

SEASIDE BASIN WATERMASTER
REQUEST FOR SERVICE

DATE: 2/4/2009

RFS NO. 2009-02
(To be filled in by WATERMASTER)

TO: Derrick Williams
HydroMetrics LLC
PROFESSIONAL

FROM: Robert Jaques
Technical Program Manager
WATERMASTER

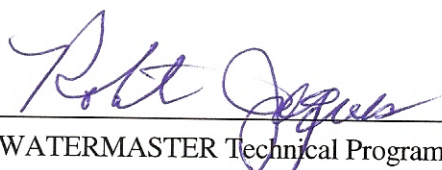
Services Needed and Purpose: See Scope of Work in Attachment 1.


Completion Date: All work of this RFS shall be completed not later than December 31, 2009, and shall be performed in accordance with the Schedule contained in Attachment 1.

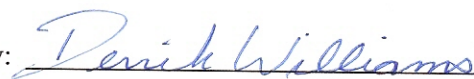
Method of Compensation: Time and Materials (As defined in Section V of Agreement.)

Total Price Authorized by this RFS: \$ 286,240.00 (Cost is authorized only when evidenced by signature below.)
(See Table 1 in Attachment 1 for Detailed Breakdown of Estimated Costs).

Total Price may not be exceeded without prior written authorization by WATERMASTER in accordance with Section V. COMPENSATION.

Requested by:  Date: 1/27/09
WATERMASTER Technical Program Manager

Authorized by:  Date: 1/20/09
WATERMASTER Chief Executive Officer

Agreed to by:  Date: Jan 22 2009
PROFESSIONAL
HydroMetrics

ATTACHMENT 1

Scope of Work for Protective Elevations

Task 1: Develop Protective Groundwater Elevation Goals and Objectives

Protective groundwater elevations depend strongly on the depth and location of the aquifer that will be protected. Protecting a deep aquifer at the shoreline requires a higher groundwater level than protecting a shallow aquifer inland.

In coordination with TAC members, the desired locations and depths for the freshwater/seawater interface will be determined. It is anticipated that the location will either be at the coastline or some point offshore. Additionally, the Professional will work with the TAC to determine if groundwater should be held in offshore storage for drought supply.

With the assistance of the TAC, a determination will be made of how many protective groundwater elevation locations are required. Generally, protective groundwater elevations are only useful at existing or future monitoring well locations. Useful existing and potential new coastal monitoring well locations will be identified for modeling.

For costing purposes, it is assumed that five well locations will be modeled, and that one meeting with the TAC will be required to develop the goals and objectives for the protective groundwater modeling.

Deliverables: Not less than 10 days prior to the meeting with the TAC, a Technical Memo will be provided to the Watermaster's Technical Program manager in electronic format describing the issues the TAC should consider in providing direction on the Goals and Objectives to be developed under this Task, and any recommendations the Professional would like the TAC to also consider in providing that direction.

Task 2: Develop Protective Groundwater Elevations

A series of cross-sectional models will be created that show where the freshwater/seawater interface is located for known groundwater elevations in monitoring wells. These models will then be used to determine target groundwater elevations that maintain the position of the interface sufficiently far offshore to protect the Basin's aquifers.

The position of the freshwater/seawater interface depends on the density difference between freshwater and seawater, and on the groundwater level at the monitoring well. This modeling will require a density dependent groundwater flow model. The USGS SEAWAT model will be used to for this Task.

A cross-sectional, two-dimensional model will be developed at each of the coastal monitoring well or potential monitoring well locations. The cross-sectional model of each site will be layered to reflect the aquifer and aquitard units according to the current conceptual hydrogeologic model. These cross-sectional models will span the depth of the aquifer units and extend offshore beneath the ocean. Aquifer parameters e.g. hydraulic conductivity, storativity, etc. for each unit will be taken from existing estimates of these parameters for the various aquifer units.

Results from this task will include a range of reasonable groundwater elevations that are protective of seawater intrusion of the Basin's aquifers.

Deliverables: At the conclusion of work on this Task a Draft Technical Memo will be provided to the Watermaster's Technical Program manager in electronic format describing the work that was performed under this Task, including the modeling results, and any recommendations the Professional would like the TAC to consider. Following review by the TAC, the Professional will address any questions or comments from the TAC by preparing a Final Technical Memo.

Scope of Work for Groundwater Flow Model

Figure 1 presents the steps that will be taken in developing the Seaside Groundwater Basin model.

