Attachment 5: Work Plan

The following attachment outlines the proposed scope of work for the Main San Gabriel Basin Data Management Platform and Integrated Groundwater Surface Water Model, as described in Attachment 4, Project Description. This Work Plan has been prepared to document all necessary details to show the process by which the Upper San Gabriel Valley Municipal Water District will successfully implement the project and achieve its goals and objectives. This attachment is consistent with and supports Attachments 6 and 7, the Budget and Schedule, respectively.

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Introduction/Purpose

Currently, the collection of data among the various stakeholders in the Basin is not consolidated in one place. For example, the Watermaster compiles groundwater elevation and quality information from selected wells in the Basin while the San Gabriel Water Quality Authority compiles information on contamination and pumping from the clean-up projects it implements. Separately, the Los Angeles County Department of Public Works collects and maintains data on flows into its spreading facilities but does not correlate this information necessarily to groundwater levels.

Meanwhile, each entity has developed separate planning and analytical tools designed to service their own responsibilities. For example, Public Works has a runoff model of its system that it uses to plan future improvements to its surface facilities (without taking dynamics of surface water-groundwater interaction into account). Meanwhile, the Watermaster maintains a 2-dimensional groundwater model to track groundwater contour levels (that does not take contaminant transport into account). However, the groundwater model does not incorporate surface water-groundwater interaction and/or effects of changes in surface runoff and corresponding recharge.

Thus, under these circumstances, cooperative planning and analysis can be challenging and time consuming, requiring multiple requests for data that may not be provided in either the format needed or with the appropriate quality assured.

Project Goals and Objectives

With this backdrop, the goals of the proposed project are to:

- Improve coordination and collaboration among Basin stakeholders to increase Basin yields, improve operating efficiency, and help control the costs of groundwater replenishment
- Develop and maintain a complete single database of groundwater basin information and an efficient mechanism for sharing groundwater basin data with stakeholders
- Provide a tool that more accurately models the dynamics of the groundwater basin including surface flows and the movement of contaminants.

Specific project objectives are to:

- Develop a data management system that makes groundwater elevation and quality as well as surface water and streamflow information accessible to authorized users in a user-friendly and graphical platform.
- Develop a 3-dimensional basin-wide model that will be useful for surface and subsurface flows in an integrated manner, including modeling surface water-groundwater interactions as well as solute transport.

- Promote and support the involvement of key stakeholders in the development of these tools to maximize their usefulness to all parties.

This proposed project is directly relevant to many of the Basin management responsibilities mandated for the Watermaster and documented in the Basin's GWMP (see Attachment 3).

Scope of Work

The scope of work for this project is divided into two sections:

- Main SGB Data Management Platform
- Integrated Groundwater Surface Water Model

The first part of the scope, the Main SGB Data Management Platform, develops a web-based database management system (DMS) for storing, retrieving, displaying, analyzing, exporting, and reporting groundwater elevation, water quality, and well data on a Google-Map based platform. The DMS can be hosted on servers owned by any of the partners involved in the project. The work will involve an evaluation of the existing databases maintained by the Main SGB Watermaster and the Water Quality Authority. The DMS itself will provide single administrative privileges, or depending on the type of data, can provide for multiple administrators. It will also allow multiple levels of authorization for access to data, including Administrative, Power User, User, and Public access. Appropriate training will be provided for use of the DMS.

The second part of the scope, the Main SGB Integrated Groundwater Surface Water Model (IGSM), develops a new integrated water resources model that will serve as an analytical tool for the quantification of the regional water budget, planning and analysis of conjunctive use management strategies, design and evaluation of specific water supply projects, evaluation of groundwater recharge and banking operations, evaluation of recycled water and storm water projects, evaluation of flood control studies, and development of financing mechanisms and cost sharing arrangements among parties in the Main SGB. Development of the new model will improve the understanding of the surface water and groundwater flow system and response characteristics in the Basin, and aid in the evaluation of the state of the Basin in terms of rate and amount of potential overdrafts, as well as trends and directions of regional water quality conditions.

It should be noted that development of the DMS and IGSM do not require a plan for California Environmental Quality Act (CEQA) compliance or other regulatory compliance. This will reduce the time required to implement the project.

