RFP ADDENDUM NO. 1

February 11, 2019

TO: SHORT-LISTED DB TEAMS

SUBJECT: REGIONAL SURFACE WATER SUPPLY PROJECT
PROCUREMENT DOCUMENTS – RFP ADDENDUM NO. 1

The Stanislaus Regional Water Authority Request for Proposals (RFP) for the Regional Surface Water Supply Project dated December 24, 2018 is amended by this Addendum No. 1, including changes to the RFP, Proposal forms, draft Design-Build Contract and draft Design-Build Contract appendices.

The RFP and related documents are modified as follows:

RFP

ITEM 1: REQUEST FOR PROPOSAL, SECTION 1.6, REFERENCE DOCUMENTS

ADD the following as the third paragraph of the section:

"Questions have arisen from the Proposers concerning consideration of the data contained in the five soil corrosivity evaluation reports prepared by JDH Corrosion Consultants, Inc. and that are included as Reference Documents on the SharePoint site. A Proposer may consider and rely upon the soil and water sample corrosivity testing results and data in the reports in connection with the Proposer's evaluation and preparation of its Proposal. Those results and data will be considered as information about the Sites made available to Proposers prior to the Proposal submittal deadline for purposes of Design-Build Contract section 4.4 (Geotechnical and Site Conditions). However, with respect to the engineering recommendations contained in the reports, Proposers may consider the recommendations but cannot and should not fully rely upon those recommendations. Rather, each Proposer is expected to independently evaluate and determine the appropriate means and methods to perform the Design-Build Work in compliance with the corrosion control requirements of the Design-Build Contract and appendices."

ITEM 2: REQUEST FOR PROPOSAL, SECTION 3.1.5 PROPOSAL SUBMITTAL

REPLACE the last sentence in the last paragraph in the Section with the following:

"Should the Proposer wish to propose any changes to the draft Design-Build Contract as part of its Proposal, the proposed changes and the associated impacts on the Proposer's Price Proposal shall be presented in a clear and detailed manner in accordance with the requirements specified in Section 4.8 (Price Proposal) and Section 4.9 (Proposed Changes to the Draft Design-Build Contract) of this RFP."

ITEM 3: REQUEST FOR PROPOSAL, SECTION 3.1.15 LIMITATIONS ON WITHDRAWAL OF PROPOSALS

DELETE the following from the first sentence of the paragraph:

"Materials Cost Adjustment to the Base Design Build Price,"

ITEM 4: REQUEST FOR PROPOSAL, SECTION 4.6.1 PROJECT TEAM INTEGRATION AND MANAGEMENT APPROACH

DELETE the following from the third bullet:

"Further discussion will be included in the preliminary Quality Management Plan required in Section 4.6.6 (Quality Management Plan) of this RFP."

ITEM 5: REQUEST FOR PROPOSAL, SECTION 4.6.6 QUALITY MANAGEMENT PLAN

REPLACE the entire Section with the following:

"Proposers shall provide an example Quality Management Plan that is similar in content to the Design-Build Quality Management Plan required in Appendix 4 (Design-Build Quality Management). The Design-Build Quality Management Plan prepared following Design-Build Contract award shall be of similar or better quality to the example provided as part of the Proposal.

In addition to the example Quality Management Plan, the Proposer shall complete and submit Proposal From T-34. As part of Proposal Form T-34 the Proposer shall identify the level of quality control effort that will be provided during the design, construction, and testing phases of the project, including the minimum amount of worker hours during each phase of the project, and the qualifications of the personnel dedicated to providing the quality control review and inspections.

The Design-Build Contract will require that Company to provide an experienced and professional full-time QA/QC Manager in preparation for and during the construction phase to be responsible for implementing and managing the Company's approved Design-Build Quality Management Plan, as described in Appendix 4 (Design-Build Quality Management). Proposers shall describe the role of the QA/QC Manager, the amount of his/her time dedicated to each phase of the Project, and his/her authority to enforce modifications to ensure quality control. The example Quality Management Plan, completed Proposal Form T-34, and qualifications and role of the QA/QC Manager will be evaluated along with other non-priced features of the Proposal in determining the Proposer with the best value to consider for final negotiations and will, following negotiations, be included as part of the Design-Build Contract obligations of the Successful Proposer."

ITEM 6: REQUEST FOR PROPOSAL, SECTION 4.7.12 PROPOSAL FORMS (T-1 THROUGH T-33)

REPLACE the Section title with the following:

"Proposal Forms (T-1 through T-34)"

ADD the following after the last bullet point:

- "Proposal Form T-34 – Design-Build Quality Management"

ITEM 7: REQUEST FOR PROPOSAL, SECTION 4.8 PRICE PROPOSAL

ADD the following after the second to last sentence ending in "…in the Base Design-Build Price.":

"If SRWA accepts the proposed modification, then the Base Design-Build Price adjustment (whether additive or deductive) will be negotiated with the Successful Proposer during Design-Build Contract negotiations; however, the final price adjustment for the modification shall not exceed plus or minus 10% of the proposed price change for the modification as set forth in the Proposal. Therefore, when proposing an Appendix modification and an accompanying price change, a Proposer must be reasonably certain about the cost/proposed price change provided with its proposal."

ITEM 8: REQUEST FOR PROPOSAL, SECTION 4.8 PRICE PROPOSAL

REPLACE the last sentence in the second paragraph in the Section with the following:

"The actual costs for these items shall be determined and paid in accordance with Design-Build Contract Section 6.2(E)."

ITEM 9: REQUEST FOR PROPOSAL, SECTION 4.8.1 PRICE PROPOSAL FORMS

REPLACE the second bullet point with the following:

- "Proposal Form P-2 – Materials Cost Adjustment to the Base Design-Build Price (This form need not be submitted as part of the Price Proposal. The Successful Proposer will be asked to complete this form during the Design-Build Contract negotiation period.)

ITEM 10: REQUEST FOR PROPOSAL, SECTION 4.8.1

REPLACE the first sentence from the last paragraph in Section 4.8.1:

"The Base Design-Build Price may be adjusted for fluctuations in certain raw materials, as determined with the Successful Proposer during Design-Build Contract negotiations and as described in Section 6.2 (D) (Base Design-Build Price Adjustment for Certain Raw Materials Cost Fluctuations) of the draft Design-Build Contract."

PROPOSAL FORMS

ITEM 11: REQUEST FOR PROPOSAL, PROPSAL FORM T-1

REPLACE footnote (b) from the bottom of Proposal Form T-1 (Firm Capacities) with the following:

"(b) System firm capacity is the system capacity with the largest unit removed from service for maintenance. Refer to Appendix 5 (Project Technical Requirements) of the Design-Build Contract for required hydraulic capacities of individual Project components."

ITEM 12: REQUEST FOR PROPOSAL, PROPSAL FORM T-34

ADD the attached Proposal Form T-34 Design-Build Quality Management

ITEM 13: REQUEST FOR PROPOSAL, PROPSAL FORM P-2

REPLACE the title with the following:

"MATERIALS COST ADJUSTMENT TO THE BASE DESIGN-BUILD PRICE (to be completed by the Successful Proposer during Design-Build Contract negotiations)"

REPLACE the second sentence with the following:

"The Successful Proposer, during Design-Build Contract negotiations, shall provide the Reference Cost Amount, associated material quantity, and the Record Adjustment Date in accordance with the table below."

DRAFT DESIGN-BUILD CONTRACT

ITEM 14: DRAFT DESIGN-BUILD CONTRACT, SECTION 4.4 GEOTECHNICAL AND SITE CONDITIONS

ADD Subsection (F) to read as follows:

"(F) Undisclosed Underground Utilities. If the Company has timely contacted the appropriate Underground Service Alert regional notification center and has performed the actions required by an excavator pursuant to California Government Code Sections 4216 to 4216.24, and if the Company during the course of excavation or trenching work encounters any underground main or trunkline utility facility that was not marked or disclosed through the Underground Service Alert system (e.g., because the utility operator failed to comply with its utility marking obligation under the statute or the subject utility is not regulated under the Underground Service Alert system) and that conflicts with the planned installation of the Design-Build Work, then SRWA shall compensate the Company for its actual and direct costs for relocating and redesigning the SRWA pipeline or facility to avoid the conflict or removing or relocating the pre-existing utility facility. These costs shall be subject to Cost Substantiation in accordance with Section 10.8 (Cost Substantiation of Work Already Performed), but shall not include any Company mark-up pursuant to Section 10.8(D) (Mark-Up). Upon encountering any such

conflicting utility facility, the Company promptly shall inform SRWA about the undisclosed utility facility and conflict and coordinate with SRWA to quickly resolve the conflict and, if needed, re-sequence the Design-Build Work so as to stay on schedule. If SRWA pays compensation pursuant to this subsection, then it may pursue any appropriate and available remedy against the subject utility operator pursuant to California Government Code Section 4216.7 or other Applicable Law and, upon written request by SRWA, the Company shall assign to SRWA its rights and remedies against the utility operator under Section 4216.7 and other Applicable Law. The Company shall not be entitled to any compensation under this subSection with regard to any pre-existing utility service laterals or appurtenances whenever the presence of such utilities on the construction Site can be inferred from the presence of other visible facilities, such as buildings, meter or junction boxes on or adjacent to the Site."

Existing subsections (F) and (G) are renumbered to (G) and (H).

ITEM 15: DRAFT DESIGN-BUILD CONTRACT, SECTION 4.23(B) DEADLINE TO ACHIEVE FINAL COMPLETION

REPLACE the first sentence with the following:

"The Company shall achieve Final Completion within 120 days after the Acceptance Date."

ITEM 16: DRAFT DESIGN-BUILD CONTRACT, SECTION 6.2(E) ALLOWANCES FOR CERTAIN ITEMS

REPLACE the section with the following:

"(E) Allowances for Certain Items. At the time of the Proposal and Contract Date, the scope, need, and type of the following portions of the Design-Build Work are uncertain: potholing as addressed at Section 4.4(G) (Allowance for Potholing), remedial measures relating to compliance with certain hydraulic standards as described in Appendix 5 (Project Technical Requirements) Section 5.2.3.4, and non-SCADA computers as addressed in Appendix 5 (Project Technical Requirements). Therefore, allowances are provided (and are included within the Base Design-Build Price) for these three items. The allowances are: $110,000 (100 holes x $1,100/hole) for potholing; $xxxx for remedial measures; and, $xxxx for non-SCADA computers. The potholing allowance may be used by the Company for its and its Subcontractors actual and direct costs of labor, materials, equipment, transportation, Taxes, and insurance associated with the potholing work (which includes surveying, excavation, backfilling, surface restoration, permitting, and traffic control, as needed). The remedial measures allowance may be used by the Company for its and its Subcontractors actual and direct costs of labor, materials, equipment, transportation, Taxes, and insurance to develop and implement hydraulic compliance remedial measures under Appendix 5 (Project Technical Requirements) Section 5.2.3.4. The computer allowance may be used for the purchase, installation, and configuration of the computer equipment described in Appendix 5 (Project Technical Requirements). All other costs (including the Company's design, project management, general conditions costs, overhead, and profit) are deemed to be included in the original Base Design-Build Price, and are not subject to adjustment, regardless of the actual cost

of the allowance item. The Company shall not incur any costs under the remedial measures or non-SCADA computer allowance items without prior consultation with and approval of the SRWA Engineer. The Company shall track and substantiate its actual costs incurred on each allowance item. If the final actual costs are more than or less than the stated allowance value, the Base Design-Build Price shall be adjusted accordingly by Change Order to reflect the difference between the actual allowance item costs incurred by the Company and the allowance value."

ITEM 17: DRAFT DESIGN-BUILD CONTRACT, SECTION 10.11 SIGNIFICANT SUBCONTRACTS

REPLACE the entire Section with the following:

(A) **"SRWA Consents.** The Company shall not take any of the following actions, unless the Company has informed SRWA in writing about the proposed action and SRWA has consented to such action in writing, such consent not to be unreasonably withheld or delayed: (1) permit any Significant Subcontractor to assign or transfer to any Person all or substantially all of the obligations under the Significant Subcontract; or (2) enter into, or permit the entering into of, any Significant Subcontract other than those entered on or before the Contract Date and designated in Appendix 10 (Key Personnel and Approved Subcontractors). Any SRWA consent under this subSection shall be reflected in a Contract Administration Memorandum.

(B) **Process for Company to Award Subcontract.** As required by California Public Contract Code Section 22166(b), the Company shall proceed as follows in awarding any new Subcontract (including any Significant Subcontract subject to SRWA consent under subSection (A)) with a value exceeding 0.5 percent of the Base-Design Build Price allocable to the Construction Work: (a) Provide public notice of availability of work to be subcontracted in accordance with the publication requirements described at California Public Contract Code Section 20164, including a fixed date and time when qualifications statements, bids, or proposals will be due; (b) Establish reasonable qualification criteria and standards; and (3) Award the subcontract either on a best value basis (as defined and described at California Public Contract Code Sections 22161 and 22164) or to the lowest responsible responsive bidder. The process may include prequalification or short-listing. This subSection (B) does not apply to the Subcontractors listed in Appendix 10 (Key Personnel and Approved Subcontractors)."

APPENDIX 5

ITEM 18: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.3.4 RAW WATER PUMPING SYSTEM

REPLACE the seventh bullet item with the following:

- "The Company shall conduct computational fluid dynamics (CFD) modeling of the Raw Water Pump Station, including the Wet Well, to examine the entire facility's compliance with Hydraulic Institute (HI) standards. If modeling results reveal that remedial measures are required to ensure compliance with HI standards, the Company

shall develop and test such remedial measures using scaled physical modeling prior to implementation. With the exception of the construction of filler walls within individual pump bays, the costs for any such remedial measures, including the costs for scaled physical modeling, shall be covered by the remedial measures allowance included in Proposal Form P-1 (Base-Design Build Price)."

ITEM 19: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.4.1.1 REQUIRED UNIT PROCESSES

REPLACE the second sentence of the third bullet with the following:

"The ozone system shall include provisions for the future addition of hydrogen peroxide to assist with the removal of organic chemicals, and algae-related taste and odor constituents, when necessary."

ITEM 20: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.4.5 PRIMARY DISINFECTION

REPLACE the fifth bullet point on page 5-19 with the following:

- "The ozone facility shall be designed to accommodate and shall include all plumbing, including injection equipment, necessary for the future, for as-needed injection of hydrogen peroxide. Space shall be reserved within the bulk chemical storage and metering areas for the future installation of hydrogen peroxide storage and metering facilities. All piping necessary for bulk hydrogen peroxide delivery, and for conveyance of hydrogen peroxide between the chemical storage area and the ozone facility, shall be provided by the Company and capped as appropriate for the SRWA's future use."

ITEM 21: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.4.8 FINISHED WATER STABILIZATION

ADD the following to the end of the first bullet after the first paragraph:

"Facilities for the storage, metering and application of each of these chemicals must be included."

ITEM 22: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.4.12 CHEMICAL STORAGE AND ADDITION

REPLACE the third bullet item with the following:

- "With the exception of sodium hypochlorite storage facilities, bulk storage tanks may be located outdoors and uncovered. Bulk storage tanks for sodium hypochlorite shall be covered to avoid direct sun exposure. All chemical transfer and feed pumps, as well as ancillary equipment, shall be stored within buildings or covered and suitably protected from the environment, and within secondary containment areas. If stored outdoors and covered, bulk storage for sodium hypochlorite shall be heat traced and insulated. For all other bulk chemical storage equipment stored outdoors, insulation and/or heat tracing shall be provided where suggested by standard industry guidelines for the chemicals and

concentrations in question, based on the anticipated minimum and maximum ambient temperatures. If required by Applicable Law, the Company shall provide separate buildings for individual chemicals."

REPLACE the portion of Table 5-7 titled "Lime" with the following:

Lime		
Point of Application 1	--	Raw Water at Flash Mix Process
Point of Application 2	--	Finished Water Ahead of Clearwell

REPLACE the portion of Table 5-7 titled "Ozone (O_3)" with the following:

Ozone (O_3)		
Specified in Section 5.2.4.5	--	

REPLACE the portion of Table 5-7 titled "Corrosion Inhibitor (Chemical[s] TBD)" and the following footnotes with the following:

Corrosion Inhibitor (Chemical s TBD) [(c)]		
Chemical Form	--	TBD
Point of Application	--	Finished Water for each City, at the Finished Water Pumping Station
Dosage	TBD	TBD
(a) To allow the SRWA the ability to switch from an aluminum-based coagulant (which the Company is re uired to use during pre-Acceptance and Acceptance Testing) to an iron-based coagulant in the future, chemical storage and metering e uipment shall be designed to be compatible with both types of coagulants. (b) The Company shall be responsible for the selection of polymer type(s) for flash mixing, residuals thickening and residuals dewatering. (c) For bidding purposes, the Company shall assume the use of orthophosphate with a target residual of 1-5 mg/L.		

ITEM 23: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.4.17.1 GENERAL ARCHITECTURAL REQUIREMENTS

REPLACE the second to the last sentence in the first paragraph in the Section with the following:

"The SRWA is anticipating that the general architectural treatment, finishes, and furnishings of the Plant buildings will be similar to one or more of the example architectural styles presented in Reference Document 26."

ITEM 24: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.4.17.4 ADMINISTRATION AND OPERATIONS BUILDING

REPLACE the fourth bullet point with the following:

- "A minimum of four (4) private offices. Each office shall be secured and lockable and provide acoustical privacy for private or confidential conversation. Each office shall include a minimum of three (3) electric duplex receptacle wall outlets, three (3) data lines and a minimum of one (1) speakerphone."

REPLACE the sixth bullet point with the following:

- "Small conference room for use by up to six (6) people. This room shall be secured and lockable as needed and provide acoustical privacy for confidential conversation."

REPLACE the eighth bullet point with the following:

- "Male and female locker rooms separate from restrooms with lockers sufficient to accommodate the minimum SRWA operation and maintenance staff, plus 30 percent. Two lockers shall be provided for each employee, inclusing management and supervisors. The minimum restroom fixture count shall be provided, as required by code. Showers shall be provided."

REPLACE the ninth bullet point with the following:

- "Lunch room for staff breaks and lunch. Commercial-grade counter top and cabinets, sink, disposal, refrigerator, range, microwave oven, exhaust hood, and storage closet for supplies."

REPLACE the tenth bullet point with the following:

- "Multipurpose room, separate from the lunch and conference room, sufficient to accommodate twenty-five (25) people, in classroom-style/row seating, for Board of Directors meetings, public tour orientations, and training with audio/visual equipment including large flat screen and overhead projector, including the necessary computer connections to allow for presentation of materials from laptop computers. Acoustical privacy for confidential conversation shall be a feature of the multi-purpose room, and storage for supplies and storage of tables and chairs shall be provided."

ITEM 25: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.4.17.6 ONSITE LABORATORY

ADD the following after the last bullet point:

- "The onsite laboratory is intended to be an "operations lab" that will process grab samples and provide the onsite testing required by DDW. The onsite laboratory is not intended to be a certified laboratory for performing water quality tests for compliance monitoring. Water samples for compliance monitoring will be sent to an offsite certified laboratory for testing."

ITEM 26: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.5.3 REPLACEMENT BRIDGE DESIGN

REPLACE the first bullet on page 5-37 with the following:

- "The bridge may include a single span superstructure supported on reinforced concrete abutments, or a multiple span structure including one or more intermediate vertical supports. All elements of the bridge, except the vertical bridge abutments, if used, must remain above the highest adjacent canal lining or vertical side wall. If intermediate vertical supports are utilized, the Company shall demonstrate to TID's satisfaction that

the structures do not constrict the flow cross-Section or result in increase to water velocity or turbulence, when compared to the existing bridge, under the canal's design capacity. Demonstration shall include hydraulic calculations in Excel format accompanied by graphical output(s) depicting water surface elevations between the downstream extent of the replacement bridge and the upstream weir structure."

ITEM 27: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.6.7.1 RAW WATER FLOW SPLIT STRUCTURE

ADD the following after the third bullet:

- "If the diameter of the Raw Water Transmission Main piping between the flow split structure and the head of the treatment process is less than the diameter of the pipeline between the Raw Water Pump Station and the flow split structure, the flow split structure shall include a pigging retrieval system for retrieval of pigs launched at the Raw Water Pump Station. Retrieval facilities shall conform to the requirements of Section 5.2.4.2 (Raw Water Transmission Main Pigging Retrieval) of this Appendix.

- Within or adjacent to the flow split structure, and downstream of the isolation valve, an access manway shall be provided on the pipeline leading to the Ceres Main Canal to facilitate inspection, maintenance and sediment removal activities."

ITEM 28: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.2.6.10 POINTS OF INTERCONNECTION

ADD the following sentence to the end of the paragraph in the first bullet point ("Below-grade vault to house flow and pressure monitoring equipment.") in the second paragraph in the section:

"The sump pump in the vault shall be level-controlled by a level transmitter or level floats in the sump."

ADD the following sentence at the end of the fifth item in the list, under the fourth bullet point ("Isolation valves, bypass piping and other appurtenances:"), in the second paragraph in the section:

"Pressure gauges shall be installed upstream and downstream of the pressure reducing valve to aid in proper adjustment of the valve."

ADD the following item after the fifth item in the list, under the fourth bullet point ("Isolation valves, bypass piping and other appurtenances:"), in the second paragraph in the section:

"– A check valve on the sump pump discharge piping located in the flow meter vault. Unions shall be provided on the piping to allow for check valve replacement."

ITEM 29: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.2 GEOTECHNICAL ENGINEERING

ADD the following after the last bullet point:

Crawford & Associates. (2018) Geotechnical Memorandum, Stanislaus Regional Water Authority (SRWA) Regional Water Supply Pipeline Project Geotechnical Data Report, Stanislaus County, California.

ITEM 30: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.3.8 ACCESS ROAD IMPROVEMENTS

REPLACE the first sentence in the first paragraph in the Section with the following:

"The Company shall design and reconstruct Aldrich Road between John Fox Road and the primary Plant entrance."

ITEM 31: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.3.9.7 PIPELINE TRENCH DESIGN

REPLACE the second sentence with following:

"All pipe trenches shall be fully bedded and backfilled with imported material unless otherwise specified by the Stanislaus County design and construction standards. Imported material shall be approved by an engineer specializing in soil mechanics and consistent with the site-specific geotechnical report prepared in accordance with Section 5.3.2 (Geotechnical Engineering) of this Appendix."

