Project Description:

The work includes the furnishing of all labor, materials, supplies, equipment, tools, transportation, recommendations, testing, services, and appurtenances unless hereinafter specifically excepted, necessary to move-in, move –out, disinfect and clean-up; satisfactorily complete rotary drilled pilot boreholes, log, secure pilot boreholes; rotary drilled gravel packed wells including but not limited to drill, construct, disinfect, test, maintain/test drilling fluid, gravel pack, develop, clean pump, test pump, check casing, plumbness and alignment, perform final borehole caliper survey, obtain and analyze water samples as specified, place sounder pipe and gravel pack make up pipes and caps, and well cap; and submittals of logs and test results.

SPECIAL PROVISIONS

GENERAL

a. Scope

The work includes the drilling of exploratory/ production well for Calamba Water District.

b. Water Level Sounding

The Contractor shall provide a functioning and accurate water sounding instrument acceptable to the Engineer to measure the water level during all drilling, development and testing of the well. Failure to provide such will subject the Contractor to penalty of P 200.00 per day

WELL DRILLING

a. No Special Provisions

Equipment

The Contractor shall provide and operate one exploratory drilling including all auxiliary equipment necessary to complete the work within the contract period.

Drilling Method

All drilling shall be performed with rotary drilling method

GEOPHYSICAL LOGGING

Scope

The work includes geophysical logging (electric resistivity and self potential).

WELL CASING

Casing Material

All permanent casings to be installed shall be spiral welded steel casing with minimum wall thickness of 6 mm and should be of new stock and complies with ASTM A 139 Grade B.

WELL SCREEN

Type of Screen

The screens shall be stainless steel continuous slot wedge wire wound. with slot size 1.5 mm (slot size), 3 meters length per piece and of new stock with a minimum 30% open area. The well screen and attached end fittings shall be fabricated from corrosion-resistant type 316 stainless steel. The slot size shall not vary by more than +- 10% as measured by wire gages.

The ends of the screens and blank casing shall be beveled for welding and shall meet the same standard as the beveled ends of the blank casing.

The contractor shall be responsible for ensuring that the materials utilized will be adequate for the actual conditions encountered.

End fittings shall be welded to the screen body with electrical insulation provided between stainless steel and other metallic materials. Insulation joints shall be provided between screen and casing as required by screen placement.

The screen length and wire shape shall be chosen so that the maximum velocity of the water entering the screen shall not exceed o0.1 foot per second at the desired yield. The screen shall be selected by the contractor and submitted with supporting calculations for approval by the CWD.

FORMATION STABILIZER/GRAVEL PACK

Scope

The Contractor shall provide and install uniform pea size gravel packed materials. It shall composed of siliceous materials and well rounded particles as approved in the Final Well Design

WELL DEVELOPMENT

Well development for the exploratory/production well drilled method shall consist of but not necessarily limited to, work items as listed and described in Quotation Form.

The series of development activity shall involved removal of the mud cake formed during the drilling at the wall of the borehole, removal of fine formation materials and rearrangement of the gravel packed materials for a stable permeable envelop is developed around the well intake zones(screens).

Expected Yield

The exploratory/production well is expected to yield 25-30 lps.

WELL TESTING

Measurement of time of start, stop and interval measurements must be made with reasonable accuracy(+- 6 seconds).Any irregular events (e.g. pump failure and restart occurring during the test cycle must be noted and their times recorded. Should this event occur, the CWd must be notified and decisions made as to validity of the test. F the pumping test is interrupted due to contractors equipment malfunction, the test shall be re run at the contractors expense. Pumping rate shall not vary by more than 5%(+-).

Water Level measurements should be accurate to within 2cm and carried out with the following frequency.

Every minute for the first 10 minutes
Every 2 minutes for the next 20 minutes
Every 3 minutes for the next 30 minutes
Every 10 minutes for the next 1 hour
Every 20 minutes for the next 2 hours
Every 30 minutes for the next three hours
Every hour thereafter until completion of test

As soon as pump is stopped, recovery measurements should commence immediately using the same frequency of measurement as above.

CEMENT GROUTING

The annular space around the casing shall be filled with a cement slurry ground mixed n the following proportions by volume.

1-part cement;1-1/2 parts sharp, clean sand and 6/10-part water.

