January 10, 2005

Pacific Institute for Studies in Development, Environment, and Security
654 13th Street, Preservation Park
Oakland, CA 94612

Debra Gonzalez
California Department of Water Resources
Office of Water Use Efficiency
1416 Ninth Street, Room 338, Sacramento, CA 95814

Ms. Gonzalez,

Enclosed is our submission for the 2004 Water Use Efficiency PSP entitled "Clarification of Key Concepts in Water Use Efficiency: Reducing Barriers to Understanding, Quantification, and Implementation." We are submitting this proposal as a "Training, Education, and Public Information" project under Section B.

As stipulated in the proposal solicitation package, we have included an original, eight photocopies, and an electronic copy on diskette. Each proposal contains the following components:

- Project Information Form
- Signature Page
- Project Description
    - Statement of Work, Section One: Relevance and Importance
    - Statement of Work, Section Two: Technical/Scientific Merit, Feasibility
    - Statement of Work, Section Three: Monitoring and Assessment
    - Qualifications of the Applicants and Cooperators
    - Outreach, Community Involvement, and Acceptance
    - Innovation
    - Benefits
- Work Schedule Timeline
- Cost Table
- Resumes for Peter Gleick, Gary Wolff, Nick Cain, and Heather Cooley

Thank you for your consideration, and we look forward to hearing from you.

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

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

❑ (g) technical assistance

❑ **(h) other**

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

4. Project Title: **Clarification of Key Concepts in Water Use Efficiency: Reducing Barriers to Understanding, Quantification, and Implementation**

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

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

6. Contact person (if different):

Name, title.
Mailing address.

Telephone
Fax.
E-mail

7. Grant funds requested (dollar amount): $108,043
(from Table C-1, column VI)

8. Applicant funds pledged (dollar amount): **$0**

9. Total project costs (dollar amount): **$108,043**
(from Table C-1, column IV, row n)

10. Percent of State share requested (%) 100%
(from Table C-1)

11. Percent of local share as match (%) 0%
(from Table C-1)

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?

❑ (a) yes

X (b) no

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.

12. Duration of project (month/year to month/year):	24 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.

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

X (b) no

(Provide supporting documentation.)

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.

Electronic signature on file

_____	_____	_____
Signature	Name and title	Date

Clarification of Key Concepts in Water Use Efficiency: Reducing Barriers to Understanding, Quantification, and Implementation

A "Training, Education, and Public Information" 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. The project information form, signature page, resumes of key staff, and cost table are provided separately in our submittal package. This section 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. A summary of the proposal and its merits precedes the required sections.

Summary of Proposal and Its Merits

The question of water-use efficiency and conservation are critical questions for long-term planning and management of water for the State of California. There remain, however, a set of vitally important, but unresolved questions about the role and extent of the potential for water-use efficiency and about how best to implement effective programs. This project will prepare "White Papers" addressing four of these critical questions. These four have been identified through discussions with CALFED program directors, water agencies, staff at the Department of Water Resources, and other researchers working in this field. When these questions are better resolved, it will be easier to move forward with comprehensive and effective implementation of cost-effective demand management options.

These analyses will be distributed to all water utilities and agencies (Federal, State, and local) in California and presented in several venues (e.g., workshops). In addition, an extensive and innovative electronic outreach effort, including specialized notice, focused "Fact Sheets," and free electronic dissemination of the White Papers is also written into the Project.

The proposal has many merits. It will allow utilities, especially smaller ones with limited staff and consulting resources, to analyze conservation program or measure economics in a professional, transparent, understandable, and defensible way. It will help clarify a framework for doing water-use efficiency analysis that is consistent across agencies. This in turn allows utilities to exchange information and data and learn from one another

more easily. It also allows regional and statewide organizations to be able to compare projections of water use, and of conservation potential, on a common basis. These merits have value. As described in later parts of this proposal, one hundred million or more dollars per year of net benefits (total benefits minus total costs) are potentially available from additional water conservation in California. While the Research projects requested under Section B of the RFP are not required to have "benefit/cost" analysis, 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 10 times over.

