Development of Water Use Efficiency Implementation Cost and Cost-Effectiveness Model

A Technical Assistance Proposal from The Pacific Institute, Oakland California

This proposal has been prepared in accordance with the final water use efficiency PSP (11/15/04) issued by the Department of Water Resources under Proposition 50.
It contains:

- The project information form and signature page
- The body of the proposal, including the Statement of Work, Sections One, Two, and Three; Summary of Qualifications; Outreach, Community Involvement and Acceptance; Innovation; and Benefits components of our proposal, as required in the PSP.
- Resume for the proposed project manager
- Cost Table C-1
- A tabular breakdown of the total cost in Table C-1, as required in the PSP.
- Letters of support from three water districts that have agreed to serve on the Project Advisory Council (PAC)

2004 Water Use Efficiency Proposal Solicitation Package

APPENDIX A: Project Information Form

Applying for: X Urban ❑ Agricultural

1. **(Section A)** Urban or Agricultural Water Use Efficiency Implementation Project

❑ (a) implementation of Urban Best Management Practice, #_____

❑ (b) implementation of Agricultural Efficient Water Management Practice, #_____

❑ (c) implementation of other projects to meet California Bay-Delta Program objectives, Targeted Benefit # or Quantifiable Objective #, if applicable _____

❑ **(d) Specify other: _____**

2. **(Section B)** Urban or Agricultural Research and Development; Feasibility Studies, Pilot, or Demonstration Projects; Training, Education or Public Information; Technical Assistance

❑ (e) research and development, feasibility studies, pilot, or demonstration projects

❑ (f) training, education or public information programs with statewide application

X (g) technical assistance

❑ **(h) other**

3. Principal applicant (Organization or affiliation): **Pacific Institute for Studies in Development, Environment, and Security**

4. Project Title: **Development of a Water Use Efficiency Implementation Cost and Cost Effectiveness Model**

5. Person authorized to sign and submit proposal and contract:

Name, title	**Peter Gleick**
Mailing address	**654 13th St., Preservation Park**
	Oakland, CA 94612
Telephone	**510-251-1600**
Fax.	**510-251-2203**
E-mail	**pgleick@pacinst.org**

6. Contact person (if different):	**Name, title.**	**Gary Wolff**
	Mailing address.	**654 13th St., Preservation Park**
		Oakland, CA 94612
	Telephone	**510-251-1600**
	Fax.	**510-251-2203**
	E-mail	**gwolff@pacinst.org**
7. Grant funds requested (dollar amount): *(from Table C-1, column VI)*		**$142,385**
8. Applicant funds pledged (dollar amount):		**$0**
9.Total project costs (dollar amount): *(from Table C-1, column IV, row n)*		**$142,385**
10.Percent of State share requested (%) *(from Table C-1)*		100%
11.Percent of local share as match (%) *(from Table C-1)*		0%
12.Is your project locally cost effective? ***Locally cost effective means that the benefits to an entity (in dollar terms) of implementing a program exceed the costs of that program within the boundaries of that entity.*** ***(If yes, provide information that the project in addition to Bay-Delta benefit meets one of the following conditions: broad transferable benefits, overcome implementation barriers, or accelerate implementation.)***		❑ (a) yes ❑ (b) no
		Not Applicable
11. Is your project required by regulation, law or contract? **If no, your project is eligible. If yes, your project may be eligible only if there will be accelerated implementation to fulfill a future requirement and is not currently required.** ***Provide a description of the regulation, law or contract and an explanation of why the project is not currently required.***		❑ (a) yes X (b) no

_____
_____
_____
_____
_____

12. Duration of project (month/year to month/year):	30 months
13. State Assembly District where the project is to be conducted:	District 16
14. State Senate District where the project is to be conducted:	District 9
15. Congressional district(s) where the project is to be conducted:	District 9
16. County where the project is to be conducted:	Alameda
17. Location of project (longitude and latitude)	37.8 N 122.3 W
18. How many service connections in your service area (urban)?	Not Applicable
19. How many acre-feet of water per year does your agency serve?	Not Applicable

20. Type of applicant (select one):

- ❑ **(a) City**
- ❑ **(b) County**
- ❑ **(c) City and County**
- ❑ **(d) Joint Powers Authority**
- ❑ **(e) Public Water District**
- ❑ **(f) Tribe**
- **X (g) Non Profit Organization**
- ❑ **(h) University, College**
- ❑ **(i) State Agency**
- ❑ **(j) Federal Agency**
- ❑ **(k) Other**
  - ❑ **(i) Investor-Owned Utility**
  - ❑ **(ii) Incorporated Mutual Water Co.**
  - ❑ **(iii) Specify _____**

21. Is applicant a disadvantaged community? If 'yes' include annual median household income. (Provide supporting documentation.)

❑ **(a) yes, _____ median household income**

X (b) no

2004 Water Use Efficiency Proposal Solicitation Package
APPENDIX B: Signature Page

By signing below, the official declares the following:

The truthfulness of all representations in the proposal;

The individual signing the form has the legal authority to submit the proposal on behalf of the applicant;

There is no pending litigation that may impact the financial condition of the applicant or its ability to complete the proposed project;

The individual signing the form read and understood the conflict of interest and confidentiality section and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant;

The applicant will comply with all terms and conditions identified in this PSP if selected for funding; and

The applicant has legal authority to enter into a contract with the State.

PAPER COPIES SIGNED	Peter H. Gleick, President	1/6/05
Signature	Name and title	Date

Development of Water Use Efficiency Implementation Cost and Cost-Effectiveness Model

A Technical Assistance Proposal from The Pacific Institute, Oakland California

This section of our proposal contains the Statement of Work, Sections One, Two, and Three; Summary of Qualifications; Outreach, Community Involvement and Acceptance; Innovation; and Benefits components of our proposal, as required in the PSP.

Summary of This Proposal and Its Merits

The economics of water conservation are a critical issue for the State of California. A full set of cost and benefit estimating tools are not yet available to utilities and other water managers, although tools that address parts of the situation are either available or in development. Almost all of the tools that are available are proprietary and not transparent. This proposal is for development of a conservation program economic analysis model that will be fully transparent and available at no charge in the public domain. The model will *primarily address implementation costs* and water savings from programs in detail, but will place those costs and water savings in an overall framework that allows users to assess whether a program or measure is economically desirable or not. The model will allow input of benefit values from other sources such as existing, commercially available proprietary models or models that are being developed (e.g., the CUWCC sponsored avoided cost and environmental benefit models).

The dialogue in California has recently shifted from whether significant urban water conservation beyond BMPs is possible into a dialogue about implementation obstacles and the cost of overcoming them. This project proposes an innovative way of addressing that issue. *Rather than analyzing implementation obstacles and costs and issuing our opinion on the topic, we are proposing to collaboratively develop a tool that can and will be used in a decentralized way to address the issue over the next five or more years.* This is an innovative approach to problem solving. It replaces "dueling models" with broadly shared and participatory research.