ITEM 32: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.3.14.1 FENCING

REPLACE the first bullet item with the following:

- "The entire Raw Water Pump Station and Plant Sites shall be enclosed by fencing. The entirety of the Raw Water Pump Station Site fencing shall be eight-foot tall wrought iron fencing, topped with outward curving spear pickets. Fencing in areas of the Plant Site which are publicly accessible or visible from the main Plant entrance shall be eight-foot tall wrought iron fencing, topped with outward curving spear pickets; all other portions of the Site shall be enclosed by eight-foot tall galvanized steel chain link fencing, topped with three strands of barbed wire angled outwards from the Plant Site."

ITEM 33: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.4.3 GENERAL

REPLACE the third sentence in the first paragraph with the following:

"If the Company provides bar wrapped steel pipe (AWWA C303) or mortar coated steel pipe (AWWA C200 with AWWA C205 Coating), the Company shall determine whether cathodic protection is required due to the mildly corrosive soils; in any event, however,

electrical continuity of the pipe, electrical isolation from other structures and test stations for corrosion monitoring shall be provided as outlined below."

ITEM 34: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.4.6.2.3 FINISH AND COLOR SCHEDULES

DELETE the third bullet point in this section.

ITEM 35: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.9.4.5 COATINGS

REPLACE the second paragraph with the following:

"All welded steel pipe shall be either tape-wrapped in accordance with AWWA C214, with a minimum total thickness of the tape coating system of 80 mils, or cement mortar coating with a minimum thickness of 1-inch in accordance with AWWA C205."

ITEM 36: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.9.4.14.4 ACCESS STRUCTURES

REPLACE the first and second sentence of the first paragraph with the following:

"Pipeline access structures shall be provided for the finished water transmission mains for construction and to permit inspection, cleaning and repair of the pipelines. Access structures shall be placed at a maximum spacing of 2,500-feet along the pipelines."

ITEM 37: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, SECTION 5.3.10.7.15 FIBER OPTIC CABLE

REPLACE the first bullet item with the following:

- "Primary communication between Regional Water Facilities shall be via fiber optic cable. All fiber optic cable shall be installed within conduit and located generally parallel to the Raw Water Transmission Main (between the Raw Water Pump Station and the Plant), the Turlock Finished Water Transmission Main (between the Plant and the Turlock terminal storage tank site), and the Ceres Finished Water Transmission Main (between the Plant and the Ceres terminal storage tank site)."

ITEM 38: APPENDIX 5 PROJECT TECHNICAL REQUIREMENTS, ATTACHMENTS

ADD the following as an attachment to the appendix:

"Attachment 5E: Crawford 2018 Finished Water Transmission Main Data Report"

APPENDIX 9

ITEM 39: APPENDIX 9 GOVERNMENT APPROVALS, UTILITIES AND LANDOWNER COORDINATION, SECTION 9.5.8.2 RESTRICTIONS FOR CONSTRUCTION IN TID RIGHT-OF-WAY

ADD the following sentence to the third paragraph of the Section between the second and third sentence:

"All parallel pipeline construction within TID right-of-way shall remain outside the limits of the canal bank. Any areas that may require deviation from this requirement shall be provided to TID for review and approval."

APPENDIX 13

ITEM 40: APPENDIX 13 STATE REVOLVING FUND REQUIREMENTS, SECTION 13.2 DWSRF PROGRAM

REPLACE the second paragraph with the following:

"The DWSRF Program has both bidding (Procurement Phase) requirements and design and construction (Contract Phase) requirements that shall be followed by the Company. Table 13-1 summarizes these two sets of requirements. The Procurement Phase requirements of the DWSRF Program shall be met by the Company after approval of the Contract and prior to the start of construction activities, except Proposal Forms G12A – G12C that are required to be submitted with each proposal (see RFP Section 4.5.6 Good Faith Effort Documentation). The Contract Phase requirements of the DWSRF Program shall be met during design and construction and according to the specific deadlines specified for each requirement."

PLEASE MAKE THESE CHANGES IN THE PROCUREMENT DOCUMENTS IN YOUR POSSESSION BEFORE YOU SUBMIT YOUR PROPOSAL.

You must acknowledge receipt of all addenda on Proposal Form G-1 to be considered a valid proposal.

This Addendum No. 1, including all attachments, is being sent to you via email, and is also posted on the SRWA Procurement SharePoint site.

Please follow the communication protocol included in Section 3.3 of the RFP if you have any questions regarding this addendum.

Sincerely,

Lindsay Smith
SRWA Project Engineer

ATTACHMENT A

Proposal Form T-34

PROPOSAL FORM T-34

DESIGN-BUILD QUALITY MANAGEMENT

Proposers shall provide the minimum number of worker hours and staff qualifications to adequately perform quality control reviews and inspections during design, construction, and start-up/testing phases of the project.

To aid SRWA in the selection process, Proposers shall provide the digital Microsoft® Word document version on CD-ROM. To facilitate transfer of the table to a spreadsheet format, Proposers shall not merge cells, use special symbols, or change the order of the requested parameters. Proposers shall limit the number of characters in each cell to 1024.

Phase of Work	Minimum Worker Hours	Staff Type	Role/Responsibility	Minimum Qualifications

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ATTACHMENT B

Crawford 2018 Finished Water Transmission Main Data Report

GEOTECHNICAL DATA REPORT

Stanislaus Regional Water Authority
Regional Water Supply Pipeline Project
Stanislaus County, California

Prepared by:

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

June 2018

Prepared for:

West Yost Associates, Inc.
2020 Research Park Drive, Suite #100
Davis, CA 95618

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June 27, 2018
CAInc File No. 16-268.1

Mr. David Pezzini
West Yost Associates, Inc.
2020 Research Park Drive, Suite #100
Davis, CA 95618

Subject: **GEOTECHNICAL DATA REPORT**
Stanislaus Regional Water Authority
Regional Water Supply Pipeline Project
Stanislaus County, California

Dear Mr. Pezzini,

Attached is our Geotechnical Data Report for the Stanislaus Regional Water Authority - Regional Water Supply Pipeline Project in Stanislaus, California. We prepared this report to provide geotechnical data for the project. Crawford & Associates, Inc. (CAInc) completed this report in accordance with our agreement dated September 25, 2015.

Please call if you have questions or require additional information.

Sincerely,

Crawford & Associates, Inc.,

Keiko Lewis, MS, EIT
Project Engineer

Benjamin Crawford, PE, GE
Principal Geotechnical Engineer

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FIGURES

APPENDIX A

APPENDIX B

1 INTRODUCTION

1.1 PURPOSE

Crawford & Associates, Inc. (CAInc) prepared this Geotechnical Data Report for the Stanislaus Regional Water Authority (SRWA) - Regional Water Supply Pipeline Project in Stanislaus, California. This report is meant to provide geotechnical and geologic data for contracting aspects of the project.

1.2 SCOPE OF SERVICES

To prepare this report, CAInc:

- Reviewed geologic, soils, and seismic maps pertaining to the site;
- Discussed the project with West Yost engineer David Pezzini, PE.;
- Drilled, logged, and sampled twenty-one exploratory borings along the proposed transmission pipeline alignment to a maximum depth of about 41 feet below ground surface (bgs);
- Performed laboratory testing on soil samples recovered from the borings; and
- Developed conclusions and recommendations based on the data and test results.

2 PROJECT DESCRIPTION

The Stanislaus Regional Water Authority (SRWA) is a Joint Powers Authority (JPA), which includes the California Cities of Ceres and Turlock. SRWA's regional surface water supply project is a collaborative effort that will provide water from the Tuolumne River via an existing set of perforated pipelines installed below the bottom of the river (located just west of the Geer Road Bridge). The river water will be distributed via new intake structure, pump station, and pipelines to SRWA service areas for municipal and industrial uses. The water pipeline project will consist of two different portions referred to as the Turlock Finished Water Transmission Main and the Ceres Finished Water Transmission Main. The Turlock transmission main will extend from the water treatment plant (WTP) to N. Quincy Road south of E. Zeering Road and the Ceres transmission main will extend from the RWTF to the intersection of Eastgate Blvd and E. Hatch Road.

Key project components include:

- Turlock transmission Main which includes about 7.25 miles of water pipeline and two trenchless crossing near the intersection of Berkeley Avenue and Santa Fe Avenue (below the RR crossing) and the intersection of Berkeley Avenue and Service Road (TID Canal/Lateral). The majority of the transmission main will be installed within the existing pavement using conventional open cut trench construction, and
- Ceres transmission Main which includes 5 miles of water pipeline and two trenchless crossing near the intersection of E. Hatch Road and Santa Fe Avenue (below the RR crossing) and the intersection of E. Hatch Road and Faith Home Road (irrigation culverts). The majority of the transmission main will be installed within the existing pavement using conventional open cut trench construction.

We provide a general exploration location map of the project site on Figure 1.

3 SITE GEOLOGY

The site is shown on published geologic mapping to be underlain by Quaternary alluvium near the Tuolumne River; these soils are typically unconsolidated, non-marine sand, silt and clay. Late Pleistocene sediments are mapped away from the river and underlying the Quaternary alluvium; these soils are mapped as Modesto Formation, comprised mostly of semi-consolidated, non-marine sand and silt. The Riverbank Formation, Middle Pleistocene sediments, is mapped on the center region of Berkeley Road (north-south portion of the alignment). The Riverbank Formation is comprised mostly of slightly- consolidated silt and medium dense to dense sand.

We present a geologic map as Figure 3.

4 EXPLORATION

Geo-Ex Subsurface Exploration (Geo-Ex) drilled twenty-one exploratory test borings for the project in January and February of 2018 to a maximum depth of about 41 ft. Geo-Ex used a CME 55 drill rig equipped with an autohammer and auger to perform this work. Blow counts shown on our boring logs are uncorrected field blow counts.

CAInc's project engineers and geologists logged the exploratory borings consistent with the Unified Soil Classification System (USCS) and the 2010 Caltrans Logging Manual. CAInc retained samples from the borings and made groundwater and pavement observations during drilling operations. The borings were backfilled with native cuttings and roadway borings were capped with concrete.

5 SURFACE AND SUBSURFACE CONDITIONS

5.1 SOIL CONDITIONS

5.1.1 OPEN TRENCHES

Based on our subsurface investigation, the soils encountered along the transmission mains seem to generally agree with published geologic maps and previously acquired subsurface boring data. In general, the soils consist of loose silty sand, poorly graded sand with silt, and/or (occasional) silt to depths of approximately 7-11 ft bgs (below ground surface), underlain by loose to medium dense sand to 7-20 ft bgs (consistent with unconsolidated alluvium), underlain by interbedded medium dense to dense sand and silt (consistent with Modesto and Riverbank Formation deposits), with the exception of B23 which contained lean clay between approximately 8 and 11ft.

5.1.2 TRENCHLESS CROSSINGS

The trenchless crossing along the Ceres transmission main (B4) near E. Hatch Road and Santa Fe Avenue follows the general trend of the other borings in the upper 12 ft, with the exception that poorly graded sand was observed in the uppermost 3ft. The sand was underlain by layers of medium dense poorly graded sand with silt and silty sand to approximately 16ft, where poorly graded sand was encountered to a depth of approximately 18ft. The poorly graded sand was underlain by interbedded sand and silt (consistent with the Riverbank formation).

The trenchless crossing along the Ceres transmission main (B-9, Kleinfelder 2007) near E. Hatch Road and Faith Home Road displayed soft to stiff sandy silt in the uppermost 5 ft. The silt was

underlain by thin interbedded layers (0.5 to 3.0 ft thick) of medium dense to very dense sandy silt and silty sand to a depth of approximately 20 ft.

The trenchless crossing along the Turlock transmission main (B13) near Berkeley Avenue and Service Road, displayed loose to medium dense silty sand in the uppermost 7 ft. The silty sand was underlain by medium dense to dense poorly graded sand to a depth of approximately 15 ft.

The trenchless crossing along the Turlock transmission main (B17 & B18) near Berkeley Avenue and Santa Fe Avenue, displayed very dense interbedded silty sand and poorly graded sand with silt layers to approximately 16ft. Between approximately 16 and 31ft we encountered dense to very dense, interbedded silty sand and poorly graded sand with silt. Thin layers (0.5 to 2.0 ft thick) of poorly graded sand, silty sand, sandy silt, and poorly graded sand were encountered in B17 from approximately 31 to 41ft. Whereas in B18, we encountered poorly graded sand and poorly graded sand with silt below 20ft to the explored depth of about 40ft.

We present the plan and profile of the boring locations on Figure 2 and provide boring logs in Appendix A.

5.2 GROUNDWATER

Published studies indicate groundwater levels have decreased over time in the Central Valley. During a 2007 exploration by Kleinfelder, groundwater was encountered at numerous locations along the planned transmission mains as shallow as 20ft bgs. Department of Water Resources (DWR) data indicate groundwater levels in Spring 2017 generally at depths of about 50-70ft bgs. We did not encounter groundwater in any of our boring locations.

Adjacent to the Tuolumne River, groundwater will likely be impacted by seasonal river fluctuations. Groundwater may be present as shallow, perched water, above a low permeability confining layer (such as areas with high percentages of silt, which was observed during subsurface investigation). Groundwater levels will be dependent on variable factors such as precipitation, irrigation and well pumping.

6 LABORATORY TESTING

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

- Moisture Content / Dry Density (ASTM D2216 / D2937)
- Particle Size Analysis (ASTM D422)
- No. 200 Sieve Wash (ASTM D1140)
- Atterberg Limits (ASTM D4318)
- Direct Shear (ASTM D3080)
- R-value (CTM 301)

We present the laboratory test results in Appendix B

7 SEISMIC DATA

7.1 FAULT RUPTURE

The site does not lie within an Alquist–Priolo Earthquake Fault Zone and no known active faults are mapped within or through the project area. The California Geologic Survey (CGS) considers a fault to be active if it has shown movement one or more times during the Holocene period, defined as the last 11,700 years. According to the CGS, the closest active faults are the Ortigalita Fault at about 30 miles southwest of the site and the Carnegle Fault at about 33 miles west-northwest of the site. Based on this mapping, we consider the potential for fault rupture along the alignment to be low. We present regional faults on Figure 4.

7.2 SEISMIC DESIGN PARAMETERS

Based on our exploratory borings, we provide California Building Code (CBC) design parameters below for the proposed pipeline alignment.

We determined the values in Table 1 by using the US Seismic Design Maps web tool developed by the United States Geological Survey and provide the highest determined values.

Table 1: CBC Seismic Parameters
Class Site D, Risk Category I/II/III

Alignment	Hatch Road	Berkeley Avenue
Latitude Longitude	37.60926, -120.91107	37.55022 -120.82874
S_s – Acceleration Parameter	0.847 g	0.801 g
S_1 – Acceleration Parameter	0.319 g	0.307 g
F_a – Site Coefficient	1.161	1.180
F_v – Site Coefficient	1.762	1.785
S_{MS} – Adjusted MCE[1] Spectral Response Acceleration Parameter	0.983 g	0.945 g
S_{M1} – Adjusted MCE[1] Spectral Response Acceleration Parameter	0.562 g	0.549 g
S_{DS} – Design Spectral Acceleration Parameter	0.656 g	0.630 g
S_{D1} – Design Spectral Acceleration Parameter	0.375 g	0.366 g
T_L – Long-Period Transition Period[2]	12 sec	12 sec

[1] Maximum Considered Earthquake
[2] Figure 22-12, ASCE 7-10

7.3 LIQUEFACTION POTENTIAL

Liquefaction can occur when saturated, loose to medium dense, granular soils (generally within 50 ft of the ground surface), or specifically defined cohesive soils, are subjected to ground shaking. Based on groundwater conditions encountered during drilling activities, published groundwater data, and current industry accepted liquefaction evaluation methods, the potential for liquefaction along the pipeline alignment is low.

8 LIMITATIONS

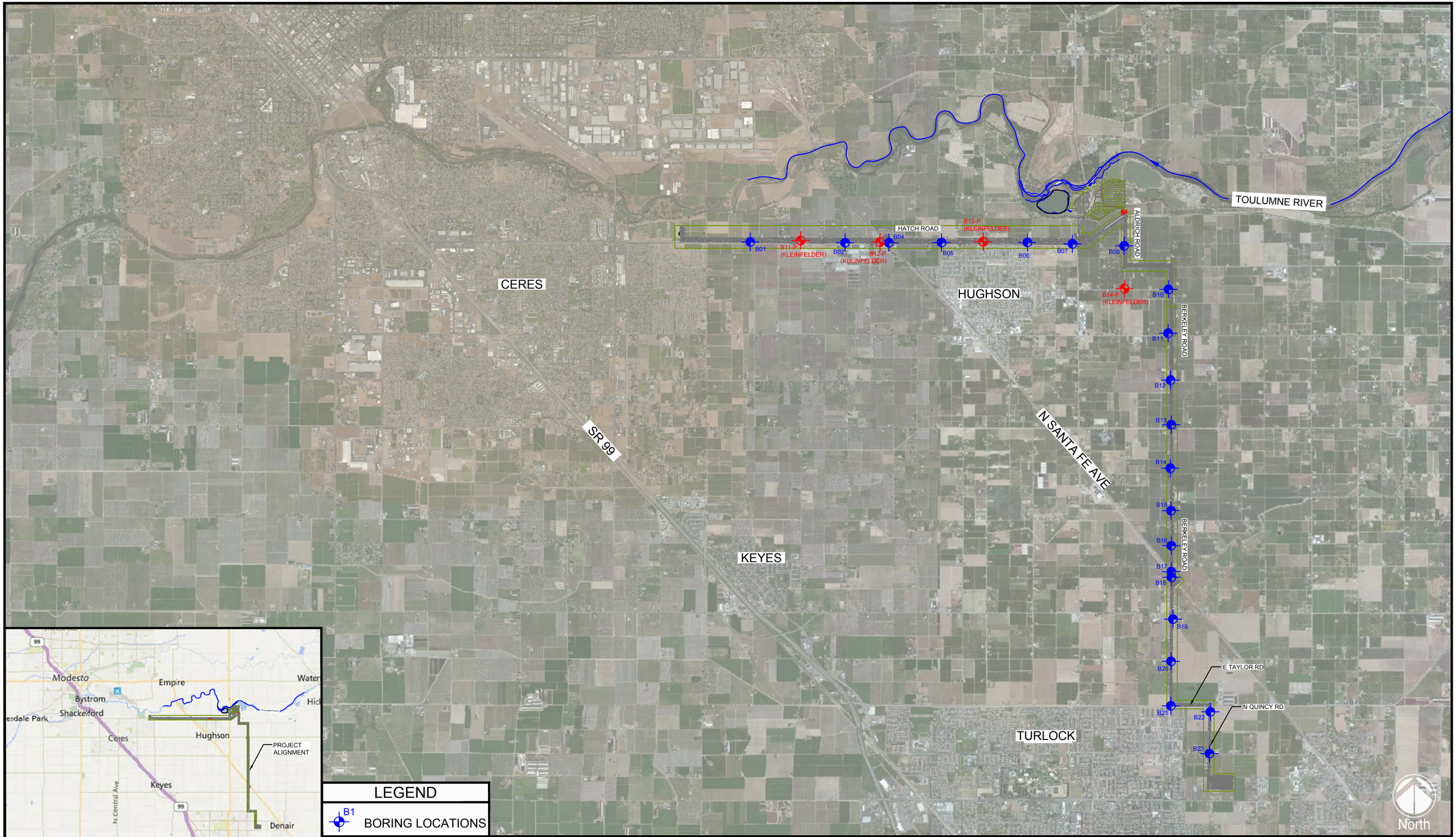
CAInc performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. Do not use this report for different locations and/or projects without the written consent of CAInc. Where referenced, we used ASTM or Caltrans standards as a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

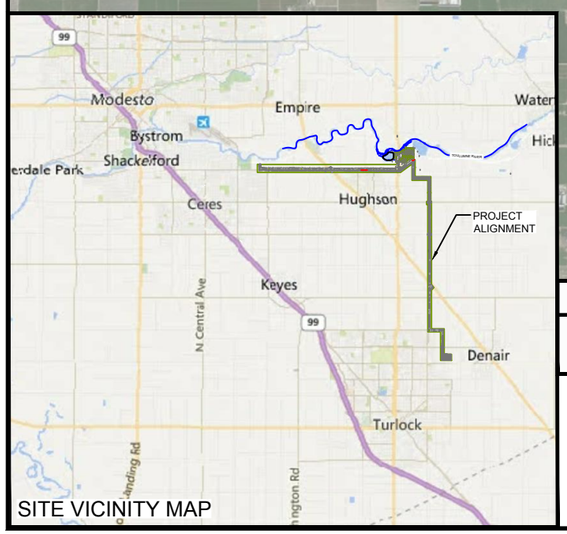
CAInc based this report on the current site conditions. We assumed the soil and groundwater conditions are representative of the subsurface conditions on the site. Actual conditions between explorations will vary along the project alignment.

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

Logs of our explorations are presented on Figure 1 and Appendix A. The lines designating the interface between soil types are approximate. The transition between soil types may be abrupt or gradual. Our recommendations are based on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geological conditions

FIGURES





SITE VICINITY MAP

LEGEND

B1 BORING LOCATIONS

NOTE: ALL BORING ELEVATIONS APPROXIMATED BASED ON GOOGLE EARTH.

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Checked By	BDC	3/15/18
Drawn By	SJC	3/15/18

Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

Figure 1
Exploration Location Map

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

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

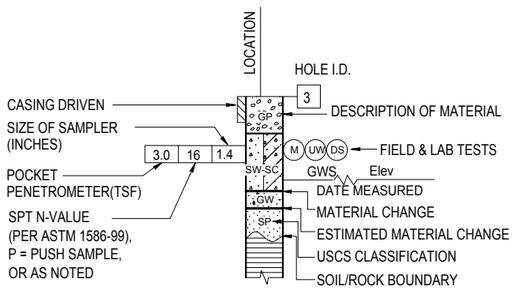
LEGEND - SOIL
(SHEET 1 OF 2)

CEMENTATION	
DESCRIPTION	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.