Task 3: Develop Model Goals and Objectives

General objectives of the basin wide groundwater model include:

- Evaluating selected supplemental water projects,
- Evaluating selected management actions,
- Determining storage efficiency of recharged water, and
- Verifying Total Useable Stored Groundwater and Total Useable Storage Space.

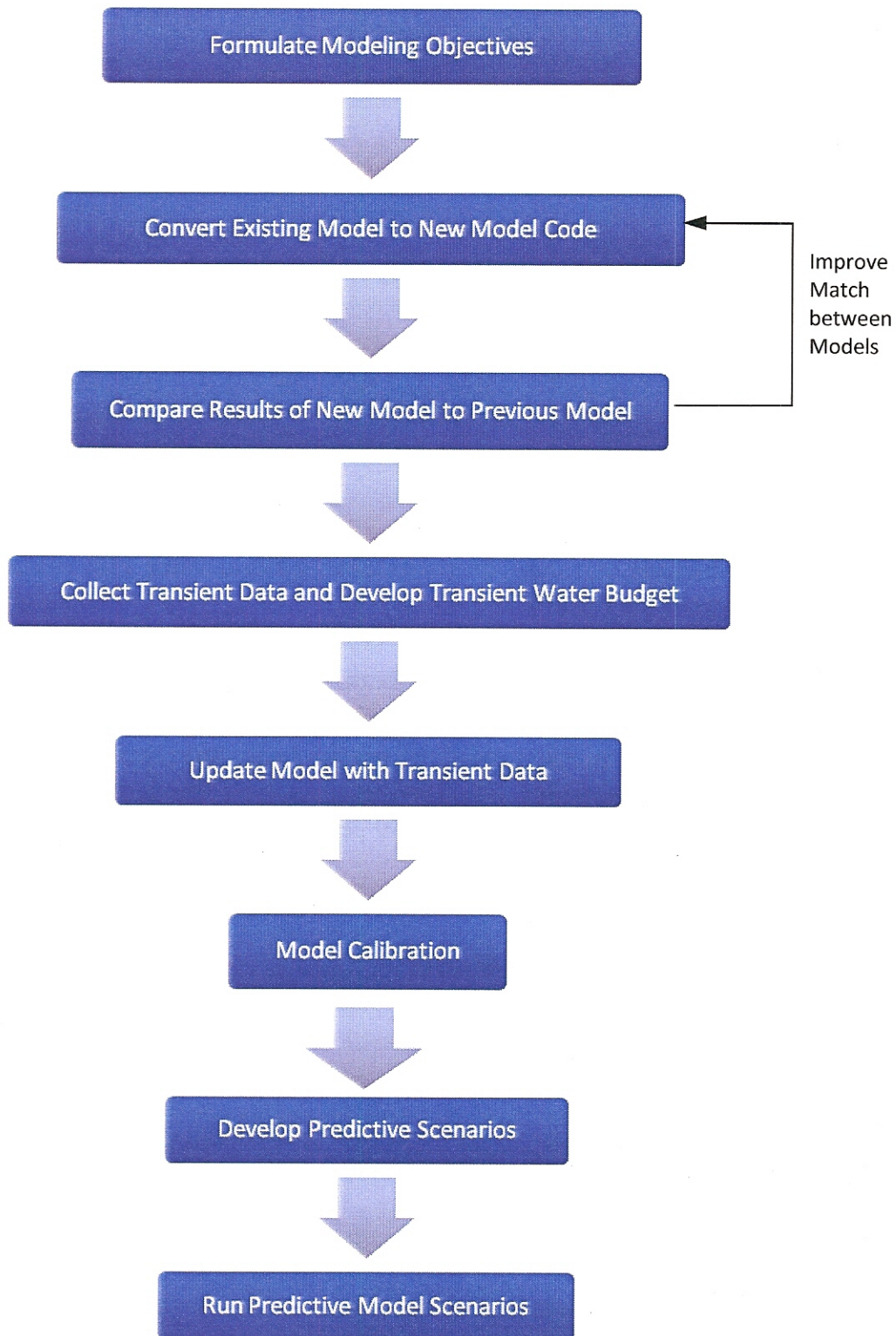


Figure 1: Model Development Process

The first step in developing the groundwater model will be a workshop with the TAC to agree upon specific model objectives. This will include developing a list of probable questions the model may be used to answer. The workshop will be facilitated by HydroMetrics LLC.

The defined model objectives will dictate which features of the Basin should be represented in the model, and to what degree of accuracy. In some cases averaged groundwater levels taken over large areas may be satisfactory, while in others groundwater levels at specified points may be necessary. The time periods simulated by the model (annual, quarterly or monthly) will also need to be decided upon based on the goals and objectives for the model.