Using the tool, each utility can consider implementation costs and economic desirability under its own constraints and conditions. Of course that has and is implicitly taking place in the absence of the tool, but utilities are not always able to explain to their customers, to interested parties, or to other utilities, all the details of how they are making those assessments. The technical assistance tool we propose to develop will create a level of transparency that will greatly increase the credibility and effectiveness of utility's self-assessments in this area. It will also greatly increase the ease with which utilities can compare and exchange cost data and experiences with conservation program implementation. The tool will also allow smaller utilities with limited staff and consulting resources, to analyze conservation program or measure economics in a professional, transparent, understandable, and defensible way. The cost accounting framework it creates will be comparable across water utilities, which in turn will allow regional and statewide organizations (e.g., CALFED or DWR) to compare requests for financial assistance on a common basis.

The project will lead to more or faster water conservation in California, a tangible economic benefit. As described in a later part of this proposal, one hundred million dollars per year, or more, of net

benefits (total benefits minus total costs) are potentially available from additional water conservation in California. If the work in this proposal helps to capture only 1% of that value added, it will have repaid the dollar amount of the grant up to 70 times over.

Statement of Work, Section One: Relevance and Importance

Relevance to CALFED and State and Local Water Planning Objectives

The Pacific Institute is proposing to develop and disseminate a model that utilities can use to evaluate the economic desirability and other economic aspects of conservation programs or measures. This type of technical assistance is essential for achieving CALFED Program goals, which include ecosystem restoration, water supply reliability, water quality, and levee integrity. In accordance with Water Use Efficiency Program goals, our project will facilitate the implementation of conservation measures and improve water use efficiency. These improvements will advance water quality and reliability and augment in-stream flows, thereby facilitating ecosystem restoration.

Recognizing that cost-effectiveness varies regionally and according to the level of analysis, e.g., local or state, CALFED seeks to maintain a high degree of flexibility in regards to conservation mandates. Distributing soil moisture sensors, for example, may be cost-effective in regions where lawns are common, but not in more densely populated areas. In addition, some measures may be cost-effective from a statewide perspective, but not locally. Our model will be sufficiently general and flexible to address these concerns. A conservation measure or program can be evaluated at a local, regional, or State level and integrated into one or more management plans as appropriate. Our model will explicitly allow users to consider various levels of cost sharing for programs that are not locally cost-effective but are still desirable for a State perspective.[1]

The model is also relevant for local urban water management plans. Using the tool, each utility will be able to consider implementation costs and obstacles under its own constraints and conditions. Of course that has and is implicitly taking place in the absence of the tool, but utilities are not always able to explain to their customers, to interested parties, or to other utilities, all the details of how they are making those assessments. The technical assistance tool we propose to develop will create a level of transparency that will greatly increase the credibility and effectiveness of utility's self-assessments in this area. It will also greatly increase the ease with which utilities can compare and exchange cost data and experiences with conservation program implementation.

Importance of The Proposed Work

As described in the benefits section toward the end of this proposal, most analysts seem to agree that at least one million acre-foot (af) of water conservation is possible by the year 2020, over and above the conservation that will result from full compliance by Urban Water Districts with the MOU for urban water conservation (about 1.6 million af by 2020; see Fiske, 2001). This implies that the possible economic benefit of additional water conservation beyond the BMPs is at least $100 million a year.

This potential might not be realized, however, because: 1) conserving all of the technical potential might not be economically desirable, and 2) we may fail to overcome implementation obstacles for conservation programs that are economically desirable.

[1] The model will also allow users to share costs regionally or statewide even when their program is cost-effective locally, because Proposition 50 allows such cost-shares to take place when regional or statewide benefits exist.

Parts of the economic analysis needed to answer these questions have been or are being systematized in spreadsheet models that either already are or will be made available to water agencies and companies in California. For example, the CUWCC is currently sponsoring an avoided cost and an environmental benefits projects, each of which will result in a spreadsheet model and associated users manual. Similarly, the CUWCC has previously developed some tools for estimating the implementation costs and benefits of BMPs for exemption purposes under the MOU.

But *no one has yet created a framework model* for overall assessment of economic desirability, *nor built into that model a way of exploring implementation costs* and the many ways that costs and benefits can be shared among customers, their water suppliers, and regional and state entities. Our proposal is to develop a general and transparent model that does these two things. It will NOT provide "the answer" to the question of economic desirability for each conservation measure, nor will it say "how to allocate" costs and benefits. Instead, it will allow users to systematically organize and input the implementation costs of possible conservation measures (not just BMPs and PBMPs, but any conservation measure) and to compare those costs with any set of benefits the user chooses to quantify and input to the model (or import from another model). The model output will then say whether a measure (or program) is economically desirable, and what the allocation of costs and benefits among parties is, under the assumptions that were input.

These issues are illustrated in Figures 1-4, below. A few economic definitions are relevant to the figures. First, costs and benefits can be either *tangible* or *intangible*. By definition, tangible costs and benefits have been quantified; intangible ones have not (Tietenberg, 2000). Most economists believe that all costs and benefits can be quantified in principle, but not in practice. One can think of intangible costs and benefits as qualitative factors that may be very relevant to a decision process, but that we have not been able to estimate in any reasonable numerical fashion. The "line" between other tangibles and intangibles is not hard and fast: it will change over time as our knowledge changes.

Second, quantified costs and benefit can be *financial* or *other tangible* values. The staff labor cost to administer a clothes washer rebate program, and the rebates, are financial costs. The water and utility bill reductions for owners of the washers are financial benefits. In contrast, other tangible benefits might include the value to fishermen (or those who sell fishing equipment, rent boats, etc.) of reduced raw water intake for reduced discharges of wastewater. Even if these other tangible benefits have an estimated value of $50 per acre-foot of water conserved each year (on average) based on the fisheries economic valuation literature, they are not financial benefits unless we can identify specific cash flows to or from specific fishermen, etc. The "line" between financial and other tangibles will change as new financial mechanisms (and the cash flows they make possible) are created.

Figures 1-4 assume, for simplicity, that all of the costs of conservation programs are financial.[2] Figure 1 represents a situation where financial benefits exceed financial costs, so one can safely implement the feature without quantifying other benefits. Figure 2 represents the situation where it is necessary to quantify at least some of the non-financial benefits of a feature before proceeding. This figure includes the case where local financial costs exceed local financial benefits, but a regional or statewide benefit exists. Figure 3 represents the situation where intangible benefits are decisive: that is, a decision to

[2] This is a reasonable assumption since the negatives of conservation programs can usually be estimated as extra costs for the utility, a financial cost. Water conservation usually does not have potential environmental or social costs.

proceed is based on a qualitative belief by a customer or utility that the benefits of a conservation measure or program exceed its costs. Figure 4 represents the situation where the measure or program is economically undesirable.

