

Exhibit A

Scope of Work

Investigate Surface Water-Groundwater Interaction along the Lower Colorado River

Young et al. discussed the lack of hydrogeologic data needed for appropriate construction and calibration of the recently-updated version of the central portion of the Carrizo-Wilcox Groundwater Availability Model (GAM):

Young, S., Jones, T., and Jigmond, M., 2017, Field studies and updates to the Central Carrizo-Wilcox, Queen City, and Sparta GAM to improve the quantification of surface water-groundwater interaction in the Colorado River Basin: prepared for the Texas Water Development Board, accessed Oct. 10, 2018, at http://www.twdb.texas.gov/groundwater/models/gam/czwx_c/Final_BBASC_083117.pdf?d=1539188051814

The recently-updated GAM included refinement of the model grid resolution in regions where major river systems flow through aquifer outcrop areas. However, while the refined grid theoretically allows for more-accurate simulation of surface/groundwater interactions, there are almost no data available pertaining to the hydraulic properties of the river/aquifer interaction zone that can be used to configure the refined model cells. As a result, the hydraulic parameters assigned to the refined grid cells are not based on measured data, and the currently-modeled surface water-groundwater fluxes produced by the GAM cannot be verified. Improved representation of hydrogeologic properties and calibration of surface water-groundwater exchanges in the GAM are essential for both establishing the accuracy of model predictions and evaluating the usefulness of the refined grid resolution in river/aquifer interaction zones.

In order to obtain the data necessary for proper model configuration and calibration, hydrogeologic conditions should be measured in several representative areas along the river basins included in the GAM. The primary goals of this project are to: 1) obtain field data documenting the direction and rate of flux between the Colorado River, the shallow alluvial sediments over which it flows, and the underlying aquifer outcrop recharge/discharge zones at a test site in Bastrop County, and 2) explore and evaluate various techniques for obtaining and analyzing the measured data. It is anticipated that this study represents a pilot-project that may be used as a template for future surface water-groundwater interaction studies at additional sites along major river basins included within the GAM footprint.

The data necessary for this project will be obtained from collocated groundwater monitoring wells and surface water probes at a study site shown in Figure 1. Successful completion of this pilot-project will demonstrate the value of continued monitoring at this site and expansion of similar monitoring efforts at additional sites in the region. This project represents a necessary first step in a much larger scale process eventually required for improving the understanding of surface water-groundwater interactions along Texas' rivers.

