
	MSD	2024089-57	ND	0.10979	0.15000	ug/L	5.7	73.2	30	50 - 130	
gamma-BHC (Lindane)	MS	2024089-57	ND	0.12966	0.15000	ug/L		86.4		60 - 130	
	MSD	2024089-57	ND	0.12370	0.15000	ug/L	4.7	82.5	30	60 - 130	
4,4'-DDT	MS	2024089-57	ND	0.13548	0.15000	ug/L		90.3		60 - 130	
	MSD	2024089-57	ND	0.13113	0.15000	ug/L	3.3	87.4	30	60 - 130	
Dieldrin	MS	2024089-57	ND	0.12842	0.15000	ug/L		85.6		60 - 130	
	MSD	2024089-57	ND	0.12190	0.15000	ug/L	5.2	81.3	30	60 - 130	
Endrin	MS	2024089-57	ND	0.13720	0.15000	ug/L		91.5		60 - 130	
	MSD	2024089-57	ND	0.13188	0.15000	ug/L	4.0	87.9	30	60 - 130	
Heptachlor	MS	2024089-57	ND	0.13488	0.15000	ug/L		89.9		50 - 130	
	MSD	2024089-57	ND	0.12815	0.15000	ug/L	5.1	85.4	30	50 - 130	
TCMX (Surrogate)	MS	2024089-57	ND	0.26327	0.30000	ug/L		87.8		40 - 140	
	MSD	2024089-57	ND	0.25691	0.30000	ug/L	2.4	85.6		40 - 140	
Decachlorobiphenyl (Surrogate)	MS	2024089-57	ND	0.61554	0.60000	ug/L		103		40 - 130	
	MSD	2024089-57	ND	0.59097	0.60000	ug/L	4.1	98.5		40 - 130	

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Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B085755						
Benzene	B085755-BLK1	ND	ug/L	0.50	0.062	
Bromodichloromethane	B085755-BLK1	ND	ug/L	0.50	0.050	
Bromoform	B085755-BLK1	ND	ug/L	0.50	0.067	
Bromomethane	B085755-BLK1	ND	ug/L	1.0	0.077	
Carbon tetrachloride	B085755-BLK1	ND	ug/L	0.50	0.050	
Chlorobenzene	B085755-BLK1	ND	ug/L	0.50	0.050	
Chloroethane	B085755-BLK1	ND	ug/L	0.50	0.057	
Chloroform	B085755-BLK1	ND	ug/L	0.50	0.050	
Chloromethane	B085755-BLK1	ND	ug/L	0.50	0.055	
Dibromochloromethane	B085755-BLK1	ND	ug/L	0.50	0.050	
1,2-Dichlorobenzene	B085755-BLK1	ND	ug/L	0.50	0.050	
1,3-Dichlorobenzene	B085755-BLK1	ND	ug/L	0.50	0.050	
1,4-Dichlorobenzene	B085755-BLK1	ND	ug/L	0.50	0.050	
1,1-Dichloroethane	B085755-BLK1	ND	ug/L	0.50	0.051	
1,2-Dichloroethane	B085755-BLK1	ND	ug/L	0.50	0.068	
1,1-Dichloroethene	B085755-BLK1	ND	ug/L	0.50	0.050	
cis-1,2-Dichloroethene	B085755-BLK1	ND	ug/L	0.50	0.060	
trans-1,2-Dichloroethene	B085755-BLK1	ND	ug/L	0.50	0.056	
1,2-Dichloropropane	B085755-BLK1	ND	ug/L	0.50	0.050	
cis-1,3-Dichloropropene	B085755-BLK1	ND	ug/L	0.50	0.050	
trans-1,3-Dichloropropene	B085755-BLK1	ND	ug/L	0.50	0.050	
Ethylbenzene	B085755-BLK1	ND	ug/L	0.50	0.050	
Methylene chloride	B085755-BLK1	ND	ug/L	1.0	0.055	
Methyl t-butyl ether	B085755-BLK1	ND	ug/L	0.50	0.050	
1,1,2,2-Tetrachloroethane	B085755-BLK1	ND	ug/L	0.50	0.066	
Tetrachloroethene	B085755-BLK1	ND	ug/L	0.50	0.050	
Toluene	B085755-BLK1	ND	ug/L	0.50	0.051	
1,1,1-Trichloroethane	B085755-BLK1	ND	ug/L	0.50	0.050	
1,1,2-Trichloroethane	B085755-BLK1	ND	ug/L	0.50	0.050	
Trichloroethene	B085755-BLK1	ND	ug/L	0.50	0.081	
Trichlorofluoromethane	B085755-BLK1	ND	ug/L	0.50	0.080	
1,1,2-Trichloro-1,2,2-trifluoroethane	B085755-BLK1	ND	ug/L	0.50	0.050	
Vinyl chloride	B085755-BLK1	ND	ug/L	0.50	0.059	
Total Xylenes	B085755-BLK1	ND	ug/L	0.50	0.15	

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Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B085755						
p- & m-Xylenes	B085755-BLK1	ND	ug/L	0.50	0.10	
o-Xylene	B085755-BLK1	ND	ug/L	0.50	0.050	
1,2-Dichloroethane-d4 (Surrogate)	**B085755-BLK1**	**98.4**	%	**75 - 125 (LCL - UCL)**		
Toluene-d8 (Surrogate)	**B085755-BLK1**	**96.7**	%	**80 - 120 (LCL - UCL)**		
4-Bromofluorobenzene (Surrogate)	**B085755-BLK1**	**94.8**	%	**80 - 120 (LCL - UCL)**		

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Project Manager: Kennedy Hauder

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B085755										
Benzene	B085755-BS1	LCS	27.790	25.000	ug/L	111		79 - 120		
Bromodichloromethane	B085755-BS1	LCS	28.460	25.000	ug/L	114		79 - 125		
Bromoform	B085755-BS1	LCS	28.520	25.000	ug/L	114		66 - 130		
Bromomethane	B085755-BS1	LCS	25.100	25.000	ug/L	100		53 - 141		
Carbon tetrachloride	B085755-BS1	LCS	28.380	25.000	ug/L	114		72 - 136		
Chlorobenzene	B085755-BS1	LCS	27.500	25.000	ug/L	110		82 - 118		
Chloroethane	B085755-BS1	LCS	29.140	25.000	ug/L	117		60 - 138		
Chloroform	B085755-BS1	LCS	28.420	25.000	ug/L	114		79 - 124		
Chloromethane	B085755-BS1	LCS	28.560	25.000	ug/L	114		50 - 139		
Dibromochloromethane	B085755-BS1	LCS	29.200	25.000	ug/L	117		74 - 126		
1,2-Dichlorobenzene	B085755-BS1	LCS	28.880	25.000	ug/L	116		80 - 119		
1,3-Dichlorobenzene	B085755-BS1	LCS	28.740	25.000	ug/L	115		80 - 119		
1,4-Dichlorobenzene	B085755-BS1	LCS	28.600	25.000	ug/L	114		79 - 118		
1,1-Dichloroethane	B085755-BS1	LCS	27.900	25.000	ug/L	112		77 - 125		
1,2-Dichloroethane	B085755-BS1	LCS	26.910	25.000	ug/L	108		73 - 128		
1,1-Dichloroethene	B085755-BS1	LCS	28.070	25.000	ug/L	112		71 - 131		
cis-1,2-Dichloroethene	B085755-BS1	LCS	27.650	25.000	ug/L	111		78 - 123		
trans-1,2-Dichloroethene	B085755-BS1	LCS	27.830	25.000	ug/L	111		75 - 124		
1,2-Dichloropropane	B085755-BS1	LCS	26.850	25.000	ug/L	107		78 - 122		
cis-1,3-Dichloropropene	B085755-BS1	LCS	27.090	25.000	ug/L	108		75 - 124		
trans-1,3-Dichloropropene	B085755-BS1	LCS	27.690	25.000	ug/L	111		73 - 127		
Ethylbenzene	B085755-BS1	LCS	28.830	25.000	ug/L	115		79 - 121		
Methylene chloride	B085755-BS1	LCS	26.810	25.000	ug/L	107		74 - 124		
Methyl t-butyl ether	B085755-BS1	LCS	26.100	25.000	ug/L	104		71 - 124		
1,1,2,2-Tetrachloroethane	B085755-BS1	LCS	27.800	25.000	ug/L	111		71 - 121		
Tetrachloroethene	B085755-BS1	LCS	27.610	25.000	ug/L	110		74 - 129		
Toluene	B085755-BS1	LCS	28.960	25.000	ug/L	116		80 - 121		
1,1,1-Trichloroethane	B085755-BS1	LCS	28.620	25.000	ug/L	114		74 - 131		
1,1,2-Trichloroethane	B085755-BS1	LCS	27.830	25.000	ug/L	111		80 - 119		
Trichloroethene	B085755-BS1	LCS	28.320	25.000	ug/L	113		79 - 123		
Trichlorofluoromethane	B085755-BS1	LCS	29.240	25.000	ug/L	117		65 - 141		
1,1,2-Trichloro-1,2,2-trifluoroethane	B085755-BS1	LCS	27.270	25.000	ug/L	109		70 - 136		
Vinyl chloride	B085755-BS1	LCS	29.430	25.000	ug/L	118		58 - 137		

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Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B085755										
Total Xylenes	B085755-BS1	LCS	86.180	75.000	ug/L	115		79 - 121		
p- & m-Xylenes	B085755-BS1	LCS	57.730	50.000	ug/L	115		80 - 121		
o-Xylene	B085755-BS1	LCS	28.450	25.000	ug/L	114		78 - 122		
1,2-Dichloroethane-d4 (Surrogate)	B085755-BS1	LCS	10.190	10.000	ug/L	102		75 - 125		
Toluene-d8 (Surrogate)	B085755-BS1	LCS	10.360	10.000	ug/L	104		80 - 120		
4-Bromofluorobenzene (Surrogate)	B085755-BS1	LCS	10.310	10.000	ug/L	103		80 - 120		

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Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B085755	Used client sample: N										
Benzene	MS	2024734-03	ND	26.460	25.000	ug/L		106		79 - 120	
	MSD	2024734-03	ND	25.970	25.000	ug/L	1.9	104	30	79 - 120	
Bromodichloromethane	MS	2024734-03	ND	26.800	25.000	ug/L		107		79 - 125	
	MSD	2024734-03	ND	26.370	25.000	ug/L	1.6	105	30	79 - 125	
Bromoform	MS	2024734-03	ND	27.070	25.000	ug/L		108		66 - 130	
	MSD	2024734-03	ND	27.280	25.000	ug/L	0.8	109	30	66 - 130	
Bromomethane	MS	2024734-03	ND	26.300	25.000	ug/L		105		53 - 141	
	MSD	2024734-03	ND	26.990	25.000	ug/L	2.6	108	30	53 - 141	
Carbon tetrachloride	MS	2024734-03	ND	27.220	25.000	ug/L		109		72 - 136	
	MSD	2024734-03	ND	26.830	25.000	ug/L	1.4	107	30	72 - 136	
Chlorobenzene	MS	2024734-03	ND	26.570	25.000	ug/L		106		82 - 118	
	MSD	2024734-03	ND	26.080	25.000	ug/L	1.9	104	30	82 - 118	
Chloroethane	MS	2024734-03	ND	27.280	25.000	ug/L		109		60 - 138	
	MSD	2024734-03	ND	26.630	25.000	ug/L	2.4	107	30	60 - 138	
Chloroform	MS	2024734-03	ND	26.940	25.000	ug/L		108		79 - 124	
	MSD	2024734-03	ND	26.500	25.000	ug/L	1.6	106	30	79 - 124	
Chloromethane	MS	2024734-03	ND	26.970	25.000	ug/L		108		50 - 139	
	MSD	2024734-03	ND	26.880	25.000	ug/L	0.3	108	30	50 - 139	
Dibromochloromethane	MS	2024734-03	ND	27.400	25.000	ug/L		110		74 - 126	
	MSD	2024734-03	ND	27.660	25.000	ug/L	0.9	111	30	74 - 126	
1,2-Dichlorobenzene	MS	2024734-03	ND	27.690	25.000	ug/L		111		80 - 119	
	MSD	2024734-03	ND	27.190	25.000	ug/L	1.8	109	30	80 - 119	
1,3-Dichlorobenzene	MS	2024734-03	ND	27.600	25.000	ug/L		110		80 - 119	
	MSD	2024734-03	ND	27.030	25.000	ug/L	2.1	108	30	80 - 119	
1,4-Dichlorobenzene	MS	2024734-03	ND	27.600	25.000	ug/L		110		79 - 118	
	MSD	2024734-03	ND	27.000	25.000	ug/L	2.2	108	30	79 - 118	
1,1-Dichloroethane	MS	2024734-03	ND	26.120	25.000	ug/L		104		77 - 125	
	MSD	2024734-03	ND	25.660	25.000	ug/L	1.8	103	30	77 - 125	
1,2-Dichloroethane	MS	2024734-03	ND	25.820	25.000	ug/L		103		73 - 128	
	MSD	2024734-03	ND	25.930	25.000	ug/L	0.4	104	30	73 - 128	
1,1-Dichloroethene	MS	2024734-03	ND	26.420	25.000	ug/L		106		71 - 131	
	MSD	2024734-03	ND	25.830	25.000	ug/L	2.3	103	30	71 - 131	
cis-1,2-Dichloroethene	MS	2024734-03	ND	25.890	25.000	ug/L		104		78 - 123	
	MSD	2024734-03	ND	25.660	25.000	ug/L	0.9	103	30	78 - 123	
trans-1,2-Dichloroethene	MS	2024734-03	ND	26.270	25.000	ug/L		105		75 - 124	
	MSD	2024734-03	ND	25.780	25.000	ug/L	1.9	103	30	75 - 124	

