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A Division of GEI Consultants

Geotechnical  
Environmental and  
Water Resources  
Engineering

2006 Monterey Peninsula

# Seawater Desalination Project Evaluation

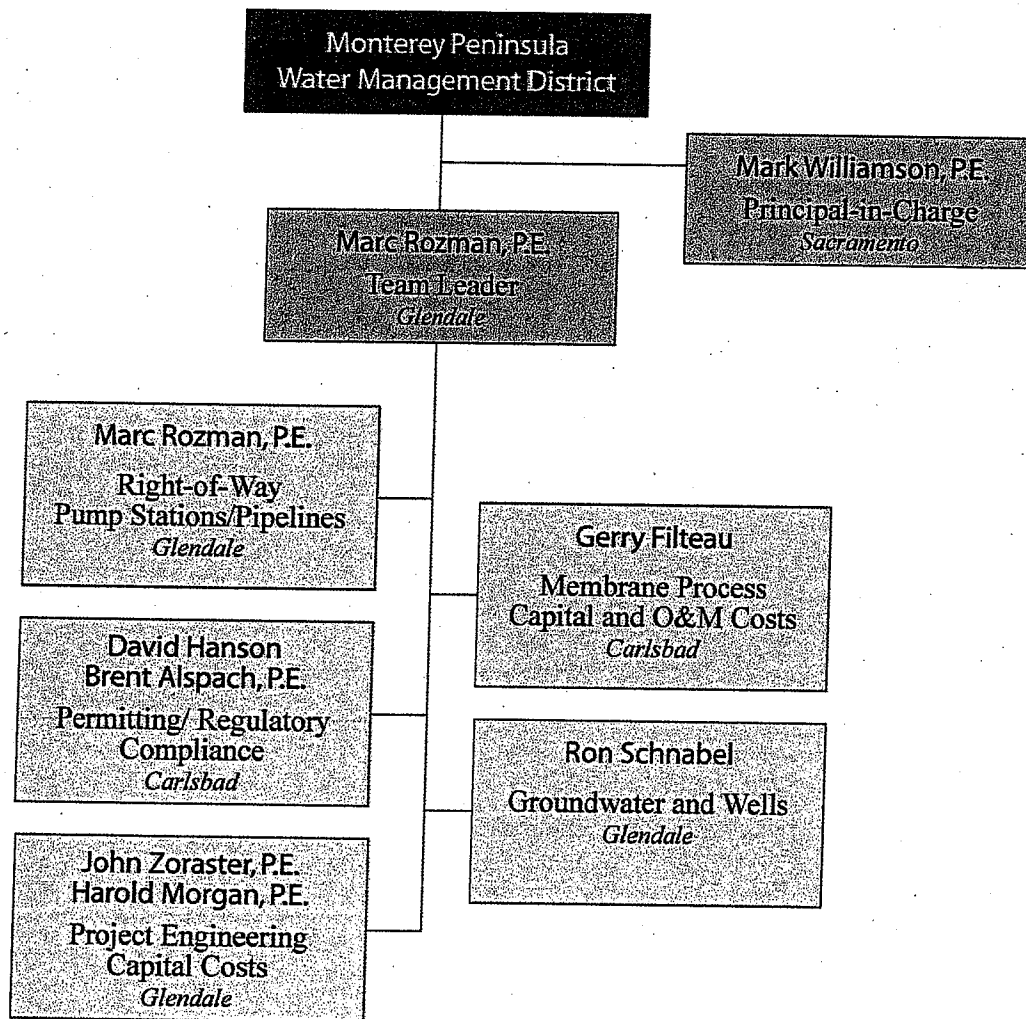
Monterey, CA

Submitted to:  
Monterey Peninsula Water Management District

Date: January 10, 2006



The team will be lead by **Marc Rozman**. Mr. Rozman has worked closely with key B-E/GEI staff members John Zoraster and Harold Morgan over the past five years. He has worked closely with SPI on three significant membrane process projects over the past seven years and he has also worked on past projects with Malcolm Pirnie. Mr. Rozman provides the team with design and construction expertise on treatment plants, pipelines and pump stations. He is a very capable project manager and will lead the team in the decision making process and be the primary contact with the District.



**John Zoraster** and **Harold Morgan** are two of B-E/GEI's senior level staffers who will provide expertise on financial and feasibility project aspects. Mr. Zoraster is an economist as well as an engineer. He has performed recent financial studies for the City of Rialto and Coachella Valley Water District. He will also assist with analysis of the proposed construction costs.

Mr. Morgan is a noted expert in the area of water system valuations. He has prepared due diligence analysis on numerous projects including seawater desalination projects in Tijuana,

### 3 Scope of Work

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#### Project Understanding

The project's purpose is to provide an independent, unbiased, third-party assessment of the competing proposals and make recommendations on the technical merit, completeness, and readiness to proceed to allow the Monterey Peninsula Water Management District (MPWMD) Board to determine the best project or projects to support to meet the District's mission and comply with SWRCB Order 95-10.

The MPWMD is responsible for managing the water resources on the Monterey Peninsula, Seaside basin, and Carmel River drainage. Cal-Am is a privately owned utility responsible for providing water service to the residents within the Monterey Peninsula Water Management District (MPWMD). SWRCB Order 95-10 determined that Cal-Am was diverting 10,730-afy from the Carmel River system without legal right, and an equivalent supply is now required.

The State allows Cal-Am 11,285 acre-feet per year from the Carmel River. The State Water Resources Control Board set the limit in 1995, when it issued Order 95-10. An ultimate reduction to 3,376 afy is expected.

The MPWMD Board has directed staff to review the following three water desalination projects in the Monterey Bay area:

- California American Water (Cal-Am) Coastal Water Project. The water desalination portion of a combination seawater desalination at Moss Landing and aquifer storage and recovery project. An environmental study was released in summer 2005. Target yield is 11,730 to 20,272 acre-feet per year
- Pajaro/Sunny Mesa Community Services District (P/SM) Monterey Bay Regional Desalination Project in Moss Landing. P/SM and Poseidon Resources Corporation would develop this project on Duke Energy property. Target yield is 21,000 to 23,000 acre-feet per year.
- MPWMD Water Supply Project at Sand City. Target yield: 8,400 acre-feet per year.

P/SM operates the water systems in Pajaro and Sunny Mesa. Board members are appointed by the Monterey County Board of Supervisors. The District is studying annexing the Moss Landing water system.

Monterey County has an ordinance requiring public ownership of desalination plants, which is being challenged by Cal-Am.



Since the late 1980s, the price of taking salt out of seawater has dropped from nearly \$2,000 an acre-foot to below \$800 per acre-foot. The cost of desalination is related to salt content of the source water. Treatment of seawater requires pressures of approximately 1,000 pounds per square inch, though an improvement in membrane technologies is likely to reduce the pressure required. Significant additional costs may be required for distribution of the desalinated water.

There are now nine seawater desalination plants along the California coast. At least 19 new desalination plants are proposed, including at least five in the Monterey Bay area. Locally, a 0.3 mgd desalination plant owned by the Marina Coast Water District is in intermittent operation. Competing regional uses for the Moss Landing site include plans by the City of Santa Cruz, Soquel Creek Water District, and Pajaro Valley Water Management Agency (PVWMA). The PVWMA wholesale agricultural water service area overlaps the P/SM water service territory.