Figure 1: Economically Desirable Based on Financial Benefits Alone

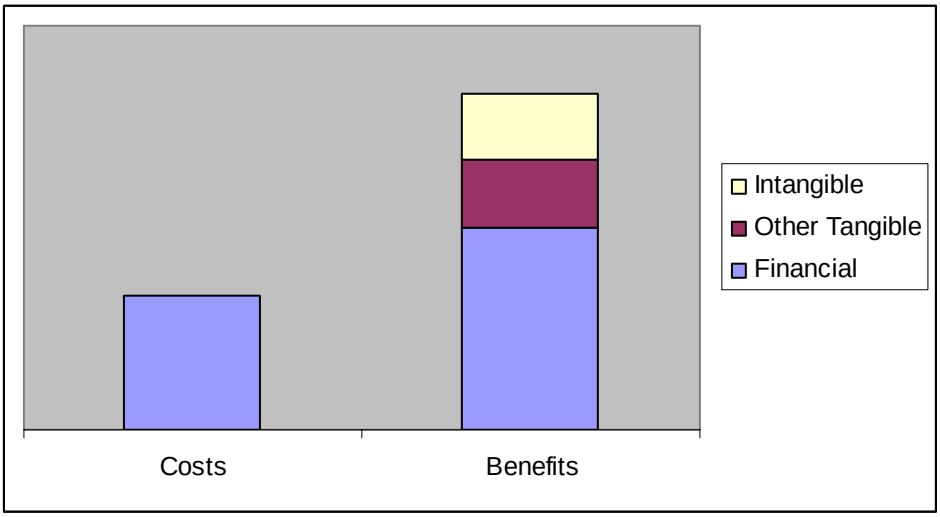


Figure 2: Economically Desirable, Other Tangibles Decisive

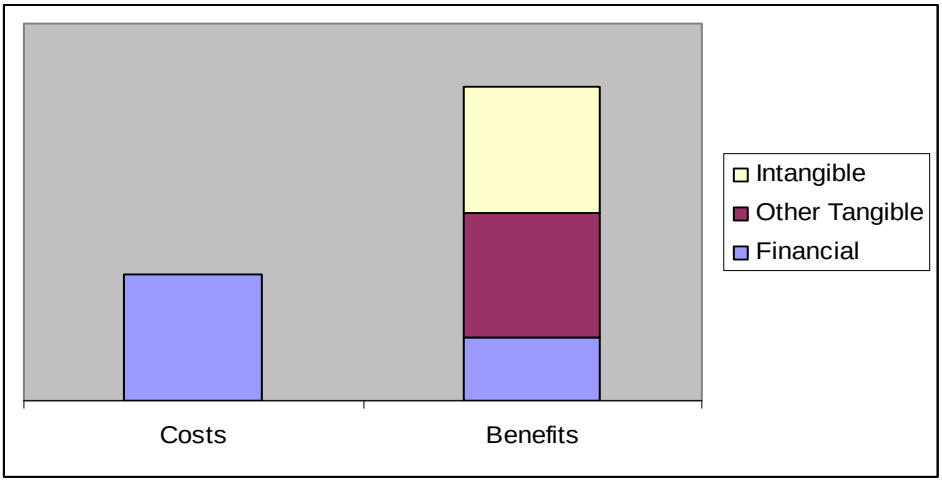


Figure 3: Economically Desirable, Intangibles Decisive

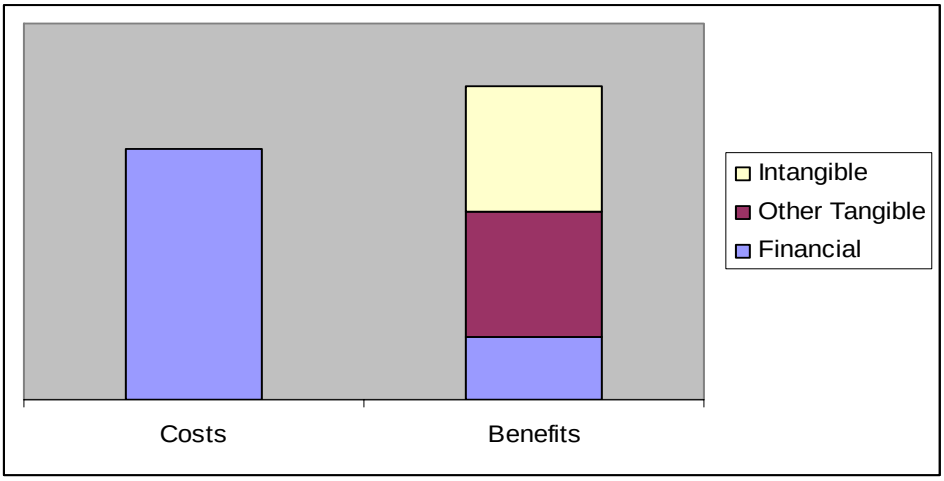
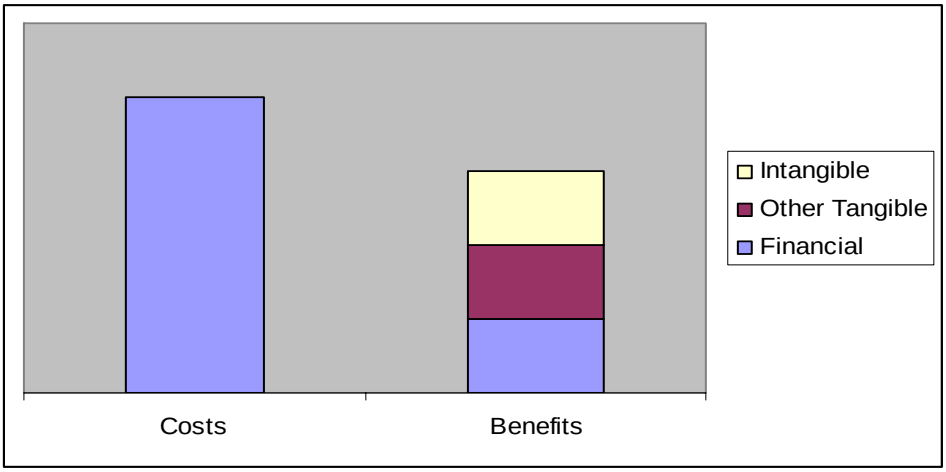


Figure 4: Economically Undesirable



An implementation obstacle to proceeding in the economically desirable situations (Figures 1-3) is the allocation of costs and benefits. If one party bears all costs and benefits, no problem exists. But there is typically a *split incentive* problem. The utility incurs financial costs that create financial benefits for customers and others. Unless customers and other beneficiaries (e.g., wastewater agencies, or fishermen in the example above) are willing to share these costs through higher water rates or other means, the utility's financial incentive is to *under invest* in water conservation. We need to be clear in our communications, however: that this implementation obstacle is a separate issue from the issue of overall economic desirability.

The model we propose to construct will allow users to compare financial and other tangible costs and benefits to obtain an assessment of economic desirability. But it cannot estimate the value of intangibles, so it will not provide final answers about desirability. Furthermore, the model will not evaluate in detail the financial or other tangible benefits of conservation. There are other work efforts underway in California to do that. The model will allow users to input or import benefit values from these other sources.

