



ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

October 26, 2004
Project No. 2005-3356

Monterey Peninsula Water Management District
Post Office Box 85
Monterey, California 93942

Attention: Mr. Joe Oliver

Subject: Proposal for Hydrogeologic and Engineering Services, Santa Margarita Test Injection Well, Water Year 2005 Program

Dear Joe:

In accordance with your request, Padre is pleased to present this scope of work for additional hydrogeologic and engineering services associated with the Santa Margarita Test Injection Well (SMTIW) project. We understand that the Monterey Peninsula Water Management District (District) anticipates that it will be able to obtain water for injection operations through the Cal-Am distribution system this winter, beginning as early as December 1, 2004 (depending on the timing of permit approval from SWRCB and flow conditions in the Carmel River). The District therefore desires to amend Padre's existing contract to develop and implement a test program for Water Year 2005 (WY2005) at the SMTIW site.

Background

The District has undertaken a Water Supply Augmentation Plan, which includes the evaluation of the feasibility of implementing an Aquifer Storage and Recovery ([ASR] a.k.a. injection/recovery) program on the Monterey Peninsula. The concept involves injecting 'excess' filtered and treated water originating from the Carmel River and Carmel Valley aquifer system into the aquifer system in the Seaside Basin. An expanded 'small' scale ASR project (1,300 to 1,800 acre per year yield) is currently being pursued by the District, and ASR is also being evaluated as a possible component of a California American Water Company (Cal-Am) sponsored alternative water supply project for the Monterey Peninsula (currently known as the Coastal Water Project).

As part of the investigation of ASR, the SMTIW was constructed in the spring of 2001. The well is constructed to a total depth of 720 feet, and is perforated solely in the Santa Margarita Sandstone aquifer to accurately assess the hydrogeologic conditions for injection/recovery of this formation. The design injection rate of the SMTIW is approximately 1,000 gallons per minute (gpm), i.e., approximately 4.4 acre-feet per day.

Formal testing of the SMTIW has been performed in WY2002, WY2003, and WY2004. During these past three injection seasons, a total of approximately 503 acre-feet (AF) of water have been successfully injected into the Seaside Groundwater Basin with the SMTIW.

Evaluation of the wells hydraulic performance over the past three years has confirmed that the design operational injection rate of 1,000 gpm is sustainable and is recommended for ongoing injection operations in order to maintain long-term capacity and performance.

Based on the testing and analyses conducted to date, it has also been determined that a second well could feasibly be constructed at the site and operated simultaneously with SMTIW, thereby increasing the overall injection capacity of the existing site. It is likely that another well constructed with a larger casing diameter (22 inches) would be capable of a greater injection capacity (up to 1,500 to 2,000 gpm) without inducing undesirable effects (i.e., water 'daylighting' at the ground surface). A preliminary Basis-of-Design is currently being developed for a second well at the site as part of the WY2004 project report.

Purpose and Scope

The overall purpose of the ongoing SMTIW program is to further demonstrate the capabilities and limitations of injection, storage, and recovery of treated Carmel River system water in the Santa Margarita Sandstone aquifer of the Seaside Groundwater Basin. While evaluation of injection well hydraulics and monitoring the groundwater basin response to injection will continue to be an important part of the WY2005 program, the focus of the program will be primarily on issues of water quality, particularly disinfection-by-products ([DPBs] i.e., trihalomethanes [THMs] and haloacetic acids [HAAs]).

Issues related to water quality are important because both intermixing with native groundwater, biodegradation, and geochemical interaction with aquifer minerals can affect the potability (i.e., DBPs, hydrogen sulfide, etc.) of the recovered water and the plugging rate of the injection well. During WY2004 testing, significant degradation (accounting for mixing/dilution effects) of DBPs was observed to be occurring in the subsurface. However, the observed degradation occurred following an initial increase in DBP levels during the storage period as a result of the residual chlorine in the injectate (up to 1.5 mg/l free chlorine) and continued formation of these compounds in the subsurface. Based on these observations, Padre is recommending that dechlorination of the injectate prior to injection will likely limit the additional formation of DBPs and that the observed degradation mechanisms will likely result in significant additional reductions of DBPs during storage and recovery.

