Notice and Agenda of a Meeting of the Special Project Committee of the Beaumont Basin Watermaster

Thursday, April 3, 2014 at 10:00 a.m.

Meeting Location:

Beaumont Cherry Valley Water District
560 Magnolia Avenue
Beaumont, California 92223
(951) 845-9581

Watermaster Members:

City of Banning
City of Beaumont
Beaumont Cherry Valley Water District
South Mesa Water Company
Yucaipa Valley Water District

I. Call to Order

II. Roll Call

III. Pledge of Allegiance

IV. Public Comments At this time, members of the public may address the Beaumont Basin Watermaster on matters within its jurisdiction; however, no action or discussion may take place on any item not on the agenda. To provide comments on specific agenda items, please complete a Request to Speak form and provide that form to the Secretary prior to the commencement of the meeting.

V. Special Project Committee of Beaumont Cherry Valley Water District, City of Banning, Yucaipa Valley Water District, and South Mesa Mutual Water Company

A. Status Report on the Beaumont Basin Groundwater Model and Redetermination of Safe Yield [Watermaster Memorandum No. 14-02, Page 2 of 15]

Recommendation: No recommendation.

VI. Topics for Future Meetings

VII. Comments from the Watermaster Committee Members

VIII. Announcements

A. The next regular meeting of the Beaumont Basin Watermaster is scheduled for Wednesday, June 4, 2014 at 10:00 a.m.

IX. Adjournment

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 14-02

Date: April 3, 2014

From: Joseph Zoba, Treasurer

Subject: Status Report on the Beaumont Basin Groundwater Model and Redetermination of Safe Yield

Recommendation: No recommendation.

As a result of litigation initiated by the City of Beaumont, the Beaumont Groundwater Model and Redetermination of Safe Yield has been classified as a Special Project of the Watermaster to include the following Watermaster Committee Members:

Beaumont Cherry Valley Water District
City of Banning
Yucaipa Valley Water District
South Mesa Mutual Water Company

At this meeting, the consultant will provide an overview of the safe yield model results for the Beaumont Basin.

Technical Memorandum

To: Mr. Hannibal Blandon
Alda Engineering

From: Thomas Harder, P.G., CH.G.
Thomas Harder & Co.

Date: 28-Jan-14

Re: Report on the Reevaluation of the Safe Yield of the Beaumont Basin

At the 5-Feb-14 Beaumont Basin Watermaster Board meeting, we will present the results of our analysis of the reevaluation of the Safe Yield of the Beaumont Basin Adjudicated Area. The Safe Yield of the Beaumont Basin Adjudicated Area has been reevaluated through a detailed water balance using a combination surface and groundwater flow modeling. We will provide a presentation that includes the following:

1. A review of the study objective.
2. A description of the Safe Yield evaluation methodology.
3. A summary of the Beaumont Basin conceptual model.
4. A description of the Beaumont Basin numerical model.
5. A description of the model calibration.
6. A summary of the water balance of the Beaumont Basin Adjudicated Area.
7. Conclusions regarding the Safe Yield of the Beaumont Basin Adjudicated Area.
8. Considerations for basin management based on the Safe Yield reevaluation results.
9. Recommendations for additional data collection to help refine our understanding of the basin.

Thomas Harder & Co.
1260 N. Hancock St., Suite 109
Anaheim, California 92807
(714) 779-3875

Beaumont Basin Watermaster

INDEPENDENT CONTRACTOR'S TASK ORDER ISSUED TO ALDA, INC.

