

REQUEST FOR PROPOSAL
PUBLIC SUPPLY WELL
SEPTEMBER 18, 2024

Introduction:

The Yocha Dehe Wintun Nation, a federally recognized tribal government (Tribe) is requesting proposals from experienced contractors to properly drill and construct one Public Supply Well (Well) in Brooks, California. The Well is being constructed for purposes of supplying potable water to the Tribe's existing supply and water distribution system customers. The potable water system is regulated by the U.S. Environmental Protection Agency (EPA).

The detailed project specifications for the new Well (Casino Supply Well No. 1A) are attached and were prepared by Luhdorff & Scalmanini Consulting Engineers (LSCE). LSCE will oversee implementation of the specifications. The Bid Item and Payment Sheet for the new Well pricing is attached following the specifications.

Proposals will be selected based on an assessment of the total cost submitted on the attached Bid Item and Payment Sheet and the contractor's ability to understand and complete the project.

The Tribe reserves the right to amend or supplement this Request for Proposal by providing notice of such to all who have received the proposal document.

Pre-Bid Meeting:

A mandatory pre-bid meeting is scheduled for 11:00 AM on Thursday September 26th at the project site. Interested bidders will meet at the Séka Hills Olive Mill parking lot in Brooks, California. Interested bidders will be escorted to the Well site. Direct questions regarding the specifications, plans, and contract may be asked and answered at this time. Questions that cannot be answered will be addressed, as necessary, in writing as an addendum.

Funding:

Funding for the project is provided by the California Department of Water Resources Small Community Drought Relief Program. Prevailing wage rates and applicable

apprenticeship requirements must be met. The contractor must have adequate insurance, including that required by California Labor Code section 3700.

Contractor Qualifications:

The contractor must have a current C-57 Well Drilling Contractor License and be in good standing. The contractor will be contractually required to meet the attached project specifications.

Bid Submittal:

The Yocha Dehe Wintun Nation will receive proposals for said work as described herein until the close of business on October 18, 2024.

Bids should be sent electronically to mfawns@yochadehe.gov and smorgan@yochadehe.gov

Please indicate the earliest contractor availability in the bid. Successful bidders will be required to sign a Tribal contract that will include adherence to the attached project specifications and provided Bid Item and Payment Sheet.

The Tribe reserves the right to accept or reject any or all portions of a bid in its sole discretion. Further, the Tribe accepts no responsibility for any costs involved in preparing or submitting a bid. The Tribe also reserves the right to choose, in its judgment, the most appropriate proposal from those submitted, and to negotiate with the successful contractor any changes in its proposal prior to, or as part of, awarding a contract. This Request for Proposal neither expresses nor implies any obligation on the part of the Tribe to enter into a contract with a contractor submitting a proposal.

Contact Information:

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**Specification for the Yocha Dehe
Wintun Nation
Casino Supply Well No. 1A**

Specifications for the Yocha Dehe Wintun Nation Casino Supply Well No. 1A

Prepared for



By



August 2024

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1. GENERAL

1.1. References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. The most recent published edition of each of the reference standards applies.

- AWS - American Welding Society
- ASTM - American Society of Testing and Materials
- NSF/ANSI - Standard 60, Drinking Water Treatment Chemicals
- NSF/ANSI 61 - Drinking Water System Components – Health Effects
- API - Standard 13-A, Drilling Fluid Materials, American Petroleum Institute
- API - Standard 13-B, Recommended Practice Standard Procedure for Field Testing Oil-Based Drilling Fluids
- ANSI/AWWA - A100-20 Water Wells
- Water Well Standards, State of California; Bulletin 74-90 (Supplement to Bulletin 74-81) June 1991 or latest applicable edition/revision.

1.2. General Requirements

1.2.1. Purpose and Scope of Work

1.2.1.1. Purpose

The water supply well to be constructed under this Contract and in accordance with these Technical Provisions is intended for use as a drinking water supply well. The well site and well to be constructed are summarized below:

The well site is located on the lands of the Yocha Dehe Wintun Nation, proximal to the Cache Creek Casino Resort on the west side of Highway 16, Brooks, California, as depicted in the plans. Information from numerous existing wells and test holes drilled on the property was used for preliminary well design information.

The design capacity of the well is tentatively in the 250-500 gpm range. The well will be constructed of 16-inch diameter stainless-steel casing, and stainless-steel louvered well screen with a slot size of 0.050-inches to a depth of 530 feet. The well assembly will be installed in a 30-inch diameter borehole drilled to a depth up to 1,000 feet (in order to explore deeper lithology and water quality at the project site). It should be noted that the maximum depth previously drilled at the site is approximately 650 feet.

1.2.1.2. General

- A. The work consists of furnishing all drilling permits, materials, labor, equipment, fuel, tools, transportation, and services for the drilling, construction, development, testing, and completion of a water supply well, all in accordance with these Technical Provisions.
- B. Other work by the Contractor shall include keeping records of all construction activities, including time-drilling and work logs; capping of the well casing and cleaning and restoration of the well site upon completion of work; and performing all necessary tasks

for the safe and efficient construction and completion of the well specified in these Technical Provisions. The Contractor shall make available to the Engineer all daily drilling and work records, as well as other specific information listed in these specifications, for the construction activities that are a part of this Contract.

C. The Owner is:

Yocha Dehe Wintun Nation
PO Box 18
Brooks, CA 95606
Contact Person: Marc Fawns, P.G
Telephone: (530) 601-6607
Email: mfawns@yochadehe.gov

D. The Engineer is:

Luhdorff and Scalmanini, Consulting Engineers
500 First Street
Woodland, CA 95695
Contact Person: Mr. Eddy Teasdale, P.G., CH.G
Telephone: (530) 661-0109
Cellular Telephone: (530) 419-9484
Email: eteasdale@lsce.com

The Engineer is the Owner's agent with respect to design, project coordination, and inspection.

1.2.1.3. Services Provided the Owner

The owner has obtained the necessary legal right-of-way for the drilling and well construction work.

1.2.1.4. Work Area Restrictions

- A. General -- The Contractor shall protect all existing facilities and shall keep the site clear and open at all times.
- B. Coordination with Other Activities -- The Contractor is advised that other work may be conducted at the project site. The Contractor shall limit all activities to the designated work areas at the site.
- C. Work Hours – 24-hour operations for drilling and construction of the well are allowed.
- D. Traffic Control—The Contractor shall exercise caution and provide adequate traffic control when entering or exiting the project site. The Contractor shall provide and arrange all traffic control signage as required by project permits and accepted safety practices.
- E. Health and Safety -- Contractor shall provide and adhere to a health and safety plan to address actual or potential hazards associated with the Work. A copy of the Contractor's health and safety form shall be posted at the job site.
- F. Hazardous Materials -- The Contractor shall comply with all government laws, rules, and regulations concerning the use of hazardous materials and the disposal of hazardous wastes at the job site, including but not limited to the following:
 - 1. The Contractor shall not bring hazardous materials onto the job site or deliver hazardous materials without providing the Engineer with Material Safety Data Sheets for each hazardous material in advance.

2. All hazardous material shall be stored and used safely and according to the manufacturer's recommendations.
3. Any hazardous products, waste, or empty containers used or generated shall be properly and legally disposed of and shall not be poured down any drain or sewer nor disposed of in any trash container or dumpster.
4. The Contractor will be considered the hazardous waste generator and will be responsible for the legal transport and disposal of all hazardous waste. No containers or trash will be left on any job site.
5. Violation of any of the above methods shall be sufficient cause for the Engineer to stop all work. Any expense incurred by the Engineer caused by the work stoppage will be borne by the Contractor. These expenses will include all costs to return the job site and all other areas contaminated by the Contractor to a hazard-free condition.
6. The Contractor will be solely responsible for all the costs, including fines and penalties, the investigation and cleanup of any suspected hazardous materials the Contractor used, left on the job site, or disposed of through a municipal drain or sewer, and any damage to property and/or injury to any person.

1.2.1.5. Water Well Construction and Testing

- A. The proposed well site is located in Yolo County in Brooks, as shown in the Plans.
- B. Time is of the essence for this project. The Contractor shall mobilize, construct, and test the well within the timeframe set forth in the Contract Documents. Failure to do so will result in sufficient hardship and possible financial loss to the Owner.
- C. Depth to first encountered ground water at the project site is estimated to be approximately 30 feet below ground surface (BGS).
- D. The construction of the well structures shall consist of the following steps:
 1. Drilling a conductor borehole and grouting in place a steel conductor casing as specified in the plans.
 2. Establishing and maintaining a drilling fluid program to maintain borehole stability, transport cuttings to the surface, and mitigate flowing groundwater conditions.
 3. Drilling a minimum 17.5-inch diameter borehole beneath the conductor casing.
 4. Performing geophysical, borehole diameter, and gyroscopic surveys in the completed borehole.
 5. Perform groundwater zone sampling of no more than two zones.
 6. Reaming the borehole to the final specified diameter.
 7. Installing a casing assembly consisting of blank well casing and well screen, all as specified in the final well design.
 8. Equipping the casing with centralizers to ensure that the casing assembly is centered in the borehole.
 9. Installing a 2-inch diameter, Schedule 40 Type 304 stainless steel pipe where it will enter the well casing to serve as a still well for measuring water levels in the well as specified in the Plans.
 10. Installing a 3-inch diameter, Schedule 40 Type 304 stainless steel pipe to be used

as a gravel fill pipe as specified in the Plans.

11. Conditioning of the drilling fluids for casing installation and gravel packing.
 12. Installing a graded gravel envelope between the well casing and borehole wall from the bottom of the production borehole to the depth specified in the Plans by the tremie pipe method.
 13. Placement of sand/cement annular seal from the top of the gravel envelope to ground surface as specified in the plans by the tremie pipe method.
- F. Initial development of the well shall consist of open-ended airlift pumping from the sump and a combination of airlift pumping and swabbing, through the screened intervals. An engine-driven deep well turbine pump shall be temporarily installed for final well development and testing. For bidding purposes, the temporary pump shall be installed to a depth of 250 feet.

The pump and engine shall be capable of pumping 150 percent of the well's design capacity. The final development methods shall include frequent surging and shall proceed until the well satisfies performance requirements concerning sand content and well efficiency, as specified herein.

- G. After final development and when the well meets the specified performance requirements, pumping tests will be performed, including an 8-hour step test with steps at 50, 75, 100, 125, and 150 percent of the final design capacity of the well and an 8-hour constant rate discharge test at the final design capacity. The final design capacity of the well will be determined by the Engineer based on the evaluation of well performance during the step test.

1.2.2. Design Criteria and Performance Requirements

The design of the subject well includes specifications for screen intake locations, slot size and gravel pack gradation for sand control, sealing for sanitary and other water quality concerns, and consideration of other structural requirements. The specified design does not relieve the Contractor of the performance requirements that are a part of these Technical Provisions. Should the Contractor feel that the design furnished by the Owner will affect Contractor's ability to achieve the performance requirements based upon the Contractor's interpretation of the formation samples obtained during the drilling of the production well, the Contractor shall, within 24 hours following completion of the drilling of the borehole, inform the Owner of Contractor's concerns and furnish a written report to the Engineer specifying alternate recommendations for completion of the well which would satisfy these Technical Provisions and the performance requirements herein. The alternate recommendations shall include the Contractor's estimate of the yield that will be obtained, sieve analyses of the formation samples, the material settings, the size of screen openings, and the type and grading of gravel material to be used for a gravel envelope.

1.2.3. Other Data

Information for existing wells in the vicinity of the proposed well has been reviewed to determine their current yield (i.e., pumping capacity), drawdown, and specific capacity. The Contractor may inspect and evaluate all information concerning the existing wells upon written request to the Engineer. This information will be made available solely for the purpose of assisting with the bidding process and is not intended to relieve the Contractor of any responsibility to perform the work under the terms of these Technical Provisions.

1.2.4. Termination and Alternative Well

The Owner reserves the right to terminate the work on the well at any time. In such an event, the Contractor shall be paid for work completed at that time on the basis of the unit bid prices. The Owner reserves the right to select an alternate well site to replace an abandoned well. If the Owner chooses an alternate site, the Contractor shall be paid for the work done on the alternate well on the basis of the unit bid prices.

1.2.5. Contractor's Experience and Equipment

1.2.5.1. Contractor's Experience

The Contractor shall be experienced in well projects of similar scope as judged by the Owner.

1.2.5.2. Contractor's Equipment

The water supply well to be drilled in accordance with these Technical Provisions shall be drilled by the reverse rotary drilling method, with drilling equipment in good condition and of sufficient capacity to drill the hole required by these Technical Provisions. All drilling equipment, including mast and draw works, air compressors, drilling fluid pumps, drill pipe, etc., must be of requisite size, sufficient capacity, and suitable condition to drill and set casing to the specified depth.

1.2.6. Drilling Fluids

1.2.6.1. Drilling Fluid Control Program

- A. A drilling fluid control program shall be submitted and approved by the Engineer prior to the commencement of drilling operations. Selection and use of the drilling fluid materials shall be a part of this Contract. The Contractor shall be responsible for maintaining the quality of the drilling fluid to ensure the protection of water-bearing and potential water-bearing formations exposed in the borehole and the ability to obtain representative samples of the aquifer materials encountered during the drilling process. The Contractor shall use fresh, non-polluted water from the approved source to prepare the drilling fluid. Any modification of the approved drilling fluid control program shall first be approved by the Engineer.
- B. The Contractor shall submit, for approval by the Engineer, a list of all additives that will be employed or are anticipated to be used during the drilling operations prior to the commencement of drilling. Drilling fluid additives shall meet or surpass Standard 13-A, Drilling Fluid Materials, American Petroleum Institute. All drilling fluid additives must comply with recognized industry standards and practices, and they must be applied and used as prescribed by the manufacturer. Toxic or dangerous substances shall not be added to the drilling fluid. The disallowance of any material by the Owner prior to or during construction of the well will not relieve the Contractor of the responsibility to complete the drilling program as defined in these Technical Provisions.

1.2.6.2. Failure to Maintain Proper Control

Proper control of the drilling fluid must be maintained to the satisfaction of the Engineer. The Contractor will be required, at the Contractor's expense, to retain or employ an experienced, qualified drilling fluid engineer to supervise and maintain the drilling fluid properties if such control cannot be accomplished by the Contractor to the satisfaction of the Engineer.

1.2.6.3. Non-Compliance

If at any time the drilling fluid does not comply with these Technical Provisions or the approved recommendations of a drilling fluid engineer, the drilling fluid shall be re-conditioned and tested until the drilling fluid obtains the specified characteristics. If proper drilling fluid properties cannot be maintained, the drilling fluid shall be replaced at the Contractor's expense.

1.2.7. Water for Drilling

Water for drilling will be available at the project site via an existing well located within 1,000 feet of the proposed well location. The Contractor is responsible for supplying the necessary equipment for delivering the water from the connection point to the drilling location. Water will be made available to the Contractor at no cost.