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Sacramento, CA 95831

Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B085755	Used client sample: N										
1,2-Dichloropropane	MS	2024734-03	ND	24.970	25.000	ug/L		99.9		78 - 122	
	MSD	2024734-03	ND	24.220	25.000	ug/L	3.0	96.9	30	78 - 122	
cis-1,3-Dichloropropene	MS	2024734-03	ND	25.900	25.000	ug/L		104		75 - 124	
	MSD	2024734-03	ND	25.590	25.000	ug/L	1.2	102	30	75 - 124	
trans-1,3-Dichloropropene	MS	2024734-03	ND	26.450	25.000	ug/L		106		73 - 127	
	MSD	2024734-03	ND	26.550	25.000	ug/L	0.4	106	30	73 - 127	
Ethylbenzene	MS	2024734-03	ND	27.510	25.000	ug/L		110		79 - 121	
	MSD	2024734-03	ND	26.790	25.000	ug/L	2.7	107	30	79 - 121	
Methylene chloride	MS	2024734-03	ND	25.190	25.000	ug/L		101		74 - 124	
	MSD	2024734-03	ND	24.940	25.000	ug/L	1.0	99.8	30	74 - 124	
Methyl t-butyl ether	MS	2024734-03	ND	25.480	25.000	ug/L		102		71 - 124	
	MSD	2024734-03	ND	25.720	25.000	ug/L	0.9	103	30	71 - 124	
1,1,2,2-Tetrachloroethane	MS	2024734-03	ND	26.210	25.000	ug/L		105		71 - 121	
	MSD	2024734-03	ND	26.700	25.000	ug/L	1.9	107	30	71 - 121	
Tetrachloroethene	MS	2024734-03	ND	26.350	25.000	ug/L		105		74 - 129	
	MSD	2024734-03	ND	26.030	25.000	ug/L	1.2	104	30	74 - 129	
Toluene	MS	2024734-03	ND	27.280	25.000	ug/L		109		80 - 121	
	MSD	2024734-03	ND	26.600	25.000	ug/L	2.5	106	30	80 - 121	
1,1,1-Trichloroethane	MS	2024734-03	ND	27.060	25.000	ug/L		108		74 - 131	
	MSD	2024734-03	ND	26.350	25.000	ug/L	2.7	105	30	74 - 131	
1,1,2-Trichloroethane	MS	2024734-03	ND	26.040	25.000	ug/L		104		80 - 119	
	MSD	2024734-03	ND	26.160	25.000	ug/L	0.5	105	30	80 - 119	
Trichloroethene	MS	2024734-03	ND	26.260	25.000	ug/L		105		79 - 123	
	MSD	2024734-03	ND	25.330	25.000	ug/L	3.6	101	30	79 - 123	
Trichlorofluoromethane	MS	2024734-03	ND	27.510	25.000	ug/L		110		65 - 141	
	MSD	2024734-03	ND	27.030	25.000	ug/L	1.8	108	30	65 - 141	
1,1,2-Trichloro-1,2,2-trifluoroethane	MS	2024734-03	ND	25.900	25.000	ug/L		104		70 - 136	
	MSD	2024734-03	ND	25.560	25.000	ug/L	1.3	102	30	70 - 136	
Vinyl chloride	MS	2024734-03	ND	27.950	25.000	ug/L		112		58 - 137	
	MSD	2024734-03	ND	27.070	25.000	ug/L	3.2	108	30	58 - 137	
Total Xylenes	MS	2024734-03	ND	82.440	75.000	ug/L		110		79 - 121	
	MSD	2024734-03	ND	80.970	75.000	ug/L	1.8	108	30	79 - 121	
p- & m-Xylenes	MS	2024734-03	ND	55.100	50.000	ug/L		110		80 - 121	
	MSD	2024734-03	ND	54.130	50.000	ug/L	1.8	108	30	80 - 121	
o-Xylene	MS	2024734-03	ND	27.340	25.000	ug/L		109		78 - 122	
	MSD	2024734-03	ND	26.840	25.000	ug/L	1.8	107	30	78 - 122	

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Volatile Organic Analysis (EPA Method 624.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B085755	Used client sample: N										
1,2-Dichloroethane-d4 (Surrogate)	MS	2024734-03	ND	10.050	10.000	ug/L		100		75 - 125	
	MSD	2024734-03	ND	10.080	10.000	ug/L	0.3	101		75 - 125	
Toluene-d8 (Surrogate)	MS	2024734-03	ND	10.250	10.000	ug/L		102		80 - 120	
	MSD	2024734-03	ND	10.030	10.000	ug/L	2.2	100		80 - 120	
4-Bromofluorobenzene (Surrogate)	MS	2024734-03	ND	10.030	10.000	ug/L		100		80 - 120	
	MSD	2024734-03	ND	9.8200	10.000	ug/L	2.1	98.2		80 - 120	

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B086222						
Acenaphthene	B086222-BLK1	ND	ug/L	2.0	0.20	
Acenaphthylene	B086222-BLK1	ND	ug/L	2.0	0.20	
Aldrin	B086222-BLK1	ND	ug/L	2.0	0.23	
Aniline	B086222-BLK1	ND	ug/L	5.0	0.28	
Anthracene	B086222-BLK1	ND	ug/L	2.0	0.20	
Benzidine	B086222-BLK1	ND	ug/L	20	1.6	
Benzo[a]anthracene	B086222-BLK1	ND	ug/L	2.0	0.21	
Benzo[b]fluoranthene	B086222-BLK1	ND	ug/L	2.0	0.24	
Benzo[k]fluoranthene	B086222-BLK1	ND	ug/L	2.0	0.30	
Benzo[a]pyrene	B086222-BLK1	ND	ug/L	2.0	0.20	
Benzo[g,h,i]perylene	B086222-BLK1	ND	ug/L	2.0	0.33	
Benzoic acid	B086222-BLK1	ND	ug/L	10	0.52	
Benzyl alcohol	B086222-BLK1	ND	ug/L	2.0	0.20	
Benzyl butyl phthalate	B086222-BLK1	ND	ug/L	2.0	0.20	
alpha-BHC	B086222-BLK1	ND	ug/L	2.0	0.20	
beta-BHC	B086222-BLK1	ND	ug/L	2.0	0.20	
delta-BHC	B086222-BLK1	ND	ug/L	2.0	0.20	
gamma-BHC (Lindane)	B086222-BLK1	ND	ug/L	2.0	0.20	
bis(2-Chloroethoxy)methane	B086222-BLK1	ND	ug/L	2.0	0.20	
bis(2-Chloroethyl) ether	B086222-BLK1	ND	ug/L	2.0	0.31	
bis(2-Chloroisopropyl)ether	B086222-BLK1	ND	ug/L	2.0	0.20	
bis(2-Ethylhexyl)phthalate	B086222-BLK1	ND	ug/L	5.0	0.20	
4-Bromophenyl phenyl ether	B086222-BLK1	ND	ug/L	2.0	0.20	
4-Chloroaniline	B086222-BLK1	ND	ug/L	2.0	1.1	
2-Chloronaphthalene	B086222-BLK1	ND	ug/L	2.0	0.20	
4-Chlorophenyl phenyl ether	B086222-BLK1	ND	ug/L	2.0	0.20	
Chrysene	B086222-BLK1	ND	ug/L	2.0	0.20	
4,4'-DDD	B086222-BLK1	ND	ug/L	2.0	0.26	
4,4'-DDE	B086222-BLK1	ND	ug/L	3.0	0.24	
4,4'-DDT	B086222-BLK1	ND	ug/L	2.0	0.22	
Dibenzo[a,h]anthracene	B086222-BLK1	ND	ug/L	3.0	0.34	
Dibenzofuran	B086222-BLK1	ND	ug/L	2.0	0.20	
1,2-Dichlorobenzene	B086222-BLK1	ND	ug/L	2.0	0.20	
1,3-Dichlorobenzene	B086222-BLK1	ND	ug/L	2.0	0.20	

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Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B086222						
1,4-Dichlorobenzene	B086222-BLK1	ND	ug/L	2.0	0.27	
3,3-Dichlorobenzidine	B086222-BLK1	ND	ug/L	10	0.53	
Dieldrin	B086222-BLK1	ND	ug/L	3.0	0.39	
Diethyl phthalate	B086222-BLK1	ND	ug/L	2.0	0.20	
Dimethyl phthalate	B086222-BLK1	ND	ug/L	2.0	0.20	
Di-n-butyl phthalate	B086222-BLK1	ND	ug/L	2.0	0.20	
2,4-Dinitrotoluene	B086222-BLK1	ND	ug/L	2.0	0.40	
2,6-Dinitrotoluene	B086222-BLK1	ND	ug/L	2.0	0.20	
Di-n-octyl phthalate	B086222-BLK1	ND	ug/L	2.0	0.21	
1,2-Diphenylhydrazine	B086222-BLK1	ND	ug/L	2.0	0.20	
Endosulfan I	B086222-BLK1	ND	ug/L	10	0.31	
Endosulfan II	B086222-BLK1	ND	ug/L	10	0.30	
Endosulfan sulfate	B086222-BLK1	ND	ug/L	3.0	0.23	
Endrin	B086222-BLK1	ND	ug/L	2.0	0.38	
Endrin aldehyde	B086222-BLK1	ND	ug/L	10	0.44	
Fluoranthene	B086222-BLK1	ND	ug/L	2.0	0.28	
Fluorene	B086222-BLK1	ND	ug/L	2.0	0.20	
Heptachlor	B086222-BLK1	ND	ug/L	2.0	0.20	
Heptachlor epoxide	B086222-BLK1	ND	ug/L	2.0	0.26	
Hexachlorobenzene	B086222-BLK1	ND	ug/L	2.0	0.25	
Hexachlorobutadiene	B086222-BLK1	ND	ug/L	2.0	0.20	
Hexachlorocyclopentadiene	B086222-BLK1	ND	ug/L	2.0	0.31	
Hexachloroethane	B086222-BLK1	ND	ug/L	2.0	0.20	
Indeno[1,2,3-cd]pyrene	B086222-BLK1	ND	ug/L	2.0	0.29	
Isophorone	B086222-BLK1	ND	ug/L	2.0	0.20	
2-Methylnaphthalene	B086222-BLK1	ND	ug/L	2.0	0.20	
Naphthalene	B086222-BLK1	ND	ug/L	2.0	0.20	
2-Naphthylamine	B086222-BLK1	ND	ug/L	20	1.3	
2-Nitroaniline	B086222-BLK1	ND	ug/L	2.0	0.20	
3-Nitroaniline	B086222-BLK1	ND	ug/L	2.0	0.22	
4-Nitroaniline	B086222-BLK1	ND	ug/L	5.0	0.38	
Nitrobenzene	B086222-BLK1	ND	ug/L	2.0	0.20	
N-Nitrosodimethylamine	B086222-BLK1	ND	ug/L	2.0	1.2	
N-Nitrosodi-N-propylamine	B086222-BLK1	ND	ug/L	2.0	0.21	

