GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

DRAFT

Prepared for:

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March 31, 2022

Ms. Laurie Loaiza
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Subject: **GEOTECHNICAL BASIS OF DESIGN REPORT**
City of Wheatland
Wheatland Regional Sewer Connection Project
Wheatland, California

Dear Ms. Loaiza,

Blackburn Consulting (Blackburn) is pleased to submit this Geotechnical Basis of Design Report for the Wheatland Regional Sewer Connection Project in Wheatland, California. Blackburn prepared this report in accordance with our June 25, 2021 Proposal and July 14, 2021 Amendment Number 12 to our September 23, 2015 Master Agreement.

Thank you for selecting Blackburn to be on your design team. Please call if you have questions or require additional information.

Sincerely,

BLACKBURN CONSULTING

Prepared by:

Daniel Contreras, P.E.
Senior Engineer

Reviewed by:

Haze Rodgers, G.E., P.E.
Director of Geotechnical Services

Copies: 1 to Addressee (PDF).

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1 INTRODUCTION

1.1 Purpose

Blackburn Consulting (Blackburn) prepared this Geotechnical Basis of Design Report (GBODR) for the City of Wheatland (City) Wheatland Regional Sewer Connection Project (Project) in Wheatland, California. This report contains descriptions of the surface and subsurface conditions, site geology, and geotechnical design considerations.

Blackburn prepared this report for Coastland Civil Engineering (Coastland) and the project design team to use during design. This report shall not be relied upon by others or used for different locations or improvements without the written consent of Blackburn.

This report contains separate sections for each major project component: Sewer Pipeline, Trenchless Pipeline Crossings, and Pump Stations.

1.2 Scope of Services

To prepare this report, Blackburn:

- Discussed the proposed improvements with Ms. Laurie Loaiza, Mr. Dane Schilling, and Mr. Ernie Leporini with Coastland and with Mr. Dan Rich and Ms. Magdelene Lai with NEXGEN Utility Management (NEXGEN).
- Reviewed the Draft Preliminary Plan and Profile sheets provided by Coastland.
- Reviewed available geotechnical information for the Dry Creek Levee and Jasper Lane Bridge over Dry Creek.
- Observed the subsurface conditions in sixty-one borings drilled along the project alignment and at Pump Stations sites in August and November 2021; pushed four Cone Penetration Tests (CPTs) in January 2022 at two Pump Station Sites.
- Performed laboratory tests on soil samples obtained from the exploratory borings.
- Performed engineering analyses and calculations to develop our design considerations.

2 PROJECT AND SITE DESCRIPTION

2.1 Project Description

The proposed project includes:

- About 9 miles of 12-inch- to 18-inch-diameter HDPE sewer force main
- One bore and jack (B&J) crossing State Highway 65 (SR-65)
- Horizontal directional drill (HDD) crossings at Dry Creek and Best Slough (two crossings)
- Four B&J crossing Union Pacific Railroad (UPRR) tracks
- Three new sewer pump stations

Based on input from design team members, force main depths will generally range from 4 to 5 feet below the ground surface (bgs) except where existing utilities or agriculture fields require depths of 7 to 8 feet bgs.

Figure 1 shows the general project location and Figure 2 shows the proposed alignment.

2.2 Site Location

Figure 2 shows the proposed pipeline alignment and approximate locations of the other proposed improvements. The site plans in Appendix A1 show the pipeline alignment. Site plans for the trenchless crossings are in Appendix B1. The pump station site plans are in Appendix C1.

Proposed Pump Station 1 will replace existing Pump Station on Malone Road in Wheatland, California. The pipeline begins at the proposed Pump Station 1 and extends:

- Northeast, parallel to South Grasshopper Slough to SR-65
- Under SR-65 to State Street where it crosses under the UPRR track to 6th Street
- Northeast along 6th Street to Main Street
- Northeast along Main Street and Spenceville Road, east of town
- Continues along Spenceville Road approximately 900 feet northeast of the intersection with Jasper Lane to the proposed Pump Station 2 on the south side of Spenceville Road

From proposed Pump Station 2, the pipeline extends southwest along Speceville Road and:

- Turns northwest along Jasper Lane and continues approximately 2.4 miles, where it turns southwest onto a farm road
- Extends southwest along dirt farm roads approximately 2.4 miles before it crosses under Best Slough
- Northwest from Best Slough toward SR-65 and S Beale Road, including 2 crossings under UPRR spurs after which it turns north to S Beale Road
- Southwest along S Beale Road approximately 300 yds before turning northwest for approximately 500 yds where it turns southwest and crosses under UPRR track
- Southwest across Rancho Road to the proposed Pump Station 3 near the intersection of Rancho Rd and SR-65

The pipeline will have HDD crossings under Dry Creek and Best Slough and B&J crossings under SR-65 and multiple UPRR tracks. Table 2.1 summarizes the location and method of each trenchless crossing. Appendix B1 shows the proposed trenchless crossing locations.

Table 2.1: Trenchless Crossing Locations

Feature Crossed	Crossing Method	Upstream Road/APN	Downstream Road/APN
SR-65	B&J	015-490-024	015-490-017
UPRR 1	B&J	State St	6th St
Dry Creek	HDD	Jasper Ln	Jasper Ln
Best Slough	HDD	015-100-052	015-520-015
UPRR 2	B&J	015-520-016	015-520-004
UPRR 3	B&J	015-520-004	015-520-011
UPRR 4	B&J	015-530-013	Rancho Rd

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Table 2.2 presents proposed pump station locations. Appendix C1 shows the proposed pump station sites and proposed improvements.

Table 2.2: Pump Station Locations

Pump Station	Street	Nearest Cross Street	Approximate Station
PS-1	Malone	Main St	1001+85
PS-2	Spenceville Rd	Jasper Ln	1090+16
PS-3	Rancho Rd	SR-65	3189+53

2.3 Site Description

2.3.1 Sewer Pipeline

The existing ground surface along the pipeline alignment is generally level with gentle slopes from about Elevation 79[1] at the Malone Pump Station to about Elevation 90 at the east edge of town, where the ground surface gently slopes up to about Elevation 118 at the Spenceville Pump Station and remains generally level with an overall gentle slope downward to about Elevation 75 at the Rancho Pump Station.

The southwestern-most mile of the pipeline (approximate Stations 1001+85 to 1056+00) extends through predominantly residential portions of Wheatland. Photos 1 and 2 show conditions along these streets.

Photo 1: C Street

Looking northeast on 6th St between B St and C St. (approx. Sta 1017+00)

[1] Unless otherwise noted, elevations are based on topography provided by Coastland.

Photo 2: Spenceville Road

Looking southwest on Spenceville Rd toward McCurry St. (approx. Sta 1052+50)

East of Wheatland (approximate Stations 1056+00 to 2134+00), the alignment extends along approximately 3 miles of rural roads (Spenceville Rd and Jasper Rd). These roads cross over Grasshopper Slough and Dry Creek. Photos 3 through 5 show conditions along these streets.

Photo 3: Spenceville Road

Looking southwest along Spenceville Rd toward Grasshopper Slough. (approx. Sta 1068+00)

Photo 4: Spenceville Road

Looking southeast along Jasper Ln from southern approach to Dry Creek. (approx. Sta 2046+00)

Photo 5: Jasper Lane

Looking southeast along Jasper Ln from approximate Station 2134+30.

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The northwest portion of the pipeline alignment (approximate Stations 2134+00 to 3189+53) generally extends along private dirt or gravel roads and crosses S Beale Rd and Rancho Rd. Photos 6 through 9 show conditions along this portion.

Photo 6: Upple Property

Looking southwest along the Project alignment from approximate Station 3000+00.

Photo 7: Royal Lands LLC Property

Looking northeast along the Project alignment near Station 3108+30.

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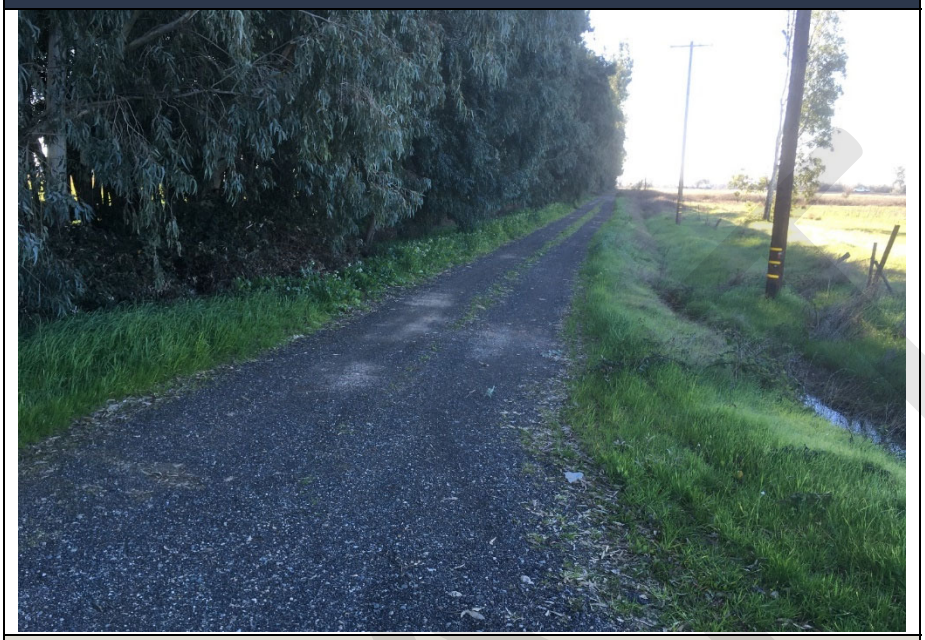
Photo 8: Lundeberg Property



Looking south along the Project alignment from approximate Station 3162+40.

Photo 9: Staas Property

Looking northwest from S Beale Rd toward trenchless crossing UPRR #4. (approx. Sta 3170+50)

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2.3.2 Trenchless crossings

The SR-65 and UPRR grades are generally level with or slightly higher than the adjacent alignment grades. Best Slough is approximately 12 feet deep. The bottom of Dry Creek is approximately 10 to 12 feet below the toe of the Dry Creek Bridge approaches. The United States Army Corps of Engineers (USACE) maintains a levee on the southern bank of Dry Creek. Photos 10 through 14 represent typical site conditions at certain crossings at the time of our January 2022 site visit.

Photo 10: SR-65

Looking west towards PS-1 from SR-65

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Photo 11: UPRR 1

Looking east at UPRR from State Street.

Photo 12: Dry Creek

Southern approach to Jasper Lane Bridge over Dry Creek.

Photo 13: Best Slough

Looking northeast toward proposed B&J location across Best Slough.

Photo 14: UPRR 4

Looking east from Rancho Road at UPRR.

2.3.3 Pump Stations

The proposed Pump Station 1 (PS-1) site is bordered on the northwest by a tree-lined drainage channel, on the west by a narrow asphalt-paved road, on the southeast by an embankment, and on the northeast by SR-65. The site is covered in grassy vegetation, and overhead powerlines run across the site in a generally northeast-southwest direction. The drainage channel to the north is approximately 4 ft. deep. The embankment to the south is approximately 3 to 5 ft. tall and surrounds an approximately 10- to 15-ft.-deep basin. There is an existing pump station in the western portion of the site Photos 15 through 17 represent typical site conditions at the time of our January 2022 site visit.

Photo 15: Pump Station 1

Looking northeast at proposed Pump Station 1 site on Malone.

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Photo 16: Pump Station 1

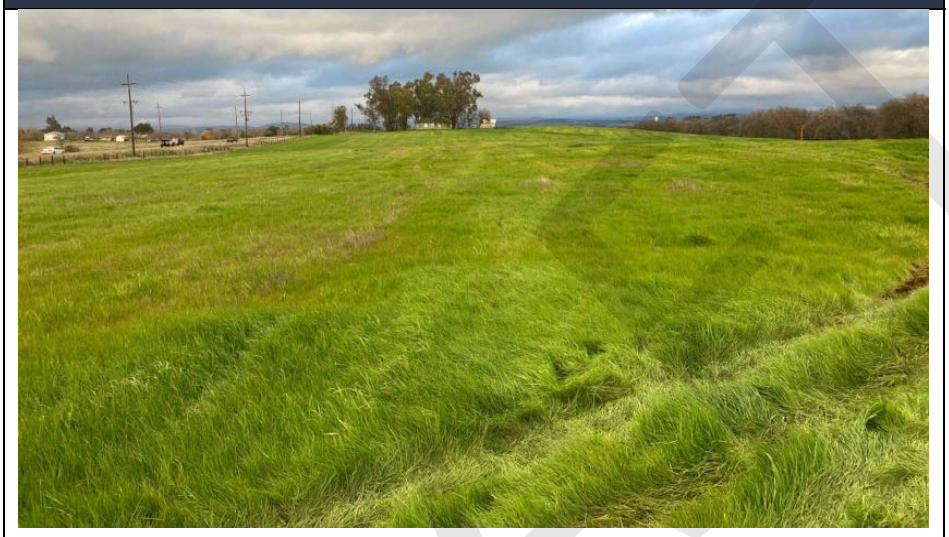
Looking southeast at embankment and basin to the south of the proposed PS-1 site.

Photo 17: Pump Station 1

Looking north at the existing pump station at the proposed Pump Station 1 site on Malone.

The proposed Pump Station 2 (PS-2) site is in an agricultural field with gentle undulations and an overall southwesterly slope. It is bordered on the northwest by Spenceville Rd and on the southeast by a tree-lined bluff which drops approximately 10 ft. The site had been disced and was covered in grassy vegetation at the time of our November drilling. Photos 18 and 19 represent typical site conditions at the time of our November 2021 site visit.

Photo 18: Pump Station 2



Looking northeast at the proposed Pump Station 2 site on Spenceville Rd.

Photo 19: Pump Station 2

Looking east at the proposed Pump Station 2 site on Spenceville Rd.

The proposed Pump Station 3 (PS-3) site is in a generally flat agricultural field. It is bordered on the north and west by Rancho Rd, on the south by an irrigation canal, and on the east by an agricultural field. The site is covered in grassy vegetation. Photo 20 represents typical site conditions at the time of our January 2022 site visit.

Photo 20: Pump Station 3

Looking southwest at proposed Pump Station 3 site on Rancho Rd.

3 PROJECT GEOLOGY AND SOIL SURVEY

3.1 Geology and Soil Survey

We reviewed available geologic maps and the United States Department of Agriculture's (USDA) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm). The "Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierra Foothills, California" (Helley and Harwood, 1985) shows the project is underlain by:

- Quaternary Alluvium (Qa) - unweathered gravel, sand, and silt deposited by present-day stream and river systems.
- Quaternary Basin Deposits, Undivided (Qb) - silt and clay derived from the same sources as modern alluvium. Thickness in the valley varies from 3 to 6 ft. along the perimeter and up to 200 ft. in the center.
- Laguna Formation (Tla) – Interbedded alluvial gravel, sand, and silt
- Upper Member, Riverbank Formation (Qru) - Unconsolidated but compact, dark brown to red alluvium composed of gravel, sand, silt and clay.

Figure 3 shows an excerpt of the geologic map covering the project area.

The USDA Web Soil Survey indicates that the site is mostly underlain by San Joaquin loam (Map Unit 214) in the north and Redding gravelly loam (Map Unit 208) in the south. Conejo Loam (Map Units 141, 142), and Hollenbeck silty clay loam (Map Unit 131) also underlie the alignment. Table 3.1 presents properties of these soil units according to the USDA Web Soil Survey.

Table 3.1: USDA Soil Properties

Map Unit Name/Symbol	Depth (in)	USCS Classification	Percent fines	Liquid Limit	Plasticity Index
San Joaquin loam/214	0 to 16	Silt, Silty Clay	50 to 60	15 to 30	0 to 10
	16 to 25	Lean Clay	55 to 70	40 to 50	25 to 35
Redding gravelly loam/208	0 to 19	Gravelly loam, loam	31 to 69	0 to 32	0 to 15
Conejo loam/141,142	0 to 65	Lean Clay	58 to 80	31 to 49	13 to 25
Hollenbeck silty clay loam/131	0 to 43	Lean Clay, Fat Clay, Clay loam	75 to 95	35 to 60	15 to 35

Figure 4 shows the mapped extent of the USDA soil units below the project site.

The Fault Activity Map of California[2] does not identify Historic or Holocene age faults (displacement within the last 11,700 years) within or adjacent to the project site. The nearest mapped fault is the Late Quaternary Foothills Fault System, Spenceville fault, located about 9 miles to the east. The nearest active mapped fault is the Cleveland Hill Fault located approximately 35 miles north of the site. Figure 5 shows the mapped faults near the project. Figure 5 shows the approximate locations of the mapped faults near the project.

4 FIELD WORK AND LABORATORY TESTING

4.1.1 Exploratory Borings

Blackburn drilled, logged and sampled 61 borings along the pipeline alignment and at pump station sites and pushed 4 CPTs at two Pump Station Sites to characterize the site subsurface conditions. Taber Drilling drilled the borings to depths ranging from about 10 to 45 feet below the existing ground surface (bgs)and pushed the CPTs to depths ranging from about 10 to 50 feet bgs. The site plans in Appendix A1 show the approximate boring locations along the pipeline alignment. Appendices B1 and C1 show the approximate boring locations near trenchless crossings and at pump stations, respectively. Appendix A2 presents the boring logs along the pipeline alignment. Appendices B2 and C2 present the boring logs for the trenchless crossings and pump stations, respectively.

[2] Jennings, Charles W., and Bryant, William A., 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6.

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Taber drilled the borings using a combination of 4-inch diameter solid-stem auger and mud-rotary. Soil samples were obtained at various intervals using a 3.0-inch O.D. Modified California (MC) sampler (equipped with 2.4-inch diameter steel liners) or 2–inch O.D. Standard Penetration (SPT) sampler. Samplers were driven with an automatic hammer, weighing 140-pounds and falling approximately 30-inches per blow. Blackburn's project engineers/geologists logged the borings, collected samples at various depths, and retained samples for laboratory testing.

Taber pushed the CPTs with a track-mounted CPT rig. The track-mounted computer-based data acquisition and presentation system processed the CPT data . The computer-generated graphical logs include cone resistance (qt), friction resistance (fs), friction ratio, and pore pressure (u) ratio versus depth. The Soil Behavior Type (SBT) interpretations are based on Robertson, P.K. and Campanella, R.C., 1998, "Guidelines for Geotechnical Design Using the Cone Penetrometer Test and CPT with Pore Pressure Measurement," Soil Mechanics Series NO. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989. The interpretation of the SBT based solely on qt, fs, and u is not always possible. Therefore, experience, judgment and correlations with nearby borings are also used to infer SBT in CPT probes.

At the Pump Station 2 site, Taber encountered refusal in CPT 3 at three depths. Each time Taber encountered refusal, the operator removed the CPT, drilled through the material causing refusal, backfilled with sand, and then re-pushed the CPT. For this reason, Appendix C2 includes four CPT plots for CPT 3. Table 4.1 presents the hole numbers assigned by Taber and the relevant depths of each hole for CPT 3.

Table 4.1: CPT 3 Plot Depths

Hole Number	Depth of Refusal (ft)	Approximate Undisturbed Soil Depths (ft)
CPT 3b	5	0-5
CPT 3	16	5-16
CPT 3a	35	16-35
CPT 3c	NA	35-50

4.1.2 Laboratory Testing

We performed the following laboratory tests on soil samples collected from the borings:

- Unit weight and moisture content tests for in-situ soil property characterization.
- Sieve analysis and Plasticity index for soil classification.
- Direct shear and Unconsolidated Undrained (UU) triaxial tests for soil strength analysis.
- R-Value tests for pavement design recommendations.
- Soil corrosivity (pH, resistivity, sulfate and chlorides) for corrosion considerations.

The boring logs in Appendices A2, B2, and C2 include unit weight and moisture content results. Appendix D includes Soil Corrosion test results. Appendices A3, B3, and C3 present the other laboratory test results for the pipeline, trenchless crossings, and pump stations, respectively.

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Table 4.2 presents the soil corrosivity test results.

Table 4.2: Soil Corrosivity Test Results

Sample No.	Depth (ft.)	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
B1-1B	2-2.5	6.17	2,060	26.9	4.1
B1-6	25-26.5	6.63	2,950	7.2	2.8
B2 Bulk A	0-5	6.46	1,720	29.5	3.7
B2-2B	5-5.5	6.78	1,260	79.1	9.7
B2-5	20-21.5	6.48	780	74.5	8.3
B3-2B	5.5-6	7.1	750	158.4	81.7
B4-3	10-11.5	6.2	2,650	7.8	1.9
B5-2B	5-5.5	6.9	2,600	11.5	3.7
B5-4B	15.5-16	6.37	1,740	48.4	10.8
B6-5	20.5-21.5	6.39	2,010	26.6	8.4
B7-2B	5.5-6	6.64	2,680	6.2	1.6
B7-3B	10.3-10.8	6.29	4,020	9.0	3.2
B50-3C	11-11.5	7.08	4,820	3.7	78.5
B51-2C	5-5.5	7.13	1,050	27.3	47.4
B52-1B	2-2.5	6.98	1,070	46.7	44.1
B52-3B	10-10.5	7.37	780	54.6	140.4
B53-2B	5-5.3	6.01	1,020	27.0	51.8
B53-4A	15-15.5	6.54	3,480	5.6	11.1
B54-3B	10.3-10.8	6.64	1,450	31.0	8.7
B58-3B	10-10.5	6.54	2,680	6.0	21.8
B58-4B	15.5-16	6.81	1,500	8.5	22.5
B59-2B	5-5.5	6.73	1,550	19.8	4.7

Type II or V Portland cement can generally be used for concrete mix design based on the sulfate and chloride contents. The onsite soil has no to low corrosive potential to metal pipes based on the pH and resistivity test results. Certain areas have low minimum resistivity which indicates higher corrosion potential to concrete and to metal pipes, particularly at Pump Stations PS-2 (B-02) and PS-3 (B-03, B-51, and B-52) and near UPRR-2 B&J crossing (B-53). We are not corrosion consultants and cannot evaluate the potential corrosion impacts to metallic elements embedded in, or in contact with, the ground. A corrosion consultant should provide specific corrosion protection recommendations for buried metallic elements used at the site.

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5 SUBSURFACE FINDINGS

5.1 General Subsurface Soil Conditions

We predominantly encountered very stiff to hard clay and sandy clay in borings drilled along the proposed alignment. Medium dense to very dense sand and clayey sand lenses was encountered scattered throughout the alignment. Some of the soil layers contained gravel.

We separated the pipeline alignment into zones/reaches with similar subsurface conditions. Table 5.1 summarizes the subsurface conditions in the upper 10 feet bgs, mapped geologic formations, and USDA soil types within each pipeline reach.

Tables 5.2 and 5.3 summarize the subsurface conditions, mapped geologic formations, and USDA soil types at B&J and HDD crossings, respectively.

Table 5.4 summarizes the subsurface conditions, mapped geologic formations, and USDA soil types at the proposed pump station sites.

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Table 5.1: Subsurface Soil Conditions

Reach ID (Approximate Station)	Boring ID	Boring Depth[2] (ft)	Boring Elevation[2] (ft)	Approximate Boring Station	Existing Pavement		Depth to GW[2] (ft)	Mapped Geologic Unit[1]	USDA Soil Type[1]	General Subsurface Soil Conditions within upper 10 feet[2]
					AC[2] (in)	AB[2] (in)				
Reach 1 (1001+85-1007+00)	B-04	38.0	79.3	1003+40	NE[4]	NE[4]	19.0	Laguna Formation	Redding gravelly loam / Conejo loam	Stiff to hard lean clay to sandy lean clay and medium dense clayey sand.
	B-05	31.5	78.3	1004+50	NE[4]	NE[4]	21.5	Laguna Formation	Redding gravelly loam	
Reach 2 (1007+00-1022+00)	B-06	31.5	83.3	1008+50	6	NE[4]	23.5	Laguna Formation	Redding gravelly loam	Stiff to hard lean clay to sandy/gravelly lean clay in the upper 8 ft. underlain by medium dense to very dense clayey sand and clayey gravel. Pockets of clayey sand in the upper 2 ft.
	B-07	31.5	81.3	1009+80	NM[3]	NM[3]	NE[4]	Laguna Formation	Redding gravelly loam	
	B-08	11.5	83.3	1017+90	2.5	NE[4]	NE[4]	Laguna Formation	Redding gravelly loam	
Reach 3 (1022+00-1054+00)	B-09	11.5	92.3	1027+00	2.5	NE[4]	NE[4]	Laguna Formation	Redding gravelly loam	Stiff to very stiff lean clay to lean clay with sand in the upper 1.5 to 4 ft. underlain by medium dense to very dense clayey sand.
	B-10	11.5	90.3	1034+90	NE[4]	NE[4]	NE[4]	Laguna Formation	Redding gravelly loam	
	B-11	11.5	100.3	1043+00	NE[4]	NE[4]	NE[4]	Laguna Formation	Redding gravelly loam	
Reach 4 (1054+00-1071+00)	B-12	10.8	100.3	1051+20	NE[4]	NE[4]	NE[4]	Laguna Formation	Redding gravelly loam	Dense sand with clay, silty sand, and clayey sand in the upper 1 to 4 ft. underlain by hard lean clay, sandy lean clay, and elastic silt.
	B-13	10.0	98.9	1059+20	NE[4]	NE[4]	NE[4]	Laguna Formation	Redding gravelly loam	
	B-14	10.3	91.3	1067+20	NE[4]	NE[4]	NE[4]	Laguna Formation	Redding gravelly loam	
Reach 5 (1071+00-1080+00)	B-15	10.5	103.3	1075+20	NE[4]	18	NE[4]	Laguna Formation	Redding gravelly loam	Dense to very dense clayey sand in the upper 7 ft. underlain by medium dense clayey sand.
Reach 6 (1084+00-2008+52)	B-60	21.5	116.3	2004+40	4	8	NE[4]	Laguna Formation	Redding gravelly loam	Very stiff to hard sandy lean clay.
Reach 7 (1080+00-1084+00 & 2008+52-2050+00)	B-16	10.5	112.3	1082+80	NE[4]	18	NE[4]	Laguna Formation	Redding gravelly loam	Very stiff to hard lean clays and silts to sandy silts in the upper 6 to 9 ft. underlain by medium dense to dense sands, silty sands, and clayey sands (very stiff sandy silt in Boring B-20).
	B-17	11.5	92.3	2017+20	NE[4]	NE[4]	NE[4]	Laguna Formation	Redding gravelly loam	
	B-18	11.5	86.3	2025+20	NE[4]	NE[4]	NE[4]	Holocene Alluvium	Conejo loam	
	B-19	11.5	86.3	2033+10	7	5	NE[4]	Holocene Alluvium	Conejo loam	
	B-20	11.5	87.3	2041+10	NE[4]	NE[4]	NE[4]	Holocene Alluvium	Conejo loam	
	B-21	46.5	90.7	2046+50	NE[4]	NE[4]	25.0	Holocene Alluvium	Conejo loam	
Reach 8 (2050+00-2088+00)	B-22	46.5	92.3	2051+60	11	8	26.3	Riverbank Formation	Conejo loam	Interbedded layers of hard lean clay to gravelly lean clay and medium dense to very dense silty sand and clayey sand to clayey gravel.
	B-23	10.9	93.3	2058+80	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-24	11.5	93.3	2066+50	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-25	11.5	94.3	2074+80	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-26	11.5	93.3	2082+80	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
Reach 9 (2088+00-3081+00)	B-27	11.5	94.3	2090+90	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	Very stiff to hard lean clay to sandy lean clay. Pockets of dense silty to clayey sand in borings B-30, B-37, B-40, of hard fat clay in boring B-31, and of hard sandy silt in B-35.
	B-28	11.5	96.3	2098+90	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-29	10.0	97.3	2106+90	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-30	11.5	97.3	2114+80	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-31	10.0	97.3	2122+90	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-32	11.5	98.3	2130+80	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-33	9.9	94.3	3005+60	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-34	11.2	94.3	3014+10	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-35	10.5	93.3	3022+60	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-36	11.5	91.3	3031+00	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-37	10.8	90	3039+60	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-38	11.5	87.6	3048+50	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	

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Table 5.1: Subsurface Soil Conditions

Reach ID (Approximate Station)	Boring ID	Boring Depth[2] (ft)	Boring Elevation[2] (ft)	Approximate Boring Station	Existing Pavement		Depth to GW[2] (ft)	Mapped Geologic Unit[1]	USDA Soil Type[1]	General Subsurface Soil Conditions within upper 10 feet[2]
					AC[2] (in)	AB[2] (in)				
	B-39	11.5	89.3	3057+60	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-40	11.5	88.3	3066+60	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-41	11.5	87.3	3075+60	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
Reach 10 (3081+00-3118+00)	B-42	11.5	83.3	3085+70	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam / Hollenbeck silty clay loam	Hard lean clay to sandy lean clay in the upper 8 to 10 ft. underlain by medium dense to dense clayey sand.
	B-43	13.0	81.3	3093+00	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-44	13.0	80.3	3102+10	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-45	11.5	79.3	3112+10	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
Reach 11 (3118+00-3147+00)	B-46	11.5	74.3	3122+30	NE[4]	NE[4]	NE[4]	Holocene Basin Deposits	Conejo loam	Very stiff to hard lean clay to sandy lean clay. Very dense silty sand below 4 ft. in boring B-49.
	B-47	46.0	76.6	3128+20	NE[4]	NE[4]	38.0	Holocene Basin Deposits	Conejo loam	
	B-48	45.8	80.7	3129+70	NE[4]	NE[4]	NE[4]	Holocene Basin Deposits / Laguna Formation	San Joaquin loam	
	B-49	10.8	80.3	3136+20	NE[4]	NE[4]	NE[4]	Laguna Formation	San Joaquin loam	
	B-50	31.0	78.3	3143+00	NE[4]	NE[4]	NE[4]	Laguna Formation	San Joaquin loam	
Reach 12 (3147+00-3189+53)	B-53	31.3	79.3	3152+10	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	Stiff to hard lean clay and lean clay with sand in the upper 7 to 10 ft. (3 ft. in boring B-58) underlain by medium dense to very dense clayey sand.
	B-54	31.5	79.5	3162+30	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-55	31.5	81.3	3162+90	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-56	11.5	78.3	3171+90	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-57	11.5	78.3	3177+60	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-58	36.5	78.3	3185+80	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	
	B-59	31.5	76.6	3188+40	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	

1 Refer to Section 3.1 for description of geologic formation and USDA mapped soil type.
2 Depths and elevations are approximate.
3 Not measured.
4 Not encountered.

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Table 5.2: Subsurface Soil Conditions at Proposed Bore and Jack Crossings

Crossing	Boring ID	Boring Depth[2] (ft)	Approximate Boring Station	Existing Pavement		Depth to GW[2] (ft)	Mapped Geologic Unit[1]	USDA Soil Type[1]	General Subsurface Soil Conditions[2]
				AC[2] (in)	AB[2] (in)				
SR-65	B-4	38.0	1003+40	NE[4]	NE[4]	19.0	Laguna Formation	Redding gravelly loam / Conejo loam	Medium stiff to hard lean clay to sandy lean clay with lenses of loose to medium dense clayey sand in the upper 25 ft. underlain by medium dense clayey sand and very dense sand to a depth of 37.5 ft. Hard lean clay with sand in the deepest 0.5 ft. explored.
	B-5	31.5	1004+50	NE[4]	NE[4]	21.5			
UPRR 1	B-6	31.5	1008+50	6	NE[4]	23.5	Laguna Formation	Redding gravelly loam	Very stiff to hard lean clay in the upper 8 ft. underlain by 5 to 8 ft. of dense clayey gravel to hard gravelly clay with sand. Interbedded lean clays, sandy silts and silty sands from approximately 14 ft. below ground surface to maximum depth explored.
	B-7	31.5	1009+80	NM[3]	NM[3]	NE[4]			
UPRR 2	B-50	31.0	3143+00	NE[4]	NE[4]	NE[4]	Laguna Formation	San Joaquin loam	Hard lean clay in the upper 15 ft. underlain by 5 ft. of hard sandy silt. Very dense clayey sand from 20 ft. deep to 25 ft. underlain by hard silt and sandy silt to the maximum depth explored.
UPRR 3	B-53	31.3	3152+10	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	Hard lean clay in the upper 10 ft. underlain by lenses of very dense silty, clayey sand and stiff lean clay with sand. Hard silt to silt with sand from 18 ft. to the maximum depth explored.

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Table 5.2: Subsurface Soil Conditions at Proposed Bore and Jack Crossings

Crossing	Boring ID	Boring Depth[2] (ft)	Approximate Boring Station	Existing Pavement		Depth to GW[2] (ft)	Mapped Geologic Unit[1]	USDA Soil Type[1]	General Subsurface Soil Conditions[2]
				AC[2] (in)	AB[2] (in)				
UPRR 4	B-58	36.5	3185+80	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	Hard lean clay in the upper 33 ft. with a 10-ft.-thick, dense clayey sand layer from 3 to 13 ft. Hard sandy silt from 33 ft. to the maximum depth explored.
	B-59	31.5	3188+40	NE[4]	NE[4]	NE[4]	Riverbank Formation	San Joaquin loam	Hard lean clay in the upper 23 ft. with a 4-ft.-thick, dense clayey sand layer from 10 to 14 ft. Very dense silty sand from 23 ft. to 27 ft. underlain by hard lean clay with sand to the maximum depth explored.

1 Refer to Section 3.1 for description of geologic formation and USDA mapped soil type.
2 Depths and layer thicknesses are approximate
3 Not measured.
4 Not encountered.

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Table 5.3: Subsurface Soil Conditions at Proposed HDD Crossings

Crossing	Boring ID	Boring Depth[2] (ft)	Approximate Boring Station	Existing Pavement		Depth to GW[2] (ft)	Mapped Geologic Unit[1]	USDA Soil Type[1]	General Subsurface Soil Conditions[2]
				AC** (in)	AB** (in)				
Best Slough	B-47	46.0	3128+20	NE[4]	NE[4]	38.0	Holocene Basin Deposits	Conejo loam	Very stiff to hard silts and lean clays with varying amounts of sand in the upper 33 to 35 ft. underlain by interbedded lenses of hard lean clays to sandy silts and medium dense to very dense sands and silty sands to the maximum depth explored.
	B-48	45.8	3129+70	NE[4]	NE[4]	NE[4]	Holocene Basin Deposits / Laguna Formation	San Joaquin loam	
Dry Creek	B-21	46.5	2046+50	NE[4]	NE[4]	25.0	Holocene Alluvium	Conejo loam	Very dense sandy, gravelly fill in the upper 3 ft. Native very stiff to hard lean clay and silt to a depth of 12 ft. underlain by 30 ft. of medium dense to dense sand to clayey sand. Hard lean clay from 43 feet deep to the maximum depth explored.
	B-22	46.5	2051+60	11	8	26.3	Riverbank Formation		Very dense clayey gravel to hard gravelly clay in the upper 7 ft. underlain by very stiff to hard lean clay, silt, and silt with sand to maximum depth explored.

1 Refer to Section 3.1 for description of geologic formation and USDA mapped soil type.
2 Depths and layer thicknesses are approximate
3 Not measured.
4 Not encountered.

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Table 5.4: Subsurface Conditions

Pump Station	Boring ID	Boring Depth[2] (ft)	Approximate Station	Depth to GW[2] (ft)	Mapped Geologic Unit[1]	USDA Soil Type[1]	General Subsurface Soil Conditions[2]
PS 1	B-01	41.0	1001+85	19	Laguna Formation	Redding gravelly loam / Conejo loam	Stiff to hard lean clay to sandy lean clay in the upper 20.5 ft., underlain by approximately 2 ft of dense well-graded sand with clay and gravel. Hard lean clay to sandy lean clay from approximately 22.5 ft. to the maximum depth explored of approximately 41 ft.
	CPT 1	20.0		NM[3]			
	CPT 2	10.0		NM[3]			
PS 2	B-02	31.5	1090+16	NE[4]	Laguna Formation	Redding gravelly loam	Soft to stiff lean clay with sand in the upper 2 to 5 ft. underlain by 2 to 6 ft. of dense to very dense silty sand. Very stiff to hard lean clay and silt at 6 to 8 ft. deep down to 20 to 25 ft. deep underlain by medium stiff to very stiff sandy lean clay and clay to the maximum depth explored of 50 ft.
	B-61	6.5		NE[4]			
	CPT 3	50.0		NM[3]			
	CPT 4	50.0		NM[3]			
PS 3	B-03	41.5	3189+53	NE[4]	Riverbank Formation	San Joaquin Loam	Very stiff to hard lean clay to sandy lean clay in the upper 38 ft. underlain by 3 ft. of dense to very dense sand over hard lean clay with sand to the maximum depth explored of approximately 41.5 ft.
	B-51	11.5		NE[4]			
	B-52	11.5		NE[4]			

1 Refer to Section 3.1 for description of geologic formation and USDA mapped soil type.
2 Depths and layer thicknesses are approximate
3 Not measured.
4 Not encountered.

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5.2 Groundwater

We reviewed groundwater level data for nearby wells available at the California Department of Water Resources (DWR) website (http://www.water.ca.gov/waterdatalibrary/) and using the Sustainable Groundwater Management Act (SGMA) data viewer (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels). Based on this information, the groundwater elevation[3] across the site typically ranges from 45 to 70 feet, dropping to Elevations of 30 to 50 feet in the late summer. Some data points were as high as about Elevation 75 feet and as low as about 20 feet. Relatively shallow perched water may occur within the near-surface soil during the winter and spring months, and adjacent to the existing canals, streams, and flooded rice fields.

Groundwater (Regional and perched) levels will fluctuate due to changes in precipitation, creek and canal levels, irrigation, pumping of wells, and other factors.

5.2.1 Pipeline

Within the town of Wheatland, we observed groundwater at depths of 19 to 23.5 ft bgs. In our borings near Dry Creek, we observed groundwater about 25 to 26 ft bgs. North of Dry Creek, we encountered groundwater in one boring (B-47) at a depth of 38 feet and perched groundwater in boring B-53 (UPRR crossing #3) at a depth of 15.5 ft. Table 5.5 lists the borings and depths where we encountered groundwater.

Table 5.5: Groundwater Summary

Boring	Approximate Station	Boring Depth[1] (ft)	Depth to Water[1] (ft)	Groundwater Elevation[1] (ft)
B-01	PS-1	41.0	19.0	60.6
B-04	1003+40	38.0	19.0	60.3
B-05	1004+50	31.5	21.5	56.8
B-06	1008+50	31.5	23.5	59.8
B-21	2046+50	46.5	25.0	65.7
B-22	2051+60	46.5	26.3	66
B-47	3128+20	46.0	38.0	38.6

Perched groundwater was encountered at 10 feet and 15.5 feet bgs in borings B-8 (on 6th St) and B-53 (approximately 1,000 feet south of S Beale Rd), respectively.

[3] Elevations in this paragraph reference NAVD88

5.2.2 Trenchless Crossings

Table 5.6 lists the trenchless crossing borings and depth to groundwater if encountered.

Table 5.6: Groundwater Summary – Trenchless Crossing Borings

Boring	Approximate Station	Boring Depth[1] (ft)	Ground Elevation[1] at Boring (ft)	Depth to Groundwater[1] (ft)	Groundwater Elevation[1] (ft)
B-04	1003+40	38.0	79.3	19.0	60.3
B-05	1004+50	31.5	78.3	21.5	56.8
B-06	1008+50	31.5	83.3	23.5	59.8
B-07	1009+80	31.5	81.3	NE[2]	NE[2]
B-21	2046+50	46.5	90.7	25.0	65.7
B-22	2051+60	46.5	92.3	26.3	66.0
B-47	3128+20	46.0	76.6	38.0	38.6
B-48	3129+70	45.8	80.7	NE[2]	NE[2]
B-50	3143+00	31.0	78.3	NE[2]	NE[2]
B-53	3152+10	31.3	79.3	NE[2]	NE[2]
B-58	3185+80	36.5	78.3	NE[2]	NE[2]
B-59	3188+40	31.4	76.6	NE[2]	NE[2]

1 Depths and elevations are approximate.
2 Not Encountered.

5.2.3 Pump Stations

At the Pump Station 1 site, we encountered groundwater approximately 19 ft bgs in our boring on November 19, 2021. We did not encounter groundwater in our 40-ft-deep borings at Pump Stations 2 or 3. Groundwater was not measured in CPTs.

Based on our review of the DWR website SGMA data viewer, the depth to groundwater at:

- Pump Station 1 typically ranges from 30 to 45 feet bgs. Some data points were as shallow as about 20 feet bgs and others were as deep as about 55 feet bgs.
- Pump Station 2 typically ranges from 55 to 70 feet bgs. Some data points were as shallow as about 50 feet bgs and others were as deep as about 75 feet bgs.
- Pump Station 3 typically ranges from 35 to 50 feet bgs. Some data points were as shallow as about 25 feet bgs and others were as deep as about 55 feet bgs.

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5.3 Existing Pavement Sections

Six borings were drilled in paved roadways. Table 5.7 lists the pavement sections measured in these six borings.

Table 5.7: Existing Pavement Summary

Boring	Approximate Station	AC[1] (in)	AB[1] (in)
B-06	1008+50	6	NE[2]
B-07	1009+80	NM[3]	NM[3]
B-08	1017+90	2.5	NE[2]
B-09	1027+00	2.5	NE[2]
B-60	2004+40	4.0	8.0
B-22	2033+10	7.0	5.0
B-47	2051+60	11.0	8.0

1 Layer thicknesses are approximate
2 Not encountered.
3 Not measured.

Pavement conditions may vary between borings with recorded pavement data.

During our January 27, 2022 site visit, we observed an area on State Street approximately 350 feet south of Station 1008+00 where the Asphalt had worn away to reveal concrete pavement beneath. We did not observe concrete at our B-06 boring location or north of the alignment, however, it is possible that a State Street is underlain by concrete at the alignment. Photos 16 through 18 show the exposed concrete pavement.

Photo 16: State Street

Looking north toward pipeline alignment.

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Photo 17: State Street

Asphalt pavement underlain by concrete pavement.

Photo 18: State Street

Concrete beneath asphalt.

6 DESIGN CONSIDERATIONS – SEWER PIPELINE

6.1 Alignment Ground Suitability

The ground conditions along the proposed pipeline alignment will be suitable for the planned improvements when constructed in accordance with the project plans, industry standards, and our geotechnical recommendations.

6.2 Geologic Hazards

- Faulting—The potential for surface rupture or creep due to faulting at the site is very low. The Fault Activity Map of California[4] and the Geologic Map of the Sacramento Quadrangle[5] (Figure 5) do not show Historic or Holocene age faults (displacement within the last 11,700 years) within or immediately adjacent to the pipeline alignment. The pipeline alignment does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone[6].
- Ground Shaking—For the Maximum Considered Earthquake, a peak horizontal ground acceleration (PGA) of approximately 0.21 times gravity (g's) could be expected.
- Liquefaction—Our subsurface exploration indicates:
    - Groundwater is relatively deep.
    - The saturated soil below the alignment generally consists of stiff to hard clays and dense to very dense clean sands that are not liquefiable.
    - Isolated discontinuous saturated granular layers may be present between boring locations, however the anticipated settlements at the MCE level shaking are expected to be relatively small (less than 1/2 inch).
    - Therefore, the potential for damaging liquefaction at the site is low.
- Seismically Induced Settlement—During a seismic event, ground shaking can cause densification of granular soil that can result in settlement of the ground surface. Considering the cohesive characteristics of the soil, relatively low PGA, and relative density of the sandy soil encountered in the borings, we consider the potential for more than ½ inch of seismically induced settlement to be very low.
- Landslides and Slope Stability—Due to the relatively low topographic relief and existing slope gradients we do not expect landslides or natural slope failure along the pipeline alignment.

6.3 Seismic Design

The pipeline alignment is underlain by stiff soil and a Site Class "D" (2019 California Building Code[7] (CBC)).

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[4] Jennings, Charles W., and Bryant, William A., 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6.

[5] Saucedo, G.J. and Wagner, D.L., et al, 1992, Geologic map of the Chico quadrangle, California, 1: 250,000: California Division of Mines and Geology, Regional Geologic Map 7A, scale 1: 250,000.

[6] Bryant, W.A., and Hart, E.W., 2007 (Interim Revision), Fault-Rupture Hazard Zones in California: California Department of Conservation, Division of Mines and Geology, Special Publication 42.

[7] California Building Code, 2016, California Code of Regulations, Title 24, Part 2 (Volume 2); published by International Conference of Building Officials and the California Building Standards Commission (CBSC).

Table 6.1 presents the recommended CBC design parameters for the alignment. These values consider a site location near the midpoint of the pipeline alignment. Section 8.2 presents Seismic Design Parameters for each Pump Station site.

Table 6.1: 2019 CBC Seismic Design Parameters (Site Class D)	
S_s – MCE_R ground motion (0.2 second period)	0.478 g
S_1 – MCE_R ground motion (1.0 second period)	0.234 g
F_a – Site Coefficient	1.417
F_v – Site Coefficient	2.132[1]
S_{MS} – Adjusted MCE* Spectral Response Acceleration Parameter	0.678 g
S_{M1} – Adjusted MCE* Spectral Response Acceleration Parameter	0.499 g[1]
S_{DS} – Design Spectral Acceleration Parameter	0.452 g
S_{D1} – Design Spectral Acceleration Parameter	0.333 g[1]
**T_L – Long Period Transition Period	12 sec
PGA	0.206

* Maximum Considered Earthquake
** Figure 22-14, ASCE 7-16
1 – We assume that the seismic response coefficient, Cs, is determined by ASCE 7-16 Eq. (12.8-2) for values of T ≤ 1.5Ts and taken as equal to 1.5 times the value computed in accordance with either ASCE 7-16 Eq. (12.8-3) for TL ≥T > 1.5Ts or Eq. (12.8-4) for T > TL. Contact Blackburn to re-evaluate the above parameters if this assumption is not valid.

If the proposed design does not meet the exception noted above (note 1) a site-specific response analysis will be required for final design.

6.4 Soil Excavatability and Trench Stability

We anticipate that the subsurface materials can be excavated with a medium to large size excavator (such as a CAT 320 or similar).

Open excavations 5 feet or deeper will require sloping and/or shoring in accordance with Section 8.4 of the Yuba County Standard Specifications and Cal OSHA requirements. For planning and preliminary design, generally anticipate sloping/shoring requirements within the soil along the alignment for Type A soil. Shoring/sloping requirements for Type C soil will be required for excavations where perched groundwater/seepage or a sand layer is encountered.

The contractor is responsible for the safety of all temporary excavations and must provide trench sloping and shoring in accordance with current Cal OSHA requirements based on exposed soil and groundwater/seepage conditions. The contractor is also responsible for the protection of existing facilities and improvements. The Contractor should review the borings logs and must retain an engineer to evaluate the impact of construction traffic vibrations, actual soil conditions exposed in the open excavations, seepage and/or groundwater conditions, surcharges adjacent to excavations, proximity of excavations to existing structures, and other factors that may promote excavation wall instability or cause excavation related damage to existing facilities and improvements and adjust excavation sloping/shoring methods accordingly.

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6.5 Trench Dewatering

Groundwater was not encountered in the pipeline borings at anticipated trench depths. We anticipate that groundwater/seepage could be encountered at/near trenchless crossings or perched at shallower depths along the project alignment. Table 5.5 shows the depth of groundwater encountered in our borings. Groundwater levels may be higher during the late fall through late spring months, resulting from higher water levels in creeks and precipitation infiltrating the shallow surficial soil and ponding above the hard clay layers. Similarly, agricultural and landscape irrigation along the project alignment could infiltrate and pond above the hard clay layer.

Sump pumps should be adequate to dewater excavations if groundwater/seepage is encountered. during excavation. The contractor is solely responsible for design and performance of dewatering systems.

We recommend scheduling the project excavations and backfill when adjacent agricultural fields are not flooded to reduce potential groundwater/seepage impacts. Avoid open excavations in or near agricultural fields while the fields are flooded/irrigated.

Dewatering needs may differ near creak crossings. Refer to Section 7.1.3 for dewatering recommendations for trenches near creek crossings.

6.6 Trench Backfill and Compaction

6.6.1 Pipe Bedding and Pipe Zone Material

Support pipe on a minimum of 4-inches of granular bedding and in accordance with the pipe manufacturer's recommendations. Although not anticipated, soft, unsuitable pipe subgrade can occur where shallow perched groundwater conditions or sandy soils are encountered. Notify the project engineer and Blackburn for review and mitigation recommendations if unsuitable subgrade conditions are encountered. Mitigation might include over excavation and replacement of unsuitable subgrade with ¾-inch minus crushed rock (minimum of 6 inches) enclosed in geotextile filtration fabric such as Mirafi 140N (or equivalent). Granular pipe zone material may also be used.

The native soil contains a significant amount of fines (passing #200 sieve) and is not be suitable for bedding or pipe zone backfill (extends a minimum 12 inches above the top of pipe). Yuba County, Department of Public Works, Standard Plans and Specifications specifies the following for bedding and pipe zone backfill material:

1. ¾-inch crushed rock or clean sand compacted to 95% or
2. 2 sack slurry

Use Controlled Low-Strength Material (CLSM) as trench backfill in, or near, agricultural fields to prevent irrigation water from seeping into the pipe bedding and pipe zone backfill.

6.6.2 Trench Backfill

Yuba County Department of Public Works Trench Details show backfill within existing roadways is to be ¾-inch Class 2 AB compacted to 95% relative compaction (based on ASTM D1557) unless recommended by an engineer and approved by the County. Intermediate trench backfill above the pipe zone material

can consist of native excavated soil provided it meets the recommendations in Table 6.2. Fill should be free of debris and concentrations of vegetation.

Table 6.2: Intermediate Trench Backfill Requirements			
Gradation		**Test Procedures**	
Sieve Size	**Percent Passing**	**ASTM**	**Caltrans**
3 inch	100	D6913	202
No. 200	12-85	D6913	202
Organic Content			
Less than 3%		D2974	
Expansion Index			
Less than 20		D4829	

If import fill is required for trench backfill, it should be graded and have material properties as follows:

- 100% passing the 1-inch sieve
- 75% to 100% passing the #4 sieve
- 12% to 70% passing the #200 sieve
- Plasticity Index not greater than 20
- Free of debris and concentrations of vegetation.

Use ¾-inch Class 2 AB in the upper 12-inches of the trench within roadways.

Trench backfill above the Pipe Zone material for trenches not in a roadway, can consist of excavated soil. Fill should be free of debris and concentrations of vegetation.

6.6.3 Trench Backfill Compaction

It is important to achieve compaction of Pipe Bedding and Pipe Zone materials at the pipe haunches and spring line; compaction below the pipe spring line will be difficult for the contractor. Follow the pipe manufacturer's requirements for initial backfill to avoid damage to the pipe. To facilitate compaction in the pipe zone area (top of bedding up to 12 inches above pipe), use a trench width that provides a minimum clearance of 12 inches between the pipe and trench wall. A wider trench might be required to achieve proper compaction depending upon the contractor's equipment and methods. We recommend including test sections to check that the contractor's planned placement and compaction means and methods can achieve the recommended relative compaction. A test section should be performed for each material type used.

Moisture condition trench backfill above the Pipe Zone material to at least the optimum moisture content. Compact pipe backfill:

- To a minimum 92% relative compaction (based on ASTM D1557) below depths of 10 feet.
- To a maximum of 90% relative compaction (based on ASTM D1557) above depths of 10 feet
- In roadways, compact upper 12-inches of AB subgrade to 95% relative compaction (based on ASTM D1557).

To protect the pipe, use a maximum loose lift thickness of 12 inches for the first lift of fill placed above the top of the pipe. Use a maximum loose lift thickness of 8 inches for subsequent lifts. Jetting is not acceptable for compaction.

Test all trench backfill (bedding, pipe zone backfill, trench zone, etc.) at vertical increments of not more than 1 foot and at final grade or pavement subgrade, and at least one test for every 200 linear feet of pipe per vertical foot of backfill (both sides of pipe in pipe zone). Complete at least one compaction curve (Proctor) for each material type, source location (for import), and as changes in materials occur. Material changes include a change in material designation based on the Unified Soil Classification System. Testing frequency can be adjusted based on contractor performance, ease of compaction, and material variability.

Soil excavated during pipe installation can have moisture contents well over optimum, especially during the winter and spring months or if perched water is encountered. It will be necessary to dry back wet soil to within 2% of optimum moisture content prior to use as backfill.

6.6.4 Trench Backfill Settlement

The magnitude of potential trench backfill settlement will largely be dependent on the degree and uniformity of compaction; therefore, it is important that backfill materials and compaction are checked at frequent intervals to limit potential settlement.

6.7 Pavement Design

Trench patches in existing County roads should adhere to Yuba County Department of Public Works Trench Details or match the existing pavement section (asphalt/aggregate base), whichever is greater.

For gravel maintenance roads we recommend a minimum pavement section of 16 inches of Class 2 AB underlain by geotextile filtration fabric such as Mirafi 140N (or equivalent). Scarify the exposed soil to a depth of approximately 8 inches, moisture condition subgrade to within 2% of the optimum moisture content, and recompact the subgrade soil to a minimum 95% relative compaction based on ASTM D1557. Blackburn assumed a Traffic Index of 5 and subgrade R-value of 8 (minimum lab test result) for these recommendations. Notify Blackburn if this assumption is not valid so that we may provide additional recommendations, if necessary.

Aggregate base (AB) should conform to Caltrans Class 2 requirements. Moisture condition and compact AB to a minimum 95% relative compaction. Prior to placing asphalt, the aggregate base should be stable under the weight of a loaded water truck. Mitigate unstable areas as recommended by Blackburn.

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6.8 Flexible Pipe Deflection and Loading

For flexible pipe deflection estimates, we evaluated appropriate modulus of soil reaction (E') values using the USBR, 2019, "Method for Prediction of Flexible Pipe Deflection" publication (USBR Method). We provide our recommended E' values in Table 6.3.

Table 6.3: Pipe Zone Embedment Material Parameters

Soil Type	Minimum Relative Compaction	Modulus of Reaction (E' in psi)
Class 2 Aggregate Base	95	4,000
Bedding Sand	95	4,000
Recompacted On-site Soil	95	1500
Native Soil	NA	1500

Determine the combined E' for pipe design per Section 3.10 of the USBR Method.

The above modulus of soil reaction values should be used only when estimating pipe deflection using the USBR Method. Contact us if specific soil parameters for other flexible pipe deflection analysis methods are needed. The pipe designer should use appropriate Design Factors (F_d) and Time-Lag Factors (T_f) in pipe deflection analysis consistent with the USBR Method.

When using the USBR Method for pipe deflection estimates, the backfill load (dead load) on the pipe should be estimated using the "Prism Method". The prism load is the weight of a column of soil that is the width of the outside pipe diameter for the full backfill height over a 1-inch length of pipe. For backfill dead load calculations, we recommend using a backfill unit weight of 130 pcf.

Calculate live loads on the pipes in accordance with Appendix E of the USBR Method.

6.9 Pipeline Thrust Block Design

Thrust at pipe manifolds/connections will be resisted by the native soils/rock and backfill around these structures. Use an ultimate passive pressure of 350 psf per foot of depth up to a maximum of 3,500 psf. These values assume undisturbed native soil or recompacted native soil backfill outside the pipe trench compacted to a minimum of 90% relative compaction.

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7 DESIGN CONSIDERATIONS – TRENCHLESS PIPELINE CROSSINGS

7.1 Bore And Jack (B&J) Crossings

7.1.1 Soil Conditions

The borings drilled near the trenchless crossings (Table 5.2 and Appendix B) generally encountered hard lean clays to dense clayey sands and gravels in the upper 12 ft. One boring (B-04) at the SR-65 crossing encountered loose clayey sand and medium stiff lean clay in the upper 12 ft. Tables 5.2 and 5.3 summarize the subsurface soil conditions encountered at each boring. Refer to the boring logs in Appendix B2 for additional detail.

7.1.2 Excavation and Shoring Design

Based on the soil conditions and drilling performance, excavation is likely possible with conventional equipment (common earthmoving equipment and large backhoe/excavator). Hard fine-grained soil conditions can create slow excavation conditions.

Open excavations 5 ft. or deeper (e.g., pits) will require sloping and/or shoring in accordance with Cal OSHA requirements. Table 7.1 summarizes the OSHA soil types in the upper 15 ft at each trenchless crossing boring.

Table 7.1: OSHA Soil Types

Boring	Approximate Station	Soil Depth (ft)	OSHA Soil Type
B-04	1003+40	0-8	Type B
		8-15	Type A
B-05	1004+50	0-2	Type C
		2-15	Type A
B-06	1008+50	0-15	Type A
B-07	1009+80	0-12	Type B
		12-15	Type C
B-50	3143+00	0-15	Type A
B-53	3152+10	0-10	Type A
		10-15	Type C
B-58	3185+80	0-15	Type B
B-59	3188+40	0-10	Type A
		10-15	Type C

The contractor is responsible for final excavation and shoring design and construction based on actual excavation conditions encountered during construction. The contractor is also responsible for the protection of existing facilities and improvements. The Contractor should review the borings logs and must retain an engineer to evaluate the impact of construction traffic vibrations, actual soil conditions exposed in the open excavations, seepage and/or groundwater conditions, surcharges adjacent to excavations, proximity of excavations to existing structures, and other factors that may promote excavation wall instability or cause excavation related damage to existing facilities and improvements and adjust excavation sloping/shoring methods accordingly.

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7.1.3 Excavation Dewatering

Section 5.2 and Table 5.6 summarize the groundwater conditions encountered. Groundwater was not observed in the borings within the expected excavation depths for sending and receiving pits. Groundwater was encountered at depths of 19 to 24 feet bgs in the borings near the SR-6 Crossing and the UPRR #1 crossing. Groundwater was not encountered in the borings at the other UPRR crossings.

Sump pumps should be adequate to dewater excavations if groundwater/seepage is encountered. during excavation. The contractor is solely responsible for design and performance of dewatering systems.

We recommend scheduling the project excavations and backfill when adjacent agricultural fields are not flooded to reduce potential groundwater/seepage impacts. Avoid open excavations in or near agricultural fields while the fields are flooded/irrigated.

To facilitate work at the base of the excavation, groundwater should be drawn down at least 3 feet below the planned bottom of excavation. The need for dewatering can be reduced by planning excavations during the lowest anticipated seasonal water levels.

7.1.4 Pit Bottom Support

We anticipate stiff to hard lean clay or dense clayey sands will be exposed at the pit bottoms. We expect pit floors will be stable. Unsuitable pit floors can occur where shallow perched groundwater conditions or sandy soil with low plastic fines are encountered. Notify the project engineer and Blackburn for review and mitigation recommendations if unsuitable subgrade conditions are encountered. Mitigation might include over excavation and replacement of unsuitable subgrade with ¾-inch minus crushed rock (minimum of 6 inches) enclosed in geotextile filtration fabric such as Mirafi 140N (or equivalent). Granular pipe zone material may also be used.

7.1.5 Pit Thrust Wall Design

Use an ultimate (no factor of safety) passive earth pressure of 370 psf, per foot of depth up to a maximum of 4,000 psf for preliminary design of thrust walls. This value should be reduced by an appropriate factor of safety and adjusted if necessary for actual soil conditions exposed.

7.1.6 Pit Backfill

The excavated soil may be used as pit backfill provided it is free of debris and concentrations of vegetation.

If import fill is used, it should be graded and have material properties as follows:

- 100% passing the 1-inch sieve
- 75% to 100% passing the #4 sieve
- Minimum 12% passing the #200 sieve
- Plasticity Index not greater than 20
- Free of debris and concentrations of vegetation.
- Approval from Blackburn prior to placement

Place backfill in maximum 8-inch-thick loose lifts, moisture condition 1% to 2% above optimum, and compact to a minimum of:

- 92% relative compaction (based on ASTM D1557 test procedure) below depths of 10 feet.
- 90% relative compaction (based on ASTM D1557 test procedure) above depths of 10 feet.

7.2 Horizontal Directional Drill (HDD) Crossings

Blackburn provides the recommendations in this section based on the subsurface information contained in this report. It is the responsibility of the contractor to design and select the appropriate equipment, means and methods to construct the crossing. The contractor should review the information in this report and, if necessary, collect additional information they deem necessary to design and construct the crossing.

7.2.1 Dry Creek

Directional drilling installation is geotechnically possible at Dry Creek. However, potential for "frac-out" into the creek and potential for hydraulic fracture under the USACE Dry Creek Levee are concerns for the project. Blackburn's Preliminary Hydraulic Fracture Analysis Report, Hydraulic Fracture Calculations, and a Preliminary Frac-Out Emergency Action Plan are included in Appendix E. The The Directional Drilling Contractor is responsible to prepare a final analysis and plan for construction based on their equipment, and means and methods.

Boring B-21 [south of Dry Creek (approximate Station 2046+50)] encountered medium dense to dense sand to clayey sand from approximate elevation 78 to 48 feet. The sand and clayey sand is underlain by hard lean clay to approximate elevation 44 feet (bottom of boring). Boring B-22[north of Dry Creek (approximate Station 2051+60)] encountered very stiff to hard lean clay, silt, and silt with sand from approximate elevation 85 to 47 feet (bottom of boring). Groundwater will be present at the HDD drilling depths.

Historic borings for the Jasper Lane Bridge Replacement Project indicate the subsurface conditions at the Dry Creek crossing consist of loose to medium dense sand to silty sand from Elevation 90 feet to approximate Elevation 65 or 70 feet, underlain by 20' of stiff to very stiff silty clay, sandy clay, and sandy silt to approximate Elevation 45 or 50 feet over medium dense to dense silty sand and sandy silt which becomes dense to very dense from approximate Elevation 30 feet to approximate Elevation 15 to 20 feet. Appendix B4 includes the Log of Test Borings for the Jasper Lane Bridge Replacement Project.

URS, Inc (URS) completed a *North NULE Geotechnical Data Report* (GDR) for the California Department of Water Resources Non-Urban Levee Evaluation (NULE) Program. Volume 5 of the GDR addresses the Dry Creek Levee from approximately 1 mile east of Jasper Lane, downstream about 3.4 miles, ending near Oakley Lane, west of SR-65. To prepare the GDR, URS and Gregg Drilling and Testing, Inc conducted 28 subsurface explorations on or near the levee, 5 of which (2 borings and 3 CPTs) are 300 to 500 feet from the Jasper Lane Bridge.

7.2.2 Best Slough

Directional drilling installation is geotechnically possible at Best Slough. However, potential for "frac-out" into the slough is a concern for the project. Typical minimum cover for this type of crossing is 15 feet (for competent soils) according to ASCE's manual of practice titled, *Pipeline Design for Installation by Horizontal Directional Drilling, 2nd Edition*.

Boring B-47 [east of Best Slough (approximate Station 3128+20)] encountered hard lean clay, elastic silt, silt, and silt with sand from approximate Elevation 76 to 45 feet, which is underlain by interbedded lenses of hard silts and clays and very dense sands and silty sands (bottom of boring). Boring B-48 west of Best Slough (approximate Station 3129+70) we encountered very stiff to hard lean clay to sandy lean clay and silt from approximate Elevation 81 to 36 (bottom of boring), with a lens of medium dense silty sand to sandy silt at approximate Elevation 46 to 45 feet. Groundwater may be present within drilling depths. At the time of our August 2021 drilling, there was no water in Best Slough. The potential for groundwater being present within drilling depths increases if directional drilling is done while water is in the slough.

8 DESIGN CONSIDERATIONS – PUMP STATIONS

8.1 Geologic Hazards

- Faulting—The potential for surface rupture or creep due to faulting at the site is very low. The Fault Activity Map of California[8] and the Geologic Map of the Sacramento Quadrangle[9] (Figure 5) do not show Historic or Holocene age faults (displacement within the last 11,700 years) within or immediately adjacent to the pipeline alignment. The pipeline alignment does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone[10].
- Ground Shaking—For the Maximum Considered Earthquake, a peak horizontal ground acceleration (PGA) of approximately 0.21 times gravity (g's) could be expected.
- Liquefaction—Our subsurface exploration indicates:
    - Groundwater is relatively deep.
    - The saturated soil below the alignment generally consists of stiff to hard clays and dense to very dense clean sands that are not liquefiable.
    - Isolated discontinuous saturated granular layers may be present between boring locations, however the anticipated settlements at the MCE level shaking are expected to be relatively small (less than 1/2 inch).
    - Therefore, the potential for damaging liquefaction at the site is low.
- Seismically Induced Settlement—During a seismic event, ground shaking can cause densification of granular soil that can result in settlement of the ground surface. Considering the cohesive characteristics of the soil, relatively low PGA, and relative density of the sandy soil encountered in the borings, we consider the potential for more than ½ inch of seismically induced settlement to be very low.
- Landslides and Slope Stability—Due to the relatively low topographic relief and existing slope gradients we do not expect landslides or natural slope failure along the pipeline alignment.

[8] Jennings, Charles W., and Bryant, William A., 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6.
[9] Saucedo, G.J. and Wagner, D.L., et al, 1992, Geologic map of the Chico quadrangle, California, 1: 250,000: California Division of Mines and Geology, Regional Geologic Map 7A, scale 1: 250,000.
[10] Bryant, W.A., and Hart, E.W., 2007 (Interim Revision), Fault-Rupture Hazard Zones in California: California Department of Conservation, Division of Mines and Geology, Special Publication 42.

8.2 Seismic Design

8.2.1 Pump Station 1

Based on the mapped geology and our subsurface exploration, PS-1 is underlain by stiff soil and a Site Class "D" (California Building Code, 2019).

Table 8.1 presents the California Building Code[11] (CBC) design parameters for the site.

Table 8.1: 2019 CBC Seismic Design Parameters (Site Class D)	
S_s – MCE_R ground motion (0.2 second period)	0.474 g
S_1 – MCE_R ground motion (1.0 second period)	0.233 g
F_a – Site Coefficient	1.421
F_v – Site Coefficient	2.134[1]
S_{MS} – Adjusted MCE* Spectral Response Acceleration Parameter	0.673 g
S_{M1} – Adjusted MCE* Spectral Response Acceleration Parameter	0.497 g[1]
S_{DS} – Design Spectral Acceleration Parameter	0.449 g
S_{D1} – Design Spectral Acceleration Parameter	0.331 g[1]
**T_L – Long Period Transition Period	12 sec
PGA	0.203

* Maximum Considered Earthquake
** Figure 22-14, ASCE 7-16
1 – We assume that the seismic response coefficient, Cs, is determined by ASCE 7-16 Eq. (12.8-2) for values of T ≤ 1.5Ts and taken as equal to 1.5 times the value computed in accordance with either ASCE 7-16 Eq. (12.8-3) for TL ≥T > 1.5Ts or Eq. (12.8-4) for T > TL. Contact Blackburn to re-evaluate the above parameters if this assumption is not valid.

If the proposed design does not meet the exception noted above (note 1) a site-specific response analysis will be required for final design.

8.2.2 Pump Station 2

Blackburn provides seismic design recommendations for Pump Station 2 in accordance with both American Water Works Association Standard D100-21, *Welded Carbon Steel Tanks for Water Storage* (AWWA D100-21) and American Society of Civil Engineers Standard 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-16). The design engineer should determine which recommendations are appropriate for design.

[11] California Building Code, 2016, California Code of Regulations, Title 24, Part 2 (Volume 2); published by International Conference of Building Officials and the California Building Standards Commission (CBSC).

8.2.2.1 AWWA D100-21

Table 8.2 presents recommended seismic design parameters for tanks designed in accordance with AWWA D100-21. These inputs were selected based on the subsurface conditions encountered at the tank site.

Table 8.2: AWWA D100-21 Seismic Design Parameters	
Latitude/Longitude	39.023042/-121.400530
Site Class	D
S_s – Acceleration Parameter	0.472
S_1 – Acceleration Parameter	0.232
F_a – Site Coefficient	1.422
F_v – Site Coefficient	1.936
S_{MS} – Adjusted MCE Spectral Response Acceleration Parameter	0.672
S_{M1} – Adjusted MCE Spectral Response Acceleration Parameter	0.449
S_{DS} – Design Spectral Response Acceleration Parameter	0.448
S_{D1} – Design Spectral Response Acceleration Parameter	0.299
T_L – Long Period Transition Period	12

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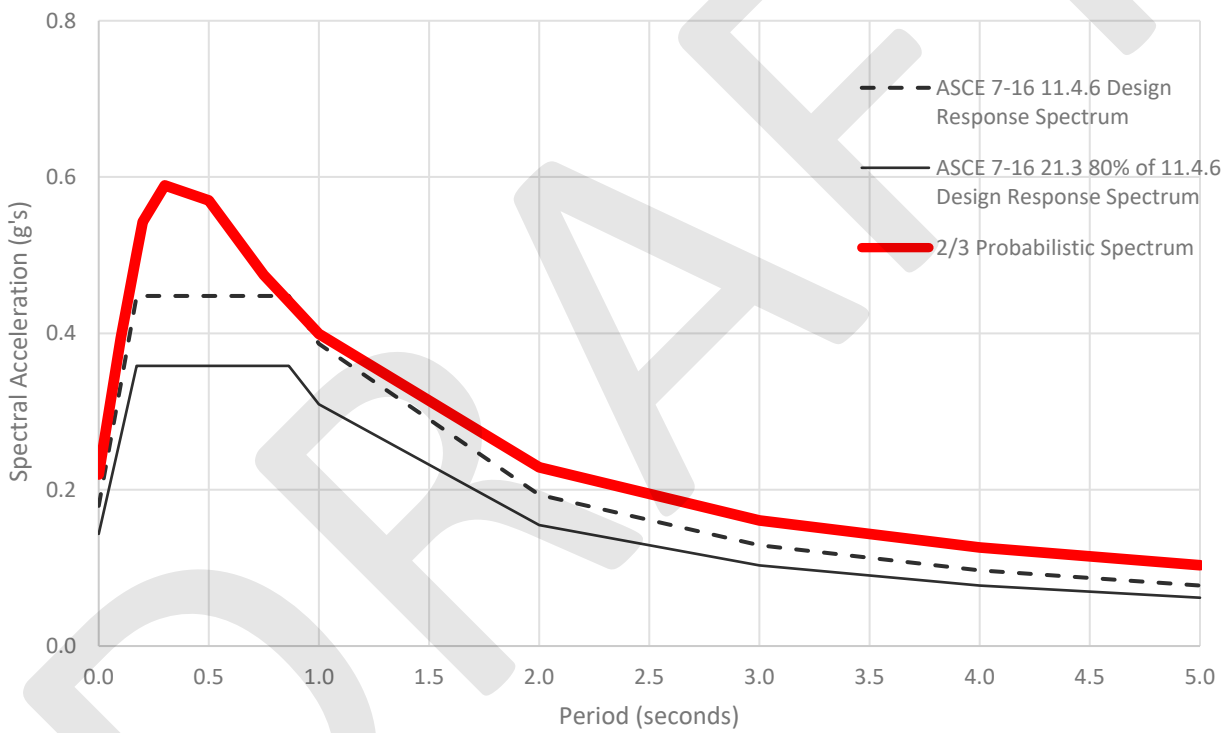
8.2.2.2 ASCE 7-16

Using the information from our subsurface exploration we estimate an average shear wave velocity (V_{S30}) of 800 ft/sec (Site Class "D") for the site. Per ASCE 7-16 a site-specific analysis is required for a site class "D" site unless one of the exceptions noted in ASCE7-16, Section 11.4.8, is used. We understand that for the exception will not be used for improvements at Pump Station 2. Therefore, we performed a site-specific analysis per ASCE 7-16, Chapter 21. We analyzed probabilistic and minimum code values to develop a site-specific spectra for 5% damping. A deterministic analysis is not required because the largest spectral response acceleration of the probabilistic ground motion response calculated in accordance with ASCE 7-16 21.2.1 is less than 1.2 F_a. The recommended spectra are presented in Graph 8.1 and digitized spectral values in Table 8.3. Appendix C4 presents details of our site-specific response analysis.



Graph 8.1: Site-Specific Design Spectra

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Use the S_{MS}, S_{M1}, S_{DS}, and S_{D1} values in Table 8.4. We calculated the values in accordance with ASCE 7-16, Sections 21.4 and 21.5.

Table 8.3: Comparison of Recommended and ASCE 7-16 Section 11.4.6 Spectra

Period	Recommended Design Response Spectrum	ASCE 7-16 11.4.6 Response Spectrum	80% of ASCE 7-16 11.4.6 Response Spectrum
0	0.329	0.179	0.143
0.1	0.591	0.335	0.268
0.173	0.753	0.448	0.358
0.2	0.814	0.448	0.358
0.3	0.884	0.448	0.358
0.5	0.855	0.448	0.358
0.75	0.712	0.448	0.358
0.863	0.661	0.448	0.358
1	0.599	0.387	0.309
2	0.343	0.193	0.155
3	0.241	0.129	0.103
4	0.189	0.097	0.077
5	0.155	0.077	0.062

Table 8.4: Design Spectral Acceleration Values and Peak Ground Acceleration

Parameter	Acceleration Value (g's)
S_{MS}	1.193[1]
S_{M1}	1.163[2]
S_{DS}	0.796[3]
S_{D1}	0.775[4]
PGA_M	0.299[5]

[1]S_{MS} 1.5 times the S_{DS} value in Table 8.4
[2]S_{M1} 1.5 times the S_{D1} value in Table 8.4
[3]S_{DS} 90% of the maximum spectral acceleration from the site-specific spectrum (0.884)
[4]S_{D1} Maximum value of the product of TS_a (time multiplied by spectral acceleration value) for periods of 1 to 5 seconds for sites with V_{S30} of less than 1,200 ft/s
[5]The site-specific MCE_G peak ground acceleration (PGA_M) is the lesser of the probabilistic or deterministic mean peak ground acceleration.

8.2.3 Pump Station 3

Based on the mapped geology and our subsurface exploration, PS-3 is underlain by stiff soil and a Site Class "D" (California Building Code, 2019).

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Table 8.5 presents the California Building Code[12] (CBC) design parameters for the alignment.

Table 8.5: 2019 CBC Seismic Design Parameters (Site Class D)	
S_s – MCE_R ground motion (0.2 second period)	0.487 g
S_1 – MCE_R ground motion (1.0 second period)	0.238 g
F_a – Site Coefficient	1.410
F_v – Site Coefficient	2.124[1]
S_{MS} – Adjusted MCE* Spectral Response Acceleration Parameter	0.687 g
S_{M1} – Adjusted MCE* Spectral Response Acceleration Parameter	0.506 g[1]
S_{DS} – Design Spectral Acceleration Parameter	0.458 g
S_{D1} – Design Spectral Acceleration Parameter	0.337 g[1]
**T_L – Long Period Transition Period	12 sec
PGA	0.209

* Maximum Considered Earthquake
** Figure 22-14, ASCE 7-16
1 – We assume that the seismic response coefficient, Cs, is determined by ASCE 7-16 Eq. (12.8-2) for values of T ≤ 1.5Ts and taken as equal to 1.5 times the value computed in accordance with either ASCE 7-16 Eq. (12.8-3) for TL ≥T > 1.5Ts or Eq. (12.8-4) for T > TL. Contact Blackburn to re-evaluate the above parameters if this assumption is not valid.

If the proposed design does not meet the exception noted above (note 1) a site-specific response analysis will be required for final design.

8.3 General Grading Recommendations

8.3.1 Excavation Conditions

Based on the soil conditions and drilling performance, excavation is likely possible with conventional equipment (common earthmoving equipment and large backhoe/excavator). The hard fine-grained soil conditions can slow excavation.

8.3.2 Site Clearing

Prior to excavation or making any cuts and fills, remove existing foundations, vegetation (root balls and roots), organics, debris, underground utilities, and other underground features in accordance with this Geotechnical Report. Remove loose and disturbed soil caused by the removal(s) and widen the excavation/depression so it is accessible to compaction equipment. Remove strippings from the site or use as landscape soil in designated areas.

[12] California Building Code, 2016, California Code of Regulations, Title 24, Part 2 (Volume 2); published by International Conference of Building Officials and the California Building Standards Commission (CBSC).

8.3.3 Original Ground and Subgrade Preparation

Overexcavate the zone of influence of settlement-sensitive structures to a depth of 3 feet below original grade or to competent material, whichever is deeper. After overexcavation, compact the exposed soil at the bottom of the excavation as follows:

- Scarify the exposed soil to a depth of approximately 8 inches.
- Moisture condition subgrade to within 3% of the optimum moisture content.
- Compact the subgrade soil to a minimum 90% relative compaction based on ASTM D1557.
- Backfill the excavation with General Fill as recommended below.

Blackburn must observe all overexcavations prior to scarification of exposed soil to verify competent bearing materials are exposed.

Where fill is placed on sloping ground, blade back slopes horizontally during placement of embankment fill to create a stepped (or benched) fill surface (such that a uniform, sloping fill surface is avoided). Benching must remove loose surficial soils and result in stepped benches, generally one to two feet in height and depth into the existing slope. The lower bench should be sloped a minimum of 2% into the slope. Where benching will interfere with existing structures, utilities, or vegetation, Blackburn can review modifications on a case-by-case basis.

8.3.4 General Fill Placement and Compaction

General Fill (not structure backfill) may consist of on-site soil. Fill should be free of debris and concentrations of vegetation.

If import fill is required for trench backfill, it should be graded and have material properties as follows:

- 100% passing the 1-inch sieve
- 75% to 100% passing the #4 sieve
- 12% to 70% passing the #200 sieve
- Plasticity Index not greater than 20
- Free of debris and concentrations of vegetation.

Place fill in maximum 8-inch-thick loose lifts, moisture condition 1% to 2% above optimum, and compact to a minimum of 90% relative compaction based on ASTM D1557 test procedure. Compact fill using a sheepsfoot roller.

Construct cut slopes and fill slopes no steeper than 2.5(H):1(V). To achieve adequate compaction on the face of fill slopes, over-build the slopes and then cut back to the design grade. Track-walking is not an adequate method to compact the face of slopes.

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8.4 Dewatering

Dewatering may be required for excavations deeper than approximately 20 feet deep. Significant groundwater inflow may occur at the pump stations, particularly those located near irrigated agricultural fields.

If seepage is encountered in project excavations, we anticipate that sump pumps would be sufficient to dewater the excavations since relatively low permeability clay was predominantly encountered in our borings from the surface to below the planned excavation depths.

At PS-1, we encountered dense sand with clay and gravel approximately 20 to 23 feet below ground surface in boring B-01. Considering the presence sand below groundwater, sumps within the excavation are not likely to provide good drawdown. Well points will likely work better to cut off flow into the excavation and drawdown the water level over a larger area.

To facilitate work at the base of the excavation, groundwater should be drawn down at least 3 feet below the planned bottom of excavation. The need for dewatering can be reduced by planning excavations during the lowest anticipated seasonal water levels (expected during the late summer and fall months.

The above is guideline information only. The contractor is solely responsible for design and performance of dewatering systems.

8.5 Temporary Excavations

Temporary excavations will require sloping and/or shoring in accordance with Cal OSHA requirements. Based on our subsurface exploration and laboratory testing, preliminary excavation and shoring design may generally be based on Type A soil to planned excavation depth that may be sloped at 3/4(H):1(V). Appendix C2 includes boring logs which contain more detailed subgrade information which may be used for preliminary excavation and shoring design.

Where groundwater is present or cohesionless/uncemented granular soils are encountered, Type C soil conditions will apply and a 1.5(H):1(V) slope gradient is required.

The Contractor must review the information in this report; retain an engineer to evaluate the impact of existing structures, traffic vibrations, actual soil conditions exposed in the open trenches, and other factors that may promote trench wall instability; and adjust trench sloping/shoring accordingly. Surcharge loads such as trench spoils, equipment, etc. should not be placed adjacent to an open excavation (within a distance of ½ the height of the excavation). ***The above is guideline information only.*** The contractor is responsible for the safety of all excavations and should provide appropriate excavation sloping and shoring in accordance with current Cal OSHA requirements and observe conditions observed during construction for necessary modification and safety.

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8.6 Foundations

8.6.1 Chemical Tank

PS-1 plans include a 9.75-foot-diameter Chemical Tank. We expect the tank foundation to consist of a 25-foot by 14-foot mat foundation embedded 5 feet below final grade.

- Use an average ultimate bearing pressure for mat foundation of 4,000 psf.
- Use a Modulus of Subgrade Reaction, ks, equal to 55 pci.
- We expect settlement of mat foundations is expected to be less than ½ inch with differential settlement less than ½-inch across the pad.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials.
- For subgrade uniformity, Caltrans Class 2 Aggregate Base (AB) may be used as underlayment. If an aggregate underlayment is used, place a minimum thickness of 6-inches, and compact to a minimum of 95% relative compaction.

8.6.2 Equalization Tanks

PS-2 plans include three 70-foot-diameter Equalization tanks. We expect a perimeter (ring) footing and a compacted baserock interior will be used.

- Embed the footing a minimum 18 inches into the lowest adjacent prepared subgrade.
- Footings must be a minimum 18 inches wide.
- Size footings not to exceed an allowable (factor of safety of 3) bearing capacity of 2,300 pounds per square foot (dead load plus live load). The allowable bearing capacity may be increased by one-third if seismic and/or wind loads are included.
- The tank bottom may be designed using a Modulus of Subgrade Reaction, k_s, of 25 pounds per square inch per inch (pci) where engineered fill is placed as recommended in this report.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials.
- Slope the ground surface away from foundations at a minimum of 2 percent for a distance of at least 5 feet.
- To resist lateral movement, use an ultimate coefficient of friction of 0.4 at the base of the foundation and an ultimate passive earth pressure of 350 psf per foot of embedment depth up to a maximum of 3,000 psf. Ignore the upper one foot of footing depth (below the lowest adjacent soil grade) in determination of the passive pressure. Both frictional resistance and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0.
- Based on underlying soil conditions, we anticipate total settlement to be less than ½ inch and differential settlement less than ½ inch over a length of 70 feet. We anticipate approximately 1/3 of the total settlement will occur during loading of the foundations and 2/3rds will occur when the tank is filled.

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8.6.3 Below-Grade Foundations

8.6.3.1 Bearing Capacity

Pump station PS-1 PS-2 plans include the below-grade structures in Table 8.6.

Table 8.6: Below Grade Structures

Structure	Depth to bottom of structure (ft)	
	PS-1	PS-2
Two Underground storage tanks	28	19
Splitter Box	30	24
Wet well	38	32

The net pressure exerted upon the subsurface by these structures will be similar to or less than the current soil pressure at the bottom of the structures. Excavation for below-grade structures reduces the net pressure by removing soil that acts as a "preload" to the underlying soils, thus "unloading" the bearing materials before "loading" by placement of the structure.

We understand that below grade structures will use mat type foundations for support. For structures at depths greater than 15 feet:

- Use an average ultimate bearing pressure for mat foundation of 3,000 psf.
- Use a Modulus of Subgrade Reaction, k_s, equal to 40 pci.
- We expect settlement of mat foundations is expected to be less than 1 inch with differential settlement less than ½-inch across each underground structure.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials.
- For subgrade uniformity, Caltrans Class 2 aggregate baserock may be used as underlayment. If an aggregate underlayment is used, place a minimum thickness of 6-inches and compact to a minimum of 95% relative compaction (per ASTM D1557 test method).
- Crushed rock underlayment may also be used (and can benefit excavation dewatering). Underlay the crushed rock with a geotextile filter fabric (i.e., Mirafi 140N) and compact the rock with at least 6 passes of a static roller.

If isolated spread footings or piers are required for column support, Blackburn can provide additional recommendations when the planned design and approximate loading is available.

8.6.3.2 Structure Backfill

Native material encountered in our borings primarily consist of fine-grained soils and are <u>not</u> suitable for structure backfill.

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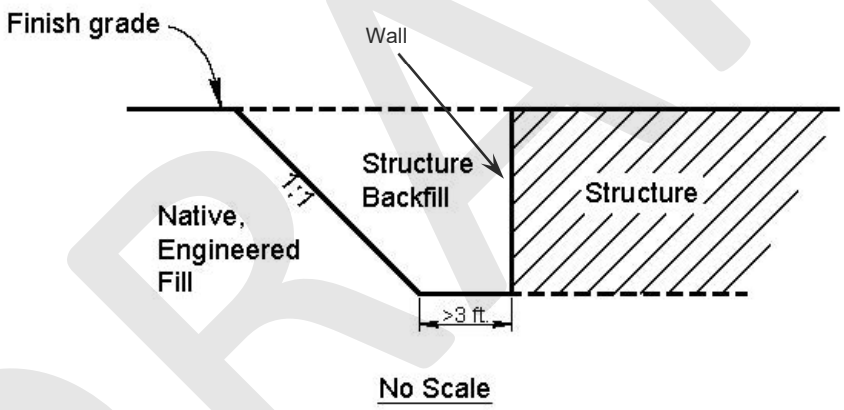
Use the specifications in Table 8.7 for imported structure backfill for all below-grade structures:

Table 8.7: Import Structure Backfill Requirements			
Gradation		**Test Procedures**	
Sieve Size	**Percent Passing**	**ASTM**	**Caltrans**
1 inch	100	D6913	202
¾ inch	70-100	D6913	202
No. 4	50-100	D6913	202
No. 200	12-40	D6913	202
Plasticity			
Plasticity Index	<12	D4318	204

If temporary excavations are shored rather than sloped, provide adequate spacing between shoring and structures to properly compact backfill. If temporary excavations are sloped rather than shored, the zone of placement for structure backfill should extend up from the base of the wall at a slope of 1(H):1(V) and at least 3 feet behind the wall, as shown below.



- Moisture condition structure backfill to within 2% of optimum and place in maximum 8-inch thick, horizontal, loose lifts.
- Compact structure backfill to a minimum 92% relative compaction based on the ASTM D1557 test method. Compact upper 5 ft. of structure backfill to a minimum 95% relative compaction based on the ASTM D1557 test method.

To minimize the residual lateral earth pressures on structure walls, restrict compaction equipment behind the walls (by load and distance from wall) so that wall design values are not exceeded. We recommend compaction within a horizontal distance equal to one-half of the wall height (to a maximum distance of 5 feet), be completed with hand-operated equipment (i.e., jumping jack).

To minimize the potential for significant settlement around deep walls, controlled low strength material (CLSM) can be used to backfill to the surface or to a manageable depth (e.g., 10 feet below grade).

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8.6.3.3 Lateral Earth Pressures

Below grade structures will act as restrained retaining structures. Walls will retain compacted select native soils and/or imported soils meeting the requirement for structure backfill. For evaluation of lateral earth pressures, use the backfill equivalent fluid weights (EFW) for level ground conditions shown below in Table 8.8. We show values for both drained and undrained backfill with level ground conditions; the drained condition assumes groundwater cannot accumulate behind the wall (backfill is drained).

Table 8.8: LATERAL EARTH PRESSURES

Condition	Equivalent Fluid Weight (pcf)	
	Drained	Undrained
At-Rest	60	90
Active	40	85
Passive	420	300
At-rest Seismic*	75	96
Active Seismic*	55	91

*Total passive EFW for passive condition

The above pressures assume structure backfill placed against the structure wall in accordance with our recommendations, a total saturated (undrained condition) unit weight of approximately 135 pounds per cubic foot (pcf), a total unsaturated (drained condition) unit weight of approximately 130 pcf, and a minimum internal angle of friction of 32 degrees. Notify Blackburn if these assumptions are not valid so that we may assess the situation and provide additional recommendations, if necessary. Backfill with CLSM is an acceptable alternative.

For seismic loading, add the Seismic EFW to the at-rest EFW and apply the total force as a uniform load on the wall with a resultant located at 0.5H where H is the backfill height. We estimated the EFWs for seismic loading using the Mononobe-Okabe equation and a horizontal seismic acceleration coefficient, k_h, of approximately ½ the expected PGA (0.21). This k_h value assumes that the walls displace at least 1-inch during the design seismic event.

Surface loads (footings, storage, vehicle traffic) applied near the structure wall will increase the lateral pressure on the wall. A uniform surface load of 240 psf to 300 psf is often used to approximate construction traffic loading on walls. In general, if surface loads are closer to the edge of the retaining wall than three-fourths of the retained height, increase the design wall pressure by 0.5q over the area of the structure wall. In this expression, q is the surface surcharge load in psf. This is a conservative procedure and lower design pressures may be applicable upon evaluation of individual surface loads and setback distances.

Design underground structures within 5 feet of the Chemical Tank foundation to withstand 200 psf surcharge and structures within 10 feet of the Chemical Tank foundation to withstand 100 psf.

8.6.3.4 Buoyancy Resistance

Based on our borings and available data summarized in Section 5.2, we recommend the design groundwater elevations presented in Table 8.9.

Table 8.9: Recommended Groundwater Elevations

Boring	Approximate Groundwater Elevation (ft)
PS-1	60
PS-2	45
PS-3	50

In undrained conditions, structures below these elevations, may be subjected to an uplift load (buoyancy). The uplift force will be resisted by the weight of the structure and the weight of the backfill overlying foundation extensions (if any).

If Nexgen designs foundation extensions to resist buoyancy forces, calculate the resistance against uplift due to the weight of the soil. Use a backfill total unit weight of 130 pcf above groundwater and 67 pcf below groundwater, with a soil wedge extending vertically up from foundation extensions.

8.6.3.5 Lateral Resistance

Lateral resistance for retaining structures can be achieved through friction and passive earth pressures acting on the foundation. For design, use an ultimate coefficient of friction of 0.45 (below or above groundwater) at the base of the concrete footing and an ultimate passive earth pressure of 150 psf per foot of embedment depth. Limit passive earth pressures to a maximum of 3,000 psf (additional passive pressure can be evaluated for specific locations if necessary). Do not include the upper 1-foot of soil in passive resistance calculations. Where passive pressure or friction alone is used against sliding, use a minimum factor of safety of 1.5 for lateral stability (1.1 if seismic loading is included). Where both passive pressure and friction are used to resist sliding, use a minimum factor of safety of 2.0.

8.6.4 Minor Structures

Provided that the recommendations in this report are followed, we anticipate minor structures (such as valve vaults, etc.) may be founded on concrete mat or strip footings, or a compacted granular base (minimum of 6 inches of Class 2 baserock) if appropriate.

- Embed the foundations a minimum of 18 inches below the lowest adjacent prepared subgrade into firm native soil or compacted fill/backfill.
- Footings must be a minimum of 18 inches wide and sized not to exceed an allowable bearing capacity of 2,000 psf. The allowable bearing capacity may be increased by one-third if seismic and/or wind loads are included.
- If additional bearing capacity is required for specific minor structures, we can review and provide recommendations on a case-by-case basis.

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- To resist lateral movement, use an ultimate coefficient of friction of 0.45 at the base of the foundation and an ultimate passive earth pressure of 350 psf (undrained condition) per foot of embedment depth up to a maximum of 3,000 psf. Ignore the upper one-foot of footing depth (below the lowest adjacent soil grade) in determination of the passive pressure. Both frictional resistance and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0.

8.7 Retaining Walls

8.7.1 Pump Station 1

8.7.1.1 Foundations

We recommend the design of continuous shallow foundations consider:

- Embed footings at least 30 inches into properly compacted fill below the lowest adjacent soil grade.
- Footings must be a minimum of 36 inches wide.
- Stepped footings should adhere to Section 1809.3 of the 2019 California Building Code (CBC).
- An allowable bearing capacity (factor of safety of 3) of 2,200 pounds per square foot (psf) (dead plus live load) for footings bearing on properly compacted fill.
- The allowable bearing capacity may be increased by one-third for transient loads when used with alternative basic load combinations in Section 1605.3.2 (2019 California Building Code, (CBC)) that include seismic and/or wind loads.
- We estimate total settlement ≤ 1-inch considering the allowable bearing capacity above.
- To resist lateral movement, use an ultimate coefficient of friction of 0.35 at the base of the foundation and an ultimate passive earth pressure of 160 psf per foot of embedment depth not to exceed 1,000 psf. Both friction and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0. Ignore the passive resistance of the soil within the upper foot of the foundations.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials are exposed.

8.7.1.2 Lateral Earth Pressures

For evaluation of lateral earth pressures, use the backfill equivalent fluid weights (EFW) for level ground conditions shown below in Table 8.10. We show values for both drained and undrained backfill with level ground conditions; the drained condition assumes groundwater cannot accumulate behind the wall (backfill is drained).

Table 8.10: LATERAL EARTH PRESSURES

Condition	Equivalent Fluid Weight (pcf)	
	Drained	Undrained
At-Rest	60	90
Active	40	85
Passive	420	300
At-rest Seismic*	75	96
Active Seismic*	55	91

*Total passive EFW for passive condition

The above pressures assume structure backfill placed against the structure wall in accordance with our recommendations, a total saturated (undrained condition) unit weight of approximately 135 pounds per cubic foot (pcf), a total unsaturated (drained condition) unit weight of approximately 130 pcf, and a minimum internal angle of friction of 32 degrees. Notify Blackburn if these assumptions are not valid so that we may assess the situation and provide additional recommendations, if necessary. Backfill with CLSM is an acceptable alternative.

For seismic loading, add the Seismic EFW to the at-rest EFW and apply the total force as a uniform load on the wall with a resultant located at 0.5H where H is the backfill height. We estimated the EFWs for seismic loading using the Mononobe-Okabe equation and a horizontal seismic acceleration coefficient, k_h, of approximately ½ the expected PGA (0.21). This k_h value assumes that the walls displace at least 1-inch during the design seismic event.

Surface loads (footings, storage, vehicle traffic) applied near the structure wall will increase the lateral pressure on the wall. A uniform surface load of 240 psf to 300 psf is often used to approximate construction traffic loading on walls. In general, if surface loads are closer to the edge of the retaining wall than three-fourths of the retained height, increase the design wall pressure by 0.3q over the area of the retaining wall. In this expression, q is the surface surcharge load in psf.

8.7.1.3 Drainage

Construct a vertical layer of ¾-inch crushed rock, or a geosynthetic drain between the wall and backfill. The layer of crushed rock should be at least 12 inches thick, wrapped in a nonwoven geotextile such as Mirafi 140N or equivalent, and extend from within 2 feet of top of top of wall to the wall foundation. Place a minimum 4-inch-diameter, perforated pipe (with perforations facing down) at the bottom of the crushed rock within the geotextile. Slope the pipe a minimum of 2% to discharge onto a suitable surface or into a storm drain.

The geosynthetic drain should consist of a geocomposite specifically designed for retaining wall drainage and approved by Blackburn prior to installation. The drainage material shall be placed in accordance with manufacturers recommendations.

8.7.2 Pump Station 2

8.7.2.1 Foundations

We recommend the design of continuous shallow foundations consider:

- Embed footings at least 24 inches into properly compacted fill below the lowest adjacent soil grade.
- Footings must be a minimum of 24 inches wide.
- Stepped footings should adhere to Section 1809.3 of the 2019 California Building Code (CBC).
- An allowable bearing capacity of 3,000 pounds per square foot (psf) (dead plus live load) for footings bearing on properly compacted fill.
- The allowable bearing capacity may be increased by one-third for transient loads when used with alternative basic load combinations in Section 1605.3.2 (2019 California Building Code, (CBC)) that include seismic and/or wind loads.
- We estimate total settlement ≤ 1-inch considering the allowable bearing capacity above.

- To resist lateral movement, use an ultimate coefficient of friction of 0.45 at the base of the foundation and an ultimate passive earth pressure of 390 psf per foot of embedment depth not to exceed 3,500 psf. Both friction and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0. Ignore the passive resistance of the soil within the upper foot of the foundations.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials are exposed.

8.7.2.2 Lateral Earth Pressures

Table 8.11 presents the recommended lateral earth pressures for the design of retaining walls provided soil backfill within 3 feet of the wall is non-expansive and level and compacted as recommended in Section 8.6.3.2. For the design of retaining walls with sloping backfill, limit the slope to no steeper than 3H:1V.

Table 8.11: Retaining Wall Lateral Pressures (Equivalent Fluid Weights)

Condition	Static (pcf)	
	Level Backfill	Sloped[1] Backfill
At-Rest	60	80
Active	40	50
For the active pressure condition, the top-of-wall should be free to rotate outward at least 1 percent of the wall height; otherwise, the at-rest pressure condition should be used for "non-yielding" walls.		

1 Applies to slopes no greater than 3H:1V

For static design, apply the resultant of the earth pressure at a depth of 0.33H from the base of the wall where H equals the wall height in feet.

The above pressures assume level backfill or backfill with slopes no greater than 3H:1V, no surcharge loads within 10 feet behind the wall, and backfill drainage as recommended below. For surcharge loads, apply an additional uniform lateral load behind the wall equivalent to 0.3 times the surcharge pressure.

8.7.2.3 Drainage

Construct a vertical layer of ¾-inch crushed rock, or a geosynthetic drain between the wall and backfill. The layer of crushed rock should be at least 12 inches thick, wrapped in a nonwoven geotextile such as Mirafi 140N or equivalent, and extend from within 2 feet of top of top of wall to the wall foundation. Place a minimum 4-inch-diameter, perforated pipe (with perforations facing down) at the bottom of the crushed rock within the geotextile. Slope the pipe a minimum of 2% to discharge onto a suitable surface or into a storm drain.

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The geosynthetic drain should consist of a geocomposite specifically designed for retaining wall drainage and approved by Blackburn prior to installation. The drainage material shall be placed in accordance with manufacturers recommendations.

8.8 Soil Corrosivity

Our sulfate and chloride content tests indicate that Type II or V Portland cement can generally be used for concrete mix design. Our pH and resistivity tests generally indicate that the onsite soils may exhibit corrosive to extremely corrosive conditions for metal pipes. We are not corrosion consultants and cannot evaluate the potential corrosion impacts to metallic elements embedded in, or in contact with, the ground. A corrosion consultant should provide specific corrosion protection recommendations for buried metallic elements used at the site. Table 8.12 presents the soil corrosivity test results from borings at or near the pump station sites. Refer to Appendix A1 for approximate boring locations.

Table 8.12: Soil Corrosivity Test Results

Sample No.	Depth (ft.)	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
B1-1B	2-2.5	6.17	2,060	26.9	4.1
B1-6	25-26.5	6.63	2,950	7.2	2.8
B2 Bulk A	0-5	6.46	1,720	29.5	3.7
B2-2B	5-5.5	6.78	1,260	79.1	9.7
B2-5	20-21.5	6.48	780	74.5	8.3
B3-2B	5.5-6	7.1	750	158.4	81.7
B4-3	10-11.5	6.2	2,650	7.8	1.9
B51-2C	5-5.5	7.13	1,050	27.3	47.4
B52-1B	2-2.5	6.98	1,070	46.7	44.1
B52-3B	10-10.5	7.37	780	54.6	140.4
B59-2B	5-5.5	6.73	1,550	19.8	4.7

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8.9 Hot Mix Asphalt (HMA) Pavement Design

Table 8.15 provides our recommended pavement section alternatives for a range of traffic indexes for pavement constructed on the native subgrade soil compacted to a minimum 95% relative compaction. Recommended design R-values in Table 8.13 are based on an evaluation of the subsurface conditions encountered in the borings and our experience. After cut-and-fill, the contractor should confirm that the subgrade R-Value is no less than the recommended design R-Value.

Table 8.13: Recommended HMA Pavement Sections

Pump Station	Design R-Value	Pavement Section	Traffic Index			
			5	5.5	6	7
PS-1	13	Hot Mix Asphalt, Type A (inches)	2.5	3.0	3.5	4.0
		Class 2 Aggregate Base (inches)	9.5	10.5	11.0	13.5
PS-2	20	Hot Mix Asphalt, Type A (inches)	3.0	3.0	3.5	4.0
		Class 2 Aggregate Base (inches)	7.0	9.0	9.5	12.0
PS-3	8	Hot Mix Asphalt, Type A (inches)	3.0	3.0	3.2	4.0
		Class 2 Aggregate Base (inches)	9.5	11.5	12.0	15.0

Asphalt binder grade must be PG64-10. Aggregate Base (AB) should conform to Caltrans Class 2 requirements. Moisture condition and compact AB to a minimum 95% relative compaction. Prior to placing asphalt, the AB should be stable under the weight of a loaded water truck. Mitigate unstable areas as recommended by Blackburn.

Premature failure of flexible pavement is often caused by water migrating into the aggregate base and subgrade. Construct concrete cut-off curbs where landscaping abuts the pavement to help prevent premature failure due to moisture intrusion. Provide a minimum cut-off curb width of 4 inches. Extend curbs a minimum of 4 inches into the native soil underlying the AB.

9 RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services during design and construction. For this project, retain Blackburn to:

- Review and provide comments on the civil plans and specifications prior to construction.
- Attend a preconstruction meeting with the owner, general contractor, earthwork contractor, underground contractor and other parties associated with the management, oversite and process of demolition and earthwork prior to site clearing, grubbing and demolition of existing structures to review geotechnical recommendations, testing requirements and project schedule.
- Observe removal of underground utilities, foundations, vegetation (root balls and roots) and other underground features in accordance with the project plans, specifications and this Geotechnical Report including loose soil generated from the removal.
- Monitor construction to check and document our report assumptions. At a minimum, Blackburn should monitor grading, overexcavation and recompaction of building pad areas, trench backfill, pavement subgrade and aggregate base compaction, and footing excavations.

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- Update this report as design changes occur, 2 years or more lapse between this report and construction, and/or site conditions have changed.

If we are not retained to perform the above applicable services, we are not responsible for any other party's interpretation of our report, and subsequent addendums, letters, and discussions.

10 LIMITATIONS

Blackburn performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. Where referenced, we used ASTM or Caltrans standards as a general (not strict) *guideline* only. We do not warranty our services.

Blackburn based this report on the current site conditions. We assumed the soil and groundwater conditions encountered in our borings are representative of the subsurface conditions across the site. Actual conditions between these locations could be different.

Blackburn completed a Phase 1 Initial Site Assessment for the project. Refer to Blackburn's report dated January 12, 2022 for our evaluation of on-site hazardous material.

Appendices A2, B2, and C2 present our exploratory boring logs. 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, laboratory test results and general knowledge of the site and geological conditions.

Refer to Appendix F (Important Information about This Geotechnical Engineering Report, Geoprofessional Business Association, 2019) for additional limitations regarding this report.

Modern design and construction is complex, with many regulatory sources/restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.

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GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

DRAFT

FIGURES

Figure 1: Vicinity Map
Figure 2: Overall Project Map
Figure 3: Regional Geologic Map
Figure 4: USDA Soil Map
Figure 5: Regional Fault Map

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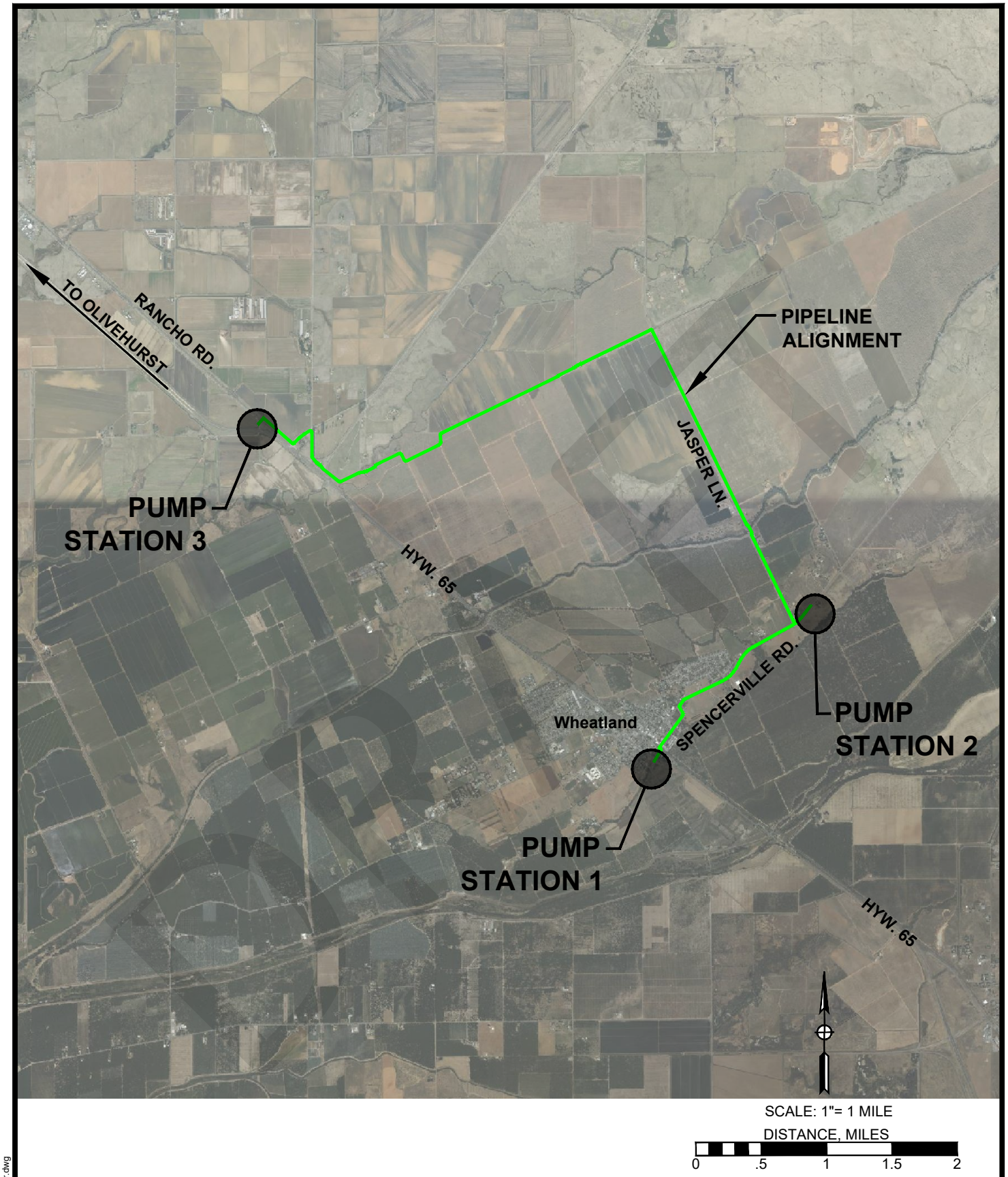

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VICINITY MAP

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x

March 2022

Figure 1

3/31/2022 3934.x Fig1 Wheatland Sewer.dwg

Notes:
1. Refer to Appendix A1 for detailed site plan of sewer pipeline.
2. Refer to Appendix B1 for detailed site plans of trenchless crossings.
3. Refer to Appendix D1 for detailed site plans of pump stations.
4. Historic borings not shown for clarity.

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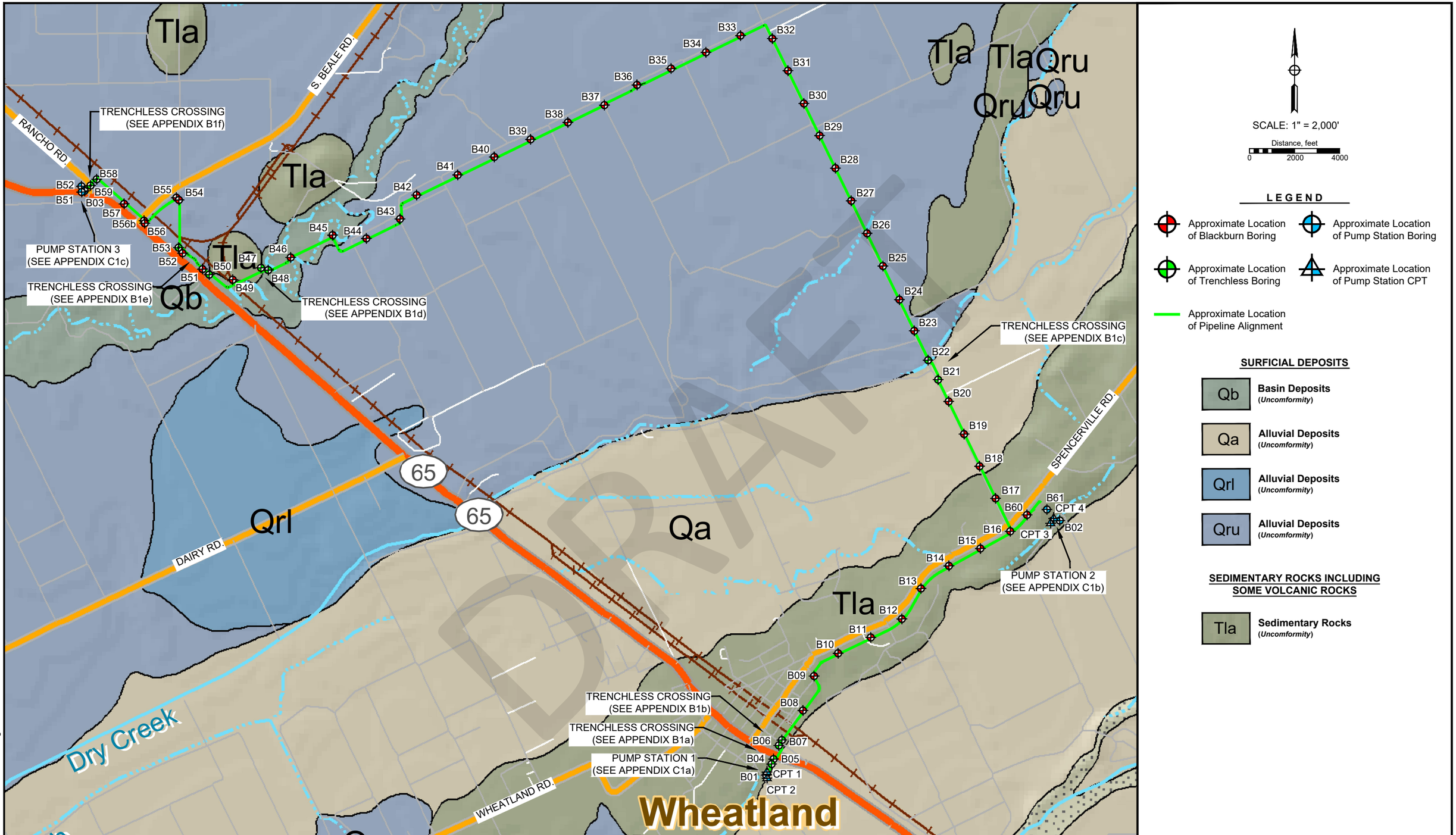
OVERALL SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Figure 2

2/17/2021 3934.x Fig2 Wheatland Sewer.dwg



Source: Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierra Foothills, California, Sheet 2 of 5, by Edward J. Helley and David S. Harwood.

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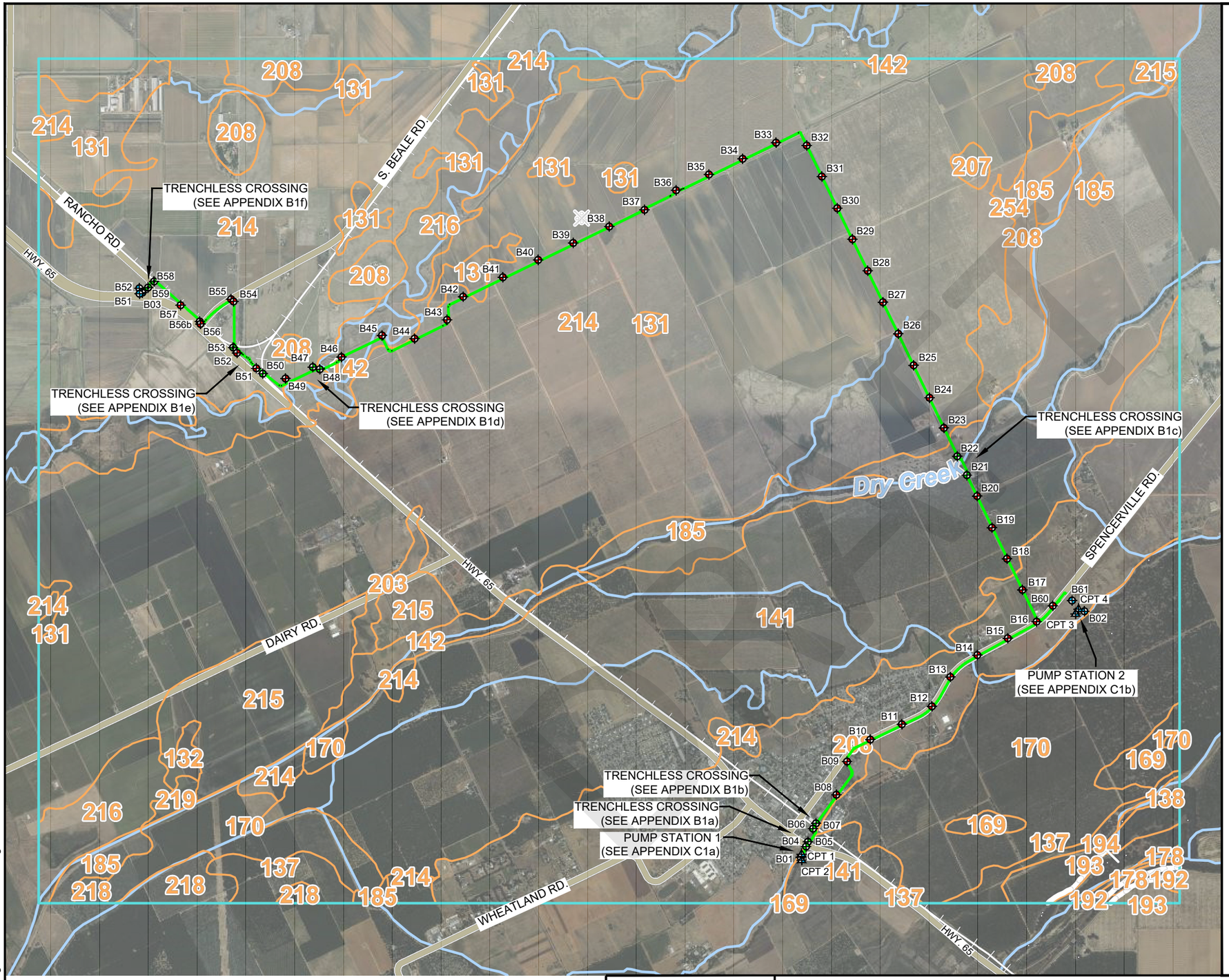
REGIONAL GEOLOGY MAP

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Figure 3

2/17/2021 3934.x Fig3 Wheatland Sewer.dwg



SCALE: 1" = 2,400'

Distance, feet

0 2400 4800

LEGEND

131	Hollenbeck silty clay loam, 0 to 1% slopes	216	San Joaquin loam, 0 to 1% slopes, occasionally flooded
132	Hollenbeck silty clay loam, 0 to 1% slopes, occasionally flooded	218	Shanghai silt loam, 0 to 1% slopes,
137	Columbia fine sandy loam, 0 to 1% slopes,	219	Shanghai silt loam, 0 to 1% slopes, occasionally flooded
138	Columbia fine sandy loam, 0 to 1% slopes, occasionally flooded	254	WATER
141	Conejo loam, 0 to 1% slopes, MLRA 17	178	Riverwash
142	Conejo loam, 0 to 2% slopes, occasionally flooded, MLRA 17	192	Xerofluvents, sandy
169	Horst sandy loam, 0 to 1% slopes,	193	Xerofluvents, occasionally flooded
170	Horst silt loam, 0 to 2% slopes,	194	Xerofluvents, occasionally flooded
185	Kimball loam, 0 to 1% slopes,	198	WATER
203	Perkins loam, 0 to 2% slopes, MLRA 17		Area of Interest (AOI)
207	Redding gravely loam, 0 to 3% slopes, MLRA 17		Soil Map Unit Lines
208	Redding gravely loam, 0 to 8% slopes, MLRA 17		Approximate Location of Pipeline Alignment
214	San Joaquin loam, 0 to 1% slopes,		Approximate Location of Blackburn Boring
215	San Joaquin loam, 0 to 3% slopes,		Approximate Location of Trenchless Boring
			Approximate Location of Pump Station Boring
			Approximate Location of Pump Station CPT

Source: USDA, Natural Resources Conservation Service, Soil Map - Placer County, California, Western Part; and Yuba County, California (Wheatland Sewer Connection) Web Soil Map, page 1 of 4, dated 1-3-2022

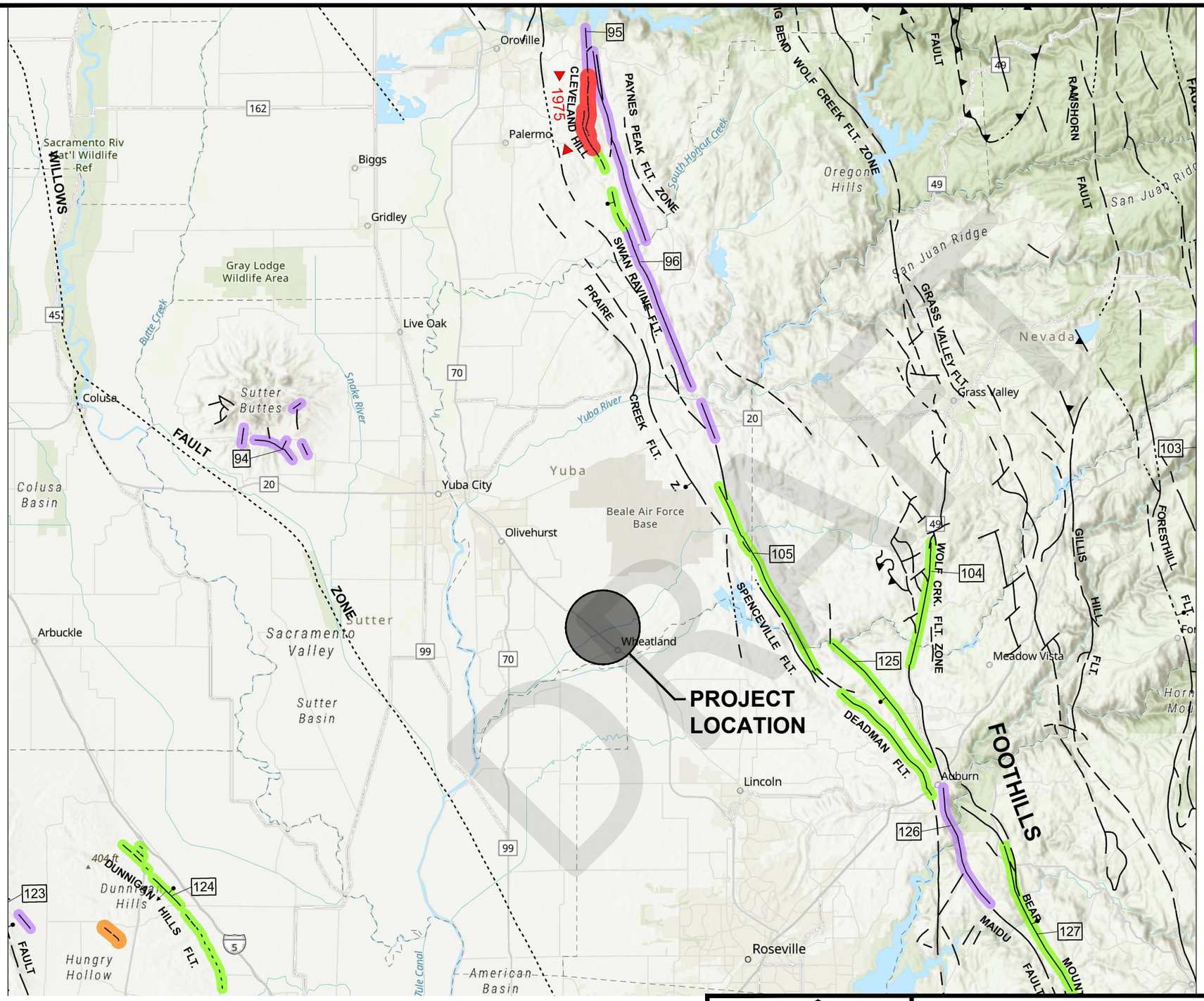
BLACKBURN CONSULTING

USDA SOIL MAP

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Figure 4

2/17/2021 3934.x Fig4 Wheatland Sewer.dwg



SCALE: 1"= 8 Miles

LEGEND

FAULT CLASSIFICATION COLOR CODE
(Indicating Recency or Movement)

Fault along which historic (last 200 years) displacement has occured.

Holocene fault displacement (during past 11,700 years) without historic record.

Late Quaternary fault displacement (during past 700,000 years).

Quaternary fault (age undifferentiated).

Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement.