Statement of Work, Section One: Relevance and Importance

[Relevance to CALFED and State and Local Water Planning Objectives]

Our project will provide education, training, and information vital to improving water-use efficiency planning and implementation. Water-use efficiency is a critical element 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.

Water-use efficiency is growing as a key factor in California water policy, with improvements in knowledge, data collection, and analytical tools. This is partly reflected in new studies from the California Department of Water Resources, independent research organizations and universities, and water agencies working hard to improve long-range planning.

The analyses proposed here are also relevant for local urban water management plans. Each utility must be able to analyze conservation potential and evaluate implementation costs and obstacles under its own constraints and conditions, using consistent definitions and tools. The questions we propose to answer here 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 data and experiences with others.

[Importance of The Proposed Work]

There remain a set of vitally important, but unresolved questions about the role and extent of the potential for water-use efficiency and about how best to implement effective programs. This project will prepare "White Papers" addressing four of these critical questions. These four have been identified through discussions with CALFED program directors, water agencies, staff at the Department of Water Resources, and other researchers working in this field. Until these questions are better resolved, it will be difficult to move forward with comprehensive and effective implementation of cost-effective demand management options.

All four of these White Papers will receive extensive peer-review prior to publication, and all four will be widely disseminated to researchers, analysts, water planners, and the public as a fundamental part of the project, as is reflected in the budget. As such, this project falls under the "Training, Education, and Public Information" category of the Proposition 50 PSP.

"Imperfect" and "incomplete" information are significant barriers to success in any field. The most important detailed work these White Papers will do is to organize and help users to assess the potential for water-use efficiency and tools for overcoming barriers to implementing conservation programs. We need to understand this overall potential and barriers to implementation much better than we do at present.

These analyses will allow people to compare more transparently their estimates, approaches, and assumptions about the potential for improving water use efficiency. Until that is done, the potential of water conservation in California will probably not be realized to the full extent possible.

The four White Papers to be prepared are:

White Paper #1: Definitions and Analysis of Cost-Effectiveness

Economists and water planners use cost-effectiveness analysis to compare the unit cost of alternatives. Since each water-use efficiency measure is an alternative to new or expanded physical water supply, such measures are considered cost-effective when their unit cost is less than the unit cost of the lowest-cost option for new or expanded water supply. Thus this measure is vital for forecasting and planning water use, demand management potential, and the design and implementation of water-use efficiency programs.

Unfortunately, there remains considerable confusion about how to define and measure "cost-effectiveness" of demand management and water-use efficiency options. This Pacific Institute analysis will review terms and definitions in the context of California water and will clearly lay out appropriate methods for calculating WUE cost-effectiveness. It will build on ongoing activities of the Research and Evaluation committee and the avoided cost and environmental benefits projects of the California Urban Water Conservation Council (CUWCC) for which Gary Wolff, our principal economist, has been engaged as a compensated peer reviewer.

While the typical water-related "cost-benefit" analysis focuses on marginal costs associated with new capacity, a number of other concepts are crucial for water-use efficiency methodologies, including opportunity costs, conservation savings, perspectives, and how estimated costs and benefits can be different when measures are evaluated individually or in groups. This White Paper will expand on these issues. For example, "cost-effectiveness" may be calculated differently from the perspective of the water utility, the consumer, and the water utility and all of its customers considered as a group (and the community). Some types of conservation create significant avoided costs for the customer other than water expenditures, such as energy to heat water, or labor in

landscape maintenance. Yet water agencies often miss such savings in their calculations because the benefits do not accrue to the utility. Only by combining perspectives can a full assessment of the costs be prepared.

Other issues to be addressed in this project are the impact on economic desirability of persistence of savings, assumptions about useful lifetimes, nominal and real interest rates, the strengths and weaknesses of the "payback period," levelized cost, relative net present value approaches used by various parties, and more. This White Paper will be extensively peer-reviewed by independent water economists prior to publication.