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Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B086222						
N-Nitrosodiphenylamine	B086222-BLK1	ND	ug/L	2.0	0.20	
Phenanthrene	B086222-BLK1	ND	ug/L	2.0	0.20	
Pyrene	B086222-BLK1	ND	ug/L	2.0	0.22	
1,2,4-Trichlorobenzene	B086222-BLK1	ND	ug/L	2.0	0.20	
4-Chloro-3-methylphenol	B086222-BLK1	ND	ug/L	5.0	0.20	
2-Chlorophenol	B086222-BLK1	ND	ug/L	2.0	0.20	
2,4-Dichlorophenol	B086222-BLK1	ND	ug/L	2.0	0.23	
2,4-Dimethylphenol	B086222-BLK1	ND	ug/L	2.0	0.20	
4,6-Dinitro-2-methylphenol	B086222-BLK1	ND	ug/L	10	0.24	
2,4-Dinitrophenol	B086222-BLK1	ND	ug/L	10	0.20	
2-Methylphenol	B086222-BLK1	ND	ug/L	2.0	0.20	
3- & 4-Methylphenol	B086222-BLK1	ND	ug/L	2.0	0.40	
2-Nitrophenol	B086222-BLK1	ND	ug/L	2.0	0.20	
4-Nitrophenol	B086222-BLK1	ND	ug/L	2.0	0.30	
Pentachlorophenol	B086222-BLK1	ND	ug/L	10	0.40	
Phenol	B086222-BLK1	ND	ug/L	2.0	0.21	
2,4,5-Trichlorophenol	B086222-BLK1	ND	ug/L	5.0	0.20	
2,4,6-Trichlorophenol	B086222-BLK1	ND	ug/L	5.0	0.20	
2-Fluorophenol (Surrogate)	**B086222-BLK1**	**65.0**	%	**30 - 120 (LCL - UCL)**		
Phenol-d5 (Surrogate)	**B086222-BLK1**	**44.7**	%	**12 - 110 (LCL - UCL)**		
Nitrobenzene-d5 (Surrogate)	**B086222-BLK1**	**107**	%	**50 - 130 (LCL - UCL)**		
2-Fluorobiphenyl (Surrogate)	**B086222-BLK1**	**97.4**	%	**55 - 125 (LCL - UCL)**		
2,4,6-Tribromophenol (Surrogate)	**B086222-BLK1**	**131**	%	**40 - 150 (LCL - UCL)**		
p-Terphenyl-d14 (Surrogate)	**B086222-BLK1**	**151**	%	**40 - 150 (LCL - UCL)**		**S09**

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B086222										
Acenaphthene	B086222-BS1	LCS	46.065	50.000	ug/L	92.1		50 - 120		
1,4-Dichlorobenzene	B086222-BS1	LCS	50.595	50.000	ug/L	101		50 - 120		
2,4-Dinitrotoluene	B086222-BS1	LCS	58.113	50.000	ug/L	116		50 - 120		
Hexachlorobenzene	B086222-BS1	LCS	56.958	50.000	ug/L	114		60 - 120		
Hexachlorobutadiene	B086222-BS1	LCS	45.677	50.000	ug/L	91.4		40 - 110		
Hexachloroethane	B086222-BS1	LCS	51.526	50.000	ug/L	103		40 - 120		
Nitrobenzene	B086222-BS1	LCS	59.558	50.000	ug/L	119		50 - 120		
N-Nitrosodi-N-propylamine	B086222-BS1	LCS	50.450	50.000	ug/L	101		50 - 120		
Pyrene	B086222-BS1	LCS	74.118	50.000	ug/L	148		40 - 140		L01
1,2,4-Trichlorobenzene	B086222-BS1	LCS	53.156	50.000	ug/L	106		45 - 120		
4-Chloro-3-methylphenol	B086222-BS1	LCS	53.457	50.000	ug/L	107		50 - 120		
2-Chlorophenol	B086222-BS1	LCS	42.699	50.000	ug/L	85.4		50 - 120		
2-Methylphenol	B086222-BS1	LCS	40.788	50.000	ug/L	81.6		40 - 110		
3- & 4-Methylphenol	B086222-BS1	LCS	76.281	100.00	ug/L	76.3		40 - 110		
4-Nitrophenol	B086222-BS1	LCS	17.198	50.000	ug/L	34.4		10 - 110		
Pentachlorophenol	B086222-BS1	LCS	35.987	50.000	ug/L	72.0		30 - 130		
Phenol	B086222-BS1	LCS	21.680	50.000	ug/L	43.4		20 - 110		
2,4,6-Trichlorophenol	B086222-BS1	LCS	51.129	50.000	ug/L	102		54 - 120		
2-Fluorophenol (Surrogate)	B086222-BS1	LCS	23.775	40.000	ug/L	59.4		30 - 120		
Phenol-d5 (Surrogate)	B086222-BS1	LCS	16.509	40.000	ug/L	41.3		12 - 110		
Nitrobenzene-d5 (Surrogate)	B086222-BS1	LCS	39.896	40.000	ug/L	99.7		50 - 130		
2-Fluorobiphenyl (Surrogate)	B086222-BS1	LCS	37.122	40.000	ug/L	92.8		55 - 125		
2,4,6-Tribromophenol (Surrogate)	B086222-BS1	LCS	59.568	40.000	ug/L	149		40 - 150		
p-Terphenyl-d14 (Surrogate)	B086222-BS1	LCS	25.288	20.000	ug/L	126		40 - 150		

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Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B086222	Used client sample: N										
Acenaphthene	MS	2024089-51	ND	42.808	50.000	ug/L		85.6		50 - 120	
	MSD	2024089-51	ND	43.290	50.000	ug/L	1.1	86.6	30	50 - 120	
1,4-Dichlorobenzene	MS	2024089-51	ND	48.005	50.000	ug/L		96.0		47 - 120	
	MSD	2024089-51	ND	50.840	50.000	ug/L	5.7	102	30	47 - 120	
2,4-Dinitrotoluene	MS	2024089-51	ND	56.410	50.000	ug/L		113		50 - 130	
	MSD	2024089-51	ND	53.320	50.000	ug/L	5.6	107	30	50 - 130	
Hexachlorobenzene	MS	2024089-51	ND	53.430	50.000	ug/L		107		50 - 120	
	MSD	2024089-51	ND	54.390	50.000	ug/L	1.8	109	30	50 - 120	
Hexachlorobutadiene	MS	2024089-51	ND	42.303	50.000	ug/L		84.6		40 - 110	
	MSD	2024089-51	ND	44.560	50.000	ug/L	5.2	89.1	30	40 - 110	
Hexachloroethane	MS	2024089-51	ND	48.688	50.000	ug/L		97.4		40 - 120	
	MSD	2024089-51	ND	49.520	50.000	ug/L	1.7	99.0	30	40 - 120	
Nitrobenzene	MS	2024089-51	ND	57.212	50.000	ug/L		114		50 - 120	
	MSD	2024089-51	ND	58.210	50.000	ug/L	1.7	116	30	50 - 120	
N-Nitrosodi-N-propylamine	MS	2024089-51	ND	46.550	50.000	ug/L		93.1		50 - 120	
	MSD	2024089-51	ND	48.910	50.000	ug/L	4.9	97.8	30	50 - 120	
Pyrene	MS	**2024089-51**	**ND**	**55.925**	**50.000**	**ug/L**		**112**		**40 - 140**	
	MSD	**2024089-51**	**ND**	**73.260**	**50.000**	**ug/L**	**26.8**	**147**	**30**	**40 - 140**	**Q03**
1,2,4-Trichlorobenzene	MS	2024089-51	ND	49.104	50.000	ug/L		98.2		43 - 120	
	MSD	2024089-51	ND	52.010	50.000	ug/L	5.7	104	30	43 - 120	
4-Chloro-3-methylphenol	MS	**2024089-51**	**ND**	**50.718**	**50.000**	**ug/L**		**101**		**50 - 120**	
	MSD	**2024089-51**	**ND**	**35.470**	**50.000**	**ug/L**	**35.4**	**70.9**	**30**	**50 - 120**	**Q02**
2-Chlorophenol	MS	**2024089-51**	**ND**	**41.818**	**50.000**	**ug/L**		**83.6**		**50 - 120**	
	MSD	**2024089-51**	**ND**	**29.810**	**50.000**	**ug/L**	**33.5**	**59.6**	**30**	**50 - 120**	**Q02**
2-Methylphenol	MS	2024089-51	ND	42.154	50.000	ug/L		84.3		40 - 110	
	MSD	2024089-51	ND	34.780	50.000	ug/L	19.2	69.6	30	40 - 110	
3- & 4-Methylphenol	MS	2024089-51	ND	74.092	100.00	ug/L		74.1		40 - 110	
	MSD	2024089-51	ND	61.270	100.00	ug/L	18.9	61.3	30	40 - 110	
4-Nitrophenol	MS	**2024089-51**	**ND**	**17.850**	**50.000**	**ug/L**		**35.7**		**10 - 110**	
	MSD	**2024089-51**	**ND**	**12.250**	**50.000**	**ug/L**	**37.2**	**24.5**	**30**	**10 - 110**	**Q02**
Pentachlorophenol	MS	**2024089-51**	**ND**	**40.283**	**50.000**	**ug/L**		**80.6**		**30 - 120**	
	MSD	**2024089-51**	**ND**	**21.260**	**50.000**	**ug/L**	**61.8**	**42.5**	**30**	**30 - 120**	**Q02**
Phenol	MS	2024089-51	ND	20.820	50.000	ug/L		41.6		20 - 110	
	MSD	2024089-51	ND	17.940	50.000	ug/L	14.9	35.9	30	20 - 110	
2,4,6-Trichlorophenol	MS	2024089-51	ND	49.886	50.000	ug/L		99.8		50 - 150	
	MSD	2024089-51	ND	38.410	50.000	ug/L	26.0	76.8	30	50 - 150	

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Sacramento, CA 95831

Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Base Neutral and Acid Extractables Organic Analysis (EPA Method 625.1)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B086222	Used client sample: N										
2-Fluorophenol (Surrogate)	MS	2024089-51	ND	22.433	40.000	ug/L		56.1		30 - 120	
	MSD	2024089-51	ND	18.380	40.000	ug/L	19.9	46.0		30 - 120	
Phenol-d5 (Surrogate)	MS	2024089-51	ND	15.523	40.000	ug/L		38.8		12 - 110	
	MSD	2024089-51	ND	13.670	40.000	ug/L	12.7	34.2		12 - 110	
Nitrobenzene-d5 (Surrogate)	MS	2024089-51	ND	36.293	40.000	ug/L		90.7		50 - 130	
	MSD	2024089-51	ND	38.160	40.000	ug/L	5.0	95.4		50 - 130	
2-Fluorobiphenyl (Surrogate)	MS	2024089-51	ND	33.878	40.000	ug/L		84.7		55 - 125	
	MSD	2024089-51	ND	41.130	40.000	ug/L	19.3	103		55 - 125	
2,4,6-Tribromophenol (Surrogate)	MS	2024089-51	ND	53.856	40.000	ug/L		135		40 - 150	
	MSD	2024089-51	ND	34.020	40.000	ug/L	45.1	85.0		40 - 150	
p-Terphenyl-d14 (Surrogate)	MS	2024089-51	ND	18.810	20.000	ug/L		94.0		40 - 150	
	MSD	2024089-51	ND	21.750	20.000	ug/L	14.5	109		40 - 150	