1.2.8. Nuisance Water and Drill Cuttings

- Nuisance Water—Nuisance water, such as rainfall or surface runoff, may occur at the well site during the period of construction under this contract. The Contractor shall at all times protect the Work from damage by such waters and shall take all due measures to prevent delays in the progress of the Work caused by such waters.
- Drill Cuttings—The Contractor may stockpile drill cuttings at the site as directed by the Engineer before they are spread onsite at a final location determined by the Owner.

1.2.9. Records and Forms

The Contractor shall maintain current records on the site at all times to show:

- A. Time, depth, and results of all drilling fluid tests.
- B. All materials added to the system, kind, amount, time and depth.
- C. Variances or modifications from the agreed-to drilling fluid program; time, depth, reason for variance/modification, and authorization.

1.2.10. Supervision

The Contractor shall designate one person who will have full decision-making authority to represent the Contractor on a daily basis at the project site.

1.2.11. Construction Inspection

1.2.11.1. General

The Contractor will be required to contact the Engineer at various stages of construction for the purpose of construction inspection. The Contractor shall perform no work until the Engineer has made such inspections. The Contractor shall notify the Engineer at least 24 hours prior to each of the required inspections to ensure that a representative will be available to conduct the inspection.

1.2.11.2. Inspection Items

The following is a list of required inspection items. Inspection and approval of each item by the Engineer are required before proceeding to a subsequent stage of the project.

Description	Item
1) Mobilization	Equipment (Drilling equipment and accessories), Site layout, Storm Water Prevention Measures, Sanitary Facilities
2) Construction Materials	Drilling Fluid Additives Casing and Screen Sections Gravel Fill pipe, Sounding Pipe, and Sounding Pipe Inlet Structure, Gravel
3) Drilling	Drilling Fluid Properties Geophysical, Caliper, and Borehole Geometry Survey
4) Zonal Sampling	Zone Construction and Development Groundwater Sampling
5) Construction	Conductor Casing Installation Casing Assembly Installation Gravel Fill and Sounding Tube Installation Gravel Envelope Installation Seal Placement
6) Plumbness and Alignment	Equipment Testing
7) Well Development	Swabbing Tool Pumping Equipment Discharge Assembly
8) Well Testing	Sand Test Well and Aquifer Tests Video Survey Plumbness and Alignment Testing
9) Disinfection	Disinfection Agent Disinfection
10) Final	Casing Stick-up and Security Site Clean-up

1.2.11.3. Access for Inspection

Contractor shall provide safe access to all areas of the work site and to allow for permit inspection by the Engineer at all times.

1.2.12. Notifications and Permits

It shall be the Contractor's responsibility to obtain the appropriate well permits and to satisfy all requirements of that permit. The well permitting agency for this project is:

Yolo County – Department of Community Services, Environmental Health Division
292 West Beamer Street
Woodland, CA 95695
(530) 666-8646

The Contractor shall provide the Engineer with completed permit applications for review and approval before submission to the permitting agency.

The Contractor shall notify the Engineer and the appropriate regulatory agencies in advance of the start and completion of the well.

1.2.13. Project Site and Well Security

The Contractor shall provide, at all times during well construction, suitable means of protecting the well bore and casing assemblies, when installed, from the entrance of foreign objects and from vandalism.

It is the Contractor's responsibility to provide any site security the Contractor deems necessary.

1.3. Submittals: General

The Contractor shall submit the following general submittals as part of a single package to the Engineer before mobilization to the project site.

- A. A description of the drilling equipment including rig manufacturer, model, mast height, capacity, maximum casing length, and drill pipe diameter, length, and connection type.
- B. A construction schedule for well construction and testing.
- C. A site plan of the drilling location delineating the location and size of the drilling rig and related support equipment, tank locations, access roads, casing and gravel storage, sanitary facilities, drill cuttings stockpile, and site trash storage.
- D. A storm water protection program and plan.
- E. The Contractor's daily report form.
- F. A health and safety plan.
- G. A list of supervisory personnel who will be responsible for the performance of all work associated with the Contract. The list will include the phone numbers where the personnel may be reached by the Engineer.
- H. List of proposed subcontractors.
- I. A drawing illustrating the tools, equipment, and discharge piping to be used during the zonal sampling operations.
- J. A drawing delineating the size, location, and plumbing arrangement of the equipment to be used during the gravel packing operations.
- K. A drawing illustrating the tools, equipment, and discharge piping to be used during the well development operations.
- L. The Contractor's estimates of the volumes of gravel and sealing material required to fill the theoretical annular spaces in the well in accordance with the specified design.
- M. A proposed drilling fluid control program.

1.3.14. Submittals: Materials

The Contractor shall submit certificates of compliance for the following materials for approval by the Engineer. No material shall be incorporated into the work until certificates of compliance have been approved in writing by the Engineer. Conductor Casing

- A. Conductor Casing

- B. Sand Cement Grout
- C. Blank Production Well Casing
- D. Production Well Screen
- E. Sounding Pipe
- F. Gravel Fill Pipe
- G. Gravel Envelope Material
- H. Sieve analysis of the gravel pack material.
- I. Disinfection Agent

1.3.14.1. Product Submittal Requirements

- A. Certificates of compliance from the Contractor, suppliers, and/or manufacturers, shall clearly indicate that the material to be delivered to the job site will meet all requirements of these Technical Provisions. A certificate of compliance shall include, but not be limited to, the project title, delivery location, date (or approximate date) of delivery, name of the material with appropriate classification or model numbers, quantity, name of the manufacturer, statement of compliance with all requirements of the Technical Provisions, and the name, title, and signature of the certifying agent.
- B. NSF/ANSI 60/61 certifications shall be submitted for each material used in the drilling of the borehole or construction of the well.
- C. A factory or mill certification (laboratory test report) shall be submitted with the certificates of compliance for all components of the casing assembly. The factory or mill certification shall not be a substitute for the certificate of compliance unless it contains all information required for a certificate of compliance as described above.
- D. Insufficient, incomplete, or unclear certificates will be rejected, and the Contractor shall be responsible for all delays caused by any need for re-submittal. Said delays will not serve as a condition for awarding additional workdays for determining liquidated damages.

2. WELL CONSTRUCTION MATERIALS

2.1. Materials

All materials provided by the Contractor to be incorporated into the work shall be new.

2.1.1. Conductor Casing

- A. Conductor Casing and Collars - The conductor casing for the well shall be manufactured of ASTM A-139 Grade B steel. Conductor Casing shall have the following dimensions:

36-inch O.D. x 3/8-inch wall

Collars, if utilized, shall be of the same thickness and have the same physical and chemical properties as the casing, 5 inches minimum in width, shall be rolled to fit the outside diameter, and shall be circumferentially welded to the casing section. The inside edge of the collars shall be ground or sufficiently scarfed to remove sharp edges, burrs, and welds. Alignment holes shall be provided in each collar to ensure proper matching of the sections. The male end of the casing section shall be ground to remove the excess welding bead for a distance of 4 inches to permit the casing section to enter the collar during field assembly without binding.

- B. Alignment - All casing section ends shall be flat and perpendicular to the axis of the casings. Longitudinal welds shall be ground flush, and the inside of the collar and outside of the casing sections shall be de-burred and fitted prior to assembly. The ends of all sections shall not vary more than 0.010 inches at any point from a true plane perpendicular to the casing.
- C. Centralizers - Centralizers shall be manufactured of the same material thickness as the casing. They shall be a minimum of 2 inches in width and 30 inches in length and shall be angled to provide a minimum 2-1/2-inch offset between the casing and borehole wall. Each centralizer strip shall provide at least a 1-foot length of bearing surface at the bore interface. A minimum of 4 centralizers shall be provided at each location for centering the casing. Centralizers shall be placed on the conductors five feet below ground surface and five feet from the bottom of the conductor.
- D. Roundness - The casing shall be round such that neither the largest nor smallest outer diameter differs from that specified to the equivalent of less than or equal to one percent ellipticity.

2.1.2. Grout

The grouting material shall consist of a sand-cement mixture as described by California Department of Water Resources Well Standards, Bulletin 74-81/Supplement 74-90. The cement shall be Type I or II as defined by the Standards. The mixture shall conform to State standards and local ordinances (well permitting agency) for sanitary seals.

2.1.3. Casing Assembly

The casing assembly consists of blank well casing, screen intake section, and external sounding and gravel fill pipes. The Contractor shall provide materials and components that are compatible with field assembly.

A. Blank Well Casing

1. The blank well casing shall be as specified below and as shown in the Plans.
2. For field assembly, the ends of casing sections shall be furnished with collars. Collars shall be of the same thickness and have the same physical and chemical properties as the corresponding casing section, shall be 5 inches minimum in width, shall be rolled to fit the outside diameter, and shall be circumferentially welded to the casing section. The inside edge of the collars shall be ground or sufficiently scarfed to remove sharp edges, burrs, and welds. Alignment holes shall be provided in each collar to ensure proper matching of the sections. The male end of the casing section shall be ground to remove the excess welding bead for a distance of 4 inches to permit the casing section to enter the collar during field assembly without binding.

B. Louvered Well Screen

1. Louvered well screen and attached end fittings shall be as specified below and as shown in the Plans and shall be fabricated from ASTM A-778 Type 304 stainless steel. The well screen shall be manufactured by Roscoe Moss Company or approved equal. The screen sections shall be furnished with collars of the same material as the screen body and with the tolerances specified for blank well casing.
2. The width of the well screen slots shall be 0.050 inches

3. For field assembly, the ends of casing sections shall be furnished with collars. Collars shall be of the same thickness and have the same physical and chemical properties as the corresponding casing section, shall be 5 inches minimum in width, shall be rolled to fit the outside diameter, and shall be circumferentially welded to the casing section. The inside edge of the collars shall be ground or sufficiently scarfed to remove sharp edges, burrs, and welds. Alignment holes shall be provided in each collar to ensure proper matching of the sections. The male end of the casing section shall be ground to remove the excess welding bead for a distance of 4 inches to permit the casing section to enter the collar during field assembly without binding.
 4. The blank well casing and intake screen shall be manufactured by the same source to ensure compatibility for field assembly.
- C. Alignment - All casing section ends shall be machined flat and perpendicular to the axis of the casings. Longitudinal welds shall be ground flush, and the inside of the collar and outside of the casing sections shall be de-burred and fitted prior to assembly. The ends of all sections shall not vary more than 0.010 inches at any point from a true plane perpendicular to the casing.
 - D. Centralizers - Centralizers shall be manufactured of the same material thickness as the casing. They shall be a minimum of 2 inches in width and 30 inches in length and shall be angled to provide a 5-inch offset between the casing and borehole wall. Each centralizer strip shall provide at least a 1-foot length of bearing surface at the bore interface. A minimum of 4 centralizers shall be provided at each location for centering the casing.
 - E. Roundness - The casing shall be round such that neither the largest nor smallest outer diameter differs from that specified to the equivalent of less than or equal to one percent ellipticity.
 - F. Bottom Plate - The bottom end piece of the casing assembly shall be secured by a SE-type head of the same thickness and material as the blank well casing.
 - G. Sounding Pipe - Two-inch Schedule 40, ASTM A-778 stainless steel pipe, in random lengths, shall be furnished for the installation of the sounding pipe to the specified depth. The sounding pipe shall be furnished with collars for assembly by welding.
 - H. Gravel Fill Pipe - Three-inch Schedule 40, ASTM A-778 stainless steel pipe, in random lengths, shall be furnished for the installation of the gravel fill pipe to the specified depth. The gravel fill pipe shall be assembled by butt welding.

2.1.4. Gravel Envelope

The gravel envelope for the well shall consist of an 8x16 gradation manufactured by P.W. Gillibrand Co. or approved equal.

The gradation of the pack material shall conform to that published by the manufacturer and shall consist of washed, rounded silica material. The gravel shall be delivered to the well site and stored in super sacks. Upon delivery to the well site, the Engineer will inspect and verify that the gravel meets the specified type and gradation before it is installed in the well. Failure to meet the specified gradation shall be grounds for rejection of the delivered gravel material. The gravel shall be protected at the job site and kept free of all foreign matter.

2.1.5. Disinfection Agent

Liquid sodium hypochlorite shall be used to disinfect the gravel pack material. The disinfectant shall be delivered to the site in original unopened containers bearing the manufacturer's label indicating the percentage of available chlorine. Liquid sodium hypochlorite shall not be stored for more than 60 days after the manufactured date prior to use. During secured storage, disinfectants shall not be exposed to the atmosphere or to direct sunlight.

3. WELL CONSTRUCTION AND TESTING

3.1. Mobilization

3.1.1. General

- A. Mobilization shall include transportation of personnel, equipment, and operating supplies to and from the site; providing portable sanitary facilities; providing approved fencing or barricades suitable to keep unauthorized personnel away from construction activities around the site; providing site security, providing pumping equipment, discharge lines, and other necessary facilities at the site; and other preparatory work at the site for the Contractor to conduct the specified work.
- B. The Contractor shall provide a complete reverse rotary drilling unit; all tools, accessories, power, fuel, materials, supplies, lighting, piping, and other equipment; and experienced personnel necessary to conduct safe and efficient drilling operations. The drilling unit shall be in good condition and of such capacity as to drill the borehole required by these Technical Provisions. All drilling equipment shall be thoroughly steam cleaned prior to performing any work on the project.

3.1.2. Reverse Rotary Drilling Equipment

- A. The drilling equipment shall be equipped with a dial reading weight indicator suitable for reading the weight of the drilling string and the casing loads.
- B. Tanks shall be used for circulation of drilling fluids during drilling and construction of the well as specified below. The volume of the tanks shall be at least 100% the volume of the borehole.

3.1.3. Noise Mitigation Measures

Temporary sound attenuation (sound walls) is not required for this project.

3.2. Conductor Casing Installation

3.2.4. Scope

This item shall consist of drilling of a borehole, furnishing and installing conductor casing, and grouting it into place for each well.

3.2.5. Construction Methods

The Contractor shall drill a 48-inch diameter borehole to a depth of 60 feet.

The conductor borehole shall be drilled using the bucket auger drilling method.

- A. Centralization - Care shall be taken to install the casings plumb. A set of four centralizer strips shall be attached on 90 degrees spacing at each centralizer location. The

centralizers shall be attached directly to the casing by welding in order to center and hold the casing in the proper position until grouting is completed. Centralizers shall be installed at 5 feet from the top, at the center of the string, and 5 feet from the bottom.

B. Grouting

1. Grouting operations shall comply with State and local ordinances.
2. Cement grout shall be pumped into the annular spaces by means of a tremie pipe. The tremie pipe must be set within five (5) feet of the bottom of the borehole at the start of the placement. The tremie pipe may be raised during seal placement to avoid excessive pump pressures on the casing. The end of the tremie pipe must remain submerged in grout, and the tremie pipe shall be kept full of grout at all times during the seal placement. Upon completion of the sealing operation, grout shall be visible above the surface of the ground outside the casing.
3. The grout shall be placed in one continuous lift for each casing string. The Contractor shall keep the inside of the casing full of water during the sealing operation.
4. After grouting operations are completed, the well shall be secured and left undisturbed. Work shall not resume until 24 hours have elapsed.