Thrust fault
Fault, certain
Fault, approx.
Fault, concealed

SYMBOL EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or interred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

Source: California Geologic Survey, Geologic Data Map No. 6, Compilation and Interpretation by: Charles W. Jennings and William A. Bryant, 2015.
http://maps.conservation.ca.gov/cgs/fam/

Distance, Miles
0 4 8 12 16

BLACKBURN CONSULTING

REGIONAL FAULT MAP

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Figure 5

3/31/2022 3934.x Fig5 Wheatland Sewer.dwg

GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

DRAFT

TABLE

Table 1: Laboratory Test Results Summary Table

BLACKBURN CONSULTING

TABLE 1: Blackburn Exploration Laboratory Test Results Summary Table

Wheatland Regional Sewer Connection Project

Boring ID / Sample No.	Sample Depth (feet)	Sampler Type	USCS Classification	Blow Count	Pocket Pen. (tsf)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size Analysis			Shear Strength			R-Value	Corrosivity Tests			
								Liquid Limit	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Fines	Type of Test	Cohesion (psf)	Phi Angle		pH	Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)
B1 / Bulk A	0.0 – 5.0	Bulk	CL														13				
B1 / 1B	2.0 – 2.5	Cal-Mod	CL	22	>4.5													6.17	2,060	4.1	26.9
B1 / 1C	2.5 - 3.0	Cal-Mod	CL			18.7	103.0	36	24	12				UU	3501.6						
B1 / 3C	10.5 – 11.0	Cal-Mod	CL	24	3.0	26.3	96.5	35	23	12			84.6								
B1 / 4	15.0 – 16.5	SPT	CL	6				33	23	10			59.2								
B1 / 5B	20.0 – 20.5	Cal-Mod	CL	48	>4.5	24.9	95.0														
B1 / 5C	20.5 – 21.0	Cal-Mod	GP-GC			6.3	140.4				63.5	27.0	9.5								
B1 / 6	25.0 – 26.5	SPT	ML	33				43	33	10								6.63	2,950	2.8	7.2
B1 / 7B	30.5 – 31.0	Cal-Mod	CL	41	4.25			34	22	12											
B1 / 8	35.0 – 36.5	SPT	CL	27				43	26	17			83.2								
B1 / 9B	40.0 – 40.5	Cal-Mod	CL	50/6”	>4.5	27.9	96.6														
B2 / Bulk A	0.0 – 5.0	Bulk	CL														21	6.46	1,720	3.7	29.5
B2 / 2B	5.0 – 5.5	Cal-Mod	CL	51	>4.5													6.78	1,260	9.7	79.1
B2 / 2C	5.5 – 6.0	Cal-Mod	CL			7	119	35	16	19			70.1	DS	412.2	35.2					
B2 / 3	10.0 – 11.5	SPT	ML	51				43	27	16											
B2 / 4C	15.5 – 16.0	Cal-Mod	CL	96/11.5”	>4.5	20	101.7	43	26	17			92.7								
B2 / 5	20.0 – 21.5	SPT	CL	18														6.48	780	8.3	74.5
B2 / 6C	26.0 – 26.5	Cal-Mod	ML	20	1.75	38.6	81.3	44	28	16			91.4	UU	1688.1						
B2 / 7	30.0 – 31.5	SPT	CL	5				49	27	22											
B3 / Bulk A	0.0 – 5.0	Bulk	CL														8				
B3 / 2B	5.5 – 6.0	Cal-Mod	CL	86/10”		14.3	112.0	29	20	9			66.2	UU	4465.0			7.10	750	81.7	158.4
B3 / 3C	11.0 – 11.5	Cal-Mod	CL	66		19.4	108.5	47	22	25			85.6	UU	4952.1						
B3 / 5C	5.5 – 6.0	Cal-Mod	CL	50/4”	>4.5	16.2	108.9														
B4 / 1	2.0 – 3.0	SPT	CL	8		23.6							66.6								
B4 / 2C	5.5 – 6.0	Cal-Mod	SC	19	4.5	11.7	102.0	31	20	11			40.8								
B4 / 3	10.0 – 11.5	SPT	CL	7				36	22	14								6.20	2,650	1.9	7.8
B4 / 4B	15.0 – 15.5	Cal-Mod	CL	11	1.5			42	26	16											
B4 / 5	20.0 – 21.5	SPT	CL	9				49	24	25			60.8								
B4 / 6C	26.0 – 26.5	Cal-Mod	SC	18	2.0	32.9	90.0	37	22	15			44.8								
B5 / 1C	1.5 – 2.0	Cal-Mod	CL	21		13.9	85.6							UU	1205.9						
B5 / 2B	5.0 – 5.5	Cal-Mod	CL	28	>4.5													6.90	2,600	3.7	11.5
B5 / 2C	5.5 – 6.0	Cal-Mod	CL			13.7	104.4	35	20	15											
B5 / 4B	15.5 – 16.0	Cal-Mod	CL	26														6.37	1,740	10.8	48.4
B5 / 4C	16.0 – 16.5	Cal-Mod	CL			16.5	75.7	39	23	16				UU	2923.4						
B5 / 5C	21.0 – 21.5	Cal-Mod	SC	6		30	89						27.4	DS	47.7	31.7					
B5 / 7C	26.0 – 26.5	Cal-Mod	CL	25		31.4	92.0							UU	1569.2						
B6 / 2C	5.5 – 6.0	Cal-Mod	CL	50/6”	>4.5			31	17	14											
B6 / 3C	10.0 – 10.5	Cal-Mod	GC	50/6”	2.75	7.5	59.9						49.6								
B6 / 4C	16.0 – 16.5	Cal-Mod	CL	35	2.75	40.0	80.9							UU	2688.8						
B6 / 5B	20.5 – 21.0	Cal-Mod	CL	15				43	24	19			75.6					6.39	2,010	8.4	26.6
B6 / 5C	21.0 – 21.5	Cal-Mod	ML			35.7	72.8						56.9								
B6 / 6B	25.3 – 25.8	Cal-Mod	ML	24				33	25	8											
B7 / 1C	2.0 – 2.5	Cal-Mod	CL	11	3.0	15.8	109.6														
B7 / 2B	5.5 – 6.0	Cal-Mod	CL	63	>4.5													6.64	2,680	1.6	6.2
B7 / 2C	6.0 – 6.5	Cal-Mod	CL			7.8	117.0	37	18	19											
B7 / 3B	10.3 – 10.8	Cal-Mod	GC	44	3.5													6.29	4,020	3.2	9.0
B7 / 3C	10.8 – 11.3	Cal-Mod	GC					52	21	31	44.8	38.6	16.6								

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TABLE 1: Blackburn Exploration Laboratory Test Results Summary Table

Wheatland Regional Sewer Connection Project

Boring ID / Sample No.	Sample Depth (feet)	Sampler Type	USCS Classification	Blow Count	Pocket Pen. (tsf)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size Analysis			Shear Strength			R-Value	Corrosivity Tests			
								Liquid Limit	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Fines	Type of Test	Cohesion (psf)	Phi Angle		pH	Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)
B7 / 4C	16.0 – 16.5	Cal-Mod	SM	17	4.0	21.9	98.6						18.4								
B7 / 5C	20.8 – 21.3	Cal-Mod	CL	33	>4.5	26.3	99.6							UU	3792.0						
B7 / 6C	25.5 – 26.0	Cal-Mod	SM	36	>4.5								46.4								
B7 / 7B	30.5 – 31.0	Cal-Mod	CL	29	1.5			44	21	23											
B7 / 7C	31.0 – 31.5	Cal-Mod	SC					45	24	21			47.1								
B8 / 1B	1.0 – 1.5	Cal-Mod	SC	12									37.6								
B8 / 2C	6.0 - 6.5	Cal-Mod	CL	21	3.25	15.6	109.7	39	16	23											
B9 / 2C	5.5 – 6.0	Cal-Mod	SC	65	>4.5	5.9	125.1	35	20	15	38.5	45.4	16.1								
B10 / 2C	5.75 – 6.25	Cal-Mod	SC	27	>4.5	18.5	103.1	43	20	23			28.9	UU	2396.3						
B10 / 3B	10.25 – 10.75	Cal-Mod	SC	32	>4.5	11.9	108.0						14.5								
B11 / 1C	1.5 – 2.0	Cal-Mod	SC	23	>4.5	15.1	120.6	34	17	17			48.1								
B11 / 3B	10.2 – 10.7	Cal-Mod	SC	26		20.9	100.2						20.4								
B12 / 1B	1.3 – 1.8	Cal-Mod	SC	41	>4.5								44.0								
B12 / 1C	1.8 – 2.3	Cal-Mod	SC			10.7	109.9														
B12 / 2C	5.5 – 6.0	Cal-Mod	CL	42	>4.5	5.6	110.7						64.1								
B12 / 3C	10.5 – 11.0	Cal-Mod	ML	50/4”	>4.5			38	32	6			41.4								
B13 / 1C	1.8 – 2.3	Cal-Mod	CL	59	>4.5	25.2	94.9														
B13 / 2C	5.5 – 6.0	Cal-Mod	MH	80/9”	>4.5	39.1	82.1	53	37	16			95.3								
B13 / 3C	9.5 – 10.0	Cal-Mod	ML	50/6”	>4.5			40	35	5											
B14 / 1B	1.0 – 1.5	Cal-Mod	SM	32	>4.5	4.2	116.9						29.2								
B14 / 2B	5.2 – 5.7	Cal-Mod	CL	30	>4.5	14.6	106.1														
B15 / 2C	5.5 – 6.0	Cal-Mod	SC	54		14.5	109.7	57	27	30			23.5								
B16 / 2C	5.5 – 6.0	Cal-Mod	ML	50/6”	>4.5	28.2	90.1							UU	3177.4						
B16 / 3C	10.8 – 11.3	Cal-Mod	SM	74		17.3	99.0	NP	NP	NP			26.2								
B17 / 2C	5.5 – 6.0	Cal-Mod	ML	50/5.5”		20.2	103.3	NP	NP	NP			52.2								
B18 / 2B	5.5 – 6.0	Cal-Mod	CL	30									56.3								
B18 / 3B	10.5 – 11.0	Cal-Mod	SM	21				NP	NP	NP			18.7								
B19 / 1C	2.2 – 2.7	Cal-Mod	CL	20	2.0	20.3	106.6														
B19 / 2C	5.8 – 6.3	Cal-Mod	SC	25	>4.5			30	17	13			40.2								
B19 / 3C	10.3 – 10.8	Cal-Mod	SM	15		14.8	101.6						20.9								
B20 / 2C	5.0 – 5.5	Cal-Mod	CL	15	2.75	17.3	110.4	30	18	12											
B21 / 3C	11.0 – 11.5	Cal-Mod	ML	18	4.5	15.9	105.7	24	21	3											
B21 / 4C	15.5 – 16.0	Cal-Mod	SC	22		8.7	114						21.5	DS	332.6	33.7					
B21 / 5B	20.5 – 21.0	Cal-Mod	SC	28				37	20	17			30.3								
B21 / 6C	25.5 – 26.0	Cal-Mod	SW-SC	45							41.8	52.3	5.9								
B21 / 8C	36.0 – 36.5	Cal-Mod	SC	18				35	20	15			17.8								
B22 / 2C	5.5 – 6.0	Cal-Mod	CL	36	>4.5	10.0	119.5						68.5								
B22 / 3B	10.3 – 10.8	Cal-Mod	CL	74/11.5”	>4.5			30	15	15											
B22 / 4C	16.0 – 16.5	Cal-Mod	ML	79	>4.5	23.7	99.3	40	26	14											
B22 / 6B	25.5 – 26.0	Cal-Mod	CL	36	>4.5			43	25	18											
B22 / 8C	36.0 -36.5	Cal-Mod	ML	28	3.0	32.3	90.3						73.5								
B23 / 1C	2.0 – 2.5	Cal-Mod	SM	50/6”		8.1	116.5				13.4	40.8	45.8								
B24 / 1C	1.5 – 2.0	Cal-Mod	SC	47	>4.5	5.2	108.9						42.9								
B25 / 2C	5.8 – 6.3	Cal-Mod	SC	37	4.5	14.8	116.3	41	15	26			36.8								
B26 / 1C	2.5 – 3.0	Cal-Mod	SC-SM	17	2.0	10.3	112.4	23	16	7			39.1								
B27 / 2C	5.0 – 5.5	Cal-Mod	CL	50/5”	>4.5	13.8	107.5						67.7								
B28 / 1C	2.8 – 3.3	Cal-Mod	CL	41	>4.5	14.3	111.7	39	18	21			57.7								
B29 / 2C	5.5 – 6.0	Cal-Mod	CL	86	>4.5	8.9	128.9	46	21	25	13.6	29.8	56.6								

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Wheatland Regional Sewer Connection Project

Boring ID / Sample No.	Sample Depth (feet)	Sampler Type	USCS Classification	Blow Count	Pocket Pen. (tsf)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size Analysis			Shear Strength			R-Value	Corrosivity Tests			
								Liquid Limit	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Fines	Type of Test	Cohesion (psf)	Phi Angle		pH	Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)
B30 / 2C	6.0 - 6.5	Cal-Mod	CL	72	4.5			31	16	15			56.3								
B30 / 3C	10.8-11.3	Cal-Mod	SC	36									46.3								
B31 / 1C	1.8 -2 .3	Cal-Mod	CH	28	>4.5	13.3	105.4														
B32 / 1C	3.0 – 3.5	Cal-Mod	CL	18									70.2								
B32 / 2B	5.5 – 6.0	Cal-Mod	CL	75/12”	4.5	16.4	112.8							UU	10495.5						
B32 / 2C	6.0 – 6.5	Cal-Mod	CL					35	22	13			75.0								
B33 / 2C	5.0 - 5.5	Cal-Mod	CL	45	>4.5	9.8	117.2						75.7								
B34 / 1B	2.4 – 2.9	Cal-Mod	CL	40	1.5	23.2	97.2														
B34 / 2C	5.5 – 6.0	Cal-Mod	CL	50/6”				31	20	11			69.7								
B35 / 2B	5.0 – 5.5	Cal-Mod	CL	63				31	14	17											
B35 / 3C	9.3 – 9.8	Cal-Mod	ML	42	>4.5	19.4	111.4						66.8								
B36 / 1C	2.5 – 3.0	Cal-Mod	CL	41	>4.5	9.0	107.4						70.5								
B36 / 3B	10.5 – 11.0	Cal-Mod	CL	28				38	19	19											
B37 / 1C	2.0 – 2.5	Cal-Mod	CL	11	2.5	13.0	103.3														
B37 / 2C	5.0 – 5.5	Cal-Mod	SM	50/4”									34.6								
B38 / 2C	5.5 – 6.0	Cal-Mod	CL	48	3.0	22.6	104.8	32	20	12											
B38 / 3C	10.7 – 11.2	Cal-Mod	CL	53	>4.5								56.8								
B39 / 1C	1.5 – 2.0	Cal-Mod	CL-ML	11	2.5	10.6	101.7	22	15	7			64.5								
B40 / 2C	5.0 – 5.5	Cal-Mod	SC	50/6”	>4.5			26	16	10			27.8								
B41 / 3C	11.0 – 11.5	Cal-Mod	CL	62	>4.5								83.5								
B42 / 1C	1.5 – 2.0	Cal-Mod	CL	22	>4.5	9.9	98.7	36	16	20											
B42 / 3B	10.5 – 11.0	Cal-Mod	SC	49	>4.5								16.5								
B43 / 1C	1.5 – 2.0	Cal-Mod	CL	14	>4.5								75.2								
B44 / 3B	10.5 – 11.0	Cal-Mod	SC	49	4.5			35	15	20			17.6								
B45 / 2B	5.0 – 5.5	Cal-Mod	CL	15	1.75	20.7	101.5	32	17	15			74.6	UU	1076.6						
B45 / 3B	10.0 – 10.5	Cal-Mod	SC	27	3.0			39	15	24			46.7								
B46 / 3C	11.0 – 11.5	Cal-Mod	CL	6	<0.25	21.9	108.7	30	15	15			59.8								
B47 / 3C	10.3 – 10.8	Cal-Mod	CL	50/6”	>4.5	15.8	116.2	29	18	11											
B47 / 5C	20.0 – 20.5	Cal-Mod	MH	50/4”	>4.5			56	36	20			95.7								
B47 / 6C	25.7 – 26.2	Cal-Mod	ML	94/8”	>4.5								93.2								
B47 / 9A	40.0 – 40.5	Cal-Mod	SP	57		33.4	88.6														
B48 / 3C	11.0 – 11.5	Cal-Mod	ML	89	>4.5			NP	NP	NP			85.5								
B48 / 4C	16.0 – 16.5	Cal-Mod	ML	77/11.5”	>4.5	29.8	89.2							UU	4079.0						
B48 / 6C	26.0 – 26.5	Cal-Mod	ML	74/11”	>4.5	39.2	81.5						91.5								
B48 / 7C	30.5 – 31.0	Cal-Mod	CL	50/5.5”	>4.5	33.7	86.2														
B48 /8A	35.0 – 35.5	Cal-Mod	SM		1.15	36.6	84.7						27.2								
B49 / Bulk A	0.0 – 5.0	Bulk	CL														8				
B49 / 2C	5.5 – 6.0	Cal-Mod	SM	71/11”				37	30	7			42.9								
B49 / 3B	10.5 – 11.0	Cal-Mod	SM	50/3”									26.4								
B50 / 2C	5.5 – 6.0	Cal-Mod	CL	50/6”	>4.5	14.7	100.1	39	23	16											
B50 / 3C	11.0 – 11.5	Cal-Mod	CL	82/12”	>4.5	19.0	112.8							UU	3874.3			7.08	4,820	78.5	3.7
B50 / 4C	15.5 – 16.0	Cal-Mod	ML	50/5”	>4.5	24.9	91.1	40	31	9			61.8								
B50 / 5C	21.0 – 21.5	Cal-Mod	SC	78/10”	>4.5			38	23	15			21.6								
B51 / 2C	5.2 – 5.7	Cal-Mod	CL	90/11.5”	>4.5	17.5	113.0	34	24	10			61.7					7.13	1,050	47.4	27.3
B52 / 1B	2.5 – 3.0	Cal-Mod	CL	31	>4.5													6.98	1,070	44.1	46.7
B52 / 1C	3.0 – 3.5	Cal-Mod	CL										88.4								
B52 / 3B	10.5 – 11.0	Cal-Mod	CL	66	>4.5													7.37	780	140.4	54.9
B53 / 2B	5.0 – 5.5	Cal-Mod	CL	50/5”	>4.5													6.01	1,020	51.8	27.0

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Boring ID / Sample No.	Sample Depth (feet)	Sampler Type	USCS Classification	Blow Count	Pocket Pen. (tsf)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits			Particle Size Analysis			Shear Strength			R-Value	Corrosivity Tests			
								Liquid Limit	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Fines	Type of Test	Cohesion (psf)	Phi Angle		pH	Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)
B53 / 3C	10.7 – 11.2	Cal-Mod	SC-SM	56		5.5	107.7	23	18	5			19.3								
B53 / 4A	15.0 – 15.5	Cal-Mod	CL															6.54	3,480	11.1	5.6
B53 / 4B	15.5 – 16.0	Cal-Mod	SC	55		17.5	110.1				0.9	81.5	17.6								
B53 / 4C	16.0 – 16.5	Cal-Mod				14	119							DS	92.3	42.2					
B53 / 5C	20.5 – 21.0	Cal-Mod	ML	88/11”	>4.5			49	28	21											
B54 / 2B	5.5 – 6.0	Cal-Mod	CL	33	3.5	16.1	106.7														
B54 / 3B	10.3 – 10.8	Cal-Mod	CL	48	4.5													6.64	1,450	8.7	31.0
B54 / 3C	10.8 – 11.3	Cal-Mod	SC			9.8	115.5							UU	3707.7						
B54 / 4C	16.0 – 16.5	Cal-Mod	CL	86/11”	>4.5	15.4	112.6	30	17	13											
B55 / 2C	5.5 – 6.0	Cal-Mod	CL	9	1.0	17.4	112.5	48	16	32											
B55 / 3B	10.0 – 10.5	Cal-Mod	SC	48	>4.5	14.3	116.0	36	17	19			41.0								
B55 / 4C	16.0 – 16.5	Cal-Mod	SM	52		16	114						29.5	DS	0	39.9					
B56 / 1B	2.0 – 2.5	Cal-Mod	CL	11	1.25	20.4	100.0	29	17	12			70.6								
B56 / 3C	10.5 – 11.0	Cal-Mod	SC	24	2.75	14.5	113.1	33	16	17			26.4								
B57 / 1C	2.0 – 2.5	Cal-Mod	CL	8	1.5	23.0	104.0	31	16	15			76.0								
B57 / 3B	10.2 – 10.7	Cal-Mod	SC	60									32.7								
B58 / 2C	6.0 – 6.5	Cal-Mod	SC	42	>4.5	16.0	110.3						40.2								
B58 / 3B	10.5 – 11.0	Cal-Mod	SC	44														6.54	2,680	21.8	6.0
B58 / 4B	15.25 – 15.75	Cal-Mod	CL	87/9”														6.81	1,500	22.5	8.5
B58 / 5C	20.8 – 21.3	Cal-Mod	CL	93/9”	>4.5	15.9	112.6	34	19	15				UU	6499.9						
B58 / 6C	25.3 – 25.8	Cal-Mod	CL	50/4”	>4.5	22.2	101.6														
B58 / 8C	36.0 – 36.5	Cal-Mod	ML	83/11.5”	4.5								56.7								
B59 / 2B	5.5 – 6.0	Cal-Mod	CL	43														6.73	1,550	4.7	19.8
B59 / 2C	6.0 – 6.5	Cal-Mod	CL	43	>4.5	18.9	110.0	30	16	14											
B59 / 3C	11.0 – 11.5	Cal-Mod	SC	46	3.75	10.9	109.1	28	14	14			12.8								
B59 / 6C	25.2 – 25.7	Cal-Mod	ML	50/6”	>4.5	23.4	101.0						60.6								
B60 / 1	1.0 – 2.5	SPT	CL	17				34	19	15											
B60 / 2C	5.5 – 6.0	Cal-Mod	CL	29	>4.5	12.6	112.6	30	15	15			69.5	UU	1318.0						
B60 / 3	10.0 – 11.0	SPT	CL	50/5”									63.1								
B60 / 4B	15.0 – 15.5	Cal-Mod	CL	50/3”		7.6	87.8	26	14	12			55.8								
B61 / 1C	2.5 – 3.0	Cal-Mod	SM	50/5”	>4.5	15	97	39	31	8			26.7	DS	240.3	43.7					
B61 / 2	5.0 – 6.5	SPT	SM	34				34	25	9			38.3								

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GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

APPENDIX A: Sewer Pipelines

A1: Pipeline Site Plans

A2: Boring Log Legend

Boring Logs

A3: Laboratory Test Results

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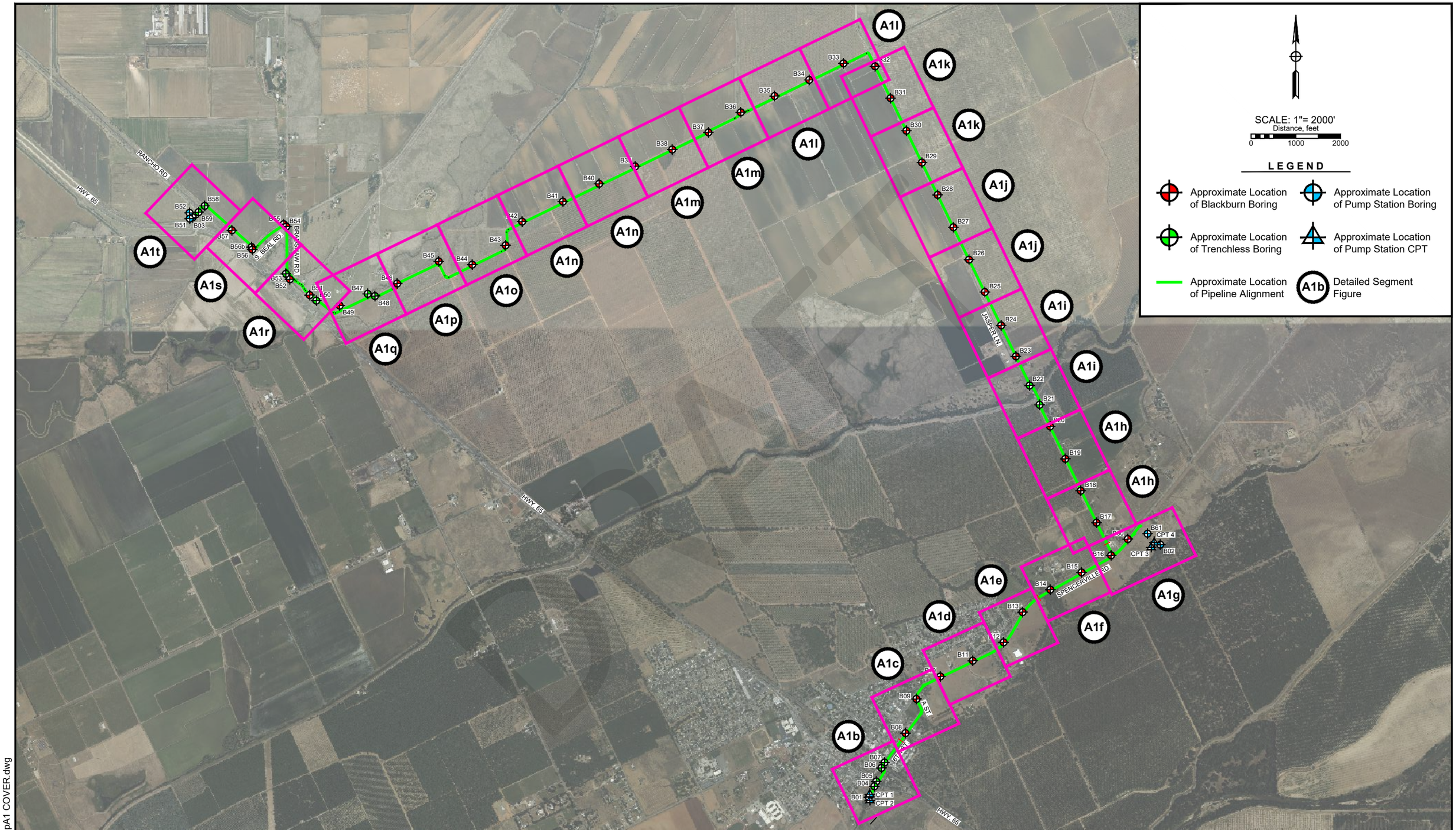
A1: Pipeline Site Plans

DRAFT



2/17/2021 3934.x AppA1 COVER.dwg

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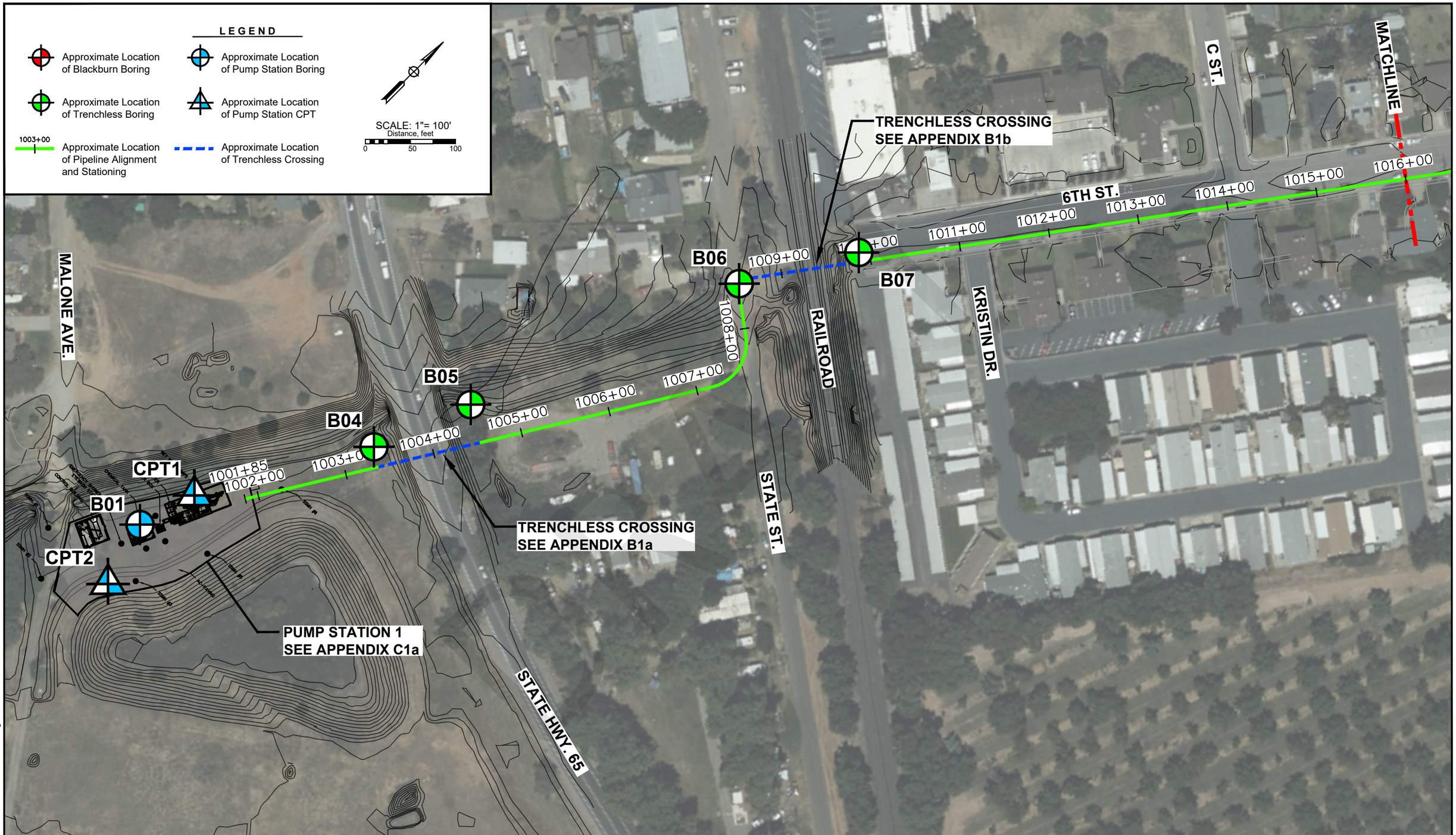
OVERALL PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1a



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PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1b

2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1c

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PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x

March 2022

Appendix A1d

2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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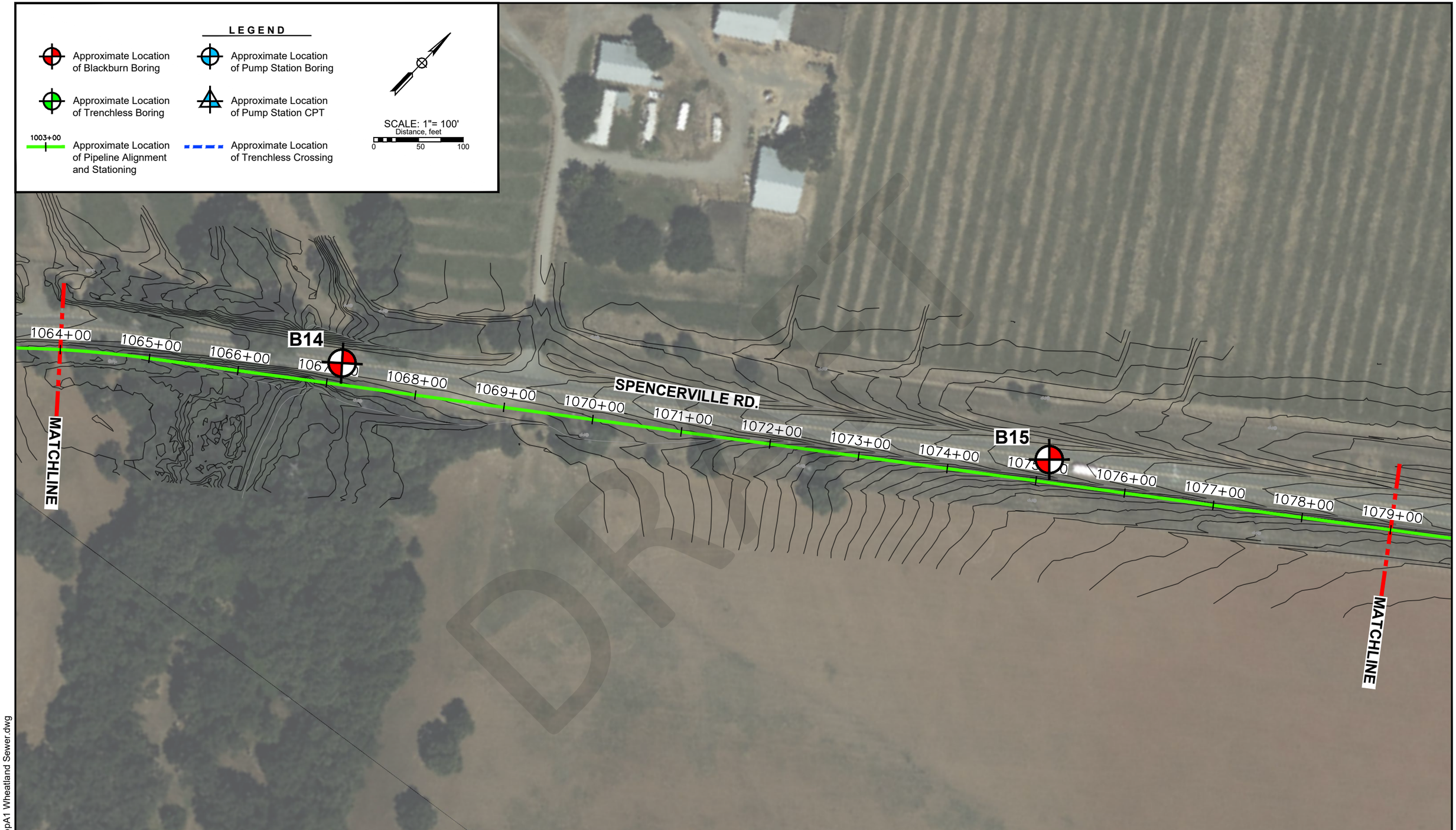
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1e



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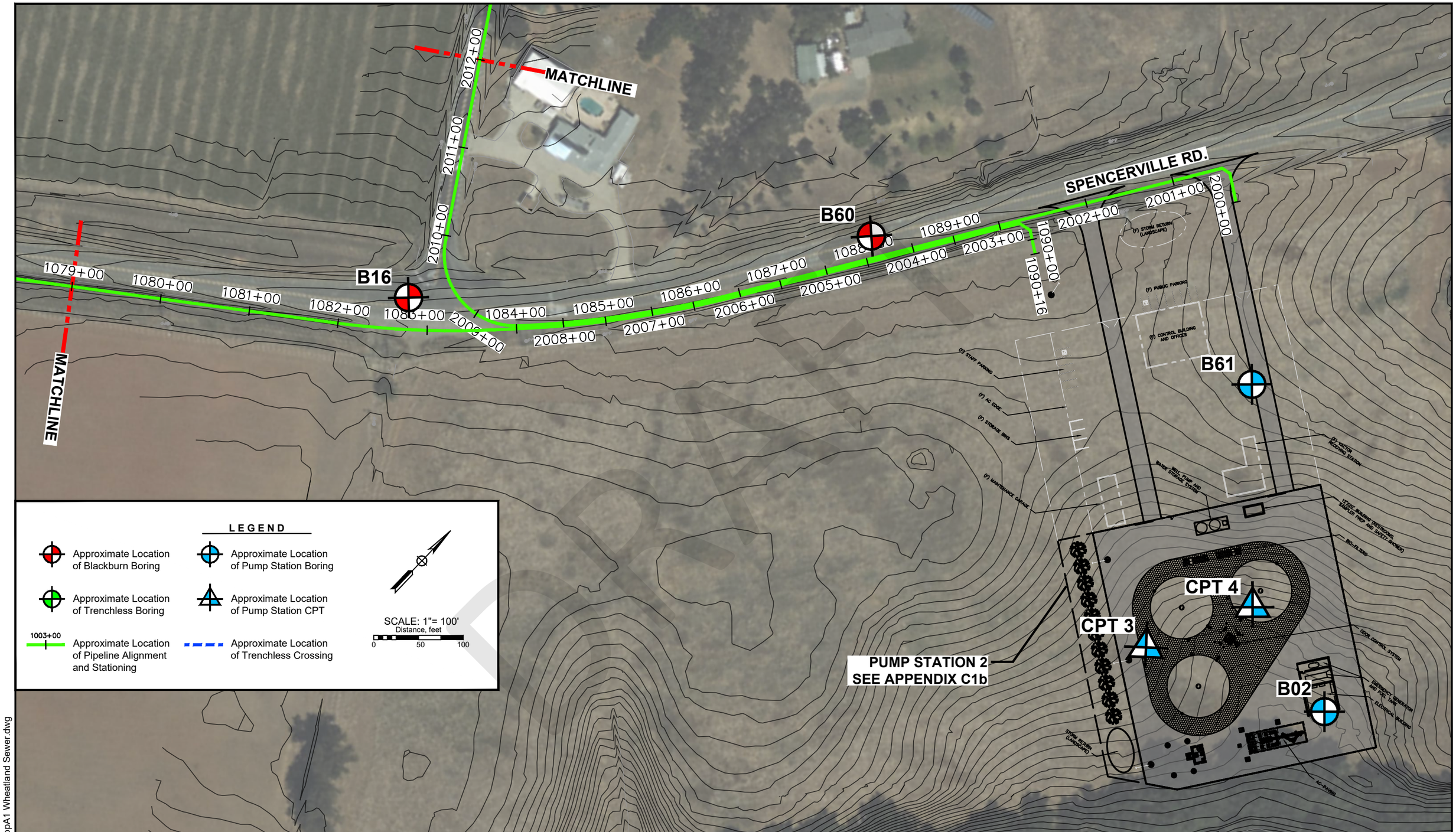
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1f



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PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1g

2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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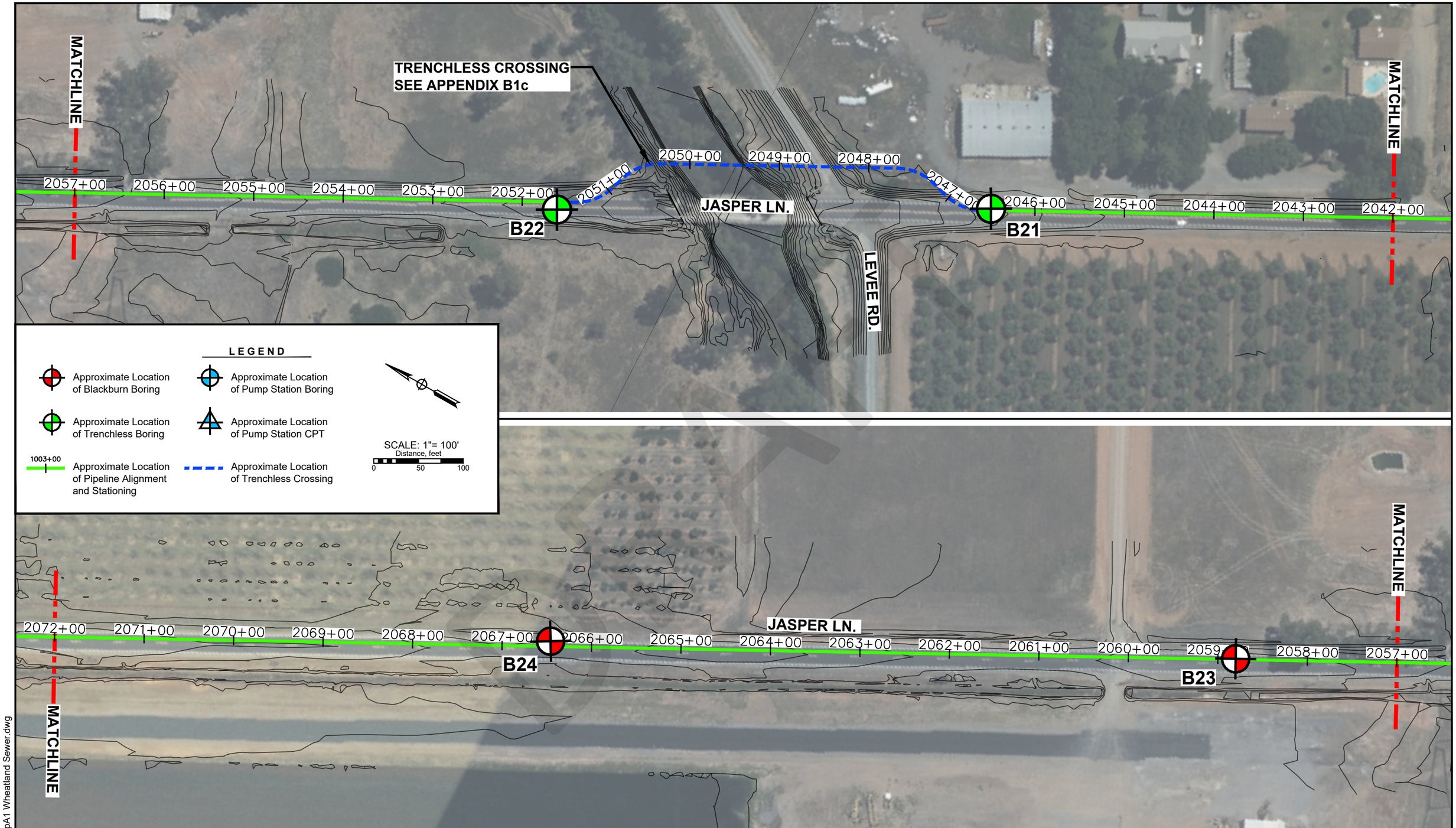
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1h



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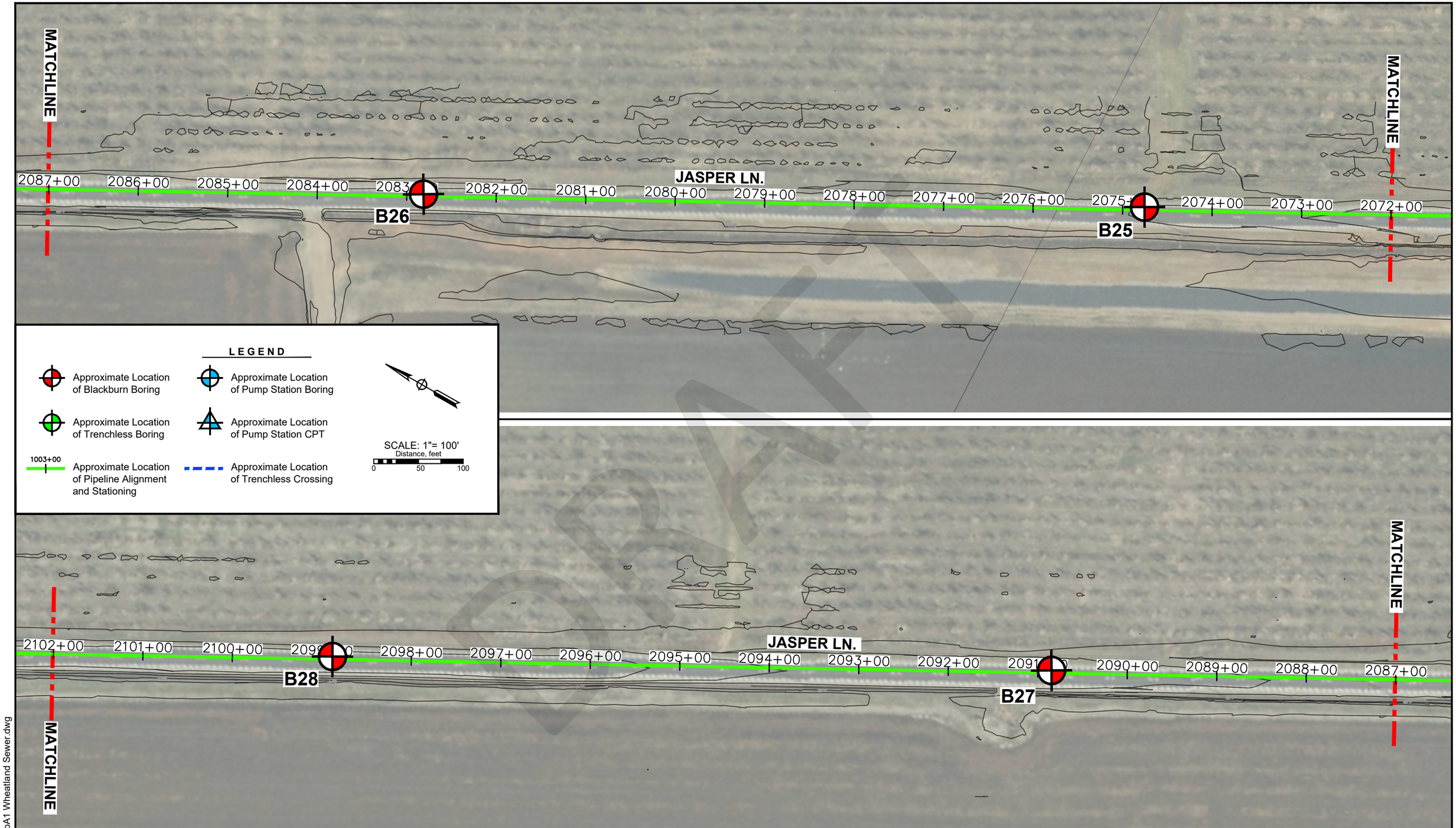
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1i

2/17/2021 3934.x AppA1 Wheatland Sewer.dwg



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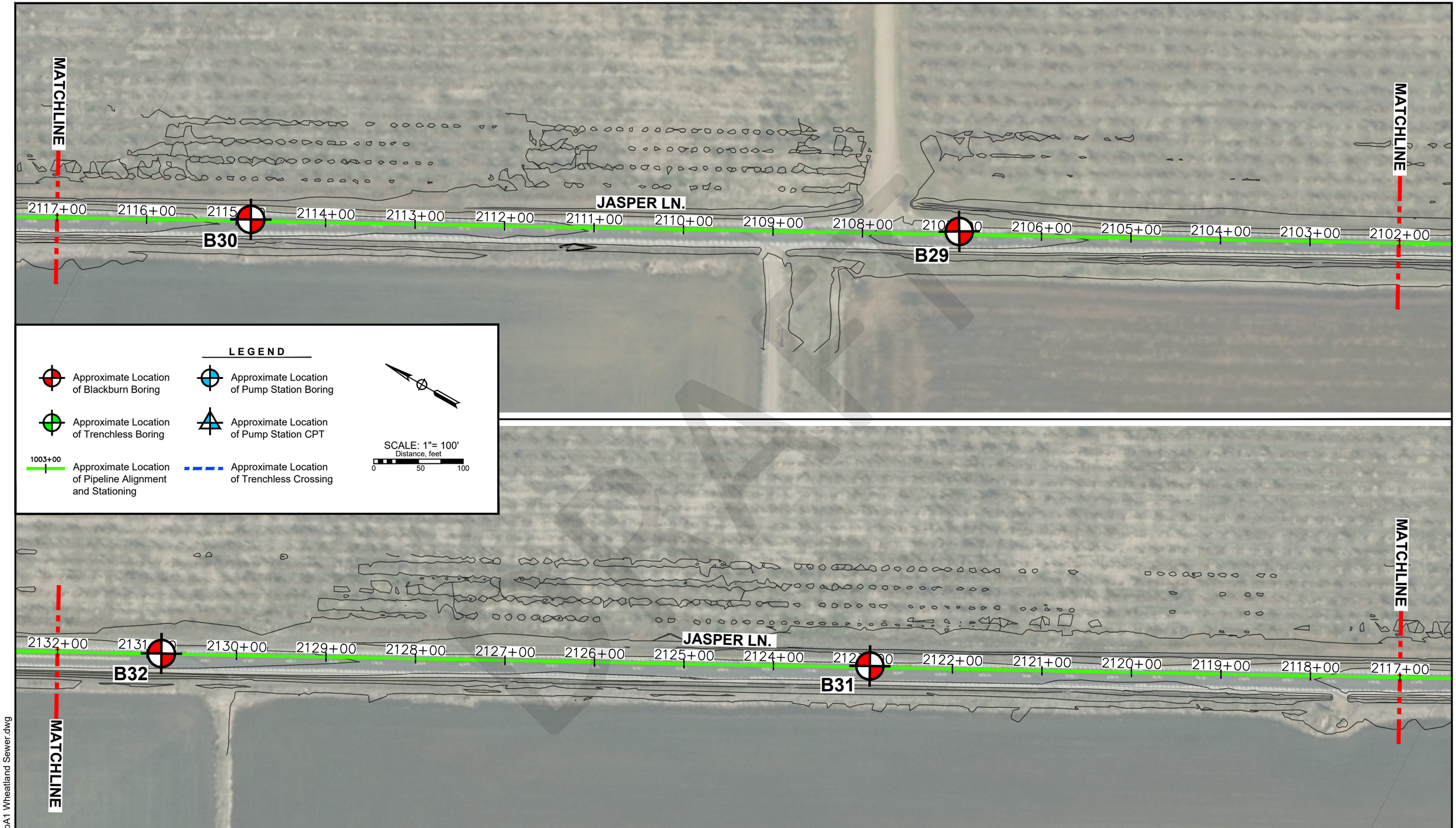
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1j

2/17/2021 3934.x AppA1 Wheatland Sewer.dwg



2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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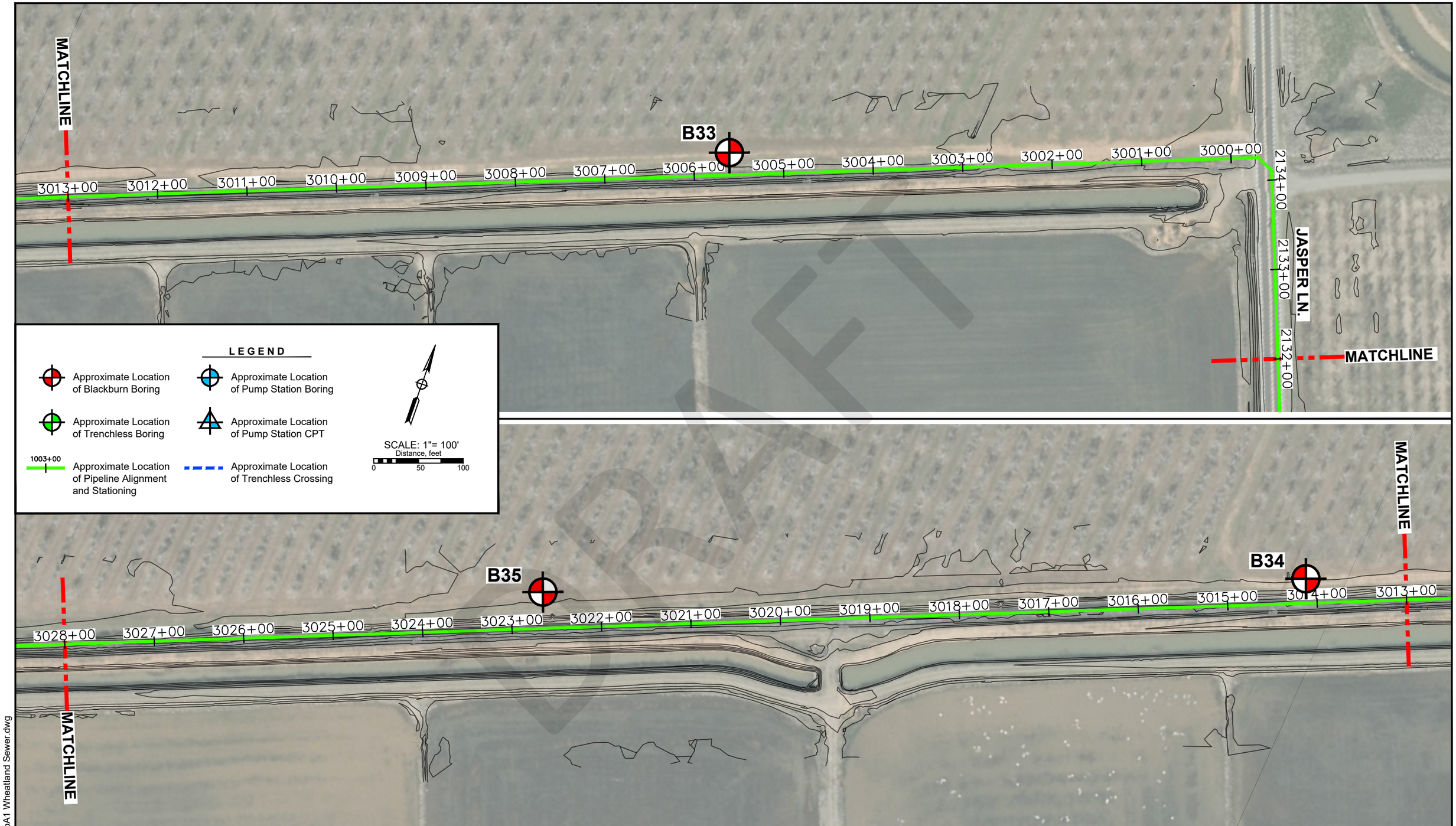
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1k



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2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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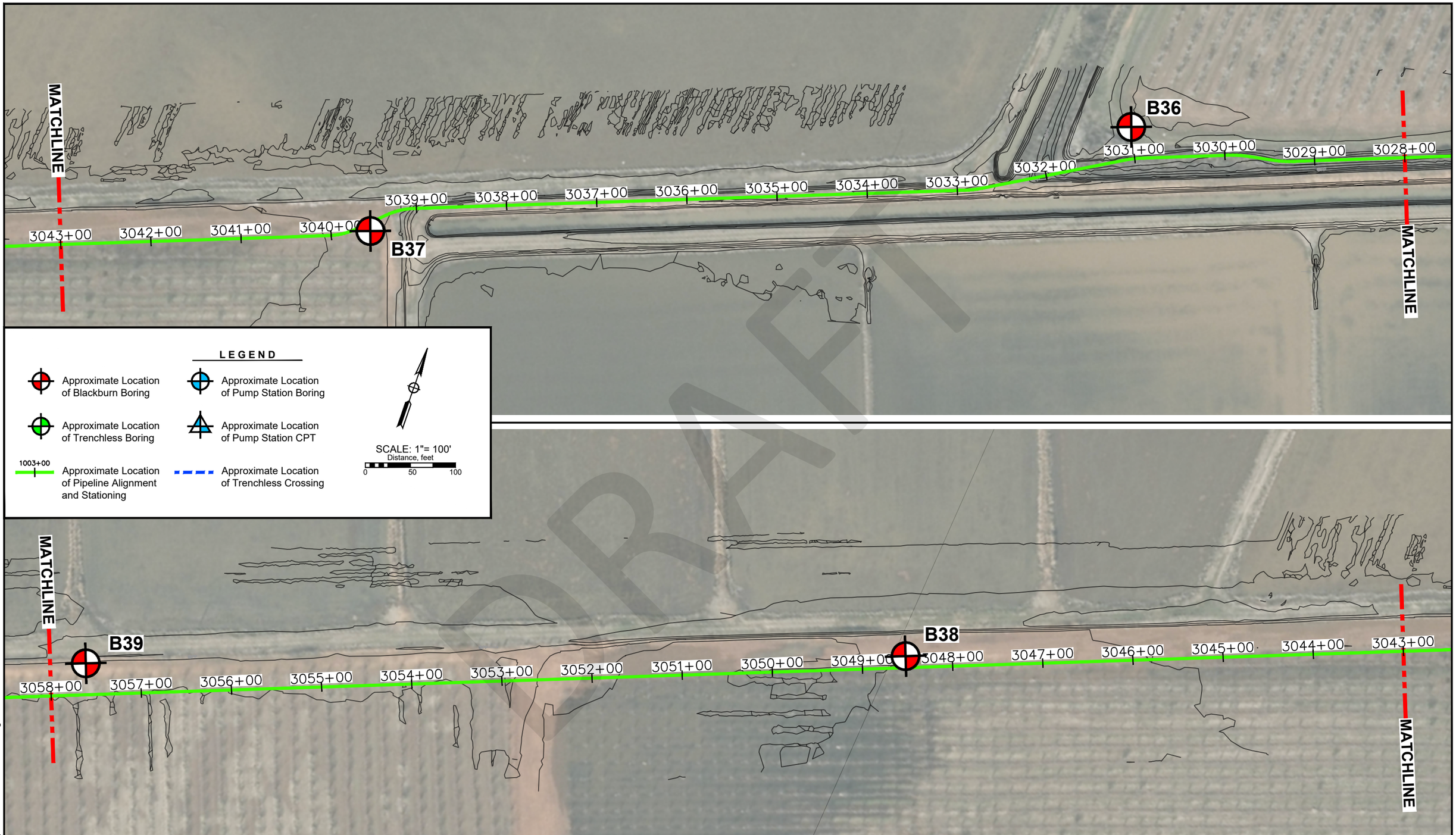
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1I



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2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1m

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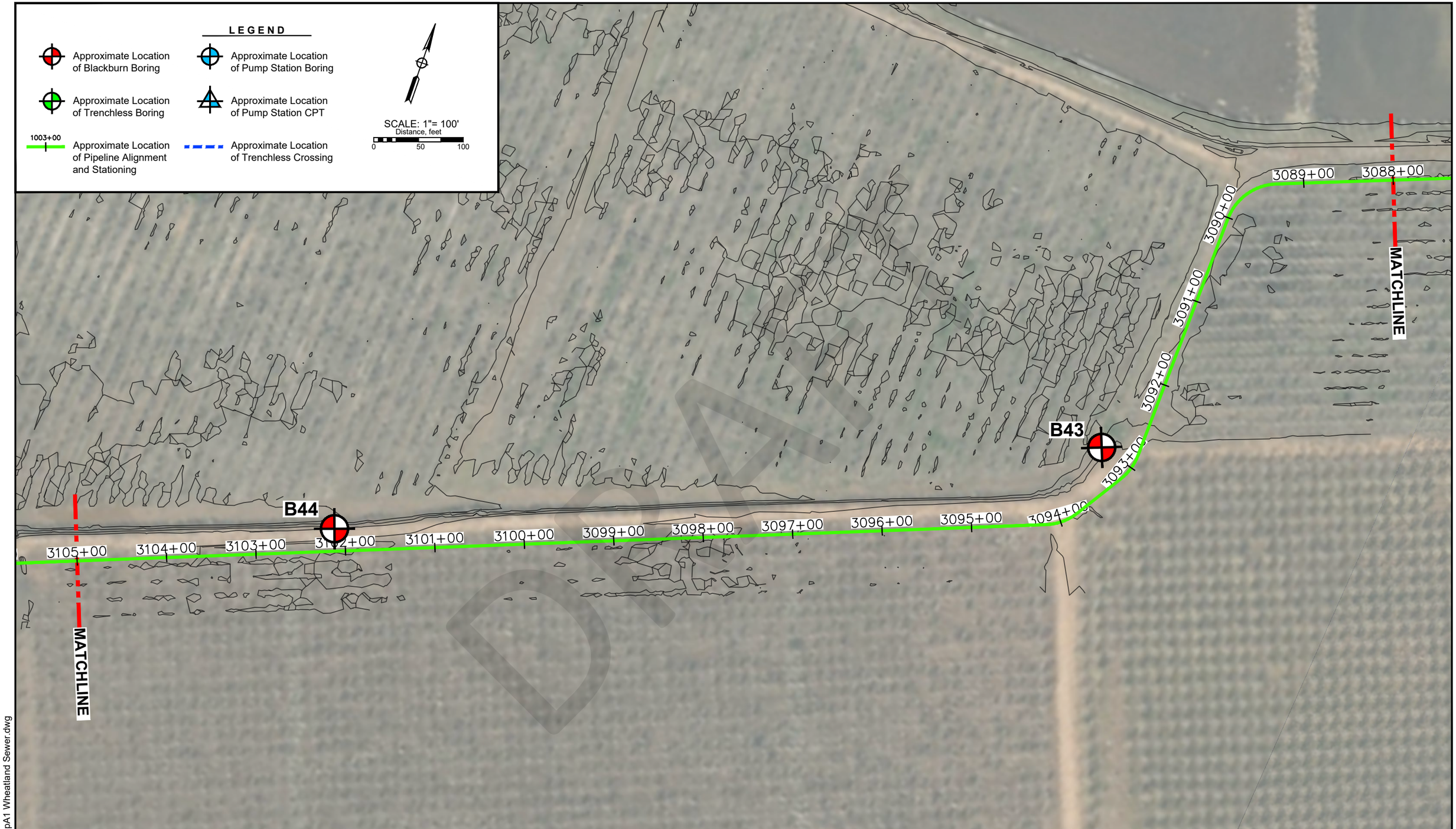
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1n

2/17/2021 3934.x AppA1 Wheatland Sewer.dwg



2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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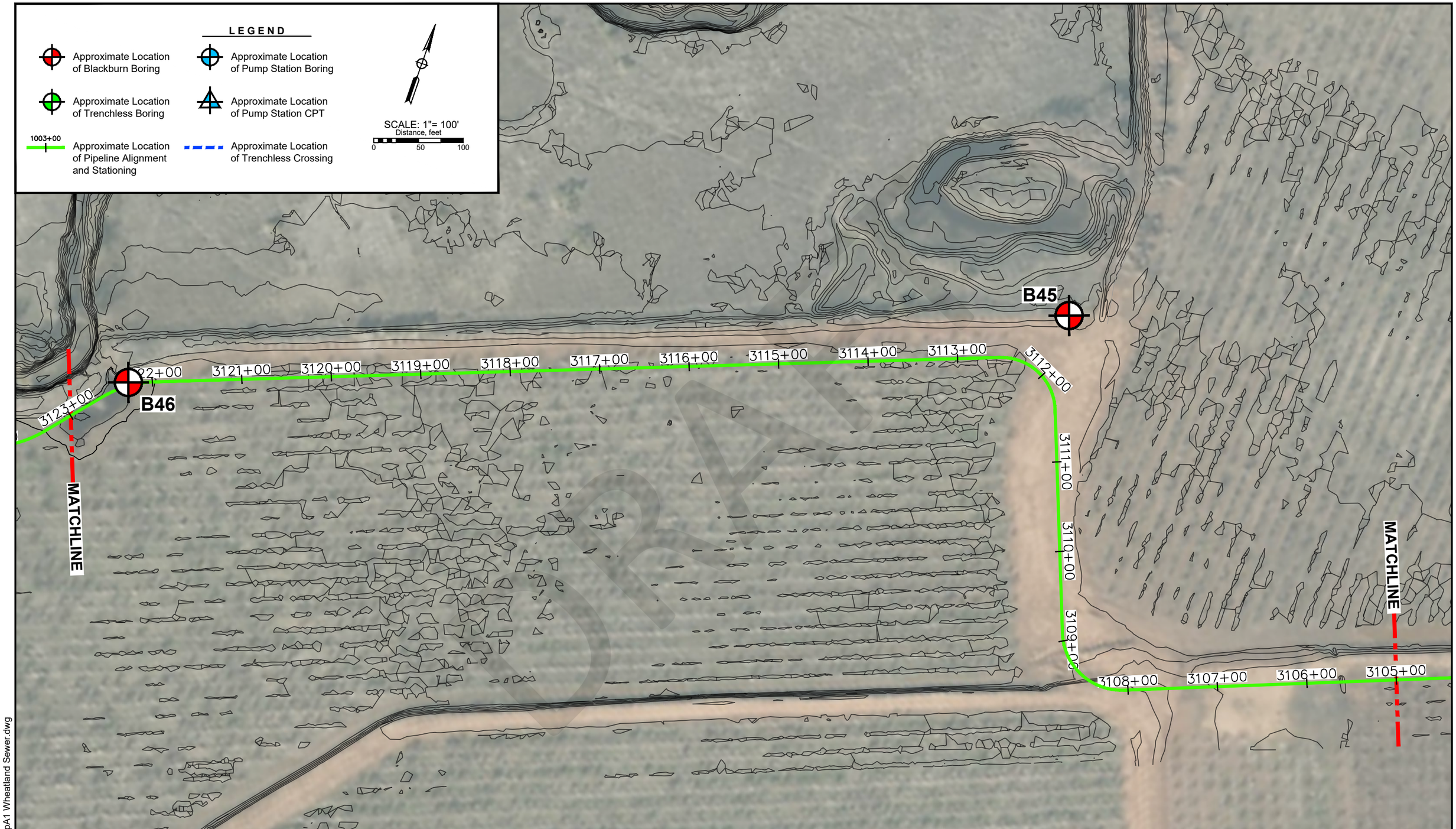
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1o



2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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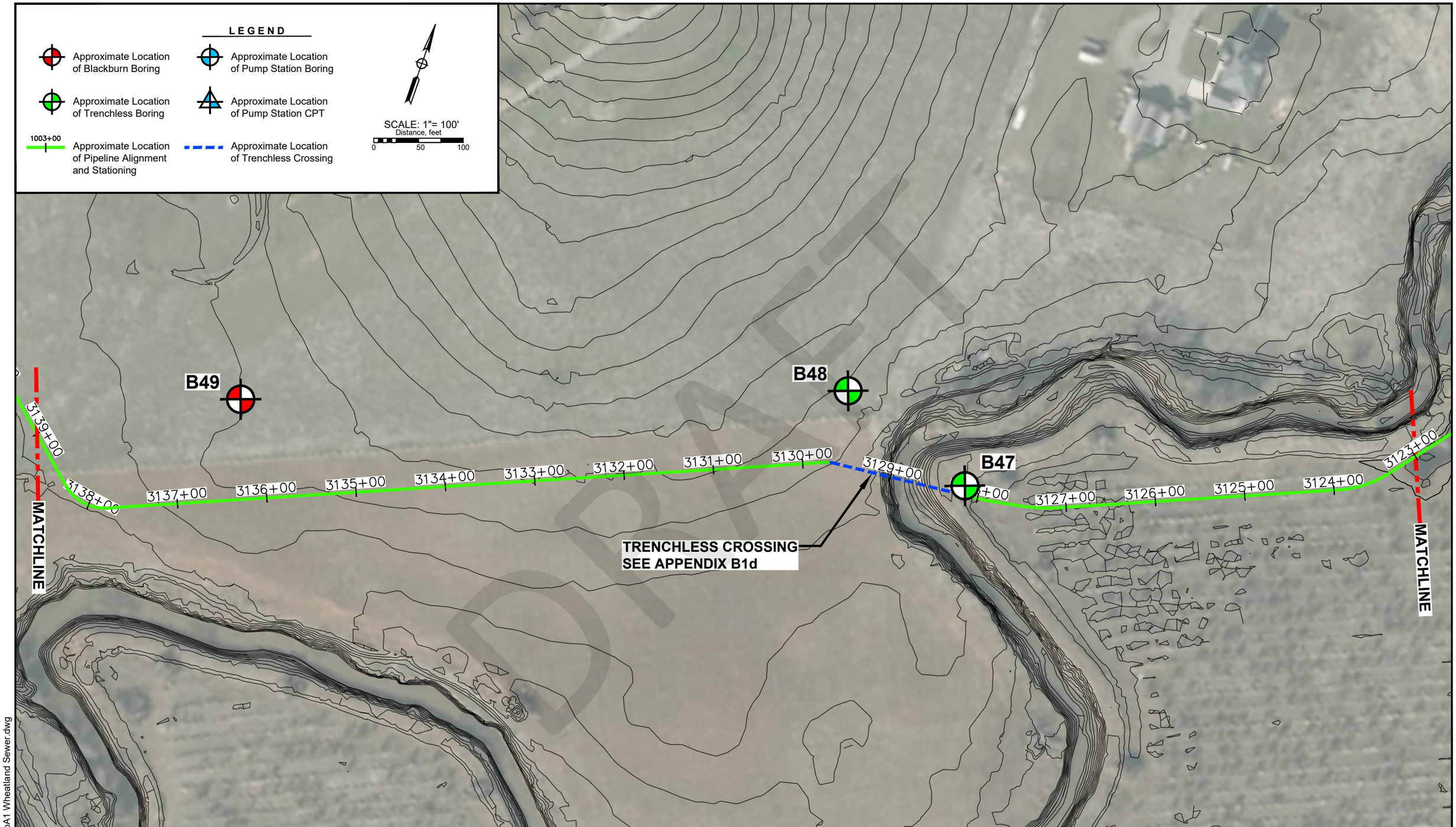
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1p



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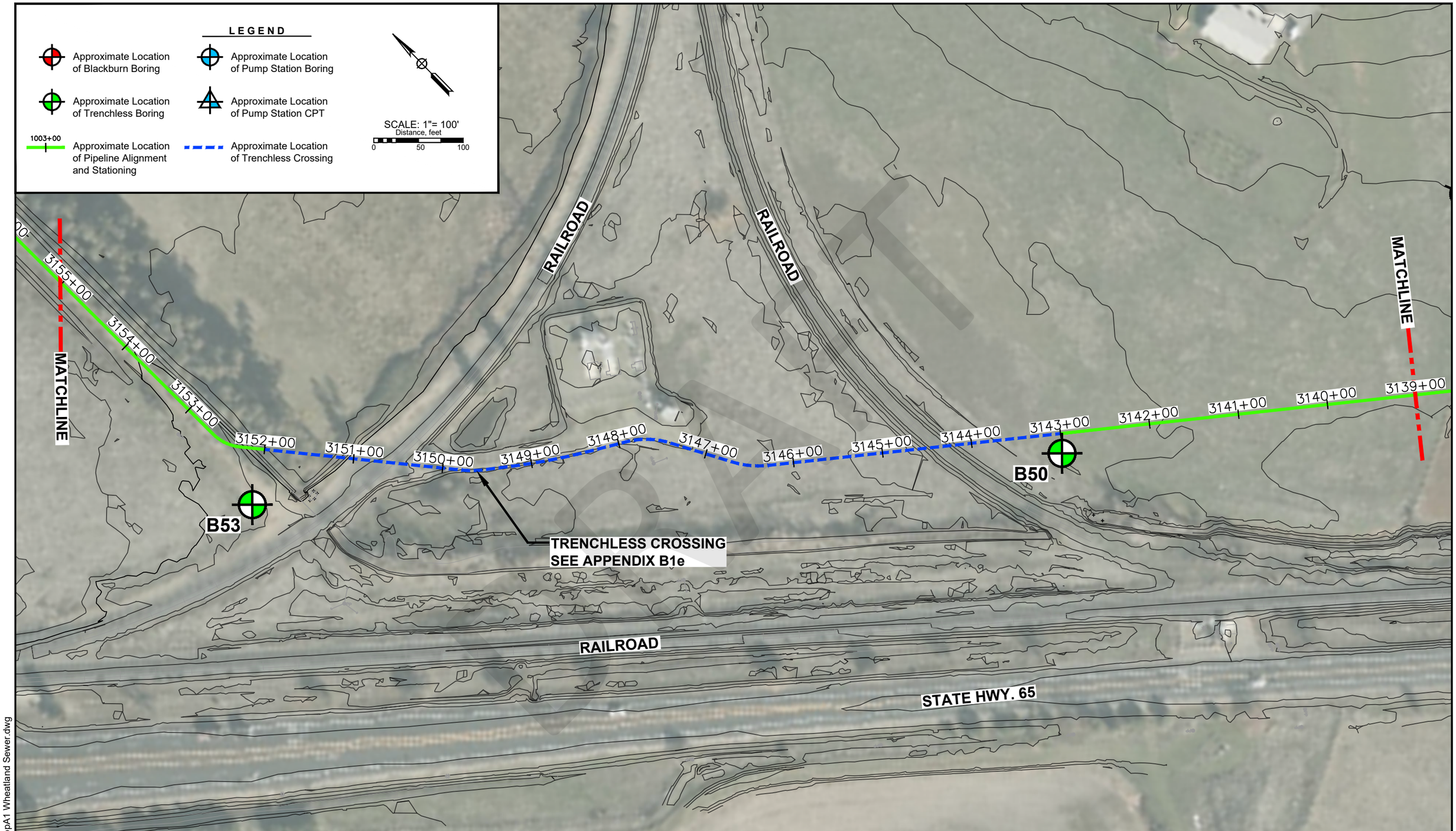
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1q



2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

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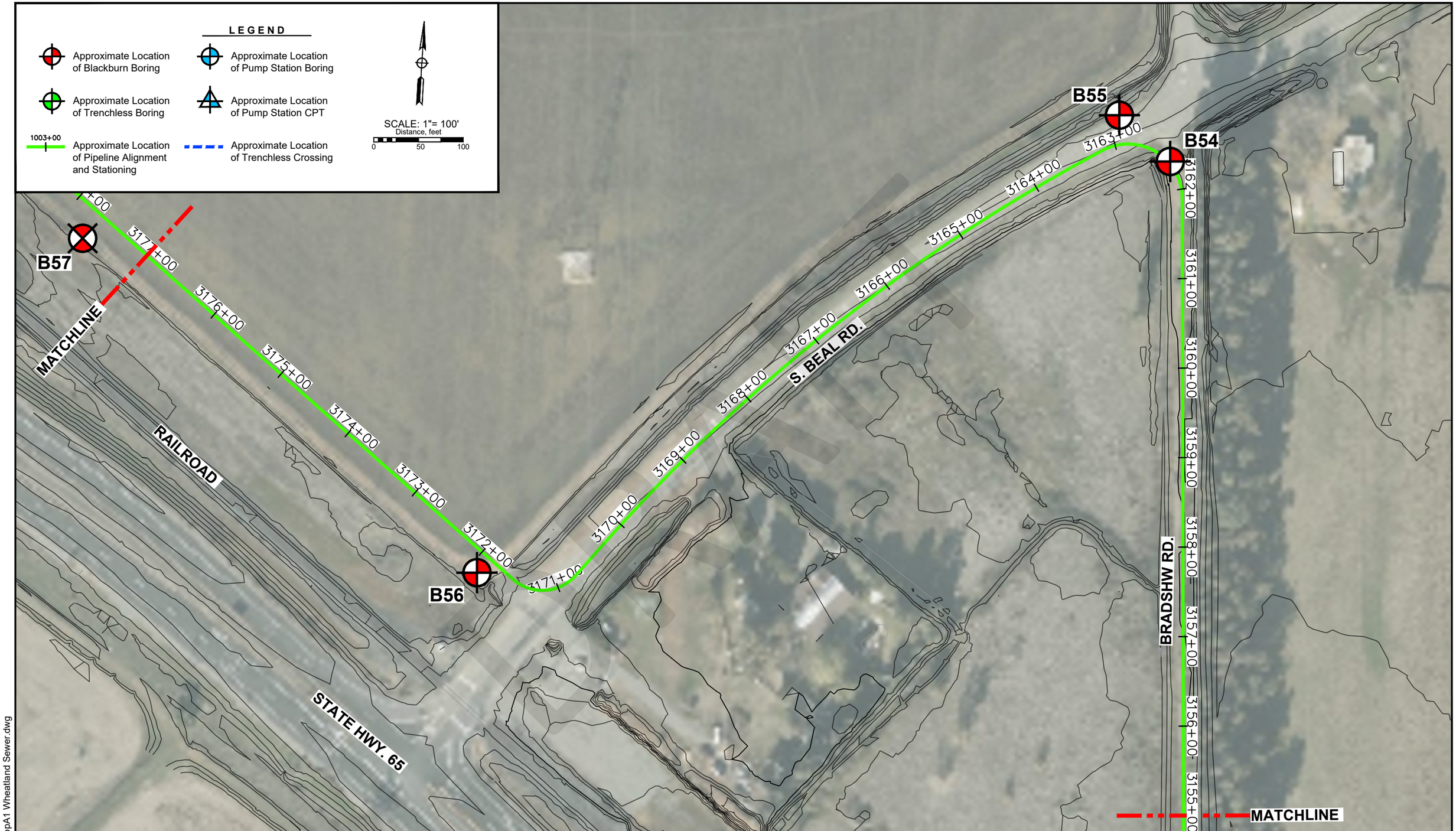
PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1r



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PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1s

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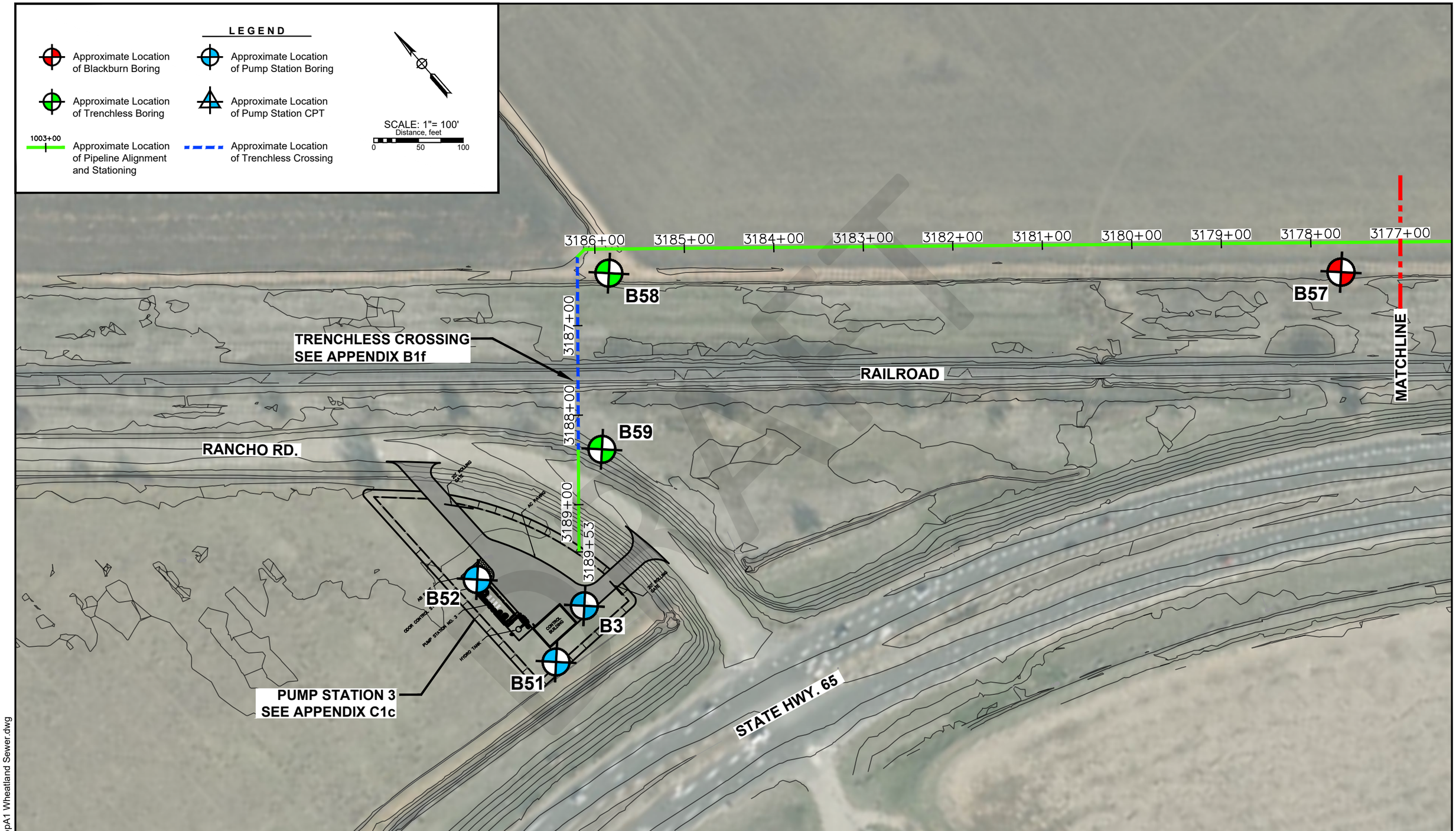

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PIPELINE SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix A1t

2/17/2021 3934.x AppA1 Wheatland Sewer.dwg

A2: Boring Log Legend
Boring Logs

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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 5333)
CP	Compaction Curve (ASTM D 698 & 1557, CTM 216)
CR	Corrosion, Sulfates, Chlorides (CTM 643, CTM 417, CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
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 (ASTM D 5084)
PA	Particle Size Analysis (ASTM D 6913 & 7928)
PI	Liquid Limit, Plastic Limit, Plasticity Index (ASTM D 4318)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T100)
SL	Shrinkage Limit (ASTM D 4943)
SW	Swell Potential (ASTM D 4546)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 7012)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 7263)
VS	Vane Shear (AASHTO T223 / ASTM D 2573)

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- California Sampler (2" ID)
- Modified California Sampler (2.4" ID)
- 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)

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BORING LOG LEGEND

8/5/2019 Boring Legend for Reports 2019.dwg

CONSISTENCY OF COHESIVE SOILS				
Descriptor	**Unconfined Compressive Strength (tsf)**	**Pocket Penetrometer (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 0.25	< 0.25	< 0.12	Extrudes between fingers when squeezed
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} - Value (blows / foot)**
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE	
Descriptor	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

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.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

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LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
LDM	8-18-21	8-18-21	39.011262° / -121.420099°	B-08
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1017+90	SURFACE ELEVATION: 83.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings and patch			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		2.5" ASPHALT CONCRETE (AC)															
			CLAYEY SAND (SC); medium dense; brown; moist; some fine to coarse SAND; some fines; few fine GRAVEL															
82	1					5												
					1	6	12		65						38			
	2					6												
			GRAVELLY Lean CLAY (CL); (stiff); dark brown; moist; some fine GRAVEL; few coarse GRAVEL															
80	3																	
	4		Lean CLAY with SAND (CL); very stiff; dark brown; moist; little fine to medium SAND; trace coarse GRAVEL															
78	5					6												
					2	9	21		100	3.25								
	6					12					16	110	39	23				
76	7																	
	8		CLAYEY SAND (SC); medium dense; strong brown with blackish streaks; wet; mostly fine to medium SAND; little to some fines															
74	9																	
	10		perched groundwater encountered			4												
					3	6	20		100									
72	11					14												
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with cuttings and patch Perched groundwater encountered at 10 ft bgs Bulk A 2.0-5.0 ft bgs															
70	13																	
	14																	
	15																	

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PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-08
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
LDM	8-18-21	8-18-21	39.013353° / -121.41922°	B-09
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1027+00	SURFACE ELEVATION: 92.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout and patch			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		2.5" ASPHALT CONCRETE (AC)															
92			Lean CLAY with SAND (CL); very stiff; orangish brown; moist; little fine to coarse SAND; few fine GRAVEL															
	1					11												
					1	11	24		85									
	2					13												
90																		
	3																	
	4		CLAYEY SAND with GRAVEL (SC); very dense; mottled dark yellowish brown, brown, and orangish brown; dry; some fine to coarse SAND; some fine to coarse GRAVEL; little fines															
88																		
	5					23												
					2	30	65		65	>4.5	6	125	35	15	16			
	6					35												
86																		
	7																	
	8																	
84																		
	9																	
	10		decreasing GRAVEL content															
82						23												
					3	32	74		70									
	11					42												
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with grout and patch Groundwater not encountered Bulk A 1.0-4.0 ft bgs															
80																		
	13																	
	14																	
78																		
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-09
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-20-21	8-20-21	39.014949° / -121.416972°	B-10
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1034+90	SURFACE ELEVATION: 90.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); very stiff; dark reddish brown; moist; mostly fines; trace fine to medium GRAVEL															
90	1																	
			few fine SAND		1	15 17 11	28		85	3.5								
88	2																	
	3																	
			CLAYEY SAND (SC); medium dense; dark orangish brown; moist; mostly fine to medium SAND; some fines															
86	4																	
	5				2	7 10 17	27		85	>4.5	19	103	43	23	29	UU= 2396psf		
84	6																	
	7																	
82	8		mostly medium SAND; little fines															
	9																	
80	10				3	12 13 19	32		85	>4.5	12	108			15			
	11		SILTY SAND (SM); medium dense; light olive brown; moist; some fines															
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
78	12		Backfilled with cuttings Groundwater not encountered Bulk A 0.5-5.0 ft bgs															
	13																	
76	14																	
	15																	

BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-10
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

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LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-20-21	8-20-21	39.01866° / -121.414768°	B-11
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1043+00	SURFACE ELEVATION: 100.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
100	0		Lean CLAY with SAND (CL); stiff; dark brown; moist; little fine SAND; trace medium to coarse SAND; trace GRAVEL															
	1																	
			CLAYEY SAND (SC); medium dense; mottled dark reddish brown and spots of yellowish brown; moist; fine to medium SAND; trace fine GRAVEL		1	11 7 16	23		65	>4.5	15	121	34	17	48			
98	2																	
	3																	
96	4																	
	5				2	40 50/5"	50/ 5"		100	>4.5								
			very dense; dark reddish brown; mostly fine to coarse SAND; little fines															
94	6																	
	7																	
92	8																	
	9																	
	10		medium dense; mostly fine to medium SAND		3	10 12 14	26		80		21	100			20			
90	11																	
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
88	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	13																	
86	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-11
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-20-21	8-20-21	39.01672° / -121.412432°	B-12
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1051+20	SURFACE ELEVATION: 100.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 10.8 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
100	0		Poorly-graded SAND with CLAY (SP-SC); dense; dark olive brown; moist; mostly fine SAND; few fine GRAVEL; trace medium GRAVEL; few fines															
	1		CLAYEY SAND (SC); dense; light brown; moist; some fine SAND; some fines; trace coarse SAND		1	13 19 22	41		85	>4.5	11	110			44			
98	2																	
	3		SANDY Lean CLAY (CL); hard; olive brown; dry; some fine SAND; few medium SAND; trace fine GRAVEL															
96	4																	
	5				2	17 21 21	42		65	>4.5	6	111			64			
94	6																	
	7																	
92	8		SILT with SAND (ML); hard; yellowish brown; dry; mostly fine SAND; some fines; low plasticity; strong cementation															
	9																	
90	10				3	21 50/4"	50/4"		100	>4.5			38	6	41			
	11		Bottom of exploration at 10.8 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered Bulk A 0.5-5.0 ft bgs															
88	12																	
	13																	
86	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-12
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-19-21	8-19-21	39.018657° / -121.410876°	B-13
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1059+20	SURFACE ELEVATION: 98.9 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 10.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0	CLAYEY SAND (SC); dense; olive brown; dry; mostly fine to coarse SAND; few fine GRAVEL															
98	1	Lean CLAY (CL); hard; mottled dark reddish brown and dark olive brown; few fine SAND; trace coarse SAND		1	15 26 33	59		90	>4.5	25	95						
96	3																
	4	Elastic SILT (MH); hard; olive brown and spots of reddish brown; moist; trace fine SAND															
94	5			2	17 30 50/3"	80/ 9"		80	>4.5	39	82	53	16	95			
92	7																
	8	Lean CLAY (CL); (hard); dark brown; moist; few fine SAND															
90	9			3	18 50/6"	50/ 6"		100	>4.5			40	5				
	10	SILT (ML); hard; dark orangish brown; moist; few fine SAND															
88	11	Bottom of exploration at 10.0 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered Bulk A 0.5-5.0 ft bgs															
86	13																
84	15																

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-13
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-19-21	8-19-21	39.020163° / -121.408452°	B-14
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1067+20	SURFACE ELEVATION: 91.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 10.3 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		SILTY SAND with GRAVEL (SM); medium dense; dark brown; moist; mostly fine to coarse SAND; some fines; little fine GRAVEL															
90	1			X	1	18 17 15	32		65	>4.5	4	117			29			
	2		Lean CLAY (CL); hard; mottled brown and very pale brown and spots of orange; moist; few fine SAND															
88	3																	
	4		dark reddish brown; moist; medium plasticity; trace coarse GRAVEL; tree roots															
86	5			X	2	9 13 17	30		80	>4.5	15	106						
	6		dark orangish brown; trace coarse SAND															
84	7																	
	8																	
82	9			X	3	18 40 50/3"	90/ 9"		80	>4.5								
	10		Bottom of exploration at 10.3 ft below ground surface (bgs)															
80	11		Backfilled with cuttings Groundwater not encountered Bulk A 0.5-5.0 ft bgs															
	12																	
78	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-14
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-19-21	8-19-21	39.020924° / -121.406274°	B-15
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1075+20	SURFACE ELEVATION: 103.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 10.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		18" AGGREGATE BASE (AB)															
102	1		CLAYEY SAND (SC); dense; light reddish brown; moist; mostly fine to coarse SAND; little high plasticity fines; trace fine GRAVEL		1	20 19 23	42		65	>4.5								
	2																	
100	3																	
	4																	
98	5				2	9 14 40	54		65		15	110	57	30	24			
	6																	
96	7																	
	8																	
94	9				3	7 5 7	12		80									
	10		loose to medium dense															
92	11		Bottom of exploration at 10.5 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered Bulk A 0.5-5.0 ft bgs															
	12																	
90	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-15
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-19-21	8-19-21	39.022009° / -121.403902°	B-16
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1082+80	SURFACE ELEVATION: 112.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 10.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
112	0		18" AGGREGATE BASE (AB)															
	1		Lean CLAY (CL); very stiff; dark brown; moist; few fine SAND; trace coarse SAND; medium plasticity		1	4 7 12	19		90	3.5								
110	2																	
	3		SILT (ML); hard; dark olive brown with spots of orangish brown; moist; some moderate to strong cementation															
108	4																	
	5				2	20 50/6"	50/6"		100	>4.5	28	90				UU= 3177psf		
106	6																	
	7		SILTY SAND (SM); very dense; dark brown; moist; mostly fine SAND; little fines															
104	8																	
	9				3	20 36 38	74		85		17	99	NP	NP	26			
102	10																	
	11		Bottom of exploration at 10.5 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered Bulk A 0.5-5.0 ft bgs															
100	12																	
	13																	
98	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-16
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.024096° / -121.404965°	B-17
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2017+20	SURFACE ELEVATION: 92.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
92	0		Lean CLAY (CL); hard; light orangish brown; dry; few fine SAND															
	1																	
90	2				1	50/6"	50/ 6"		100									
	3																	
88	4		SANDY SILT (ML); hard; light brown; moist; fine to medium SAND															
	5				2	21 50/5.5"	50/ 5.5"		100		20	103	NP	NP	52			
86	6																	
	7																	
84	8		Poorly-graded SAND with CLAY (SP-SC); dense; light brown; moist; fine to medium SAND; few fines															
	9																	
82	10				3	12 19 21	40		100									
	11																	
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
80	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	13																	
78	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-17
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.026062° / -121.406186°	B-18
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2025+20	SURFACE ELEVATION: 86.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
86	0		SANDY Lean CLAY (CL); very stiff; brown; moist; mostly fines; some fine SAND															
	1																	
	2																	
84					1	8 10 13	23		85									
	3																	
	4																	
82																		
	5																	
	6				2	8 13 17	30		95						56			
80																		
	7																	
	8		SILTY SAND (SM); medium dense; reddish brown; moist; mostly fine to medium SAND; little fines															
78																		
	9																	
	10																	
76					3	6 10 11	21		100				NP	NP	19			
	11																	
	12		Bottom of exploration at 11.5 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered No Bulk obtained															
74																		
	13																	
	14																	
72																		
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-18
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-17-21	8-17-21	39.028026° / -121.40739°	B-19
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2033+10	SURFACE ELEVATION: 86.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 11.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings and patched with concrete			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
86	0		7" ASPHALT CONCRETE (AC)															
			5" AGGREGATE BASE (AB)															
	1		Lean CLAY (CL); very stiff; very dark brown; moist															
84	2			X	1	7 7 13	20		80	2.0	20	107						
	3																	
82	4																	
	5			X	2	6 10 15	25		85	>4.5			30	13	40			
80	6		CLAYEY SAND (SC); medium dense; dark yellowish brown; moist; mostly fine to medium SAND; some fines															
	7																	
78	8																	
	9		SILTY SAND (SM); medium dense; reddish brown; moist; mostly fine to medium SAND; little fines															
76	10			X	3	6 7 8	15		85		15	102			21			
	11		Bottom of exploration at 11.0 ft below ground surface (bgs) Backfilled with cuttings and patched with concrete Groundwater not encountered No Bulk obtained															
74	12																	
	13																	
72	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-19
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-17-21	8-17-21	39.030022° / -121.40857°	B-20
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2041+10	SURFACE ELEVATION: 87.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 11.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; very dark brown; dry to moist															
86	1					10												
	2				1	12	25		65	>4.5								
						13												
84	3																	
	4																	
82	5		very stiff; lower plasticity			5					17	110	30	12				
	6				2	7	15		40	2.75								
						8												
80	7																	
	8																	
78	9		SANDY SILT (ML); very stiff; mottled olive gray and brown; moist; some fine SAND															
	10					5												
					3	9	23		90	2.5								
						14												
76	11		Bottom of exploration at 11.0 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
74	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-20
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-16-21	8-16-21	39.034333° / -121.411222°	B-23
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2058+80	SURFACE ELEVATION: 93.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike, Matt		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 10.9 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		SILTY SAND (SM); very dense; yellowish brown; dry; some fines; some fine to coarse SAND; little fine GRAVEL															
92	1																	
	2				1	50/6"	50/6"		100		8	117			46			
90	3																	
	4																	
88	5		little fine to coarse GRAVEL		2	50/6"	50/6"		100									
	6																	
86	7																	
	8																	
84	9																	
	10		few fine GRAVEL		3	31 50/5"	50/5"		100									
82	11		Bottom of exploration at 10.9 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
80	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-23
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-16-21	8-16-21	39.036236° / -121.412368°	B-24
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2066+50	SURFACE ELEVATION: 93.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; brown; dry															
92	1																	
			CLAYEY SAND (SC); dense; yellowish red; moist; fine to coarse SAND; some fines; trace fine GRAVEL		1	12 24 23	47		65	>4.5	5	109			43			
	2																	
90	3																	
	4		Lean CLAY (CL); hard; dark yellowish brown; dry															
88	5																	
			SILTY SAND (SM); very dense; brown; dry		2	7 39 50/4"	89/ 10"		30	>4.5								
	6																	
86	7																	
	8																	
84	9		Lean CLAY (CL); hard; dark brown; moist															
	10																	
82	11				3	3 20 50/4"	70/ 10"		30	>4.5								
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
80	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-24
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.038289° / -121.413635°	B-25
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2074+80	SURFACE ELEVATION: 94.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
94	0		SANDY Lean CLAY (CL); hard; reddish brown; dry; fine SAND															
	1																	
	2																	
92					1	37 39 20	59		65									
	3																	
	4																	
90																		
	5		CLAYEY SAND (SC); dense; reddish yellow; moist; fine to medium SAND															
	6				2	12 17 20	37		90	4.5	15	116	41	26	37			
88																		
	7																	
	8		CLAYEY GRAVEL with SAND (GC); dense; reddish brown; moist; fine GRAVEL; fine to coarse SAND; little fines															
86																		
	9																	
	10																	
84					3	11 15 21	36		90									
	11																	
	12		Bottom of exploration at 11.5 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered No Bulk obtained															
82																		
	13																	
	14																	
80	15																	

BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-25
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

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LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.040284° / -121.414861°	B-26
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2082+80	SURFACE ELEVATION: 93.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		SILTY, CLAYEY SAND (SC-SM); medium dense; dark brown; moist; fine to medium SAND; some fines															
92	1																	
	2																	
	3				1	8 8 9	17		65		10	112	23	7	39			
90																		
	4																	
	5																	
88			very dense; fine to coarse SAND; little fines		2	31 50/6"	50/ 6"		100									
	6																	
	7																	
86																		
	8																	
	9																	
84																		
	10																	
	11				3	14 18 20	38		90									
82			Lean CLAY with SAND (CL); hard; orange brown; moist; little fine SAND															
	12		Bottom of exploration at 11.5 ft below ground surface (bgs)															
			Backfilled with cuttings Groundwater not encountered No Bulk obtained															
80	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-26
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-17-21	8-17-21	39.042275° / -121.416079°	B-27
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2090+90	SURFACE ELEVATION: 94.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 10.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
94	0		Lean CLAY (CL); hard; dark yellowish brown; dry															
	1				1	14 21 21	42		65	>4.5								
92	2		SANDY Lean CLAY (CL); hard; reddish brown; moist; some fine to medium SAND															
	3																	
90	4																	
	5				2	10 50/5"	50/5"		55	>4.5	14	108			68			
88	6																	
	7																	
86	8																	
	9		Lean CLAY (CL); hard; dark yellowish brown; moist		3	3 15 29	44		65	>4.5								
84	10		Bottom of exploration at 10.0 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
	11																	
82	12																	
	13																	
80	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-27
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.044266° / -121.417298°	B-28
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2098+90	SURFACE ELEVATION: 96.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
96	0		SANDY Lean CLAY (CL); hard; strong brown; moist; mostly fines; some fine SAND															
	1																	
	2																	
94				X	1	12 17 24	41		85		14	112	39	21	58			
	3																	
	4																	
92																		
	5																	
				X	2	18 32 34	66		90	>4.5								
	6																	
90																		
	7																	
	8																	
88																		
	9																	
	10																	
86				X	3	5 8 12	20		100	>4.5								
	11																	
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
84																		
	13																	
	14																	
82																		
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-28
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-17-21	8-17-21	39.046258° / -121.418517°	B-29
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2106+90	SURFACE ELEVATION: 97.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 10.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY with SAND (CL); hard; brown; dry to moist; fine to medium SAND															
96	1					14												
			SANDY Lean CLAY (CL); hard; yellowish red; moist; mostly fines; some fine to coarse SAND; little fine GRAVEL		1	15	52		70	>4.5								
	2					37												
94	3																	
	4																	
92	5					17												
					2	37	86		65	>4.5	9	129	46	25	57			
	6					49												
90	7																	
	8																	
	9					2												
88			very stiff		3	21	45		65	3.25								
						24												
	10		Bottom of exploration at 10.0 ft below ground surface (bgs)															
			Backfilled with cuttings Groundwater not encountered No Bulk obtained															
86	11																	
	12																	
84	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-29
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.048217° / -121.419724°	B-30
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2114+80	SURFACE ELEVATION: 97.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		36" AGGREGATE BASE (AB)															
96	1																	
	2			X	1	26 16 20	36		65	4.5								
94	3		SANDY Lean CLAY (CL); hard; brown; moist; some fine to medium SAND															
	4																	
92	5			X	2	22 30 42	72		65	4.5			31	15	56			
	6																	
90	7																	
	8		CLAYEY SAND (SC); medium dense to dense; reddish brown; moist; fine to coarse SAND; few fine GRAVEL															
88	9																	
	10			X	3	21 21 15	36		85						46			
86	11																	
	12		Bottom of exploration at 11.5 ft below ground surface (bgs)															
84	13		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-30
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-17-21	8-17-21	39.05022° / -121.420953°	B-31
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2122+90	SURFACE ELEVATION: 97.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 10.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Fat CLAY (CH); hard; dark yellowish brown; dry to moist; high plasticity															
96	1					12												
	2				1	13	28		90	>4.5	13	105						
						15												
94	3																	
	4		Lean CLAY (CL); hard; dark brown; moist; few fine SAND															
92	5					10												
	6				2	18	45		85	>4.5								
						27												
90	7																	
	8																	
	9					5												
88			Lean CLAY with SAND (CL); hard; dark yellowish brown; moist; little fine to medium SAND		3	14	35		85	>4.5								
						21												
	10		Bottom of exploration at 10.0 ft below ground surface (bgs)															
			Backfilled with cuttings Groundwater not encountered No Bulk obtained															
86	11																	
	12																	
84	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-31
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.05218° / -121.422159°	B-32
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2130+80	SURFACE ELEVATION: 98.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
98	0		Lean CLAY with SAND (CL); very stiff to hard; reddish brown; dry; some fine SAND															
	1																	
	2																	
96					1	9 9 9	18		65						70			
	3																	
	4																	
94																		
	5																	
	6		hard; moist; little fine to medium SAND		2	10 25 50	75		85	4.5	16	113	35	13	75	UU= 10496 psf		
92																		
	7																	
	8		Lean CLAY (CL); very stiff; reddish brown; moist; few fine SAND															
90																		
	9																	
	10																	
88					3	9 15 21	36		85	3.75								
	11																	
	12		Bottom of exploration at 11.5 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered No Bulk obtained															
86																		
	13																	
	14																	
84																		
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-32
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-17-21	8-17-21	39.052372° / -121.424639°	B-33
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3005+60	SURFACE ELEVATION: 94.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 9.9 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
94	0		Lean CLAY (CL); hard; dark yellowish brown; dry															
	1		Lean CLAY with SAND (CL); hard; mottled brown and black; moist; little fine SAND			16												
					1	18	36		65	>4.5								
92	2					18												
	3																	
90	4																	
	5					3					10	117			76			
					2	10	45		45	>4.5								
88	6					35												
	7																	
86	8		SANDY Lean CLAY (CL); hard; olive brown; moist; some fine SAND															
	9				3	18 50/4.5"	50/ 4.5"		55	>4.5								
84	10		Bottom of exploration at 9.9 ft below ground surface (bgs)															
	11		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
82	12																	
	13																	
80	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-33
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.05137° / -121.427349°	B-34
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3014+10	SURFACE ELEVATION: 94.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.2 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
94	0		SANDY Lean CLAY (CL); hard; reddish brown; moist; some fine SAND															
	1																	
92	2				1	4 11 29	40		90	1.5	23	97						
	3		strong brown; dry															
90	4																	
	5				2	24 50/6"	50/6"		100				31	11	70			
88	6																	
	7																	
86	8																	
	9																	
84	10		fine to medium SAND		3	18 42 50/2"	92/8"		100									
	11																	
82	12		Bottom of exploration at 11.2 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	13																	
80	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-34
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-17-21	8-17-21	39.050394° / -121.430078°	B-35
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3022+60	SURFACE ELEVATION: 93.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 10.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; dark yellow brown; dry to moist															
92	1			X	1	7 11 50/5.5"	61/ 11.5"		65	>4.5								
	2		Lean CLAY (CL); hard; dark brown; moist; few fine SAND															
90	3		SANDY Lean CLAY (CL); hard; strong brown; moist; some fine to medium SAND															
	4																	
88	5			X	2	12 27 36	63		65	>4.5			31	17				
	6																	
86	7																	
	8		SANDY SILT (ML); hard; mottled brown and olive gray; moist; some fine SAND															
84	9			X	3	4 16 26	42		50	>4.5	19	111			67			
	10																	
			Bottom of exploration at 10.5 ft below ground surface (bgs)															
82	11		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	12																	
80	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-35
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-17-21	8-17-21	39.049411° / -121.432745°	B-36
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3031+00	SURFACE ELEVATION: 91.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY with SAND (CL); hard; reddish brown; dry; some fine SAND															
90	1																	
	2																	
	3				1	16 21 20	41		65	>4.5	9	107			71			
88																		
	4																	
	5				2	50/6"	50/6"		100	4.5								
86																		
	6																	
	7																	
84			SANDY Lean CLAY (CL); very stiff; reddish brown; moist; some fine SAND															
	8																	
	9																	
82																		
	10				3	11 12 16	28		100				38	19				
	11																	
80																		
	12		Bottom of exploration at 11.5 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered No Bulk obtained															
78	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-36
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-11-21	8-11-21	39.04822° / -121.43527°	B-37
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3039+60	SURFACE ELEVATION: 90.0 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 10.8 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); very stiff; dark reddish brown; moist; trace fine SAND															
	1																	
88	2				1	6 5 6	11		85	2.5	13	103						
	3																	
86	4		SILTY SAND (SM); very dense; dark reddish brown; moist; fine to medium SAND; some fines															
	5		little fine GRAVEL		2	21 50/4"	50/ 4"		80						35			
84	6																	
	7																	
82	8		SANDY Lean CLAY (CL); hard; mottled dark yellowish brown, brown, and black; moist; some fine to medium SAND															
	9																	
80	10				3	36 50/4"	50/ 4"		100	>4.5								
	11		Bottom of exploration at 10.8 ft below ground surface (bgs)															
78	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	13																	
76	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-37
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-11-21	8-11-21	39.04722° / -121.4381°	B-38
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3048+50	SURFACE ELEVATION: 87.6 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); very stiff; very dark brown; moist; few fine to medium SAND															
	1																	
86					1	4 4 8	12		70	2.75								
	2																	
	3																	
84																		
	4																	
	5		strong brown; few fine SAND; lower plasticity															
82					2	14 22 26	48		70	3.0	23	105	32	12				
	6																	
	7																	
80																		
	8		SANDY Lean CLAY (CL); hard; mottled dark yellowish brown and black; moist; some fine to medium SAND															
	9																	
78																		
	10																	
	11				3	13 21 32	53		80	>4.5					57			
76			Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	13																	
74																		
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-38
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-11-21	8-11-21	39.04615° / -121.44105°	B-39
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3057+60	SURFACE ELEVATION: 89.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		SANDY SILTY CLAY (CL-ML); very stiff; dark reddish brown; moist; some fine to medium SAND															
88	1				1	3 5 6	11		70	2.5	11	102	22	7	65			
86	3																	
84	5		hard; little moderate cementation		2	35 50/3"	50/ 3"		90	>4.5								
82	7																	
	8		Lean CLAY (CL); very stiff; mottled dark yellowish brown, dark brown, and black; moist, few fine to medium SAND															
80	9																	
78	10				3	5 8 14	22		85	3.5								
	11		Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
76	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-39
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-11-21	8-11-21	39.04499° / -121.44412°	B-40
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3066+60	SURFACE ELEVATION: 88.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
88	0		Lean CLAY (CL); hard; dark reddish brown; dry to moist; high plasticity															
	1					9												
					1	9	29		90	>4.5								
86	2					20												
	3																	
84	4																	
	5		CLAYEY SAND (SC); very dense; yellowish brown; moist; fine to coarse SAND; some fines		2	50/6"	50/ 6"		85	>4.5			26	10	28			
82	6																	
	7		Lean CLAY with SAND (CL); very stiff; dark brown; moist; little fine SAND															
80	8																	
	9																	
	10					7												
78					3	10	23		90	2.75								
	11					13												
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
76	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	13																	
74	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-40
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-11-21	8-11-21	39.044° / -121.44674°	B-41
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3075+60	SURFACE ELEVATION: 87.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; dark reddish brown; dry to moist															
86	1					10												
	2				1	11	25		80	>4.5								
						14												
84	3																	
	4		Lean CLAY with SAND (CL); hard; dark yellowish brown; moist; little fine to medium SAND; trace coarse SAND															
82	5					33												
	6				2	50/4"	50/4"		40	>4.5								
80	7																	
	8																	
78	9																	
	10					14												
	11				3	25	62		90	>4.5					84			
76						37												
	12		Bottom of exploration at 11.5 ft below ground surface (bgs)															
74	13		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-41
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-11-21	8-11-21	39.04282° / -121.4499°	B-42
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3085+70	SURFACE ELEVATION: 83.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; dark reddish brown; dry to moist; trace fine SAND															
82	1				1	9 10 12	22		60	>4.5	10	99	36	20				
80	3																	
	4		Lean CLAY with SAND (CL); hard; dark yellowish brown; dry; little medium SAND															
78	5				2	32 50/5"	50/ 5"		90	>4.5								
			SANDY Lean CLAY (CL); hard; dark yellowish brown; moist; some fine to medium SAND; trace coarse SAND															
76	6																	
	7																	
	8		CLAYEY SAND (SC); dense; dark brown; moist; mostly fine to medium SAND; little fines; few coarse SAND; trace fine GRAVEL; low plasticity															
74	9																	
	10				3	19 25 24	49		90	>4.5					17			
72	11		Lean CLAY (CL); hard; dark yellowish brown; moist; few fine to medium SAND															
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
70	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-42
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-11-21	8-11-21	39.04121° / -121.45131°	B-43
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3093+00	SURFACE ELEVATION: 81.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 13.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY with SAND (CL); hard; dark brown; moist; little fine SAND															
80	1		thin lens (1/16") of black material		1	5 6 8	14		65	>4.5					75			
78	3																	
76	5		SANDY Lean CLAY (CL); hard; dark brown; moist; some fine to medium SAND		2	17 50/6"	50/6"		75	>4.5								
74	7																	
72	9		Lean CLAY with SAND (CL); hard; dark yellowish brown; moist; little fine to medium SAND															
70	10				3	17 34 50	84		60	>4.5								
	12		moderately cemented; calcification		4	14 20 26	46		100									
68	13		Bottom of exploration at 13.0 ft below ground surface (bgs)															
	14		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-43
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-11-21	8-11-21	39.040195° / -121.45387°	B-44
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3102+10	SURFACE ELEVATION: 80.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 13.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
80	0		Lean CLAY (CL); hard; dark brown; moist; high plasticity															
	1																	
					1	10 9 12	21		80	>4.5								
78	2																	
	3																	
			Lean CLAY with SAND (CL); hard; dark brown; moist; little fine SAND															
76	4																	
	5																	
					2	10 18 24	42		85	>4.5								
74	6																	
	7																	
	8		CLAYEY SAND (SC); dense; yellowish brown; moist; fine to coarse SAND; little fines; few fine GRAVEL															
72	9																	
	10																	
70					3	14 26 23	49		90	4.5			35	20	18			
	11		Lean CLAY (CL); hard; olive brown; moist															
	12				4	9 12 19	31		100									
68			Lean CLAY with SAND (CL); very stiff; olive brown; moist; little fine SAND															
	13		Bottom of exploration at 13.0 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered No Bulk obtained															
66	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-44
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-12-21	8-12-21	39.04038° / -121.456581°	B-45
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3112+10	SURFACE ELEVATION: 79.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY with SAND (CL); hard; dark brown; moist; little fine to medium SAND															
78	1				1	4 4 4	8		70	4.5								
76	3																	
74	5		stiff		2	4 7 8	15		60	1.75	21	102	32	15	75	UU= 1077psf		
72	7																	
70	9		CLAYEY SAND (SC); medium dense; dark brown; dry; some fine to coarse SAND; some fines; few fine GRAVEL															
68	11				3	8 11 16	27		55	3.0			39	24	47			
			Lean CLAY (CL); very stiff; mottled dark brown and dark olive brown; moist; few fine SAND															
	12		Bottom of exploration at 11.5 ft below ground surface (bgs)															
66	13		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-45
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-12-21	8-12-21	39.039034° / -121.459865°	B-46
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3122+30	SURFACE ELEVATION: 74.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
74	0		Lean CLAY (CL); hard; dark brown; dry; trace fine SAND															
	1					8												
					1	29	69		70	>4.5								
72	2					40												
	3																	
			SANDY Lean CLAY (CL); very stiff; brown; moist; some fine SAND															
70	4																	
	5					6												
					2	8	20		85	3.5								
68	6					12												
	7																	
66	8																	
	9																	
	10					3												
64			very soft; few fine GRAVEL		3	3	6		100	<0.25								
	11					3					22	109	30	15	60			
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
62	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	13																	
60	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-46
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-9-21	8-9-21	39.037702° / -121.464398°	B-49
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3136+20	SURFACE ELEVATION: 80.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: Diedrich D120	TOTAL DEPTH: 10.8 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
80	0		Lean CLAY (CL); hard; reddish brown; dry; moderate cementation														R	
	1																	
	2																	
78				X	1	13 21 50/4"	71/ 10"		75									
	3																	
	4		SILTY SAND (SM); very dense; light brown; dry; fine to medium SAND; some fines															
76	5																	
				X	2	9 21 50/5"	71/ 11"		65				37	7	43			
	6																	
74	7																	
	8																	
72	9																	
	10		reddish brown; little fines; moderate cementation	X	3	37 50/3"	50/ 3"		100						26			
70	11		Bottom of exploration at 10.8 ft below ground surface (bgs)															
			Backfilled with cuttings Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
68	12																	
	13																	
66	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-49
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-13-21	8-13-21	39.04278° / -121.46845°	B-54
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3162+30	SURFACE ELEVATION: 79.5 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 31.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY with SAND (CL); hard; olive brown; moist; little fine to coarse SAND; few fine GRAVEL															
	1																	
	2				1	8 13 12	25		100	>4.5								
	2		dark yellowish brown with dark orangish brown streaks															
	3																	
	4																	
75			Lean CLAY (CL); very stiff; dark reddish brown; moist; trace fine SAND															
	5																	
	6				2	8 12 21	33		100	3.5	16	107						
	7																	
	8																	
	9		Lean CLAY with SAND (CL); hard; reddish brown; moist; little fine to medium SAND															
70	10																	
	11				3	11 18 30	48		90	4.5	10	116				UU= 3708psf	CR	
	11		CLAYEY SAND (SC); dense; reddish brown; moist; mostly medium SAND; little fines															
	12																	
	13																	
	14																	
65			Lean CLAY (CL); hard; mottled yellowish red and grayish brown; little fine SAND; low plasticity															
	15																	
	16				4	20 36 50/5	86/ 11"		100	>4.5	15	113	30	13				
	17																	
	18																	
	19																	
60	20																	
	21		mottled dark yellowish brown and dark olive brown with white streaks; medium plasticity		5	37 38 50/5	88/ 11"		100	>4.5								
	22																	
	23																	
	24																	
55	25																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-54
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		Lean CLAY (CL) *(continued)*.			23												
	26		dark brown		6	30 45	75		90	>4.5								
	27																	
	28																	
	29		Poorly-graded SAND with CLAY (SP-SC); very dense; dark yellowish brown; moist; mostly fine to medium SAND															
50	30					48												
	31				7	39 46	85		95									
	32		Bottom of exploration at 31.5 ft below ground surface (bgs)															
	33		Backfilled with grout Groundwater not encountered No Bulk obtained															
	34																	
45	35																	
	36																	
	37																	
	38																	
	39																	
40	40																	
	41																	
	42																	
	43																	
	44																	
35	45																	
	46																	
	47																	
	48																	
	49																	
30	50																	
	51																	
	52																	
	53																	
	54																	
25	55																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-54**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **LDM**	CHECKED BY	SHEET **2 of 2**

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-13-21	8-13-21	39.04275° / -121.46872°	B-55
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3162+90	SURFACE ELEVATION: 81.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 31.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY with SAND (CL); hard; dark brown; moist; little fine SAND															
80	1																	
	2		dark reddish brown; trace fine to coarse GRAVEL		1	10 14 20	34		65	>4.5								
	3																	
	4																	
	5																	
	6		Lean CLAY (CL); medium stiff; dark reddish brown; moist; few fine SAND; medium plasticity		2	3 4 5	9		70	1.0	17	113	48	32				
75	7																	
	8																	
	9		CLAYEY SAND (SC); dense; reddish brown; moist; fine SAND; some fines															
	10																	
	11				3	14 19 29	48		70	>4.5	14	116	36	19	41			
70	12		Lean CLAY (CL); medium stiff; dark reddish brown; moist; few fine SAND; medium plasticity															
	13																	
	14		SILTY SAND (SM); dense; reddish brown; moist; mostly fine SAND; some fines															
	15																	
	16				4	13 17 35	52		90		16	114			30	DS		
65	17																	
	18																	
	19		Lean CLAY (CL); hard; dark yellowish brown; moist; few fine SAND; low to medium plasticity															
	20																	
	21				5	17 30 50/5"	80/ 11"		90	>4.5								
60	22																	
	23																	
	24		Lean CLAY (CL); hard; mottled dark yellowish brown and dark brown with white streaks; moist; few fine to medium SAND; trace coarse SAND															
	25																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-55
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		Lean CLAY (CL) *(continued)*.		6	25 50/6"	50/ 6"		100	>4.5								
55	26																	
	27																	
	28																	
	29		CLAYEY SAND (SC); very dense; mottled olive brown and orangish brown; moist; mostly fine to medium SAND; trace coarse SAND; little fines															
	30				7	18 30 50/6"	80/ 12"		65									
50	31																	
	32		Bottom of exploration at 31.5 ft below ground surface (bgs)															
	33		Backfilled with grout Groundwater not encountered No Bulk obtained															
	34																	
	35																	
45	36																	
	37																	
	38																	
	39																	
	40																	
40	41																	
	42																	
	43																	
	44																	
	45																	
35	46																	
	47																	
	48																	
	49																	
	50																	
30	51																	
	52																	
	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME **Wheatland Regional Sewer Connection**	FILE NO. **3934.X**	HOLE ID **B-55**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **LDM**	CHECKED BY	SHEET **2 of 2**

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	11-22-21	11-22-21	39.041326° / -121.471299°	B-56
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3171+90	SURFACE ELEVATION: 78.3 ft
OPERATOR'S NAME: David	HELPER'S NAME: Lawrence, Tanner		EQUIPMENT: CME 55 Crawler	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
78	0		Lean CLAY with SAND (CL); stiff; dark reddish brown; moist; few fine SAND															
	1																	
	2																	
76					1	2 4 7	11		65	1.25	20	100	29	12	71			
	3																	
	4																	
74																		
	5		hard; brown; dry to moist															
					2	11 20 24	44		100									
72	6																	
	7																	
			CLAYEY SAND (SC); medium dense; reddish brown; moist; very fine to medium SAND; little fines															
70	8																	
	9																	
	10																	
68					3	8 10 14	24		65	2.75	15	113	33	17	26			
	11																	
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
66																		
	13																	
	14																	
64	15																	

DRAFT

BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-56
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-10-21	8-10-21	39.0424° / -121.47293°	B-57
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3177+60	SURFACE ELEVATION: 78.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: Diedrich D120	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
78	0		Lean CLAY with SAND (CL); stiff; dark brown; moist; little fine SAND															
	1					2												
					1	4	8		100	1.5								
76	2					4					23	104	31	15	76			
	3																	
74	4		hard															
	5					17												
					2	36	86/ 11"		50	>4.5								
72	6					50/5												
	7		CLAYEY SAND (SC); very dense; dark brown; moist; fine through coarse SAND; some fines; trace fine GRAVEL															
70	8																	
	9																	
	10					25									33			
68					3	27	60		80	>4.5								
	11		Lean CLAY (CL); hard; dark brown; moist; few SAND			33												
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
66	12		Backfilled with cuttings Groundwater not encountered No Bulk obtained															
	13																	
64	14																	
	15																	

DRAFT

BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-57
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	11-18-21	11-18-21	39.023079° / -121.402513°	B-60
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2004+40	SURFACE ELEVATION: 116.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 55	TOTAL DEPTH: 21.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
116	0		4" ASPHALT CONCRETE (AC) 8" AGGREGATE BASE (AB)															
	1		SANDY Lean CLAY (CL); very stiff to hard; strong brown; moist; some fine SAND		1	5 7 10	17		90				34	15				
114	2																	
	3																	
112	4																	
	5		hard; dark yellowish brown lens (<1/8") of organics		2	20 15 14	29		65	>4.5	13	113	30	15	70	UU= 1318psf		
110	6																	
	7																	
108	8																	
	9																	
106	10		light brown with orange streaks		3	29 50/5"	50/5"		100						63			
	11																	
104	12																	
	13																	
102	14		olive brown; dry															
	15																	

(continued)

DRAFT

BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-60
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	15		SANDY Lean CLAY (CL) *(continued)*.		4	28	50/3"		100		8	88	26	12	56			
			Poorly-graded SAND (SP); very dense; brown; moist; very fine to fine SAND; trace fines			50/3"												
100	16																	
	17																	
			Lean CLAY (CL); hard; light brown; moist; trace very fine to fine SAND															
98	18																	
	19																	
	20																	
96					5	7 14 22	36		90									
	21																	
			Bottom of exploration at 21.5 ft below ground surface (bgs)															
	22		Backfilled with grout Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
94																		
	23																	
	24																	
92																		
	25																	
	26																	
90																		
	27																	
	28																	
88																		
	29																	
	30																	
86																		
	31																	
	32																	
84																		
	33																	

DRAFT

BLACKBURN CONSULTING

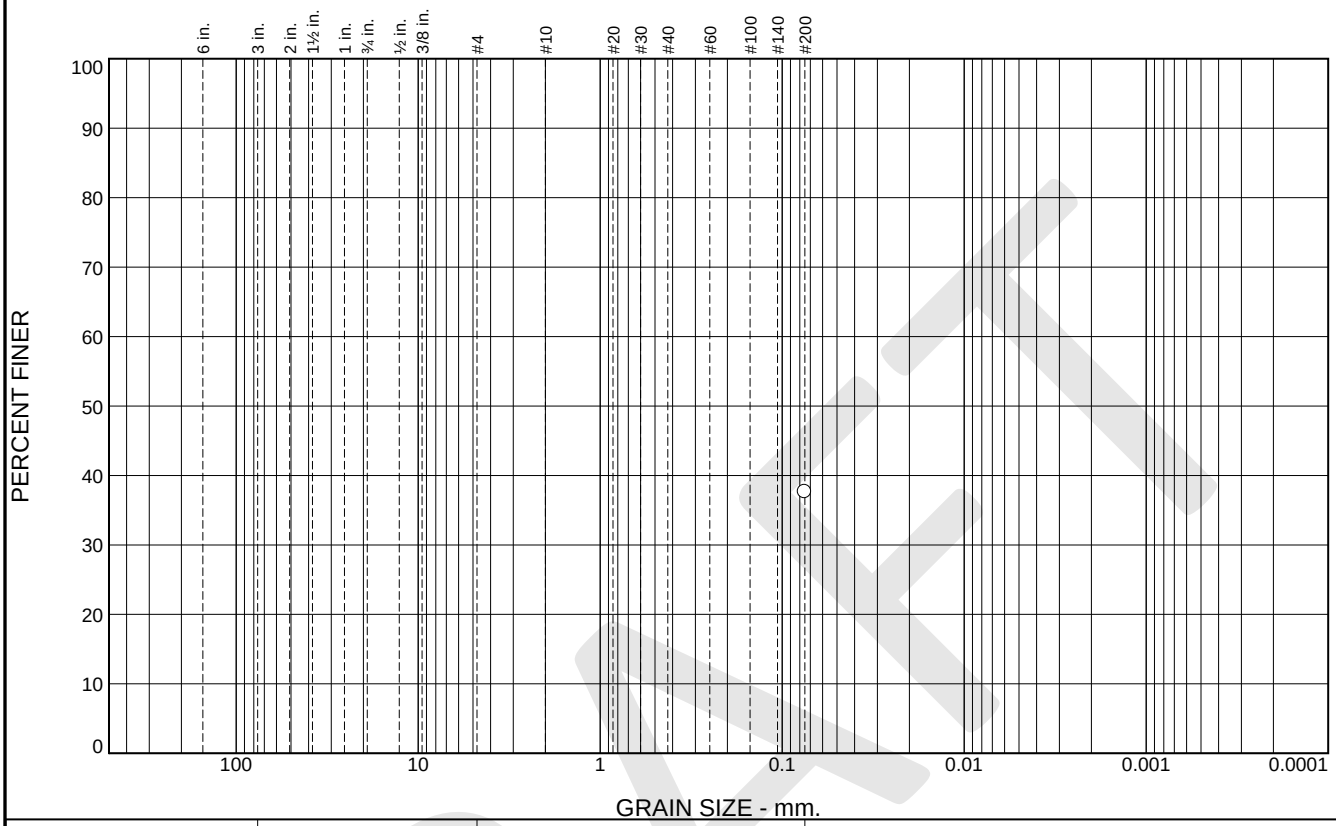
PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-60**
COUNTY: **YUB**	ROUTE	POSTMILE
CLIENT: **Coastland Civil Engineering**		
PREPARED BY: **NRV**	CHECKED BY	SHEET: **2 of 2**

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

A3: Laboratory Test Results

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						37.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	37.6		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B8 **Depth:** 1-1.5'
Sample Number: 1B **Date:**

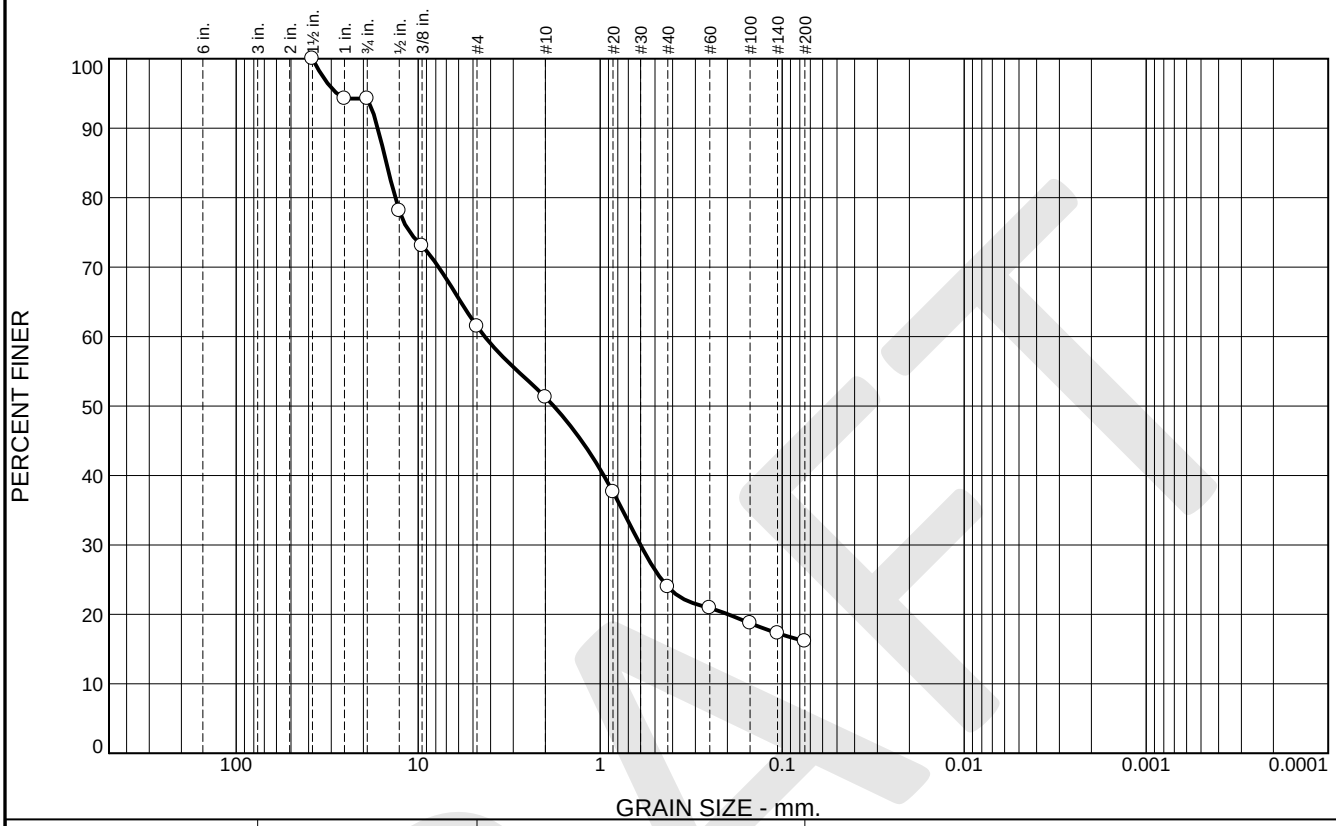
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.8	32.7	10.2	27.3	7.9	16.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	94.2		
3/4"	94.2		
1/2"	78.1		
3/8"	73.1		
#4	61.5		
#10	51.3		
#20	37.6		
#40	24.0		
#60	20.9		
#100	18.7		
#140	17.3		
#200	16.1		

* (no specification provided)

Material Description

CLAYEY SAND with GRAVEL, reddish brown

Atterberg Limits

PL= 20 LL= 35 PI= 15

Coefficients

D_{90}= 16.6598 D_{85}= 14.9360 D_{60}= 4.3079
D_{50}= 1.8005 D_{30}= 0.6005 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(0)

Remarks

Source of Sample: B9 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

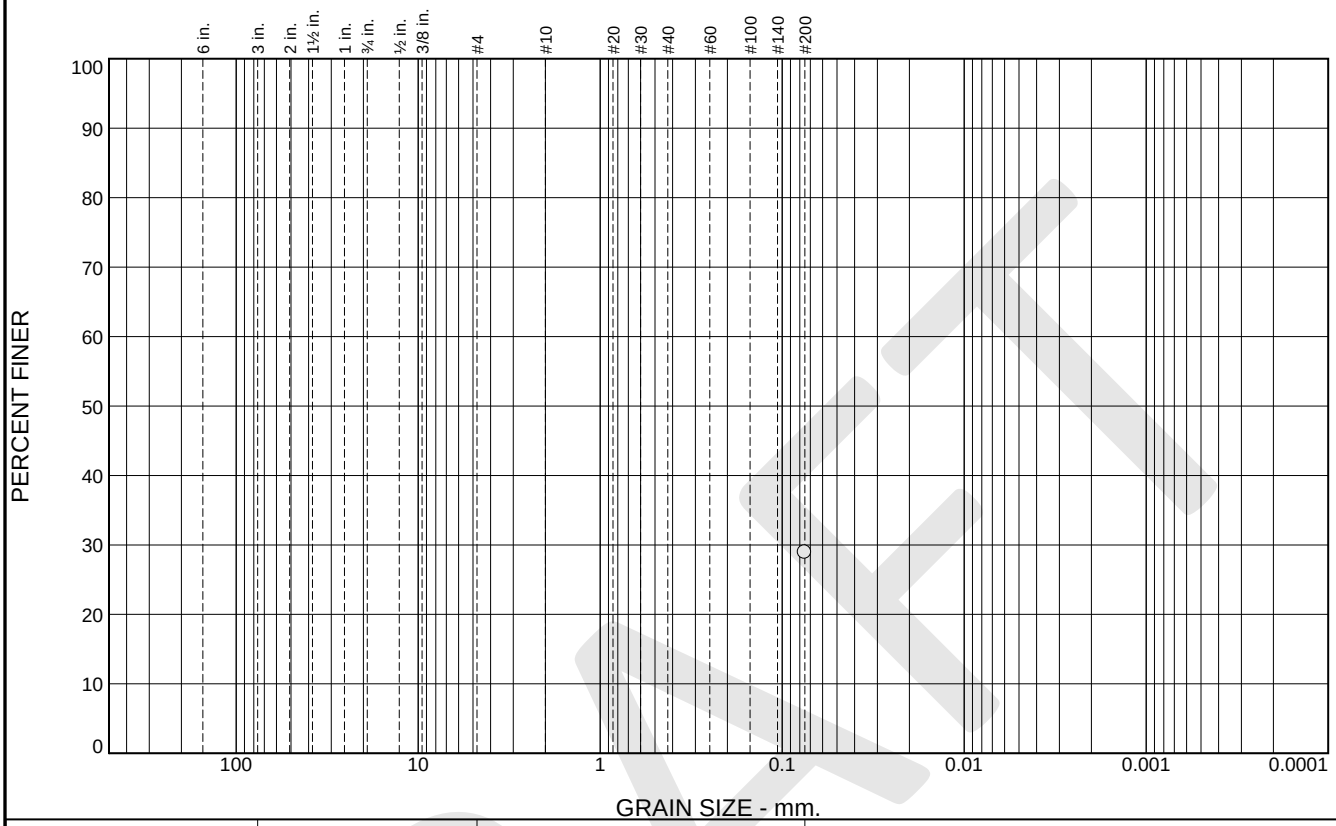
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						28.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	28.9		

* (no specification provided)

Material Description

CLAYEY SAND, strong brown

Atterberg Limits

PL= 20 LL= 43 PI= 23

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B10 **Depth:** 5.75-6.25'
Sample Number: 2C **Date:**

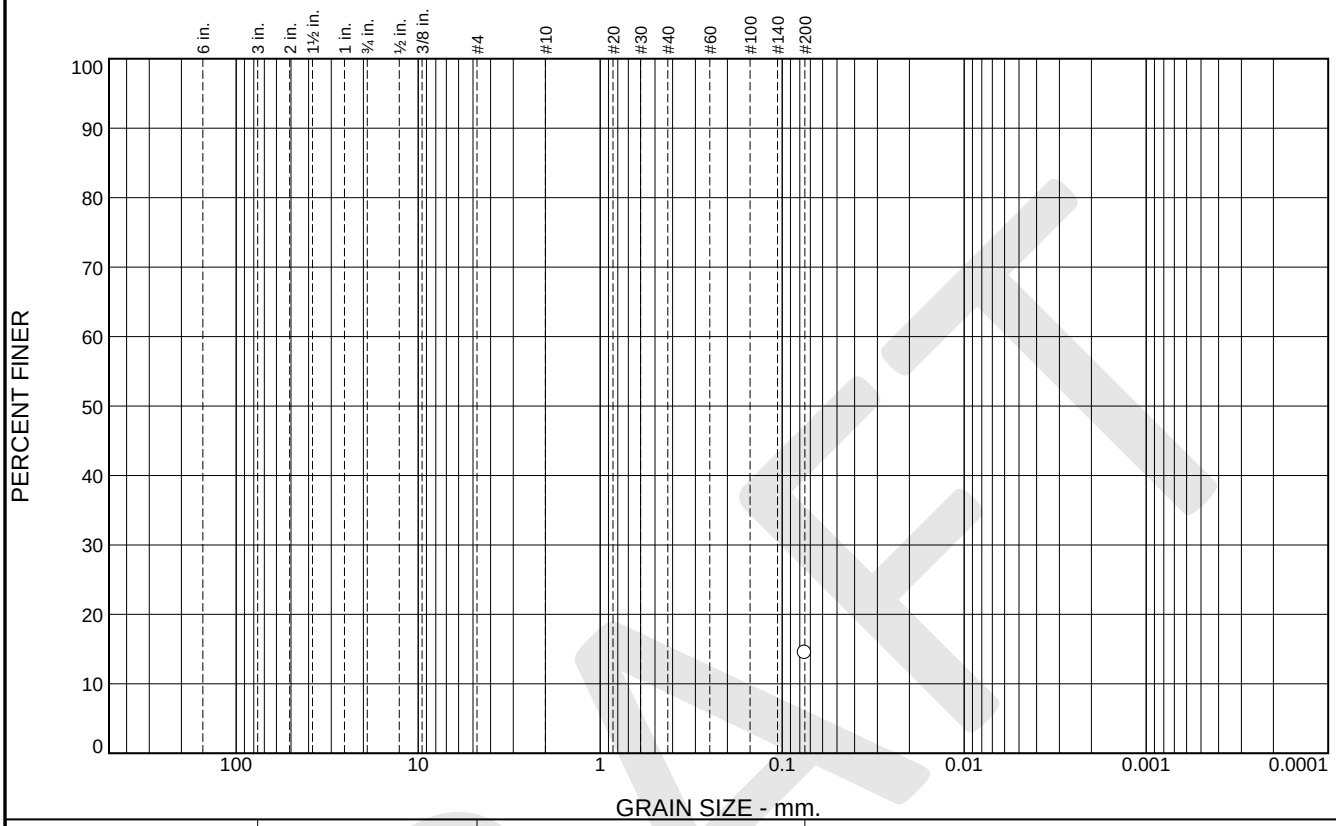
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						14.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	14.5		

* (no specification provided)

Material Description

CLAYEY SAND, strong brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B10 **Depth:** 10.25-10.75'
Sample Number: 3B **Date:**

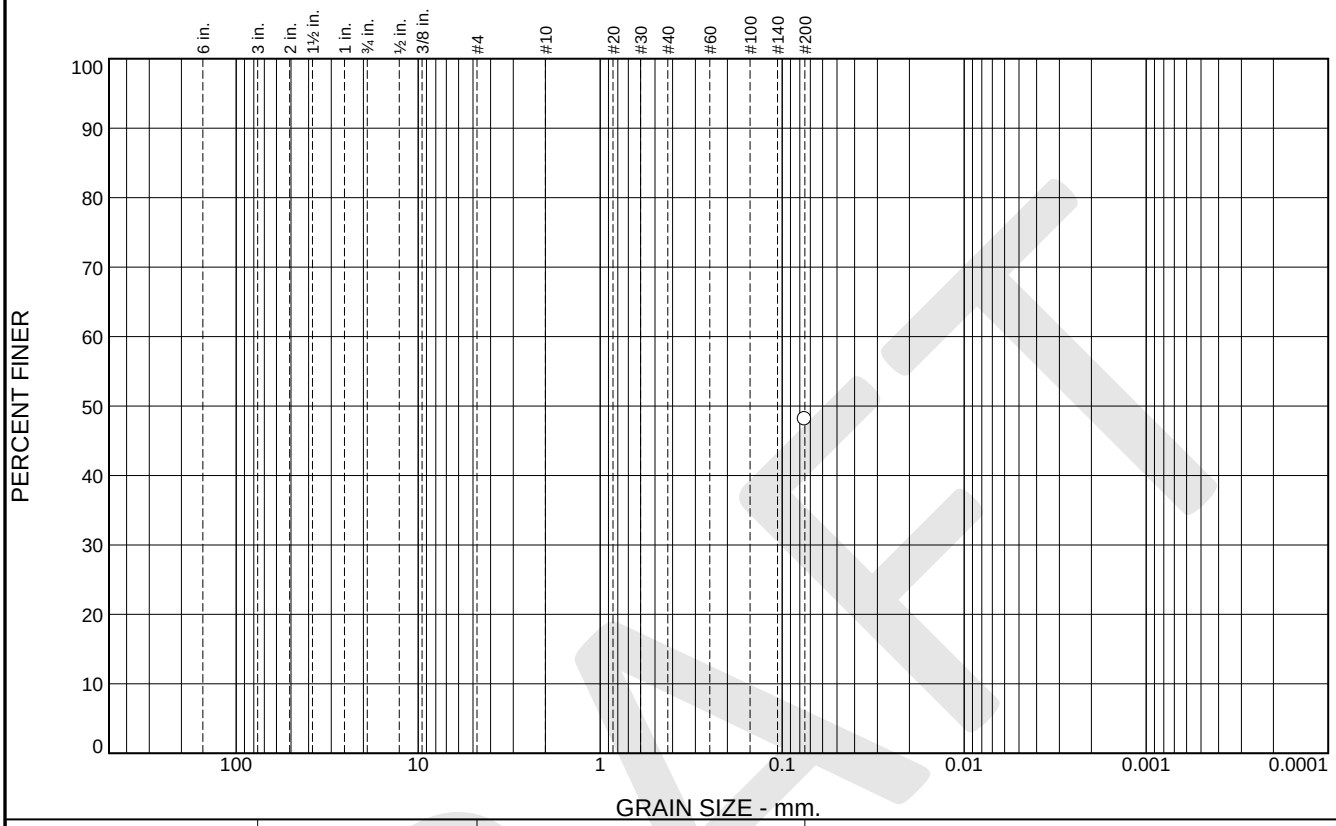
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						48.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	48.1		

* (no specification provided)

Material Description

CLAYEY SAND, yellowish red

Atterberg Limits

PL= 17 LL= 34 PI= 17

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B11 **Depth:** 1.5-2'
Sample Number: 1C **Date:**

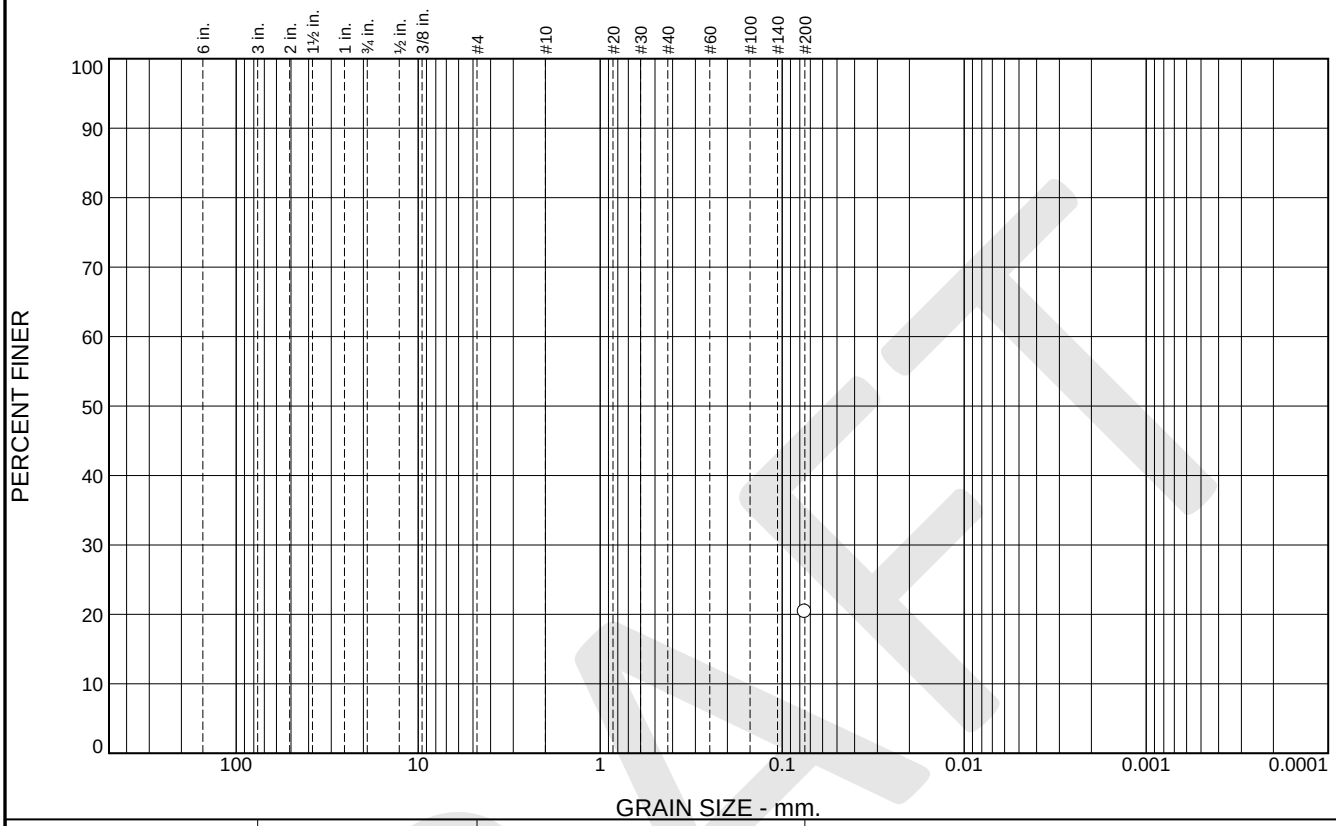
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						20.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	20.4		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: B11 **Depth:** 10.2-10.7'
Sample Number: 3B **Date:**

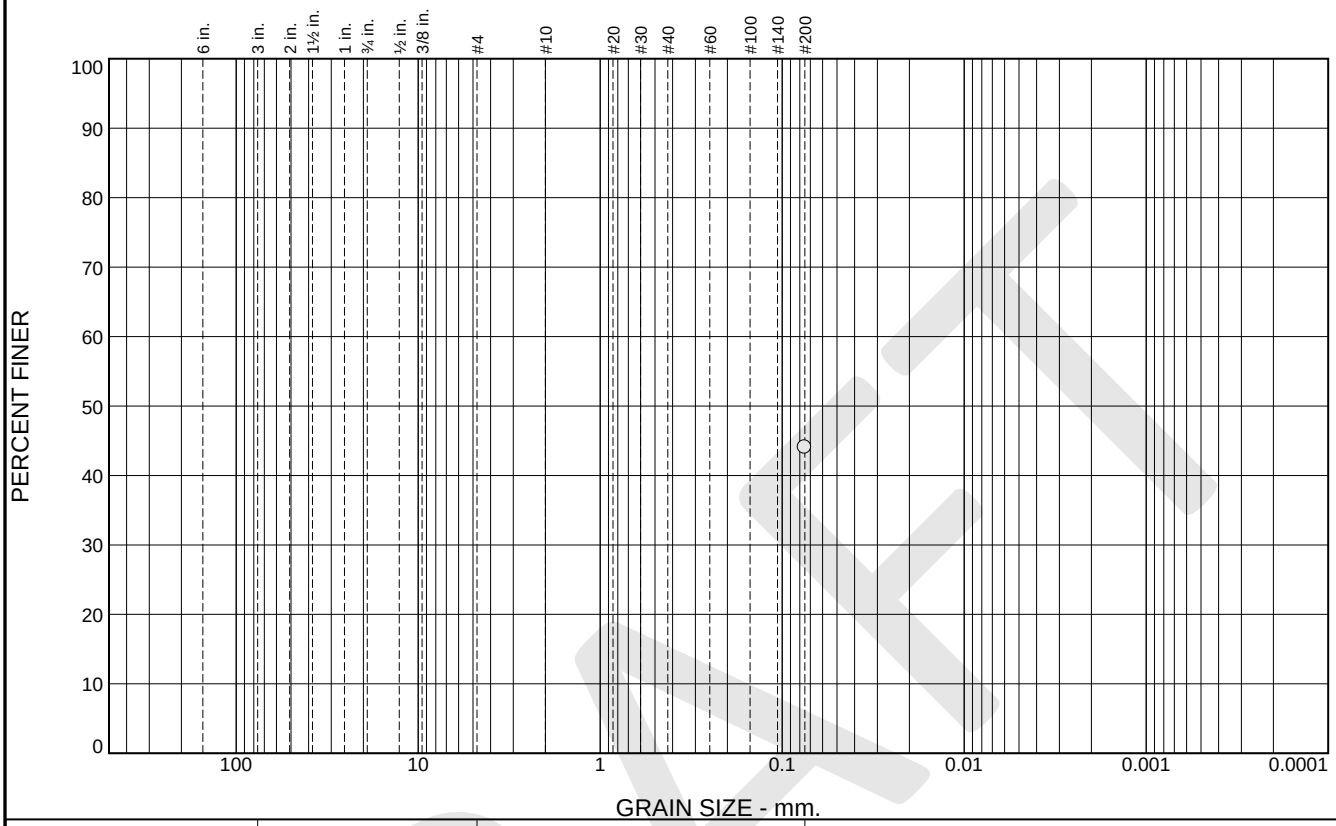
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						44.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	44.0		

* (no specification provided)

Material Description

CLAYEY SAND, strong brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B12 **Depth:** 1.3-1.8'
Sample Number: 1B **Date:**

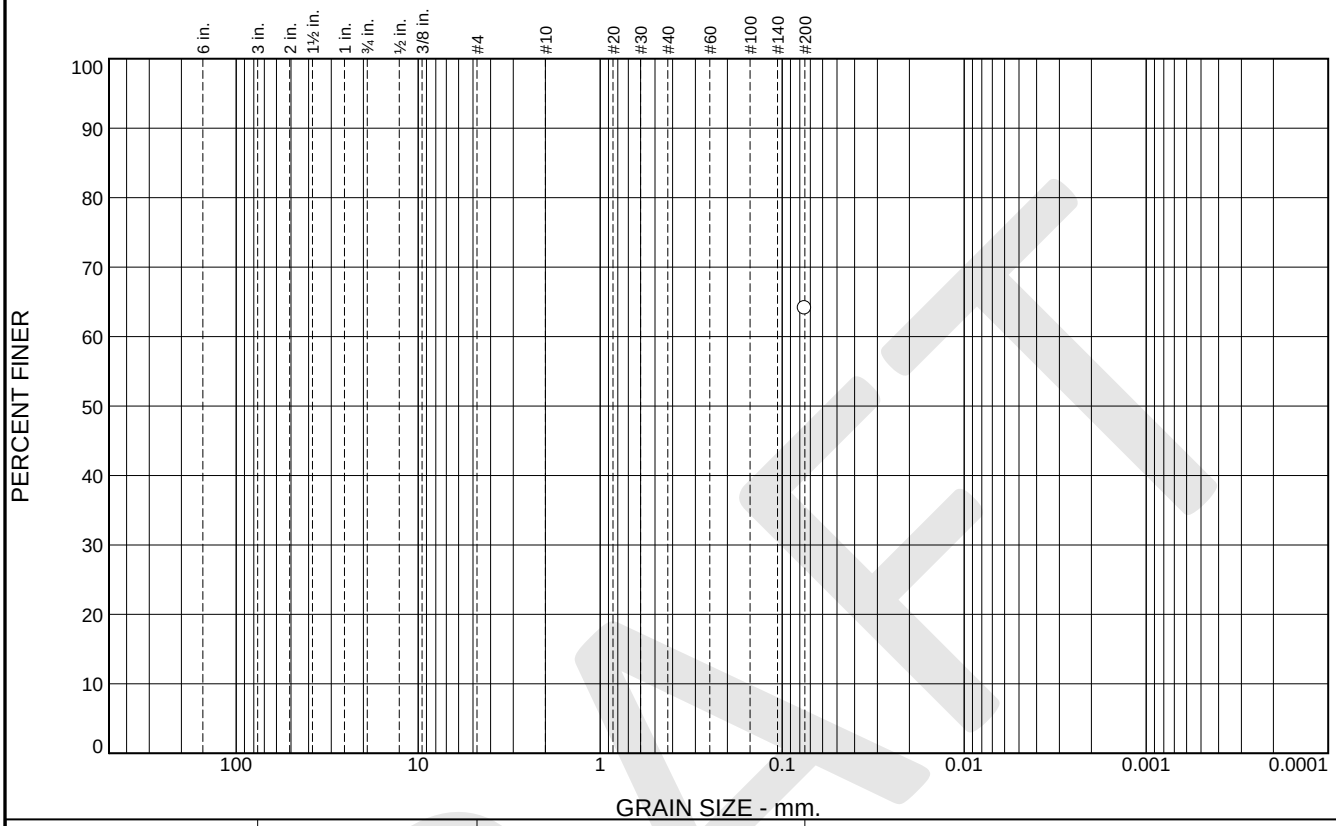
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						64.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	64.1		

* (no specification provided)

Material Description

SANDY lean CLAY, reddish yellow

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B12 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

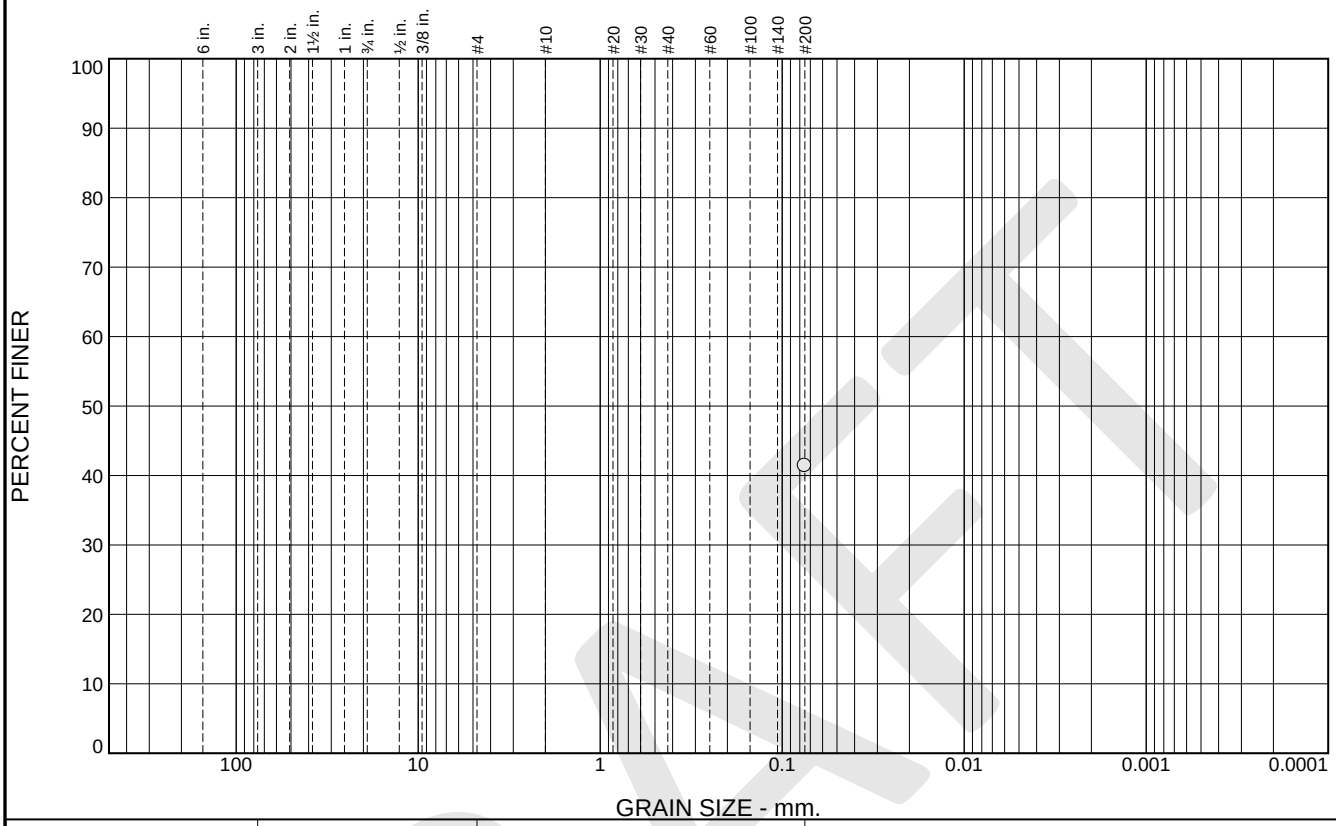
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						41.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	41.4		

* (no specification provided)

Material Description

SILT with SAND, yellowish brown

Atterberg Limits

PL= 32 LL= 38 PI= 6

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Test results incorrectly indicate the material is SILTY SAND due to strongly cemented SILT nodules retained on the #200 sieve.