Important aspects of the water quality investigative program to be conducted during WY2005 include the following:

- Perform testing of dechlorination of the injectate at the site;
- Monitor injectate water quality versus plugging rates;
- Identify water quality changes during subsurface storage associated with mixing and geochemical interactions, and;

- Perform further analysis of DBPs to assess the stability and fate of these compounds during aquifer storage, particularly the effects of dechlorination on their formation and degradation in the subsurface.

Scope of Services

Based on our understanding of the District's needs and our experience with the SMTIW and similar projects, we have prepared a scope of services to assist the District with the development and implementation of another complete injection/storage/recovery (ISR) program for WY2005. In addition to assisting the District with basic ASR system operations in the continuing program to enhance basin recharge for the public good, the WY2005 program specifically focuses on refining the understanding of water quality stability and long-term operational strategies. It is anticipated that the general level of assistance to District staff during the implementation of WY2005 SMTIW testing program will be similar to that provided during WY2004, with the addition of a dechlorination testing program.

Task 1 - Test Program Development. Padre will review existing conditions at the site and meet with District staff and Cal-Am to discuss test program goals and scheduling. Padre will provide the following services associated with program development.

- Project kickoff meeting(s) with District and Cal-Am.
- Develop hydrogeologic and water quality test program and data needs.
- Develop analytic laboratory testing schedule.

Task 2 - Test Program Implementation and Assistance. Padre will assist District staff with the implementation of the test program. Padre assistance is envisioned to be at a similar level as was provided during WY2004 and will include the following:

- Supervision of test initiation.
- Periodic field observation of critical phases of the test.
- Ongoing 'as-needed' assistance and training of District staff in operation of test facilities (i.e., FCV, water level transducers, dechlorination agent injection and monitoring, etc.).
- Provision of test logs and procedures to District staff.

It is estimated that Padre staff will assist with the initiation of each test phase (i.e., injection and recovery start-up), and provide on-going site visits on approximately a monthly basis, depending on program needs. Our budget estimate assumes a total of six (6) 2-day site visits by Padre staff over the course of the testing program.

This task assumes that Padre will be supported by District staff in the ongoing operation, data collection, and water sampling for the test program. At this time, it is estimated that District staff involvement at the SMTIW site will include approximately 1 hour per day for routine monitoring/sampling and up to 6 hours per week for backflushing operations. In order to further

reduce our costs, is also assumed that District staff will take a more prominent role in the monitoring well program of the project (i.e., routine maintenance, downloading of data, etc.). It is estimated that this would involve monthly downloading and status checks of the dataloggers in each of the monitoring wells by District staff (approximately 4 to 6 hours per event).

Task 3 - Water Quality Investigations. While it has been successfully demonstrated at the SMTIW and at other sites in California that successive injection/storage/recovery cycles can yield fully potable water upon recovery, issues regarding the fate and transport of DBPs in the subsurface can also affect the potability of the recovered water, and is of increasing interest by various regulatory agencies overseeing ASR programs. Based on the findings of the WY2004 program, additional information needs to be gathered to determine to what extent DBP formation in the subsurface can be managed/reduced through dechlorination of the injectate prior to injection. Potential increases or changes in subsurface bioactivity are also important issues that will be investigated; these mechanisms may be directly related to both DBP degradation and well plugging.

As presented above, additional formation of DBPs in the subsurface was observed during WY2004 and was considered to be the result of further reactions between the chlorine residual in the injectate and organic material in the injectate and/or subsurface. It is considered likely that dechlorination of the injectate prior to injection will limit the additional formation of DBPs during aquifer storage. This task will include the following:

- Evaluation of preferred dechlorinating agents at the SMTIW (e.g., ascorbic acid versus sodium bisulfite).
- Purchase/rent (as appropriate) and set-up of dechlorinating agent injection facilities (e.g., metering pump, storage tank, piping, instrumentation, etc.).
- Initiation of dechlorination testing and training of District staff in the operation of these test facilities.