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Crawford & Associates, Inc. 1100 Corporate Way, Suite 230 Sacramento, CA 95831	**Reported:** 09/08/2020 11:14 Project: Turloc NVRWP Pipeline Project Number: 20-642.1 Turlock Water Distribution System Project Manager: Kennedy Hauder

Water Analysis (General Chemistry)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B^H0283						
Trivalent Chromium	B^H0283-BLK1	ND	ug/L	10	5.0	
QC Batch ID: B085793						
Total Dissolved Solids @ 180 C	B085793-BLK1	ND	mg/L	6.7	3.3	
QC Batch ID: B085864						
Total Cyanide	B085864-BLK1	ND	ug/L	5.0	1.7	

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Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Water Analysis (General Chemistry)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B085793										
Total Dissolved Solids @ 180 C	B085793-BS1	LCS	585.00	586.00	mg/L	99.8		90 - 110		
QC Batch ID: B085864										
Total Cyanide	B085864-BS1	LCS	155.07	150.00	ug/L	103		90 - 110		

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Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Water Analysis (General Chemistry)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B085793	Used client sample: N										
Total Dissolved Solids @ 180 C	DUP	2024486-01	1010.0	1000.0		mg/L	1.0		10		
QC Batch ID: B085864	Used client sample: N										
Total Cyanide	DUP	2024762-01	1.7560	ND		ug/L			10		
	MS	2024762-01	1.7560	94.466	100.00	ug/L		92.7		90 - 110	
	MSD	2024762-01	1.7560	100.96	100.00	ug/L	6.7	99.2	20	90 - 110	

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Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Metals Analysis

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B085772						
Hexavalent Chromium	B085772-BLK1	ND	ug/L	0.20	0.020	
QC Batch ID: B085860						
Total Recoverable Antimony	B085860-BLK1	ND	ug/L	2.0	0.11	
Total Recoverable Arsenic	B085860-BLK1	ND	ug/L	2.0	0.70	
Total Recoverable Barium	B085860-BLK1	ND	ug/L	1.0	0.21	
Total Recoverable Beryllium	B085860-BLK1	ND	ug/L	1.0	0.14	
Total Recoverable Cadmium	**B085860-BLK1**	**0.18000**	**ug/L**	**1.0**	**0.11**	**J**
Total Recoverable Chromium	B085860-BLK1	ND	ug/L	3.0	0.50	
Total Recoverable Cobalt	B085860-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Copper	**B085860-BLK1**	**0.23200**	**ug/L**	**2.0**	**0.22**	**J**
Total Recoverable Lead	B085860-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Molybdenum	B085860-BLK1	ND	ug/L	1.0	0.11	
Total Recoverable Nickel	B085860-BLK1	ND	ug/L	2.0	0.19	
Total Recoverable Selenium	B085860-BLK3	ND	ug/L	2.0	0.19	
Total Recoverable Silver	B085860-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Thallium	B085860-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Vanadium	B085860-BLK1	ND	ug/L	3.0	0.78	
Total Recoverable Zinc	B085860-BLK2	ND	ug/L	10	1.7	
QC Batch ID: B086101						
Total Recoverable Mercury	B086101-BLK1	ND	ug/L	0.20	0.022	

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Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Metals Analysis

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B085772										
Hexavalent Chromium	B085772-BS1	LCS	19.601	20.000	ug/L	98.0		90 - 110		
QC Batch ID: B085860										
Total Recoverable Antimony	B085860-BS1	LCS	43.392	40.000	ug/L	108		85 - 115		
Total Recoverable Arsenic	B085860-BS1	LCS	110.38	100.00	ug/L	110		85 - 115		
Total Recoverable Barium	B085860-BS1	LCS	43.835	40.000	ug/L	110		85 - 115		
Total Recoverable Beryllium	B085860-BS1	LCS	44.955	40.000	ug/L	112		85 - 115		
Total Recoverable Cadmium	B085860-BS1	LCS	45.224	40.000	ug/L	113		85 - 115		
Total Recoverable Chromium	B085860-BS1	LCS	44.896	40.000	ug/L	112		85 - 115		
Total Recoverable Cobalt	B085860-BS1	LCS	44.966	40.000	ug/L	112		85 - 115		
Total Recoverable Copper	B085860-BS1	LCS	113.41	100.00	ug/L	113		85 - 115		
Total Recoverable Lead	B085860-BS1	LCS	109.84	100.00	ug/L	110		85 - 115		
Total Recoverable Molybdenum	B085860-BS1	LCS	42.153	40.000	ug/L	105		85 - 115		
Total Recoverable Nickel	B085860-BS1	LCS	114.25	100.00	ug/L	114		85 - 115		
Total Recoverable Selenium	B085860-BS3	LCS	114.44	100.00	ug/L	114		85 - 115		
Total Recoverable Silver	B085860-BS1	LCS	44.753	40.000	ug/L	112		85 - 115		
Total Recoverable Thallium	B085860-BS1	LCS	43.275	40.000	ug/L	108		85 - 115		
Total Recoverable Vanadium	B085860-BS1	LCS	43.524	40.000	ug/L	109		85 - 115		
Total Recoverable Zinc	B085860-BS2	LCS	115.10	100.00	ug/L	115		85 - 115		
QC Batch ID: B086101										
Total Recoverable Mercury	B086101-BS1	LCS	0.88000	1.0000	ug/L	88.0		85 - 115		

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Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Metals Analysis

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B085772	Used client sample: N										
Hexavalent Chromium	DUP	2024427-03	3.0800	3.1110		ug/L	1.0		10		
	MS	2024427-03	3.0800	22.813	20.202	ug/L		97.7		90 - 110	
	MSD	2024427-03	3.0800	23.179	20.202	ug/L	1.6	99.5	10	90 - 110	
QC Batch ID: B085860	Used client sample: N										
Total Recoverable Antimony	DUP	2024708-05	ND	ND		ug/L			20		
	MS	2024708-05	ND	44.086	40.000	ug/L		110		70 - 130	
	MSD	2024708-05	ND	42.860	40.000	ug/L	2.8	107	20	70 - 130	
Total Recoverable Arsenic	DUP	2024708-05	ND	ND		ug/L			20		
	MS	2024708-05	ND	112.51	100.00	ug/L		113		70 - 130	
	MSD	2024708-05	ND	111.18	100.00	ug/L	1.2	111	20	70 - 130	
Total Recoverable Barium	DUP	2024708-05	105.66	105.02		ug/L	0.6		20		
	MS	2024708-05	105.66	145.49	40.000	ug/L		99.6		70 - 130	
	MSD	2024708-05	105.66	146.87	40.000	ug/L	0.9	103	20	70 - 130	
Total Recoverable Beryllium	DUP	2024708-05	ND	ND		ug/L			20		
	MS	2024708-05	ND	43.221	40.000	ug/L		108		70 - 130	
	MSD	2024708-05	ND	43.222	40.000	ug/L	0.0	108	20	70 - 130	
Total Recoverable Cadmium	DUP	2024708-05	0.13000	0.14700		ug/L	12.3		20		J
	MS	2024708-05	0.13000	43.706	40.000	ug/L		109		70 - 130	
	MSD	2024708-05	0.13000	42.722	40.000	ug/L	2.3	106	20	70 - 130	
Total Recoverable Chromium	DUP	2024708-05	ND	ND		ug/L			20		
	MS	2024708-05	ND	37.650	40.000	ug/L		94.1		70 - 130	
	MSD	2024708-05	ND	37.825	40.000	ug/L	0.5	94.6	20	70 - 130	
Total Recoverable Cobalt	DUP	2024708-05	0.21000	0.21700		ug/L	3.3		20		J
	MS	2024708-05	0.21000	37.164	40.000	ug/L		92.4		70 - 130	
	MSD	2024708-05	0.21000	37.355	40.000	ug/L	0.5	92.9	20	70 - 130	
Total Recoverable Copper	DUP	2024708-05	1.2060	1.3470		ug/L	11.0		20		J
	MS	2024708-05	1.2060	106.65	100.00	ug/L		105		70 - 130	
	MSD	2024708-05	1.2060	106.21	100.00	ug/L	0.4	105	20	70 - 130	
Total Recoverable Lead	DUP	2024708-05	ND	ND		ug/L			20		
	MS	2024708-05	ND	105.22	100.00	ug/L		105		70 - 130	
	MSD	2024708-05	ND	107.66	100.00	ug/L	2.3	108	20	70 - 130	
Total Recoverable Molybdenum	DUP	2024708-05	0.80100	0.69700		ug/L	13.9		20		J
	MS	2024708-05	0.80100	45.983	40.000	ug/L		113		70 - 130	
	MSD	2024708-05	0.80100	45.335	40.000	ug/L	1.4	111	20	70 - 130	
Total Recoverable Nickel	DUP	2024708-05	3.2320	3.4850		ug/L	7.5		20		
	MS	2024708-05	3.2320	92.955	100.00	ug/L		89.7		70 - 130	
	MSD	2024708-05	3.2320	93.818	100.00	ug/L	0.9	90.6	20	70 - 130	

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Reported: 09/08/2020 11:14
Project: Turloc NVRWP Pipeline
Project Number: 20-642.1 Turlock Water Distribution System
Project Manager: Kennedy Hauder

Metals Analysis

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B085860	Used client sample: N										
Total Recoverable Selenium	DUP	2024708-05	ND	ND		ug/L			20		
	MS	2024708-05	ND	113.50	100.00	ug/L		114		70 - 130	
	MSD	2024708-05	ND	116.51	100.00	ug/L	2.6	117	20	70 - 130	
Total Recoverable Silver	DUP	2024708-05	ND	ND		ug/L			20		
	MS	2024708-05	ND	42.422	40.000	ug/L		106		70 - 130	
	MSD	2024708-05	ND	41.701	40.000	ug/L	1.7	104	20	70 - 130	
Total Recoverable Thallium	DUP	2024708-05	ND	ND		ug/L			20		
	MS	2024708-05	ND	41.786	40.000	ug/L		104		70 - 130	
	MSD	2024708-05	ND	43.424	40.000	ug/L	3.8	109	20	70 - 130	
Total Recoverable Vanadium	DUP	2024708-05	2.6320	2.4870		ug/L	5.7		20		J
	MS	2024708-05	2.6320	41.921	40.000	ug/L		98.2		70 - 130	
	MSD	2024708-05	2.6320	41.650	40.000	ug/L	0.6	97.5	20	70 - 130	
Total Recoverable Zinc	DUP	2024708-05	9.6890	9.8880		ug/L	2.0		20		J
	MS	2024708-05	9.6890	120.55	100.00	ug/L		111		70 - 130	
	MSD	2024708-05	9.6890	115.81	100.00	ug/L	4.0	106	20	70 - 130	
QC Batch ID: B086101	Used client sample: N										
Total Recoverable Mercury	DUP	2024766-01	ND	ND		ug/L			20		
	MS	2024766-01	ND	0.83750	1.0000	ug/L		83.8		70 - 130	
	MSD	2024766-01	ND	0.87000	1.0000	ug/L	3.8	87.0	20	70 - 130	

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Notes And Definitions

J	Estimated Value (CLP Flag)
MDL	Method Detection Limit
ND	Analyte Not Detected
PQL	Practical Quantitation Limit
A07	Detection and quantitation limits were raised due to sample dilution caused by high analyte concentration or matrix interference.
A20	Surrogate is low due to matrix interference. Interference verified through second extraction/analysis.
L01	The Laboratory Control Sample Water (LCSW) recovery is not within laboratory established control limits.
Q02	Matrix spike precision is not within the control limits.
Q03	Matrix spike recovery(s) was(were) not within the control limits.
S09	The surrogate recovery for this compound was not within the control limits.