Deliverables: Not less than 10 days prior to the workshop with the TAC, a Technical Memo will be provided to the Watermaster's Technical Program manager in electronic format describing the issues the TAC should consider in providing direction on the Goals and Objectives to be developed under this Task, and any recommendations the Professional would like the TAC to also consider in providing that direction.

Following the workshop, a written summary of the issues discussed during the workshop, and the conclusions and decisions reached at the workshop, will be prepared by the Professional and provided to the Technical Program Manager in electronic format to memorialize these actions.

Task 4: Develop Groundwater Flow Model

Subtask 4.1: Convert Existing Groundwater Model to New Model Code

The existing Seaside Basin Groundwater Model was developed using the USGS FEMFLOW model. This model is well documented and adequately checked, however the model code is not commonly used. Because this model is not commonly used, there are limited programs available for analyzing and modifying it. Other, more commonly used models are better suited for model modification, calibration, and display of model results.

The present model will be converted to either the FEFLOW or MODFLOW codes. Coordination with TAC members will be done to identify the pros and cons of each model code. After importing all relevant data to the new model code, it will be demonstrated that the model results from the new code are similar, although not identical, to the FEMFLOW results. This will confirm that all relevant information has been correctly transferred to the new model.

One meeting with the TAC is assumed for this subtask.

Deliverables: Not less than 10 days prior to the meeting with the TAC, a Technical Memo will be provided to the Watermaster's Technical Program manager in electronic format describing the

pros and cons of each model, so that the TAC can provide informed direction on the model to be used. The Professional will also provide any recommendations it would like the TAC to also consider in providing that direction.

Following the meeting, a written summary of the issues discussed during the meeting, and the conclusions and decisions reached at the meeting, will be prepared by the Professional and provided to the Technical Program Manager in electronic format to memorialize these actions.

Subtask 4.2: Collect Transient Data and Develop Transient Water Budget

Two important modifications to the existing Seaside Groundwater Basin model will be converting it to a transient (or time dependent) model, and developing a complete water budget separate from the groundwater model. These recommendations were presented in an earlier memorandum on the existing groundwater model (HydroMetrics LLC, September 27, 2007).

Historical hydrologic data will be required to convert the model to a transient model. Historical groundwater pumping data, historical groundwater elevation data, historical precipitation and evaporation data, as well as any other data necessary for a developing a complete water budget will be collected. It is assumed that the Monterey Peninsula Water Management District (MPWMD) will provide historical pumping data. Where possible, the Seaside Groundwater Basin Database will be accessed for data such as groundwater elevations.

The data will be combined into a complete water budget that includes estimates of flow across the coastline and other potential boundary flows. These boundary flows will be estimates that guide model calibration.

For budgetary purposes, it is assumed that one trip to MPWMD will be made to co-ordinate data collection.

Deliverables: At the conclusion of work on this Subtask a brief Technical Memo will be provided to the Watermaster's Technical Program manager in electronic format describing the work that was performed under this Task.

Subtask 4.3: Update and Calibrate Groundwater Model

Historical pumping, recharge, and groundwater elevation data, will all be incorporated into the groundwater model. The model will be calibrated to within acceptable tolerances, as agreed to by the TAC during the workshop on modeling objectives in Task 3.

Up to two meetings are assumed for this subtask to discuss technical modeling issues with the TAC. These meetings will also be used as progress meetings.

Deliverables: Not less than 10 days prior to each meeting with the TAC, a Memo will be provided to the Watermaster's Technical Program manager in electronic format describing the topics and issues the Professional wishes to discuss at the meeting, so that the TAC will be prepared for those discussions. The Memo will also include any recommendations the Professional would like the TAC to consider during those discussions.

Following the two meetings, a written summary of the issues discussed during the meetings, and the conclusions and decisions reached at the meetings, will be prepared by the Professional and provided to the Technical Program Manager in electronic format to memorialize these actions.

Task 5: Develop and Run Predictive Model Scenarios

Subtask 5.1: Develop Predictive Model Scenarios

In coordination with TAC members predictive model scenarios that represent realistic projects to supplement water supply in the Seaside Groundwater Basin will be developed. It is assumed that analyses of the projects have been completed and that only the input (recharge) and output (groundwater extraction) components will be considered in the model scenarios. For costing purposes, developing up to five scenarios is anticipated. Example scenarios may include developing in-lieu recharge by providing supplemental sources in excess of the annual basin overdraft; injecting water into the existing MPWMD ASR wells in excess of the annual basin overdraft; developing an injection barrier along the coast; or recharge of highly treated wastewater via MRWPCA's proposed Ground Water Recharge Project using either surface spreading, vadose zone injection wells, and/or direct aquifer injection wells.