Task 1 Main SGB Data Management Platform

Subtask 1.1 Evaluate Existing Database

This subtask consists of evaluating the existing databases. The work performed under this subtask includes:

- Obtaining a copy of the merged database that includes the Main SGB Watermaster and the Water Quality Authority database
- Evaluating the data and the database structure, in order to design and develop a transformation protocol for mapping the data into the appropriate fields in the new DMS
- Evaluating the data requirements for the DMS, including the types, units, period of record, and other features.

Deliverables

- Draft TM documenting the DMS structure and mapping protocol
- A technical working group will be held at the beginning of this task to review existing data and to make requests for data from relevant stakeholders. This meeting is covered under Task 3.

Assumptions

- Upper District, Watermaster, and Water Quality Authority will provide the full databases with all documents available

Subtask 1.2 Design Database Conversion Plan

This subtask consists of developing a plan for conversion of the database fields and mapping the data from the existing database to the new DMS.

This subtask will include designing and developing the DMS, customizing the DMS user interface, and implementing data reporting queries. The database conversion will be designed and implemented according to the data requirements evaluated and refined in Subtask 1.1. The DMS will also contain multiple levels of user and agency access based on the defined data access protocols.

At an in-person meeting, budgeted under Subtask 3.2, the consultant will present the DMS to the Watermaster and the Upper District staff and explain the interface and functionalities. The functional specifications will be defined for standard reports, including the California Statewide Groundwater Elevation Monitoring (CASGEM) reporting requirements.

The DMS will be developed and customized for specific use by the Watermaster and the Upper District. The DMS will be enhanced to include modules that will be designed and developed to:

- Prepare custom reports to meet the Watermaster annual reporting needs;
- Prepare other reports, as needed, for the Upper District to provide information to the Board or public;
- Export monthly or seasonal groundwater level data as needed;
- Export seasonal groundwater level data associated with the CASGEM program for reporting to the Department of Water Resources (DWR) CASGEM Online System. The CASGEM reporting module will allow the Client to manage a list of CASGEM reporting wells and export their associated seasonal data. This module will also contain reporting tools to track submittals to DWR to ensure the Watermaster is meeting the CASGEM program reporting requirements and protocols as a designated monitoring entity.

Deliverables

- Presentation of the DMS
- Preliminary DMS installed on test environment
- CASGEM reporting module

Subtask 1.3 Convert and Upload Data

This subtask consists of developing software tools and procedures to upload and verify the data collected in Subtask 1.1. The data will first be converted to a format consistent with the tools and procedures for upload. During this process, the data will be quality controlled for significant discrepancies or omissions. Software tools and procedures will be developed to load the converted data into the DMS test environment. These tools will assist in implementing the QA/QC process that may include the following elements: security, data validation, data rejection, and timely data upload.

Upon upload of the data to the DMS, the data will be quality controlled using tools and reports available in the DMS. System testing and data quality control will be conducted in cooperation with the Watermaster and the Upper District staff. Discrepancies and inconsistencies will be corrected in coordination with the staff. The DMS and converted data will be installed on a production environment and be ready to use by the Watermaster and the Upper District staff and stakeholders.

Deliverable

- Populated DMS installed on production environment

Assumptions

- Only readily available public data will be incorporated into the database.
- Data conversion and upload will be limited to a total of 120 hours.

Task 2 Integrated Groundwater Surface Water Model

Subtask 2.1 Data Collection & Analysis

This subtask involves acquiring data from the existing regional two-dimensional PLASM[1] model developed for the Upper District, and it involves acquiring data from local, state and federal sources to make additional data corrections and remove deficiencies from the existing PLASM model data. The data will be analyzed and synthesized for the purposes of model development and calibration. The work performed under this subtask shall include the following items:

2.1.1 Hydrogeologic Investigative Study

Geologic and hydrogeologic data from the existing PLASM model will be extracted and reviewed. Additional data from reports, previous hydrogeologic studies and regional models will be used for verification and refinement. Collected data will be used to develop geologic cross sections, aquifer parameter zones and define hydrologic and water management sub-regions.