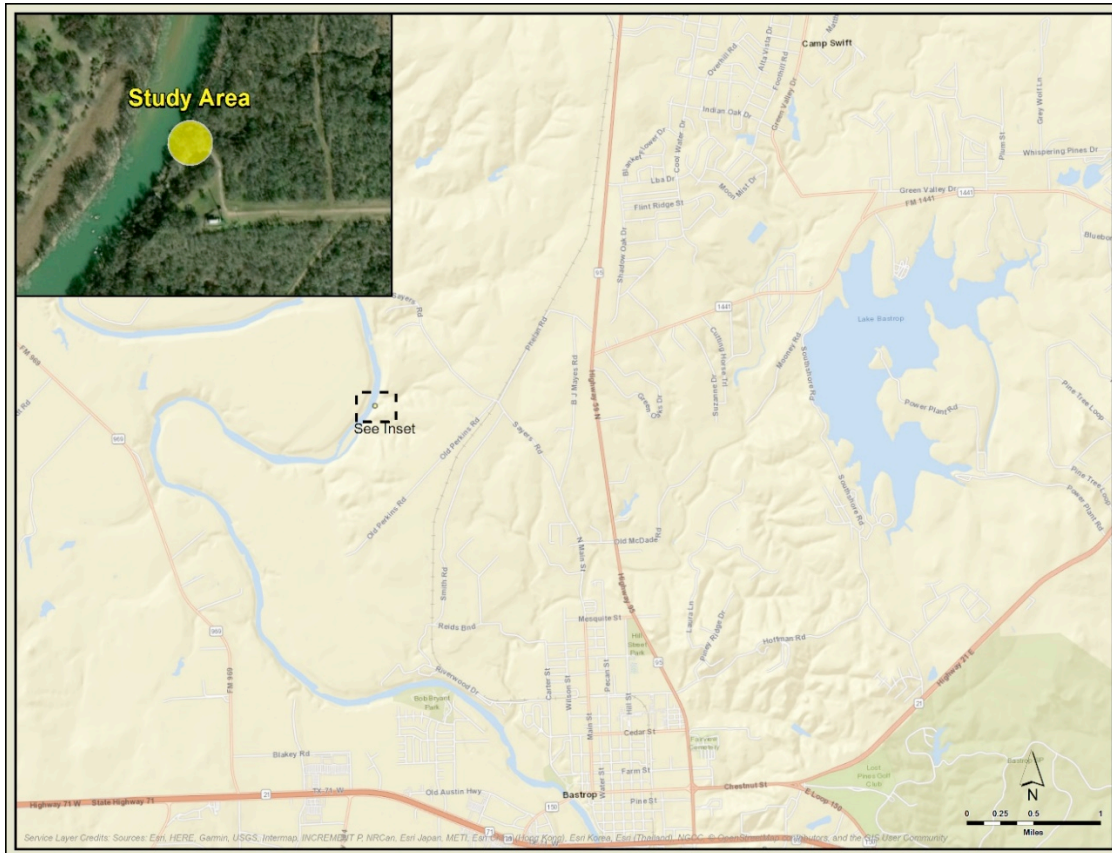


Figure 1. Project site location.

General Project Description

This project focuses on installation, data collection, and evaluation of various monitoring wells and devices at the site of LCRA's Lake Bastrop input/discharge facilities along the Colorado River in Bastrop County.

This project will progress in two general phases with subtasks including:

- Phase 1: Installation of Monitoring Wells and SW Probe Housing
 - Task 1 – Work Specifications and Contractor Selection
 - Task 2 – Site Preparation and Monitoring Well Construction
 - Task 3 – Construction of Surface Water Probe Housing
- Phase 2: Data Collection, Analysis, and Reporting
 - Task 4 – Furnish and Install Monitoring Probes and Telemetry
 - Task 5 – Data Collection and Preliminary Analysis
 - Task 6 – Data Evaluation and Reporting

The following are discussions of the specific tasks to be completed during this project.

Task 1: Work Specifications and Contractor Selection

General technical specifications outlining the methods and materials to be used by the selected contractor for drilling and construction of monitoring wells and surface water probe

housing will be generated. The technical specifications will include descriptions of formation logging, material settings and sizes, development methods, and ancillary equipment. The technical specifications will be distributed to contractors that have experience and equipment necessary to conduct the work in a skillful and cost-effective manner.

The project site is generally maintained by LCRA, but the site will require some relatively-minor initial grading and clearing to allow access for unencumbered drilling operations, field equipment setup, and to facilitate data collection. A contractor capable of effectively performing site preparation activities will be selected and will coordinate work with the contractor selected to complete drilling and construction of monitoring wells.

A site-specific Health and Safety Plan (HASP) that describes general hazards of the site and provides directions to nearest care facilities in case of an emergency will also be prepared. A Sample Analysis Plan (SAP) for collection of water quality samples, if required, to be tested for basic physical and chemical parameters, will be prepared. The SAP will describe the sample collection procedures and the site-specific parameters to be tested, in case water quality analyses are needed.

Task 2: Site Preparation and Construction of Monitoring Wells

Prior to the commencement of site work, final monitoring well locations (line of investigation), and site preparation work (*i.e.*, grading, road work and tree/brush clearing) will be determined. Work of clearing and drilling contractors will be coordinated to insure proper access of drilling equipment. It is anticipated that the smaller cleared material will be mulched and spread on-site, while the trunks and any limbs too large to mulch will be cut and stacked on site.

Groundwater flux rates and potential changes in the direction of flow between the Colorado River and the shallow aquifer zones may be estimated by comparing river stage and hydraulic head measurements in the underlying alluvial and aquifer outcrop sediments. Groundwater levels at the project site will be obtained by installing and measuring data in four monitoring wells (piezometers). The four monitoring wells will be installed along the line of investigation.

It is intended that each of the four wells will be screened through a discrete zone of flow that can be compared to other vertically-distinct zones at the site. The actual screened intervals for each well will be determined during drilling and logging operations. Upon completion of all groundwater monitoring wells, slug and/or bail tests will be conducted to determine the apparent hydraulic conductivity of the local aquifer sediments in the screened interval.