Source of Sample: B12 **Depth:** 10.5-11'
Sample Number: 3C **Date:**

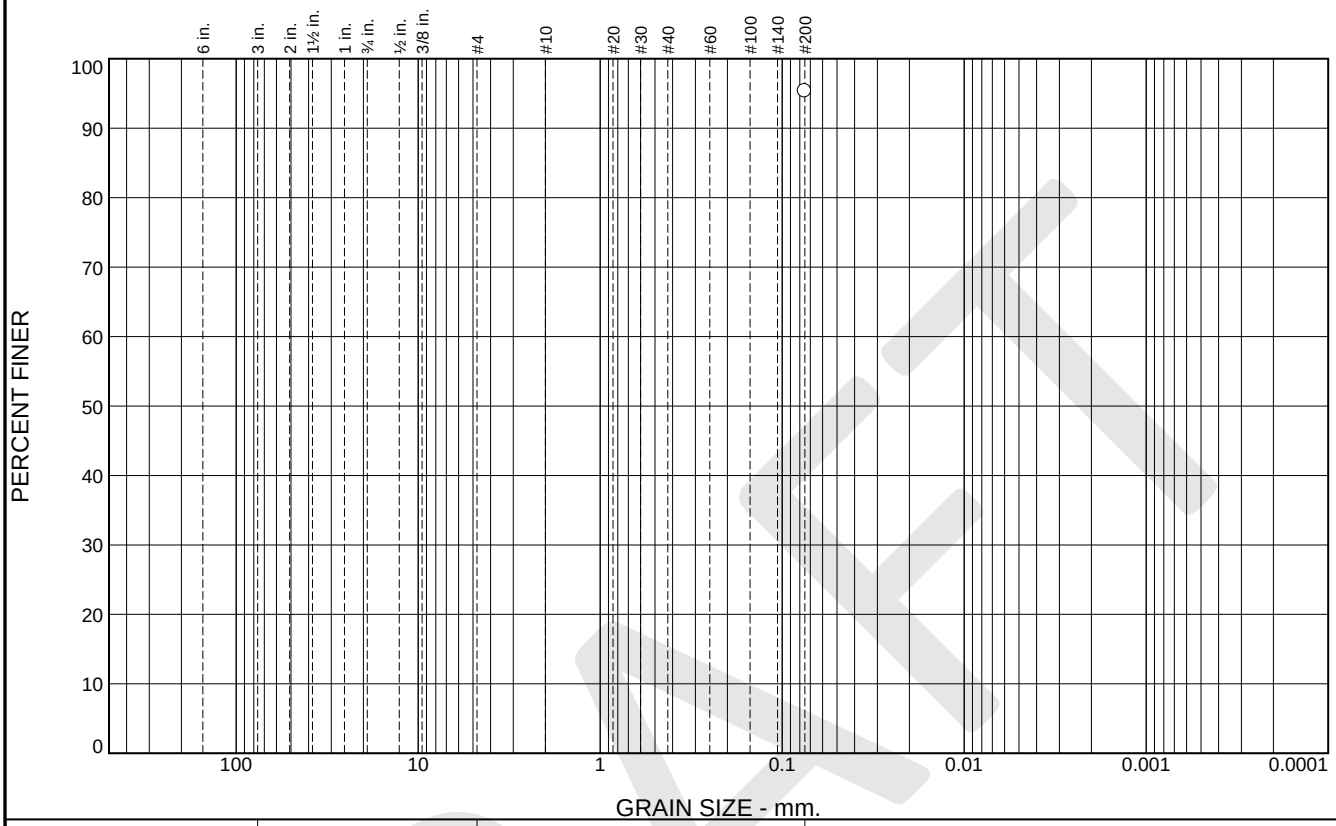
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						95.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	95.3		

* (no specification provided)

Material Description

Elastic SILT, yellowish brown

Atterberg Limits

PL= 37 LL= 53 PI= 16

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Source of Sample: B13 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

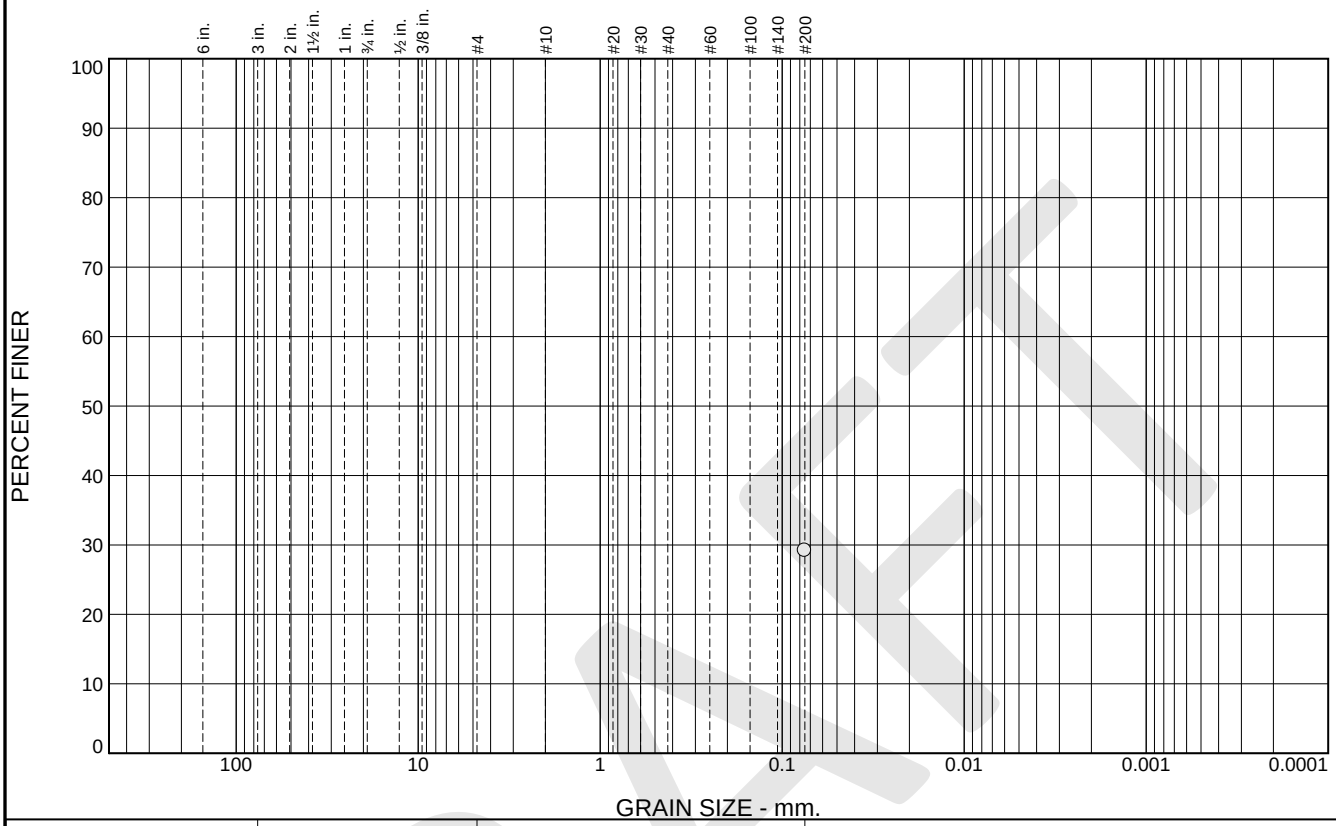
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						29.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	29.2		

* (no specification provided)

Material Description

SILTY SAND with GRAVEL, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B14
Sample Number: 1B

Date:

Blackburn Consulting

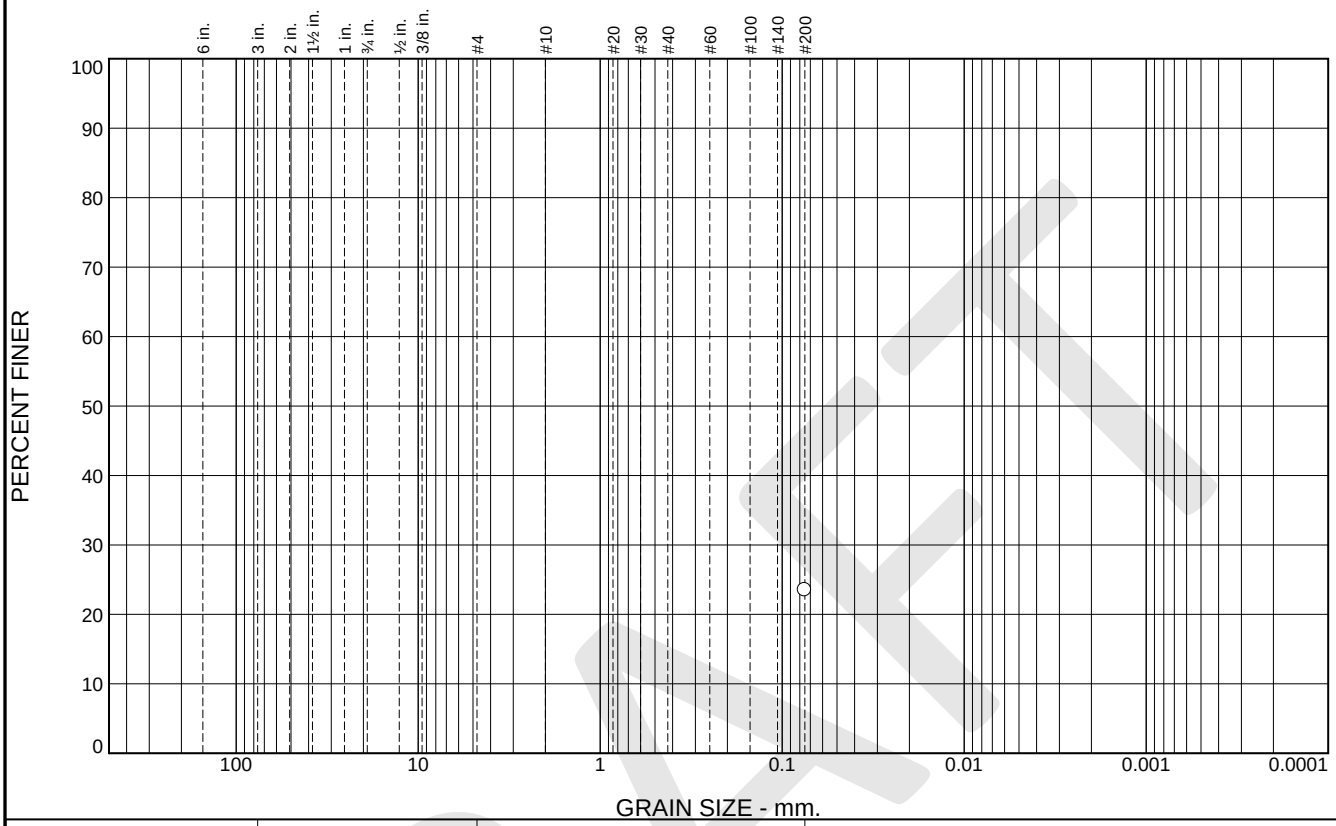
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project

Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						23.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	23.5		

* (no specification provided)

Material Description

CLAYEY SAND, brown

Atterberg Limits

PL= 27 LL= 57 PI= 30

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B15 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

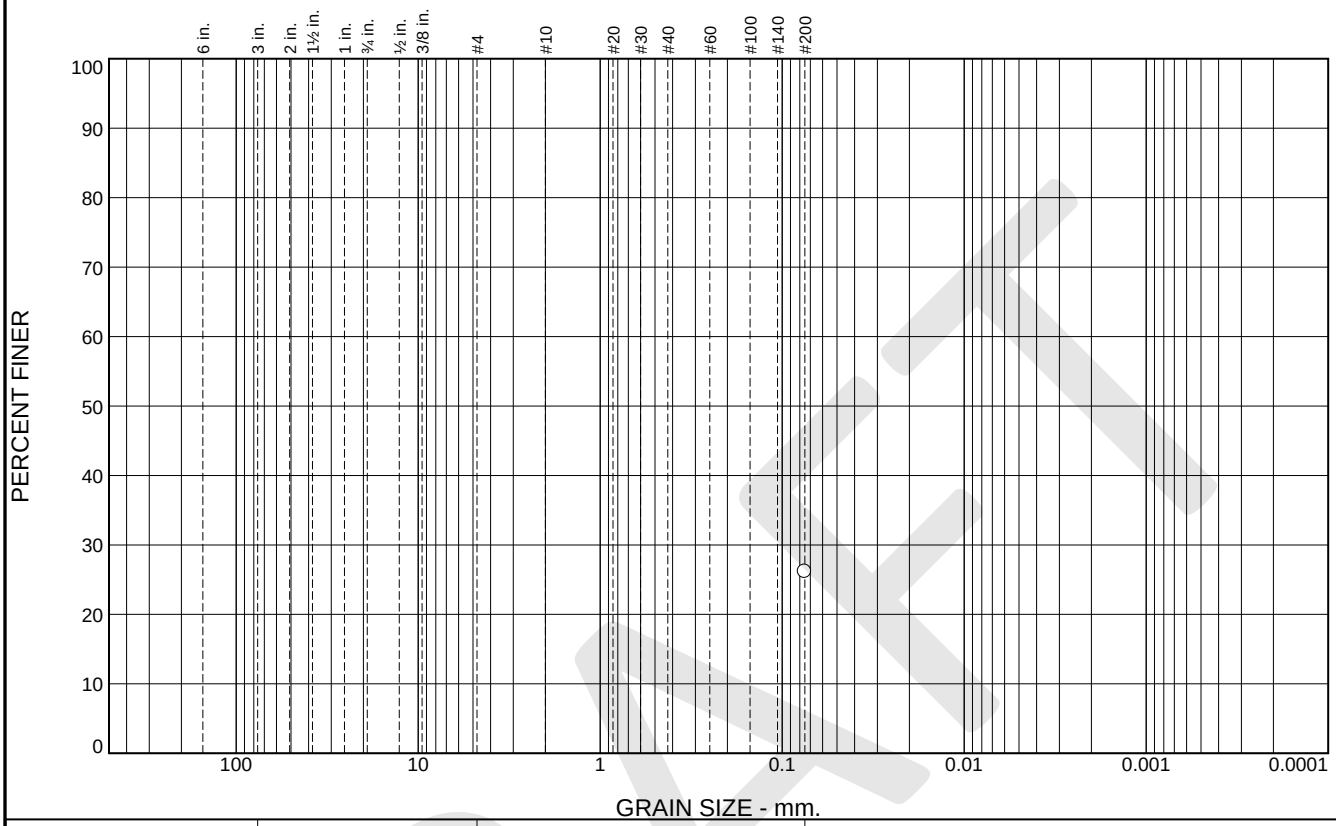
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						26.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	26.2		

* (no specification provided)

Material Description

SILTY SAND, dark brown

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B16 **Depth:** 10-10.5'
Sample Number: 3C **Date:**

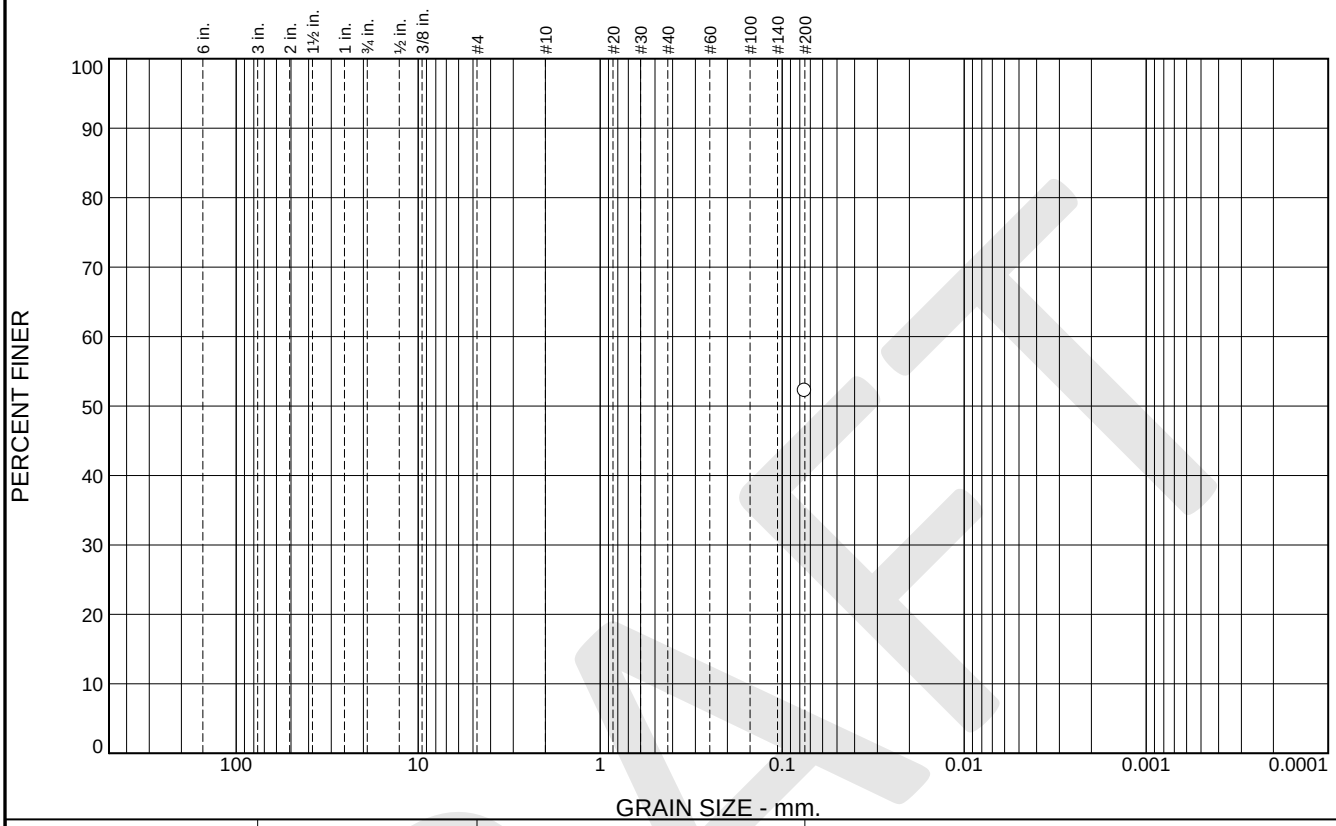
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						52.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	52.2		

* (no specification provided)

Material Description

SANDY SILT, dark yellowish brown

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B17 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

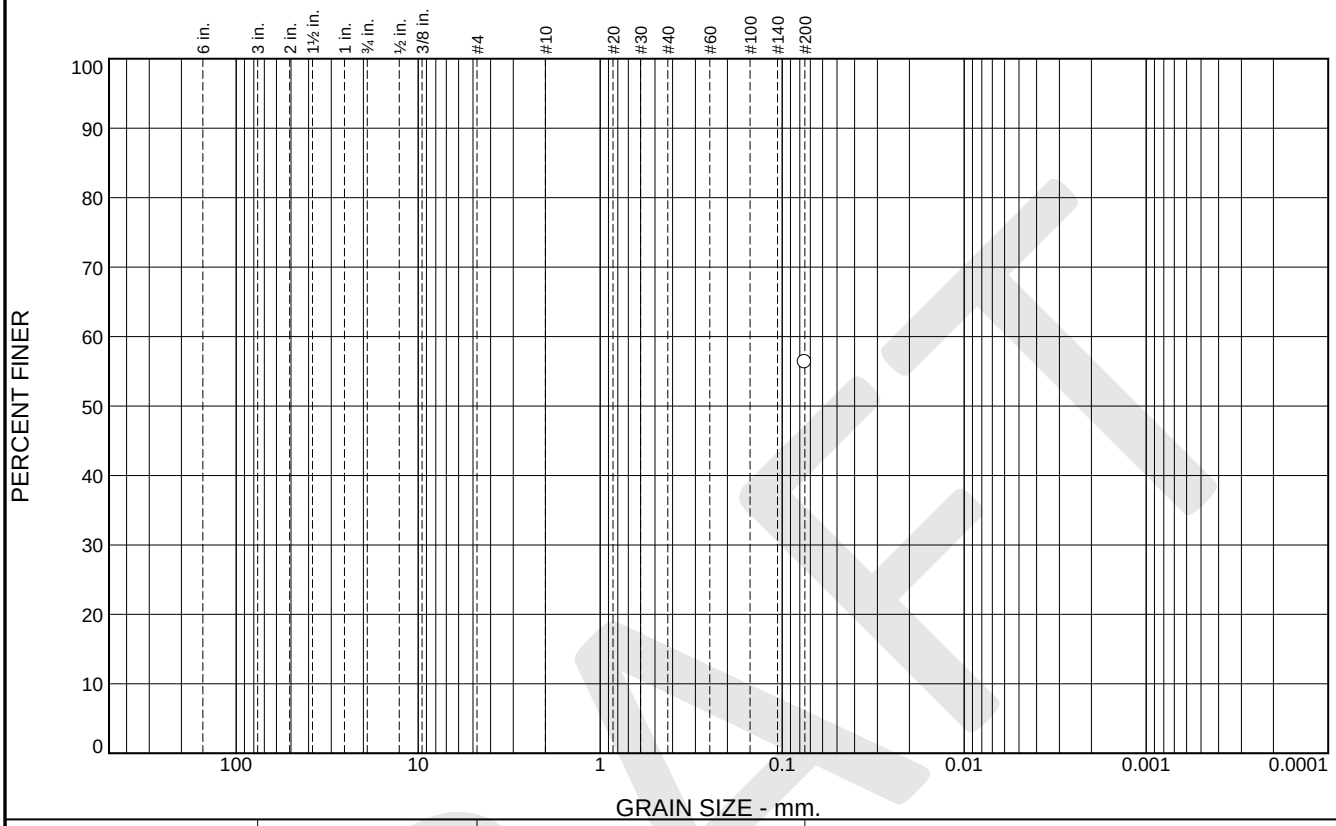
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						56.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	56.3		

* (no specification provided)

Material Description

SANDY lean CLAY, yellowish red

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B18 **Depth:** 5.5-6'
Sample Number: 2B **Date:**

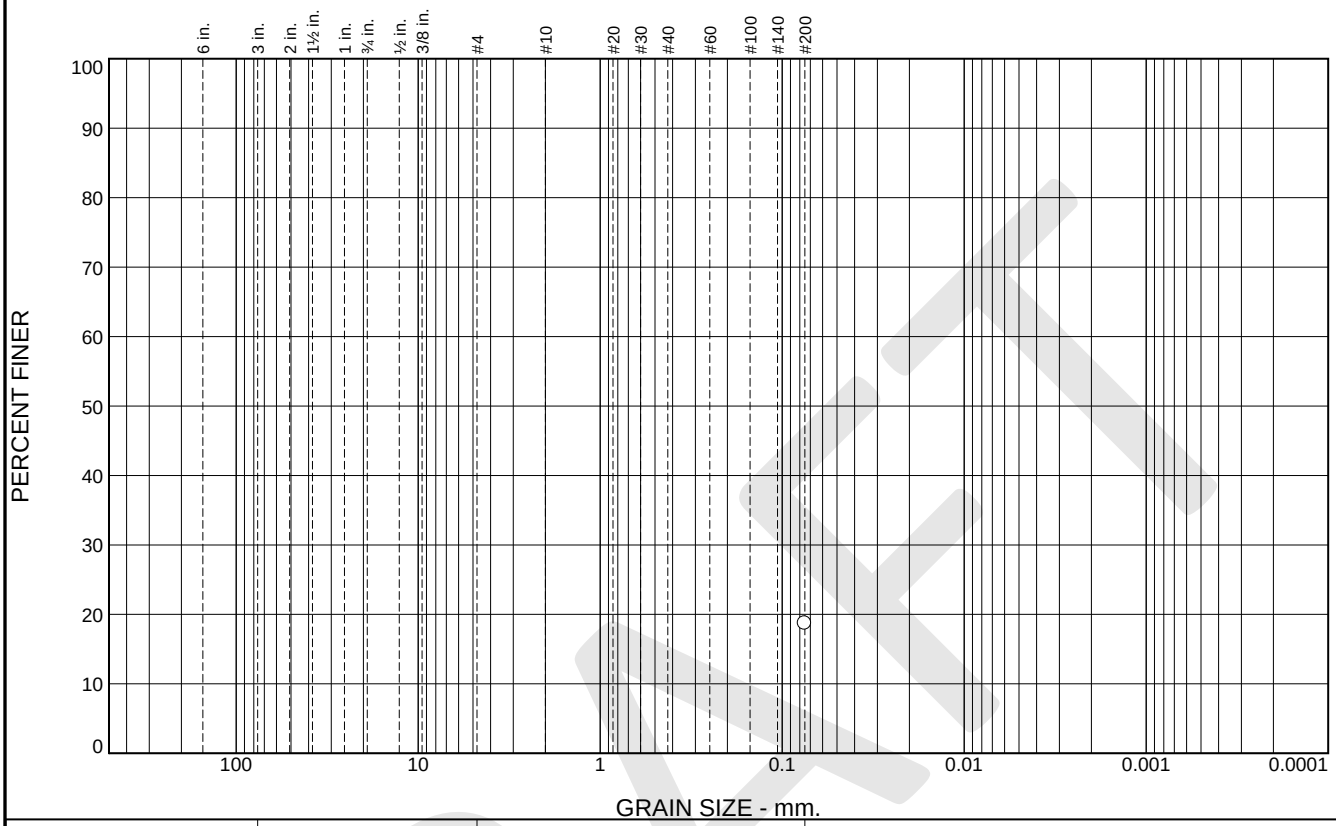
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						18.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	18.7		

* (no specification provided)

Material Description

SILTY SAND, dark reddish brown

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B18 **Depth:** 10.5-11'
Sample Number: 3B **Date:**

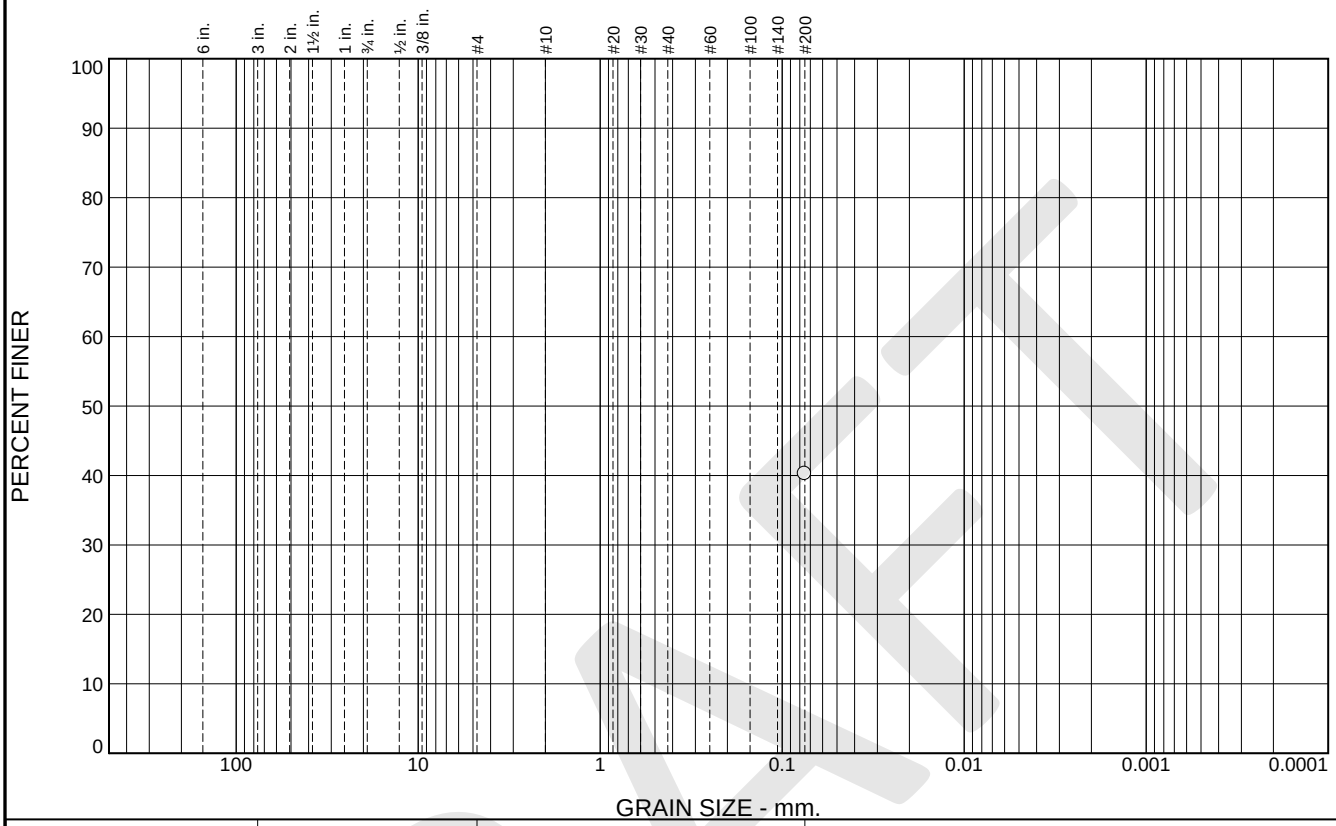
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						40.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	40.2		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= 17 LL= 30 PI= 13

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B19 **Depth:** 5.8-6.3'
Sample Number: 2C **Date:**

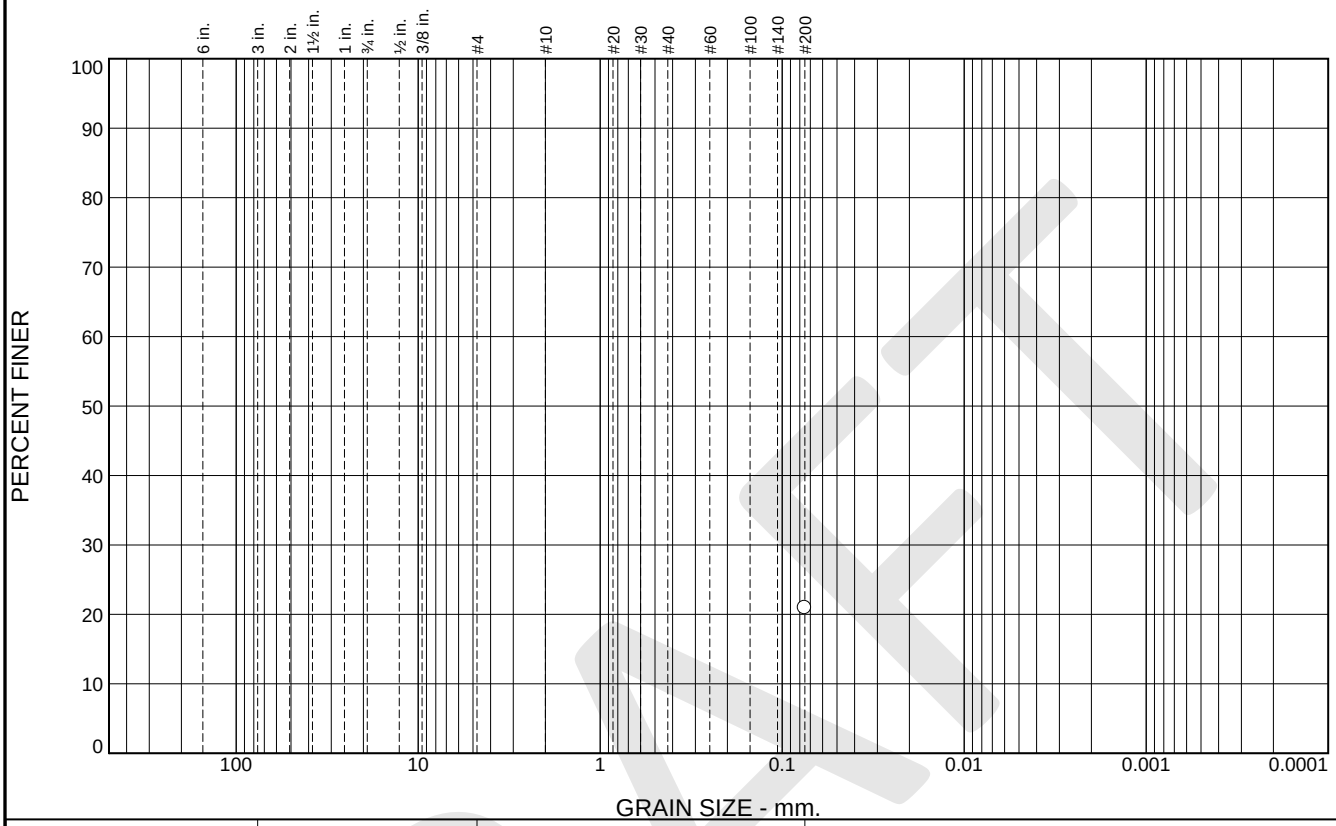
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						20.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	20.9		

* (no specification provided)

Material Description

SILTY SAND, dark reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B19 **Depth:** 10.3-10.8'
Sample Number: 3C **Date:**

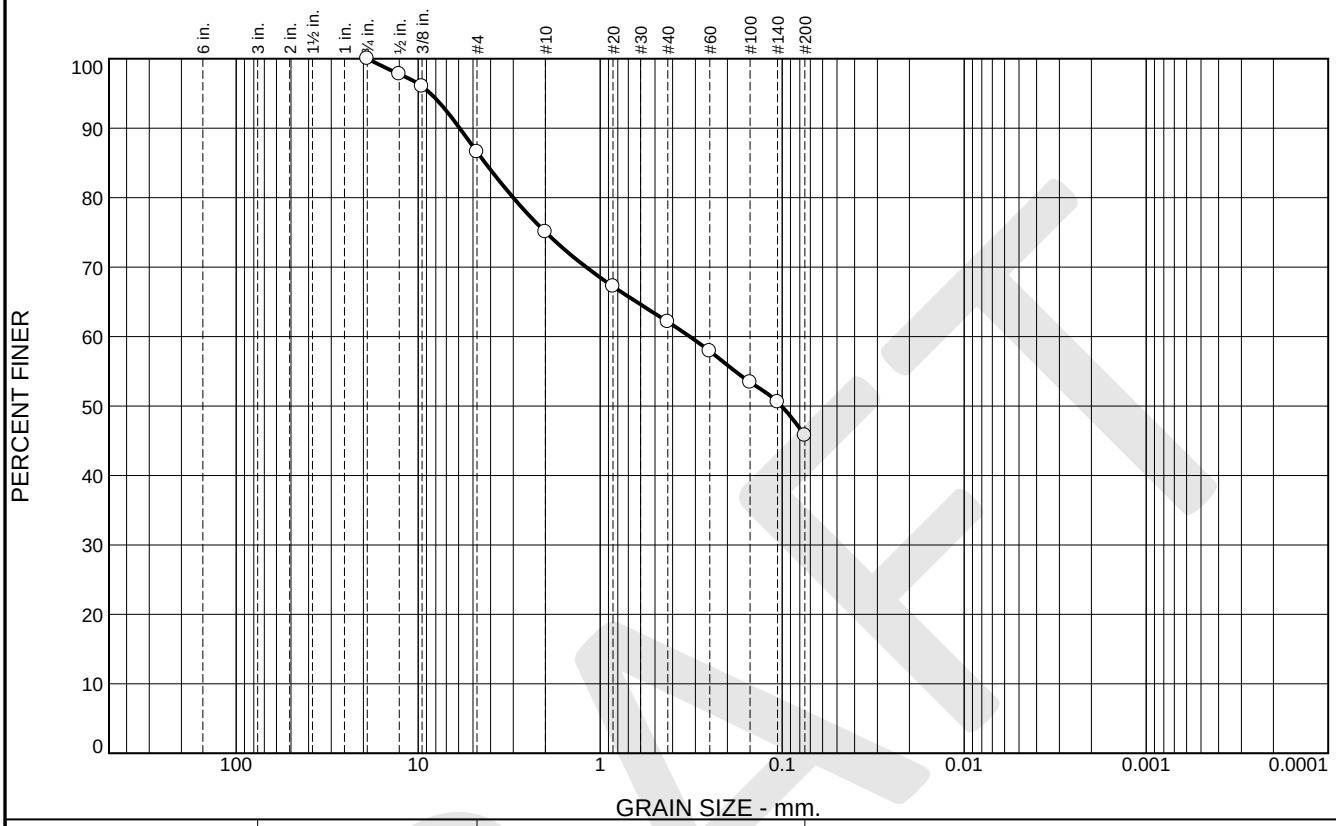
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.4	11.5	13.0	16.3	45.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	97.8		
3/8"	96.0		
#4	86.6		
#10	75.1		
#20	67.2		
#40	62.1		
#60	57.9		
#100	53.4		
#140	50.6		
#200	45.8		

* (no specification provided)

Material Description

SILTY SAND, yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 5.9157 D_{85}= 4.2813 D_{60}= 0.3216
D_{50}= 0.1008 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B23 **Depth:** 2-2.5'
Sample Number: 1C **Date:**

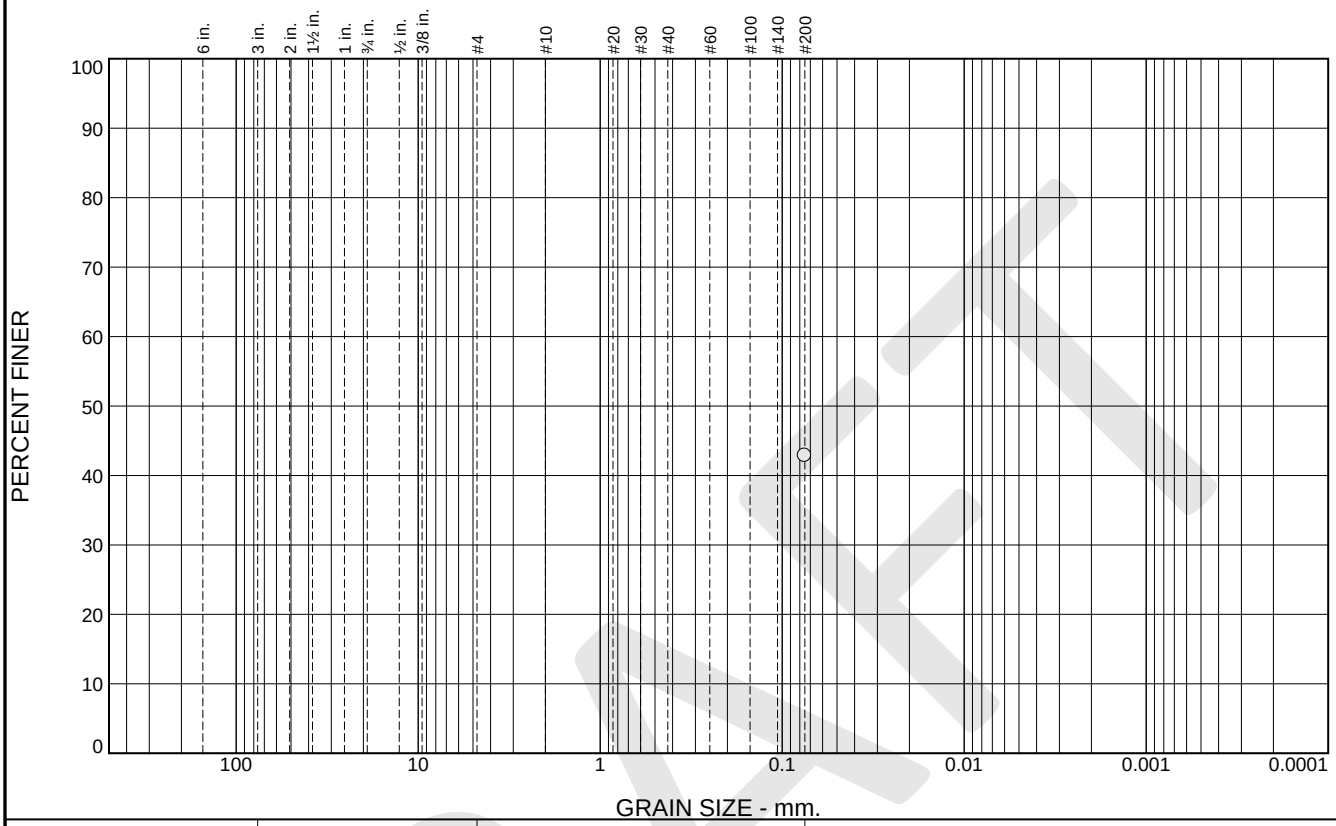
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						42.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	42.9		

* (no specification provided)

Material Description

CLAYEY SAND, yellowish red

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B24 **Depth:** 1.5-2'
Sample Number: 1C **Date:**

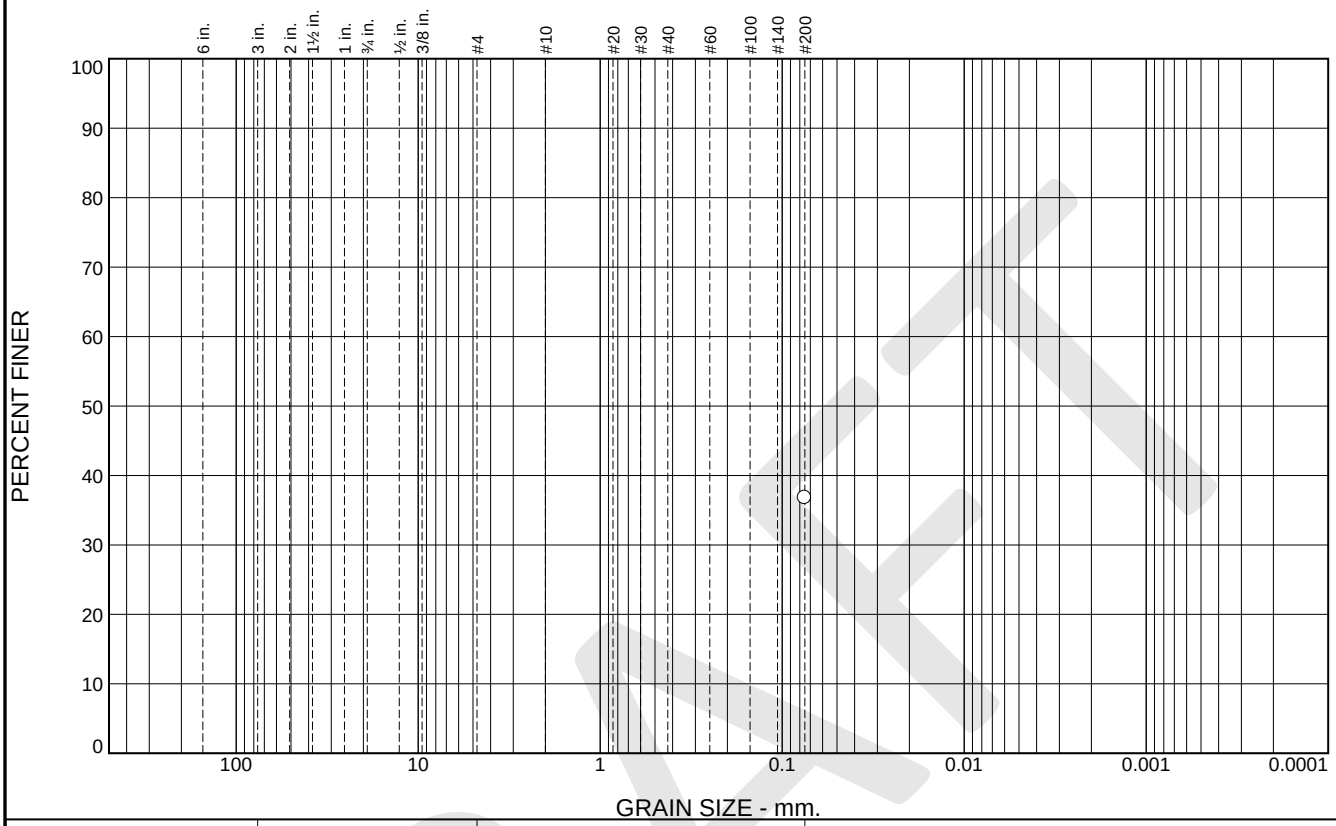
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						36.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	36.8		

* (no specification provided)

Material Description

CLAYEY SAND, reddish yellow

Atterberg Limits

PL= 15 LL= 41 PI= 26

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B25 **Depth:** 5.8-6.3'
Sample Number: 2C **Date:**

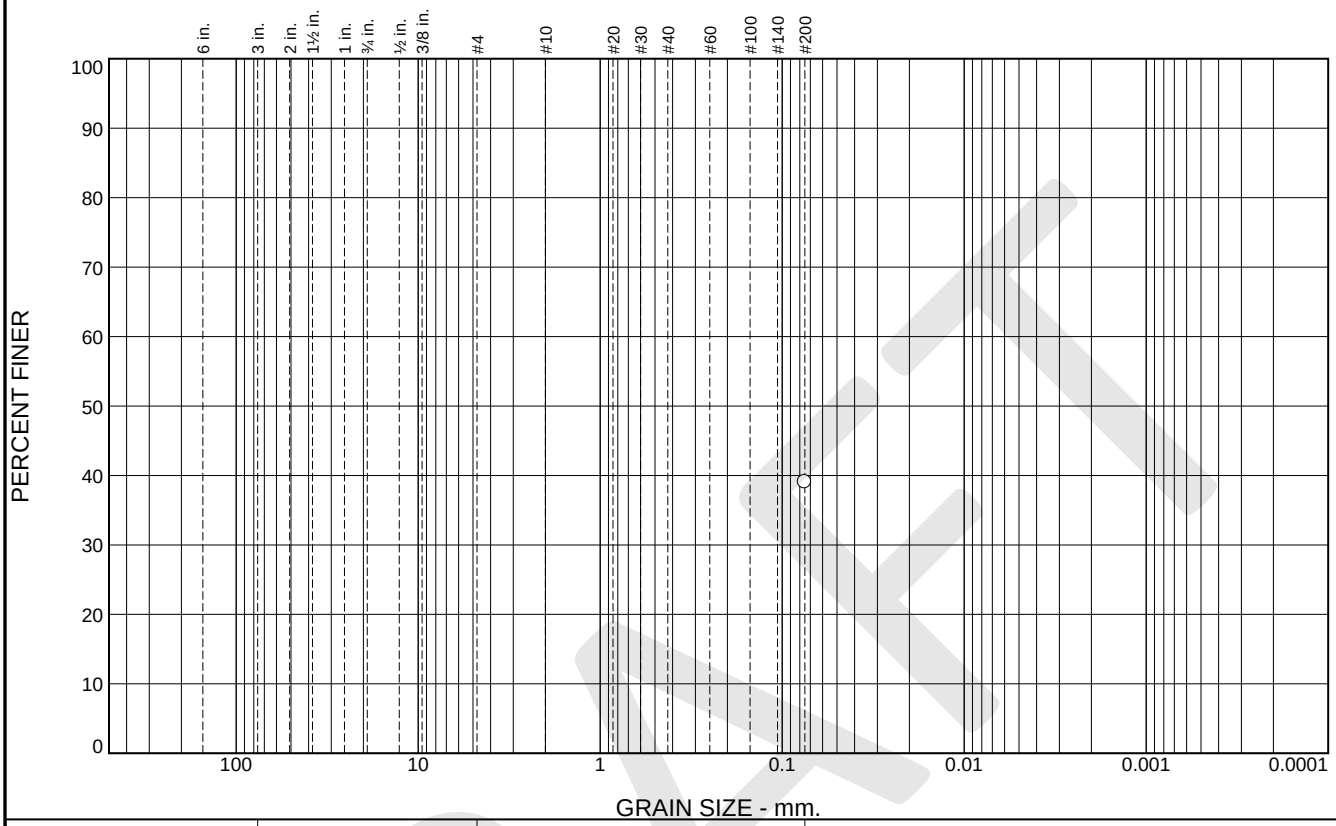
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						39.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	39.1		

* (no specification provided)

Material Description

SILTY, CLAYEY SAND, dark brown

Atterberg Limits

PL= 16 LL= 23 PI= 7

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO=

Remarks

Source of Sample: B26 **Depth:** 2.5-3'
Sample Number: 1C **Date:**

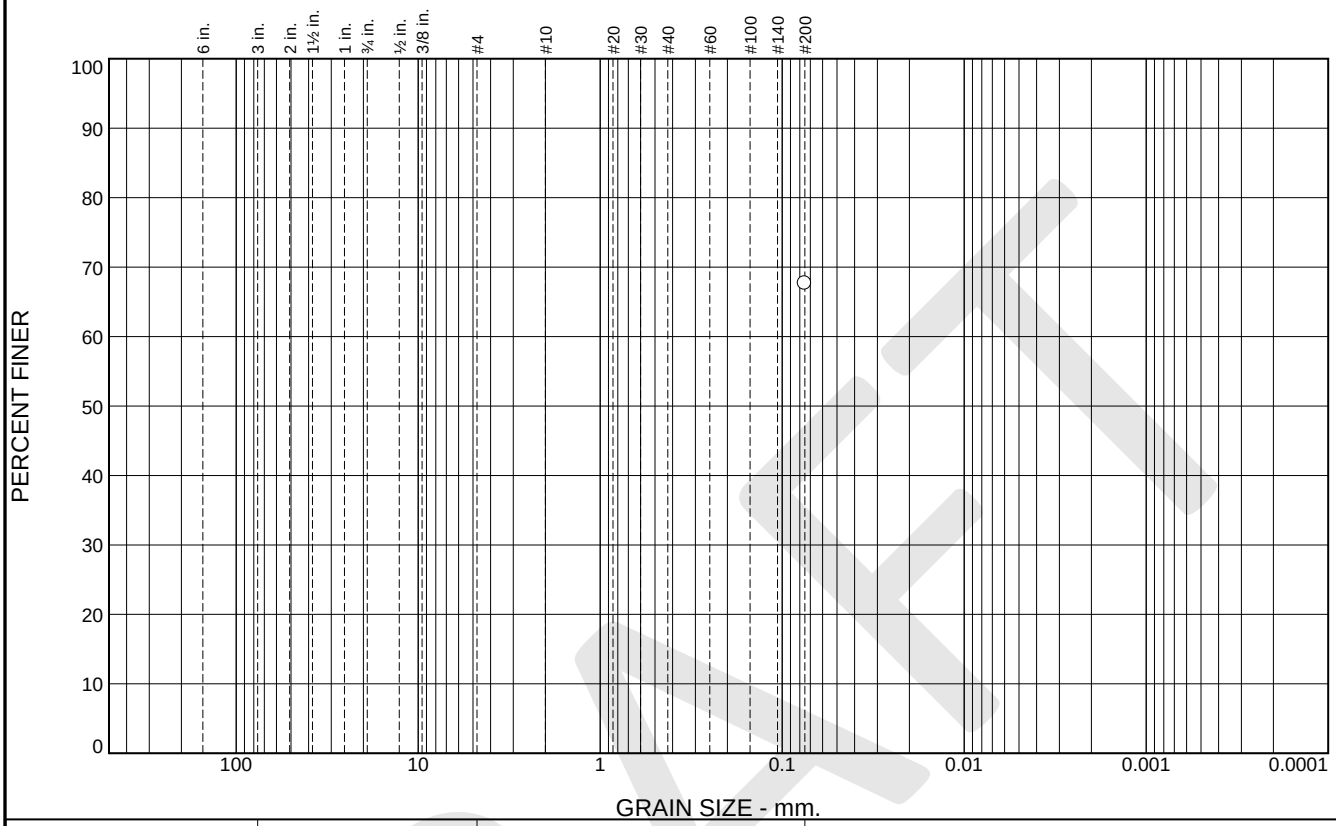
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						67.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	67.7		

* (no specification provided)

Material Description

SANDY lean CLAY, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B27 **Depth:** 5-5.5'
Sample Number: 2C **Date:**

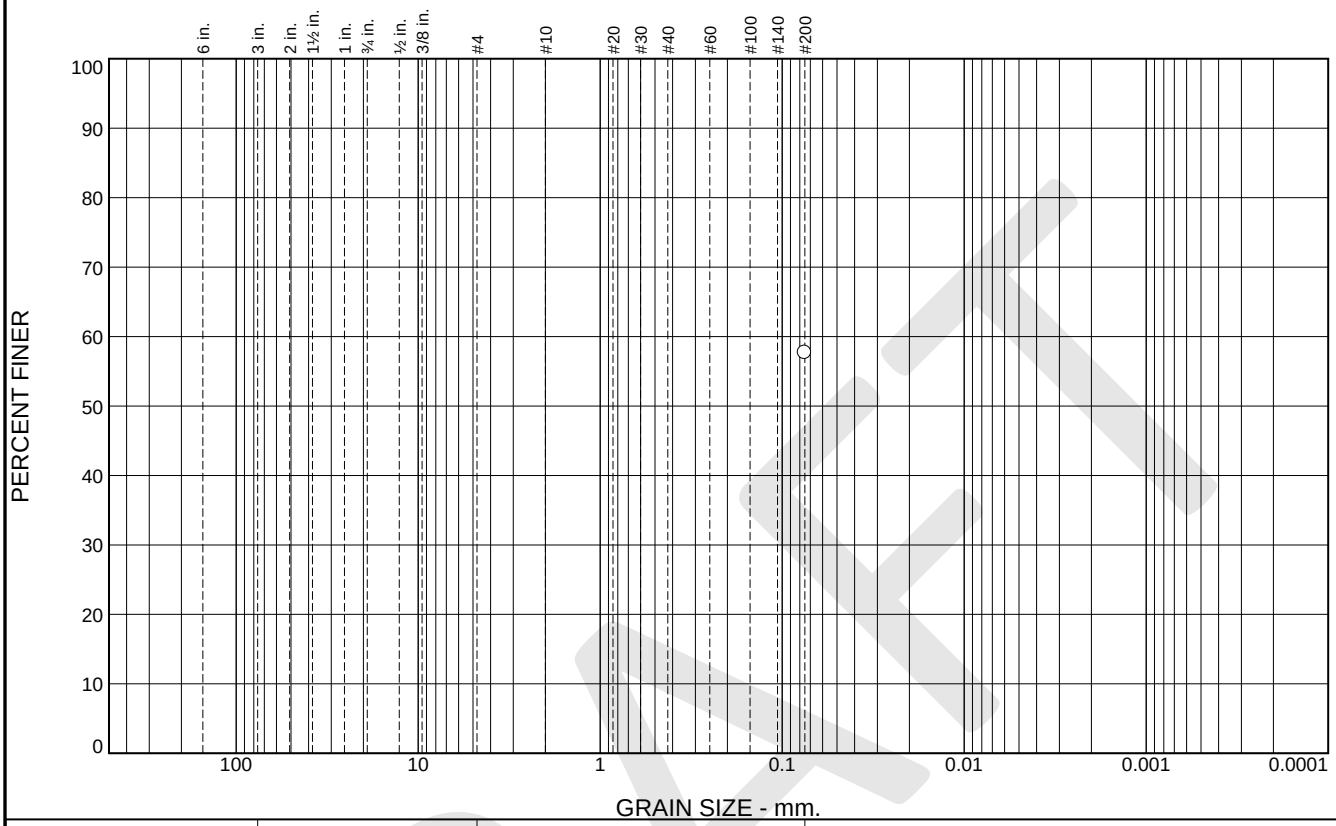
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						57.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	57.7		

* (no specification provided)

Material Description

SANDY lean CLAY, strong brown

Atterberg Limits

PL= 18 LL= 39 PI= 21

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B28 **Depth:** 2.8-3.3'
Sample Number: 1C **Date:**

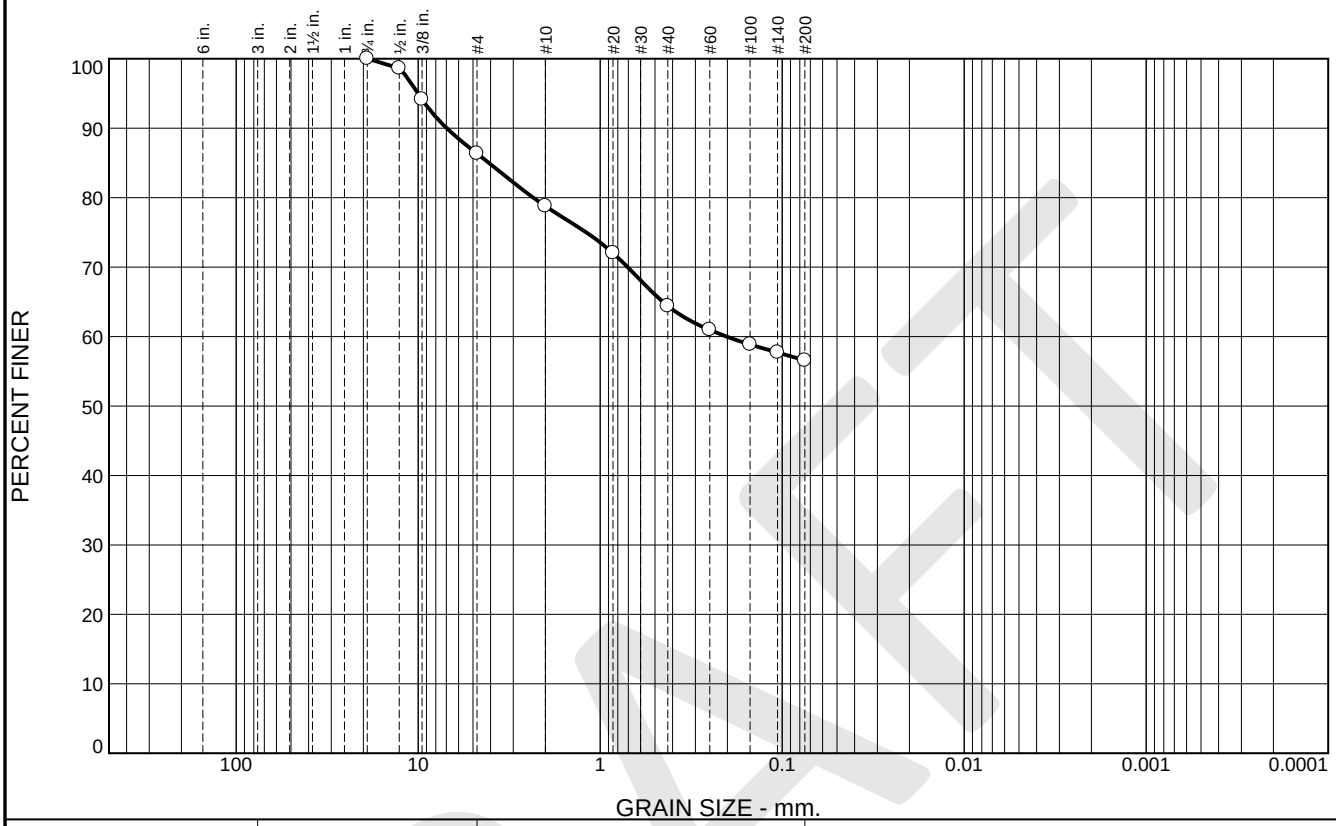
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.6	7.6	14.4	7.8	56.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.6		
3/8"	94.1		
#4	86.4		
#10	78.8		
#20	72.0		
#40	64.4		
#60	61.0		
#100	58.8		
#140	57.7		
#200	56.6		

* (no specification provided)

Material Description

SANDY lean CLAY, yellowish red

Atterberg Limits

PL= 21 LL= 46 PI= 25

Coefficients

D_{90}= 6.9731 D_{85}= 4.0900 D_{60}= 0.2022
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(11)

Remarks

Source of Sample: B29 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

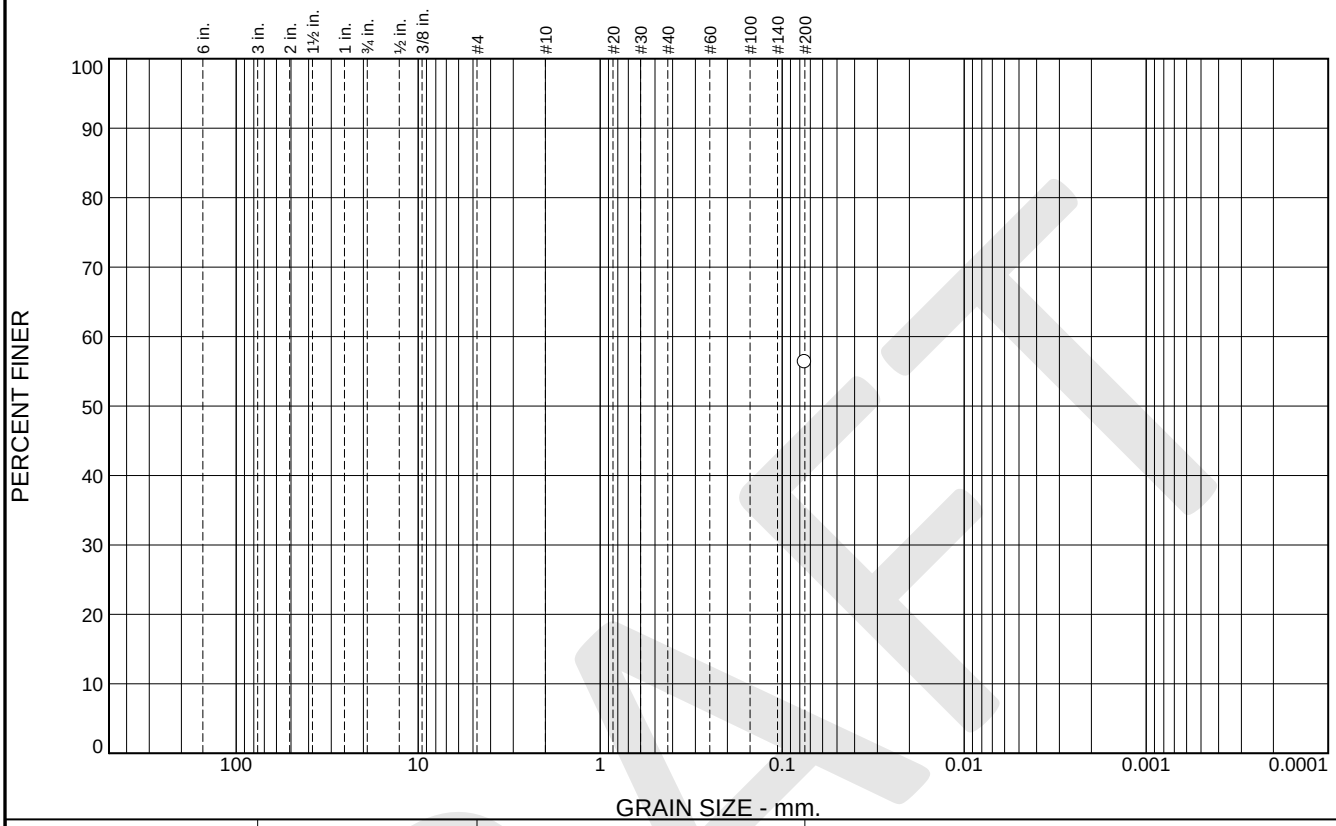
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						56.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	56.3		

* (no specification provided)

Material Description

SANDY lean CLAY, brown

Atterberg Limits

PL= 16 LL= 31 PI= 15

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B30 **Depth:** 6-6.5'
Sample Number: 2C **Date:**

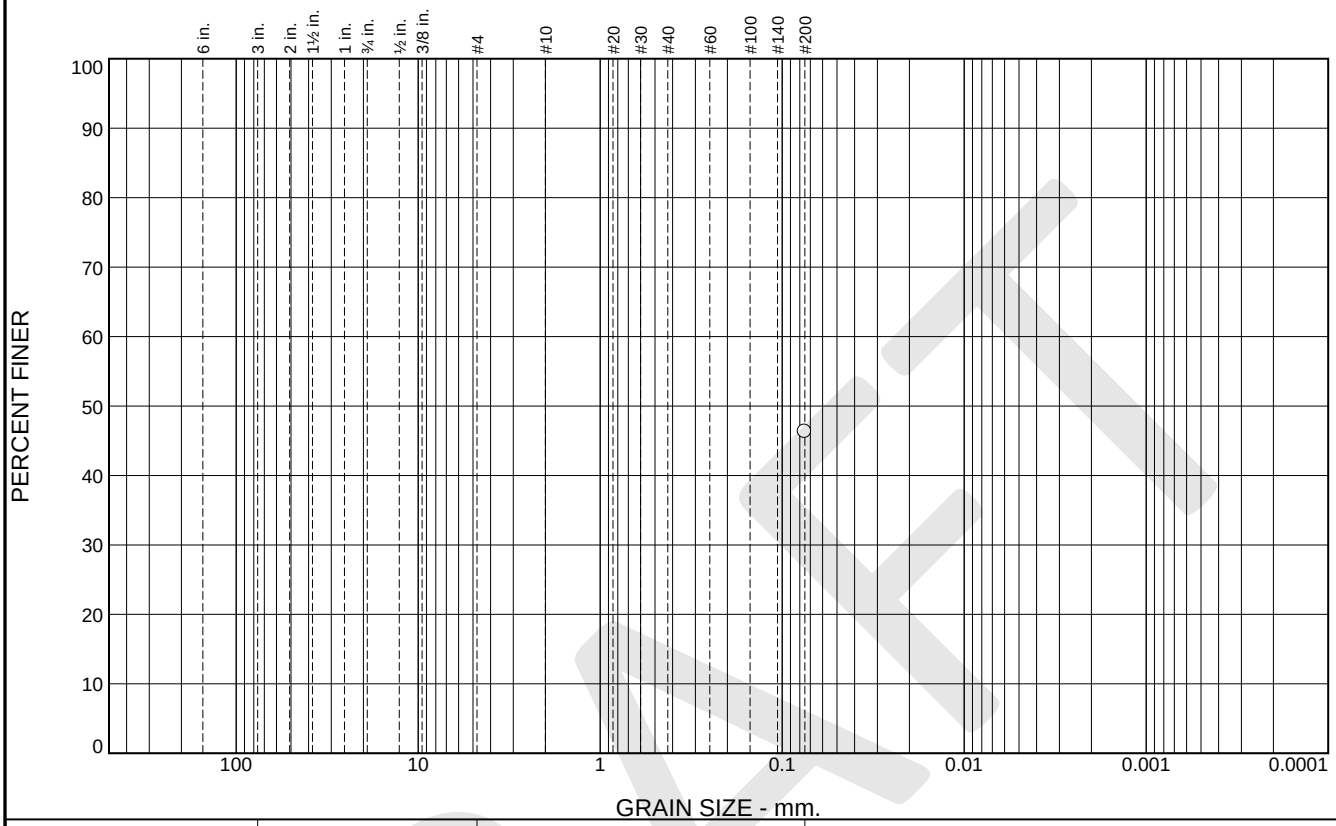
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						46.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	46.3		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B30 **Depth:** 10.8-11.3'
Sample Number: 3C **Date:**

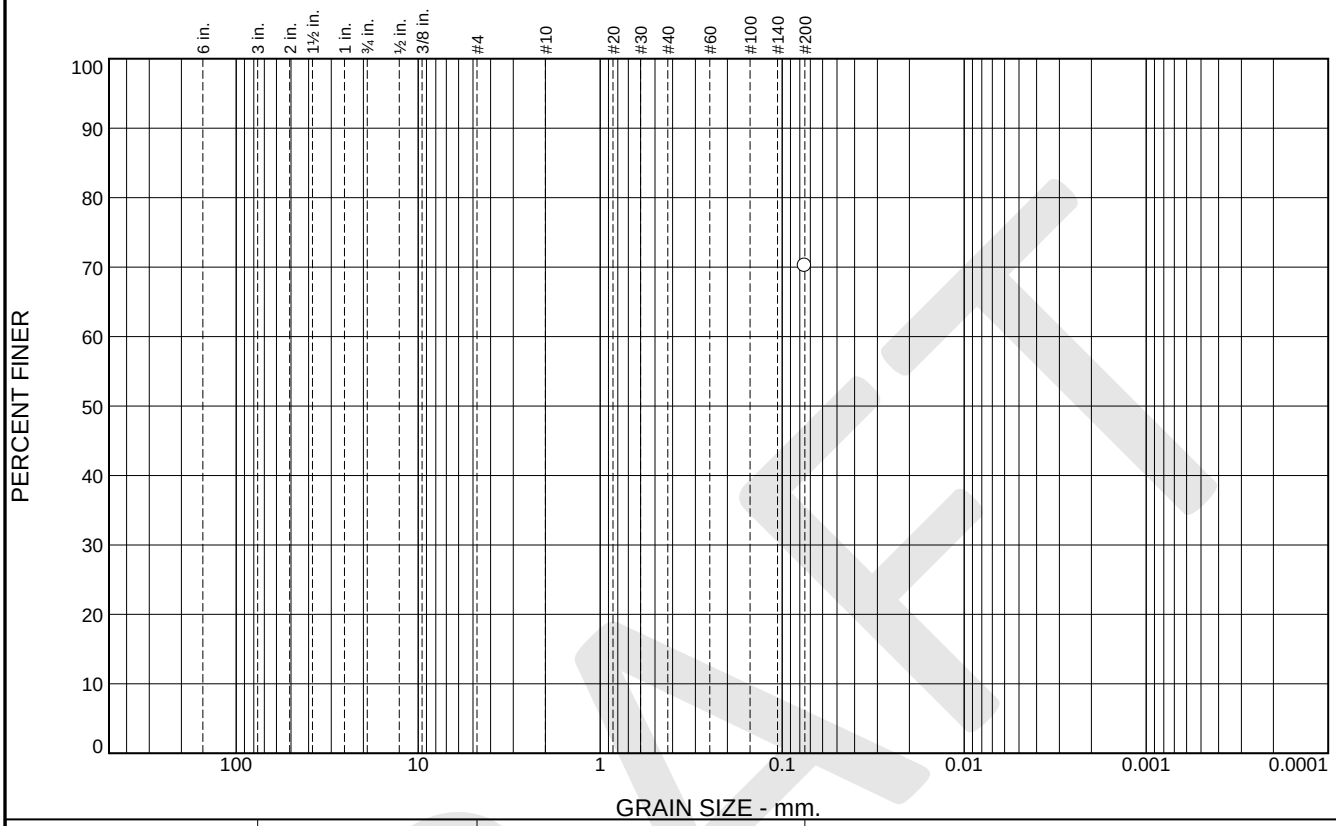
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						70.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	70.2		

* (no specification provided)

Material Description

Lean CLAY with SAND, brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B32 **Depth:** 3-3.5'
Sample Number: 1C **Date:**

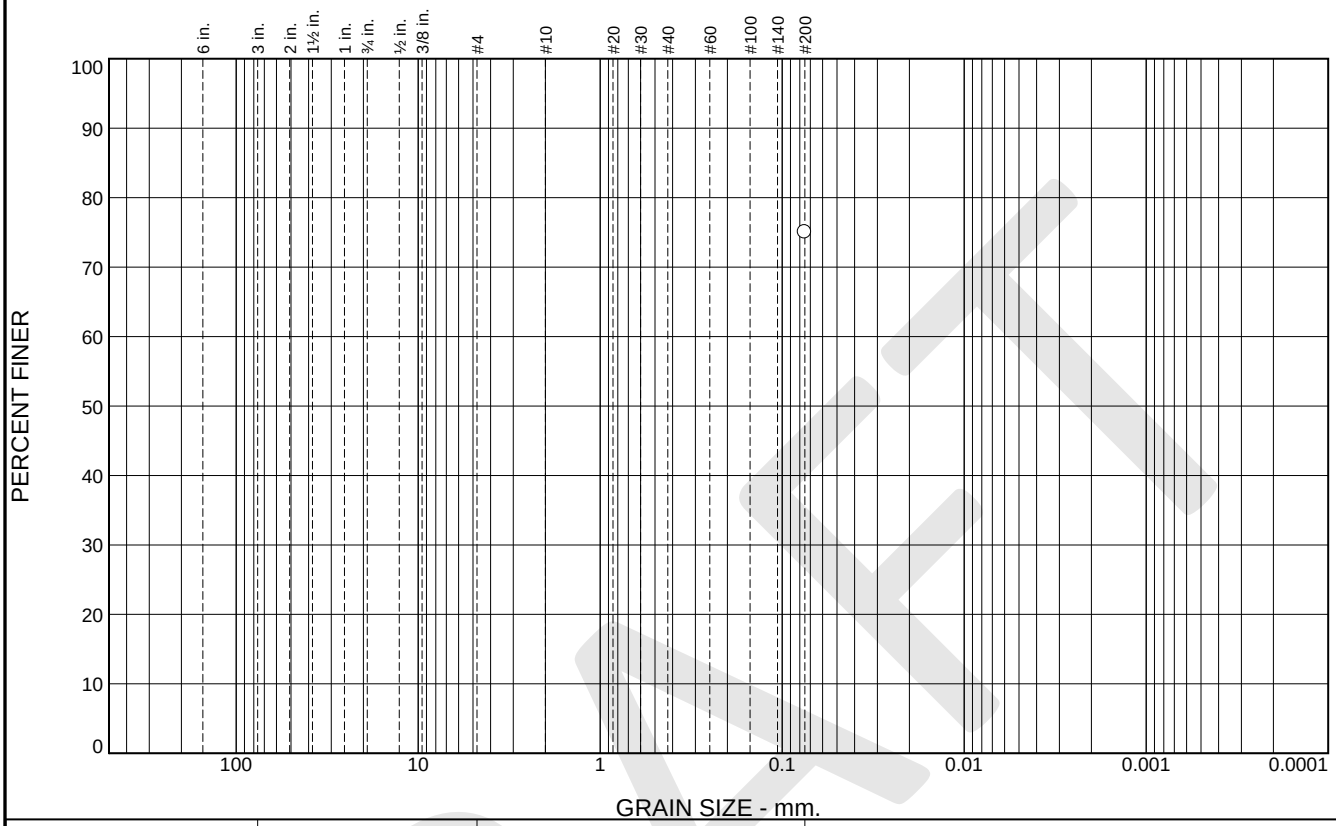
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						75.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	75.0		

* (no specification provided)

Material Description

Lean CLAY with SAND, reddish brown

Atterberg Limits

PL= 22 LL= 35 PI= 13

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B32 **Depth:** 6-6.5'
Sample Number: 2C **Date:**

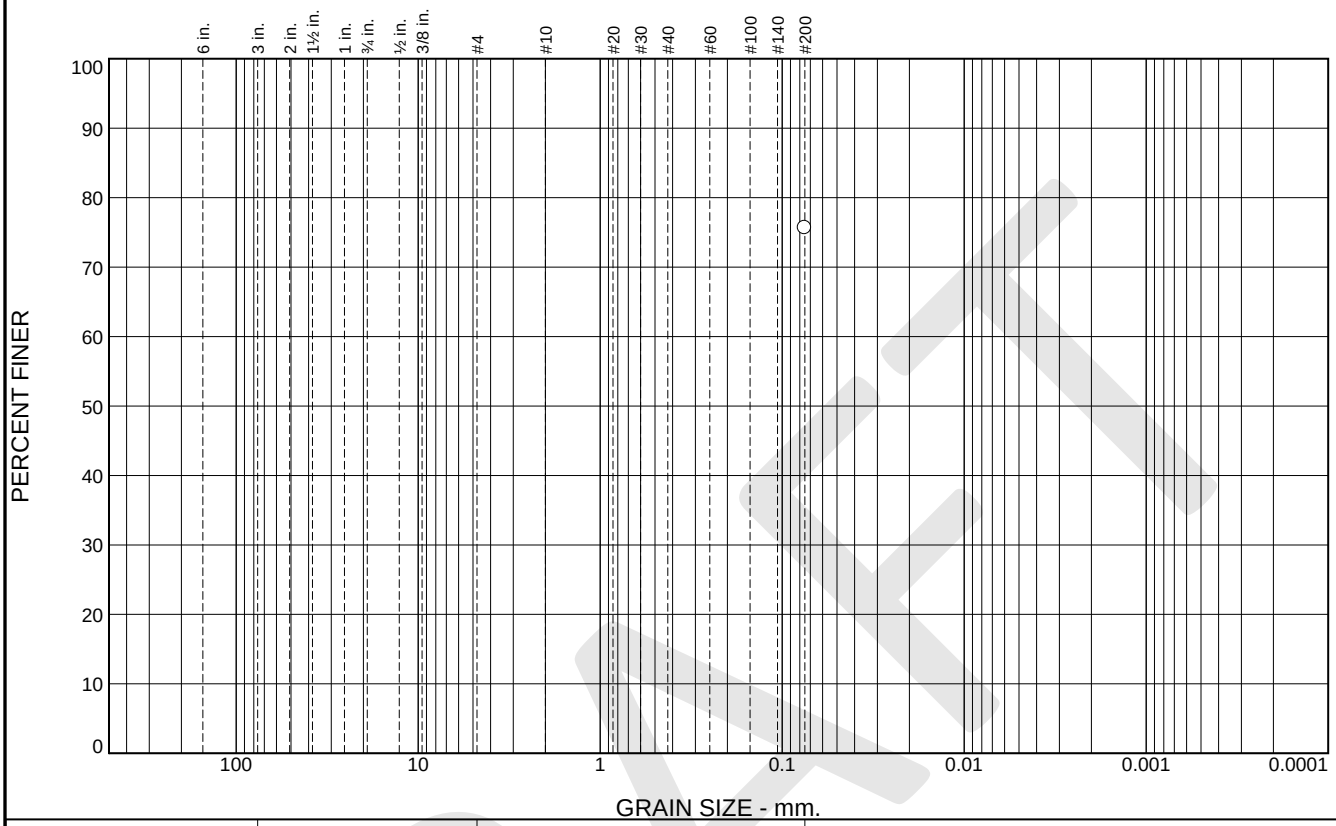
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						75.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	75.7		

* (no specification provided)

Material Description

Lean CLAY with SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: B33 **Depth:** 5-5.5'
Sample Number: 2C **Date:**

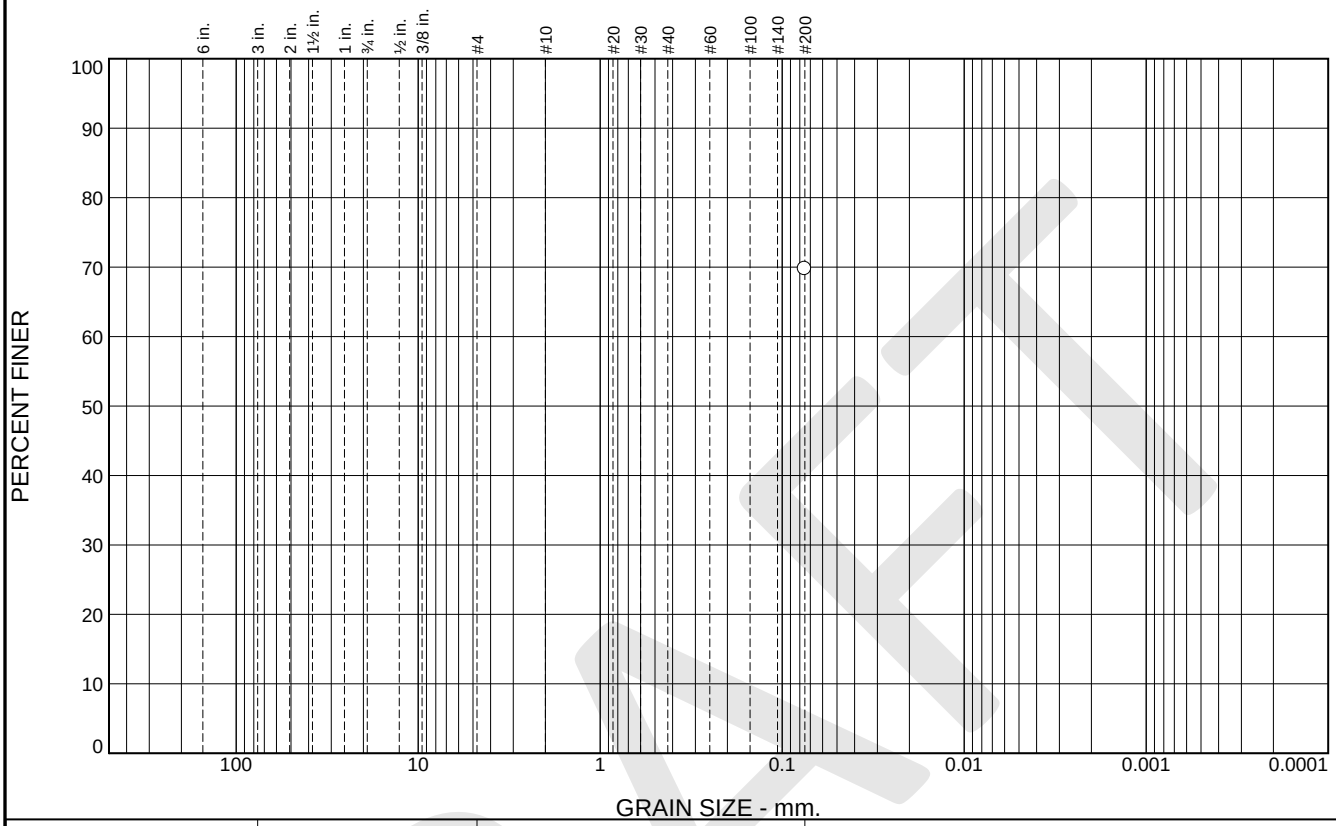
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						69.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	69.7		

* (no specification provided)

Material Description

SANDY lean CLAY, strong brown

Atterberg Limits

PL= 20 LL= 31 PI= 11

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B34 **Depth:** 6-6.5'
Sample Number: 2C **Date:**

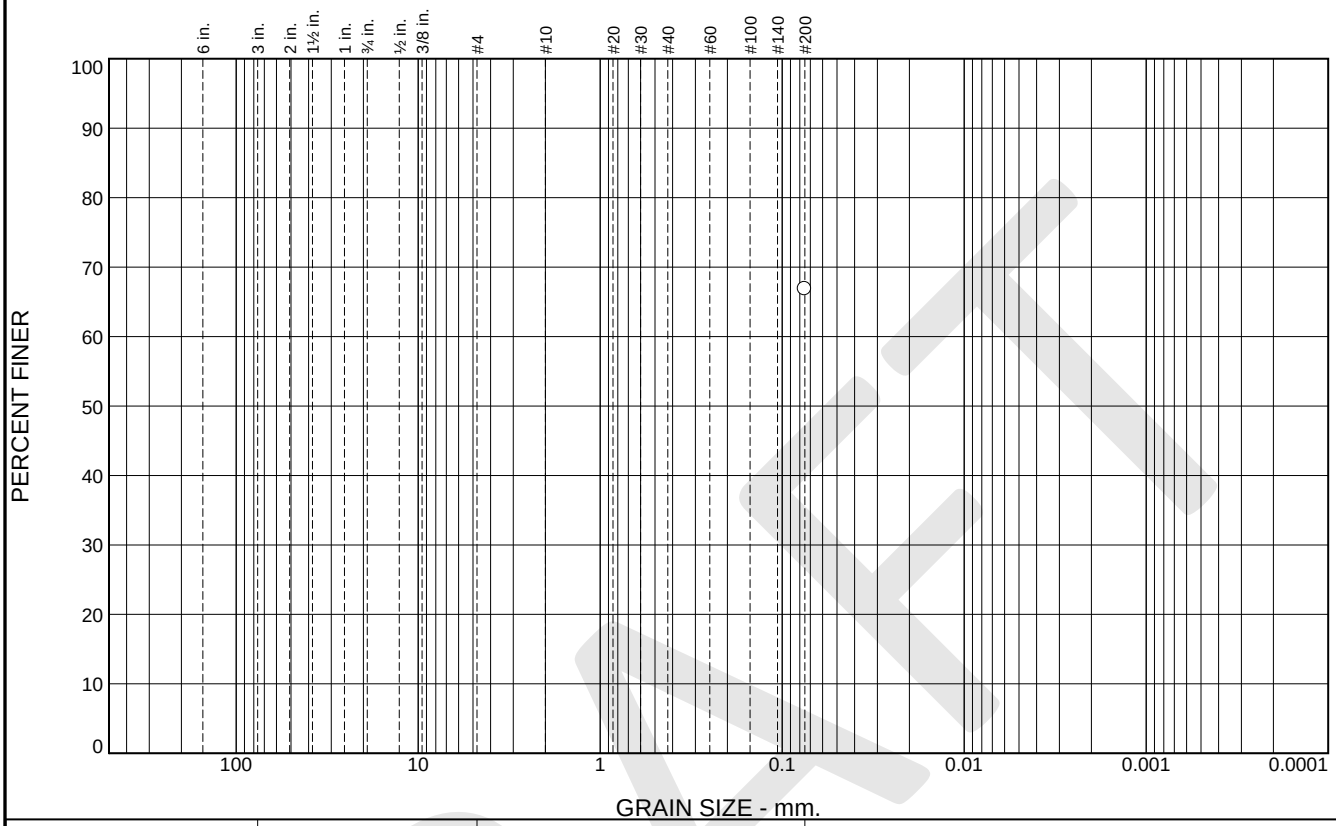
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						66.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	66.8		

* (no specification provided)

Material Description

SANDY SILT, olive brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B35 **Depth:** 9.3-9.8'
Sample Number: 3C **Date:**

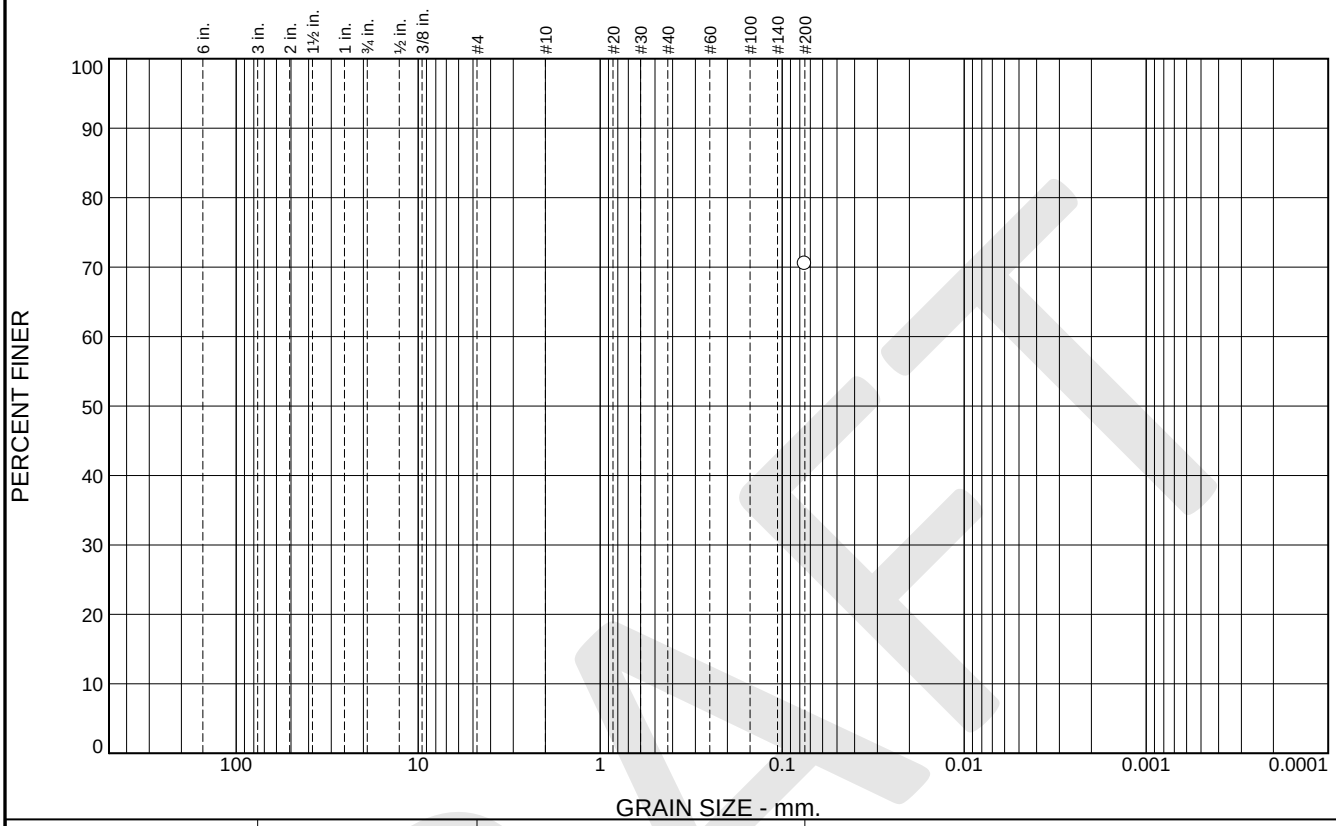
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						70.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	70.5		

* (no specification provided)

Material Description

Lean CLAY with SAND, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B36
Sample Number: 1C

Date:

Blackburn Consulting

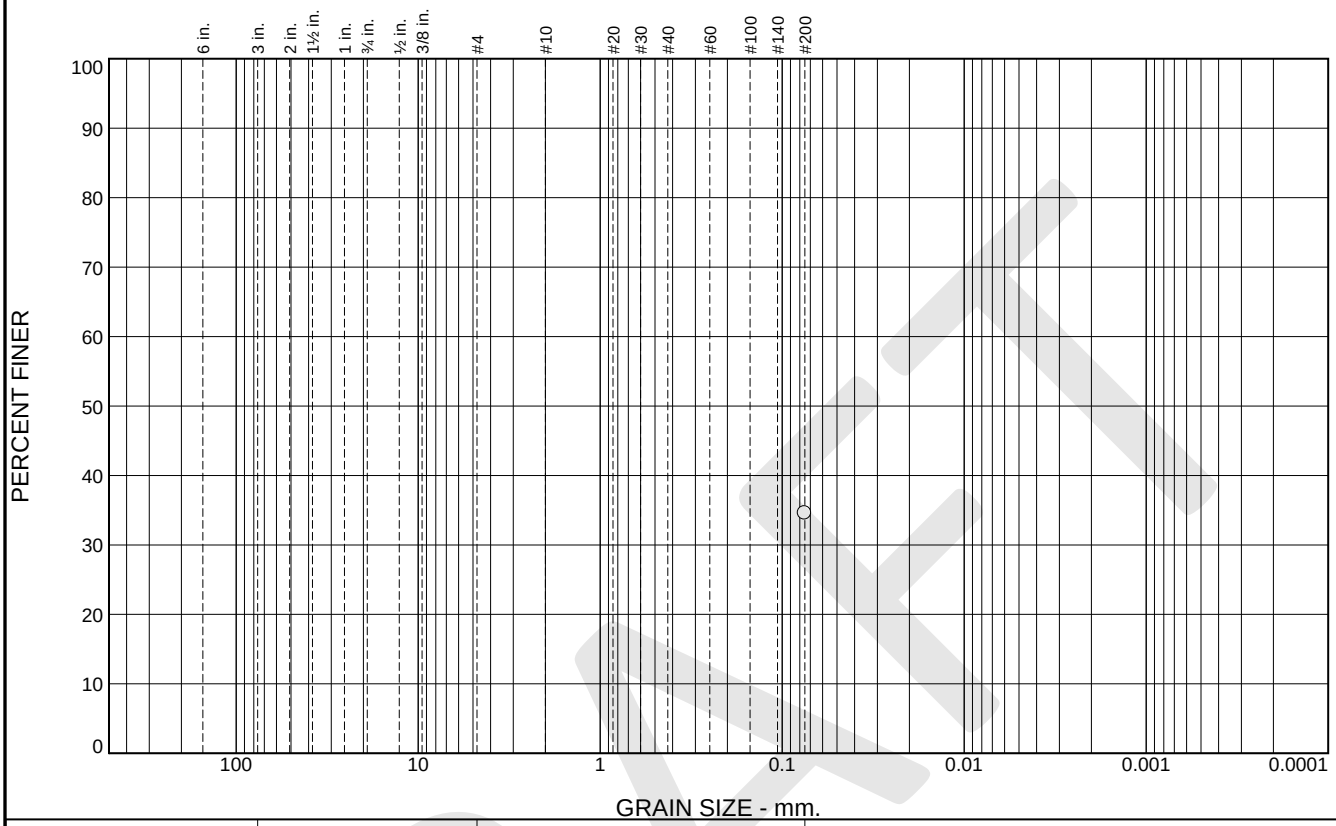
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project

Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						34.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	34.6		

* (no specification provided)

Material Description

SILTY SAND, dark reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B37 **Depth:** 5-5.5'
Sample Number: 2C **Date:**

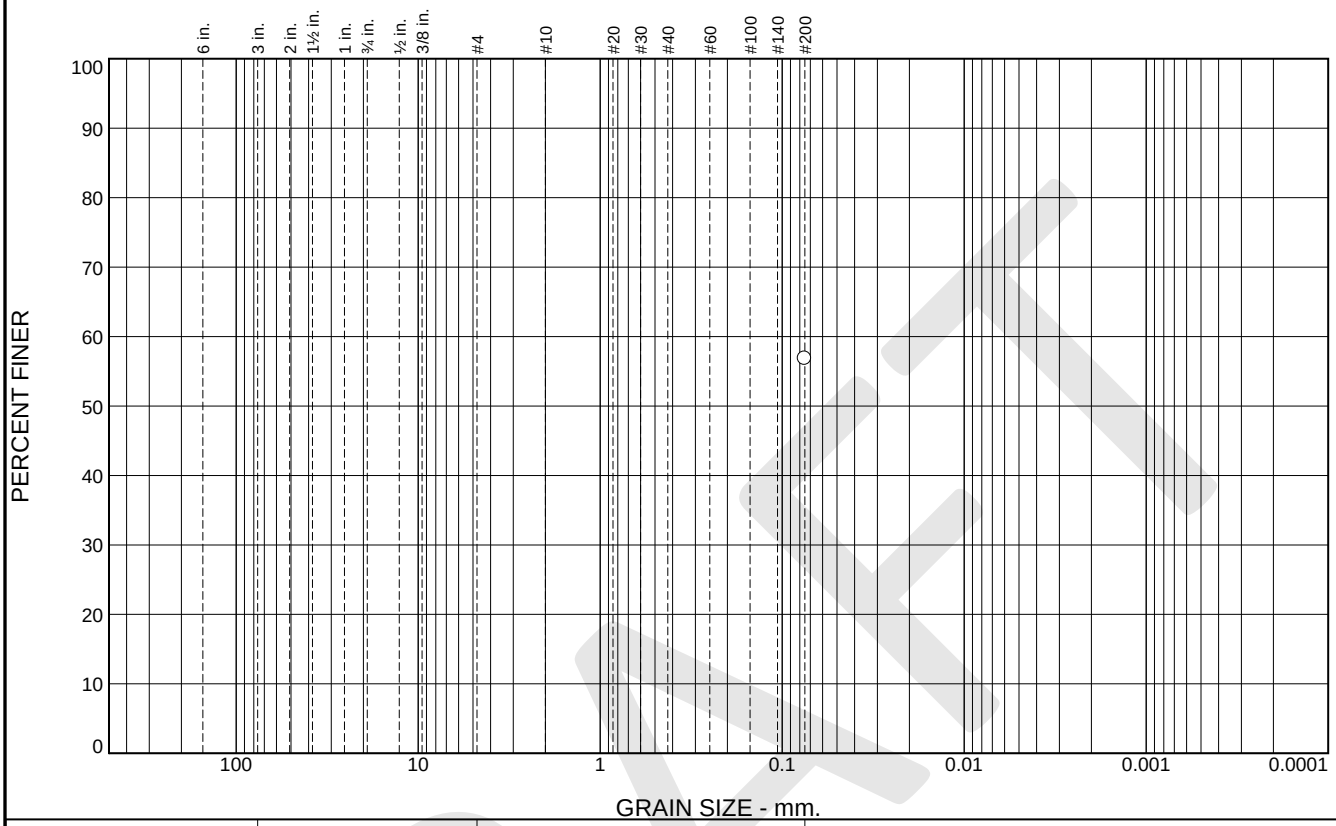
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						56.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	56.8		

* (no specification provided)

Material Description

SANDY lean CLAY, dark yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B38 **Depth:** 10.7-11.2'
Sample Number: 3C **Date:**

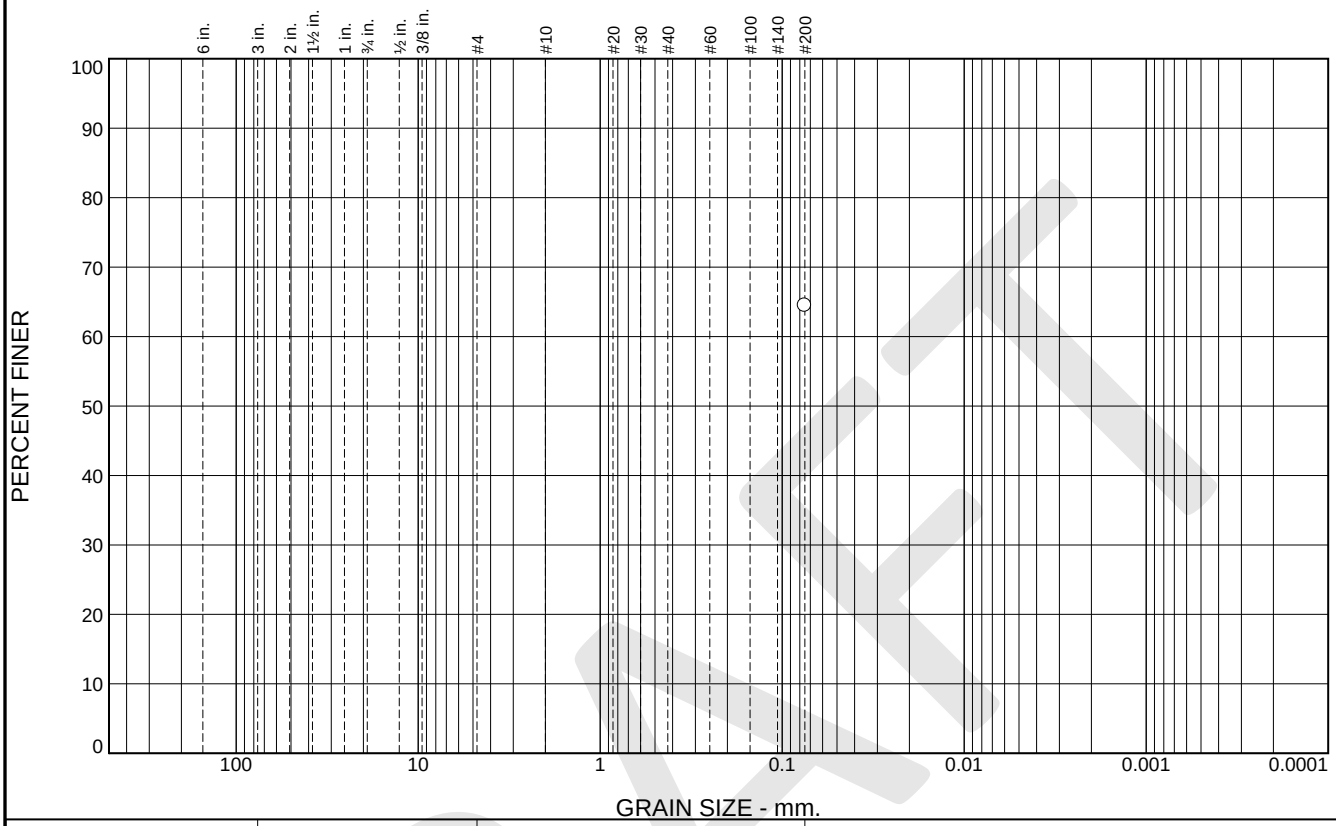
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						64.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	64.5		

* (no specification provided)

Material Description

SANDY SILTY CLAY, dark reddish brown

Atterberg Limits

PL= 15 LL= 22 PI= 7

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO=

Remarks

Source of Sample: B39
Sample Number: 1C

Date:

Blackburn Consulting

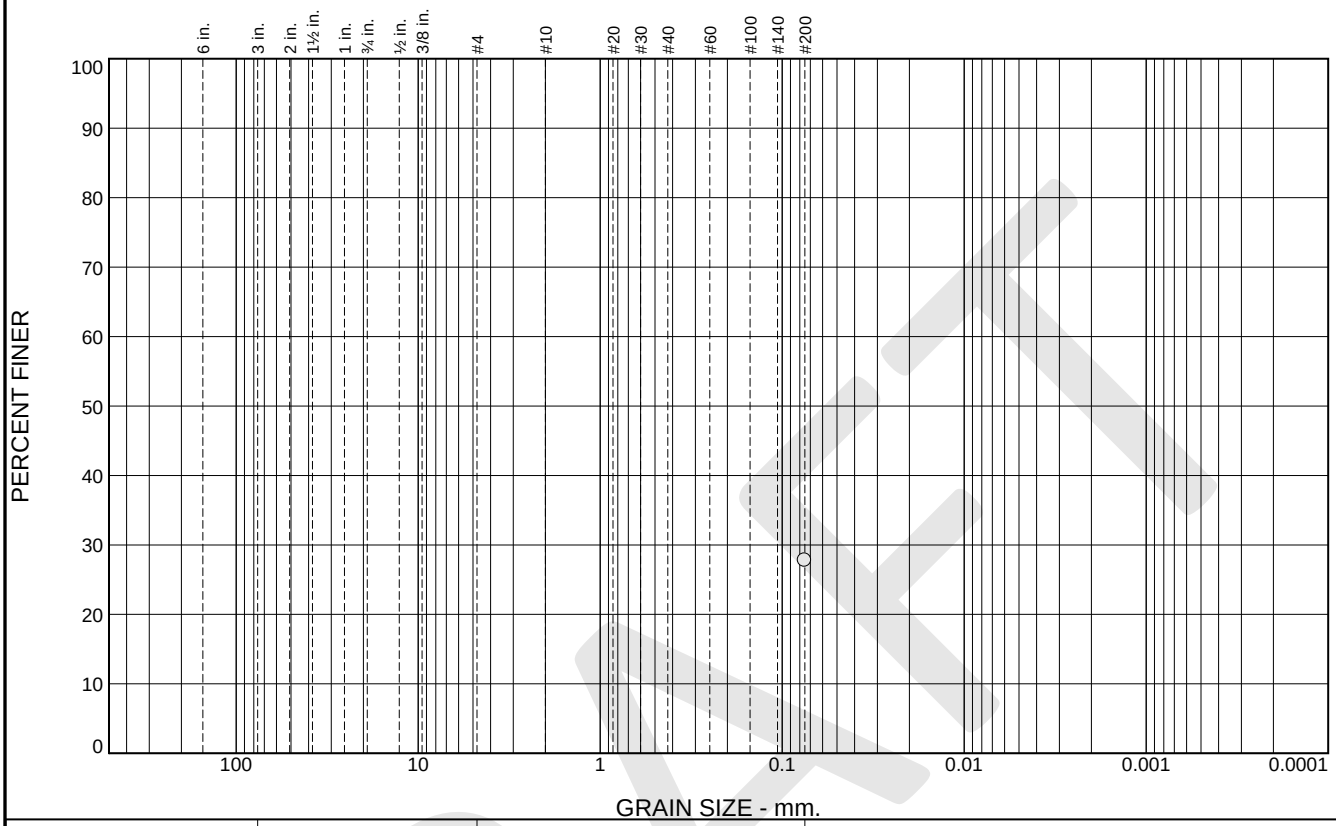
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project

Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						27.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	27.8		

* (no specification provided)

Material Description

CLAYEY SAND, reddish yellow

Atterberg Limits

PL= 16 LL= 26 PI= 10

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B40 **Depth:** 5-5.5'
Sample Number: 2C **Date:**

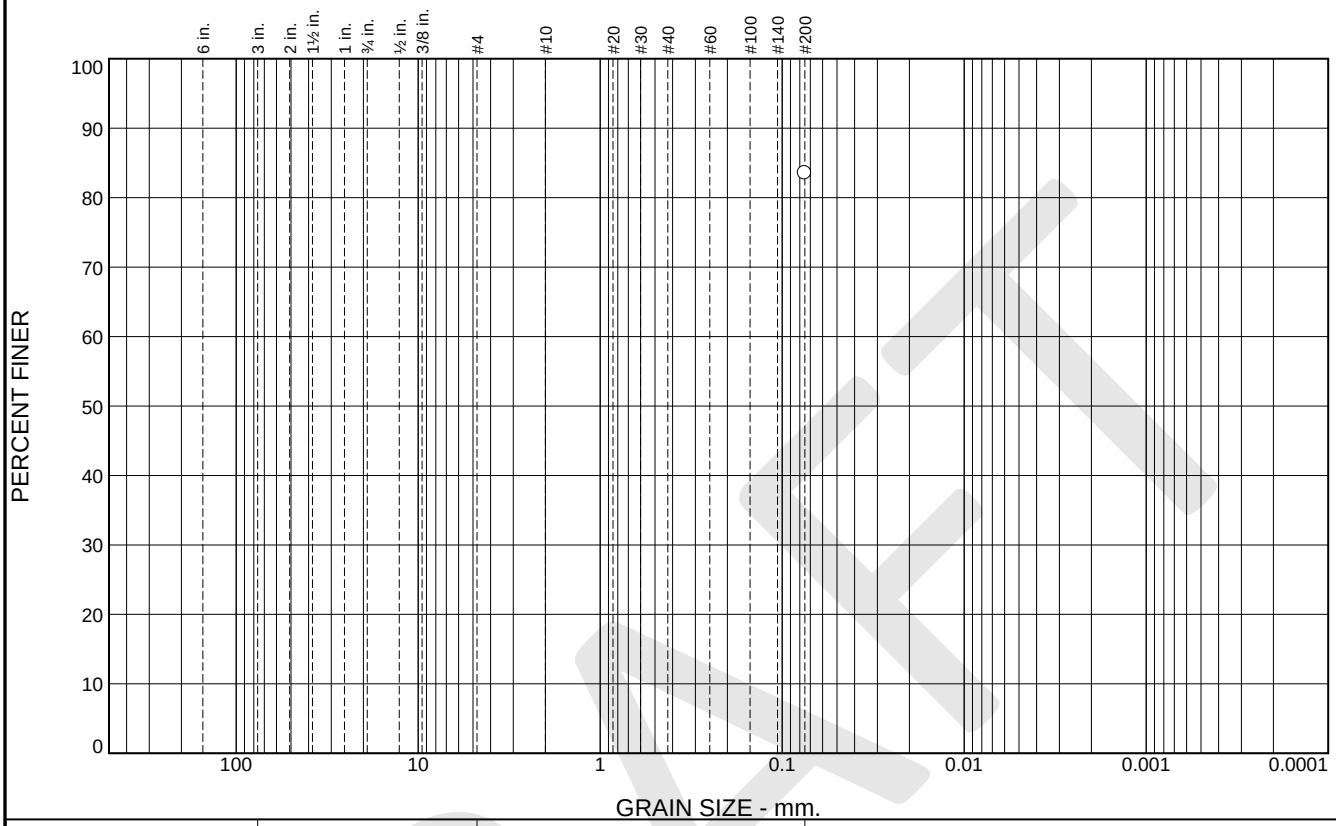
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						83.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	83.5		

* (no specification provided)

Material Description

Lean CLAY with SAND, dark yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B41 **Depth:** 11-11.5'
Sample Number: 3C **Date:**

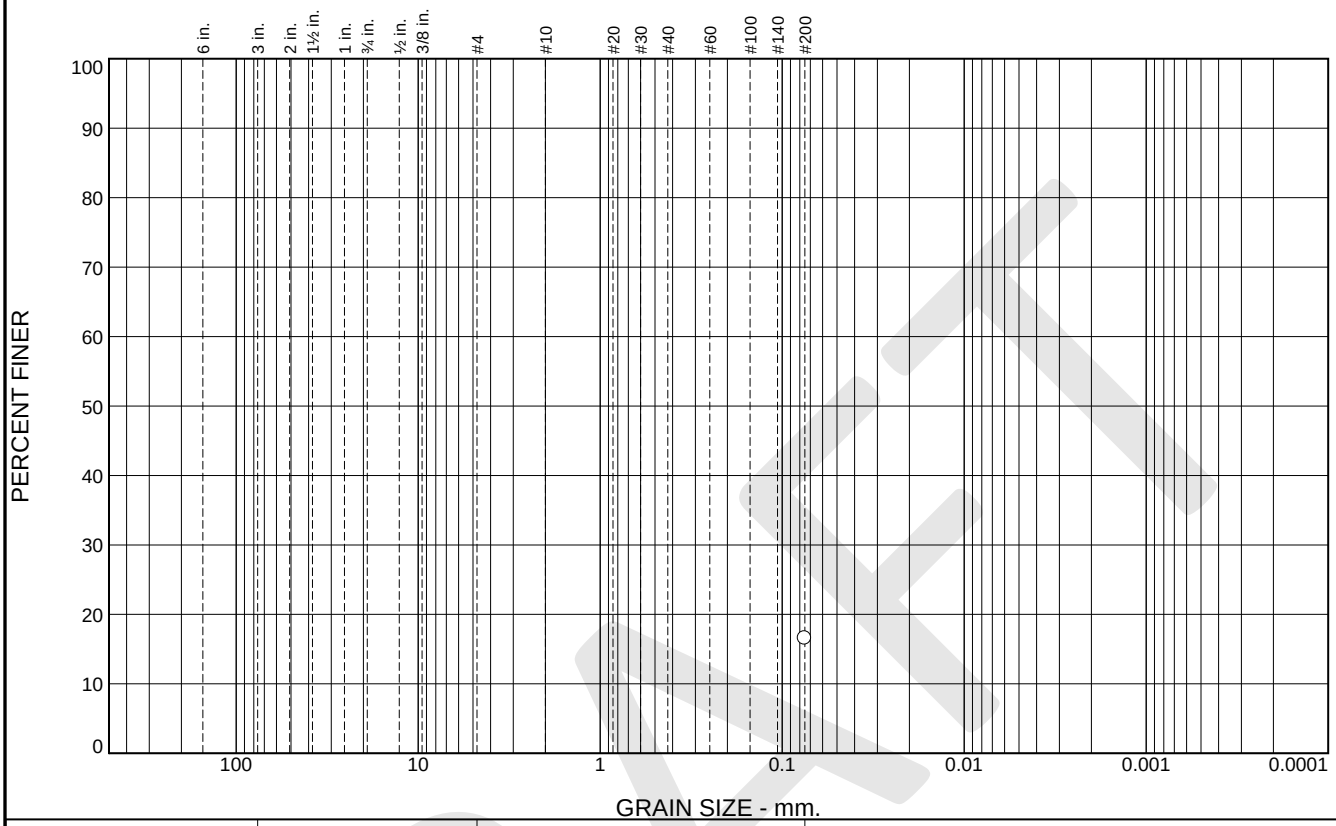
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						16.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	16.5		

* (no specification provided)

Material Description

CLAYEY SAND, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B42 **Depth:** 10.5-11'
Sample Number: 3B **Date:**

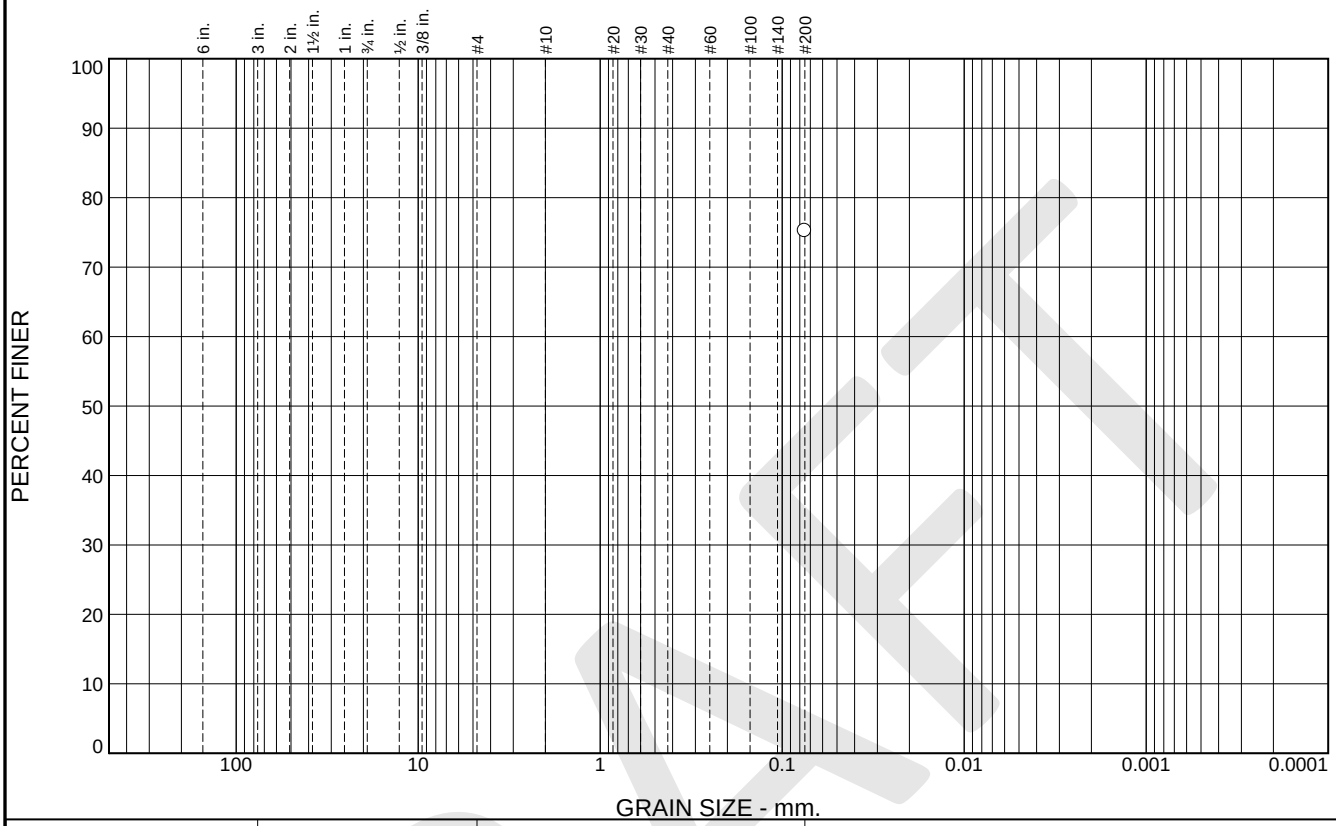
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						75.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	75.2		

* (no specification provided)

Material Description

Lean CLAY with SAND, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B43 **Depth:** 1.5-2'
Sample Number: 1C **Date:**

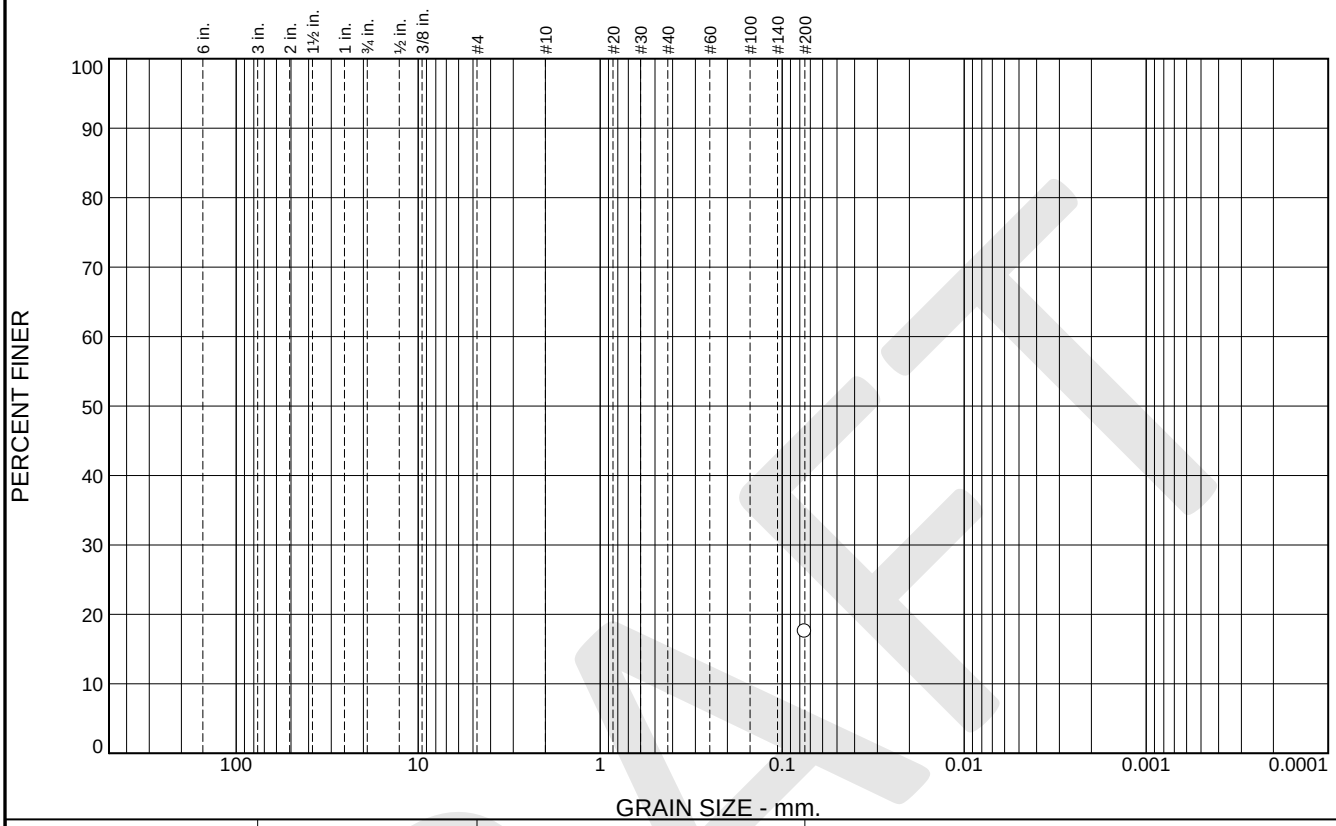
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						17.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	17.6		

* (no specification provided)

Material Description

CLAYEY SAND, yellowish brown

Atterberg Limits

PL= 15 LL= 35 PI= 20

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B44 **Depth:** 10.5-11'
Sample Number: 3B **Date:**

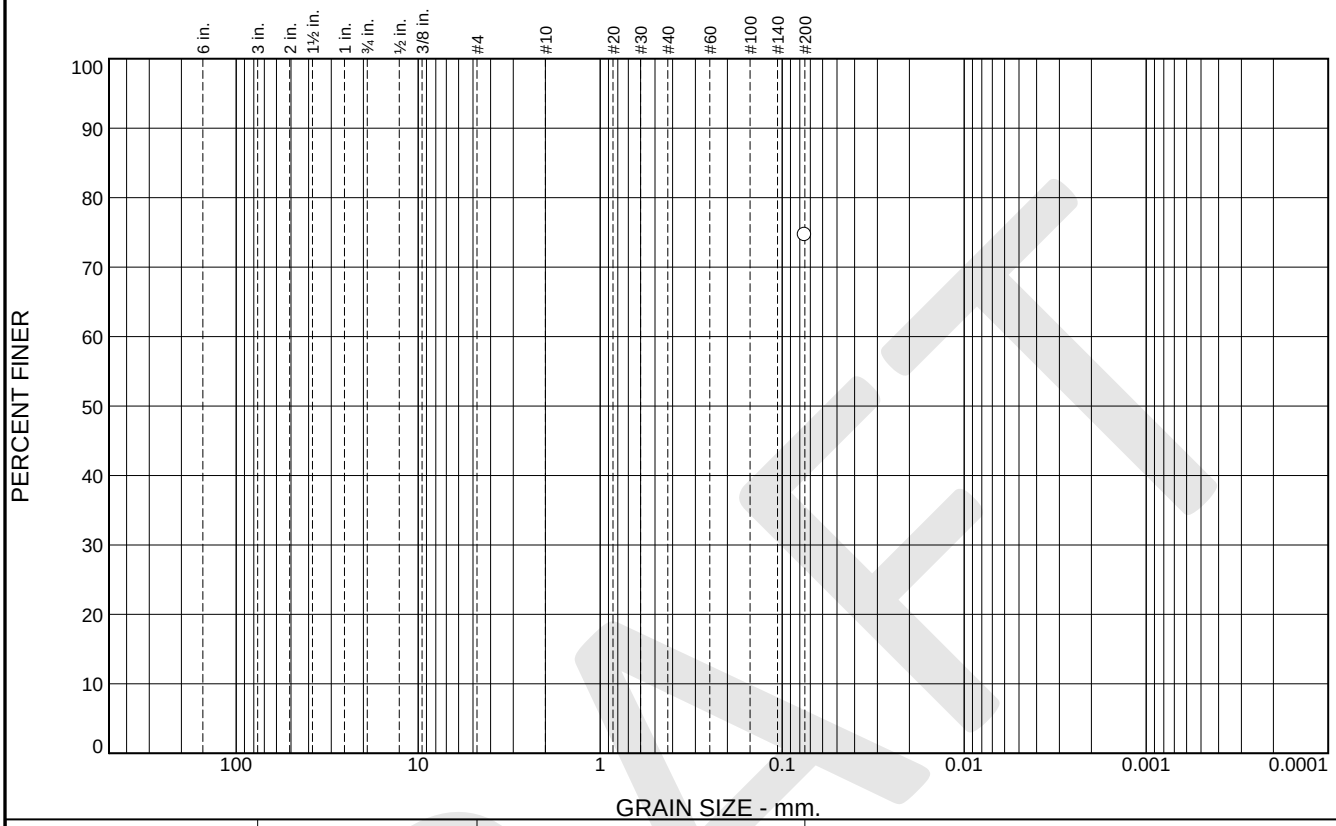
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						74.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	74.6		

* (no specification provided)

Material Description

Lean CLAY with SAND, dark brown

Atterberg Limits

PL= 17 LL= 32 PI= 15

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B45 **Depth:** 5-5.5'
Sample Number: 2B **Date:**

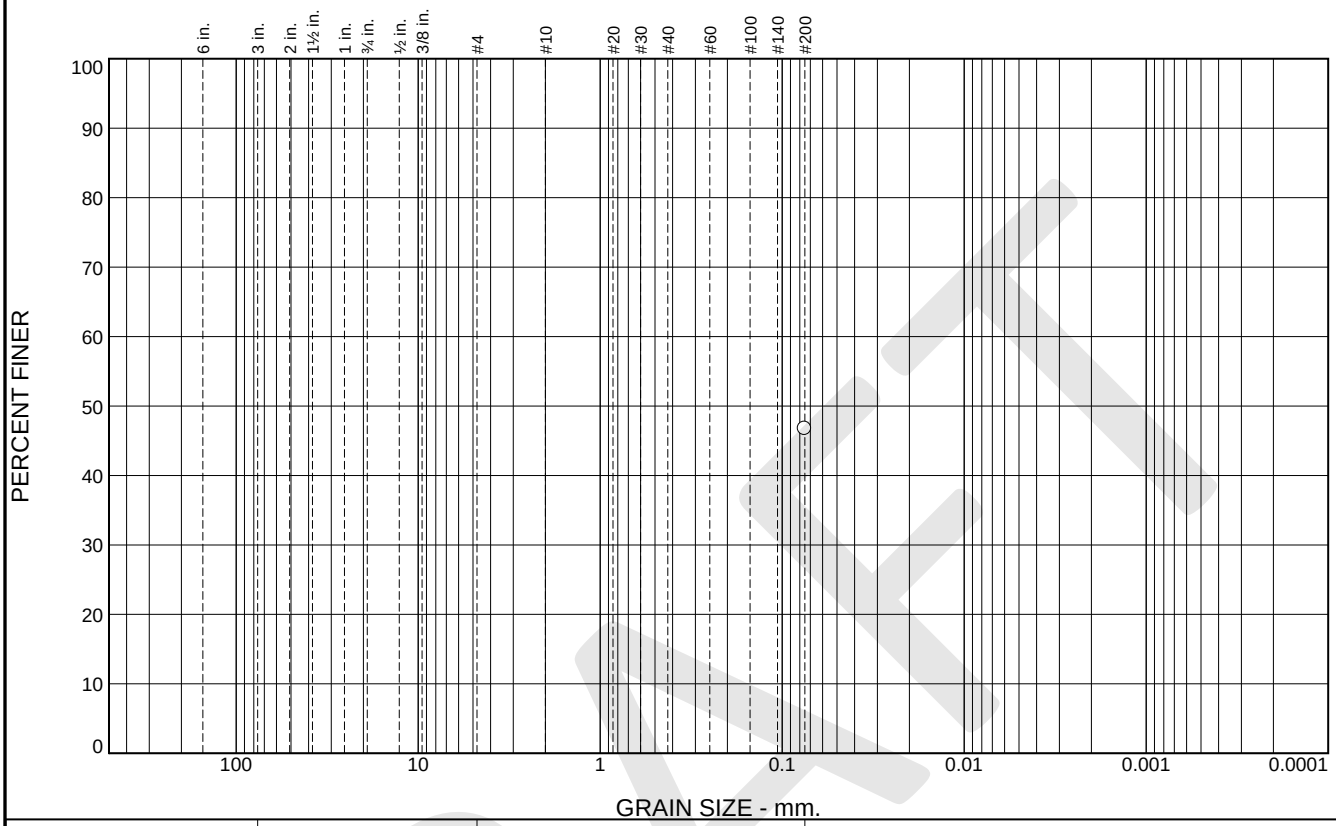
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						46.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	46.7		

* (no specification provided)

Material Description

CLAYEY SAND, dark brown

Atterberg Limits

PL= 15 LL= 39 PI= 24

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B45 **Depth:** 10-10.5'
Sample Number: 3B **Date:**

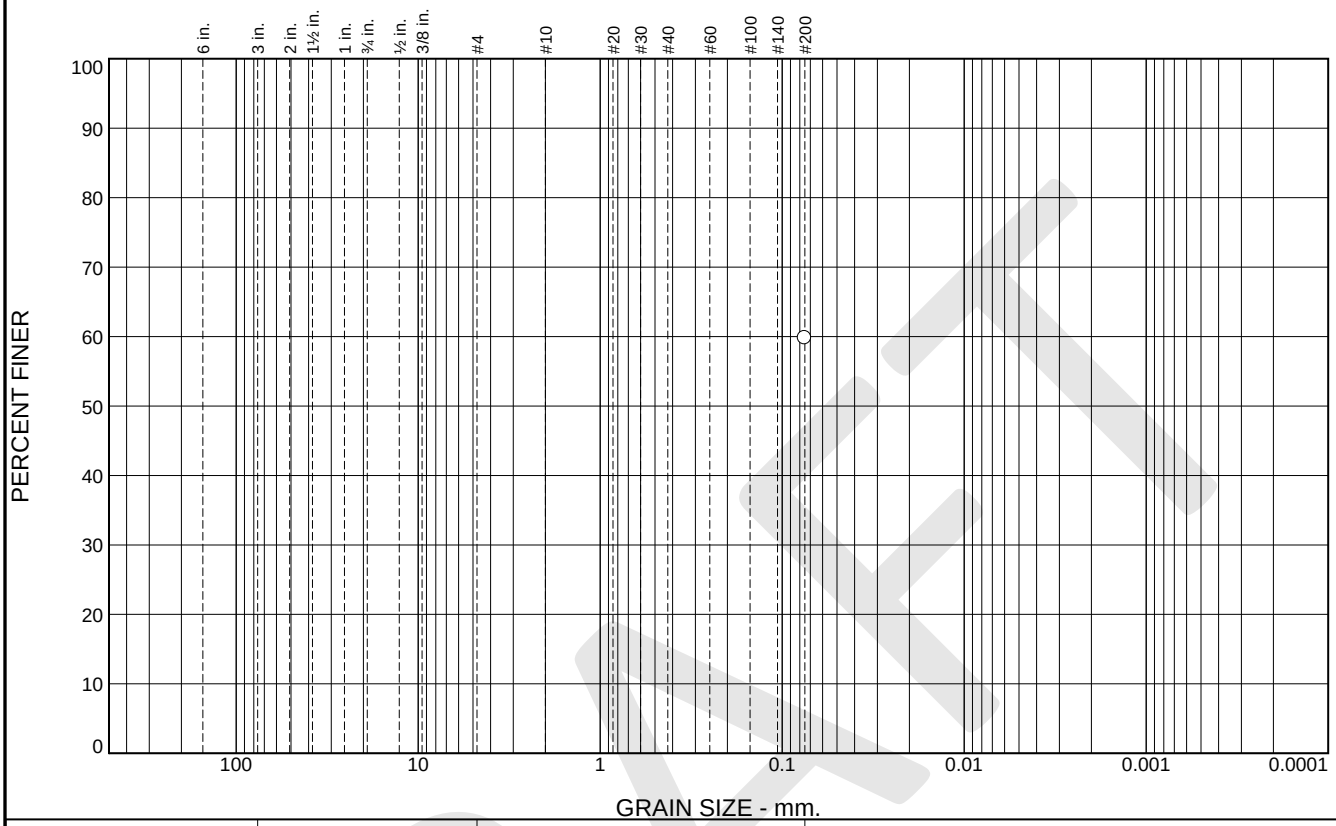
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						59.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	59.8		

* (no specification provided)

Material Description

SANDY lean CLAY, brown

Atterberg Limits

PL= 15 LL= 30 PI= 15

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B46 **Depth:** 11-11.5'
Sample Number: 3C **Date:**

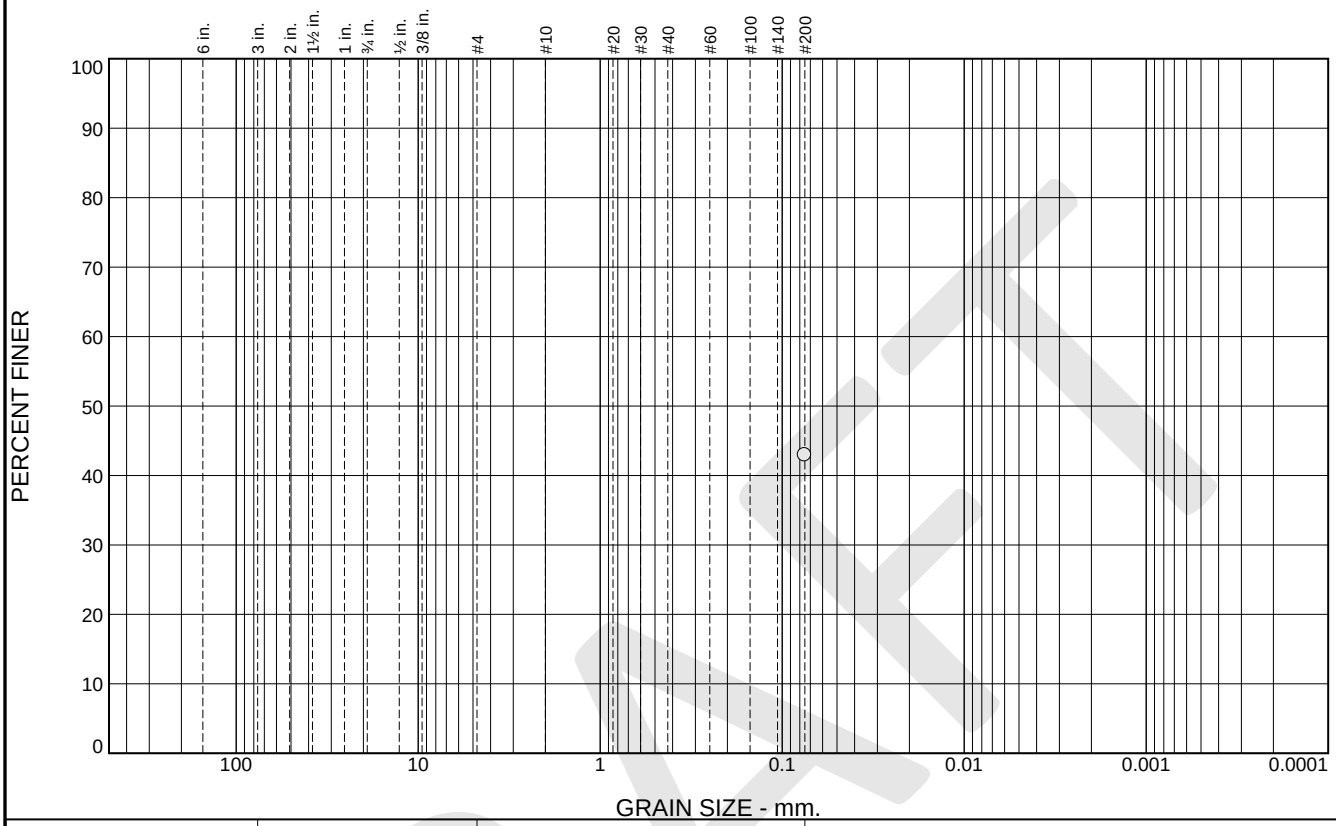
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						42.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	42.9		

* (no specification provided)

Material Description

SILTY SAND, strong brown

Atterberg Limits

PL= 30 LL= 37 PI= 7

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B49 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

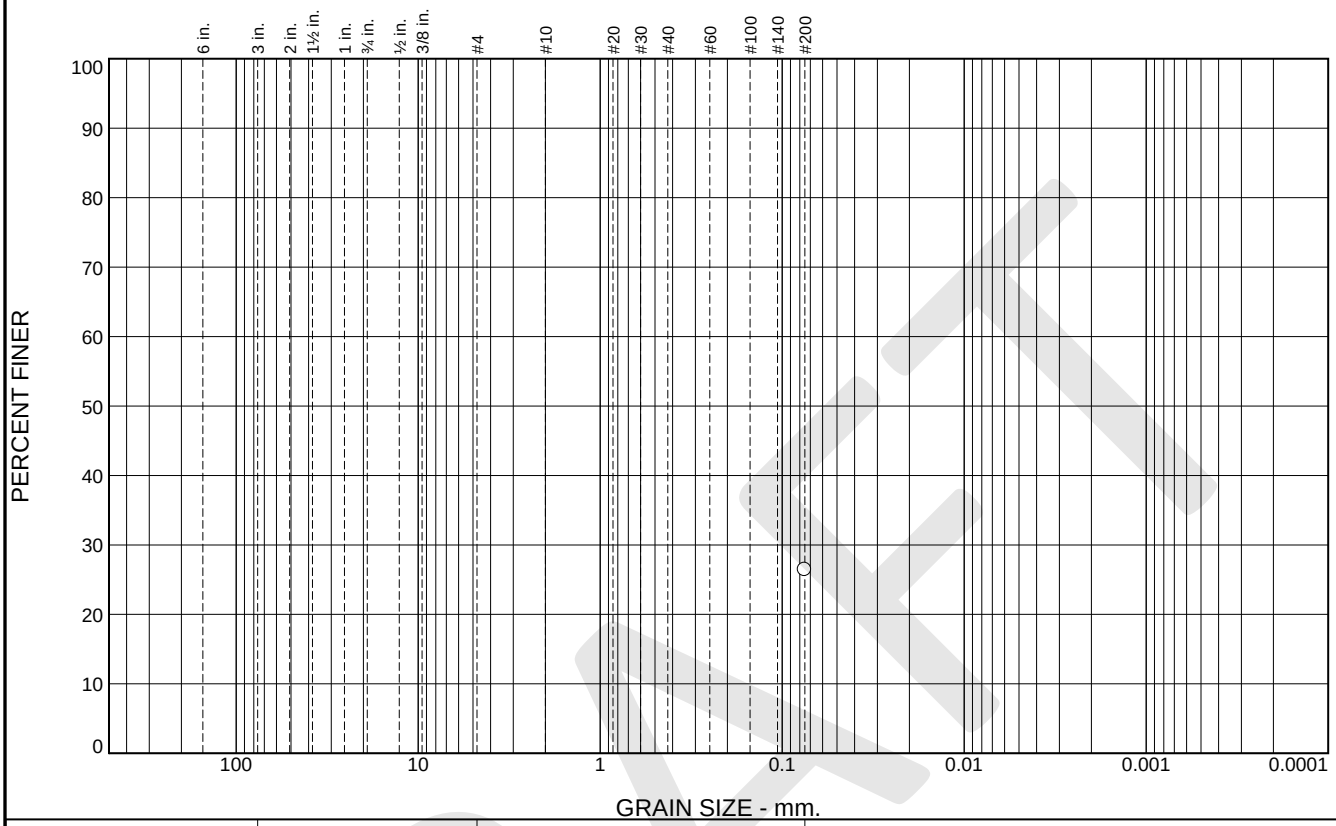
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						26.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	26.4		

* (no specification provided)

Material Description

SILTY SAND, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B49 **Depth:** 10.5-11'
Sample Number: 3B **Date:**

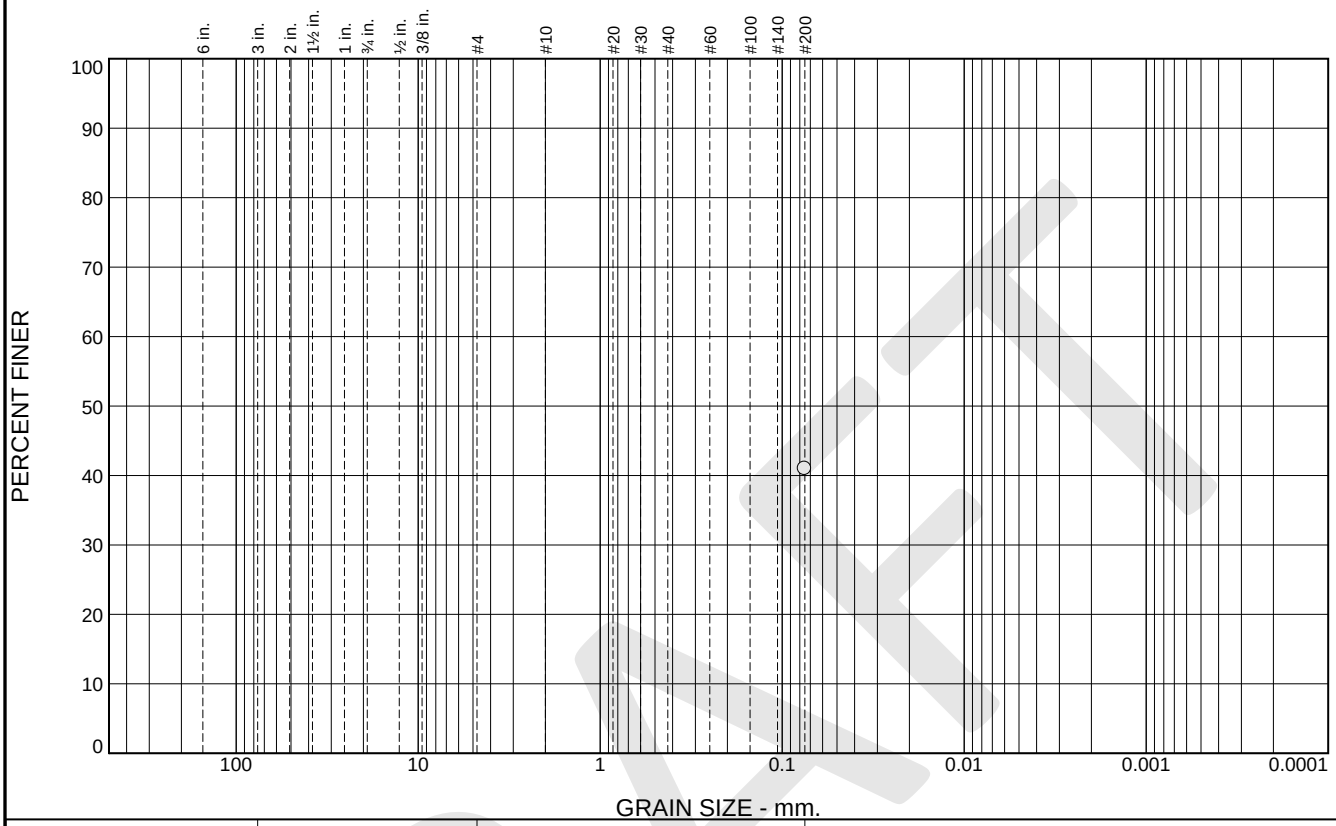
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						41.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	41.0		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= 17 LL= 36 PI= 19

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B55 **Depth:** 10-10.5'
Sample Number: 3B **Date:**