One TAC meeting will be held to discuss and select five model scenarios. The final model calibration from Subtask 4.3 will also be presented at this meeting.

Deliverables: Not less than 10 days prior to the meeting with the TAC, a Memo will be provided to the Watermaster's Technical Program manager in electronic format describing the topics and issues the Professional wishes to discuss at the meeting, so that the TAC will be prepared for those discussions. The Memo will also include any recommendations the Professional would like the TAC to consider during those discussions.

Following the meeting, a written summary of the issues discussed during the meeting, and the conclusions and decisions reached at the meeting, will be prepared by the Professional and provided to the Technical Program Manager in electronic format to memorialize these actions.

Subtask 5.2: Run and Evaluate Predictive Model Scenarios

Using the calibrated groundwater model developed in Subtask 4.3, the five predictive scenarios developed in Task 5.1 will be simulated. The Seaside Groundwater Basin model will be run with each scenario and the results analyzed based on:

- Ability to meet protective elevations,
- Storage efficiency of recharged water (i.e., how much of the recharged water can be extracted), and
- Change in basin wide groundwater flow directions, especially along the northern basin boundary.

Deliverables: No deliverables are required under this Subtask. The work performed under this Subtask will be described and discussed in the Model Report to be prepared under Task 6.

Task 6: Report

A Model Report will detail the methodology and results from all of the activities included in Tasks 1 through 5. The report serves as both a record of the models' development, and as reference documents for future model users. Our documentation will include a discussion of data adequacy, provide suggestions for strengthening the existing data set, and present guidelines for regularly updating and improving the model.

Deliverables: The Watermaster's Technical Program Manager will be provided with both draft and final documents for distribution to TAC members for their review. Fifteen printed and bound copies of the Draft Model Report and 15 printed and bound copies of the Final Model Report will be provided. Additionally, the final document will be provided to the Technical Program Manager in electronic format in MS Word.

COST

The estimated costs to complete the work described in the above scope are included in Table 1.

SCHEDULE

The work will be performed in accordance with the attached time Schedule.