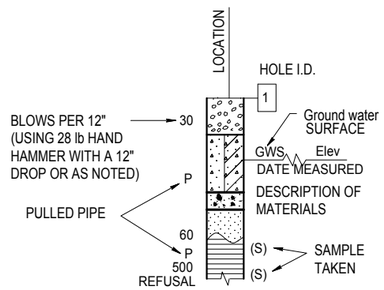
SOIL COLOR LEGEND	
COLOR	SOIL TYPE
	GRAVEL (GP, GW, GM, GC) > 50% SAND AND GRAVEL; %GRAVEL > %SAND
	SAND (SP, SW, SM, SC) > 50% SAND AND GRAVEL; %SAND > %GRAVEL
	FINE-GRAINED (ML, MH, CL, CH) > 50% FINES

BOREHOLE IDENTIFICATION		
SYMBOL	HOLE TYPE	DESCRIPTION
Size	A	AUGER BORING (HOLLOW OR SOLID STEM BUCKET)
Size	R RW RC P	ROTARY DRILLED BORING (CONVENTIONAL) ROTARY DRILLED WITH SELF-CASING WIRE-LINE ROTARY CORE WITH CONTINUOUSLY-SAMPLED, SELF-CASING WIRE-LINE ROTARY PERCUSSION BORING (AIR)
Size	R	ROTARY DRILLED DIAMOND CORE
Size	HD HA	HAND DRIVEN (1-INCH SOIL TUBE) HAND AUGER
●	D	DYNAMIC CONE PENETRATION BORING
▲	CPT	CONE PENETRATION TEST (ASTM D 5778)
□	O	OTHER (NOTE ON LOTB)
Note: Size in inches.		

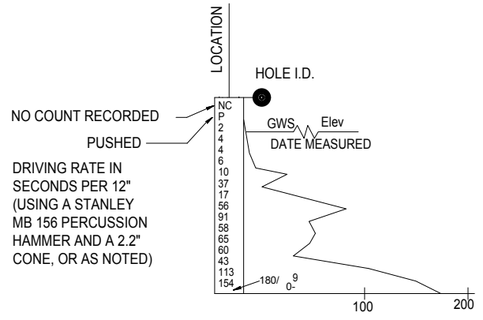
CONSISTENCY OF COHESIVE SOILS				
DESCRIPTION	SHEAR STRENGTH (tsf)	POCKET PENETROMETER MEASUREMENT, PP, (tsf)	TORVANE MEASUREMENT, TV, (tsf)	VANE SHEAR MEASUREMENT, VS, (tsf)
VERY SOFT	LESS THAN 0.12	LESS THAN 0.25	LESS THAN 0.12	LESS THAN 0.12
SOFT	0.12 - 0.25	0.25 - 0.5	0.12 - 0.25	0.12 - 0.25
MEDIUM STIFF	0.25 - 0.5	0.5 - 1	0.25 - 0.5	0.25 - 0.5
STIFF	0.5 - 1	1 - 2	0.5 - 1	0.5 - 1
VERY STIFF	1 - 2	2 - 4	1 - 2	1 - 2
HARD	GREATER THAN 2	GREATER THAN 4	GREATER THAN 2	GREATER THAN 2



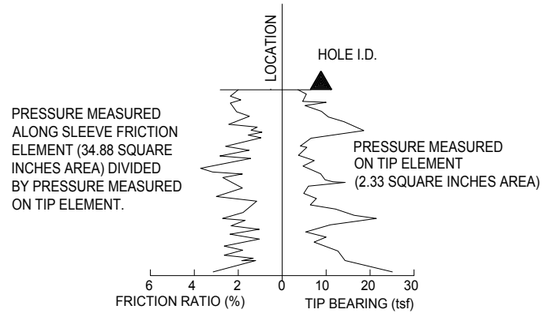
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) BORING

NOTE: ALL BORING ELEVATIONS APPROXIMATED BASED ON GOOGLE EARTH.

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Drawn By	SJC	3/15/18
	By	Date

Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 1 of 12

Project No. 16-268.2

Scale

Date 3/15/18

LEGEND - SOIL (SHEET 2 OF 2)

GROUP SYMBOLS AND NAMES

GRAPHIC/SYMBOL	GROUP NAMES	GRAPHIC/SYMBOL	GROUP NAMES
GW	WELL-GRADED GRAVEL WELL-GRADED GRAVEL WITH SAND	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
GP	POORLY-GRADED GRAVEL POORLY-GRADED GRAVEL WITH SAND		
GW-GM	WELL-GRADED GRAVEL WITH SILT WELL-GRADED GRAVEL WITH SILT AND 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
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	ML	SILT SILT WITH SAND SILT WITH GRAVEL SANDY SILT SANDY SILT WITH GRAVEL GRAVELLY SILT GRAVELLY SILT WITH 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	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
GC	CLAYEY GRAVEL CLAYEY GRAVEL WITH SAND		
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL 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
SW	WELL-GRADED SAND WELL-GRADED SAND WITH GRAVEL		
SP	POORLY-GRADED SAND POORLY-GRADED SAND WITH GRAVEL	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
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)	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
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)	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
SM	SILTY SAND SILTY SAND WITH GRAVEL		
SC	CLAYEY SAND CLAYEY SAND WITH GRAVEL	OH	ORGANIC ELASTIC SILT ORGANIC ELASTIC SILT WITH SAND ORGANIC ELASTIC SILT WITH GRAVEL SANDY ORGANIC ELASTIC SILT SANDY ORGANIC ELASTIC SILT WITH GRAVEL GRAVELLY ORGANIC ELASTIC SILT GRAVELLY ORGANIC ELASTIC SILT WITH SAND
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND WITH GRAVEL		
PT	PEAT	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
	COBBLES COBBLES AND BOULDERS BOULDERS		

FIELD AND LABORATORY TESTING

- (C) CONSOLIDATION (ASTM D 2435)
- (CL) COLLAPSE POTENTIAL (ASTM D 5333)
- (CP) COMPACTION CURVE (CTM 216)
- (CR) CORROSIVITY TESTING (CTM 643, CTM 422, CTM 417)
- (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 (CTM 220)
- (PA) PARTICLE SIZE ANALYSIS (ASTM D 422)
- (PI) PLASTICITY INDEX (AASHTO T 90) LIQUID LIMIT (AASHTO T 89)
- (PL) POINT LOAD INDEX (ASTM D 5731)
- (PM) PRESSURE METER
- (R) R-VALUE (CTM 301)
- (SE) SAND EQUIVALENT (CTM 217)
- (W) 200 WASH (ASTM D 1140)
- (SL) SHRINKAGE LIMIT (ASTM D 427)
- (SW) SWELL POTENTIAL (ASTM D 4546)
- (UC) UNCONFINED COMPRESSION-SOIL (ASTM D 2166) UNCONFINED COMPRESSION-ROCK (ASTM D 2938)
- (UU) UNCONSOLIDATED UNDRAINED TRIAXIAL (ASTM D 2850)
- (UW) UNIT WEIGHT (ASTM D 4767)

APPARENT DENSITY OF COHESIONLESS SOILS

DESCRIPTION	SPT N (BLOWS / 12 INCHES)
VERY LOOSE	0 - 5
LOOSE	5 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	GREATER THAN 50

MOISTURE

DESCRIPTION	CRITERIA
DRY	NO DISCERNABLE MOISTURE
MOIST	MOISTURE PRESENT, BUT NO FREE WATER
WET	VISIBLE FREE WATER

PERCENT OR PROPORTION OF SOILS

DESCRIPTION	CRITERIA
TRACE	PARTICLES ARE PRESENT BUT ESTIMATED TO BE LESS THAN 5%
FEW	5% - 10%
LITTLE	15% - 25%
SOME	30% - 45%
MOSTLY	50% - 100%

PARTICLE SIZE

DESCRIPTION		SIZE
BOULDER		GREATER THAN 12"
COBBLE		3" - 12"
GRAVEL	COARSE	ƒ" - 3"
	FINE	1/5" - ƒ"
SAND	COARSE	^" - 1/5"
	MEDIUM	" - ^"
	FINE	1/300" - "
SILT AND CLAY		LESS THAN 1/300"

NOTE: ALL BORING ELEVATIONS APPROXIMATED BASED ON GOOGLE EARTH.

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

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	By	Date	

Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 2 of 12

Project No. 16-268.2

Scale

Date 3/15/18

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Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 3 of 12

Project No.	16-268.2
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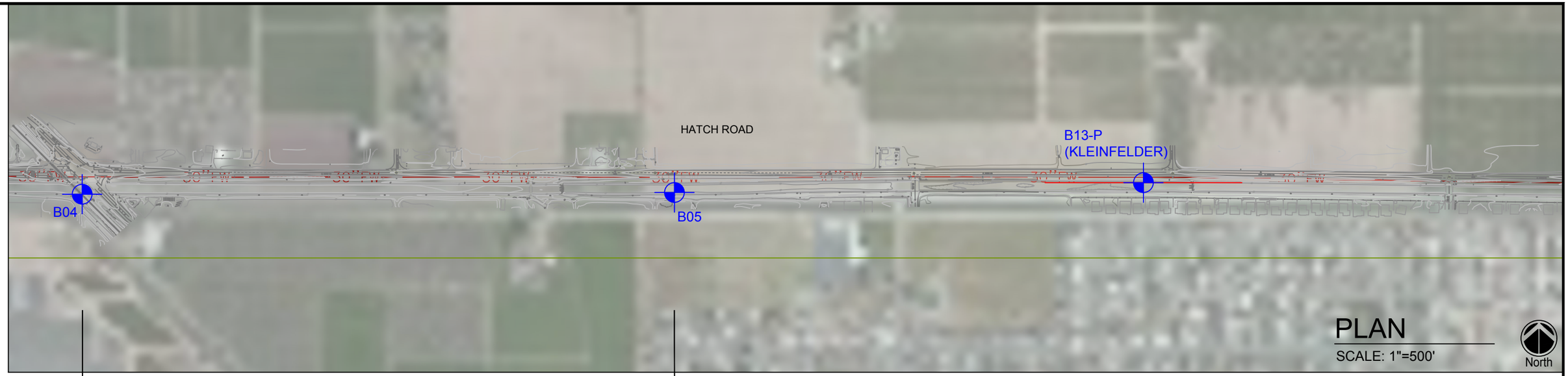

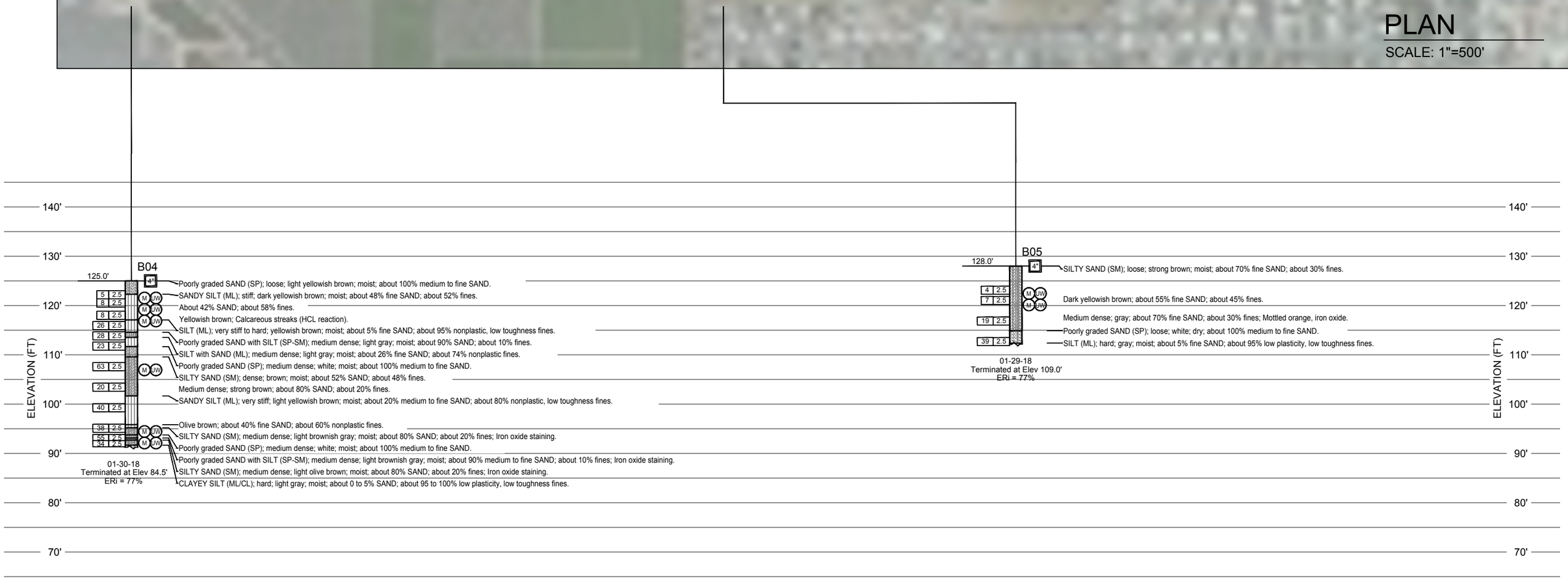

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Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

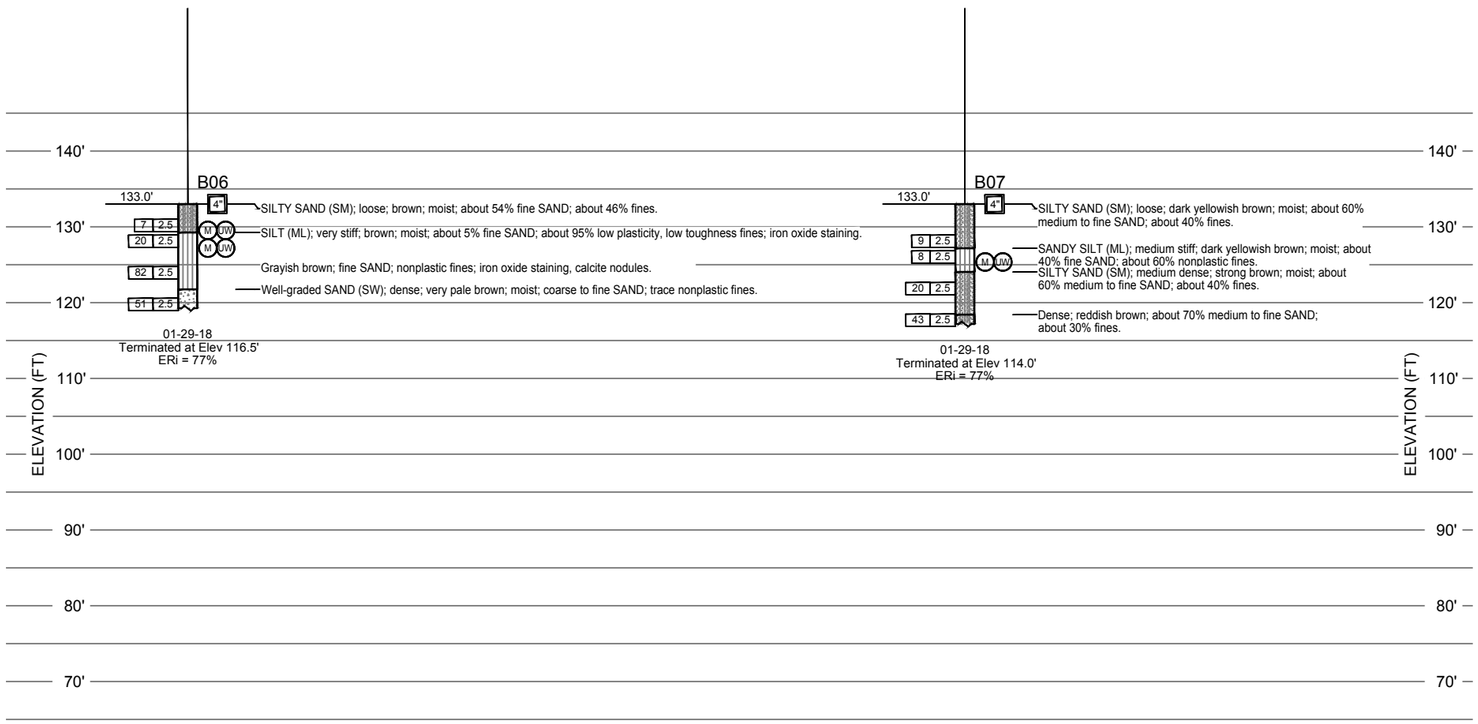
Figure 2
Plan and Profile
Sheets
Sheet 4 of 12

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

PLAN

SCALE: 1"=500'

North



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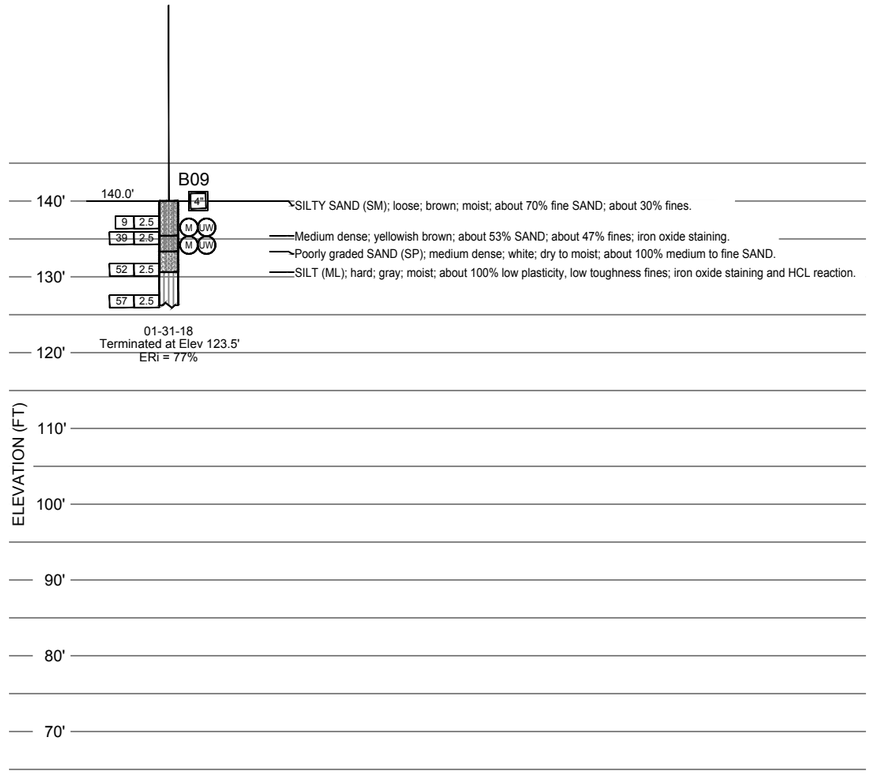
Stanislaus Regional Water Authority
(SRWA) Wet Well Project

Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 5 of 12

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



NOTE: ALL BORING ELEVATIONS APPROXIMATED BASED ON GOOGLE EARTH.

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(209) 312-7668

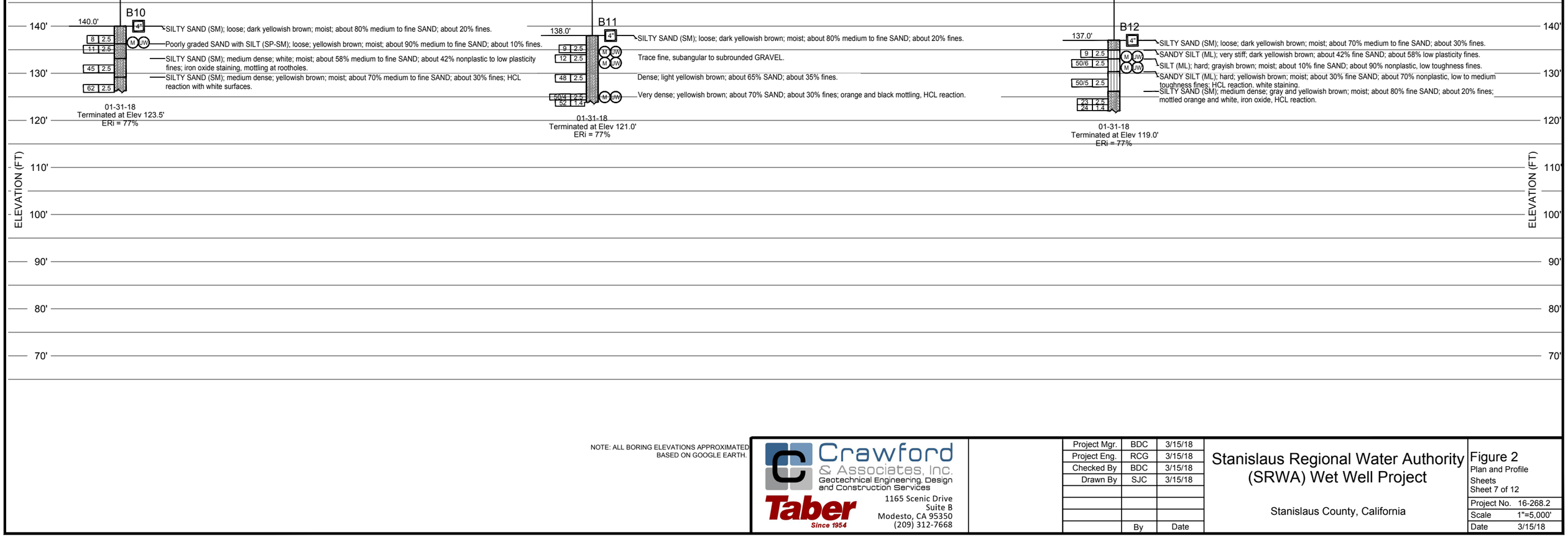
Project Mgr.	BDC	3/15/18
Project Eng.	RCG	3/15/18
Checked By	BDC	3/15/18
Drawn By	SJC	3/15/18
	By	Date

Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 6 of 12

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



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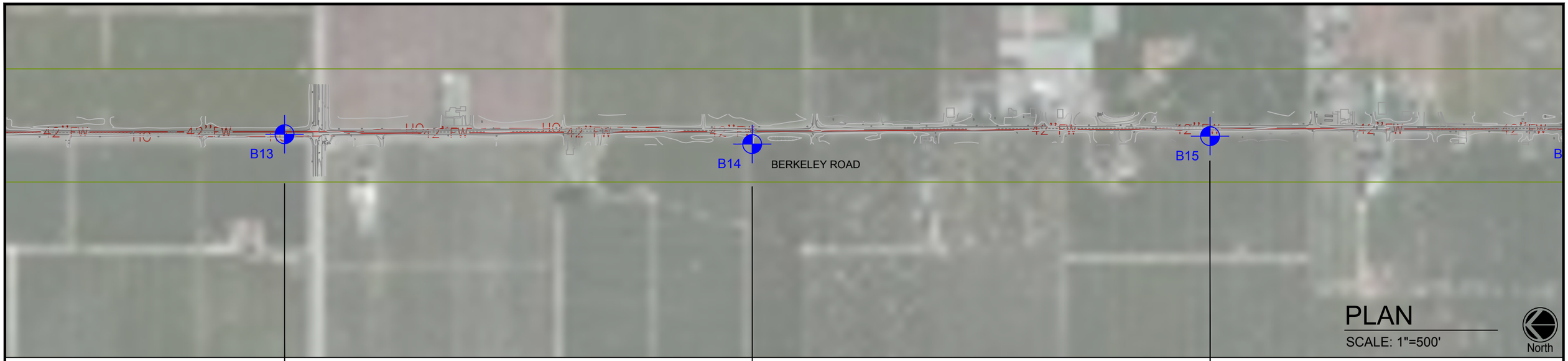
Project Eng.	RCG	3/15/18
Checked By	BDC	3/15/18
Drawn By	SJC	3/15/18
		By / Date

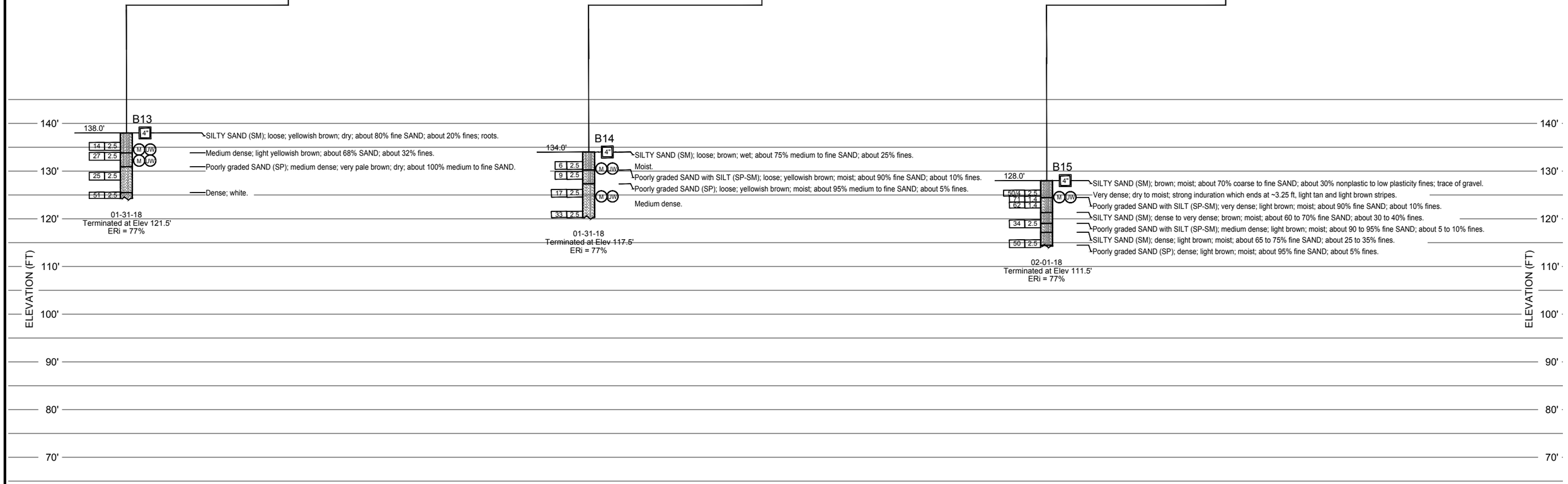
Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 7 of 12

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





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Drawn By	SJC	3/15/18
	By	Date

Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

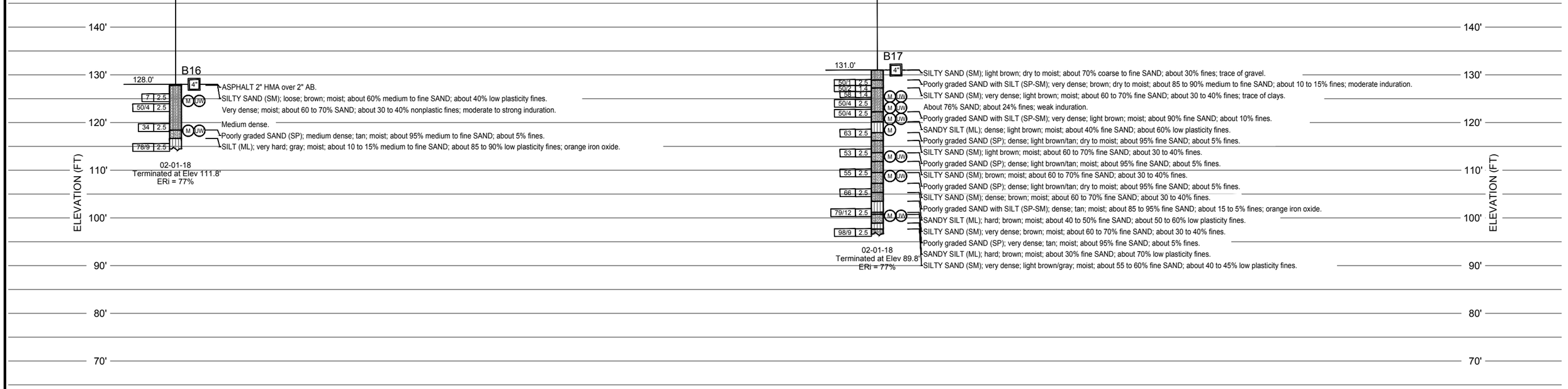
Figure 2
Plan and Profile
Sheets
Sheet 8 of 12

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

PLAN

SCALE: 1"=500'

North



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Drawn By	SJC	3/15/18
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Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

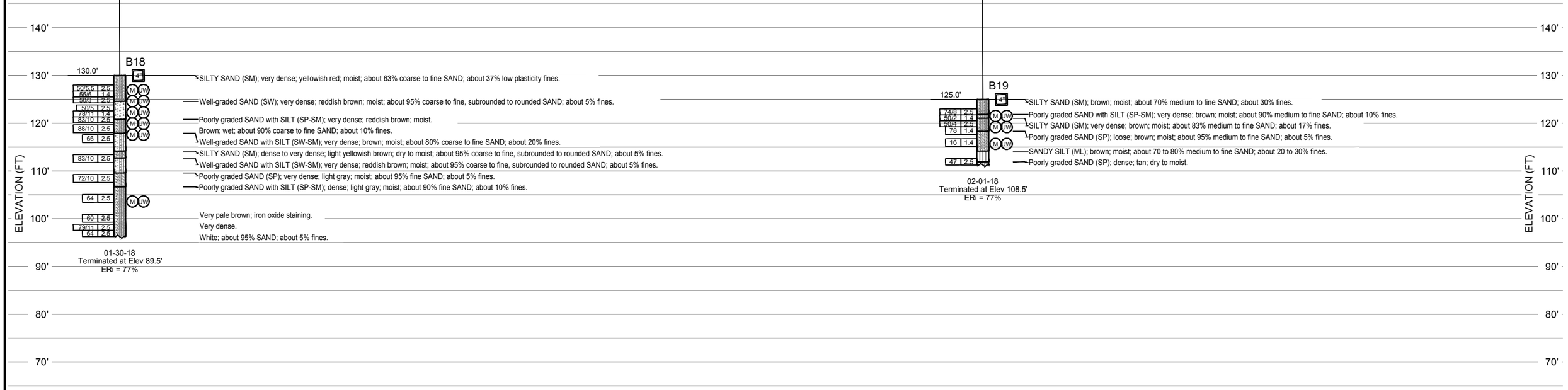
Figure 2
Plan and Profile
Sheets
Sheet 9 of 12

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

PLAN

SCALE: 1"=500'

North



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Drawn By	SJC	3/15/18
	By	Date

Stanislaus Regional Water Authority
(SRWA) Wet Well Project

Stanislaus County, California

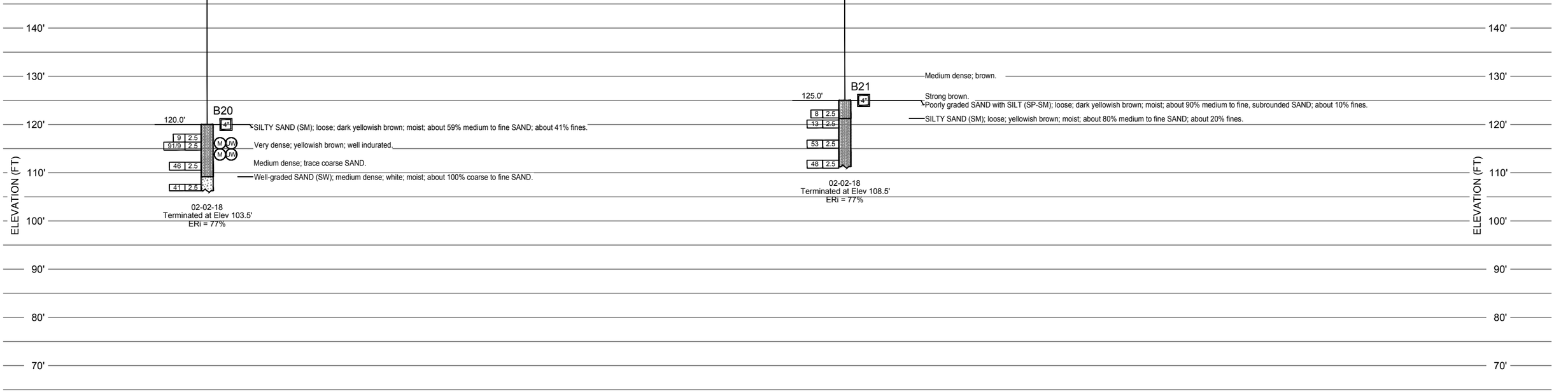
Figure 2
Plan and Profile
Sheets
Sheet 10 of 12

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

PLAN

SCALE: 1"=500'

North



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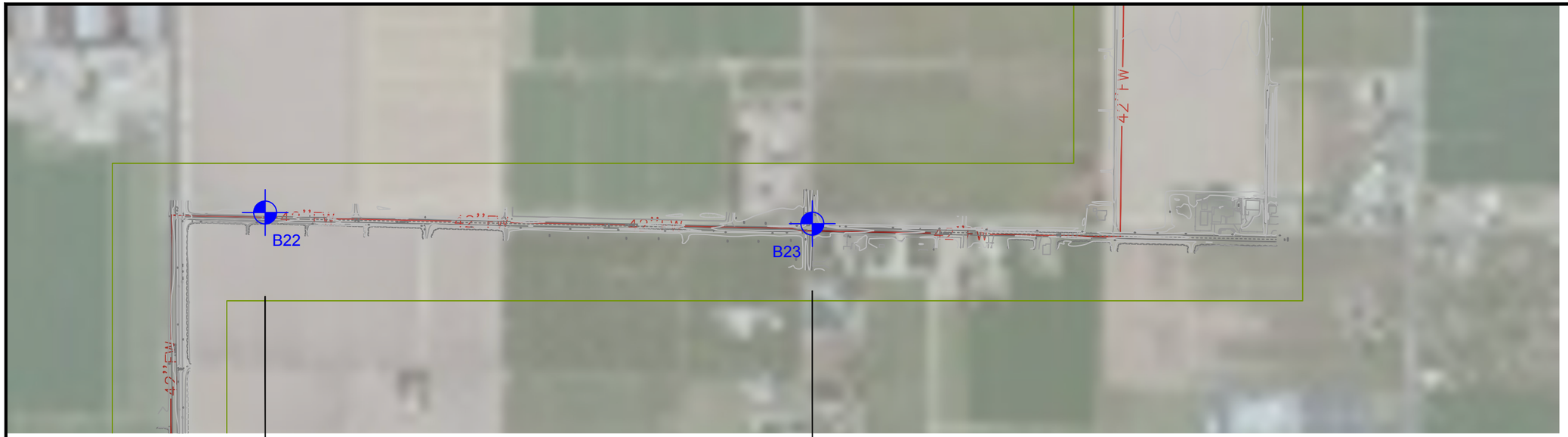
	By	Date

Stanislaus Regional Water Authority (SRWA) Wet Well Project

Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 11 of 12

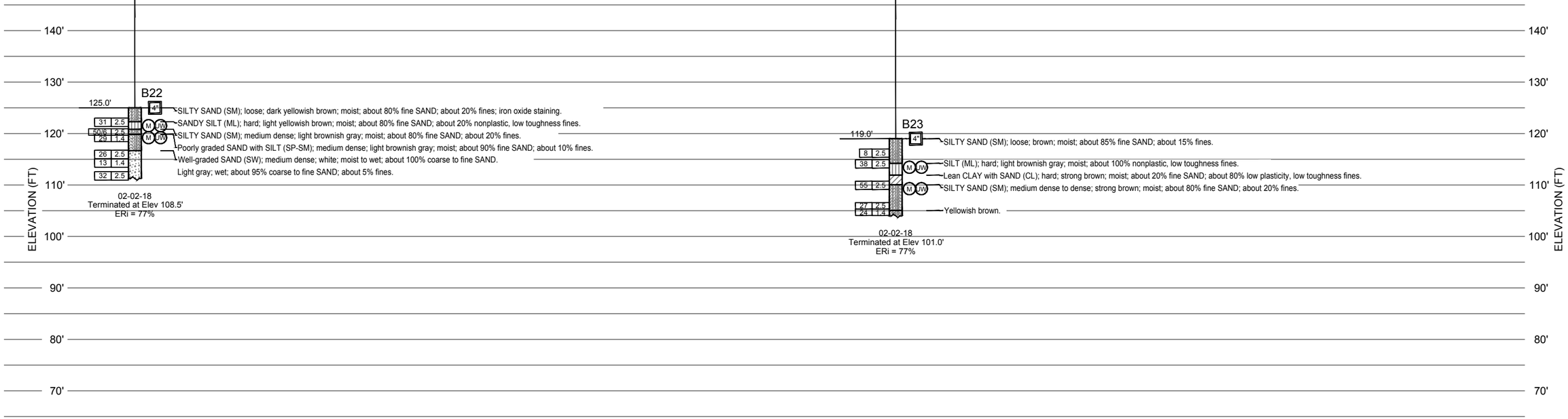
Project No.	16-268.2
Scale	1"=5,000'
Date	3/15/18



PLAN

SCALE: 1"=500'

North



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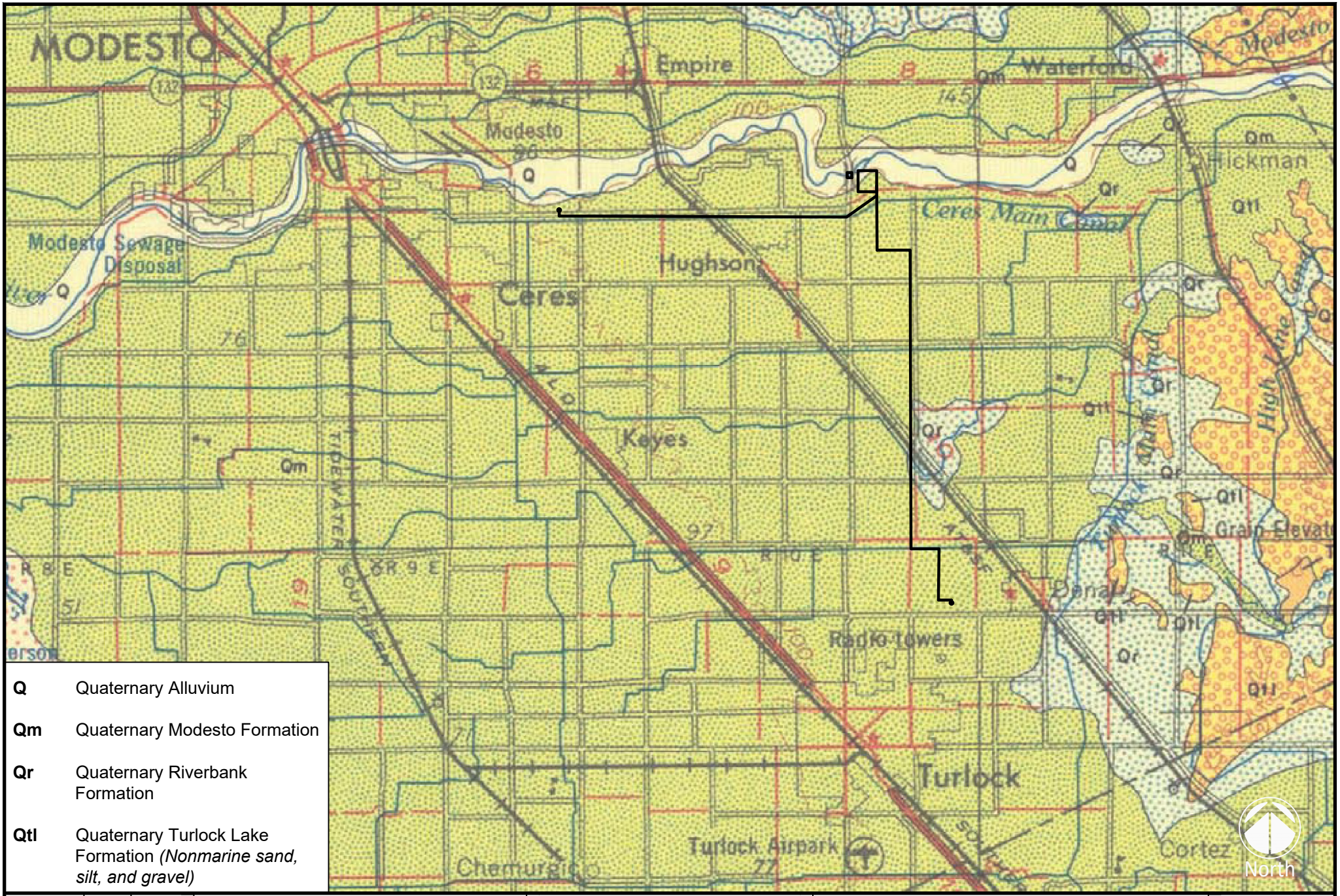
Stanislaus Regional Water Authority
(SRWA) Wet Well Project

Stanislaus County, California

Figure 2
Plan and Profile
Sheets
Sheet 12 of 12

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



Project Mgr.	AJK	7/20/16
Project Eng.	NRA	7/20/16
Designer		
Checked By	AJK	7/20/16
Drawn By	NRA	7/20/16
	By	Date

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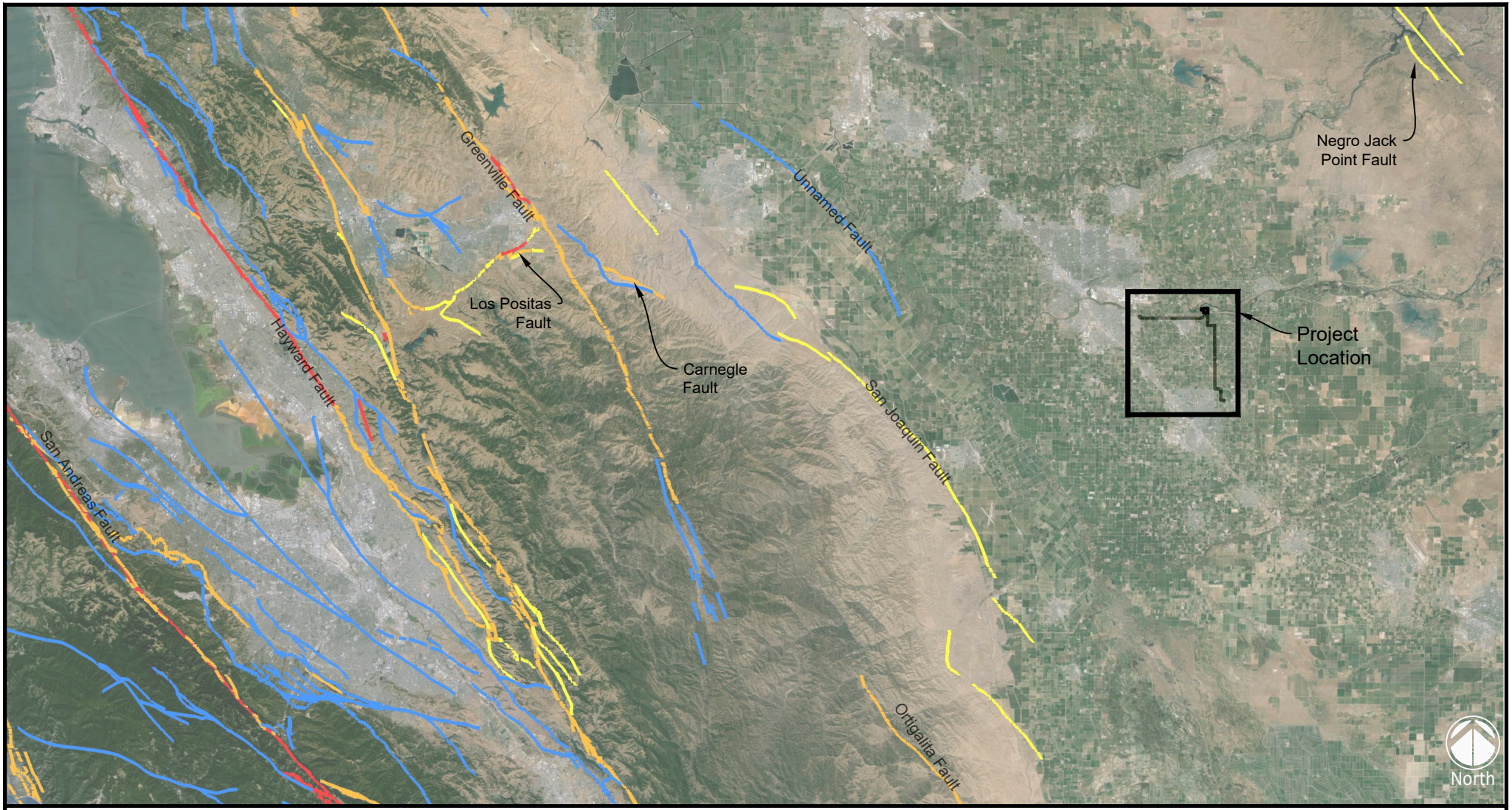
Stanislaus Regional Water Authority (SRWA) Water Treatment Project
Stanislaus County, California

Figure 3
Geology Map

Project No.	16-268.1
Scale	1"=10,000'
Date	3-20-18



LEGEND

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

Project Mgr.	AJK	7/20/16
Project Eng.	NRA	7/20/16
Designer		
Checked By	AJK	7/20/16
Drawn By	NRA	7/20/16
	By	Date

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Stanislaus Regional Water Authority (SRWA) Water Treatment Project
Stanislaus County, California

Figure 4
Fault Activity Map

Project No.	16-268.1
Scale	1"=10miles
Date	3-20-18

APPENDIX A

Boring Log Legend
Boring Logs

GROUP SYMBOLS AND NAMES

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

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

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435)
CL	Collapse Potential (ASTM D 4546)
CP	Compaction Curve (CTM 216)
CR	Corrosion, Sulfates, Chlorides (CTM 643, CTM 417, CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
DR	Drained Residual Shear Strength (ASTM D 6467)
DS	Direct Shear (ASTM D 3080)
EI	Expansion Index (ASTM D 4829)
M	Moisture Content (ASTM D 2216)
OC	Organic Content (ASTM D 2974)
P	Permeability (CTM 220)
PA	Particle Size Analysis (ASTM D 422)
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89, AASHTO T 90)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T 100)
SW	Swell Potential (ASTM D 4546)
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 7012-C)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 7263)

SAMPLER GRAPHIC SYMBOLS

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

DRILLING METHOD SYMBOLS

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

WATER LEVEL SYMBOLS

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

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

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Boring Record Legend

Soil Legend

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

APPARENT DENSITY OF COHESIONLESS SOILS	
Descriptor	**SPT N_{60} (blows / 12 inches)**
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

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

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

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

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

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

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

ROCK GRAPHIC SYMBOLS


IGNEOUS ROCK


SEDIMENTARY ROCK


METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 ft - 10 ft
Thickly bedded	1 ft - 3 ft
Moderately bedded	4 in - 1 ft
Thinly bedded	1 in - 4 in
Very thinly bedded	1/4 in - 1 in
Laminated	< 1/4 in

WEATHERING DESCRIPTORS FOR INTACT ROCK

	Diagnostic Features					
	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		
Descriptor	Body of Rock	Fracture Surfaces		Texture	Solutioning	General Characteristics
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull	Minor to complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened.
Decomposed	Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregated)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

Note: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

PERCENT CORE RECOVERY (REC)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

ROCK QUALITY DESIGNATION (RQD)

$$\frac{\Sigma \text{ Length of intact core pieces} > 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100$$

Note: RQD* indicates soundness criteria not met

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/16 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light manual pressure.