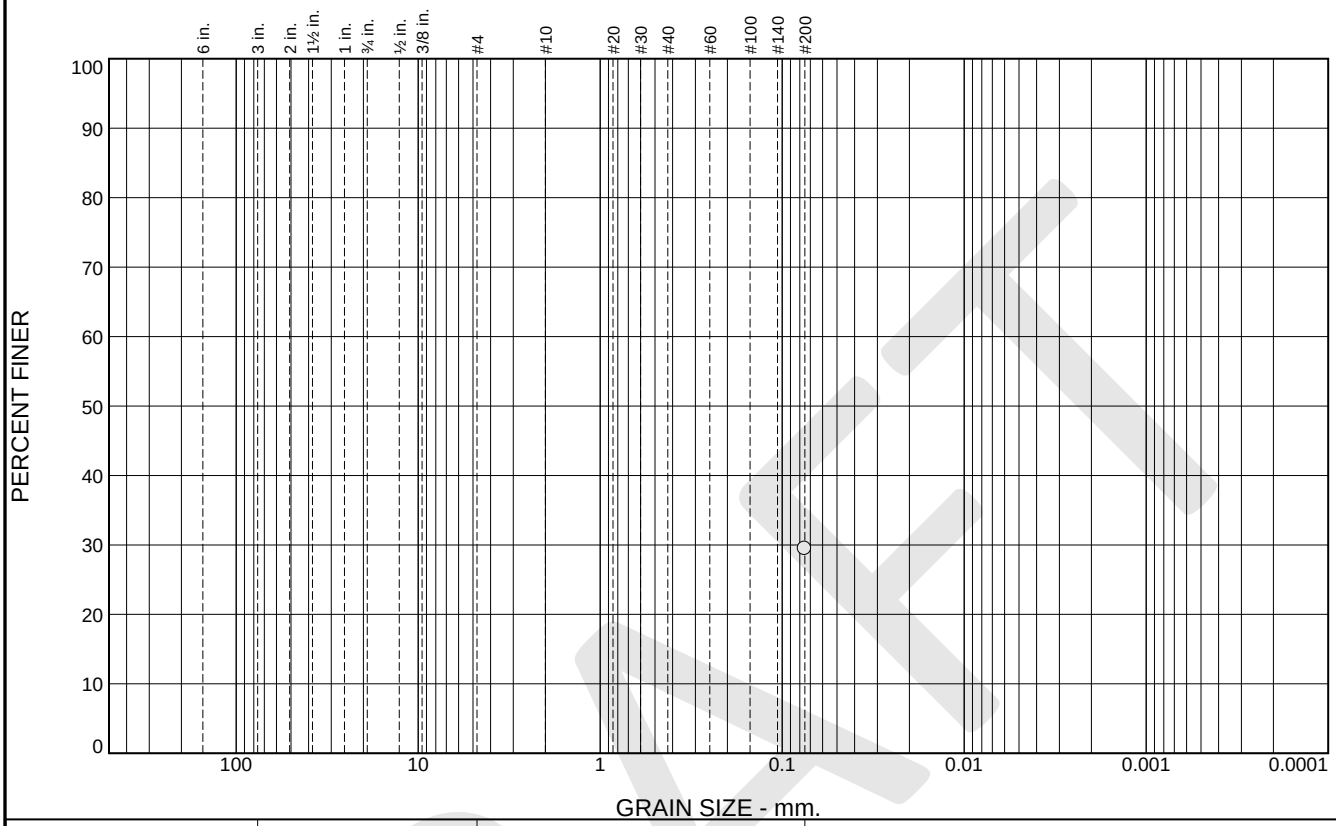
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						29.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	29.5		

* (no specification provided)

Material Description

SILTY SAND, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B55 **Depth:** 16-16.5'
Sample Number: 4C **Date:**

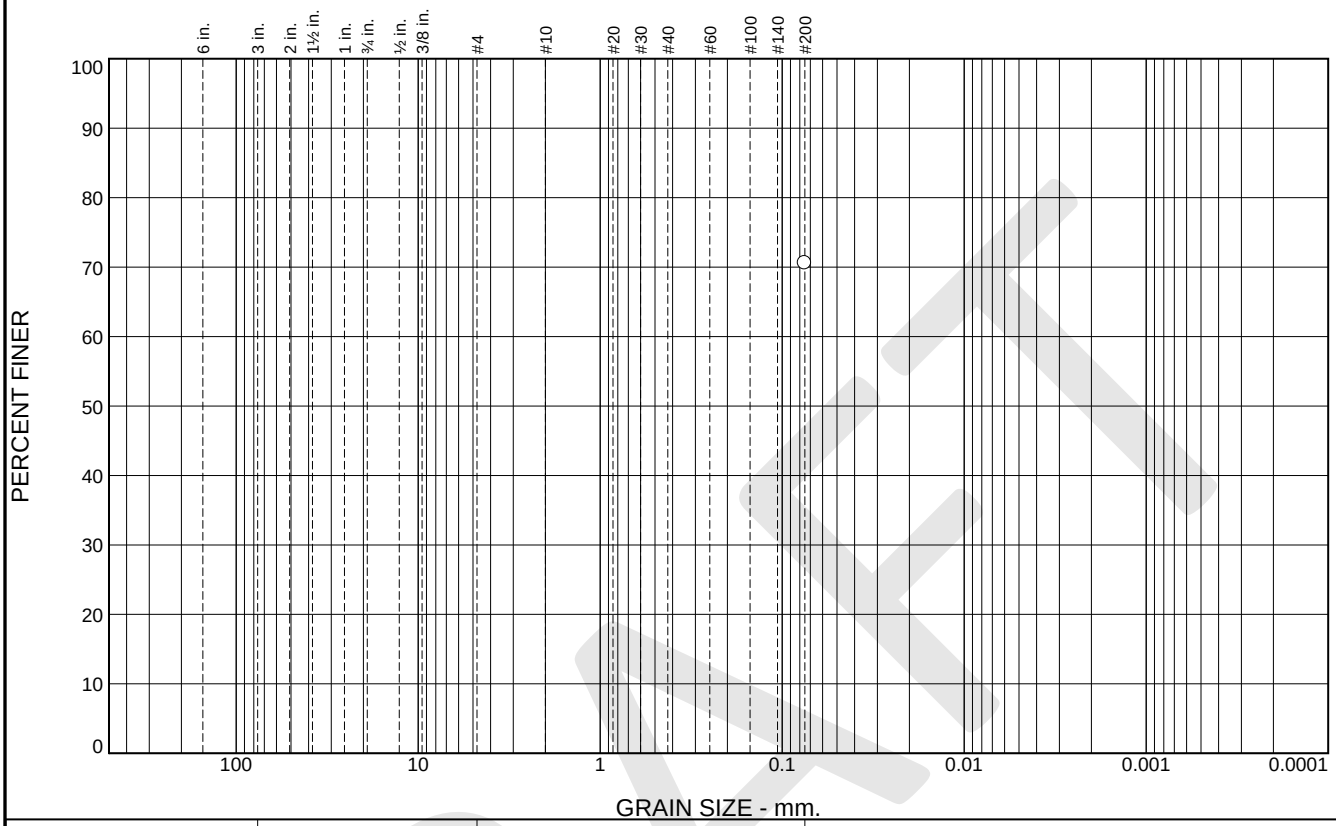
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						70.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	70.6		

* (no specification provided)

Material Description

Lean CLAY with SAND, dark reddish brown

Atterberg Limits

PL= 17 LL= 29 PI= 12

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B56 **Depth:** 2-2.5'
Sample Number: 1B **Date:**

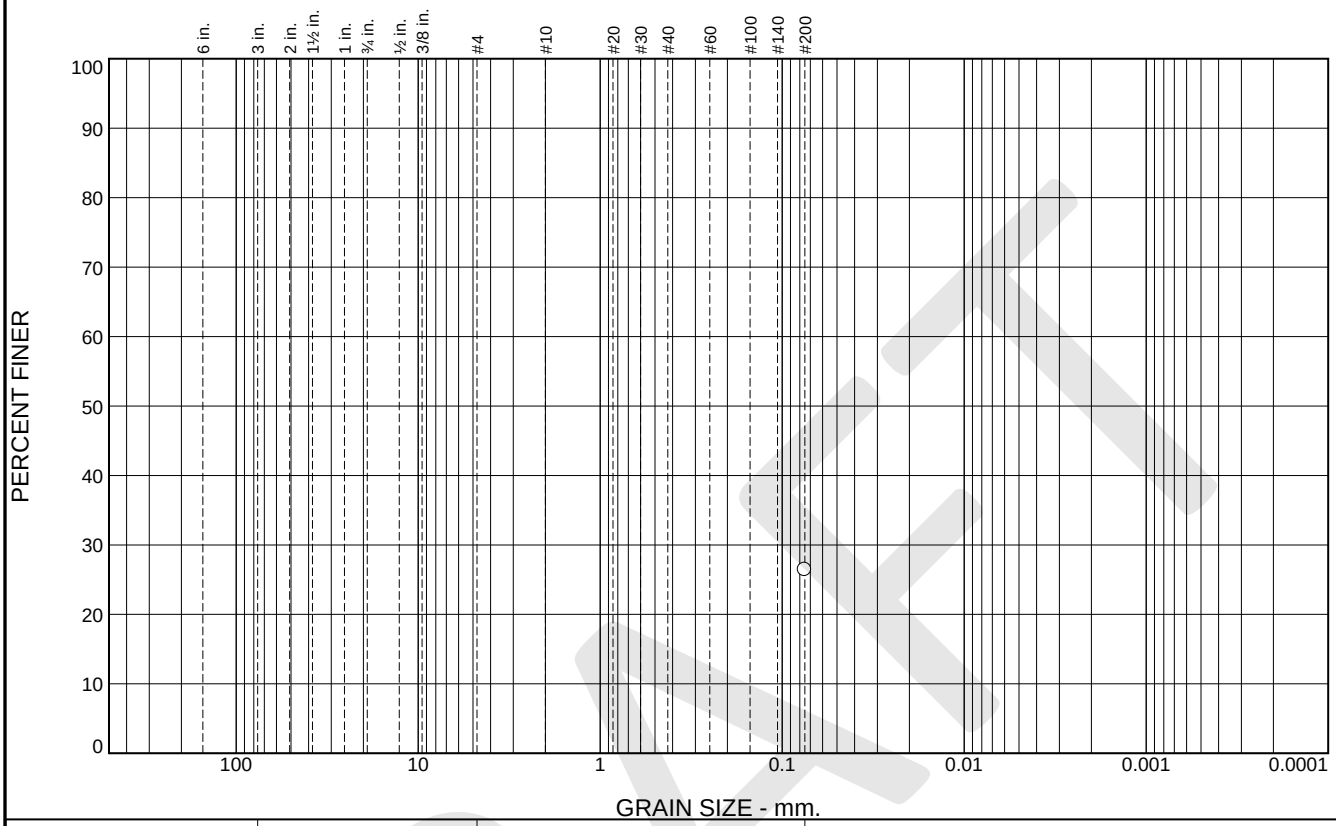
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						26.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	26.4		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= 16 LL= 33 PI= 17

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B56 **Depth:** 10.5-11'
Sample Number: 3C **Date:**

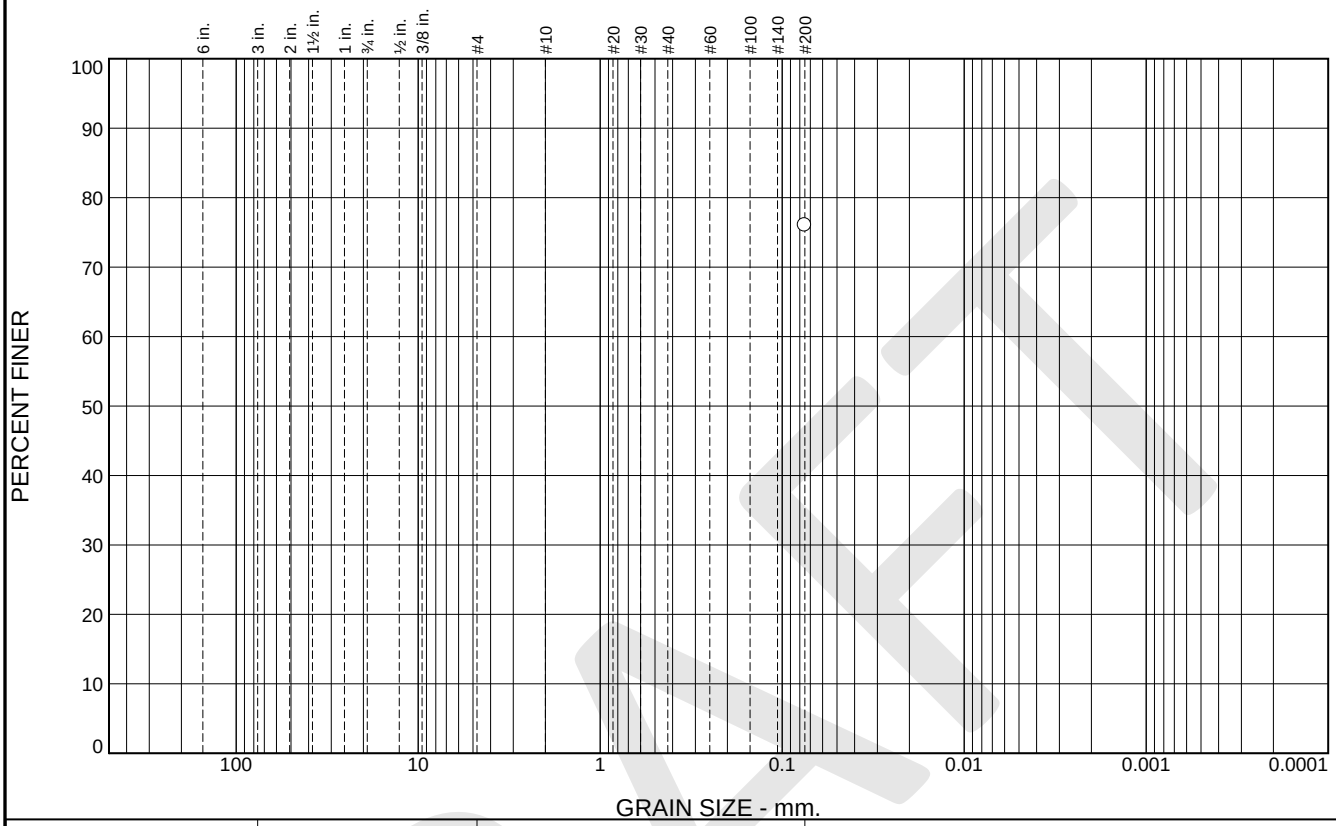
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						76.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	76.0		

* (no specification provided)

Material Description

Lean CLAY with SAND, dark brown

Atterberg Limits

PL= 16 LL= 31 PI= 15

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B57 **Depth:** 2-2.5'
Sample Number: 1C **Date:**

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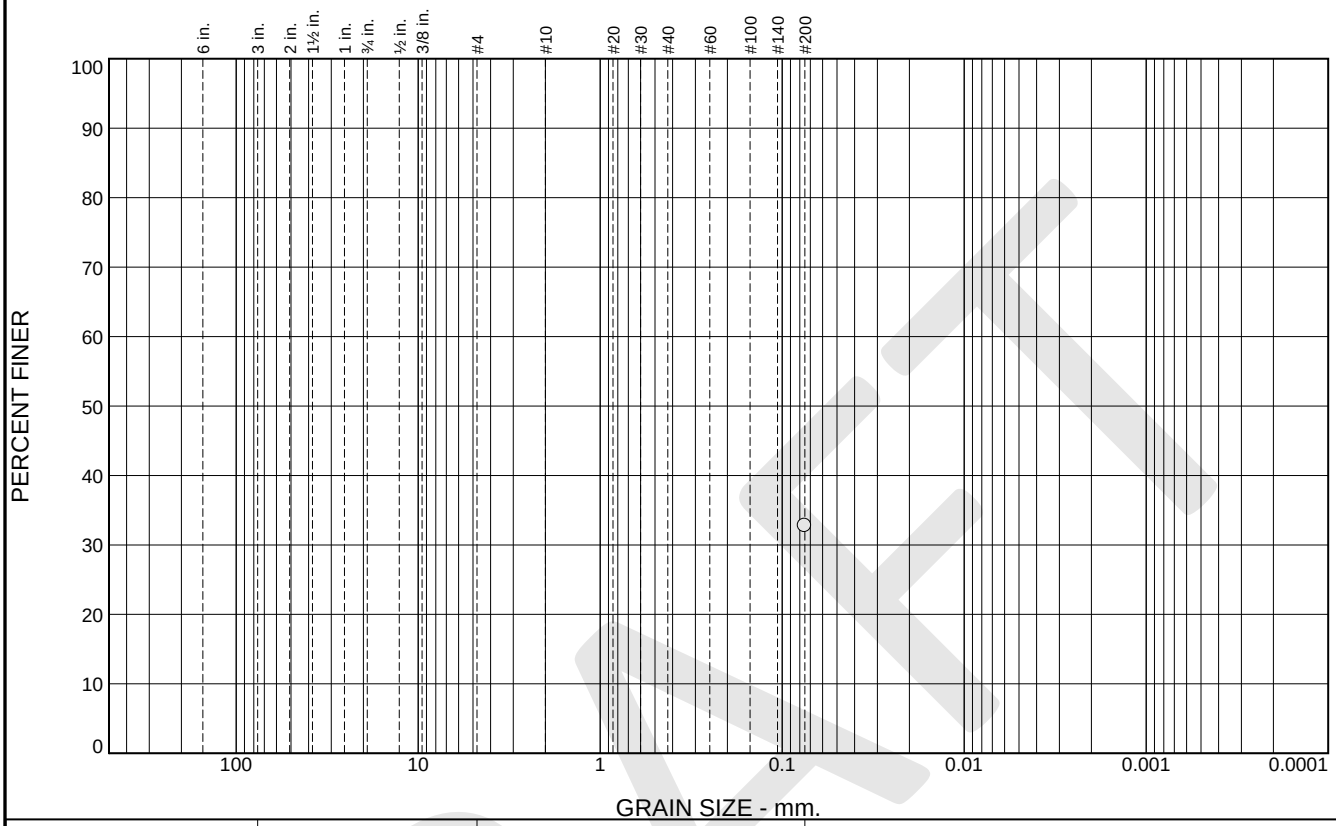
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						32.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	32.7		

* (no specification provided)

Material Description

CLAYEY SAND, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B57 **Depth:** 10.2-10.7'
Sample Number: 3B **Date:**

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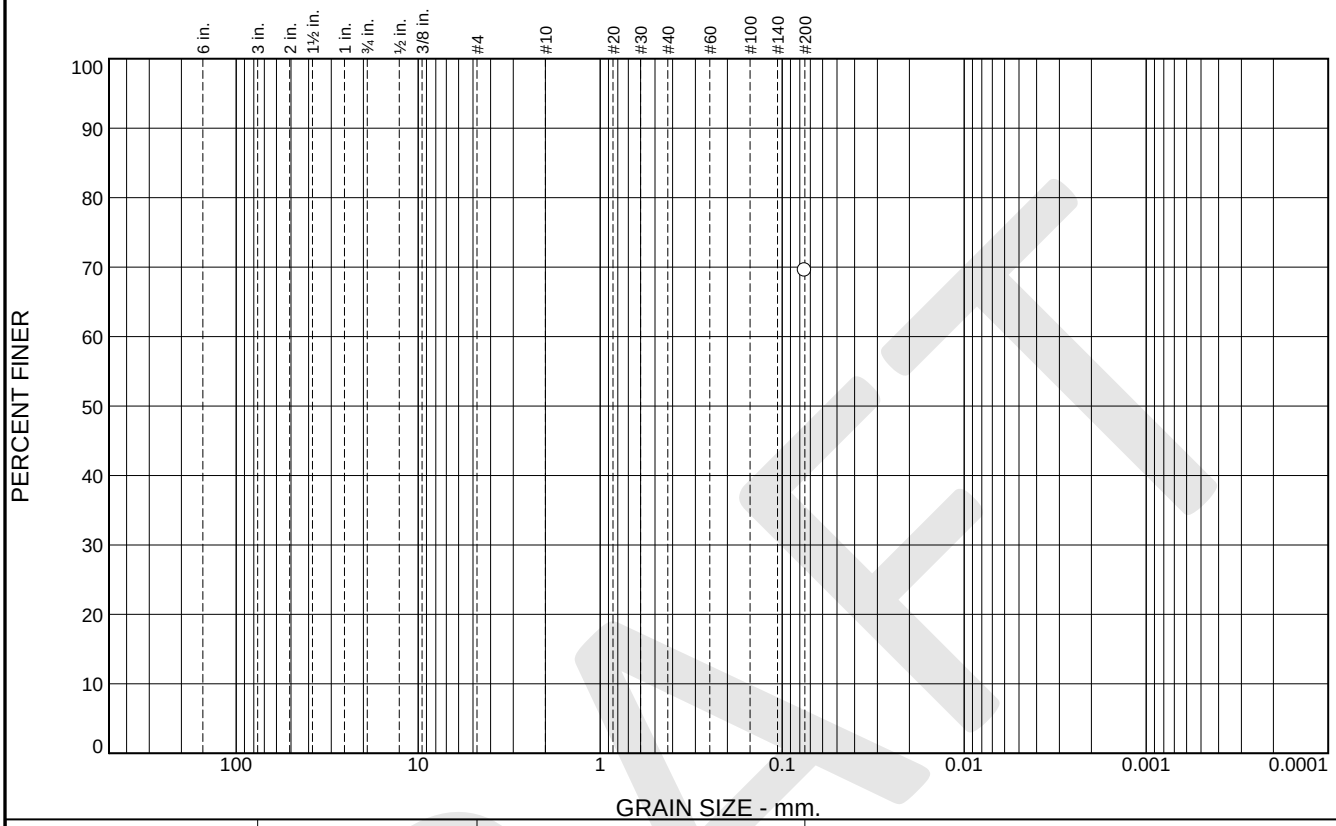
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						69.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	69.5		

* (no specification provided)

Material Description

SANDY lean CLAY, dark yellowish brown

Atterberg Limits

PL= 15 LL= 30 PI= 15

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B60 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

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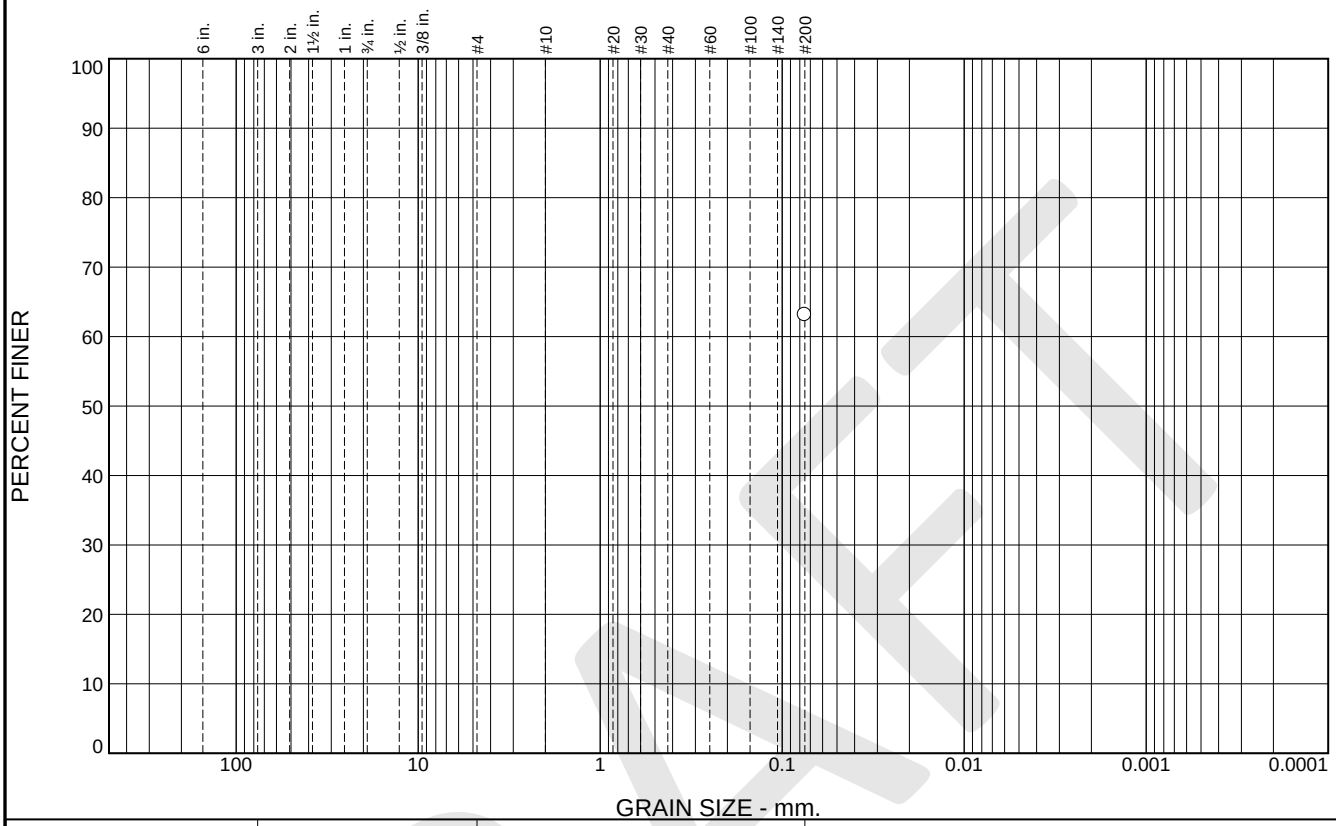
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						63.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	63.1		

* (no specification provided)

Material Description

SANDY lean CLAY, light brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B60 **Depth:** 10-11'
Sample Number: 3 **Date:**

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Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project

Project No: 3934.X **Figure**

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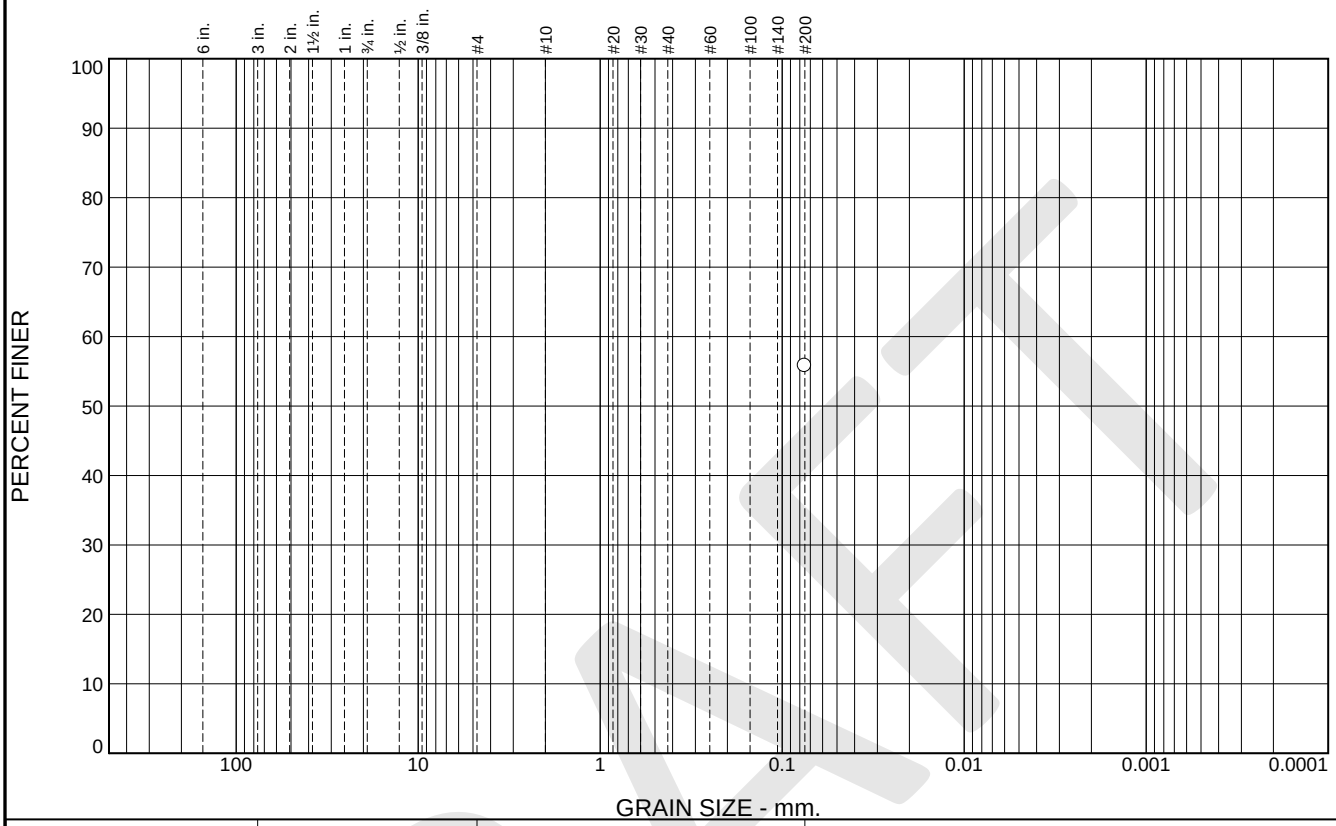
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						55.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	55.8		

* (no specification provided)

Material Description

SANDY lean CLAY, olive brown

Atterberg Limits

PL= 14 LL= 26 PI= 12

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B60 **Depth:** 15-15.5'
Sample Number: 4B **Date:**

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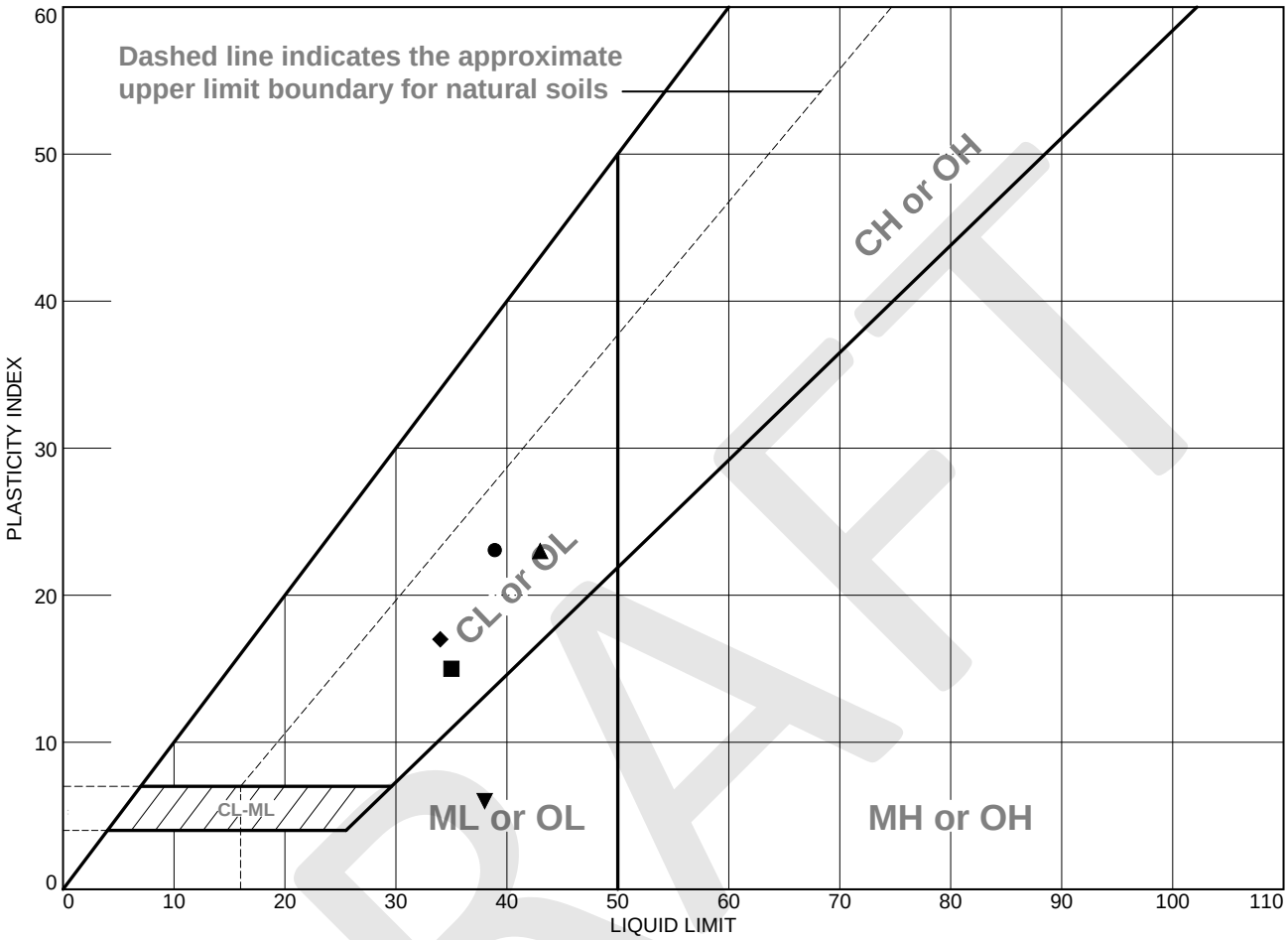
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY with SAND, brown	39	16	23			CL
■	CLAYEY SAND with GRAVEL, reddish brown	35	20	15	24.0	16.1	SC
▲	CLAYEY SAND, strong brown	43	20	23		28.9	SC
◆	CLAYEY SAND, yellowish red	34	17	17		48.1	SC
▼	SILT with SAND, yellowish brown	38	32	6		41.4	ML

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B8 **Depth:** 6-6.5' **Sample Number:** 2C
■**Source of Sample:** B9 **Depth:** 5.5-6' **Sample Number:** 2C
▲**Source of Sample:** B10 **Depth:** 5.75-6.25' **Sample Number:** 2C
◆**Source of Sample:** B11 **Depth:** 1.5-2' **Sample Number:** 1C
▼**Source of Sample:** B12 **Depth:** 10.5-11' **Sample Number:** 3C

Remarks:
▼Sieve analysis test results incorrectly indicate the material is SILTY SAND due to strongly cemented SILT nodules retained on the #200 sieve

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Figure

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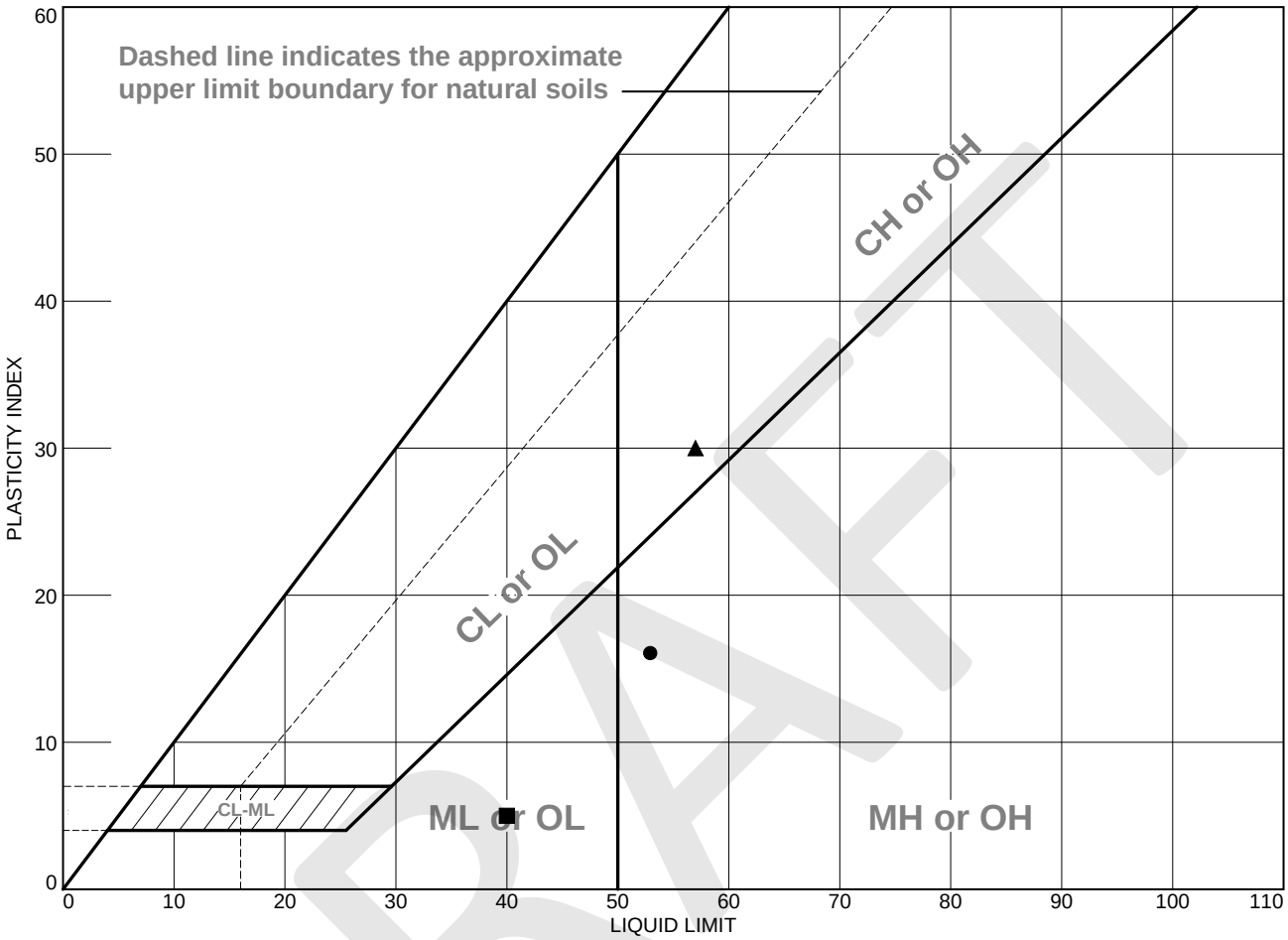
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Elastic SILT, yellowish brown	53	37	16		95.3	MH
■	SILT, brown	40	35	5			ML
▲	CLAYEY SAND, brown	57	27	30		23.5	SC
◆	SILTY SAND, dark brown	NP	NP	NP		26.2	SM
▼	SANDY SILT, dark yellowish brown	NP	NP	NP		52.2	ML

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B13 **Depth:** 5.5-6' **Sample Number:** 2C
■**Source of Sample:** B13 **Depth:** 9.5-10' **Sample Number:** 3C
▲**Source of Sample:** B15 **Depth:** 5.5-6' **Sample Number:** 2C
◆**Source of Sample:** B16 **Depth:** 10-10.5' **Sample Number:** 3C
▼**Source of Sample:** B17 **Depth:** 5.5-6' **Sample Number:** 2C

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Remarks:

Figure

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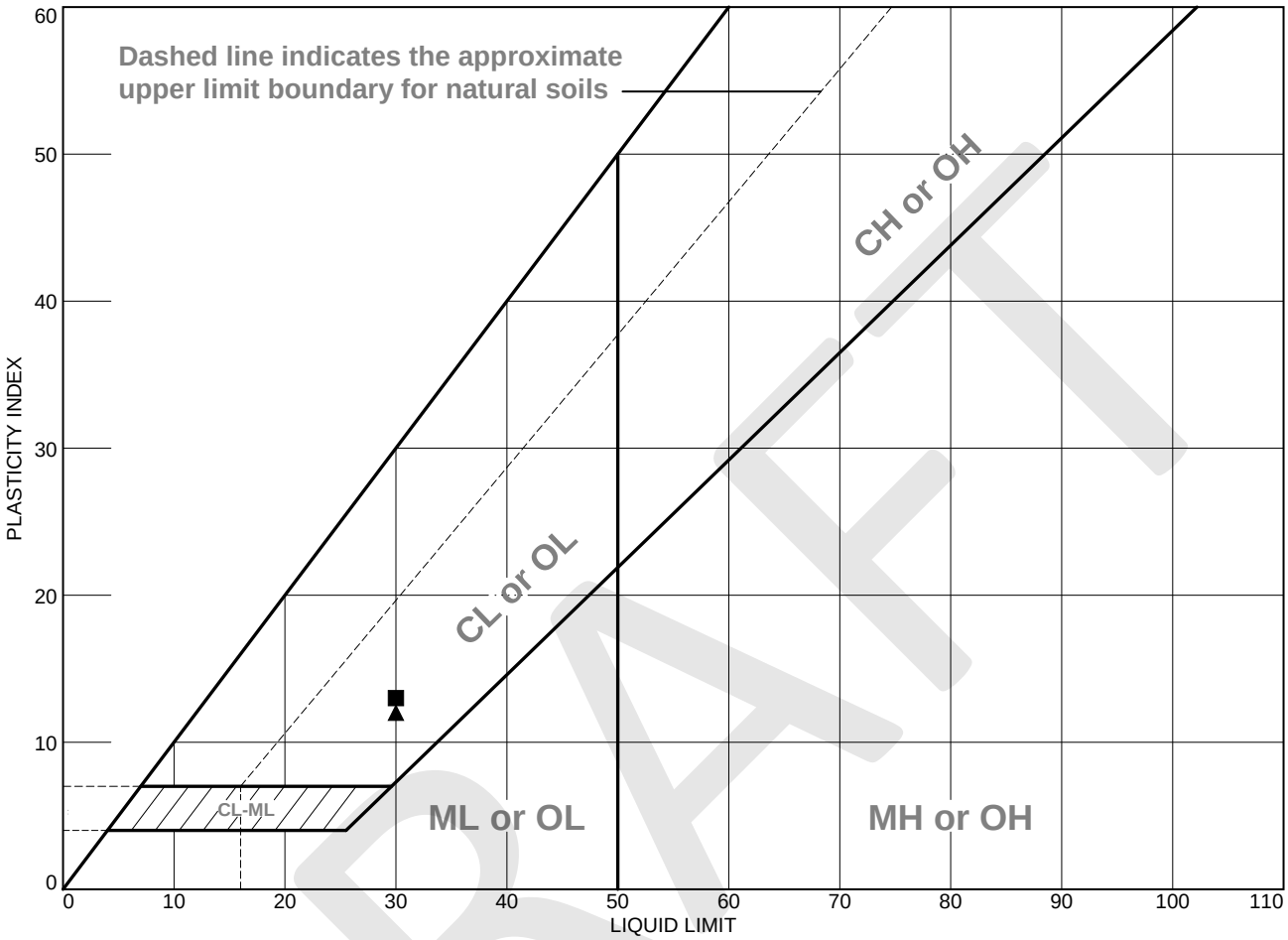
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SILTY SAND, dark reddish brown	NP	NP	NP		18.7	SM
■	CLAYEY SAND, reddish brown	30	17	13		40.2	CL
▲	Lean CLAY, dark brown	30	18	12			CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B18 **Depth:** 10.5-11' **Sample Number:** 3B

■**Source of Sample:** B19 **Depth:** 5.8-6.3' **Sample Number:** 2C

▲**Source of Sample:** B20 **Depth:** 5-5.5' **Sample Number:** 2C

Remarks:

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Figure

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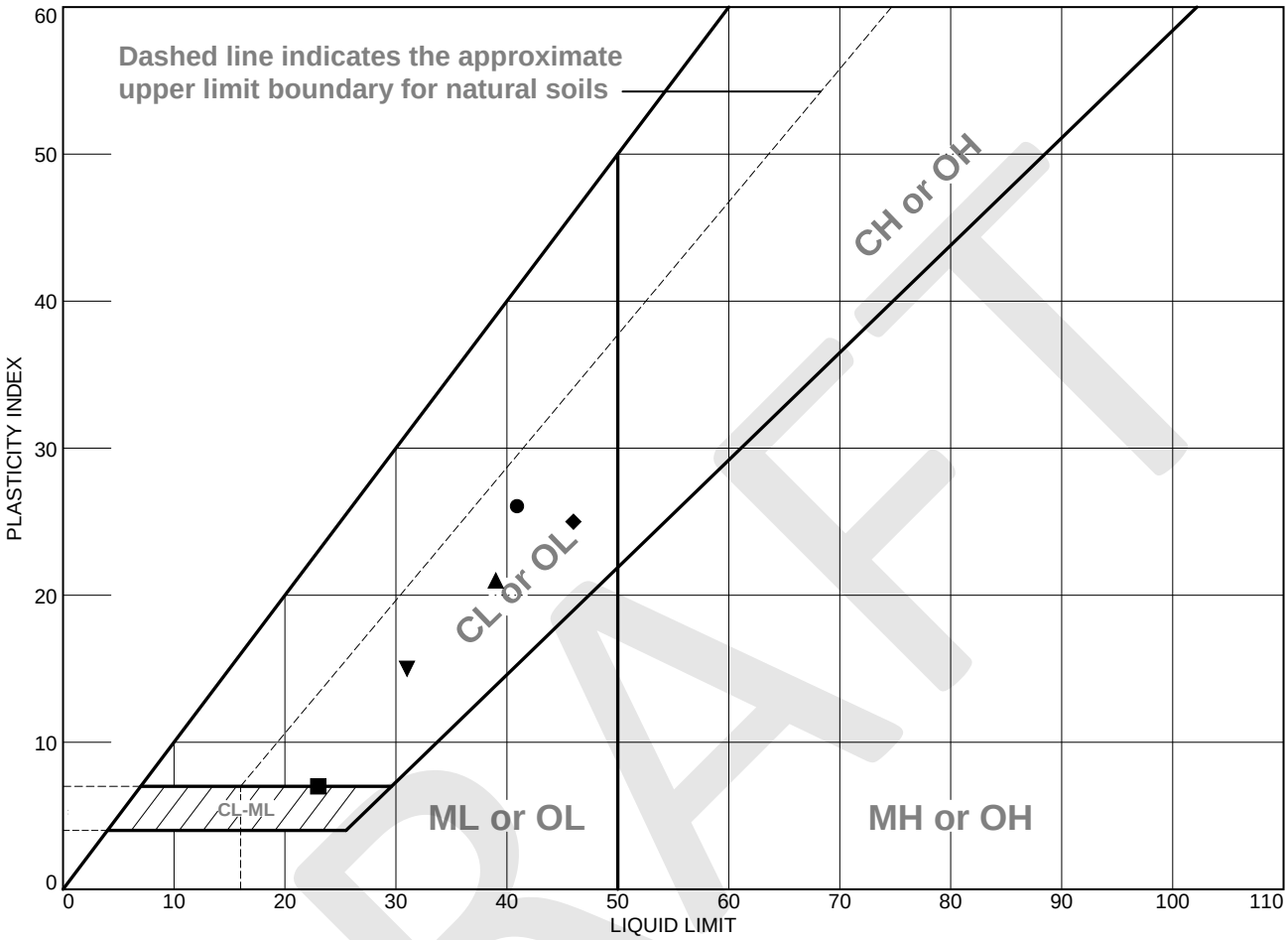
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	CLAYEY SAND, reddish yellow	41	15	26		36.8	SC
■	SILTY, CLAYEY SAND, dark brown	23	16	7		39.1	SC-SM
▲	SANDY lean CLAY, strong brown	39	18	21		57.7	CL
◆	SANDY lean CLAY, yellowish red	46	21	25	64.4	56.6	CL
▼	SANDY lean CLAY, brown	31	16	15		56.3	CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B25 **Depth:** 5.8-6.3' **Sample Number:** 2C
■**Source of Sample:** B26 **Depth:** 2.5-3' **Sample Number:** 1C
▲**Source of Sample:** B28 **Depth:** 2.8-3.3' **Sample Number:** 1C
◆**Source of Sample:** B29 **Depth:** 5.5-6' **Sample Number:** 2C
▼**Source of Sample:** B30 **Depth:** 6-6.5' **Sample Number:** 2C

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Remarks:

Figure

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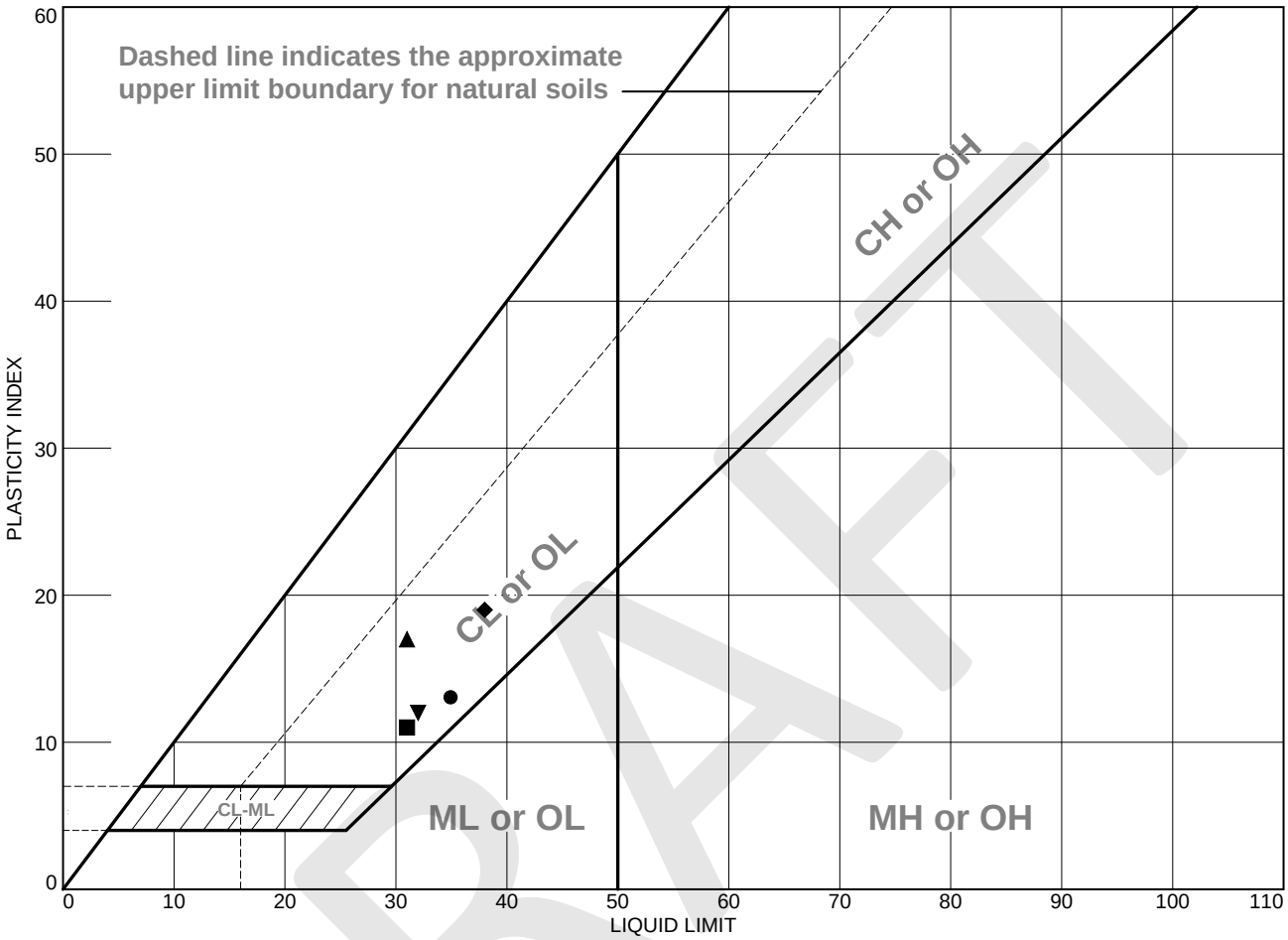
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY with SAND, reddish brown	35	22	13		75.0	CL
■	SANDY lean CLAY, strong brown	31	20	11		69.7	CL
▲	SANDY lean CLAY, strong brown	31	14	17			CL
◆	SANDY lean CLAY, reddish brown	38	19	19			CL
▼	Lean CLAY, strong brown	32	20	12			CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B32 **Depth:** 6-6.5' **Sample Number:** 2C
■**Source of Sample:** B34 **Depth:** 6-6.5' **Sample Number:** 2C
▲**Source of Sample:** B35 **Depth:** 5-5.5' **Sample Number:** 2B
◆**Source of Sample:** B36 **Sample Number:** 3B
▼**Source of Sample:** B38 **Depth:** 5.5-6' **Sample Number:** 2C

Remarks:

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Figure

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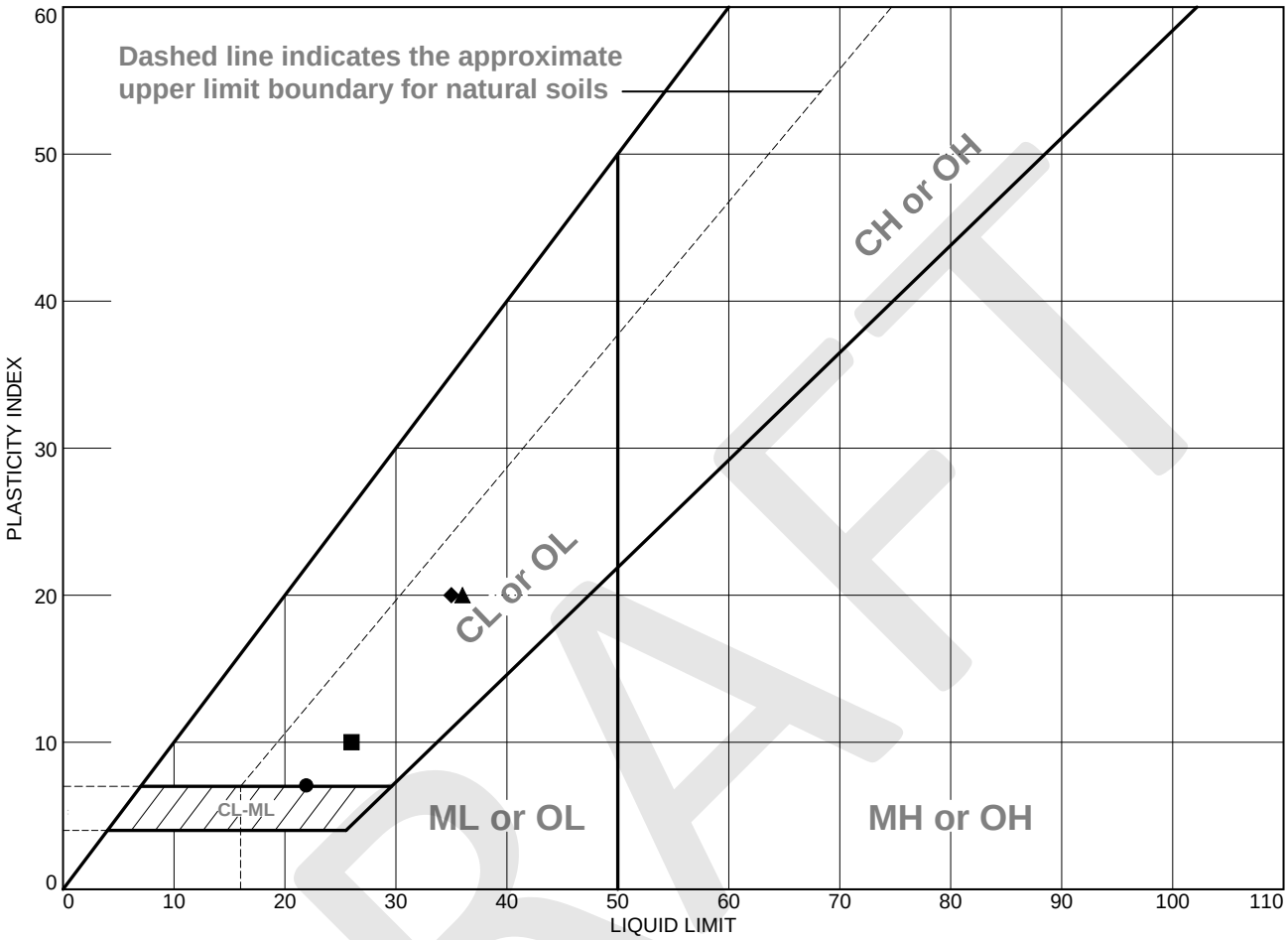
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SANDY SILTY CLAY, dark reddish brown	22	15	7		64.5	CL-ML
■	CLAYEY SAND, reddish yellow	26	16	10		27.8	SC
▲	Lean CLAY, brown	36	16	20			CL
◆	CLAYEY SAND, yellowish brown	35	15	20		17.6	SC

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B39 **Sample Number:** 1C

■**Source of Sample:** B40 **Depth:** 5-5.5' **Sample Number:** 2C

▲**Source of Sample:** B42 **Depth:** 1.5-2 **Sample Number:** 1C

◆**Source of Sample:** B44 **Depth:** 10.5-11' **Sample Number:** 3B

Remarks:

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Figure

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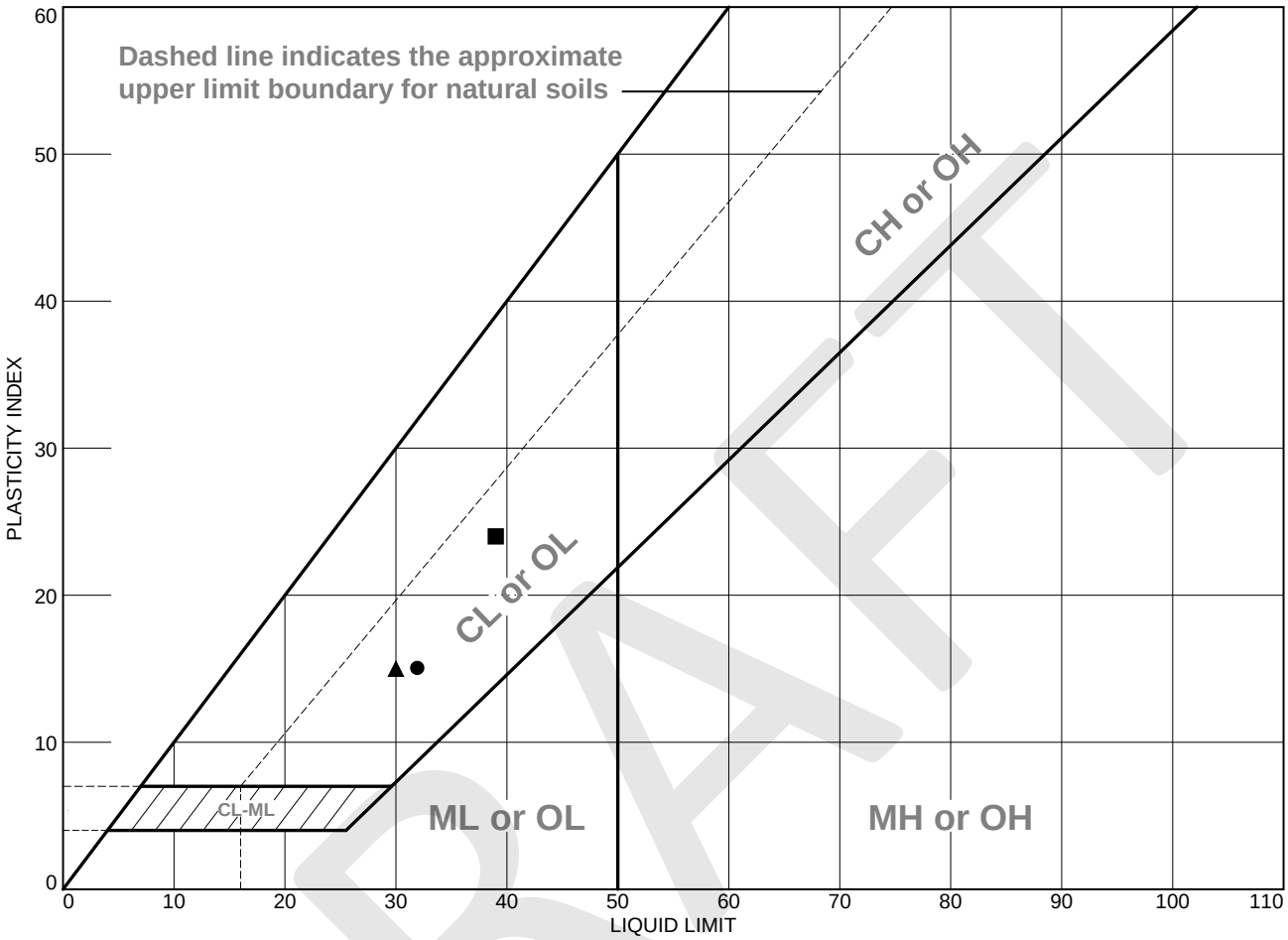
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY with SAND, dark brown	32	17	15		74.6	CL
■	CLAYEY SAND, dark brown	39	15	24		46.7	SC
▲	SANDY lean CLAY, brown	30	15	15		59.8	CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B45 **Depth:** 5-5.5' **Sample Number:** 2B

■**Source of Sample:** B45 **Depth:** 10-10.5' **Sample Number:** 3B

▲**Source of Sample:** B46 **Depth:** 11-11.5' **Sample Number:** 3C

Remarks:

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Figure

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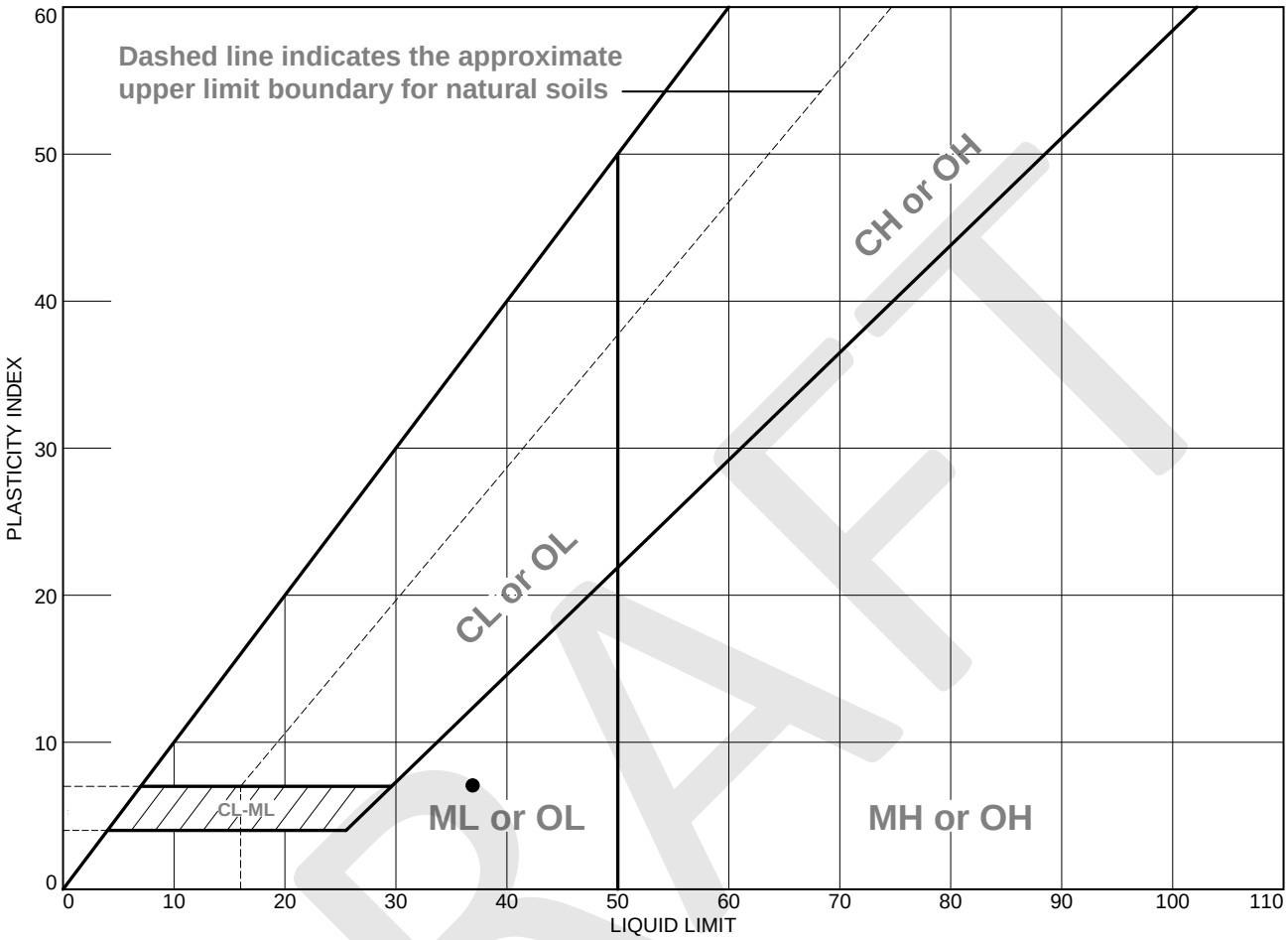
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SILTY SAND, strong brown	37	30	7		42.9	SM

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B49 **Depth:** 5.5-6' **Sample Number:** 2C

Remarks:

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Figure

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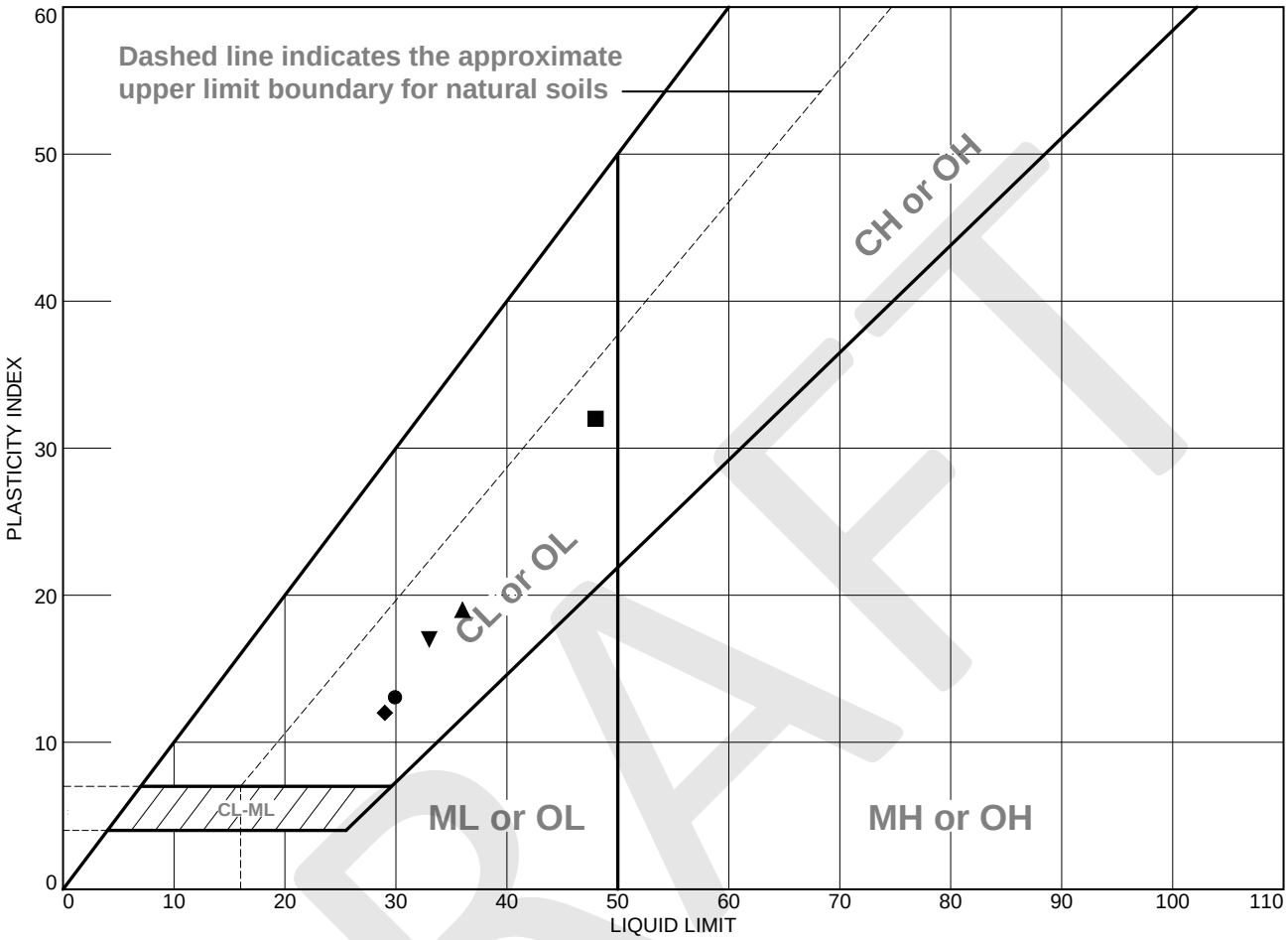
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY, yellowish red & grayish brown	30	17	13			CL
■	Lean CLAY, dark reddish brown	48	16	32			CL
▲	CLAYEY SAND, reddish brown	36	17	19		41.0	SC
◆	Lean CLAY with SAND, dark reddish brown	29	17	12		70.6	CL
▼	CLAYEY SAND, reddish brown	33	16	17		26.4	SC

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B54 **Depth:** 16-16.5' **Sample Number:** 4C
■**Source of Sample:** B55 **Depth:** 5.5-6' **Sample Number:** 2C
▲**Source of Sample:** B55 **Depth:** 10-10.5' **Sample Number:** 3B
◆**Source of Sample:** B56 **Depth:** 2-2.5' **Sample Number:** 1B
▼**Source of Sample:** B56 **Depth:** 10.5-11' **Sample Number:** 3C

Remarks:

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Figure

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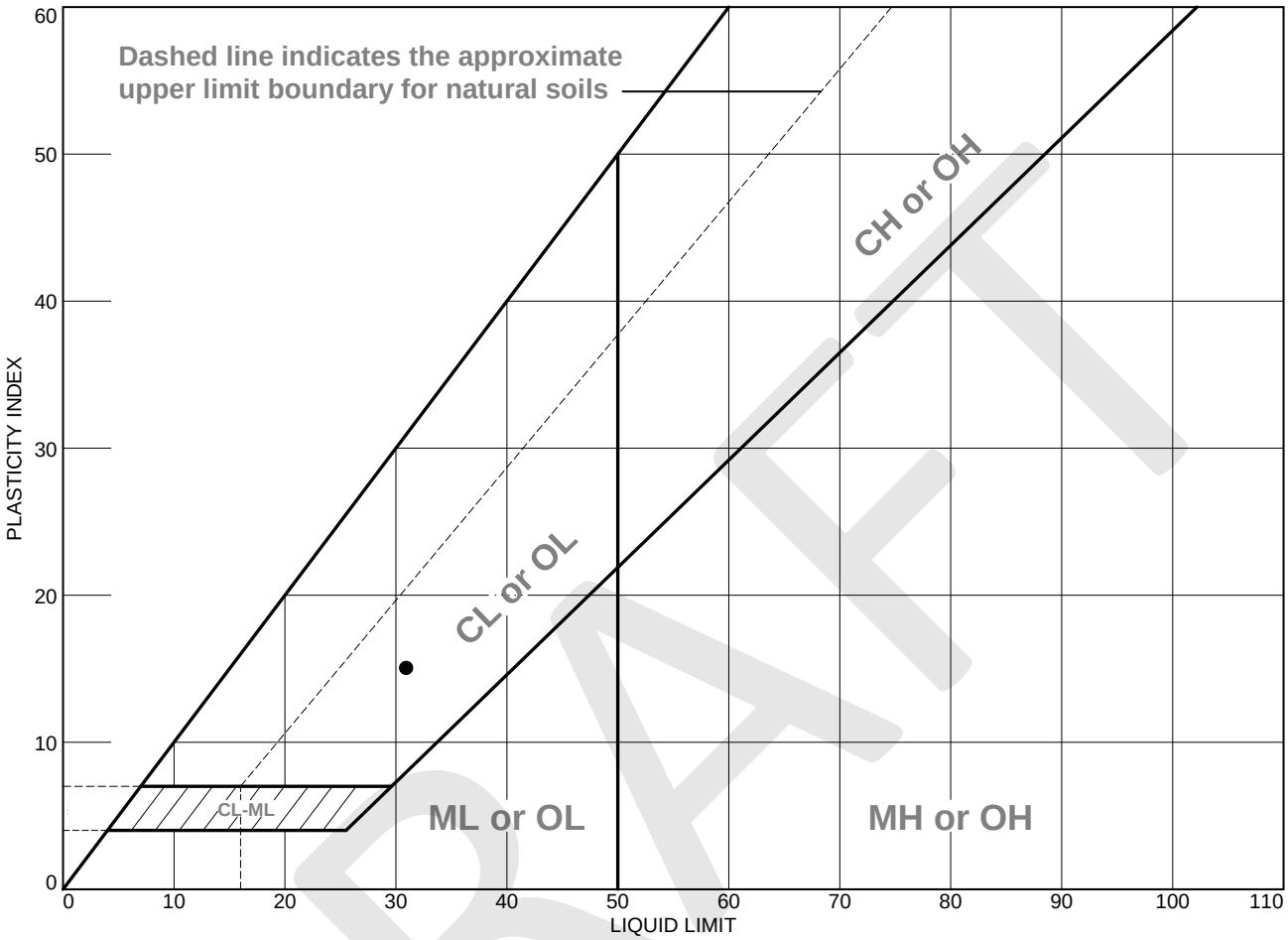
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY with SAND, dark brown	31	16	15		76	CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B57 **Depth:** 2-2.5' **Sample Number:** 1C

Remarks:

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Figure

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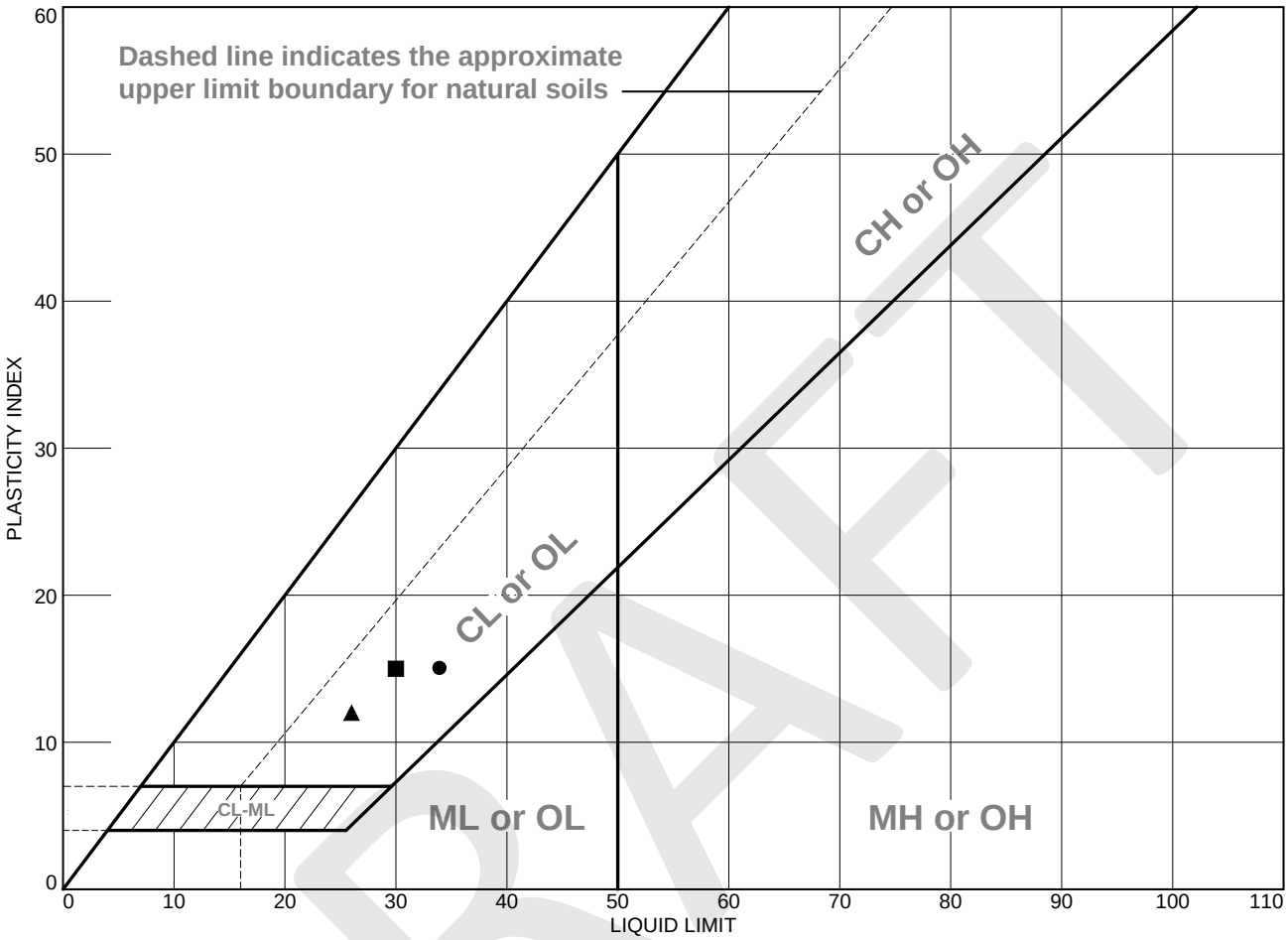
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SANDY lean CLAY, strong brown	34	19	15			CL
■	SANDY lean CLAY, dark yellowish brown	30	15	15		69.5	CL
▲	SANDY lean CLAY, olive brown	26	14	12		55.8	CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B60 **Depth:** 1-2.5' **Sample Number:** 1

■**Source of Sample:** B60 **Depth:** 5.5-6' **Sample Number:** 2C

▲**Source of Sample:** B60 **Depth:** 15-15.5' **Sample Number:** 4B

Remarks:

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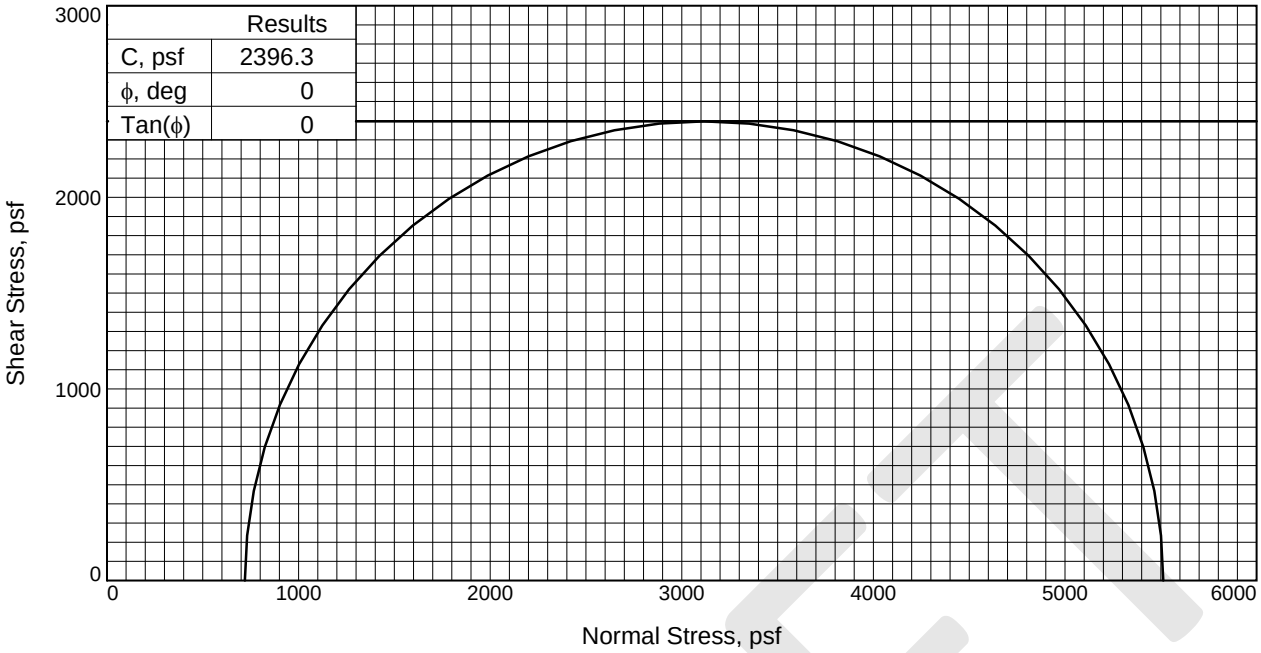
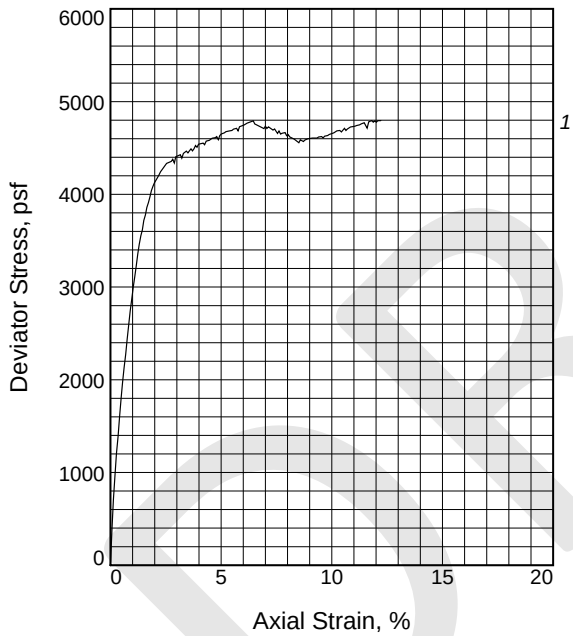
W. Sacramento, CA

Figure

DRAFT





Sample No.		1
Initial	Water Content, %	18.5
	Dry Density, pcf	103.1
	Saturation, %	78.7
	Void Ratio	0.6347
	Diameter, in.	2.408
	Height, in.	4.995
At Test	Water Content, %	23.2
	Dry Density, pcf	103.6
	Saturation, %	100.0
	Void Ratio	0.6269
	Diameter, in.	2.404
	Height, in.	4.987
Strain rate, in./min.		0.024
Back Pressure, psf		0.0
Cell Pressure, psf		720.0
Fail. Stress, psf		4792.5
Strain, %		6.5
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		5512.5
σ_3 Failure, psf		720.0

Type of Test:
Unconsolidated Undrained

Sample Type: CalMod

Description: CLAYEY SAND, strong brown

LL= 43 **PL=** 20 **PI=** 23

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B10 **Depth:** 5.75-6.25'

Sample Number: 2C

Proj. No.: 3934.X **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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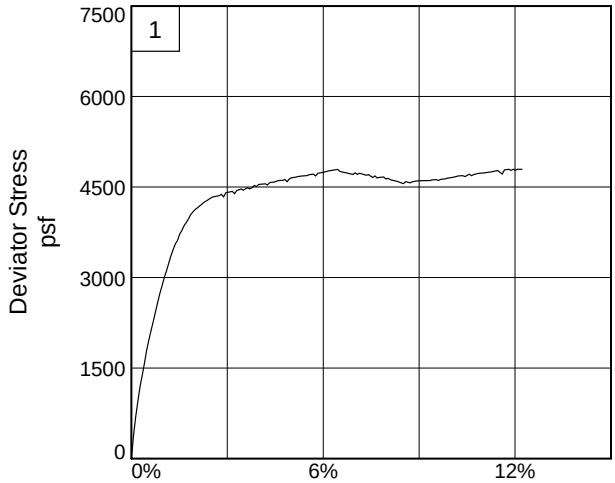

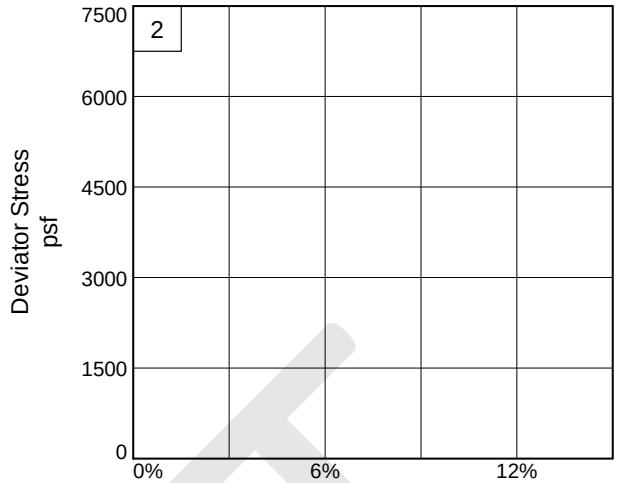

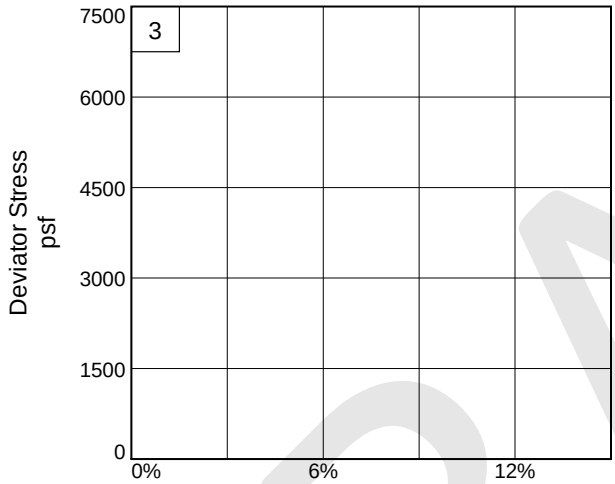

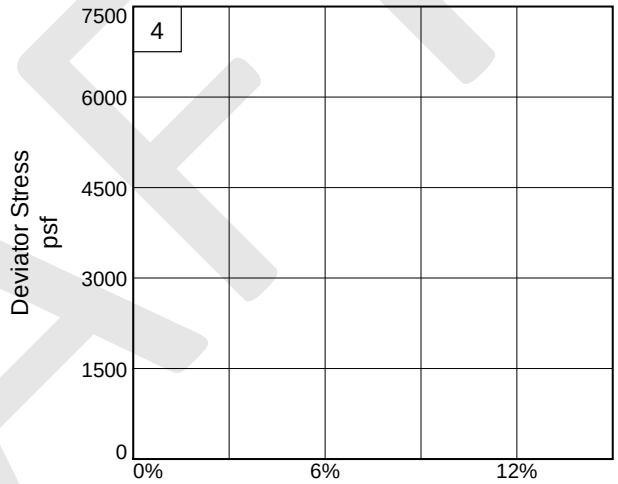

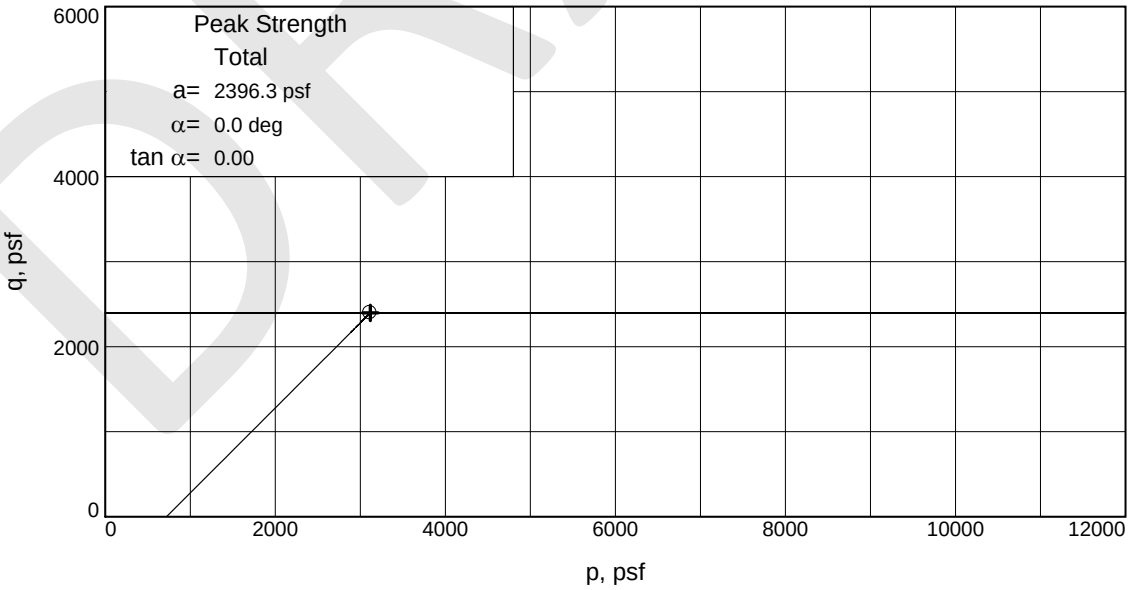

Stress Paths: o indicates peak + indicates end

DRAFT

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B10 **Depth:** 5.75-6.25' **Sample Number:** 2C

Project No.: 3934.X **Figure** _____

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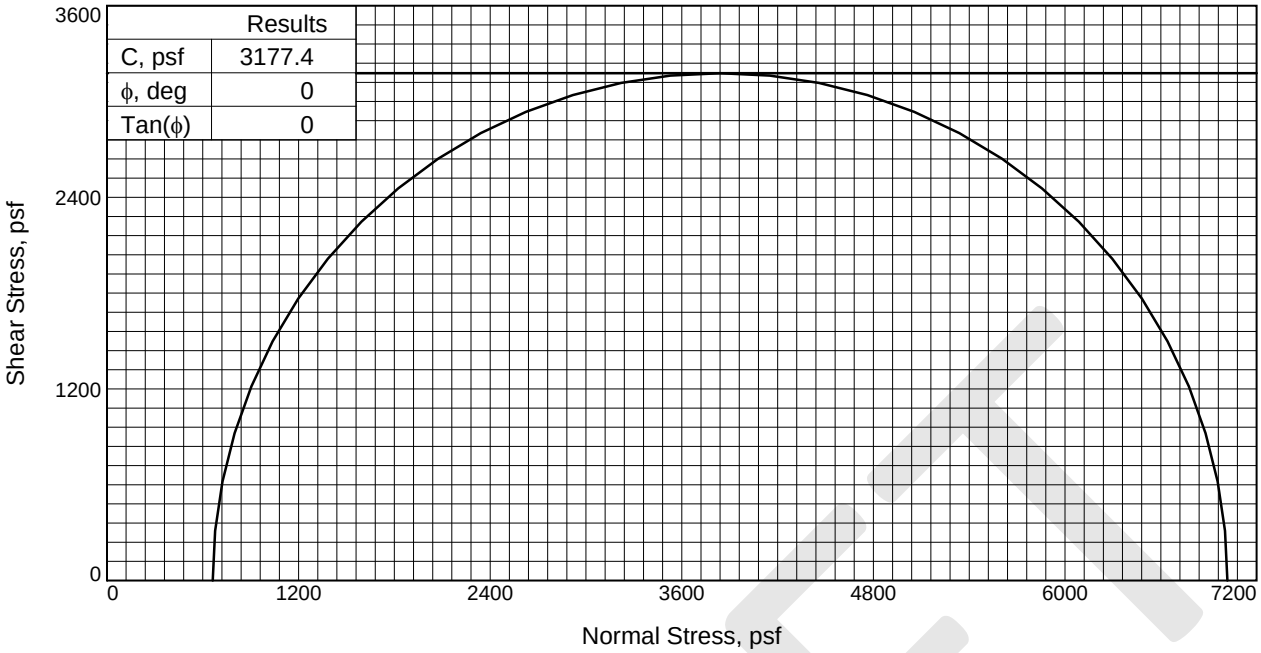

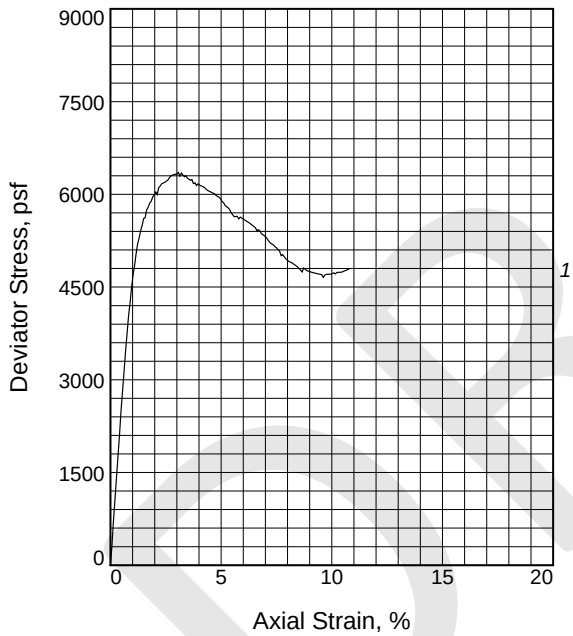

Sample No.		1
Initial	Water Content, %	28.2
	Dry Density, pcf	90.1
	Saturation, %	87.6
	Void Ratio	0.8708
	Diameter, in.	2.424
	Height, in.	5.018
At Test	Water Content, %	28.2
	Dry Density, pcf	90.1
	Saturation, %	87.4
	Void Ratio	0.8708
	Diameter, in.	2.424
	Height, in.	5.018
Strain rate, in./min.		0.023
Back Pressure, psf		0.0
Cell Pressure, psf		662.4
Fail. Stress, psf		6354.7
Strain, %		3.1
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		7017.1
σ_3 Failure, psf		662.4

Type of Test:
Unconsolidated Undrained

Sample Type: CalMod

Description: SILT, brown

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B16 **Depth:** 5.5-6'

Sample Number: 2C

Proj. No.: 3934.X **Date Sampled:**

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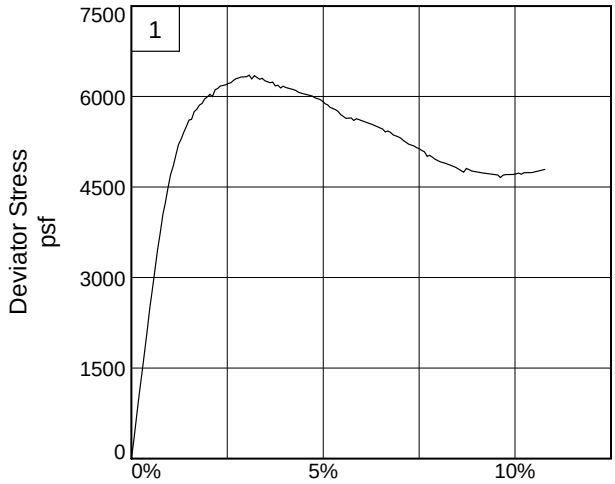

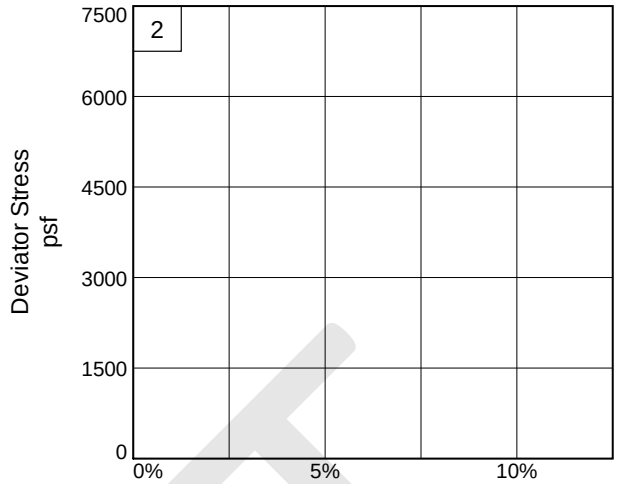

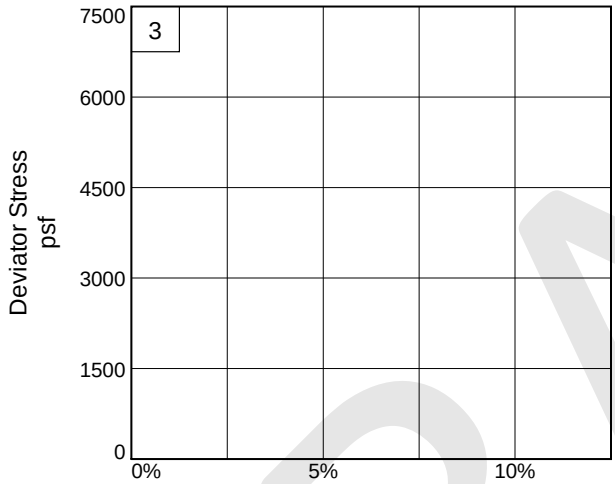

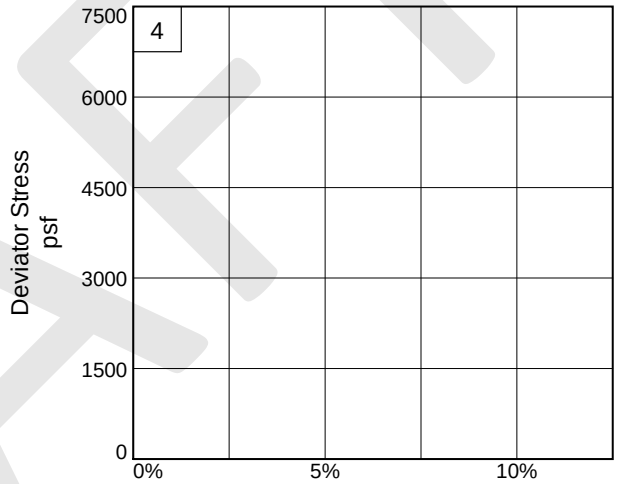

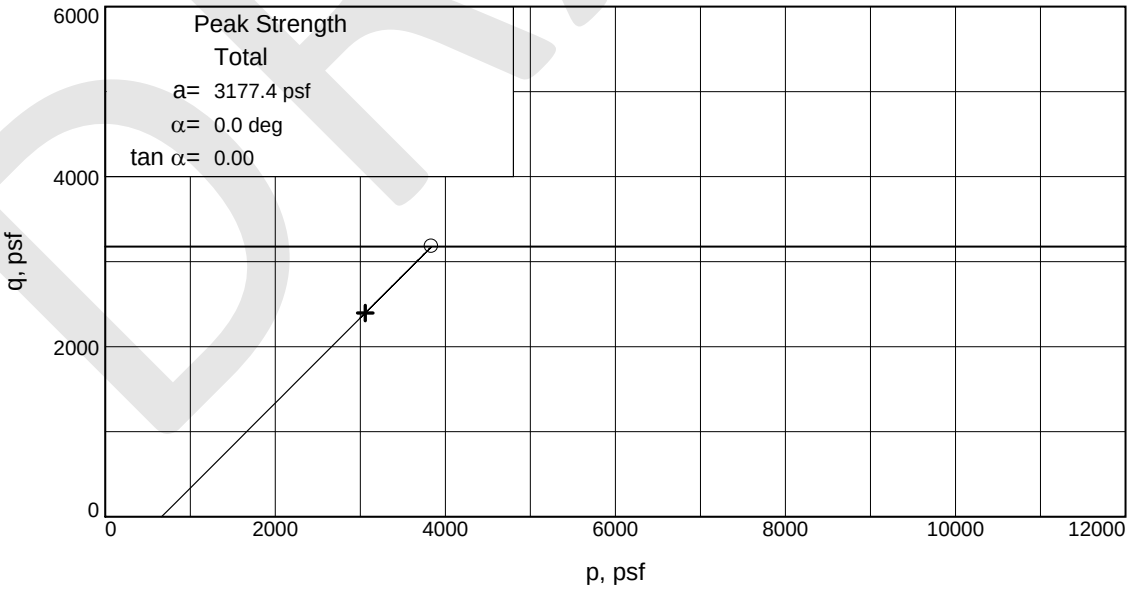

Stress Paths: o indicates peak + indicates end

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B16 **Depth:** 5.5-6' **Sample Number:** 2C

Project No.: 3934.X **Figure** _____

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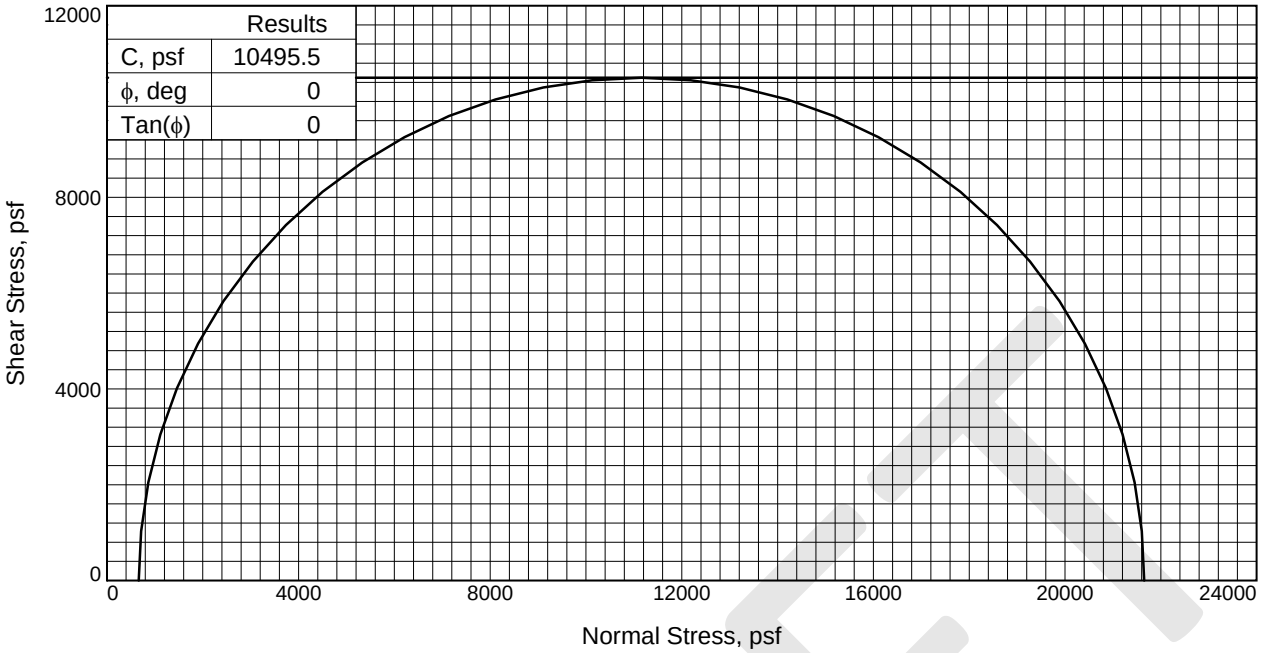

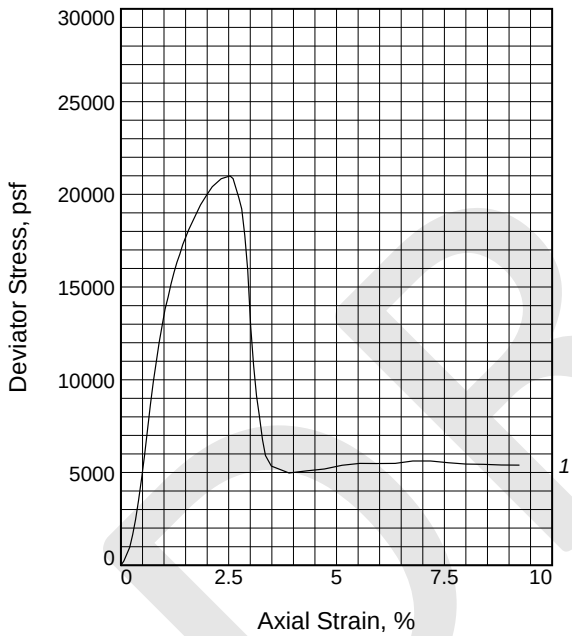

Sample No.		1
Initial	Water Content, %	16.4
	Dry Density, pcf	112.8
	Saturation, %	89.6
	Void Ratio	0.4938
	Diameter, in.	2.391
	Height, in.	5.005
At Test	Water Content, %	16.4
	Dry Density, pcf	112.8
	Saturation, %	89.7
	Void Ratio	0.4938
	Diameter, in.	2.391
	Height, in.	5.005
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		662.4
Fail. Stress, psf		20991.0
Strain, %		2.5
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		21653.4
σ_3 Failure, psf		662.4

Type of Test:
Unconsolidated Undrained

Sample Type: CalMod

Description: Lean CLAY, reddish brown

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B32 **Depth:** 5.5-6'

Sample Number: 2B

Proj. No.: 3934.X **Date Sampled:**

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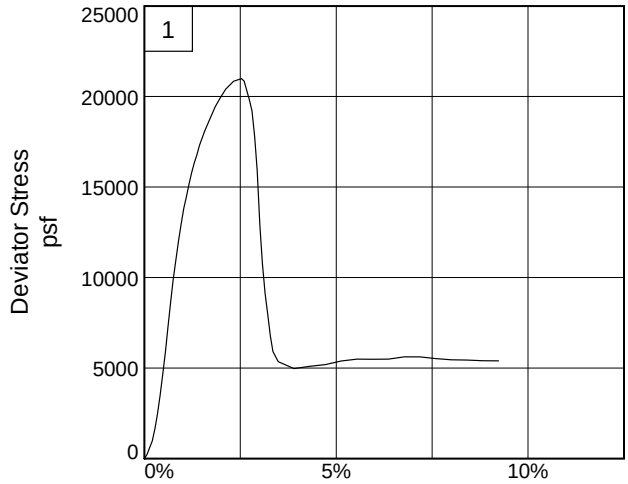

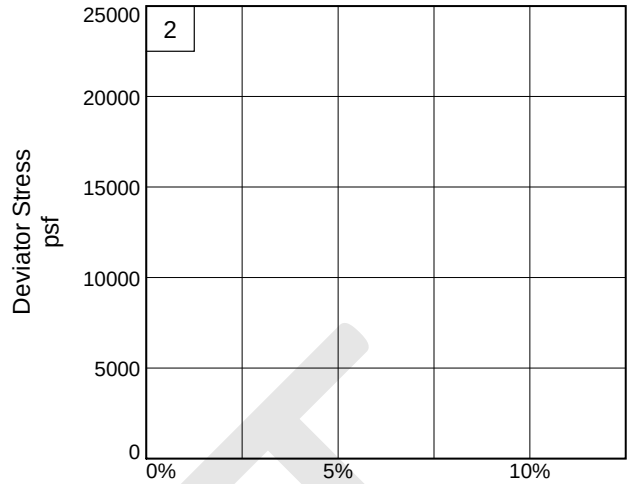

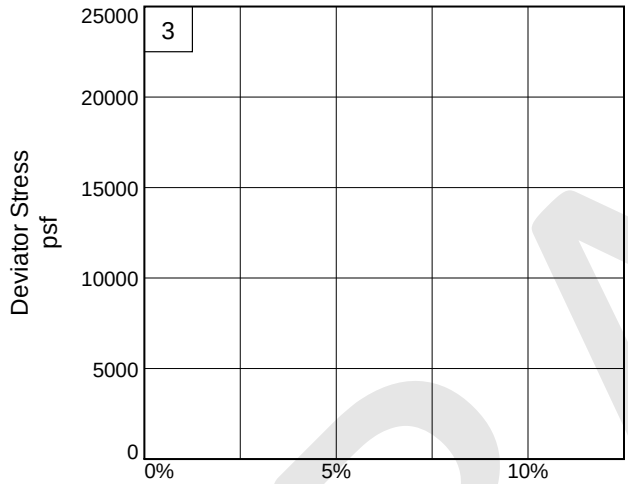

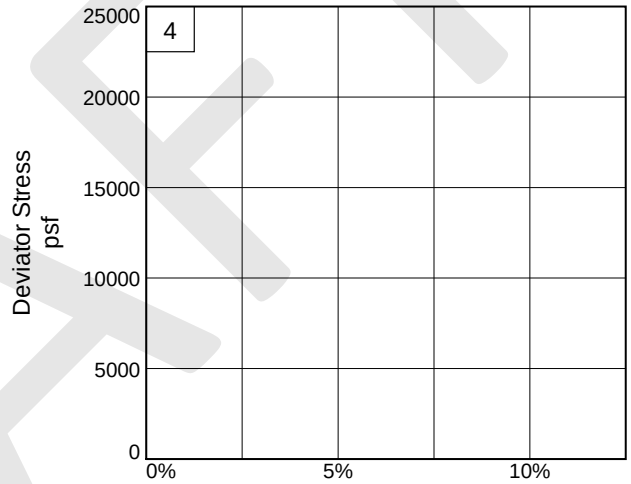

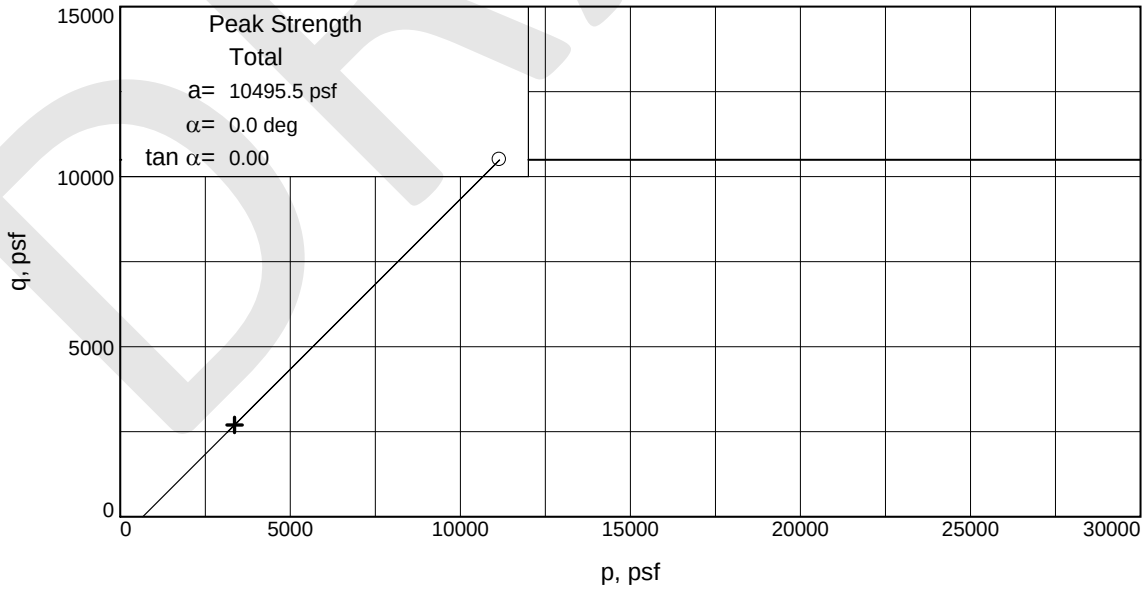

Stress Paths: o indicates peak + indicates end

DRAFT

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B32 **Depth:** 5.5-6' **Sample Number:** 2B

Project No.: 3934.X **Figure** _____

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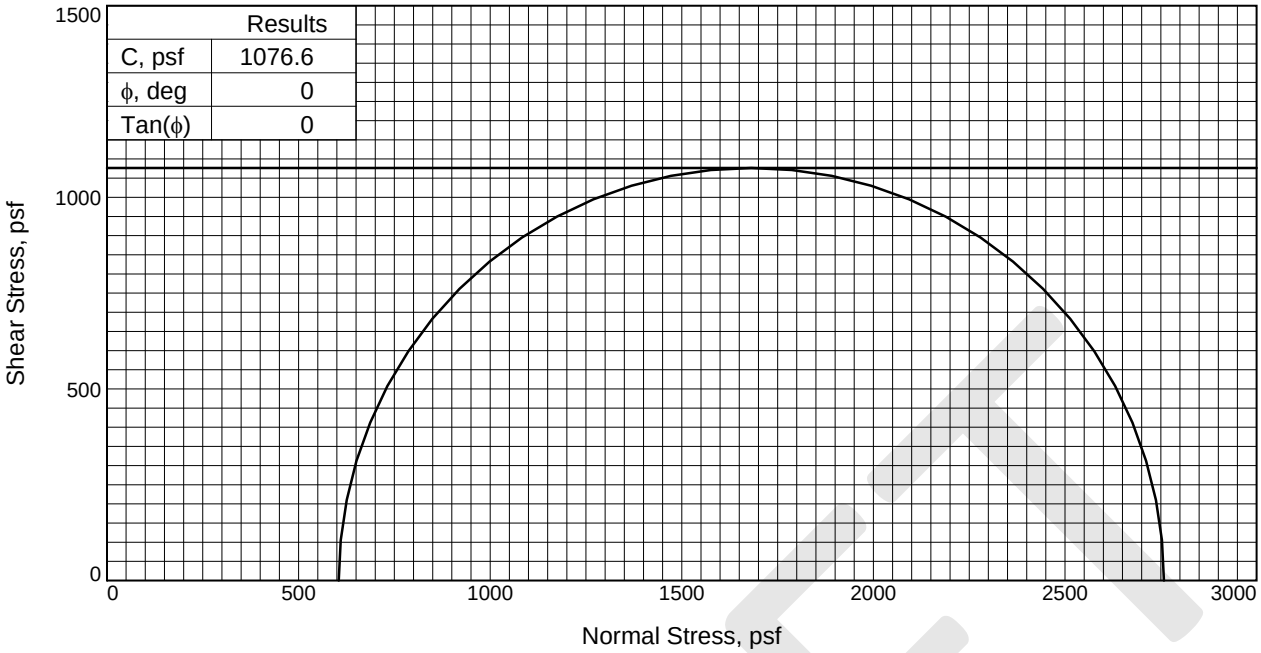

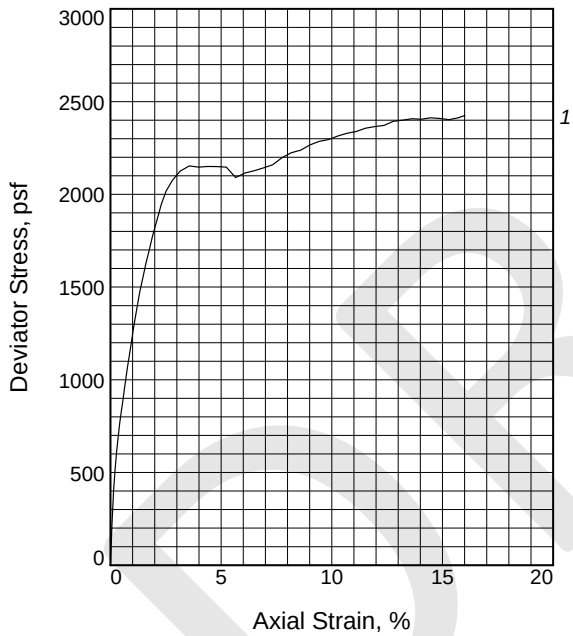

Sample No.		1
Initial	Water Content, %	20.7
	Dry Density, pcf	101.5
	Saturation, %	84.5
	Void Ratio	0.6603
	Diameter, in.	2.370
	Height, in.	4.901
At Test	Water Content, %	20.7
	Dry Density, pcf	101.5
	Saturation, %	84.6
	Void Ratio	0.6603
	Diameter, in.	2.370
	Height, in.	4.901
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		604.8
Fail. Stress, psf		2153.2
Strain, %		3.6
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		2758.0
σ_3 Failure, psf		604.8

Type of Test:
Unconsolidated Undrained

Sample Type: CalMod

Description: Lean CLAY with SAND, dark brown

LL= 32 **PL=** 17 **PI=** 15

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B45 **Depth:** 5-5.5'

Sample Number: 2B

Proj. No.: 3934.X **Date Sampled:**

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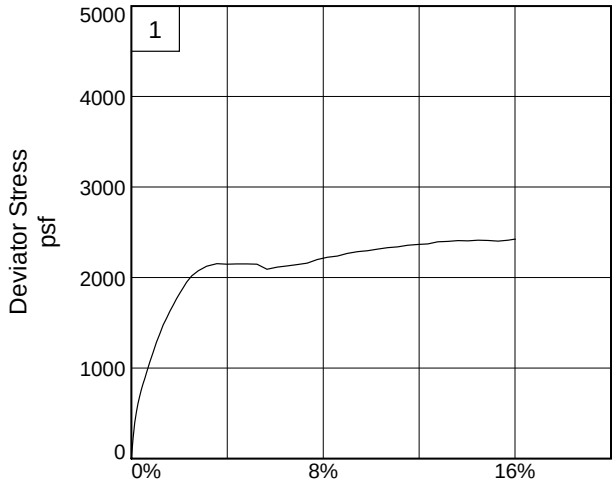

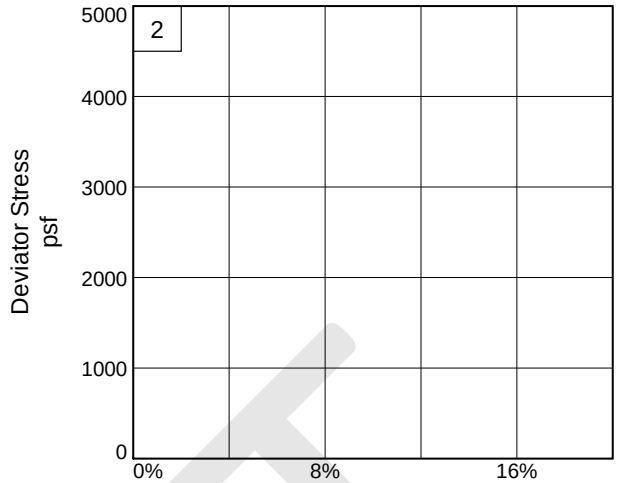

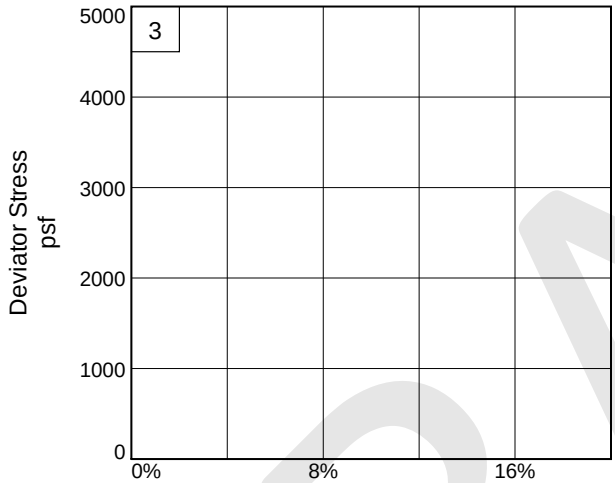

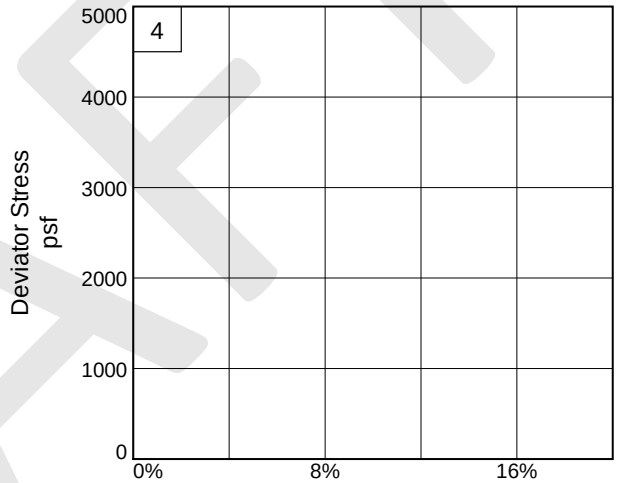

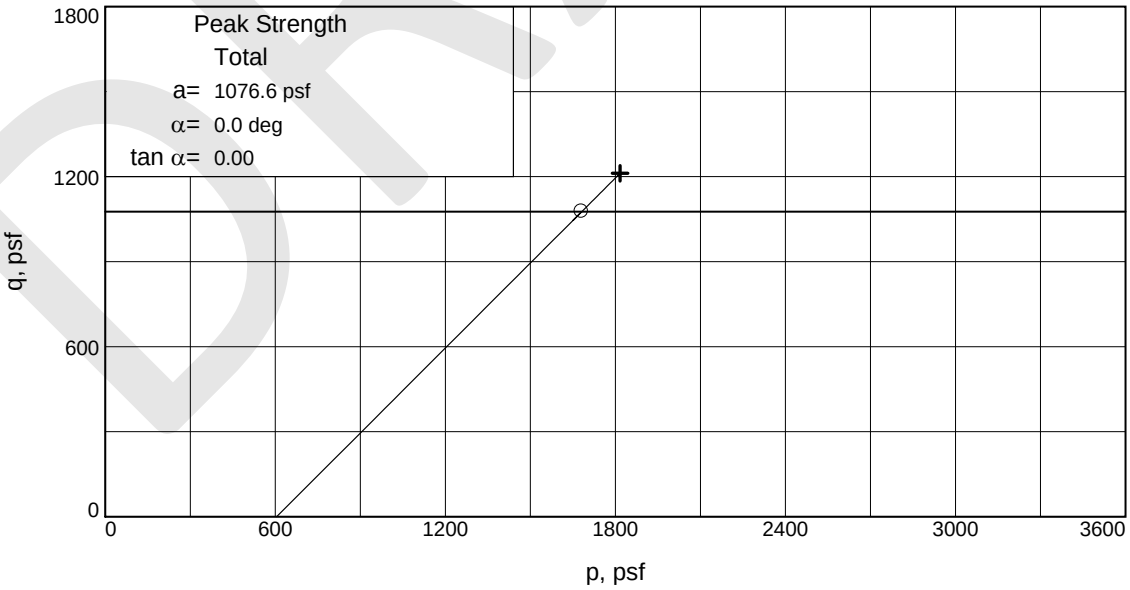

Stress Paths: o indicates peak + indicates end

DRAFT

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B45 **Depth:** 5-5.5' **Sample Number:** 2B

Project No.: 3934.X **Figure** _____

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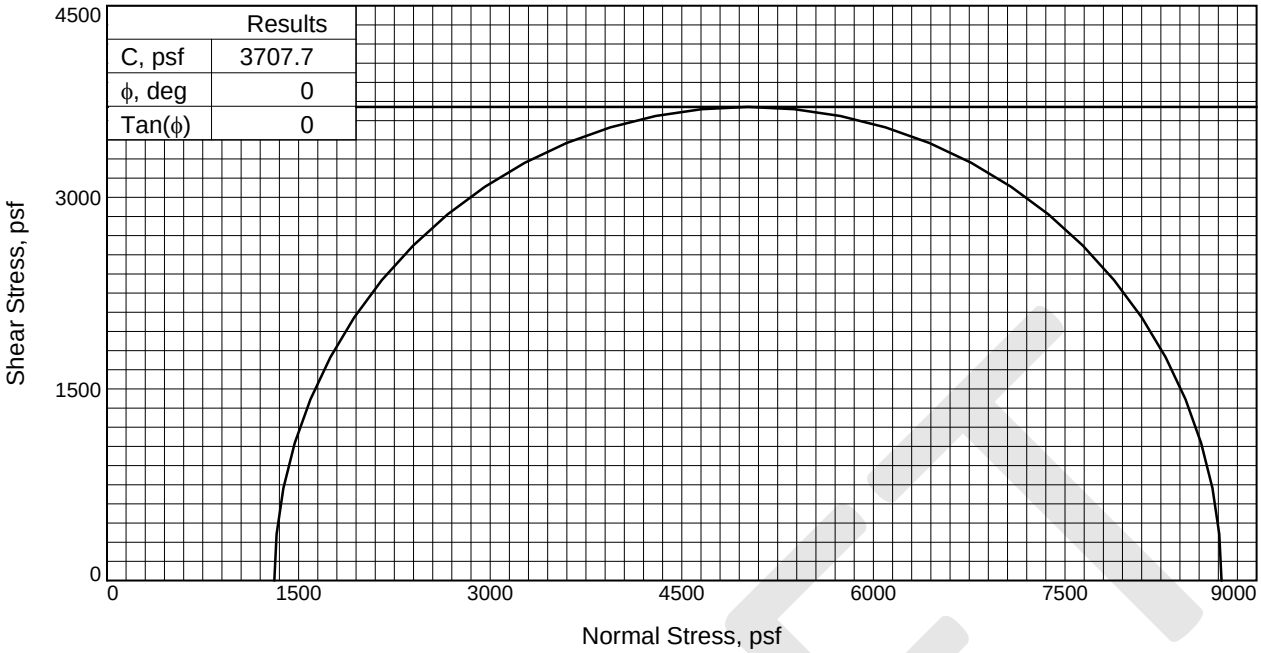

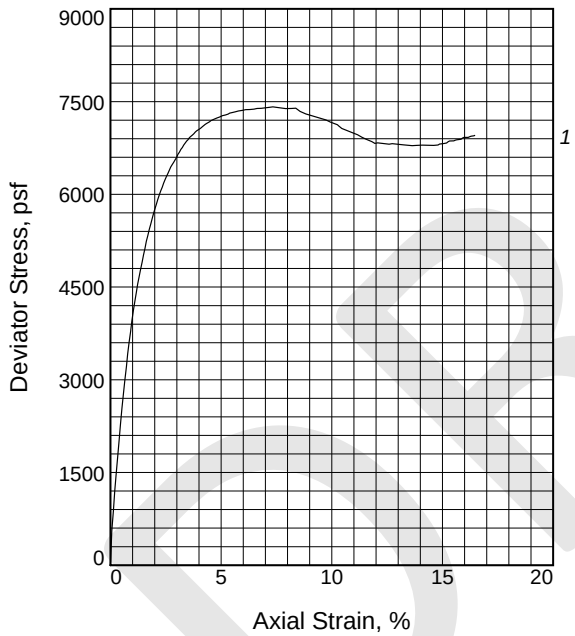

Sample No.		1
Initial	Water Content, %	9.8
	Dry Density, pcf	115.5
	Saturation, %	57.3
	Void Ratio	0.4598
	Diameter, in.	2.401
	Height, in.	4.982
At Test	Water Content, %	16.7
	Dry Density, pcf	116.2
	Saturation, %	100.0
	Void Ratio	0.4510
	Diameter, in.	2.396
	Height, in.	4.972
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		1310.4
Fail. Stress, psf		7415.4
Strain, %		7.3
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		8725.8
σ_3 Failure, psf		1310.4

Type of Test:
Unconsolidated Undrained

Sample Type: Cal Mod

Description: CLAYEY SAND, reddish brown

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B54 **Depth:** 10.8-11.3'

Sample Number: 3C

Proj. No.: 3934.X **Date Sampled:**

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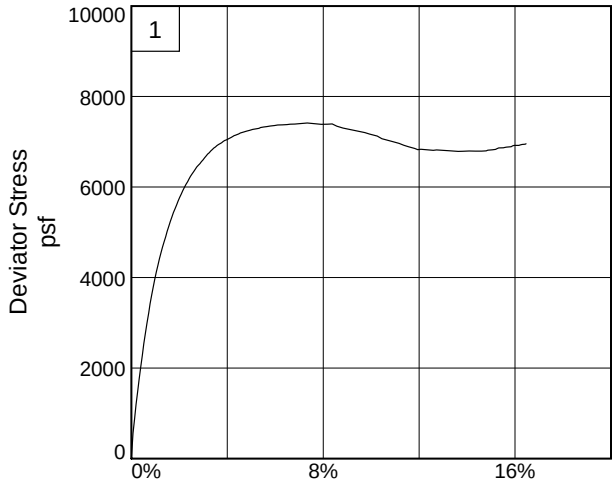

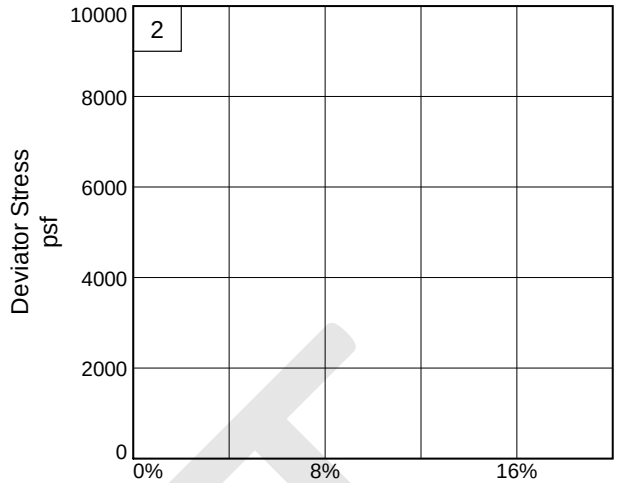

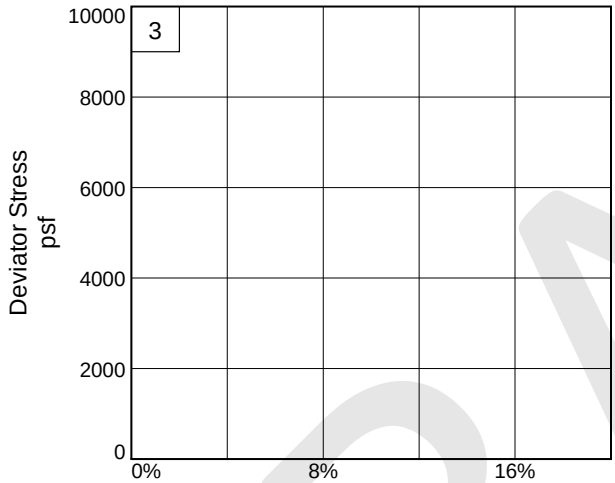

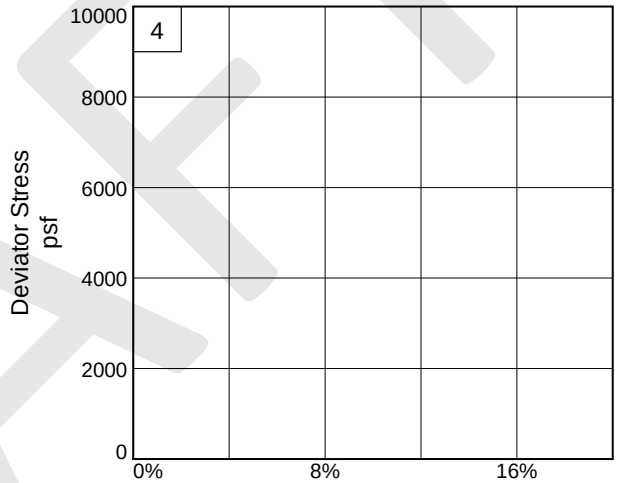

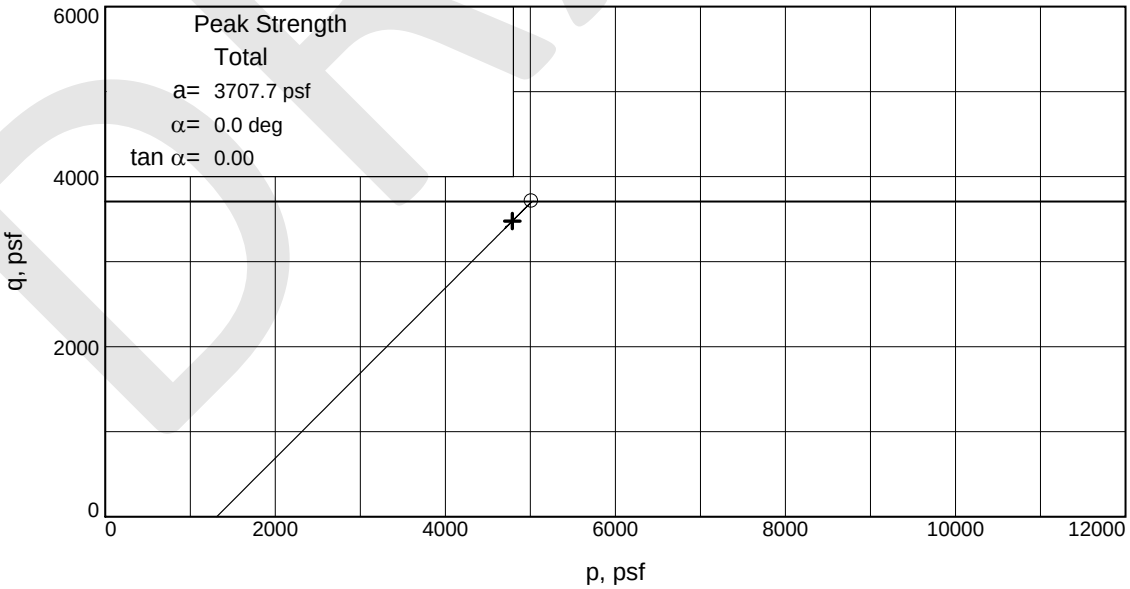

Stress Paths: o indicates peak + indicates end

DRAFT

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B54 **Depth:** 10.8-11.3' **Sample Number:** 3C

Project No.: 3934.X **Figure** _____

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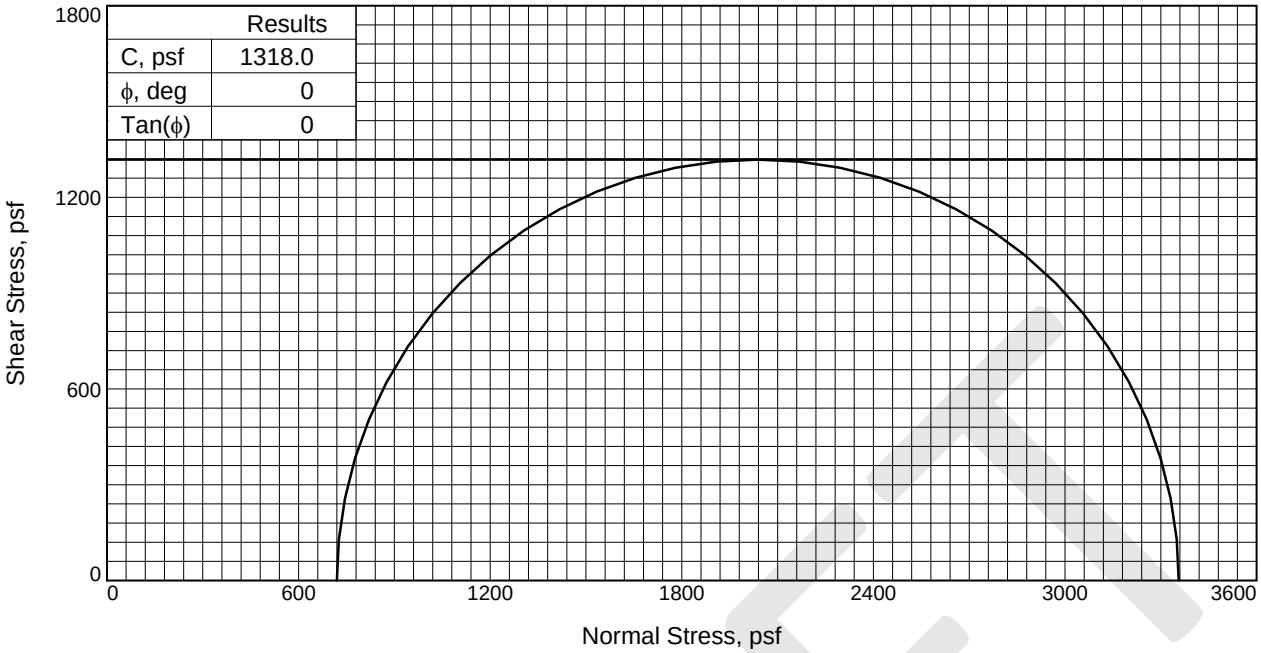

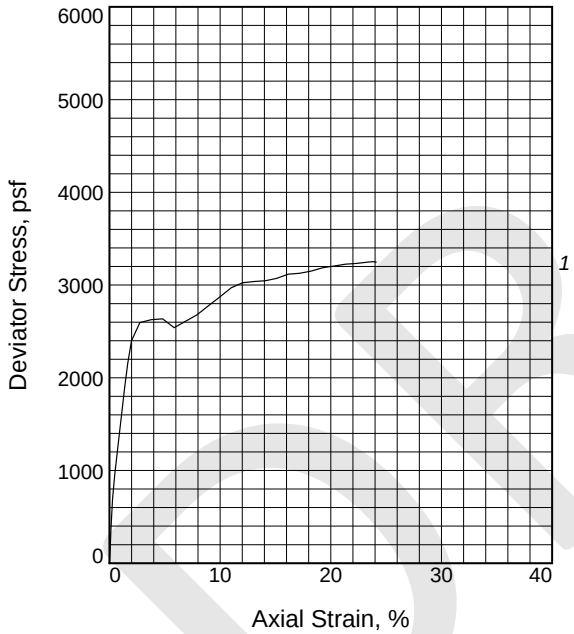

Sample No.		1
Initial	Water Content, %	12.6
	Dry Density, pcf	112.6
	Saturation, %	68.7
	Void Ratio	0.4966
	Diameter, in.	2.375
	Height, in.	4.978
At Test	Water Content, %	12.6
	Dry Density, pcf	112.6
	Saturation, %	68.5
	Void Ratio	0.4966
	Diameter, in.	2.375
	Height, in.	4.978
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		720.0
Fail. Stress, psf		2636.1
Strain, %		4.8
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		3356.1
σ_3 Failure, psf		720.0

Type of Test: Unconsolidated Undrained

Sample Type: CalMod

Description: SANDY lean CLAY, dark yellowish brown

LL= 30 **PL=** 15 **PI=** 15

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B60 **Depth:** 5.5-6'

Sample Number: 2C

Proj. No.: 3934.X **Date Sampled:**

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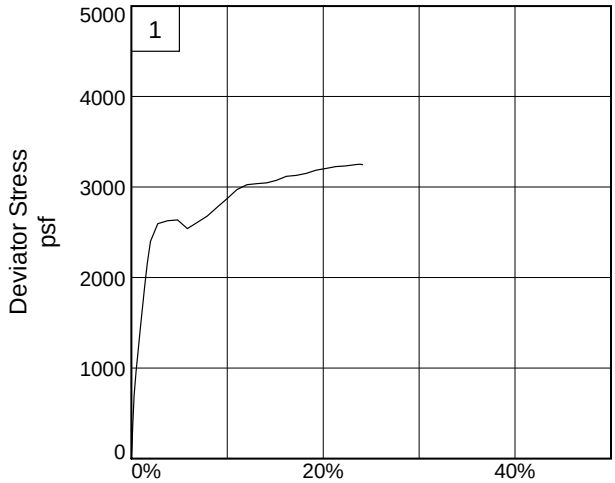