It is anticipated that the monitoring wells will be installed using relatively-inexpensive drive point or auger drilling techniques, depending on the subsurface conditions found at the site. In general, it is possible to use these techniques when wells are constructed in shallow, soft sediments. However, it is important to note that if subsurface cobbles, boulders or other obstructions are found at the site, it will not be possible to install monitoring wells using

drive point or auger drilling methods. If unfavorable drilling conditions are found, alternate drilling technologies and/or relocating the study location will be considered.

Task 3: Installation of Surface Water Probe Housing

It is anticipated that monitoring of Colorado River water elevation, electrical conductivity, and temperature will be monitored at one site. The electronic probe used to measure surface water parameters will be lowered into a protective housing set in the river. Preliminary site investigations suggest that existing LCRA discharge facility infrastructure may be suitable for probe installation at the site.

However, if data requirements and site conditions require setting the probe housing on the riverbed sediments, various potential procedures will be evaluated with respect to drilling conditions experienced during the installation of the groundwater probes completed during Task 2. Initial site reconnaissance suggests that a drive point piezometer may be anchored to river bank and riverbed sediments to establish a permanent onsite housing for the surface water probe.



Figure 2. LCRA site infrastructure.

Task 4: Furnish and Install Monitoring Probes and Telemetry

Data logger/probes capable of measuring water elevation, electrical conductivity, barometric pressure, and temperature will be installed at five sites (four groundwater monitoring wells and one surface water monitoring site) and connected to a cellular telemetry device to transmit the observations to a data collection center. It is anticipated that the following equipment will be purchased as part of this project:

- 5 - In-Situ Aqua TROLL 200 Data Loggers capable of recording water level/pressure, conductivity and temperature data;

- 1,125 feet of In-Situ RuggedCable;
- In-Situ Cube 300S Cellular Telemetry System; and
- A 40-foot steel, self-supporting tower antennae for the In-Situ Cube 300S telemetry station.

Task 5: Data Collection and Analysis

Groundwater and surface water measurements will be recorded at 15-minute intervals and uploaded to the cellular telemetry device described in Task 4 above. As part of this project, groundwater and surface water data will be recorded for an approximate period of 6 months. However, it is important to note that a five-year cellular data plan is included with the monitoring equipment described in Task 4. Consequently, monitoring data will continue to be accessible for approximately four years after the completion of this project. During the initial data collection period, the data stream will be continuously analyzed for any apparent anomalies that may indicate equipment malfunctions or the need for equipment repair or maintenance. The recorded data will also be analyzed periodically to estimate flow direction and potential surface water/groundwater fluxes. These analyses may indicate development of temporal trends that may help adjust field equipment to improve data collection. The preliminary data analysis and monitoring task will also allow flagging of certain data as either unusable or inappropriate for inclusion in the final data evaluations.

Task 6: Data Evaluation and Reporting

Final data evaluation will include estimation of flow direction and volumetric water flux exchanged between surface water and groundwater at the river-aquifer interface. The final evaluation will be conducted using the appropriate physical data as obtained and identified after preliminary data analysis in Task 5.

The project deliverables will be a report that will include a description of the work completed, summary of the data gathered, results from the final data evaluation, and recommendations for future work. The final report will be submitted along with the data collected, in a digital format, approximately three months after the completion of the data collection period.

Assumptions

- Flooding or other occurrences do not interrupt the instrument installation, data gathering, or other field operations.
- Drilling operations are not interrupted by unanticipated events.
- Drilling operations can be conducted using standard drilling equipment (*i.e.*, no decontamination of equipment or supplies is necessary).
- Monitoring equipment do not require maintenance beyond standard guidelines.
- It is assumed that the monitoring wells will be installed using relatively-inexpensive drive point or auger drilling techniques, depending on the subsurface conditions found at the site. In general, it is possible to use these

techniques when wells are constructed in shallow, soft sediments. However, it is important to note that if subsurface cobbles, boulders or other obstructions are found at the site, it will not be possible to install monitoring wells using drive point or auger drilling methods. If unfavorable drilling conditions are found at the project site, LCRA will consult with study partners before continuing work using alternate drilling technologies and/or relocating the study location.