White Paper #2: Definition and Analysis of "Demand Hardening."

A second White Paper will be prepared to clarify the concept of "demand hardening," which has been used to describe a couple of different concerns. Most typically, the term "demand hardening" refers to the diminished ability or willingness of customers to implement conservation measures during water shortages after more permanent water-use efficiency measures have been implemented. This concept has periodically appeared in California water policy papers – most recently in the draft California Water Plan (Bulletin 160, page 4 of the Advisory Committee Review Draft), but the literature on this subject is inadequate and incomplete. This White Paper will review the literature, provide clear definitions and examples of "demand hardening," and offer tools for analyzing its applicability in the context of both urban and agricultural water use in California.

This concept can be seen in the following example: Replacing a 6-gallon per flush (gpf) toilet with a 1.6 gpf toilet. Assuming ten flushes per day, a toilet that would have used 60 gallons per day (gpd) will use only 16 gpd. During a drought, voluntary actions to reduce flushes from 10 to 5 per day will save 30 gallons with the old toilet. With the more efficient toilet, such voluntary actions will only save 8 gallons.

A second way in which the term is used is in relation to the concept that once a set of conservation and efficiency actions have been taken, no further improvements in efficiency will be possible. This assumes that technology is static, that the economics of water-use efficiency are static, and that the costs of implementation remain constant. For example, recent state-of-the-art toilet retrofits all assumed replacement of 6 or 3.5 gallon per flush toilets with ULFTs using 1.6 gallons per flush. All forecasts and projections used this lower estimate to determine residential end-use needs. But in the past few years, dual-flush systems (mandated for several years in Australia and Japan) have appeared on the commercial market in the U.S. and several manufacturers are beginning to compete in price. Thus, baseline estimates of residential water use may continue to drop. We note, of course (and our analysis will note as well), the potential for new technologies that increase water demand, such as multi-head showers.

While this analysis is typical of the demand hardening argument, it is incomplete. Among the unresolved analytical pieces are evaluating the difference between voluntary and involuntary savings, permanent and temporary savings, and especially the impacts on system reliability in the drought and non-drought situations. Additional questions to be evaluated include the effects of "reallocation" of saved water on potential voluntary

savings during droughts, the concept of 'demand softening' resulting from load shifting, careless water-use behavior, and other relevant factors. This analysis, like the others, will be peer-reviewed.

White Paper #3: Definition and Analysis of "Real Water, Applied Water, New Water."

The DWR Bulletin 160-98, CALFED EIR/EIS, and others interested in water forecasting and management have in the past drawn a distinction between "applied water," "real water," and "new water." The difference between these terms has long been understood in agricultural water analysis and under certain circumstances it is very useful. In recent years it has been applied in Asia and Africa. Among other things, this distinction can help identify where improvements in water-use efficiency may be most appropriate and valuable.[1] Unfortunately, there remain some serious misunderstandings about the meaning and application of these terms that hinder the analysis of conservation and efficiency potential. This White Paper will review the history and meaning of these terms in both the urban and agricultural areas and will offer guidance about how to best apply them in the California context.

The distinction between "applied water," "real water," and "new water" is critically important. In a region with limited water resources and 100 percent downstream reuse, it is argued that any reductions in non-consumptive uses of water do not produce "new" water because water saved is already committed for use by a downstream user. In a region with **fixed demand**, therefore, only reductions in consumptive uses produce "new" water. This line of reasoning, when applied to calculations of agricultural water use and certain urban uses, is justifiable.

Confusion arises, however, in DWR, CALFED, and water agency assessments when this concept is applied in all sectors, including inland regions with growing demand. In such a situation, improvements in water-use efficiency do not lead to "new" water being created, but they do lead to real reductions in assumed future demands in a region. As a result, some previous water-use efficiency analyses have significantly underestimated water-use efficiency potential.[2] White Paper #3 will clarify these situations and definitions, which is critical to proper analysis of water-use efficiency potential.