Specific water quality testing and analyses to be performed in this task include the following:

- Monitoring of and tracking of field water quality parameters during various phases of injectate, storage, and recovery (including chloride ion).
- Periodic grab sampling and analysis for characterization and assessment of injectate and recovered waters to supplement field water quality data.
- Bioassay of injected, native, and backflush waters.
- Nutrient screening of injectate and native waters.
- Sampling and analysis of disinfection by-products (THMs and HAAs) for the injectate and recovered water.

It is assumed that District staff will assist with portions of the grab sampling program and delivery to courier/laboratories. It is also assumed that lab testing for certain analyses (e.g., general mineral and general physical parameters) will be provided by the District through the Monterey County Consolidated Laboratory. This testing will occur during both injection operations and recovery of injected waters. It is assumed recovery water will be pumped into the Cal-Am distribution system.

Task 4 - Coordinate Improvements to Luzern Booster Station. This task will involve coordination with Cal-Am and District staff to implement necessary improvements to Cal-Am's Luzern Booster Station for continued injection operations at the SMTIW, including:

1. Installation of a sound attenuation enclosure (i.e., a 'dog house') over the Luzern Booster pump, and;
2. Installation of flow control valve (FCV) at the booster pump to regulate flow volume/rate at the SMTIW.

At this time, it is our understanding that Cal-Am (or others under contract with Cal-Am, such as Monterey Peninsula Engineering) will implement these improvements at the Luzern site, with design assistance from Padre personnel (Note: we have included an optional task below for Padre to implement these improvements, should Cal-Am be unable to).

Task 5 - Data Analysis and Reporting. A summary of operations report will be prepared documenting the test program, procedures, and results. Conclusions regarding the relative success of the testing and recommendations for further analysis, modeling, or subsequent test phases will be provided. Much of the data and information developed in this task will be directly applicable to the District's planned expansion of the ASR program in the Seaside Basin and preparation of the upcoming Environmental Impact Report.

Optional Tasks

Given our understanding of the District's current budgetary constraints for WY2005, we have included several optional tasks that would be performed in the event additional financial resources are made available for the project. In addition to the above necessary tasks, there are several other items of work that are recommended to be performed as part of the WY2005 program to further advance the District's ASR program. These optional tasks are presented below:

Task 6 - (Optional) Prepare Plans and Specifications for Second ASR Well. As part of the WY2004 work, a preliminary Basis-of-Design for second well at the site, as well as a variety of capital improvements necessary for on-going and expanded operations at the SMTIW well site was performed (to be presented in the WY2004 Summary of Operations Report, currently in progress). It is our understanding that the District desires to take additional steps towards the implementation of a second well at the site during WY2005. Specific work items for this task include the following:

- Task 6.1 - Prepare technical specifications and construction drawings for a second ASR well at the SMTIW site (including the installation of a monitoring well). The documents are intended to provide adequate detail for bidding and well construction by competent, licensed (C-57) well drilling contractors (actual bidding and construction is anticipated to occur during WY2006).
- Task 6.2 - Design services for piping systems to provide up to 2,500 gpm of flow capacity for a second well at the SMTIW site (electrical not included). These services apply to facilities at the SMTIW site; it is assumed that design and modifications to the Cal-Am system to facilitate the increased flow to the SMTIW site will be made by Cal-Am.

Task 7 - (Optional) Implement Minor Capital Improvements. We have included as an optional task item the coordination and implementation of minor site improvements. Under this optional task, Padre would purchase the necessary equipment and secure the services of an outside contractor (e.g. Monterey Peninsula Engineering) to implement the site improvements, including:

- Task 7.1 - Implement Luzern Booster Station Improvements (e.g., the FCV and 'Dog House');
- Task 7.2 - Maintenance of the backflush pit (i.e., cleaning and rototilling of pit interior to restore/improve percolation rates);
- Task 7.3 - Restore the SMTIW pump motor (i.e., 'dip, bake, rewind');
- Task 7.4 - Minor site improvements to improve sampling, data collection, site access, and rainfall runoff control.