The most important detailed work the model will do is to organize and help users to assess the financial costs of implementing conservation programs. We need to understand implementation costs and obstacles much better than we do at present. As part of that work, the quantities of water that will be conserved by a program need to be estimated. So the model will evaluate physical water savings and the various ways of estimating them in detail (including the issue of savings decay, over time).

The model is a technical assistance tool that will allow people to share their experiences and concerns with each other in transparent, comparable, ways. Until that is done, the potential of water conservation in California will probably not be realized to the full extent that is economically desirable, whatever that is. This is because "imperfect" and "incomplete" information are significant barriers to success in any field. In water conservation, lack of transparency and comparability in economic assessments has been a major impediment for water solutions. Opinions based on opaque analysis dominate the discussions. We need to move toward opinions based on transparent analysis. Only then will we be able to find real solutions that meet the needs of many different people and organizations.

Statement of Work, Section Two: Technical/ Scientific Merit, Feasibility

The primary tasks and deliverables for this project are described below. The proposed project schedule is presented after the text. A cost breakdown by task is attached following Table C-1, the cost summary table required in the PSP.

Scope of Work

Task 1: Finalize the project advisory committee (PAC)
We've begun to assemble a PAC, as evidenced by letters of support included in this proposal. But we will finish that task at the beginning of the project to ensure that the full range of possible model users – cities, special districts, wholesalers, retailers, private companies, state and regional agencies, others – are represented on the PAC. PAC members are a sample of those who will use the model and will provide advice on model architecture and functions, and test the model, during development. They are not expected to provide any project funding.

Task 2: Interviews with PAC members
The project will begin with a review of the budget formats of a variety of water suppliers, hopefully represented on the PAC, but if not, accessible through PAC members. Ultimately, this project will create a cost input format that meshes with all or most budget formats that exist today, but is also not too complicated. We'll begin moving toward that outcome by reviewing the actual formats in use.

We'll also review the implementation cost models and formats used by the CUWCC for exemptions or mock exemptions. These formats are narrowly tailored to particular BMPs or PBMPs. This project will eventually create a model format that is capable of including all of these particular situations, but is more general and flexible. We need to review the existing model details in order to achieve that outcome.

In this task we'll also review the needs that the model is intended to meet as described in the objectives of our proposal, by talking with those who will use the model. If we can meet any needs not identified in the proposal but identified in this stage of the project, we will. For example, we know that

a standardized cost accounting format for implementation costs will be helpful to CALFED or DWR in reviewing future applications for funding of water conservation programs that claim to be not cost-effective at the local level. This project will address that need. We also know that CALFED or DWR funding may be made available even when a project is cost-effective at the local level if the regional or statewide benefits justify contributions from the broader public. This project will NOT address that need. But are there any other cases relevant to grant funding that the model might address, and that we should be aware of at the beginning of the project? Also, what forms of regional and state cost-sharing might exist in the future? Grants with cost-share percentages, certainly. Device rebates, certainly. But should the model show those rebates paid directly to customers, to agencies, or have an option for either? And are loans a possible form of state/ regional cost-sharing with local entities? If so, how might loans and loan payback terms be incorporated in a cost estimating spreadsheet model?

The final model created in this project needs to have enough detail in it to substantially advance our understanding of conservation program implementation costs and cost-effectiveness at the local level. This means, for example, that the categories of implementation costs that everyone knows about – e.g., labor, or conservation device purchase costs – need to be broken into sub-categories that cover the full range of possible expenditures but that are also simple enough to allow comparison and learning across utilities. Labor for installing devices, labor for informing customers about their options, labor for audits, labor for managing programs, etc., should be accounted for in separate line items so that agencies can compare and learn from each other about which components are the most costly, the most likely to contain surprises, and so forth.

But the model can't have too many categories of labor (and other categories) or it will become unusable. In addition, the data details required by the model have to be available within the accounting systems of most water suppliers who would use the model. The match between available data sources and the model structures is very important and will be addressed, initially, in this task.

The deliverables in this task are two PAC meetings by phone and separate conversations and communications as necessary to obtain and understand the information described above.

Task 3: Draft a Model

Using the results of task 1, we will create a first draft of a transparent, fully generalized spreadsheet model that "easily integrates" with other tools that are already available or are being developed (e.g., the avoided cost and environmental benefits models being developed by the CUWCC). Our water-to-air models (www.pacinst.org) are examples of fully generalized, transparent spreadsheet models. They allow comparison of any number of water management scenarios created by the user. Users create these scenarios within a template that is both standardized and flexible enough to accommodate any water system. The models include default values for many (but not all) input parameters, in order to give users a feeling for the models. But the default values are not necessarily typical or representative. The models are general and don't claim to offer "the answer." Instead, they organize user thinking and data about possible air quality impacts of water management decisions, a complicated but important topic that all of us need to understand better.

The model drafted in this task will have similar capabilities. Specifically, it will:

- Help users to systematically organize the costs of conservation program implementation, not just by the agency but by customers and cost-sharing parties as well, and

- Prompt the user to input (or import) estimates of the benefits of conservation programs developed outside the program, and

- Output a determination of economic desirability overall and the INITIAL allocation of costs and benefits among parties.

This last point is critical. Most analyses of costs and benefits have two results that are often intermingled in a confusing way. First, do total benefits exceed total costs? If so, the project is economically desirable. Second, to benefits to every party exceed costs to that party? If not for ANY party, an implementation obstacle exists. But this second situation is not about desirability, overall. It is a subordinate issue – a difficult and important one – but one that must be understood in context. If an implementation obstacle exists for a desirable project, there will ALWAYS be a way to re-allocate costs and benefits to overcome the obstacle. Creativity and patience may be required, and political or other obstacles may prevent the re-allocation from taking place, but there will always be some allocation of costs and benefits under which all parties come out ahead if in fact the project is desirable overall.

The cost evaluation method within the model is an important point for discussion with the PAC. At minimum, the levelized cost method used widely in the utility sector and in Waste Not, Want Not (Gleick, et al., 2003) will be incorporated. This method calculates an equivalent "cost of conserved water" for comparison with the cost of providing physical water. If the cost of conserved water is less than the avoided cost of providing physical water, conservation is cost-effective. If the cost of conserved water is more than the avoided cost of providing physical water, but the environmental (or other tangible) benefits of water conservation make up the difference, conservation is economically desirable. The levelized cost method is a simple way of getting at these comparisons, but it can be misleading because it does not usually account for future changes in costs and quantities of water conserved. To do that requires more data inputs or assumptions and a method that compares the relative net present value of conservation programs and their alternatives.

PI staff will provide some worked examples of these methods, and perhaps others, to the PAC during Task 2 in order to determine the best balance between simplicity of use and meaningful model outputs, before beginning to program the model.

This task culminates in distribution of a review package composed of an initial model ("beta version") and enough documentation of the model structure and data requirements to allow thorough review by the PAC. Default values based on the research in Task 1 will be provided for most parameters, but these values will NOT be considered representative or typical. Instead, they will be used to show users by example how they might use the model.