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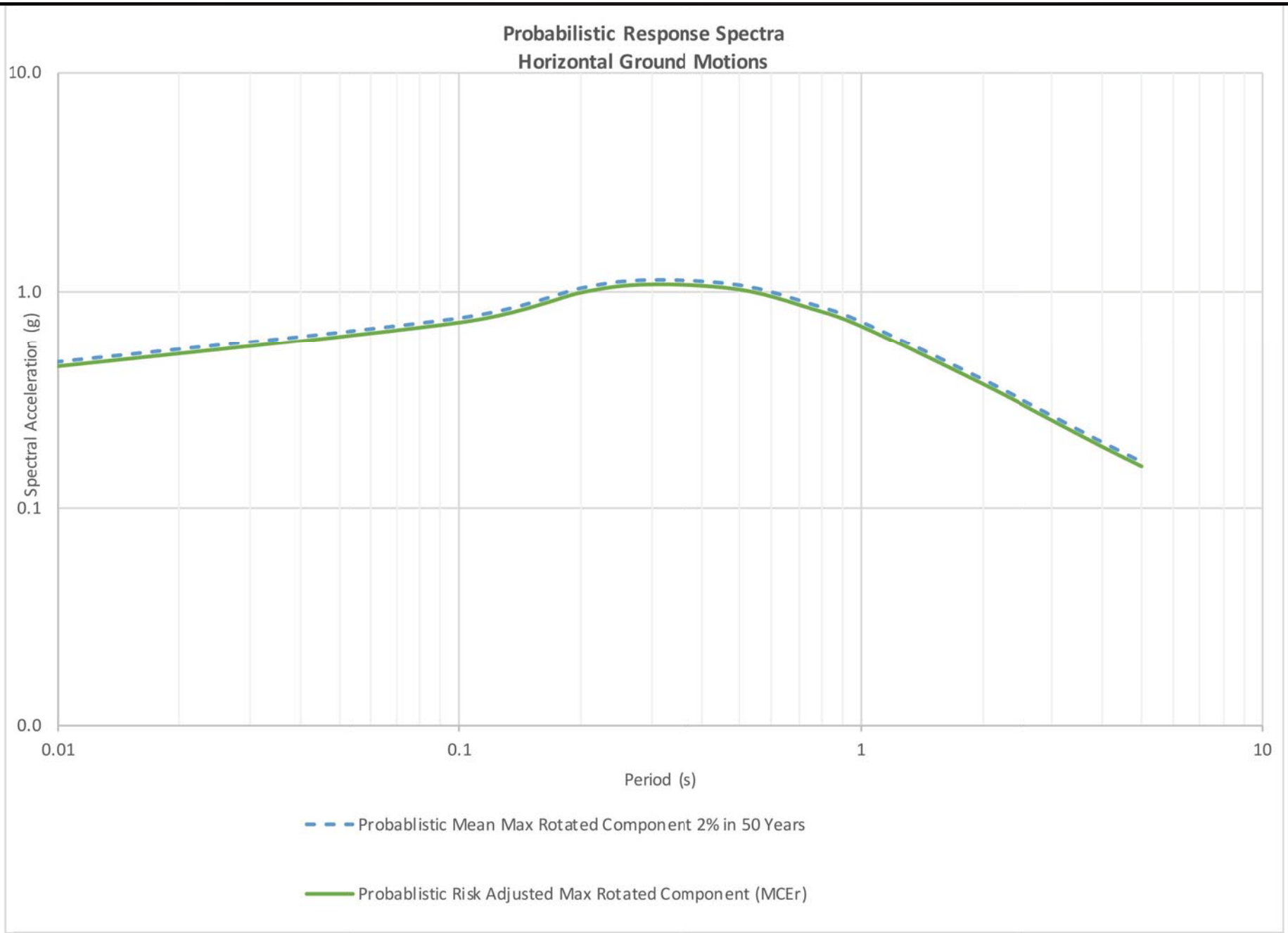
APPENDIX IV

Figure 5: Probabilistic Response Spectra
Figure 6: Deterministic Response Spectra
Figure 7: Probabilistic Risk Targeted Maximum Considered Earthquake (MCE_R) vs 1.2Fa
Figure 8: Site-Specific Risk Targeted Maximum Considered Earthquake (MCE_R) vs Site Specific Design Response
Figure 9: Section 11.4.6 Design Spectral Response
Figure 10: Design Response Spectrum



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Turlock Water Distribution System Project