Task 8 - (Optional) Tracer Testing. It is possible that during WY2005 the water quality of the injectate could vary more than it did in WY2004 as a result of Cal-Am's utilization of various Carmel Valley system water sources during the injection period. Should this occur, the use of chloride ion as a 'natural tracer' may be compromised, which could complicate (or prevent) accurate quantification of the various subsurface reactions (i.e., mixing/dilution versus biodegradation) which affect the fate of the injected water in the aquifer. This optional task includes the analysis and comparison of injected and recovered waters utilizing a chemical tracer (e.g., iodide ion) to 'tag' the injectate, which would be used to assess the degree of intermixing within the aquifer and monitor recovery efficiency (i.e., the percentage of injected water molecules recovered by an ASR well in a given volume of extracted water).

Services Not Included

Completion of the test program may require the services of other entities as well as additional costs or fees, which are not included in our scope of services. These items are assumed to be provided by District staff, contractors retained by the District, or others. Work items that are not a part of our services include the following.

- Hermit and Mini-Troll transducers/data-loggers (assumed District provided)
- Analytic laboratory fees for analyses that can be performed by Monterey County Consolidated Laboratory
- Installation of sound enclosure and FCV at the Luzern Booster Pump (assumed to be performed by Cal-Am)
- Permit fees (if any)
- Cost of water, electricity, or other utilities
- Any others items not specifically included in Padre's scope of services

Schedule

The general schedule anticipated for the WY2005 test program is presented below:

- Injection Operations - December 1, 2004 through May 31, 2005 (depending on flow conditions in the Carmel River).
- Recovery Operations - June 1 through September 15, 2005.
- Summary of Operations Report (draft) - October 15, 2005.

Based on our current workload, we believe that we can commence work within 14 days of your authorization. We understand that in order to authorize this work, a formal contract amendment must first be approved by your Board and signed with the District.

Estimated Fees

Based on the scope of services presented herein, we estimate the fees for our services (not including optional tasks) will be approximately \$68,138, which will be billed on a time-plus-expenses basis in accordance with our current Fee Schedule (attached). A summary of costs by task is also attached. A 10 percent contingency has been noted in the attached budget summary (total w/contingency is \$74,952) in the event that unforeseen project complications or constraints arise. We recommend the contingency be held by the District, to be authorized for release by District staff upon appropriate justification and written notice by Padre.

Monterey Peninsula Water Management District
October 26, 2004 (2005-3356)
SMTIW WY2005



We appreciate the opportunity to work with the District on this important project, and look forward to a timely and successful completion of the work. As always, if you have any questions or would like to modify the scope of services, please call us.

Sincerely,

PADRE ASSOCIATES, INC.

A handwritten signature in black ink, appearing to read "R. Marks", written over the printed name.

Robert C. Marks, R.G.
Project Hydrogeologist

A handwritten signature in black ink, appearing to read "S.P. Tanner", written over the printed name.

Stephen P. Tanner, P.E.
Principal Engineer

RCM:SPT:av

Attachments: Cost Summary
Fee Schedule

**COST SUMMARY
SANTA MARGARITA TEST INJECTION WELL
WY2005 TEST PROGRAM**

Task 1 - Develop Test Program	\$ 3,825
Task 2 - Test Program Implementation and Assistance	\$ 19,370
Task 3 - Water Quality Investigations	\$ 26,133
Task 4 - Coordinate Improvements to Luzern Booster Station	\$ 3,550
Task 5 - Data Analysis and Reporting	\$ 15,260
Subtotal:	\$ 68,138
Recommended 10% Budget Contingency*:	\$ 6,814
Total:	\$ 74,952
Task 6 (Optional) - Prepare Plans and Specifications for 2 nd Well	\$ 12,780
Task 7 (Optional) - Implement Minor Capital Improvements	\$ 24,935
Task 8 (Optional) - Tracer Testing	\$ 25,065
Optional Task Subtotal:	\$ 62,780
Total w/ Optional Tasks:	\$ 137,732

* We recommend this contingency be held by District staff/management to be utilized in the event that additional services are required or unforeseen project constraints or requirements arise.