2.1.2 Analysis of Urban and Agricultural Water Demands

Analysis of water demands in the Basin will be conducted. Time series data of water demand for agricultural, urban and native land use categories will be developed for the modeling area. These data will be on a monthly time step and include analysis of historical land use, historical crop acreage and irrigation efficiency. Distribution of land use categories for each land use survey in GIS shapefile format will be developed as part of this subtask. In addition, annual tables of crop mix acreage for each model sub-region and for the period of model simulation will be developed as part of this subtask. Based on the information, monthly tables of agricultural and urban water demand for each of the user types and categories for each water management sub-region will be developed.

2.1.3 Analysis of Urban and Agricultural Water Supplies

An accounting of the various sources of water supplies (groundwater and surface water) for each user type and category will be developed for analysis and use in the model. Pumping data for municipal and industrial wells will be collected and analyzed, agricultural pumping data will be estimated, spatial and vertical distribution of pumping will be analyzed, surface water delivery and distribution data will be collected and analyzed, and recycled water use data will be collected and analyzed. Based on the information, monthly tables of groundwater pumping and surface water deliveries to each of the user types and categories based on the source of water for each water management sub-region will be developed.

2.1.4 Initial Water Budget Analysis

This subtask includes the development of an initial water budget analysis to present the inter-relationship of the various hydrologic and land and water use components in the Basin. The existing PLASM model will be used for any additional conceptual understanding of the Basin.

[1] Pricket-Lonnquist Aquifer Simulation Model two-dimensional finite difference groundwater flow model.

2.1.5 Develop Maps and Synthesize Data

Soil coverage classifications and crop categories collected and analyzed in subtask 2.1.2 will be evaluated for purposes of modeling. In addition, the subtask 2.1.1 well yield and capacity data and aquifer parameters data will be evaluated for modeling purposes. Other related maps for spatial analysis and presentation of data shall be developed.

2.1.6 Additional Data Collection and Estimation of Missing Records

Time series data from the existing PLASM model such as surface water diversion, groundwater extraction, rainfall, stream flow, and other pertinent data will be analyzed as necessary for model input data development. Missing data will be identified and collected; and a representative historic hydrologic period will be selected. The model related non-time series data will be analyzed and un-gauged watersheds will be delineated.

Deliverables

- A technical working group will be held at the end of this task to review data collection and analysis findings with relevant stakeholders. This meeting is covered under Task 3.

Subtask 2.2 Model Input Data Development

2.2.1 Develop Model Finite Element Grid

The finite element model grid will be developed to ensure the best estimates of groundwater elevations and groundwater flow and will be constructed based on specific regional and local criteria to ensure that:

- geologic characteristics are properly matched, accounting for geologic boundaries, faults, and subsurface barriers;
- grid orientation corresponds to known groundwater flow lines;
- grid orientation corresponds to major streams and creeks;
- element meshes are relatively fine in the vicinity of steep groundwater gradients to account for sharper rates of decline in groundwater elevation;
- element meshes can be used to designate model sub-areas (e.g., water districts);
- areas of potential recharge sites are included in the model as a finer grid for evaluation of conjunctive water management alternatives.

2.2.2 Prepare IGSM Non-Time Series Input Data

Required non-time series input files will be prepared in their respective input formats for IGSM simulation runs. These input data files include:

- Model grid configuration including the element and node data and sub-region assignment;
- Physical characteristics for each model element;
- Aquifer stratigraphy data;
- Stream channel characteristics data;
- Soil and aquifer parameter data; and
- Well characteristics data for selected water supply production wells.

As part of the non-time series input data file development, the IGSM will be run and the IGSM input data will be debugged to ensure that the model grid is encoded correctly, the model sub-regions are defined correctly, the aquifer layer definitions are correct, the well locations and production depths are consistent with aquifer stratigraphy, and the stream bed elevations are correct and consistent with the physical system.

2.2.3 Prepare Land Use Input Data

As part of this subtask, the land use and crop acreage time series input data files for IGSM simulation runs will be developed.

2.2.4 Prepare IGSM Time Series Input Data

As part of this task, the time series input data files for IGSM simulation runs will be developed. The IGSM time series input files include the land use and crop acreage data developed in Subtask 2.2.3 and the following data items:

- Hydrologic data representing rainfall and stream flow conditions;
- Surface water diversion and water delivery data;
- Groundwater pumping data;
- Agricultural water use estimates;
- Urban water use data and estimates (including surface water as well as groundwater pumping);
- Potential evapotranspiration data for different crops in different regions;
- Initial groundwater level data;
- Boundary conditions data at specified boundaries;
- Irrigation efficiencies and minimum soil moisture contents by crop and model sub-region; and
- Calibration well locations and perforation layers, stream flow calibration locations, time periods for groundwater contour calibration.