TASK ORDER NO. 3

Project Title: Professional Engineering Services - Groundwater Model Update and Redetermination of Safe Yield

Task Order Authorization Date: January 9, 2013

Contractor Name: Alda, Inc.
Contact: Mr. F. Anibal Blandon
Address: 5928 Vineyard Avenue
Alta Loma, California 91701
Telephone: (909) 587-99160
Fed. Tax ID #: _____

SUMMARY OF TASK ORDER:

Description	Amount	Reference
Original Contract Amount	$229,210	Watermaster Memorandum No. 13-02

This TASK ORDER No. 3 is issued pursuant to that certain Agreement for Services by Independent Contractor between the BEAUMONT BASIN WATERMASTER ("OWNER") and ALDA, INC. (CONTRACTOR") dated May 16, 2012 (the "AGREEMENT").

The OWNER and CONTRACTOR have entered into this TASK ORDER as specifically set forth herein below, and except as specifically provided herein, the AGREEMENT shall remain in full force and effect as originally stated.

1. Tasks to be Performed & Compensation. CONTRACTOR shall provide all labor, materials and equipment to perform the following tasks as fully described in the attached Task Order No. 3 Scope of Services dated January 3, 2013 and the proposal to Provide Professional Engineering Services by the CONTRACTOR dated April 16, 2012.

2. Term. This Task Order shall remain in full effect until the proposed project is completed which is estimated to be by December 31, 2013.

IN WITNESS WHEREOF, the parties have executed this Task Order No. 3 on the date indicated below.

Beaumont Basin Watermaster		**Alda, Inc.**	
By:	_____	By:	_____
Dated:	January 9, 2013	Dated:	_____
Name:	Duane Burk, Chairman	Name:	_____

Beaumont Basin Watermaster – Task Order No. 3
GW Model Update and Re-determination of Safe Yield 3-Jan-13

Task Objectives

The objectives of Task No. 3 are as follows:

A. Update the existing surface and groundwater flow models and calibrate them through 2012

B. Re-evaluate the Safe Yield of the Beaumont Basin in accordance to the Judgment

C. Develop methodologies for addressing other important Watermaster functions, including recharge from recycled water discharges by the City of Beaumont, new yield, and groundwater losses from the basin.

Background and Approach

Although there are multiple methods available for estimating the safe yield of a groundwater basin, the most comprehensive evaluation is through a calibrated, distributed parameter, numerical surface and groundwater flow model. As presented at our December 2012 workshop, the analysis necessary to complete and calibrate a model provides the most complete representation of the water balance of the basin. Further, the model will provide a valuable tool to address other aspects of the Judgment including:

- ✓ New yield estimates
- ✓ Groundwater losses from the basin
- ✓ Potential changes in safe yield over time from past and future land use changes
- ✓ Optimum management of groundwater resources from planned operation
- ✓ Identification of data gaps

Fortunately, a surface and groundwater flow model has already been developed for the Beaumont Basin and is available for use. The United States Geological Survey (USGS) developed a surface and groundwater flow model for the Beaumont Basin and published the results in 2006.[1] This model was developed using the USGS code MODFLOW, a three-dimensional numerical finite difference modeling code. The model is public domain, encompasses the entire Beaumont Basin and simulates hydrological and hydrogeological conditions from 1927 through 2003.

Although the existing model provides a good basis for evaluating groundwater resources in the Beaumont Basin, it will need to be updated and refined for the purpose of re-determining the safe yield of the basin. The following updates/refinements are necessary:

[1] Rewis, D.L., Christensen, A.H., Matti, J.C., Hevesi, J.A., Nishikawa, T., Martin, P., 2006. *Geology, Ground-Water Hydrology, Geochemistry, and Ground-Water Simulation of the Beaumont and Banning Storage Units, San Gorgonio Pass Area, Riverside County, California.* USGS Scientific Investigations Report 2006-5026.