White Paper #4: Definition and Analysis of "Water Conservation Decay" or "Savings Persistence."

Water efficiency savings result from the installation of new technology or implementation of a new water-use policy. Such savings are sometimes, but not always, considered permanent. If the water savings performance of a device or program isn't

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[1] See, for example, Keller and Keller, 1995, "Effective efficiency: A water use efficiency concept for allocating freshwater resources," Center for Economic Policy Studies, Winrock International, Arlington, VA; Molden, 1997, "Accounting for water use and productivity," International Irrigation Management Institute (IIMI), Sri Lanka; and Seckler, 1996, "The new era of water resources management: From 'dry' to 'wet' water savings," Research Report 1, International Irrigation Management Institute (IIMI), Sri Lanka.
[2] See the previous Pacific Institute analysis: Gleick, 1998, "Application of Applied Water/Real Water/New Water Distinction in Bulletin 160-98 and CALFED DEIR/DEIS," Pacific Institute, Oakland, California.

consistent, or changes with time, the traditional assumptions of constant savings may no longer be appropriate. Drop-off in savings could be caused by many factors, including reversion to old habits, improper operation or maintenance of water-savings equipment, or changes in the composition of the household or business.

Some analysts argue that water conservation and efficiency improvements decay over time as technologies fail or as consumers replace equipment. In a number of studies, analysts have built decay rates into water-use efficiency models. For example, in the California Urban Water Agencies analysis, and in an effort to properly model the effectiveness of Best Management Practices (BMP) by the CUWCC, 'decay rates' have been built into calculations.[3]

In the CUWCC BMP model, decay rates above zero (which implies decay in savings over time) are adopted for BMPs 1, 2, 5, and 9 under certain circumstances. Yet this concept remains controversial, and data on actual decay rates are limited or incompletely analyzed.

Here is a real-world example where the question of decay rates is instrumental: The Pacific Institute is involved in analyzing the potential for water-use efficiency improvements to permit water planners to reduce the size of new infrastructure. For example, Kings County, Washington is planning a new wastewater treatment system, to last many decades. The size of this system, and the overall cost, will depend upon the volume of current and projected wastewater flows, which in turn is vitally dependent on the level of water conservation implemented. If water-use efficiency improvements permit significant reduction in wastewater flows, the overall savings from reducing the size of the new treatment plant could be on the order of millions of dollars. Yet if water-use efficiency savings decay, it may not be possible, or prudent, to build a smaller plant.

This fourth White Paper will revisit the concept of "decay" for water-use efficiency technologies and policies and will offer guidance on how to incorporate this concern into future studies.

[Describe how project will contribute toward or support California Bay-Delta Program goals.]

A major barrier to comprehensive and effective Water-Use Efficiency programs is the lack of understanding and consistency on a set of key issues, especially the four summarized above. Policy and implementation efforts should not get hung up on this lack of understanding, and this proposal will help to clarify and eliminate barriers.

[3] See, for example, CUWA, 2004, "Urban Water Conservation Potential: 2003 Technical Update," Sacramento, California, and the memo written by Tim Blair, September 2004, "BMP Water Savings Calculation Model Recommendation for Adoption and Policy Considerations" CUWCC, Sacramento.

All four of these unresolved issues directly affect the Bay-Delta Program Goals of water quality, ecosystem quality, water supply, and Delta vulnerability. As stated in the CALFED mission statements, Bay-Delta Program goals related to water-use efficiency include efforts to generate significant water supply, water quality and ecosystem benefits in the short term, with a focus on (1) reducing water demand through "real water" conservation; (2) improving water quality by altering volume, concentration, timing and location of return flows; and (3) improving ecosystem health by increasing in-stream flows where necessary to achieve targeted benefits.

Without good and consistent analysis of “real water” conservation, demand hardening potential, conservation “decay,” and cost-effectiveness, questions will remain about the ability of water-use efficiency to produce the benefits desired by the Bay-Delta Program. These questions have dogged recent assessments of conservation, as described below, and conversations with senior CALFED officials have strongly supported the need for these independent white papers.