The addition of any additives to prevent shrinkage shall be approved by CWD. The water shall be potable and the sand free of clay, silt, organics or other deleterious matter. The grout shall be undisturbed for a period of not less than 48 hours.

WELL DISINFECTION AND CLEANING

The work includes disinfection with a chlorine solution.

GENERAL TECHNICAL SPECIFICATIONS

1. GENERAL

1.1 Technical Definitions

The following definitions shall apply:

a. Borehole – means any drilled section of boring before completion as defined in well below.
b. Casing – means unslotted of non-perforated lining tubes.
c. Development Equipment – means high velocity jetting tool, airlift equipment. surge plunger and all other equipment needed to develop the well.
d. Diameters – means nominal diameters unless otherwise stated.
e. Drilling Rig – means the drilling equipment and the auxiliary equipment for its operation.
f. Drilling Unit – as defined in Clause 2.2.
g. Final Well Design – means the drawing and description prepared by the Engineer upon completion of drilling specifying the final well construction.
h. Lining Materials – means any casing, screen, slotted lining or perforated lining tube whether permanently or temporarily installed in the borehole.
i. Pumping Unit – as defined in Clause 8.7.
j. Screens – means continuous wire wound stainless of low carbon steel screens, or slotted or perforated lining tube.
k. Tentative Well Design – means the contract drawing showing the estimated quantities of the work.
l. Well – means any completed hole in which all lining material has been set, all grouting completed and all temporary lining removed.

1.2 Technical Standards

All materials or workmanship shall comply with the specifications. Other standards equal or superior to those enumerated in this specification, shall be acceptable, subject to the approval of the Engineer. The opinion of the Engineer must be obtained prior to utilizing such materials or workmanship on or off the site.

1.3 Water Supply and Illumination

In the absence of adequate quantities of water or illumination required for drilling at the drilling site, the Contractor shall make such arrangements including the provision for mobile tanks or fixed tanks as may be necessary to ensure a supply of water and illumination sufficient for drilling operations.

1.4 Electrical Power Supply

The Contractor will make arrangements as may be necessary for the connection of or supply of power to the site.

Payment for the provision of electrical power supplies as specified in subclause 1.4 (1) shall be deemed to be included in the rates entered in the Bid Form for setting up equipment at the site, drilling rates and rates entered for operation of pumping unit.

1.5 Storage of Inflammables

The Contractor shall comply with all local authority regulations applicable to the use and storage of diesel oils, petrol, paraffin and other inflammable fuels used by him on the site, and shall ensure that adequate precautions are taken against fire.

1.6 Boundaries of Work

The Owner shall provide land or rights-of-way for the work specified in this Contract and make suitable provisions for ingress and egress. and Contractor shall not enter or occupy with men, tools, equipment or material, any ground outside the property of the Owner without the written consent of the Owner of such property. Other Contractors and employees or agents of CWD and/or the Owner may, for all necessary purposes, enter upon the work and premises used by the Contractor, and the Contractor shall conduct his work so as not to impede unnecessarily any work being done by others on or adjacent to the site.

1.7 Access Roads

Construction or improvement of access roads to the wells shall, unless otherwise agreed, be done by the Contractor at his own cost, whish is deemed to be included in the contract sum. The access road shall be kept in proper condition during the entire construction period.

1.8 Protection of site

Excepting as otherwise provided herein, the Contractor shall protect all structures, walks, pipelines, tress, shrubberies, lawns, etc., during the progress of his work, shall remove from the site all drill cuttings, debris, and unused materials, and shall upon the completion of the work restore the site as nearly as possible to its original condition, including removal of access tracks and the replacement, at the Contractor's sole expense, of any facility or landscaping which has been damaged beyond restoration to its original condition all to the satisfaction of the Engineer.

Water pumped from the well shall be conducted to a place approved by the Engineer where it will be possible to dispose the water without damage to property or creation of a nuisance.

1.9 Site to be kept Tidy

The Contractor shall at all times keep the site and all working areas in a tidy and workmanship condition and free from rubbish and waste materials.

1.10 Temporary Buildings for Use by Contractor

The Contractor shall provide at the site of the works such temporary buildings, tanks, workshops, etc. as may be necessary and proper for his general use in connection with the works, and for the use of persons employed by him. The nature of the buildings. tanks, etc. and the positioning of them shall be subject to the prior approval of the Engineer and the relevant authorities.