- ✓ The existing model simulates hydrological and hydrogeological conditions through 2003. The model will need to be updated with pumping, recharge and other data from 2003 through 2012.
- ✓ The grid in the USGS model consists of approximate 820-ft squares. While this grid spacing met the objectives of the USGS for a regional analysis of groundwater recharge and flow characteristics, it will be necessary to refine the grid to provide better resolution for simulating groundwater pumping, artificial recharge, return flow recharge, stream bed infiltration and other processes. We are recommending 200-ft grid cells throughout the model area.
- ✓ Pumping and recharge stresses in the current USGS model are varied on an annual basis. While this met the USGS's original objectives for the model, it will be necessary to create monthly stress periods for the latter parts of the transient model calibration in order to simulate seasonal changes in recharge and pumping. Based on our review of available data, it is proposed to maintain annual stress periods from 1927 through 1999 and create monthly stress periods from 2000 to 2012.
- ✓ Finally, it would be beneficial to reevaluate some of the simplifying land use and hydrogeological assumptions that were incorporated into the existing model. We are proposing to vary land use over time (the existing model does not). We are also proposing to reevaluate aquifer parameters in the model area (the existing model uses one specific yield value for the entire model area).

Regardless of these necessary changes, updating and refining the existing model tool will save both time and money over developing a new model.

Our recommended approach to updating the USGS model includes the following main tasks:

1. Obtain and Compile Data to Update the Model
2. Update and Refine the Existing USGS Groundwater Flow Model
3. Update and Refine the Existing USGS Surface Water Model
4. Calibrate the Surface and Groundwater Flow Model through December 2012
5. Reevaluate the Safe Yield of the Beaumont Basin Using the Calibrated Model
6. Prepare a Report Summarizing the Findings

In addition, we have included a task to develop the methodologies for addressing other important Watermaster functions, including recharge from recycled water discharges by the City of Beaumont, new yield resulting from surface water capture and recharge, and groundwater losses from the basin. As part of this task, we will contact the administrative staff for other groundwater basins in Southern California to obtain information related to their methodologies used for addressing these issues.

SCOPE OF WORK

Task 1 – Obtain and Compile Data

The first task will be to obtain and compile the data necessary to refine and update the USGS model. The specific types of data to be compiled will include:

- ✓ Geological Data
  - Reports and studies on faults in the Beaumont Basin
  - Detailed borehole lithologic logs
  - Driller's logs
  - Geophysical logs
  - Surficial soil type maps
- ✓ Hydrogeological Data
  - Pumping test data/aquifer parameters (transmissivity, hydraulic conductivity, and storativity/specific yield)
  - Groundwater levels
- ✓ Basin Operational Data
  - Groundwater production
  - Artificial recharge
  - Imported water deliveries
  - Wastewater treatment plant inflows/outflows
- ✓ Surface Water Hydrological Data
  - Precipitation
  - Evapotranspiration
  - Stream flow
- ✓ Land Use Data
  - Land use/land cover maps
  - Crop data
  - Satellite imagery

Sources of data will include online databases, previous Beaumont Basin Annual Reports, and the various agencies in the basin. Letter requests for this information will be forwarded to all applicable agencies. It will also be necessary to send a request for driller's logs to the California Department of Water Resources (CDWR). Where possible, data will be obtained in electronic format as database or spreadsheet files. Maps and aerial coverage will be obtained as Geographic Information System (GIS) files to expedite the analysis. The budget for this task includes two trips to the Beaumont area to assist local agencies, as necessary, to obtain the data, reports and maps.

Task 2 – Refine the Groundwater Flow Model

Subtask 2.1 Model Grid and Boundary Conditions

It is recommended to refine the model grid spacing from the current 820-ft square cells to 200-ft square grid cells throughout the model area. In refining the grids, it will be necessary to adjust boundary conditions to accommodate the refined grid spacing. In addition, given that most of the model edge is constructed of General Head Boundaries, it will be necessary to update the reference head in these areas from 2003 through 2012. The ALDA/TH&Co team will refine the grid spacing, adjust the boundary conditions to accommodate the new grid spacing, and update the reference heads at the boundary.

Subtask 2.2 Update Calibration Target Well Hydrographs

Groundwater levels for wells used as calibration targets in the USGS model will be updated from 2003 through 2012. This will include updates to the groundwater level hydrographs for up to 12 wells.