Turlock, CA

Figure 5

Proj. No:	20-642.1
Scale:	N/A
Date:	12/4/2020

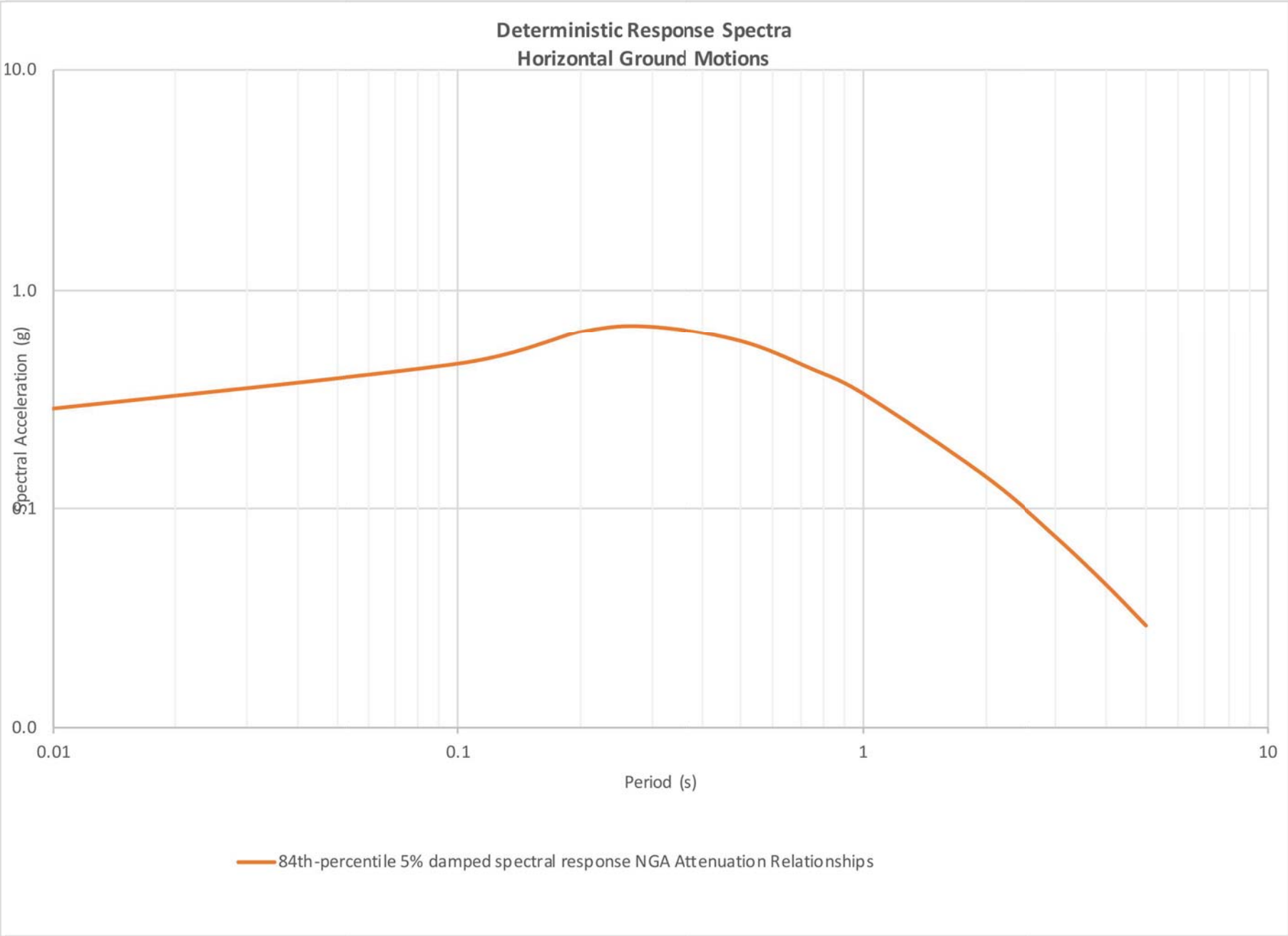

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Figure 6

Proj. No:	20-642.1
Scale:	N/A
Date:	12/4/2020

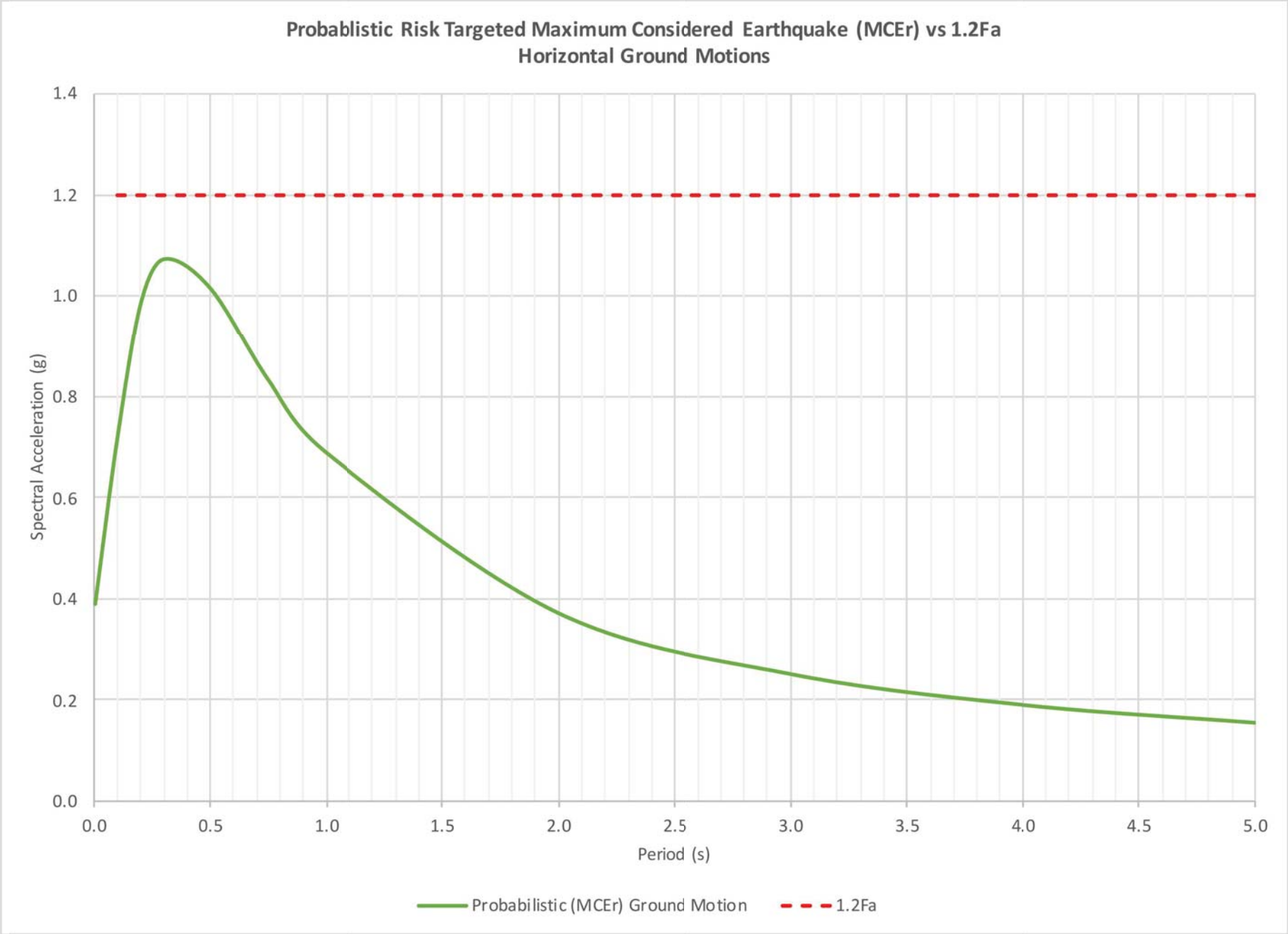

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Figure 7

Proj. No:	20-642.1
Scale:	N/A
Date:	12/4/2020

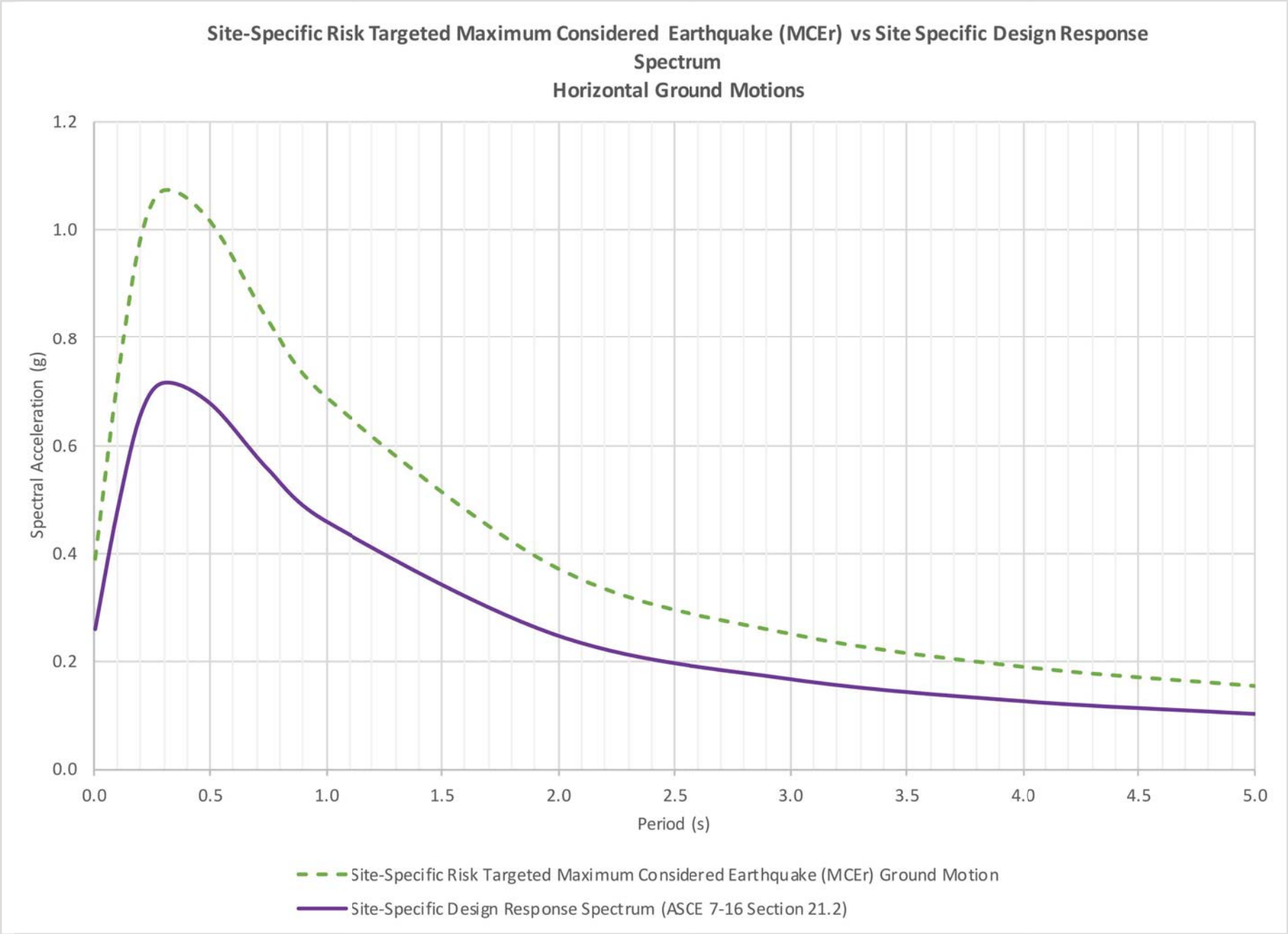

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Figure 8

Proj. No:	20-642.1
Scale:	N/A
Date:	12/4/2020

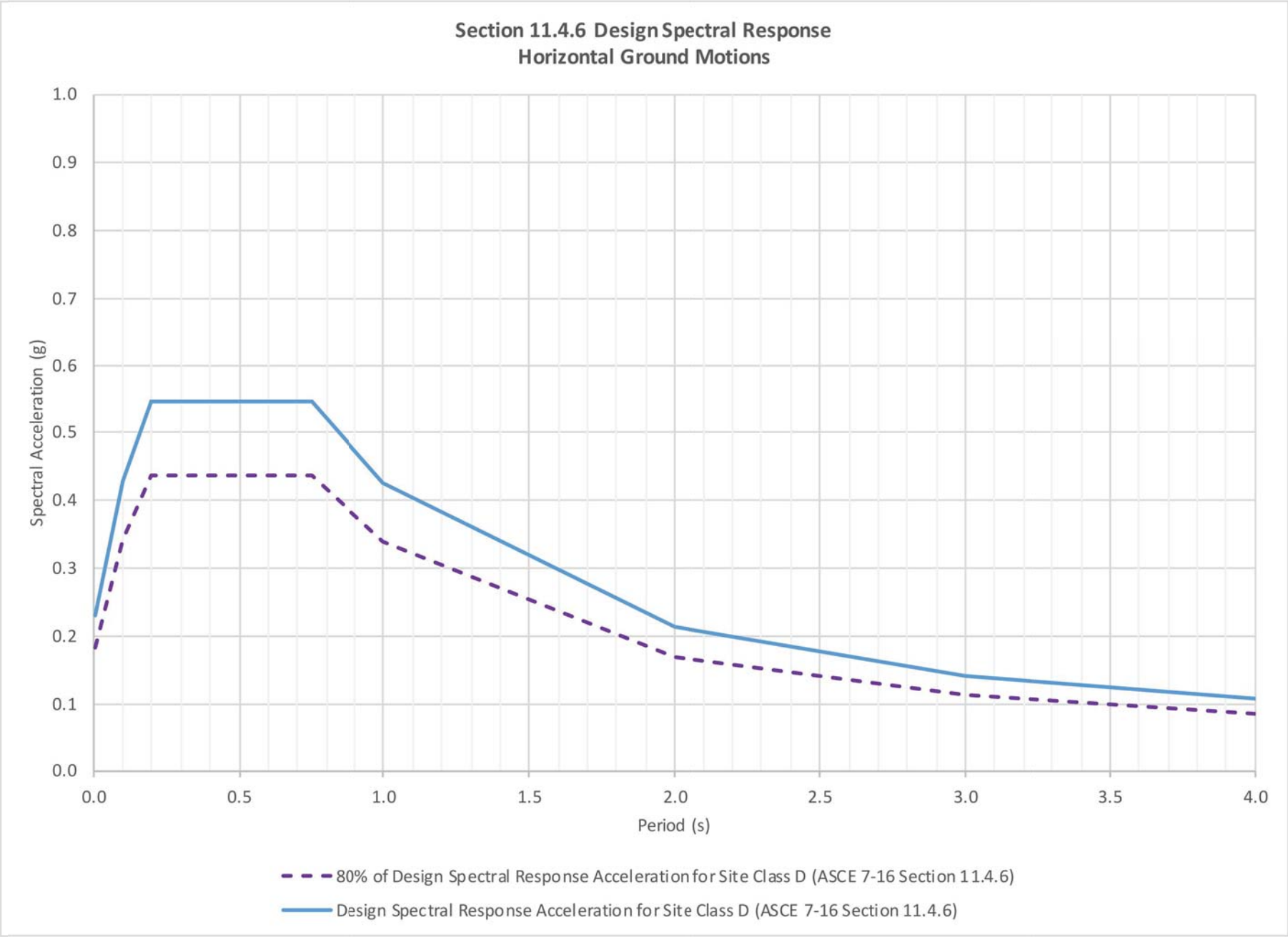

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Figure 9

Proj. No:	20-642.1
Scale:	N/A
Date:	12/4/2020

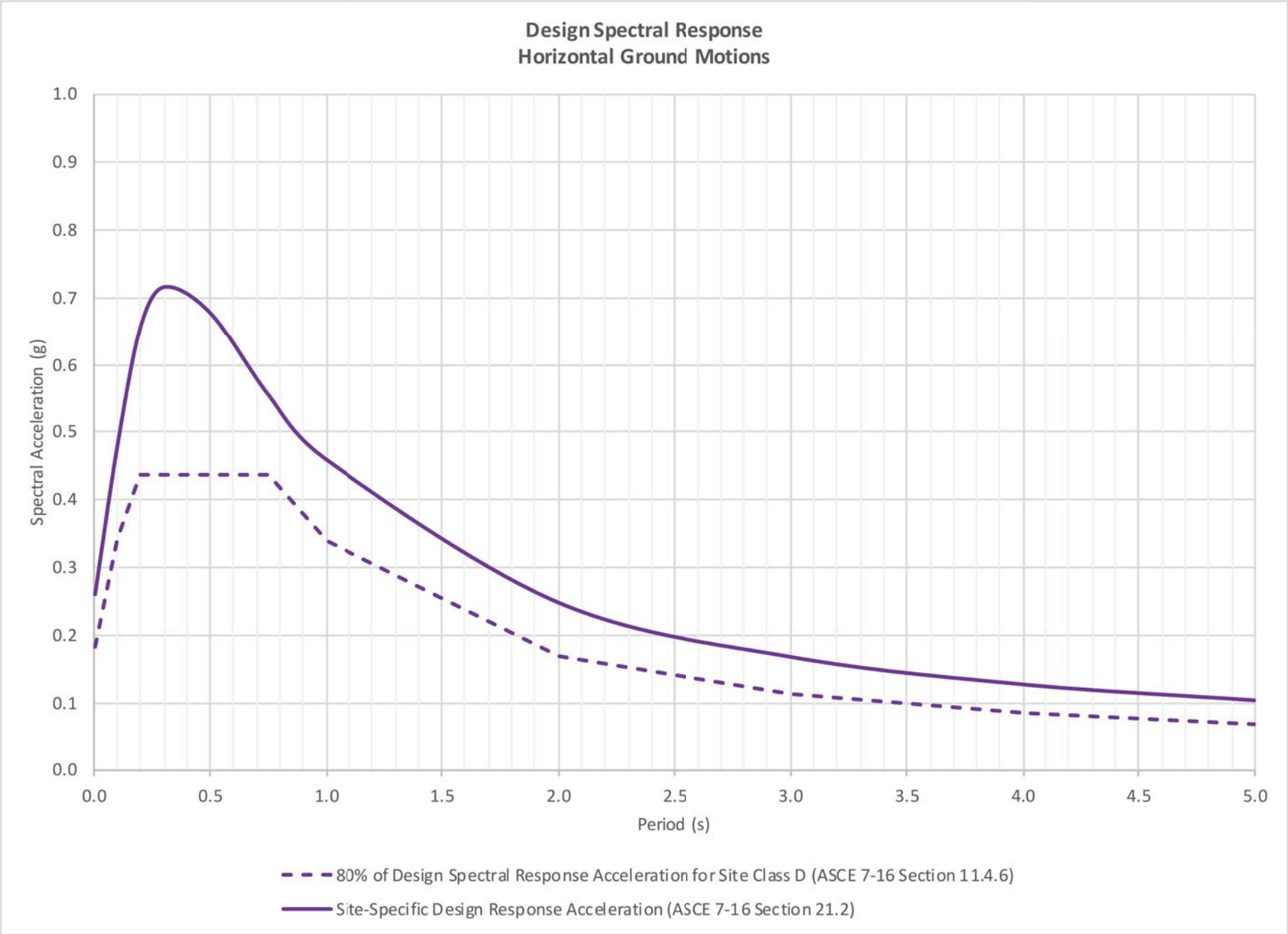

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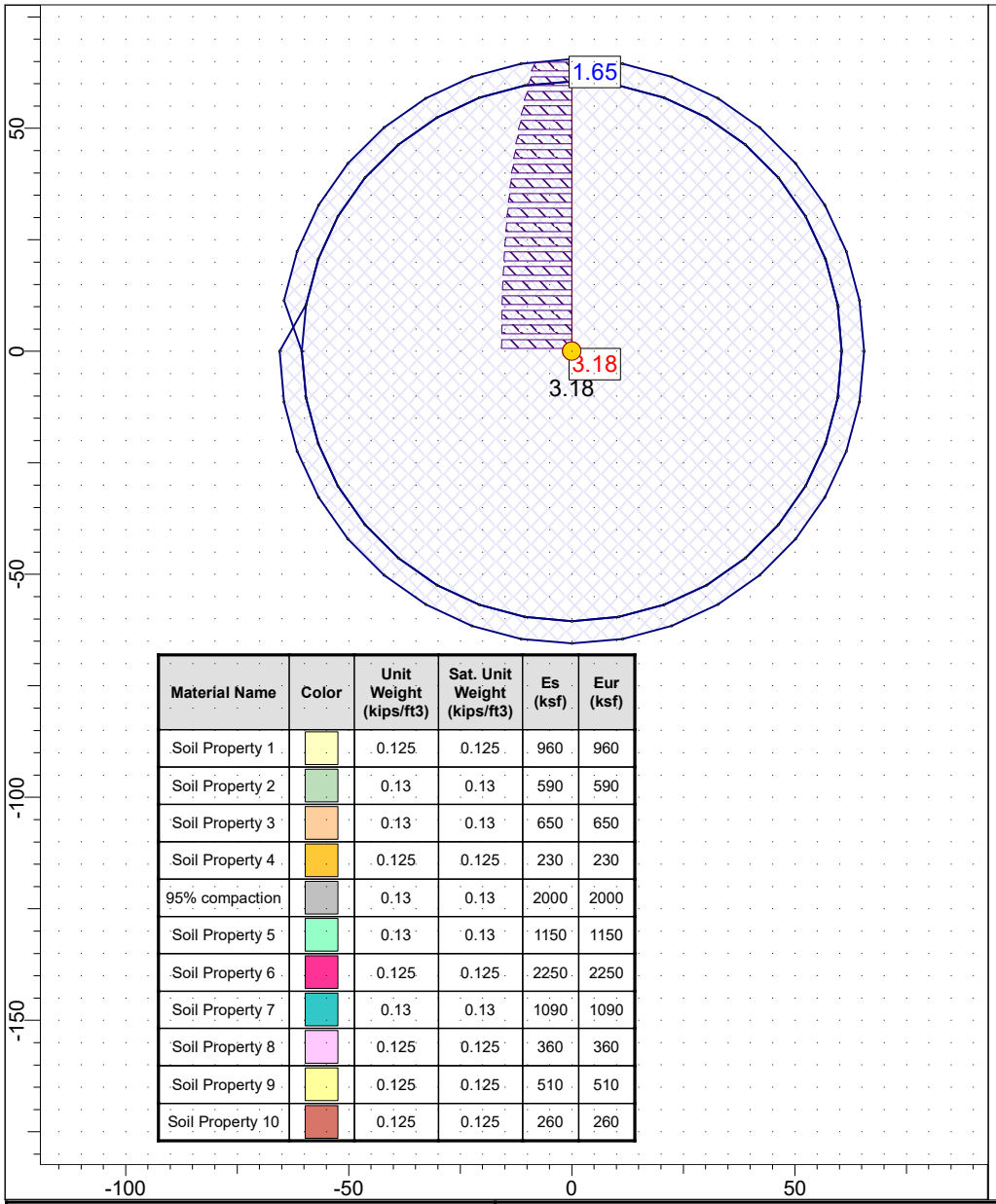
Figure 10

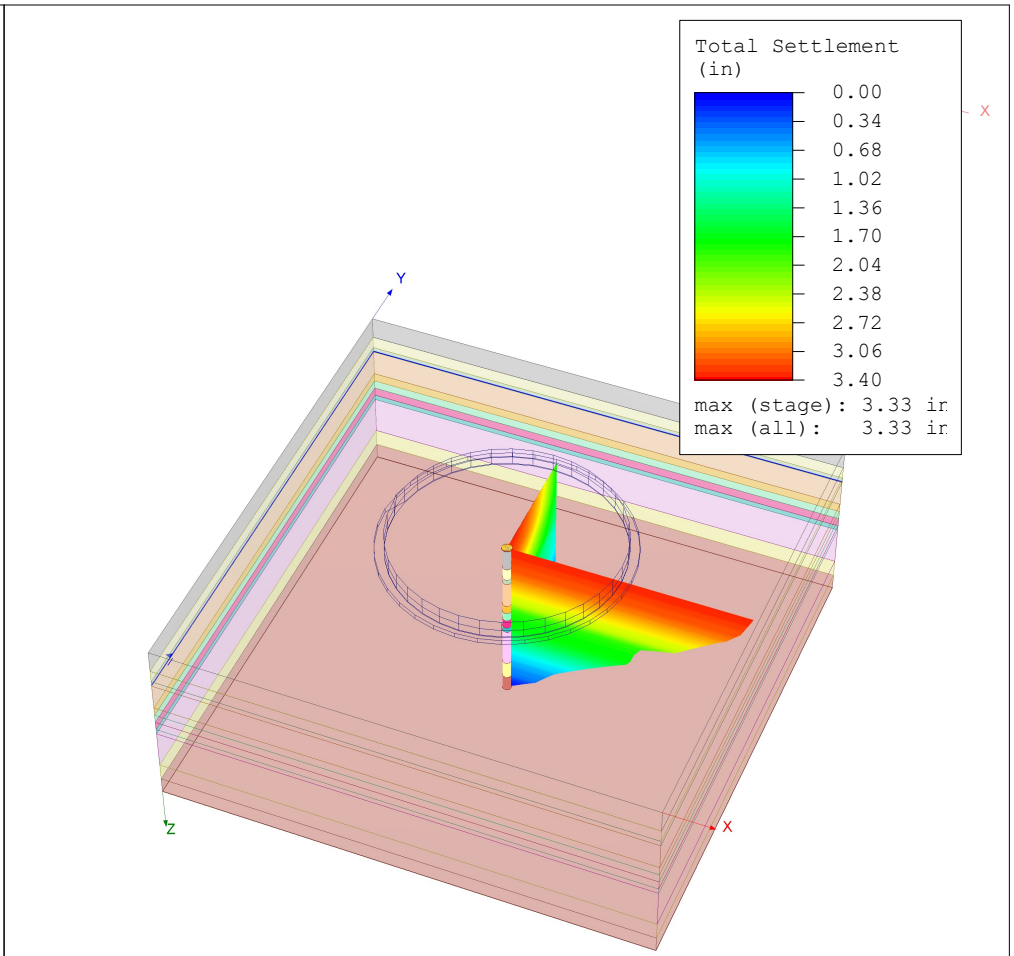
Proj. No:	20-642.1