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Core lengths greater than 3 ft.
Slightly Fractured	Core lengths mostly from 1 ft. to 3 ft.
Moderately Fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely Fractured	Core lengths mostly from 1 in. to 4 in.
Very Intensely Fractured	Mostly chips and fragments.

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

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Boring Record Legend

Rock Legend

LOG OF BORING B01

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 18.5 (ft)

BEGIN DATE: 1/29/2018
COMPLETION DATE: 1/29/2018
SURFACE ELEVATION: 112 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

FIELD										LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1							SILTY SAND (SM); loose; dark yellowish brown; moist; about 70% SAND; about 30% fines; Upper 2 feet of material was removed to level off surface.										
110	2		Bulk						100									
	3																	
108	4																	
	5		2	2 2 2	4				100									
106	6																	
	7		3	3 5 9	14				100									
104	8																	
	9																	
102	10																	
	11							Poorly graded SAND (SP); medium dense; light gray; moist; about 100% SAND.										
100	12		4	12 13 16	29				100									
	13												4.9	99.9				
98	14																	
	15																	
96	16																	
	17		5	13 18 21	39				100									
94	18																	
	19							Bottom of borehole at 18.5 ft bgs										
92	20																	
	21																	
90	22																	
	23																	
88	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B01
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B02

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 1/29/2018
COMPLETION DATE: 1/29/2018
SURFACE ELEVATION: 118 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	0																	
	1		Bulk					Poorly graded SAND with SILT (SP-SM); loose; dark yellowish brown; moist; about 60% medium to fine SAND; about 40% fines.	100									
116	2																	
	3		2	6 4 5	9				100									
114	4																	
	5																	
	6		3	3 4 4	8				100				9.1	105.3				
112	7																	
	8																	
110	9							SANDY SILT (ML); hard; light olive brown; moist; about 40% medium to fine SAND; about 60% fines.										
	10		4	10 18 17	35	4.5 4.5			100				19.4	101.4				
108	11																	
	12																	
106	13							SILT (ML); very stiff; grayish brown; moist; about 5% fine SAND; about 95% nonplastic, low toughness fines.										
	14																	
104	15																	
	16		5	9 11 10	21	2.5			100									
102	17							Bottom of borehole at 16.5 ft bgs										
	18																	
100	19																	
	20																	
98	21																	
	22																	
96	23																	
	24																	
94																		

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B02
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B04

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 40.5 (ft)

BEGIN DATE: 1/30/2018
COMPLETION DATE: 1/30/2018
SURFACE ELEVATION: 125 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Neat Cement Grout

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1	BULK						Poorly graded SAND (SP); loose; light yellowish brown; moist; about 100% medium to fine SAND.	100									
123	2																	
	3		2	3 2 3	5				100									
121	4							SANDY SILT (ML); stiff; dark yellowish brown; moist; about 48% fine SAND; about 52% fines.					8	105.3			
	5		3	3 4 4	8	1.25		About 42% SAND; about 58% fines.	100									
119	6												11.8	99.4				
	7																	
117	8		4	3 3 5	8	1.5		Yellowish brown; Calcareous streaks (HCL reaction).	100									
	9												13.8	103.1				
115	10		5	4 9 17	26	1.75 4.25		SILT (ML); very stiff to hard; yellowish brown; moist; about 5% fine SAND; about 95% nonplastic, low toughness fines.	100									
113	12																	
	13		6	9 11 17	28			Poorly graded SAND with SILT (SP-SM); medium dense; light gray; moist; about 90% SAND; about 10% fines.	100									
111	14							SILT with SAND (ML); medium dense; light gray; moist; about 26% fine SAND; about 74% nonplastic fines.										
	15		7	8 8 15	23				100									
109	16							Poorly graded SAND (SP); medium dense; white; moist; about 100% medium to fine SAND.										
	17																	
107	18																	
	19							SILTY SAND (SM); dense; brown; moist; about 52% SAND; about 48% fines.										
105	20		8	18 34 29	63				100									
	21												12.2	125.9				
103	22																	
	23																	
101	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B04
ENTRY BY: RG
CHECKED BY:

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
99	26		9	7 8 12	20			Medium dense; strong brown; about 80% SAND; about 20% fines. SILTY SAND (SM) *(continued)*.	100									
	27																	
97	28							SANDY SILT (ML); very stiff; light yellowish brown; moist; about 20% medium to fine SAND; about 80% nonplastic, low toughness fines.										HCL reaction with calcite nodules
	29																	
95	30		10	10 13 27	40	3.75			100									
	31																	
93	32																	
	33																	
91	34																	
	35		11	10 17 21	38	2.25		Olive brown; about 40% fine SAND; about 60% nonplastic fines.	100									
89	36							SILTY SAND (SM); medium dense; light brownish gray; moist; about 80% SAND; about 20% fines; Iron oxide staining.					20.7 19.3	86.4 109.6				
	37																	
87	38		12	21 27 28	55			Poorly graded SAND (SP); medium dense; white; moist; about 100% medium to fine SAND.	100									
	39		13	9 14 20	34			Poorly graded SAND with SILT (SP-SM); medium dense; light brownish gray; moist; about 90% medium to fine SAND; about 10% fines; Iron oxide staining.	100									
85	40					4.5		SILTY SAND (SM); medium dense; light olive brown; moist; about 80% SAND; about 20% fines; Iron oxide staining.										
83	41							CLAYEY SILT (ML/CL); hard; light gray; moist; about 0 to 5% SAND; about 95 to 100% low plasticity, low toughness fines.										
	42							Bottom of borehole at 40.5 ft bgs										
	43																	
81	44																	
	45																	
79	46																	
	47																	
77	48																	
	49																	
75	50																	
	51																	
73	52																	
	53																	
71	54																	
	55																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B04
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B05

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 19 (ft)

BEGIN DATE: 1/29/2018
COMPLETION DATE: 1/29/2018
SURFACE ELEVATION: 128 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	0							SILTY SAND (SM); loose; strong brown; moist; about 70% fine SAND; about 30% fines.										
126	2																	
	3	BULK							100									
124	4																	
	5																	
	5		2	2 2 2	4				100									
122	6												6.9	100.1				
	7																	
	8		3	3 3 4	7				100									
120	8							Dark yellowish brown; about 55% fine SAND; about 45% fines.					7.3	111.7				
	9																	
118	10																	
	11																	
116	12																	
	13		4	6 6 13	19			Medium dense; gray; about 70% fine SAND; about 30% fines; Mottled orange, iron oxide.	100									
114	14																	
	15																	
112	16							Poorly graded SAND (SP); loose; white; dry; about 100% medium to fine SAND.										
	17																	
110	18		5	9 12 27	39				100									
	19							SILT (ML); hard; gray; moist; about 5% fine SAND; about 95% low plasticity, low toughness fines.										
108	20							Bottom of borehole at 19.0 ft bgs										
	21																	
106	22																	
	23																	
104	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B05
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B06

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 1/29/2018
COMPLETION DATE: 1/29/2018
SURFACE ELEVATION: 133 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
131	1	BULK						SILTY SAND (SM); loose; brown; moist; about 54% fine SAND; about 46% fines.	100									
	2																	
	3		2	5 4 3	7				100									
129	4												8.3	111.6				
	5							SILT (ML); very stiff; brown; moist; about 5% fine SAND; about 95% low plasticity, low toughness fines; iron oxide staining.										
	6		3	3 6 14	20	2.75			100				28.8	88.1				
127	7																	
125	8																	
	9																	
123	10		4	25 37 45	82			Grayish brown; fine SAND; nonplastic fines; iron oxide staining, calcite nodules.	100									
	11					3												
121	12																	
	13																	
119	14							Well-graded SAND (SW); dense; very pale brown; moist; coarse to fine SAND; trace nonplastic fines.										
	15		5	21 24 27	51				100									
117	16																	
	17							Bottom of borehole at 16.5 ft bgs										
115	18																	
	19																	
113	20																	
	21																	
111	22																	
	23																	
109	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B06
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B07

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 19 (ft)

BEGIN DATE: 1/29/2018
COMPLETION DATE: 1/29/2018
SURFACE ELEVATION: 133 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

FIELD										LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1							SILTY SAND (SM); loose; dark yellowish brown; moist; about 60% medium to fine SAND; about 40% fines.										
131	2																	
	3		BULK						100									
129	4																	
	5																	
	6		2	4 4 5	9				100									
127	7																	
	8		3	4 3 5	8	0.75		SANDY SILT (ML); medium stiff; dark yellowish brown; moist; about 40% fine SAND; about 60% nonplastic fines.	100				13.6	113				
125	9																	
	10																	
123	11																	
	12							SILTY SAND (SM); medium dense; strong brown; moist; about 60% medium to fine SAND; about 40% fines.										
121	13		4	4 7 13	20				100									
	14																	
119	15																	
	16																	
117	17																	
	18		5	21 23 20	43			Dense; reddish brown; about 70% medium to fine SAND; about 30% fines.	100									
115	19							Bottom of borehole at 19.0 ft bgs										
113	20																	
	21																	
111	22																	
	23																	
109	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B07
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B09

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 1/31/2018
COMPLETION DATE: 1/31/2018
SURFACE ELEVATION: 140 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1	BULK						SILTY SAND (SM); loose; brown; moist; about 70% fine SAND; about 30% fines.	100									
138	2																	
	3		2	3 4 5	9				100									
136	4												6.4	118.7				
	5		3	22 23 16	39			Medium dense; yellowish brown; about 53% SAND; about 47% fines; iron oxide staining.	100									
134	6												16.2	94.8				
	7																	
132	8							Poorly graded SAND (SP); medium dense; white; dry to moist; about 100% medium to fine SAND.										
	9																	
130	10		4	11 23 29	52				100									
	11					4.5												
128	12							SILT (ML); hard; gray; moist; about 100% low plasticity, low toughness fines; iron oxide staining and HCL reaction.										
	13																	
126	14																	
	15		5	19 29 28	57	4.5			100									
124	16					4.5												
	17							Bottom of borehole at 16.5 ft bgs										
122	18																	
	19																	
120	20																	
	21																	
118	22																	
	23																	
116	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B09
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B10

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 1/31/2018
COMPLETION DATE: 1/31/2018
SURFACE ELEVATION: 140 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

FIELD										LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1		BULK					SILTY SAND (SM); loose; dark yellowish brown; moist; about 80% medium to fine SAND; about 20% fines.	100									
138	2																	
	3		2	3 4 4	8				100									
136	4												6.4	115				
	5							Poorly graded SAND with SILT (SP-SM); loose; yellowish brown; moist; about 90% medium to fine SAND; about 10% fines.										
	6		3	4 4 7	11				100									
134	7																	
132	8																	
	9							SILTY SAND (SM); medium dense; white; moist; about 58% medium to fine SAND; about 42% nonplastic to low plasticity fines; iron oxide staining, mottling at rootholes.										
130	10		4	20 21 24	45				100									
	11																	
128	12																	
	13																	
126	14							SILTY SAND (SM); medium dense; yellowish brown; moist; about 70% medium to fine SAND; about 30% fines; HCL reaction with white surfaces.										
	15		5	16 28 34	62				100									
124	16																	
	17							Bottom of borehole at 16.5 ft bgs										
122	18																	
	19																	
120	20																	
	21																	
118	22																	
	23																	
116	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B10
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B11

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 17 (ft)

BEGIN DATE: 1/31/2018
COMPLETION DATE: 1/31/2018
SURFACE ELEVATION: 138 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID, SPT
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1	BULK						SILTY SAND (SM); loose; dark yellowish brown; moist; about 80% medium to fine SAND; about 20% fines.	100									
136	2																	
	3		2	4 4 5	9				100									
134	4												5.4	117.1				
	5		3	4 5 7	12			Trace fine, subangular to subrounded GRAVEL.	100									
132	6												5.7	115.6				
130	7 8 9																	
128	10		4	12 19 29	48			Dense; light yellowish brown; about 65% SAND; about 35% fines.	100									
126	11 12 13																	
124	14																	
	15		5	50/4"	REF			Very dense; yellowish brown; about 70% SAND; about 30% fines; orange and black mottling, HCL reaction.	100				13.5	105.5				
122	16		6	44 26 26	52				100									
	17							Bottom of borehole at 17.0 ft bgs										
120	18 19																	
118	20 21																	
116	22 23																	
114	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B11
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B12

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 18 (ft)

BEGIN DATE: 1/31/2018
COMPLETION DATE: 1/31/2018
SURFACE ELEVATION: 137 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID, SPT
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
135	1	BULK						SILTY SAND (SM); loose; dark yellowish brown; moist; about 70% medium to fine SAND; about 30% fines.	100									
	2																	
	3		2	2 4 5	9	3.75		SANDY SILT (ML); very stiff; dark yellowish brown; about 42% fine SAND; about 58% low plasticity fines.	100									
133	4												9.3	117.9				
	5		3	28 50/5.5"	50/6	4.5 4.5		SILT (ML); hard; grayish brown; moist; about 10% fine SAND; about 90% nonplastic, low toughness fines.	100									
131	6												24.5	100.1				
	7																	
129	8							SANDY SILT (ML); hard; yellowish brown; moist; about 30% fine SAND; about 70% nonplastic, low to medium toughness fines; HCL reaction, white staining.										
	9																	
127	10		4	34 50/5"	50/5	3.75 4.5			100									
	11																	
125	12																	
	13							SILTY SAND (SM); medium dense; gray and yellowish brown (10YR 5/4); moist; about 80% fine SAND; about 20% fines; mottled orange and white, iron oxide, HCL reaction.										
123	14																	
	15		5	8 9 14	23				100									
121	16																	
	17		6	9 11 13	24				100									
119	18							Bottom of borehole at 18.0 ft bgs										
	19																	
117	20																	
	21																	
115	22																	
	23																	
113	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B12
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B13

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 1/31/2018
COMPLETION DATE: 1/31/2018
SURFACE ELEVATION: 138 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1	BULK						SILTY SAND (SM); loose; yellowish brown; dry; about 80% fine SAND; about 20% fines; roots.	100									
136	2																	
	3		2	6 7 7	14				100									
134	4												3.4	107.3				
	5		3	9 11 16	27			Medium dense; light yellowish brown; about 68% SAND; about 32% fines.	100									
132	6												2.9	117.3				
	7																	
130	8																	
	9							Poorly graded SAND (SP); medium dense; very pale brown; dry; about 100% medium to fine SAND.										
128	10		4	9 10 15	25				100									
	11																	
126	12																	
	13																	
124	14																	
	15		5	8 16 35	51			Dense; white.	100									
122	16																	
	17							Bottom of borehole at 16.5 ft bgs										
120	18																	
	19																	
118	20																	
	21																	
116	22																	
	23																	
114	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B13
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B14

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 1/31/2018
COMPLETION DATE: 1/31/2018
SURFACE ELEVATION: 134 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1	BULK						SILTY SAND (SM); loose; brown; wet; about 75% medium to fine SAND; about 25% fines.	100									
132	2																	
	3		2	4 3 3	6			Moist.	100									
130	4												12.4	117.1				
	5							Poorly graded SAND with SILT (SP-SM); loose; yellowish brown; moist; about 90% fine SAND; about 10% fines.										
			3	3 4 5	9				100									
128	6																	
	7																	
126	8							Poorly graded SAND (SP); loose; yellowish brown; moist; about 95% medium to fine SAND; about 5% fines.										
	9																	
			4	7 8 9	17				100									
124	10												3.1	102.1				
	11																	
122	12																	
	13							Medium dense.										
120	14																	
	15																	
			5	9 13 20	33				100									
118	16																	
	17							Bottom of borehole at 16.5 ft bgs										
116	18																	
	19																	
114	20																	
	21																	
112	22																	
	23																	
110	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B14
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B15

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: ETT
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 2/1/2018
COMPLETION DATE: 2/1/2018
SURFACE ELEVATION: 128 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID, SPT
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
			BULK					SILTY SAND (SM); brown; moist; about 70% coarse to fine SAND; about 30% nonplastic to low plasticity fines; trace of gravel.	100									
126	2																	
	3		2	50/4"	REF			Very dense; dry to moist; strong induration which ends at ~3.25 ft, light tan and light brown stripes.	100									
			3	35 32 39	71				83				14.4	106.4				
124	4																	
	5							Poorly graded SAND with SILT (SP-SM); very dense; light brown; moist; about 90% fine SAND; about 10% fines.										
			4	32 43 19	62				100									
122	6																	
	7																	
120	8																	
	9							SILTY SAND (SM); dense to very dense; brown; moist; about 60 to 70% fine SAND; about 30 to 40% fines.										
118	10		5	11 15 19	34				100									
	11							Poorly graded SAND with SILT (SP-SM); medium dense; light brown; moist; about 90 to 95% fine SAND; about 5 to 10% fines.										
116	12																	
	13							SILTY SAND (SM); dense; light brown; moist; about 65 to 75% fine SAND; about 25 to 35% fines.										
114	14																	
	15		6	9 17 33	50				100									
112	16																	
	17							Poorly graded SAND (SP); dense; light brown; moist; about 95% fine SAND; about 5% fines.										
110	18							Bottom of borehole at 16.5 ft bgs										
	19																	
108	20																	
	21																	
106	22																	
	23																	
104	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B15
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B16

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: ETT
DEPTH OF BORING: 16.25 (ft)

BEGIN DATE: 2/1/2018
COMPLETION DATE: 2/1/2018
SURFACE ELEVATION: 128 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
								ASPHALT 2" HMA over 2" AB.										
	1		BULK					SILTY SAND (SM); loose; brown; moist; about 60% medium to fine SAND; about 40% low plasticity fines.	100									
126	2																	
	3		2	3 3 4	7				100									
124	4												7.4	109.5				
	5		3	20 50/3.5"	50/4				100									
122	6							Very dense; moist; about 60 to 70% SAND; about 30 to 40% nonplastic fines; moderate to strong induration.										
120	8																	
118	10		4	9 14 20	34			Medium dense.	100									
	11												21.6	95.6				
116	12							Poorly graded SAND (SP); medium dense; tan; moist; about 95% medium to fine SAND; about 5% fines.										
	13																	
114	14							SILT (ML); very hard; gray; moist; about 10 to 15% medium to fine SAND; about 85 to 90% low plasticity fines; orange iron oxide.										
	15		5	13 28 50/3"	78/9				100									
112	16							Bottom of borehole at 16.3 ft bgs										
110	18																	
108	20																	
106	22																	
104	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B16
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B17

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: ETT
DEPTH OF BORING: 41.25 (ft)