<u>Task 4: Review</u>
Written comments will be required from all PAC members. A conference call to discuss them will be held. Members will have an opportunity after the call to modify their comments.

Task 5: Revision of the model and users manual
PI staff will then revise the draft model and prepare a full draft users manual.

Task 6: Second review
PI staff will distribute the second draft model and manual to the PAC and, if possible, a few people who are not on the PAC. Ideally, the model and manual will be usable by people who have never seen or discussed it before. We will ask reviewers to actually use the model for one conservation program, document the results, and to send us written comments and suggestions. These comments will be with respect to operation of the model, adequacy of the documentation, and the usefulness of the information obtained from the model.

Task 7: Finalize the model and users manual
PI staff will finalize the model and users manual in response to comments received in the second review. The final manual will be professionally laid out and printed in four colors.

Task 8: Distribution and Outreach
We will post the model on our website and arrange for the users manual to be mailed to all urban water agencies and companies in California. The CUWCC graciously mailed our water-to-air users manual to these agencies recently. We will perform a similar mailing either directly or working with the CUWCC. Website posting allows "glitches" and upgrades to be made at later times. We also have found that website posting is extremely cost effective. We have had literally tens of thousands of full downloads of some documents, far more than we could afford to print and mail. The model and users manual will be available in the public domain for anyone to use.

We will also present the model and users manual in four venues approved by the PAC. These might be workshops organized by the CUWCC or conferences organized by professional associations. For budget purposes, we've assumed four half-day workshops and the time required to prepare for them. We will collaborate with water utility organizations (e.g., CUWA or ACWA, etc.) to find the best venues for these presentations. The Pacific Institute has conducted such briefings on numerous occasions in the past. We'll be sure to pick venues that address Federal, State, and Local agency audiences in at least Southern California, Sacramento, and the Bay Area.

We may also make one or more formal presentations at major conferences like an annual American Water Works Association meeting; the American Water Resources Association meeting, or the annual POWER (Public Officials for Water and Energy Reform) meeting in Los Angeles. Finally, we will prepare and distribute a summary of the model and users manual for distribution to trade and professional association magazines or journals in order to "drive" possible users to our website for download of these tools.

Task 9: Monitoring and Assessment
We will send a survey to all urban water utilities in California that received copies of the users manual in Task 7 approximately six months after the manuals are mailed. The survey will ask, at minimum, if they have used the model, their general impressions of it, their specific experiences with it (e.g., what conservation programs did they analyze and what did they find), and the cost input parameters they used in their particular situations. We will make selected follow-up phone calls if necessary to ensure that at least 50 responses are received (about 10% of the urban water agencies in California).

We'll summarize the results of the survey *without revealing individual respondent identities* in a final project report for submittal to DWR. The summary will provide mean, median, low and high values for numerical responses, and will break the data into regional groups to the extent possible. We'll also make the final report available at no charge on our website. The summary of cost input parameters should be very useful for utilities. By reading the final report, they will be able to see for example how contract or in-house staff cost of residential water audits varies around the state. Summaries of economic results from model use should also be very useful as a source of comparative data for utilities in their future planning efforts.

Task 10: Quarterly and final grant progress reports
PI staff will provide quarterly and final grant progress reports and other administrative deliverables required by the DWR as necessary. For budgetary purposes, we've assumed that the quarterly reports can be completed in a few hours each.

Project Schedule

Task or Activity	Deliverable	Date
Notice to Proceed	None	Month "0"
Finalize the PAC	Final PAC membership list	Plus 1 month
Interviews/ data gathering	Two meetings	Plus 3 months
Draft model and documentation	Review package	Plus 6 months
First review	Written comments and meeting	Plus 8 months
Revise models & users manual	Review package	Plus 11months
Second review	Written comments	Plus 13months
Finalize and disseminate	Publish and mail user manual	Plus 16 months
	Present the model in four venues	Plus 20 months
	Publicize in trade magazines	Plus 20 months
Monitor and Assess	Mail Survey	Plus 22 months
Summarize Survey Results	Final project report to DWR	Plus 25 months

The total project duration is 25 months, without "slack" to account for the inevitable surprises that occur. We propose a 30-month schedule for the project.

Statement of Work, Section Three: Monitoring and Assessment

We've addressed the requirements of the PSP for this section through Task 8 of the scope of services. As described in the Task, we will survey urban water agencies six months after the model is disseminated and summarize the results of the survey in a final project report to DWR. The proposed assessment will be useful as an educational and technical assistance tool because it will summarize and organize into comparable numbers the implementation costs and other actual experiences of a wide variety of water suppliers, and share that information (anonymously) among water suppliers.

Peer reviewers and participating utility staff will also assess the quality of the work internally during the course of the project. This internal monitoring and assessment is an important part of the quality control process for the project, a process that will ensure a useful product that is practical and tailored to meet the needs of utility staff.

Qualifications of Applicant and Cooperators

The Pacific Institute is well qualified to perform this work. It is a direct extension of previous projects and reports such as Gleick, et al. (2003), Wolff (2004), and Wolff, et al., (2004). We've recently completed a model preparation project that is similar in scope under a grant from the California Energy Commission, and successfully completed a previous DWR Water Use Efficiency grant (more details below). Gary Wolff, P.E., Ph.D., the proposed project manager and principal investigator, is a licensed Civil Engineer with water project experience and holds a Ph.D. in resource economics. He performed all the economic analysis in Gleick, et al. (2003) and was the project manager for Wolff, et al. (2004) and principal investigator for Wolff (2004). He is a member of the CUWCC "Avoided Cost and Environmental Benefits Projects" and the AWWARF "Water Efficiency Programs for Integrated Water Management" Project Advisory Committees (PACs), and is a compensated peer reviewer for these projects.

Dr. Wolff is currently working with two municipal utilities and the Bureau of Reclamation on water conservation and water supply economic analysis. Descriptions of those projects are available upon request. Dr. Wolff's resume is attached.

The project team will also include Peter Gleick, Ph.D., Heather Cooley, and Sanjay Gaur. Peter is the President of the Institute and has more than 20 years of experience in water conservation issues in and outside of California. Heather Cooley is a Research Associate at the Institute and recent graduate of the Energy and Resources Group at UC Berkeley. Sanjay Gaur is a policy analyst and programmer with extensive experience in the water sector. He has worked for several well-known firms in the water conservation field, and programmed the water-to-air models under Gary Wolff's direction. He will be a contractor to the Institute on this project. Resume's for these people are available upon request. Biographical materials for Institute staff are also available at www.pacinst.org.

External cooperators will include but not be limited to the Dublin-San Ramon Services District, the City of Santa Rosa, and the Coachella Valley Water District. Letters of support and a commitment of about 200 hours of staff time from each of these agencies are attached. External cooperators will be organized into a project advisory committee (PAC) in the first task of the project. *Participants other than these three agencies will be solicited*. Dr. Wolff, however, has a working relationship with these agencies and felt it would be useful to demonstrate in the proposal the willingness of agencies to collaborate in this project. Furthermore, these three agencies have different internal cost accounting frameworks and different model related needs.

