Quarterly Progress Report No. 1
TWDB Contract No. 1600011956
Reporting Period: May 2016- December 31, 2016

Work Completed (as a follow-up per request for additional detail):

Task 1- Formulate Program

- Prepared materials and met with the District, City of Corpus Christi, and TWDB stakeholders on October 17, 2016 for a kick-off meeting to discuss project objectives and confirm goals.
- Coordinated with City Staff and obtained GIS shapefiles of water lines, wastewater lines, delineated floodplains, and City owned or authorized land parcels eligible for ASR feasibility project exploratory activities.
- Prepared preliminary hydrogeologic information based on previous studies, confirmed sampling plan, and began developing monitoring well construction diagrams.
- Prepared draft memorandum describing trade-offs in drilling techniques and recommendations and delivered to District/City
    - Single borehole versus two-phased approach
    - Core barrel coring versus sidewall coring
    - Plugging borehole versus developing/completing as monitoring wells
    - Recommendations: Two-phased approach; sidewall coring; and developing at least one monitoring well screened in an interval that appears suitable for ASR
- Prepared draft work plan
    - Summarized local hydrogeology
    - Identified up to six potential sites for ASR exploratory testing
    - Described exploratory test drilling program
        - Initial evaluation (Phase I)
            - Minimum of three (maximum six) boreholes drilled to approximate 1,200 ft depth. Approximate borehole size: 9 7/8 inch diameter
            - Drill cuttings collected and logged every 10 feet; cutting samples of sand layers for sieve analysis
            - Borehole geophysical logging for geophysical suite, including: Gamma, Resistivity, Spontaneous Potential, Sonic, and Caliper
            - Results will be used to identify location and target depths of sand layers for expanded evaluation. Sites will be prioritized based on (a) number of 70-ft+ thick sand layers, (b) correlation of sand layers between locations, (c) presence of upper and lower clay confining layers, (d) site logistics, and (e) other information
        - Expanded evaluation (Phase II)
            - Based on the Phase I initial evaluation results, a separate borehole adjacent to initial location will be drilled at up to three preferred sites. Approximate borehole size: 12 1/4 inch diameter
            - Top down approach, with coring and interval testing completed on the shallowest target sand layer first followed by coring and interval testing of lower target sand layers
            - Core barrel samples will be collected and sent for laboratory analysis. Laboratory results will be used in future geochemical modeling.
            - Cores will be collected to be representative of:
                - Contact between the upper confining layer and target sand layer;
                - Within target sand layer;
                - Contact between the lower confining layer and target sand layer.
            - Temporary well will be constructed, with screening across the entire target sand layer for each interval.

        - Pump tests will consist of a step-drawdown test followed by a constant-rate test and recovery. Pumping rate of 200 gpm is anticipated to be most likely.
        - Field parameters and water quality samples for laboratory analysis will be collected for each interval
    - Decision to install monitoring well and location(s) will be made with input from the District/City.
- Compared benefits and drawbacks of three drilling techniques: mud rotary, sonic drilling, and dual rotary. Due to project needs, mud rotary was selected.

Task 2- Exploratory Drilling Program

- Compiled existing geophysical logs to identify suitable intervals for ASR for testing
    - Reviewed 23 geophysical logs from BRACS and BEG databases within the most favorable area for ASR, as identified in previous City study. Preliminary geophysical log evaluation interpretation favorable intervals between 400 and 550 ft bls and 980 to 1150 ft bls.
    - Used Petra for interpretation and to plot cross-sections for the study area
- Prepared preliminary map of proposed testing locations
- Began coordinating with City staff to identify access issues and other site-specific logistical constraints