Subtask 2.3 Update Aquifer Properties

Although the USGS model already has spatially distributed aquifer properties (hydraulic conductivity and specific yield), data has been collected since 2003 that can be used to refine the previous distribution (e.g. BCVWD Wells 24, 25 and 26 have been drilled and tested since 2003 and the Noble Creek Recharge Basins have gone into service providing information). Utilizing new data from Task 1, the ALDA/TH&Co team will update, as appropriate, the hydraulic conductivity distribution in the model.

In addition, the USGS model uses simplifying assumptions with respect to the specific yield characteristics of the aquifer sediments (it uses one value for the model). Specific yield is a measure of the ability of sediments to take water into storage or release water from storage. A representative specific yield distribution is important in developing a reliable safe yield estimate for the basin. Other studies have provided specific yield distribution but the bases for the results have not been available to review. Accordingly, it is proposed to reevaluate the specific yield distribution within the Beaumont Basin. This will be conducted through an analysis of detailed borehole lithologic logs, driller's logs, and geophysical logs.

Subtask 2.4 Evaluate Fault Characteristics

The Beaumont Basin is bounded by faults, which act as barriers to groundwater flow. There has been uncertainty as to the amount of groundwater that flows across the faults and into the basin, particularly along the Banning Fault on the north side of the basin. The amount of flow that enters the basin affects the safe yield. Multiple studies have been conducted in the past to understand groundwater flow across the faults. The ALDA/TH&Co team will review these studies as well as recent data collected by the USGS. Any new findings will be incorporated into the model.

It is noted that this task consists of a "paper" study only and no additional field work to investigate the faults is proposed. In the event that the study identifies areas and methods for

further investigation, they will be specified in the summary report for potential investigation at a later time.

Task 3 – Refine the Surface Water Model

Surface water flow was addressed by the USGS using a precipitation/runoff model code called Infil v.3. The original model was calibrated through 2003 and will need to be updated through December 2012. In addition, there are a number of refinements necessary for the purpose of safe yield determination. The updated USGS model is constructed with a single land use designation through time. Given that land use in the Beaumont area has changed significantly in the last 40 years and given that these changes affect return flow and, therefore, the safe yield, it is proposed to incorporate land use changes into the model. It is also recommended to reevaluate the return flow assumptions for the various land use conditions for the model.

Subtask 3.1 Land Use Evaluation

The ALDA/TH&Co team will generate land use distribution maps for up to seven representative time periods since 1970. Electronic versions of land use maps are available for 1990, 1993, 2000, and 2006. The ALDA/TH&Co team will generate two additional land use maps representative of 1970s land use conditions, 1980s land use conditions and a recent time period (since 2006). Return flow values will be assigned to each of the land use conditions based on the analysis in Subtask 3.2 below.

Subtask 3.2 Return Flow Analysis

There are multiple sources of return flow to the groundwater system in the Basin, including agricultural irrigation, individual septic systems, and municipal irrigation (e.g. homeowner lawns and golf courses). The ALDA/TH&Co team will evaluate return flow over time in conjunction with the land use changes determined from Subtask 3.1. For example, agricultural irrigation return flow will be assigned values consistent with the crop type and irrigation efficiency. Return flow from septic systems and municipal irrigation will be evaluated with respect to water delivery records and, if necessary, pumping records, which provide an indication of the amount of water used on each parcel, consistent with its land use.

For this purpose of this task, it is assumed that the billing system used by the BCVWD identifies individual accounts in the Cherry Valley area by street address of the parcel served and assessor parcel number (APN).

Subtask 3.3 Update Stream Flow Records

Stream flow data for stream gages that will be used as calibration targets in the USGS model will be updated from 2003 through 2012. For cost estimating purposes, daily stream records will be updated for up to three stream gages.