[Describe how project would be consistent with local or regional water management plans or other integrated resource management plans. Describe how the project will further implement existing water management activities or initiate new ones.]

One of the challenges facing local water agencies and planners is lack of consistency in definitions and concepts used to evaluate water-use efficiency. To meet the needs of CALFED’s Water Use Efficiency Program, our project will clarify key concepts by which to evaluate water-use efficiency potential and implementation programs. A conservation measure or program can be evaluated at a local, regional, or State level and integrated into management plans where it is deemed appropriate. These four analyses will also help agencies determine what local programs to emphasize.

This project will also improve program consistency by providing a benchmark for the concepts described above. As more and more urban and agricultural agencies move to evaluate water-use efficiency potential and programs, it is vital that consistent terminology, definitions, and tools be used. These White Papers will offer such consistency.

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

[Describe methods, procedures, equipment, and facilities. Provide enough information to permit evaluation of the feasibility and technical adequacy of the approach and readiness to proceed.]

The Pacific Institute is one of the leading independent, non-partisan thinktanks working on questions of water-use efficiency and conservation. The methods used to produce these white papers involve comprehensive **literature searches** to identify existing analysis (see samples below for the proposed projects) followed by **case studies** and

quantitative analysis for each white paper (demand hardening, cost-effectiveness, conservation decay, and real/new/applied water). The final steps will include external **peer review**, followed by **public outreach and educational efforts**. Case studies from California urban agencies are already available for some of these subjects. The Institute has done considerable initial analysis in these areas.[4]

The project work plan will involve preparation of four White Papers according to the following task list and schedule (See Timeline Figure):

Task List, Scope of Work, and Schedule.

The project will be split into four equal sections over twenty months, with one of the four White Papers prepared during each of five-month periods. An additional four months is included in the overall project for additional dissemination and outreach. There will be overlap as technical analysis and writing begin on subsequent reports during the outreach effort of the previous one. We have separate research and communications staff allocations of time for these efforts.

For **EACH** White Paper, the following Task Structure will apply.

Task 1: Literature Search and Outline Preparation
Month 1
Task 2: Collection and Analysis of Case Studies
Month 1 and 2
Task 3: Quantitative Analysis
Month 2
Task 4: Report Preparation
Month 3 and 4
Task 5: Report Peer Review
Month 4
Task 6: Rewrite and Final Report Preparation:
Month 4-5.
Task 7: Dissemination: Public Outreach and Education
Months 4 to 6, plus ongoing from each final report preparation.

[Provide a project plan and work schedule. Include task deliverable items, start and end dates, and projected costs for each task. Plan will form the basis of quarterly and annual project fiscal and programmatic reports.]

The **Work Schedule** can be seen in the attached Timeline.

[4] See, for example, Wong et al. 1999. Sustainable Use of Water: California Success Stories. Pacific Institute, Oakland, California, which describes 40 case studies of comprehensive local water conservation, efficiency, restoration, and supply efforts. Initial definitions and analysis of "cost-effectiveness" are also presented in Gleick et al. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California. Pacific Institute, Oakland.

The start date is one month after award grant confirmation and contract, and the end date of the entire project is 24 months following that. Individual White Papers will be produced at approximately six-month intervals. **Program costs** for each task are as follows (and also see overall budget). Total Project Cost is $108, 043.

