

Work Plan

Upon notice of award of the grant by the DWR, and in order to expedite the schedule and to ensure that the proper project mobilization is provided, ID4 intends to fund part of the tasks within the work plan. ID4 will fund the engineering and development of plans and specifications and construction administration for the project. Preliminary bid documents have been prepared and can be found in Attachment 5.2.

The project will drill and construct three groundwater monitoring wells which will enable ID4 to obtain detailed geologic and hydrogeologic data of the area, and will provide long-term monitoring points to evaluate groundwater flow and quality. Three wells are proposed in a cluster at one site.

At the monitoring well cluster site, three separate boreholes will be drilled to a total depth of approximately 260, 510, and 710 feet below ground surface. Samples will be collected every ten feet and at every change in lithology from the drill cuttings. The boring will be geophysically logged for the purpose of creating a detailed geologic record for the site. The process will be supervised by at least one California Registered Geologist, who will log cuttings (using the Unified Soil Classification System), provide direction to drillers, ensure that the wells are installed to specifications and make design changes in the field based on information obtained during drilling. Geophysical logging will include spontaneous potential and resistivity logs for all boreholes. Upon completion of drilling and logging of the exploratory boring, wells will be installed in accordance with California Well Standards and Kern County regulations. Monitoring wells will be developed until discharge water is clear. These monitoring wells are expected to be installed at depths of approximately 250, 500, and 700 feet below ground surface.

ID4 will comply with the requirements of the California Environmental Quality Act (CEQA) applicable to this project. Well drilling permits are anticipated for the proposed project. For further details on CEQA compliance, please see Attachment 5.3 of this grant application.

The drilling site is owned by the Agency. A copy of the grant deed is included as Attachment 5.4.

Construction of the three groundwater monitoring wells is divided into four tasks. The four tasks are: 1) Pre-Construction Activities; 2) Drilling, Well construction and Development; 3) Analytical Testing and Evaluation; and 4) Reporting. A detailed description of the work items to be performed for each task is presented below:

Task 1: Pre-Construction Activities

1.1) Finalize Well Locations

The locations identified in the proposal are the general locations for the drilling sites. These sites were chosen based on their locations near the CVC and between the Joint Use Groundwater Recovery Project site and the contamination plumes in the groundwater below the former Shell Oil Company Rosedale Refinery. The property where the proposed well sites will be located is owned by the Agency.

1.2) Public Notice and Drilling Contractor Selection

Bids will be solicited from drilling contractors with the technical capabilities to drill and construct the proposed wells. ID4 has considerable experience with this task.

1.3) Permitting Process

ID4 will work with the Kern County Environmental Health Services Department to obtain all necessary well drilling permits. The well drilling contractor will obtain an encroachment permit from the Agency to provide facilities for obtaining and conveying water from the forebay of the CVC Pumping Plant No. 6.

Task 2: Drilling, Well Construction, and Development

The wells will be drilled and constructed by a drilling contractor licensed in the State of California with a valid C-57 license. The boreholes will be drilled using direct rotary methods. The final borehole diameter will be 15 inches. Three separate boreholes will be drilled to a total depth of 250, 500, and 700 feet below ground surface. During drilling, samples will be collected and materials will be classified by a Registered Geologist following the Manual Soil Description Standard (ASTM D2488-00) and the Unified Soils Classification System.

During construction, ID4 will comply with all local and federal environmental regulations. ID4 will use best management practices criteria as outlined in ID4's Best Management Practices Guidelines for construction operations and comply with all storm water runoff requirements of the Kern County Flood Control District and the Central Valley Regional Water Quality Control Board. ID4 will also comply with any local jurisdictional requirements relating to noise abatement or construction hours.

Geophysical tests will be performed in each of the deep boreholes. The testing will include: resistivity, spontaneous potential and spectral gamma logs. The

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geologist will evaluate the geophysical log and lithologic log to determine the screening interval and proper design for each well.

All the wells will be completed as 6-inch diameter monitoring wells constructed with schedule 80 PVC casing with 20 feet of well screen (pending evaluation of the detailed well logs). All wells will be constructed (i.e., the type of materials used and the interval of installation of the filter pack, bentonite seal, and cement seal) in accordance with California Well Standards and Chapter 14.08 of the Kern County Codes. Generally, the screened interval is gravel or sand packed 5 feet above the screen. A bentonite seal is placed 10 feet above and below the filter pack. The filter pack is placed from the bottom of the screen to 3 feet above the screen. An annular seal of neat cement grout or sand-cement slurry is then placed from the top of the filter pack to the surface.