3.3. Test Hole Drilling

Purpose -- The test hole shall serve to evaluate the lithologic character of subsurface formations and aquifers at the candidate well site and to determine characteristics of the aquifer materials through geophysical surveys and measurements.

A. Scope -- The test hole shall be drilled using the direct rotary method. The hole shall be drilled at a minimum diameter of 17.5 inches. The final depth of the test hole will depend on the lithology encountered while drilling and will be determined by the Engineer. It is anticipated that the final test hole depth will be 1,000 feet below ground surface (bgs).

B. Methods

1. The test hole shall be drilled using the direct circulation rotary drilling method of construction. The drilling fluid for the direct rotary drilling operation shall conform to the specifications in Section 3.5.9 Construction Method, D. Drilling Fluid Program.
2. The drilling operations shall be conducted using equipment that is adequate to reach the depth and perform the evaluations specified in the Technical Provisions. If, in the opinion of the Engineer, the Contractor's equipment is not capable of satisfactorily performing the specified work, the Contractor, at his/her own expense, shall substitute equipment satisfactory to the Engineer.
3. The Contractor shall take all measures necessary to protect the top portions of the test hole from caving or raveling.
4. The Contractor shall keep records providing the following information:
 - a) A record of construction activities for each shift.
 - b) A time drilling log of the test hole recording the time (in minutes) required to

drill down each section of the drill pipe.

c) A log of drilling bit types and depths of changes.

d) Record of drilling fluid properties at 4-hour intervals during drilling operations. The record shall show drilling fluid weights, Marsh Funnel viscosity, sand content, drilling fluid losses, and any additives used.

e) A drilling log that defines and classifies the type of formations encountered during the drilling. The log will consist of the depth at which each change in formation is encountered, the classification of the material encountered, its color, and particle size. Classification of silt, sand, gravel, cobbles, etc., shall be based on the size of the material encountered in accordance with the established and accepted geologic standard for the classification of these materials. If more than one size of the material is encountered in a formation such as "sand and clay," an estimate of the quantity of each shall be recorded, such as "20% sand, 80% clay".

f) All measurements for depth shall be referenced to the existing ground surface at the well site.

5. During the drilling of the test hole, the Contractor shall collect representative samples of the rotary drill cuttings at 10-foot intervals and at formation changes. The Engineer may direct the Contractor to collect samples at more frequent intervals if deemed appropriate. The samples collected shall not be washed. They shall be carefully drained of excess drilling fluid but in a manner that will preserve the finer particle size of the sample. Each sample taken shall be preserved in quart-size "Zip-Lock" plastic freezer bags and marked as to date, depth, and well number. The samples shall be properly stored by the Contractor in a manner as to prevent breakage or loss until they are accepted by the Engineer.

6. Upon completion of the test hole drilling, a geophysical log shall be conducted according to Section 3.3.2 Construction Method, E. Geophysical Log.

3.4. Discrete Zone Sampling

3.4.6. Scope

Upon drilling to the final depth and completion of geophysical logging, up to two (2) discrete zones will be selected by the Engineer for zone sampling. This section includes the construction of temporary isolated zones for the evaluation of aquifer properties, and air lifting to approximate the yield of the aquifer at each isolated zone.

3.4.7. Construction Method

The contractor shall commence zonal sampling with the deepest zone selected and proceed progressively to shallower zones until all specified zones have been tested. Procedures for zone construction and testing include:

- 1) Install a slotted sampling tool to a specified depth.
- 2) Fill the borehole annulus with gravel pack materials (coarse-grained sand or pea gravel, as approved by the Engineer) to a depth of approximately 30 feet below the lowest slot of the sampling tool or as specified by the Engineer.

Gravel pack shall be installed via tremie pipe methods.

- 3) Install a 10-foot-thick lower bentonite chip seal in the annulus above the gravel pack via tremie pipe.
- 4) Install gravel pack materials via tremie pipe above the lower bentonite chip seal to a depth of approximately 20 feet above the upper slots of the sampling tool.
- 5) Install a 5-foot-thick layer of plaster sand via tremie pipe.
- 6) Install a 10-foot-thick upper bentonite chip seal via tremie pipe above the plaster sand.
- 7) Install a 20-foot-thick layer of gravel pack material in the annulus above the upper bentonite seal.
- 8) Upon completion, allow a minimum of 12-hours for bentonite seals to hydrate and setup before beginning airlift development.
- 9) Install air line inside the sampling tool to a depth of at least 100-feet below static water level in isolated aquifer zone. Adjust the depth of the airline as needed to accommodate conditions encountered.
- 10) Record static water level in the sampling tool prior to starting airlift operations.
- 11) Develop the isolated aquifer zone:
 - a. Use airlifting methods for a minimum of 6 hours, or as directed by the engineer, or until discharge water is free of drilling fluids and fine sediments, and the specific conductance stabilizes to the satisfaction of the Engineer.
 - b. Collect and preserve water samples at 30-minute intervals during airlifting using containers acceptable to the Engineer.
 - c. Record the final stabilized static water level in the isolated aquifer zone after airlift pumping has been stopped.
- 12) At the Engineers option, install a submersible pump inside of the sampling tool string to a depth specified by the Engineer, generally on the order of 100-feet below static water level in the zone tested.
 - a. Record static water level.
 - b. Commence pumping the isolated aquifer zone for a minimum of 2 hours after discharge water clears and specific conductance, pH, and

temperature of discharge water stabilizes to the satisfaction of the Engineer.

- c. Measure and record the pumping rate and pumping water level at a frequency based on Section 3.9.22.
- d. Calculate the specific capacity.
- e. Assist the Engineer with sample collection as requested.
- f. After the final water sample is collected, cease pumping and allow the water level in the isolated zone to stabilize.
- g. Measure and record stabilized water level.
- h. Remove the sampling pump and repeat the above procedures to construct and test the next isolated aquifer zone.

13) Once all samples have been collected and equipment removed from the pilot borehole, backfill the remaining open borehole with gravel pack material as directed by the Engineer.

14) The Contractor will be responsible for the proper disposal of all fluids generated during discrete zone sampling activities, in accordance with Sections 3.8.16 and 3.8.17.

15) The Engineer will be responsible for the collection, preservation, transport, and analysis of all groundwater samples during isolated aquifer zone testing.

16) After all isolated aquifer zone samples have been collected, an evaluation period will begin:

- a. The evaluation period begins following completion of zone testing from all aquifer zones testing.
- b. No standby time shall accrue during this period.
- c. Assume a 7 to 14 calendar day evaluation period.
- d. After evaluating water sample results, the Engineer will provide the Contractor with the final details for the construction of a new well.

3.5. Borehole Reaming

3.5.8. Scope

This item shall consist of reaming the test hole to the proper diameter to achieve the production borehole diameter.

3.5.9. Construction Method

The production borehole shall be constructed using reverse rotary drilling equipment. The borehole shall be drilled to a diameter of 30 inches to a depth of 540 feet. Final depth might be adjusted depending on results from the pilot hole testing.

A. Materials On-Site

All equipment and materials must be on-site before commencing drilling of the

production borehole.

B. Establishment of an Acceptable Drilling Fluid System - At the completion of conductor casing installation, the Contractor shall recondition or replace the drilling fluid system to comply with the approved drilling fluid program.

C. Drilling Method

1. The borehole may be constructed using multiple passes to achieve the specified borehole diameter. If the borehole is constructed with multiple passes, a pilot bit shall be used for each successive pass.
2. The Contractor shall be responsible for keeping the well bore full at all times in order to maintain the integrity of the borehole. Sufficient piping of adequate diameter to convey water from the approved source to the drilling sump is the responsibility of the Contractor.
3. The Contractor shall employ appropriate drill collars to ensure that the hole remains straight and plumb during drilling operations.

D. Drilling Fluid Program - A drilling fluid program shall be employed by the contractor in accordance with the following general conditions.

1. A drilling fluid control program shall be submitted to the Engineer for approval. Selection and use of the drilling fluid materials shall be a part of this agreement. The Contractor shall be responsible for maintaining the quality of the drilling fluid to ensure the protection of water-bearing and potential water-bearing formations exposed in the borehole and the ability to obtain reliable representative samples of the formation materials.
2. Material used by the Contractor to prepare the drilling fluid shall be composed of water from an assigned source and drilling additives processed to meet or surpass the specification in the American Petroleum Institute "Std. 13-A for Drilling Fluid Materials". All drilling fluid additives will comply with recognized industry standards and practices, and they shall be used as prescribed by the manufacturer. Toxic and/or dangerous substances shall not be added to the drilling fluid.
3. The drilling fluid for the reverse rotary construction shall be made up of high-grade bentonite clays or organic polymer additives in common drilling usage in the water well industry and shall possess such characteristics as required to condition the walls of the borehole to prevent caving of formations and excessive loss of circulation, facilitate removal of the cuttings, and produce an easily removed thin filter cake.
4. In accordance with these Technical Provisions, the Contractor shall submit a drilling fluid program for approval prior to construction. The submittal shall include the recommendations for make-up water conditioning, quantities of clay base, and additives required to maintain a drilling fluid having properties within the ranges specified below for drilling operations.

Weight	8.3 to 9.0 lb./gal.
Marsh Funnel Viscosity	28 to 35 sec./qt.
Sand Content (Returns)	0-2% by volume
API Filter Cake	<3/32" Thickness

5. The above drilling fluid parameters can be modified to address flowing conditions. Any proposed modifications to address such conditions shall be prepared by a

drilling fluid specialist and submitted to the Engineer for approval before implementation.

6. The drilling rig must be equipped with equipment to measure the above drilling fluid properties. The measurements must be made at a minimum of once every 4 hours with the results reported on the daily drilling log.
7. Proper control of the drilling fluid must be maintained to the satisfaction of the Engineer. The Contractor will be required, at the Contractor's expense, to retain or employ an experienced, qualified drilling fluid, or mud engineer acceptable to the Engineer to supervise and maintain drilling fluid characteristics to the satisfaction of the Engineer if such control cannot be accomplished by the Contractor.
8. If at any time the drilling fluid is not in compliance with these Technical Provisions or the recommendations of the drilling fluid engineer, as approved by the Engineer, the properties shall be adjusted, and the tests rerun until the drilling fluid obtains the specified characteristics. If the specified properties cannot be maintained, the drilling fluid shall be replaced at the Contractors expense.

E. Geophysical Log

1. When drilling has reached the prescribed final depth, the Contractor shall conduct a geophysical survey in the borehole. Acceptable service companies include Pacific Surveys, Stewart Well Logging, or equivalent as approved by the Engineer. The Borehole geophysical survey shall include spontaneous potential (SP), natural gamma, and multiple resistivity logs.
2. The spontaneous potential survey shall be plotted on a scale of one inch equal to plus or minus 20 millivolts. The multiple resistivity survey shall consist of a point resistivity curve and multiple resistivity curves for 16-inch short normal and 64-inch-long normal recordings on a one-inch equal to 20- or 40-ohm scale. All surveys shall be plotted on a depth scale of one inch equal to 20 feet.
3. The Contractor is responsible for the integrity of the borehole to ensure that the geophysical logging is successfully completed. The Contractor shall maintain circulation in the borehole with tools on the bottom of the hole until the logging equipment is on location and prepared to conduct the surveys. The logging service company shall have access to a ditch sample of the circulation fluid for calibration of the logs prior to ceasing circulation. When the logging service company is fully prepared, the Contractor shall pull drilling tools from the well, and the logging services immediately commence. If the logging tools fail to reach the desired depth, the Contractor, at the Contractor's expense, shall reinstall the drilling tools into the borehole, clean out the borehole to the final drilled depth, and recondition the hole to allow for logging operations.
4. Upon completion of logging, the Contractor will deliver to the Engineer four (4) field prints and a digital file of the geophysical surveys, including the raw data (e.g., .las files). The Engineer shall approve the field copies of the surveys before the Contractor releases the logging service company from the site.

F. Caliper Log

1. When drilling has reached the prescribed final depth, the Contractor shall conduct a caliper survey to confirm the diameter of the borehole. The caliper survey will be used to verify the quantities of gravel that will be required for later installation during

the well construction.

2. If at any point within the intake or screened portion of the well, a minimum gravel pack thickness of 5 inches cannot be achieved, the borehole will be considered unacceptable for completion. The Contractor shall then proceed to ream the hole at the Contractor's own expense. A second caliper log shall be conducted on completion of the reaming, at the expense of the Contractor, to satisfy the requirements of the Contract. If the borehole remains unacceptable and it is determined that the well cannot be reasonably constructed to satisfy these Technical Provisions, the Contractor shall abandon the hole and re-drill the well at a new location on the site, all in accordance with the requirements of Section 3.5. All costs for abandonment to meet these requirements shall be borne by the Contractor. Additional workdays may be awarded at the sole discretion of the Engineer.

G. Borehole Geometry Survey

The borehole geometry survey tool shall be incorporated into an X-Y caliper tool and shall measure borehole inclination and direction using an integrated magnetometer and accelerometers. Inclination shall be reported in degrees and direction shall be reported in azimuthal degrees. If the results of the borehole geometry survey indicate that the Contractor will not be in compliance with the well casing plumbness and/or alignment requirements described in Section 3.14, the Contractor is advised to correct the deviation prior to the commencement of well construction. Failure to comply with the plumbness and/or alignment requirements is grounds for rejection of the completed well.

3.6. Installation of Well Casing, Screens, Gravel Fill Pipe, and Sounding Pipe

3.6.10. Scope

This item shall consist of providing and installing casing, screens, tremie pipe, sounding pipe, and gravel fill pipe.

3.6.11. Construction Method

At the completion of the drilling and geophysical operations, the Contractor will prepare the borehole for casing installation. The Contractor shall ensure that all cuttings have been removed from the borehole. During the electric log and caliper survey, the borehole shall be kept full of drilling fluid. The Contractor will not be required to return to the bottom with the drilling tools if the casing installation immediately follows the caliper survey, assuming acceptable results are achieved.

A. Tremie, Accessory Pipes, and Casing Installation

1. A tremie pipe having a minimum inside diameter of 2 inches shall be run into the borehole to the specified casing installation depth. Circulation shall commence 30 minutes prior to casing installation and continue until the start of gravel packing. Circulation shall commence using drilling fluid from the circulation tanks of the same viscosity as that in the borehole and thinned using clean water containing less than 2 percent solids. With the tremie pipe remaining in the borehole, casing installation shall proceed in accordance with the specified well design.
2. Circulation through the tremie pipe shall continue during the casing and screen installation.
3. Three-inch steel pipe shall be used as a gravel fill pipe. The pipe shall be installed

to the depth specified in the Plans. The pipe assembly shall be butt welded together to provide a watertight seal. The gravel fill pipe shall be pulled to the side and welded to the conductor casing at ground level, as shown in the Plans. Orientation of the 3-inch pipe shall be offset from the future pump discharge side of the well as specified in the Plans.