2003 WATER RESOURCES Fee Schedule

Professional Services

Senior Principal Professional.....	\$	150/hr
Principal Professional	\$	140/hr
Senior Professional.....	\$	115/hr
Project Professional.....	\$	100/hr
Staff Professional.....	\$	85/hr
Senior Technician	\$	75/hr
Technician.....	\$	65/hr
Drafting.....	\$	50/hr
Word Processing	\$	45/hr

Other Direct Charges

Subcontracted Services.....	Cost Plus 15%
Outside Reproduction.....	Cost Plus 15%
Travel, Subsistence, and Expenses.....	Cost Plus 15%
Vehicle	\$ 75/day
Automobile Mileage (beyond 50 miles from Padre offices)	\$ 0.36/mile

Monterey Peninsula Water Management District

Santa Margarita Test Injection Well - WY2005 Injection Testing

BUDGET

\$68,138

2003 Rates

Professional Service

TASK DESCRIPTION	HOURS	FEE	Prin	Senior	Project	Staff	Word Proc.	Data Entry	Graphics	
			\$140	\$115	\$100	\$85	\$50	\$40	\$50	
Task 1 Develop Test Program	34	\$ 3,480	8	4	16		4		2	
Task 2 Test Program Implementation and Assitance	166	\$ 17,300	20	24	96	24			2	
Task 3 Water Quality Investigations	48	\$ 5,260	16		20	12				
Task 4 Coordinate Improvements to Luzern Booster Station	29	\$ 3,550	20		6				3	
Task 5 Data Analysis and Reporting	146	\$ 15,260	30	24	60	20	6		6	
<i>Optional Tasks</i>										
Task 6 Plans and Specs for 2nd Well (optional)	128	\$ 12,780	18	24	64		12		10	
Task 7 Implement Minor Capital Improvements (optional)	20	\$ 2,510	12	2	6					
Task 8 Tracer Testing (optional)	143	\$ 14,945	24	14	70	35				
TOTAL (LABOR)		423	\$	44,850						
TOTAL (LABOR) w/optional tasks		714	\$	75,085						

Other Direct Charges (ODC)

Task	Description	Number	Rate\$	Fee
Task 1	Travel Expenses	2	\$ 150	\$ 300
Task 2	Travel Expenses	12	\$ 150	\$ 1,800
Task 3	Specialized Outside Lab Analyses	1	\$ 8,500	\$ 8,500
Task 3	Sample/Test Equipment	1	\$ 650	\$ 650
Task 3	Dechlorination Chemicals and Equipment	1	\$ 9,000	\$ 9,000
SUBTOTAL (ODC)				\$ 20,250
15% markup				\$ 3,038
SUBTOTAL (ODC)				\$ 23,288
<i>Optional ODCs</i>				
Task 7.1	FCV and 'Dog House' Installation	1	\$ 9,000	\$ 9,000
Task 7.2	Maintenance of Backflush Pit	1	\$ 850	\$ 850
Task 7.3	Restore SMTIW pump motor	1	\$ 1,300	\$ 1,300
Task 7.4	Minor SMTIW site improvements	1	\$ 8,350	\$ 8,350
Task 8	Tracer Chemical and Equipment	1	\$ 8,800	\$ 8,800
OPTIONAL ITEMS SUBTOTAL (ODC)				\$ 28,300
15% markup				\$ 4,245
OPTIONAL ITEMS SUBTOTAL (ODC)				\$ 32,545
TOTAL COST				\$ 68,138
TOTAL COST (w/optional tasks)				\$ 130,918