Schedule

The estimated scheduling of the work efforts described above is shown in Figure 3. The schedule provides the expected time to complete the work by task. Please note that the schedule assumes that a suitable drilling contractor and rig is readily available, and that no significant delays result from contractual or performance problems with the contractors conducting the work.

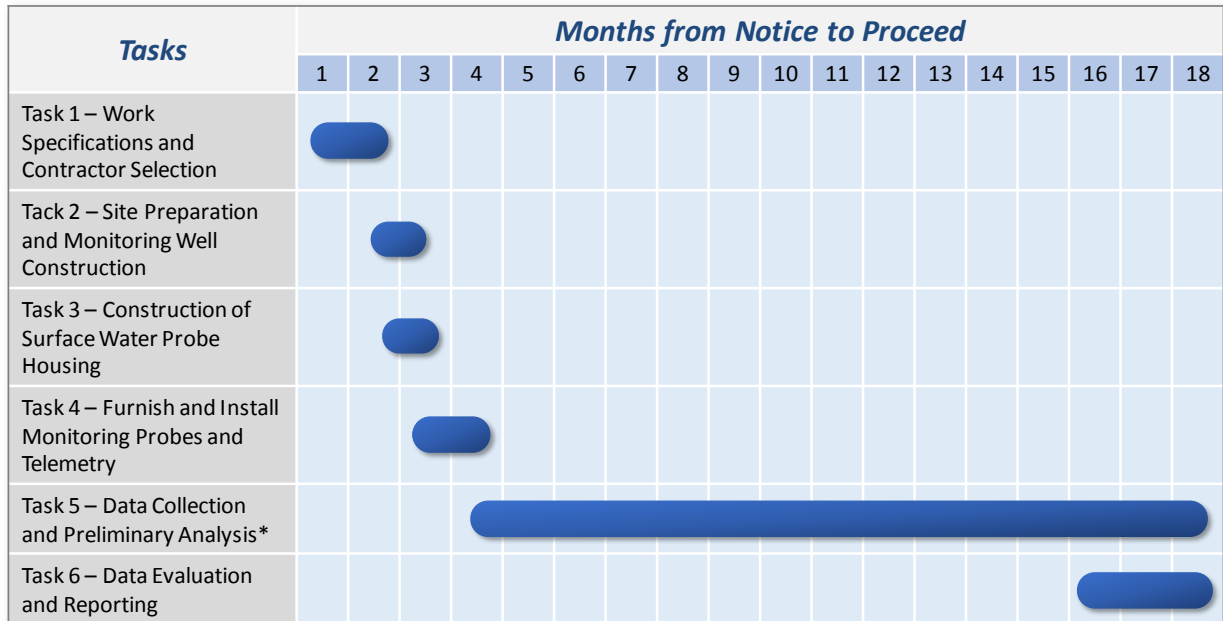


Figure 3. Project schedule.

Exhibit B
Task and Expense Budget

Task Budget

Task	Description	Amount
Task 1	Work specifications and contractor selection	\$13,200
Task 2	Site preparation and construction of monitoring wells	\$43,700
Task 3	Installation of surface water probe housing	\$7,600
Task 4	Furnish and install monitoring probes and telemetry	\$35,100
Task 5	Data collection and analysis	\$29,200
Task 6	Data evaluation and reporting	\$31,200
Total		\$160,000

Expense Budget

Category	Amount
Salaries & Wages ¹	\$0
Fringe ²	\$0
Travel ³	\$0
Other Expenses ⁴	\$0
Subcontractor Services	\$160,000
Overhead ⁵	\$0
Profit	\$0
Total	\$160,000

¹ Salaries and Wages is defined as the cost of salaries of engineers, draftsmen, stenographers, surveymen, clerks, laborers, etc., for time directly chargeable to this CONTRACT.

² Fringe is defined as the cost of social security contributions, unemployment, excise, and payroll taxes, workers' compensation insurance, retirement benefits, medical and insurance benefits, sick leave, vacation, and holiday pay applicable thereto.

³ Travel is limited to the maximum amounts authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2015, Article IX, Part 5, as amended or superseded

⁴ Other Expenses is defined to include expendable supplies, communications, reproduction, postage, and costs of public meetings directly chargeable to this CONTRACT.

⁵ Overhead is defined as the costs incurred in maintaining a place of business and performing professional services similar to those specified in this CONTRACT.