## **Approach**

B-E/GEI will provide dedicated engineering expertise to fully address the District's Scope of Work within the indicated timeline. Our overall objective will be to provide the District Board with an unbiased assessment of the technical merit and readiness to proceed for the various proposals. The Scope includes the following five principal tasks, which are discussed in greater detail below:

- A. Kick-off and Collection of Available Information
- B. Technical Evaluation
- C. Evaluate Costs and Financing
- D. Evaluation of Readiness to Proceed
- E. Conclusions, Recommendations and Reporting

### **A. Kick-off and Collection of Available Information**

#### **1. Kick-off meeting with MPWMD**

The initial task will be a meeting with District project managers and decision makers. This meeting will serve to kick-off the project, and will confirm overall project objectives, project approach, schedule, and responsibilities. B-E/SPI task leaders will attend.

In addition, the consulting team will present an initial list of evaluation metrics to be used for comparison of the various projects. These metrics will include quantitative and qualitative descriptors of Function, Economics, Equity, and Implementability. For example, economics metrics will describe whether the proponent's cost estimate is reported at a conceptual, preliminary, or advanced level, and will recommend the confidence bound (e.g. +50%, -30%

of estimated cost) to be applied. The implementability metric will include assessments of the level to which agreements, easements, permits, and community support have been initiated or secured.

The B-E/GEI team proposes to conduct telephone interviews with each of the project proponents, plus other key players (e.g. local Duke Energy representatives). It is anticipated that the District would provide names and contact data at the kick-off meeting.

In summary, the key items under this Task are:

- Confirm project objectives
- Confirm project approach
- Review schedule of studies and deliverables
- Identify principal contacts for both District and consulting team
- Collect available documents from District staff
- Identify key metrics for project evaluation
- Obtain contacts for project proponent interviews

#### **B. Technical Evaluation**

2. Review existing information
3. Evaluate technical feasibility of the major components of each project

For these tasks, the existing technical information will be reviewed both quantitatively and qualitatively. Qualitative assessment will include level of analysis performed, completeness, whether processes have been identified to deal with key issues.

The B-E/GEI team proposes to conduct telephone interviews with each of the project proponents, plus other key players (e.g. local Duke Energy representatives) within the first three weeks following notice to proceed.

The technical evaluation will include, at a minimum, assessment of:

- Appropriateness of proposed treatment and pre-treatment technologies
- Feedwater collection, quality, and quantity
- Brine disposal and management
- Product water distribution systems and hydraulics
- Power availability and energy management
- Land requirements, availability, and expansion potential
- Environmental impact



The B-E/GEI team will evaluate the technical feasibility of each project. Major elements of this review are as follows:

**Source water.** The feasibility, cost and reliability of a seawater desalination project are very dependent on the characteristics and of the source water. A review of the project's description of the raw water source, together with the level of documentation of the source water quality will contribute to a determination of the suitability and confidence level for the proposed treatment processes. Source water from an open seawater intake structure, such as available through co-location at a power plant will be subject to seasonal variations in quality, including potential algal blooms. Additionally, proximity to potential contamination from urban runoff, waste discharge pipelines and marine traffic are areas of concern. The completeness of source and water quality information will be assessed.

**Desalination process selection and approach.** While it is anticipated that any large-scale desalination project in California will be based on the use of reverse osmosis to accomplish the desalination aspect of the treatment objectives, review will be appropriate to evaluate the design approach, including operating flux, water recovery rate and membrane selection. Each of these can have dramatic impact on the trade-off of capital cost vs. O&M costs, as well as process reliability. For example, a high operating flux can minimize capital expense and improve permeate quality, by reducing membrane area, but results in higher operating pressure and possibly greater rate of fouling, depending on the feed source and pretreatment. Another area of specific interest is the reliability and redundancy of the treatment process to meet the project's product water goals. Product quality goals for a seawater desalination project generally go beyond a TDS limit. Chloride and boron product concentrations are often design considerations for the desalination process. The approach for energy recovery in the desalination process will also deserve review, to ensure a responsible approach to energy use is used.

**Pretreatment.** The RO desalination process requires feed water which meets certain criteria for key water quality parameters. Most important are those related to suspended solids, which could cause fouling the membrane and deterioration in performance. The evaluation of each project will include an assessment of the effectiveness of the proposed pretreatment methods to achieve the RO feed water goals considering the range of source water quality which is anticipated. The impact of inadequate pretreatment on overall plant performance cannot be overstated. Additionally, the experience and track record of the proposed pretreatment methods on seawater will be evaluated.

**Post-treatment.** While meeting total dissolved solids limits, the permeate of the desalination process will require post treatment to make it suitable for the intended use. The strategy to accomplish stabilization, disinfection and compatibility with other water in the distribution system will require evaluation.



### C. Evaluate Costs and Financing

4. Evaluate the reasonableness of the estimated capital and O&M costs for each project
5. Review and evaluate proposed financing, where available

For these tasks, we will separate cost elements that are comparable among the three projects from other unique or non-comparable elements. We will assess the reasonableness and thoroughness of the cost information and provide an opinion on the reasonable of the quantities and unit cost factors used. All costs will be escalated to 2006 price levels. The level of development of the cost estimate will be characterized (e.g. conceptual, preliminary, 30 percent, final, etc.) and appropriate confidence bounds applied. The cost estimates will be evaluated for completeness, and significant missing elements will be identified as appropriate.

We will also provide an assessment of equity issue and provide an opinion on whether there is a reasonably fair and equitable distribution of costs among beneficiaries, identify any redirected impacts, and identify any benefits or impacts to disadvantaged communities.

For projects with identified financing sources, we will evaluate the adequacy of the funding sources and estimated rate impacts. We will assess the relative viability and probability of the funding sources, particularly if project funding is dependent on grant sources. Also taken into consideration will be the relative cost of funding sources, e.g. low interest cost loans versus investor owned utility bonds. A review will be made of rate impact studies or projections resulting from bringing the projects online. However, in view of the budget for this study, no independent rate impact assessments will be performed by B-E/GEI.

Specific evaluation criteria include:

- Separate cost elements into comparable and non-comparable categories
- Assess reasonableness and thoroughness of cost information
- Provide opinions on reasonableness of quantities and unit cost factors used
- Escalate costs to 2006 cost levels
- Characterize level of development of estimate and apply confidence bounds
- Identify significant missing elements
- Evaluate proposed funding mechanisms
- Review identified rate impacts

Evaluation of the project cost estimate will include comparison to cost data developed for other recent cost estimates of similar projects to assess reasonableness of the values. Review of cost components will be made to ensure all items are included which are appropriate for the particular estimate level (Order-of-Magnitude, Conceptual, Preliminary, etc.). O&M

estimates frequently omit or underestimate the contribution from maintenance materials, replacement parts and associated labor for a seawater system. Capital cost estimates often vary due to equipment life used for the basis of design. For example "industrial" grade desalination equipment can often enjoy a low capital cost, but achieve only a seven year life. When used in a long term municipal project with a 20-25 year life, this equipment can be unacceptable due to high maintenance costs, related downtime and resulting poor reliability of the process.