Projected Costs for Each Task

White Paper #1: Cost-Effectiveness

Task Number	Task Name	Task Subtotal
1	Literature Search, Outline Preparation	$990.58
2	Collection and Analysis of Case Studies	$1,540.26
3	Quantitative Analysis	$3,888.09
4	Report Preparation	$3,118.36
5	Report Peer Review	$1,540.26
6	Rewrite and Final Report Preparation	$9,352.46
7	Outreach, Dissemination, Education	$4,967.53

White Paper #2: Demand Hardening

Task Number	Task Name	Task Subtotal
1	Literature Search, Outline Preparation	$1,689.39
2	Collection and Analysis of Case Studies	$1,909.85
3	Quantitative Analysis	$3,087.01
4	Report Preparation	$3,416.63
5	Report Peer Review	$1,468.94
6	Rewrite and Final Report Preparation	$10,420.86
7	Outreach, Dissemination, Education	$5,225.43

White Paper #3: Real Water, Applied Water New Water

Task Number	Task Name	Task Subtotal
1	Literature Search, Outline Preparation	$1,689.39
2	Collection and Analysis of Case Studies	$1,909.85
3	Quantitative Analysis	$3,307.47
4	Report Preparation	$3,746.24
5	Report Peer Review	$1,468.94
6	Rewrite and Final Report Preparation	$10,641.31
7	Outreach, Dissemination, Education	$5,225.43

White Paper #4: Conservation Decay

Task Number	Task Name	Task Subtotal
1	Literature Search, Outline Preparation	$1,689.39

2	Collection and Analysis of Case Studies	$1,909.85
3	Quantitative Analysis	$3,307.47
4	Report Preparation	$3,416.63
5	Report Peer Review	$1,468.94
6	Rewrite and Final Report Preparation	$10,420.86
7	Outreach, Dissemination, Education	$5,225.43

Examples of Literature Search and Analysis for White Papers

Keller and Keller. 1995. "Effective efficiency: A water use efficiency concept for allocating freshwater resources," Center for Economic Policy Studies, Winrock International, Arlington, VA;

Molden. 1997. "Accounting for water use and productivity," International Irrigation Management Institute (IIMI), Sri Lanka.

Seckler. 1996. "The new era of water resources management: From 'dry' to 'wet' water savings," Research Report 1, International Irrigation Management Institute (IIMI), Sri Lanka.

Gleick. 1998. "Application of Applied Water/Real Water/New Water Distinction in Bulletin 160-98 and CALFED DEIR/DEIS." Public Memo, Pacific Institute for Studies in Development, Environment, and Security, Oakland, California;

Gleick and Haas. 1998. "Comments on the Draft Bulletin 160-98," Pacific Institute for Studies in Development, Environment, and Security, Oakland, California. April 20.

Fryer. 1999. Demand elasticity during a drought. American Water Works Association (AWWA) Conference Proceedings, CONSERV99, January 31 – February 3, 1999. Monterey, California (from CD-ROM Proceedings).

Gleick. 2000. "Memo on Demand Hardening." Pacific Institute for Studies in Development, Environment, and Security, Oakland, California. February 4.

[Also see the footnotes throughout this proposal.]

Statement of Work, Section Three: Monitoring and Assessment

Monitoring and Assessment are less critical components of Proposition 50 Section B research plans, as noted in the Proposition 50 RFP, but it remains an important part of this particular research effort. Without explicit data collection or quantifiable water savings, assessment in this case will focus on evaluating the production of the research and, especially, on assessment of outreach efforts and application of the analysis prepared by the Institute by other organizations over time.

Monitoring and Assessment for the White Papers themselves will include comprehensive peer-review, in order to ensure the quality of the analysis, and to broaden the audience for the product.

Assessment will also include detailed tracking of the use of the White Papers, where possible. Data are already kept at the Institute on web-based use of Institute work products and publications. This will permit us to evaluate hits, downloads, and views.

We've further addressed the requirements of the PSP for this section through Tasks 5 and 7 of the scope of services. As described in Task 5, the quality of the analyses will be assessed and improved through peer review. As described in Task 7, we will work to disseminate the results, and to monitor outreach efforts and how our results are being used by water agencies at all levels. This will include a major effort on training, education, and public outreach focused on dissemination of the white papers and discussions with key water policy players at CALFED and water agencies to ensure that the concepts addressed in the white papers are understood and adopted. Further details of this effort are described in the Outreach discussion, below.