Subtask 3.4 Analysis of Return Flow from Wastewater Discharge

The City of Beaumont operates a wastewater treatment plant in the southern part of the Beaumont Basin. Recycled water from the treatment plant is discharged into Cooper's Creek where a portion of it infiltrates into the subsurface. While most of the stream channel is located outside the Beaumont Basin, a portion of the channel extends over the adjudicated basin. Any infiltration in the channel segment that overlies the Beaumont Basin would become recharge in the Beaumont Basin, thus contributing to the safe yield.

The purpose of this subtask is to estimate the amount of recharge attributable to infiltration of discharge runoff from the wastewater treatment plant. As part of the analysis, the ALDA/TH&Co team will evaluate the previous method for estimating recharge to the Beaumont Basin from wastewater treatment plant discharge and determine if changes are necessary.

Task 4 – Update Surface Water Model Input Files

The ALDA/TH&Co team will update the Infil v.4 input files with daily precipitation and air temperature data from 2009 through 2012. Where necessary, historical precipitation data for the 102 weather stations used in the USGS model will be refined based on Doppler radar data (available since 2002) which will provide a more accurate spatial precipitation distribution.

Task 5 – Calibrate the Surface Water Model

The surface water model will be calibrated using the history-matching technique whereby model input parameters will be adjusted until model-generated stream flow at selected calibration points provide an acceptable match with measured stream flow.

Task 6 – Update Groundwater Flow Model Input Files

Pumping and recharge stresses in the current USGS model are varied on an annual basis. While this met the USGS's original objectives for the model, it will be necessary to create monthly stress periods for the latter parts of the transient model calibration in order to simulate seasonal changes in recharge and pumping. Based on our review of available data, it is proposed to maintain annual stress periods from 1927 through 1999 and create monthly stress periods from 2000 to 2012.

Monthly input files will be created for groundwater production and artificial recharge for the period January 2000 through December 2012. The cost estimate assumes creation of monthly input files for approximately 42 wells, two artificial recharge facilities (SGPWA spreading ponds and the Noble Creek artificial recharge facility), and recycled water discharges by the City of Beaumont.

Monthly areal recharge, mountain-front recharge, and return-flow recharge will be input for the same time period (January 2003 through December 2012) based on output from the surface water model. In addition, stream channel flow output from the surface water model will be

incorporated into the Stream Flow Routing package in the MODFLOW groundwater model to simulate recharge within unlined stream channels.

Task 7 – Calibrate Groundwater Model and Perform Sensitivity Analysis

The groundwater flow model will be calibrated using the history-matching technique whereby model input parameters will be adjusted until model-generated groundwater levels provide an acceptable match with measured groundwater levels. During calibration, the ALDA/TH&Co team will perform a sensitivity analysis to test the effects of varying certain model parameters on calibration. The results of the sensitivity analysis will be plotted on graphs and presented in the summary report described in Task 9. The final model calibration will also be presented in Task 9.

Task 8 – Analysis of Safe Yield

The ALDA/TH&Co team will use the updated and calibrated groundwater flow model to re-determine the safe yield of the Beaumont Basin. The analysis will involve a predictive simulation using the model to assess the combination of artificial recharge and pumping that result in stable groundwater levels over a 30-yr period of time (i.e. no net change in groundwater storage). Preliminarily, it is proposed to conduct the simulation using an average hydrology developed from a 40-yr base period. Land use will be maintained at 2012 conditions. Initial groundwater production and artificial recharge will be input based on planned pumping and recharge rates. The ALDA/TH&Co team will then adjust pumping and recharge in order to achieve equilibrium within the basin. The safe yield will be estimated from the water budget that results in long-term hydrologic equilibrium within the basin.