Scale:	N/A
Date:	12/4/2020

APPENDIX V

Settle 3D Results

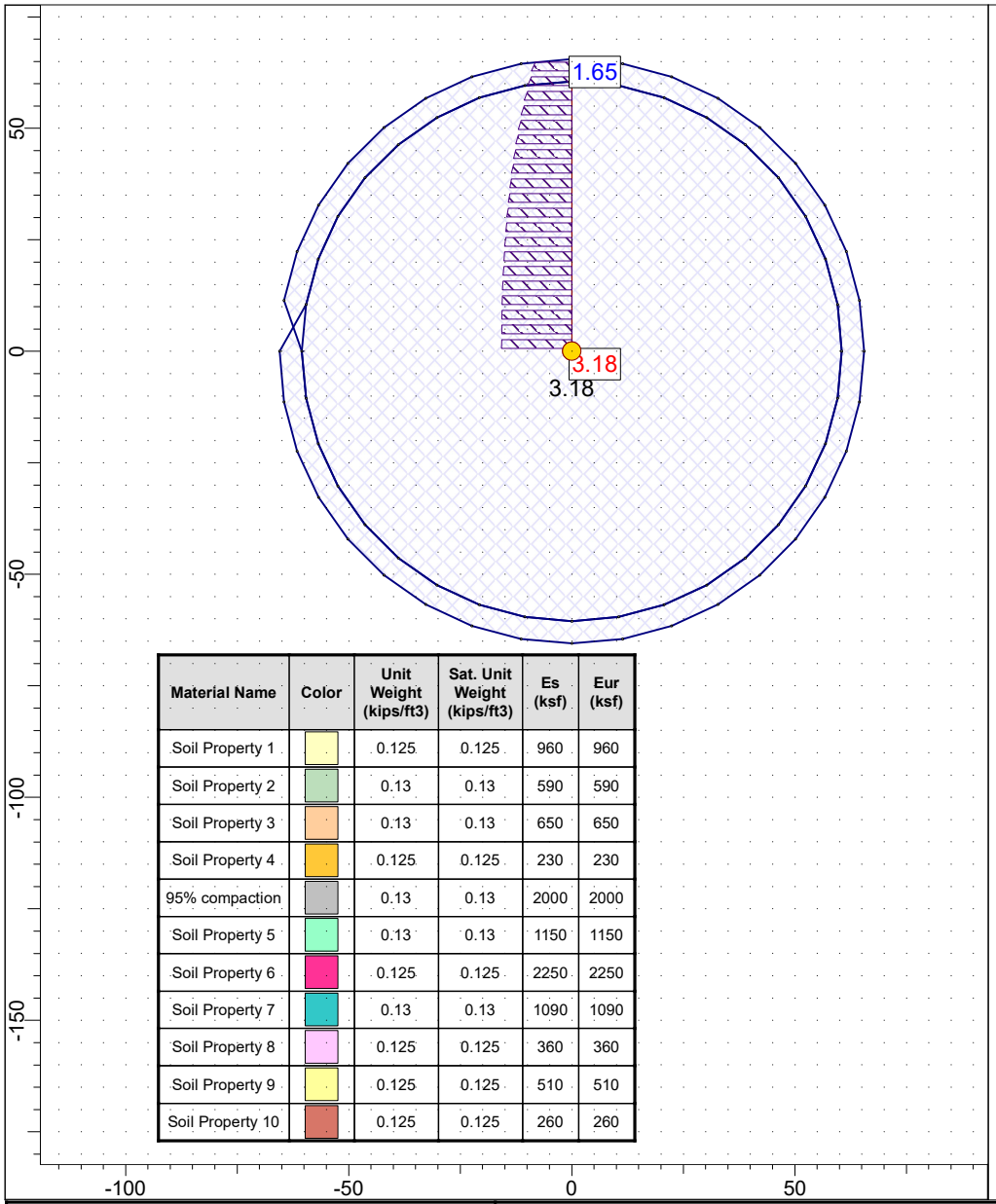


Material Name	Color	Unit Weight (kips/ft3)	Sat. Unit Weight (kips/ft3)	Es (ksf)	Eur (ksf)
Soil Property 1		0.125	0.125	960	960
Soil Property 2		0.13	0.13	590	590
Soil Property 3		0.13	0.13	650	650
Soil Property 4		0.125	0.125	230	230
95% compaction		0.13	0.13	2000	2000
Soil Property 5		0.13	0.13	1150	1150
Soil Property 6		0.125	0.125	2250	2250
Soil Property 7		0.13	0.13	1090	1090
Soil Property 8		0.125	0.125	360	360
Soil Property 9		0.125	0.125	510	510
Soil Property 10		0.125	0.125	260	260



rocscience	*Project*	20-642.1 Turlcok Water Distribution System	
	Analysis Description	125 ft-ID Concrete Tank	
	Drawn By	Hailey W/Johnathan W	*Company* Crawford & Associates, Inc
	Date	5/19/21	*File Name* 20-642.1 125ft Diam Tank R-21-002 8 ft OX (original loads).s3z