#### **D. Evaluation of Readiness to Proceed**

6. Review and evaluate existing and proposed agreements and permits for each project
7. Identify, investigate, and evaluate potential project constraints, including physical conditions, regulatory conditions, environmental impacts, and permitting

These tasks will result in an overall opinion on the relative readiness to proceed for the various proposals. We will enumerate the various permits and agreements required for each proposal and provide an opinion on the stage of development and completeness of the regulatory and permitting aspects. The evaluation will include:

- Land needs, availability, purchase options for the treatment facility, intake, and brine management facilities. Included will be agreements to utilize Duke Energy's Moss Landing facilities
- Land, right-of-way, and easements for intake and brine management pipelines, water distribution pipelines and pumping stations
- National Pollutant Discharge Elimination System (NPDES) permitting
- Consultation with regulatory entities, including the California Coastal Commission

We will provide an opinion on the overall institutional complexity based on the number of permits and agreements required, the number of entities involved, and the degree to which there is demonstrated community support for the project.

Major potential constraints will be enumerated and evaluated. These could include:

- physical constraints such as crossings of freeways, railroads, private lands or population centers
- regulatory constraints such as Coastal Commission, discharge permits, and Public Utilities Commission constraint for projects sponsored by private entities
- environmental impacts, including impacts to Elkhorn Slough
- permitting
- flexibility
- water rights requirements



The product of this task will be an annotated scorecard assessing the project proponents efforts to minimize the risk of institutional challenges to implementation, and avoid or minimize environmental or community impacts.

## **E. Conclusions, Recommendations and Reporting**

### 8. Draft report

- 7 copies & electronic reproducible
- Summary of setting
- Findings and conclusions

### 9. Final Report

- 30 copies & electronic reproducible

As specified in the Request for Proposals, we will produce both draft and final reports in the quantities specified. Because the RFP specifies three weeks between submittal of the draft and final reports, we assume that District review can be accomplished in five working days or less. The reports will include a summary of the physical, institutional, and project setting, and a discussion of pertinent findings and conclusions.

## 5 Estimated Costs

**Cost Estimate**  
**2006 Monterey Peninsula Seawater Desalination Projects Evaluation**  
**Bookman-Edmonston/Separation Processes/Malcolm Pirnie**

	Principal Engineer	Project Manager	Project Engineer	Clerical	Expenses	Total
A. Kick-off and Collection of Available Information						
Kick-Off Meeting/Evaluation Metrics	8	20			\$1,250	\$6,403
Team Meeting/ Brainstorming Session						
Compile Background Information/ Reconnaissance						
B. Technical Evaluation						
Technical Feasibility of Process		20	12			\$5,440
Storage/ Transmission Pipelines/ Pump Stations		20				\$3,460
Right-of-Way		20				\$3,460
Seawater Collection System Options		20				\$3,460
C. Evaluate Costs and Financing		20	34			\$9,070
D. Evaluation of Readiness to Proceed						
Permits and Agreements	2		22			\$4,022
Site Requirements/ Facility Constraints	2	14				\$2,814
Progress Meeting		8			\$500	\$1,934
E. Conclusions, Recommendations and Reporting						
Preliminary Report Preparation	2	26	20	6		\$8,622
Submit Preliminary Report						
District Review						
Prepare Board Presentation						
Final Report Preparation	2	12	10	3		\$4,334
Submit Final Report						
District Review						
Board Presentation		6				\$1,038
<b>Total</b>	<b>16</b>	<b>186</b>	<b>98</b>	<b>9</b>	<b>\$1,750</b>	<b>\$54,036</b>
<b>Cost per hour</b>	<b>196</b>	<b>173</b>	<b>165</b>	<b>72</b>	<b>1.10</b>	
<b>Total Cost</b>	<b>\$3,136</b>	<b>\$32,178</b>	<b>\$16,149</b>	<b>\$648</b>	<b>\$1,925</b>	<b>\$54,036</b>



## SECTION 3 PROJECT TEAM

### PROJECT TEAM ORGANIZATION

Our proposed Principal-In-Charge and Project Manager (PM), Vinod Badani, will be the point of contact between the E2 Team and the MPWMD. Our team has been structured to optimize internal communications, address the interrelationships of the technical aspects of the work, and ensure a quality project. The following is a brief description of the background, experience and functional role of the key team members. Full-length resumes for all team members are included in Appendix A.

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#### Principal In-Charge / Project Manager - Vinod Badani, P.E

Mr. Badani holds an M.S. in Civil Engineering and is a registered Civil Engineer in the state of California with over 30 years of experience in the design and construction of water and wastewater projects. Mr. Badani's experience includes planning, design and construction management of complex inter-agency projects for local public jurisdictions. During his career, Mr. Badani has managed and provided technical directions on many water and wastewater projects. He was the project manager for the design and construction of the \$20 million, award-winning Recycled water project for the Carmel Area wastewater District and the Pebble Beach Community Services District. He also was the project manager and technical director for the Phase II - CAWD/PBCSD Wastewater Reclamation Project. Phase II project included: Rehabilitation and modifications to the existing Forest Lake Reservoir; and treatment facilities to remove algae. Mr. Badani also managed the Water Quality Improvement Reverse Osmosis Feasibility Study and Water Quality Improvement Desalination Treatment System Evaluations for CAWD/PBCSD Wastewater Reclamation Project. AS a part of the Water Quality Improvement Desalination Treatment System Evaluations, Mr. Badani participated in developing Recycled Water Management Model. The purpose of this model was to provide a tool for determining the optimum desalination plant capacity required to produced an irrigation water supply, in quality and quantity, to meet the projected irrigation demands, balance irrigation demand with plant influent flow and minimize use of potable water. Mr. Badani also participated in a siting study for RARE Project for EBMUD, which included: MF-RO desalination facilities pump stations, and transmission pipelines. The construction cost for this project was estimated at approximately \$75 million.

Mr. Badani also managed Stockton RWCF - Stages I and II improvement projects for the City of Stockton. The constructed value for these improvements was \$70 million. This Project included two (2) design/build contracts, one for Cogeneration Facilities - constructed value \$15 million, and other for Odor Control Facilities-Constructed value \$ 5 million. Currently, Mr. Badani is the deputy project Manager for Dublin San Ramon Services District's recycled water project. The construction cost is estimated at \$17 million.

Mr. Badani also served as the Project Manager for the Capital Asset Management Program (CAMP) for the Monterey County Water Resources Agency (MCWRA). At present, E2 is in the process of updating the CAMP for the MCWRA's Zone 2C.

As PIC of this Project, Mr. Badani will provide technical direction to the Project team and assure to the City that all needed staff will be committed to the Project.



### **Project Engineer- Paul Tjogas, P.E.**

Mr. Tjogas is a registered Civil Engineer and has over 25 years of experience in water supply and wastewater projects. His expertise includes: hydraulic network modeling, pump station design and water distribution system analysis and design. Mr. Tjogas worked as a team member of the validation team on an Integrated Management Program for the \$2.3 billion CIP of Orange County Sanitation District. The validation team developed a phased program, which consolidated projects from the existing CIP, identified additional projects required to meet the District's long term goals, eliminated unnecessary or redundant projects, revised cost estimates and developed cost estimates for new projects, prioritized projects and determined a schedule for implementation along with manpower projections and cash flow estimates.