Task 9 – Prepare a Report on the Safe Yield of the Beaumont Basin

The results of the safe yield analysis using the calibrated groundwater flow model will be summarized in a report. The report will include:

- ✓ A background and purpose for the analysis
- ✓ A description of the original USGS model
- ✓ A description of the sources of data used to refine and update the USGS model
- ✓ A description of the hydrogeologic setting and updated conceptual model
- ✓ A description of the refined numerical model
- ✓ Results of the updated model calibration and sensitivity analyses
- ✓ A description of the methodology and assumptions used to analyze the safe yield of the basin using the model
- ✓ Results of the safe yield analysis
- ✓ Identification of data gaps for future collection and analysis

The report will include maps showing the model area, hydrogeologic setting, wells and recharge basins, boundary conditions, input parameter distribution and model analysis results. Supporting data and information will be provided in appendices as appropriate.

The budget for this task includes development and submittal of one draft version of the safe yield report for review and comment (ten hard copies with electronic files). Upon incorporation of comments, the ALDA/TH&Co team will generate one final version of the report (ten hard copies with electronic files).

Task 10 – Develop Methodologies for Addressing Recycled Water Recharge, Groundwater Losses and New Yield

The ALDA/TH&Co team will use the updated surface and groundwater models as the basis for developing methodologies to be used by the Beaumont Basin Watermaster in evaluating a) groundwater recharge credits resulting from the recycled water discharges by the City of Beaumont, b) New Yield that may result from the implementation of new surface water diversion and recharge projects, and c) potential groundwater losses resulting from the implementation of various groundwater recharge projects.

In addition, the ALDA/TH&Co team will contact the watermaster administrative staff for other groundwater basins in Southern California to obtain information related to their methodologies for addressing the above mentioned issues; up to three groundwater basin watermasters will be contacted by our team.

Task 11 – Project Management and Meetings

During the course of preparing the groundwater flow model, it is recommended to have meetings/workshops to provide model progress updates, present the methodology and assumptions for re-determining the safe yield, and present preliminary results of the analyses. The workshops will provide a forum for answering questions and obtaining feedback on assumptions. The budget for this task assumes four meetings/workshops in Beaumont between the time the scope of work is approved and the time the final report is submitted. Overall project management activities are also included as part of the budget for this task.

SCHEDULE

The attached Figure 1 shows the proposed schedule to perform Tasks 1 through 11 of this scope of work. The schedule assumes that all necessary data for developing the model can be obtained by the end of March, 2013. Based on this schedule, a draft report on the safe yield of the Beaumont Basin would be submitted to the Watermaster Board in October 2013.

COST ESTIMATE

Our estimated cost to perform the scope of work as outlined herein is estimated at $229,210.00; this estimate is based on 2,032 technical and administrative hours and is summarized in the attached table by task and sub-task.

Beaumont Basin Watermaster - Task Order No. 3

Update of the USGS Beaumont Basin Model and Re-Determine the Safe Yield of the Basin