The external cooperators will help to guide the project as it proceeds, ensure that its data requirements are consistent with their internal practices, and that the outputs will be most useful to them. They will test the model twice during the project and provide written comments on the draft users manual. The scope of services, above, describes their participation in more detail.

The Institute has had several previous grants that seem relevant. These are:

Department of Water Resources Agreement (46002001674). 2001. $72,500.
"Quantifying Commercial, Industrial, Institutional Demand Side Management Potential."

The objectives of the project were to (1) estimate current CII demand by sector and end-use, (2) identify demand management alternatives, and (3) quantify water savings based on each alternative for selected industries and regions of California. Based on these results, we prepared a series of policy recommendations for water conservation. The results of this study were included in the report entitled "Waste Not, Want Not: The Potential for Urban Water Conservation in California" (Gleick, et.al., 2003) and led to a series of legislative and water agency briefings.

CALFED Bay-Delta Agreement. 1998. Six community workshops on CALFED water efforts, conservation, community outreach, and public involvement.

CALFED/US Bureau of Reclamation Agreement 8-FG-20-16250. 1998. **$39,992**. Review of CALFED's Water Use Efficiency analyses. This project led to a comprehensive review of the draft CALFED water use efficiency analysis.

California office of the US Department of the Interior. 1997. $20,000. Preparation of our Report: "Sustainable Use of Water: California Success Stories." This was part of a $250,000 analysis of forty "success stories" in California water published by the Institute in 1999. Additional support was given by the Santa Clara Valley Water District, US EPA, Metropolitan Water District, and various foundations.

Outreach, Community Involvement, and Acceptance

The outreach and dissemination component of our proposal is described in tasks 8 and 9, above. It includes mailing of the model users manual to all urban water agencies in California, posting the manual and model on our website for free download, announcements and brief articles on the model and its capabilities in the trade press and through electronic newsletters, and presentation of the model in at least four venues, at least one each in Southern California, the Sacramento Area, and the Bay Area. Our outreach effort also includes a survey of user experience six months after the model is released, and distribution of a summary assessment report of those experiences. Nick Cain, our communications director, will run this effort. He has performed similar outreach work for the Institute on other projects.

Innovation

The Institute is a known innovator. Most of our work expands upon established methods in ways that create new tools or insights. Waste Not, Want Not (Gleick, et al., 2003) has changed the dialogue in California from whether significant urban water conservation beyond BMPs is possible into a dialogue about implementation obstacles and the cost of overcoming them. This project proposes an innovative way of addressing that issue. *Rather than analyzing implementation obstacles and costs and issuing our opinion on the topic, we are proposing to collaboratively develop a tool that can and will be used in a decentralized way to address the issue over the next five or more years.* This is an innovative approach to problem solving. It replaces "dueling models" with broadly shared and participatory research.

Using the tool, each utility can consider implementation costs and obstacles under its own constraints and conditions. Of course that has and is implicitly taking place in the absence of the tool, but utilities are not always able to explain to their customers, to interested parties, or to other utilities, all the

details of how they are making those assessments. The technical assistance tool we propose to develop will create a level of transparency that will greatly increase the credibility and effectiveness of utility's self-assessments in this area. It will also greatly increase the ease with which utilities can compare and exchange cost data and experiences with conservation program implementation.

Benefits

Various benefits of the proposed work have been presented in other portions of the proposal. In summary, the technical assistance tool we propose to develop and disseminate will make it easier for utilities to identify and capture economically desirable water conservation opportunities. This section talks about the possible dollar value of capturing more of these opportunities, and compares that with the cost of the proposal.

Bulletin 160-98 (DWR, 1998) estimated the amount of water conservation that would result from full implementation of the quantifiable BMPs in the MOU, excluding leak detection and repairs and large landscape water savings. The number reported is 1.5 million af per year (MAF/Yr) statewide. A 2001 report prepared by Gary Fiske & Associates for CUWA estimated a comparable figure of 1.6 MAF by 2020 from full implementation of BMPs, but including leak detection and large landscapes. A July 2004 report prepared for CUWA by A&N Technical Services reports a comparable figure of 1.5 MAF by 2020 from full implementation of BMPs, but with water savings decay rates included. There seems to be consensus on the amount of conservation that will be obtained from full implementation of BMPs.

Full implementation should not be taken for granted, however. Some utilities have applied for or expressed a desire to apply for exemptions. A&N (2004) presents some scenarios with lower levels of conservation.

There is also consensus that conservation beyond BMPs is possible and significant. For example, DWR (1998) estimates that another 1.0 MAF/Yr of urban demand reductions is possible beyond implementation of BMPs. The CALFED Water Use Efficiency Program Plan (2000) and Urban Water Use Efficiency Projections (2004), respectively, present similar numbers: 0.955 – 1.115 MAF/Yr and 0.814 – 1.104 MAF/ Yr, respectively, of incremental water use efficiency over and above full implementation of BMPs by 2020 <u>if</u> sufficient state cost-share dollars are made available to local utilities. Finally, Waste Not, Want Not (Gleick, et al., 2003) indicates that 2.0 to 2.3 MAF/Yr of urban efficiency improvements are available today. Projecting these figures to 2020 is difficult, but any reasonable projection is consistent with conservation potential beyond BMPs of 1.0 MAF/Yr or more.

All of this implies that at least 1.0 MAF/Yr of conservation is "in play" between now and 2020. Whether programs that fully implement BMPs or capture the potential beyond them are implemented and succeed depends on the actual and perceived economic costs and benefits of water conservation. As an illustration, assume that actual net benefits[3] of water conservation amount to $100 per af of water conserved. Then $100 million per year is at stake by the year 2020.

This illustration probably understates the potential net benefits of conservation at the margin once energy costs are included. For example, Wolff et.al. (2004) found that 3,900 equivalent kwh of energy

[3] Net benefits are defined as total benefits minus total costs.

per acre-foot are used on average on the customer side of the water meter for heating water, pumping and recirculation. If this energy were saved when water is conserved, $100 - $300 per af of direct financial benefits to customers would result. Figures 5-1 and 5-2 in Gleick, et al. (2003) also show marginal net benefits from water conservation at least this large, in part because energy benefits to customers were accounted for in that analysis. On the other hand, savings for the first and subsequent acre-feet conserved will not be the same, so we used a conservative number ($100 per af) for discussion purposes.

If the work in this proposal helps water utilities eventually conserve 1% more water than they would have without the work in the proposal, the proposed work will have a benefit of $1 million per year (1% times $100 million). Over a 10-year time horizon, say, that's a benefit of $10 million, 70 times more than the proposed funding level ($142,385). Even if the work doesn't increase the amount of conservation that takes place, eventually, but only helps agencies to achieve 1% of that amount 1 year earlier than they would have otherwise, the benefit of the work ($1 million) will be 7 times the requested grant amount.