4. All casing sections must be welded together in the field in a vertical position. Field joints shall be properly lap welded during installation into the borehole with a minimum of two passes per circumference. Welding electrodes used for welding shall be of a grade applicable to the material being welded. All alignment holes shall be filled by welding to prevent the entry of water into the completed well through the holes.
5. Centralizers, 4 per set, placed on 90-degree spacing, shall be attached directly to the casing by welding in order to center and hold the casing in the proper position until the gravel is in place. Centralizers shall be positioned at the sump, above and below each screen section, and every 80 feet of the production casing. The casing shall not be centralized between the ground surface and a depth of 80 feet, however.
6. Two-inch collared stainless steel sounding pipe to be used as a still well shall be connected to the sounding box and held close to the casing with U-shaped straps or rings as shown on the Plans. The pipe shall be run concurrently with the casing and attached to the outside of the production casing as shown in the Plans. The sounding pipe assembly shall be welded together to provide a watertight seal. The sounding pipe shall not be attached to the casing within 50 feet of the ground surface. The sounding pipe shall be pulled to the side and welded to the conductor casing at ground level, as shown in the Plans. Orientation of the 2-inch pipe shall be offset from the future pump discharge side of the well as specified in the Plans.
7. The casing shall be suspended in tension from the surface by means of an appropriate hanger or clamp. The use of float plugs to land and set casing will not be permitted. The bottom of the casing assembly shall be at a sufficient distance above the bottom of the borehole to ensure that none of the casing assembly will be supported from the bottom of the hole. Verification of this requirement will be confirmed by the Engineer by observation of the total weight suspended by the drill rig on the weight indicator.
8. If, for any reason, the casing assembly cannot be landed in the correct position or at a depth acceptable to the Engineer, the Contractor shall remove the casing and screen from the well and ream the borehole. In no event shall the Contractor attempt to drive or "spud" the casing and screen assembly. If problems arise that prevent the Contractor from completing the well, it will be considered rejected, and the provisions of Section 3.14 will apply.
9. The casing shall be centered in the conductor casing. Failure to center the casing in the conductor will be grounds for rejection, and the provisions of Section 3.14 will apply.

B. Casing and Accessory Pipe Stick-up

1. The well casing assembly and accessory pipes shall be installed with a minimum of 3 feet of stick-up above the existing ground level.

C. Preliminary Plumbness and Alignment Survey - A preliminary test to examine the plumbness and alignment of the casing may be made by the Contractor after the casing

has been installed in the borehole and before gravel packing is commenced. The intent of preliminary testing is to identify any plumbness and alignment problems so that they may be corrected before installation of the gravel envelope. Any determination made by the Contractor concerning the plumbness and alignment of the well at this point in construction shall not relieve the Contractor of the requirements specified in Section 3.13. Any measures required to correct faulty plumbness and/or alignment shall be at the Contractors own expense.

3.7. Gravel Envelope and Annular Seal Installation

3.7.12. Scope

This item shall consist of providing and installing a graded gravel pack material and sealing material in the annulus between the casing assembly and the borehole.

3.7.13. Gravel Packing Method

Prior to gravel packing, the borehole fluid shall be conditioned as follows:

Weight	< or = to 8.9 lb./gal.
Marsh Funnel Viscosity	< or = to 30 sec./qt.

If the borehole fluid exceeds this specification, the Contractor shall thin the fluid with the addition of clean water to the drilling fluid tank or sump while circulating the entire system. The Contractor shall avoid directly injecting water into the well before the hole fluid has been properly conditioned and the densities and consistencies are matched.

A. Placement

1. Gravel envelope material shall be gravity-fed through the tremie pipe with conditioned fluid. The feed system shall consist of a hopper that will allow for the measurement of the amount of gravel packing material entering the borehole and a pump capable of displacing the gravel and drilling fluid mixture through the tremie pipe.
2. The tremie pipe shall be removed in approximately 20-foot intervals (one joint) when the gravel in the borehole reaches the tremie pipe. The gravel shall not be permitted to free-fall in the annulus for more than 30 feet.
3. The gravel shall be sterilized by continuously mixing at least one gallon of 5-1/2 percent liquid sodium hypochlorite solution per 100 cubic feet of gravel as it is placed in the well.
4. Gravel packing shall continue uninterrupted until the gravel pack material is installed to the specified depth.

B. Attaining Proper Fill - The quantities of gravel placed in the annulus of the well shall not be less than the computed volume calculated from the caliper log and verified by the Engineer. A quantity less than the computed value may be judged as an indication of voids, and corrective measures may be required of the Contractor. Significant differences between the estimated and total volume of gravel installed in the well may be grounds for the rejection of the well under Section 3.15.

C. Consolidation Using Swab Tool - Immediately following the gravel packing, the gravel pack shall be consolidated to ensure that no voids in the gravel pack exist. This can be accomplished with a swab or bailer lowered in the well and moved up and down for a minimum of one hour. After consolidation, the gravel level shall be measured to

determine if consolidation has occurred. If the gravel level has dropped, additional gravel shall be added to bring the gravel level to the specified level and swabbed or bailed again. This process will be repeated until the gravel level is stable at the level specified in the plans. A detailed record shall be kept of the amount of gravel added during placement and consolidation, and the quantity of gravel placed in the annulus shall be at least the calculated volume of the annulus. The contractor shall submit the record indicating the total volume of gravel used and the calculated volume of the annulus to the Engineer. The Contractor shall measure and record the depth to the top of the gravel pack within the gravel fill pipe and ensure that it coincides with the bottom, open end of the gravel fill pipe so that there is no gravel pack within the gravel feed tube.

- D. Fine Sand Transition Seal - A five-foot, fine sand transition seal consisting of #30 sand shall be placed on top of the consolidated gravel envelope via the tremie pipe. The transition sand shall be clean and delivered to the project site in pre-packaged 50-pound sacks.

3.7.14. Annular Sealing Method

Installation of the annular seal shall conform to State Water Well Standards and the requirements of the well-permitting agency.

- A. The Contractor shall proceed with sealing operations after the Engineer verifies the depth of the top of the gravel and transition sand in the well annulus.
- B. The tremie pipe shall be installed no more than 5 feet above the fine sand transition seal before beginning cement grout seal placement. The bottom of the tremie pipe shall remain submerged in the grout sealing material, maintaining a positive displacement throughout the sealing process until the grouting material has reached the ground surface.
- C. The Contractor shall take measures to ensure that the weight of the cement column does not collapse the well casing during the sealing operation.
- D. The annular seal will be required to be placed in three lifts as specified on the Plans. Each lift shall be allowed to be set for a minimum of two hours before placement of subsequent lifts.
- E. Well development shall not commence until a minimum of 24 hours after placement of the seal.

3.8. Well Development

3.8.15. Scope

- A. Well development shall consist of initially airlifting drilling fluids from the well through an open-ended pipe; swabbing, airlift pumping, and placement of Aqua Clear PFD, or other approved dispersing agent, in screen intake section; installation of an engine-driven turbine test pump; pumping and surging of the well until the well is fully developed and meets the requirements of minimum sand production, turbidity, and specific capacity; and bailing the well of materials introduced into the casing during development.
- B. The gravel fill and sounding pipes shall be cleaned of solids and drilling fluid residues by continually adding clean water to the pipes during development, placement of Aqua Clear PFD, and brushing.

3.8.16. Discharge of Initial Development Water

Drilling fluids and initial development water produced during open-ended airlifting and swabbing shall be discharged to a location onsite designated by the Owner within 300 feet of the well site.

3.8.17. Discharge of Pump Development/Testing Water

Fluids produced during pump development and pump testing shall be discharged to a location designated by the Owner within 300 feet of the well site.

3.8.18. Equipment

- A. The Contractor shall provide sufficient drill pipe and a mechanical combination swab/air-lifting tool with a double rubber packer assembly designed to be run in the intake sections of the well. The equipment will be assembled in a manner that will allow simultaneous airlift pumping and swabbing to occur. The pumping and swabbing will be done between a double rubber packer assembly with the packers no more than 10 feet apart. The outside diameter of the swabs shall be 0.5 inches smaller than the inside diameter of the well screen. A polypropylene brush with the same diameter as the inside diameter of the well casing shall be attached to the swab tool below the bottom swab. A drawing of an acceptable swab assembly tool is shown on the Plans without the polypropylene brush attached.
- B. The eductor pipe on the swab assembly, the air pipe, the air compressor, and all other necessary equipment required to perform airlift operations shall be capable of pumping 250 gpm during development.
- C. Upon completion of the swabbing airlift pumping, the Contractor shall furnish and install one engine-driven deep well turbine pump, diesel engine, appropriate drive shaft, and incidental equipment for the safe operation of the pumping equipment. The test pump engine shall have a minimum continuous horsepower rating, which will allow for the continuous pumping of the well at the maximum desired flow rate and pumping level.
- D. The Contractor shall furnish and install discharge piping from the well to the designated discharge point as shown on the plans. The discharge area shall be properly contained to receive and control all development water.
- E. The Contractor shall furnish the necessary gate valves, calibrated totalizing and instantaneous flow meter, sand testing equipment, and other incidental equipment required to accurately measure the flow rate, water levels, sand production, and time of pumping. The installation of the flow meter shall be as defined by the manufacturer for its distance from any elbows or valves so as to provide reliable test information. An acceptable discharge piping arrangement is shown on the Plans. The Engineer will confirm that the flowmeter is measuring properly. If it is determined that the flow meter is not measuring flow correctly, the Contractor shall replace the meter with a properly measuring meter at their own cost.
- F. Water level measurements shall be made with either an electric sounder or with other equipment pre-approved by the Engineer. Water level measurements shall be recorded to the nearest 0.01 foot.
- G. The equipment for sand testing shall be the Rossum Centrifugal Sand Sampler as specified in the American Water Works Association Standard for Water Wells, A100-20, Section E.2.4.

3.8.19. Development Methods

The intake screen and gravel envelope shall be cleaned of all fluids, wall cake, and any substances that would impede the flow of water into the well.

A. Swab-Airlift Development

1. Open-ended Development

Initially, and within 24 to 36 hours after completion of the annular sealing operation, the well shall be cleaned of residual drilling fluids by displacing the well through an open-ended drill pipe or tubing set in the well sump. This process shall be conducted for a minimum of 4 hours and until the discharge is clear of residual drilling fluids. After drilling residues have been displaced from the well, the development tool shall be installed in the well.

2. Swabbing/Airlifting

Swabbing and airlifting shall be conducted with the development tool alternately over no more than the length of one joint of drill pipe until that section of the screen is fully developed.

Swabbing and airlift pumping operations will be conducted from the top screen section to the bottom, alternately over no more than the length of one joint of the drill pipe. Screen sections will be swabbed and pumped for a minimum of 7 minutes per foot of well screen or until cleaned of all drilling fluids. During pumping, the drill pipe shall be continuously moved up and down to achieve a swabbing action and uniform pumping across the screen section.

After the initial swabbing-airlift pass, a solution of potable water and Baroid "Aqua Clear PFD" product, or approved equal, shall be placed in the well. The product shall be mixed at the surface in the manufacturer-recommended proportion and injected evenly across each screened section of the well. The solution shall be displaced by adding a volume of potable water equal to the inside of the drill pipe and swabbed without airlifting. After placement of the solution, the well shall then remain idle for a period of 12 hours. Swabbing and airlift pumping of the well shall then resume from the top screen section to the bottom for a minimum of 5 minutes per foot of well screen.

If there continues to be circulation of sand, silt, mud, or water with a turbidity in excess of 25 Nephelometric Turbidity Units (NTU) to the surface from the section of screen being cleaned, additional swabbing and pumping shall be performed until the section is cleaned of such material. It is anticipated that the mechanical development described above will take on the order of 12 minutes per foot of well screen.

2. The sounding pipe and gravel fill pipe shall be cleaned by circulating water and a solution of potable water and Baroid "Aqua Clear PFD" through the pipes.
3. The level of the gravel in the gravel fill pipe shall be measured periodically during well development operations. Gravel must not be added to the gravel fill pipe without prior authorization of the Engineer.

B. Well Video

After completion of swab/airlift operations, the Contractor shall conduct a video survey of the screen assembly. The survey shall be witnessed by the Engineer. The camera shall be color and have side-scan capability. The logging speed of the video survey

shall not exceed 30 feet per minute. The record of survey shall be recorded in DVD or mp4 format and shall be submitted to the Engineer.

The purpose of the video survey is to visually confirm that all drilling fluids, mud, debris have been removed from the well screens to the satisfaction of the Engineer.

If the Engineer determines that there is blockage of screens with drilling mud or any other material, the Contractor shall, at his own expense, continue swab/airlift operations until such material has been removed. If additional swab/airlift operations are required, a second video, at the Contractors expense, shall be performed.

C. Final Development

1. Upon completion of the swabbing and airlift pumping operations, a turbine pump and piping assembly shall be installed. No foot valve shall be installed on the pump and the gearhead shall not be equipped with a non-reverse ratchet installed.
2. Development pumping shall commence within 10 working days after the completion of Initial Development. Pumping shall be initiated at the lowest pumping (i.e., flow) rate possible with the installed pumping equipment. Throughout development pumping, the well shall be surged frequently to achieve maximum compaction of the gravel pack and to remove residual drilling fluids and wall cake. Surging and pumping will continue until the water produced is clear and sand-free, at which time the pumping rate will be increased in increments of 250 gallons per minute, and the pumping and surging will resume. This process will be repeated until the capacity of the well achieves a minimum of 150 percent of the design capacity of the well unless the Contractor is directed by the Engineer to pump the well at lower capacities.
3. Development records shall be maintained at a frequency of at least every 30 minutes showing pumping rate, static water level, pumping water level, drawdown, sand production, and any other pertinent information concerning well development. Development pumping shall continue until the following conditions have been met:
 - a) The specific capacity (gallons per minute per foot of drawdown) no longer increases at the design capacity of the well.
 - b) The sand content satisfies the requirements of these Technical Provisions as specified in Section 3.6.5.C.5
4. Development pumping shall be conducted for a minimum of 24 hours.

5. Sand Testing

The equipment for sand testing shall be the Rossum Centrifugal Sand Sampler. Sand content shall be measured over a 30-minute interval after a surge at the target well capacity. The sand content shall be measured and recorded every minute over the 30 minutes of pumping after surging. The average sand content for any 5-minute period shall not exceed 5 parts per million during the 30-minute test. If the average sand content exceeds 5 parts per million for any 5-minute period, the Contractor, at Contractor's expense, shall do the necessary redevelopment work until the sand content is 5 parts per million or less.

Sand testing shall be witnessed by the Engineer.

6. Turbidity

The equipment to measure turbidity of the discharge shall be an Oakton T-100 Portable Infrared Turbidity Meter or equivalent capable of measuring between 0 and

1,000 nephelometric turbidity units (NTU's). NTU's shall be measured and recorded every 5 minutes of pumping after surging. Development shall continue until the turbidity of the discharge is 5.0 NTU's anytime after a surge.

3.8.20. Well Performance Requirements

At the conclusion of well development, it is the responsibility of the Contractor to meet the requirements contained in Section 3.14 of these Technical Provisions. If the Contractor fails to meet these requirements after the development pumping operations, development shall continue at the Contractor's expense until the well satisfies the specified performance criteria.