Task	Description	Project Manager	Hydro-geologist	Project Engineer	Staff Engineer	Staff Geologist	Graphics	Clerical	Total Hours	Total Cost
Task 1 - Obtain and Compile Data		0	10	24	0	92	0	6	132	**$ 13,510**
Task 2 - Refine the Groundwater Model										**$ 35,060**
2.1	Refine Model Grid and Boundary Conditions	2	12	0	0	80	0	0	94	$ 9,420
2.2	Update Hydrographs (assume 12)	0	2	0	0	48	0	0	50	$ 4,640
2.3	Aquifer Properties									
	Transmissivity and Hydraulic Conductivity	2	4	0	0	24	0	0	30	$ 3,100
	Specific Yield Distribution Analysis	2	18	0	0	120	0	0	140	$ 13,980
2.4	Evaluation of Fault Characteristics	0	20	0	0	8	0	0	28	$ 3,920
Task 3 - Refine the Surface Water Model										**$ 38,640**
3.1	Land Use Evaluation	0	18	0	40	80	0	0	138	$ 14,480
3.2	Refine Return Flow Factors - Land Use	4	24	24	40	8	0	0	100	$ 12,800
3.3	Update Stream Flow Records	2	2	0	0	24	0	0	28	$ 2,780
3.4	Return Flow from Waste Water Discharge	2	6	24	24	16	0	0	72	$ 8,580
Task 4 - Update Surface Water Model Input Files		0	6	0	0	80	0	0	86	**$ 8,160**
Task 5 - Calibrate Surface Water Model		4	32	12	0	40	0	0	88	**$ 10,940**
Task 6 - Update Groundwater Model Input Files		0	22	12	12	140	0	0	186	**$ 19,060**
Task 7 - GW Model Calibration & Sensitivity Analysis		4	60	16	0	96	0	0	176	**$ 21,000**
Task 8 - Analysis of Safe Yield		0	60	24	0	120	0	0	204	**$ 23,640**
Task 9 - Prepare Safe Yield Report		4	60	16	16	72	60	16	244	**$ 26,740**
Task 10 - Development of Methodologies										**$ 18,060**
	Recycled Water Recharge	4	6	24	8	0	4	0	46	$ 6,020
	Groundwater Losses	4	6	24	8	0	4	0	46	$ 6,020
	New Yield	4	6	24	8	0	4	0	46	$ 6,020
Task 11 - Project Management and Meetings		32	42	16	0	8	0	0	98	**$ 14,400**
	TOTALS:	**70**	**416**	**240**	**156**	**1056**	**72**	**22**	**2032**	**$ 229,210**

BILLING RATES

Billing Rates for ALDA Inc. for Calendar Year 2013

Position	Hourly Rate
Project Manager	$150.00
Project Engineer	$135.00
Staff Engineer	$110.00
Graphics / Designer Drafter	$ 90.00
Drafter	$ 75.00
Clerical	$ 65.00

Billing Rates for Thomas Harder and Company for Calendar Year 2013

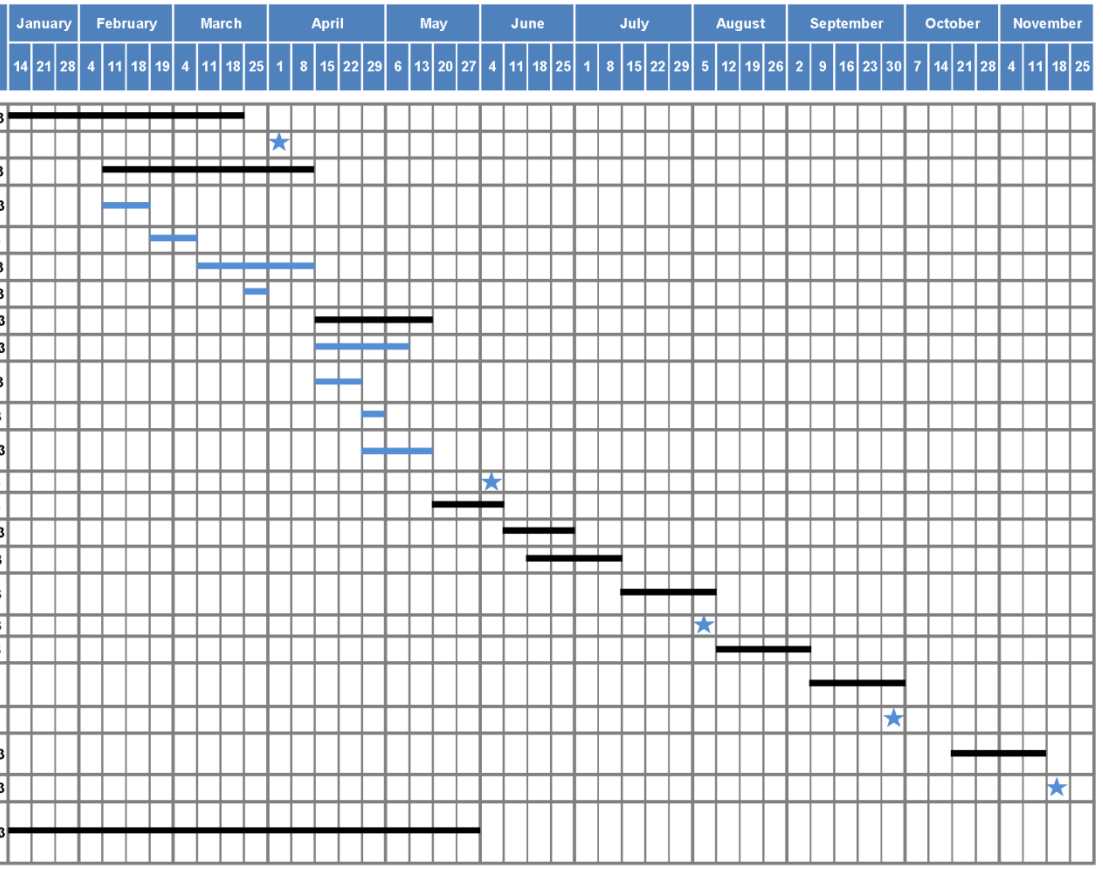
Position	Hourly Rate
Principal Hydro-geologist	$160.00
Staff Hydro-geologist	$ 90.00
Field Technician	$ 70.00
Graphics	$ 85.00
Clerical	$ 65.00
Expert Witness	$320.00