SETTLE3D 3.020



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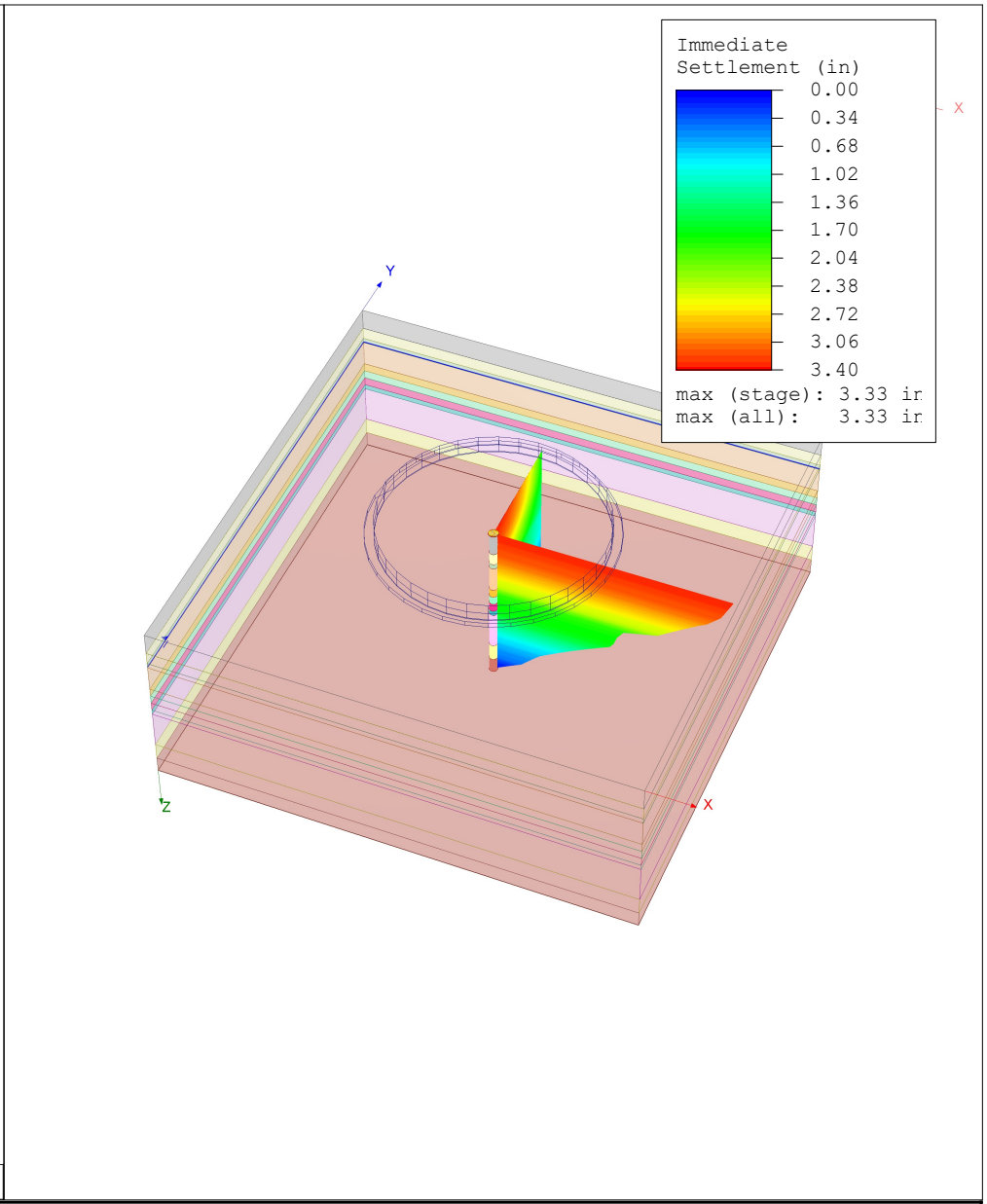
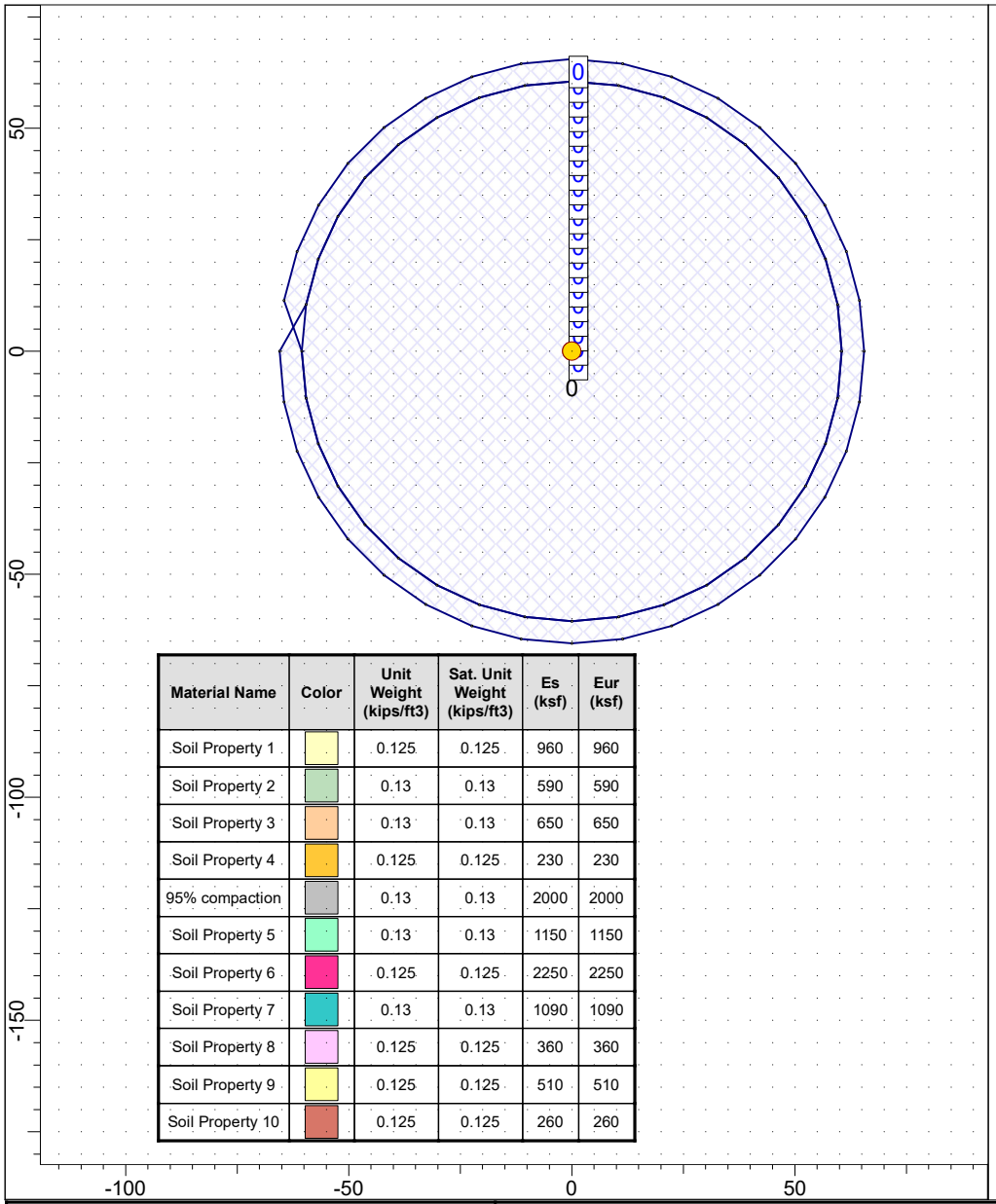
Soil Property 3		0.13	0.13	650	650
Soil Property 4		0.125	0.125	230	230
95% compaction		0.13	0.13	2000	2000
Soil Property 5		0.13	0.13	1150	1150
Soil Property 6		0.125	0.125	2250	2250
Soil Property 7		0.13	0.13	1090	1090
Soil Property 8		0.125	0.125	360	360
Soil Property 9		0.125	0.125	510	510
Soil Property 10		0.125	0.125	260	260



rocscience	*Project*	20-642.1 Turlcok Water Distribution System	
	Analysis Description	125 ft-ID Concrete Tank	
	Drawn By	Hailey W/Johnathan W	*Company* Crawford & Associates, Inc
	Date	5/19/21	*File Name* 20-642.1 125ft Diam Tank R-21-002 8 ft OX (original loads).s3z

SETTLE3D 3.020



Material Name	Color	Unit Weight (kips/ft3)	Sat. Unit Weight (kips/ft3)	Es (ksf)	Eur (ksf)
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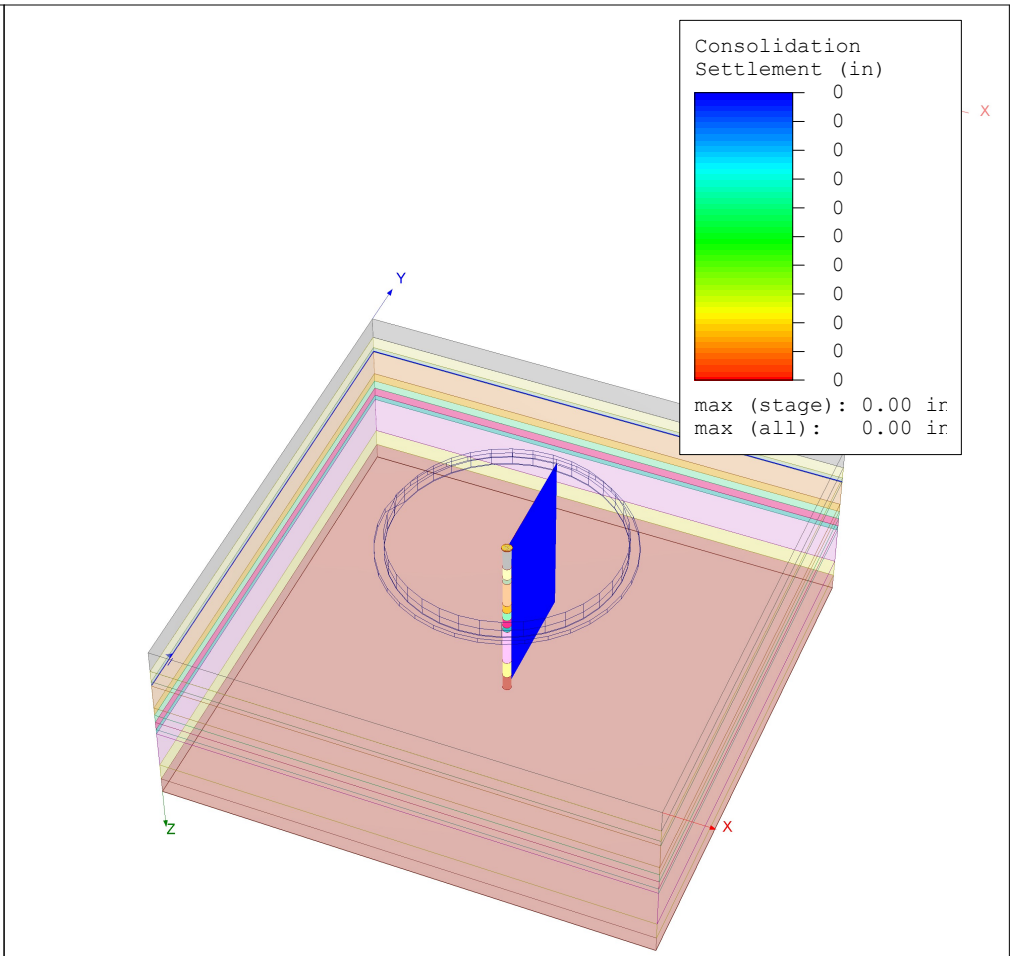
Soil Property 8		0.125	0.125	360	360
Soil Property 9		0.125	0.125	510	510
Soil Property 10		0.125	0.125	260	260



SETTLE3D 3.020

Project	20-642.1 Turlcok Water Distribution System
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