3.9. Well and Aquifer Testing

3.9.21. Scope

After final development and when the well meets the specified performance requirements, tests will be performed, including an 8-hour step pumping test at capacities of 50, 75, 100, 125, and 150 percent of the target design capacity of the well and a 12-hour aquifer test at the final design capacity as determined by the Engineer based upon evaluation of well performance during the step test. The test capacities may be modified by the Engineer before or during the testing based on the results of development and test pumping. Well and aquifer testing shall not exceed 40 hours without written direction from the Engineer/Owner.

3.9.22. Test Pumping Procedures

A. Static Water Level

At the start of each day of pumping, the Contractor shall record the static water level in the well. At all other times, the static water level shall be considered to be attained when three successive water level measurements spaced ten minutes apart show no appreciable change.

B. Flow Metering

1. During each test or step, the discharge of the pump shall be measured with an accurate, calibrated totalizing and instantaneous flow meter, or other type as approved by the Engineer. The pump discharge rate shall be maintained at all times during the test within plus or minus 5 percent of the pump test rate by means of an approved gate valve in concert with engine speed.
2. Throughout the test, the Contractor shall frequently record flow rate and totalizer readings to ensure that the pumping rate remains constant.

C. Measurements

1. The Contractor shall measure the depth to water, flow rate, and sand content at the time intervals specified herein to the nearest 0.01 feet.
2. Each pumping test shall be monitored by the Contractor, with data recorded according to the following applicable time schedules:
 - a) Turn pump on to approved test pumping capacity at time (t) = 0.
 - b) Contractor shall measure and record the depth to water as follows:
 - each minute, from t = 1 to t = 10.
 - each 2 minutes, from t = 10 to t = 20.
 - each 5 minutes from t = 20 to t = 50.

- each 10 minutes from $t = 50$ to $t = 100$.
- at $t = 120$, $t = 150$, $t = 180$, $t = 240$, and $t = 300$.
- each 100 minutes after $t = 300$.

c) Each recovery test shall be recorded according to the following applicable schedule:

d) Contractor shall measure the depth to water and record as follows (t' refers to the time since pump shut off):

- each minute, $t' = 1$ to $t' = 10$
- each 2 minutes, $t' = 10$ to $t' = 20$
- each 5 minutes, $t' = 20$ to $t' = 50$
- each 10 minutes, $t' = 50$ to $t' = 100$
- at $t' = 120$, $t' = 150$, $t' = 180$, $t' = 240$, $t' = 300$

D. Pump Failure

In the case of failure or interruption of the pump operation for a period greater than one (1) percent of the elapsed pumping time from $t = 0$, the test shall be suspended until the static water level has been attained. Should the test be aborted as a result of a deficiency on the part of the Contractor's equipment or personnel, all time consumed in waiting for complete water level recovery and in resuming the pump test to the point where it was aborted shall be at no cost to the Owner.

E. Completion

After the well testing has been completed, the record of water level measurements shall be delivered to the Engineer on the forms provided as part of these documents. The test pump shall not be removed from the well until the Engineer has evaluated the data and authorized its removal.

3.9.23. Dynamic Flowmeter (Spinner) Survey

A vertical flowmeter (spinner) survey shall be conducted in the community supply wells during the 12-hour constant rate test. The type of spinner survey tool used shall be capable of accurately measuring flows from each screened section at the pumping rate during the constant rate test.

The survey shall be run after the pumping level has stabilized, which will be determined in the field by the Engineer. A dynamic test and static stop counts shall be made under pumping conditions from above the screen section to below the screen interval. Three down runs shall be conducted during dynamic testing at rates of 20, 40 and 60 ft per minute. Each static stop count test shall consist of two-minute readings made at 10-foot increments. The record for the test shall indicate either meter speed or percentage of total meter speed with depth. The meter used for the survey shall be calibrated within the uppermost and lowermost blank sections of the well casing.

The Contractor shall provide four (4) copies of the survey to the Engineer upon completion. Calculation of flow rates and the percentage of each flow rate, from the screened interval, shall be performed by the logging subcontractor and submitted to the Engineer in tabular format. The spinner survey measurements shall also be provided electronically to the Engineer in both Adobe PDF and ASCII digital format.

Acceptable service companies to perform spinner surveys are listed in Section 3.2.2 of these Technical Specifications.

3.9.24. Water Samples

During constant rate testing of the well, the Contractor shall provide access to the well for sample collection by the Engineer.

3.9.25. Records

The Contractor shall keep accurate records of the pumping tests and furnish copies of all records to the Engineer upon completion of the test. The records shall be available to the Engineer for inspection at any time during testing. The records shall also include a description of the point from which depth to water measurements were made and its measured height above land surface.

3.10. Plumbness and Alignment Testing

3.10.26. Scope

This item shall consist of testing to determine the plumbness and alignment of the installed casing in the well. The plumbness and alignment test may be performed at any time following gravel-packing and sealing operations. The completed well shall be constructed round, plumb, and true to line as defined herein.

- A. Alignment Equipment - Alignment shall be tested with a section of pipe 40 feet long or a dummy of the same length. The outer diameter of the pipe or dummy shall be not more than 0.5 inches smaller than the inside diameter of that part of the well being tested. The dummy, if used, shall consist of a rigid spindle of at least 6-inch diameter extra heavy pipe with three rings, rigidly fixed to the pipe so that they cannot move longitudinally along the pipe. The rings shall be at least 12 inches in length, truly cylindrical, and shall be placed one at each end of the dummy and with one ring in the center. The rings shall consist of suitable material that will not harm the interior of the casing while being lowered or raised. An example of an approved dummy is shown in the Plans.
- B. Plumbness Equipment - The test for plumbness shall be conducted using a digital gyroscopic deviation probe capable of measuring inclination and direction of drift. The output of the survey shall consist of station depth, inclination, azimuth, true vertical depth, departures, and the plane of closure (displacement). Log presentation shall consist of color plots of plan, vertical, and three-dimensional views of the production well casing. Acceptable service companies to perform plumbness testing are listed in Section 3.3.2 of these Technical Specifications.

3.10.27. Methods

- A. Alignment Testing - Alignment shall be tested by lowering into the well to the top of the screened intake portion of the well, a section of pipe 40 feet long or a dummy of the same length.
- B. Plumbness Survey - The plumbness of the well shall be determined in 10-foot intervals from the ground surface to the bottom of the well.

3.11. Video Survey

- 1. After final clean-up of the well and prior to disinfection, and before welding a plate on the top of the casing, the Contractor shall conduct a video survey of the entire casing

and screen assembly. The camera shall be color and have side-scan capability. The survey shall be witnessed by the Engineer.

If the Engineer determines that any portion of the video survey record is of inadequate quality (e.g., clarity) to allow detailed examination of the inside of the well, the Contractor shall rerun the survey at Contractor's expense. Clarity should be of sufficient quality to evaluate the integrity of all joints, screen openings, the sounding port, and the entire inside surface of the casing assembly. Logging speed of the video survey shall not exceed 30 feet per minute.

2. The record of the survey shall be recorded and provided to the Engineer in digital form.

3.12. Disinfection of Well

- A. Disinfection Preparation - The Contractor shall conduct disinfection after construction of the well and all specified tests and video logging have been completed. The Contractor shall carry out adequate cleaning procedures immediately preceding disinfection where evidence indicates that normal well construction and development work have not adequately cleaned the well. All oil, grease, soil, and other materials that could harbor and protect bacteria from disinfectants shall be removed from the well. Unless prior approval is obtained for employing chemicals or unusual cleaning methods, the cleaning operation is to be carried out by pumping and swabbing only. Where test pumping equipment is to be utilized, such equipment shall be installed prior to or during disinfection and shall be thoroughly hosed, scrubbed or otherwise cleaned of foreign material prior to its installation into the well. The Contractor is responsible for removing or mitigating the effects of all materials introduced into the well during drilling, construction, development, and testing.
- B. Interim Disinfection - Should a delay of five days or more be anticipated between the completion of the well and the regularly scheduled well disinfection, an interim disinfection shall be provided by the Contractor. The Contractor shall apply liquid chlorine in an amount equal to 25 percent of the amount required for final disinfection. For this purpose, the disinfection agent shall be furnished or prepared in liquid form and placed in the well through a tremie pipe of sufficient length to extend to the bottom of the well. The disinfection agent shall be applied through the tremie pipe. A volume of water sufficient enough to displace the disinfection agent from the tremie pipe will be added to the tremie pipe. The disinfection agent shall be placed at regular intervals sufficient to achieve a residual chlorine level of not less than 25 parts per million throughout the well.
- C. Final Disinfection - The disinfection agent shall be furnished or prepared in liquid form and placed in the well through a tremie pipe of sufficient length to extend to the bottom of the well. The disinfection agent shall be applied through the tremie pipe, after which a volume of water sufficient enough to displace the disinfection agent from the tremie pipe will be added to the tremie pipe. The disinfection agent shall be placed at regular intervals sufficient to achieve a residual chlorine level of not less than 100 parts per million throughout the well unless superseded by local or other regulatory agencies.

3.13. Well Head Completion

- A. The conductor casings shall be cut flush with the existing ground surface
- B. The well casing and accessory pipes shall be made and secured watertight by welding a steel plate to the top of them.

3.14. Well Performance Requirements

It is the general objective of these Technical Provisions to achieve a sand-free and efficient well ready for use by the well Owner at the target capacity of the well. The Contractor shall be required to meet the following standards for sand content efficiency, and construction. Failure to satisfy these requirements may result in rejection of the well or a reduced valuation as determined by the Engineer.

- A. Sand Content Requirement - Sand content shall average less than 5 parts per million (ppm) over any 5-minute period when measured during the first 30 minutes after commencement of pumping. This requirement shall be met at the design capacity of the well.
- B. The turbidity of discharge is 5.0 NTU's or less anytime after pumping begins at the design capacity of the well.
- C. Well Efficiency Requirement - From analysis of the measurements made during the pumping tests of the well, the Engineer will determine the 24-hour specific capacity of the well in gallons per minute per foot of drawdown. If the Engineer determines that the projected 24-hour specific capacity of the well at the design pumping rate continues to increase, the Contractor will be required to resume development operations at Contractor's own expense until the specific capacity no longer increases. The Engineer may also employ other methods, based on the science of well hydraulics, to assess the efficiency of the well and determine the need for additional well development. The acceptable well efficiency is 0.80, corresponding to the ratio of the actual drawdown to the theoretical drawdown at the design pumping rate.
- C. Alignment - The dummy must be able to traverse freely throughout the specified well interval.
- D. Plumbness - The maximum allowable horizontal deviation (drift) of the well from the vertical shall not exceed two-thirds of the smallest inside diameter of that part of the well being tested per 100 feet of depth.
- E. Video Survey – Based on the video survey conducted after all other testing, there shall be no damage to the well structure.

3.15. Rejected Well

3.15.28. Non-Payment

No payment will be made for any labor or materials involved in the construction of the well when such a well fails to meet the specified depth and/or diameter for any preventable cause or when such a well fails to meet these Technical Provisions. Such well will be rejected and shall be replaced as specified herein at no additional cost to the Owner. Preventable failures include any failure caused by faulty or inadequate drilling equipment, failure caused by negligence or improper drilling operations or techniques, failure caused by the installation of faulty or non-approved materials, or failure caused by improperly protecting drill holes and drilling work from the natural elements, including cave-ins resulting from existing soil conditions.

3.15.29. Well Sealing

Any rejected well or drill hole shall be sealed/abandoned at no additional cost to the Owner and in accordance with the provisions of Section 3.16.

3.15.30. Construction of Replacement Well

If the well fails to meet these Technical Provisions, a replacement well shall be constructed at an adjacent site designated by the Owner and in accordance with these Technical Provisions.

3.16. Destruction of Well

3.16.31. General

If any well fails to conform to these Technical Provisions and the Contractor is unable to correct the conditions at Contractor's own expense or is unable to negotiate a mutually acceptable cost reduction for specification deviations, the well shall be considered an abandoned well, and the Contractor shall immediately start a new well at a nearby location designated by the Owner. Any abandoned well shall be treated in accordance with State Water Well Standards, Bulletin 74-81/74-90 Supplement, and local ordinances of the well permitting agency.

3.16.32. Methods

A. Salvaged Materials

1. The Contractor may salvage as much casing and screen from the rejected well as possible and may use it in the new well, subject to acceptance by the Engineer for its reuse. Cut casing sections will only be approved for reuse after the affected casing end(s) are refaced to ensure proper alignment.
2. Salvaged material, if not used in another well, shall remain the property of the Contractor.

B. Destruction

1. The rejected well shall be filled with sand-cement grout as defined in State Water Well Standards, Bulletin 74-81/74-90 Supplement.
2. Any casing remaining in the hole shall be cut off at a depth of five feet and the upper portion thereof removed.
3. The well shall be filled with concrete to within 5 feet of the ground surface with the remaining 5 feet of the hole filled with native soil and compacted.

3.17. Standby Time

During the progress of drilling operations, it may be necessary for the Engineer to perform work that will require the drilling workforce and equipment to stand idle. In such an event, the Engineer shall request the Contractor in writing to cease operations and shall state the anticipated extent or duration thereof. The Contractor shall promptly cease operations. If the Engineer requests cessation of operations, an extension of time equal to the period of stoppage will be granted. The Contractor will be paid for standby time at the rate noted in the Bid Schedule.

3.18. Site Clean-up and Records

3.18.33. Cleanup

- A. The Contractor shall remove all waste materials, drill cuttings, drilling fluids, rubbish, and debris from and about the well site and all tools, construction equipment, fuel tanks, machinery, and surplus materials. The Contractor shall leave the site clean and ready for use by the Owner. The Contractor shall restore all temporary work areas to their original condition.

- B. Drill cuttings are to be spread onsite by the Contractor in a location designated by the Owner.

3.18.34. Records

A. Well Completion Records

Prior to final acceptance of the well and payment of the final contractor invoice, the Contractor shall deliver to the Engineer the following records:

1. California Well Completion Report – The Contractor will provide the Engineer with a draft Well Completion Report for review. After approval of the report by the Engineer the Contractor shall submit a final version to the California Department of Water Resources and the Engineer.
2. Two final prints of each of all logs, surveys, and forms: daily tour reports, driller's log, geophysical logs, caliper logs, well development and test data, spinner, and plumbness and alignment surveys.
3. A digital copy of the video survey and a written video survey summary.

4. MEASUREMENT AND PAYMENT

4.1. Measurement and Payment

Direct payment will be made only for the items listed in the bid proposal. Items of work not listed but necessary to satisfactorily complete the work will not be paid for separately, and all costs in connection therewith shall be considered included for payment with the listed items. The Owner, or Owner's agent, shall measure and determine all quantities subject to payment.

4.1.1. Well Site Mobilization (Bid Item 1)

Measurement: Mobilization/Demobilization of equipment, materials, and workmen to well site for well drilling and construction, satisfactorily completed.