Mr. Tjogas has been a project engineer for a wide variety of water, wastewater and hazardous projects. His work included computer modeling, preparation of plans and specifications, field inspection, shop drawing review, and report writing. Major projects included Modesto and Ukiah Wastewater Treatment Plant expansions, Tracy Water Treatment Plant expansion, Tracy water transmission pipelines, Ione prison site utilities, and master plans for the Cities of Vallejo, Pittsburg, El Portal and UC Berkeley.

He has worked on nearly 100 pump stations. This work has included:

- Seismic design, component selection, preparation of bills of materials and shop testing of pumps while working for a major pump manufacturer.
- Master planning to locate and size pump stations.
- Preliminary design and environmental impact report support.
- Preparation of construction plans and specifications.
- Construction management and resident engineering.
- Performance testing and inspection.
- Preparation of pump station standards for municipal agencies.
- Preparation of O & M Manuals.
- Presented seminar on pump station design to EBMUD.

### **Staff Engineer- Angelina Wai P.E.**

Ms. Wai is a registered Civil Engineer in California specialized in computer-aid hydraulic modeling, pipeline design, construction cost estimating and wastewater treatment processes evaluations. Her experience includes computer modeling on Pebble Beach Community Services District's water system and recommendation to the District on pipeline replacement projects for meeting fire protection requirements; filtration system and UV disinfection system evaluations for Dublin San Ramon Services District Tertiary Treatment Plant Project; as well as preliminary design reports and contract documents preparations and construction cost estimates for various public infrastructure projects. Ms. Wai also participated in a siting study and in estimating construction costs for RARE Project for EBMUD, which included: MF-RO desalination facilities pump stations, and transmission pipelines. The construction cost for this project was estimated at approximately \$75 million. She will support the Project in evaluating construction cost estimates, annual O&M costs, and permitting requirements.



## SECTION 4

# PROJECT APPROACH

### GENERAL

The goal of the project is to review and evaluate three seawater desalination projects proposed for the Monterey Bay area. Three projects are as described below:

**California American Water (Cal-Am) – Coastal Water Project:** The major components of the project include: a seawater desalination plant in Moss Landing at the "Duke East" site on Dolan Road; use of Duke's Energy's Moss Landing Power Plant intake and outfall; a desalinated water conveyance system to Monterey Peninsula, including transmission pipeline, terminal reservoir and pumping stations; and an ASR project in the Seaside Basin. Pilot project for this project is proposed and the project will yield 11,730 AFY to 20,272 AFY to replace Cal-Am's Carmel River withdrawals to comply with SWRCB Order WR-95-10 and to help alleviate over-pumping in the Seaside Basin, and to meet existing and future water needs on the Monterey Peninsula and coastal communities of northern Monterey County, which total more than 8,000 AFY.

**Pajaro/Sunny Mesa Community Services District (P/SM) – North Monterey County Desalination Project:**

The major components of the project include: a seawater desalination plant in Moss Landing, transmission pipeline to the Monterey Peninsula, and a potential 30-acre solar energy power production facility to reduce energy costs. The proposed site will be located at former National Refractories mineral plant, with planned use of existing intake/outfall pipelines, with possible use of Duke Energy pipelines, if needed. The yield goal is 21,000 AFY to 23,000 AFY. This project will comply with SWRCB Order WR-95-10 and to meet existing and future water needs on the Monterey Peninsula and coastal communities of northern Monterey County.

**Monterey Peninsula Water management District (MPWMD) – Water Supply Project:** The desalination plant would be located within the boundaries of Sand City, California. Other major components of the project include: seawater collection wells, desalinated water conveyance pipelines, and brine disposal wells. Seawater collection system will include horizontal directionally drilled (HDD) wells and/or radial beach wells. Brine disposal will be through HDD wells or at the MRWPAC outfall pipeline. The project will yield approximately 8,400 AFY.

#### Task 1 – Kick-Off Meeting

E2 will meet with MPWMD staff at the beginning of the project to introduce project team members, their role and discuss the study approach with MPWMD staff. At this meeting, MPWMD will provide additional documents regarding the proposed projects.

#### Task 2 – Review Existing Information

E2 will review existing information on each project provided by the MPWMD. This review will enable E2 to request additional information if required and will make project team familiar with all three projects.



### **Task 3 – Evaluate Technical Feasibility**

E2 will review technical feasibility of each proposed project. Desalination process for each project will be considered as technologically proven process and emphasis will be placed on other project components. The intent of this review will be to assure that the project will meet goals and objectives of each project.

### **Task 4 – Evaluate Reasonableness of the Capital and O&M Costs**

E2 will review Capital and O&M costs for each project. These costs will be evaluated based on our experience on similar projects and current local construction costs. E2 has worked on many construction projects in the Monterey Peninsula and experience gained over the years will be utilized in evaluating the reasonableness of the capital and O&M costs.

### **Task 5 – Evaluate Project Financing**

E2 will evaluate project financing proposed for each project and will comments and recommendations as appropriate.

### **Task 6 – Review and Evaluate Proposed Agreements**

E2 will review and evaluate permitting requirements for each project and also will review supplementary agreement for right-of-way as applicable to each project.

### **Task 7 – Evaluate Potential Project Constraints**

During the review and evaluating process, E2 will identify potential constraints and their impact on each project. As appropriate, E2 will make recommendations to reduce or eliminate potential constraints.

### **Task 8 – Prepare Draft Report**

E2 will summarize the findings of the tasks 1 through 7 described above in a report. The report will include project summary and setting of all three projects, relevant findings and conclusions. E2 will meet with the MPWMD staff and present findings and conclusions of each project. Seven copies of the report will be submitted to the MPWMD staff for their review and comments.

### **Task 9 – Final Report**

E2 will incorporate review comments received from the MPWMD staff and finalize the report. Thirty copies of the final report and an electronic version of the report will be submitted to the MPWMD for their use.



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## **Project Management, QA/QC and Meetings**

E2 recognizes the importance of conducting the project within schedule and budget as well as providing a high quality product meeting the City's expectations. Throughout the project, E2 will work closely with the MPWMD staff, exchange information through frequent regular meetings and keep each other informed, so as to maintain the project schedule and to meet the MPWMD needs. The procedure described below will be used for this project.

### **Project Management**

At the beginning of the project, the project manager will prepare a Project Management Plan (PMP). The plan will serve as the road map for the conduct of the work and will contain a description of the project, the "deliverables", a list of various tasks, and a schedule. The plan also will include the task budgets, project and client organization, and procedures for correspondence, filing, approvals, project controls, applicable standards and quality control procedures.

### **Quality Control**

Quality Control (QC) will be accomplished by: (1) assignment of experienced, fully qualified project staff; and (2) regular checking procedures.

### **Communication With The City**

Close communication between the MPWMD and the E2 Project Team are critical to the successful accomplishment of the project's objectives. Timing of review meetings between the E2 project manager and the MPWMD will be scheduled as required. Progress-to-date will be summarized at the review meetings and findings/recommendations will be discussed and implemented. In addition to the formal review meetings, the PM will communicate with the MPWMD by phone and/or E-mail at least once a week to maintain a constant dialogue between the MPWMD and E2.