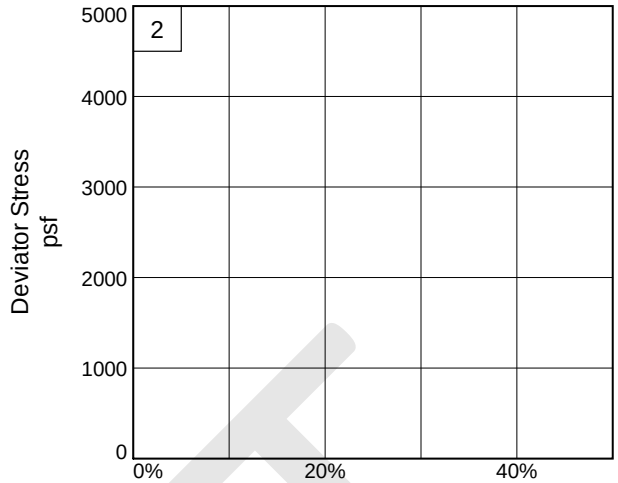

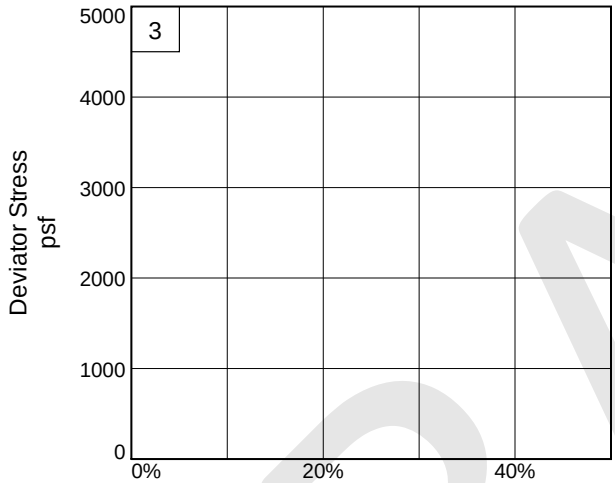

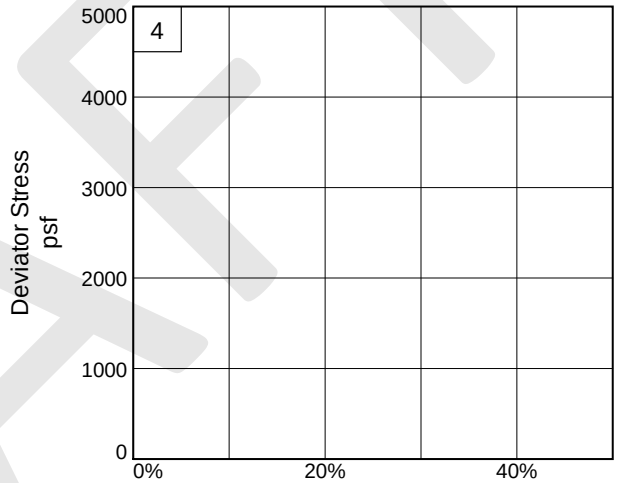

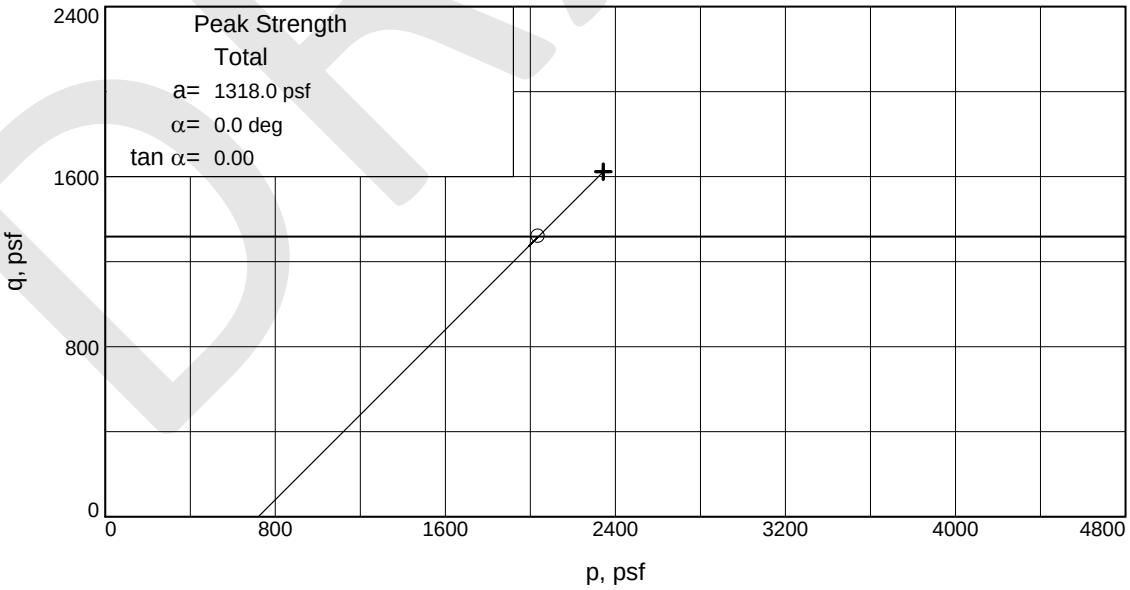

Stress Paths: o indicates peak + indicates end

DRAFT

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B60 **Depth:** 5.5-6' **Sample Number:** 2C

Project No.: 3934.X **Figure** _____

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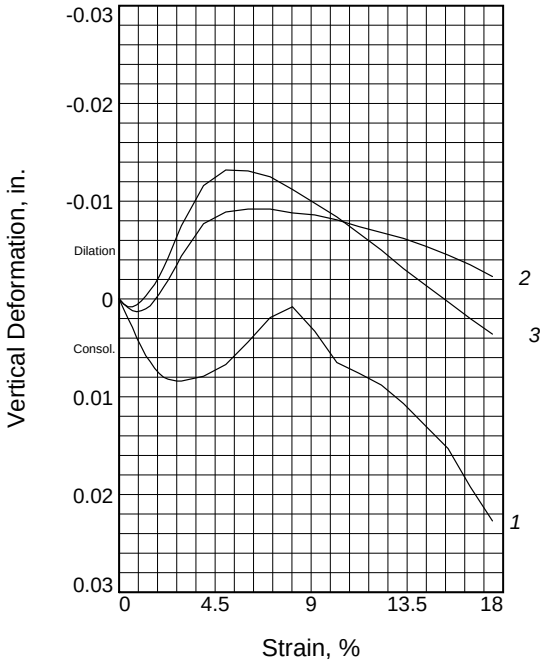
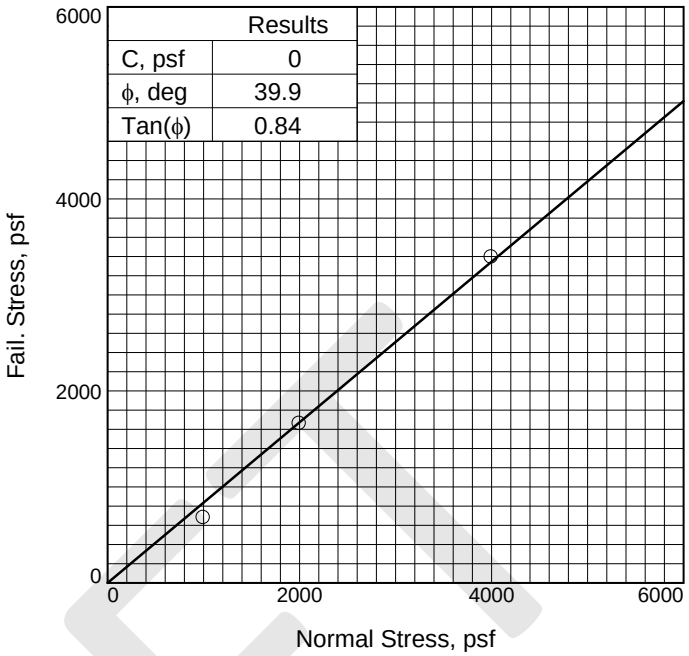
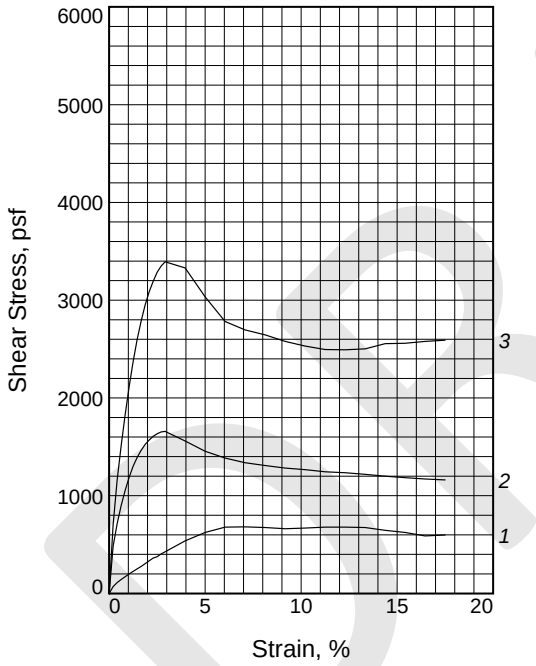




	Results
C, psf	0
ϕ, deg	39.9
Tan(ϕ)	0.84



	Sample No.	1	2	3
Initial	Water Content, %	14.9	15.4	17.0
	Dry Density, pcf	105.5	116.5	113.6
	Saturation, %	67.1	93.0	95.0
	Void Ratio	0.5982	0.4465	0.4833
	Diameter, in.	2.400	2.400	2.400
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	20.0	15.3	16.3
	Dry Density, pcf	109.2	119.2	117.1
	Saturation, %	99.5	100.0	100.0
	Void Ratio	0.5441	0.4136	0.4398
	Diameter, in.	2.400	2.400	2.400
	Height, in.	0.966	0.977	0.971
Normal Stress, psf		1000.0	2000.0	4000.0
Fail. Stress, psf		678.0	1658.4	3393.2
Strain, %		6.0	2.9	2.9
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.025	0.003	0.003

Sample Type: Cal Mod
Description: SILTY SAND, reddish brown

Assumed Specific Gravity= 2.7
Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B55 **Depth:** 16-16.5'
Sample Number: 4C
Proj. No.: 3934.X **Date Sampled:**

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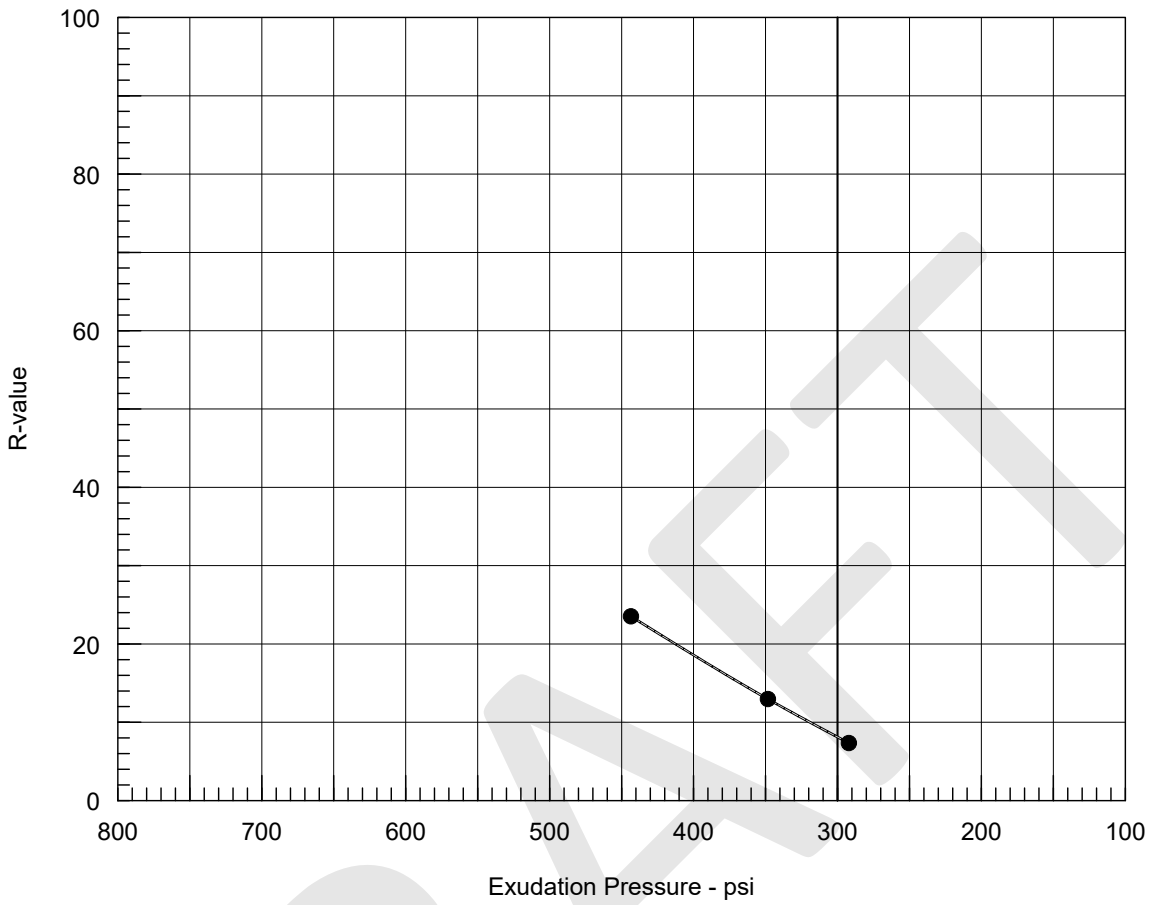
R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	104	103.7	22.2	83	114	2.55	443	24	24
2	83	100.8	23.4	0	132	2.57	348	12	13
3	63	96.6	25.7	0	143	2.40	292	8	7

Test Results	Material Description
R-value at 300 psi exudation pressure = 8	Lean CLAY, dark reddish brown

Project No.: 3934.X
Project: Wheatland Regional Sewer Connection Project
Source of Sample: B49 **Depth:** 0-5'
Sample Number: Bulk A
Date: 3/28/2022

Tested by: BRL
Checked by: RBL
Remarks:

R-VALUE TEST REPORT

Blackburn Consulting

Figure _____

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GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

APPENDIX B: Trenchless Pipeline Crossings

B1: Trenchless Crossing Site Plans

B2: Boring Log Legend

Boring Logs

B3: Laboratory Test Results

B4: Historic LOTB

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B1: Trenchless Crossing Site Plans

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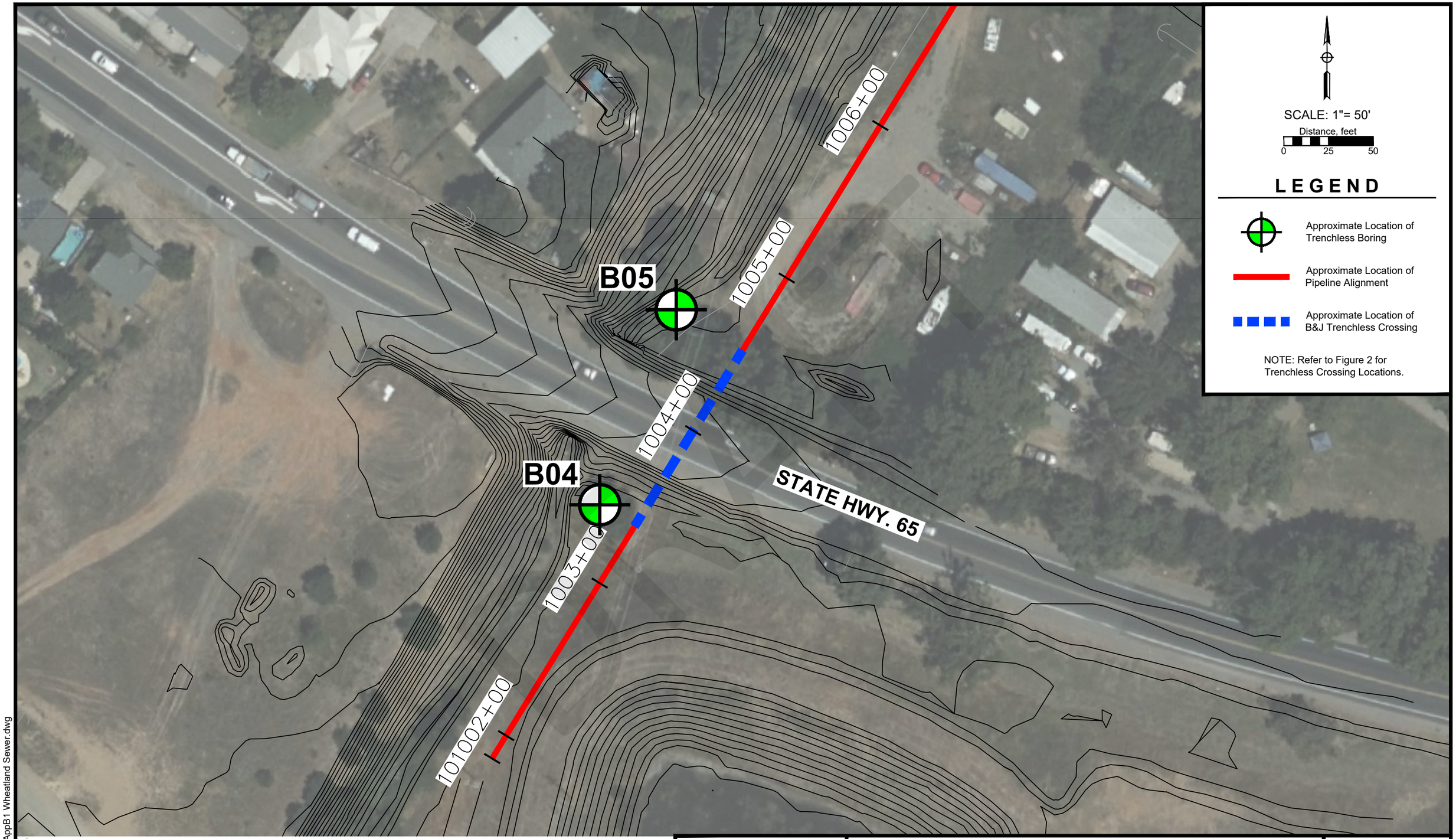


Source:

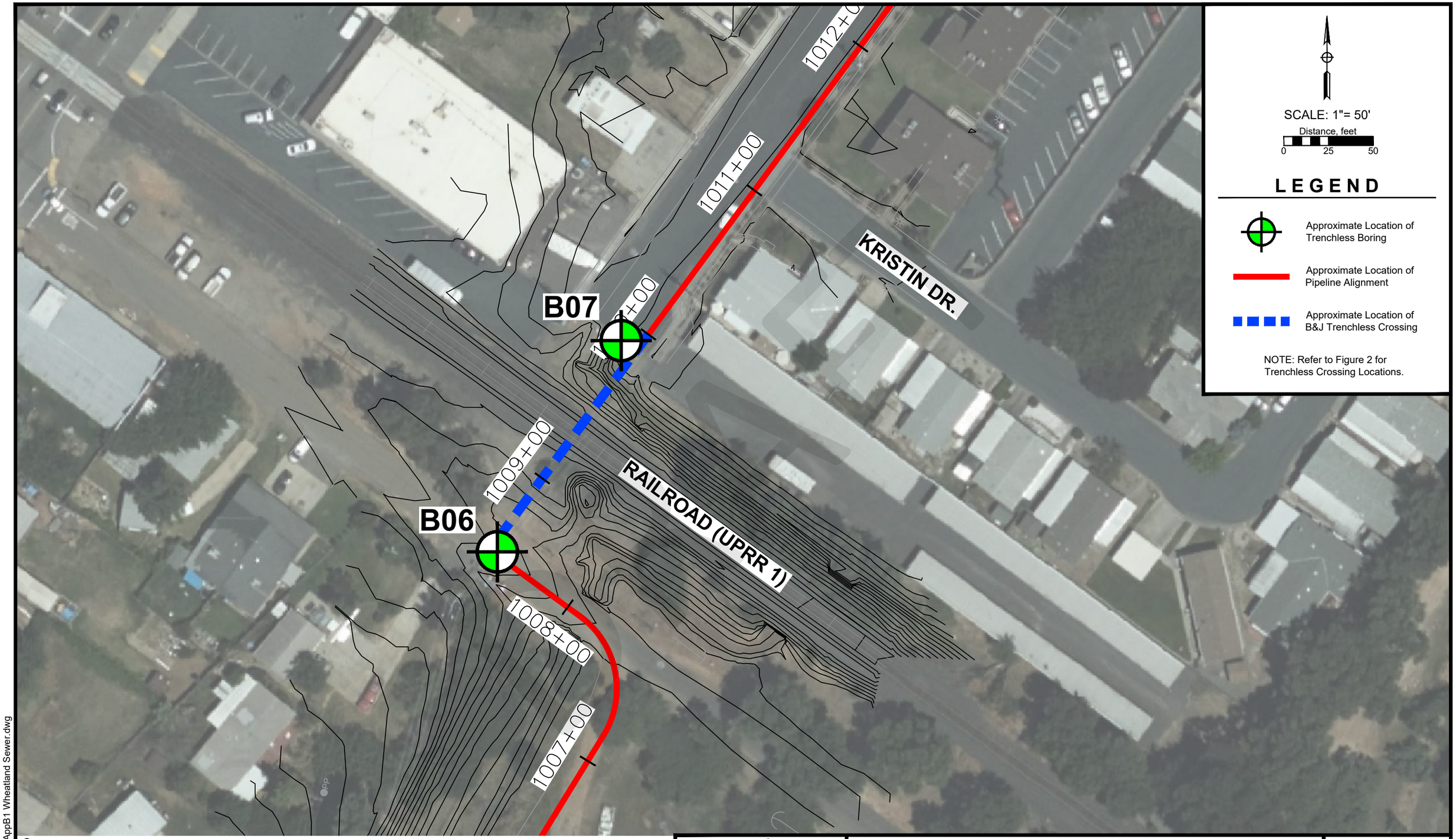
BLACKBURN CONSULTING

TRENCHLESS CROSSING SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix B1a

3/31/2022 3934.x AppB1 Wheatland Sewer.dwg



Source:

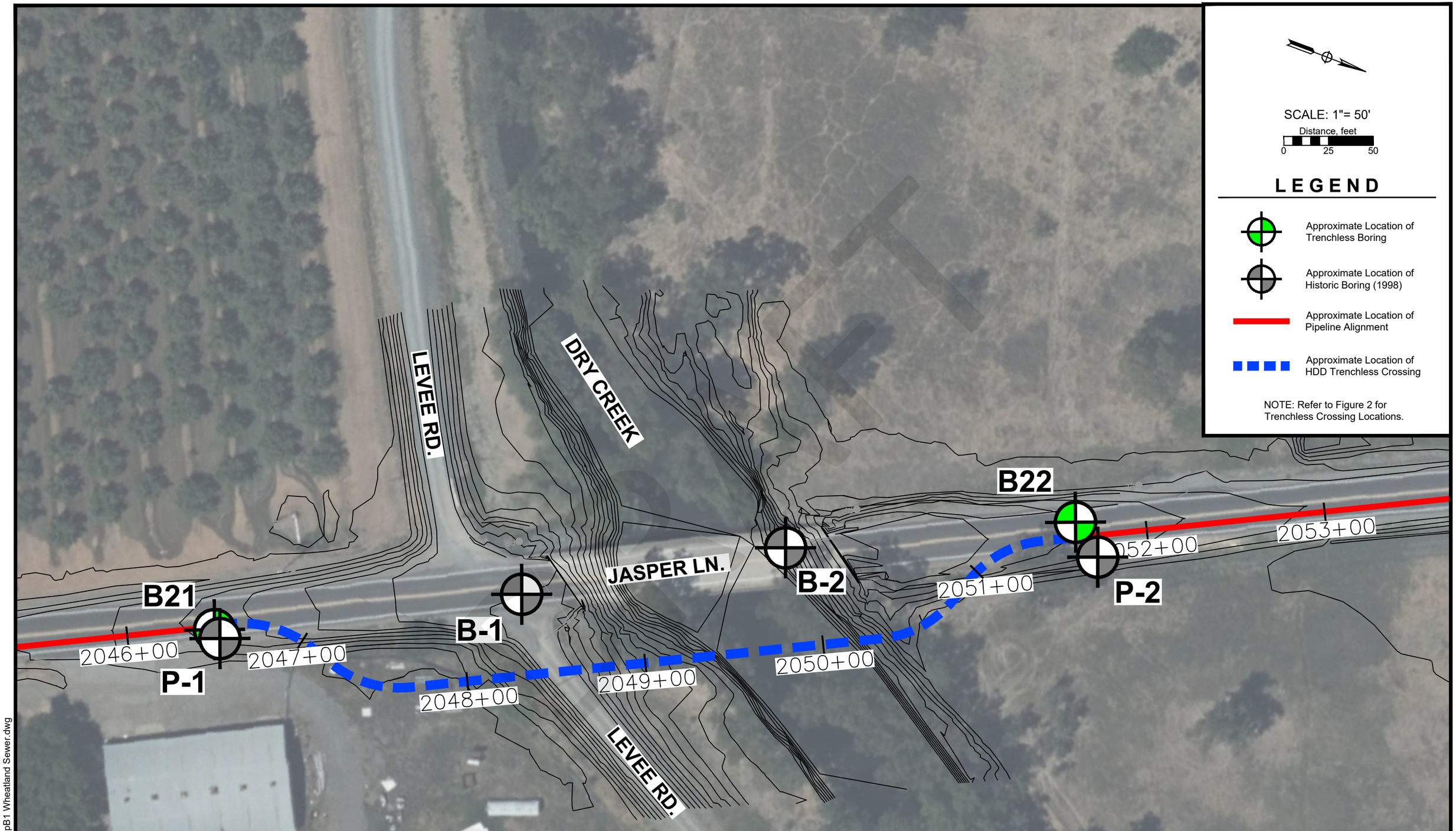
BLACKBURN CONSULTING

TRENCHLESS CROSSING SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix B1b

3/31/2022 3934.x AppB1 Wheatland Sewer.dwg



Source: Historic Boring Locations:
Dry Creek Bridge at Jasper Lane,
Log of Test Borings, As-Built Plan dated 6-15-1998,
by CH2M Hill.

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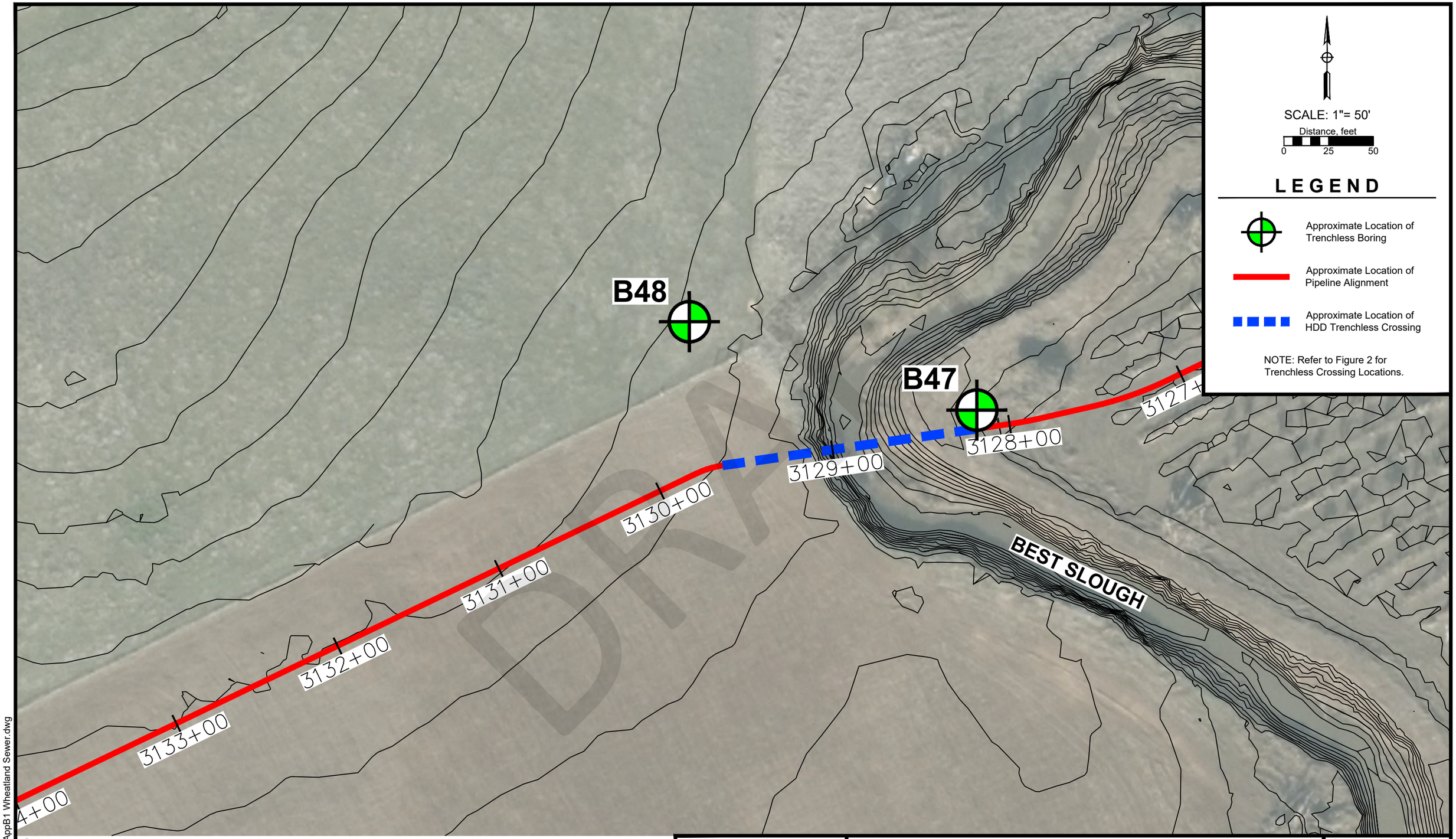
TRENCHLESS CROSSING SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix B1c

3/31/2022 3934.x AppB1 Wheatland Sewer.dwg



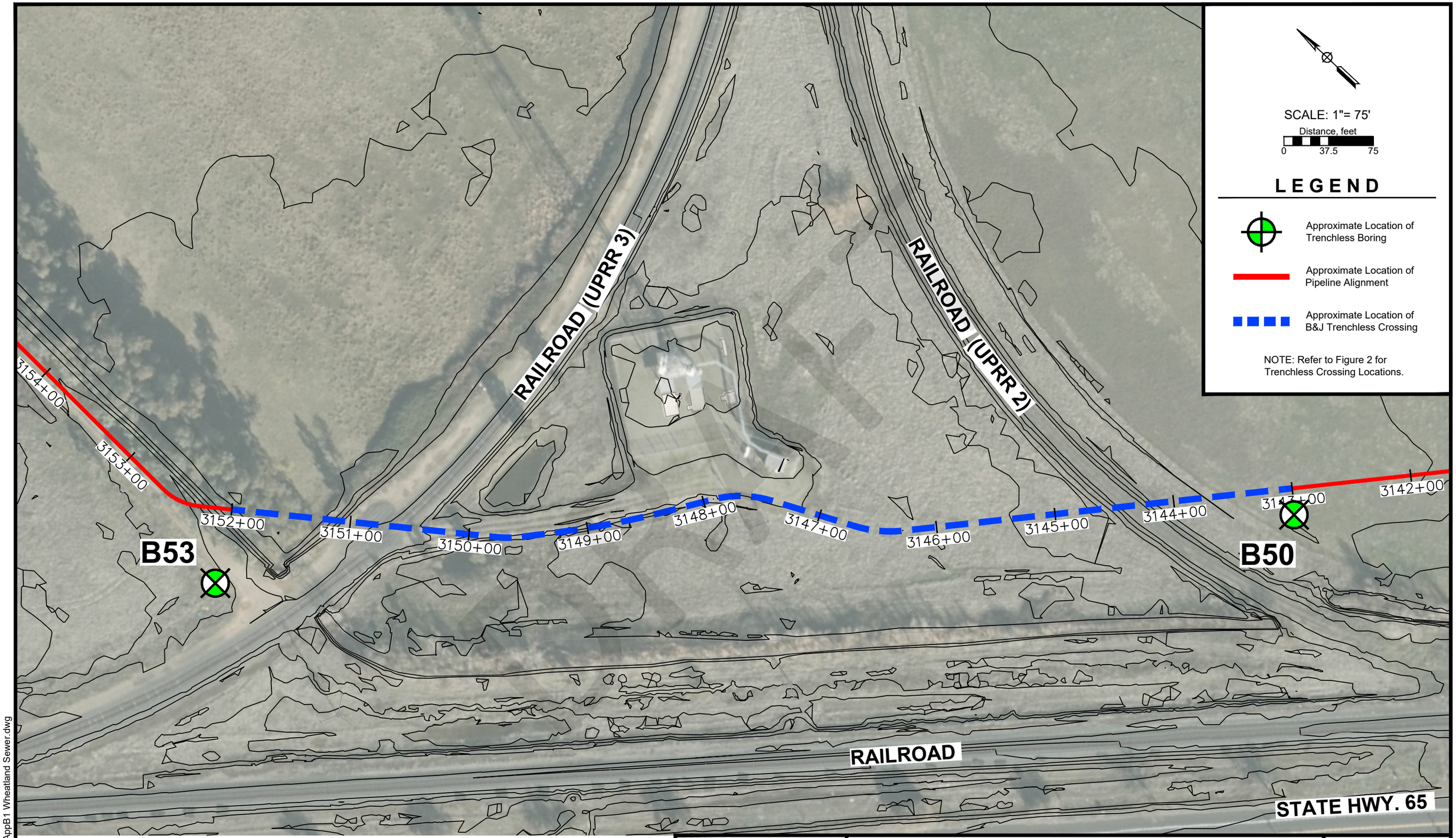
Source:

BLACKBURN CONSULTING

TRENCHLESS CROSSING SITE PLAN
Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix B1d

3/31/2022 3934.x AppB1 Wheatland Sewer.dwg



Source:

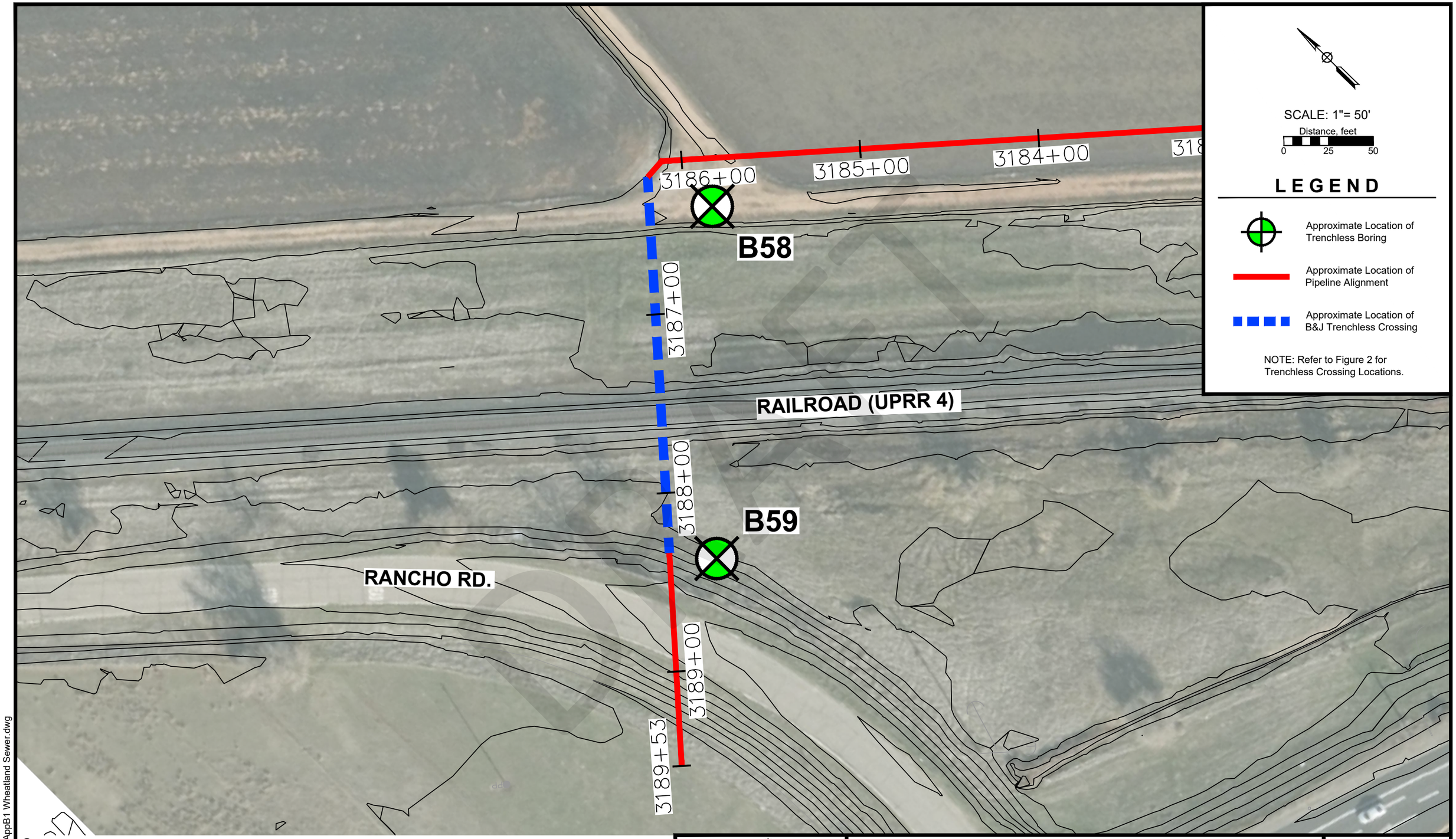
BLACKBURN CONSULTING

TRENCHLESS CROSSING SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix B1e

3/31/2022 3934.x AppB1 Wheatland Sewer.dwg



Source:

BLACKBURN CONSULTING

TRENCHLESS CROSSING SITE PLAN
Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix B1f

3/31/2022 3934.x AppB1 Wheatland Sewer.dwg

B2: Boring Log Legend
Boring Logs

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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 5333)
CP	Compaction Curve (ASTM D 698 & 1557, CTM 216)
CR	Corrosion, Sulfates, Chlorides (CTM 643, CTM 417, CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
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 (ASTM D 5084)
PA	Particle Size Analysis (ASTM D 6913 & 7928)
PI	Liquid Limit, Plastic Limit, Plasticity Index (ASTM D 4318)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T100)
SL	Shrinkage Limit (ASTM D 4943)
SW	Swell Potential (ASTM D 4546)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 7012)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 7263)
VS	Vane Shear (AASHTO T223 / ASTM D 2573)

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- California Sampler (2" ID)
- Modified California Sampler (2.4" ID)
- 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)

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BORING LOG LEGEND

8/5/2019 Boring Legend for Reports 2019.dwg

CONSISTENCY OF COHESIVE SOILS				
Descriptor	**Unconfined Compressive Strength (tsf)**	**Pocket Penetrometer (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 0.25	< 0.25	< 0.12	Extrudes between fingers when squeezed
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} - Value (blows / foot)**
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE	
Descriptor	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

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.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

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LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	11-19-21	11-19-21	39.008014° / -121.422577°	B-04
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1003+40	SURFACE ELEVATION: 79.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 55 Crawler	TOTAL DEPTH: 38.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING 19.0 ft; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0	SANDY Lean CLAY (CL); medium stiff; dark brown; moist; some fine SAND; low plasiticity															
	1																
	2																
	3		X	1	4 4 4	8		65		24				67			
75	4	CLAYEY SAND (SC); medium dense; dark brown; moist; fine to medium SAND; some fines; low plasticity															
	5																
	6		X	2	7 9 10	19		55	4.5	12	102	31	11	41			
	7																
	8	SANDY Lean CLAY (CL); medium stiff; brown; moist; medium plasticity; some fine SAND															
70	9																
	10		X	3	4 3 4	7		100				36	14			CR	
	11																
	12																
	13																
65	14																
	15	stiff; fine to medium SAND															
	16		X	4	4 5 6	11		80	1.5			42	16				
	17																
	18																
	19																
60	20	medium stiff to stiff; dark gray; fine SAND															
	21		X	5	4 4 5	9		80				49	25	61			
	22																
	23	Lean CLAY (CL); (stiff); mottled light brown and orange; moist; few fine SAND; medium plasticity															
55	24																
	25																

(continued)

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PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-04
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		Lean CLAY (CL) *(continued)*.															
	26		CLAYEY SAND (SC); medium dense; orangish brown; moist; fine SAND; some fines		6	6 7 11	18		95	2.0	33	90	37	15	45			
	27																	
	28																	
	29																	
50	30				7	6 8 12	20		100									
	31																	
	32																	
	33																	
	34																	
45	35		Well-graded SAND (SW); very dense; brown; moist; fine to coarse SAND; few fine GRAVEL; trace fines		8	13 31 40	71		65									
	36																	
	37				9	10 10 19	29		65									
	38		Lean CLAY with SAND (CL); very stiff; yellowish brown; moist; little fine SAND; medium plasticity															
	39		Bottom of exploration at 38.0 ft below ground surface (bgs)															
40	40		Backfilled with grout Groundwater encountered at 19.0 ft bgs Bulk A 0.0-5.0 ft bgs															
	41																	
	42																	
	43																	
35	44																	
	45																	
	46																	
	47																	
	48																	
30	49																	
	50																	
	51																	
	52																	
	53																	
25	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME **Wheatland Regional Sewer Connection**	FILE NO. **3934.X**	HOLE ID **B-04**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **NRV**	CHECKED BY	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
LDM	8-18-21	8-18-21	39.008312° / -121.422424°	B-05
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1004+50	SURFACE ELEVATION: 78.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 trailer	TOTAL DEPTH: 31.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING 21.5 ft; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0	Poorly-graded SAND with SILT (SP-SM); medium dense; light brown; dry; fine SAND															
	1																
	2	Lean CLAY (CL); very stiff; dark brown; dry; few fine SAND		1	8 8 13	21		70		14	86				UU= 1206psf		
75	3																
	4																
	5	hard; strong brown; trace fine GRAVEL		2	10 12 16	28		70	>4.5	14	104	35	15			CR	
	6																
	7																
70	8																
	9																
	10	mottled dark brown and grayish brown; no GRAVEL		3	15 24 34	58		55									
	11																
	12																
65	13																
	14	Lean CLAY with SAND (CL); very stiff; mottled dark yellowish brown and grayish brown; dry; little very fine SAND															
	15																
	16			4	9 12 14	26		100		17	76	39	16		UU= 2923psf	CR	
	17																
60	18	becomes moist; higher plasticity															
	19	CLAYEY SAND (SC); loose; gray; moist; mostly fine to medium SAND; little fines															
	20																
	21			5	2 2 4	6		80		30	89			27	DS		
	22	decreasing fines content		6	3 4 8	12		100									
55	23	Lean CLAY (CL); stiff; grayish brown; moist; few fine SAND															
	24	SANDY Lean CLAY (CL); stiff; mottled dark yellowish brown and light grayish brown; moist to wet; some fine SAND															
	25																

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-05
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: DWC	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SANDY Lean CLAY (CL) *(continued)*.															
	26				7	8 12 13	25		100		31	92				UU= 1569psf		
	27																	
	28																	
50	29		CLAYEY SAND (SC); medium dense; brown; moist; mostly fine SAND; some fines; low plasticity															
	30																	
	31				8	7 8 9	17		60									
	32		Bottom of exploration at 31.5 ft below ground surface (bgs)															
	33		Backfilled with grout Groundwater encountered at 21.5 ft bgs No Bulk obtained															
45	34																	
	35																	
	36																	
	37																	
	38																	
40	39																	
	40																	
	41																	
	42																	
	43																	
35	44																	
	45																	
	46																	
	47																	
	48																	
30	49																	
	50																	
	51																	
	52																	
	53																	
25	54																	
	55																	

DRAFT

BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-05**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **DWC**	CHECKED BY	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
LDM	8-18-21	8-18-21	39.009148° / -121.422009°	B-06
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1008+50	SURFACE ELEVATION: 83.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike, Cody		EQUIPMENT: CME 45 trailer	TOTAL DEPTH: 31.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING 23.5 ft; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0	6" ASPHALT CONCRETE (AC)															
	1	Lean CLAY with SAND (CL); hard; dark brown; dry; little fine SAND; low plasticity															
	2			1	21 25 24	49		80	>4.5								
80	3																
	4																
	5	SANDY Lean CLAY (CL); hard; yellowish red; dry; some SAND; medium plasticity		2	26 50/6"	50/ 6"		85	>4.5			31	14				
	6																
	7																
75	8	CLAYEY GRAVEL with SAND (GC); very dense; brown; dry; mostly fines; some fine to coarse GRAVEL; little fine to coarse SAND															
	9																
	10			3	50/6"	50/ 6"		100	2.75	8	60			50			
	11	coarse GRAVEL in sampler shoe															
	12																
70	13																
	14																
	15																
	16	Lean CLAY with SAND (CL); very stiff; dark yellowish brown; moist; little fine SAND		4	21 18 17	35		100	2.75	40	81				UU= 2689psf		
	17																
65	18																
	19																
	20																
	21	SANDY SILT (ML); stiff; dark yellowish brown; moist; fine to medium SAND		5	6 5 10	15		100	1.25	36	73	43	19	76 57		CR	
	22																
60	23																
	24																
	25																

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-06
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: DWC	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SANDY SILT (ML) *(continued)*.			6												
	26		very stiff; decreasing fines content; very dark gray; wet		6	10	24		80				33	8				
						14												
	27																	
	28																	
55																		
	29		Lean CLAY with SAND (CL); hard; dark yellowish brown with orangish brown streaks; moist; little fine SAND															
	30					17												
	31				7	31	74		90	>4.5								
						43												
	32		Bottom of exploration at 31.5 ft below ground surface (bgs)															
	33		Backfilled with grout Groundwater encountered at 23.5 ft bgs Bulk A 1.0-5.0 ft bgs															
50																		
	34																	
	35																	
	36																	
	37																	
	38																	
45																		
	39																	
	40																	
	41																	
	42																	
	43																	
40																		
	44																	
	45																	
	46																	
	47																	
	48																	
35																		
	49																	
	50																	
	51																	
	52																	
	53																	
30																		
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME **Wheatland Regional Sewer Connection**	FILE NO. **3934.X**	HOLE ID **B-06**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **DWC**	CHECKED BY	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-19-21	8-19-21	39.009508° / -121.421744°	B-07
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~1009+80	SURFACE ELEVATION: 81.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 trailer	TOTAL DEPTH: 31.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Mod Cal (2")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout and patched with concrete			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0	Lean CLAY with SAND (CL); very stiff; dark brown; moist; little fine to coarse SAND; trace fine GRAVEL															
80	1	Lean CLAY (CL); very stiff to hard; dark reddish brown; moist; few fine SAND; trace coarse SAND															
	2			1	4 4 7	11		95	3.0	16	110						
	3																
	4																
	5	hard; few fine to coarse SAND; trace fine GRAVEL															
75	6			2	14 24 39	63		95	>4.5	8	117	37	19			CR	
	7																
	8	CLAYEY GRAVEL with SAND (GC); dense; mottled dark reddish brown and olive brown; moist; some fine to coarse GRAVEL; some medium to coarse SAND; little fines; few fine SAND															
	9																
	10																
70	11			3	11 18 26	44		85	3.5			52	31	17		CR	
	12																
	13																
	14	SILTY SAND (SM); medium dense; dark reddish brown; moist; fine to medium SAND; little fines															
	15																
65	16			4	6 8 9	17		100	4.0	22	99			18			
	17																
	18	Lean CLAY (CL); hard; olive brown with spots of reddish brown; moist; few fine SAND															
	19																
	20																
60	21			5	9 15 18	33		85	>4.5	26	100				UU= 3792psf		
	22																
	23	SILTY SAND (SM); medium dense to dense; dark reddish brown; moist; mostly fine to coarse SAND; some fines															
	24																
	25																

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-07
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: DWC	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SILTY SAND (SM) *(continued)*.			10												
55	26				6	15 21	36		67	>4.5					46			
	27																	
	28		Lean CLAY with SAND (CL); stiff; dark yellowish brown; moist; little fine SAND															
	29																	
	30					8												
	31				7	12 17	29		100	1.5			44 45	23 21	47			
50			CLAYEY SAND (SC); stiff; dark yellowish brown; moist; mostly fines															
	32		Bottom of exploration at 31.5 ft below ground surface (bgs)															
	33		Backfilled with grout and patched with concrete Groundwater not encountered Bulk A 0.5-5.0 ft bgs															
	34																	
	35																	
45	36																	
	37																	
	38																	
	39																	
	40																	
40	41																	
	42																	
	43																	
	44																	
	45																	
35	46																	
	47																	
	48																	
	49																	
	50																	
30	51																	
	52																	
	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME **Wheatland Regional Sewer Connection**	FILE NO. **3934.X**	HOLE ID **B-07**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **DWC**	CHECKED BY	SHEET **2 of 2**

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-16-21	8-16-21	39.031401° / -121.409422°	B-21
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2046+50	SURFACE ELEVATION: 90.7 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike, Matt		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 46.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING 25.0 ft; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0	Well-graded SAND with CLAY and GRAVEL (SW-SC); very dense; brown; moist; fine to coarse SAND; little fine to coarse GRAVEL; few fines; [FILL]															
90	1																
	2																
	3			1	17 28 24	52		85									
	3	Lean CLAY (CL); very stiff; reddish brown; moist; trace to few fine SAND															
	4																
	5																
85	6			2	5 5 9	14		45	2.75								
	7																
	8	SILT with SAND (ML); hard; brown; moist; little fine to medium SAND															
	9																
	10																
80	11			3	6 9 9	18		90	4.5	16	106	24	3				
	12																
	13	CLAYEY SAND (SC); medium dense; dark brown; moist; fine to medium SAND; little fines															
	14																
	15																
75	16			4	5 9 13	22		65		9	114			22	DS		
	17																
	18																
	19																
	20	some fines															
70	21			5	8 9 19	28		100				37	17	30			
	21	Well-graded SAND with CLAY and GRAVEL (SW-SC); medium dense to dense; mottled brown and orange; moist; mostly fine to coarse SAND; some fine GRAVEL; few fines															
	22																
	23																
	24																
	25																

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-21
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		Well Graded SAND with CLAY and GRAVEL (SW-SC) *(continued)*.															
65	26		wet		6	13 20 25	45		70						6			
	27																	
	28																	
	29																	
	30																	
60	31				7	9 15 33	48		0									
	32		re-drove sampler with sand catcher to obtain disturbed sample															
	33																	
	34																	
	35																	
55	36				8	4 7 11	18		0				35	15	18			
			CLAYEY SAND (SC); medium dense; reddish brown; moist; some fine to medium SAND; little fines															
	37		re-drove sampler with sand catcher to obtain disturbed sample															
	38																	
	39																	
	40																	
50	41		Poorly-graded SAND with CLAY (SP-SC); medium dense; brown; moist; fine to medium SAND; few fines		9	11 15 16	31		40									
	42																	
	43		Lean CLAY (CL); hard; mottled light brown and light gray; moist; low to medium plasticity; few fine SAND															
	44																	
	45																	
45	46				10	15 20 22	42		100	4.0								
	47		Bottom of exploration at 46.5 ft below ground surface (bgs)															
	48		Backfilled with grout Groundwater encountered at 25 ft bgs Bulk A 0.0-5.0 ft bgs															
	49																	
	50																	
40	51																	
	52																	
	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME: **Wheatland Regional Sewer Connection**	FILE NO.: **3934.X**	HOLE ID: **B-21**
COUNTY: **YUB**	ROUTE	POSTMILE
CLIENT: **Coastland Civil Engineering**		
PREPARED BY: **NRV**	CHECKED BY: **DWC**	SHEET: **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-16-21	8-16-21	39.032349° / -121.410035°	B-22
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~2051+60	SURFACE ELEVATION: 92.3 ft
OPERATOR'S NAME: Scott	HELPER'S NAME: Jeff		EQUIPMENT: CME 75	TOTAL DEPTH: 46.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING 26.3 ft; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0	11" ASPHALT CONCRETE (AC)															
	1	8" AGGREGATE BASE (AB)															
90	2–3	CLAYEY GRAVEL with SAND (GC); very dense; grayish brown; moist; fine to coarse GRAVEL; little fines; little SAND; [FILL]	X	1	27 50/5"	50/ 5"		91									
	4–6	GRAVELLY Lean CLAY with SAND (CL); hard; dark yellowish brown; dry; little fine to coarse GRAVEL; little SAND	X	2	6 15 21	36		60	>4.5	10	120			69			
85	7–11	Lean CLAY (CL); hard; dark yellowish brown; dry to moist; few fine SAND	X	3	10 24 50/5.5"	74/ 11.5"		85	>4.5			30	15				
80	12–15																
	16	SILT (ML); hard; mottled strong brown and light brownish gray; moist; few fine SAND	X	4	9 34 45	79		100	>4.5	24	90	40	14				
75	17–19																
	20–21		X	5	17 33 46	79		95	>4.5								
70	22–23																
	23	Lean CLAY (CL); hard; dark yellowish brown; moist															
	24–25																

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-22
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25	Lean CLAY (CL) *(continued)*.			7												
	26			6	16	36		95	>4.5			43	18				
					20												
65	27																
	28																
	29																
	30	very stiff; olive brown; trace fine to medium SAND			6												
	31			7	8	19		100	2.5								
					11												
60	32																
	33	SILT with SAND (ML); very stiff; dark yellowish brown; moist; little fine to medium SAND															
	34																
	35				8												
	36			8	12	28		95	3.0	32	90			74			
					16												
55	37																
	38	Lean CLAY (CL); hard; mottled brown, olive gray, and black; moist; few fine SAND															
	39																
	40				10												
	41			9	23	53		70	>4.5								
					30												
50	42																
	43																
	44																
	45				19												
	46			10	30	64		80	>4.5								
					34												
	47	Bottom of exploration at 46.5 ft below ground surface (bgs)															
45	48	Backfilled with grout Groundwater encountered at 26.25 ft bgs No Bulks															
	49																
	50																
	51																
40	52																
	53																
	54																
	55																

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-22**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **NRV**	CHECKED BY **DWC**	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-12-21	8-12-21	39.03832° / -121.46163°	B-47
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3128+20	SURFACE ELEVATION: 76.6 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 46.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING 38.0 ft; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY with SAND (CL); hard; dark brown; moist; little fine SAND; weak cementation															
75	1–2				1	9 9 9	18		100	>4.5								
	3–4																	
	5–6				2	15 33 38	71		50	>4.5								
70	7																	
	8		Lean CLAY (CL); hard; strong brown; moist; few fine to medium SAND															
	9–10				3	20 50/6"	50/ 6"		75	>4.5	16	116	29	11				
65	11–12																	
	13		Elastic SILT (MH); hard; yellowish brown; moist; trace fine SAND															
	14–15				4	25 50/3"	50/ 3"		100	>4.5								
60	16–17																	
	18–19																	
	20				5	24 50/4"	50/ 4"		100	>4.5			56	20	96			
55	21–22		SILT (ML); hard; mottled dark orange and dark grayish brown; moist; little fine to medium SAND															
	23–24																	
	25		olive brown and reddish brown; little cementation															

(continued)

BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-47
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 2

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SILT (ML) *(continued)*.		6	18 44 50/2"	94/ 8"		100	>4.5					93			
	26		SILT (ML); hard; yellowish brown; moist; few fine to medium SAND															
50	27																	
	28																	
	29																	
	30		few fine SAND; moderate to strong cementation		7	15 30 50/3"	80/ 9"		100	>4.5								
	31																	
45	32																	
	33																	
	34		SILTY SAND (SM); very dense; olive brown; moist; mostly fine SAND															
	35				8	46 50/2"	50/ 2"		100	>4.5								
	36		SANDY SILT (ML); hard; dark brown; moist; some fine SAND															
40	37																	
	38																	
	39		Poorly-graded SAND (SP); very dense; dark brown; wet; mostly fine SAND															
	40				9	19 23 34	57		100	4.0	33	89						
	41		SILT with SAND (ML); hard; dark brown; moist; little fine SAND; moderate cementation															
35	42		Lean CLAY (CL); (hard); dark olive brown; moist; few fine SAND; low plasticity															
	43																	
	44																	
	45		Poorly-graded SAND (SP); very dense; dark brown; wet; mostly fine to medium SAND; trace fines		10	28 50/6"	50/ 6"		100									
	46		Bottom of exploration at 46.0 ft below ground surface (bgs)															
30	47		Backfilled with cuttings Groundwater encountered at 38.0 ft bgs No Bulk obtained															
	48																	
	49																	
	50																	
	51																	
25	52																	
	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME **Wheatland Regional Sewer Connection**		FILE NO. **3934.X**	HOLE ID **B-47**
COUNTY **YUB**	ROUTE		POSTMILE
CLIENT **Coastland Civil Engineering**			
PREPARED BY **LDM**	CHECKED BY		SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-10-21	8-10-21	39.038414° / -121.46219°	B-48
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3129+60	SURFACE ELEVATION: 80.7 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 45.8 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; dark brown; moist; trace fine SAND															
80	1																	
	2		dark yellowish brown; dry; few fine to medium SAND		1	9 13 20	33		35	>4.5								
	3																	
	4																	
	5				2	35 50/5.5"	50/ 5.5"		100	>4.5								
75	6																	
	7																	
	8		Lean CLAY with SAND (CL); very stiff; mottled dark reddish brown and olive brown; moist; little fine to medium SAND; few GRAVEL															
	9																	
	10																	
70	11		SILT (ML); hard; yellowish brown; moist; little fine SAND; little strong cementation		3	31 42 47	89		100	>4.5			NP	NP	86			
	12																	
	13																	
	14																	
	15		Lean CLAY (CL); hard; dark olive brown; moist; few fine SAND some strong cementation		4	14 27 50/5.5"	77/ 11.5"		100	>4.5								
65	16		SILT with SAND (CL); hard; dark yellowish brown; moist; some fine SAND								30	89				UU= 4079psf		
	17																	
	18																	
	19																	
	20				5	18 37 50/2"	87/ 8"		85	>4.5								
60	21																	
	22		olive brown; weak cementation															
	23																	
	24																	
	25																	

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-48
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SILT (ML); hard; yellowish brown; moist; few fine SAND															
55	26		strongly cemented		6	15 24 50/5"	74/ 11"		100	>4.5	39	82			92			
	27																	
	28		Lean CLAY with SAND (CL); hard; olive brown; moist; little fine SAND															
	29																	
	30																	
50	31		dark brown		7	16 50/5.5"	50/ 5.5"		100	>4.5	34	86						
			SANDY Lean CLAY (CL); hard; mottled brown and olive brown and dark reddish brown; moist															
	32																	
	33																	
	34																	
	35		SILTY SAND (SM); medium dense; very dark brown; wet; mostly fine SAND; little fines			10												
45	36		SANDY SILT (ML); (hard); dark brown; moist; fine SAND		8	16 30	46		70	>4.5	37	85			27			
			SANDY Lean CLAY (CL); hard; olive gray; dry to moist; fine SAND; moderate to strong cementation															
	37																	
	38																	
	39																	
	40					10												
40	41				9	28 50/5"	78/ 11"		70	>4.5								
	42																	
	43																	
	44																	
	45		Lean CLAY (CL); hard; olive brown; moist; trace fine SAND		10	29 50/4"	50/ 4"		100	>4.5								
35	46		Bottom of exploration at 45.8 ft below ground surface (bgs)															
	47		Backfilled with grout Groundwater not encountered No Bulk obtained															
	48																	
	49																	
	50																	
30	51																	
	52																	
	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-48**
COUNTY: **YUB**	ROUTE	POSTMILE
CLIENT: **Coastland Civil Engineering**		
PREPARED BY: **LDM**	CHECKED BY	SHEET: **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-10-21	8-10-21	39.03811° / -121.46634°	B-50
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3143+00	SURFACE ELEVATION: 78.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: Diedrich D120	TOTAL DEPTH: 31.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; strong brown; moist; few fine SAND															
	1																	
	2				1	10 11 17	28		85	>4.5								
75	3																	
	4																	
	5				2	34 50/6"	50/ 6"		60	>4.5	15	100	39	16				
	6																	
	7																	
70	8																	
	9																	
	10																	
	11		brown; trace fine GRAVEL		3	15 32 50/6"	82/ 12"		90	>4.5	19	113				UU= 3874psf	CR	
	12																	
65	13																	
	14																	
	15		SANDY SILT (ML); hard; yellowish brown; moist; some fine SAND: strong cementation		4	21 50/5"	50/ 5"		80	>4.5	25	91	40	9	62			
	16																	
	17																	
60	18																	
	19																	
	20		CLAYEY SAND (SC); very dense; strong brown; moist; mostly fine SAND; little fines; little medium SAND; trace coarse SAND		5	18 28 50/4"	78/ 10"		95	>4.5			38	15	22			
	21																	
	22																	
55	23																	
	24																	
	25																	

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-50
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SILT (ML); hard; olive brown; moist; few fine SAND		6	29 50/6"	50/ 6"		100	>4.5								
	26																	
	27																	
50	28																	
	29																	
	30		SANDY SILT (ML); hard; dark brown; moist; some fine SAND		7	25 50/6"	50/ 6"		100	>4.5								
	31		Bottom of exploration at 31.0 ft below ground surface (bgs)															
	32		Backfilled with grout Groundwater not encountered No Bulk obtained															
45	33																	
	34																	
	35																	
	36																	
	37																	
40	38																	
	39																	
	40																	
	41																	
	42																	
35	43																	
	44																	
	45																	
	46																	
	47																	
30	48																	
	49																	
	50																	
	51																	
	52																	
25	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME **Wheatland Regional Sewer Connection**	FILE NO. **3934.X**	HOLE ID **B-50**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **LDM**	CHECKED BY	SHEET **2 of 2**

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AG	8-13-21	8-13-21	39.04026° / -121.46869°	B-53
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3152+00	SURFACE ELEVATION: 79.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 45 Trailer	TOTAL DEPTH: 31.3 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; dark reddish brown; dry; few fine SAND															
	1																	
	2				1	20 30 23	53		70	>4.5								
	3		dark yellowish brown															
75	4																	
	5				2	21 50/5"	50/ 5"		80	>4.5							CR	
	6																	
	7																	
	8																	
70	9																	
	10																	
	11		SILTY, CLAYEY SAND (SC-SM); very dense; reddish brown; moist; mostly fine to medium SAND; little fines		3	15 24 32	56		80		6	108	23	5	19			
	12																	
	13																	
65	14		Lean CLAY with SAND (CL); stiff; dark olive brown; moist; little fine SAND															
	15																	
	16		CLAYEY SAND (SC); very dense; reddish brown; wet; mostly fine to coarse SAND; little fines; trace fine GRAVEL		4	14 25 30	55		100		18 13	110 114			18	DS	CR	
	17																	
	18																	
60	19		SILT (ML); hard; brown; moist; few fine SAND; high plasticity															
	20																	
	21				5	27 38 50/5"	88/ 11"		65	>4.5			49	21				
	22																	
	23																	
55	24																	
	25																	

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-53
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 2

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SILT (ML) *(continued)*.															
	26		dark brown; trace medium SAND		6	16 32 50/5"	82/ 11"		85	>4.5								
	27																	
	28																	
	29		SILT with SAND (ML); hard; dark olive brown with dark reddish spots; moist; little fine to medium SAND															
50	30				7	19 42 50/3"	92/ 9"		90	>4.5								
	31																	
	32		Bottom of exploration at 31.3 ft below ground surface (bgs)															
	33		Backfilled with grout Groundwater encountered at 15.5 ft bgs No Bulk obtained															
45	34																	
	35																	
	36																	
	37																	
	38																	
40	39																	
	40																	
	41																	
	42																	
	43																	
35	44																	
	45																	
	46																	
	47																	
	48																	
30	49																	
	50																	
	51																	
	52																	
	53																	
25	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-53**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **LDM**	CHECKED BY	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DWC	8-10-21	8-10-21	39.043869° / -121.474975°	B-58
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3185+90	SURFACE ELEVATION: 78.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: Diedrich D120	TOTAL DEPTH: 36.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; dark yellowish brown; moist															
	1																	
	2				1	11 11 13	24		30	>4.5								
	3		CLAYEY SAND (SC); dense; yellowish brown; moist; fine SAND; some fines															
75	4																	
	5																	
	6				2	6 14 28	42		100	>4.5	16	110			40			
	7																	
70	8																	
	9																	
	10																	
	11				3	10 18 26	44		80								CR	
	12																	
65	13																	
	14		Lean CLAY (CL); hard; dark yellowish brown; moist; few SAND; little moderate cementation															
	15																	
	16				4	15 37 50/3	87/ 9"		90	>4.5							CR	
	17																	
60	18																	
	19																	
	20		olive; little strong cementation															
	21				5	28 43 50/3	93/ 9"		100	>4.5	16	113	34	15		UU= 6500psf		
	22																	
55	23																	
	24																	
	25																	

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-58
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: LDM	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		Lean CLAY (CL) *(continued)*.		6	37 50/4	50/ 4"		100	>4.5	22	102						
	26																	
	27																	
50	28																	
	29																	
	30		mottled olive brown and reddish brown and black; moderately cemented		7	31 50/3	50/ 3"		100	>4.5								
	31																	
	32																	
45	33		SANDY SILT (ML); hard; dark yellowish brown; moist; some fine SAND															
	34																	
	35				8	19 33 50/5.5	83/ 11.5"		100	4.5					57			
	36																	
	37		Bottom of exploration at 36.5 ft below ground surface (bgs)															
40	38		Backfilled with grout Groundwater not encountered No Bulk obtained															
	39																	
	40																	
	41																	
	42																	
35	43																	
	44																	
	45																	
	46																	
	47																	
30	48																	
	49																	
	50																	
	51																	
	52																	
25	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-58**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **LDM**	CHECKED BY	SHEET **2 of 2**

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-9-21	8-9-21	39.043484° / -121.475462°	B-59
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3188+40	SURFACE ELEVATION: 76.6 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: Diedrich D120	TOTAL DEPTH: 31.4 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY with SAND (CL); hard; yellowish red; dry to moist; little to some fine SAND															
75	1																	
	2				1	50/6"	50/6"		100									
	3																	
	4																	
	5																	
	6				2	11 17 26	43		65	>4.5	19	110	30	14			CR	
70	7																	
	8																	
	9																	
	10																	
	11		CLAYEY SAND (SC); dense; dark brown; moist; fine to medium SAND; little fines		3	14 19 27	46		100	3.75	11	109	28	14	13			
65	12																	
	13																	
	14		Lean CLAY with SAND (CL); hard; light grayish brown; moist; few to little fine SAND															
	15				4	21 50/6"	50/6"		100	4.5								
	16																	
60	17																	
	18																	
	19																	
	20				5	27 50/5"	50/5"		80	4.5								
	21																	
55	22																	
	23		SANDY SILT (ML); hard; yellowish brown; moist; some fine to medium SAND															
	24																	
	25																	

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-59
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SANDY SILT (ML) *(continued)*.		6	22 50/6"	50/ 6"		65	>4.5	23	101			61			
50	26																	
	27		Lean CLAY with SAND (CL); hard; light gray and orange; moist; little fine SAND															
	28																	
	29																	
	30				7	13 32 50/5"	82/ 11"		80	4.5								
	31																	
45	32		Bottom of exploration at 31.4 ft below ground surface (bgs)															
	33		Backfilled with grout Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
	34																	
	35																	
	36																	
40	37																	
	38																	
	39																	
	40																	
	41																	
35	42																	
	43																	
	44																	
	45																	
	46																	
30	47																	
	48																	
	49																	
	50																	
	51																	
25	52																	
	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-59**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **NRV**	CHECKED BY **DWC**	SHEET **2 of 2**

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

B3: Laboratory Test Results

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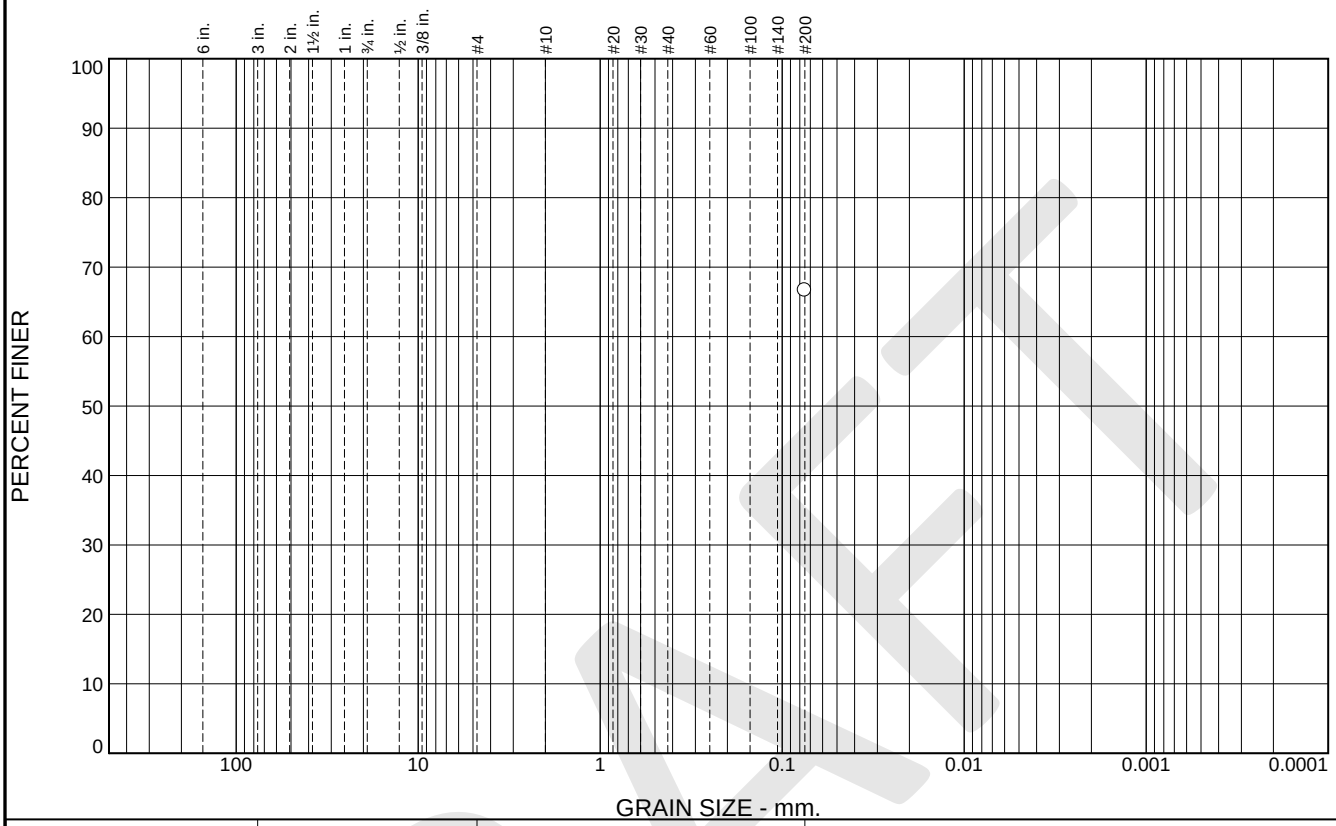
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						66.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	66.6		

* (no specification provided)

Material Description

SANDY lean CLAY, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B4 **Depth:** 2-3'
Sample Number: 1 **Date:**

Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

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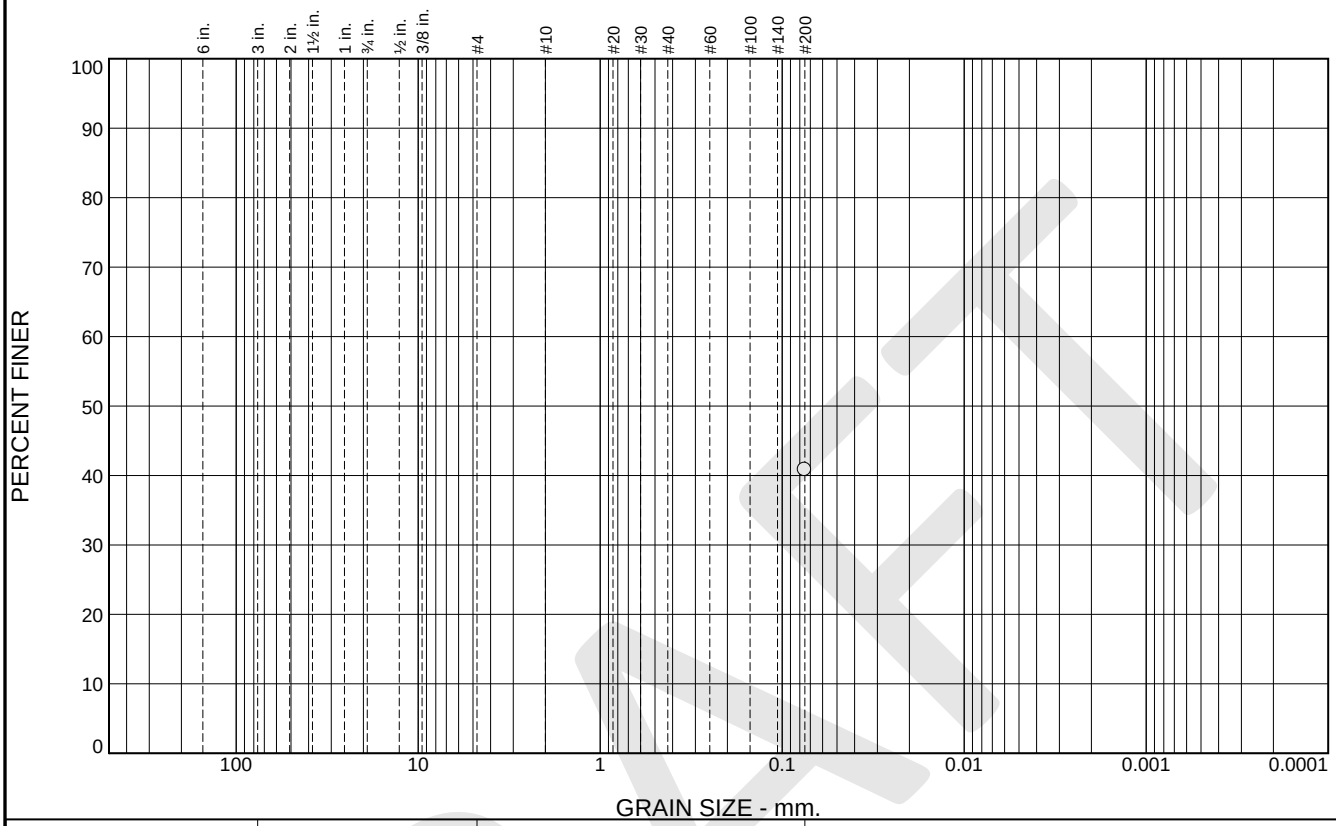
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						40.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	40.8		

* (no specification provided)

Material Description

CLAYEY SAND, very dark brown

Atterberg Limits

PL= 20 LL= 31 PI= 11

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B4 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

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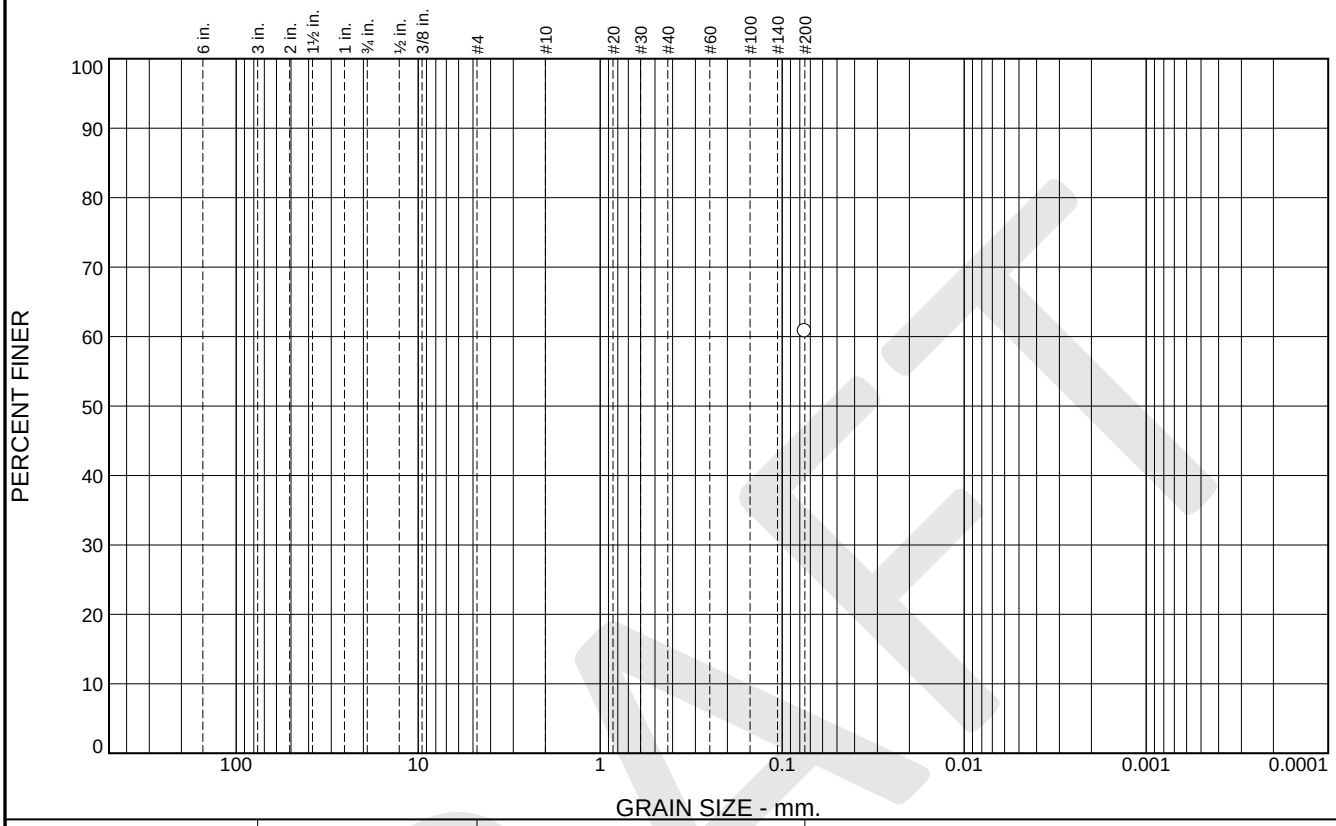
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						60.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	60.8		

* (no specification provided)

Material Description

SANDY lean CLAY, very dark grayish olive

Atterberg Limits

PL= 24 LL= 49 PI= 25

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B4 **Depth:** 20-21.5'
Sample Number: 5 **Date:**

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Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

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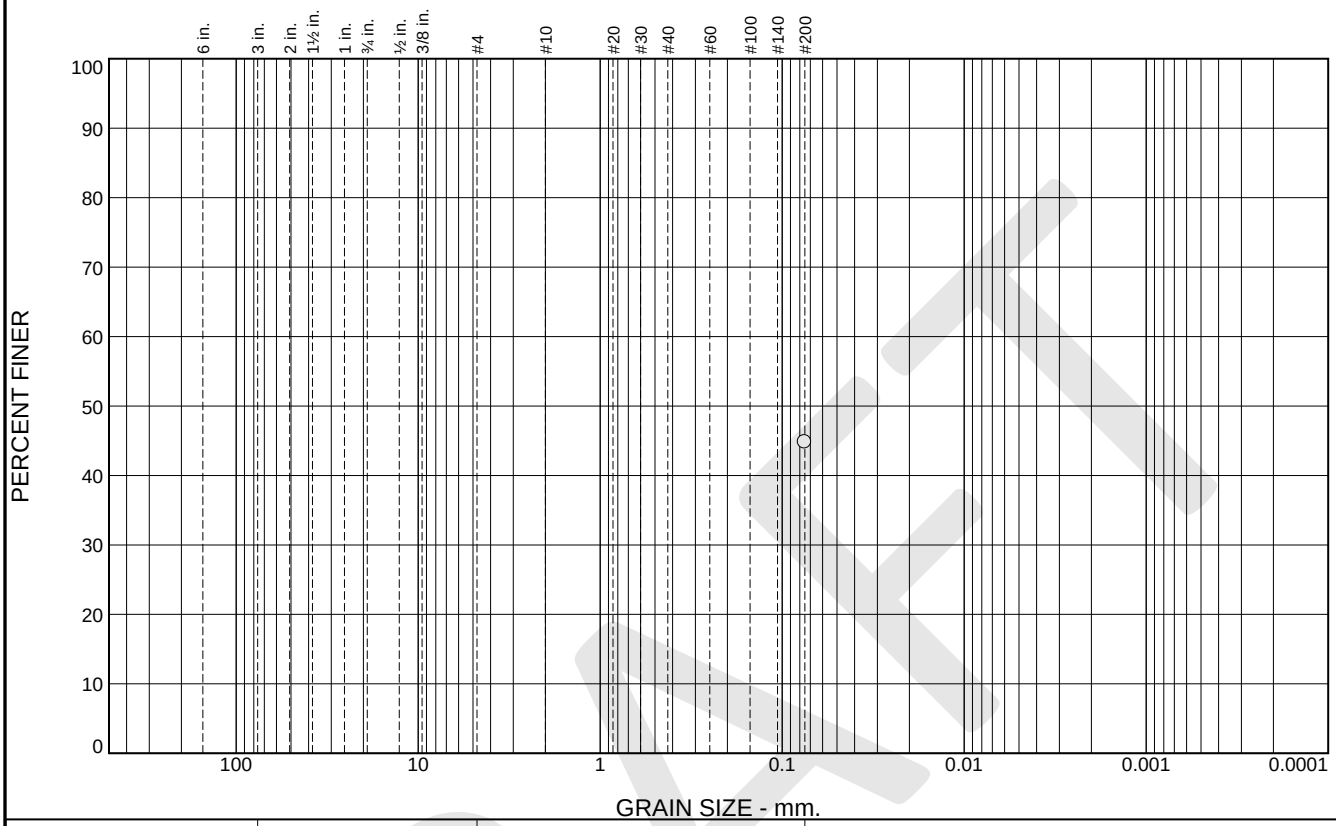
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						44.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	44.8		

* (no specification provided)

Material Description

CLAYEY SAND, strong brown

Atterberg Limits

PL= 22 LL= 37 PI= 15

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B4 **Depth:** 26-26.5'
Sample Number: 6C **Date:**

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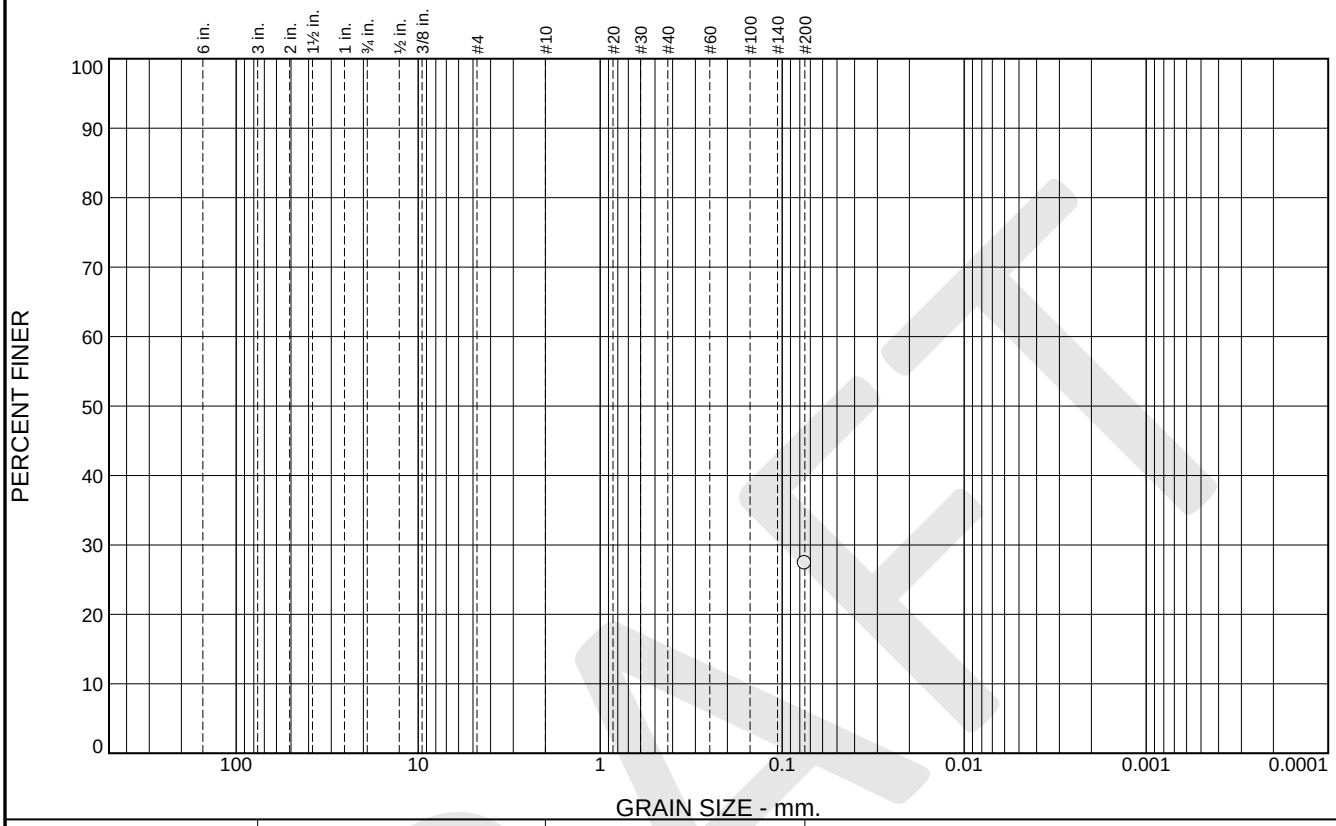
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
				27.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	27.4		

* (no specification provided)

Material Description

CLAYEY SAND, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B5 **Depth:** 21-21.5'
Sample Number: 5C **Date:**

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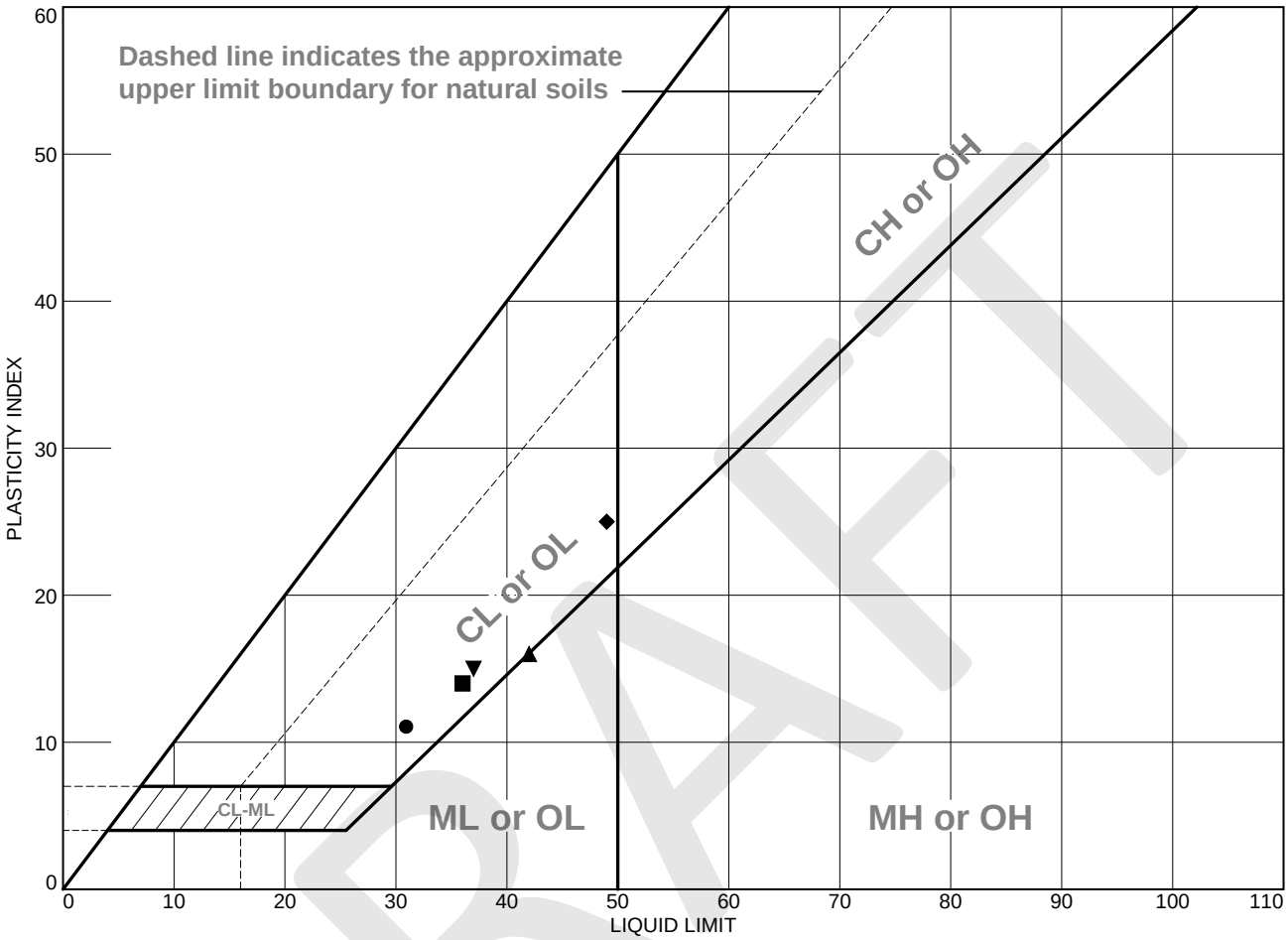
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	CLAYEY SAND, very dark brown	31	20	11		40.8	SC
■	SANDY lean CLAY, brown	36	22	14			CL
▲	SANDY lean CLAY, brown	42	26	16			CL
◆	SANDY lean CLAY, very dark grayish olive	49	24	25		60.8	CL
▼	CLAYEY SAND, strong brown	37	22	15		44.8	SC

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B4 **Depth:** 5.5-6' **Sample Number:** 2C
■**Source of Sample:** B4 **Depth:** 10-11.5' **Sample Number:** 3
▲**Source of Sample:** B4 **Depth:** 15-15.5 **Sample Number:** 4B
◆**Source of Sample:** B4 **Depth:** 20-21.5' **Sample Number:** 5
▼**Source of Sample:** B4 **Depth:** 26-26.5' **Sample Number:** 6C

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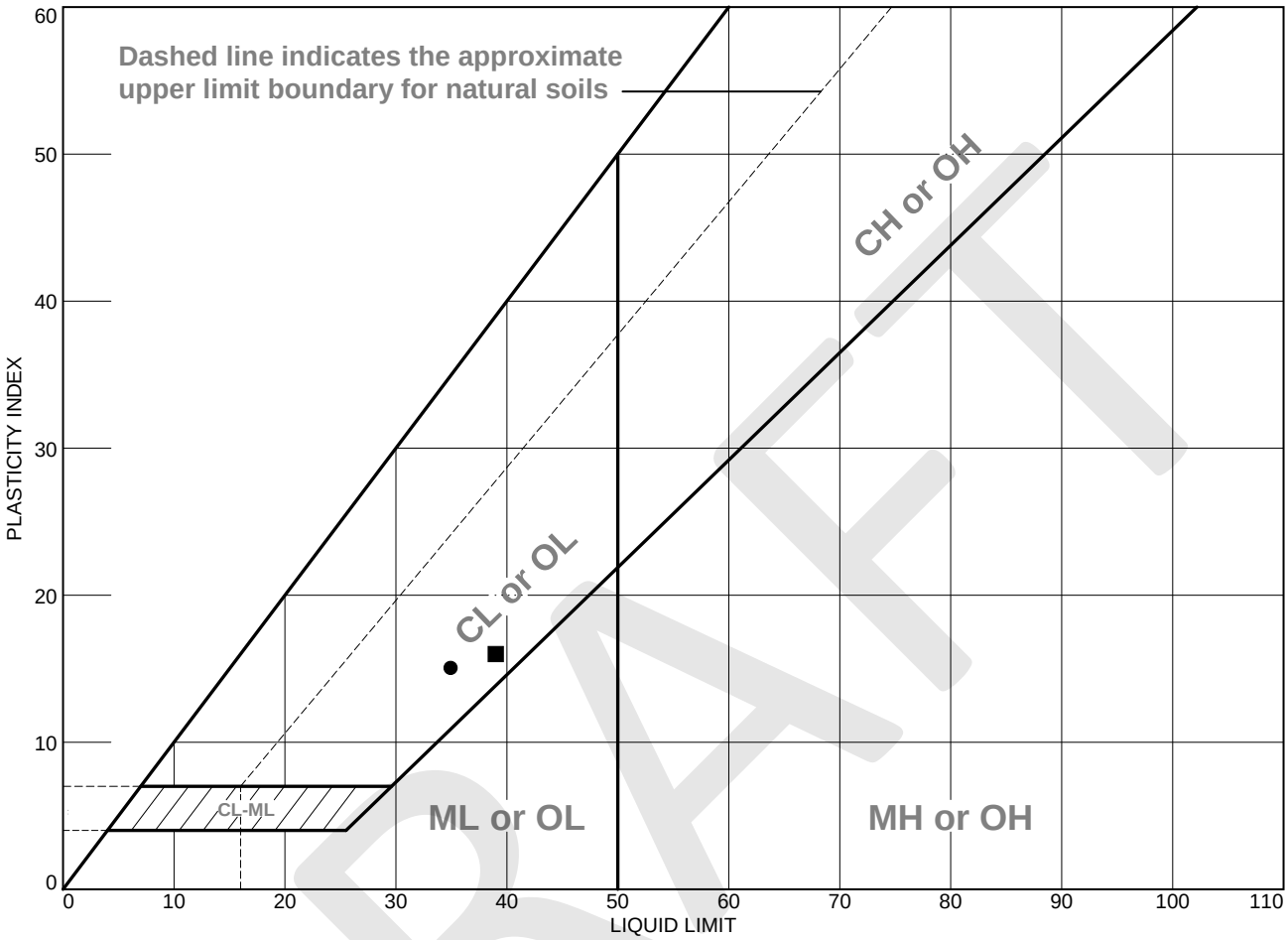
Remarks:

Figure

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY, dark brown	35	20	15			CL
■	Lean CLAY with SAND, dark brown	39	23	16			CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B5 **Depth:** 5.5-6' **Sample Number:** 2C

■**Source of Sample:** B5 **Depth:** 16-16.5' **Sample Number:** 4C

Remarks:

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Figure

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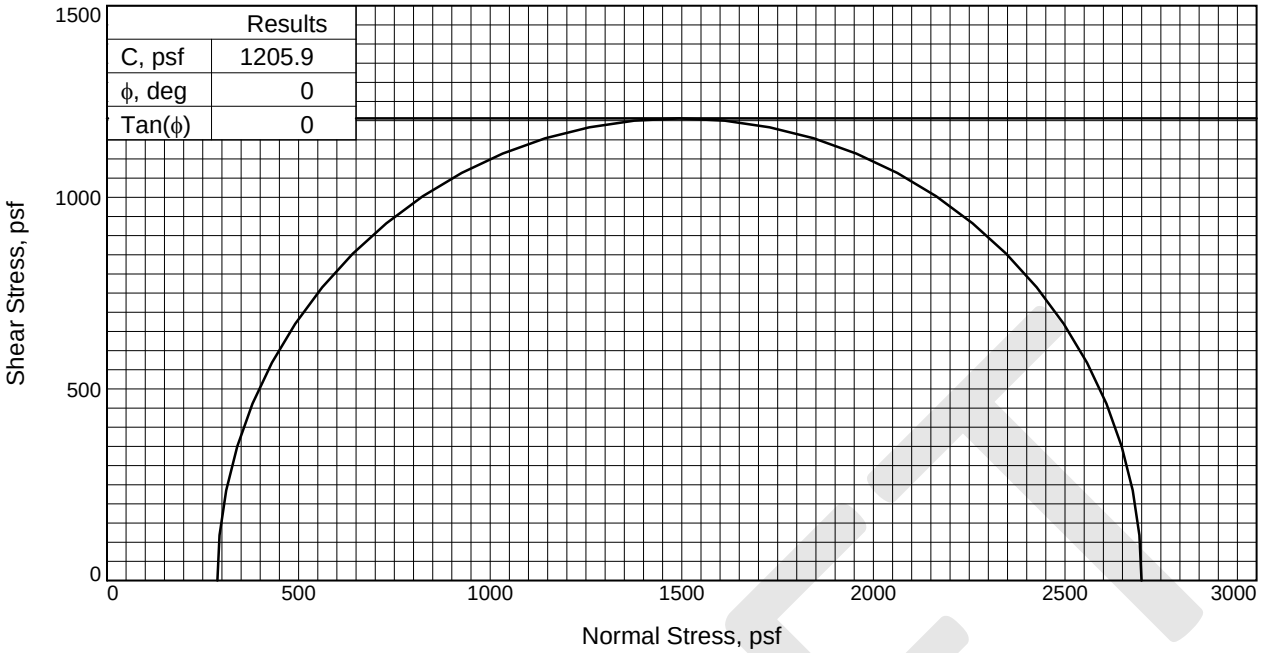

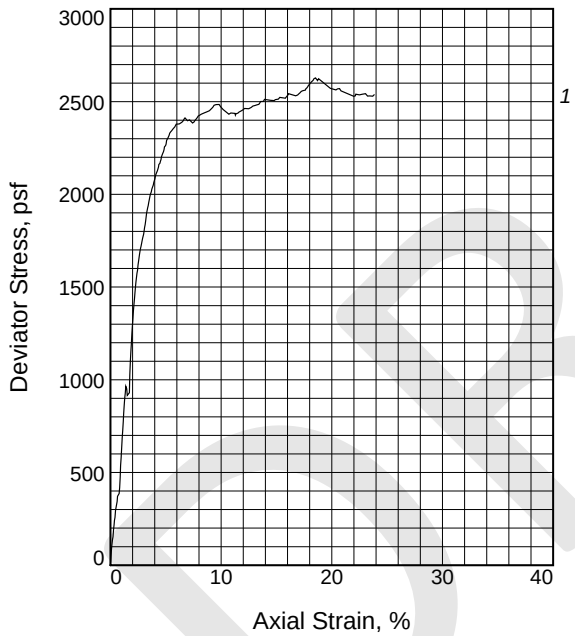

Sample No.		1
Initial	Water Content, %	13.9
	Dry Density, pcf	85.6
	Saturation, %	38.9
	Void Ratio	0.9685
	Diameter, in.	2.395
	Height, in.	4.950
At Test	Water Content, %	35.9
	Dry Density, pcf	85.6
	Saturation, %	100.0
	Void Ratio	0.9685
	Diameter, in.	2.395
	Height, in.	4.950
Strain rate, in./min.		0.020
Back Pressure, psf		0.0
Cell Pressure, psf		288.0
Fail. Stress, psf		2411.8
Strain, %		6.7
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		2699.8
σ_3 Failure, psf		288.0

Type of Test:
Unconsolidated Undrained

Sample Type: CalMod

Description: Lean CLAY, strong brown

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B5 **Depth:** 1.5-2'

Sample Number: 1C

Proj. No.: 3934.X **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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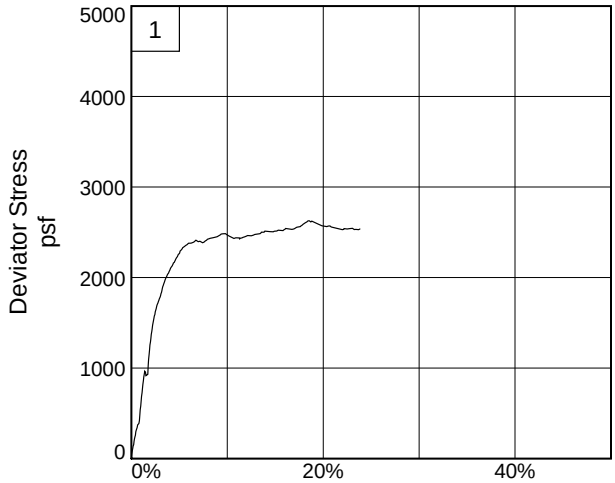

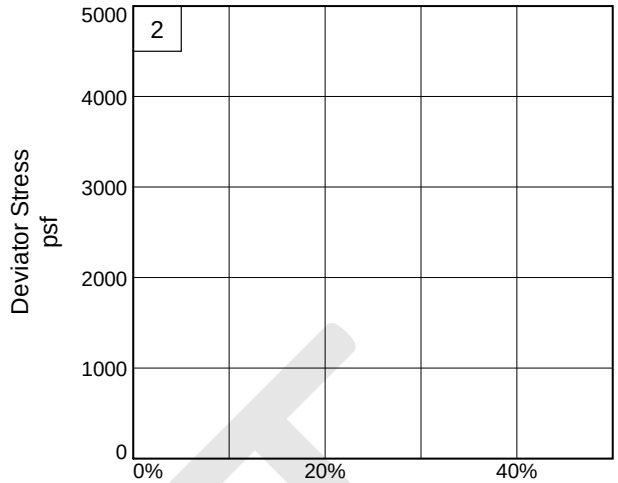

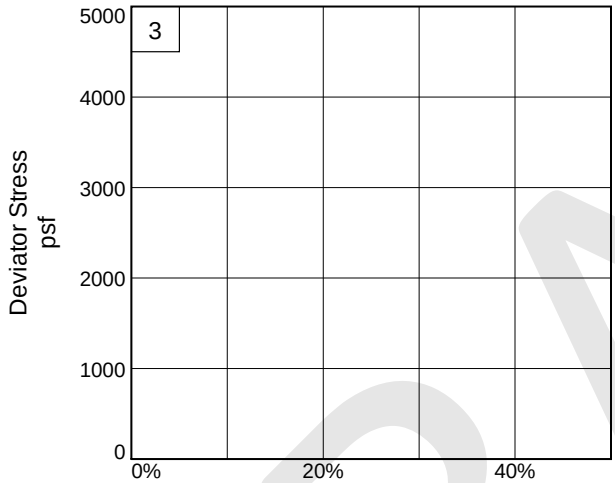

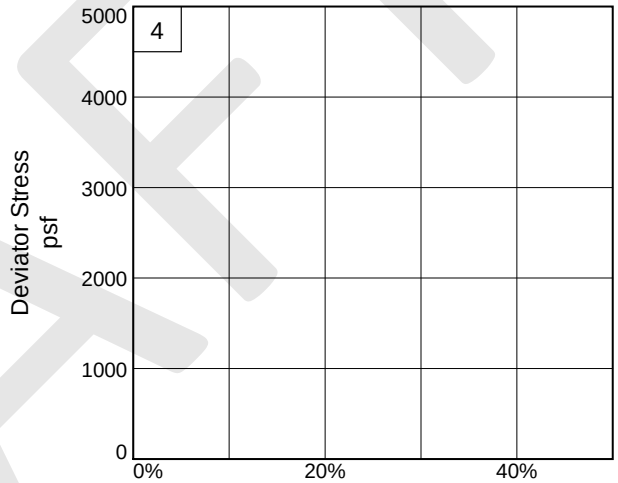

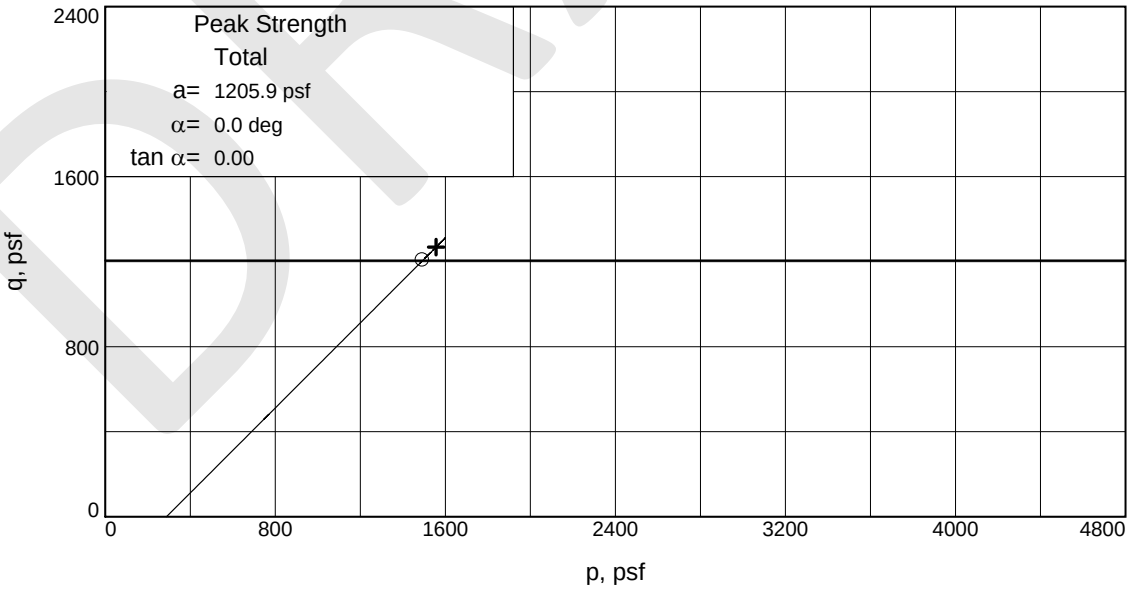

Stress Paths: o indicates peak + indicates end

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B5 **Depth:** 1.5-2' **Sample Number:** 1C

Project No.: 3934.X **Figure** _____

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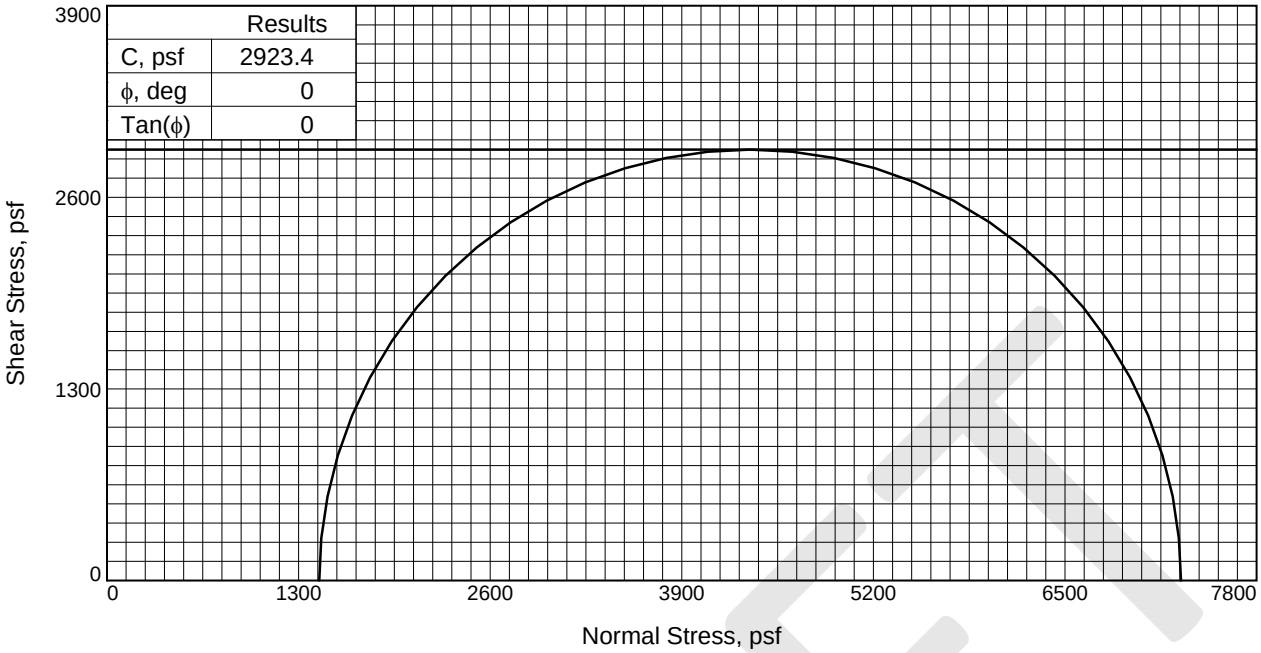

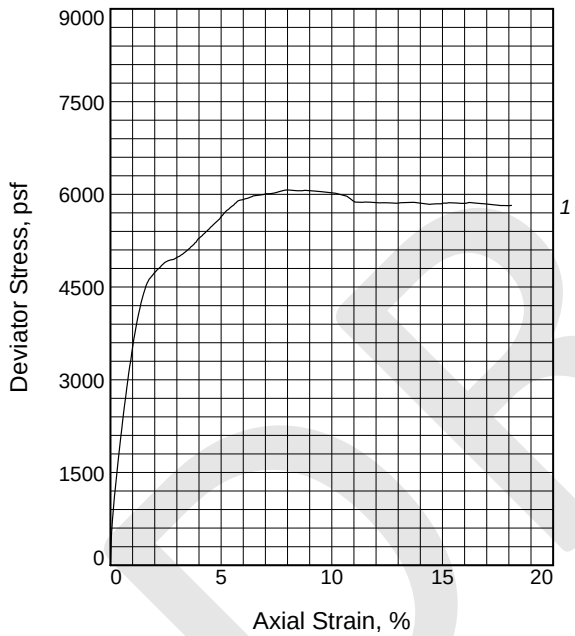

Sample No.		1
Initial	Water Content, %	16.5
	Dry Density, pcf	75.7
	Saturation, %	36.3
	Void Ratio	1.2257
	Diameter, in.	2.395
	Height, in.	5.008
At Test	Water Content, %	16.5
	Dry Density, pcf	75.7
	Saturation, %	36.3
	Void Ratio	1.2257
	Diameter, in.	2.395
	Height, in.	5.008
Strain rate, in./min.		0.020
Back Pressure, psf		0.0
Cell Pressure, psf		1440.0
Fail. Stress, psf		5846.8
Strain, %		5.6
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		7286.8
σ_3 Failure, psf		1440.0

Type of Test:
Unconsolidated Undrained

Sample Type: Cal Mod

Description: Lean CLAY with SAND, dark brown

LL= 39 **PL=** 23 **PI=** 16

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B5 **Depth:** 16-16.5'

Sample Number: 4C

Proj. No.: 3934.X **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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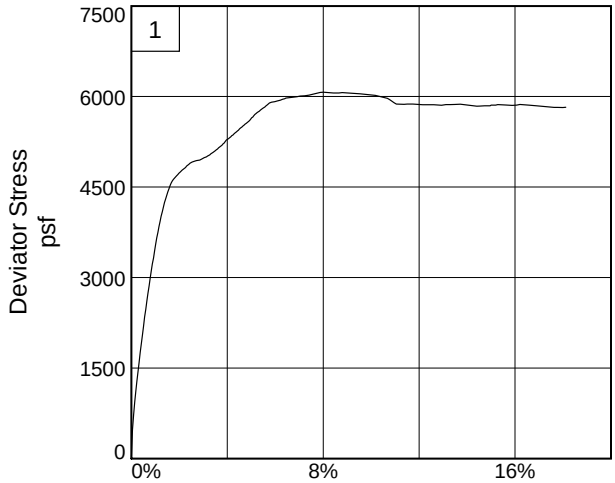
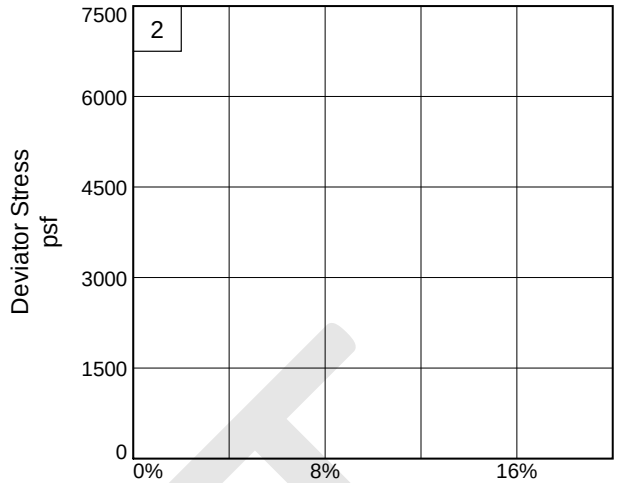
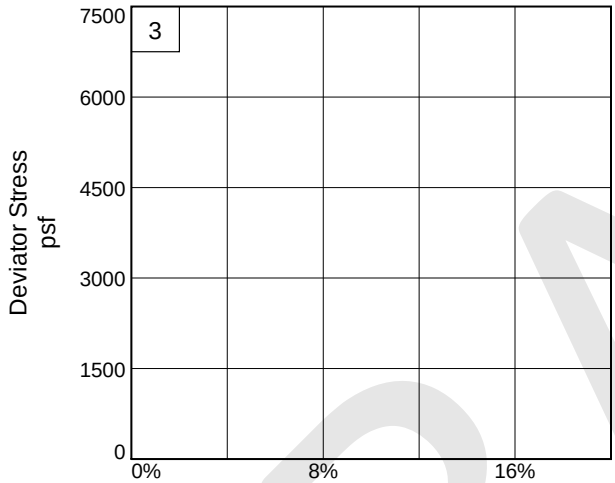
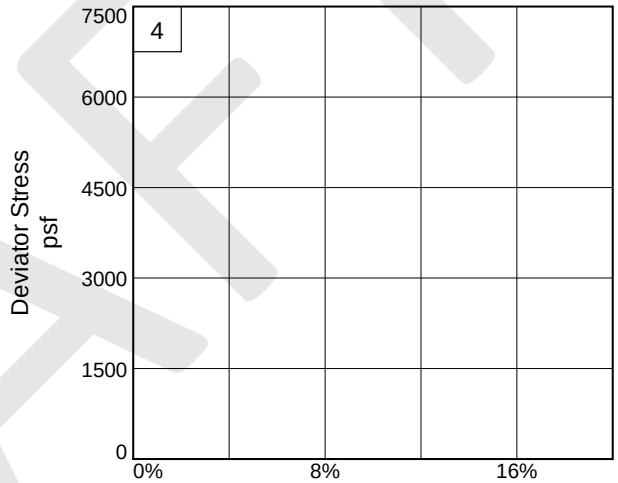
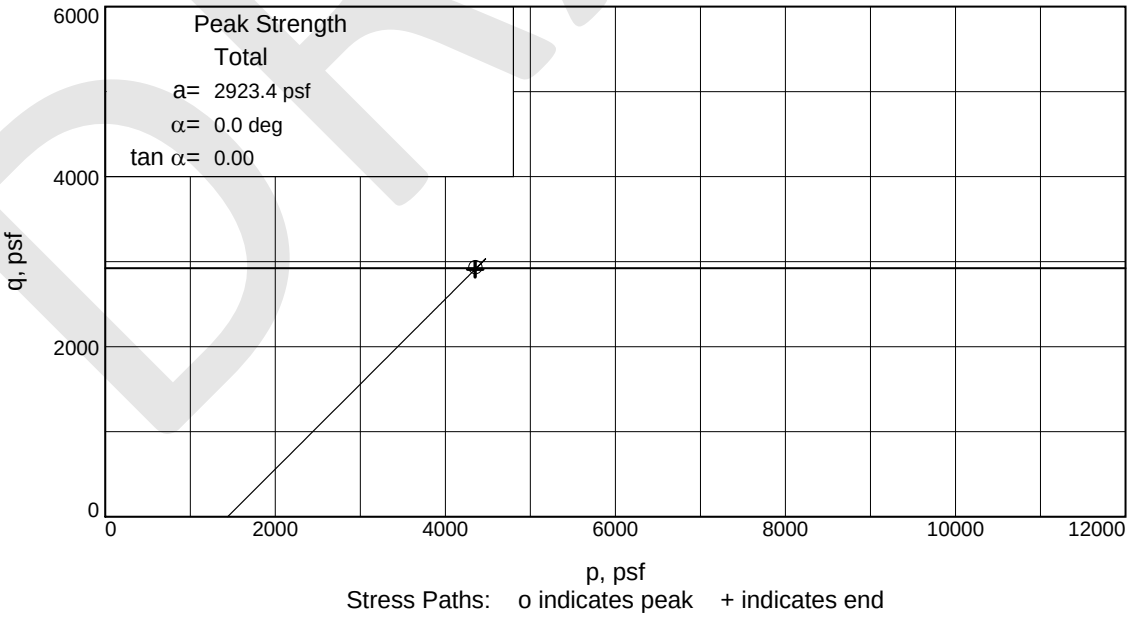










DRAFT

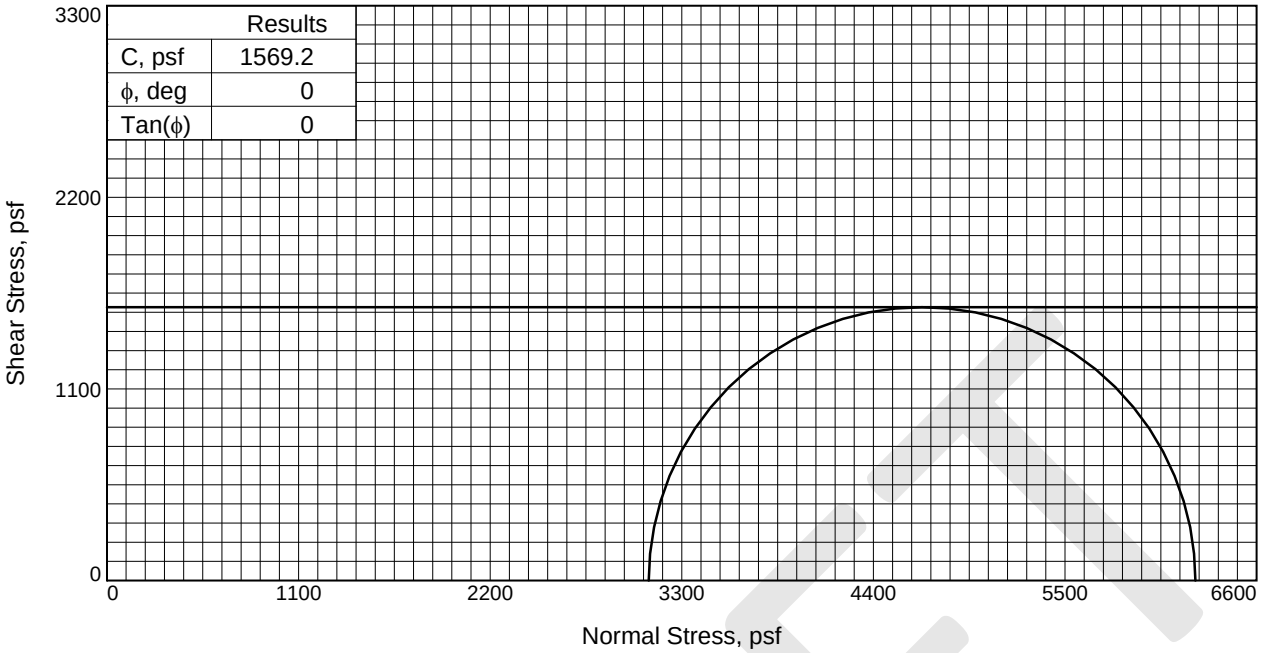
Client: Coastland Civil Engineering

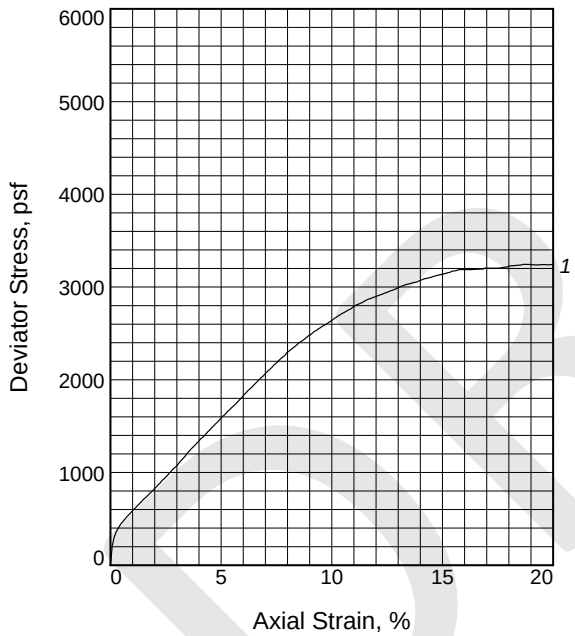
Project: Wheatland Regional Sewer Connection Project

Source of Sample: B5 **Depth:** 16-16.5' **Sample Number:** 4C

Project No.: 3934.X **Figure** _____

Blackburn Consulting





Sample No.		1
Initial	Water Content, %	31.4
	Dry Density, pcf	92.0
	Saturation, %	101.9
	Void Ratio	0.8313
	Diameter, in.	2.406
	Height, in.	5.000
At Test	Water Content, %	31.4
	Dry Density, pcf	92.0
	Saturation, %	102.0
	Void Ratio	0.8313
	Diameter, in.	2.406
	Height, in.	5.000
Strain rate, in./min.		0.040
Back Pressure, psf		0.0
Cell Pressure, psf		3110.4
Fail. Stress, psf		3138.3
Strain, %		15.0
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		6248.7
σ_3 Failure, psf		3110.4

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: SANDY lean CLAY, strong brown

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B5 **Depth:** 26-26.5'

Sample Number: 7C

Proj. No.: 3934.X **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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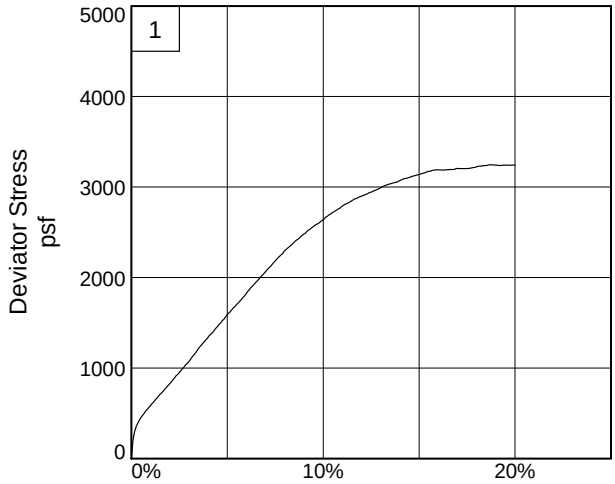

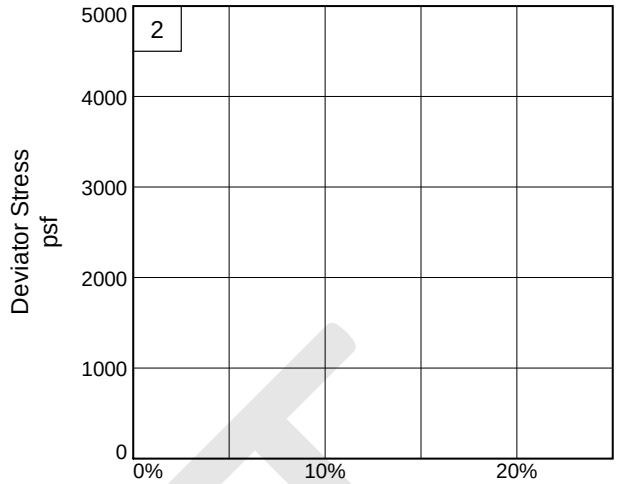

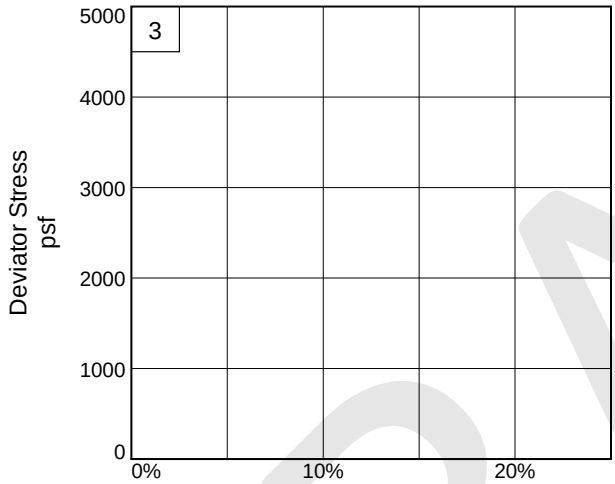

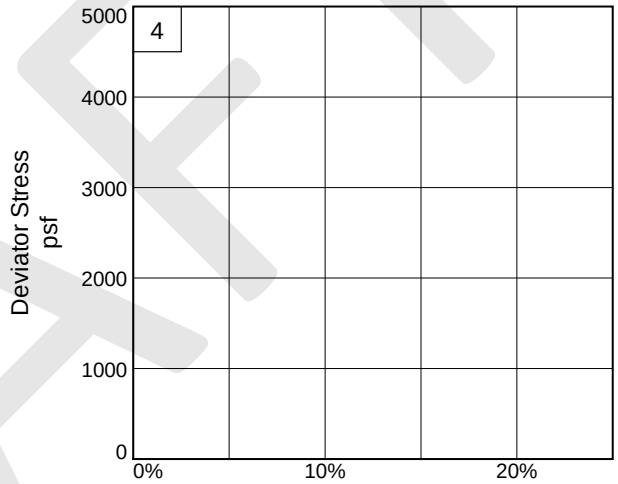

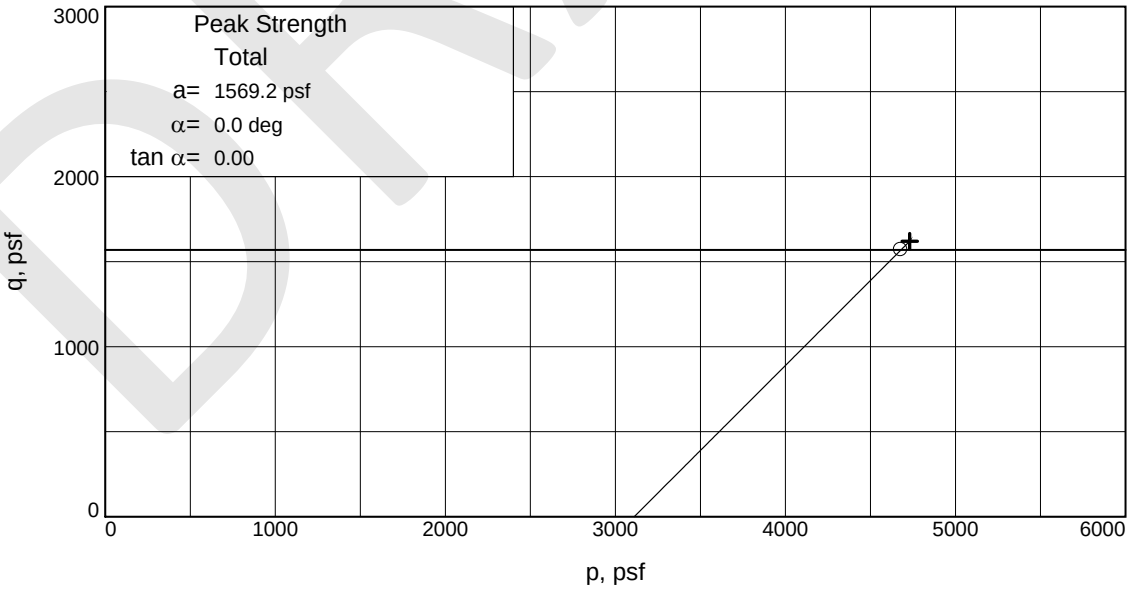

Stress Paths: o indicates peak + indicates end

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B5 **Depth:** 26-26.5' **Sample Number:** 7C

Project No.: 3934.X **Figure** _____

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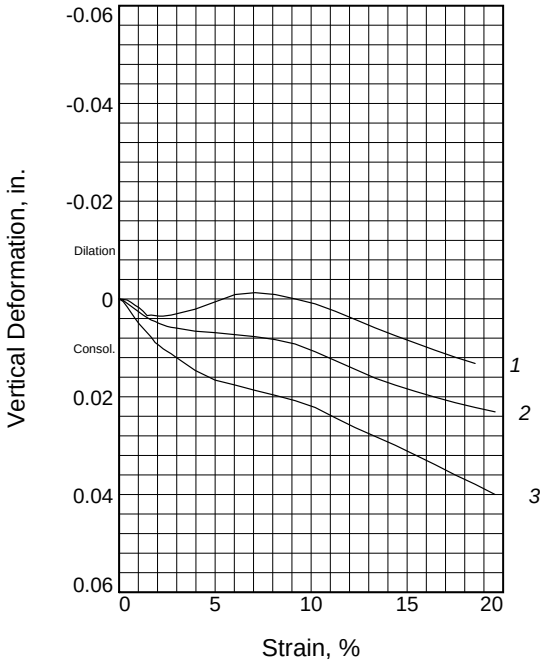
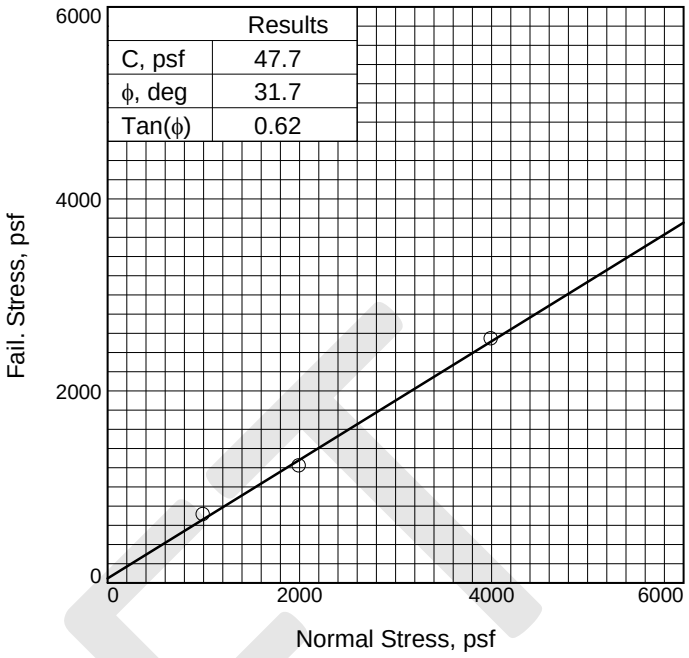
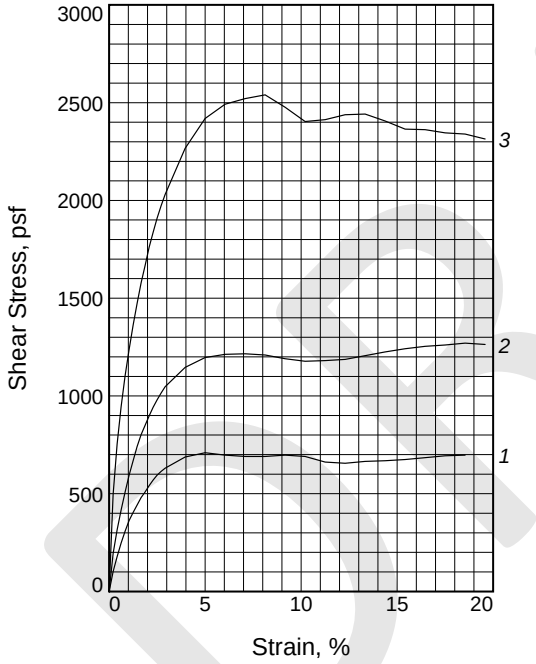




	Results
C, psf	47.7
ϕ, deg	31.7
Tan(ϕ)	0.62



	Sample No.	1	2	3
Initial	Water Content, %	31.4	28.2	30.1
	Dry Density, pcf	85.9	88.7	89.1
	Saturation, %	88.2	84.4	91.2
	Void Ratio	0.9626	0.9007	0.8911
	Diameter, in.	2.400	2.400	2.400
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	33.4	30.3	29.5
	Dry Density, pcf	88.7	92.7	93.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.9009	0.8175	0.7964
	Diameter, in.	2.400	2.400	2.400
	Height, in.	0.969	0.956	0.950
Normal Stress, psf		1000.0	2000.0	4000.0
Fail. Stress, psf		709.8	1215.9	2540.1
Strain, %		5.0	7.1	8.1
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.003	0.003	0.003

Sample Type: Cal Mod
Description: CLAYEY SAND, dark brown

Assumed Specific Gravity= 2.7
Remarks:

Figure _____

Client: Coastland Civil Engineering

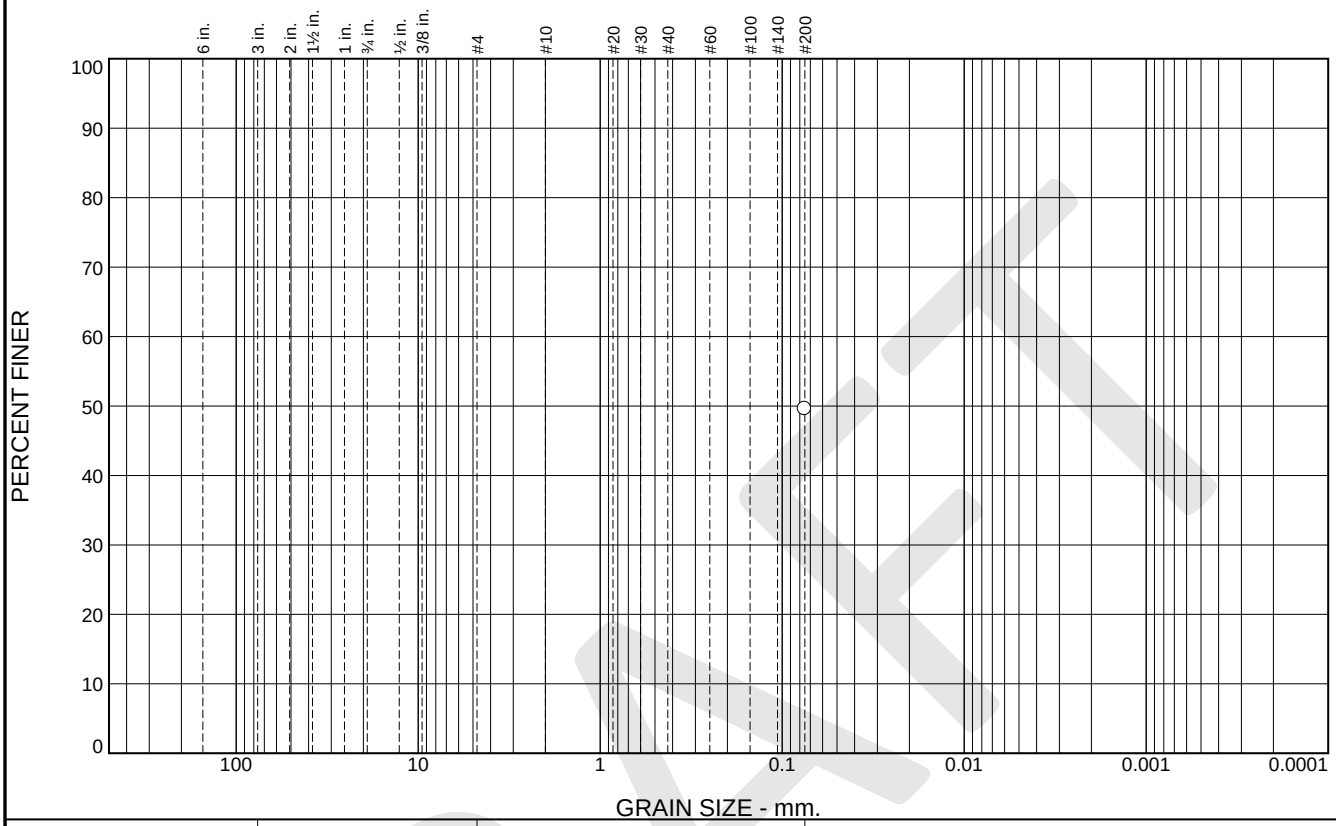
Project: Wheatland Regional Sewer Connection Project

Source of Sample: B5 **Depth:** 21-21.5'
Sample Number: 5C
Proj. No.: 3934.X **Date Sampled:**

DIRECT SHEAR TEST REPORT
Blackburn Consulting
W. Sacramento, CA

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						49.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	49.6		

* (no specification provided)

Material Description

CLAYEY GRAVEL with SAND, dark yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO=

Remarks

Source of Sample: B6 **Depth:** 10-10.5'
Sample Number: 3C **Date:**

Blackburn Consulting

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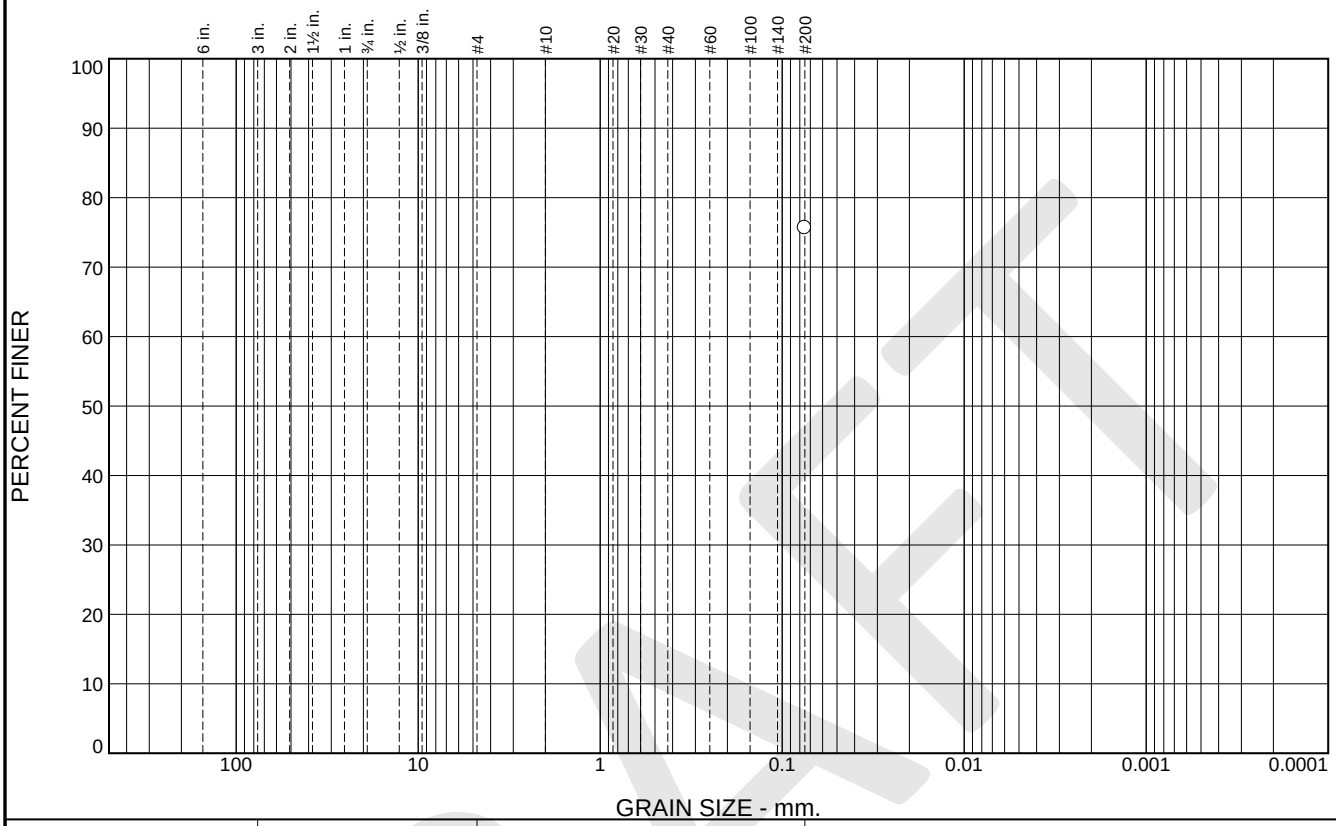
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						75.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	75.6		