Payment: Payment for Mobilization/Demobilization will be made in accordance with the applicable contract price.

Unit of Measure: Lump Sum

4.1.2. Conductor Casing (Bid Item 2)

Measurement: Conductor casing will be measured in place to the nearest unit as the number of linear feet of conductor casing satisfactorily installed in each well.

Payment: Conductor casing installation, satisfactorily completed, will be paid for at the applicable contract unit price.

Unit of Measure: Linear Foot

4.1.3. Pilot Borehole Drilling (Bid Item 3)

Measurement: Drilling of the pilot borehole will be measured to the nearest unit as the number of linear feet of pilot borehole, satisfactorily completed and accepted, below the bottom of the conductor casing.

Payment: Pilot borehole, satisfactorily completed, will be paid for at the applicable contract unit price.

Unit of Measure: Linear Foot

4.1.4. Geophysical Logging (Bid Item 4)

Measurement: Satisfactory completion of electric, caliper, and borehole deviation logs to total depth of borehole.

Payment: Electric log and caliper logs will be paid for at the applicable contract unit price.

Unit of Measure: Lump Sum

4.1.5. Zonal Sampling (Bid Item 5)

Measurement: Satisfactory completion of zonal sampling.

Payment: A zonal sample, satisfactorily completed, will be paid for at the applicable contract unit price.

Unit of Measure: Each

4.1.6. Borehole Reaming (Bid Item 6)

Measurement: The reaming of the pilot borehole will be measured to the nearest unit as the number of linear feet of borehole reamed, satisfactorily completed, and accepted below the bottom of the conductor casing.

Payment: Borehole reaming, satisfactorily completed, will be paid for at the applicable contract unit price.

Unit of Measure: Linear Foot

4.1.7. Blank Well Casing (Bid Items 7)

Measurement: Blank well casing will be measured in place to the nearest unit as the number of linear feet of each size and type satisfactorily installed. The casing may be measured before installation in the production borehole.

Payment: Blank well casing, satisfactorily installed and completed, will be paid for at the applicable contract unit price.

Unit of Measure: Linear Foot

4.1.8. Louvered Well Screen (Bid Item 8)

Measurement: Louvered well screen will be measured in place to the nearest unit as the number of linear feet of each size and type satisfactorily installed. The screen may be measured before installation in the production borehole.

Payment: Louvered well screen, satisfactorily installed and completed, will be paid for at the applicable contract unit price.

Unit of Measure: Linear Foot

4.1.9. Sounding Pipe (Bid Item 9)

Measurement: Sounding pipes will be measured in place to the nearest unit as the number of linear feet satisfactorily installed. The sounding pipes may be measured before installation in the production borehole.

Payment: Sounding pipe, satisfactorily installed and completed, will be paid for at the applicable contract unit price.

Unit of Measure: Linear Foot

4.1.10. Gravel Envelope (Bid Item 10)

Measurement: Gravel envelope will be measured in place to the nearest unit as the number of linear feet of annular space satisfactorily filled.

Payment: Gravel envelope, satisfactorily installed, will be paid for at the applicable contract unit price.

Unit of Measure: Linear Foot

4.1.11. Annular Seal (Bid Item 11)

Measurement: Annular seal will be measured in place to the nearest unit as the number of linear feet of annular space satisfactorily filled.

Payment: Annular seal, satisfactorily installed, will be paid for at the applicable contract unit price.

Unit of Measure: Linear Foot

4.1.12. Well Development (Bid Item 12)

Measurement: Well Development satisfactorily completed.

Payment: The development of the well, satisfactorily completed, will be paid for at the applicable contract unit price.

Unit of Measure: Lump Sum

4.1.13. Install and Remove Test Pump (Bid Item 13)

Measurement: Installation and Removal of the test pump.

Payment: Installation and Removal of the test pump, satisfactorily completed, will be paid for at the applicable contract price.

Unit of Measure: Lump Sum

4.1.14. Well and Aquifer Testing (Bid Item 14)

Measurement: Well and aquifer testing will be measured to the nearest one-quarter unit as the number of hours well and aquifer testing satisfactorily performed.

Payment: Well and aquifer testing, satisfactorily performed, will be paid for at the applicable contract unit price.

Unit of Measure: Hour

4.1.15. Dynamic Flowmeter (Spinner) Testing (Bid Item 15)

Measurement: Well and aquifer testing will be measured to the nearest one-quarter unit as the number of hours well and aquifer testing satisfactorily performed.

Payment: Well and aquifer testing, satisfactorily performed, will be paid for at the applicable contract unit price.

4.1.16. Plumbness and Alignment Testing and Video Surveys (Bid Item 16)

Measurement: Plumbness and alignment testing and video surveys satisfactorily completed in the well.

Payment: Plumbness and alignment testing and video surveys of the well, satisfactorily completed, will be paid for at the price stated in the proposal.

Unit of Measure: Lump Sum

4.1.17. Disinfection of Well (Bid Item 17)

Measurement: Satisfactorily completed disinfection of the well.

Payment: Disinfection of the well, satisfactorily completed, will be paid for at the price stated in the proposal.

Unit of Measure: Lump Sum

4.1.18. Disposal of Drill Cuttings (Bid Item 18)

Measurement: Disposal of drill cuttings satisfactorily completed site cleanup and submission of required project records.

Payment: Disposal of drill cuttings, satisfactorily completed, will be paid for at the lump sum price stated in the proposal.

Unit of Measure: Lump Sum

4.1.19. Well Standby Time (Bid Item 19)

Measurement: Standby time, ordered in writing, will be measured to the nearest one-quarter unit as the number of hours of idle time of drilling equipment and workforce ordered and approved by the Owner.

Payment: Standby time ordered and approved by the Owner will be paid for at the unit price specified in the proposal.

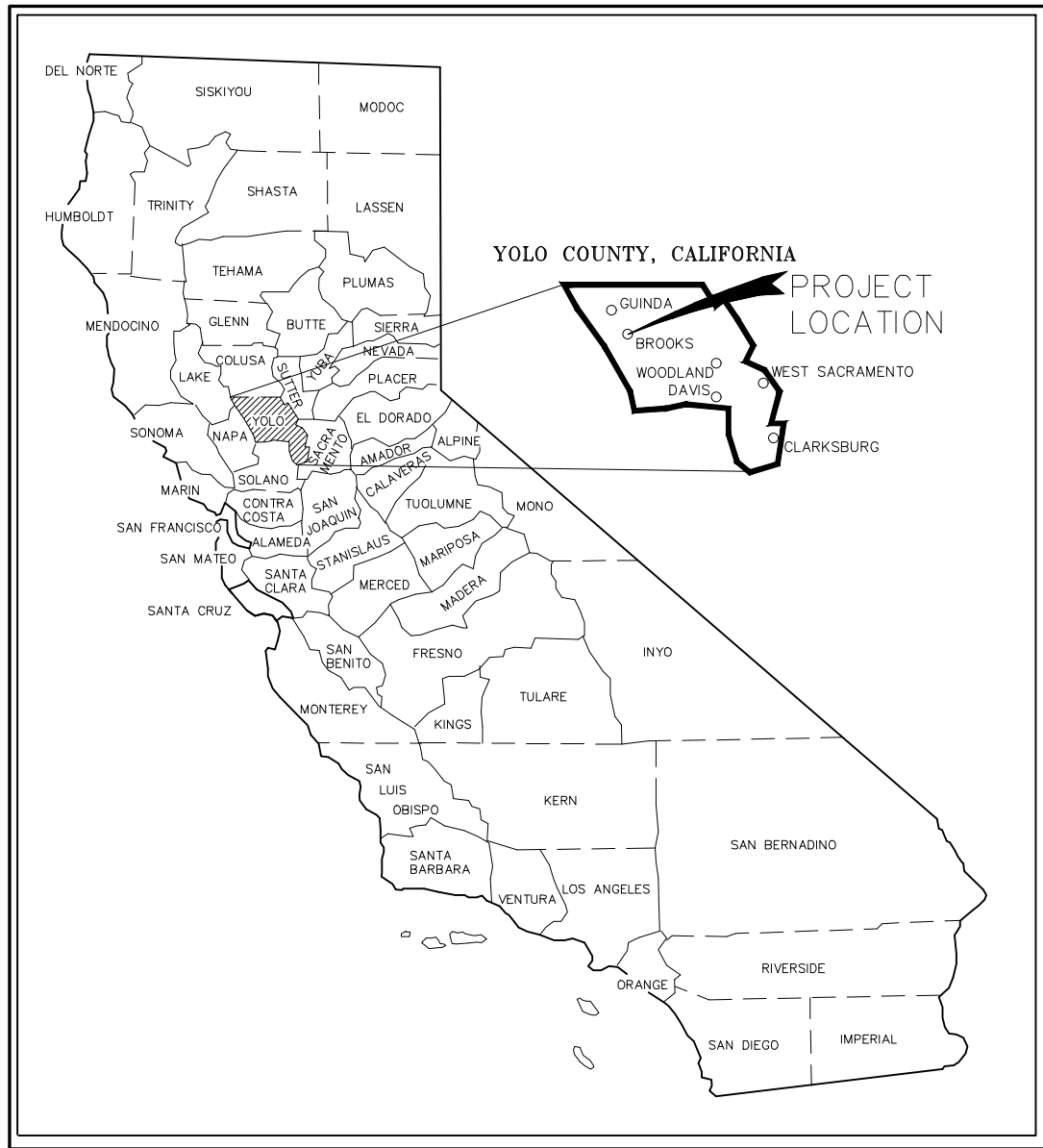
Unit of Measure: Hour

YOCHA DEHE WINTUN NATION

CASINO WELL 1A WATER SUPPLY WELL PROJECT

AUGUST 2024

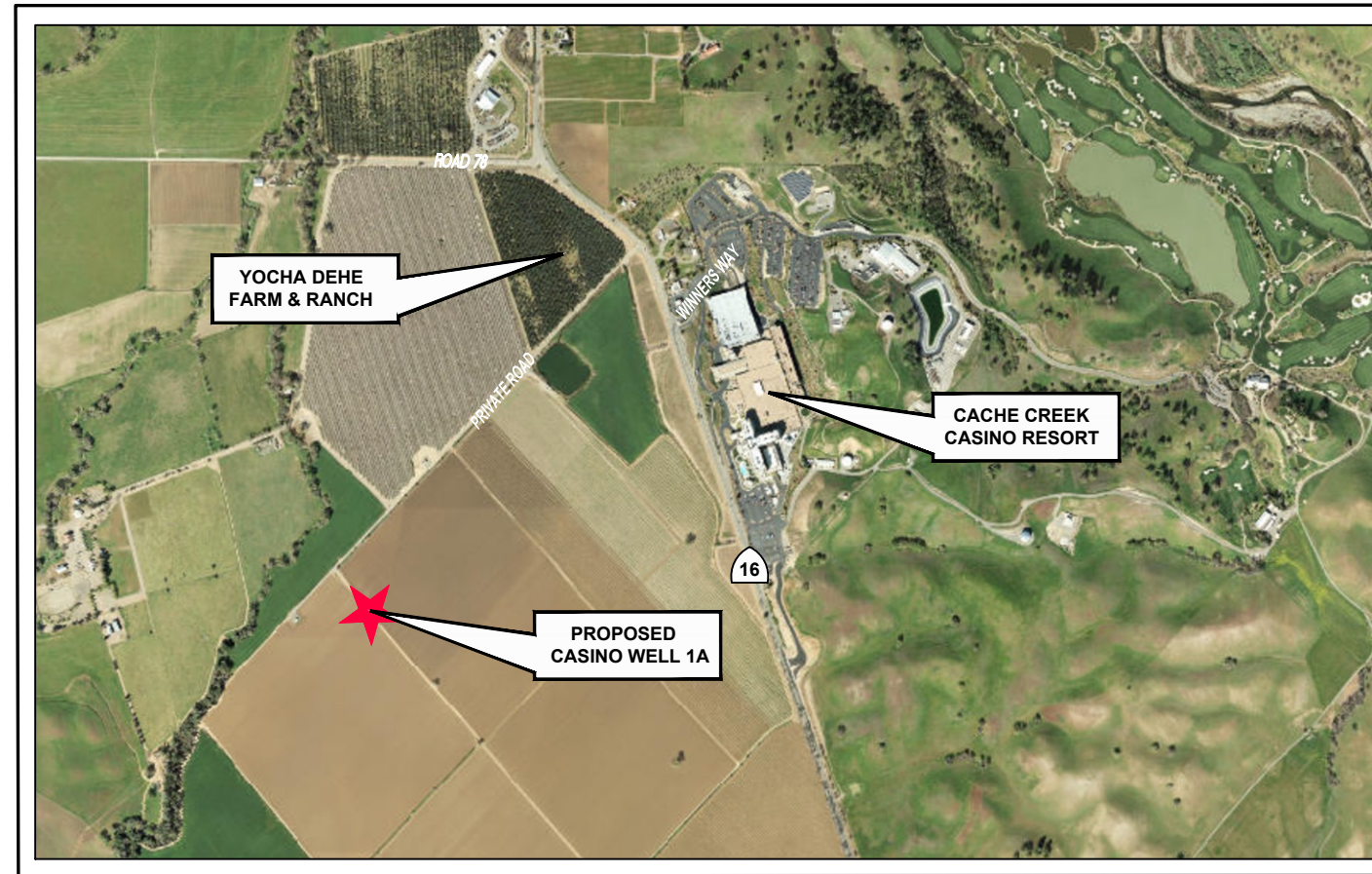
YOLO COUNTY, CALIFORNIA



LOCATION MAP
NOT TO SCALE

PRELIMINARY

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5	STANDARD CONSTRUCTION DETAILS II



VICINITY MAP
SCALE: AS SHOWN

TITLE SHEET
Yocha Dehe Wintun Nation
Well 1A Water Supply Well Project
Yolo County, California



REVISIONS	
NO.	DATE

DATE: AUGUST 2024
JOB NO.: 24-095
DESIGN BY: CJ
DRAWN BY: TEMC
CHECKED BY: ET
FILE: Sheet 1.DWG

SHEET:
1

CAD FILE: Z:\LS ACAD Dropbox\Projects\Yocha Dehe Wintun Nation\24-095\Well Development\Sheet 2.dwg DATE: 8/22/2024 11:56 AM



CASINO WELL 4 – SITE MAP
SCALE: AS SHOWN

SITE MAP
Yocha Dehe Wintun Nation
Well 1A Water Supply Well Project
Yolo County, California