After filter pack and annular seal placement has been completed, the filter pack will be cleaned first by airlift pumping and swabbing in stages opposite the entire perforated section(s). The swabbing and pumping operations will be conducted alternately over no more than the length of one joint of drill pipe until that section of screen is fully developed. Swabbing shall take place beginning at the bottom of the well progressing upward until there is no circulation of sand, silt, or mud to the surface. The well drilling contractor will be responsible for the testing of fluid. A water sample will be collected immediately prior to the conclusion of the final well development. The geologist will obtain the professional services of a California State Department of Public Health (CDPH) certified laboratory to test for general physical, general mineral and metal constituents. The samples will be collected by an ID4 representative in containers supplied by the certified laboratory and appropriately labeled and following proper chain of custody record. Results of testing will be made available to ID4 and the geologist for analysis.

Once the initial well development is complete, discharge piping and measuring devices will be installed. Pumping will continue until the water clears and the sand content has lowered. The pump will be stopped and the water will be allowed to surge the well. The pump will be restarted and continue until the discharge clears. This process will be repeated at the same pumping rate until surging produces low amounts of debris and fines at which time multiple surging will be conducted. Development records will be maintained on at least half hour interval showing pumping rate, drawdown and sand production.

Once well construction and development is complete, a steel cover, steel post bollards and a concrete apron will be installed to protect the well from contamination or vandalism. The cover will be painted as directed by ID4.

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Drilling fluids and cuttings will be properly disposed of upon well completion. Specific well construction and development tasks are summarized below:

- Drill borings in three locations.
- Collect soil samples and classify materials according to the Unified Soils Classification System.
- Conduct three geophysical logs.
- Review geophysical logs and lithologic log.
- Design wells.
- Construct 6-inch monitoring wells to a depth of approximately 250, 500, and 700 feet in three deep boreholes at three locations.
- Develop wells.
- Dispose of drilling fluids and cuttings.
- Install surface completion steel pipe cover for each well.
- Clean up and restore drilling sites

All field operations will be under the direct supervision of a Registered Geologist licensed in the State of California. The licensed professional will review all procedures and protocols outlined for the project and assure that Standard of Practice for the work proposed is followed and documented.

Upon completion of field operations, the geologist will record groundwater elevations from each well. Copies of all field records, originals of the geophysical logs, lithologic logs, laboratory analysis and the well owner's copy of a completed DWR Well Driller's Report will be supplied to ID4 and to DWR.

Task 3: Analytical Testing and Evaluation

General groundwater quality samples will be collected and analyzed for physical characteristics, chlorides (U.S. Environmental Protection Agency (EPA) Method 300), total dissolved solids (Standard Methods 2540C) and hardness (Standard Methods 2340B). The wells will be added to ID4's Groundwater Monitoring Program, which monitors water quality parameters on a semiannual basis, and ID4's existing CASGEM Monitoring Plan. The groundwater samples will be analyzed by a State of California Certified Laboratory that is in compliance with federal and state testing requirements in the Environmental Laboratory Accreditation Program. ID4 will require that the laboratory employs quality assurance measures.

All analytical data collected during this project will be reviewed by ID4's Quality Assurance/Quality Control Officer following ID4's Water Quality Laboratory Water Quality Monitoring Plan (See Attachment 8.3.)

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Specific sampling tasks to be performed during groundwater sample collection are as follows:

- Record groundwater elevation prior to purging;
- Purge the well casing the appropriate volume per ID4 Groundwater Monitoring Plan;
- Collect the samples in laboratory supplied sample containers;
- Handle and preserve samples in accordance with EPA protocols; and
- Transport samples under chain of custody record to the laboratory.

Task 4: Reporting

ID4 will submit quarterly reports to DWR during the conduct of the project which will include an executive summary, description of project operations to date, description of major accomplishments, discussion of any issues or concerns that may affect the schedule or budget, discussion of activities planned for the following quarter, cost and schedule information. The quarterly report format will follow the outline specified in Appendix C of the Guidelines and Proposal Solicitation Package for the LGA Grant Program May 2012.

Upon completion of the project, ID4 will prepare a final report that will include all data, permits, field notes, well logs, development logs, chemical analyses and permeability analyses. The final report will be a comprehensive document that will include a comparison of the planned schedule with the actual timeline, discussion of major problems encountered, a summary of all costs and a detailed description and analysis of project results. The final report will contain all of the information specified in the grant agreement.

Water level and water quality information will be collected from the new monitoring wells in accordance with the Agency monitoring and QA/QC plan found in Attachment 8.3. These data will be used to construct water level and water quality contour figures that are included in the annual Report on Water Conditions. The reports will be sent to DWR and distributed to all interested parties.