A final note on our cost estimate (Table C-1 and breakdown by task, attached) is required in the PSP. Our labor and fringe benefit costs are based on hours available for project work and actual benefit costs for each individual. Other significant expenses are an allocation of $20,000 for a spreadsheet modeling consultant, $9,500 for layout and printing of the model user manual in four colors,[4] and $2,600 of travel and mailing expenses for dissemination of the model, presentation of the model, and the monitoring and assessment survey. Our overhead rate of 41% is presented in the "other" row. Our overhead rate has been audited for previous government contracts and grants.

References

A&N Technical Services, Inc. 2004. Urban Water Conservation Potential: 2003 Technical Update. Prepared for California Urban Water Agencies. Encinitas, California.

California Bay-Delta Authority (CALFED). 2000. Water Use Efficiency Program Plan. Draft programmatic EIS/EIR Program Plan. Sacramento, California.

California Bay-Delta Authority (CALFED). 2004. "Urban WUE Projections." PowerPoint presentation for the Water Use Efficiency Comprehensive Evaluation Technical Workshops. Sacramento, California.

Department of Water Resources (DWR). 1998. California Water Plan Update. Final Bulletin 160-98, Sacramento, California.

Gary Fiske and Associates. 2001. Urban Water Conservation Potential: Final Report. Prepared for California Urban Water Agencies. Portland, Oregon.

[4] Four-color printing allows the excel sheets to be represented exactly in the users manual, an important learning tool.

Gleick, Peter H., Dana Haasz, Christine Henges-Jeck, Veena Srinivasan, Gary Wolff, Katherine Kao Cushing, and Amardip Mann. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California. Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

Tietenberg, Tom. 2000. Environmental and Natural Resource Economics. Addison-Wesley. Boston, Massachusetts.

Wolff, Gary, Ronnie Cohen, and Barry Nelson. 2004. Energy Down the Drain: the Hidden Costs of California's Water Supply. Natural Resources Defense Council and Pacific Institute for Studies in Development, Environment, and Security.

Wolff, Gary, 2004. User Manual for the Pacific Institute Water to Air Models. Pacific Institute for Studies in Development, Environment, and Security.

Gary H. Wolff, P.E., Ph.D.

Pacific Institute for Studies in Development, Environment, and Security
654 13th Street, Preservation Park, Oakland, California 94612
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gwolff@pacinst.org

EDUCATION AND REGISTRATIONS

Ph.D. Agricultural and Resource Economics, University of California at Berkeley, 1997

M.S. Civil Engineering, Stanford University, 1984

B.Sc. Renewable Energy Engineering Technology, Jordan College, Cedar Springs, MI, 1982

California Registered Civil Engineer (No. 41252)

California Contractors License C46 (inactive) -- Solar Specialty (No. 486178)

PROFESSIONAL EXPERIENCE

Principal Economist and Engineer, 2001 to Present
Pacific Institute for Studies in Environment, Development, and Security

Visiting Professor, 2000 to 2001
Monterey Institute of International Studies, Monterey, California

Director of the Incentives Program, 1998 to 2000
Redefining Progress, Oakland, California

Consultant, 1995 to 1998
Consultant to municipal government, non-profit organizations, and private clients seeking assistance with projects involving both engineering and economics skills.

Founder and Principal Engineer, 1986 to 1994
3E Engineering, Fremont, California

Environmental Engineer, 1986 to 1987
Central Contra Costa Sanitary District, Martinez, California.

Water Resources Control Engineer, 1984 to 1986
San Francisco Bay Regional Water Quality Control Board, Oakland, California

Solar Contractor, 1982 to 1983
Sundu Solar Systems, Grand Rapids, Michigan

Energy Conservation Analyst, 1981 to 1982
Under contract to Michigan Consolidated Gas Company, Grand Rapids, Michigan

HONORS, AWARDS, FELLOWSHIPS

- Visiting Scholar, Center for Conservation Biology, Stanford University, 1998-1999
- Post-Doctoral Fellow, Center for Conservation Biology, Stanford University, 1997-1998

PUBLIC AND PROFESSIONAL SERVICE

- Past President, Alameda County Recycling Board (Appointed by the Alameda County Board of Supervisors)
- Former Chair, East Bay Municipal Utility District (EBMUD) Demand Management Advisory Committee
- Board Chair, Waterkeepers of Northern California
- Executive Committee, US Bureau of Reclamation Desalination Research Roadmap Project
- Member, American Economics Association (AEA)
- Member, American Society of Civil Engineers (ASCE)
- Member, American Solar Energy Society (ASES)
- Member, International Association for Water Quality (IAWQ)
- Member, International Ecological Engineering Society (IEES)
- Member, International Society for Ecological Economics (ISEE)
- Member, Northern California Recycling Association (NCRA)
- Member, Water Environment Federation (WEF)

SELECT RESEARCH PAPERS AND PUBLICATIONS

Wolff, Gary H. Forthcoming. Economies of Scale and Scope in River Basin Management. Institute of Developing Economies: Tokyo.

Wolff, Gary H. October 2004. User Manual for the Pacific Institute Water to Air Models. Pacific Institute, Oakland, California.

Wolff, Gary H., M. Cohen, and B. Nelson. August 2004. Energy Down the Drain: The Hidden Costs of California's Water Supply. Natural Resources Defense Council, New York.

Gleick, Peter H., Dana Haasz, Christin-Henges Jeck, Veena Srinivasan, Gary Wolff, Katherine Kao Cushing, and Amardip Mann. November 2003. Waste Not Want Not: The Potential for Urban Water Conservation in California. Pacific Institute, Oakland, California.

Moss, J., Gary Wolff, Graham Gladden and Eric Guttierrez. March 2003. Valuing Water for Better Governance. CEO Panel for Business and Industry, Paris.

Wolff, Gary and P. H. Gleick. August 2002. "The Soft Path to Water," in The World's Water 2002-2003: The Biennial Report on Freshwater Resources. Island Press, Washington, DC.

NOTE: A full publications list is available online at:
http://pacinst.org/about_us/staff_board/wolff/wolff_pubs.htm

-end-

APPENDIX C: PROJECT IMPLEMENTATION COSTS TABLE
APPLICANT: The Pacific Institute
PROJECT TITLE: Development of a Water Use Efficiency Implementation Cost and Cost-Effectiveness Model

Table C-1: Project Costs (Budget)