* (no specification provided)

Material Description

Lean CLAY with SAND, dark yellowish brown

Atterberg Limits

PL= 24 LL= 43 PI= 19

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B6 **Depth:** 20.5-21'
Sample Number: 5B **Date:**

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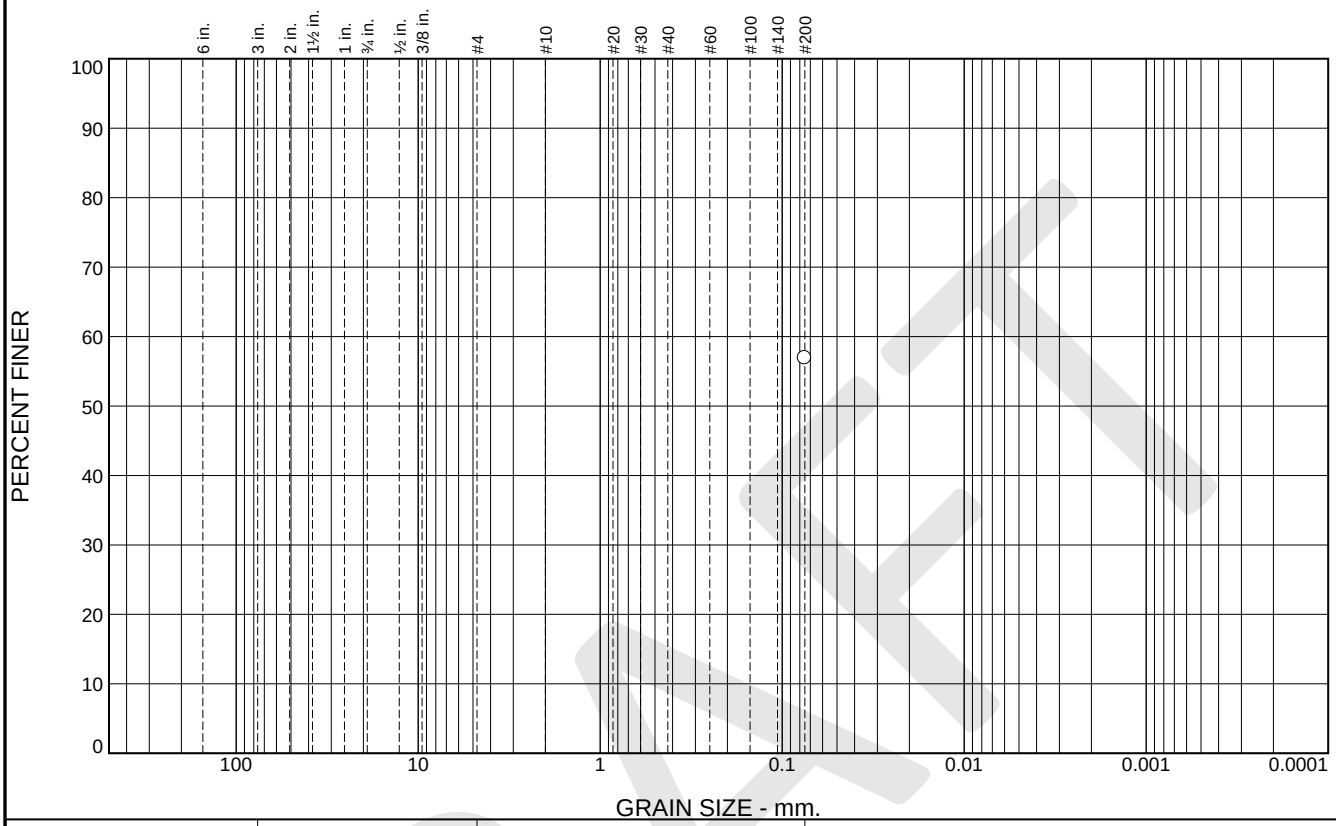
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						56.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	56.9		

* (no specification provided)

Material Description

SANDY SILT, yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B6 **Depth:** 21-21.5'
Sample Number: 5C **Date:**

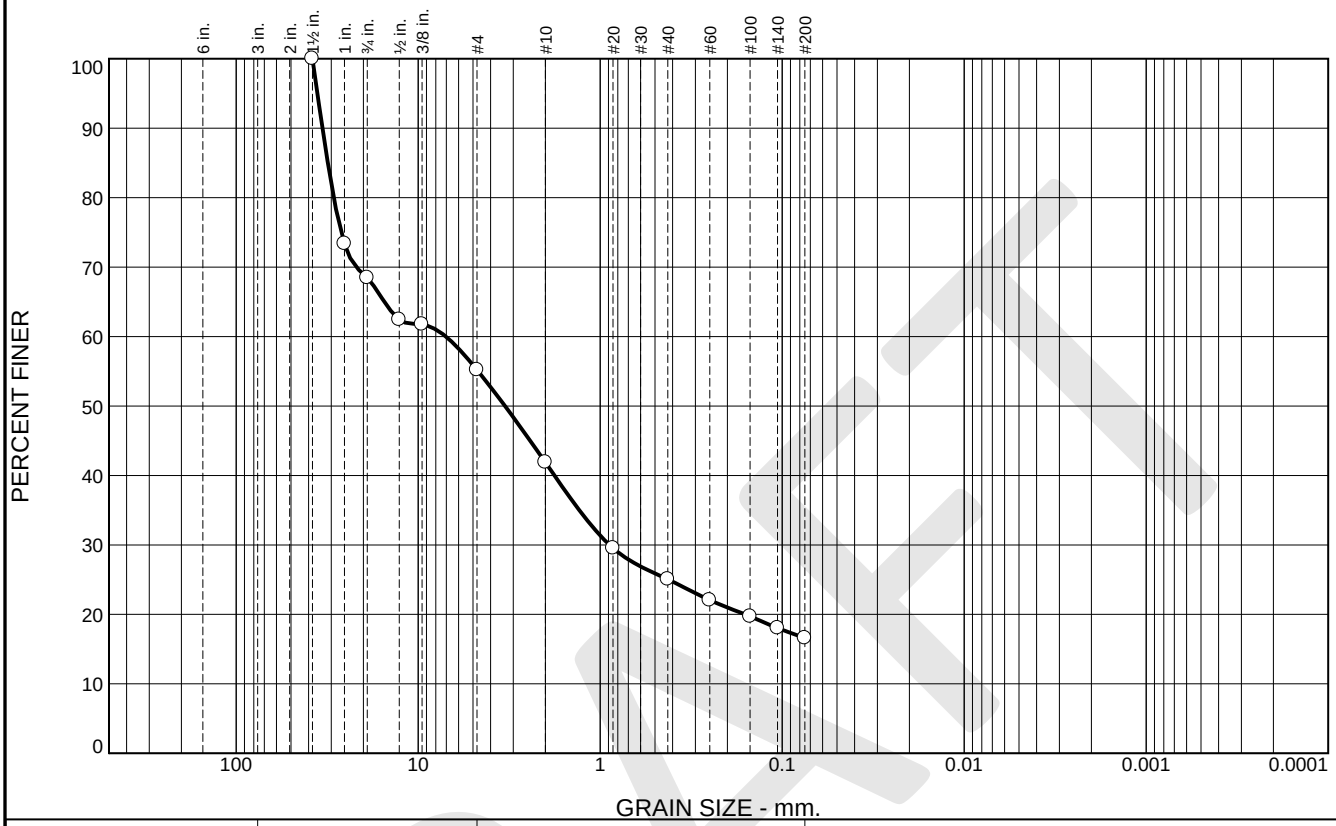
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	31.5	13.3	13.3	16.8	8.5	16.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	73.4		
3/4"	68.5		
1/2"	62.4		
3/8"	61.8		
#4	55.2		
#10	41.9		
#20	29.5		
#40	25.1		
#60	22.1		
#100	19.7		
#140	18.0		
#200	16.6		

* (no specification provided)

Material Description

CLAYEY GRAVEL with SAND, reddish brown

Atterberg Limits

PL= 21 LL= 52 PI= 31

Coefficients

D_{90}= 33.5874 D_{85}= 31.3825 D_{60}= 7.0416
D_{50}= 3.3346 D_{30}= 0.8888 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO= A-2-7(0)

Remarks

Source of Sample: B7 **Depth:** 10.8-11.3'
Sample Number: 3C **Date:**

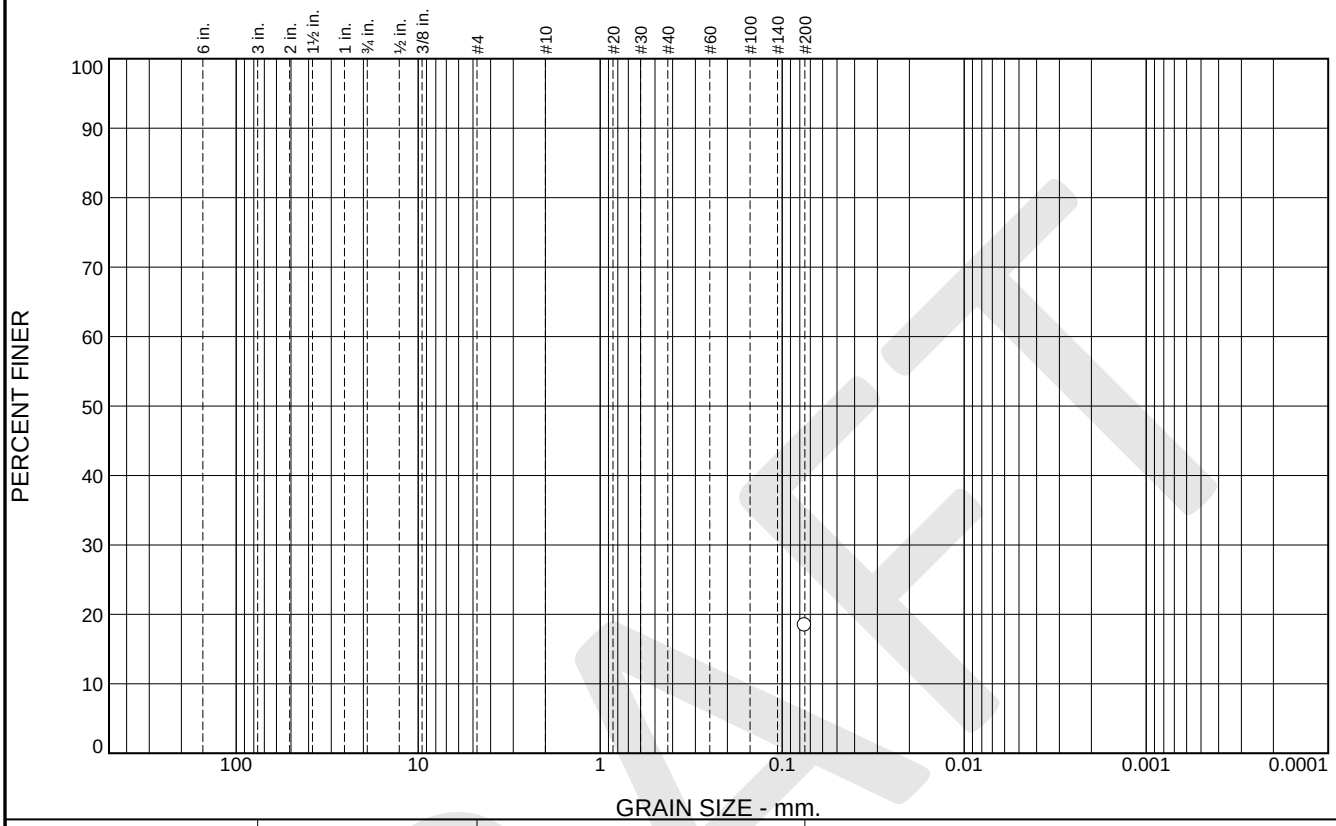
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						18.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	18.4		

* (no specification provided)

Material Description

SILTY SAND, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B7 **Depth:** 16-16.5'
Sample Number: 4C **Date:**

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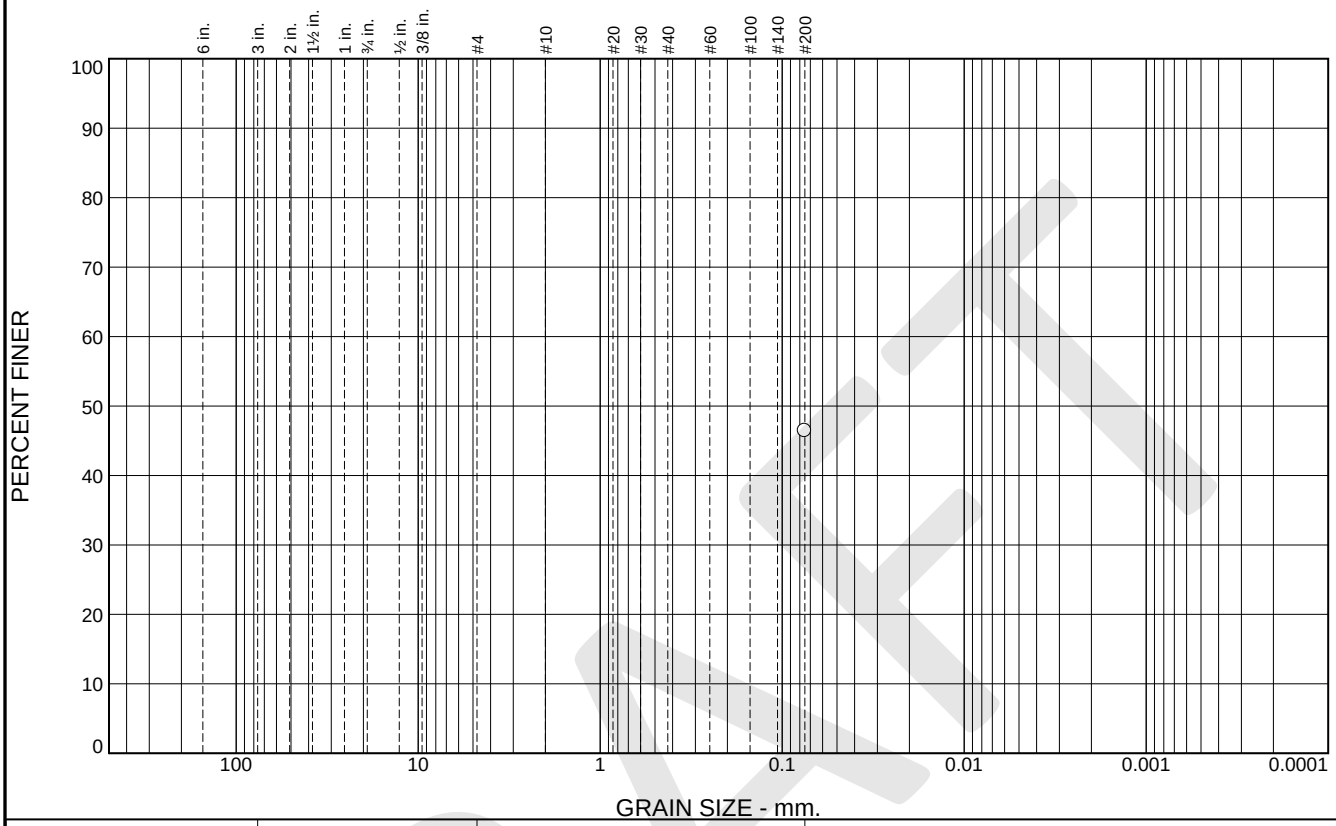
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						46.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	46.4		

* (no specification provided)

Material Description

SILTY SAND, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B7 **Depth:** 25.5-26'
Sample Number: 6C **Date:**

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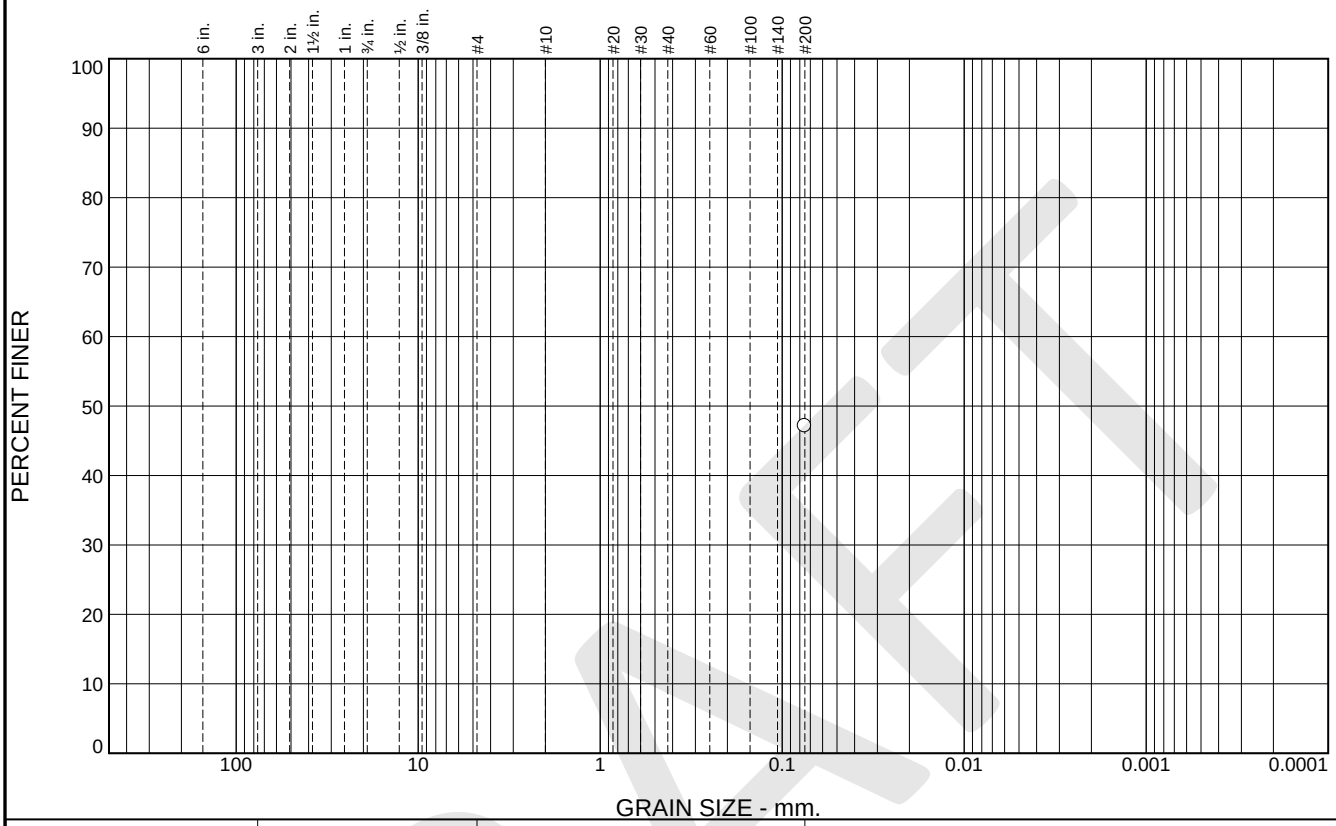
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						47.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	47.1		

* (no specification provided)

Material Description

CLAYEY SAND, dark yellowish brown

Atterberg Limits

PL= 24 LL= 45 PI= 21

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B7 **Depth:** 31-31.5'
Sample Number: 7C **Date:**

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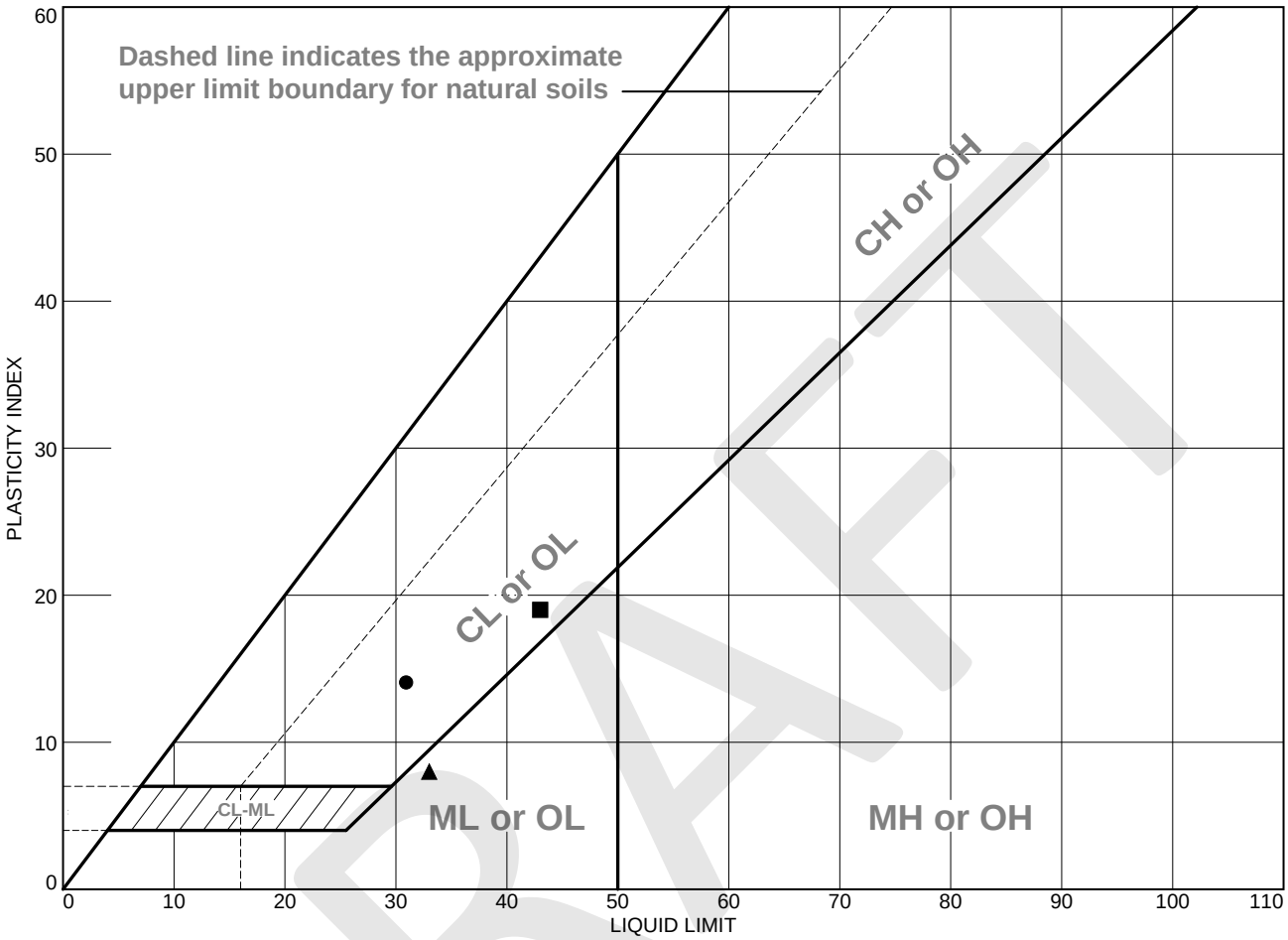
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SANDY lean CLAY, yellowish red	31	17	14			CL
■	Lean CLAY with SAND, dark yellowish brown	43	24	19		75.6	CL
▲	SANDY SILT, dark yellowish brown	33	25	8			ML

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B6 **Depth:** 5.5-6' **Sample Number:** 2C

■**Source of Sample:** B6 **Depth:** 20.5-21' **Sample Number:** 5B

▲**Source of Sample:** B6 **Depth:** 25.3-25.8' **Sample Number:** 6B

Remarks:

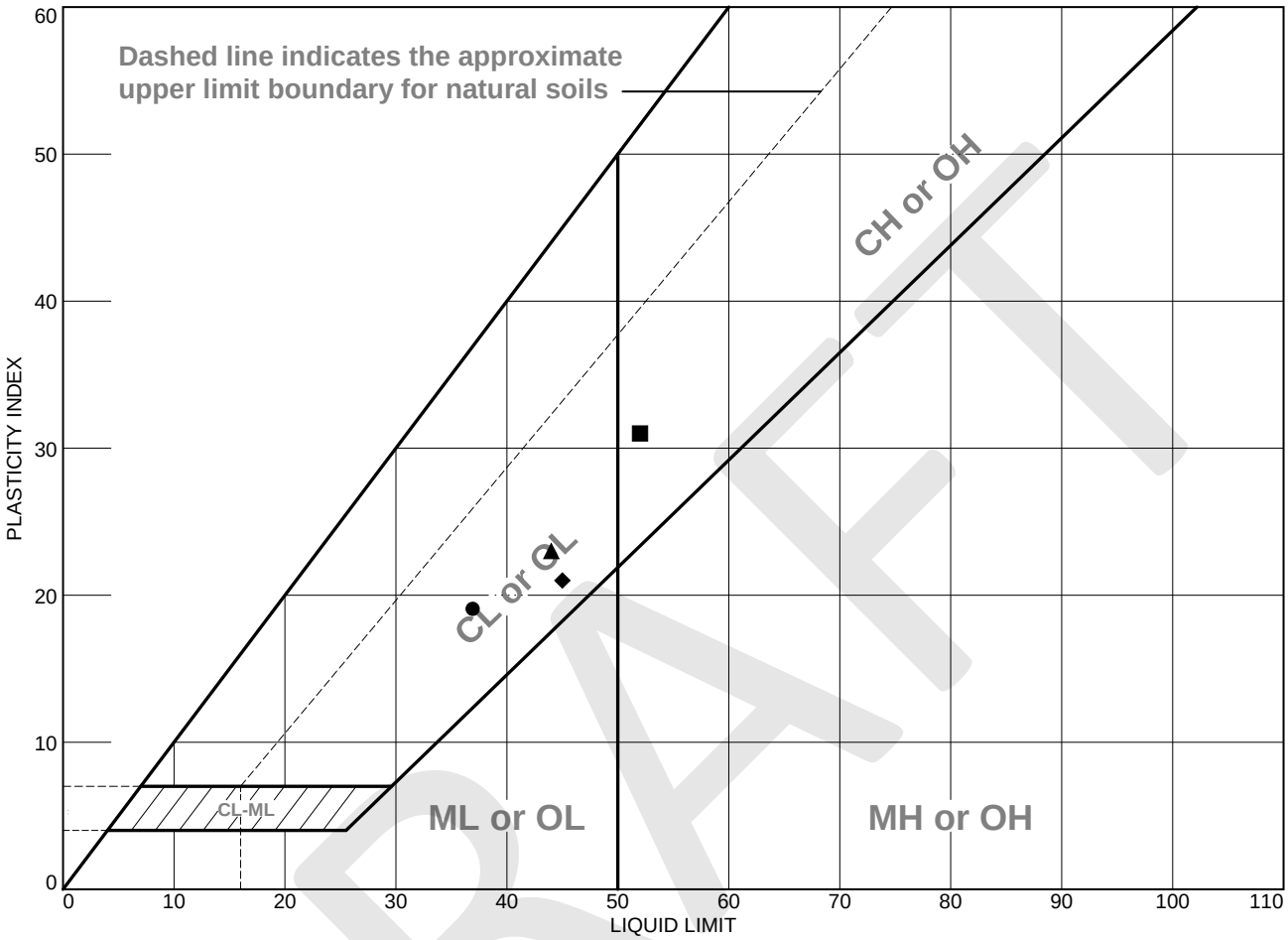
Blackburn Consulting

W. Sacramento, CA

Figure

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY, dark reddish brown	37	18	19			CL
■	CLAYEY GRAVEL with SAND, dark reddish brown	52	21	31	25.1	16.6	GC
▲	Lean CLAY with SAND, dark yellowish brown	44	21	23			CL
◆	CLAYEY SAND, dark yellowish brown	45	24	21		47.1	SC

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B7 **Depth:** 6-6.5' **Sample Number:** 2C

■**Source of Sample:** B7 **Depth:** 10.8-11.3' **Sample Number:** 3C

▲**Source of Sample:** B7 **Depth:** 30.5-31' **Sample Number:** 7B

◆**Source of Sample:** B7 **Depth:** 31-31.5' **Sample Number:** 7C

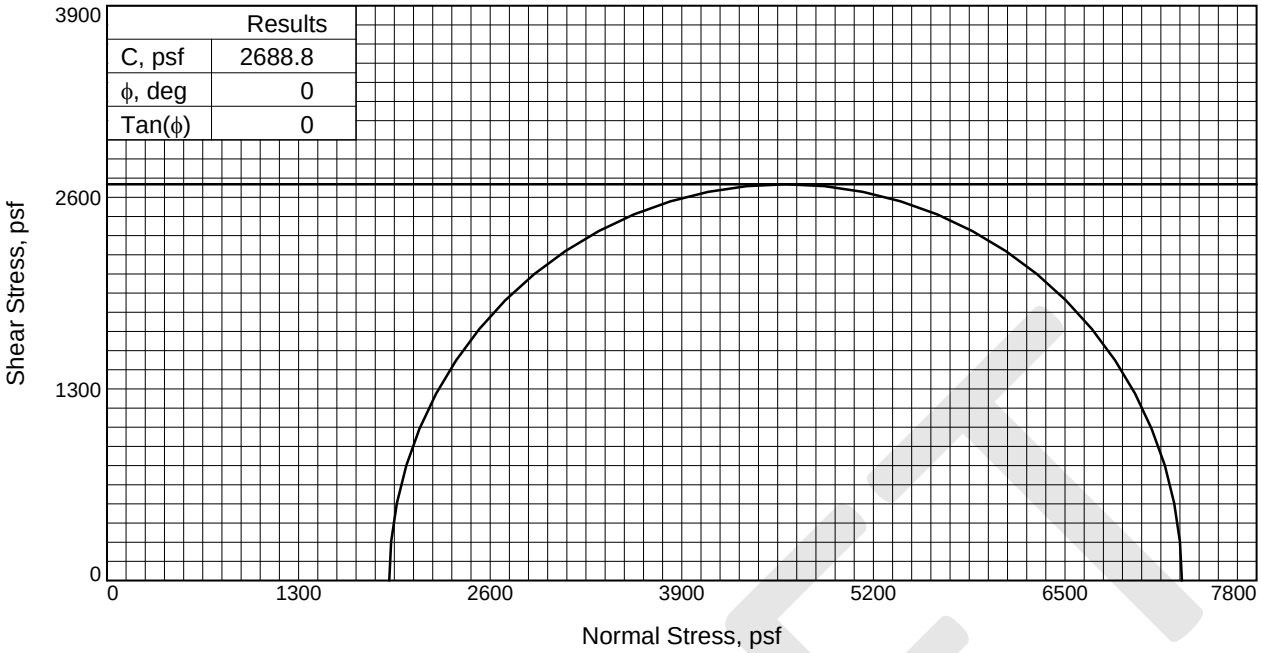
Remarks:

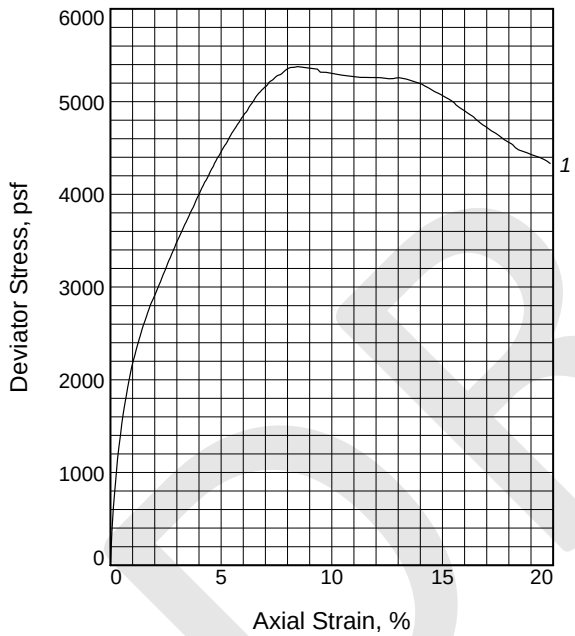
Blackburn Consulting

W. Sacramento, CA

Figure

DRAFT





Sample No.		1
Initial	Water Content, %	40.0
	Dry Density, pcf	80.9
	Saturation, %	99.7
	Void Ratio	1.0827
	Diameter, in.	2.407
	Height, in.	5.015
At Test	Water Content, %	39.6
	Dry Density, pcf	81.5
	Saturation, %	100.0
	Void Ratio	1.0690
	Diameter, in.	2.402
	Height, in.	5.004
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		1915.2
Fail. Stress, psf		5377.7
Strain, %		8.4
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		7292.9
σ_3 Failure, psf		1915.2

Type of Test: Unconsolidated Undrained

Sample Type: Cal Mod

Description: Lean CLAY with SAND, dark yellowish brown

Assumed Specific Gravity= 2.70

Remarks:

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B6 **Depth:** 16-16.5'

Sample Number: 4C

Proj. No.: 3934.X **Date Sampled:**

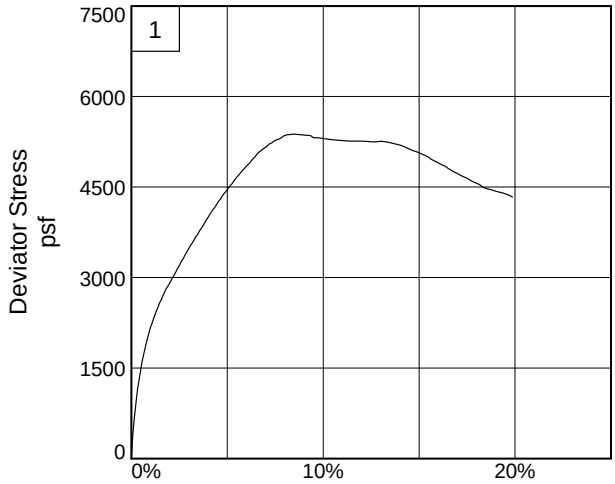
TRIAXIAL SHEAR TEST REPORT

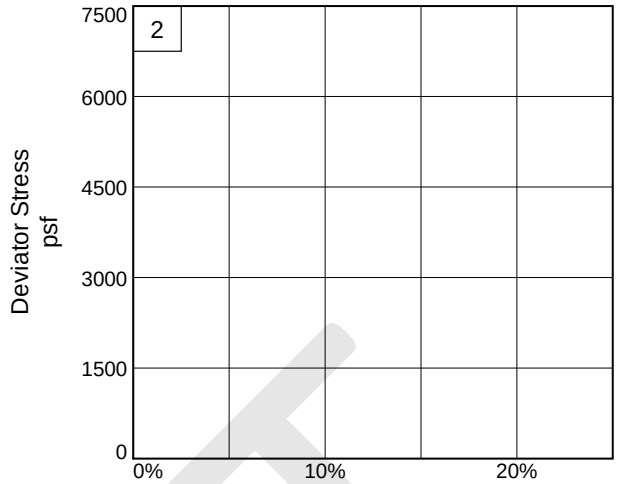
Blackburn Consulting

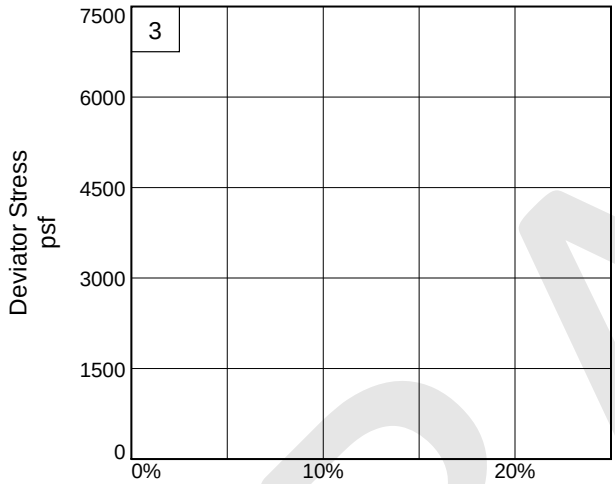
W. Sacramento, CA

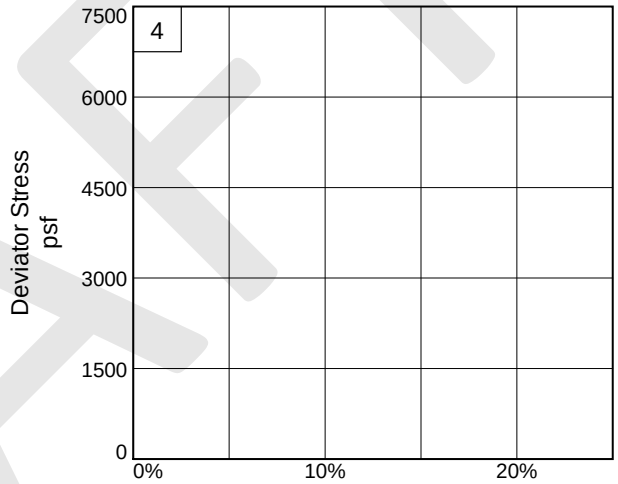
Figure _____

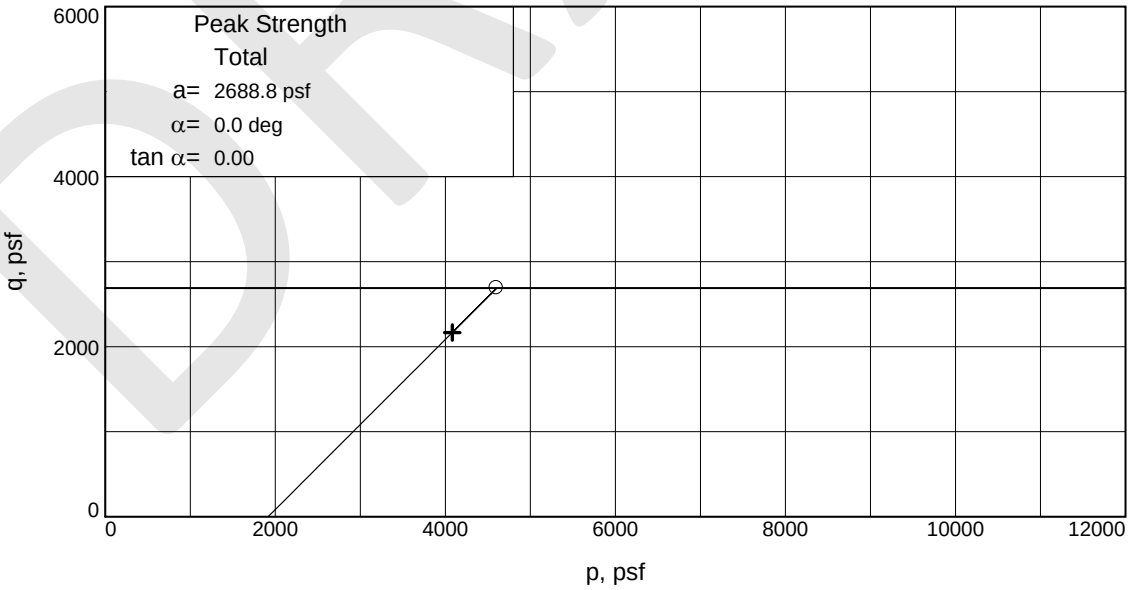
DRAFT











Stress Paths: o indicates peak + indicates end

Client: Coastland Civil Engineering

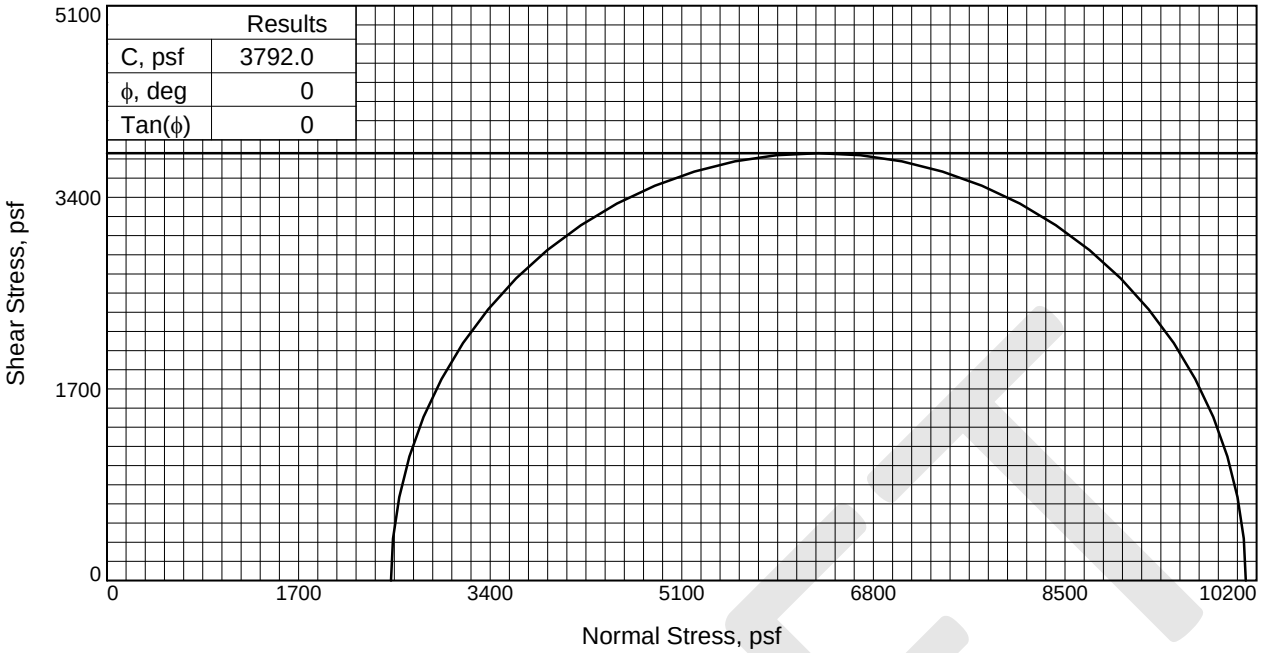
Project: Wheatland Regional Sewer Connection Project

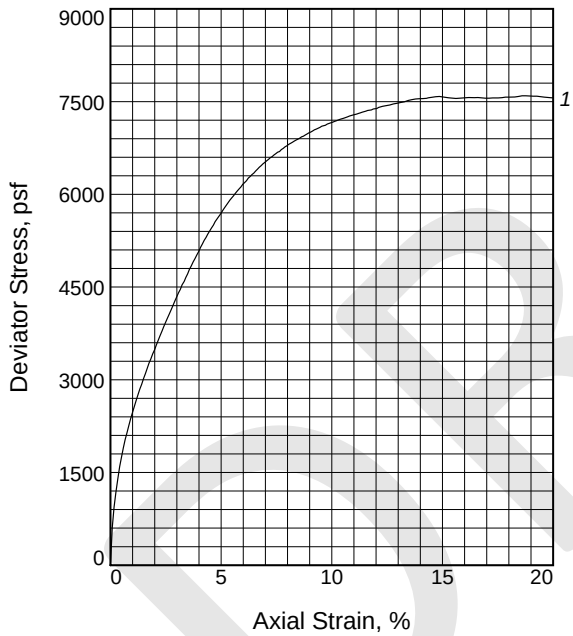
Source of Sample: B6 **Depth:** 16-16.5' **Sample Number:** 4C

Project No.: 3934.X **Figure** _____

Blackburn Consulting

DRAFT





Sample No.		1
Initial	Water Content, %	26.3
	Dry Density, pcf	99.6
	Saturation, %	102.4
	Void Ratio	0.6930
	Diameter, in.	2.402
	Height, in.	5.007
At Test	Water Content, %	25.3
	Dry Density, pcf	100.1
	Saturation, %	100.0
	Void Ratio	0.6839
	Diameter, in.	2.398
	Height, in.	4.998
Strain rate, in./min.		0.040
Back Pressure, psf		0.0
Cell Pressure, psf		2520.0
Fail. Stress, psf		7584.0
Strain, %		14.9
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		10104.0
σ_3 Failure, psf		2520.0

Type of Test:
Unconsolidated Undrained

Sample Type: Cal Mod

Description: Lean CLAY, strong brown

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B7 **Depth:** 20.8-21.3'

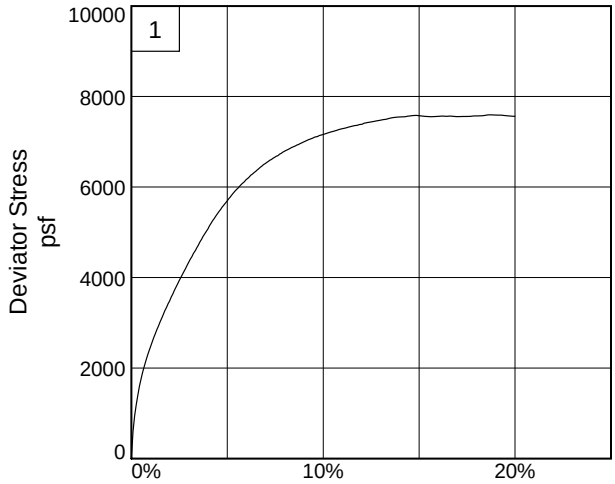
Sample Number: 5C

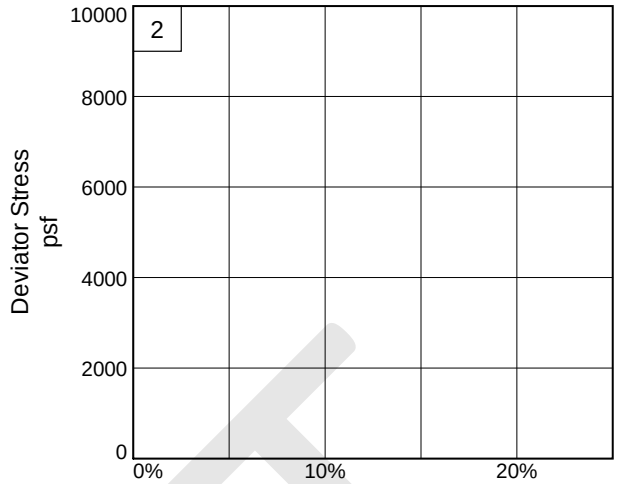
Proj. No.: 3934.X **Date Sampled:**

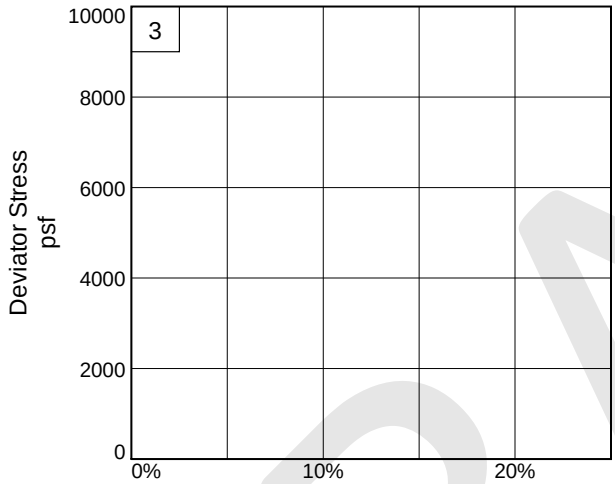
TRIAXIAL SHEAR TEST REPORT

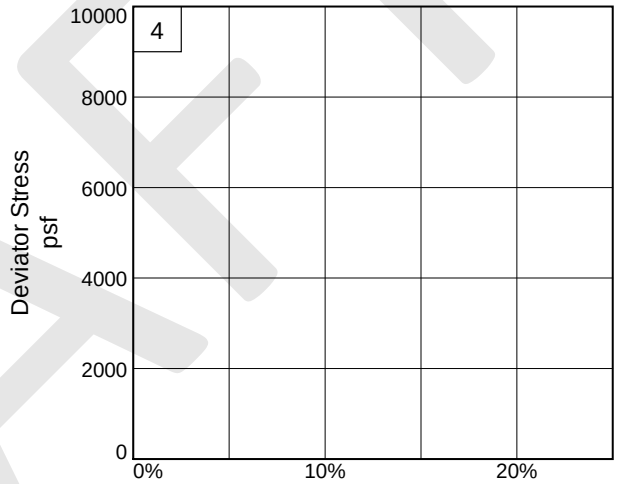
Blackburn Consulting
W. Sacramento, CA

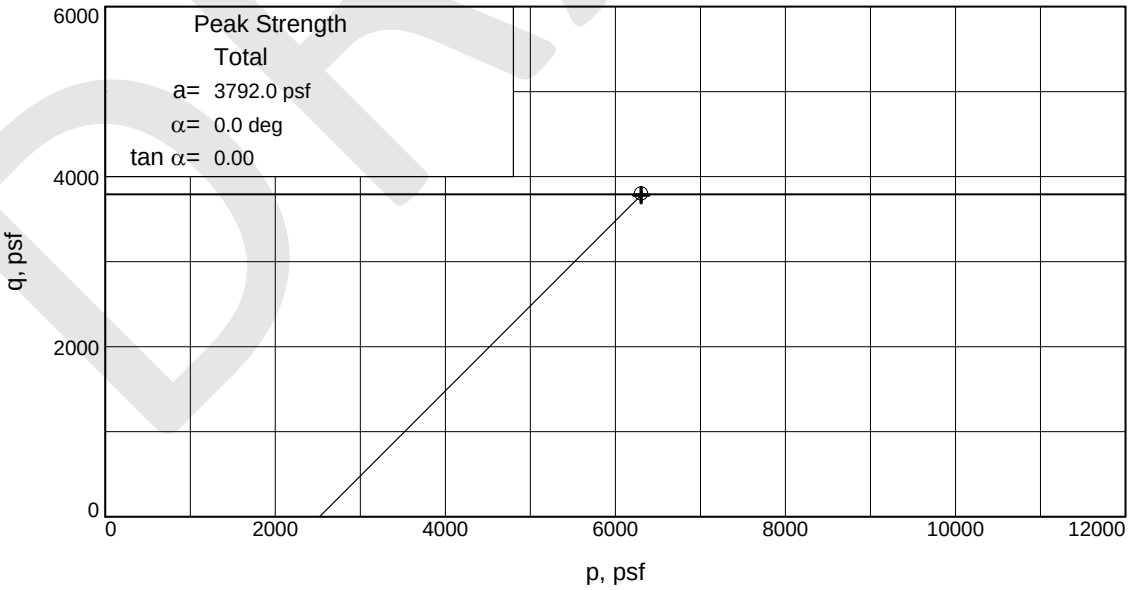
DRAFT











Stress Paths: o indicates peak + indicates end

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B7 **Depth:** 20.8-21.3' **Sample Number:** 5C

Project No.: 3934.X **Figure** _____

Blackburn Consulting

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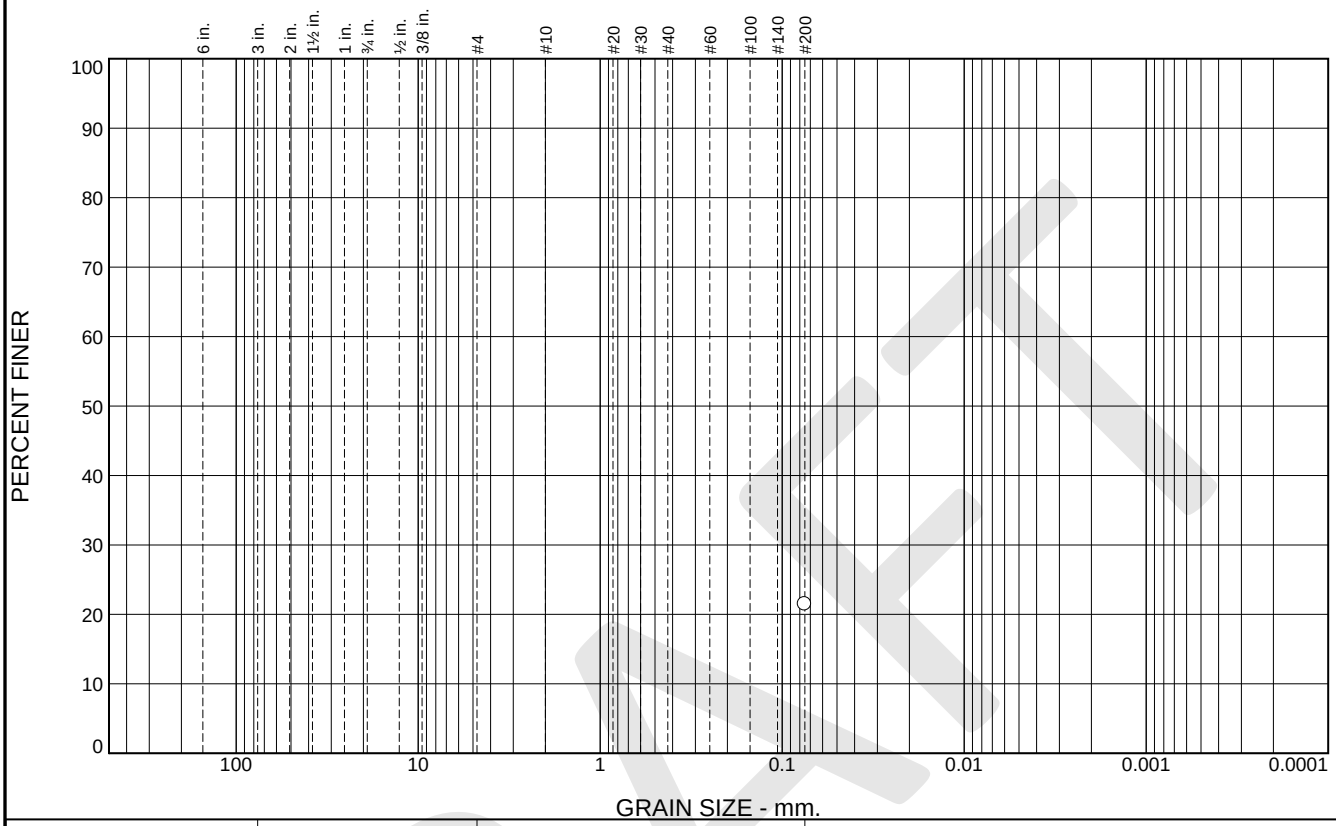
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						21.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	21.5		

* (no specification provided)

Material Description

CLAYEY SAND, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B21 **Depth:** 15.5'-16'
Sample Number: 4C **Date:**

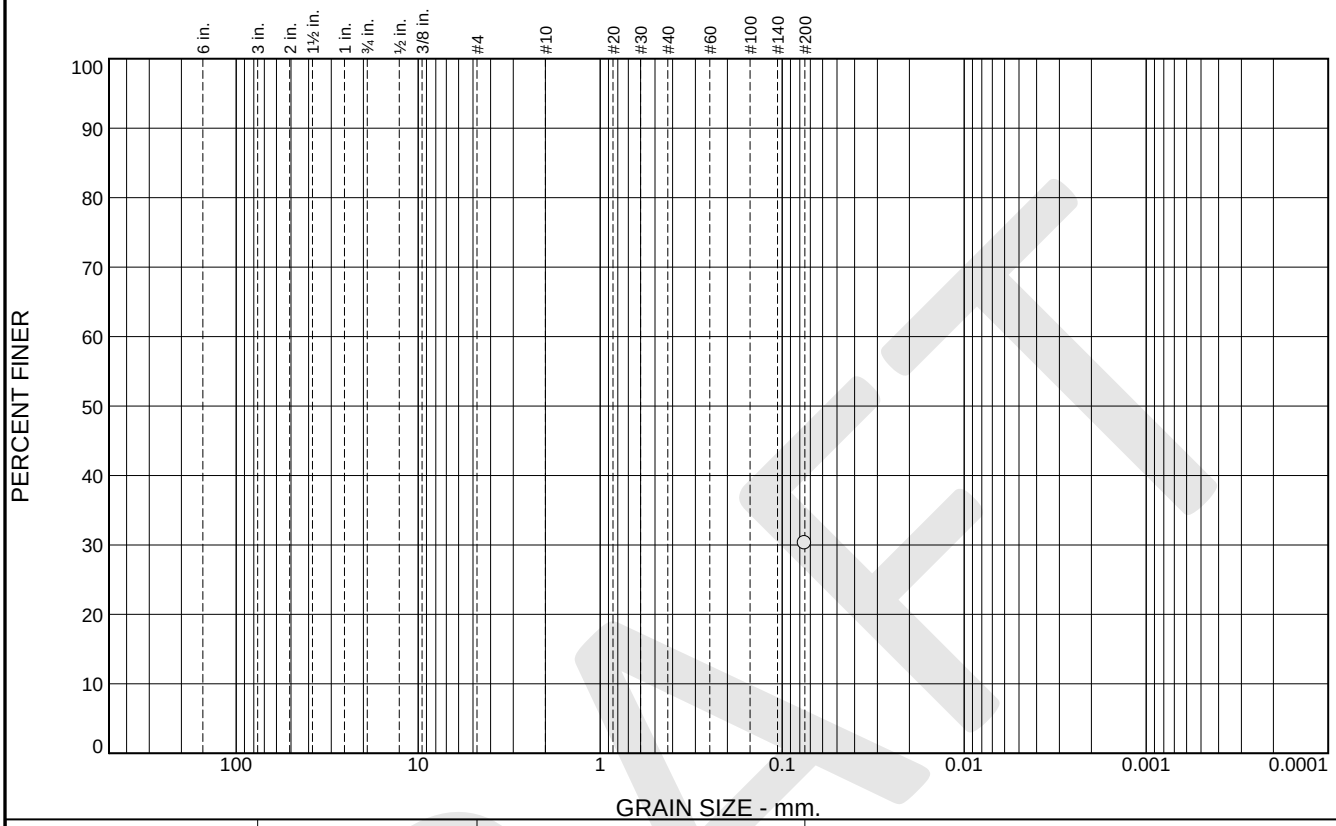
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						30.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	30.3		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= 20 LL= 37 PI= 17

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B21 **Depth:** 20.5-21'
Sample Number: 5B **Date:**

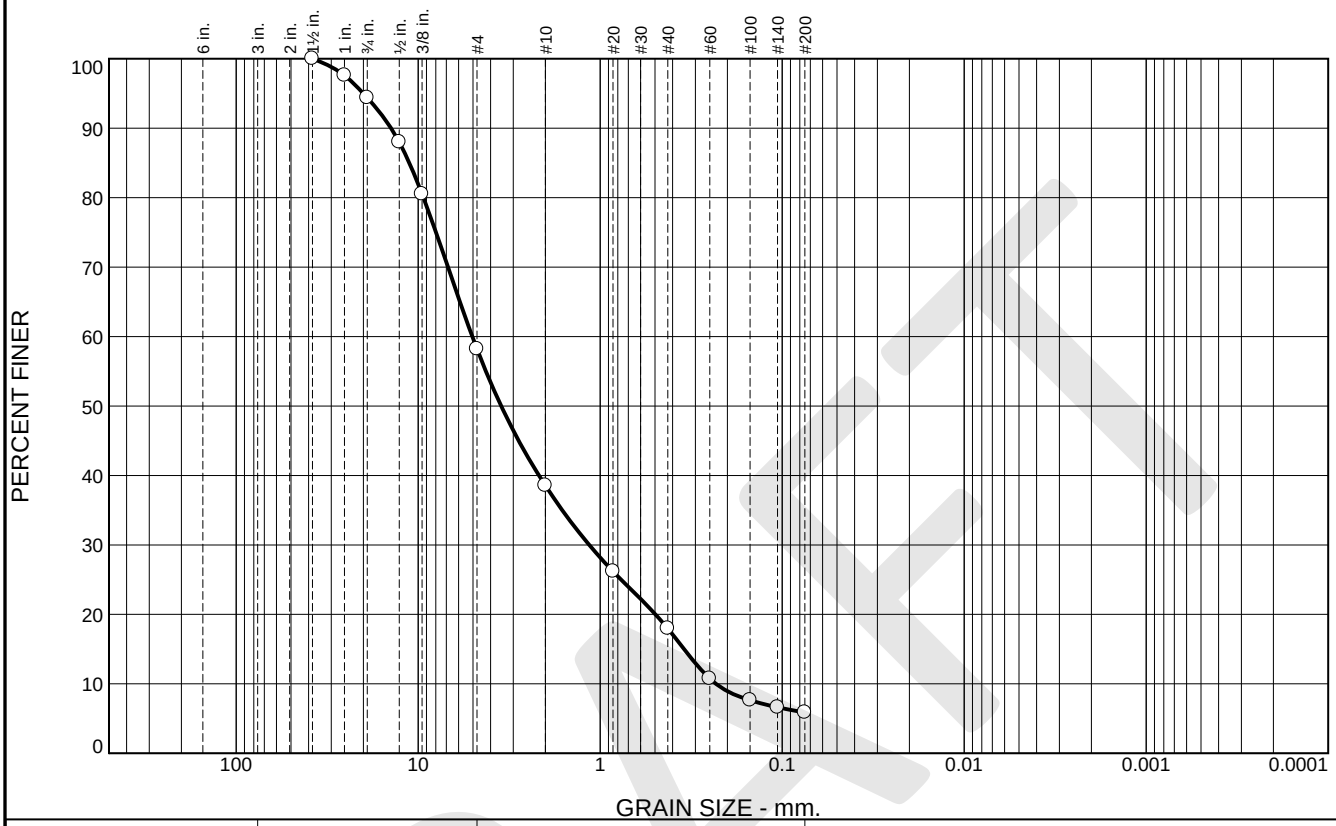
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.6	36.2	19.6	20.6	12.1	5.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	97.6		
3/4"	94.4		
1/2"	88.0		
3/8"	80.5		
#4	58.2		
#10	38.6		
#20	26.2		
#40	18.0		
#60	10.8		
#100	7.6		
#140	6.6		
#200	5.9		

* (no specification provided)

Material Description

Well-graded SAND with CLAY and GRAVEL, brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 14.0837 D_{85}= 11.1859 D_{60}= 5.0397
D_{50}= 3.4985 D_{30}= 1.1482 D_{15}= 0.3458
D_{10}= 0.2309 C_u= 21.83 C_c= 1.13

Classification

USCS= SW-SC AASHTO=

Remarks

Source of Sample: B21 **Depth:** 25.5-26'
Sample Number: 6C **Date:**

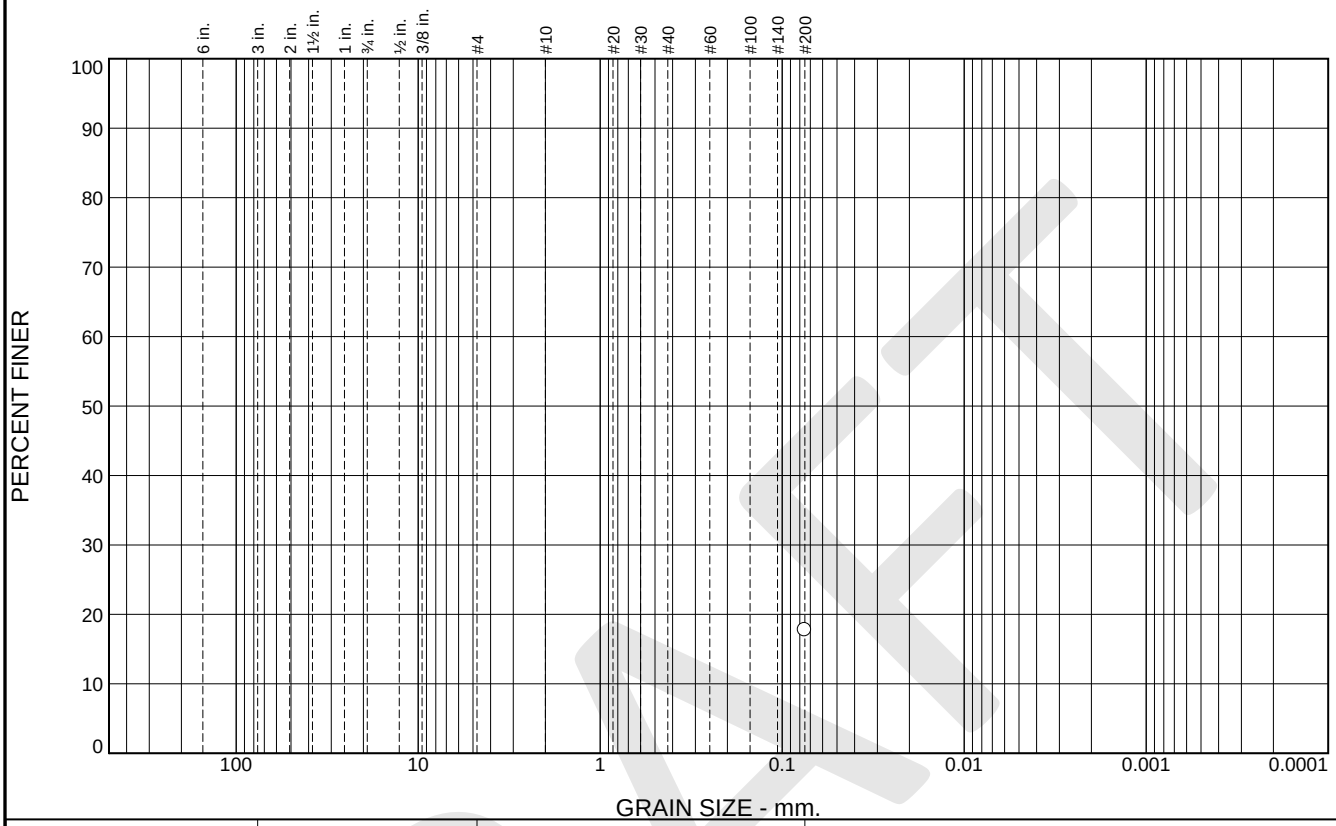
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						17.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	17.8		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= 20 LL= 35 PI= 15

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B21 **Depth:** 36-36.5'
Sample Number: 8C **Date:**

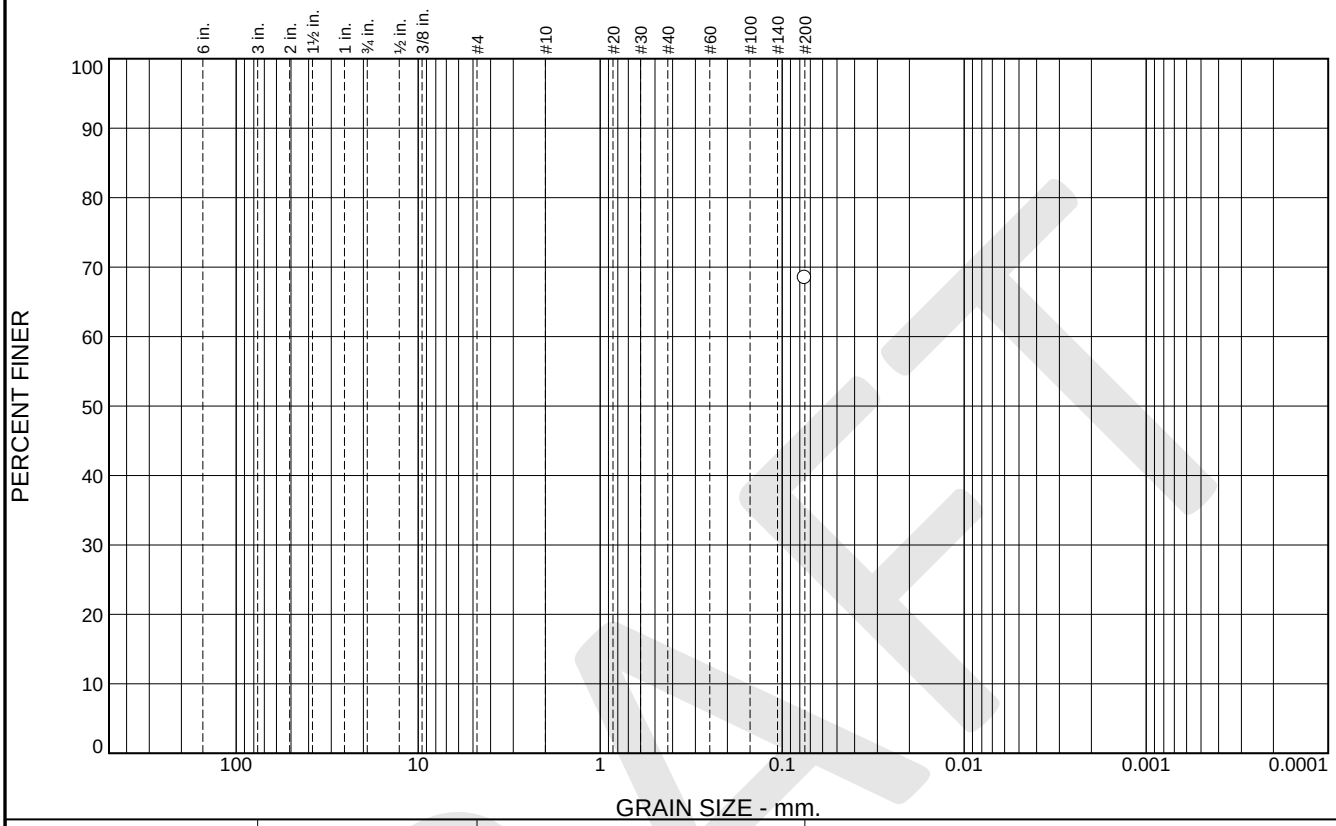
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						68.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	68.5		

* (no specification provided)

Material Description

GRAVELLY lean CLAY with SAND, dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B22 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

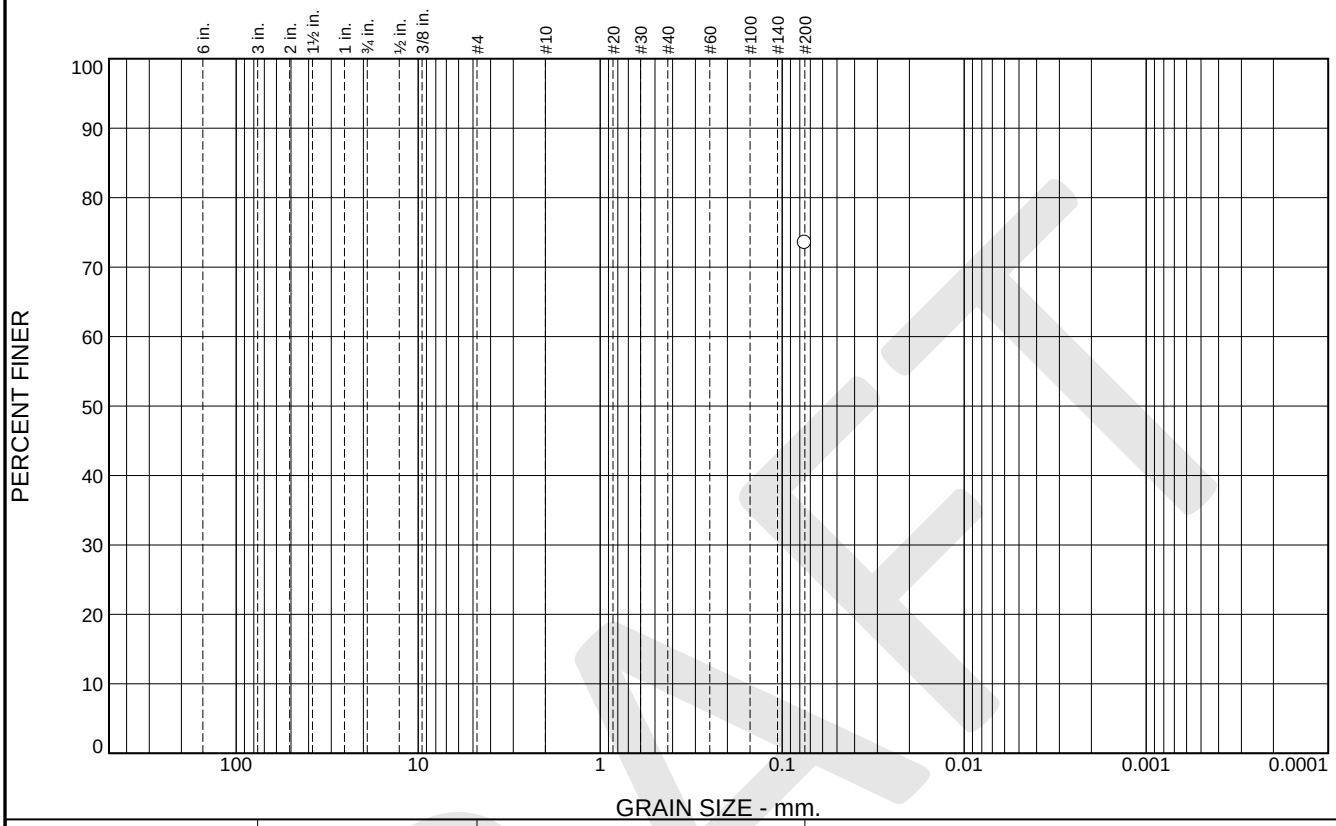
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						73.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	73.5		

* (no specification provided)

Material Description

SILT with SAND, strong brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B22 **Depth:** 36-36.5'
Sample Number: 8C **Date:**

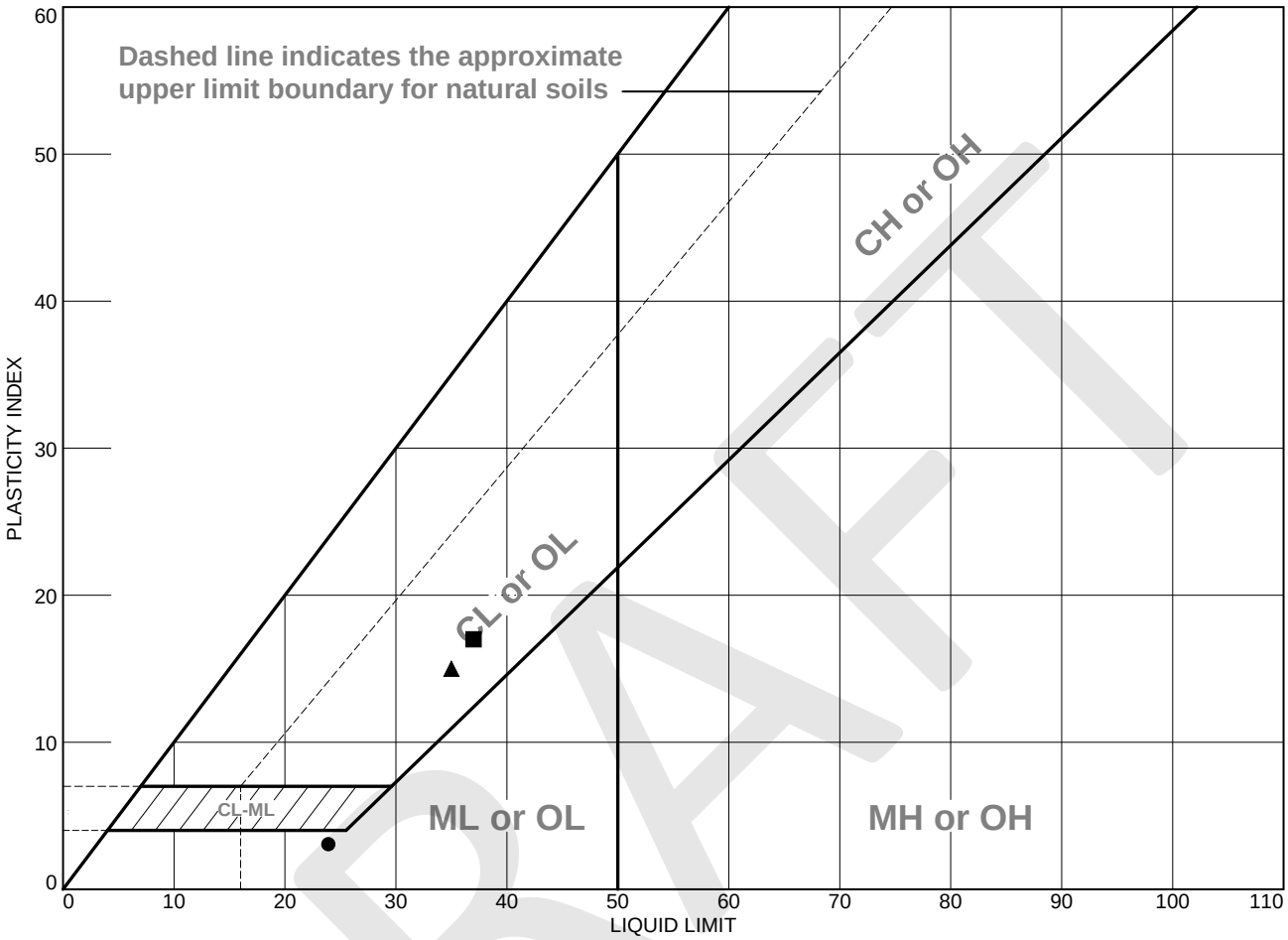
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SILT with SAND, dark brown	24	21	3			ML
■	CLAYEY SAND, reddish brown	37	20	17		30.3	SC
▲	CLAYEY SAND, reddish brown	35	20	15		17.8	SC

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B21 **Depth:** 11'-11.5' **Sample Number:** 3C

■**Source of Sample:** B21 **Depth:** 20.5-21' **Sample Number:** 5B

▲**Source of Sample:** B21 **Depth:** 36-36.5' **Sample Number:** 8C

Remarks:

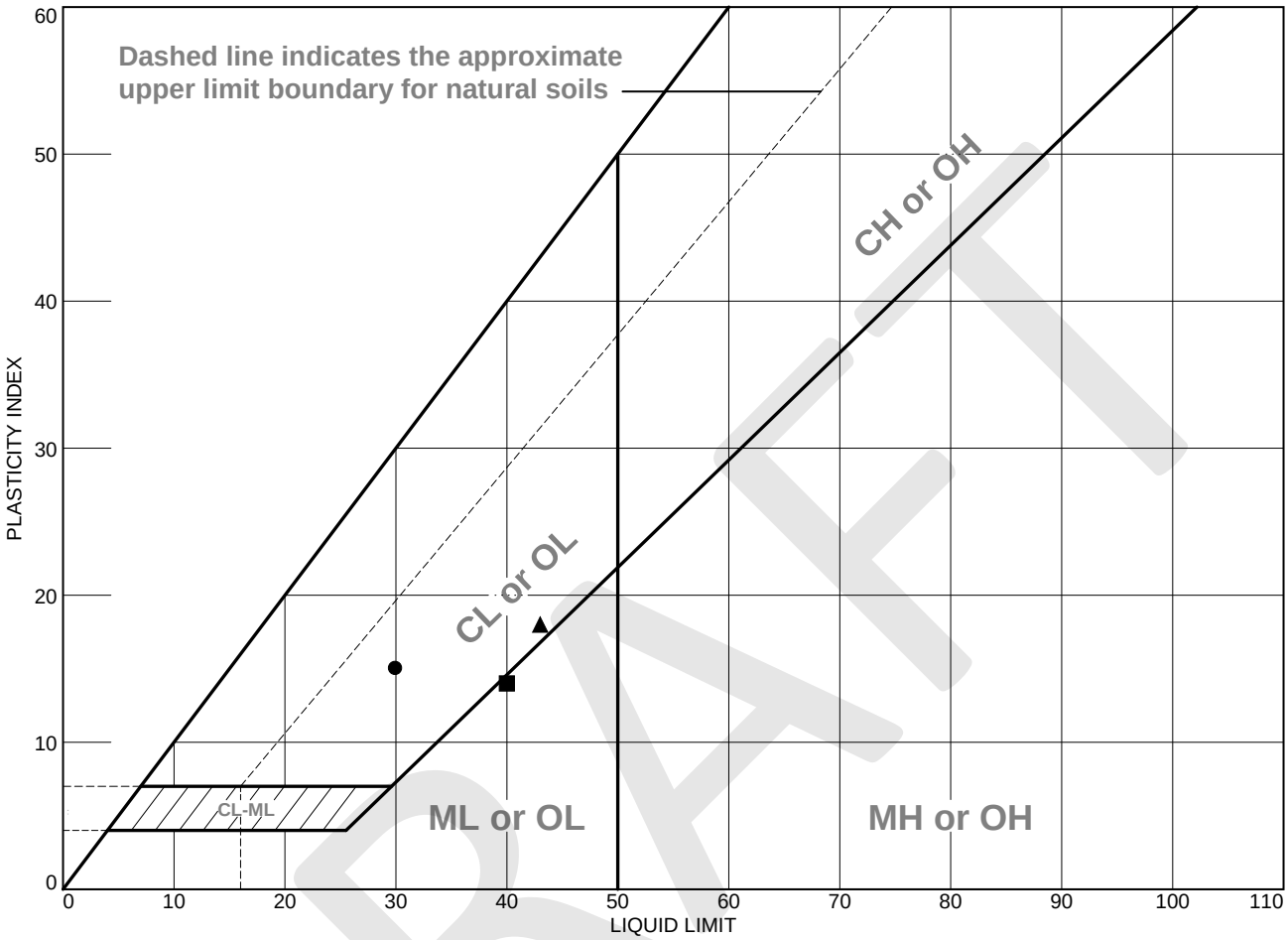
Blackburn Consulting

W. Sacramento, CA

Figure

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY, dark brown	30	15	15			CL
■	SILT, strong brown & light brownish gray	40	26	14			ML
▲	Lean CLAY, strong brown	43	25	18			CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B22 **Depth:** 10.3-10.8' **Sample Number:** 3B

■**Source of Sample:** B22 **Depth:** 16-16.5' **Sample Number:** 4C

▲**Source of Sample:** B22 **Depth:** 25.5-26' **Sample Number:** 6B

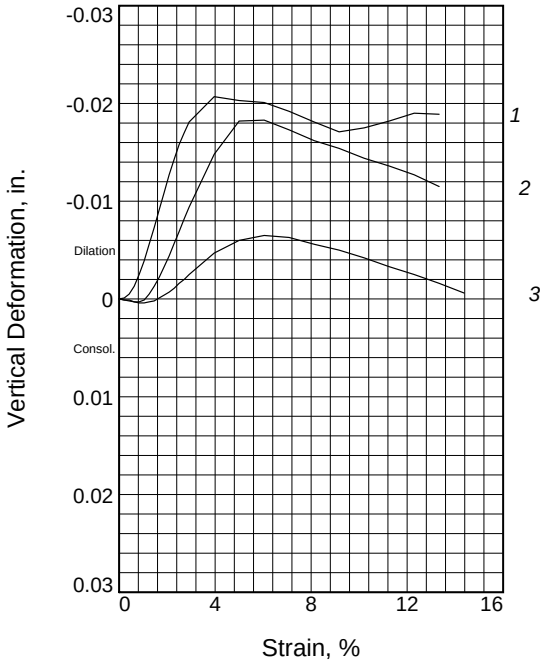
Remarks:

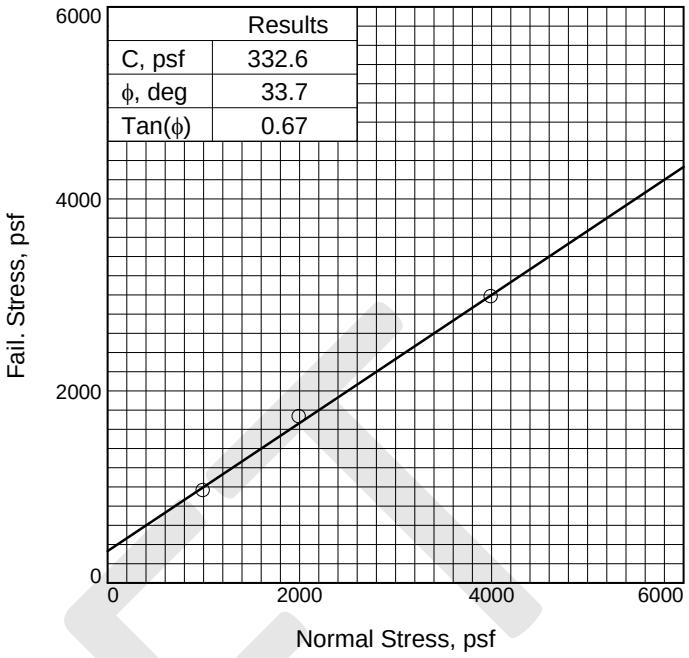
Blackburn Consulting

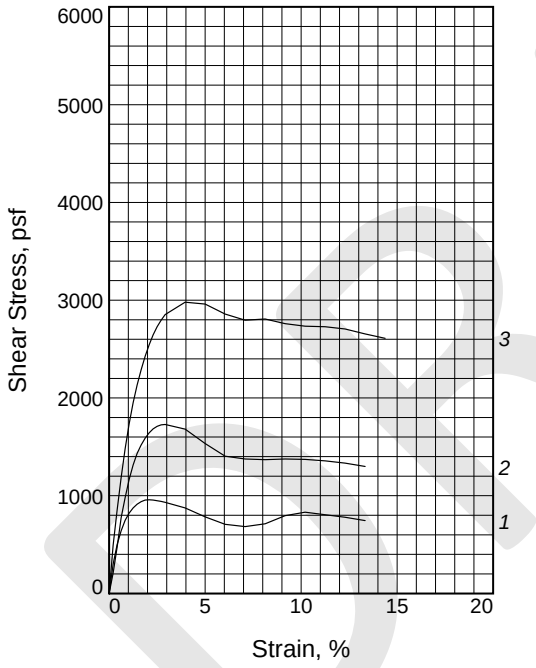
W. Sacramento, CA

Figure

DRAFT







	Sample No.	1	2	3
Initial	Water Content, %	8.7	8.7	8.7
	Dry Density, pcf	114.3	106.0	120.1
	Saturation, %	49.6	39.9	58.4
	Void Ratio	0.4752	0.5901	0.4034
	Diameter, in.	2.400	2.400	2.400
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	17.1	19.3	13.8
	Dry Density, pcf	115.3	108.5	122.8
	Saturation, %	100.0	94.2	100.0
	Void Ratio	0.4623	0.5537	0.3728
	Diameter, in.	2.400	2.400	2.400
	Height, in.	0.991	0.977	0.978
	Normal Stress, psf	1000.0	2000.0	4000.0
	Fail. Stress, psf	958.1	1728.4	2979.4
	Strain, %	2.1	2.9	4.0
	Ult. Stress, psf			
	Strain, %			
	Strain rate, in./min.	0.003	0.003	0.003

Sample Type: Cal Mod
Description: CLAYEY SAND, dark brown

Assumed Specific Gravity= 2.7
Remarks:

Figure _____

Client: Coastland Civil Engineering

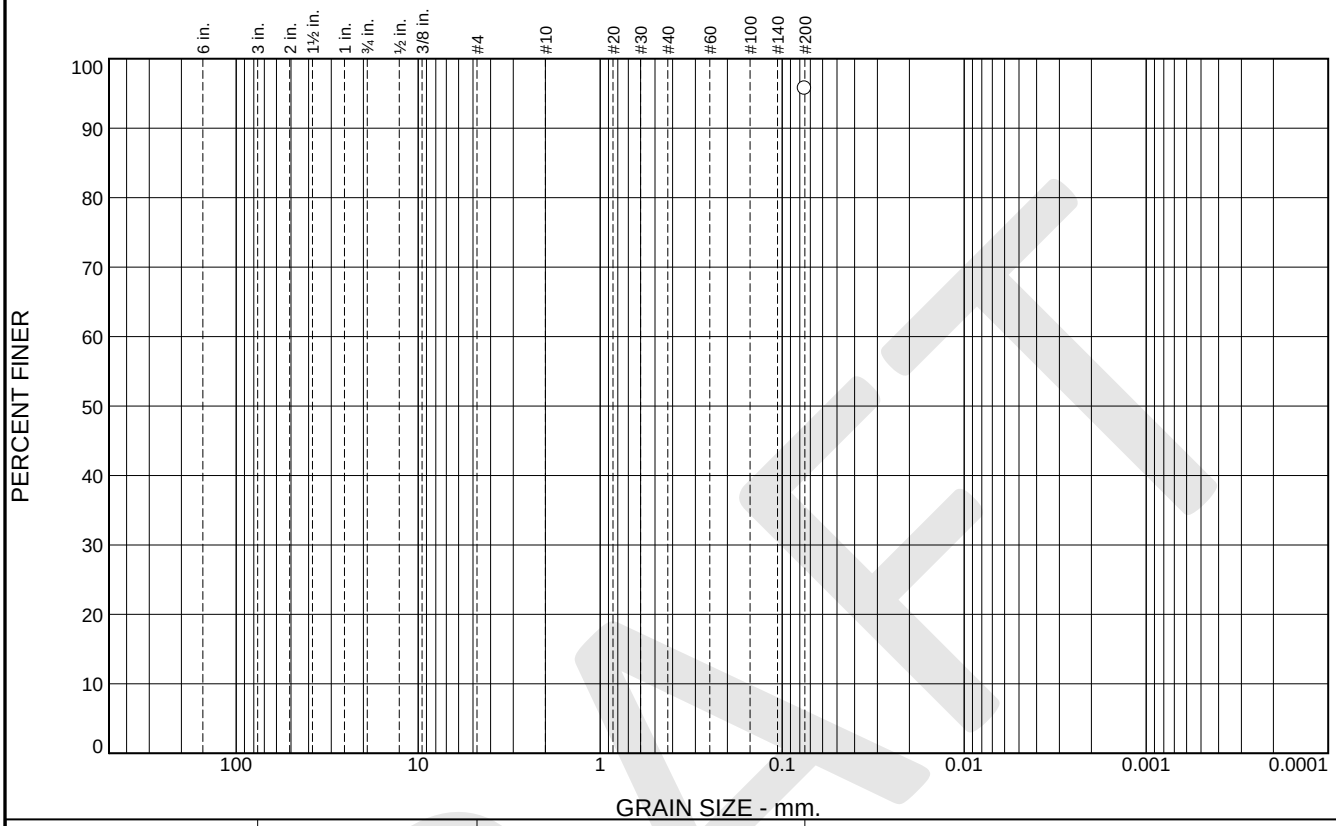
Project: Wheatland Regional Sewer Connection Project

Source of Sample: B21 **Depth:** 15.5'-16'
Sample Number: 4C
Proj. No.: 3934.X **Date Sampled:**

DIRECT SHEAR TEST REPORT
Blackburn Consulting
W. Sacramento, CA

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						95.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	95.7		

* (no specification provided)

Material Description

Elastic SILT, yellowish brown

Atterberg Limits

PL= 36 LL= 56 PI= 20

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Source of Sample: B47 **Depth:** 20.5-21'
Sample Number: 5C **Date:**

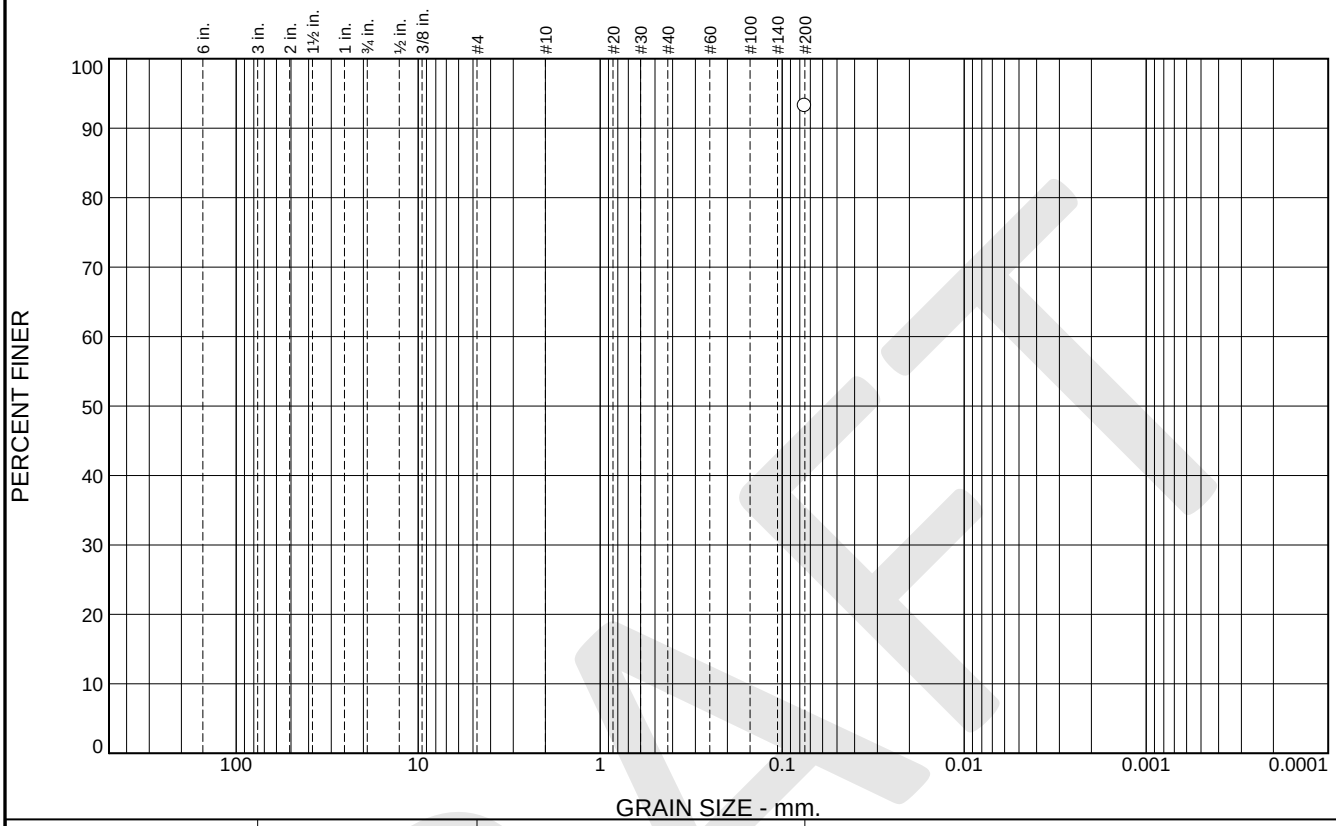
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						93.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	93.2		

* (no specification provided)

Material Description

SILT, yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B47 **Depth:** 25.7-26.2'
Sample Number: 6C **Date:**

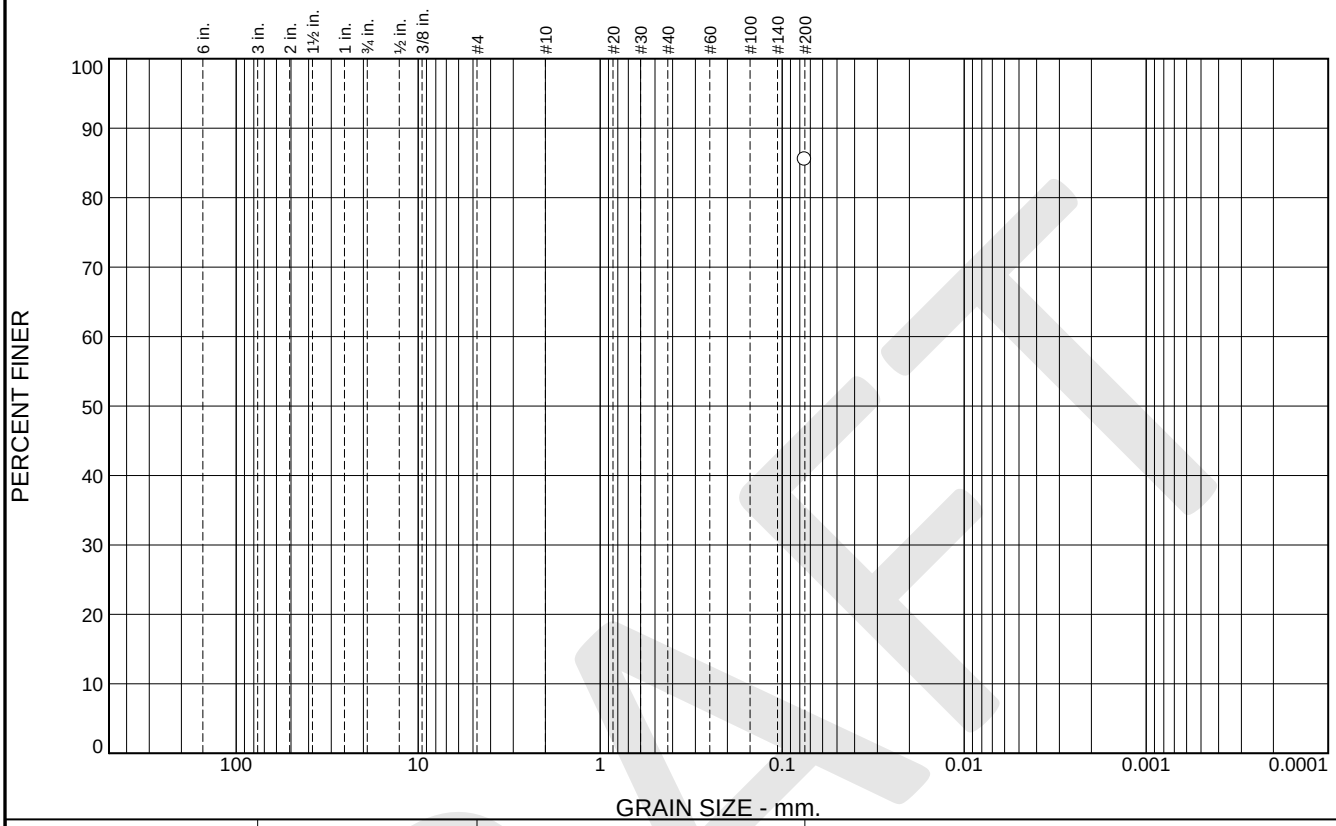
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						85.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	85.5		

* (no specification provided)

Material Description

SILT, yellowish brown

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: B48 **Depth:** 11-11.5'
Sample Number: 3C **Date:**

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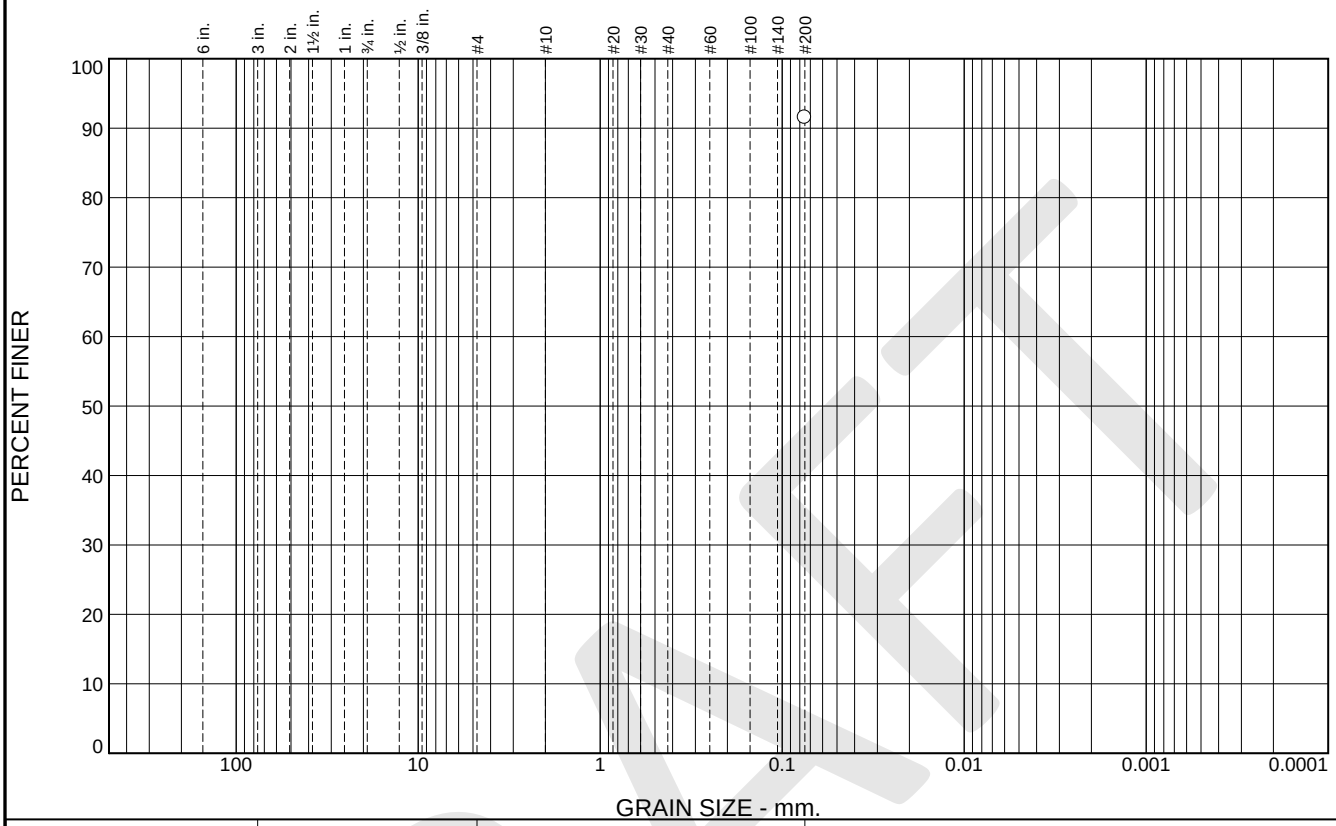
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						91.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	91.5		

* (no specification provided)

Material Description

SILT, yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B48 **Depth:** 26-26.5'
Sample Number: 6C **Date:**

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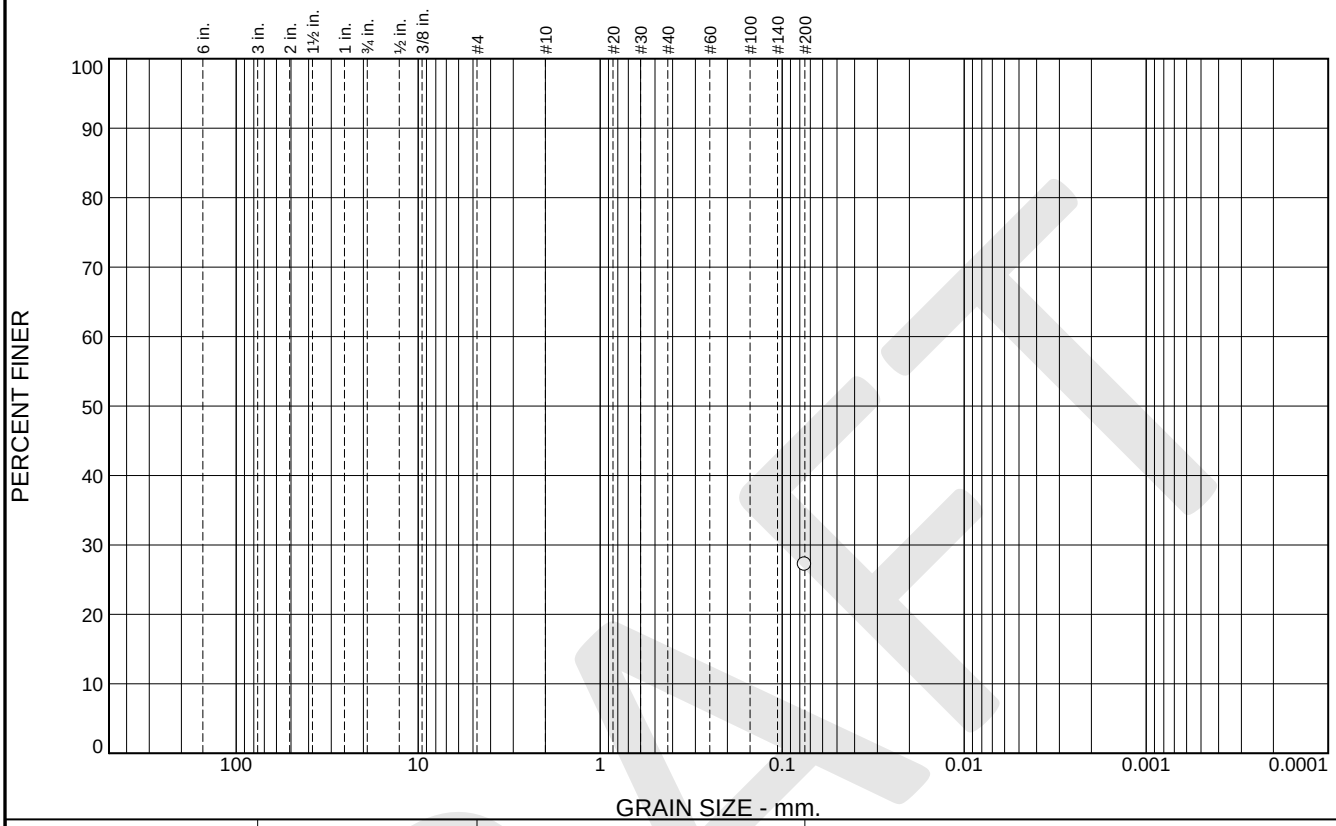
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						27.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	27.2		

* (no specification provided)

Material Description

SILTY SAND, very dark brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B48 **Depth:** 35-35.5'
Sample Number: 8A **Date:**

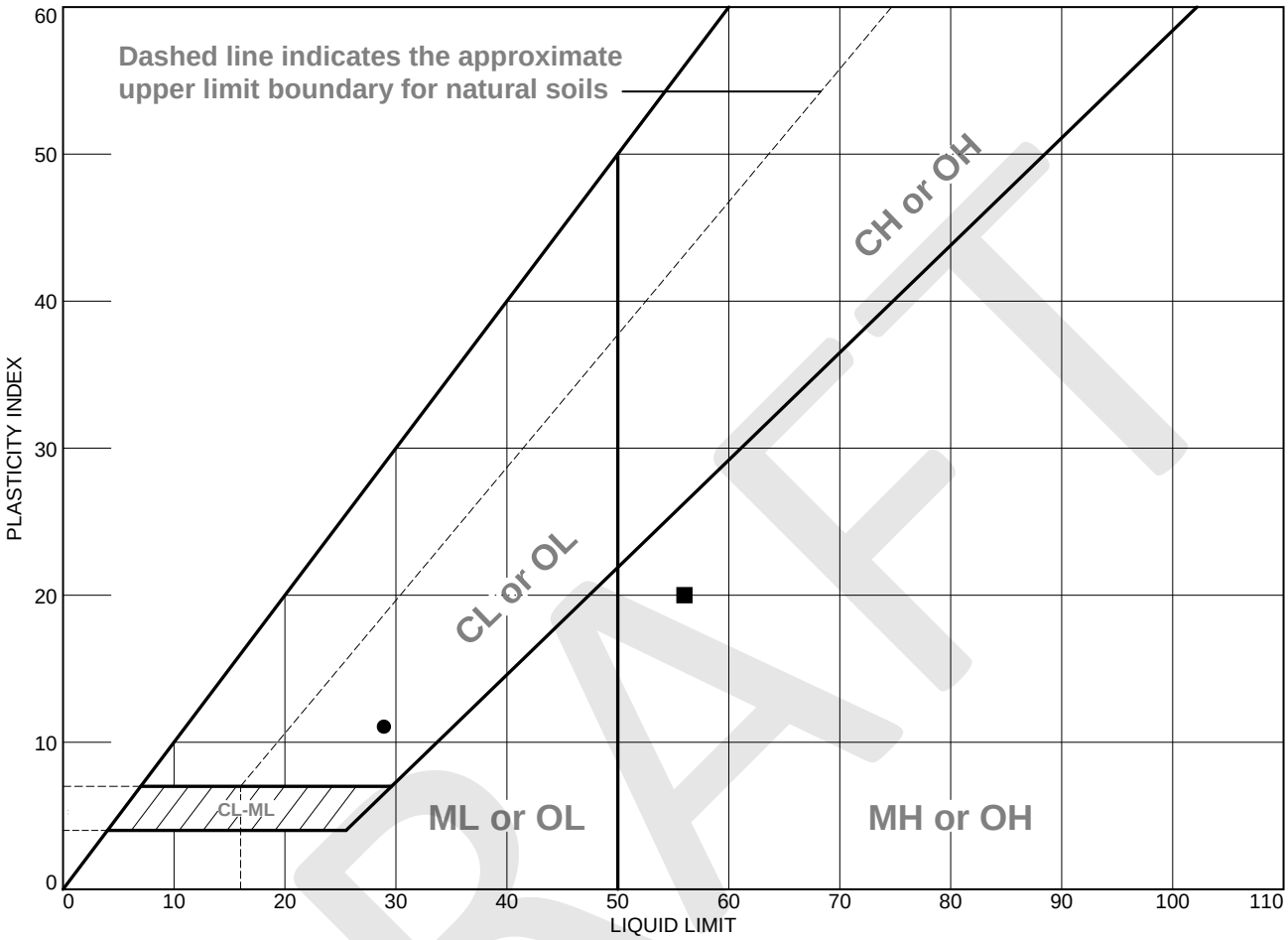
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY, strong brown	29	18	11			CL
■	Elastic SILT, yellowish brown	56	36	20		95.7	MH
▲	SILT, yellowish brown	NP	NP	NP		85.5	

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B47 **Depth:** 10.3-10.8' **Sample Number:** 3C

■**Source of Sample:** B47 **Depth:** 20.5-21' **Sample Number:** 5C

▲**Source of Sample:** B48 **Depth:** 11-11.5' **Sample Number:** 3C

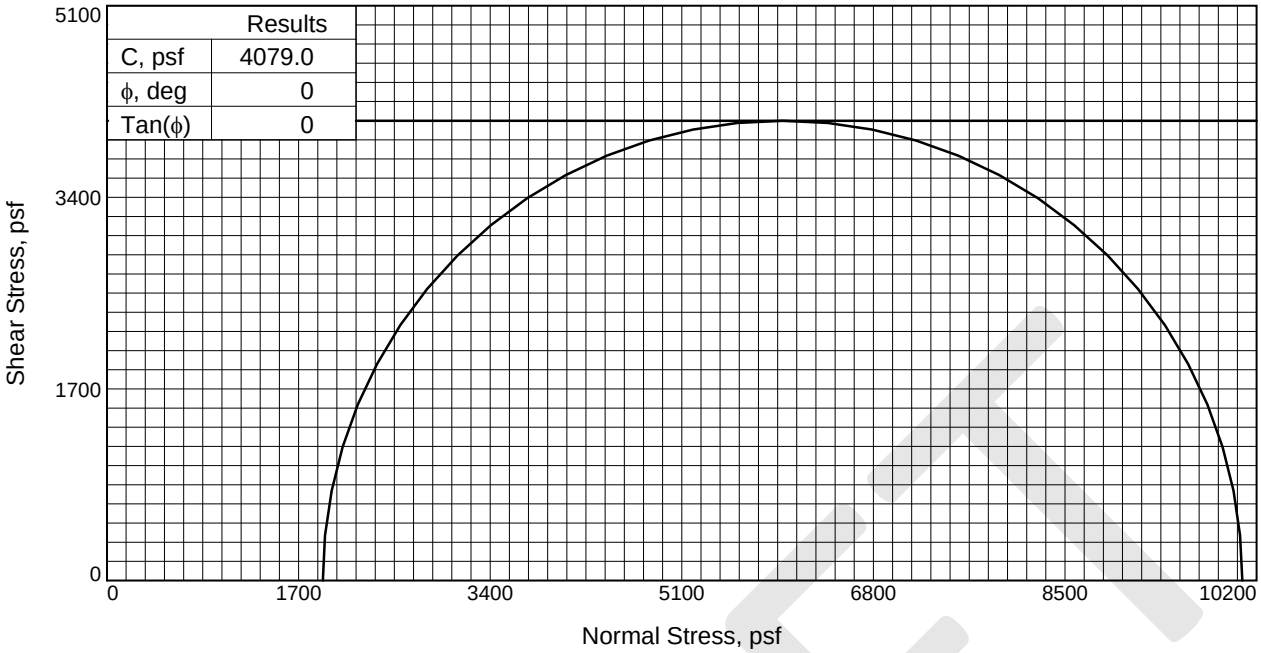
Remarks:

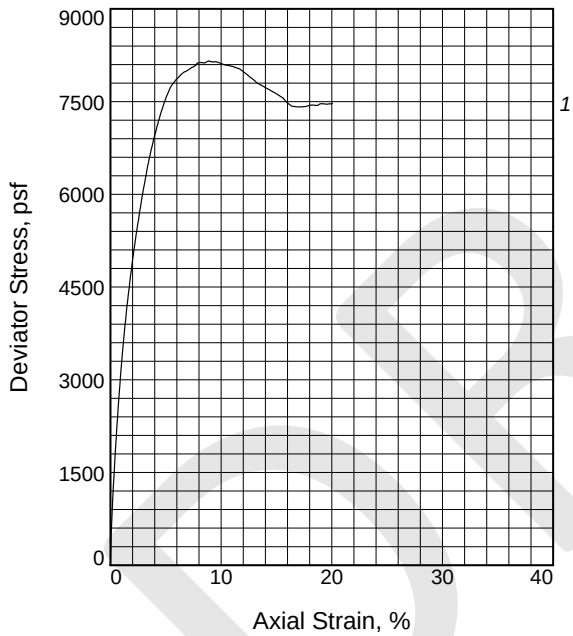
Blackburn Consulting

W. Sacramento, CA

Figure

DRAFT





Sample No.		1
Initial	Water Content, %	29.8
	Dry Density, pcf	89.2
	Saturation, %	90.5
	Void Ratio	0.8898
	Diameter, in.	2.406
	Height, in.	5.002
At Test	Water Content, %	32.1
	Dry Density, pcf	90.3
	Saturation, %	100.0
	Void Ratio	0.8672
	Diameter, in.	2.396
	Height, in.	4.982
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		1915.2
Fail. Stress, psf		8158.1
Strain, %		8.9
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		10073.3
σ_3 Failure, psf		1915.2

Type of Test: Unconsolidated Undrained

Sample Type: Cal Mod

Description: SILT with SAND, dark yellowish brown

Assumed Specific Gravity= 2.7

Remarks:

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B48 **Depth:** 16-16.5'

Sample Number: 4C

Proj. No.: 3934.X **Date Sampled:**

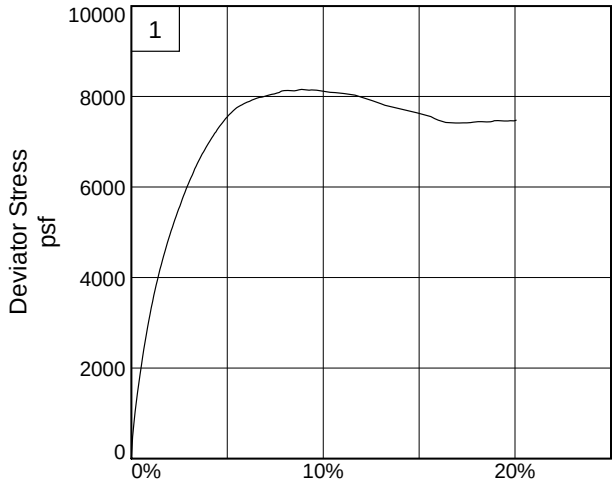
TRIAXIAL SHEAR TEST REPORT

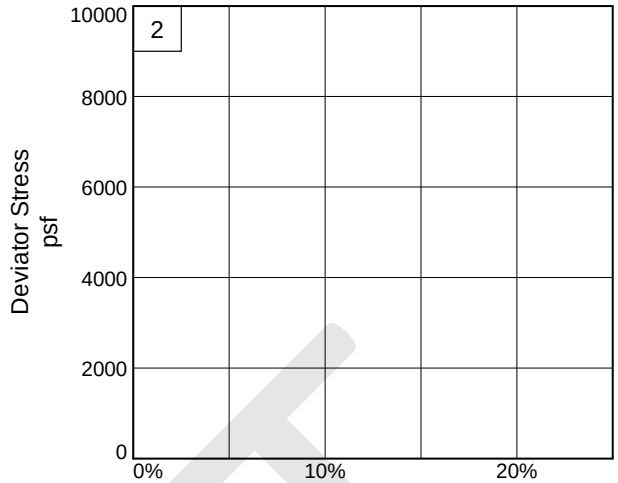
Blackburn Consulting

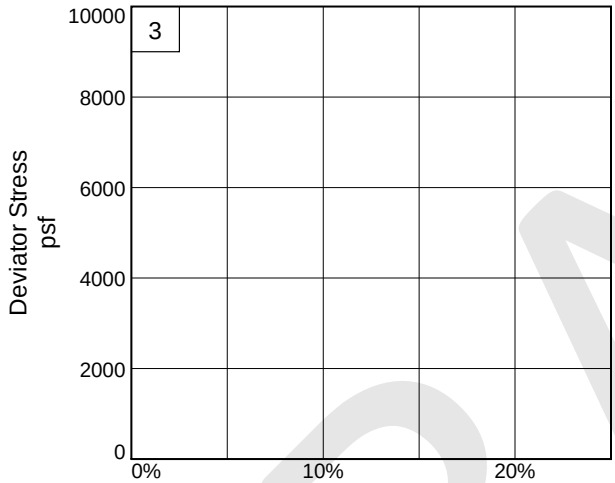
W. Sacramento, CA

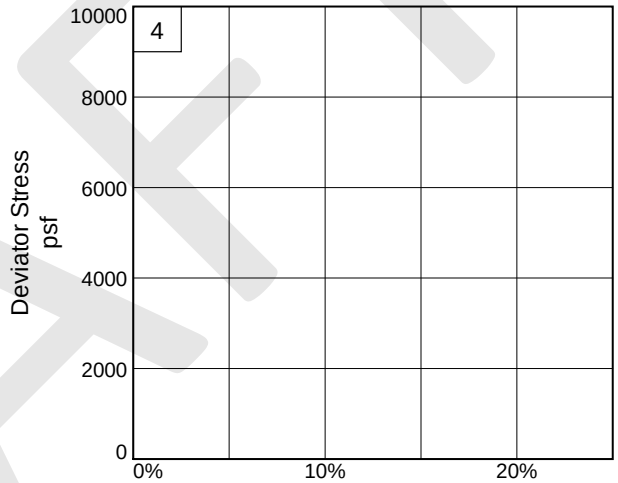
Figure _____

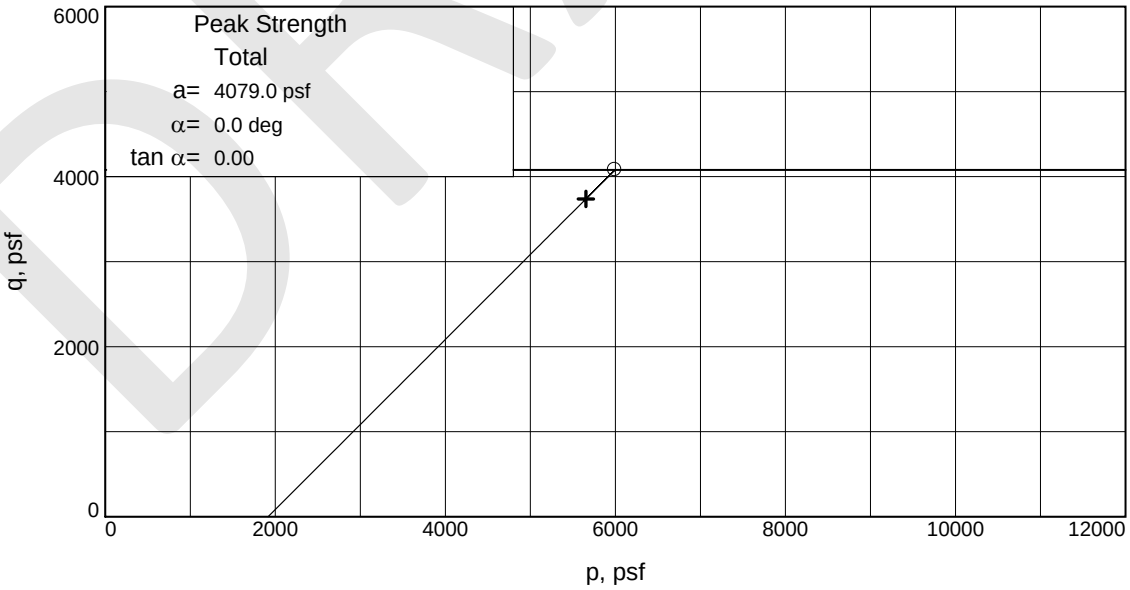
DRAFT











Stress Paths: o indicates peak + indicates end

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

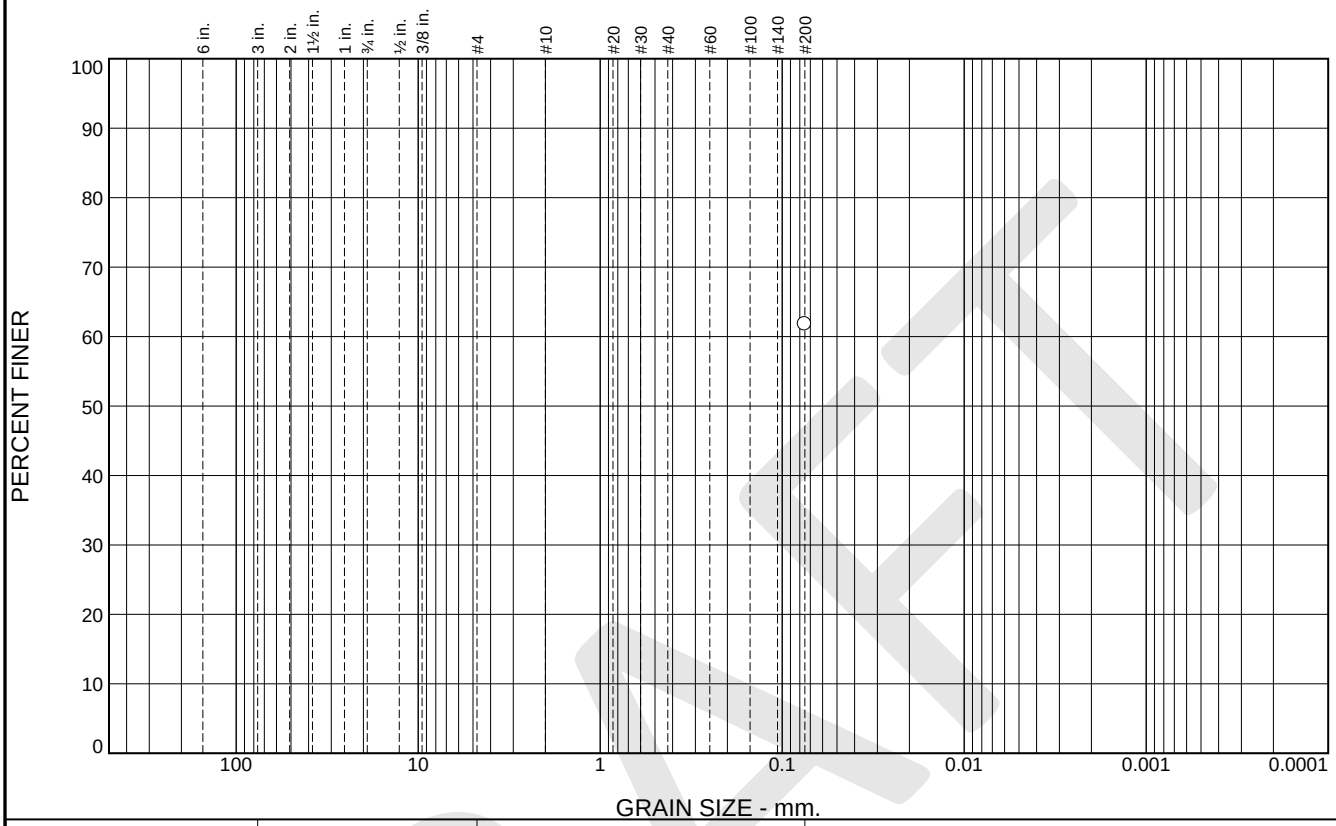
Source of Sample: B48 **Depth:** 16-16.5' **Sample Number:** 4C

Project No.: 3934.X **Figure** _____

Blackburn Consulting

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						61.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	61.8		

* (no specification provided)

Material Description

SANDY SILT, yellowish brown

Atterberg Limits

PL= 31 LL= 40 PI= 9

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B50 **Depth:** 15.5-16'
Sample Number: 4C **Date:**

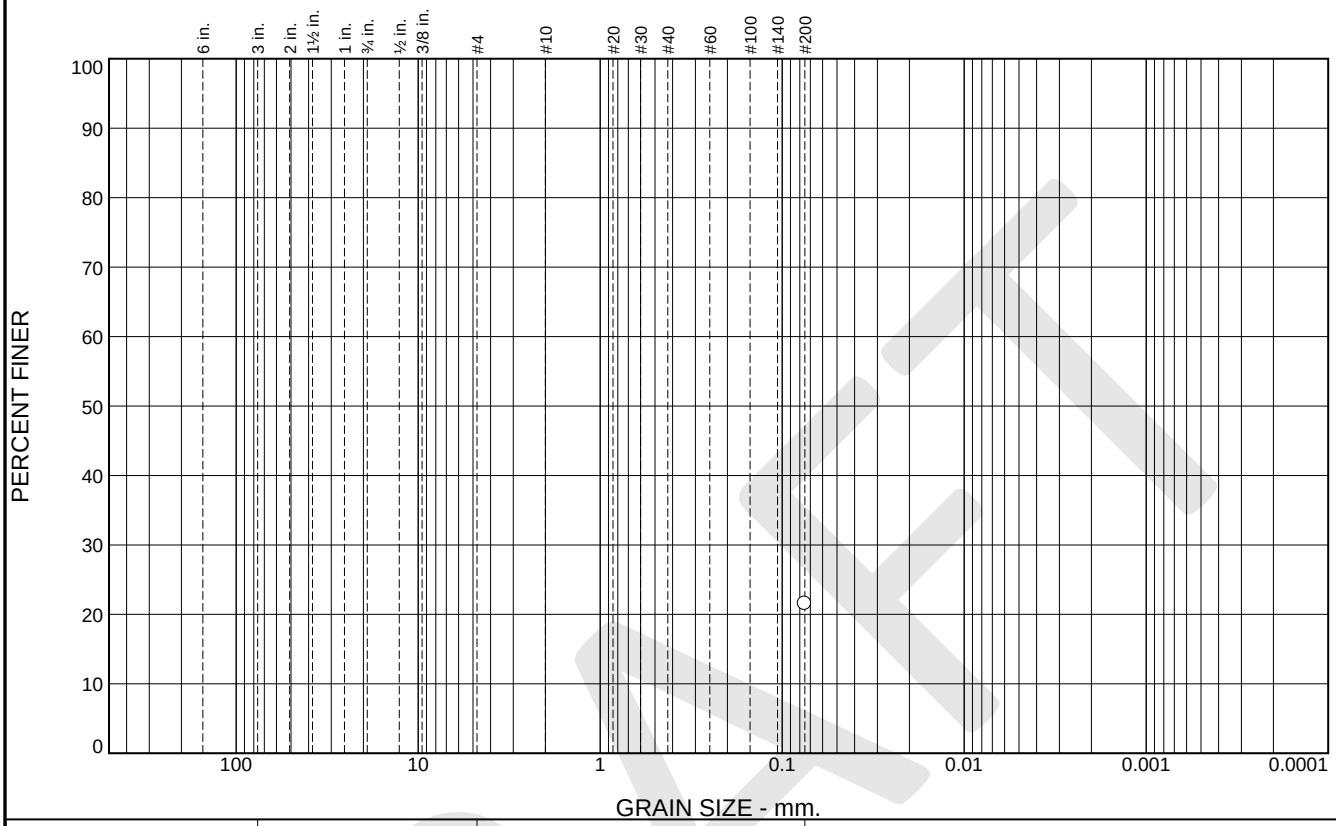
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						21.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	21.6		

* (no specification provided)

Material Description

CLAYEY SAND, strong brown

Atterberg Limits

PL= 23 LL= 38 PI= 15

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B50 **Depth:** 21-21.5'
Sample Number: 5C **Date:**

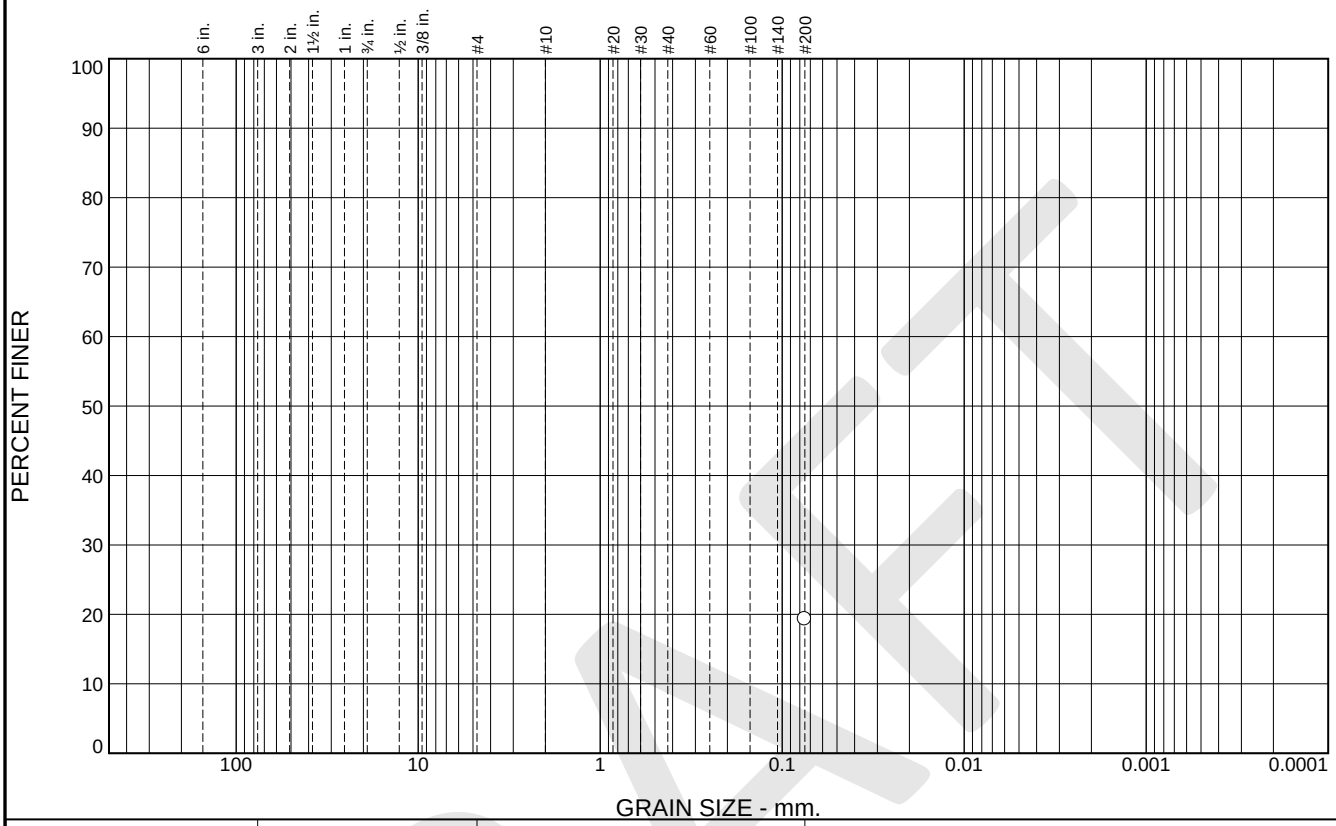
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						19.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	19.3		

* (no specification provided)

Material Description

SILTY, CLAYEY SAND, reddish brown

Atterberg Limits

PL= 18 LL= 23 PI= 5

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO=

Remarks

Source of Sample: B53 **Depth:** 10.7-11.2'
Sample Number: 3C **Date:**

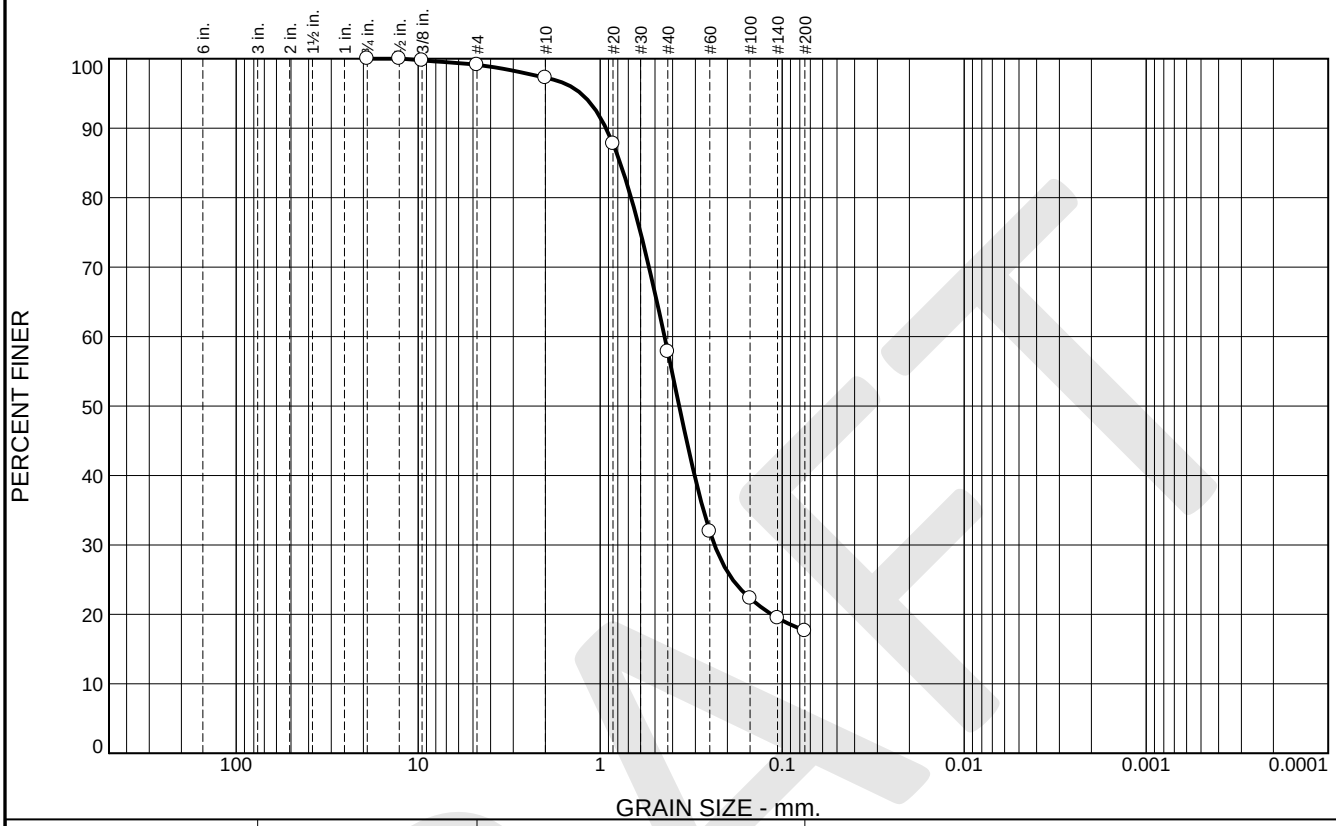
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	1.8	39.5	40.2	17.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	100.0		
3/8"	99.7		
#4	99.1		
#10	97.3		
#20	87.8		
#40	57.8		
#60	32.0		
#100	22.3		
#140	19.5		
#200	17.6		

* (no specification provided)

Material Description

CLAYEY SAND, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9281 D_{85}= 0.7760 D_{60}= 0.4427
D_{50}= 0.3678 D_{30}= 0.2352 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: B53 **Depth:** 15.5-16'
Sample Number: 4B **Date:**

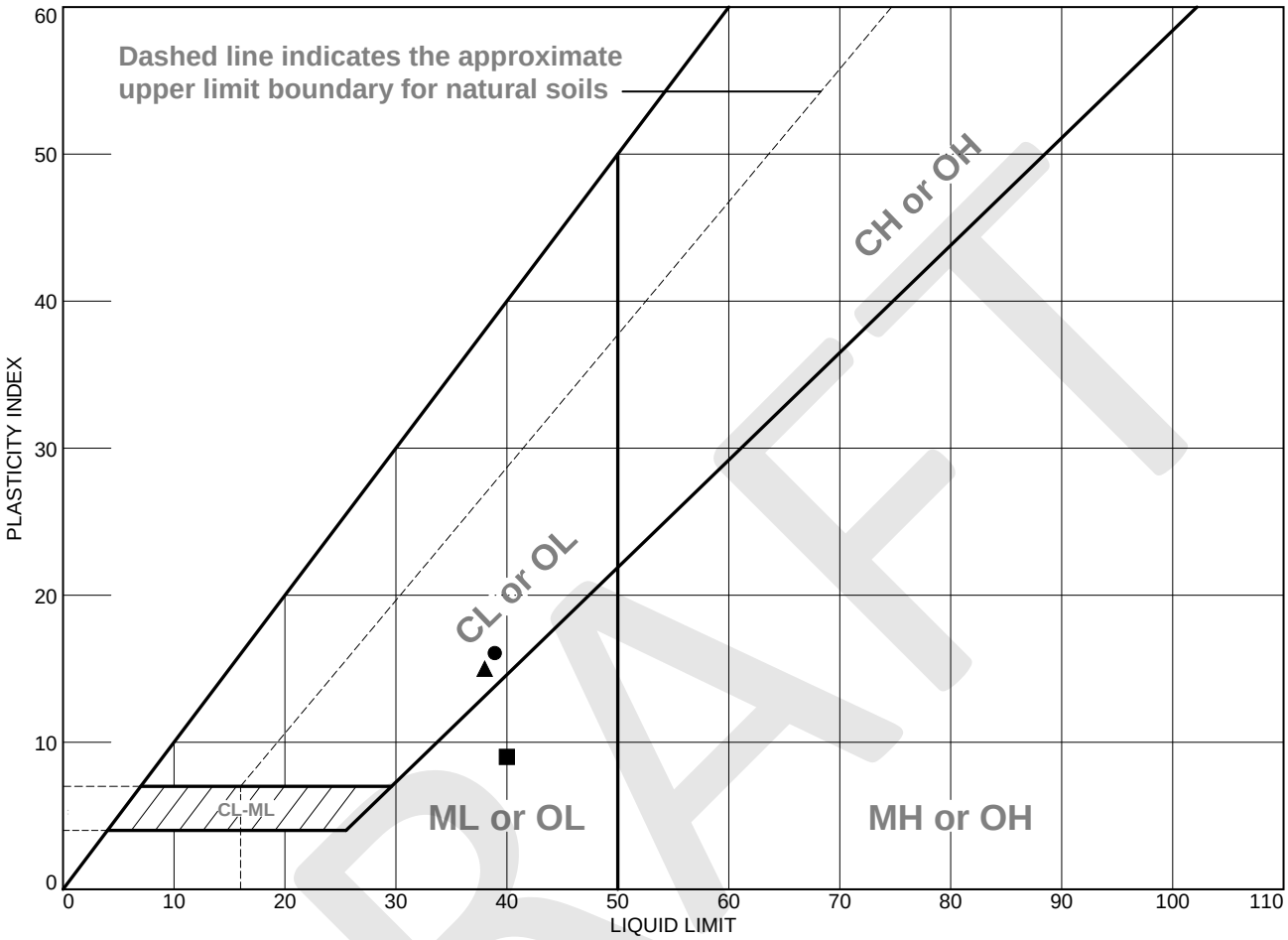
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY, strong brown	39	23	16			CL
■	SANDY SILT, yellowish brown	40	31	9		61.8	ML
▲	CLAYEY SAND, strong brown	38	23	15		21.6	SC