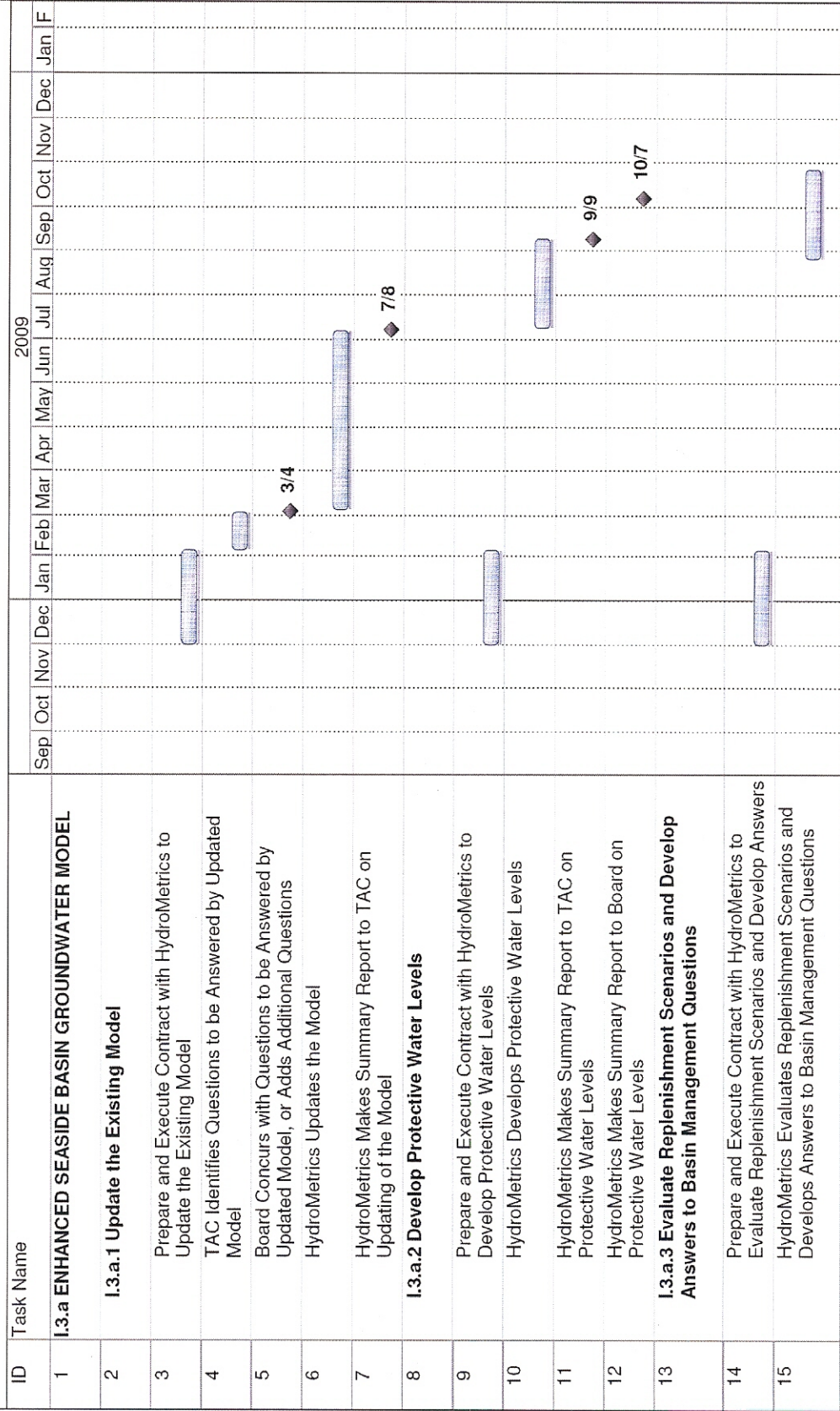
TABLE 1. ESTIMATED COSTS

	Hours				Cost				Direct Costs	Total Costs
	Derrick Williams	Cameron Tana	Georgina King	Dave Van Brocklin	Derrick Williams	Cameron Tana	Georgina King	Dave Van Brocklin		
PROTECTIVE ELEVATIONS										
Task 1: Develop Protective Groundwater Elevation Goals	20	0	40	0	\$3,600	\$0	\$6,400	\$0	\$700	\$10,700
Task 2: Model Protective Groundwater Elevations	12	80	0	80	\$2,160	\$12,800	\$0	\$10,400	\$400	\$25,760
GROUNDWATER FLOW MODEL										
Task 3: Develop Model Goals and Objectives	20	0	20	0	\$3,600	\$0	\$3,200	\$0	\$150	\$6,950
Task 4: Develop Groundwater Flow Model										
Subtask 4.1 Convert Groundwater Model to New Code	50	40	0	120	\$9,000	\$6,400	\$0	\$15,600	\$300	\$31,300
Subtask 4.2 Develop Transient Water Budget	40	40	80	160	\$7,200	\$6,400	\$12,800	\$20,800	\$700	\$47,900
Subtask 4.3 Update and Calibrate Groundwater Model	80	180	0	140	\$14,400	\$28,800	\$0	\$18,200	\$1,000	\$62,400
Task 4 Total	170	260	80	420	\$30,600	\$41,600	\$12,800	\$54,600	\$2,000	\$141,600
Task 5: Develop and Run Predictive Model Scenarios										
Subtask 5.1: Develop Predictive Model Scenarios	20	0	40	8	\$3,600	\$0	\$6,400	\$1,040	\$250	\$11,290
Subtask 5.2: Run and Evaluate Predictive Model Scenarios	40	60	40	120	\$7,200	\$9,600	\$6,400	\$15,600	\$100	\$38,900
Task 5 Total	60	60	80	128	\$10,800	\$9,600	\$12,800	\$16,640	\$350	\$50,190
Task 6: Report	36	16	140	120	\$6,480	\$2,560	\$22,400	\$15,600	\$4,000	\$51,040
Total	318	416	360	748	\$57,240	\$66,560	\$57,600	\$97,240	\$7,600	\$286,240

Hourly Rates:
 Derrick Williams \$180
 Cameron Tana \$160
 Georgina King \$160
 Dave Van Brocklin \$130

SCHEDULE

HydroMetrics LLC RFS No. 2009-02 Work Schedule



HydroMetrics LLC RFS No. 2009-02 Work Schedule

ID	Task Name	2009																				
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb			
16	HydroMetrics Makes Summary Report to TAC Regarding Evaluation of Replenishment Scenarios and Answers to Basin Management Questions																					
17	HydroMetrics Makes Summary Report to Board Regarding Evaluation of Replenishment Scenarios and Answers to Basin Management Questions																					

Special TAC Meeting
10/28

◆ 11/4