Qualifications of Applicant and Cooperators: Résumé's of Principal Researchers

The Pacific Institute is well qualified to perform this work. The Institute is a respected independent research center that works with federal, state, and international governments, local agencies, corporations, and non-governmental organizations. This project is a direct extension of previous projects and reports as noted in previous footnotes (see, for example, footnotes 2 and 4 above).

The project manager is Dr. Peter H. Gleick, President of the Pacific Institute, member of the U.S. National Academy of Sciences Water Science and Technology Board, MacArthur Foundation fellow, and academician at the International Water Academy in Oslo, Norway. Dr. Gleick is one of the world's experts on water resources issues and is editor and lead author of the biennial report on freshwater resources (The World's Water) published by Island Press. He is especially active in research on water-use efficiency and conservation.

Resumes are also provided for the three other Principals on this project: Heather Cooley is a Research Associate at the Institute and recent graduate of the Energy and Resources Group at UC Berkeley. Gary Wolff, P.E 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). 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 of these projects. Nicholas Cain, Communications Director, will be the lead on outreach, report preparation and dissemination, and education related to the products.

Describe previous WUE grant projects

The Pacific Institute has received previous WUE grants from diverse CALFED agencies and organizations or for work with these agencies. Among 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” and led to a series of legislative and water agency briefings.

CALFED/US BoR 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.

Water-Use Efficiency Program of the Pacific Institute. 1998 to 2004. $450,000. Support from various foundations, including the Hewlett Foundation, Goldsmith, Hughes, and Flora Family Foundation. This support has led to the publication of a wide range of analyses of water conservation potential and sustainable water use and has supported various CALFED/Pacific Institute activities, including participation on a scientific review group on agricultural water-use efficiency and briefings for CALFED staff on Institute WUE work.

California office US Department of the Interior. 1997. $20,000. Preparation of Water Report "Sustainable Use of Water." 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.

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

Outreach, Community Involvement, and Acceptance

[Describe how information and project results will be disseminated.]

After the research and analysis itself, the most critical component of this project is Outreach, Community Involvement, and Acceptance, and a substantial portion of the resources of this grant are devoted to this component (see the Budget).

After extensive peer-review by a wide set of stakeholders, the information, materials and conclusions will be disseminated in a series of focused and integrated products:

White Paper Preparation

The final White Papers will each be prepared as part of the Publications Series of the Pacific Institute. This involves production of both hard copy reports and web-accessible versions. Our extensive experience with the production of research reports has shown us the critical importance of making materials available in electronic format.

Physical: Paper versions of the White Papers will be produced and disseminated via mailing to leading water-use efficiency practitioners (academic and agency). The Institute maintains a list of these, and we will coordinate with the California Urban Water Conservation Council (CUWCC), which also maintains a comprehensive mailing list on this subject, for dissemination.

Electronic: Typically, for every "hard" copy of a report we release, there are between 50 and 100 electronic downloads. As a result, all four White Papers will be prepared in .pdf format; HTML format, and a searchable format, and made available at NO cost on the Institute's websites: www.pacinst.org and www.worldwater.org. The Pacific Institute maintains an electronic mailing list of several thousand people interested in water issues, and we will generate informational mailings to those who have agreed to receive information from us.

Fact Sheet Preparation

Electronic: An especially effective form of communication is Fact Sheets. The Pacific Institute regularly produces these – effectively as extended "FAQs" – for water issues, and these four White Papers are well suited for dissemination in this format. They will be prepared and posted in a manner similar to those at http://www.pacinst.org/reports/water_fact_sheet/index.htm

Briefings for Water Agencies

A crucial form of outreach will be briefings for water agencies at multiple levels. The Pacific Institute regularly conducts such briefings, and budget has been included to permit preparation of presentations and travel to Los Angeles, Sacramento, the Bay Area, and the Central Valley to disseminate the results of the project.

- Federal: CVP managers; water planners; system operators
- State: Department of Water Resources conservation program; senior staff
- Local: At least four water district briefings will be offered to MWD, EBMUD, and two additional agencies. Other water agencies officials and staff will be reached through the professional water meetings (below) and through electronic outreach efforts.