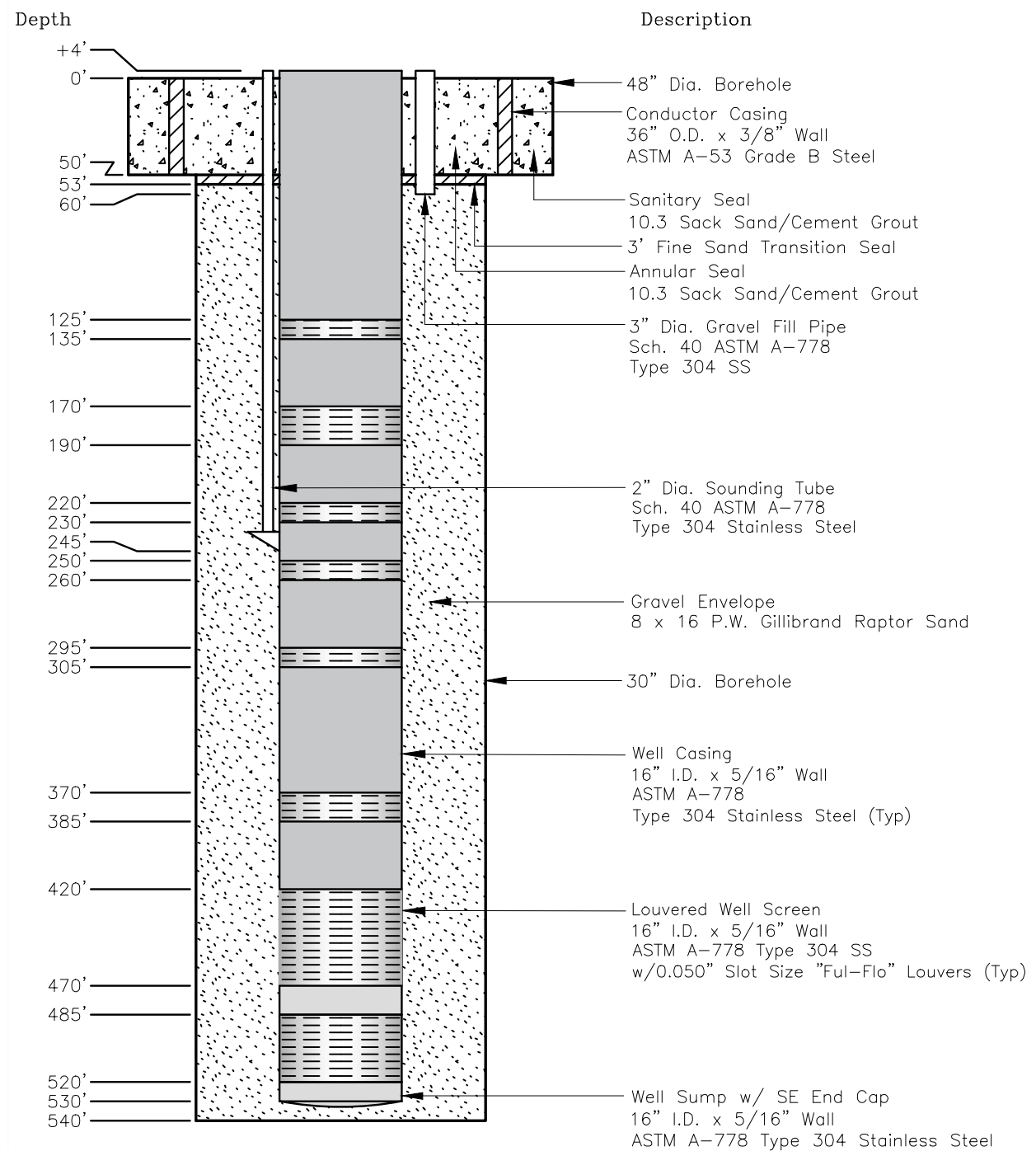
REVISIONS	
NO.	DATE

DATE: AUGUST 2024
JOB NO.: 24-095
DESIGN BY: CJ
DRAWN BY: TEMC
CHECKED BY: ET
FILE: Sheet 2.DWG

SHEET:
2

CAD FILE: Z:\LS_ACAD_Dropbox\Projects\Yocha Dehe Wintun Nation\24-095\Well Development\Sheet_3.dwg DATE: 8/22/2024 11:56 AM

YOCHA DEHE WINTUN NATION CASINO WELL 1A PRODUCTION WELL PRELIMINARY WELL PROFILE



WELL PROFILE

Yocha Dehe Wintun Nation
Well 1A Water Supply Well Project
Yolo County, California



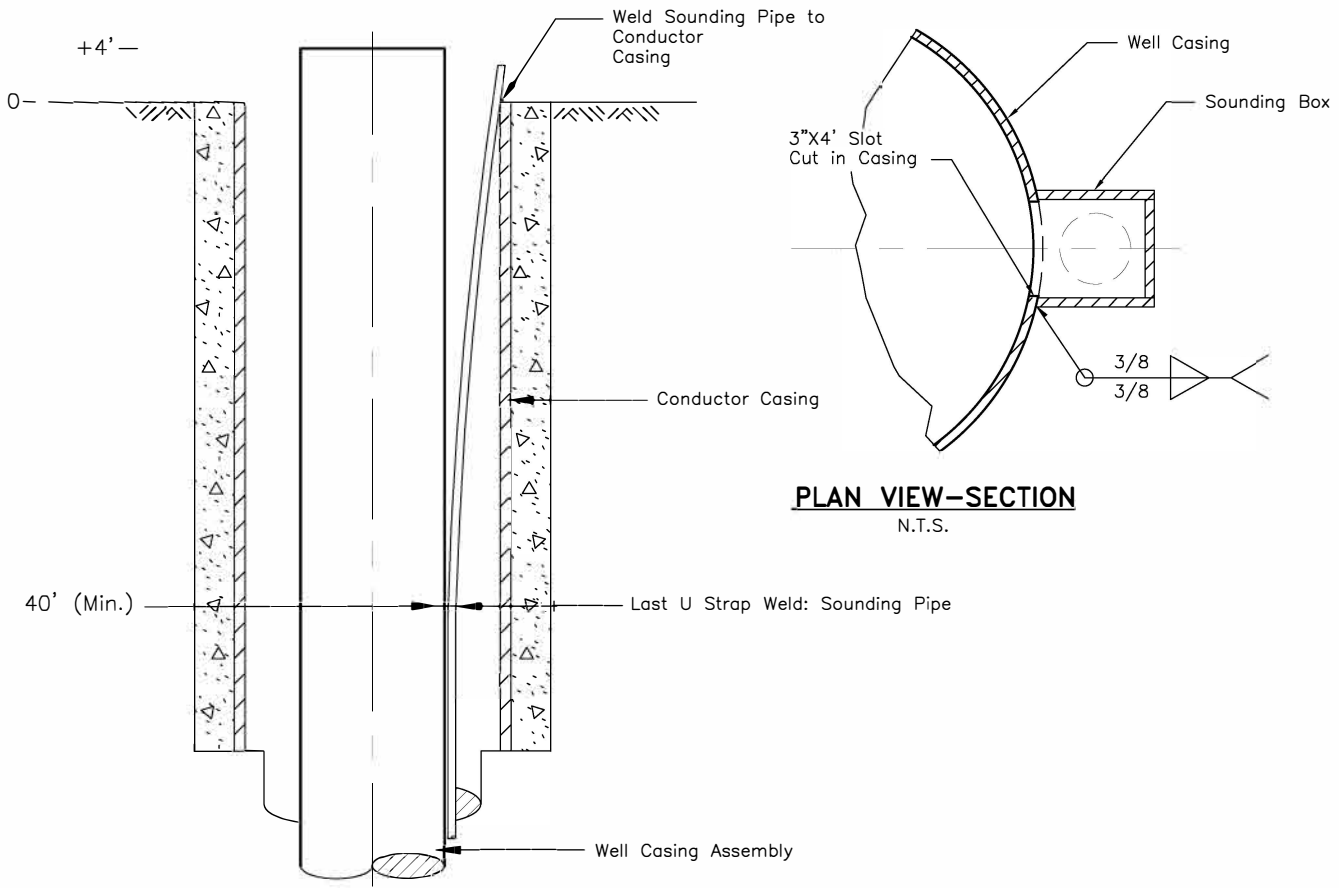
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NO.	DATE

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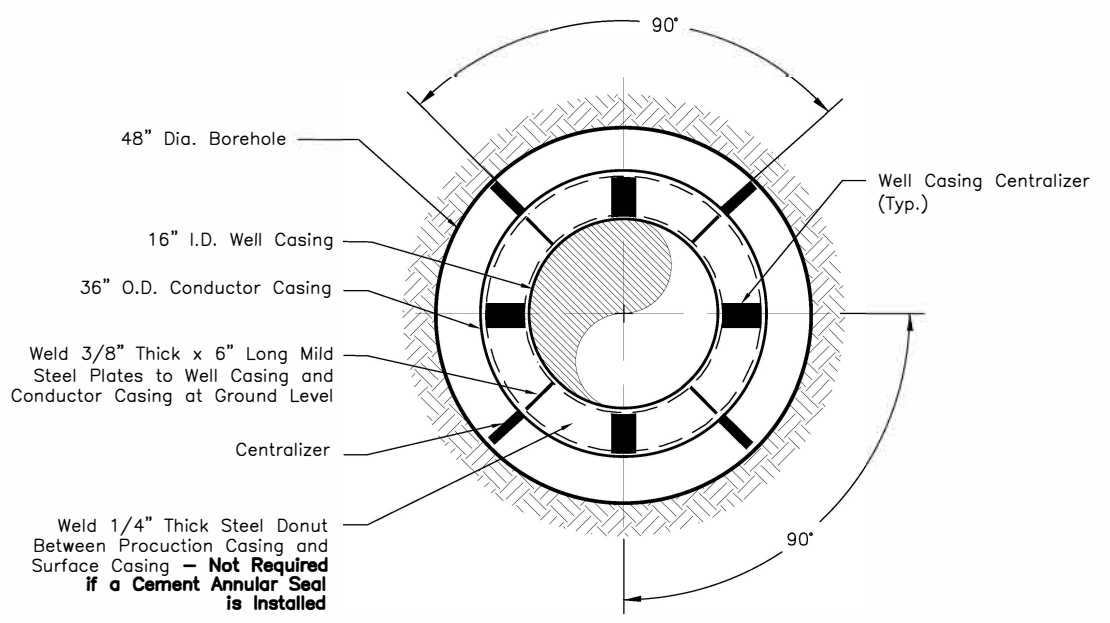
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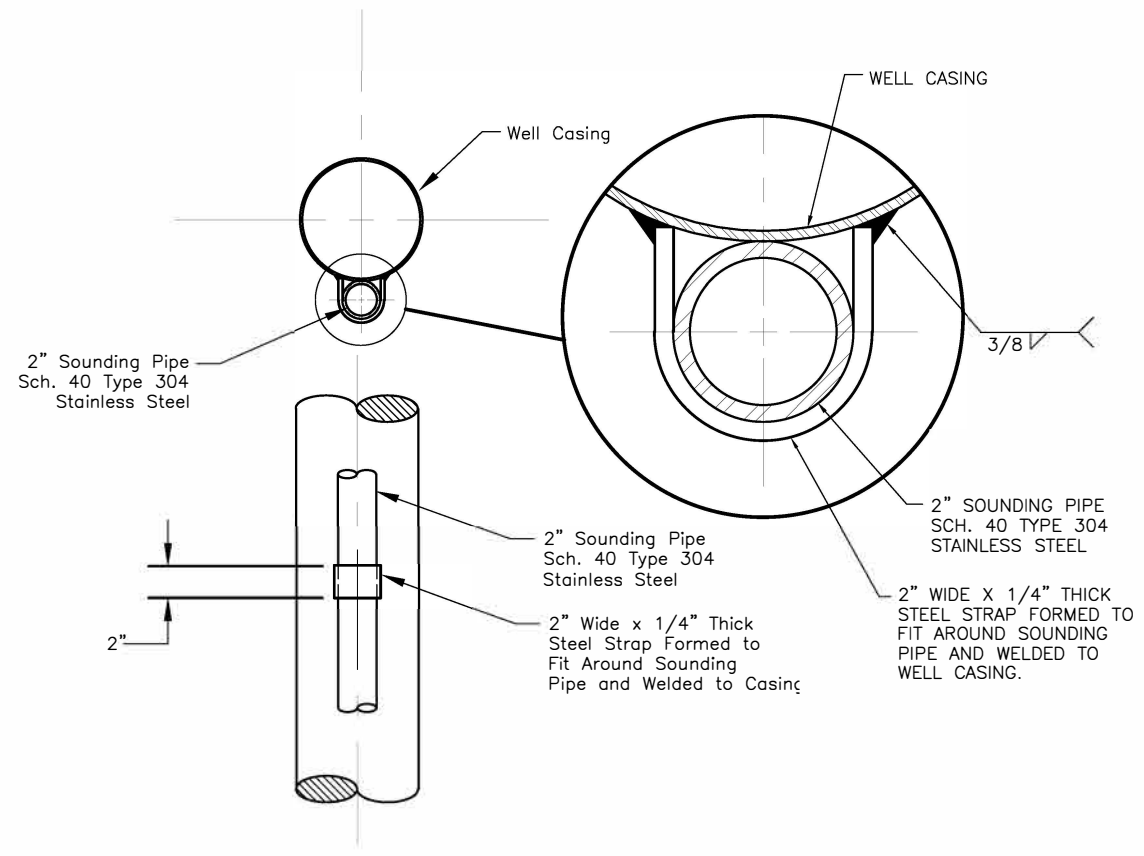
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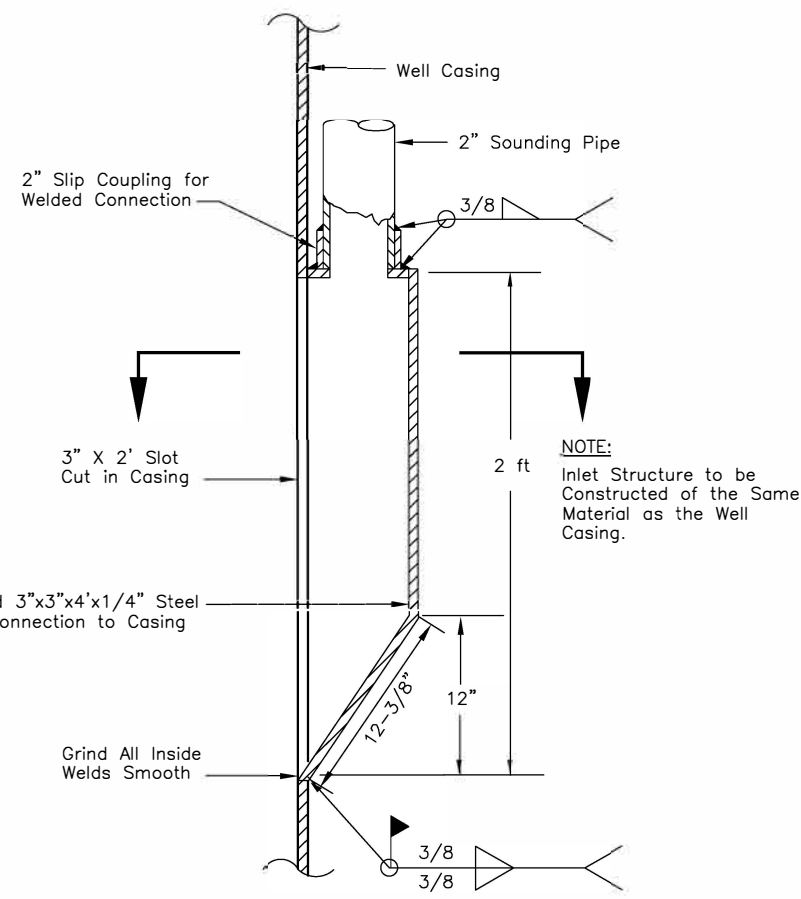
CASING STICK-UP & ACCESSORY PIPE INSTALLATION
N.T.S.