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B50 **Depth:** 5.5-6' **Sample Number:** 2C

■**Source of Sample:** B50 **Depth:** 15.5-16' **Sample Number:** 4C

▲**Source of Sample:** B50 **Depth:** 21-21.5' **Sample Number:** 5C

Remarks:

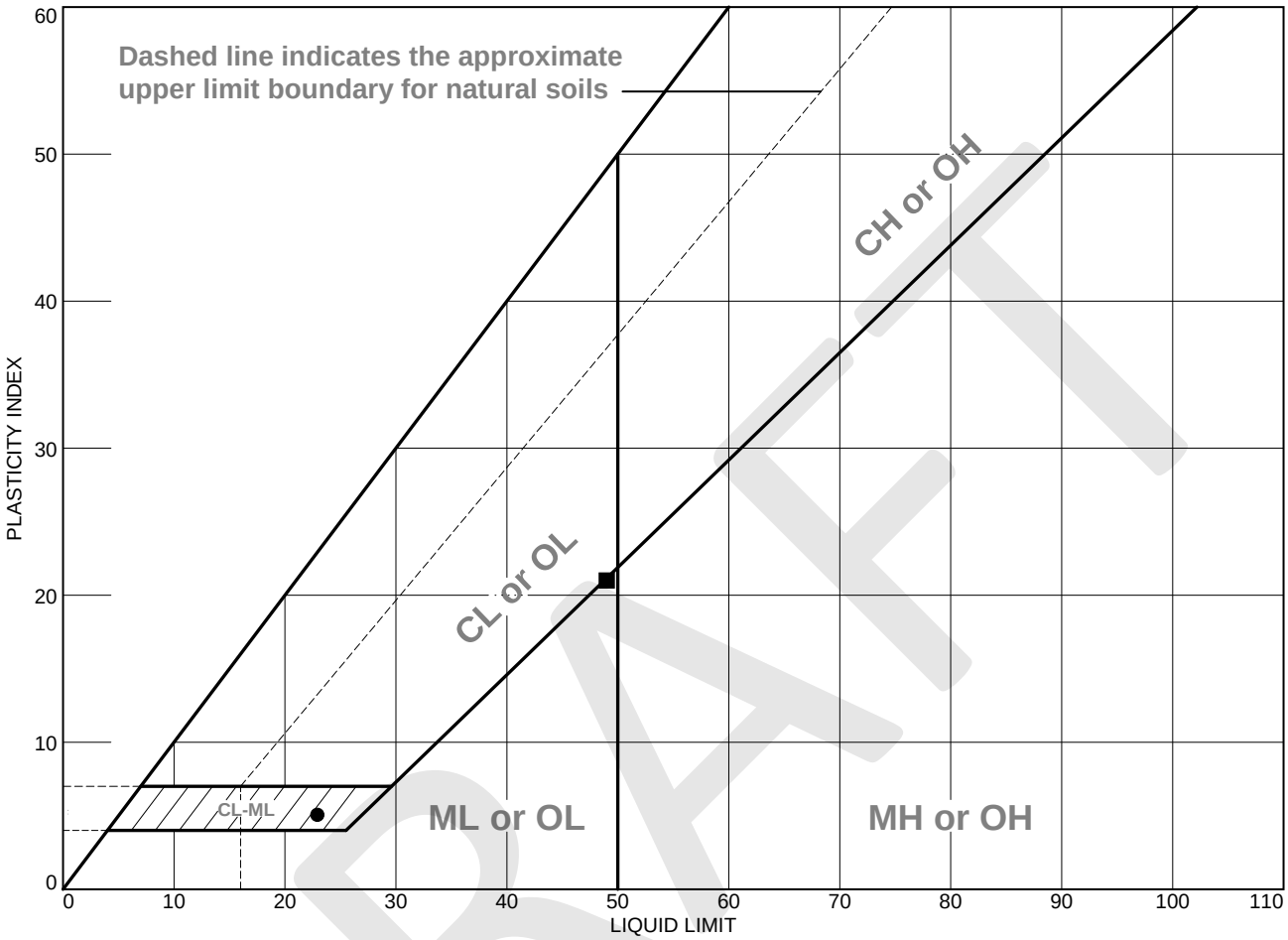
Blackburn Consulting

W. Sacramento, CA

Figure

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SILTY, CLAYEY SAND, reddish brown	23	18	5		19.3	SC-SM
■	SILT, brown	49	28	21			ML

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B53 **Depth:** 10.7-11.2' **Sample Number:** 3C

■**Source of Sample:** B53 **Depth:** 20.5-21' **Sample Number:** 5C

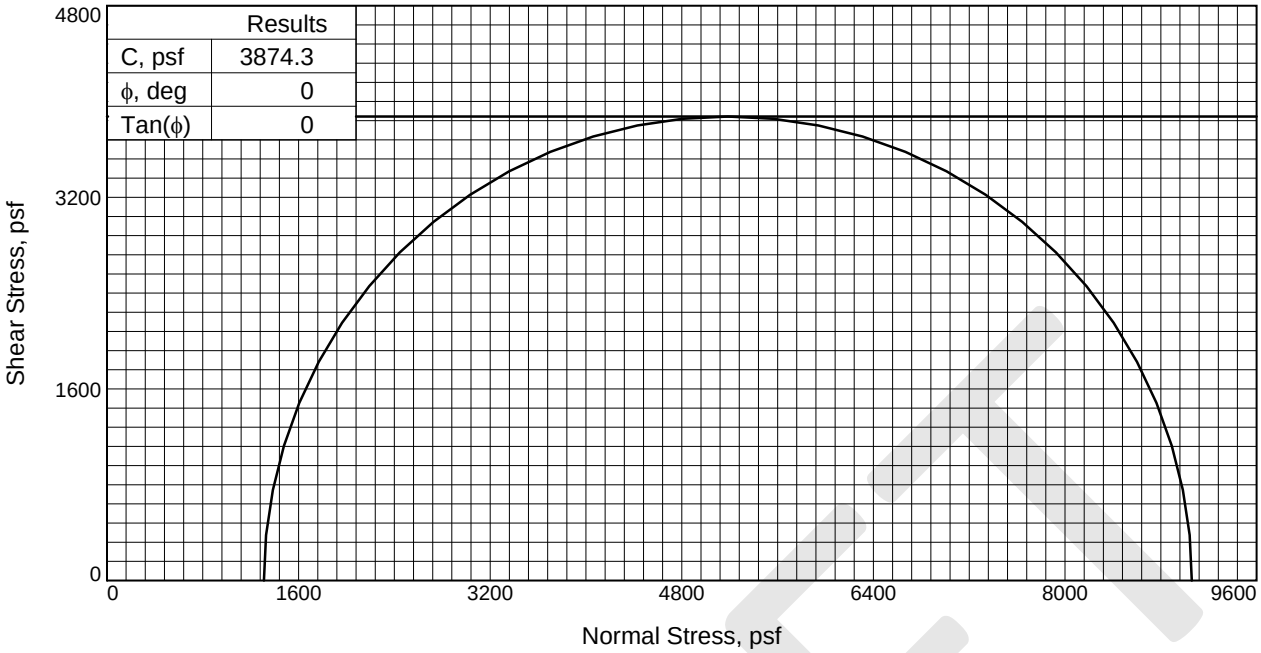
Remarks:

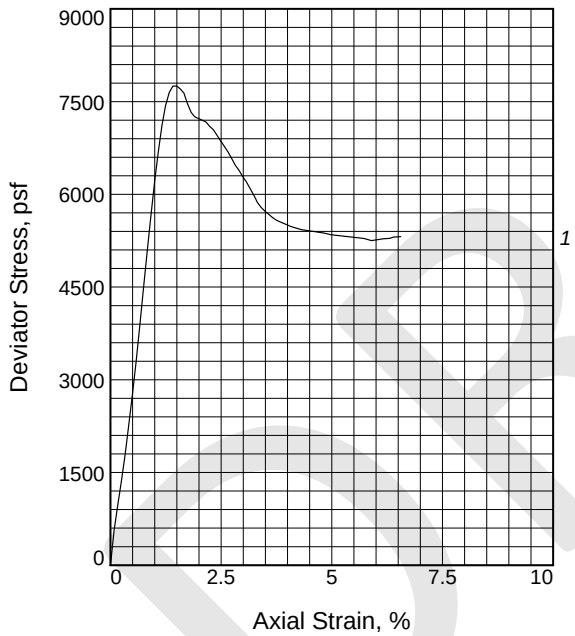
Blackburn Consulting

W. Sacramento, CA

Figure

DRAFT





Sample No.		1
Initial	Water Content, %	19.0
	Dry Density, pcf	112.8
	Saturation, %	104.0
	Void Ratio	0.4941
	Diameter, in.	2.395
	Height, in.	5.007
At Test	Water Content, %	18.0
	Dry Density, pcf	113.4
	Saturation, %	100.0
	Void Ratio	0.4870
	Diameter, in.	2.391
	Height, in.	4.999
Strain rate, in./min.		0.040
Back Pressure, psf		0.0
Cell Pressure, psf		1310.4
Fail. Stress, psf		7748.7
Strain, %		1.4
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		9059.1
σ_3 Failure, psf		1310.4

Type of Test:
Unconsolidated Undrained

Sample Type: Cal Mod

Description: Lean CLAY, brown

Assumed Specific Gravity= 2.70

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B50 **Depth:** 11-11.5'

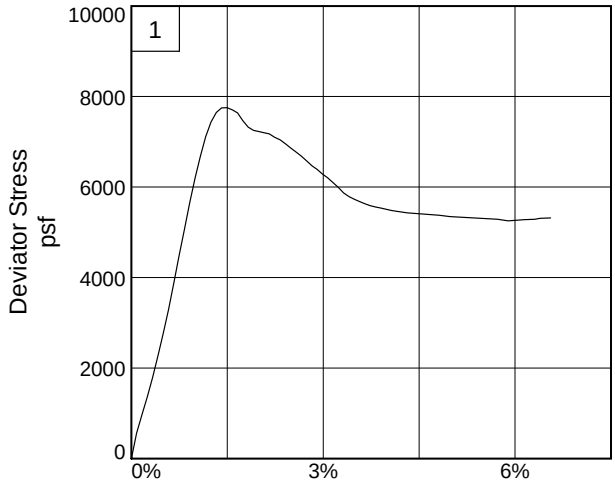
Sample Number: 3C

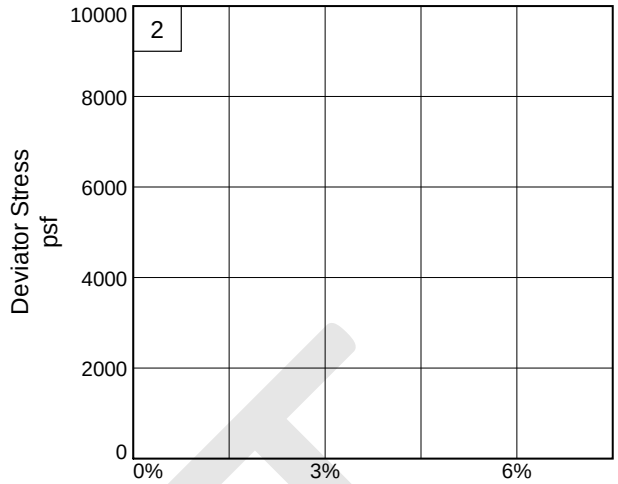
Proj. No.: 3934.X **Date Sampled:**

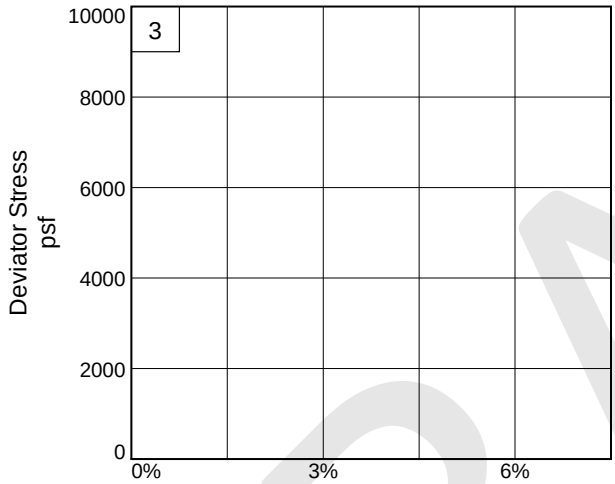
TRIAXIAL SHEAR TEST REPORT

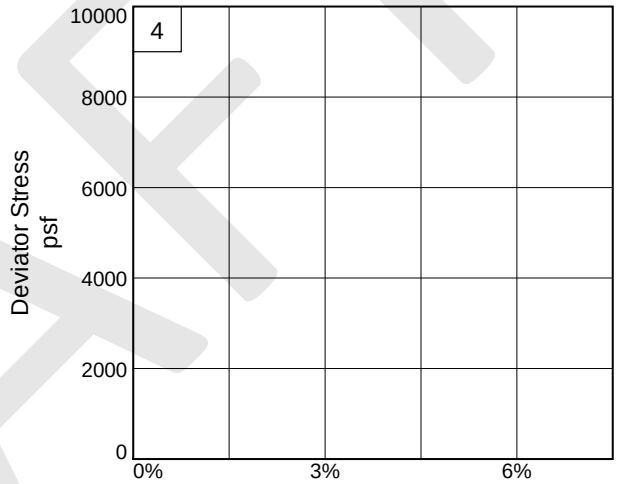
Blackburn Consulting
W. Sacramento, CA

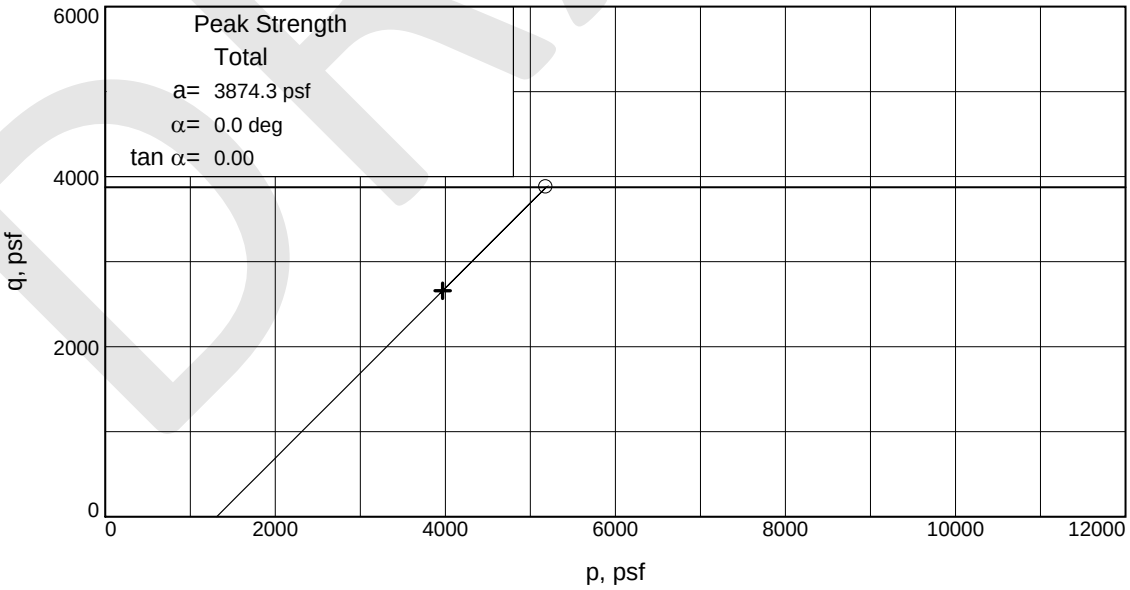
DRAFT











Stress Paths: o indicates peak + indicates end

DRAFT

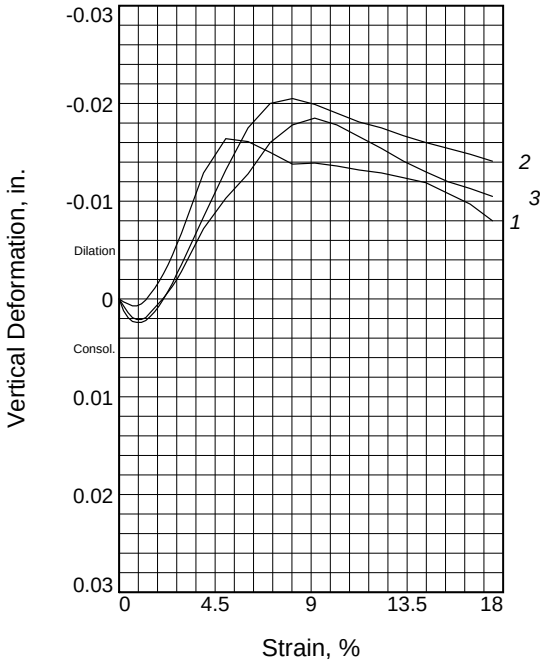
Client: Coastland Civil Engineering

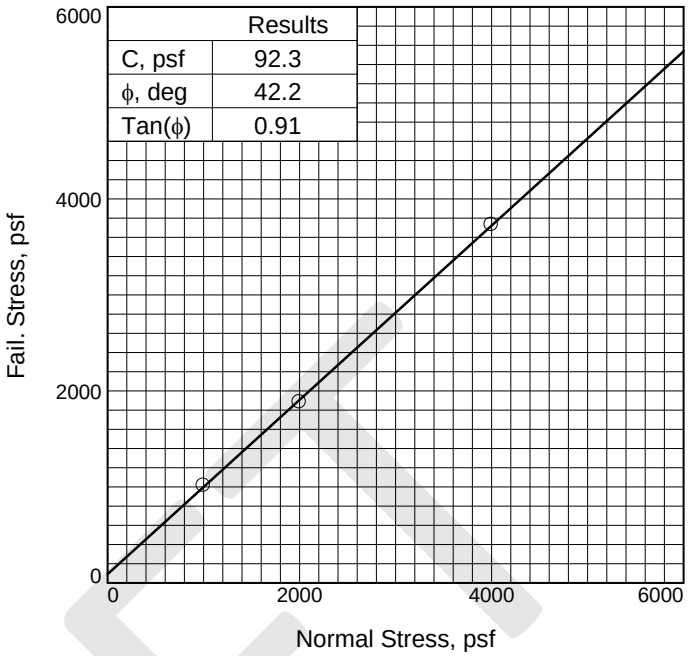
Project: Wheatland Regional Sewer Connection Project

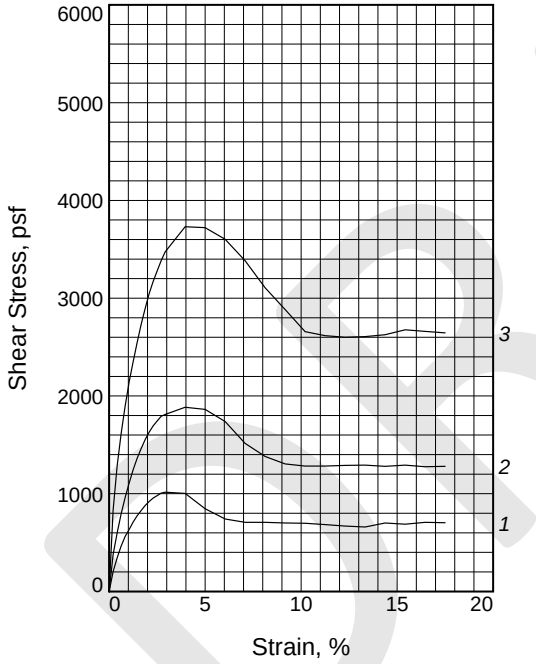
Source of Sample: B50 **Depth:** 11-11.5' **Sample Number:** 3C

Project No.: 3934.X **Figure** _____

Blackburn Consulting







Sample No.		1	2	3
Initial	Water Content, %	13.6	13.2	15.6
	Dry Density, pcf	119.1	113.8	118.7
	Saturation, %	88.2	73.9	100.0
	Void Ratio	0.4154	0.4808	0.4203
	Diameter, in.	2.400	2.400	2.400
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	14.6	16.6	14.3
	Dry Density, pcf	120.9	116.3	121.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3937	0.4493	0.3858
	Diameter, in.	2.400	2.400	2.400
	Height, in.	0.985	0.979	0.976
Normal Stress, psf		1000.0	2000.0	4000.0
Fail. Stress, psf		1015.4	1884.4	3730.6
Strain, %		2.9	4.0	4.0
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.003	0.003	0.003

Sample Type: Cal Mod
Description: CLAYEY SAND, reddish brown

Assumed Specific Gravity= 2.7
Remarks:

Figure _____

Client: Coastland Civil Engineering

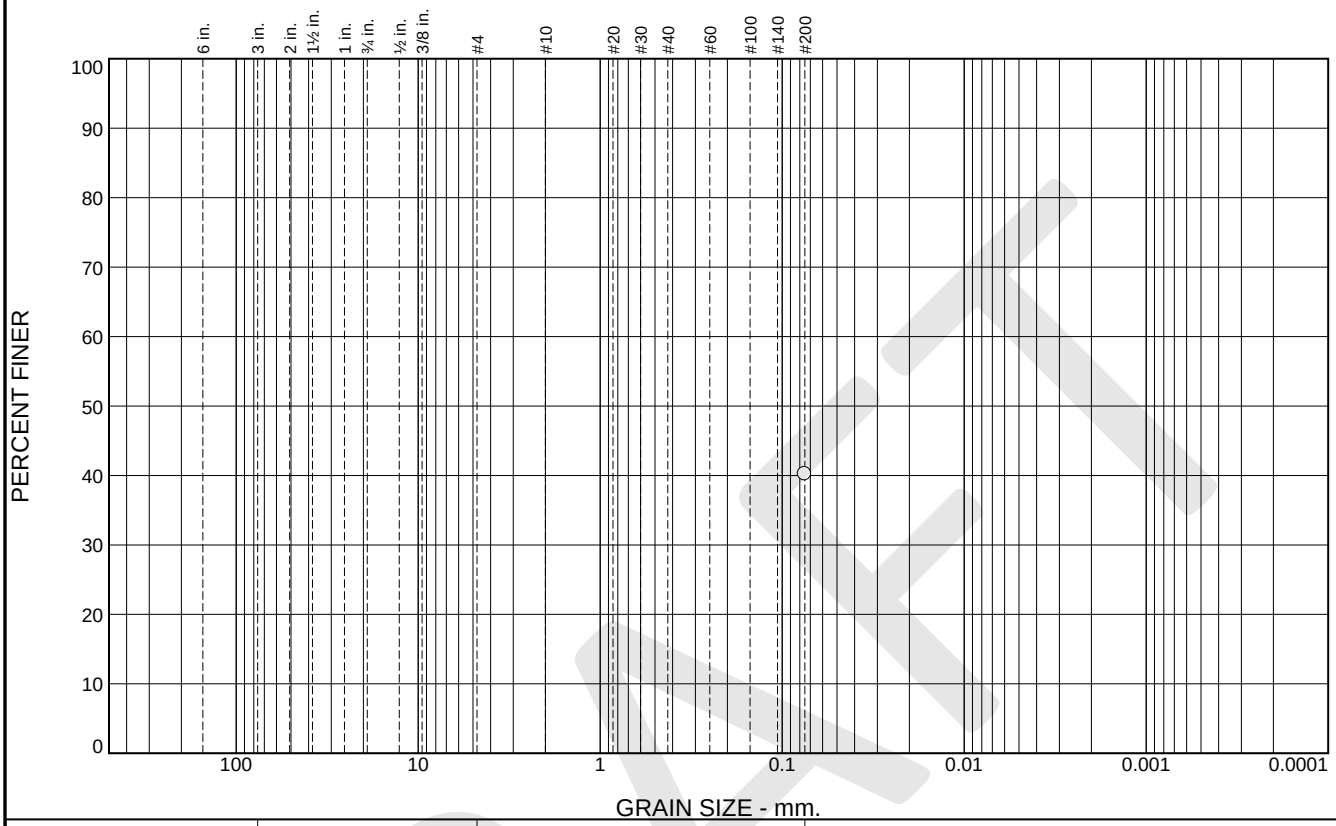
Project: Wheatland Regional Sewer Connection Project

Source of Sample: B53 **Depth:** 16-16.5'
Sample Number: 4C
Proj. No.: 3934.X **Date Sampled:**

DIRECT SHEAR TEST REPORT
Blackburn Consulting
W. Sacramento, CA

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						40.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	40.2		

* (no specification provided)

Material Description

CLAYEY SAND, yellowish red

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B58 **Depth:** 6-6.5'
Sample Number: 2C **Date:**

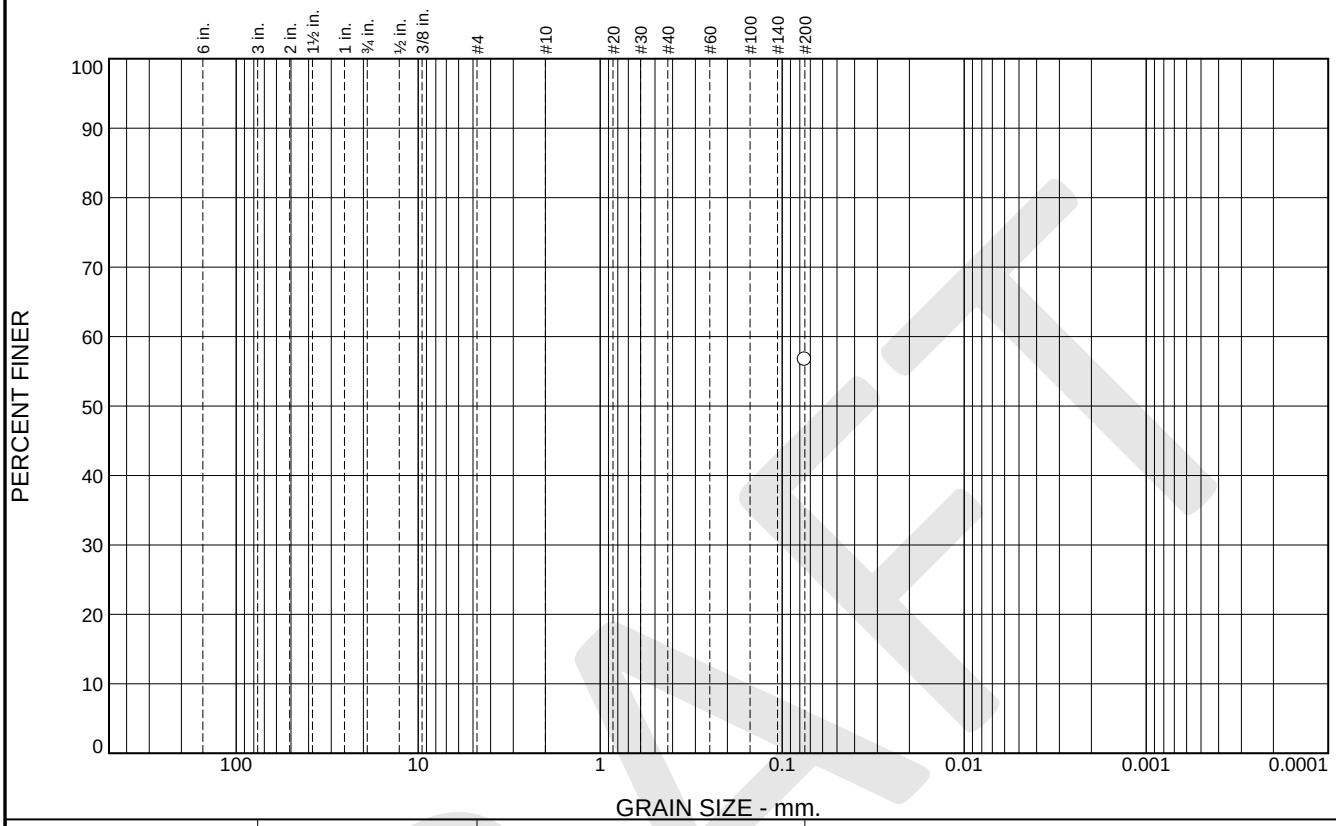
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						56.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	56.7		

* (no specification provided)

Material Description

SANDY SILT, dark yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B58 **Depth:** 36-36.5'
Sample Number: 8C **Date:**

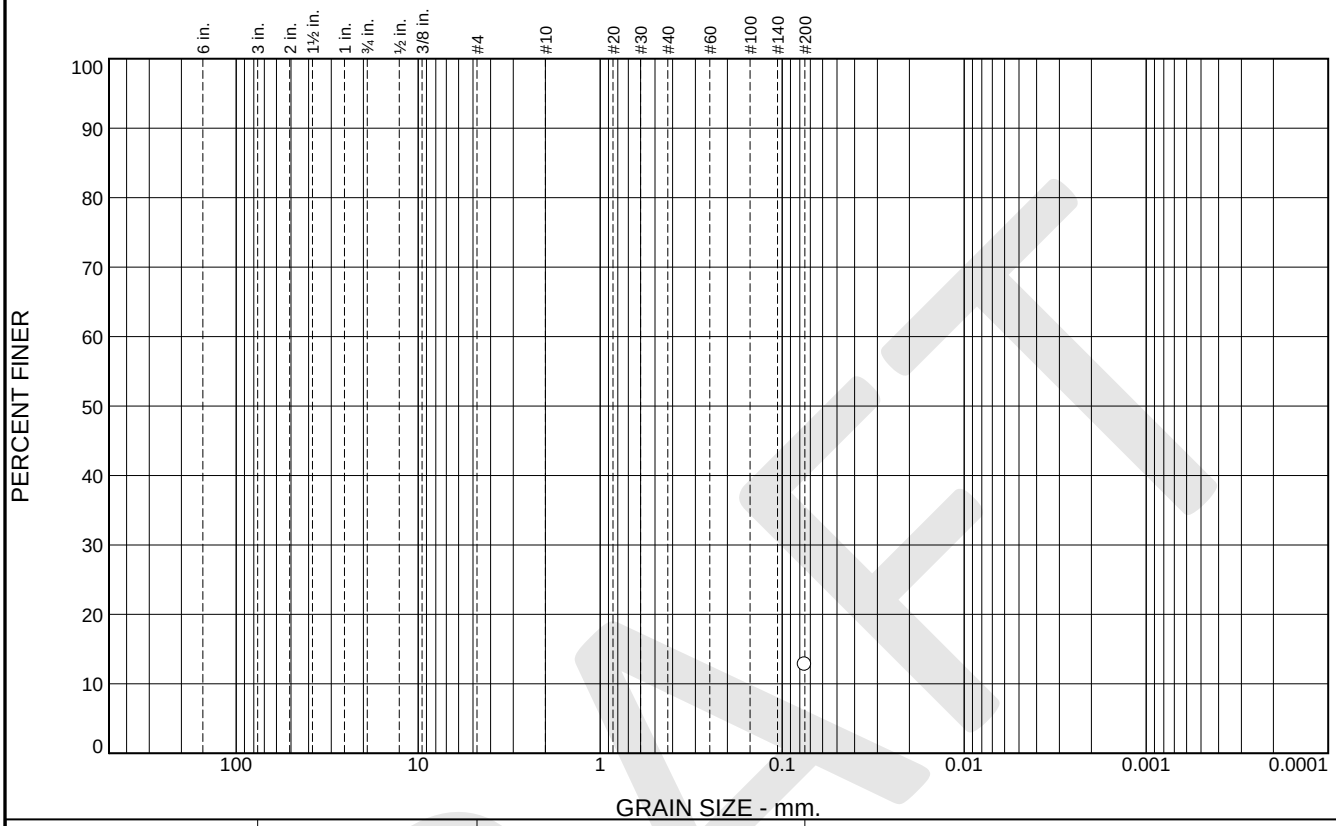
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						12.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	12.8		

* (no specification provided)

Material Description

CLAYEY SAND, dark brown

Atterberg Limits

PL= 14 LL= 28 PI= 14

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: B59 **Depth:** 11-11.5'
Sample Number: 3C **Date:**

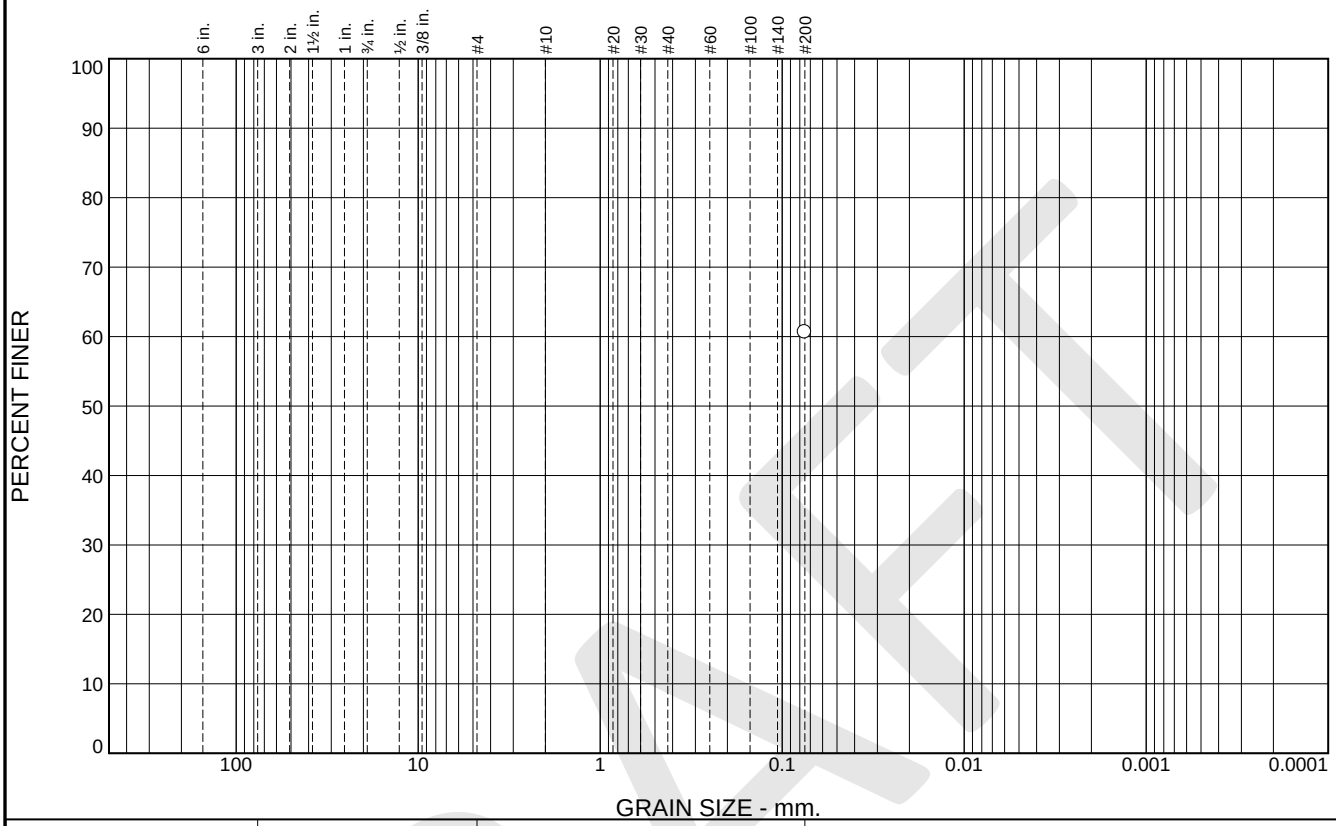
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						60.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	60.6		

* (no specification provided)

Material Description

SANDY SILT, yellowish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B59 **Depth:** 25.2-25.7'
Sample Number: 6C **Date:**

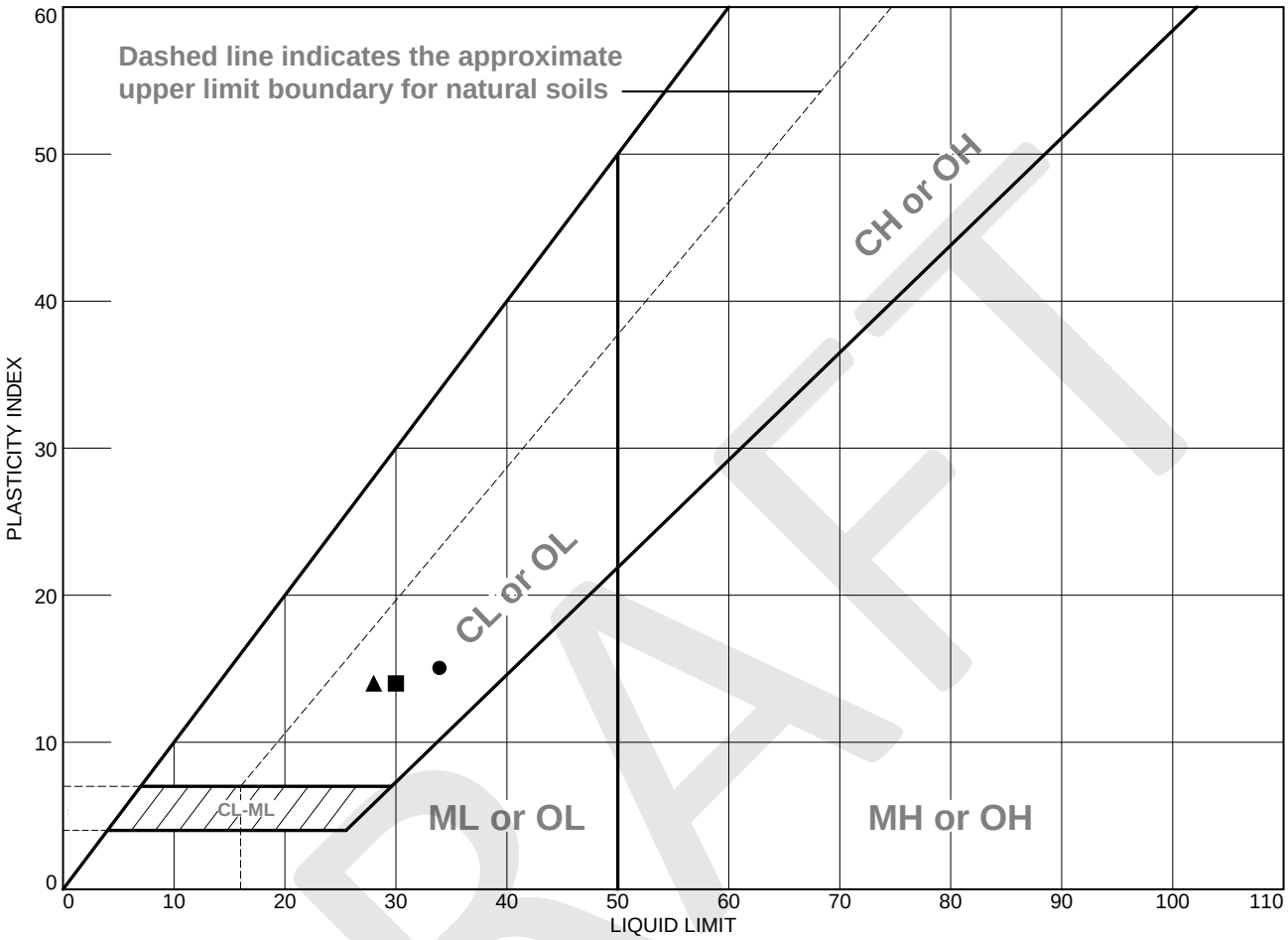
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY, dark yellowish brown	34	19	15			CL
■	Lean CLAY with SAND, yellowish red	30	16	14			CL
▲	CLAYEY SAND, dark brown	28	14	14		12.8	SC

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B58 **Depth:** 20.8-21.3' **Sample Number:** 5C

■**Source of Sample:** B59 **Depth:** 5.5-6' **Sample Number:** 2C

▲**Source of Sample:** B59 **Depth:** 11-11.5' **Sample Number:** 3C

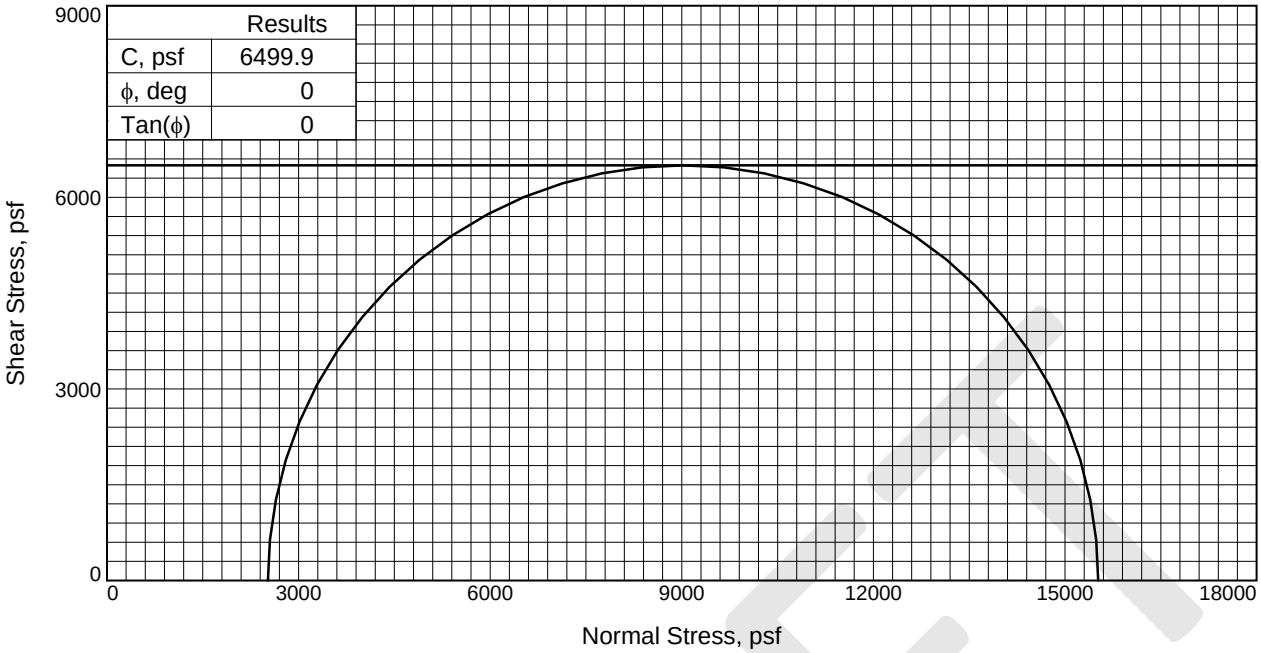
Remarks:

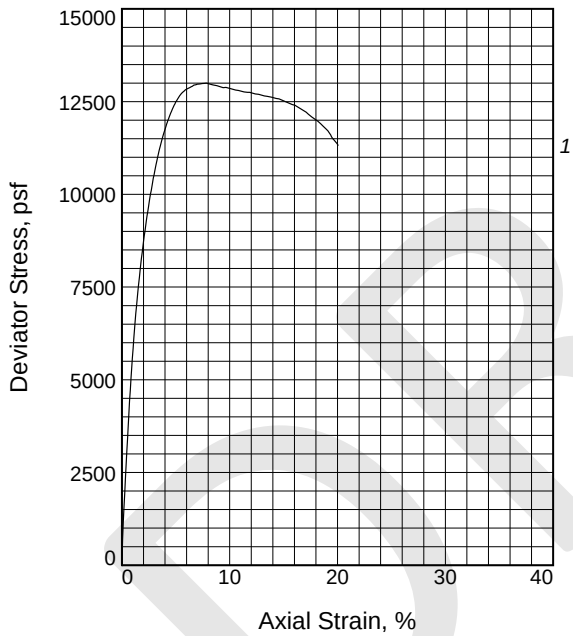
Blackburn Consulting

W. Sacramento, CA

Figure

DRAFT





Sample No.		1
Initial	Water Content, %	15.9
	Dry Density, pcf	112.6
	Saturation, %	86.6
	Void Ratio	0.4970
	Diameter, in.	2.403
	Height, in.	5.008
At Test	Water Content, %	17.6
	Dry Density, pcf	114.3
	Saturation, %	100.0
	Void Ratio	0.4747
	Diameter, in.	2.391
	Height, in.	4.983
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		2520.0
Fail. Stress, psf		12999.8
Strain, %		7.8
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		15519.8
σ_3 Failure, psf		2520.0

Type of Test:
Unconsolidated Undrained

Sample Type:

Description: Lean CLAY, dark yellowish brown

LL= 34 **PL=** 19 **PI=** 15

Assumed Specific Gravity= 2.70

Remarks:

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B58 **Depth:** 20.8-21.3'

Sample Number: 5C

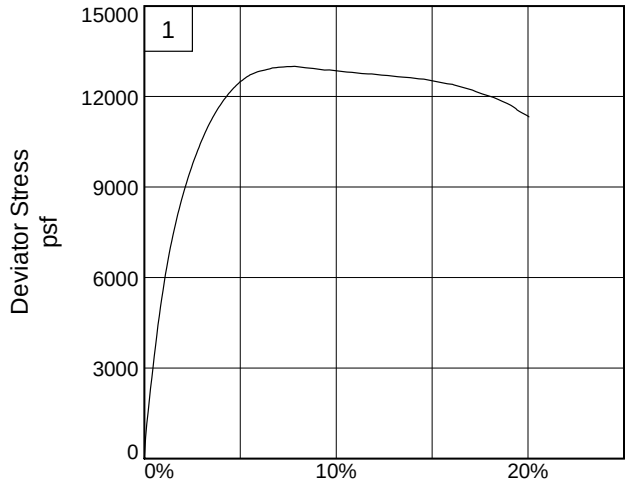
Proj. No.: 3934.X **Date Sampled:**

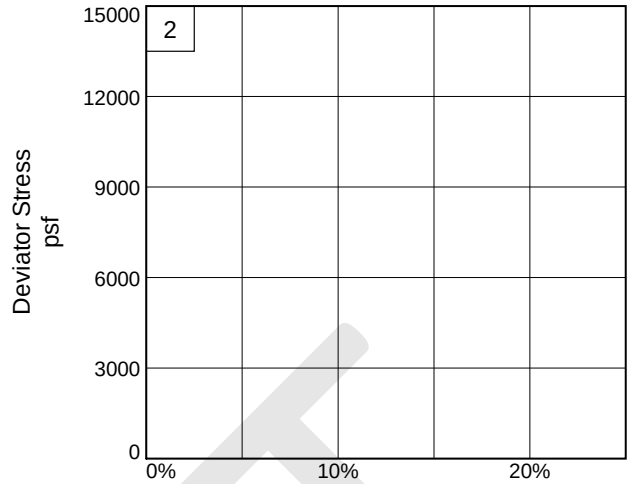
TRIAXIAL SHEAR TEST REPORT

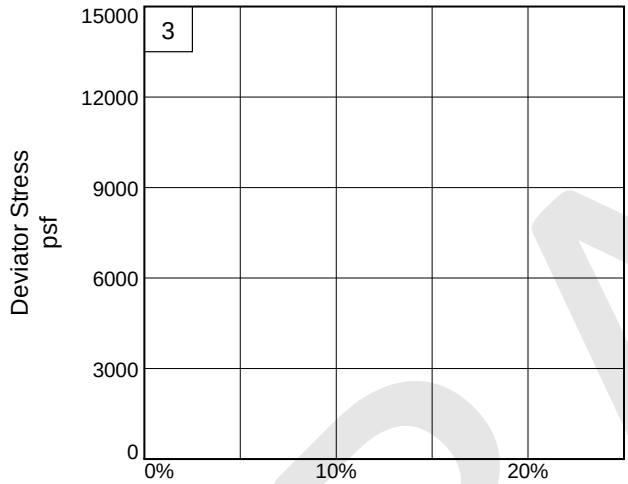
Blackburn Consulting
W. Sacramento, CA

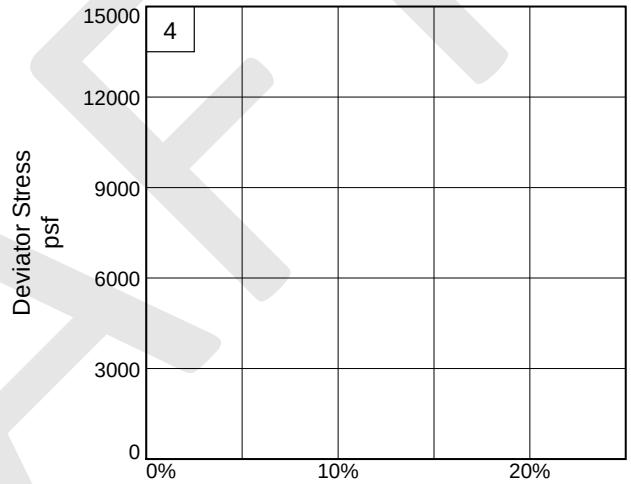
Figure _____

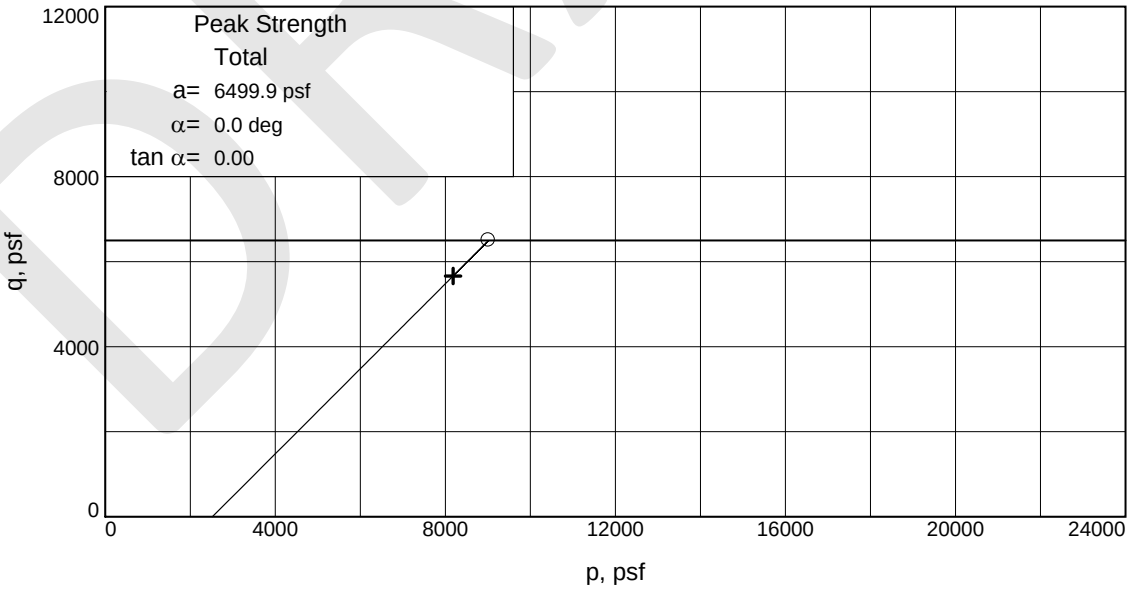
DRAFT











Stress Paths: o indicates peak + indicates end

DRAFT

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

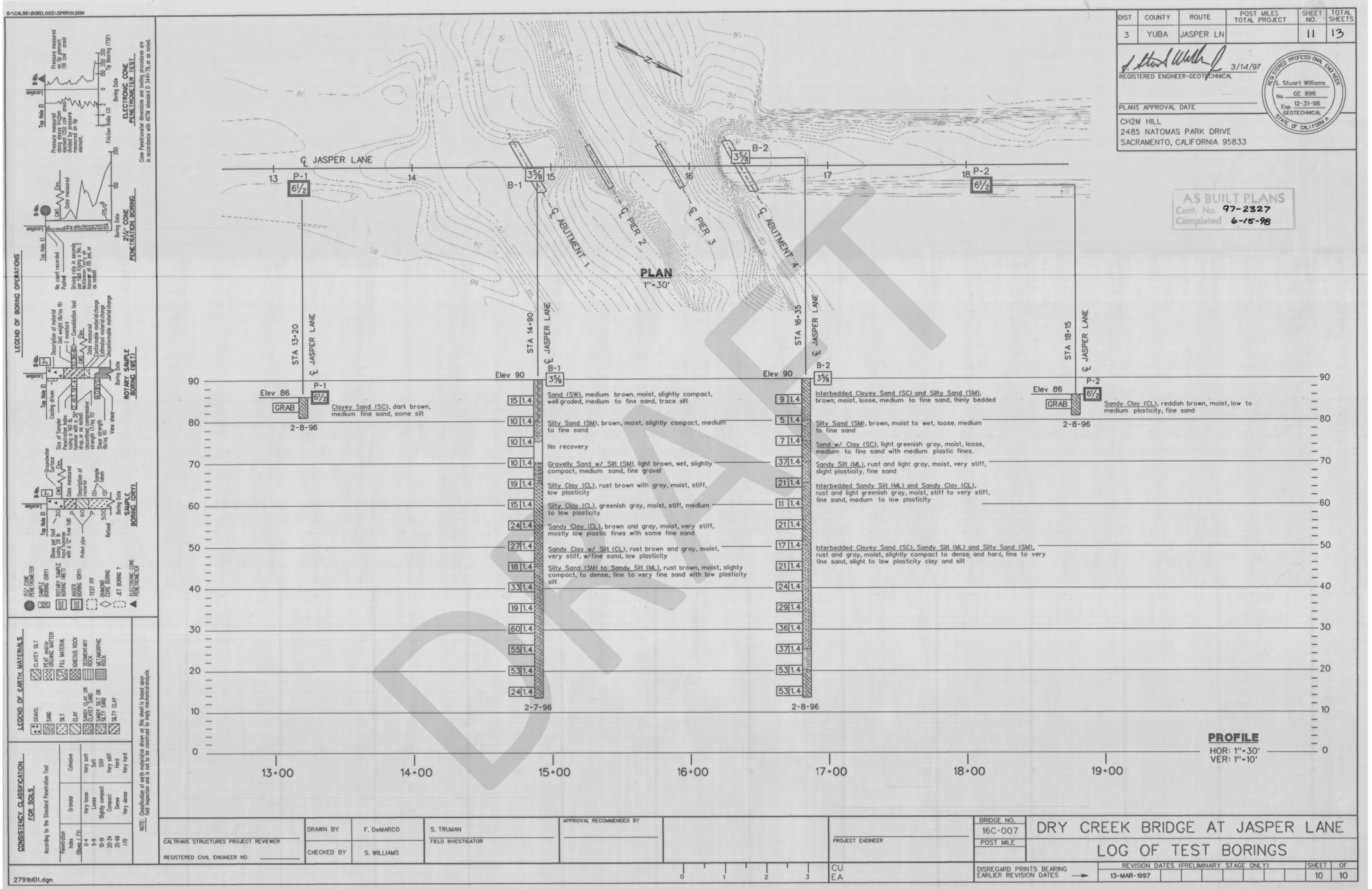
Source of Sample: B58 **Depth:** 20.8-21.3' **Sample Number:** 5C

Project No.: 3934.X **Figure** _____

Blackburn Consulting

B4: Historic LOTB

DRAFT



Source: Dry Creek Bridge at Jasper Lane, Log of Test Borings, As-Built Plan dated 6-15-1998, by CH2M Hill.

BLACKBURN CONSULTING

HISTORIC LOTB

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x

March 2022

Appendix B4

GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

DRAFT

APPENDIX C: Pump Stations

C1: Pump Stations Site Plans

C2: Boring Log Legend

Boring Logs

CPT Plots

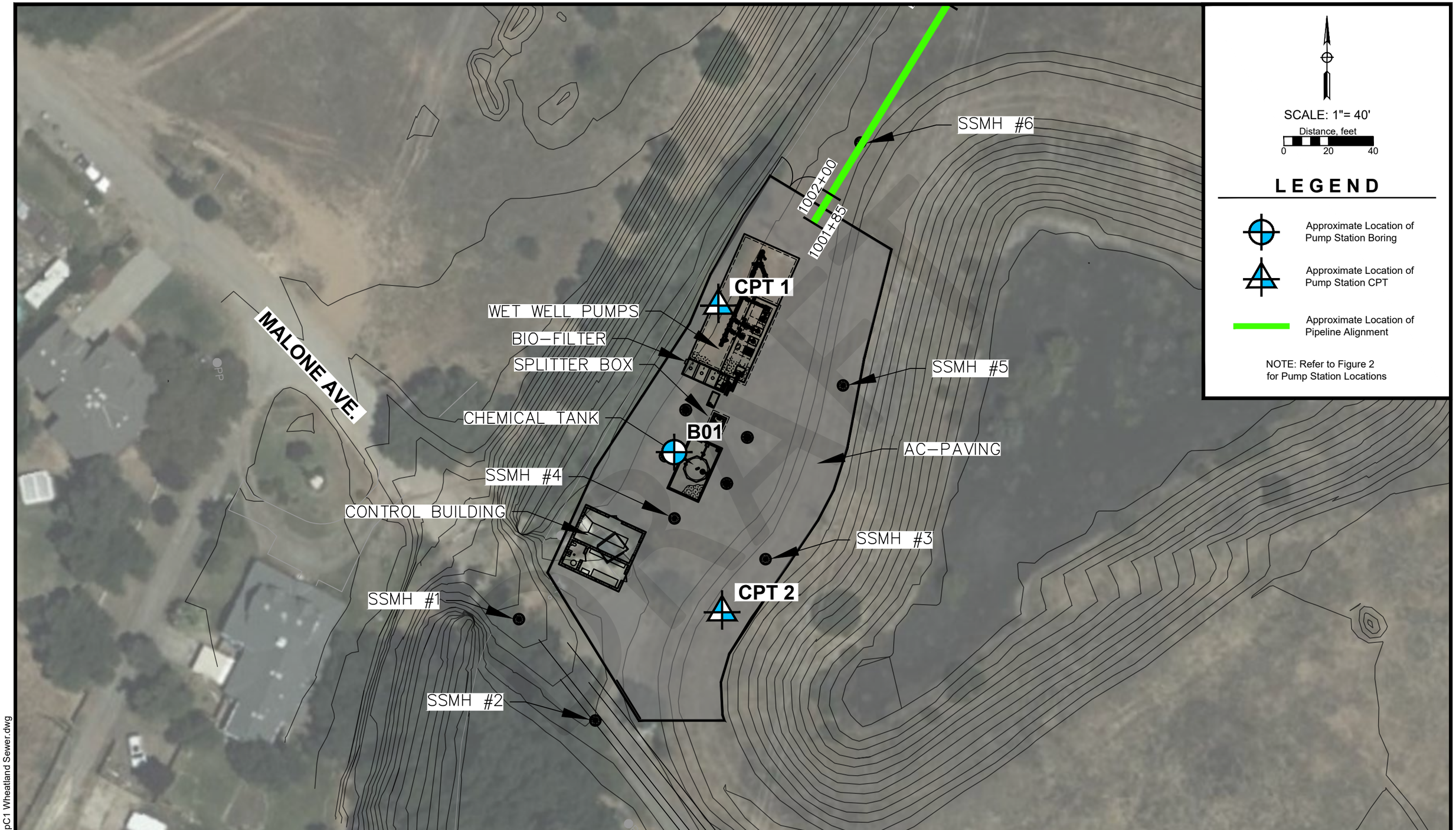
C3: Laboratory Test Results

C4: Pump Station 2 – Site-Specific Design Spectra Calculation

BLACKBURN CONSULTING

C1: Pump Stations Site Plans

DRAFT



Source: Wheatland Regional Sewer HDPE Force Main, Pump Station No. 1 Paving, Grading and Drainage Plan, Drawing Number P1.C01, by Nexgen Utility Management, dated 12-28-2021.

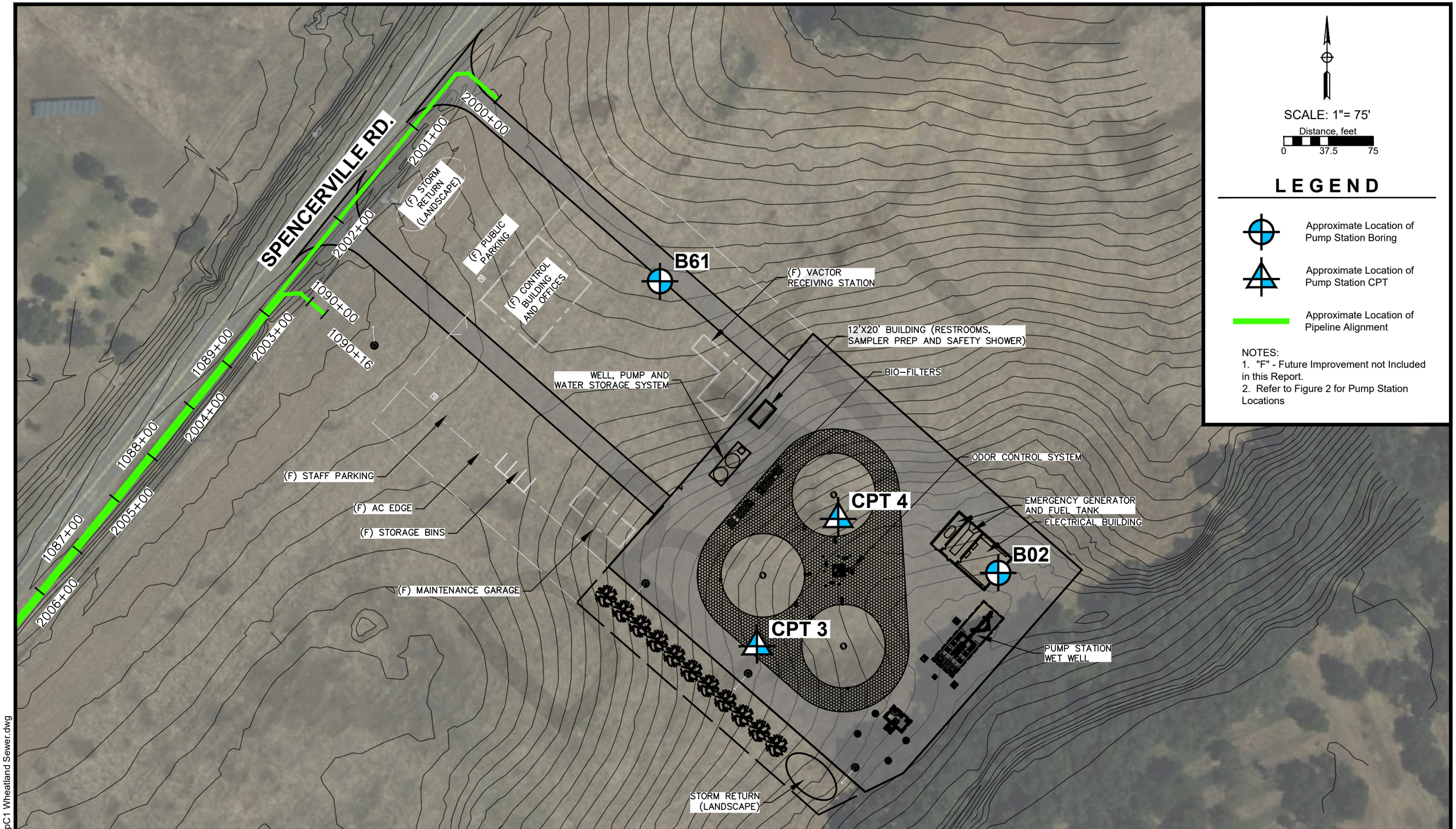
BLACKBURN CONSULTING

PUMP STATION 1 SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix C1a

3/31/2022 3934.x AppC1 Wheatland Sewer.dwg



Source: Wheatland Regional Sewer HDPE Force Main, Pump Station No. 2 Paving, Grading and Drainage Plan, Drawing Number P2.C01, by Nexgen Utility Management, dated 12-28-2021.

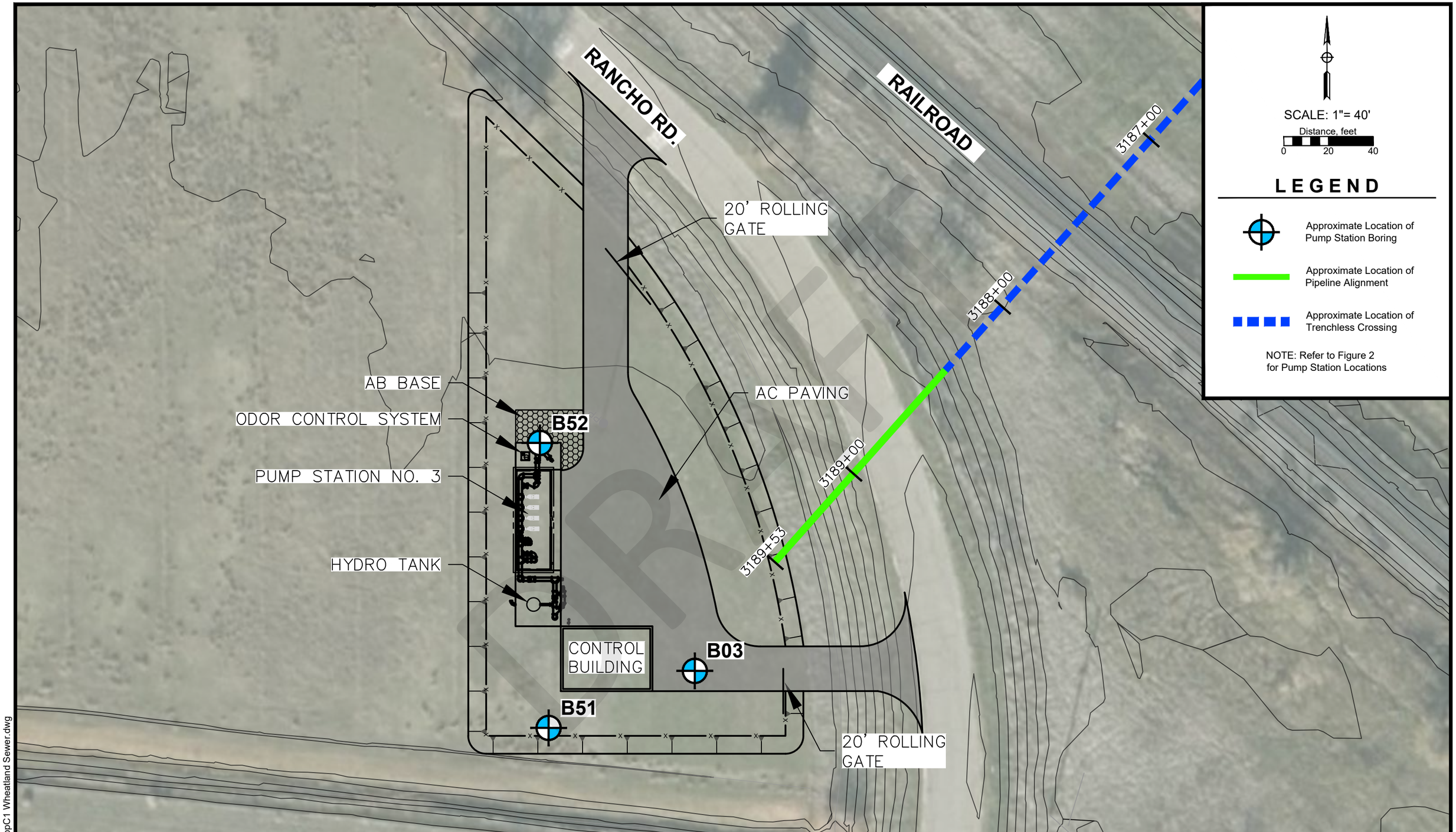
BLACKBURN CONSULTING

PUMP STATION 2 SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix C1b

3/31/2022 3934.x AppC1 Wheatland Sewer.dwg



Source: Wheatland Regional Sewer HDPE Force Main, Pump Station No. 3 Paving, Grading and Drainage Plan, Drawing Number P3.C01, by Nexgen Utility Management, dated 12-28-2021.

BLACKBURN CONSULTING

PUMP STATION 3 SITE PLAN

Wheatland Regional Sewer Connection Project
Yuba County, California

File No. 3934.x
March 2022
Appendix C1c

3/31/2022 3934.x AppC1 Wheatland Sewer.dwg

C2: Boring Log Legend
Boring Logs
CPT Plots

DRAFT

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 5333)
CP	Compaction Curve (ASTM D 698 & 1557, CTM 216)
CR	Corrosion, Sulfates, Chlorides (CTM 643, CTM 417, CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
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 (ASTM D 5084)
PA	Particle Size Analysis (ASTM D 6913 & 7928)
PI	Liquid Limit, Plastic Limit, Plasticity Index (ASTM D 4318)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T100)
SL	Shrinkage Limit (ASTM D 4943)
SW	Swell Potential (ASTM D 4546)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 7012)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 7263)
VS	Vane Shear (AASHTO T223 / ASTM D 2573)

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- California Sampler (2" ID)
- Modified California Sampler (2.4" ID)
- 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)

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BORING LOG LEGEND

8/5/2019 Boring Legend for Reports 2019.dwg

CONSISTENCY OF COHESIVE SOILS				
Descriptor	**Unconfined Compressive Strength (tsf)**	**Pocket Penetrometer (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 0.25	< 0.25	< 0.12	Extrudes between fingers when squeezed
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} - Value (blows / foot)**
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE	
Descriptor	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

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.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

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LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	11-19-21	11-19-21	39.007345° / -121.423013°	B-01
CONTRACTOR: Taber			LOCATION (Offset, Station, Line)	SURFACE ELEVATION: 79.6 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Mike		EQUIPMENT: CME 55 Crawler	TOTAL DEPTH: 41.0 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING 19.0 ft; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; dark brown; moist; few fine SAND															
	1																R	
	2				1	5 9 13	22		65	>4.5	19	103	36	12		UU= 3502psf	CR	
	3																	
	4		Lean CLAY with SAND (CL); stiff; orangish brown; moist; low plasticity; little very fine to fine SAND															
75	5				2	3 4 5	9		55									
	6																	
	7																	
	8																	
	9																	
70	10		very stiff		3	8 11 13	24		60	3.0	26	97	35	12	85			
	11																	
	12																	
	13		SANDY Lean CLAY (CL); medium stiff to stiff; brown; moist; very fine to fine SAND; low plasticity															
65	14																	
	15				4	1 3 3	6		100				33	10	59			
	16																	
	17																	
	18																	
	19			▽														
60	20																	
	21		Poorly-graded GRAVEL with CLAY and SAND (GP-GC); dense; brown; wet; mostly fine to coarse GRAVEL; little fine to coarse SAND; few fines		5	10 23 25	48		65	>4.5	25 6	95 140			10			
	22																	
	23		SILT (ML); hard; light yellowish brown; moist; trace fine SAND															
	24																	
55	25																	

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-01
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 2

BCI LOG FOR SOIL TEMPLATE.GPJ 3934.LIBRARY_2019.GLB 3/31/22

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SILT (ML) *(continued)*.															
	26				6	9 12 21	33		100				43	10			CR	
	27																	
	28		Lean CLAY (CL); hard; mottled stong brown and dark gray; moist; few very fine to fine SAND															
	29																	
50	30																	
	31				7	10 16 25	41		80	4.25			34	12				
	32																	
	33		Lean CLAY with SAND (CL); very stiff; brown; moist; little fine to coarse SAND															
	34																	
45	35																	
	36				8	11 12 15	27		100				43	17	83			
	37																	
	38		hard; little very fine to fine SAND															
	39																	
40	40																	
	41				9	26 50/6"	50/ 6"		100	>4.5	28	97						
	42		Bottom of exploration at 41.0 ft below ground surface (bgs)															
	43		Backfilled with grout Groundwater encountered at 19.0 ft bgs Bulk A 0.0-5.0 ft bgs															
	44																	
35	45																	
	46																	
	47																	
	48																	
	49																	
30	50																	
	51																	
	52																	
	53																	
	54																	
25	55																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	**3934.X**	**B-01**
COUNTY **YUB**	ROUTE	POSTMILE
CLIENT **Coastland Civil Engineering**		
PREPARED BY **NRV**	CHECKED BY	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	11-22-21	11-22-21	39.022727° / -121.399969°	B-02
CONTRACTOR: Taber			LOCATION (Offset, Station, Line)	SURFACE ELEVATION: 94.4 ft
OPERATOR'S NAME: David	HELPER'S NAME: Lawrence, Tanner		EQUIPMENT: CME 55 Crawler	TOTAL DEPTH: 31.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); stiff; dark brown; moist; medium plasticity; few very fine to fine SAND															
	1																R CR	
	2																	
	3				1	3 4 7	11		100									
	4																	
90	5		Lean CLAY with SAND (CL); hard; brown; dry to moist; some fine to medium SAND		2	9 21 30	51		80	>4.5	7	119	35	19	70	DS	CR	
	6																	
	7																	
	8		SILT with SAND (ML); hard; light brown; dry; little fine SAND															
	9																	
85	10				3	14 22 29	51		100				43	16				
	11																	
	12																	
	13		Lean CLAY (CL); hard; orangish brown; dry to moist; few fine SAND															
80	14																	
	15				4	22 46 50/5.5"	96/ 11.5"		65	>4.5	20	102	43	17	93			
	16																	
	17																	
	18																	
75	19																	
	20		very stiff; moist		5	5 7 11	18		100								CR	
	21																	
	22																	
	23		SILT (ML); stiff to very stiff; orangish brown; moist; few fine SAND															
70	24																	
	25																	

(continued)

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-02
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25		SILT (ML) *(continued)*.															
	26				6	5 8 12	20		65	1.75	39	81	44	16	91	UU= 1688psf		
	27																	
	28		Lean CLAY with SAND (CL); medium stiff; yellowish brown; moist; little very fine to fine SAND															
65	29																	
	30																	
	31				7	2 2 3	5		100				49	22				
	32		Bottom of exploration at 31.5 ft below ground surface (bgs)															
	33		Backfilled with grout Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
	34																	
60	35																	
	36																	
	37																	
	38																	
	39																	
55	40																	
	41																	
	42																	
	43																	
	44																	
50	45																	
	46																	
	47																	
	48																	
	49																	
45	50																	
	51																	
	52																	
	53																	
	54																	
40	55																	

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BLACKBURN CONSULTING

PROJECT NAME: **Wheatland Regional Sewer Connection**	FILE NO.: **3934.X**	HOLE ID: **B-02**
COUNTY: **YUB**	ROUTE	POSTMILE
CLIENT: **Coastland Civil Engineering**		
PREPARED BY: **NRV**	CHECKED BY	SHEET: **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	8-9-21	8-9-21	39.043165° / -121.475927°	B-03
CONTRACTOR: Taber			LOCATION (Offset, Station, Line)	SURFACE ELEVATION: 75.3 ft
OPERATOR'S NAME: Rick	HELPER'S NAME: Fernando, Mike		EQUIPMENT: Diedrich D120	TOTAL DEPTH: 41.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with grout			GROUND WATER READINGS: DURING / AFTER (DATE): Not encountered	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
75	0		SANDY Lean CLAY (CL); hard; light brown to strong brown; dry; some fine SAND														R	
	1																	
	2																	
	3				1	12 18 35	53		65									
	4																	
	5		moist															
70	6				2	23 36 50/4"	86/ 10"		80		14	112	29	9	66	UU= 4465psf	CR	
	7																	
	8																	
	9																	
	10		Lean CLAY (CL); hard; brown; moist; little fine SAND															
65	11				3	14 26 40	66		95		19	109	47	25	86	UU= 4952psf		
	12																	
	13																	
	14																	
	15																	
60	16				4	27 50/4.5"	50/ 4.5"		95									
	17																	
	18																	
	19																	
	20		mottled light gray and orange															
55	21				5	28 50/4"	50/ 4"		100	>4.5	16	109						
	22																	
	23																	
	24																	
	25																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-03
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY: DWC	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
50	25		Lean CLAY (CL) *(continued)*.		6	18 23 50/4"	73/ 10"		100									
	26																	
	27																	
	28																	
	29																	
45	30		few fine SAND		7	11 28 50/5"	78/ 11"		100									
	31																	
	32																	
	33																	
	34																	
40	35		very stiff		8	12 15 20	35		100									
	36																	
	37																	
	38		Poorly-graded SAND with CLAY (SP-SC); very dense; orange brown; moist; medium SAND; few fines															
	39																	
35	40				9	17 33 35	68		100									
	41		Lean CLAY with SAND (CL); hard; light brown; moist; little fine SAND															
	42		Bottom of exploration at 41.5 ft below ground surface (bgs)															
	43		Backfilled with grout Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
	44																	
30	45																	
	46																	
	47																	
	48																	
	49																	
25	50																	
	51																	
	52																	
	53																	
	54																	
	55																	

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BLACKBURN CONSULTING

PROJECT NAME **Wheatland Regional Sewer Connection**		FILE NO. **3934.X**	HOLE ID **B-03**
COUNTY **YUB**	ROUTE		POSTMILE
CLIENT **Coastland Civil Engineering**			
PREPARED BY **NRV**	CHECKED BY **DWC**		SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	11-22-21	11-22-21	39.043096° / -121.476158°	B-51
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3144+90	SURFACE ELEVATION: 77.3 ft
OPERATOR'S NAME: David	HELPER'S NAME: Lawrence, Tanner		EQUIPMENT: CME 55 Crawler	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); hard; brown; dry to moist; trace fine SAND															
76	1																	
	2																	
					1	2 7 34	41		100									
74	3																	
	4		SANDY lean CLAY (CL); hard; reddish brown; dry; some very fine to fine SAND															
72	5																	
					2	14 40 50/5.5"	90/ 11.5"		45	>4.5	18	113	34	10	62		CR	
	6																	
70	7																	
	8																	
68	9																	
	10		very stiff; mottled orange brown and light gray; dry to moist															
					3	8 12 17	29		90									
66	11																	
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
	12		Backfilled with cuttings Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
64	13																	
	14																	
	15																	

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BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-51
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	11-22-21	11-22-21	39.043446° / -121.47617°	B-52
CONTRACTOR: Taber			LOCATION (Offset, Station, Line): Sta ~3150+50	SURFACE ELEVATION: 76.3 ft
OPERATOR'S NAME: David	HELPER'S NAME: Lawrence, Tanner		EQUIPMENT: CME 55 Crawler	TOTAL DEPTH: 11.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
76	0		Lean CLAY (CL); hard; reddish brown; dry to moist; few very fine SAND															
	1																	
	2																	
74					1	5 10 21	31		65	>4.5					88		CR	
	3																	
	4		Lean CLAY with SAND (CL); very stiff; orangish brown; dry; little very fine to fine SAND															
72																		
	5				2	8 13 16	29		85									
	6																	
70																		
	7																	
	8		Lean CLAY (CL); hard; mottled brown and light gray; dry; trace very fine to fine SAND															
68																		
	9																	
	10																	
66					3	11 23 43	66		65	>4.5							CR	
	11																	
			Bottom of exploration at 11.5 ft below ground surface (bgs)															
64	12		Backfilled with cuttings Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
	13																	
62	14																	
	15																	

DRAFT

BLACKBURN CONSULTING

PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-52
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/Long or North/East and Datum)	HOLE ID
NRV	11-22-21	11-22-21	39.023404° / -121.400962°	B-61
CONTRACTOR: Taber			LOCATION (Offset, Station, Line)	SURFACE ELEVATION: 117.9 ft
OPERATOR'S NAME: David	HELPER'S NAME: Lawrence, Tanner		EQUIPMENT: CME 55 Crawler	TOTAL DEPTH: 6.5 ft
EXCAVATION METHOD: Solid-Stem Auger			DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH	BOREHOLE DIAMETER: 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Cal-Mod (2.4"), SPT (1.4")			HAMMER TYPE: Safety semi-automatic drop (140#/ 30")	HAMMER EFFICIENCY, ERi
BACKFILL AND COMPLETION: Backfilled with cuttings			GROUND WATER READINGS: DURING: Not encountered; AFTER (DATE)	CASING TYPE AND DIAMETER(in)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Pentrometer	Laboratory Data: Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	0		Lean CLAY (CL); (soft); dark brown; moist; medium plasticity; few very fine to fine SAND															
	1		SILTY SAND (SM); very dense; brown; dry; fine to medium SAND; little to some fines															
116	2				1	27 50/5"	50/5"		90	>4.5	15	97	39	8	27	DS		
	3																	
114	4																	
	5		dense; dark yellowish brown															
112	6				2	10 17 17	34		100				34	9	38			
	7		Bottom of exploration at 6.5 ft below ground surface (bgs) Backfilled with cuttings Groundwater not encountered Bulk A 0.0-5.0 ft bgs															
110	8																	
	9																	
108	10																	
	11																	
106	12																	
	13																	
104	14																	
	15																	

DRAFT

BLACKBURN CONSULTING

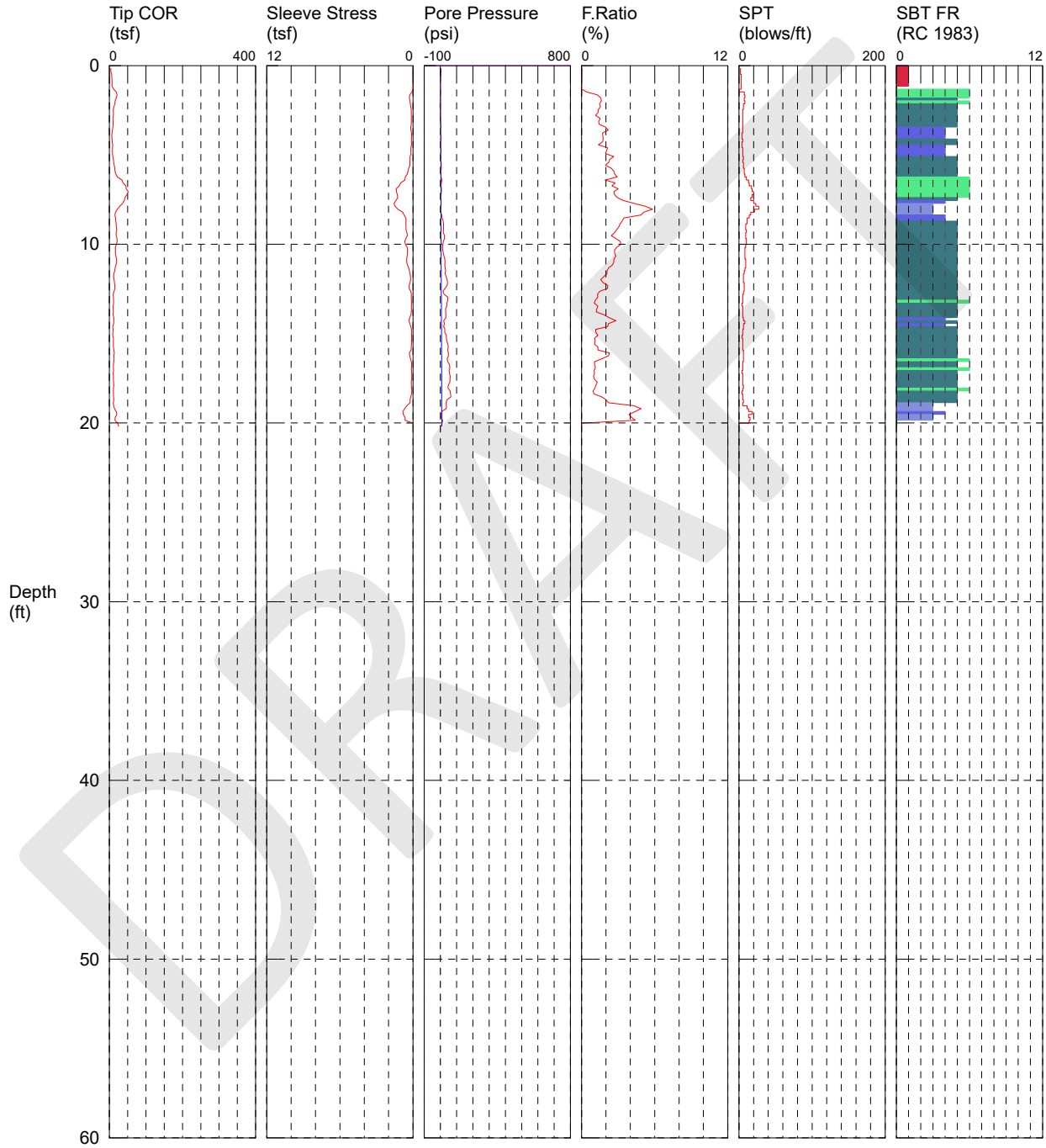
PROJECT NAME	FILE NO.	HOLE ID
Wheatland Regional Sewer Connection	3934.X	B-61
COUNTY: YUB	ROUTE	POSTMILE
CLIENT: Coastland Civil Engineering		
PREPARED BY: NRV	CHECKED BY	SHEET: 1 of 1

SOUNDING

SOUNDING
CUSTOMER: Taber Drilling
OPERATOR: Tim
CONE ID: DDG1361
LOCATION:

JOB NUMBER:
HOLE NUMBER: CPT 1
TEST DATE: 1/6/2022 2:39:33 PM
COMMENT: Auto Enhance On
COMMENT: Filter On

COMMENT:
GPS (LAT,LON,ALT): 0.00,0.00,0.0
LOCATION:
LOCATION:
LOCATION:



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

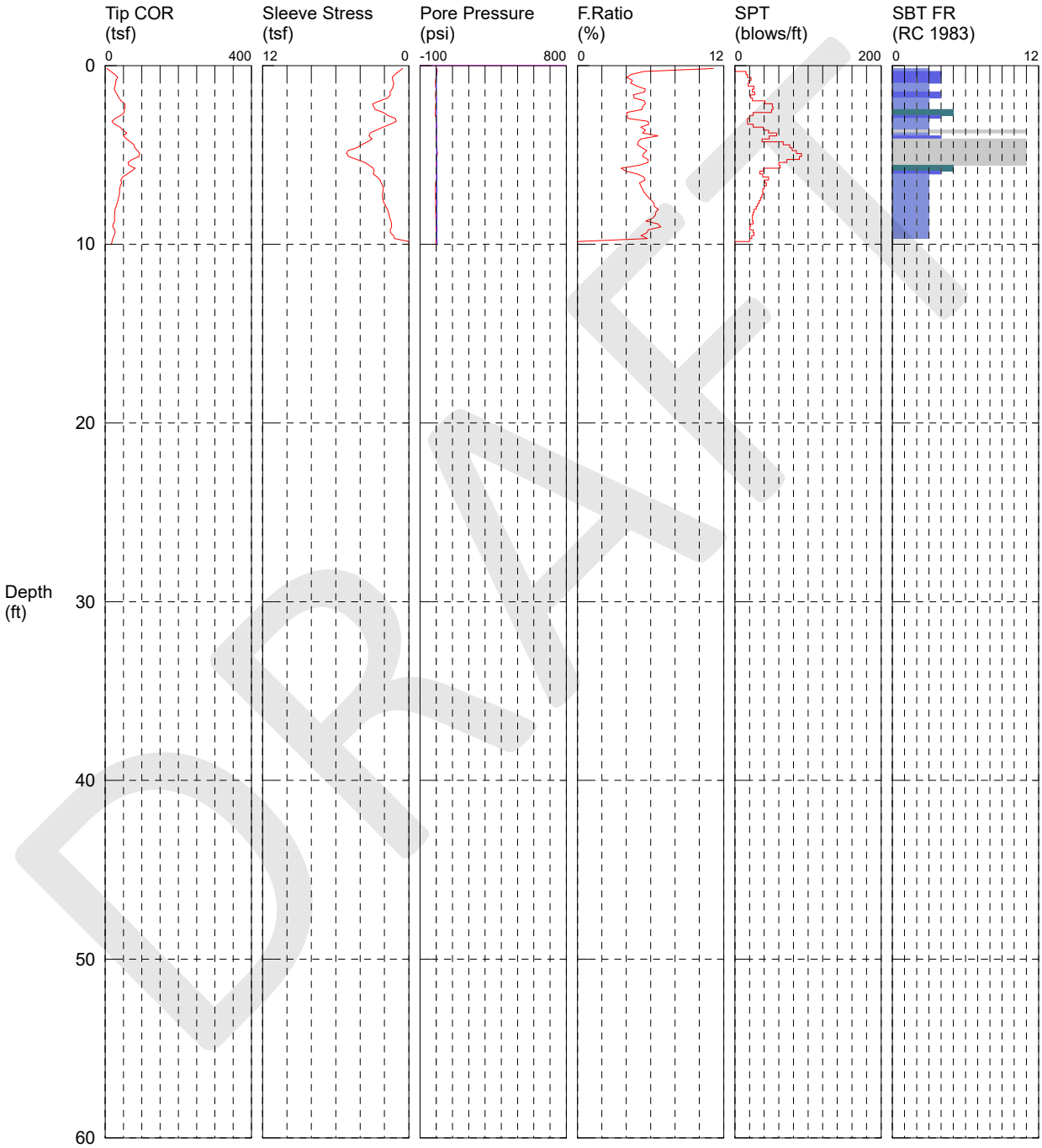
DRAFT

SOUNDING

SOUNDING
CUSTOMER: Taber Drilling
OPERATOR: Tim
CONE ID: DDG1361
LOCATION:

JOB NUMBER:
HOLE NUMBER: CPT 2
TEST DATE: 1/6/2022 3:22:47 PM
COMMENT: Auto Enhance On
COMMENT: Filter On

COMMENT:
GPS (LAT,LON,ALT): 0.00,0.00,0.0
LOCATION:
LOCATION:
LOCATION:



1 sensitive fine grained
2 organic material
3 clay
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5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

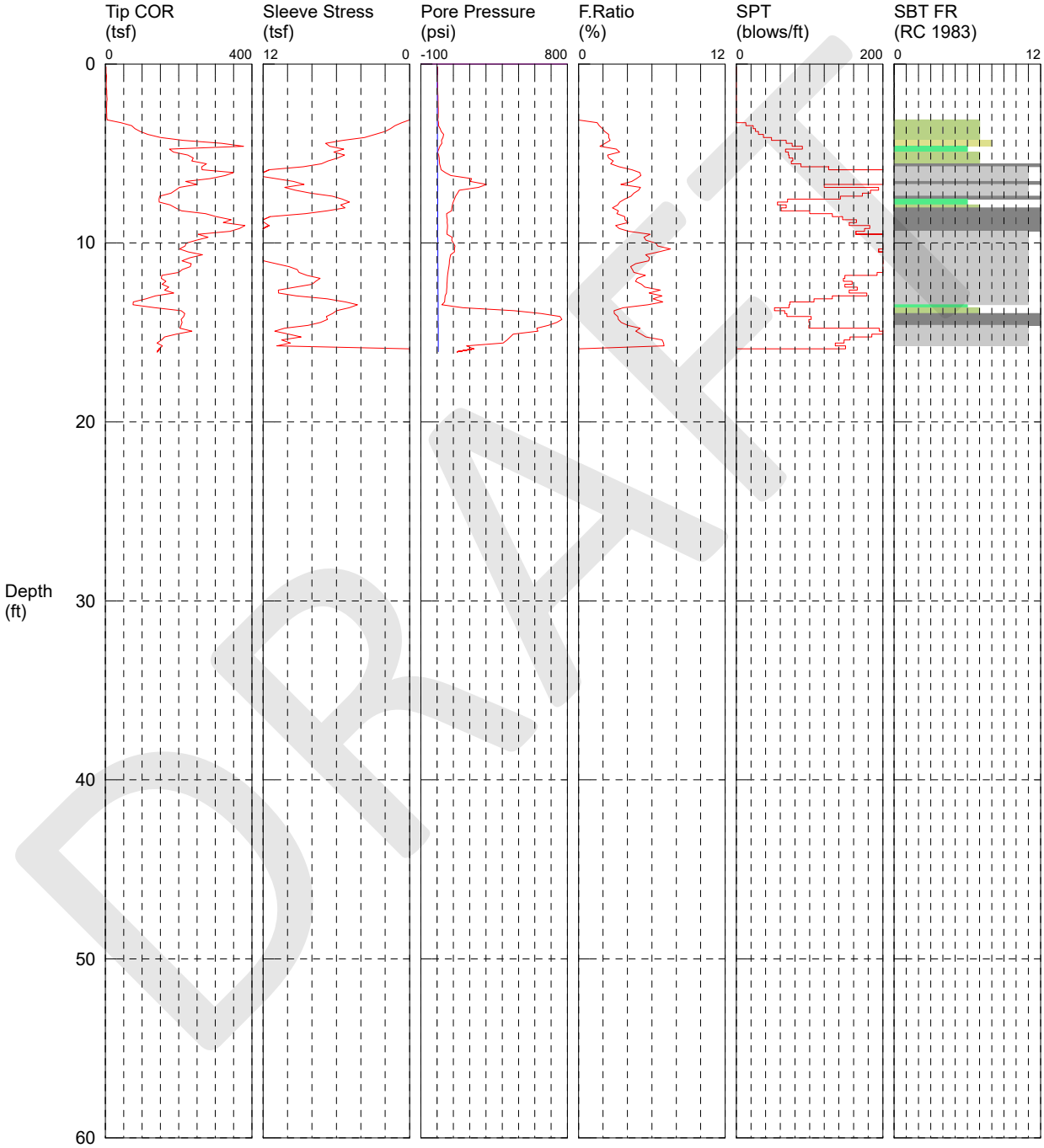
DRAFT

SOUNDING

SOUNDING
CUSTOMER: Taber Drilling
OPERATOR: Tim
CONE ID: DDG1361
LOCATION:

JOB NUMBER:
HOLE NUMBER: CPT 3
TEST DATE: 1/7/2022 11:48:28 AM
COMMENT: Auto Enhance On
COMMENT: Filter On

COMMENT:
GPS (LAT,LON,ALT): 0.00,0.00,0.0
LOCATION:
LOCATION:
LOCATION:



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

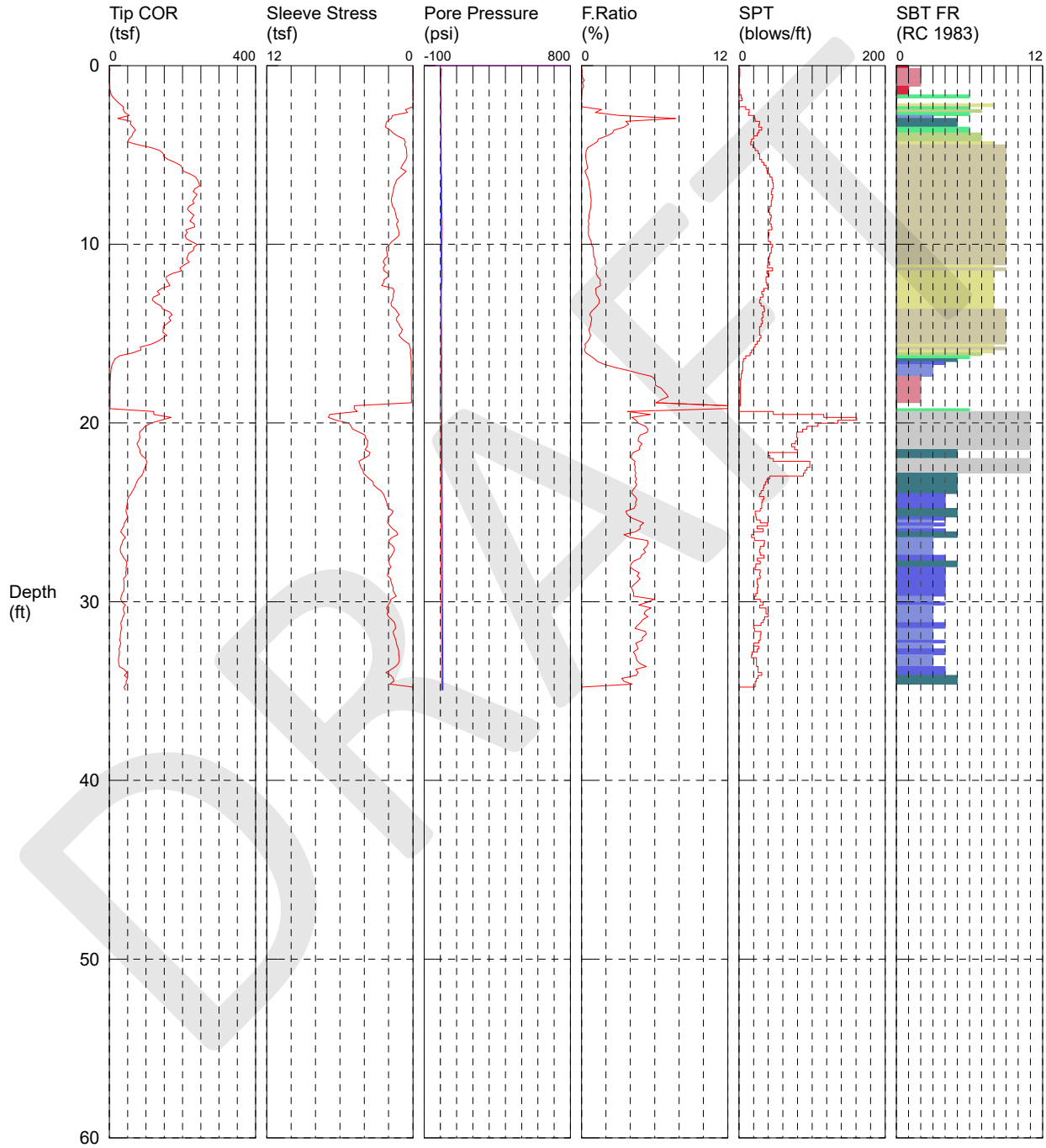
DRAFT

SOUNDING

SOUNDING
CUSTOMER: Taber Drilling
OPERATOR: Tim
CONE ID: DDG1361
LOCATION:

JOB NUMBER:
HOLE NUMBER: CPT 3a
TEST DATE: 1/7/2022 1:52:51 PM
COMMENT: Auto Enhance On
COMMENT: Filter On

COMMENT:
GPS (LAT,LON,ALT): 0.00,0.00,0.0
LOCATION:
LOCATION:
LOCATION:



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

DRAFT

SOUNDING

SOUNDING
CUSTOMER: Taber Drilling
OPERATOR: Tim
CONE ID: DDG1361
LOCATION:

JOB NUMBER:
HOLE NUMBER: CPT 3b
TEST DATE: 1/7/2022 3:10:39 PM
COMMENT: Auto Enhance On
COMMENT: Filter On

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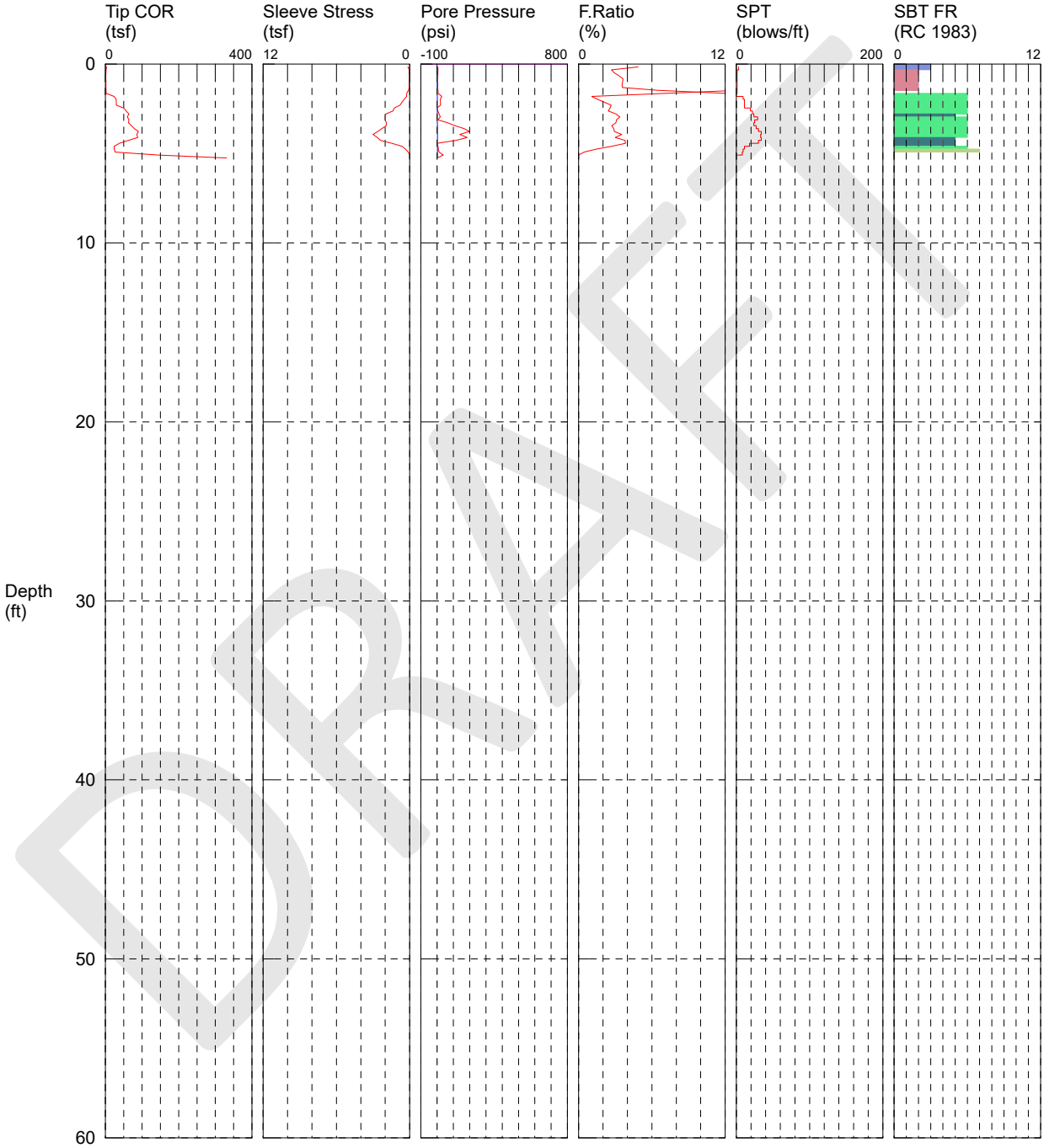
LOCATION:
LOCATION:



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

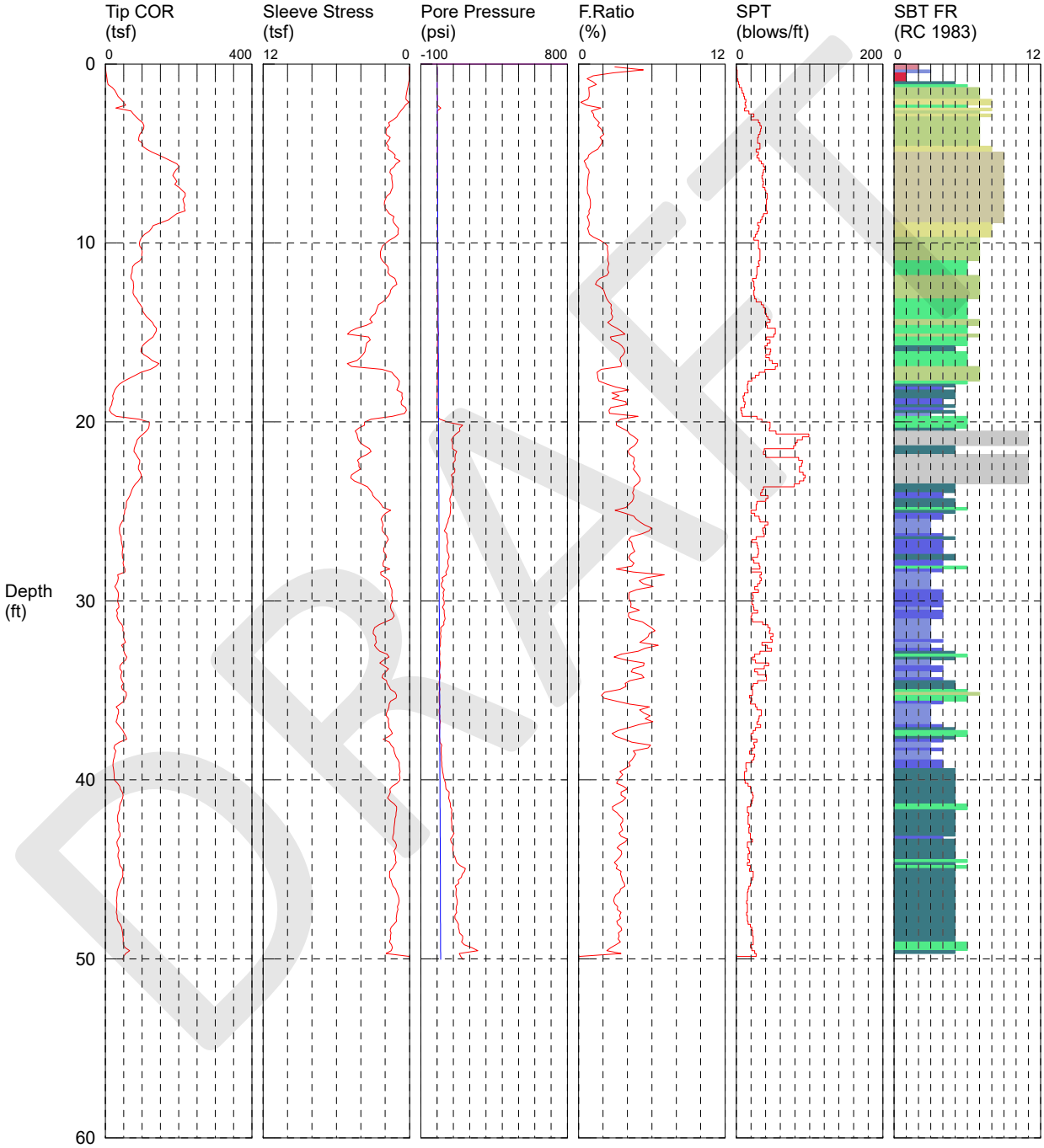
DRAFT

SOUNDING

SOUNDING
CUSTOMER: Taber Drilling
OPERATOR: Tim
CONE ID: DDG1361
LOCATION:

JOB NUMBER:
HOLE NUMBER: CPT 3c
TEST DATE: 1/7/2022 4:09:26 PM
COMMENT: Auto Enhance On
COMMENT: Filter On

COMMENT:
GPS (LAT,LON,ALT): 0.00,0.00,0.0
LOCATION:
LOCATION:
LOCATION:



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

DRAFT

SOUNDING

SOUNDING
CUSTOMER: Taber Drilling
OPERATOR: Tim
CONE ID: DDG1361
LOCATION:

JOB NUMBER:
HOLE NUMBER: CPT 4
TEST DATE: 1/7/2022 9:52:01 AM
COMMENT: Auto Enhance On
COMMENT: Filter On

COMMENT:
GPS (LAT,LON,ALT): 0.00,0.00,0.0
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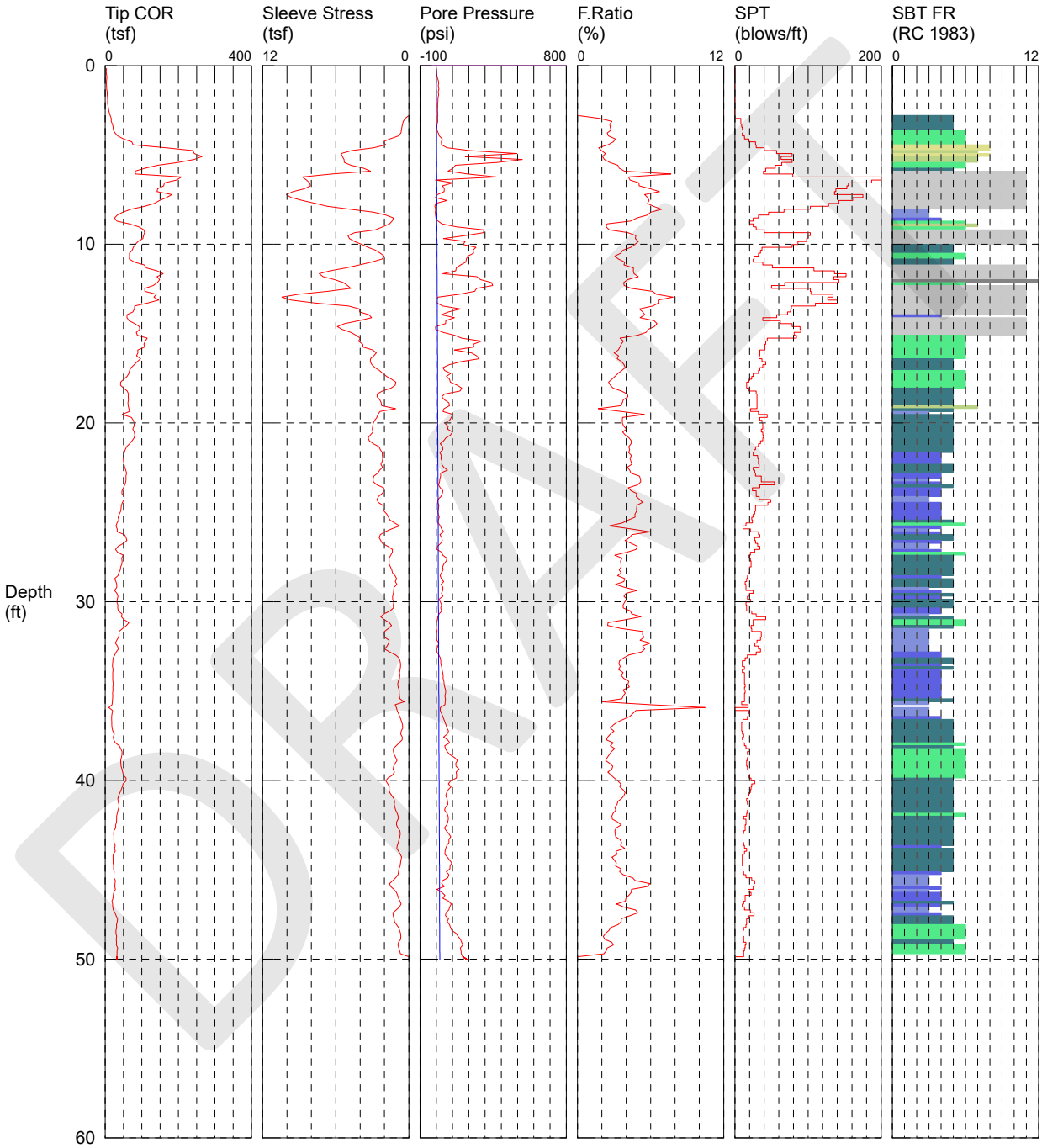
LOCATION:



1 sensitive fine grained
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3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

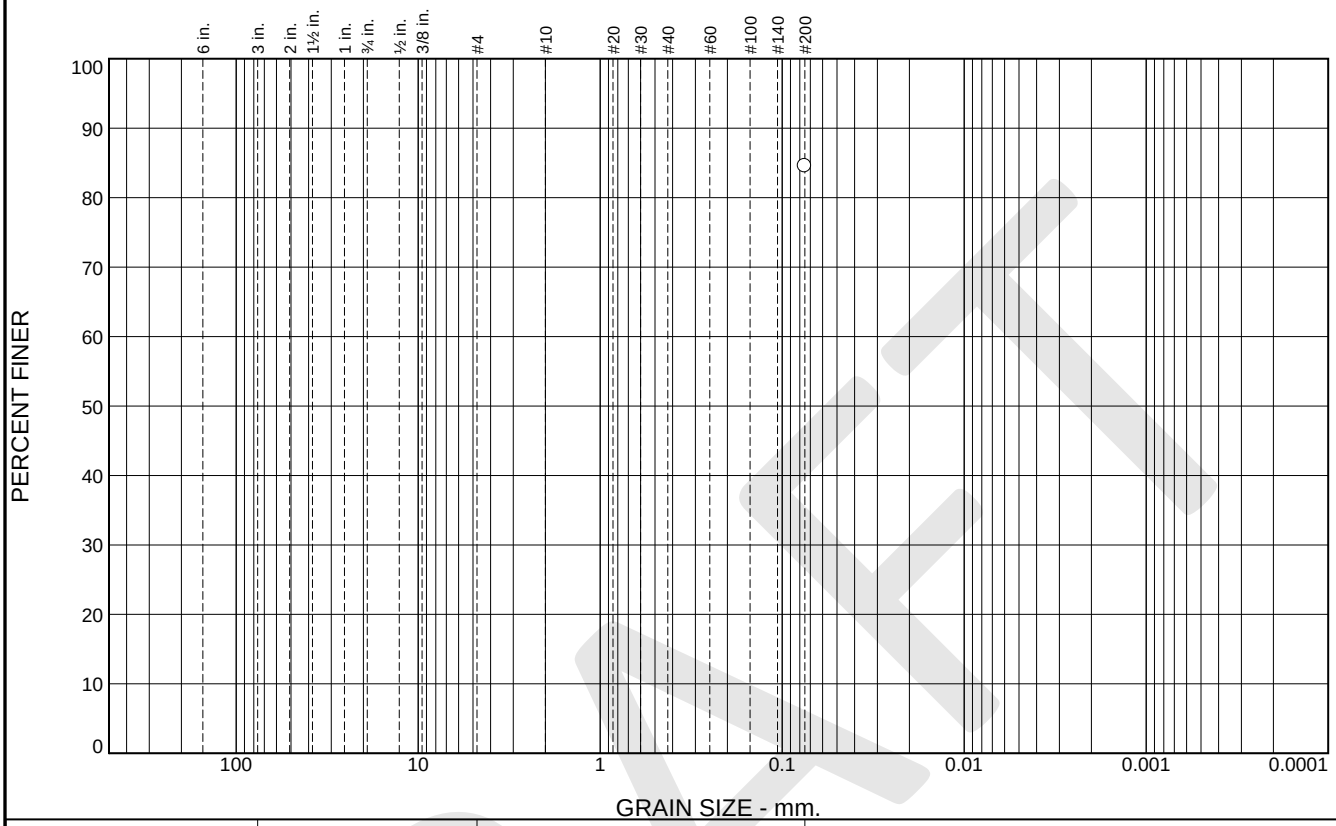
*SBT/SPT CORRELATION: UBC-1983

DRAFT

C3: Laboratory Test Results

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						84.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	84.6		

* (no specification provided)

Material Description

Lean CLAY with SAND, dark brown

Atterberg Limits

PL= 23 LL= 35 PI= 12

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B1 **Depth:** 10.5-11'
Sample Number: 3C **Date:**

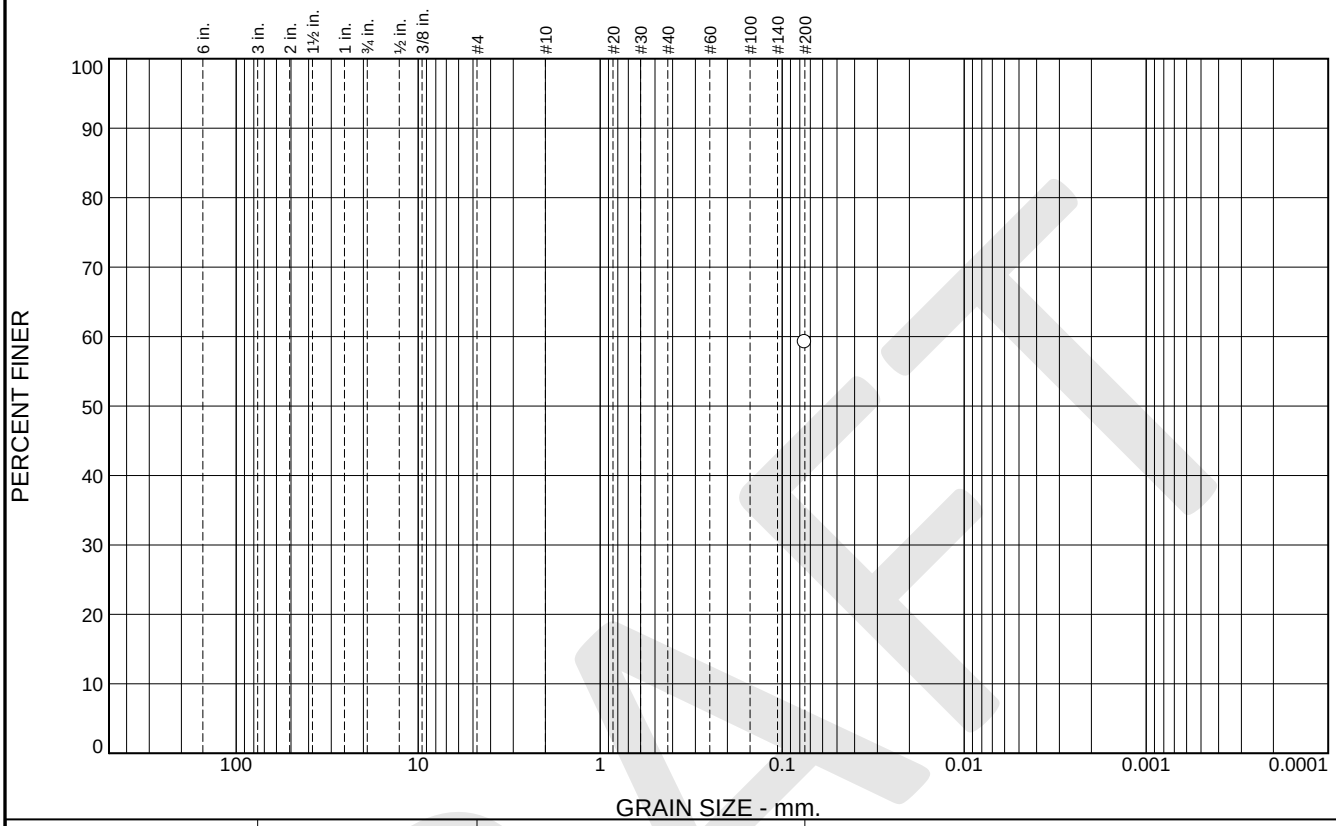
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						59.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	59.2		

* (no specification provided)

Material Description

SANDY lean CLAY, dark brown

Atterberg Limits

PL= 23 LL= 33 PI= 10

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B1 **Depth:** 15-16.5'
Sample Number: 4 **Date:**

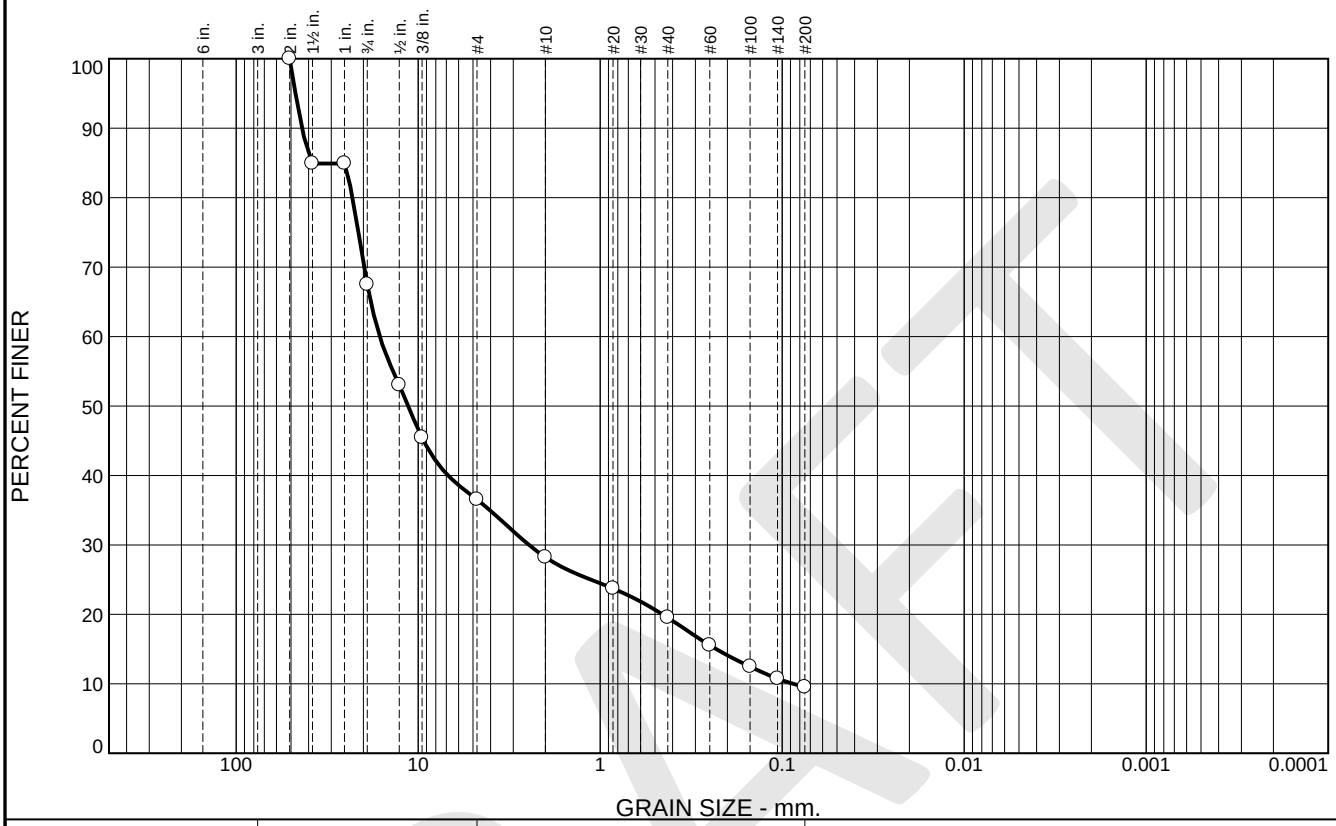
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	32.5	31.0	8.3	8.7	10.0	9.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100.0		
1.5"	84.9		
1"	84.9		
3/4"	67.5		
1/2"	53.0		
3/8"	45.5		
#4	36.5		
#10	28.2		
#20	23.7		
#40	19.5		
#60	15.6		
#100	12.5		
#140	10.7		
#200	9.5		

* (no specification provided)

Material Description

Poorly-graded GRAVEL with CLAY and SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 43.4671 D_{85}= 38.2710 D_{60}= 16.2624
D_{50}= 11.3555 D_{30}= 2.4592 D_{15}= 0.2303
D_{10}= 0.0866 C_u= 187.71 C_c= 4.29

Classification

USCS= GP-GC AASHTO=

Remarks

Source of Sample: B1 **Depth:** 20.5-21'
Sample Number: 5C **Date:**

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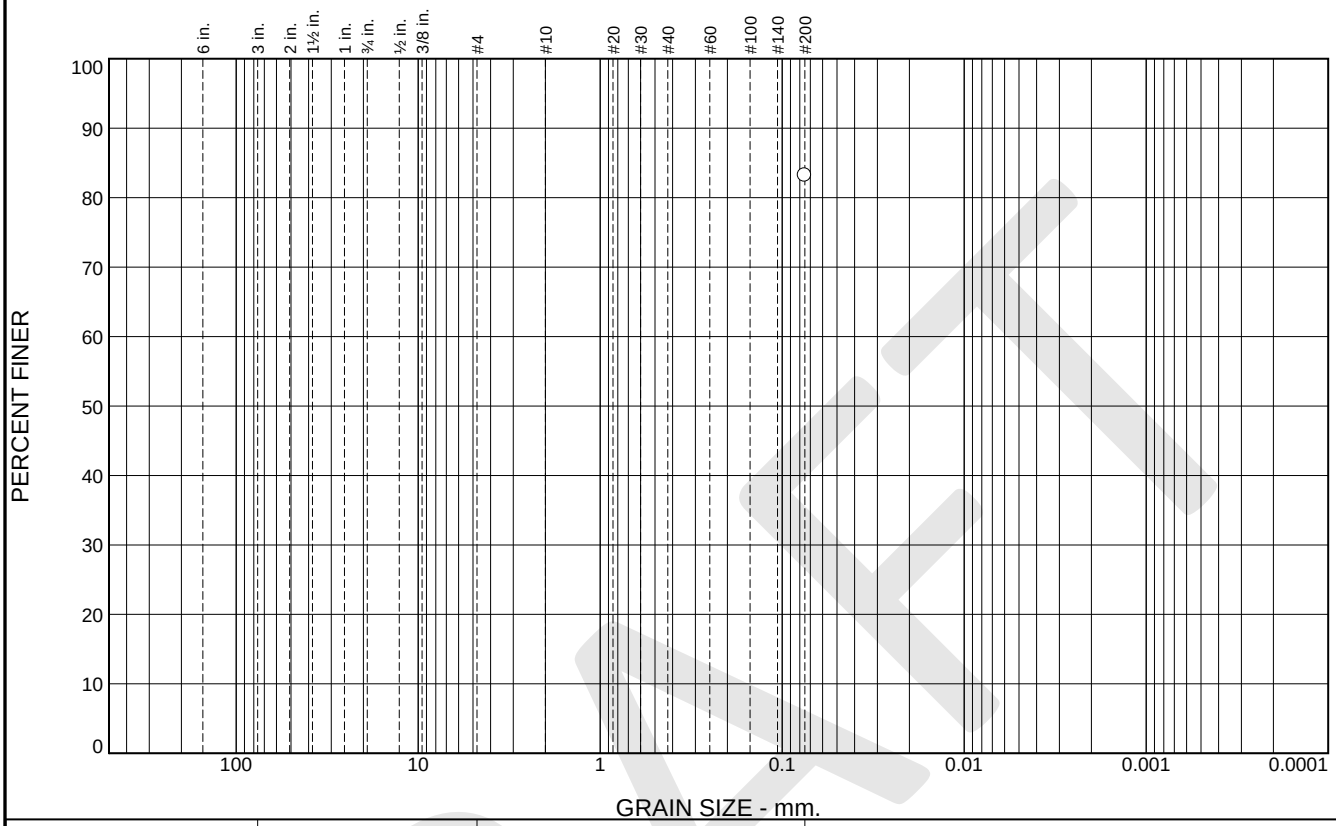
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						83.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	83.2		

* (no specification provided)

Material Description

Lean CLAY with SAND, dark yellowish brown

Atterberg Limits

PL= 26 LL= 43 PI= 17

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B1 **Depth:** 35-36.5'
Sample Number: 8 **Date:**

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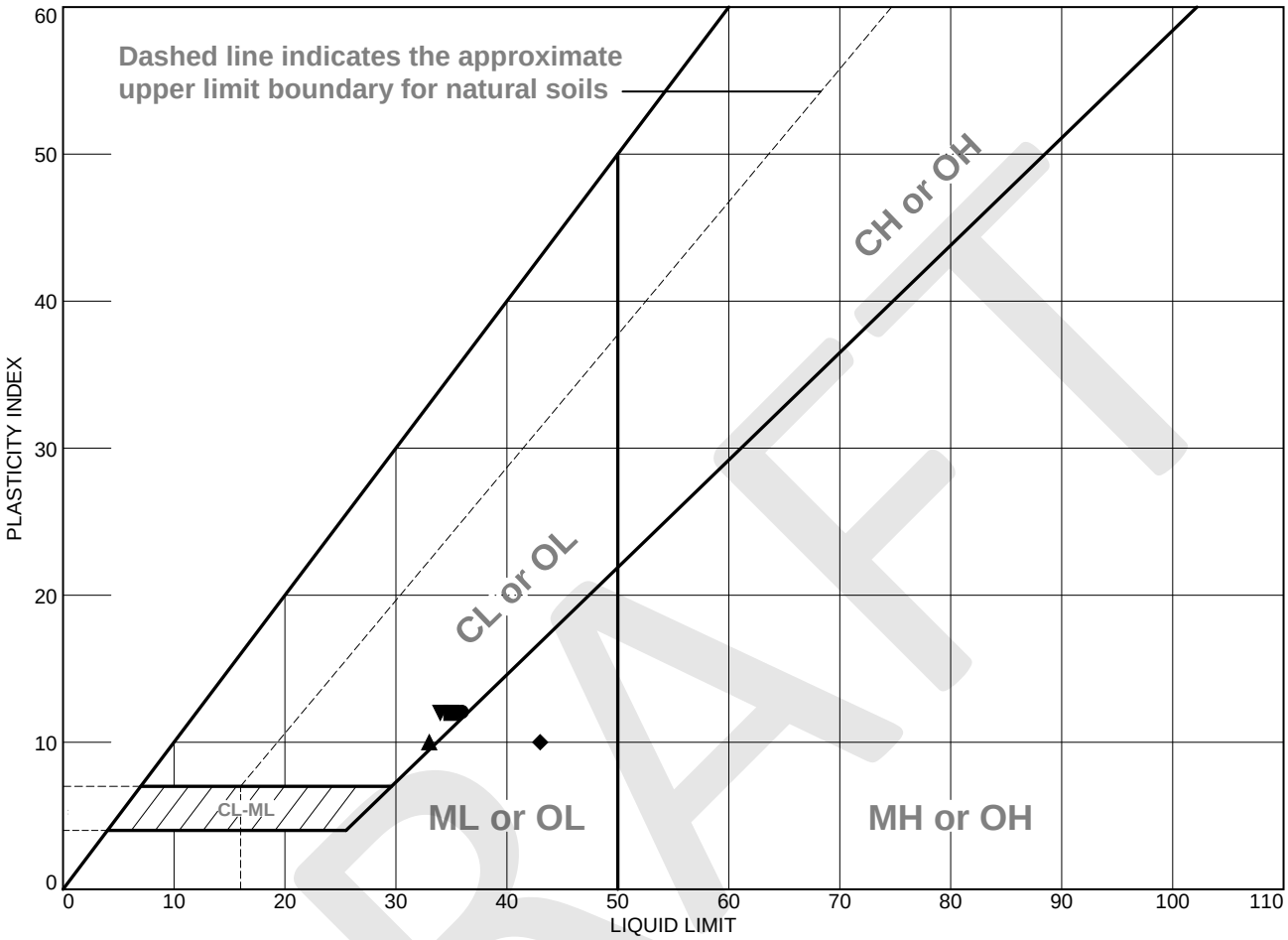
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY, very dark grayish brown	36	24	12			CL
■	Lean CLAY with SAND, dark brown	35	23	12		84.6	CL
▲	SANDY lean CLAY, dark brown	33	23	10		59.2	CL
◆	SILT, dark yellowish brown	43	33	10			ML
▼	Lean CLAY, strong brown	34	22	12			CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B1 **Depth:** 2.5-3' **Sample Number:** 1C
■**Source of Sample:** B1 **Depth:** 10.5-11' **Sample Number:** 3C
▲**Source of Sample:** B1 **Depth:** 15-16.5' **Sample Number:** 4
◆**Source of Sample:** B1 **Depth:** 25-26.5' **Sample Number:** 6
▼**Source of Sample:** B1 **Depth:** 30.5-31' **Sample Number:** 7B

Blackburn Consulting

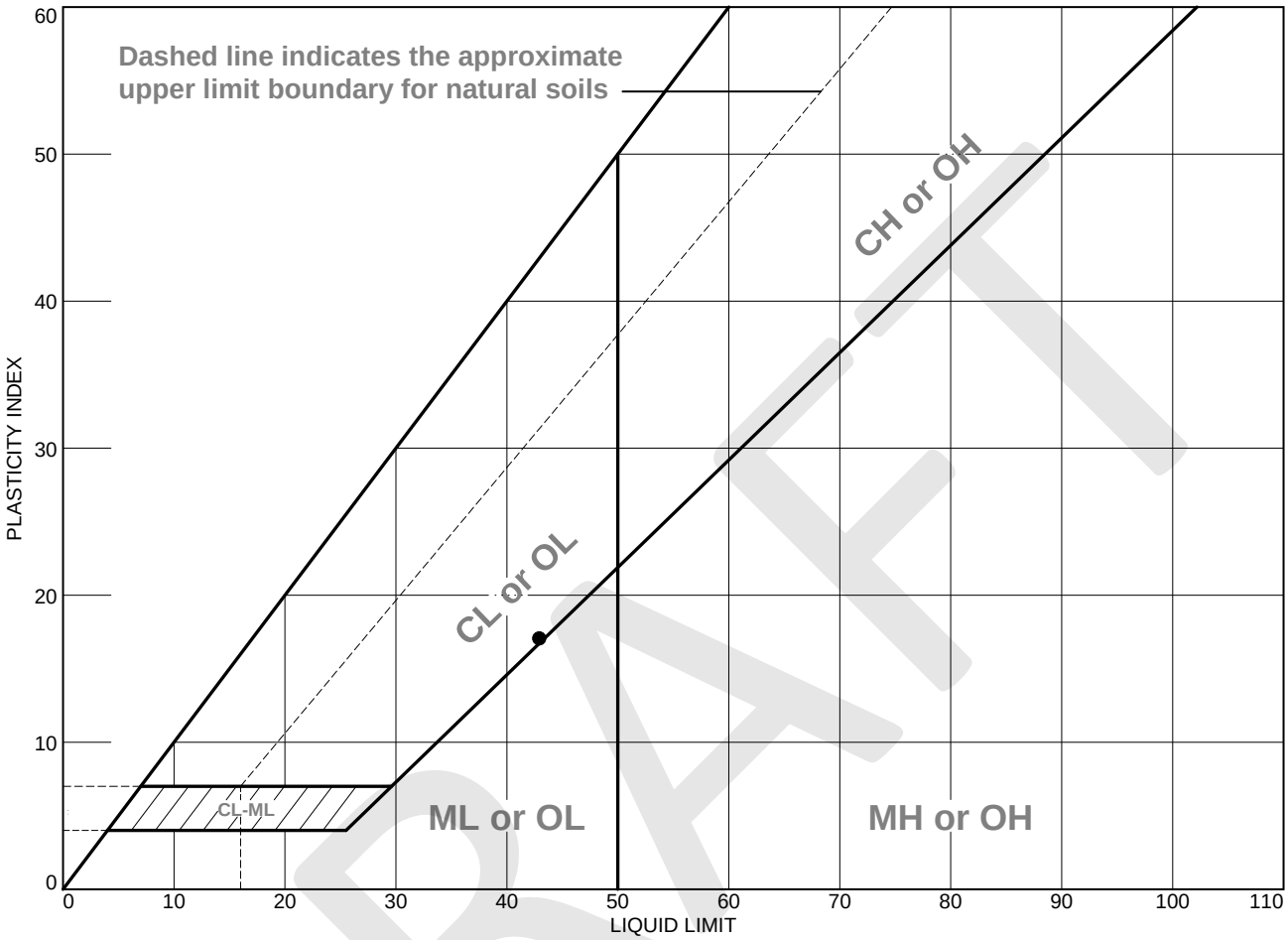
W. Sacramento, CA

Remarks:

Figure

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY with SAND, dark yellowish brown	43	26	17		83.2	CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B1 **Depth:** 35-36.5' **Sample Number:** 8

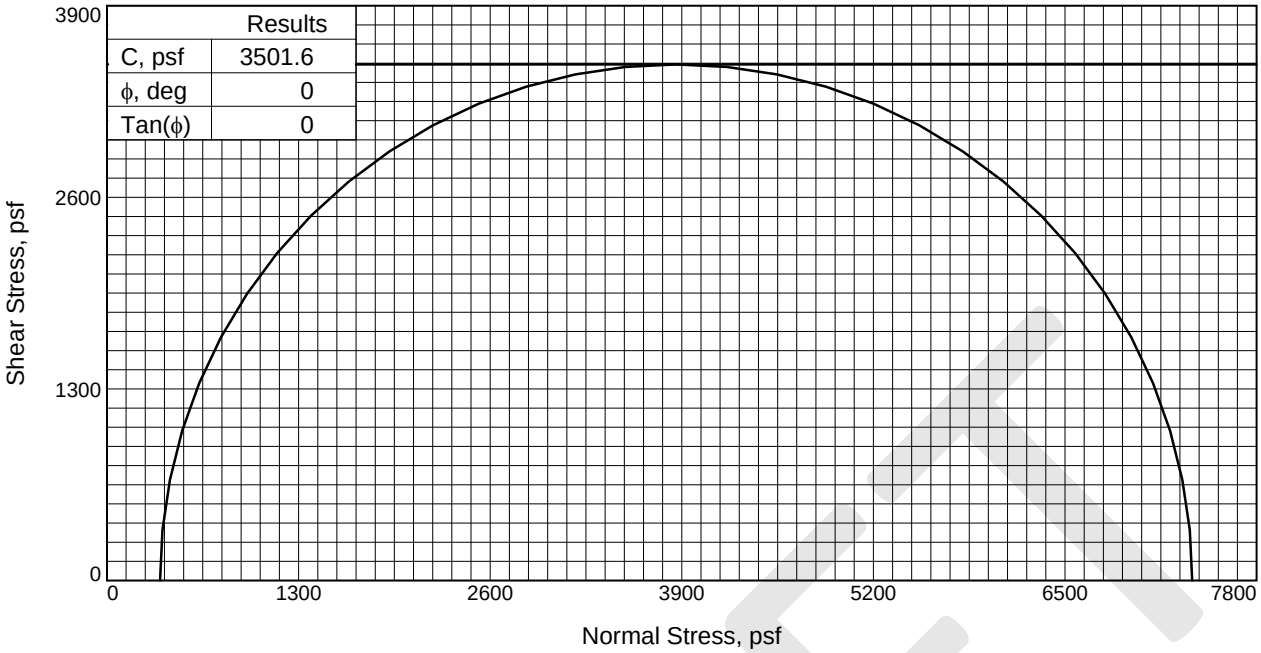
Remarks:

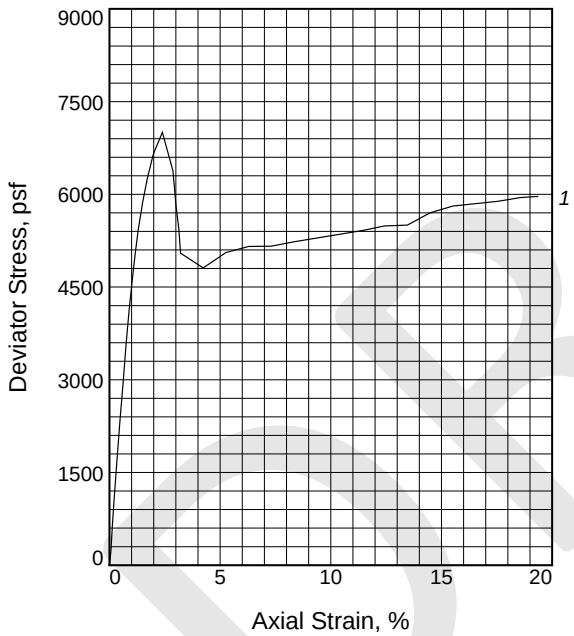
Blackburn Consulting

W. Sacramento, CA

Figure

DRAFT





Sample No.		1
Initial	Water Content, %	18.7
	Dry Density, pcf	103.0
	Saturation, %	79.4
	Void Ratio	0.6372
	Diameter, in.	2.392
	Height, in.	5.010
At Test	Water Content, %	18.7
	Dry Density, pcf	103.0
	Saturation, %	79.2
	Void Ratio	0.6372
	Diameter, in.	2.392
	Height, in.	5.010
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		360.0
Fail. Stress, psf		7003.1
Strain, %		2.4
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		7363.1
σ_3 Failure, psf		360.0

Type of Test:
Unconsolidated Undrained

Sample Type: CalMod

Description: Lean CLAY, very dark grayish brown

LL= 36 **PL=** 24 **PI=** 12

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B1 **Depth:** 2.5-3'

Sample Number: 1C

Proj. No.: 3934.X **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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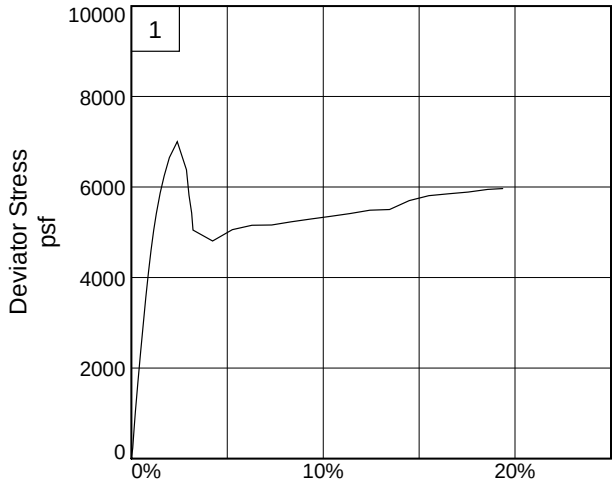
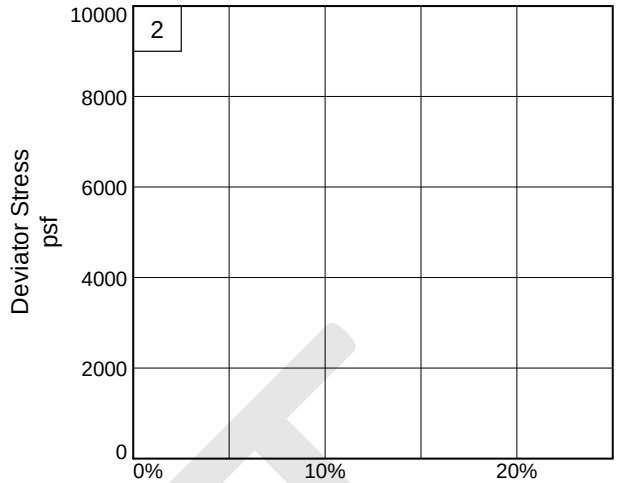
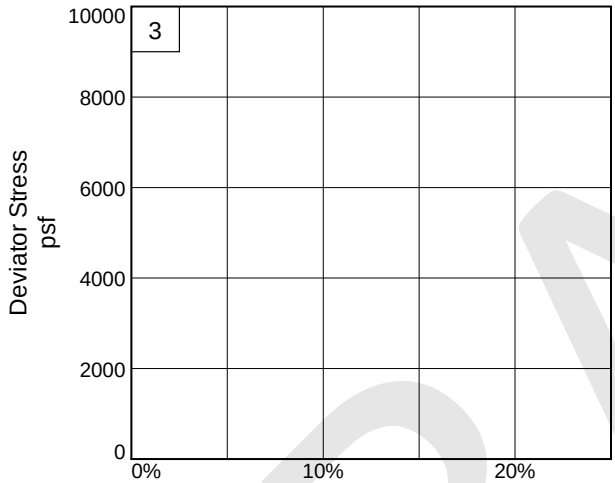
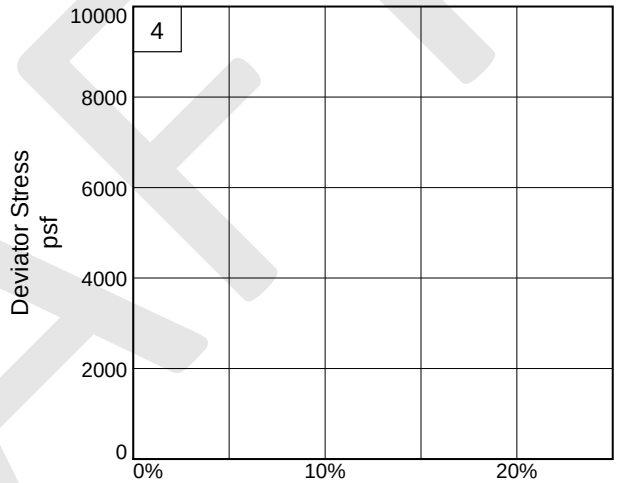
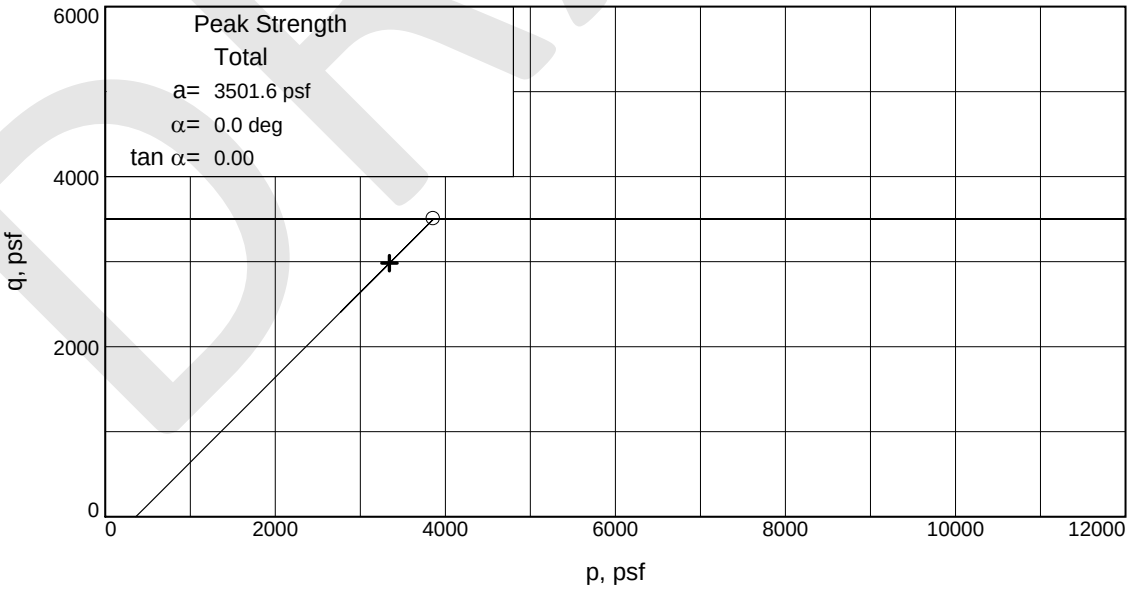










Stress Paths: o indicates peak + indicates end

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

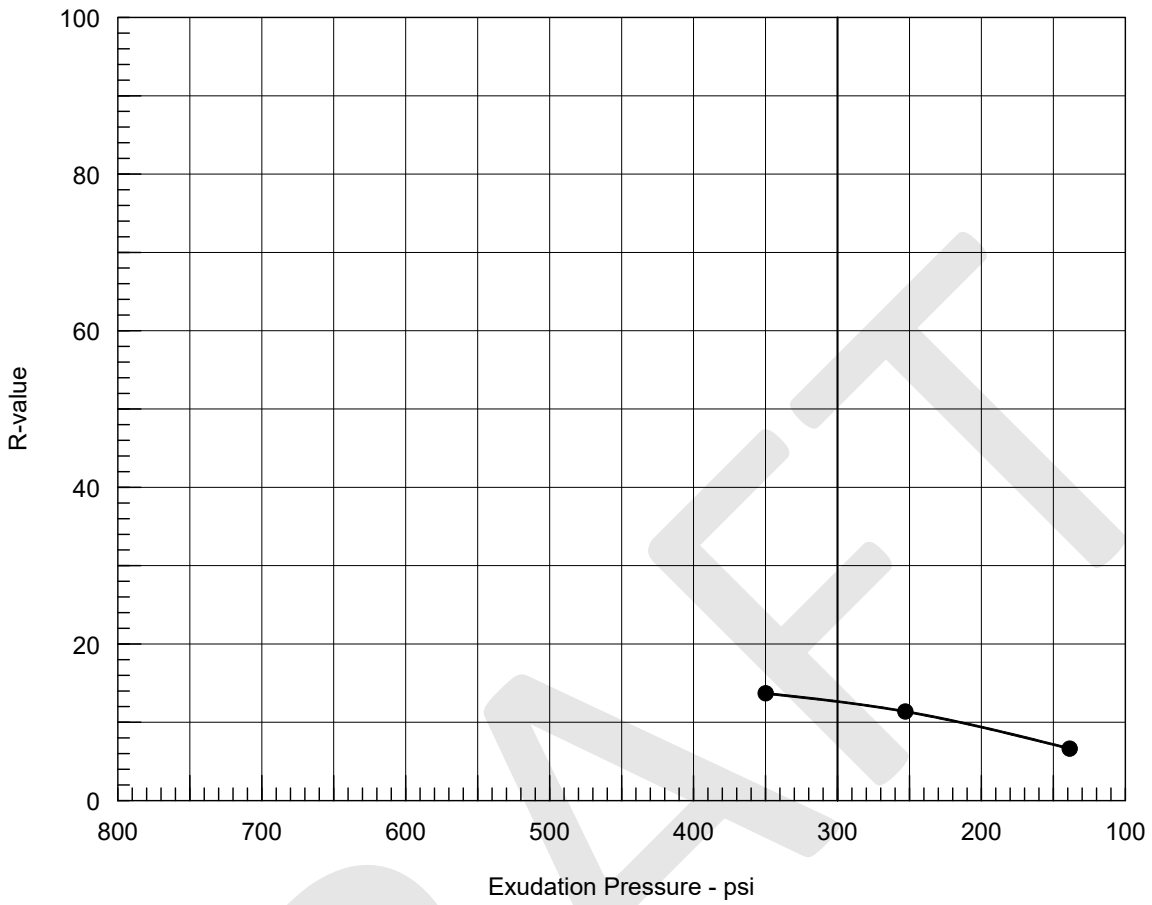
Source of Sample: B1 **Depth:** 2.5-3' **Sample Number:** 1C

Project No.: 3934.X **Figure** _____

Blackburn Consulting

DRAFT

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	42	105.0	20.1	17	128	2.43	350	14	14
2	42	102.5	21.8	0	134	2.47	253	11	11
3	36	99.4	24.2	0	143	2.53	139	7	7

Test Results	Material Description
R-value at 300 psi exudation pressure = 13	Lean CLAY, dark yellowish brown

Project No.: 3934.X
Project: Wheatland Regional Sewer Connection Project
Source of Sample: B1 **Depth:** 0-5'
Sample Number: Bulk A
Date: 3/28/2022

Tested by: BRL
Checked by: RBL
Remarks:

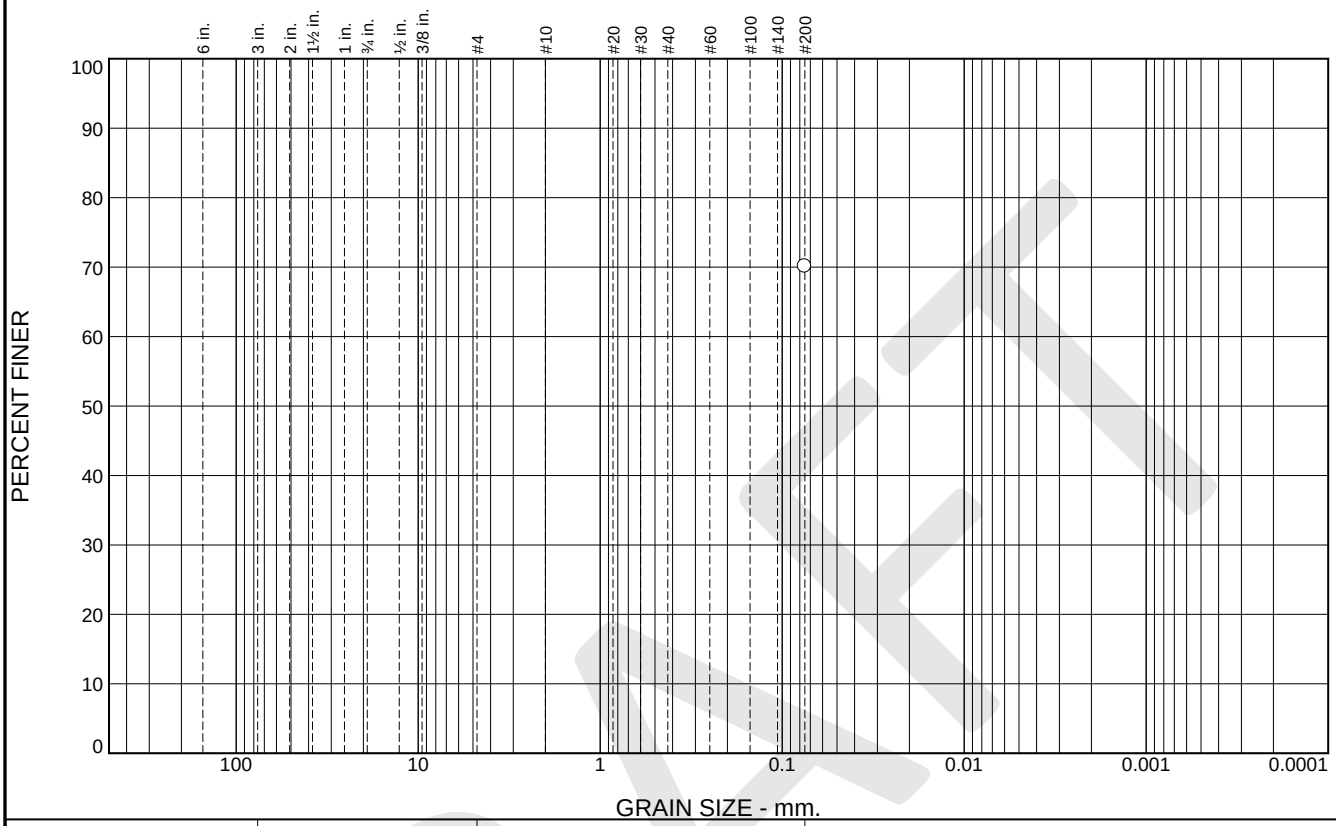
R-VALUE TEST REPORT

Blackburn Consulting

Figure _____

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						70.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	70.1		

* (no specification provided)

Material Description

Lean CLAY with SAND, brown

Atterberg Limits

PL= 16 LL= 35 PI= 19

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B2 **Depth:** 5.5-6'
Sample Number: 2C **Date:**

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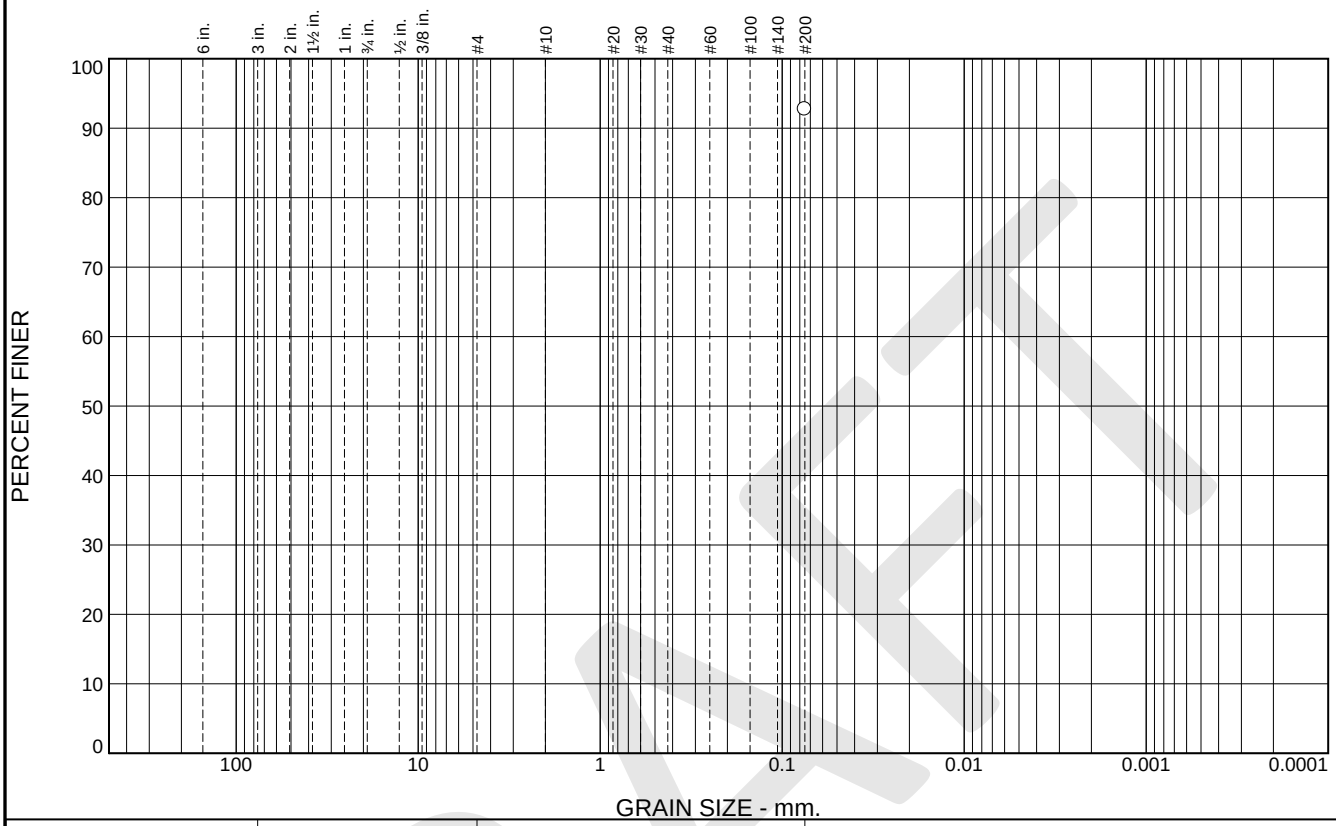
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						92.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	92.7		

* (no specification provided)

Material Description

Lean CLAY, strong brown

Atterberg Limits

PL= 26 LL= 43 PI= 17

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B2 **Depth:** 15.5-16'
Sample Number: 4C **Date:**

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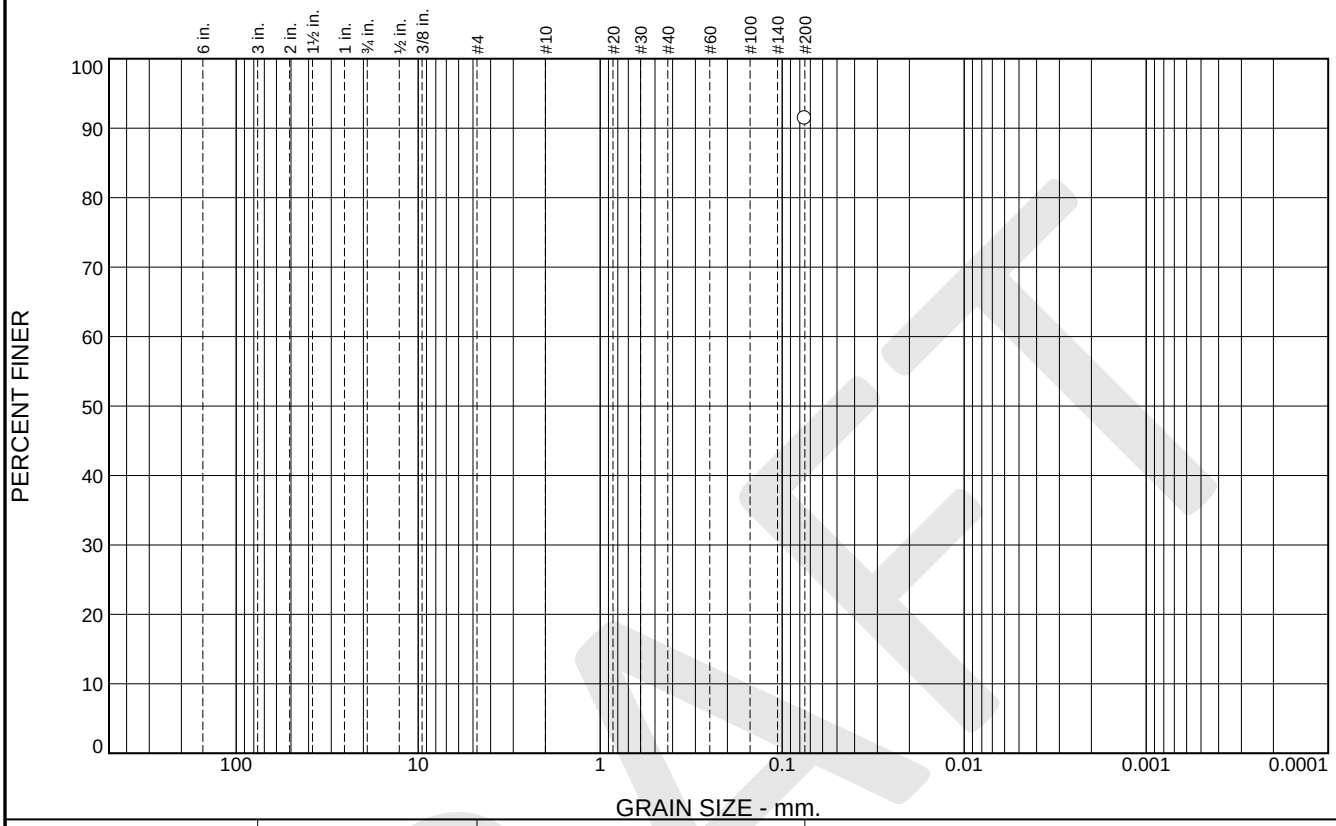
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						91.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	91.4		

* (no specification provided)

Material Description

SILT, dark yellowish brown

Atterberg Limits

PL= 28 LL= 44 PI= 16

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Source of Sample: B2 **Depth:** 26-26.5
Sample Number: 6C **Date:**

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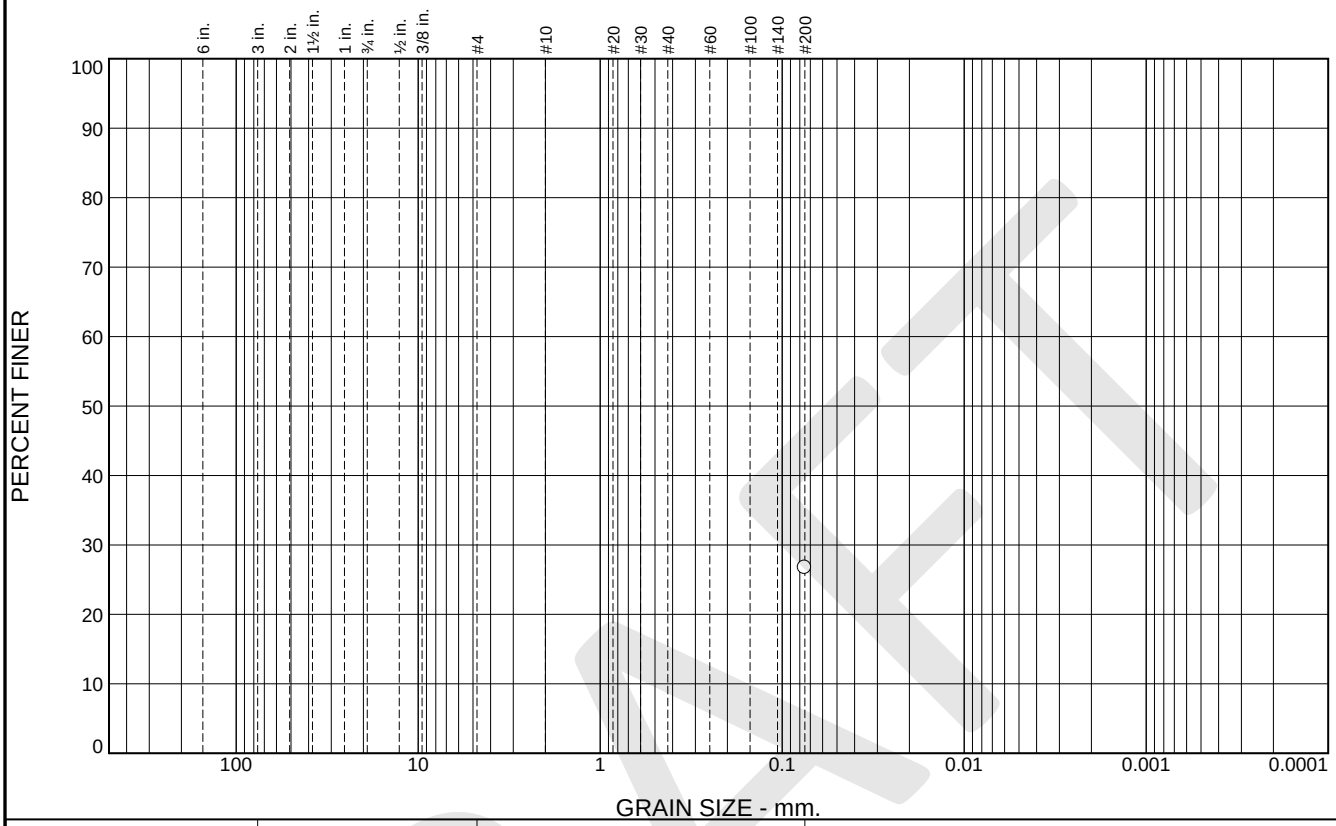
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						26.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	26.7		

* (no specification provided)

Material Description

SILTY SAND, brown

Atterberg Limits

PL= 31 LL= 39 PI= 8

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B61 **Depth:** 2.5-3'
Sample Number: 1C **Date:**

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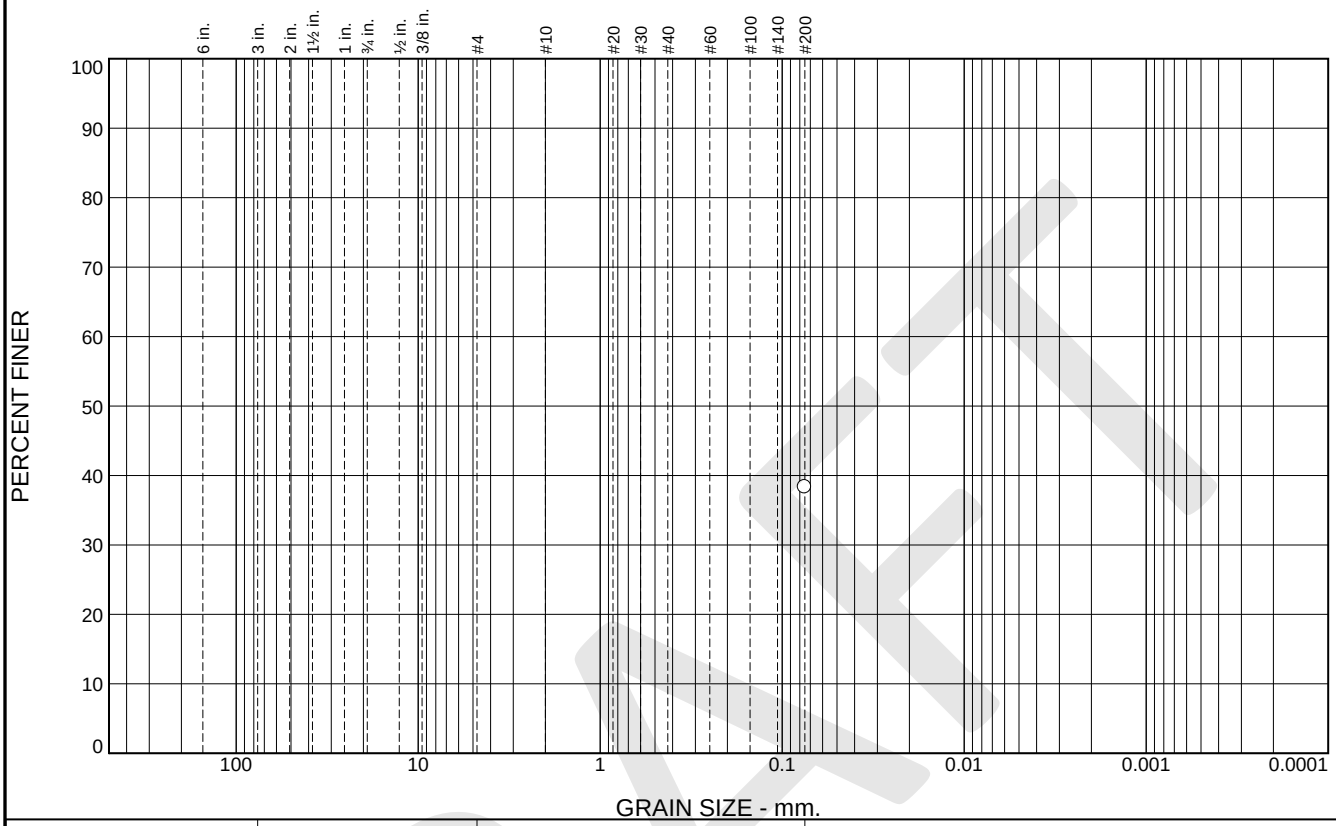
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						38.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	38.3		

* (no specification provided)

Material Description

SILTY SAND, dark yellowish brown

Atterberg Limits

PL= 25 LL= 34 PI= 9

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B61 **Depth:** 5-6.5'
Sample Number: 2 **Date:**

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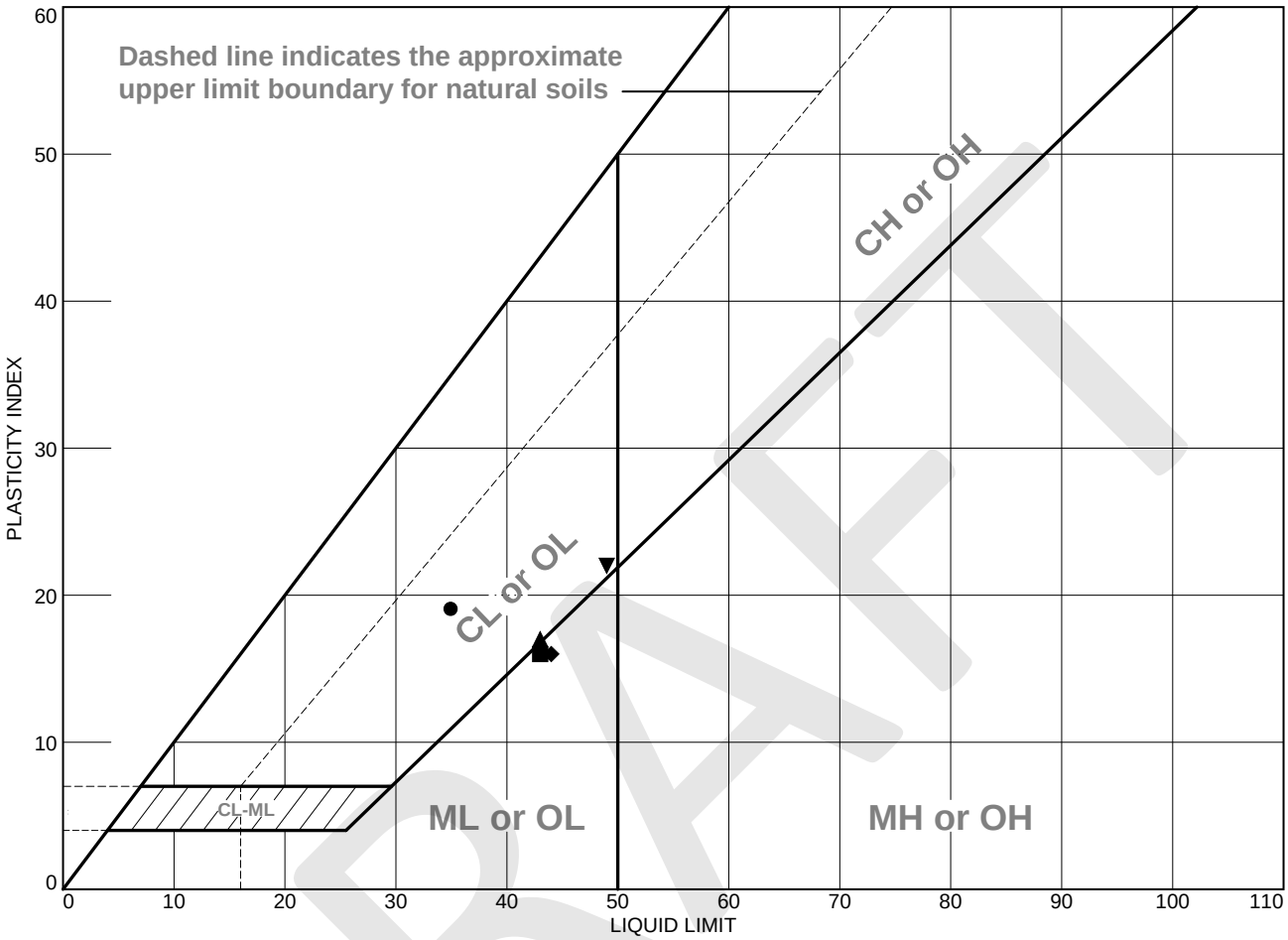
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY with SAND, brown	35	16	19		70.1	CL
■	SILT with SAND, brown	43	27	16			ML
▲	Lean CLAY, strong brown	43	26	17		92.7	CL
◆	SILT, dark yellowish brown	44	28	16		91.4	ML
▼	Lean CLAY with SAND, yellowish brown	49	27	22			CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B2 **Depth:** 5.5-6' **Sample Number:** 2C
■**Source of Sample:** B2 **Depth:** 10-11.5' **Sample Number:** 3
▲**Source of Sample:** B2 **Depth:** 15.5-16' **Sample Number:** 4C
◆**Source of Sample:** B2 **Depth:** 26-26.5 **Sample Number:** 6C
▼**Source of Sample:** B2 **Depth:** 30-31.5 **Sample Number:** 7

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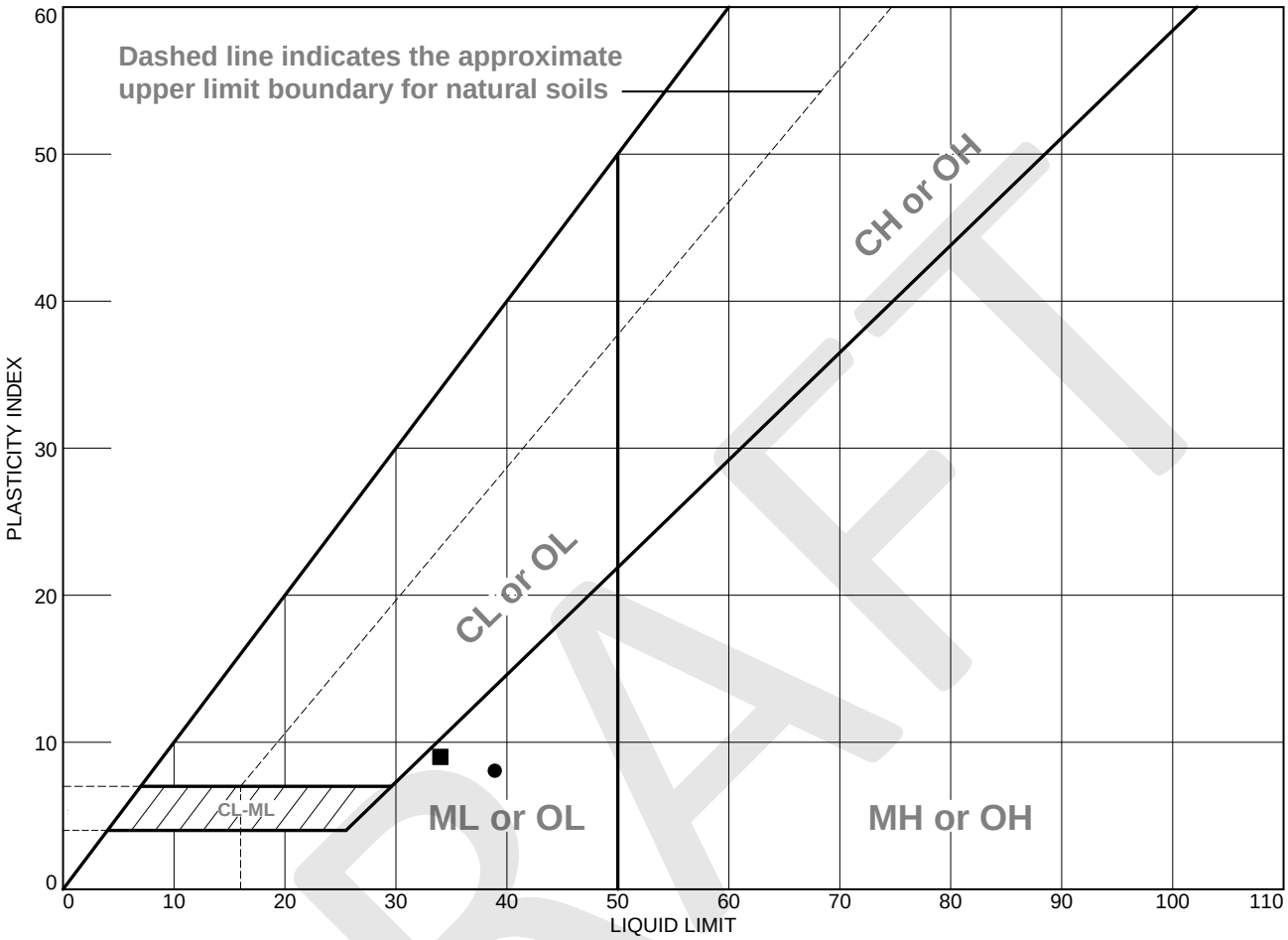
Remarks:

Figure

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SILTY SAND, brown	39	31	8		26.7	SM
■	SILTY SAND, dark yellowish brown	34	25	9		38.3	SM

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B61 **Depth:** 2.5-3' **Sample Number:** 1C

■**Source of Sample:** B61 **Depth:** 5-6.5' **Sample Number:** 2

Remarks:

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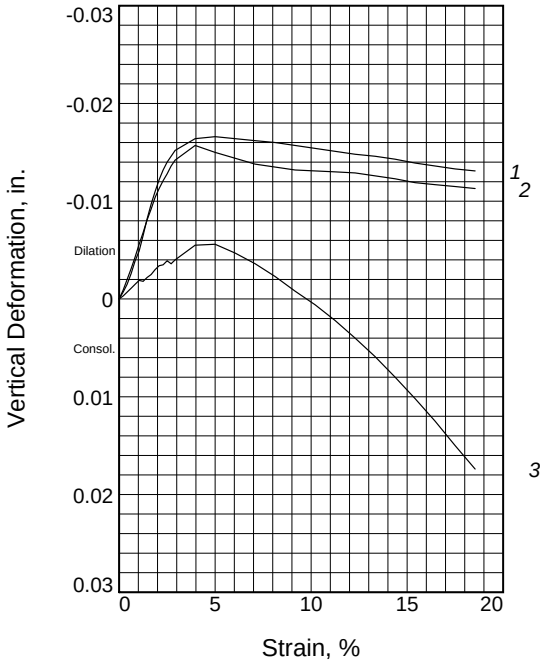
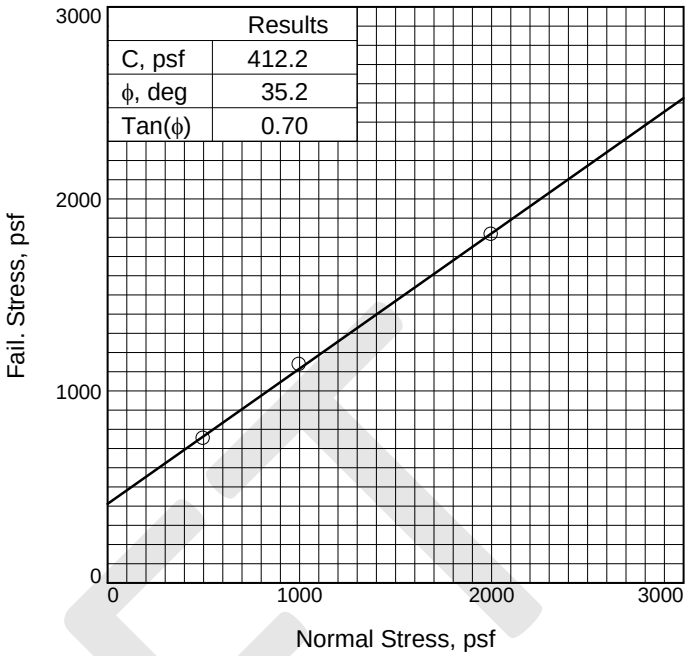
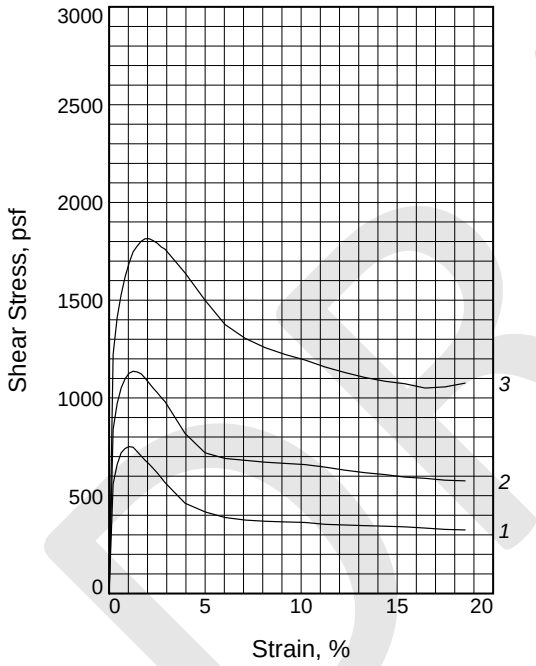
Figure

DRAFT





	Results
C, psf	412.2
ϕ, deg	35.2
Tan(ϕ)	0.70



	Sample No.	1	2	3
Initial	Water Content, %	9.4	7.1	7.0
	Dry Density, pcf	118.2	120.6	118.5
	Saturation, %	59.6	48.3	45.0
	Void Ratio	0.4259	0.3974	0.4222
	Diameter, in.	2.400	2.400	2.400
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	15.5	14.6	13.9
	Dry Density, pcf	118.9	121.0	122.5
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4174	0.3929	0.3765
	Diameter, in.	2.400	2.400	2.400
	Height, in.	0.994	0.997	0.968
Normal Stress, psf		500.0	1000.0	2000.0
Fail. Stress, psf		751.2	1136.4	1814.4
Strain, %		1.0	1.3	1.9
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.003	0.003	0.003

Sample Type: CalMod
Description: Lean CLAY with SAND, brown

LL= 35 **PL=** 16 **PI=** 19
Assumed Specific Gravity= 2.7
Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B2 **Depth:** 5.5-6'
Sample Number: 2C
Proj. No.: 3934.X **Date Sampled:**

DIRECT SHEAR TEST REPORT
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W. Sacramento, CA

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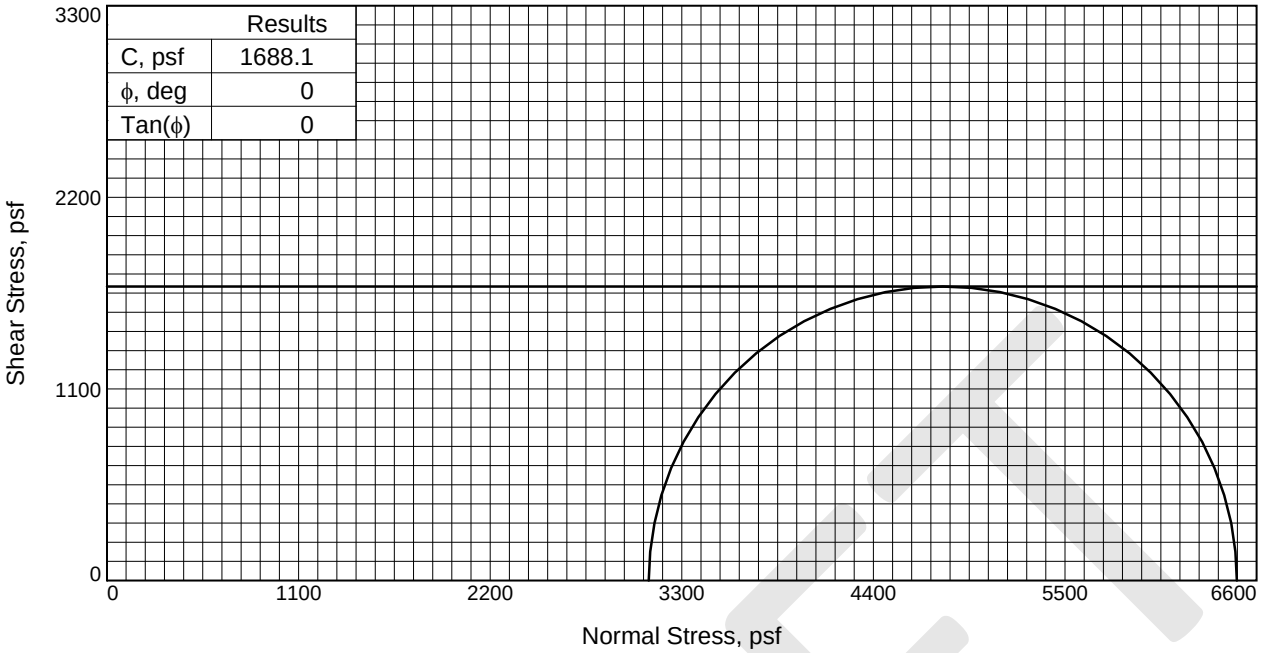

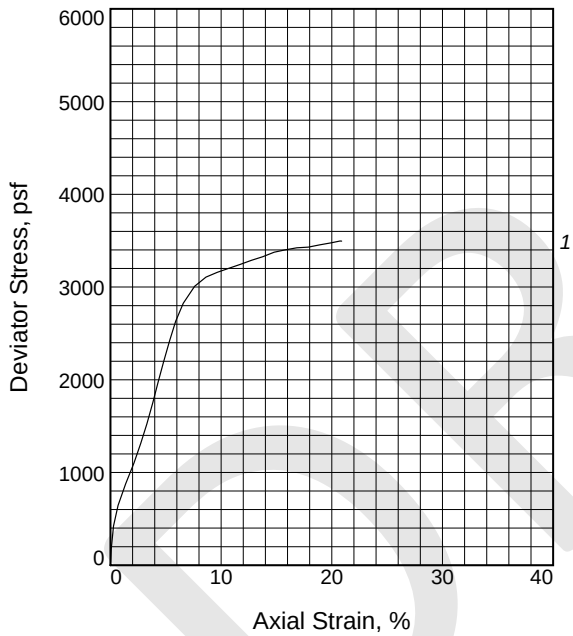

Sample No.		1
Initial	Water Content, %	38.6
	Dry Density, pcf	81.3
	Saturation, %	97.1
	Void Ratio	1.0729
	Diameter, in.	2.405
	Height, in.	4.998
At Test	Water Content, %	38.6
	Dry Density, pcf	81.3
	Saturation, %	97.1
	Void Ratio	1.0729
	Diameter, in.	2.405
	Height, in.	4.998
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		3110.4
Fail. Stress, psf		3376.2
Strain, %		14.8
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		6486.6
σ_3 Failure, psf		3110.4

Type of Test:
Unconsolidated Undrained

Sample Type: CalMod

Description: SILT, dark yellowish brown

LL= 44 **PL=** 28 **PI=** 16

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B2 **Depth:** 26-26.5

Sample Number: 6C

Proj. No.: 3934.X **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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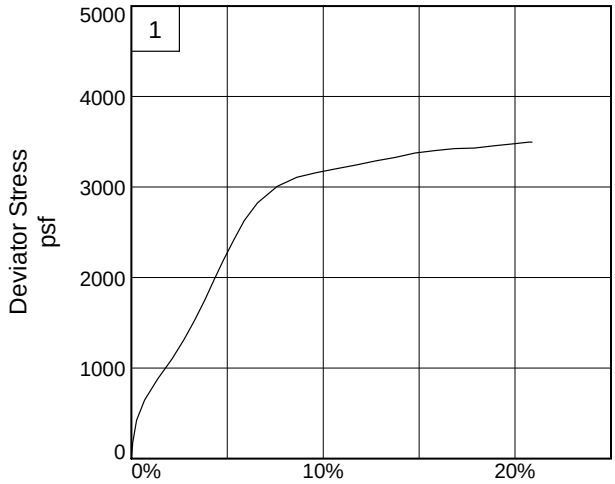
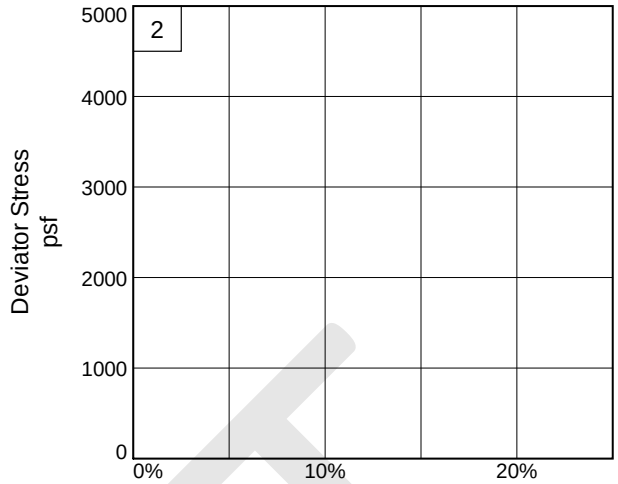
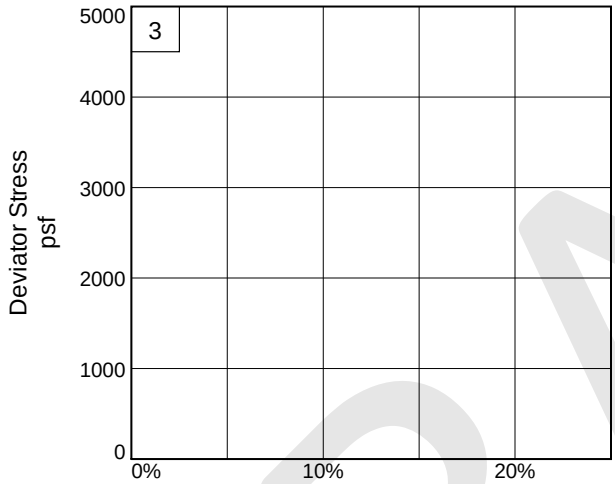
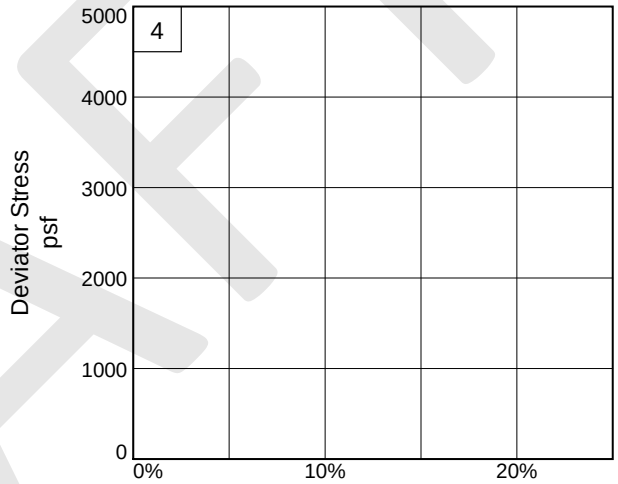
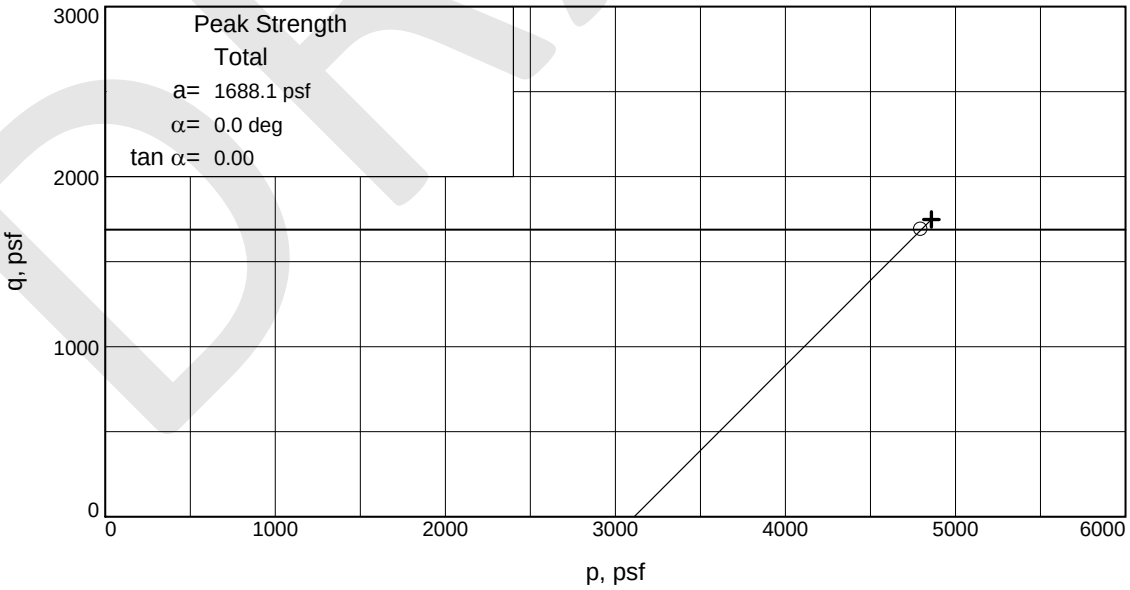
DRAFT











Stress Paths: o indicates peak + indicates end

DRAFT

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B2 **Depth:** 26-26.5 **Sample Number:** 6C

Project No.: 3934.X **Figure** _____

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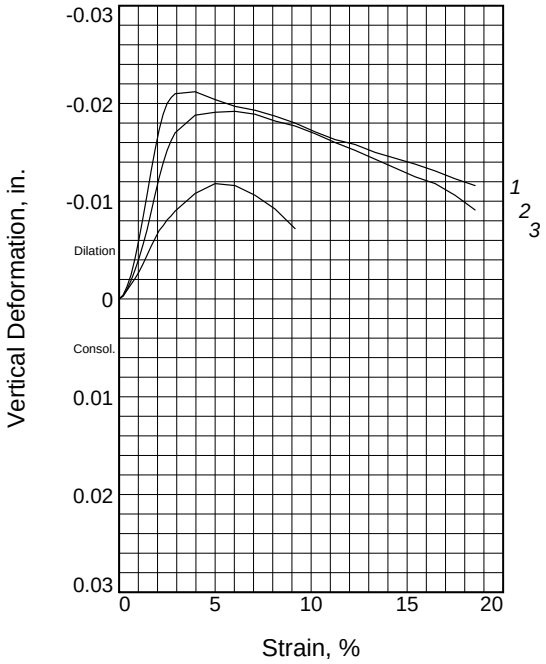
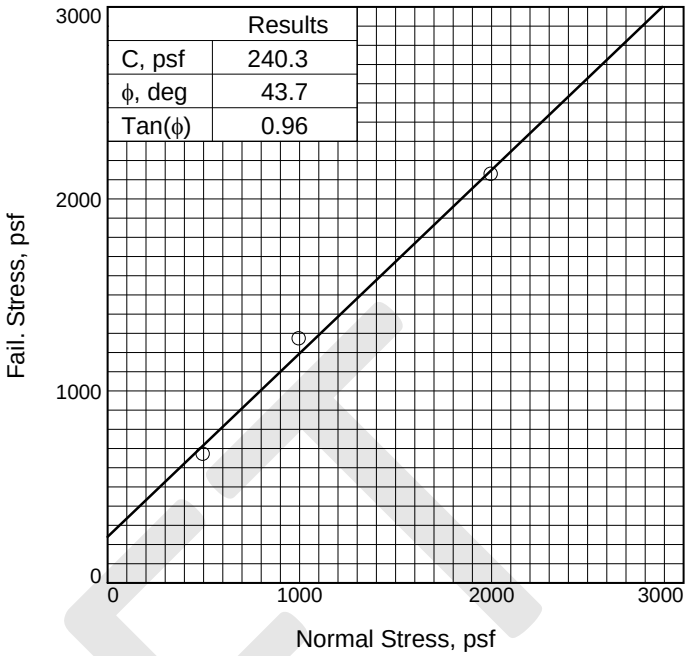
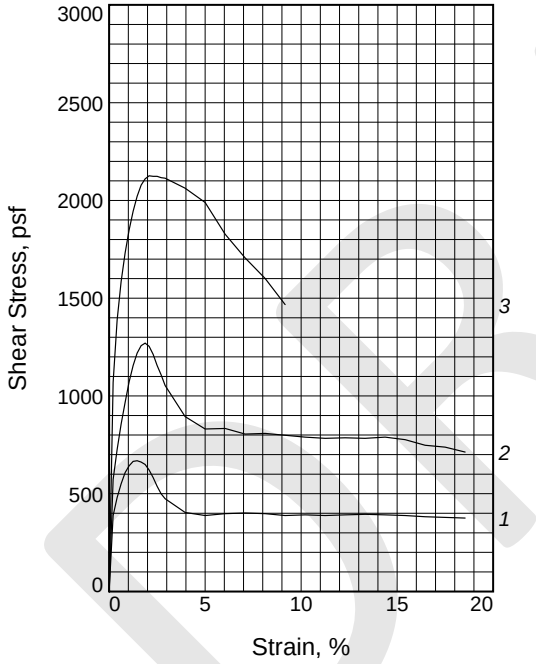




	Results
C, psf	240.3
ϕ, deg	43.7
Tan(ϕ)	0.96



	Sample No.	1	2	3
Initial	Water Content, %	13.4	16.4	15.5
	Dry Density, pcf	103.1	97.5	90.7
	Saturation, %	57.1	61.0	48.8
	Void Ratio	0.6355	0.7283	0.8588
	Diameter, in.	2.400	2.400	2.400
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	22.5	24.7	28.8
	Dry Density, pcf	104.9	99.3	94.9
	Saturation, %	100.0	95.8	100.0
	Void Ratio	0.6061	0.6968	0.7765
	Diameter, in.	2.400	2.400	2.400
	Height, in.	0.982	0.982	0.956
Normal Stress, psf		500.0	1000.0	2000.0
Fail. Stress, psf		668.5	1270.1	2126.3
Strain, %		1.5	1.9	2.1
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.003	0.003	0.003

Sample Type: CalMod
Description: SILTY SAND, brown

LL= 39 **PL=** 31 **PI=** 8
Assumed Specific Gravity= 2.7
Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B61 **Depth:** 2.5-3'
Sample Number: 1C
Proj. No.: 3934.X **Date Sampled:**

DIRECT SHEAR TEST REPORT
Blackburn Consulting
W. Sacramento, CA

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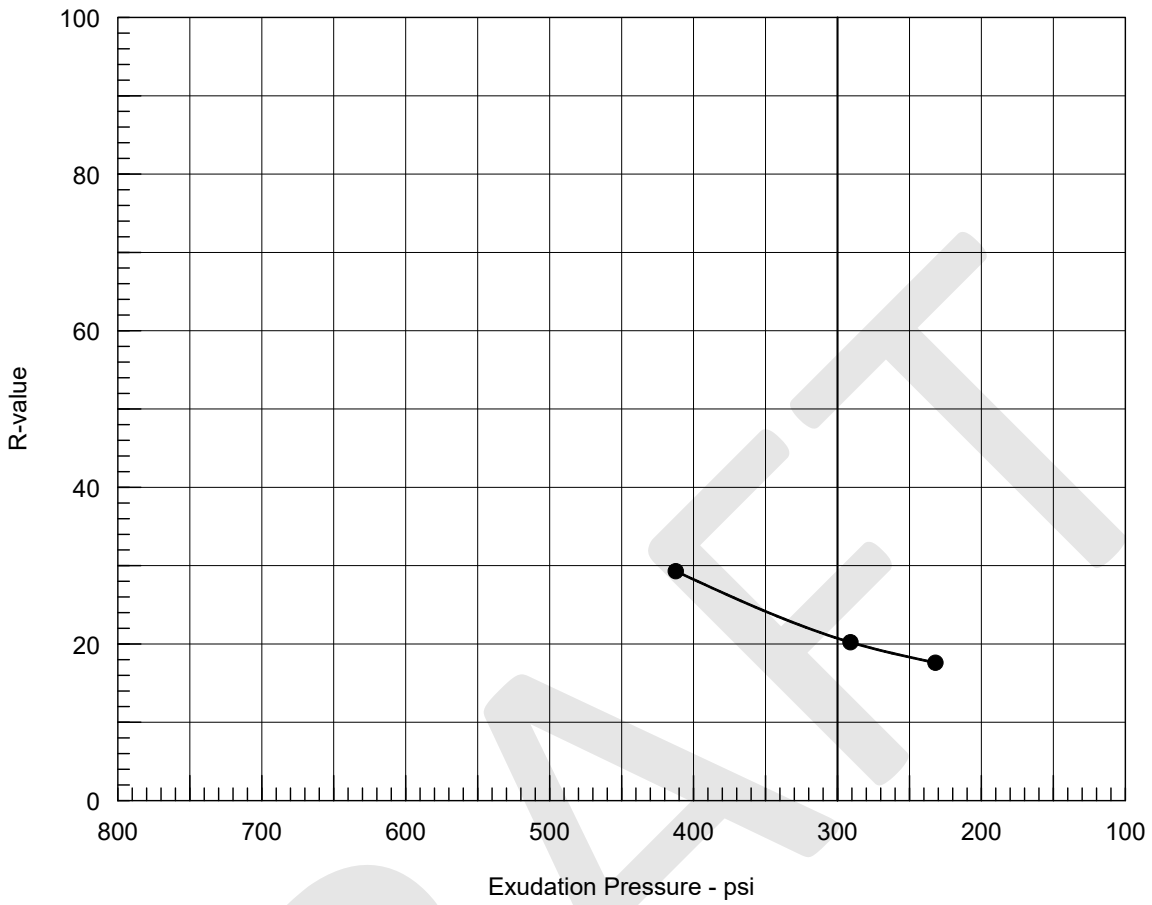
R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	73	111.5	17.2	109	104	2.50	412	29	29
2	63	108.0	18.3	17	118	2.58	291	19	20
3	42	106.3	19.4	44	124	2.57	232	17	18

Test Results	Material Description
R-value at 300 psi exudation pressure = 21	Lean CLAY, dark brown

Project No.: 3934.X
Project: Wheatland Regional Sewer Connection Project
Source of Sample: B2 **Depth:** 0-5'
Sample Number: Bulk A
Date: 3/28/2022

Tested by: BRL
Checked by: RBL
Remarks:

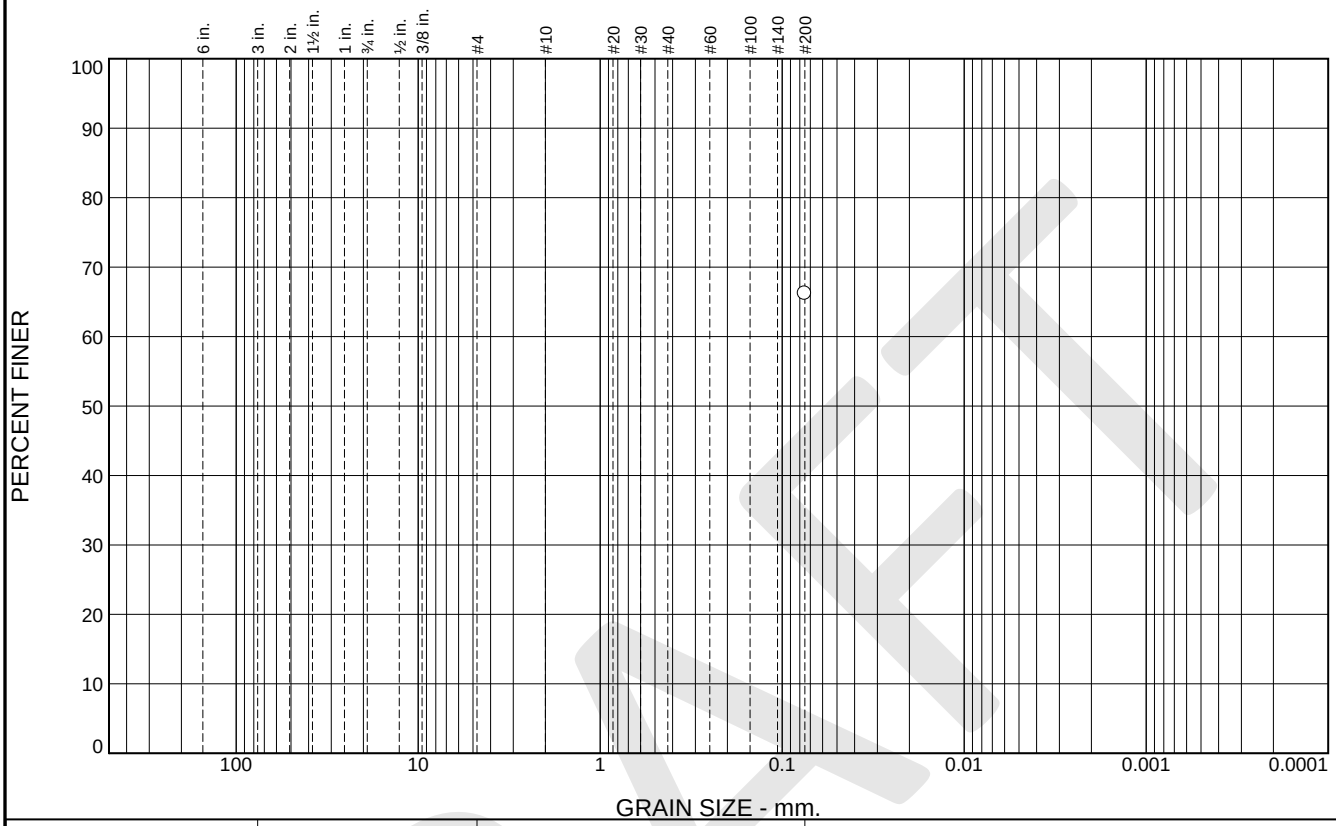
R-VALUE TEST REPORT

Blackburn Consulting

Figure _____

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						66.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	66.2		

* (no specification provided)

Material Description

SANDY lean CLAY, reddish brown

Atterberg Limits

PL= 20 LL= 29 PI= 9

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B3 **Depth:** 5.5-6'
Sample Number: 2B **Date:**

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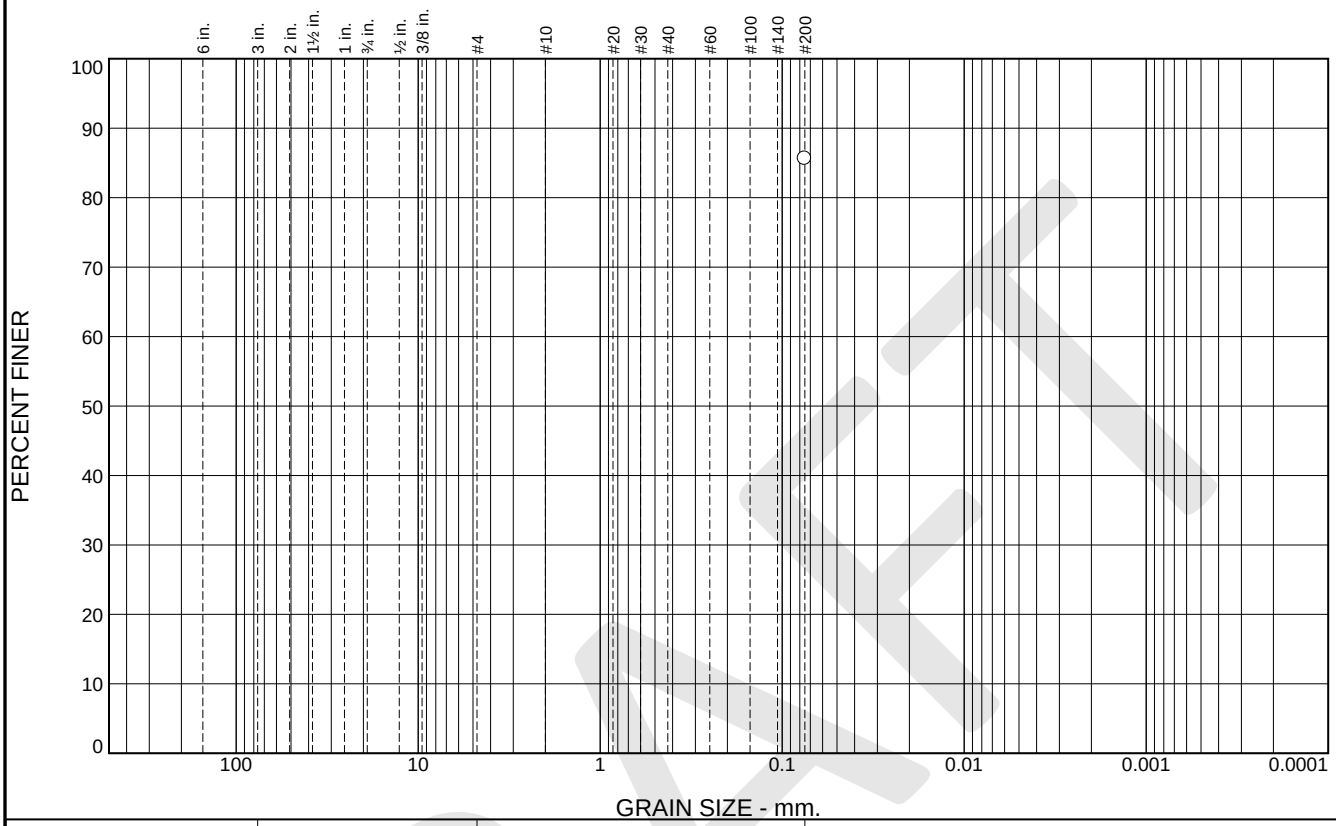
Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						85.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	85.6		

* (no specification provided)

Material Description

Lean CLAY, brown

Atterberg Limits

PL= 22 LL= 47 PI= 25

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B3 **Depth:** 11-11.5'
Sample Number: 3C **Date:**

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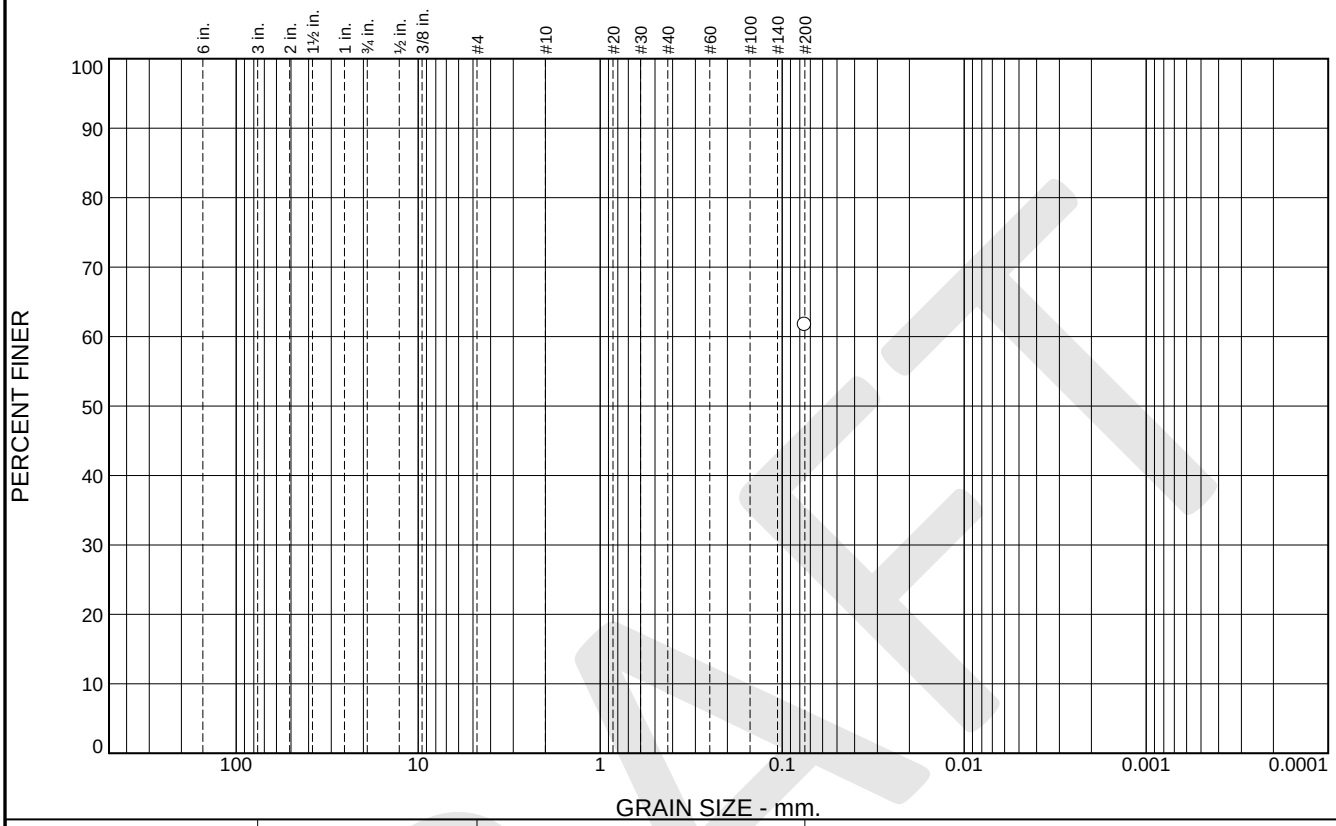
W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						61.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	61.7		

* (no specification provided)

Material Description

SANDY lean CLAY, reddish brown

Atterberg Limits

PL= 24 LL= 34 PI= 10

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B51 **Depth:** 5.2-5.7'
Sample Number: 2C **Date:**

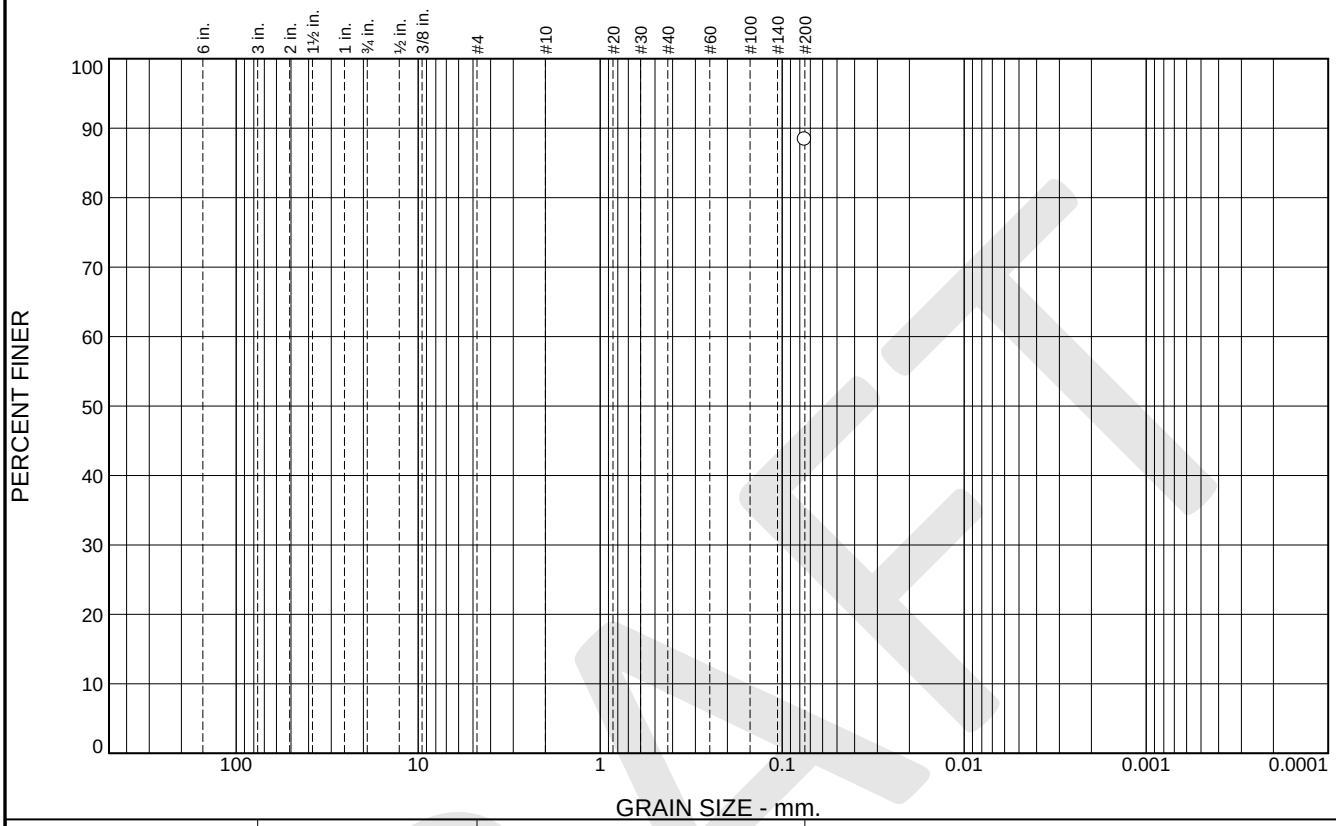
Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						88.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	88.4		

* (no specification provided)

Material Description

Lean CLAY, reddish brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B52 **Depth:** 3-3.5'
Sample Number: 1C **Date:**

Blackburn Consulting

W. Sacramento, CA

Client: Coastland Civil Engineering
Project: Wheatland Regional Sewer Connection Project
Project No: 3934.X **Figure**

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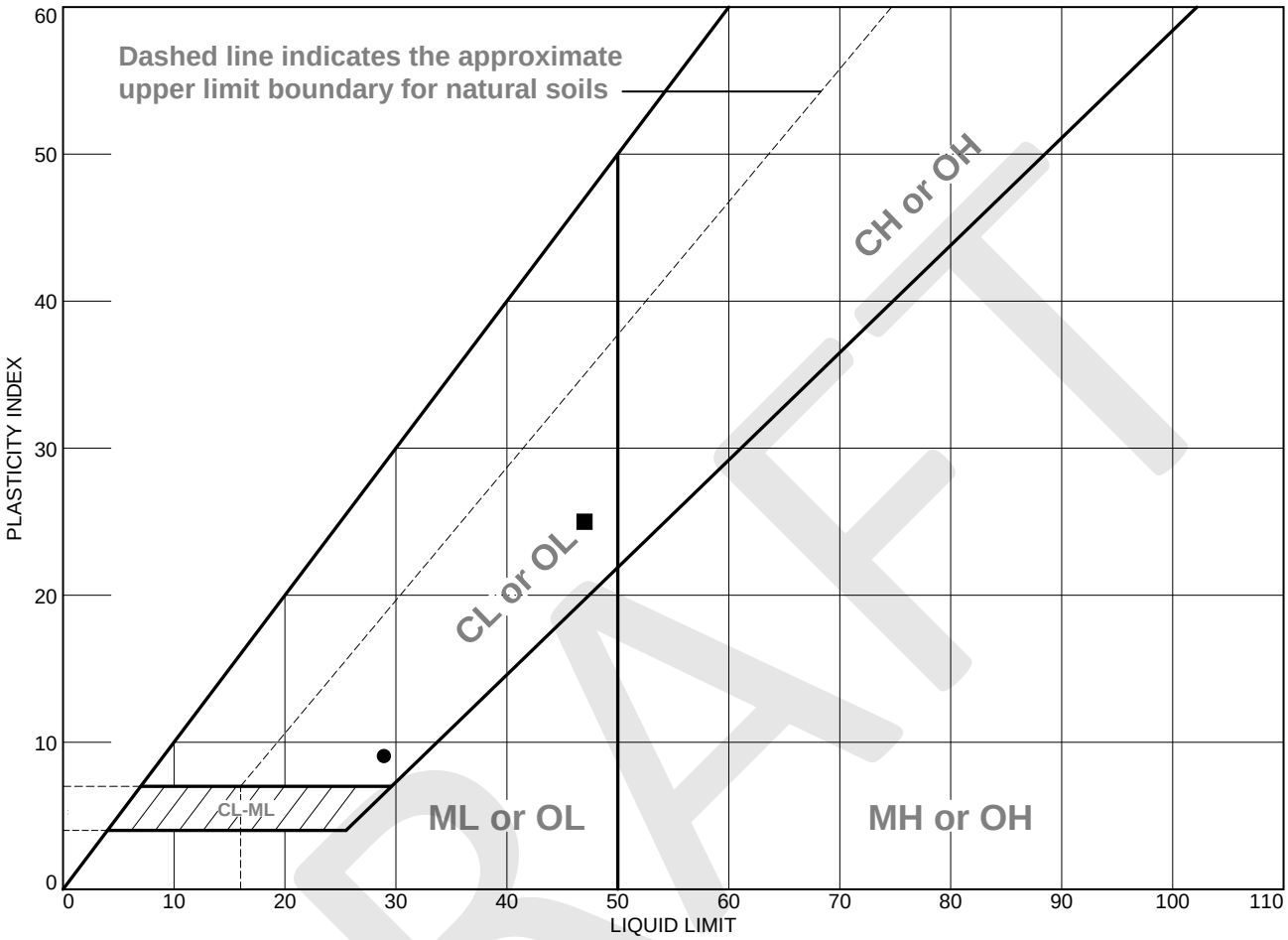
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SANDY lean CLAY, light brown	29	20	9		66.2	CL
■	Lean CLAY, brown	47	22	25		85.6	CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B3 **Depth:** 5.5-6' **Sample Number:** 2B

■**Source of Sample:** B3 **Depth:** 11-11.5' **Sample Number:** 3C

Remarks:

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W. Sacramento, CA

Figure

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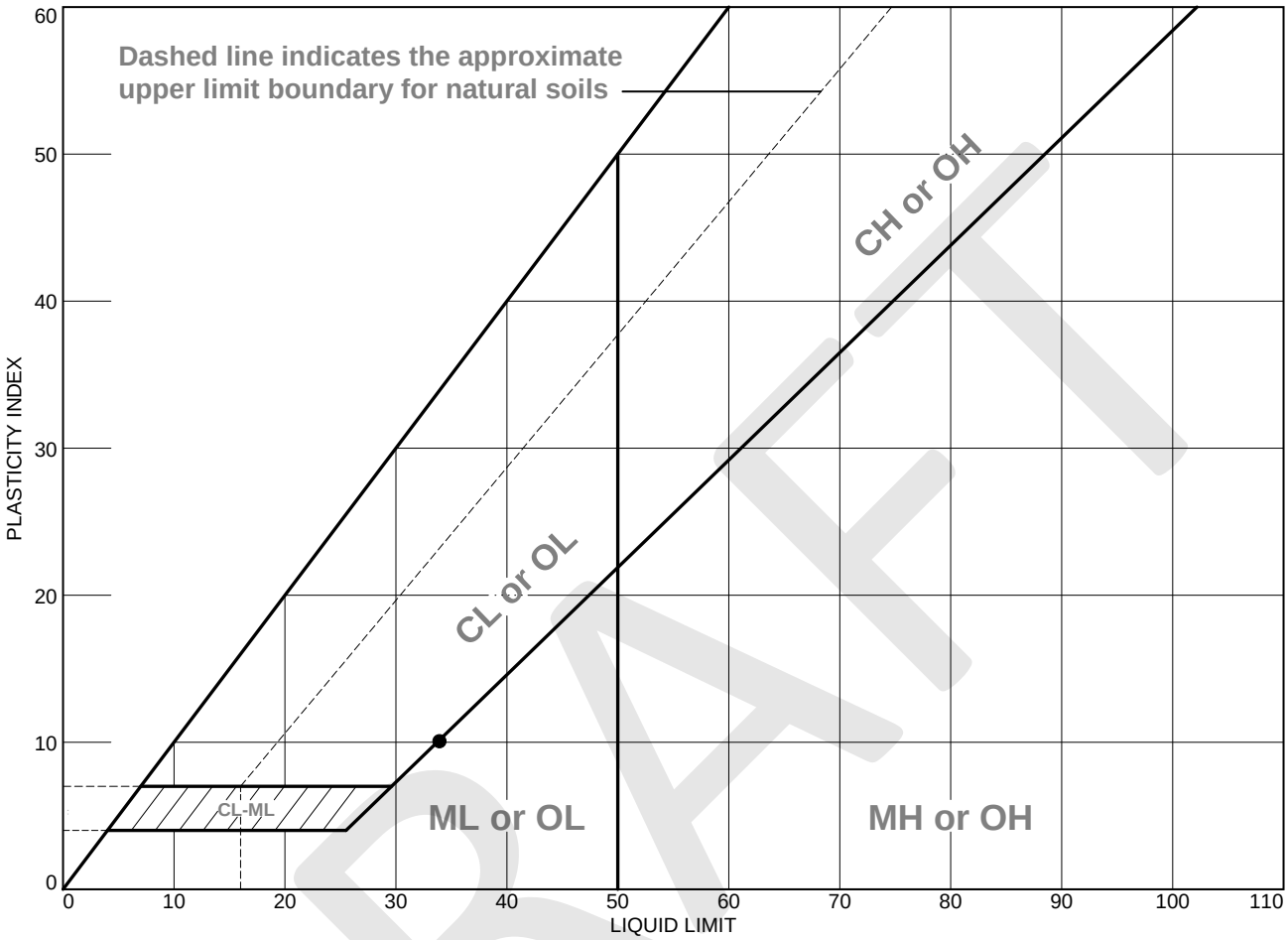
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SANDY lean CLAY, reddish brown	34	24	10		61.7	CL

Project No. 3934.X **Client:** Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

●**Source of Sample:** B51 **Depth:** 5.2-5.7' **Sample Number:** 2C

Remarks:

Blackburn Consulting

W. Sacramento, CA

Figure

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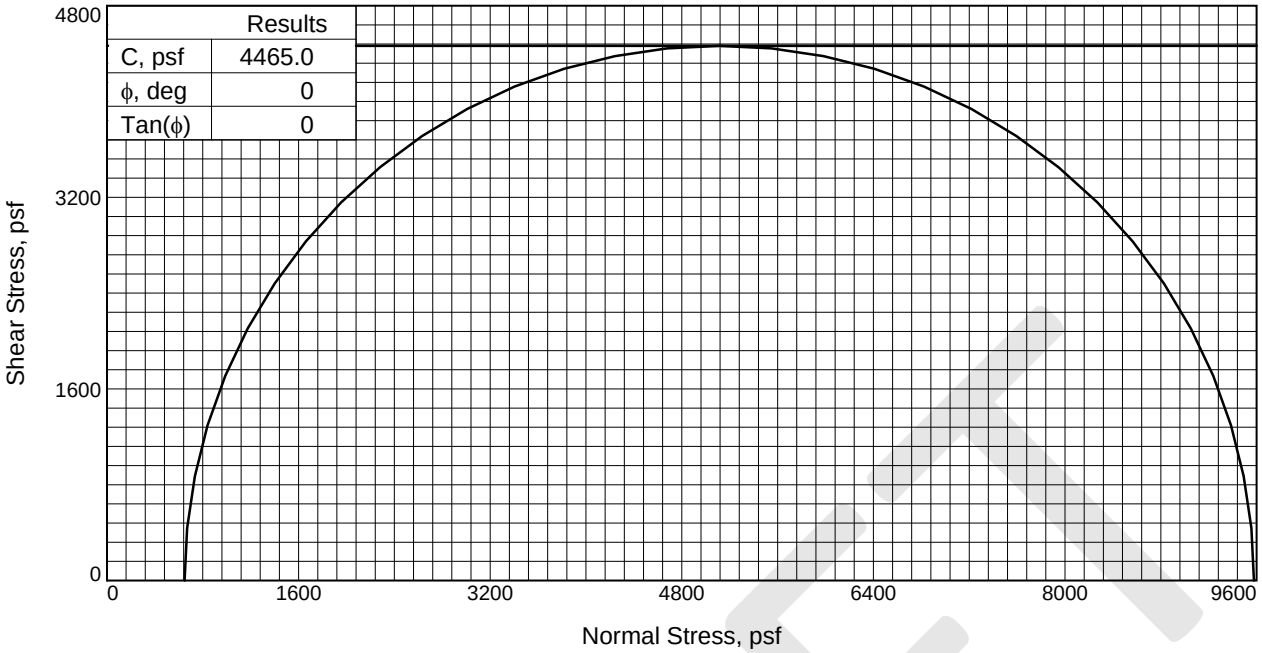

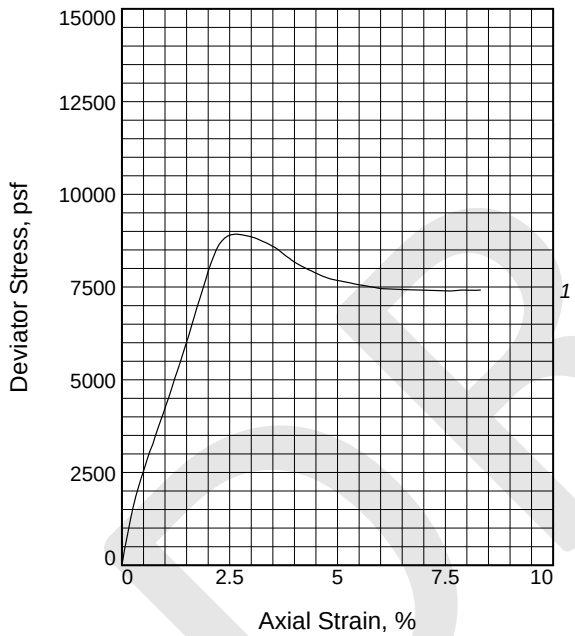

Sample No.		1
Initial	Water Content, %	14.3
	Dry Density, pcf	112.0
	Saturation, %	76.6
	Void Ratio	0.5043
	Diameter, in.	2.400
	Height, in.	5.013
At Test	Water Content, %	18.3
	Dry Density, pcf	112.8
	Saturation, %	100.0
	Void Ratio	0.4944
	Diameter, in.	2.395
	Height, in.	5.002
Strain rate, in./min.		0.030
Back Pressure, psf		0.0
Cell Pressure, psf		648.0
Fail. Stress, psf		8930.0
Strain, %		2.6
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		9578.0
σ_3 Failure, psf		648.0

Type of Test:
Unconsolidated Undrained

Sample Type: Cal Mod

Description: SANDY lean CLAY, reddish brown

LL= 29 **PL=** 20 **PI=** 9

Assumed Specific Gravity= 2.7

Remarks:

Figure _____

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B3 **Depth:** 5.5-6'

Sample Number: 2B

Proj. No.: 3934.X **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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W. Sacramento, CA

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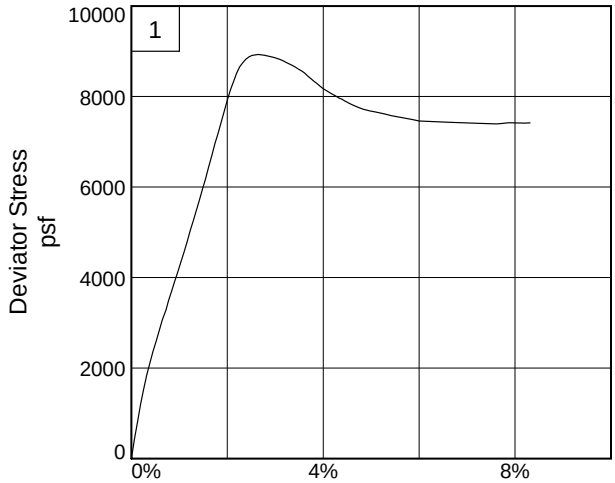
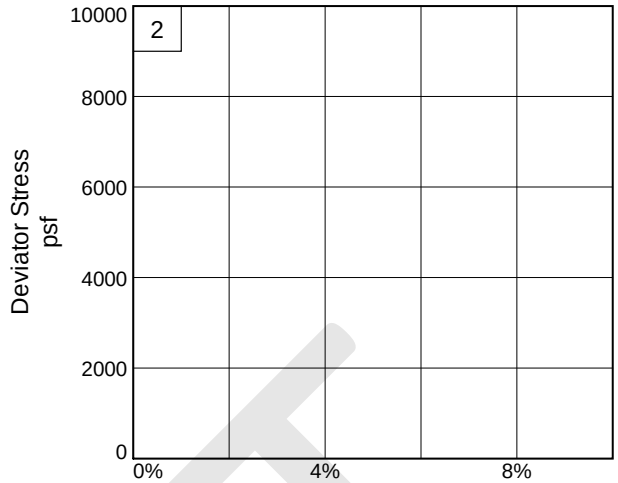
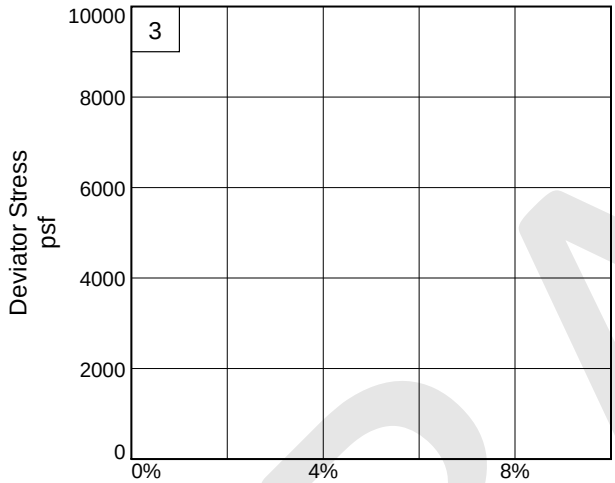
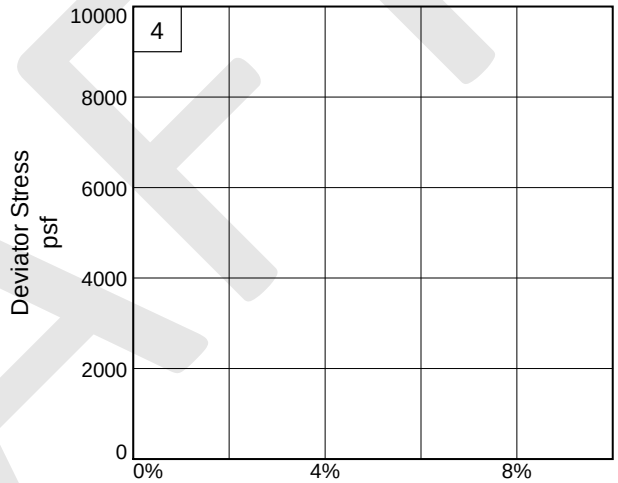
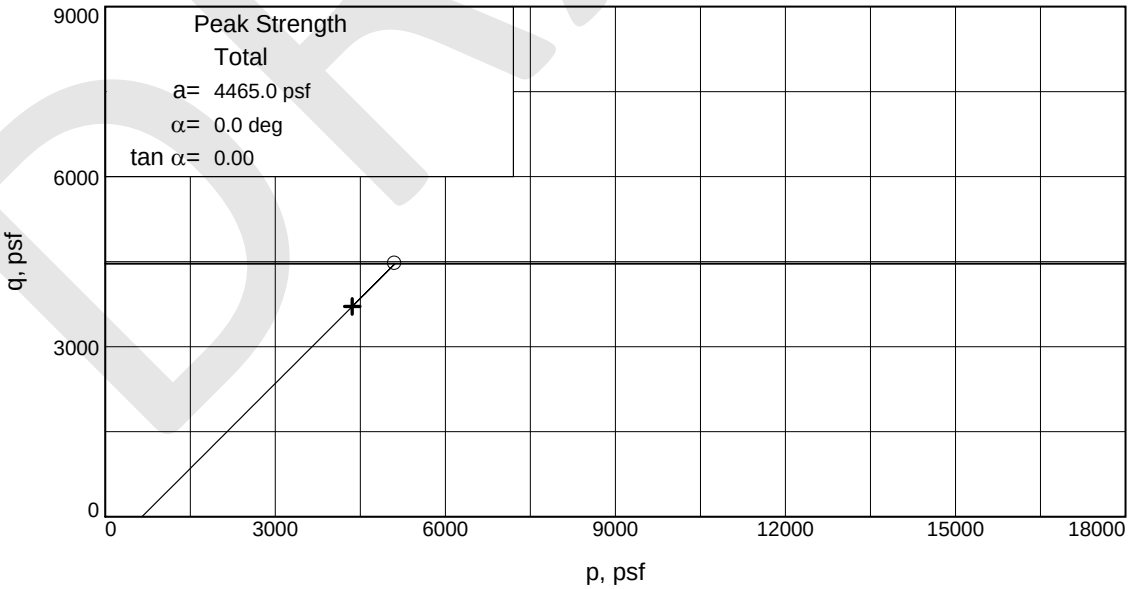










Stress Paths: o indicates peak + indicates end

Client: Coastland Civil Engineering

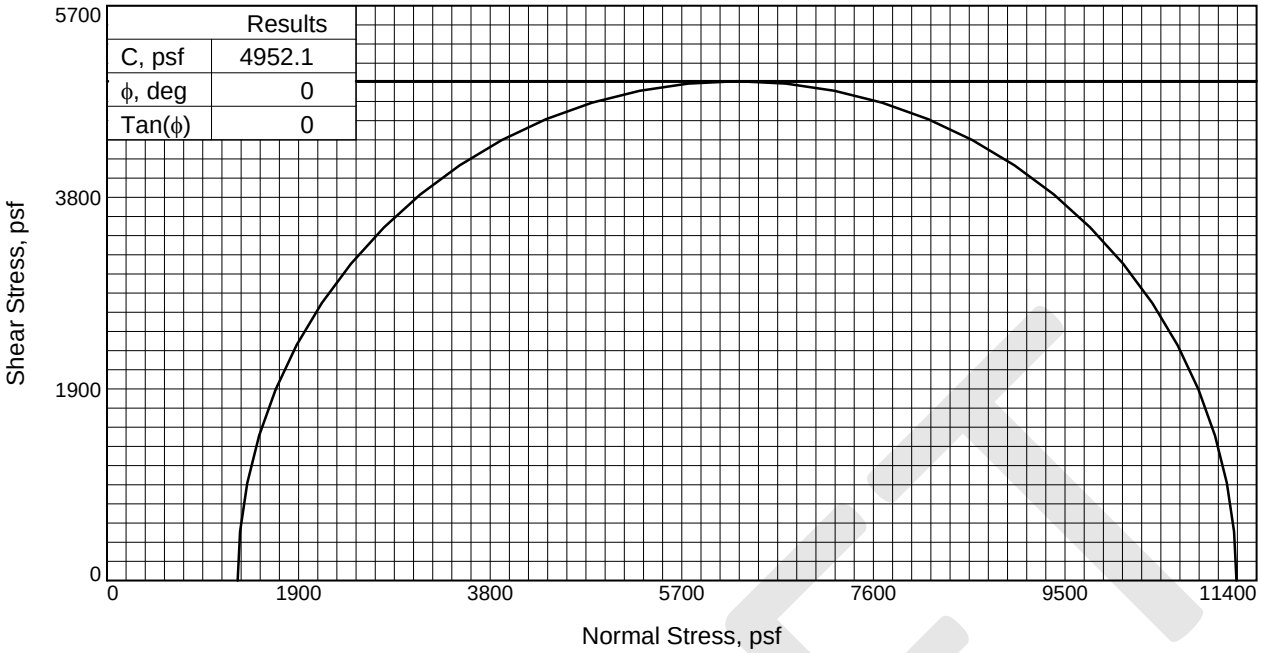
Project: Wheatland Regional Sewer Connection Project

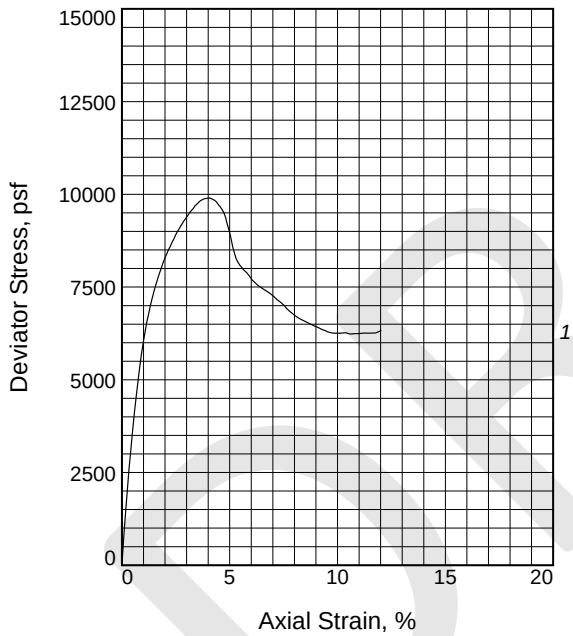
Source of Sample: B3 **Depth:** 5.5-6' **Sample Number:** 2B

Project No.: 3934.X **Figure** _____

Blackburn Consulting

DRAFT





Sample No.		1
Initial	Water Content, %	19.4
	Dry Density, pcf	108.5
	Saturation, %	94.6
	Void Ratio	0.5537
	Diameter, in.	2.394
	Height, in.	5.015
At Test	Water Content, %	20.3
	Dry Density, pcf	108.9
	Saturation, %	100.0
	Void Ratio	0.5472
	Diameter, in.	2.391
	Height, in.	5.008
Strain rate, in./min.		0.040
Back Pressure, psf		0.0
Cell Pressure, psf		1296.0
Fail. Stress, psf		9904.2
Strain, %		4.1
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		11200.2
σ_3 Failure, psf		1296.0

Type of Test:
Unconsolidated Undrained
Sample Type: Cal Mod
Description: Lean CLAY, brown

LL= 47 **PL=** 22 **PI=** 25
Assumed Specific Gravity= 2.7
Remarks:

Figure _____

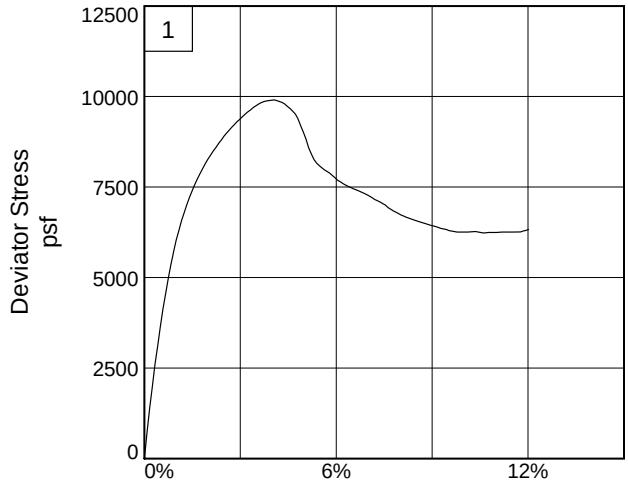
Client: Coastland Civil Engineering

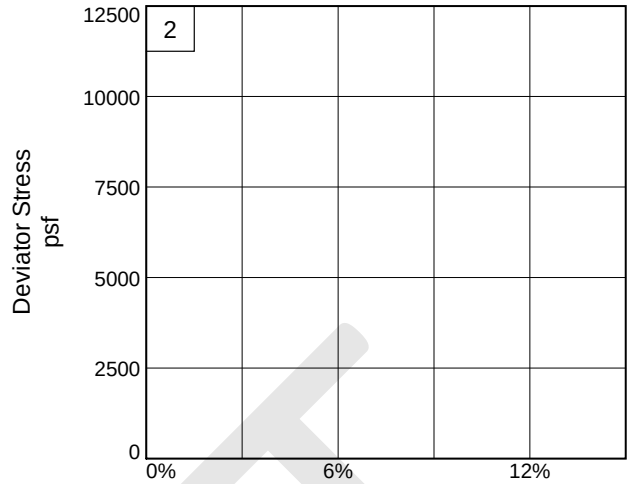
Project: Wheatland Regional Sewer Connection Project

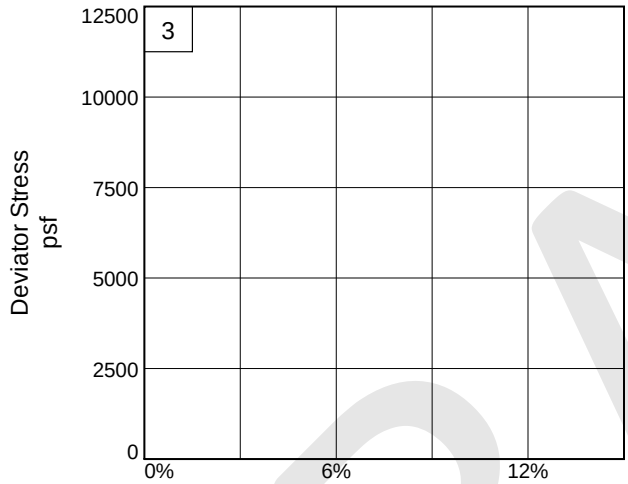
Source of Sample: B3 **Depth:** 11-11.5'
Sample Number: 3C
Proj. No.: 3934.X **Date Sampled:**

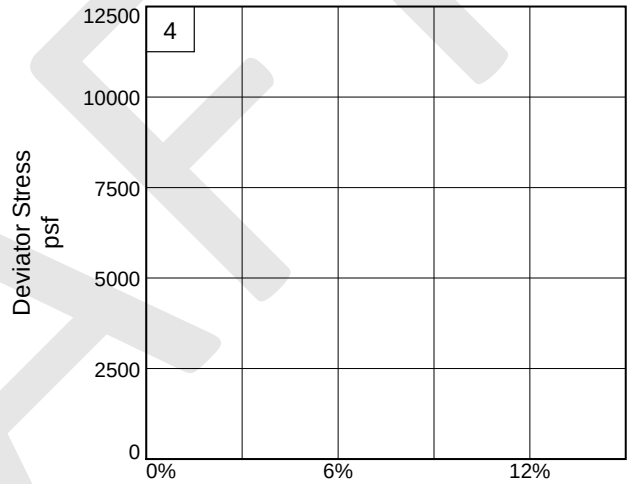
TRIAXIAL SHEAR TEST REPORT
Blackburn Consulting
W. Sacramento, CA

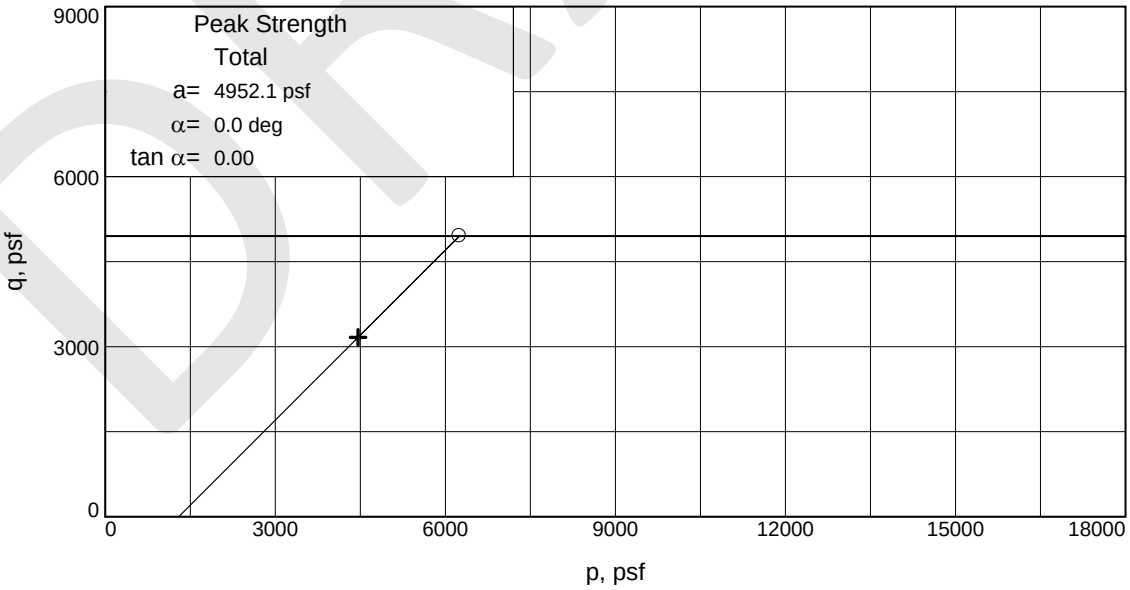
DRAFT











Stress Paths: o indicates peak + indicates end

DRAFT

Client: Coastland Civil Engineering

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B3 **Depth:** 11-11.5' **Sample Number:** 3C

Project No.: 3934.X **Figure** _____

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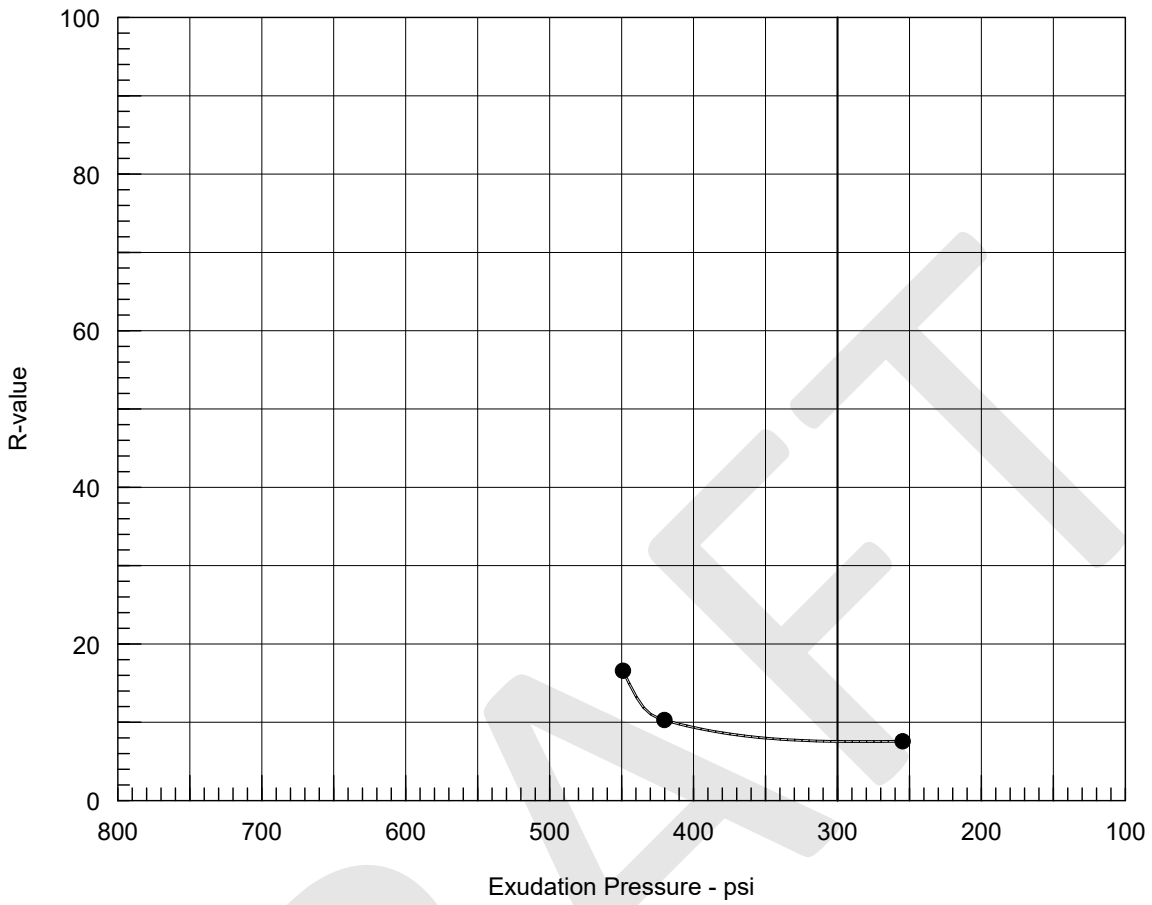
R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	93	107.6	19.6	131	123	2.39	449	18	17
2	52	102.7	21.9	22	137	2.62	420	10	10
3	30	99.1	24.2	26	143	2.58	255	7	8

Test Results	Material Description
R-value at 300 psi exudation pressure = 8	SANDY lean CLAY, reddish brown

Project No.: 3934.X

Project: Wheatland Regional Sewer Connection Project

Source of Sample: B3 **Depth:** 0-5'

Sample Number: Bulk A

Date: 3/28/2022

Tested by: BRL

Checked by: RBL

Remarks:
6% retained on the #4 sieve, sample batched

R-VALUE TEST REPORT

Blackburn Consulting

Figure _____

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C4: Pump Station 2 – Site-Specific Design Spectra Calculation

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APPENDIX C4: Site-Specific Design Spectra Calculation

In this appendix we present the details of our site-specific ground motion analysis for Pump Station 2 performed in accordance with Chapter 21 of ASCE 7-16 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. We calculated:

- Site Classification D per ASCE 7-16 Table 20.3-1.
- Probabilistic geometric mean (MCE_G[1]) and risk targeted maximum considered earthquake (MCE_R[2]) response spectra for a 5% damped, 2% probability of exceedance within a 50-year period (2,475-year return period).
- Design Earthquake (DE[3]) response spectra.
- Design acceleration parameters.
- Maximum considered earthquake geometric mean (MCE_G) peak ground acceleration (PGA_M).

C1.0 PROBABILISTIC SEISMIC HAZARD ANALYSIS

Methodology

We performed a site-specific probabilistic ground motion analysis in accordance with ASCE 7-16 Section 21.2.1.2. A probabilistic analysis is used because the location, recurrence interval, and magnitude of future earthquakes are uncertain.

To develop the site-specific probabilistic MCE_R response spectra we:

1. Used the United States Geological Survey (USGS) Unified Hazard Tool[4] to develop uniform hazard curves for spectral periods ranging from 0.1 to 5 seconds and calculate the MCE_G response spectra.
2. Applied scaling factors (per ASCE 7-16,21.2) to each hazard curve to calculate the maximum response in the horizontal plane.
3. Used the scaled hazard curve data and the USGS Risk-Targeted Ground Motion Calculator[5] to develop the risk targeted ground motion for selected periods (maximum of 5 seconds).
4. Plotted the risk targeted ground motion at selected periods to create the site-specific MCE_R response spectra.

[1] MCE_G - The most severe earthquake effects considered by ASCE 7-16 without adjustment for targeted risk.
[2] MCE_R - The most severe earthquake effects considered by ASCE 7-16 adjusted to the orientation considered to provide the maximum horizontal response.
[3] DE – The earthquake effects that are 2/3 of the corresponding risk-targeted maximum consider MCE_R effects.
[4] https://earthquake.usgs.gov/hazards/interactive/
[5] https://earthquake.usgs.gov/designmaps/rtgm/

Results

Figure C-1 shows the calculated site-specific MCE_G and MCE_R probabilistic spectra.

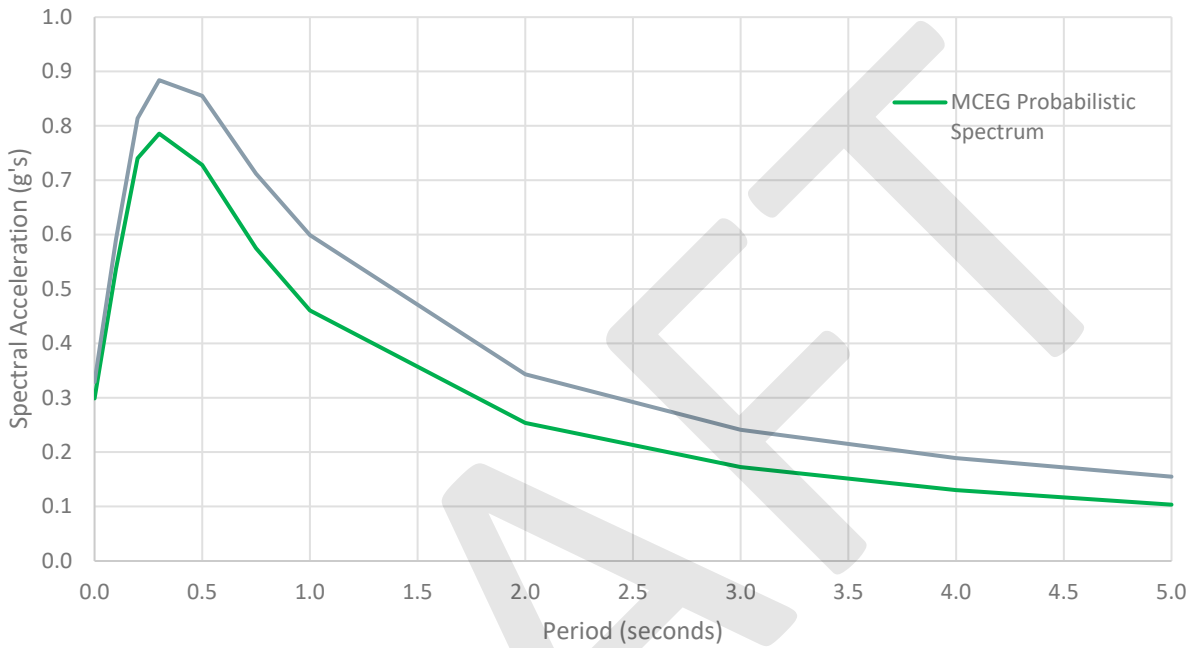

Figure C-1 – MCE_G (Geometric mean) and MCE_R (Risk Targeted) site-specific spectra for 2% probability of exceedance in 50 years.

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Table C-1 shows the calculated spectral values for the probabilistic MCE_R and MCE_G spectra.

Table C-1: Probabilistic MCE_R and MCE_G Spectral Accelerations (g's)

Period	Probabilistic MCE_G Spectra	Scaled Probabilistic MCE_R Spectra
0	0.299	0.329
0.1	0.537	0.591
0.2	0.740	0.814
0.3	0.786	0.884
0.5	0.728	0.855
0.75	0.575	0.712
1	0.461	0.599
2	0.254	0.343
3	0.172	0.241
4	0.130	0.189
5	0.103	0.155

The faults that dominate the hazard at the site are:

- PGA and 0.2 second periods - The Great Valley Mysterious Ridge, Hunting Creek-Bartlett Springs connector, and Swain Ravine - Spenceville.
- 1 second period - The San Andreas fault, Hunting Creek-Bartlett Springs connector, Great Valley Mysterious Ridge, Swain Ravine - Spenceville, and Rodgers Creek-Healdsburg.
- 5 second period - The San Andreas fault, Hunting Creek-Bartlett Springs connector, and Swain Ravine – Spenceville[6]

C2.2 Deterministic Analysis

The ASCE 7-16 Amendment for 21.2.3 states that when the largest probabilistic spectral response acceleration is less than 1.2 F_a, the site-specific MCE_R shall be taken as the site-specific probabilistic spectrum. This amendment applies to our site; therefore, a deterministic site-specific spectrum was not calculated.

C2.3 Recommended Site-Specific MCE_R and Design Response Spectra

Figure C-3 and Table C-2 compare the calculated site-specific probabilistic MCE_R spectra, the MCE_R spectra calculated in accordance with ASCE 7-16 Section 11.4.7, 80% value of the ASCE 7-16 Section 11.4.7 MCE_R spectra, and the recommended MCE_R spectra.

[6] Deaggregation results show the Cascadia Megathrust governs at the 5 second period, however we reference only the San Andreas fault, Hunting Creek-Bartlett Springs connector, and Swain Ravine – Spenceville because the Cascadia Megathrust is over 120 miles away.

DRAFT

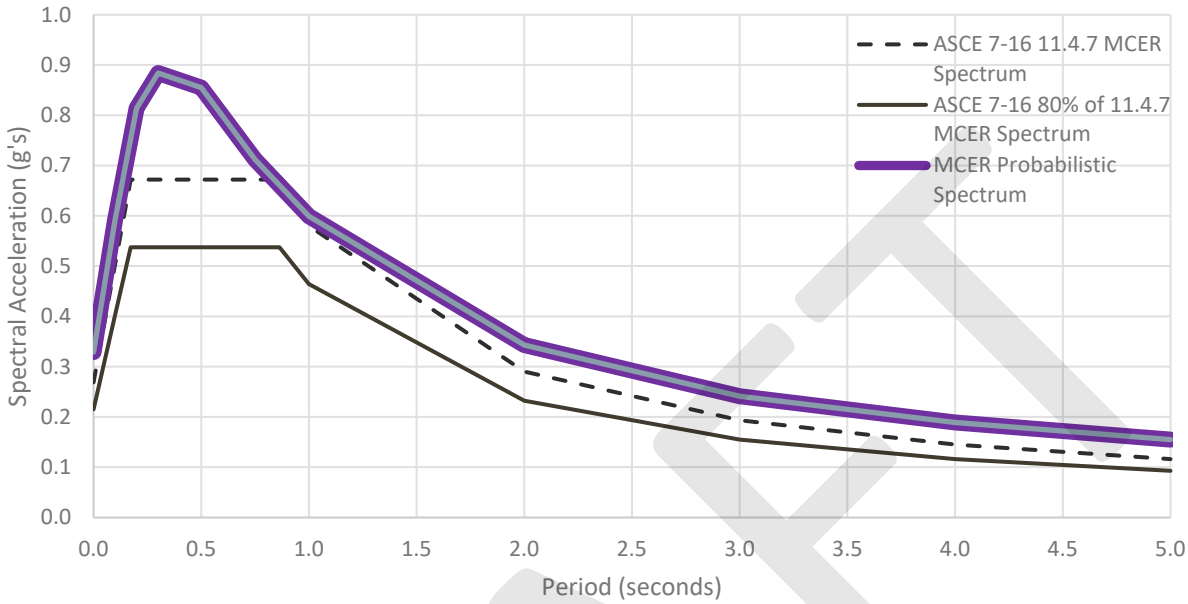

Figure C-3 – Site-Specific Probabilistic MCE_R Spectrum, ASCE 7-16 Section 11.4.7 MCE_R Spectrum, 80% of ASCE 7-16 Section 11.4.7 MCE_R Spectrum, and the recommended MCE_R Spectrum.

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Table C-2: Comparison of Recommended and ASCE 7-16 Section 11.4.7 Spectra				
Period	**Site-Specific MCE_R Spectrum**	**ASCE 7-16 11.4.7 MCE_R Spectrum**	**80% of the ASCE 7-16 11.4.7 MCE_R Spectrum**	**Recommended MCE_R Spectrum**
0	0.329	0.269	0.215	0.329
0.1	0.591	0.502	0.402	0.591
0.173	0.753	0.672	0.538	0.753
0.2	0.814	0.672	0.538	0.814
0.3	0.884	0.672	0.538	0.884
0.5	0.855	0.672	0.538	0.855
0.75	0.712	0.672	0.538	0.712
0.863	0.661	0.672	0.538	0.661
1	0.599	0.580	0.464	0.599
2	0.343	0.290	0.232	0.343
3	0.241	0.193	0.155	0.241
4	0.189	0.145	0.116	0.189
5	0.155	0.116	0.093	0.155

For this site the site-specific probabilistic spectra control the site response for all periods.

ASCE 7-16 Section 21.3 defines the design (DE) response spectrum as 2/3 of the site-specific MCE_R spectrum. The design spectral response acceleration at any period is not taken as less than 80% of spectral acceleration determined in accordance with ASCE 7-16, Section 11.4.6, where F_a and F_v are determined using Section 21.3. Figure C-4 and Table C-3 present the calculated DE response spectra, the ASCE 7-16 section 11.4.6 Spectrum, and 80% of the ASCE 7-16 11.4.6 Spectrum. The site-specific design response spectrum is greater than 80% of the response spectrum calculated using ASCE 7-16 Section 11.4.6 for all periods and therefore governs the recommended design response spectrum.

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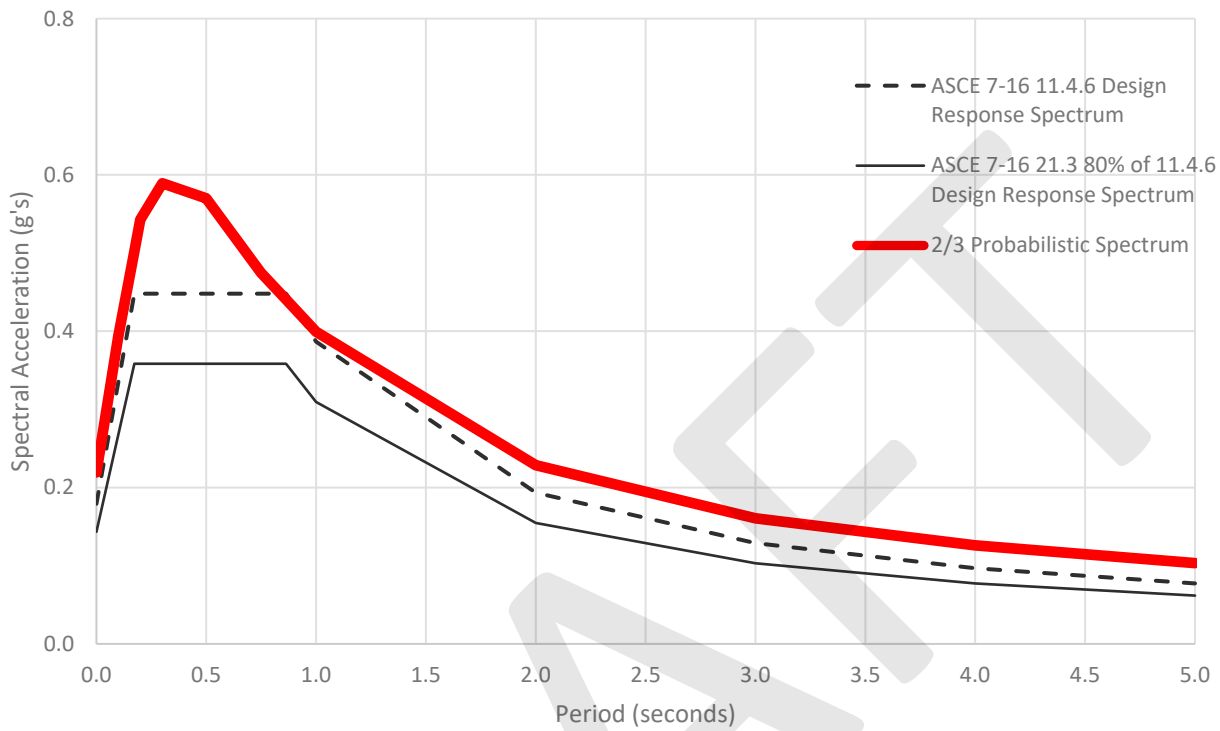

Figure C-4 – Design Response Spectrum (Greater of 2/3*SaM or 80% of General Response Spectrum), ASCE 11.4.6 Design Response Spectrum, and 80% of 11.4.6 Design Response Spectrum.

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Table C-3: Comparison of Recommended and ASCE 7-16 Section 11.4.6 Spectra			
Period	**Recommended Design Response Spectrum**	**ASCE 7-16 11.4.6 Response Spectrum**	**80% of ASCE 7-16 11.4.6 Response Spectrum**
0	0.329	0.179	0.143
0.1	0.591	0.335	0.268
0.173	0.753	0.448	0.358
0.2	0.814	0.448	0.358
0.3	0.884	0.448	0.358
0.5	0.855	0.448	0.358
0.75	0.712	0.448	0.358
0.863	0.661	0.448	0.358
1	0.599	0.387	0.309
2	0.343	0.193	0.155
3	0.241	0.129	0.103
4	0.189	0.097	0.077
5	0.155	0.077	0.062

Design Acceleration Parameters

We calculated the site-specific acceleration parameters in Table C-4 in accordance with ASCE7-16, Section 21.4 and 21.5.3.

Table C-4: Design Spectral Acceleration Values and Peak Ground Acceleration	
Parameter	**Acceleration Value (g's)**
S_{MS}	1.193[1]
S_{M1}	1.163[2]
S_{DS}	0.796[3]
S_{D1}	0.775[4]
PGA_M	0.299[5]

[1]S_{MS} 1.5 times the S_{DS} value in Table D-4
[2]S_{M1} 1.5 times the S_{D1} value in Table D-4
[3]S_{DS} 90% of the maximum spectral acceleration from the site-specific spectrum (0.884)
[4]S_{D1} Maximum value of the product of TS_a (time multiplied by spectral acceleration value) for periods of 1 to 5 seconds for sites with V_{S30} of less than 1,200 ft/s
[5]The site-specific MCE_G peak ground acceleration (PGA_M) is the lesser of the probabilistic or deterministic mean peak ground acceleration.

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GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

APPENDIX D:

Soil Corrosion Test Results

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BLACKBURN CONSULTING

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B1-1B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86446-180045.

EVALUATION FOR SOIL CORROSION

Soil pH	6.17		
Minimum Resistivity	2.06 ohm-cm (x1000)		
Chloride	4.1 ppm	00.00041	%
Sulfate	26.9 ppm	00.00269	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B1-6.
Thank you for your business.

* For future reference to this analysis please use SUN # 86446-180046.

EVALUATION FOR SOIL CORROSION

Soil pH	6.63		
Minimum Resistivity	2.95 ohm-cm (x1000)		
Chloride	2.8 ppm	00.00028	%
Sulfate	7.2 ppm	00.00072	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B2-BULK A.
Thank you for your business.

* For future reference to this analysis please use SUN # 86442-180033.

EVALUATION FOR SOIL CORROSION

Soil pH	6.46	
Minimum Resistivity	1.72 ohm-cm (x1000)	
Chloride	3.7 ppm	00.00037 %
Sulfate	29.5 ppm	00.00295 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B2-2B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86446-180047.

EVALUATION FOR SOIL CORROSION

Soil pH	6.78		
Minimum Resistivity	1.26 ohm-cm (x1000)		
Chloride	9.7 ppm	00.00097	%
Sulfate	79.1 ppm	00.00791	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
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(916) 852-8557

Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B2-5.
Thank you for your business.

* For future reference to this analysis please use SUN # 86446-180048.

EVALUATION FOR SOIL CORROSION

Soil pH	6.48		
Minimum Resistivity	0.78 ohm-cm (x1000)		
Chloride	8.3 ppm	00.00083	%
Sulfate	74.5 ppm	00.00745	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Reprint of Report
10/13/2021

Date Reported 10/13/2021
Date Submitted 10/08/2021

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B3-2B.
Thank you for your business.

* For future reference to this analysis please use SUN # 85894-178982.

EVALUATION FOR SOIL CORROSION

Soil pH	7.10		
Minimum Resistivity	0.75 ohm-cm (x1000)		
Chloride	81.7 ppm	0.00817	%
Sulfate	158.4ppm	0.01584	%

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

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11419 Sunrise Gold Circle, #10
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Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B4-3.
Thank you for your business.

* For future reference to this analysis please use SUN # 86446-180049.

EVALUATION FOR SOIL CORROSION

Soil pH	6.20		
Minimum Resistivity	2.65 ohm-cm (x1000)		
Chloride	1.9 ppm	00.00019	%
Sulfate	7.8 ppm	00.00078	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B5-2B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86446-180050.

EVALUATION FOR SOIL CORROSION

Soil pH	6.90		
Minimum Resistivity	2.60	ohm-cm (x1000)	
Chloride	3.7 ppm	00.00037	%
Sulfate	11.5 ppm	00.00115	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 11/10/2021
Date Submitted 11/03/2021

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B5-4B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86081-179396.

EVALUATION FOR SOIL CORROSION

Soil pH	6.37		
Minimum Resistivity	1.74 ohm-cm (x1000)		
Chloride	10.8 ppm	00.00108	%
Sulfate	48.4 ppm	00.00484	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 11/10/2021
Date Submitted 11/03/2021

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B6-5B&C.
Thank you for your business.

* For future reference to this analysis please use SUN # 86081-179397.

EVALUATION FOR SOIL CORROSION

Soil pH	6.39		
Minimum Resistivity	2.01 ohm-cm (x1000)		
Chloride	8.4 ppm	00.00084	%
Sulfate	26.6 ppm	00.00266	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

Sunland Analytical
11419 Sunrise Gold Circle, #10
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Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney RA
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B7-2B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86447-180051.

EVALUATION FOR SOIL CORROSION

Soil pH	6.64		
Minimum Resistivity	2.68 ohm-cm (x1000)		
Chloride	1.6 ppm	00.00016	%
Sulfate	6.2 ppm	00.00062	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical
11419 Sunrise Gold Circle, #10
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Date Reported 11/10/2021
Date Submitted 11/03/2021

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney RA
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B7-3B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86081-179398.

EVALUATION FOR SOIL CORROSION

Soil pH	6.29		
Minimum Resistivity	4.02 ohm-cm (x1000)		
Chloride	3.2 ppm	00.00032	%
Sulfate	9.0 ppm	00.00090	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical
11419 Sunrise Gold Circle, #10
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Date Reported 11/10/2021
Date Submitted 11/03/2021

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney RA
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B50-3C.
Thank you for your business.

* For future reference to this analysis please use SUN # 86081-179399.

EVALUATION FOR SOIL CORROSION

Soil pH	7.08		
Minimum Resistivity	4.82 ohm-cm (x1000)		
Chloride	78.5 ppm	00.00785	%
Sulfate	3.7 ppm	00.00037	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical
11419 Sunrise Gold Circle, #10
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(916) 852-8557

Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B51-2C.
Thank you for your business.

* For future reference to this analysis please use SUN # 86447-180052.

EVALUATION FOR SOIL CORROSION

Soil pH	7.13		
Minimum Resistivity	1.05 ohm-cm (x1000)		
Chloride	47.4 ppm	00.00474	%
Sulfate	27.3 ppm	00.00273	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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11419 Sunrise Gold Circle, #10
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Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager RH

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B52-1B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86447-180053.

EVALUATION FOR SOIL CORROSION

Soil pH	6.98	
Minimum Resistivity	1.07 ohm-cm (x1000)	
Chloride	44.1 ppm	00.00441 %
Sulfate	46.7 ppm	00.00467 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical
11419 Sunrise Gold Circle, #10
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Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney RH
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B52-3B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86447-180054.

EVALUATION FOR SOIL CORROSION

Soil pH	7.37		
Minimum Resistivity	0.78 ohm-cm (x1000)		
Chloride	140.4 ppm	00.01404	%
Sulfate	54.9 ppm	00.00549	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical

11419 Sunrise Gold Circle, #10
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Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney RH
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B53-2B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86447-180055.

EVALUATION FOR SOIL CORROSION

Soil pH	6.01		
Minimum Resistivity	1.02 ohm-cm (x1000)		
Chloride	51.8 ppm	00.00518	%
Sulfate	27.0 ppm	00.00270	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 11/10/2021
Date Submitted 11/03/2021

To: Daniel Contreras
Blackburn Consulting (W.SAC)
2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney RH
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B53-4A.
Thank you for your business.

* For future reference to this analysis please use SUN # 86081-179400.

EVALUATION FOR SOIL CORROSION

Soil pH	6.54		
Minimum Resistivity	3.48 ohm-cm (x1000)		
Chloride	11.1 ppm	00.00111	%
Sulfate	5.6 ppm	00.00056	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
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Date Reported 11/10/2021
Date Submitted 11/03/2021

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B54-3B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86081-179401.

EVALUATION FOR SOIL CORROSION

Soil pH	6.64		
Minimum Resistivity	1.45 ohm-cm (x1000)		
Chloride	8.7 ppm	00.00087	%
Sulfate	31.0 ppm	00.00310	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
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Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager RH

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B58-3B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86447-180056.

EVALUATION FOR SOIL CORROSION

Soil pH	6.54		
Minimum Resistivity	2.68 ohm-cm (x1000)		
Chloride	21.8 ppm	00.00218	%
Sulfate	6.0 ppm	00.00060	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 11/10/2021
Date Submitted 11/03/2021

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B58-4B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86081-179402.

EVALUATION FOR SOIL CORROSION

Soil pH	6.81		
Minimum Resistivity	1.50 ohm-cm (x1000)		
Chloride	22.5 ppm	00.00225	%
Sulfate	8.5 ppm	00.00085	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

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Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
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Date Reported 01/19/2022
Date Submitted 01/12/2022

To: Daniel Contreras
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2491 Boatman Ave
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 3934.X WHEATLAND Site ID : B59-2B.
Thank you for your business.

* For future reference to this analysis please use SUN # 86447-180057.

EVALUATION FOR SOIL CORROSION

Soil pH	6.73		
Minimum Resistivity	1.55 ohm-cm (x1000)		
Chloride	4.7 ppm	00.00047	%
Sulfate	19.8 ppm	00.00198	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

DRAFT

GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

DRAFT

APPENDIX E: Hydraulic Fracture Analysis

E1: Preliminary Hydraulic Fracture Analysis Report

E2: Preliminary Hydraulic Fracture Calculations

E3: Preliminary Hydraulic Fracture Emergency Action Plan

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E1: Preliminary Hydraulic Fracture Analysis Report

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E2: Preliminary Hydraulic Fracture Calculations

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E3: Preliminary Hydraulic Fracture Emergency Action Plan

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GEOTECHNICAL BASIS OF DESIGN REPORT

City of Wheatland

Wheatland Regional Sewer Connection Project

Wheatland, CA

March 2022

APPENDIX F:

Important Information about This Geotechnical Engineering Report, Geoprofessional Business

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BLACKBURN CONSULTING

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

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responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

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