Beaumont Basin Watermaster
Alda, Inc.

FIGURE 1

Proposed Schedule to Update the USGS Beaumont Basin Groundwater Model and Re-Determine the Safe Yield of the Basin

Task	Subtask	Task Description	Duration (Business Days)	Start	Finish
1		Obtain and Compile Data	50	14-Jan-13	22-Mar-13
		Workshop #1	1	3-Apr-13	3-Apr-13
2		Refine the Groundwater Model	45	11-Feb-13	12-Apr-13
	2.1	Refine Model Grid and Boundary Conditions	10	11-Feb-13	22-Feb-13
	2.2	Update Hydrographs (assume 12)	10	19-Feb-13	8-Mar-13
	2.3	Aquifer Properties	25	11-Mar-13	12-Apr-13
	2.4	Evaluation of Fault Characteristics	5	25-Mar-13	29-Mar-13
3		Refine the Surface Water Model	25	15-Apr-13	17-May-13
	3.1	Land Use Evaluation	20	15-Apr-13	10-May-13
	3.2	Refine Return Flow Factors for Various Land Use Conditions	10	15-Apr-13	26-Apr-13
	3.3	Update Stream Flow Records	5	29-Apr-13	3-May-13
	3.4	Analyze Return Flow from Waste Water Discharge	15	29-Apr-13	17-May-13
		Workshop #2	1	5-Jun-13	5-Jun-13
4		Update Surface Water Model Input Files	14	20-May-13	8-Jun-13
5		Calibrate Surface Water Model	15	11-Jun-13	28-Jun-13
6		Update Groundwater Model Input Files	19	18-Jun-13	12-Jul-13
7		Calibrate the Groundwater Flow Model and Perform Sensitivity Analysis	20	15-Jul-13	9-Aug-13
		Workshop #3	1	7-Aug-13	7-Aug-13
8		Analysis of Safe Yield	19	12-Aug-13	6-Sep-13
9		Prepare Draft Report on the Safe Yield of the Beaumont Basin	20	9-Sep-13	4-Oct-13
		Workshop #4	1	2-Oct-13	2-Oct-13
		Incorporate Comments and Prepare Final Report on the Safe Yield of the Beaumont Basin	20	7-Oct-13	15-Nov-13
		Submit Final Report	1	18-Nov-13	18-Nov-13
10		Develop Methodologies for Addressing Recycled Water Recharge, Groundwater Losses and New Yield	99	14-Jan-13	31-May-13



Thomas Harder & Co.
Groundwater Consulting

4-Jan-12