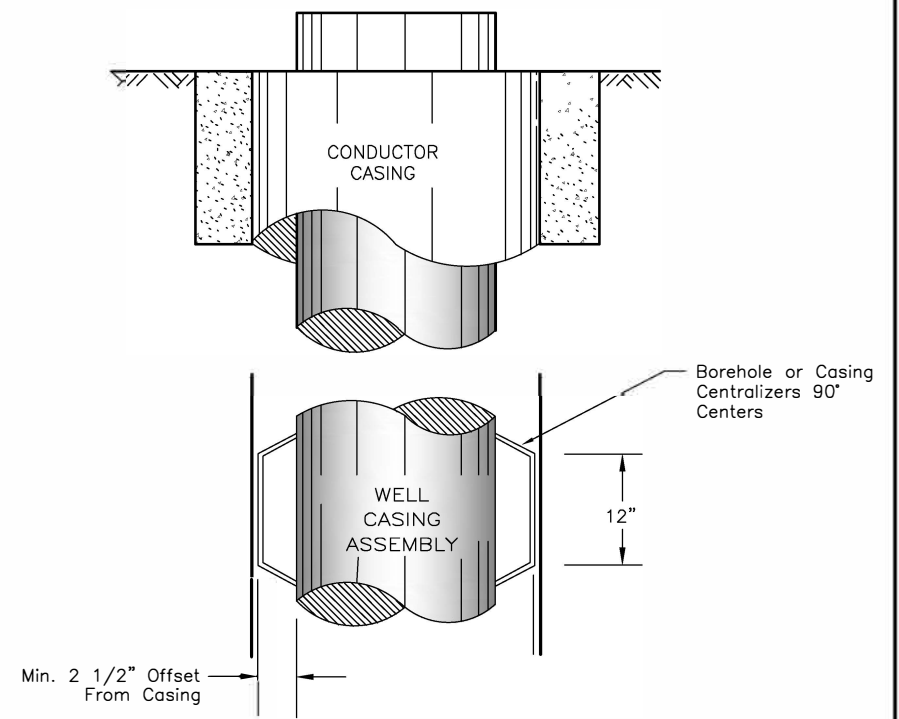
CENTRALIZER INSTALLATION - PLAN VIEW
N.T.S.



"U" STRAP DETAIL
N.T.S.



2" SOUNDING PIPE INLET STRUCTURE
N.T.S.



CENTRALIZER INSTALLATION
N.T.S.

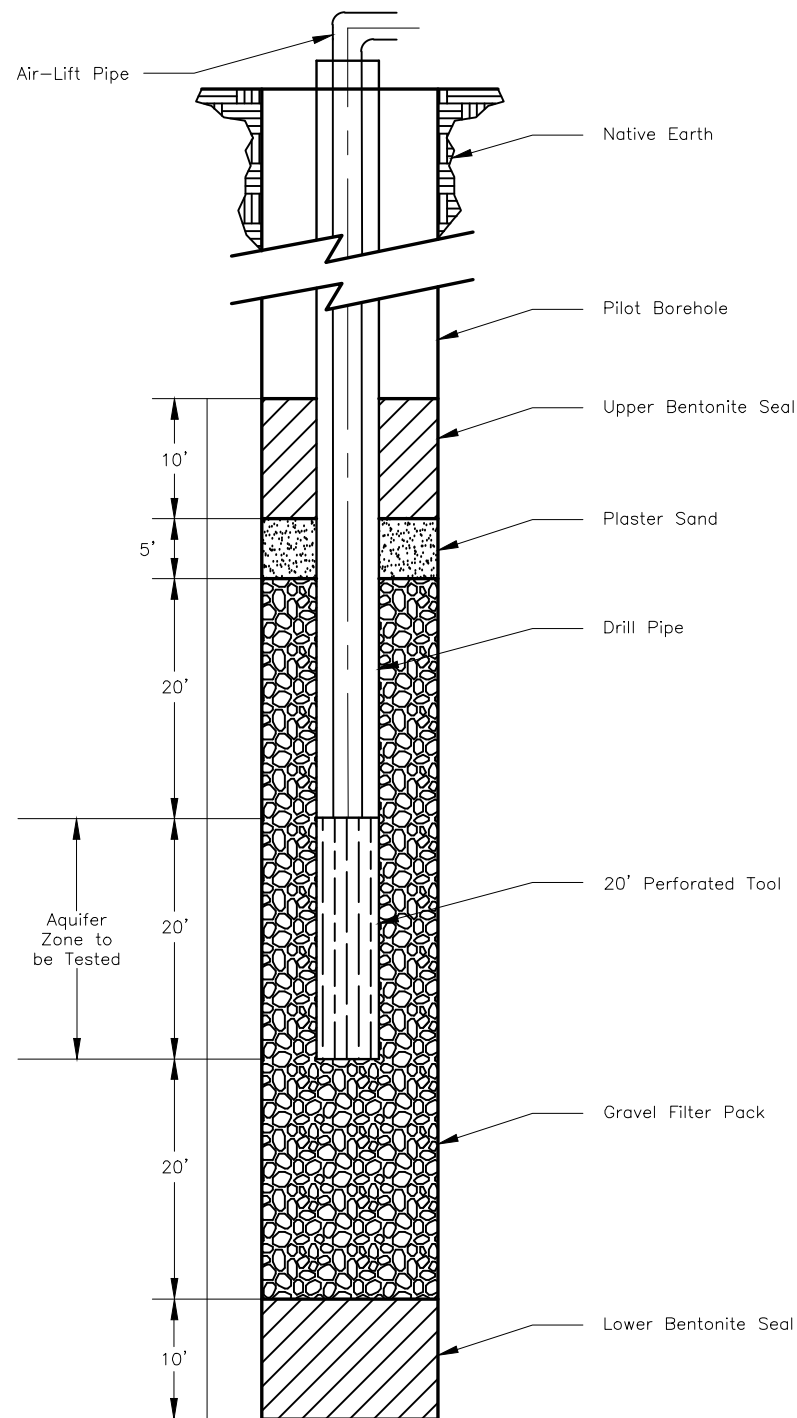
STANDARD CONSTRUCTION DETAILS I
Yocha Dehe Wintun Nation
Well 4 Water Supply Well Project
Yolo County, California



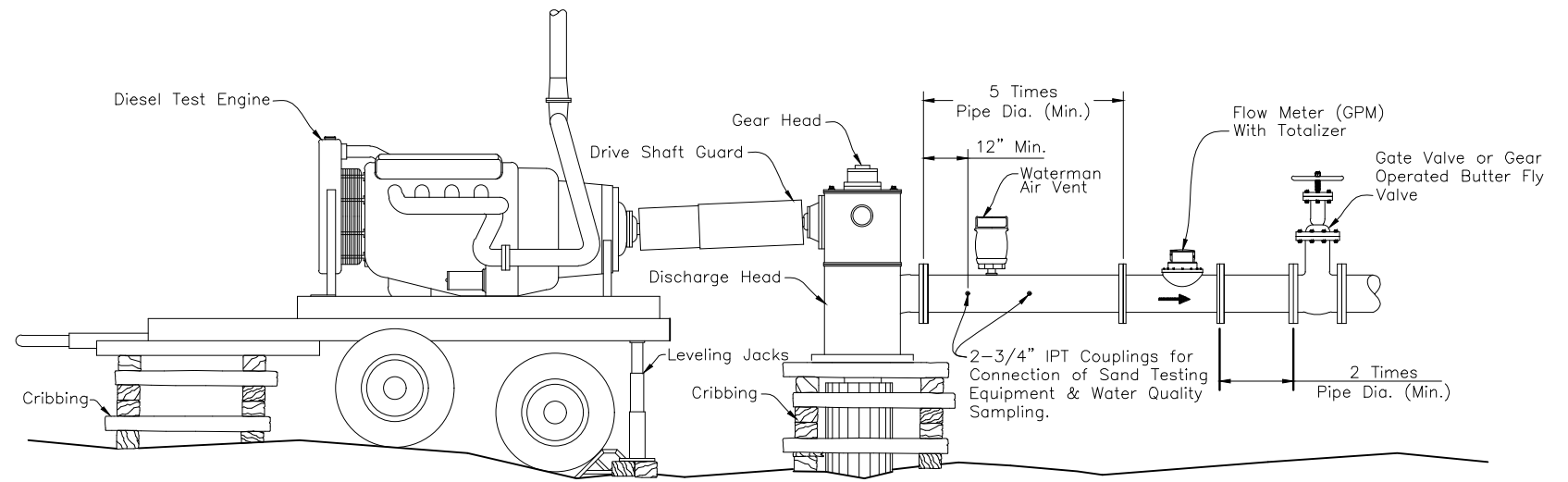
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DATE: AUGUST 2024
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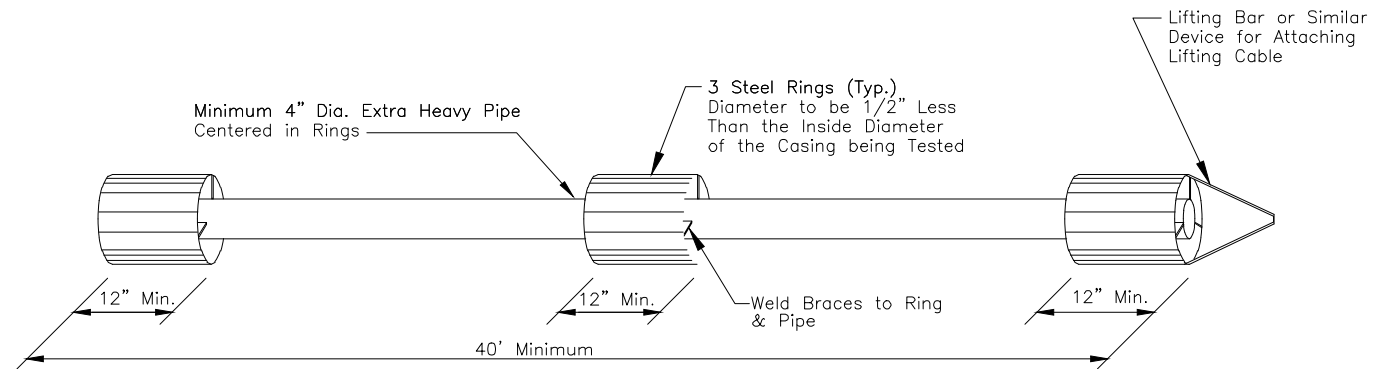
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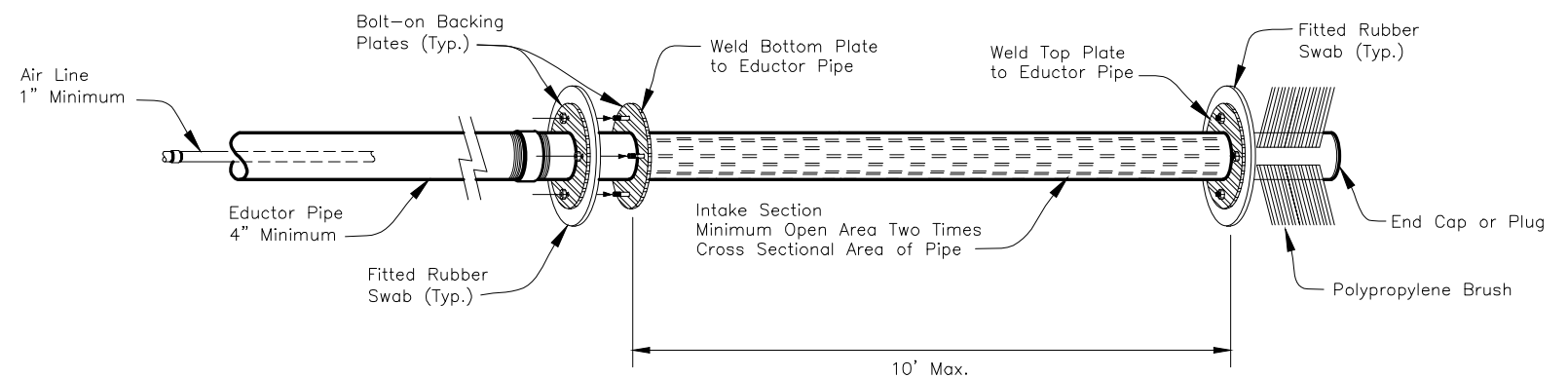
ZONAL SAMPLING TOOL
N.T.S.



WELL TEST PUMP & DISCHARGE ASSEMBLY
N.T.S.



ALIGNMENT TESTING TOOL
N.T.S.



WELL DEVELOPMENT TOOL
N.T.S.

STANDARD CONSTRUCTION DETAILS II
Yocha Dehe Wintun Nation
Well 4 Water Supply Well Project
Yolo County, California



REVISIONS	
NO.	DATE

DATE: AUGUST 2024
JOB NO.: 24-095
DESIGN BY: CJ
DRAWN BY: TEMC
CHECKED BY: ET
FILE: Sheet 5.DWG

SHEET:

5

Bid Item and Payment Sheet

**Yocha Dehe Wintun Nation
Casino Well 1A
Bid Item and Payment Sheet**

Bid Item No.	Description	Unit of Measure	Unit Price	Quantity	Extended Price
1	Well Site Mobilization	Lump Sum		1	
2	Conductor Casing	Linear Foot		50	
3	Pilot Borehole Drilling	Linear Foot		1,000	
4	Geophysical Logging	Lump Sum		1	
5	Zonal Sampling	Each		2	
6	Borehole Reaming	Linear Foot		540	
7	Blank Well Casing ASTM A-778, Type 304 SS 16" I.D. x 5/16" Wall	Linear Foot		374	
8	Louvered Well Screen ASTM A-778, Type 316 SS 16" I.D. x 5/16" wall w/ "full-flo" 0.050-inch Slot Size	Linear Foot		160	
9	Sounding Pipe	Linear Foot		245	
10	Gravel Envelope - 8x16 Raptor Sand	Linear Foot		490	
11	Annular Seal	Linear Foot		50	
12	Well Development	Lump Sum		1	
13	Install/Remove Test Pump	Lump Sum		1	
14	Well and Aquifer Testing	Hour		24	
15	Dynamic Flowmeter (Spinner) Testing	Lump Sum		1	
16	Plumbness and Alignment Testing and Video Survey	Lump Sum		1	
17	Disinfection of Well	Lump Sum		1	
18	Disposal of Drill Cuttings	Lump Sum		1	
19	Standby time	Hour		0	
Labor and Materials Total Bid Price					