IGSM simulations will be performed and the IGSM time series input data will be debugged to ensure that the model is representative of the historical hydrologic conditions.

Deliverables

- A technical working group will be held at the end of this task to review model input data development findings with relevant stakeholders. This meeting is covered under Task 3.

Subtask 2.3 Model Calibration

The purpose of the subtask is to calibrate the IGSM developed in Subtask 2.2 to closely match historical data. The historical period selected to calibrate the model should include wet and dry periods that have adequate water level and stream flow data. The work performed under this task shall include the following subtasks:

2.3.1 Establish Water Budgets for All Model Sub-regions

As part of this subtask, the model will be used to establish water budgets for all model sub-regions. Hydrologic cycle components requiring water budgets for model calibration are groundwater, surface water, land and water use, and the soil zone.

2.3.2 Establish Calibration Criteria

As part of this subtask, the modeler will work with Upper District to establish calibration criteria for the model. Establishing the calibration criteria for the IGSM may include:

- selecting data for comparisons and screening the data for any anomalies;
- establishing the error range of the historic data;
- selecting model parameters for calibration;
- establishing a plausible range for the selected parameters; and
- selecting a reasonable number of model runs to complete calibration.

2.3.3 Calibrate to Stream Flow Records

This subtask is intended to calibrate the model to the recorded stream flow data for selected rivers and streams at specific gages.

2.3.4 Calibrate to Recorded Groundwater Levels

This subtask is intended to calibrate the model to the recorded groundwater level data at specific target calibration wells, as well as regional groundwater level contours for specific years.

2.3.5 Complete the Calibration Process

To complete the calibration process, subtasks 2.3.3 to 2.3.5 will be performed in an iterative process until the calibration criteria are met.

Subtask 2.4 Model Documentation

The purpose of this subtask is to document the development and calibration of the IGSM under subtasks 2.1, 2.2, and 2.3. The report will include the development and analysis of input data, model development approach, model calibration, and results of a sensitivity analysis. The report will be produced in draft form, and will be finalized upon receipt and addressing comments.

2.4.1 Prepare Draft Report

A draft model report will be prepared and provided to the Upper District in electronic format for review and comment.

2.4.2 Prepare Final Report

Comments received on the draft model report will be addressed and the final model report will be prepared. Five (5) copies of the final report and a PDF file of the final report will be provided to Upper District.

Deliverables

- Draft Report in electronic form for review and comment

- Final Report in electronic form and five (5) hard copies

Task 3 Project Management and Coordination

Subtask 3.1 Project Management and Coordination

Coordination with data providers and others will be performed during the course of technical studies. Management of the overall technical studies process will be performed to ensure that project requirements are met. Regular progress reports (monthly to quarterly) will be prepared on tasks, budgets, and schedules.

Subtask 3.2 Public Outreach, Training, and Meetings

The purpose of this subtask is to provide public outreach support for the project. The goal is to ensure that an appropriate level of reporting and feedback is implemented among the technical team, and between the technical team and the public, including the Watermaster and the Upper District staff, and participating members. Public outreach will include workshops, meetings and presentations held quarterly to update project status, review information collected and encourage participation and contribution to the overall process of the project. These public outreach events will ultimately be conducted under another contract, except as described below.

Upon completion of Subtask 1.3, one training session will be performed, which includes a Powerpoint presentation, live demonstration, and user documentation.

Watermaster and Upper District Meetings

There will be up to 4 meetings with Watermaster and Upper District staff to coordinate work.

Upper District Board Meetings

Presentations will be given at three public Board meetings to discuss accomplishments to date and future work. These meetings will be held in coordination with Watermaster and Upper District staff. Information obtained at those meetings will be incorporated into the model development.

Technical Work Groups

The modeling project team will coordinate with the Upper District and relevant stakeholders regularly during the project. Up to eight (8) meetings are planned for this task.