BEGIN DATE: 2/1/2018
COMPLETION DATE: 2/1/2018
SURFACE ELEVATION: 131 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID, SPT
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
	1	BULK						SILTY SAND (SM); light brown; dry to moist; about 70% coarse to fine SAND; about 30% fines; trace of gravel.	100								
129	2																
	3		2 3	50/1" 50/2"	REF REF			Poorly graded SAND with SILT (SP-SM); very dense; brown; dry to moist; about 85 to 90% medium to fine SAND; about 10 to 15% fines; moderate induration.	100 100								
127	4																
	5		4	31 23 35	58			SILTY SAND (SM); very dense; light brown; moist; about 60 to 70% fine SAND; about 30 to 40% fines; trace of clays.	100								
125	6												16.5	104.5			
	7																
123	8		5	27 50/4"	50/4			About 76% SAND; about 24% fines; weak induration.	100				14.6 16.5	103.3			
	9																
121	10		6	25 50/4"	50/4				100								
	11							Poorly graded SAND with SILT (SP-SM); very dense; light brown; moist; about 90% fine SAND; about 10% fines.					16.4	101.5			
119	12																
	13							SANDY SILT (ML); dense; light brown; moist; about 40% fine SAND; about 60% low plasticity fines.									
117	14																
	15		7	15 24 39	63	4.5			100								
115	16							Poorly graded SAND (SP); dense; light brown/tan; dry to moist; about 95% fine SAND; about 5% fines.									
	17																
113	18							SILTY SAND (SM); light brown; moist; about 60 to 70% fine SAND; about 30 to 40% fines.									
	19																
111	20		8	13 21 32	53				100								
	21							Poorly graded SAND (SP); dense; light brown/tan; moist; about 95% fine SAND; about 5% fines.					11.9	88.8			
109	22																
	23							SILTY SAND (SM); brown; moist; about 60 to 70% fine SAND; about 30 to 40% fines.									
107	24																

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B17
ENTRY BY: RG
CHECKED BY:

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LABORATORY: LIQUID LIMIT	LABORATORY: MOISTURE (%)	LABORATORY: D. DENSITY (PCF)	LABORATORY: % PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
			9	12 21 34	55			SILTY SAND (SM) *(continued)*.	100									
105	26							Poorly graded SAND (SP); dense; light brown/tan; dry to moist; about 95% fine SAND; about 5% fines.					8	93.4				
	27																	
103	28																	
	29							SILTY SAND (SM); dense; brown; moist; about 60 to 70% fine SAND; about 30 to 40% fines.									
101	30		10	15 22 44	66				100									
	31							Poorly graded SAND with SILT (SP-SM); dense; tan; moist; about 85 to 95% fine SAND; about 15 to 5% fines; orange iron oxide.										
99	32																	
	33							SANDY SILT (ML); hard; brown; moist; about 40 to 50% fine SAND; about 50 to 60% low plasticity fines.										
97	34																	
	35		11	19 29 50/6"	79/12	4.5			100									
95	36							SILTY SAND (SM); very dense; brown; moist; about 60 to 70% fine SAND; about 30 to 40% fines.					17.9	88.9				
	37							Poorly graded SAND (SP); very dense; tan; moist; about 95% fine SAND; about 5% fines.										
93	38																	
	39							SANDY SILT (ML); hard; brown; moist; about 30% fine SAND; about 70% low plasticity fines.										
91	40		12	23 48 50/3"	98/9			SILTY SAND (SM); very dense; light brown/gray; moist; about 55 to 60% fine SAND; about 40 to 45% low plasticity fines.	100									
	41							Bottom of borehole at 41.3 ft bgs										
89	42																	
	43																	
87	44																	
	45																	
85	46																	
	47																	
83	48																	
	49																	
81	50																	
	51																	
79	52																	
	53																	
77	54																	
	55																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B17
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B18

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 40.5 (ft)

BEGIN DATE: 1/30/2018
COMPLETION DATE: 1/30/2018
SURFACE ELEVATION: 130 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID, SPT
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Neat Cement Grout

FIELD									LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
	1		BULK					SILTY SAND (SM); very dense; yellowish red; moist; about 63% coarse to fine SAND; about 37% low plasticity fines.	100								
128	2																
	3		2	50/5.5"	REF				100								
			3	55/6"	REF				100				14.4	108.8			
													12.6	115.3			
126	4																
	5		4	35	50/3				100								
				50/3"									18.2	107.4			
124	6																
	7							Well-graded SAND (SW); very dense; reddish brown; moist; about 95% coarse to fine, subrounded to rounded SAND; about 5% fines.									
			5	50/5"	REF				80								
122	8		6	22					100								
				28	78/11												
	9			50/5"									14.6	112.1			
120	10		7	22					100								
				33	83/10												
	11			50/4"				Poorly graded SAND with SILT (SP-SM); very dense; reddish brown; moist.					18.4	109.8			
118	12																
	13		8	25					100								
				38	88/10												
				50/4"													
116	14							Brown; wet; about 90% coarse to fine SAND; about 10% fines.									
	15							Well-graded SAND with SILT (SW-SM); very dense; brown; moist; about 80% coarse to fine SAND; about 20% fines.									
			9	21					100								
114	16			23	66												
				43													
	17																
112	18																
	19							SILTY SAND (SM); dense to very dense; light yellowish brown; dry to moist; about 95% coarse to fine, subrounded to rounded SAND; about 5% fines.									
110	20		10	28					100								
				33	83/10												
	21			50/4'				Well-graded SAND with SILT (SW-SM); very dense; reddish brown; moist; about 95% coarse to fine, subrounded to rounded SAND; about 5% fines.									
108	22																
	23																
106	24							Poorly graded SAND (SP); very dense; light gray;									

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B18
ENTRY BY: RG
CHECKED BY:

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LABORATORY: LIQUID LIMIT	LABORATORY: MOISTURE (%)	LABORATORY: D. DENSITY (PCF)	LABORATORY: % PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
				FIELD														
104	26		11	14 22 50/4"	72/10			moist; about 95% fine SAND; about 5% fines.	100									
	27																	
102	28							Poorly graded SAND with SILT (SP-SM); dense; light gray; moist; about 90% fine SAND; about 10% fines.										
	29																	
100	30		12	16 24 40	64				100									
	31												7.7	94.2				
98	32																	
	33																	
96	34																	
	35		13	16 22 38	60			Very pale brown; iron oxide staining.	100									
94	36																	
	37																	
92	38		14	21 29 50/5"	79/11			Very dense.	100									
	39		15	10 25 39	64			White; about 95% SAND; about 5% fines.	44									
90	40																	
								Bottom of borehole at 40.5 ft bgs										
	41																	
88	42																	
	43																	
86	44																	
	45																	
84	46																	
	47																	
82	48																	
	49																	
80	50																	
	51																	
78	52																	
	53																	
76	54																	
	55																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B18
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B19

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: ETT
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 2/1/2018
COMPLETION DATE: 2/1/2018
SURFACE ELEVATION: 125 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID, SPT
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	0	BULK						SILTY SAND (SM); brown; moist; about 70% medium to fine SAND; about 30% fines.	100									
123	2																	
	3		2	2 24	74/8				100									
121	4		3	50/2" 50/4"	REF			Poorly graded SAND with SILT (SP-SM); very dense; brown; moist; about 90% medium to fine SAND; about 10% fines.	100				16.3	111.1				
	5		4	50/3"	REF			SILTY SAND (SM); very dense; brown; moist; about 83% medium to fine SAND; about 17% fines.	100									
119	6		5	34 37 41	78				89				11.1	124.4				
117	8							Poorly graded SAND (SP); loose; brown; moist; about 95% medium to fine SAND; about 5% fines.										
115	10		6	13 8 8	16				100				11.3	108.6				
113	12																	
	13							SANDY SILT (ML); brown; moist; about 70 to 80% medium to fine SAND; about 20 to 30% fines.										
111	14																	
	15		7	13 19 28	47				100									
109	16							Poorly graded SAND (SP); dense; tan; dry to moist.										
	17							Bottom of borehole at 16.5 ft bgs										
107	18																	
	19																	
105	20																	
	21																	
103	22																	
	23																	
101	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B19
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B20

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Hughson, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 2/2/2018
COMPLETION DATE: 2/2/2018
SURFACE ELEVATION: 120 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1	BULK						SILTY SAND (SM); loose; dark yellowish brown; moist; about 59% medium to fine SAND; about 41% fines.	100									
118	2																	
	3		2	3 3 6	9				100									
116	4												12.1	116.2				
	5		3	17 41 50/3"	91/9			Very dense; yellowish brown; well indurated.	100				14	104.4				
114	6																	
	7																	
112	8																	
	9																	
110	10		4	17 22 24	46			Medium dense; trace coarse SAND.	100									
	11																	
108	12																	
	13							Well-graded SAND (SW); medium dense; white; moist; about 100% coarse to fine SAND.										
106	14																	
	15		5	9 17 24	41				100									
104	16																	
	17							Bottom of borehole at 16.5 ft bgs										
102	18																	
	19																	
100	20																	
	21																	
98	22																	
	23																	
96	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B20
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B21

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Turlock, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 2/2/2018
COMPLETION DATE: 2/2/2018
SURFACE ELEVATION: 125 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1	BULK						Poorly graded SAND with SILT (SP-SM); loose; dark yellowish brown; moist; about 90% medium to fine, subrounded SAND; about 10% fines.	100									
123	2																	
	3		2	3 4 4	8				100									
121	4																	
	5							SILTY SAND (SM); loose; yellowish brown; moist; about 80% medium to fine SAND; about 20% fines.									
	6		3	5 5 8	13				100									
119	7																	
117	8																	
	9																	
115	10		4	19 25 28	53			Medium dense; brown.	100									
	11																	
113	12																	
	13																	
111	14																	
	15		5	15 22 26	48			Strong brown.	100									
109	16																	
	17							Bottom of borehole at 16.5 ft bgs										
107	18																	
	19																	
105	20																	
	21																	
103	22																	
	23																	
101	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B21
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B22

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Turlock, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 2/2/2018
COMPLETION DATE: 2/2/2018
SURFACE ELEVATION: 125 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID, SPT
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
125	0	BULK						SILTY SAND (SM); loose; dark yellowish brown; moist; about 80% fine SAND; about 20% fines; iron oxide staining.	100									
123	2																	
	3		2	4 5 26	31				100									
121	4					4.5		SANDY SILT (ML); hard; light yellowish brown; moist; about 80% fine SAND; about 20% nonplastic, low toughness fines.					24.8	103.6				
	5																	
	6		3	36 50/5.5"	50/6			SILTY SAND (SM); medium dense; light brownish gray; moist; about 80% fine SAND; about 20% fines.	83									
119	6		4	15 13 16	29			Poorly graded SAND with SILT (SP-SM); medium dense; light brownish gray; moist; about 90% fine SAND; about 10% fines.	81				21.7	91.3				
117	8																	
	9																	
115	10		5	8 11 15	26			Well-graded SAND (SW); medium dense; white; moist to wet; about 100% coarse to fine SAND.	83									
	11																	
113	12		6	0 5 8	13				100									
	13																	
111	14							Light gray; wet; about 95% coarse to fine SAND; about 5% fines.										
	15		7	6 17 15	32				56									
109	16																	
	17							Bottom of borehole at 16.5 ft bgs										
107	18																	
	19																	
105	20																	
	21																	
103	22																	
	23																	
101	24																	

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PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B22
ENTRY BY: RG
CHECKED BY:

LOG OF BORING B23

PROJECT NO: 16-268.1
PROJECT: SRWA
LOCATION: Turlock, CA
COUNTY: Stanislaus
CLIENT:
LOGGED BY: SC
DEPTH OF BORING: 18 (ft)

BEGIN DATE: 2/2/2018
COMPLETION DATE: 2/2/2018
SURFACE ELEVATION: 119 (ft)
SURFACE CONDITION:
WATER DEPTH: N/A (ft)
READING TAKEN:
HAMMER EFFICIENCY: 77%

DRILLING CONTRACTOR: Geo-Ex Subsurface
DRILLING METHOD: Solid-Stem Auger
DRILL RIG: CME55
HAMMER TYPE: 140
SAMPLER TYPE & SIZE: MCAL 2.4" ID, SPT
BOREHOLE DIAMETER: 4"
BACKFILL METHOD: Native Cuttings

ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
	1	BULK						SILTY SAND (SM); loose; brown; moist; about 85% fine SAND; about 15% fines.	100									
117	2																	
	3		2	3 3 5	8				100									
115	4																	
	5		3	4 13 25	38	4.5			100				11	100.3				
113	6							SILT (ML); hard; light brownish gray; moist; about 100% nonplastic, low toughness fines.										
111	7 8																	
	9							Lean CLAY with SAND (CL); hard; strong brown; moist; about 20% fine SAND; about 80% low plasticity, low toughness fines.										
109	10		4	16 26 29	55	4.5			100									
	11							SILTY SAND (SM); medium dense to dense; strong brown; moist; about 80% fine SAND; about 20% fines.					10.5	123.8			
107	12 13																	
105	14																	
	15		5	8 11 16	27	0.5			100									
103	16																	
	17		6	6 9 15	24	2.25		Yellowish brown.	89									
101	18							Bottom of borehole at 18.0 ft bgs										
	19																	
99	20																	
	21																	
97	22																	
	23																	
95	24																	

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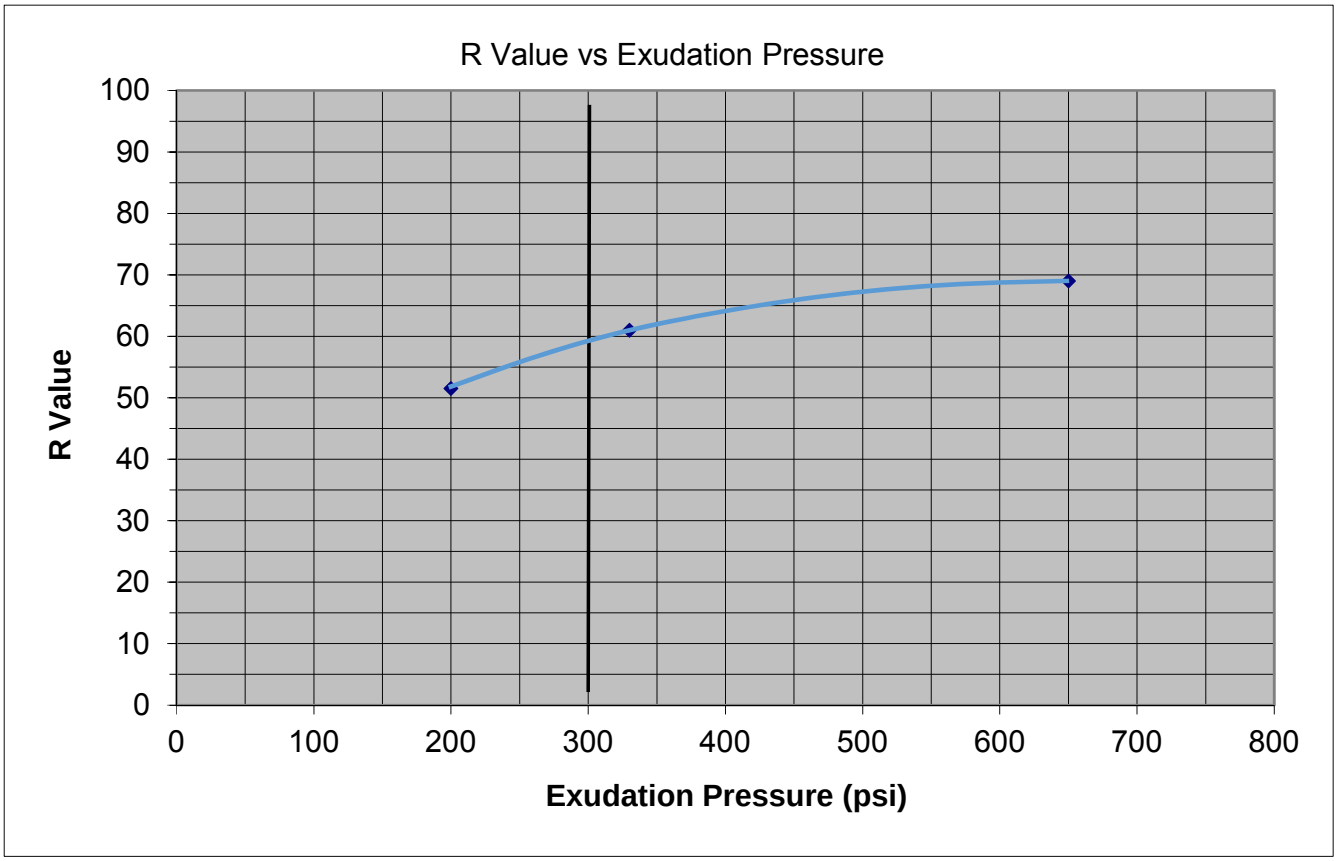
PROJECT NUMBER: 16-268.1
PROJECT: SRWA
EXPLORATION: B23
ENTRY BY: RG
CHECKED BY:

APPENDIX B

Geotechnical Laboratory Test Results



Sample ID & Description				
Boring Number	B1-1 (Bulk)			
Sample Depth (feet)	--			
Material Description	Brown Silty SAND			

Test Data			
Specimen	2090	2081	2098
Exudation Pressure (psi)	200	650	330
Expansion Dial (.0001")	0	0	0
Expansion Pressure (psf)	0.0	0.0	0.0
Resistance 'R' Value	52	69	61
Moisture at test (%)	8	7.1	7.5
Dry density at test (pcf)	125.6	131.1	133.0
R Value at 300 psi exudation pressure		**59**	
R Value by expansion pressure (TI=5.0)		**--**	
R Value by E uillibrium		**59**	

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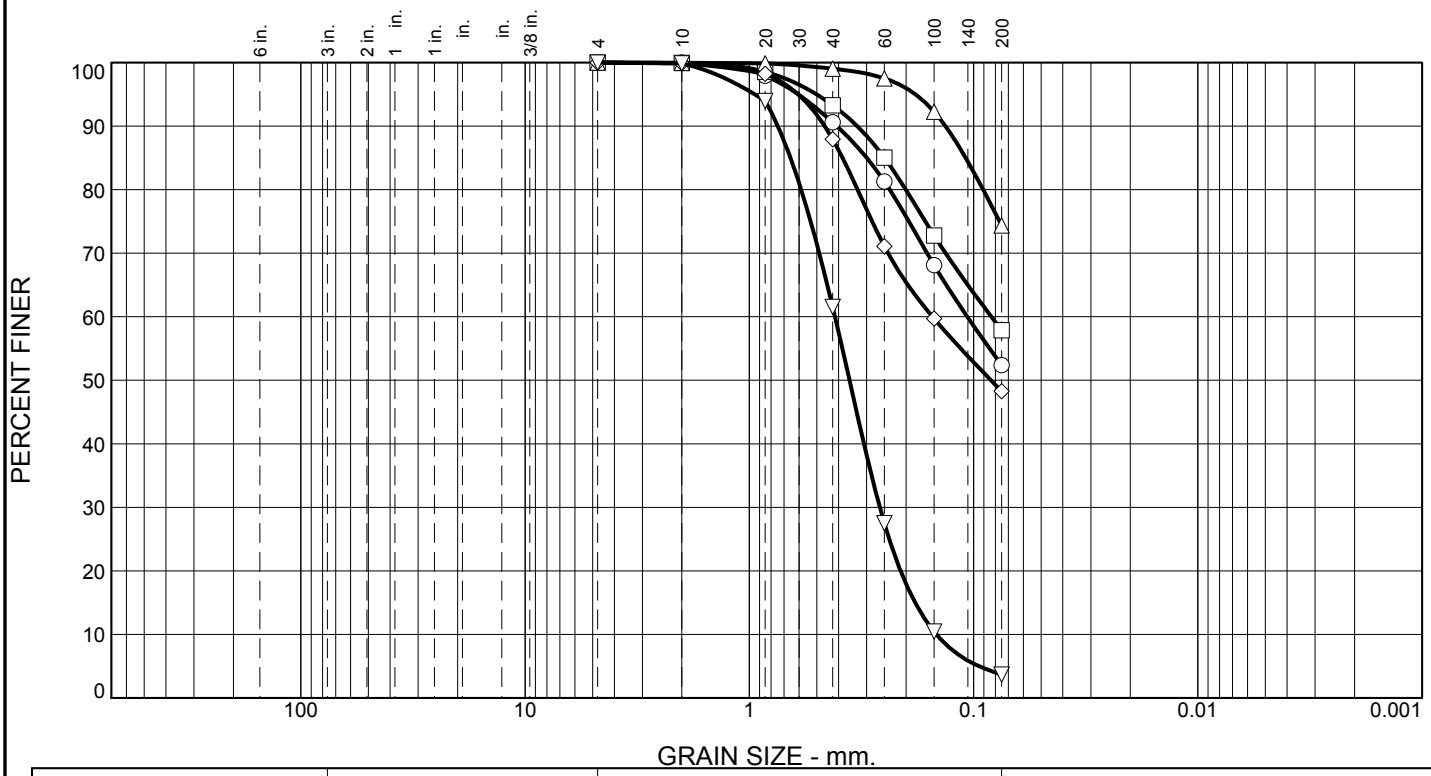
R Value By Exudation

Project: Crawford 16-268.1/SRWA WTP
Location:
Number: S9763-05-113
Figure:

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	9.4	38.2	52.4	
□	0.0	0.0	0.0	0.0	6.7	35.4	57.9	
△	0.0	0.0	0.0	0.0	1.0	24.6	74.4	
◇	0.0	0.0	0.0	0.1	12.0	39.6	48.3	
▽	0.0	0.0	0.0	0.1	38.3	57.9	3.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2995	0.1067						
□			0.2495	0.0833						
△			0.1084							
◇			0.3840	0.1525	0.0837					
▽			0.6554	0.4150	0.3577	0.2619	0.1822	0.1464	1.13	2.83

	Material Description	USCS	AASHTO
○			
□			
△			
◇			
▽		SP	

Project No. S9763-05- **Client:** Crawford and Associates

Project: Crawford 16-268.1

○ **Depth:** 4 **Sample Number:** B4-2A

□ **Depth:** 6 **Sample Number:** B4-3A

△ **Depth:** 14 **Sample Number:** B4-6A

◇ **Depth:** 21.5 **Sample Number:** B4-8A

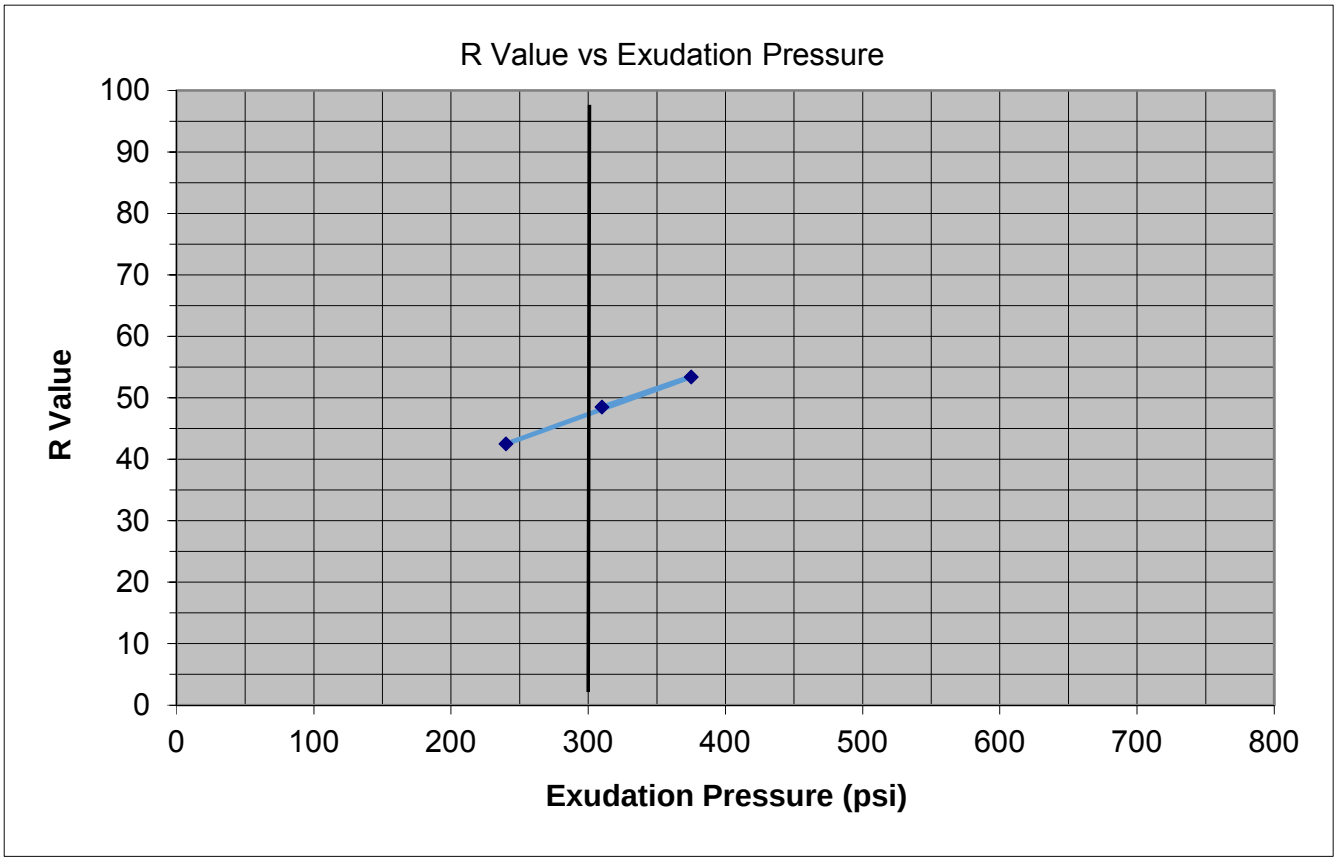
▽ **Depth:** 16.5 **Sample Number:** B6-5A

Remarks:

GEOCON CONSULTANTS, INC.