Professional Presentations

Water agency staff and directors and other water professionals will also be well-served by efforts to make formal presentations on the findings of this work at three major conferences: the annual American Water Works Association meeting; the American Water Resources Association meeting, and the annual POWER (Public Officials for Water and Energy Reform) meeting in Los Angeles. We will prepare presentations, and we have included funds in the budget for travel to these meetings. Other presentations will be made as the opportunity arises and as requests come in.

Peer-Review Articles

Finally, we will produce peer-review articles summarizing our findings for publication in the professional literature. Dr. Gleick serves on the Editorial Board of Water Policy, one possible outlet, though other options are Water Resources Research, the Journal of Hydrology, and others. These articles will be produced after final work on the project is done.

Innovation

[Describe innovative technologies or methodologies to be employed in the project that could contribute to improved efficiencies in projects throughout the State.]

As remarkable as it may seem, no previous comprehensive effort to address the four topics of this project has been made, despite the need. The innovative tools developed and used by the Pacific Institute to quantify the potential for urban water use efficiency, and its cost-effectiveness in previous studies will be applied here. As noted in both the work of the Pacific Institute, and comparable assessments from the California Urban Water Agencies review of the Institute's WUE analyses, perhaps the major barrier to conservation and efficiency improvements lie in the area of "implementation." A major inefficiency in implementing current water-use efficiency programs around the State result from uncertainty about methods, tools, definitions of precisely the topics to be addressed by this project: cost-effectiveness, demand hardening, real water/paper water, and 'decay' rates.

By resolving some uncertainties about these definitions and concepts in the proposed White Papers, new projects can be initiated, their benefits more accurately quantified and assessed, and debate over uncertain tools eliminated.

Further innovations are described in the area of Outreach and Public Education, where we will be testing various approaches of maximizing outreach. Innovative methods such as the generation of Fact Sheets, pushing electronic files and papers to selected individuals interested in water-use efficiency, and so on will help to increase the overall effectiveness of the project.

Benefits

Various benefits of the proposed work have been described in other portions of the proposal. In summary, the White Papers we propose to develop and disseminate here are vital for helping water agencies, utilities, and users to identify and capture economically desirable water efficiency improvements and opportunities. While no formal "Cost/Benefit" analysis is required for this category of Proposal under the PSP, we discuss here some ways to think about the possible dollar value of capturing more efficiency improvements, and compare 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, to be on the order of 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. Thus, there seems to be consensus on the amount of conservation that will be obtained from full implementation of BMPs and related efforts. Full implementation should not be taken for granted, however. Some utilities have applied for or expressed a desire to apply for exemptions, and definitions of "decay," "cost-effectiveness," "real water," and "demand hardening" are inconsistently applied in these studies. Hence the need for this work.

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 or 0.814 – 1.104 MAF/yr of incremental water use efficiency over and above full implementation of BMPs by 2020 if 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 at least 1.0 MAF/Yr.

All of this implies that a minimum of 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 costs and benefits of water conservation. As an illustration, assume that actual net benefits[5] of water conservation amount to $100 per af of water conserved. Then $100 million per year is at stake by the year 2020.

[5] Net benefits are defined as total benefits minus total costs. The value of $100 per af is, of course, arbitrary, but well in line with estimates in the literature. The number could be substantially larger, and not much smaller.

This illustration probably understates the potential net benefits of conservation at the margin once energy costs are included (see both Gleick et al. 2003 and Wolff 2004). If the work in this proposal helps water utilities eventually conserve even 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, 100 times more than the proposed funding level ($108,000). 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 a factor of 10 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 that vary by individual. Other significant expenses are an allocation of $16,900 for publication and dissemination, $8,460 for monitoring and assessment, including work on presentations of the results and analysis of implementation, and $4,000 for travel associated with the education and outreach component. Our overhead rate of 41% is presented in the "Administrative other" row. Our overhead rate has been audited and accepted for previous government contracts and grants.

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