1.11 Shop Drawings

The Contractor shall if requested by the Engineer prior to start of each operation, produce for the Engineer's approval shop drawings showing details of technical operations such as test of plumbness and alignment, the method of the slotted casing production, if so required, the methods of placement of formation stabilizer and/or cement grout, the arrangement for well testing, the method for well development and all other drawings pertinent to the well drilling, well construction operations and well development as requested by the Engineer.

Shop drawings shall be completed with respect to dimensions, design criteria, materials, methods of constructions and the like to enable the Engineer to review the information as required.

1.12 Well Head Protection

At all times during the progress of the work, the Contractor shall protect the well in such manner as to effectively prevent either tampering with the well or the entrance of foreign matter into it, and upon its completion he shall provide and install a well head cap satisfactory to the Engineer.

In the event that the well becomes contaminated or that water having undesirable physical or chemical characteristics has entered the well due to the negligence of the Contractor, he shall at his own expense perform such work or supply casings, seals sterilizing agents or other materials as may be necessary to eliminate the contamination or to exclude any undesirable water in the well.

1.13 Transport of Personnel and Equipment

The Contactor shall supply and operate all transport required for transporting his employees, materials and equipment.

The cost of movement of personnel, materials and equipment shall be included in the rates given for drilling, development and pump operation.

1.14 Site Preparation and Reinstatement

The Contractor shall prepare the site, provide all necessary tanks and pits and make all necessary arrangements for erecting and dismantling the drilling unit and shall reinstate the site on completion of such phase of work to the satisfaction of the Engineer.

Payment shall be deemed to be included in the items entered in the Bid Form for erection and dismantling of drilling rigs.

1.15 Standing Time

Standing time will be paid only when drilling is suspended on the written instruction of the Engineer.

2.0 WELL DRILLING

2.1 Scope

The Contractor shall provide and operate one or more mobile Drilling Units required to complete the works within the contract period

The Contractor shall provide all auxiliary equipment, lubricants, fuels and spares necessary to keep the drilling rig(s) in continuous operation.

2.2 Equipment

The drilling rig(s) together with all auxiliary equipment and personnel shall be defined as the Drilling Unit(s).

All rigs shall have sufficient capacity to drill the specified borehole(s) in the diameters specified in the tentative well design(s) to a depth which is min. 25% higher that indicated in the Contract Drawings

Payment for drilling will be by the linear meter to borehole as measured after removal of drill string. The rates set against drilling items in the Bid Form shall be deemed to include all equipment, personnel, fuels and lubricants and the accessories required for operation of the Drilling Unit.

When the Drilling Unit is being used for a purpose other than drilling, then the rates for that purpose entered in the Bid Form shall be deemed to include the running costs of the Drilling Unit.

2.3 Drilling Method

All drilling shall, unless otherwise specified in the Special Provisions, be performed with the rotary or the percussion drilling method.

The Contractor shall drill the hole to such depth and with such a diameter which shall enable an easy installation of casing and screen and placement of gravel envelope with a uniform thickness as specified, if required. During drilling of the hole, the Contractor shall ensure that the natural permeability of the yielding strata near the well bore is not irreversibly reduced due to the drilling method employed.

2.4 Strata Sampling

Strata samples shall be taken at 1 meter intervals or more frequent if the formation penetrated changes. Samples shall be placed in plastic or other appropriate bags on which or in which the sampling depth and the date of sampling is written in such a manner that it is permanently readable.

The sampling procedure must provide that all the fractions of the penetrated strata are present in the sample.

Each sample shall be placed in a wooden box with space for storage of one sample and the sampling depth shall be written on the box.

A record of samples taken with the details describe above, shall be submitted to the Engineer everyday.

Payment for sampling shall be deemed to be included in the rates entered for drilling in the Bid form

The failure on the part of the Contractor to obtain, preserve and deliver samples or records, satisfactory to the Engineer, shall be considered as actual damage to the Owner. Such a failure shall authorize the Engineer to retain from money due or to become due the Contractor. Liquidated damages for each sample that the Contractor shall fail to obtain, preserve or deliver, or for each length of pipe not properly measured and recorded in the order in which it was placed in the well. In the event that, in the opinion of the Engineer, the failure of the Contractor to take and preserve the samples may affect the proper design of the well, the Contractor may be required to perform such work as the Engineer deems necessary to remedy such failure at no cost to the Owner. It is understood that the liquidated damages herein provided are fixed, agreed and not by way of penalty; and that the Owner shall not be required to prove that he has incurred actual damages.