**MONTEREY PENINSULA SEAWATER DESALINATION PROJECT EVALUATION  
ESTIMATE OF ENGINEERING SERVICES FEES**

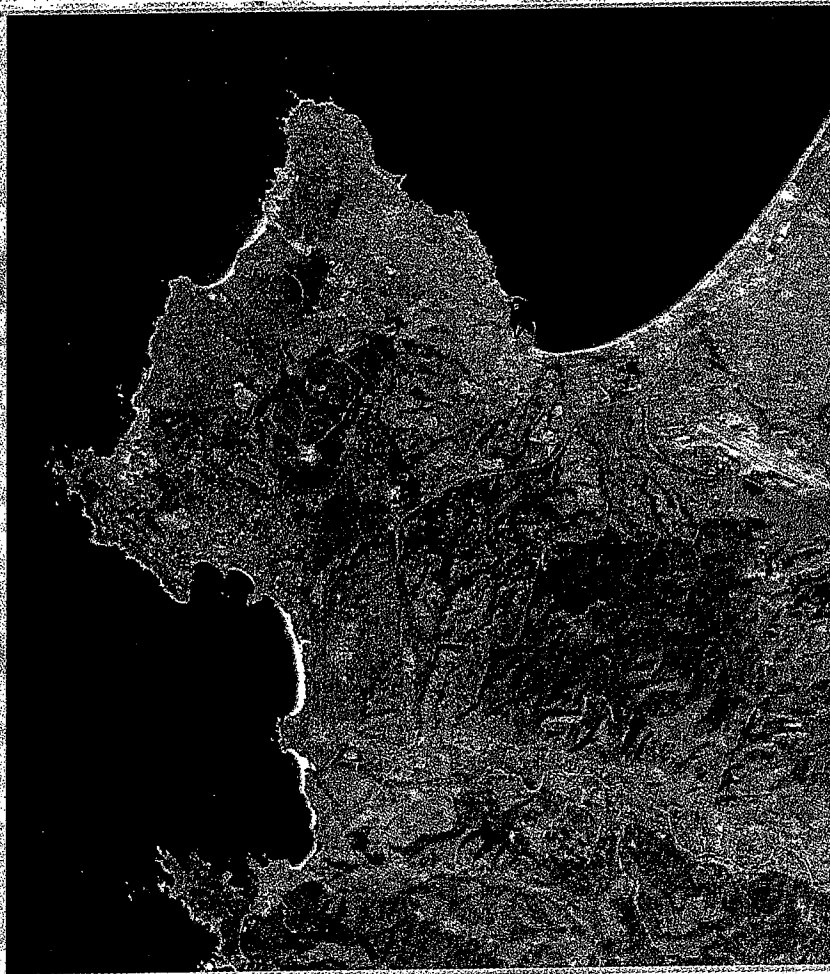
Task No.	Task Description	Hourly Rate	Principal-In-Charge AND Project Manager- Vinod Badani	Project Engineer- Paul Tjogas	Staff Engineer- Angelina Wai	Total Labor Hours	Total Labor Cost	Task ODCs	Total Cost
		\$175.00	\$125.00	\$ 100.00					
1	Kick-Off Meeting with MPWMD Staff	8	8			16	\$ 2,400	\$ 300	\$ 2,700
2	Review Existing Information								
	2.1 Cal-Am's Coastal Water Project	4	12			16	\$ 2,200		\$ 2,200
	2.2 P/SM's Monterey Bay Regional Desalination Project	4	12			16	\$ 2,200		\$ 2,200
	2.3 MPWMD's 7.5 MGD Sand City Seawater Desalination Project	4	12			16	\$ 2,200		\$ 2,200
	<b>Subtotal for Task 2</b>	12	36	0		48	\$ 6,600	\$ -	\$ 6,600
3	Evaluate Technical Feasibility of Each Project	16	80			96	\$ 12,800		\$ 12,800
4	Evaluate Reasonableness of the estimated Capital and O&M costs for each Project	8		60		68	\$ 7,400		\$ 7,400
5	Review Project Financing for each Project	8	16			24	\$ 3,400		\$ 3,400
6	Review Existing Agreement(R/W) and Permits relating to each Project	16				16	\$ 2,800		\$ 2,800
7	Evaluate Project Constraints for each Project		24	8		32	\$ 3,800		\$ 3,800
8	Prepare Draft Report	8	16	32		56	\$ 6,600	\$ 250	\$ 6,850
9	Final Report	8		12		20	\$ 2,600	\$ 1,000	\$ 3,600
	<b>Total for Tasks - Phase 1 and Phase 1B</b>	84	180	112		376	\$ 48,400	\$ 1,550	\$ 49,950





*Monterey Peninsula  
Water Management District*

*Proposal for*  
**2006 Monterey Peninsula Seawater  
Desalination Projects Evaluation**



*January 10, 2006*

**RMC** *Innovative Solutions for  
Water and the Environment*



# Section 1

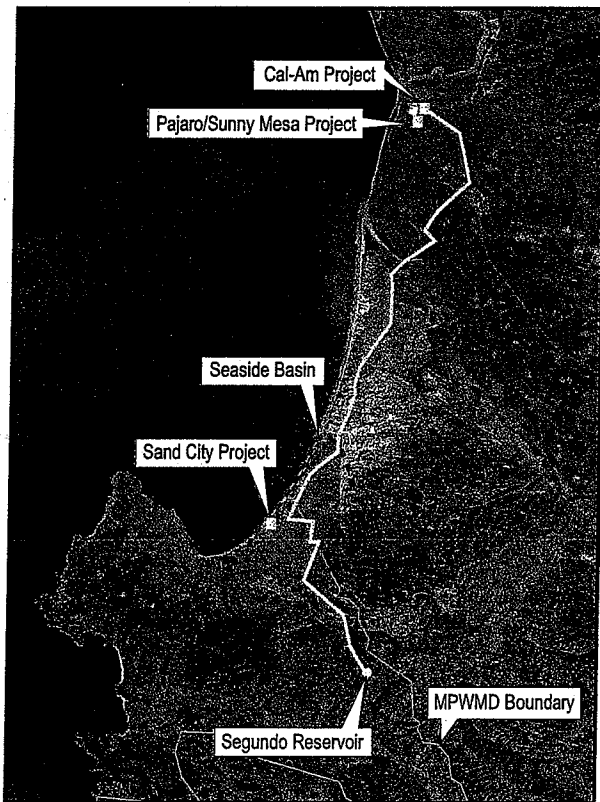
## *Project Understanding and Approach*

### Project Understanding

The Monterey Peninsula Water Management District (District) manages ground and surface water resources for eight communities on the Monterey Peninsula. The District has established five goals related to providing excellent quality of service:

1. Increase the water supply to meet community and environmental needs
2. Assist California-American Water Company in development of a legal water supply
3. Protect the quality of surface and groundwater resources and continue the restoration of the Carmel River environment
4. Instill public trust and confidence
5. Manage and allocate available water supplies and promote water conservation

The District has tracked and compared studies associated with six water supply-related projects that all have the potential to move the District closer to these defined goals. During its September 8, 2005 strategic planning workshop, the District reviewed a comparative matrix of these projects with information provided by project sponsors.