	Category	Project Costs $	Contingency % (ex. 5 or 10)	Project Cost + Contingency $	Applicant Share $	State Share $	Life of investment (Years)	Capital Recovery Factor (Table C-4)	Annualized costs $
	(I)	*(II)*	*(III)*	*(IV)*	*(V)*	*(VI)*	*(VII)*	*(VIII)*	*(IX)*
	Administration (for initiation of project)								
	Salaries, wages	$52,274	$0	$52,274	$0	$52,274			
	Fringe benefits	$16,609	$0	$16,609	$0	$16,609			
	Supplies	$10,600	$0	$10,600	$0	$10,600			
	Equipment								
	Consulting services	$20,000	$0	$20,000	$0	$20,000			
	Travel	$1,500	$0	$1,500	$0	$1,500			
	Other (Overhead)	$41,402	$0	$41,402	$0	$41,402			
(a)	Total Administration Costs[1]								
(b)	Planning/Design/ Engineering								
(c)	Equipment Purchases/Rentals/Rebates/Vouchers								
(d)	Materials/Installation/Implementation								
(e)	Implementation Verification								
(f)	Project Legal/License Fees								
(g)	Monitoring and Assessment								
(h)	Report Preparation								
(i)	Structures								
(j)	Land Purchase/Easement								
(k)	Environmental Compliance/Mitigation/Enhancement								
(l)	Construction								
(m)	Other (Specify)								
(n)	TOTAL (=a+…+m)	$142,385	$0	$142,385	$0	$142,385	NA	NA	
(o)	Cost Share Percentage	NA	NA	NA	(row n, column V/ IV) x 100	(100 –row o, column V)	NA	NA	NA

1 (Excludes administration O & M costs)

APPENDIX C: PROJECT IMPLEMENTATION COSTS TABLE
Cost Breakdown by Task

APPLICANT: The Pacific Institute
PROJECT TITLE: Development of a Water Use Efficiency Implementation Cost and Cost-Effectiveness Model

Task Number	Task Name	Task Subtotal
1	Assemble & Expand the Project Advisory Committee	$1,576.89
2	Interviews with PAC Members	$6,103.60
3	Draft the Model	$32,199.10
4	First Review by PAC	$2,227.89
5	Revise Model and User Guidance	$22,818.01
6	Second Review by PAC	$2,227.89
7	Finalize the Model and Print the Guidance Manual	$30,581.87
8	Disseminate the Model and Guidance Manual	$23,910.13
9	Monitor and Assess User Experiences	$17,383.67
10	Quarterly and Final Grant Reports	$3,356.34
Total Project Budget		$142,385.40

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COACHELLA VALLEY WATER DISTRICT

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ASST. GENERAL MANAGER
JULIA FERNANDEZ, SECRETARY
DAN PARKS, ASST. TO GENERAL MANAGER
REDWINE AND SHERRILL, ATTORNEYS

January 6, 2005

File: 0063.41

Gary Wolff, P.E, PhD
Principal Economist and Engineer
The Pacific Institute
654 13th Street
Preservation Park
Oakland, California 94612

Dear Dr. Wolff:

Subject: Proposition 50 Water Conservation Spreadsheet Model

Our agency would be very pleased to participate in development of a user-friendly spreadsheet model that would allow water districts to estimate the amount of conservation and the financial costs and benefits of water conservation programs under a wide range of conditions. Although some spreadsheet tools exist for estimating compliance with the Memorandum of Understanding for Urban Water Conservation, they are narrowly tied to the details of the memorandum.

We could use a tool that is relatively simple, transparent and flexible. Someone on my staff without much water planning and economic analysis experience should be able to use the model. They should be able to see how the amount of conservation and the cost-effectiveness of conservation change when implementation costs, public participation and other facts change.

I estimate that about 200 hours of staff time will be required over a year or so to help define the model concept at the beginning of the project, test and comment on the "beta version" of the model, and review and comment on the draft user's manual and draft final model. We would be glad to participate in this project because it will eventually save a lot more time than this level of effort.

Best luck getting Proposition 50 funding and keep us informed.

Yours very truly,

Mark Beuhler

for Steve Robbins
General Manager-Chief Engineer

MB:tl/beuhler/jan/wolff

TRUE CONSERVATION
USE WATER WISELY

DUBLIN
SAN RAMON
SERVICES
DISTRICT

7051 Dublin Boulevard
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January 6, 2005

Gary Wolff, P.E, Ph.D.
Principal Economist and Engineer
The Pacific Institute
654 13th Street
Oakland, CA 94612
FAX: (510) 251 2203

Subject: Proposition 50 Water Conservation Spreadsheet Model

Dear Dr. Wolff:

Dublin San Ramon Services District would be very pleased to participate with the Pacific Institute in the development of a user-friendly spreadsheet model that would enable water districts to estimate the amount of conservation and the financial costs and benefits of water conservation programs under a wide range of conditions. Although some spreadsheet tools exist for estimating compliance with the Memorandum of Understanding (MOU) for Urban Water Conservation, they are narrowly tied to the details of the memorandum.

We could use a tool that is relatively simple, transparent, and flexible. Someone on my staff without much water planning and economic analysis experience should be able to use the model. They should be able to see how the amount of conservation and the cost-effectiveness of conservation change when implementation costs, public participation, and other facts change. I understand that you created a model like this for assessing the energy and air pollution impacts of water systems under a grant from the California Energy Commission. So long as the model does not tell us "the answer," but instead allows us to more easily do analyses of various conservation scenarios and to compare them under different conditions, we would find the model very helpful.

I understand that about 200 hours of District staff time will be required over a year or so to help define the model concept at the beginning of the project, to test and comment on the "beta version" of the model, and to review and comment on the draft users manual and draft final model. We would be glad to participate in this project because it will eventually save a lot more time than this level of effort.

Best of luck getting Proposition 50 funding and keeping us informed.

Sincerely,

BERT MICHALCZYK
General Manager

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CITY OF
SANTA ROSA

UTILITIES DEPARTMENT
69 Stony Circle
Santa Rosa, CA 95401
707-543-3930
Fax: 707-543-3936

January 6, 2005

Gary Wolff, P.E, Ph.D.
Principal Economist and Engineer
The Pacific Institute
Oakland CA 94612

RE: California Department of Water Resources Proposition 50 Grant Application for Water Conservation Spreadsheet Model

Dear Dr. Wolff:

The City of Santa Rosa would be very pleased to offer our support of the Pacific Institute's application for Proposition 50 Water Use Efficiency grant funding for the development of a user-friendly water conservation spreadsheet model.

The proposed water conservation spreadsheet model would allow water utilities to estimate the amount of water conservation potential and the financial costs and benefits of water conservation programs under a wide range of conditions. Although some spreadsheet tools currently exist for estimating compliance with the California Urban Water Conservation Council's Memorandum of Understanding (MOU), they are narrowly tied to the details of the MOU.

Water utilities would highly benefit from a tool that is relatively simple, transparent, and flexible so that staff without much water planning and economic analysis experience could be able to use the model to be able to see how the amount of water conservation savings and the cost-effectiveness of these savings change when implementation costs, public participation, and other facts change. A water conservation spreadsheet model that does not tell us "the answer," but instead allows us to more easily obtain answers and to compare them under different conditions, would be very helpful. We understand that the Pacific Institute created a similar model for assessing the energy and air pollution impacts of water systems under a grant from the California Energy Commission.

The City of Santa Rosa is willing to be a participant in the development of this model. It is our estimation that approximately 200 hours of staff time will be required over a year or so to help define the model concept, to test and comment on the "beta version" of the model, and to review and comment on the draft users manual and draft final model. We are happy to lend our support for and participate in this project because we believe it will provide great benefit to water use efficiency.

Sincerely,

VIRGINIA PORTER
Deputy Director Water Resources

TOTAL P.01