2.5 Drilling Mud

Bentonite, if used, shall be of premium quality in accordance with API Standard 13A with 150 kg/cum of make-up water yielding a mud with a viscosity of between 35 and 40 seconds using a Marsh Funnel and a mud weight of less than 1.10 kg/1 (9.2 lbs/US gal.).

Make-up water shall be treated with caustic soda (soda ash) to maintain the pH between 8.0 and 9.0 prior to mixing mud.

During drilling with mud the Contractor shall perform hourly measurements of the following mud characteristics:

pH value
Funnel viscosity
Specific gravity
Sand content
Filtration loss
Filter cake thickness

The recorded mud characteristics shall not exceed the following values, without the prior approval of the engineer:

- Specific gravity : 9.5 lb/gal.
- Sand content : 4%

- Filtration loss : 10 ml
- Filter cake : 1.5 mm

2.6 Working Hours

All work from start of drilling of the borehole until completion of well development shall, if the rotary drilling method is applied, be on a round the clock basis.

3.0 GEOPHYSICAL LOGGING

3.1 Scope

The contractor shall, if specified in the Special Provisions, perform geophysical logging as specified in the Special Provisions.

3.2 Equipment

The geophysical logs may be recorded either by automatic recording on a chart strip or by manual reading of recorded values. In case the logs are recorded by the manual method, readings shall be taken per min. 0.33 m of borehole length.

The recorded logs shall be submitted to the Engineer immediately upon completion of logging as plots of recorded characteristics versus depth for his approval. In case of disapproval the Engineer, the logs shall be repeated immediately.

3.3 Logs

Geophysical logging shall, unless otherwise specified in the Special Provisions, comprise the following logs:

Caliper log
Resitivity log (16" and 64")
Gamma ray log
Self-potential log (SP)

4.0 WELL CASING

4.1 Scope

The Contractor shall provide and install the well casing specified in the Contract Drawings and any temporary casing required during the work, unless otherwise specified in the Special Provisions.

4.2 Casing Material

The contractor shall, before commencement of work, submit for the approval of the Engineer the following details of all casing:

Type of material
Internal and external diameters

Wall thickness
Method of jointing

All permanent casing material shall be seamless and of new stock. The casing shall be factory assembled in not less than six meter sections. There shall be no burrs or protrusions into the casing I.D.

For field assembly welding, ends of sections may be either belled or furnished with collars in accordance with the following standards:

a). Plain Ends Fitted With Collars. Collars shall be of the same thickness and have the same chemical and physical properties as the corresponding casing section, shall be 150mm in width, shall be rolled to fit the outside diameter and shall be welded to the casing section. Longitudinal welds on the plain end shall be ground to plate surface a sufficient distance from the end. The inside edge of the collars and the outside edge of the adjacent casing length shall be ground or sufficiently scrapped to remove sharp edges or burrs. Section ends shall be machined flat perpendicular to the axis of the casing and shall be machined flat perpendicular to the axis of the casing and shall not vary than 0.010 inch at any point from a true plane at right angles to the axis of the casing.

Three 1 inch by 3/8 inch alignment holes shall be provided in each Collar to insure proper matching of the sections. The casing gap shall be welded full double pass within the holes as well as hole edges.

b) Bell ends. The inside diameter of the bell shall be 1/32 2/32 inch greater than the outside diameter of the plain end. The ends of each section shall not vary more than 0.010 inch in any point from a true plane at right angles to the axis of the casing.

c) Butt welded joints shall be per AWWA C-206

The Contractor shall assume responsibility for any casing failure and shall correct, as approved by the Engineer, any casing failure at no cost to the Owner. In the event that the Contractor cannot correct a casing failure, the Contractor shall replace the casing with material complying with the specifications, or if necessary, better casing as approved by the Engineer at no extra cost.

4.3 Temporary Casing

The Contractor shall provide such temporary casing as may be necessary to prevent the collapse of any formation during the drilling operation to allow the well to be sunk to the specified depth and to allow the insertion of permanent lining material as required. The Contractor shall remove the temporary casing before completing the well, unless otherwise specified in these documents.