Figure

Tested By: ○ JH □ JH △ LH ◇ JH ▽ JH **Checked By:** MR



Sample ID & Description				
Boring Number	B5-1 (Bulk)			
Sample Depth (feet)	--			
Material Description	Brown Silty SAND			
Test Data				
Specimen	2071	2100	2070	
Exudation Pressure (psi)	240	375	310	
Expansion Dial (.0001")	0	0	0	
Expansion Pressure (psf)	0.0	0.0	0.0	
Resistance 'R' Value	43	53	49	
Moisture at test (%)	11.1	10.2	10.6	
Dry density at test (pcf)	122.4	124.6	122.6	
R Value at 300 psi exudation pressure			**47**	
R Value by expansion pressure (TI=5.0)			**--**	
R Value by E uillibrium			**47**	

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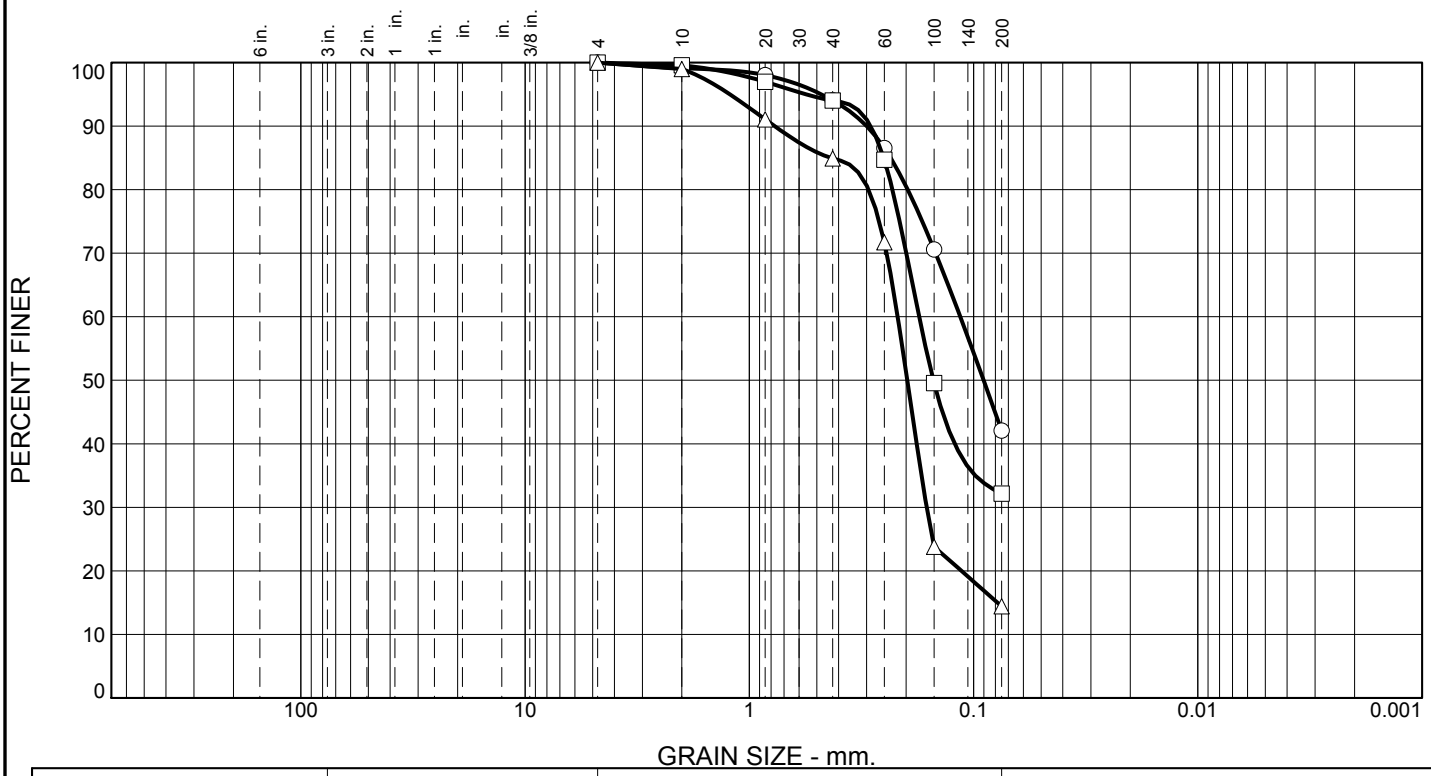
R Value By Exudation

Project: Crawford 16-268.1/SRWA WTP
Location:
Number: S9763-05-113
Figure:

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.9	5.1	51.9	42.1	
□	0.0	0.0	0.0	0.4	5.6	61.8	32.2	
△	0.0	0.0	0.0	1.0	14.1	70.5	14.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2344	0.1146	0.0903					
□			0.2514	0.1748	0.1511					
△			0.4326	0.2179	0.1975	0.1619	0.0783			

	Material Description	USCS	AASHTO
○			
□			
△			

Project No. S9763-05- **Client:** Crawford and Associates

Project: Crawford 16-268.1

○ **Depth:** 11.5 **Sample Number:** B10-4A

□ **Depth:** 6 **Sample Number:** B17-3A

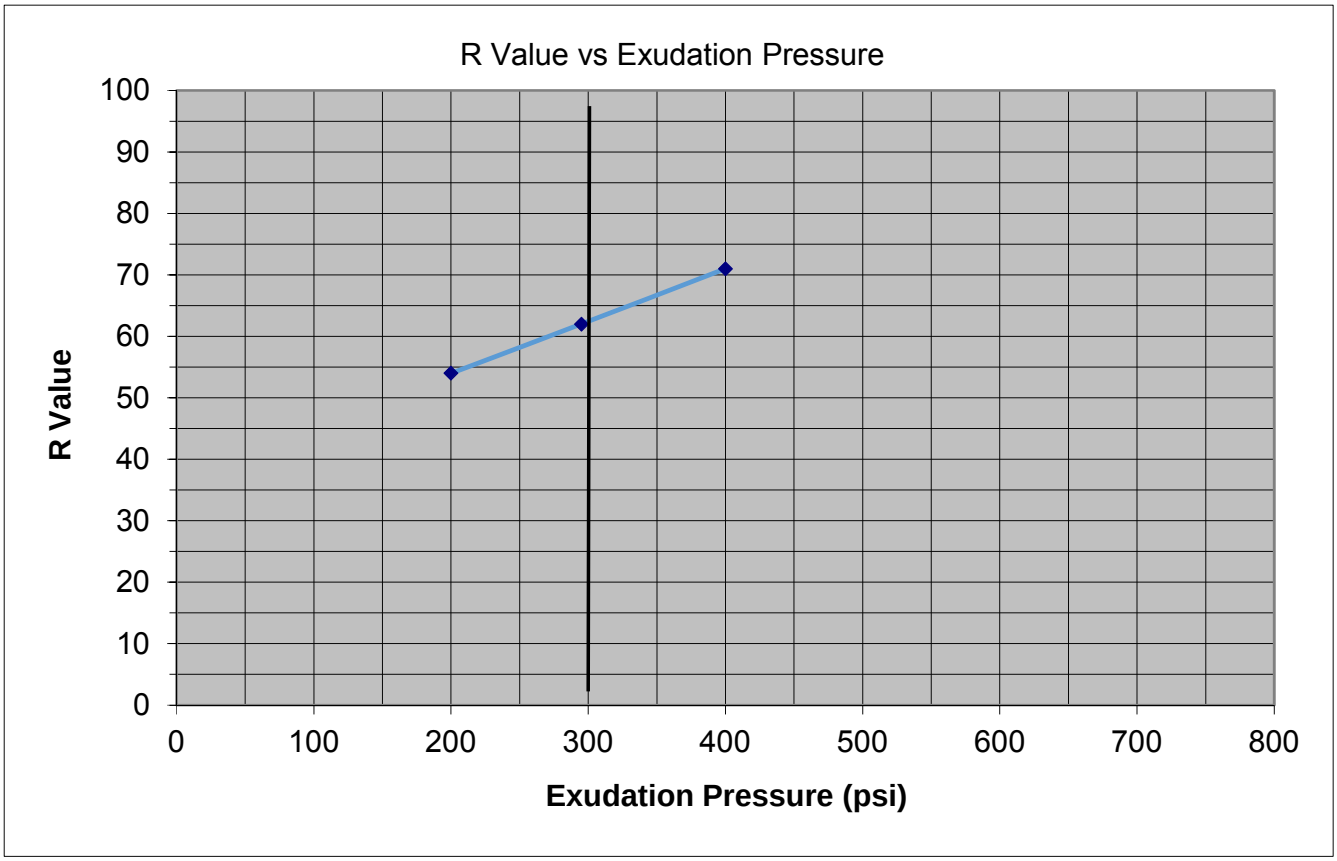
△ **Depth:** 11.5 **Sample Number:** B18-7A

Remarks:

GEOCON CONSULTANTS, INC.

Figure

Tested By: JH **Checked By:** MR



Sample ID & Description				
Boring Number	B11-1 (Bulk)			
Sample Depth (feet)	--			
Material Description	Brown Silty SAND			
Test Data				
Specimen	2054	2073	2111	
Exudation Pressure (psi)	200	295	400	
Expansion Dial (.0001")	0	0	0	
Expansion Pressure (psf)	0.0	0.0	0.0	
Resistance 'R' Value	54	62	71	
Moisture at test (%)	10.1	9.2	8.8	
Dry density at test (pcf)	124.2	125.7	124.4	
R Value at 300 psi exudation pressure			**63**	
R Value by expansion pressure (TI=5.0)			**--**	
R Value by E uillibrium			**63**	

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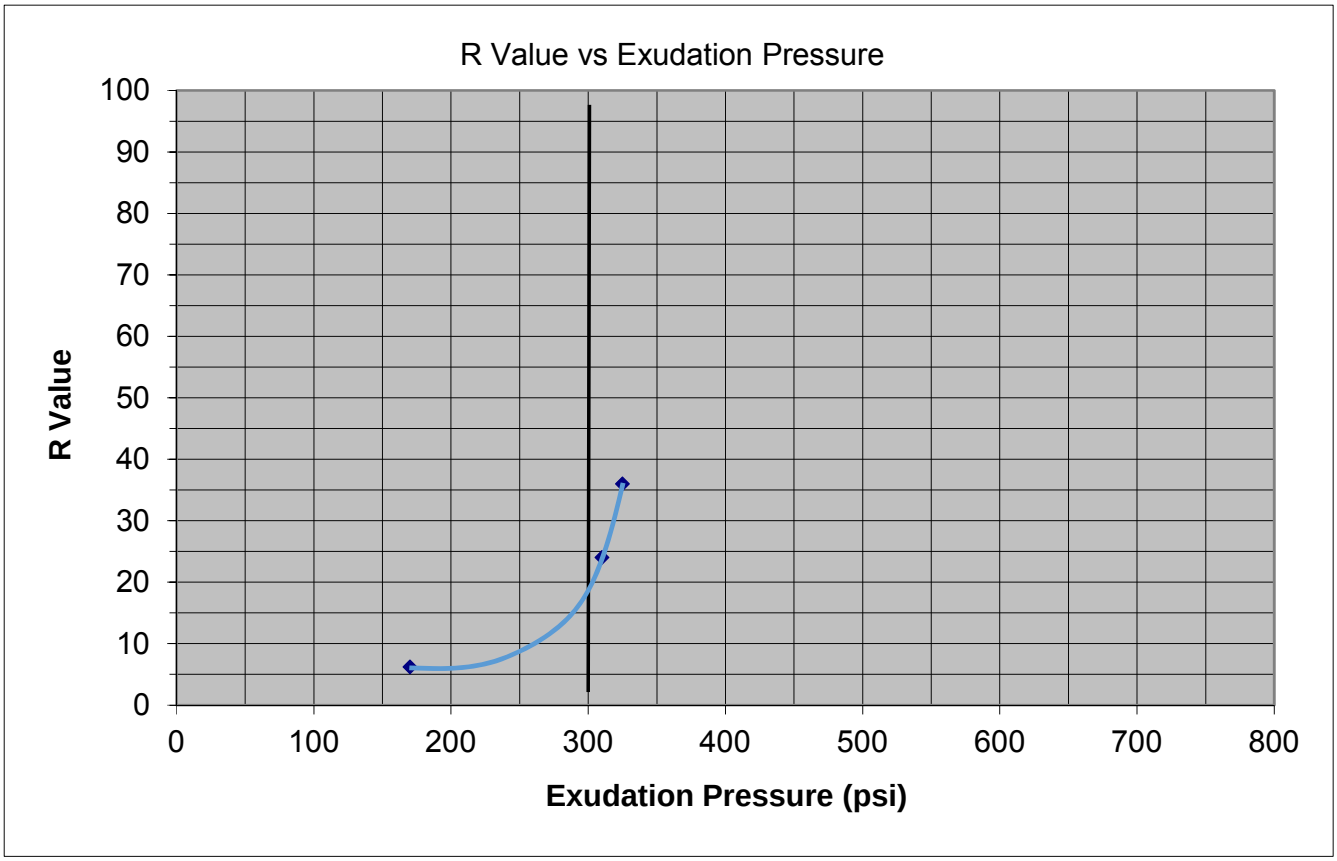
R Value By Exudation

Project: Crawford 16-268.1/SRWA WTP
Location:
Number: S9763-05-113
Figure:



Sample ID & Description				
Boring Number	B17 (Bulk)			
Sample Depth (feet)	--			
Material Description	Brown Sandy lean Clay with gravel			
Test Data				
Specimen	2054	2073	2111	
Exudation Pressure (psi)	310	170	325	
Expansion Dial (.0001")	0	0	0	
Expansion Pressure (psf)	0.0	0.0	0.0	
Resistance 'R' Value	24	6	36	
Moisture at test (%)	9.8	10.7	9.4	
Dry density at test (pcf)	131.6	125.3	127.9	
R Value at 300 psi exudation pressure			**18**	
R Value by expansion pressure (TI=5.0)			**--**	
R Value by E uillibrium			**18**	

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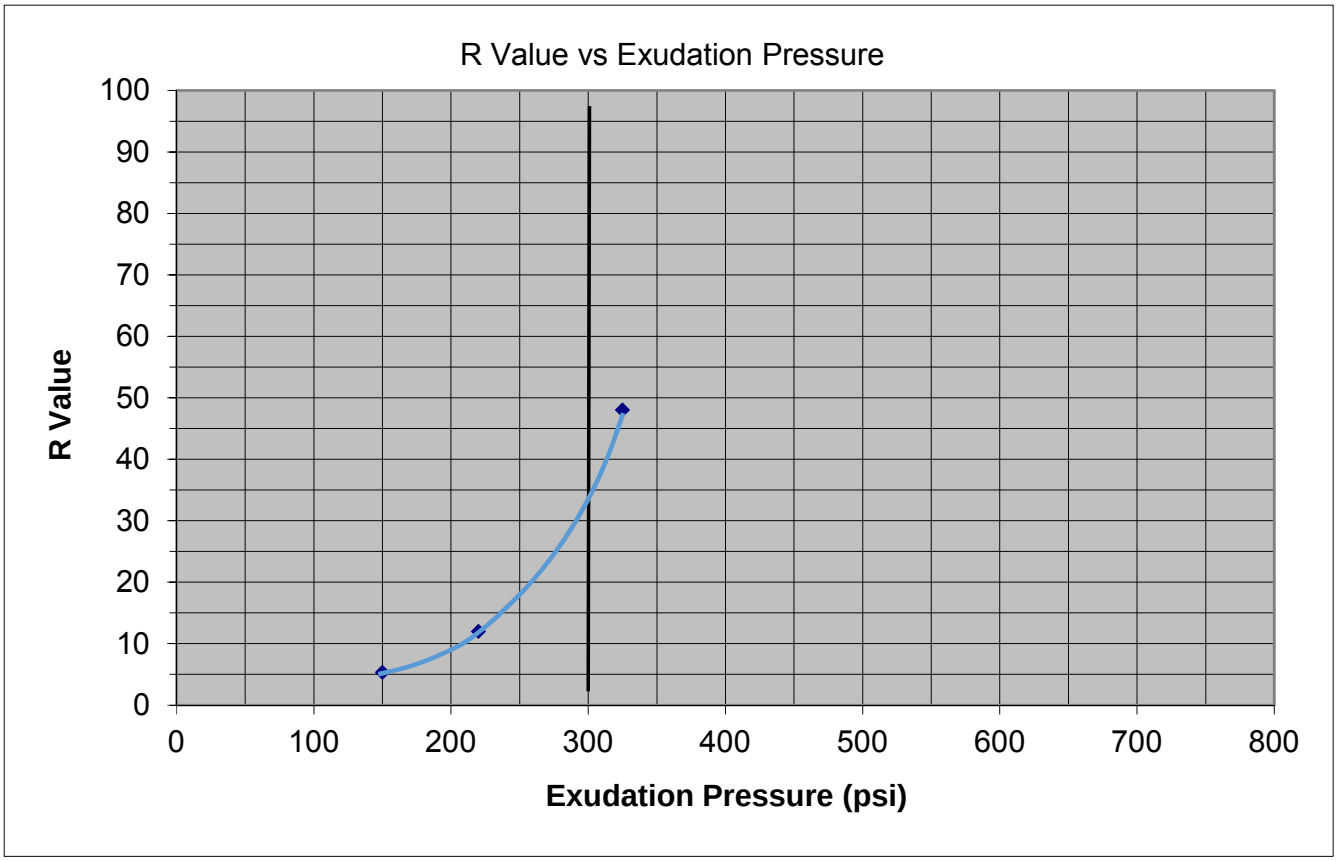
R Value By Exudation

Project: Crawford 16-268.1/SRWA WTP
Location:
Number: S9763-05-113
Figure:



Sample ID & Description				
Boring Number	B20-1 (Bulk)			
Sample Depth (feet)	--			
Material Description	Brown Silty SAND			

Test Data			
Specimen	2098	2095	2102
Exudation Pressure (psi)	150	220	325
Expansion Dial (.0001")	0	0	0
Expansion Pressure (psf)	0.0	0.0	0.0
Resistance 'R' Value	5	12	48
Moisture at test (%)	11.5	10.6	9.2
Dry density at test (pcf)	122.8	124.7	125.0
R Value at 300 psi exudation pressure		**33**	
R Value by expansion pressure (TI=5.0)		**--**	
R Value by E uillibrium		**33**	