*The District must complete a comparative analysis of the three proposed large-scale desalination projects before it can endorse a single water supply solution.*

*The District is ready to lead the effort to select the optimum water supply solution for its area and the region. First and foremost, the District is committed to meeting the requirements of State Water Resources Control Board (SWRCB) Order 95-10. This order requires the water purveyor for the District, California-American Water Company (Cal-Am), to reduce pumping from the Carmel River basin by 10,730 acre-feet/year (AFY). Understanding the potential public health and safety impacts of this reduction, the SWRCB has authorized an interim reduced requirement of 2,821 AFY. The District plans to meet this Order with a solution that provides the greatest value, reliability, and potential for success.*

*The District seeks an independent analysis and comparison of three proposed large-scale seawater desalination projects. This analysis will help the District finalize its review of alternatives and endorse a single project that addresses, at a minimum, SWRCB Order 95-10. Two of the three desalination projects, Cal-Am's Coastal Water Project and Pajaro/Sunny Mesa's (P/SM) North Monterey County Desalination Project, will meet or exceed the 10,730 AFY requirement for new water supply; the third desalination project, the District's Sand City Project combined with aquifer storage and recovery (ASR), could also meet this requirement. The remaining projects reviewed at the September 8 workshop could supplement these primary projects as needed to meet District goals.*

Although detailed information is readily available on only the District's Sand City Project and Cal-Am's Coastal Water Project, a preliminary review of the three identified projects indicates that each of the individual project sponsors has based as least some aspect of its analysis on information that is different than or absent from those of the other sponsors. It is, therefore, imperative that the project information is compared and a uniform basis for evaluating the three desalination alternatives established.

*This comparison must identify additional information that is needed for each of the proposed projects to ensure consistency in quality, completeness, and reliability of data. The issues driving an optimum desalination project are diverse and involved. These issues can be generally grouped into three categories:*

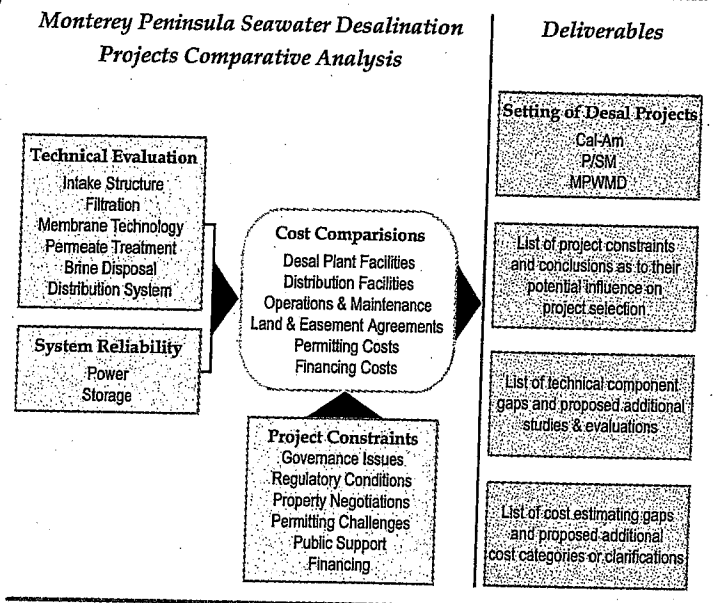
- 1) Technical issues, ranging from membrane efficiencies and intake/outfall considerations to redundancy/reliability, and distribution challenges
- 2) Cost and schedule assumptions, drivers, and realities
- 3) Governance, public support, and funding issues made more complex by private versus public ownership and operation

The prevailing concern is whether the individual sponsors have considered all of these issues, and have a consistent understanding of their complexities, relative priorities, and applicability. For example, not all sponsors have included the use of the Seaside groundwater basin for storage, or delineated the method of interconnection of the desalinated supply into the existing Cal-Am distribution system. Understanding these inconsistencies as needed to ensure a reliable basis for comparison is an important step before proceeding with further evaluation of available alternatives. Our approach will provide this foundation.

*The District, equipped with evaluation criteria and an understanding of project gaps, will be prepared to request additional information from sponsors, and ultimately, endorse an optimum project. RMC excels at identifying, evaluating, and managing the extensive issues and criteria that drive large, potentially multi-jurisdictional infrastructure projects. RMC has performed similar reviews of desalination and other large water supply projects, and has years of experience with issues that are specific to the greater Monterey Bay area. Our team members' experience*

includes work on the feasibility study of the Sand City desalination project, development of the California PUC Plan B project, a review of the Pajaro/Sunny Mesa project for PVWMA, and ongoing work for the Marina Coast Water District to develop and implement a new desalination facility to serve the redevelopment of the former Fort Ord.

RMC will identify, investigate, and compare applicable issues, and identify potential gaps in available project information. We will conduct this effort with a comprehensive perspective gained from prior comparative analyses. We will consider the broadest range of issues possible, starting from detailed technical criteria and cost drivers through to institutional concerns and financing pitfalls.



Based on our understanding of the forces driving the project, RMC has developed the following approach to the work that will quickly identify critical items and resolve discrepancies, and deliver a clear and easily applied matrix of decision factors. The District will have this matrix to guide the additional information gathering that is required to facilitate informed decision making and endorsement of an optimum water supply solution.

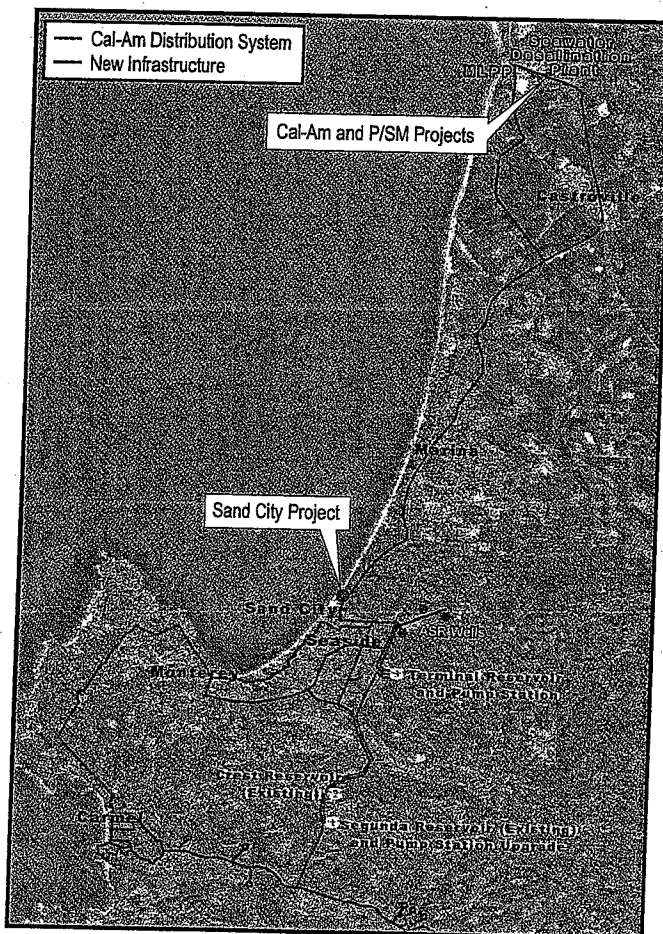
## Project Approach

RMC has identified three issues that must be addressed when completing a comparative analysis of the Monterey Peninsula Seawater Desalination Projects.

- **The technical evaluation** must be detail-driven yet comprehensive, considering all constraints and opportunities, from intake facilities and brine disposal through to delivery to the user. The solution must provide suitable reliability of service to users in the event of temporary loss of power or treatment capabilities.
- **Cost comparisons** must consider not only "hard" costs of site acquisition, operations, permitting, and facilities, but also how these costs are impacted by "soft" cost factors such as ability to secure land and easements, public approvals required for rate increases, permit requirements and associated mitigations, and eligibility for grant funding or low interest loans.
- **Institutional issues** could drive the project, and their review requires a candid, pragmatic approach. For example, the project must be designed to foster both Board and widespread public support. It needs to be consistent with ongoing pilot studies, and needs to either have, or include a plan for obtaining required approvals. Also, contractual and operational arrangements that impact the lead agency and ultimate user must be considered.

RMC's approach addresses these issues in the following paragraphs.

**Leave no stone unturned when reviewing technical feasibility.** RMC will identify comprehensive technical criteria to be applied consistently across project plans. RMC will highlight areas where project sponsors must either add or clarify their technical evaluation criteria to meet this checklist. Desalination membrane technology has been in widespread use in parts of the United States and worldwide since the late 70's, and is regarded as proven technology. However, outside of the treatment facility "box," the desalination story quickly becomes complex. Environmental impacts related to seawater intake and brine disposal are well-known concerns. However, regarding the projects being considered, developing the infrastructure needed to deliver treated water could pose an equally complex technical challenge. Critical to this issue is the location of the primary connection point(s) to the existing distribution system. The existing system was designed primarily to accommodate supply from the Carmel River. Therefore, improvements will be required within the existing system to enable transmission of water from a connection at the northern end to the central and southern portions of the distribution system. Understanding these improvements is critical to understanding total project costs and providing an equivalent basis for comparing the alternatives.



Connecting to the existing Cal-Am distribution system will introduce constructability, permitting, and easement challenges that must be considered when evaluating technical feasibility.

**Evaluate cost estimates for unit cost accuracy, completeness, and consideration of external factors.**

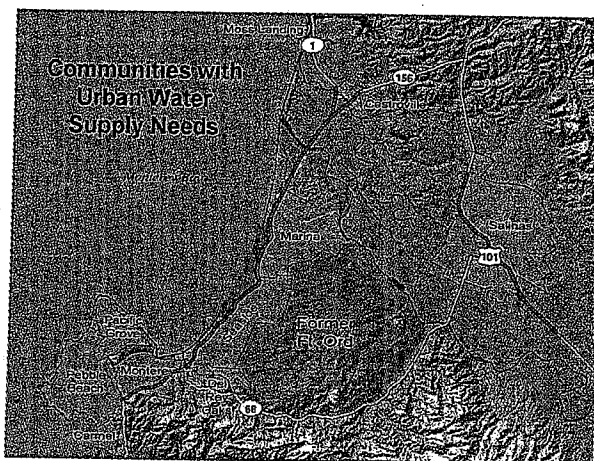
*RMC will conduct a comparative assessment that identifies gaps or inconsistencies between facility costs. RMC will then develop a list of external factors that have the potential to impact cost, and will determine whether each sponsor has considered these factors. RMC will highlight areas where project sponsors must adjust, change, or clarify their cost estimates. District staff has correctly observed discrepancies in proposed project costs that require clarification. An acute example is the difference between costs presented for the Coastal Water Project sponsored by Cal-Am, and the North Monterey County Desalination Project sponsored by Pajaro/Sunny Mesa (P/SM). In 2006, Cal-Am downsized its proposed facilities to 11,730 AFY, and consequently, reduced the estimated project cost. By comparison, P/SM has proposed a 20,000 AFY facility with essentially the same project cost as the now considerably smaller Cal-Am facility. Although there are distinct and significant differences between the projects, including the certainty of existing site agreements and availability of funding alternatives, this cost discrepancy and all cost estimates require additional scrutiny.*

**Review institutional and stakeholder issues drawing from personal experience implementing large, multi-jurisdictional, policy-driven infrastructure projects.**

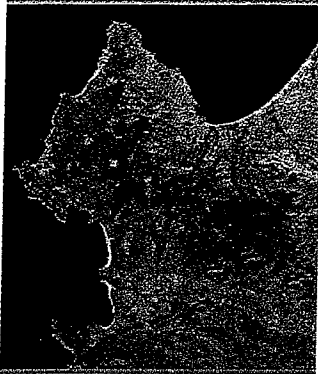
*RMC will identify potential governance, public support, permitting, funding, financing, and operational issues that could significantly change the outcome of any proposed project. RMC will relate each of these issues to factors critical to successful project implementation. RMC will highlight areas where project sponsors must augment or clarify their analyses to address these issues. One issue that will need to be addressed by all sponsors is the reality that the main objective of the District and Peninsula cities related to new water supply, to meet Order 95-10, is different than the broader Monterey County need for additional water supply for the region. This difference in philosophy creates an institutional challenge with the potential to impact implementation of any project alternative that incorporates a supply from North County. A second issue that may influence project parameters is the proposed desalination facility in the Marina Coast Water District / Ford Ord Reuse Authority (FORA) area, to provide a supplemental supply for the FORA community.*

RMC will draw upon its work involving Monterey County water supply issues; experience gaining Board, outside agency, and stakeholder support on controversial projects; and successes implementing large, infrastructure projects in the Bay Area and California to highlight these and identify other similar critical issues.

RMC's team of experts presented in Section 2, with input by District staff, will implement this approach systematically and with continuous attention to the balance between project details and global issues. The tasks that will be completed by the RMC team are outlined in the scope of services and schedule included in Section 4, and the cost proposal included in Section 5.



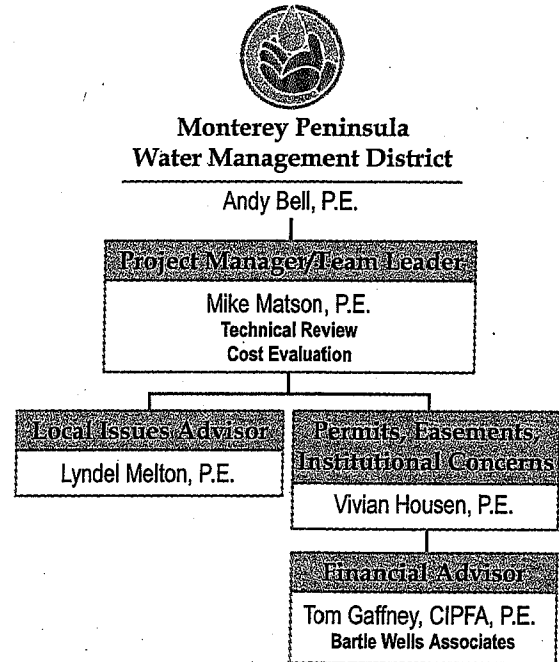
*Drivers beyond SWRCB order 95-10 must be considered to facilitate regional support of any alternative.*



## Section 2

### Team Member Qualifications

Evaluation of the Monterey Peninsula seawater desalination projects can best be accomplished with a team that has extensive local knowledge and experience and has successfully completed similar evaluations involving the technical, regulatory, environmental, institutional, and public issues associated with comparable projects. Each team member shown on our organization chart was chosen for his or her experience, technical expertise, and insight into the challenges that will frame the seawater desalination projects. All of RMC's team members proposed for this evaluation are based in our Walnut Creek office. RMC has managed and designed projects for a number of clients in Monterey and adjacent counties from our Walnut Creek office, including the City of Watsonville, the Monterey County Water Resources Agency, and the Pajaro Valley Water Management Agency. Team members will be available at any time of day or evening for meetings with your staff and other stakeholders, and for coordination visits in between. Our team is available and prepared to meet the milestone dates and deliver a draft report by April 19, 2006.



Brief descriptions of the responsibilities and expertise of our key team members are provided below. Resumes for each person are included in the Appendix.



#### Mike Matson, P.E. Project Manager/Team Leader

Mike Matson has 20 years of experience in civil engineering related to the planning, design, and construction of water infrastructure projects. He has strong experience in hydraulic evaluations and the design and construction of water and recycled water infrastructure, as well as facilities planning for water and recycled water systems. Mike was the primary author of the Plan B Project Report and played a key role in development of the facilities configuration. He also served as project engineer for offsite facilities of the San Luis Obispo Seawater Desalination Project, including seawater intake and pumping station, seawater pipelines, product water pipelines, brine disposal pipelines, and site grading. He developed alternative seawater pumping schemes, including retrofitting pumps into an existing PG&E circulation cooling water pumping plant, and developed alternative pipeline routes through an archaeologically rich area. Mike also developed the design criteria for the pipelines and pumping station and assisted with preparation of request for design/build/operate proposal documentation to construct and operate the desalination facility and the offsite facilities.



Lyndel Melton, P.E.  
**Local Issues Advisor**

Lyndel has 30 years of experience specializing in the planning and design of water resource management projects. He has an in depth understanding of local and regional water resource management issues in the greater Monterey and Peninsula areas, including surface and groundwater management, seawater intrusion, alternative water availability, environmental and habitat management, and desalination. Lyndel was the project manager for the California Public Utilities Commission's Contingency Water Supply Program (Plan B) and for the Salinas Valley Water Project, the Castroville Seawater Intrusion Project, the Basin Management Plan for the Monterey County Water Resources Agency, and for the original Sand City desalination feasibility study in the early 1990s. He was also the project manager for the Basin Management Plan Update for the Pajaro Valley Water Management Agency and managed the Zone 7 Water Management Agency's Groundwater Demineralization Project. He is presently leading the Marina Coast Water District effort for implementation of a new desalination facility to serve the water need for redevelopment in the former Fort Ord area.



Vivian Housen, P.E.  
**Permits, Easements, Institutional Concerns**

Vivian brings over 17 years of experience implementing complex infrastructure projects for public agencies. She served for seven years as general manager of the Livermore-Amador Valley Water Management Agency (LAVWMA), a joint powers agency that is heavily involved in water management issues in eastern Alameda County. As general manager, she successfully completed a \$218 million program of treated wastewater facility expansions and improvements. Under Vivian's management, LAVWMA moved forward with this program with minimal delays, and saved over \$70 million in capital costs. Program success required the coordination and oversight of numerous consultants, contractors, public agencies, regulators, community leaders, and other stakeholders involved in planning, design, and construction. Vivian is currently the program manager for Ross Valley Sanitary District's (RVSD) system assessment program. In this role, she is providing direct support to the district manager at RVSD and coordinating with the EPA to complete a comprehensive facility assessment, develop a long-range capital improvement program to alleviate capacity issues, develop a plan of finance, execute the financing, and initiate the program by the end of 2006.

Tom Gaffney, CIPFA, P.E.  
**Financial Advisor**

Thomas E. Gaffney is a principal consultant of Bartle Wells and Associates with over 20 years of consulting experience. He is an expert in water and wastewater financing plans and institutional programs, contract negotiations, utility rate studies, connection fee studies, and bond marketing. Tom has directed projects involving more than 300 separate agencies in California and five other western states. He is currently advising RMC on the Ross Valley Sanitary District's system assessment program, providing insight related to financing options and pitfalls associated with the proposed infrastructure improvement projects.

# Section 5

## Cost Estimate

RMC's team is comprised of individuals who can assure you of a thorough and accurate comparative evaluation and outcome. Our proposed team members bring prior success working in the Monterey Bay area and/or demonstrated experience addressing issues that are similar to those faced by the District. In addition, our work plan will benefit from the previous and current work we are doing for other clients.

Our cost matrix is broken down by task and sub-task as shown below.

Tasks	RMC Labor						Sub Labor	Other Direct Costs	Subconsultants	TOTALS*
	PM	PE	Advisor	Admn.	Labor Total		Financing			
	Mike Matson	Vivian Housen	Lyndel Melton		Hours	(\$)	Bartle Wells			
								(\$)	(\$)	(\$)
<b>Task 1 Project Management</b>										
1.1 Prepare Work Plan & Project Schedule		2		2	4	\$ 580				\$ 580
1.2 Contract Administration & Resource Mgmt.	4			2	6	\$ 1,040				\$ 1,040
1.3 QA/QC Program	1	1	1	1	4	\$ 715				\$ 715
								\$ 175		\$ 193
<b>Task 2 Communications</b>										
2.1 Project Meetings	16	8	4	4	32	\$ 6,140				\$ 6,140
2.2 Bi-weekly Telephone Updates	3	3	1	3	10	\$ 1,715				\$ 1,715
2.3 Presentation to Board of Directors	4		4		8	\$ 1,700				\$ 1,700
								\$ 717		\$ 788
<b>Task 3 Review Existing Information</b>										
3.1 Coast Water Project (Cal-Am)	4	2	1	1	8	\$ 1,535				\$ 1,535
3.2 Monterey Bay Regional Desalination Project (Pajaro/Sunny Mesa)	4	2	1	1	8	\$ 1,535				\$ 1,535
3.3 Sand City Seawater Desalination Project (MPWMD)	4	2	1	1	8	\$ 1,535				\$ 1,535
3.4 Governance, Stakeholder, Regional Issues	2	2	1	1	6	\$ 1,115				\$ 1,115
3.5 Pilot Project Configurations - Successes	2				2	\$ 420				\$ 420
								\$ 461		\$ 507
<b>Task 4 Evaluate Proposed Projects</b>										
4.1 Technical Feasibility	28	2	1	1	32	\$ 6,575				\$ 6,575
4.2 Proposed Costs	28	2	1	1	32	\$ 6,575				\$ 6,575
4.3 External Forces & Drivers, Project Constraints	1	24	8	1	34	\$ 6,590	3200		\$ 3,520	\$ 10,462
								\$ 1,481		\$ 1,629
<b>Task 5 Prepare Draft and Final Reports</b>										
5.1 Draft Report	24	8	2	4	38	\$ 7,390				\$ 7,390
5.2 Final Report	12	4	1	2	19	\$ 3,695				\$ 3,695
								\$ 831		\$ 915
<b>TOTAL PROJECT COST</b>	<b>137</b>	<b>62</b>	<b>27</b>	<b>25</b>	<b>251</b>	<b>\$ 48,855</b>	<b>3200</b>	<b>\$ 3,664</b>	<b>\$ 3,520</b>	<b>\$ 56,759</b>

### Notes

\*TOTALS column includes a 10% mark-up on subconsultants and ODCs  
 ODCs estimated as 0.75% of labor cost