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R Value By Exudation

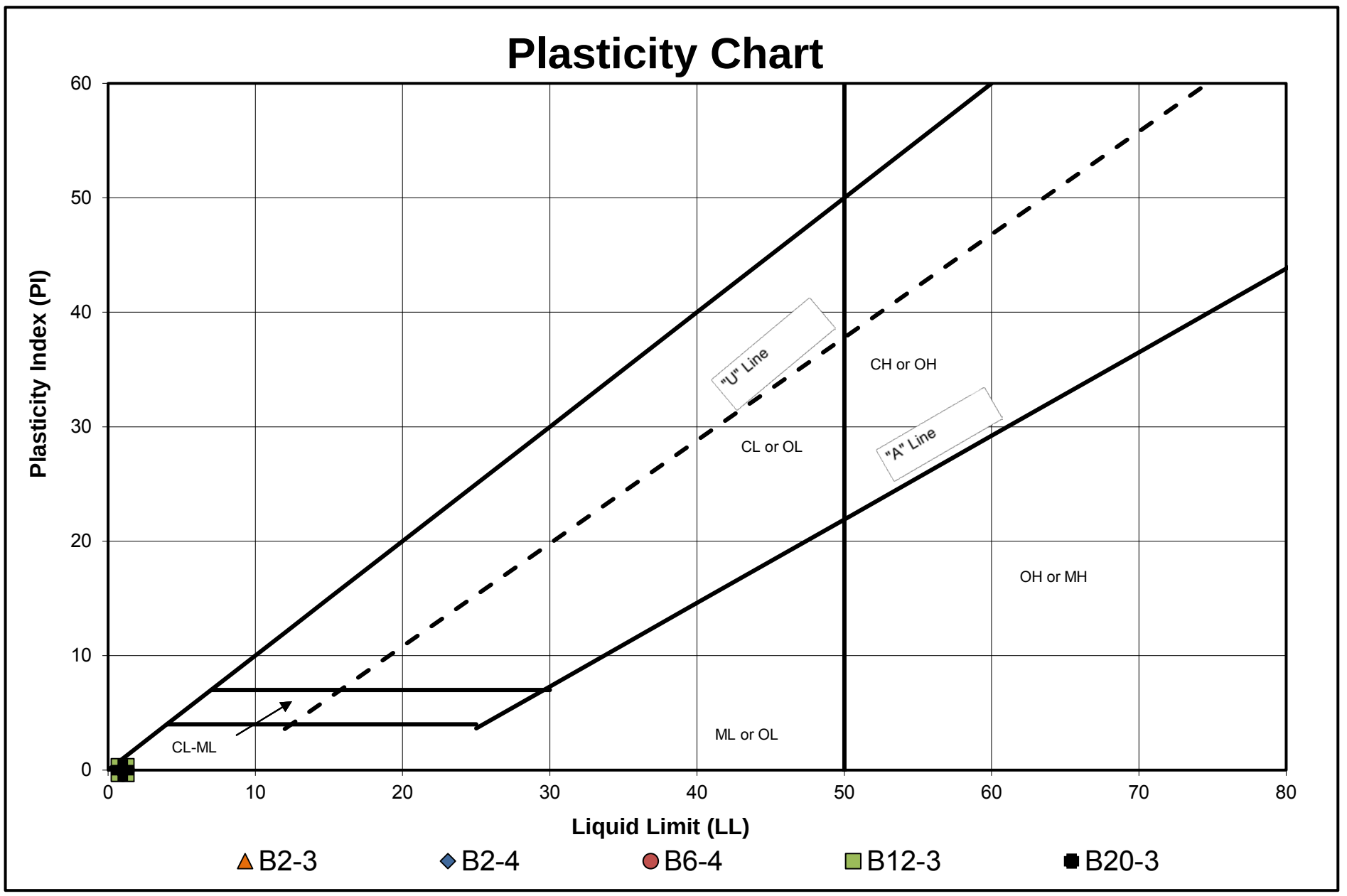
Project: Crawford 16-268.1/SRWA WTP
Location:
Number: S9763-05-113
Figure:

CONSTRUCTION TESTING SERVICES

ATTERBERG LIMITS

Test Performed in General Accordance with ASTM D 4318

Project Name: SRWA
CTS Job No. 12315
Project Location:
Client: Crawford and Associates Inc.
Sample Date: 2/26/2018
Report Date: 3/2/2018



Test #	Sample Location	Fill Type	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	USCS	Description
B2-3		0	NP	NP	NP	---	---
B2-4		0	NP	NP	NP	---	---
B6-4		0	NP	NP	NP	---	---
B12-3		0	NP	NP	NP	---	---
B20-3			NP	NP	NP	---	---

Reviewed by: Cassidy Bertsch, EIT
Date: 3/2/2018

Title: Staff Engineer

Limitations

The materials tested was sampled and/or transported to our laboratory by parties other than CTS personnel. This report therefore makes no representation of whether the sample tested was representative of the subject material

Testing was performed in accordance with the applicable test methods by qualified personnel.

Pursuant to applicable building codes and/or specifications, the results presented in this report are for the items listed herein and for the exclusive use of the Client and the registered design professional in responsible charge. The results apply only to the samples tested and are not to be considered as a guarantee or warranty, express or implied. In the event changes to the specifications (and/or materials) were made and not communicated to CTS, then CTS assumes no responsibility for the accuracy of pass/fail statements (meets/did not meet), if provided.

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2118 Rheem Drive Pleasanton, CA 94588 (925) 462-5151 office (925) 462-5183

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

Project Name: SRWA
CAInc File No: 16-268.1
Date: 2/28/18
Technician: ETT

200 Wash - ASTM D1140

Method A

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

Table from 6.2 of ASTM D1140

Sample No.	B1-3	B5-2	B6-2	B9-3	B12-4
USCS Symbol	SM	SM	SM	SM	ML
Depth (ft.)	8.5	6.5	4	6.5	11
Tare No.	R8	R9	P5	R5	R14
Tare (g)	130.4	130.6	131.8	126.6	130.1
Dry Soil + Tare (g)	325.1	324.3	323.3	302.1	310
Dry Mass before (g)	194.7	193.7	191.5	175.5	179.9
Dry Mass after (g)	127.4	107.2	103.1	92.8	75.6
Percent Fines (%)	35	45	46	47	58

Notes:

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

Project Name: SRWA
CAInc File No: 16-268.1
Date: 3/1/18
Technician: ETT/KE

200 Wash - ASTM D1140

Method A

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

Table from 6.2 of ASTM D1140

Sample No.	B17-4	B18-3	B18-5	B18-8	B19-4
USCS Symbol	SM	SM	SP-SM	SP-SM	SM
Depth (ft.)	7.8	3.5	8	14	6.1
Tare No.	R3	R16	R20	P3	R10
Tare (g)	127.8	129	129.9	128	131.2
Dry Soil + Tare (g)	304.7	330.3	332.3	315.7	429.5
Dry Mass before (g)	176.9	201.3	202.4	187.7	298.3
Dry Mass after (g)	134.9	127.4	188.8	169.1	246.2
Percent Fines (%)	24	37	7	10	17

Notes:

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

Project Name: SRWA Water Treatment Project
CAInc File No: 16-268.1
Date: 3/1/18
Technician: KE/GL

200 Wash - ASTM D1140

Method A

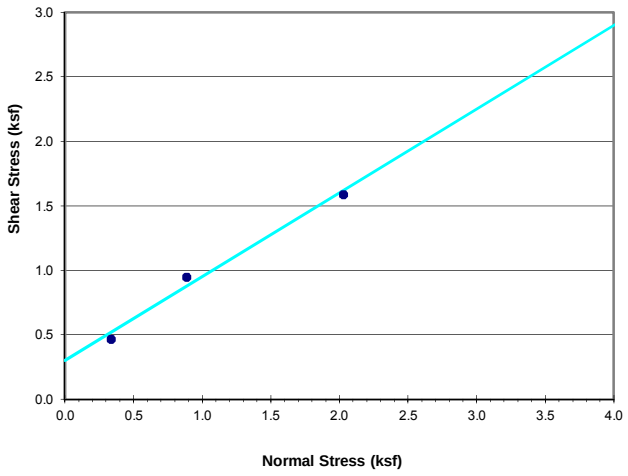
Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	B20-2	B21-4			
USCS Symbol	SM	SM			
Depth (ft.)	4	11.5			
Tare No.	R4	R2			
Tare (g)	126.9	126.4			
Dry Soil + Tare (g)	310.7	325.3			
Dry Mass before (g)	183.8	198.9			
Dry Mass after (g)	108.1	158.0			
Percent Fines (%)	41	21			

Notes:

SHEAR STRENGTH



Sample Description			
Sample ID	B1-2		
Sample Depth (feet)			
Material Description	Yellowish brown Silty SAND with clay		
Initial Conditions at Start of Test			
Sample ID (psf)	**338**	**890**	**2030**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	7.8	7.8	7.6
Dry Density (pcf)	111.9	109.6	112.7
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	43.4	40.4	43.2
Shear Test Conditions			
Strain Rate (%/min)	0.421	0.421	0.421
Major Principle Stress at Failure (psf)	464	947	1588
Strain at Failure (%)	8.00	6.74	7.58
Test Results			
ϕ, degrees **33.0**			
c, psf **300**			

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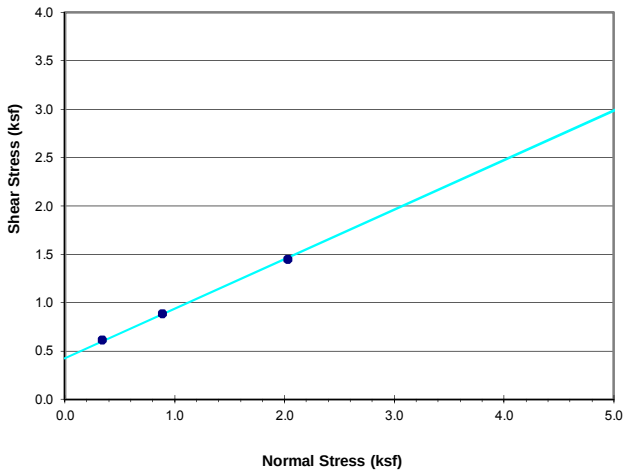
Direct Shear Strength Test (ASTM D3080)

Project: Crawford 16-268.1 SRWA WTP
Location:
Number: S9763-05-113
Figure:

SHEAR STRENGTH



Sample Description			
Sample ID	B21-3		
Sample Depth (feet)			
Material Description	Brown Silty SAND		
Initial Conditions at Start of Test			
Sample ID (psf)	**338**	**890**	**2030**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	9.7	7.9	8.5
Dry Density (pcf)	112.4	110.0	112.6
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	54.6	41.5	47.8
Shear Test Conditions			
Strain Rate (%/min)	0.421	0.421	0.421
Major Principle Stress at Failure (psf)	611	888	1450
Strain at Failure (%)	2.53	6.32	7.58
Test Results			
ϕ, degrees **27.1**			
c, psf **425**			

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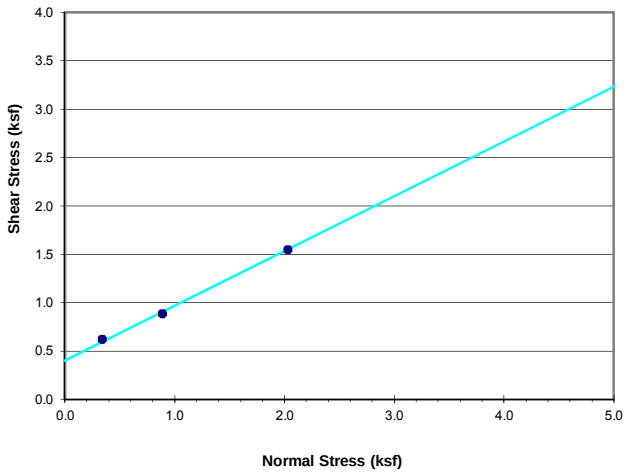
Direct Shear Strength Test (ASTM D3080)

Project: Crawford 16-268.1 SRWA WTP
Location:
Number: S9763-05-113
Figure:

SHEAR STRENGTH



Sample Description			
Sample ID	B14-3		
Sample Depth (feet)			
Material Description	Brown Silty SAND		
Initial Conditions at Start of Test			
Sample ID (psf)	**338**	**890**	**2030**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	5.8	6.4	7.8
Dry Density (pcf)	113.4	107.2	112.5
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	33.7	31.3	43.9
Shear Test Conditions			
Strain Rate (%/min)	0.421	0.421	0.421
Major Principle Stress at Failure (psf)	621	888	1548
Strain at Failure (%)	1.68	5.05	4.63
Test Results			
ϕ, degrees **29.5**			
c, psf **400**			

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Project: Crawford 16-268.1 SRWA WTP
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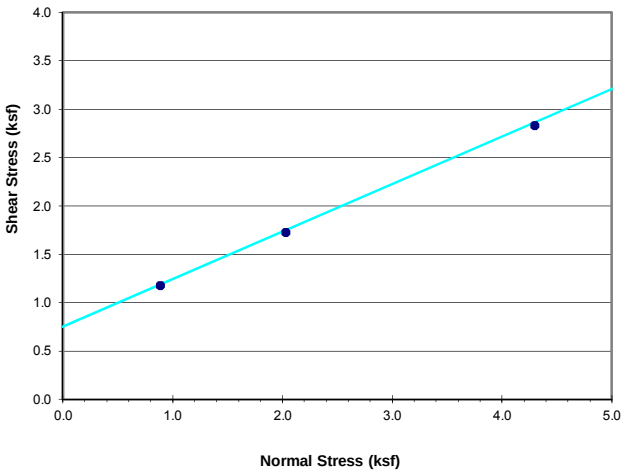
Figure:

SHEAR STRENGTH



Sample Description			
Sample ID	B17-6		
Sample Depth (feet)			
Material Description	Yellowish brown Silty SAND		
Initial Conditions at Start of Test			
Sample ID (psf)	**890**	**2030**	**4300**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	6.2	9.5	7.5
Dry Density (pcf)	92.4	92.8	92.5
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	20.9	32.3	25.3
Shear Test Conditions			
Strain Rate (%/min)	0.421	0.421	0.421
Major Principle Stress at Failure (psf)	1174	1726	2830
Strain at Failure (%)	4.63	2.95	8.42
Test Results			
ϕ, degrees **26.2**			
c, psf **750**			

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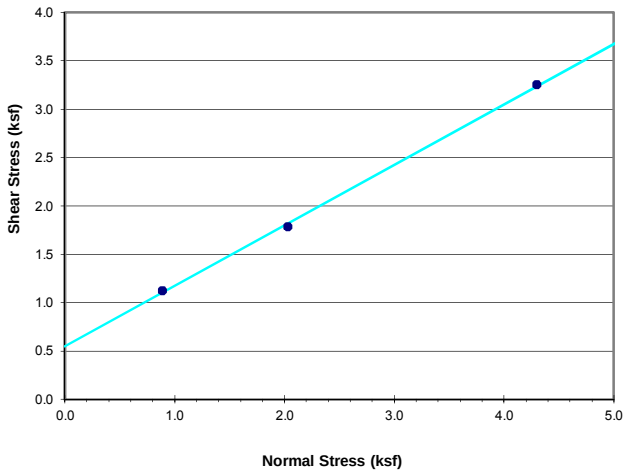
Figure:

SHEAR STRENGTH



Sample Description			
Sample ID	B18-9		
Sample Depth (feet)			
Material Description	Yellowish brown Silty SAND		
Initial Conditions at Start of Test			
Sample ID (psf)	**890**	**2030**	**4300**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	12.1	18.0	10.8
Dry Density (pcf)	109.2	95.6	106.7
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	62.4	65.3	52.0
Shear Test Conditions			
Strain Rate (%/min)	0.421	0.421	0.421
Major Principle Stress at Failure (psf)	1124	1785	3254
Strain at Failure (%)	2.11	5.47	5.05
Test Results			
ϕ, degrees **32.0**			
c, psf **550**			

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Project: Crawford 16-268.1 SRWA WTP
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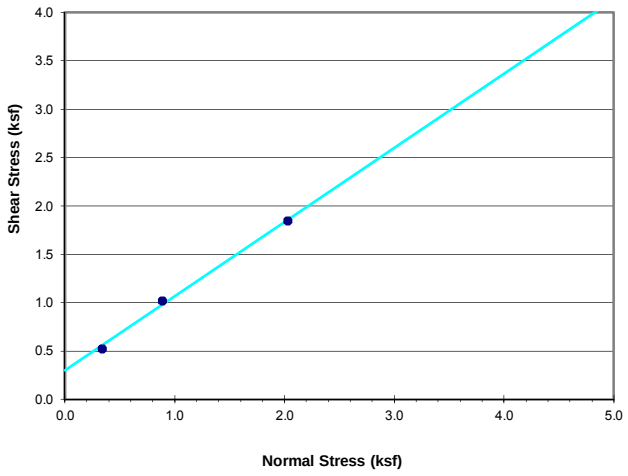
Figure:

SHEAR STRENGTH



Sample Description			
Sample ID	B10-3		
Sample Depth (feet)			
Material Description	Yellowish brown Silty SAND		
Initial Conditions at Start of Test			
Sample ID (psf)	**338**	**890**	**2030**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	4.2	4.4	4.6
Dry Density (pcf)	105.4	106.5	107.6
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	19.7	20.9	22.8
Shear Test Conditions			
Strain Rate (%/min)	0.421	0.421	0.421
Major Principle Stress at Failure (psf)	523	1016	1844
Strain at Failure (%)	7.16	8.00	4.21
Test Results			
ϕ, degrees	**37.5**		
c, psf	**300**		

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Direct Shear Strength Test (ASTM D3080)

Project: Crawford 16-268.1 SRWA WTP
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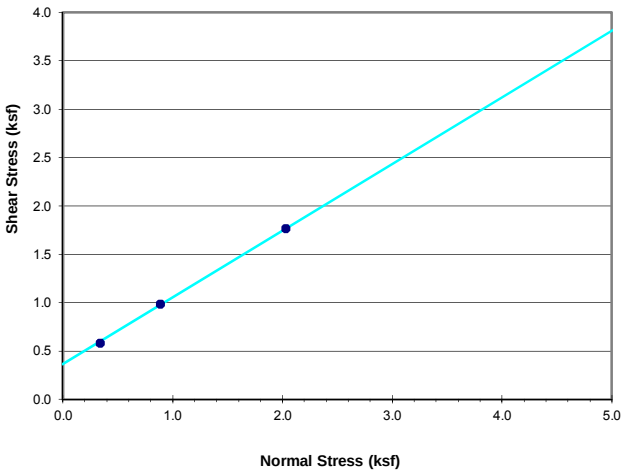
Figure:

SHEAR STRENGTH



Sample Description			
Sample ID	B7-2		
Sample Depth (feet)			
Material Description	Brown Sandy SILT		
Initial Conditions at Start of Test			
Sample ID (psf)	**338**	**890**	**2030**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	11.7	11.8	11.6
Dry Density (pcf)	116.7	116.9	118.2
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	74.3	75.5	76.6
Shear Test Conditions			
Strain Rate (%/min)	0.211	0.211	0.211
Major Principle Stress at Failure (psf)	582	986	1765
Strain at Failure (%)	8.00	3.37	2.53
Test Results			
ϕ, degrees **34.6**			
c, psf **365**			

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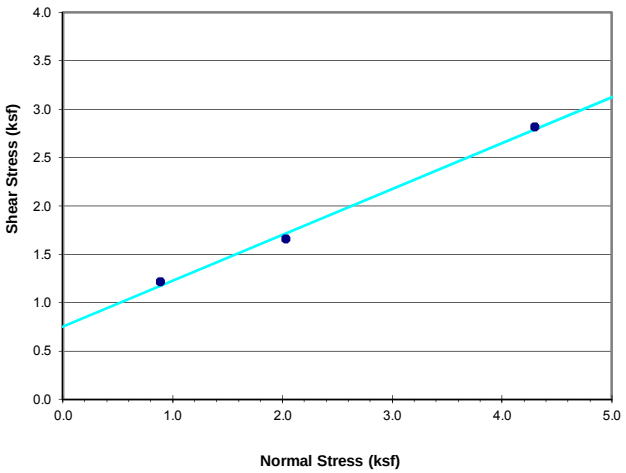
Direct Shear Strength Test (ASTM D3080)

Project: Crawford 16-268.1 SRWA WTP
Location:
Number: S9763-05-113
Figure:

SHEAR STRENGTH



Sample Description			
Sample ID	B4-7		
Sample Depth (feet)			
Material Description	Olive brown Clayey SAND		
Initial Conditions at Start of Test			
Sample ID (psf)	**890**	**2030**	**4300**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	12.3	10.8	10.6
Dry Density (pcf)	107.8	102.8	108.4
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	60.9	47.0	53.5
Shear Test Conditions			
Strain Rate (%/min)	0.421	0.421	0.421
Major Principle Stress at Failure (psf)	1213	1657	2820
Strain at Failure (%)	2.11	3.79	4.63
Test Results			
ϕ, degrees	**25.4**		
c, psf	**750**		

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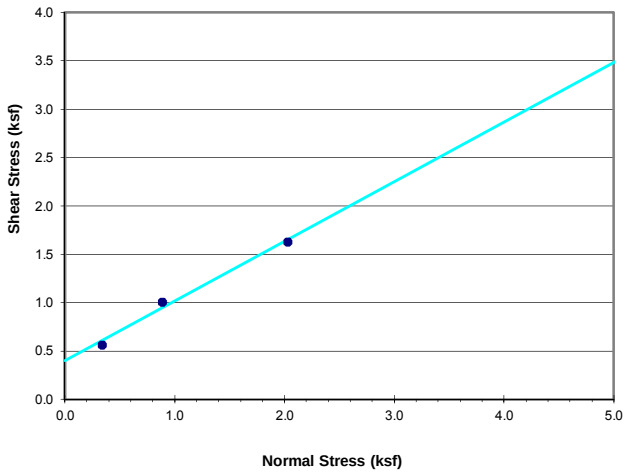
Direct Shear Strength Test (ASTM D3080)

Project: Crawford 16-268.1 SRWA WTP
Location:
Number: S9763-05-113
Figure:

SHEAR STRENGTH



Sample Description			
Sample ID	B23-2		
Sample Depth (feet)			
Material Description	Brown Silty SAND		
Initial Conditions at Start of Test			
Sample ID (psf)	**338**	**890**	**2030**
Height (inch)	1.00	1.00	1.00
Diameter (inch)	2.375	2.375	2.375
Moisture Content (%)	7.9	7.6	7.8
Dry Density (pcf)	114.7	113.4	116.1
Estimated Specific Gravity	2.65	2.65	2.65
Saturation (%)	47.6	43.8	48.5
Shear Test Conditions			
Strain Rate (%/min)	0.421	0.421	0.421
Major Principle Stress at Failure (psf)	562	1006	1627
Strain at Failure (%)	1.68	1.26	2.53
Test Results			
ϕ, degrees	**31.7**		
c, psf	**400**		

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Direct Shear Strength Test (ASTM D3080)

Project: Crawford 16-268.1 SRWA WTP
Location:
Number: S9763-05-113
Figure: