

**Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form**

1. Applying for (select one): (a) Prop 13 Urban Water Conservation Capital Outlay Grant
 (b) Prop 13 Agricultural Water Conservation Capital Outlay Feasibility Study Grant
 (c) DWR Water Use Efficiency Project
2. Principal applicant (Organization or affiliation): Regional Water Authority, Sacramento, California
3. Project Title: Leak Detection and Repair Program
4. Person authorized to sign and submit proposal:
- | | |
|-----------------|---|
| Name, title | <u>Edward Winkler, Executive Director</u> |
| Mailing address | <u>5620 Birdcage Street, Suite 180
Citrus Heights, CA 95610</u> |
| Telephone | <u>(916) 967-7692</u> |
| Fax. | <u>(916) 967-7322</u> |
| E-mail | <u>edwinkler@concourse.net</u> |
5. Contact person (if different):
- | | |
|------------------|---|
| Name, title. | <u>Charlie Pike, Regional Water Efficiency Manager</u> |
| Mailing address. | <u>5620 Birdcage Street, Suite 180
Citrus Heights, CA 95610</u> |
| Telephone | <u>(916) 967-7692</u> |
| Fax. | <u>(916) 967-7322</u> |
| E-mail | <u>cpike@concourse.net</u> |
6. Funds requested (dollar amount): \$386,750
7. Applicant funds pledged (dollar amount): \$144,250
8. Total project costs (dollar amount): \$531,000
9. Estimated total quantifiable project benefits (dollar amount): \$1,289,000
- | | |
|--|--|
| Percentage of benefit to be accrued by applicant: | <u>100% of cost and water saving benefits</u> |
| Percentage of benefit to be accrued by CALFED or others: | <u>0% of cost saving benefits,
100% of water saving benefits</u> |

**Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form (continued)**

10. Estimated annual amount of water to be saved (acre-feet): 750
- Estimated total amount of water to be saved (acre-feet): 1,200 (2 years: 2003, 2004)
- Over 20 years 15,450
- Estimated benefits to be realized in terms of water quality, instream flow, other: Dry year increase, instream flows, system reliability
11. Duration of project (month/year to month/year): November 2002 through June 2005
12. State Assembly District where the project is to be conducted: 4, 5, 9 and 10
13. State Senate District where the project is to be conducted: 1, 4, 5 and 6
14. Congressional district(s) where the project is to be conducted: 3, 4, 5 and 11
15. County where the project is to be conducted: Sacramento and Placer County
16. Date most recent Urban Water Management Plan submitted to the Department of Water Resources: 2001 for the partner agencies of City of Folsom, Carmichael Water District and Florin RCD/Elk Grove that are cooperating water suppliers
17. Type of applicant (select one):
 Prop 13 Urban Grants and Prop 13 Agricultural Feasibility Study Grants: (a) city
 (b) county
 (c) city and county
 (d) joint power authority
 (e) other political subdivision of the State, including public water district
 (f) incorporated mutual water company
- DWR WUE Projects: the above entities (a) through (f) or:
 (g) investor-owned utility
 (h) non-profit organization
 (i) tribe
 (j) university
 (k) state agency
 (l) federal agency
18. Project focus: (a) agricultural
 (b) urban

**Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:**

A. Project Information Form (continued)

19. Project type (select one):
Prop 13 Urban Grant or Prop 13
Agricultural Feasibility Study Grant
capital outlay project related to:

- (a) implementation of Urban Best Management Practices
- (b) implementation of Agricultural Efficient Water Management Practices
- (c) implementation of Quantifiable Objectives (include QO number(s))

.....
 (d) other (specify)
.....

DWR WUE Project related to:

- (e) implementation of Urban Best Management Practices
 - (f) implementation of Agricultural Efficient Water Management Practices
 - (g) implementation of Quantifiable Objectives (include QO number(s))
 - (h) innovative projects (initial investigation of new technologies, methodologies, approaches, or institutional frameworks)
 - (i) research or pilot projects
 - (j) education or public information programs
 - (k) other (specify)
-

20. Do the actions in this proposal involve physical changes in land use, or potential future changes in land use?

- (a) yes
- (b) no

If yes, the applicant must complete the CALFED PSP Land Use Checklist found at http://calfed.water.ca.gov/environmental_docs.html and submit it with the proposal.

**Consolidated Water Use Efficiency 2002 PSP
Proposal Part One
B. Signature Page**

By signing below, the official declares the following:

The truthfulness of all representations in the proposal;

The individual signing the form is authorized to submit the proposal on behalf of the applicant; and

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.


Signature

Edward D. Winkler
Executive Director
Name and title

2/2/02
Date

PROPOSAL PART TWO

This section includes a brief project summary and discusses the relevance, importance, technical/scientific merit, feasibility, monitoring and assessment, qualifications, and benefits and costs of the proposed project.

PROJECT SUMMARY

The proposed project consists of conducting leak detection and leak repairs of the water distribution systems for three Regional Water Authority member agencies, Carmichael Water District, City of Folsom and Florin Resource Conservation District/Elk Grove Water System located in the Sacramento metropolitan area. The system leak detection portion of this project consists of the following:

- Install flow monitoring devices at predetermined locations to monitor a total of 70 miles of pipeline, or 20% of the over 350 miles of distribution pipes;
- Analyze data output from flow monitoring equipment using vendor provided software to identify priority areas for further investigation;
- Investigate specific locations of leaks for repair within 1 foot tolerance using correlating data loggers; and
- Repair leaks for a minimum of 50 leaks (where at least 1 leak per mile is conservatively assumed).

Figure 1 depicts the location of the water districts within the Regional Water Authority boundary area, including the three participating agencies in this application. Appendix A provides the system distribution maps for the participating agencies along with the preliminary plans and specifications. Appendix B provides the equipment specifications for the equipment to be purchased as part of this project.

The efficient use of California's limited water supplies is a critical local, regional, and statewide water issue. Portions of the subject water distribution systems have a leak history spanning several years. For example, the Elk Grove water system experienced 31 leaks in 2001 requiring repair in the older section of town, where piping contributes disproportionately to unaccounted-for water (UAW). Each of these water agencies will target the older pipe areas for leak detection.

The goal of this project is to find and repair as least 50 leaks and quantify the resulting water loss from leaks, which will be reported to the California Department of Water Resources (DWR) in a Final Monitoring and Assessment Report. The project cost is \$531,000. This grant application is for \$386,750. It is expected that this leak detection and repair project will result in average water savings of approximately 750 ac-ft/year, and 15,450 ac-ft over a 20 year period.

A. SCOPE OF WORK: RELEVANCE AND IMPORTANCE

This section describes the nature, scope, and objectives of the project. It also includes a statement of critical local, regional, Bay-Delta, State and federal water issues and a description of how this project is consistent with local and regional water management plans and other resource management plans.

Figure 1. Location Map

A.1 Nature, Scope, and Objectives of the Project

The nature of this project is to conduct leak detection surveys and immediately repair at least 50 leaks within the three-year contract timeframe. The objectives of this project are to significantly increase water use efficiency by reducing the amount of UAW through leaks in three older communities within the Sacramento area, namely the older sections of Elk Grove Water System, Carmichael Water District and the City of Folsom.

This project solely targets leaking water transmission mains and service lines that contribute significantly to UAW. Unaccounted-for water is also attributable to unmetered water use such as for fire protection and training, system and street flushing, sewer cleaning, construction, system leaks, water use at the treatment plants, and unauthorized connections. Unaccounted-for water can also result from meter inaccuracies. These communities are partially metered and undergoing meter retrofit programs to convert all connections to meters. Most of the commercial, industrial, and institutional accounts are metered.

The distribution system water losses occurring in these treated water systems are between the surface water treatment plants, and/or groundwater wells and the retail customers. Currently, these three water purveyors lose water production to leaks. Given these systems are only partially metered, the percent of water demand due to leakage is not quantified. However, because the segments of the distribution systems targeted under this project includes many of the oldest parts of their respective systems and its aged infrastructure, these agencies estimate the UAW within these older parts of their systems are disproportional high. The following descriptions provide more detail on the participating agency systems:

Carmichael

The Carmichael Water District system encompasses 135 miles of water transmission piping with 10,980 connections, with the majority being over 10,000 residential connections. Carmichael Water District utilizes surface water from the American River and local groundwater resources as part of its water supply. The Carmichael Water District has fixed leaks detection based on observation of surface leaks by either district maintenance staff or customer complaints. No formal leak detection program has existed, although leaks are repaired regularly as part of system maintenance.

City of Folsom

The City of Folsom water distribution system consists of 148 miles of water transmission piping with 9,942 connections, with the majority being over 9,300 residential connections. City of Folsom receives surface water from the Folsom Lake reservoir on the American River and treats its own water supply. The City has fixed leaks detection based on observation of surface leaks by either district maintenance staff or customer complaints, and occasionally contracts for leak detection services.

Florin Resource Conservation District(RCD)/Elk Grove Water System

The Florin RCD/Elk Grove Water System encompasses 70 miles of water transmission piping with 8,100 connections, with the majority being residential customers. Florin RCD/Elk Grove Water System currently receives 100% of its supply from groundwater and is considering the possibility of

drawing some future water from surface supplies tributary to the Delta. The City has fixed leaks based on observation of surface leaks by either maintenance staff or customer complaints. Although leaks are repaired regularly and 31 leaks were repaired in 2001 for a total cost for labor and materials only to the utility of approximately \$35,000.

The efficient use of California's limited water supplies is a critical local, regional, and statewide water issue. The objective of this project is for the water agency staff to receive training from the vendors using the equipment purchased through this grant to perform in-house leak detection surfaces in each of the three service areas for Carmicheal Water District, City of Folsom and Florin Resource Conservation District/Elk Grove Water System. Once the crews receive training, they can perform leak detection surveys of up to 20% percent for their combined systems, and perform leak repairs over a three-year time frame. The goal is to significantly reduce water losses through leak repairs. This project does not include implementing work effort considered a part of the requirements under the Water Forum Agreement BMP 3, System Audit, Leak Detection and Repair.

The objective of the water system monitoring and leak detection portion of this project consists of installing flow monitoring devices on selective transmission mains within the areas of aged piping, and then pinpoint leaks using correlating data loggers during the night of winter months when the irrigation uses are minimal. Analyzing the data will enable crews to work throughout the remaining spring, summer and fall quarters to repair leaks.

The objective of the leak repair portion of this project will include repair of a minimum of 50 leaks that are assumed to be found within 70 miles of inspected piping within three distribution systems. Because of the average age of the system, it is anticipated that approximately more than one (1) leak per mile will be found. The existing literature recognizes average number of leaks per mile to be between 1.5 and 3. This assumption is based on references provided in Appendix C. The references include a survey of findings from 47 agencies in California by the California Department of Water Resources (DWR, 1988) and also the experience of a well-known contractor, Utility Services Associates based in Seattle Washington, that perform leak surveys throughout the west coast, including the Sacramento region.

A.2 Statement of Issues, Project Need, and Project Consistency

The efficient use of California's limited water supplies is a critical local, regional, and statewide water issue. The water supply for the retail agencies participating in this project comes partially or wholly from the American River in addition to local groundwater supplies. The purpose of this project is to significantly increase water use efficiency by reducing the amount of water losses that cause higher water demand year-round particularly critical in dry-years. This project will provide benefit to the Bay-Delta by ensuring that water diverted upstream is used efficiently, and will additionally assist with reducing groundwater overdraft in the groundwater basin beneath Sacramento.

This project has the potential to positively impact the Bay-Delta systems by increasing instream flows and reducing the overall reliance on the surface water supplies from the American and Sacramento Rivers upstream from the Bay-Delta. The RWA's and its member agencies conservation efforts are an important part of a long-term, comprehensive effort to reduce pressure on the Bay-Delta system to meet regional and state-wide water needs. One of the fundamental objectives of the CALFED Bay-Delta program is to reduce the mismatch between Bay-Delta water supplies and the current and projected beneficial uses dependent on the Bay-Delta system. Water

use efficiency projects are one of the cornerstone strategies the CALFED Bay-Delta program is deploying to achieve this objective. Purchase of leak detection equipment, training of staff personnel will reduce the water losses, which is a significant urban end use within the Sacramento region of upstream Bay-Delta water supplies. It is anticipated that a minimum of 50 leaks will be repaired under this project and will result in water savings of approximately 750 acre-feet per year and a total of 15,450 by 2023.

By reducing the amount of water use by customers in the agencies' water supply areas, other beneficial uses will be realized particularly during dry-years, such as providing flow to improve aquatic ecosystems and the habitat of many federally listed endangered species such as Delta Smelt, Splittail, Steelhead, Chinook salmon, fresh water shrimp, Coho salmon, and Steelhead along the American River and Sacramento River watersheds. Increasing the amount of water available will also reduce groundwater withdrawals and allow improved recharge efforts, thus effectively increasing the system reliability and flexibility of operations in dry years by the Regional Water Authority and its member agencies.

The Regional Water Authority is a joint powers agency of 18 water suppliers serving more than 1 million people in the greater Sacramento Region. The mission is to serve and represent regional water supply interests and assist RWA members with protecting and enhancing the reliability, availability, affordability and quality of water resources.

A major component of RWA, the Regional Water Efficiency Program is designed to expand measures to help area water providers fulfill Water Forum best management practices (BMPs). The Regional Water Efficiency Program offers two tiers of services: Core activities serve as the fundamental building blocks necessary for implementing the BMPs and includes public information, school education, program marketing coordination, grant applications and technical assistance.

In addition, agencies can choose from subscription activities according to organizational and customer needs. These can include landscape irrigation surveys, marketing partnerships with landscape retailers, training for staff and customers, pilot projects, leak detection surveys and report preparation.

Regional Water Authority and its member agencies are stakeholders in three major water management teams: Sacramento Area Water Forum (Water Forum), the American River Basin Cooperating Agencies (ARBCA), and the Sacramento Groundwater Authority (SGA). The project is consistent with the local water management plans including the SGA. This project is consistent with regional water management plans such as the ARBCA Regional Water Master Plan (RWMP) and Water Forum Agreement. This project is also consistent with statewide water management plans such as the California Urban Water Conservation Council's Memorandum of Understanding regarding Urban Water Conservation in California.

This project is compatible with all of the 2000 UWMP for each of the cooperating agencies for this project and RWA's ongoing efforts to achieve greater water use efficiency. RWA's Board of Directors recognizes the importance of water management and conservation programs. RWA's has the general policy that states in part that the RWA will supports its member agencies in operating and maintaining each individual purveyor's water system in an efficient and economical manner and distribute and supply water as fairly and equitably as possible.

All of the retail agencies that are external cooperating agencies are members of the Sacramento Water Forum. In the year 2000, the Water Forum finalized the *Water Forum Agreement* (Agreement) which contains seven major elements to meet its objectives. Water conservation is the fifth major element in the Agreement. The water conservation portion of the Agreement describes each water purveyor's commitments to implement BMPs. These BMPs were derived from the original MOU developed by the CUWCC, and then customized for the Water Forum conservation agreements prepared for the individual purveyors.

This project involves the implementation of urban water conservation best management practice (BMP) numbers 3, *System Water Audits, Leak Detection and Repair*, as defined by the California Urban Water Conservation Council (CUWCC). The unpredictable water supply and ever increasing demand on California's complex water resources have resulted in a coordinated effort by the California Department of Water Resources (DWR), water utilities, environmental organizations, and other interested groups to develop a list of urban BMPs for conserving water. This consensus-building effort resulted in the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU), which formalizes an agreement to implement these BMPs and makes a cooperative effort to reduce the consumption of California's water resources.

This project is compatible with the Carmicheal Water District, City of Folsom, and Florin Resource Conservation District/Elk Grove Water System 2000 Urban Water Management Plans and RWA's ongoing efforts to achieve greater water use efficiency. RWA's Board of Directors recognizes the importance of water management and conservation programs. Each of the agencies have adopted rules and regulations that include the general policy of the water system that states in part that the agency will operate and maintain the water system in an efficient and economical manner and distribute and supply water as fairly and equitably as possible.

This project is cost effective relative to water savings and project costs as shown in Section D of this application. Even though this project proves to be locally cost effective, agencies need grants for seemingly cost effective projects. The substantiation that a project is cost effective is not enough to get project approval, since project managers and engineers must compete for available utility dollars. There is seldom enough money to serve all of the needs. Regulatory issues often take priority, such as: monitoring water quality for an ever-broadening list and lowering detectable levels of constituents of concern; meter installation commitments (in the Sacramento region); and keeping up with new building development. In the private sector, the competition might use return-on-investment analysis where paybacks of 1-2 years receive budget allocations, but paybacks of more than 5 years seldom are considered for funding. Water efficiency measures, while meaningful investments, often have much longer paybacks.

B. SCOPE OF WORK: TECHNICAL/SCIENTIFIC MERIT, FEASIBILITY, MONITORING AND ASSESSMENT

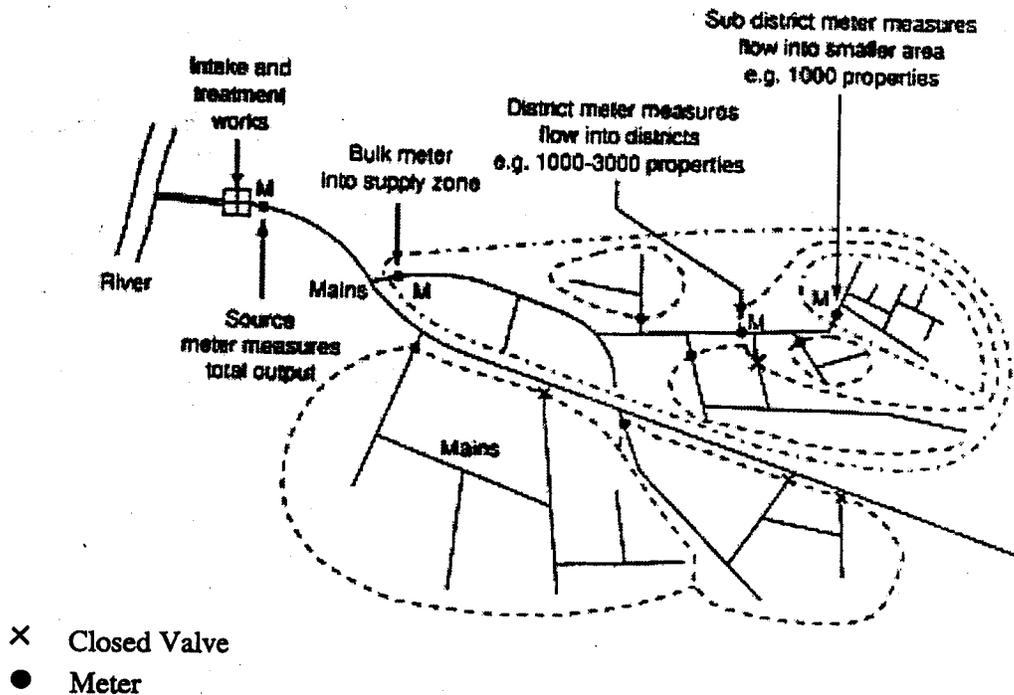
This section describes the methods, procedures and facilities associated with the project. A task list and schedule and quarterly expenditure of the project are also included in this section.

B.1 Methods, Procedures, and Facilities

The method for leak detection utilizing flow monitoring with district metering areas is an innovative concept for water utilities in California, but has been used extensively elsewhere on the East Coast

of the United States and Europe. The flow monitoring consists of installing flow meters to detect and quantify leaks in water mains between pipe sections, which eliminates perceived water losses due to meter inaccuracies. The correlating data loggers are used to detect the exact location for actual leak repair. The following diagram presents a basic metering station layout (Figure 2). Once the existence of probable leaks with flow meters, leak locations are then pinpointed with correlating data loggers. Agency maintenance staff will then perform leak repairs.

Figure 2. Example Layout of District Metering Areas



Source: *A Manual of District Metering Areas (DMA) Practice* (United Kingdom (UK) Water Research Limited, 1999)

This project will incorporate methods and procedures recommended by the AWWA *Water Audits and Leak Detection Manual, M36* (AWWA, 1990) and *A Manual of District Metering Areas (DMA) Practice* (United Kingdom (UK) Water Research Limited, 1999). Additionally, methods in the international format for water audits and leak detection will be referenced, as provided in the *Performance Indicators for Water Supply Services* (International Water Association, 2000) and used by the City of Philadelphia – Water Bureau in preparation of their leak detection and repair program. Reference documents are provided in Appendix C.

Each of the participating agencies will use standard engineering, construction, and rate structure methods to implement this project. Standard purchasing (and contracting procedures, if needed) will be used to purchase equipment, and materials in bulk for leak repair and paving as defined in the project specifications in Appendix A. Each agency will use in-house staff to conduct the leak detection and repair. This project does not require the purchase of land or easements. All planning, design and engineering is being performed in-house. Where required, RWA will assist to extent possible, the agencies as they acquire any necessary encroachment permits.

The RWA will modify the forms found in Appendices of the *AWWA Manual M36*, Water System Audit and Leak Detection for their reporting requirements by each agency staff as a part of this project. Examples of these forms are provided in Appendix D, that will be used for each leak and summary information. This information will include detailed information on the total number of leaks identified, and for each leak repaired, the size, pressure, and flow to assist with quantifying the water savings from the leak repairs.

For each project, each agency will assign an engineer to serve as a Project Engineer/Manager. The project manager is responsible for the overall conduct of that respective agency's part of the project. This includes assuring that an environmental document is prepared and appropriate land, easements and right-of-way are obtained. The project manager is also responsible for the design and preparation of plans and specifications, bidding, construction management, and assuring construction inspection and testing are performed. The project manager will specify detailed reporting by pipe sections, including leak detection survey logs, and leak repair reports to RWA along with their project summary when quarterly invoices are submitted to RWA. The summary report will include estimates of gallon per day losses. The RWA will summarize the progress of the project with each invoice submitted to DWR.

Each leak repair project will be inspected by either agency staff inspectors, or RWA contracted inspectors. Each city public work department will inspect the road rehabilitation portion of the project. Soils testing will be required and will be performed by a consulting geotechnical engineering firm employed by either RWA or the participating agencies. Pressure testing will be performed on the pipeline. If pressure tests are performed by contractors, it will be reported to the RWA, agency staff or contracted inspector.

B.2 Task List and Schedule

The tasks for implementation of this project and the project schedule are described below and presented on Figure 3. The schedule includes deliverable items, due dates, and projected costs for each task. The schedule bar chart also identifies which tasks are considered to be inseparable if only a portion of the project is funded. Table B-1 presents a quarterly expenditure projection.

Tasks

1. Develop action plan, and select locations for flow monitoring stations.
2. Install flow monitoring stations at selected points in the water distribution systems for each system by each agency's staff, and purchase flow metering and data correlating equipment.
3. Perform leak detection survey by installing meters and monitor flows, analyzing flow metering data for high priority leaks, and pinpoint leak locations with correlating data loggers.
4. Repair transmission main and service lines (also using in-house staff).
5. Prepare Quarterly Summary Reports with each invoice to RWA.
6. Prepare Interim Progress Reports with summaries of leaks found and repaired to date.
7. Prepare Monitoring and Assessment Report. This report will be written following the end of the project. It will include results of the flow monitoring results and effectiveness, a summary of leak repairs, and the resulting water savings.

B.3 Monitoring and Assessment

A key aspect of this project will be monitoring and assessment to quantify and verify water savings. The flow monitoring data analysis will include identifying specific leaks within sections of pipe. Data from the correlating loggers will be analyzed to pinpoint locations of the leaks for repair. The actual quantification of the leaks water losses will be accomplished by using measurements taken in the field at the time of repair. Subsequent evaluation will assess the water losses from individual leaks and provide a summation of water savings from the leaks repaired in both the Interim Progress Report for the repairs completed to date and the entire water losses recovered from this project in the Final Monitoring and Assessment Report. In addition, status reports of the number of leaks repaired will be monitored by RWA as part of the quarterly invoices and summary project status reports.

The project-specific performance measures that will be used to assess project success in relation to its goals will be provided as follows:

- One Interim Progress Report will be prepared. This report will be a status report summarizing findings from flow monitoring, leak location, and repairs conducted to date. This interim report will be used to document the progress of the project and determine if the project is on schedule and aid in project control. The progress report will be prepared the first quarter following completion of the auditing cycle. Example forms used by agency staff to report to RWA are provided in Appendix D.
- A Monitoring and Assessment Report will be prepared following project completion. This report will present monitoring results and assess the before and after water use in each of the three water distribution systems. The report will also include the final leak detection survey findings, and summarize all leak repairs, and recommendations for the program.

The Interim Progress Report and the Monitoring and Assessment Report will be made available to the public at the RWA office, and the office of each of the three agencies. The information will be made available to the public through various outreach methods.

B.4 Preliminary Plans and Specifications and Certification Statements

Preliminary plans and specifications are provided in Appendix A along with a Certification Statement.

C. QUALIFICATIONS OF THE APPLICANTS AND COOPERATORS

The qualifications of the project manager, cooperators, and partners to be involved in leak detection and repair program for Regional Water Authority (RWA) are discussed in this section. A description of RWA is also included above in Section A.2.

C.1 Resumes

The project manager responsible for irrigation system incentive program will be Charlie Pike, the Regional Water Efficiency Manager. Mr. Pike's resume is included in Appendix E. Mr. Pike has 17 years of experience associated with administration of incentive programs.

C.2 External Cooperators

Letters of commitment are provided in Appendix F. External cooperating water agencies for this project are:

- Carmichael Water District
- City of Folsom
- Florin Resource Conservation District/Elk Grove Water System

D. BENEFITS AND COSTS

This section includes a breakdown and justification of the project budget and cost sharing information. Also described and analyzed are the benefits and costs of this project.

D.1 Budget Breakdown and Justification

Table D-1 presents a detailed estimated budget that includes relevant line items for capital outlay project proposals and justification of each line item. This table also indicates the amount of cost sharing for each element.

Table D-1. Detailed Budget – Capital Outlay Project Proposal

Item	Justification	Labor		Other direct costs, dollars	Total, dollars	RWA portion	Prop 13 portion
		Hours	Dollars				
Land Purchase /Easement		0	0	0	0	0	
Planning/ Design/ Engineering	Mapping and Flow Monitoring Station Selection and Installation Design	936	38,000	0	38,000	19,000	19000
Materials/ Installation	Leak Detection - Flow meter installation Leak Repair: 50 leaks at 12 hours per leak (crew of 3 for 4 hours)	1,774	50,000	50,000	100,000	25,000	75,000
Equipment Purchases/ Rentals Inspection and Paving	50 leaks at \$1,500 per leak.	0	0	221,000	221,000	0	221,000
Flow Meter Data Analysis, Leak Pinpointing and Leak Repair		8,023	57,000	0	57,000	42,750	14250
Construction/ Administration/ Overhead	Water Efficiency Manager & Staff, reporting, invoicing				65,000	32,500	32,500
Project/Legal/License Fees		0	0	0	0	0	
Contingency (10%)					55,000	0	55,000
Other			0		0	0	0
Project Total		10,733	145,000	271,000	531,000	144,250	386,750

Note: Detailed justification for all costs is included in Table B-1, Appendix B. Equipment Specifications and cost quotations are also included in Appendix B.

D.2 Cost Sharing

RWA is requesting 75 percent or \$386,750 in funding from the Proposition 13 Urban Water Conservation Program. This funding will contribute to equipment purchases, leak repair and administration associated with invoicing and reporting to DWR. RWA and participating agencies will commit \$144,250 or a cost share 25% of the total construction costs. Given that this is a project solely funded by the participating agency contributions and no additional cost recovery mechanisms are available for RWA to cover the three (3) member agencies committed to this program, RWA requests a \$55,000 contingency to ensure that funding available over the 12-month periods for the rebate program are sufficient given the contractual arrangements required by RWA bylaws, a Joint Powers Authority. Grant funded projects are structured on a subscription bases by the participating agencies. RWA bylaws prohibit the encumbrance of no-participants (even though they may be RWA members) with liabilities of subscription activities. RWA will make every effort to maintain the budget within the requested \$386,750.

D.3 Benefit Summary and Breakdown

There are multiple expected beneficial outcomes of this project and physical changes will occur as a result. The value of those outcomes and physical changes are both quantifiable and non-quantifiable. The quantifiable values of physical changes that will occur as a result of this project and the beneficiary of each benefit are listed in Table D-2. Project outcomes and benefits will be shared among the project's beneficiaries and may directly or indirectly contribute to CALFED goals.

Table D-2. Quantifiable Physical Changes, Expected Benefits, and Beneficiaries

Physical change	Expected benefit	Beneficiary
Reduce unaccounted-for water. Agencies can "stretch" their surface water entitlements from the Sacramento and American Rivers, and reduce groundwater pumping.	750 ac-ft/year	CALFED goal to increase instream flows water in American and Sacramento River located upstream of the Bay-Delta system. Use local water supplies more efficiently
Agencies will save money on avoided costs of a new water supply	\$160/acre-foot of water saved	Agency/customer

Non-Quantifiable project outcomes and benefits are listed and described in Table D-3. It is indicated how each non-quantified outcome or benefit will be shared among the project beneficiaries. The non-quantified outcomes expected to directly or indirectly contribute to CALFED goals are also identified and delineated.

Table D-3. Non-Quantifiable Outcomes

Physical change	Expected benefit	Beneficiary
Decreased unaccounted-for water within the service area by this project will allow agencies to delay the date of need to used their full water right entitlements and reduce groundwater pumping.	Improved Bay-Delta ecosystem	CALFED Goal
Less water pumped into the system	Energy savings	Energy provider/RWA

D.4 Assessments of Costs and Benefits

This section includes an assessment that summarizes the costs and benefits of the proposed project. The major analysis assumptions are listed and explained. This section also shows the present value of the quantified costs and benefits to the applicant, CALFED, and other parties affected by the project and summarizes non-quantified costs and benefits to the applicant, CALFED, and other parties affected by the project.

This project is locally cost effective to RWA and the three member agency participants. Based on the simplified benefit-cost ratio assessment in Table D-4, using project benefits and costs, the project has a benefit to cost ratio of 3.1. Since this number is greater than one, it indicates an economically justifiable project.

Below is a list and explanation of all major analysis quantifiable benefits/costs assumptions and methodologies.

1. It is assumed that 70 leaks will be detected over 70 miles of monitored water mains. The number of leak repairs is a minimum of 50 (30 in 2003 and 20 in 2004).
2. This project is expected to reduce water usage by 9.5 gallons per minute (gpm) for every leak. This savings is based on Table 4-3 of AWWA manual M36, *Water Audits and Leak Detection*, using an assumed average leak size of 0.2 in and 100 pounds per square inch (psi) pressure. Water savings per leak given in this table range from 2.3 gpm for 0.1 inch diameter hole to 38 gpm for a 0.4 inch diameter hole, thus 9.5 gallons per minute is a conservative estimate. Over the course of one year, the water savings per leak with a 0.2 inch diameter hole is 15 acre-ft.
3. Cost of leak detection is estimated at \$4,400 per leak and cost of repair is estimated \$2,765 per leak. These were calculated using the estimated cost to the applicant given in Table B-1, Appendix B. These rates include the costs of equipment purchase costs, installing and reading flow monitoring meters, data loggers, other associated equipment costs, labor and project administration.
4. Marginal cost of water is \$160/ac-ft. The value of conserved water in the Sacramento area for Carmichael Water District, Florin Resource Conservation District/Elk Grove System, and City of Folsom is \$160/ac-ft.
5. The lifetime of the portable flow-meter is 10 years.
6. All quantified benefits and costs are expressed in year 2002 dollars using a 6.0 percent discount rate.

An economic analysis of this project, based on the assumptions listed above is shown in Table D-4. The present values of the quantified costs and benefits for the applicant, each project beneficiary, and CALFED are quantified in Table D-5. A summary of the non-quantified costs and benefits to the applicant, each project beneficiary, and CALFED are summarized in Table D-6.

Table D-4. Economic Analysis

No.	Assumption	
(4)	Value of conserved water (\$/acre-ft) =	160
(6)	Discount rate (real) =	6.00%
(4)	Annual water savings (acre-ft/leak repair) =	15
(3)	Leak detection cost (\$/leak) =	4,432
(3)	Cost per leak repair (\$/repair) =	2,765
(5)	No. of Leaks detected in 2002 =	0
(5)	No. of Leaks detected in 2003 =	40
(5)	No. of Leaks detected in 2004 =	30
(5)	No. of Leaks repaired in 2002 =	0
(5)	No. of Leaks repaired in 2003 =	30
(5)	No. of Leaks repaired in 2004 =	20

Calendar Year	No. of Leaks Repaired	No. of Leaks Detected	Incremental Water Savings (AF/yr)	Annual Water Savings (AF/yr)	Benefits (\$)		Costs (\$)			
					Total Undiscounted Benefits	Total Discounted Benefits (Avoided Costs)	Capital Costs	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs
Assumption	(5)	(5)	(4)		(1)	(6)	(5),(3)		(6)	
2002	0	0	0	0	0	0	0	0	0	
2003	30	40	450	450	72,000	64,080	279,271	0	279,271	
2004	20	30	300	750	120,000	100,754	201,729	0	201,729	
2005			0	750	120,000	95,051	0	0	0	
2006			0	750	120,000	89,571	0	0	0	
2007			0	750	120,000	84,595	0	0	0	
2008			0	750	120,000	79,807	0	0	0	
2009			0	750	120,000	75,289	0	0	0	
2010			0	750	120,000	71,028	0	0	0	
2011			0	750	120,000	67,007	0	0	0	
2012			0	750	120,000	63,215	0	0	0	
2013			0	750	120,000	59,636	0	0	0	
2014			0	750	120,000	56,261	0	0	0	
2015			0	750	120,000	53,076	0	0	0	
2016			0	750	120,000	50,072	0	0	0	
2017			0	750	120,000	47,238	0	0	0	
2018			0	750	120,000	44,564	0	0	0	
2019			0	750	120,000	42,041	0	0	0	
2020			0	750	120,000	39,662	0	0	0	
2021			0	750	120,000	37,417	0	0	0	
2022			0	750	120,000	35,299	0	0	0	
2023			0	750	120,000	33,301	0	0	0	
Totals:	50		750	15,450	2,472,000	1,289,062	481,000	0	481,000	417,926

Benefit cost ratio: 3.1

Table D-5. Summary of Quantifiable Present Value Costs and Benefits

	Costs, dollars	Benefits	
		Water, dollars	Water, ac-ft
RWA	417,926	1,289,062	15,450
CALFED	None	None	15,450

Note: Cost does not include contingency.

Table D-6. Summary of Non-quantifiable Costs and Benefits

	Non-quantified costs	Non-quantified benefits
RWA participating member agencies	None	<ul style="list-style-type: none"> Increased water supply reliability Increased water supply accounting
CALFED	None	<ul style="list-style-type: none"> Increased water supply reliability to water users while at the same time assuring the availability of sufficient water to meet fishery protection and restoration recovery needs More water in the near-term for Bay-Delta water quality improvements
Energy provider	None	Energy savings as a result of less water pumped into the system.
American River Watershed & Aquatic Ecosystem	None	<ul style="list-style-type: none"> Improved aquatic and terrestrial habitat in American River More water available to meet fishery protection and restoration recovery to meet near-term needs

E. OUTREACH, COMMUNITY INVOLVEMENT AND ACCEPTANCE

This project is consistent with the California Urban Water Conservation Council’s Memorandum of Understanding regarding water conservation. It is also consistent with the Water Forum Agreement for each of the participating agencies and the Regional Water Authority goals and objectives. A letter of support from the Water Forum is included in Appendix G.

Because this project provides a regional-wide benefit, outreach efforts will not focus on any particular customer sector. Due to the nature of this project it is not appropriate nor practical to extend the project to specifically target disadvantaged communities within the water agencies’ service areas. There are no tribal entities particularly impacted by this project.

On projects that impact its customer’s water service, agencies send out written notification or uses door hangers to inform the impacted customers of the pending service interruption. Generally the notification is mailed out in sufficient time to be received approximately three days prior to the service interruption. Door hangers, if used, are also disbursed approximately three days prior to the service interruption. Emergency numbers are identified on both the written and door hanger notices. Normally, the notification will include a backup date in case there is some complication that deems it inappropriate to have the service shut down. If traffic or access will be impacted this is also covered in the notification process.

If agencies are not able to conduct the work at the times identified in the notices, new notices with the new dates will be given to the customers and property owners as identified above.

Third party impacts include temporary inconvenience to local residents due to meter installation. Meter installations will take no longer than four to five hours per meter. None of the meter installations will require encroachment permits.

Information on the results of this project will be disseminated through the RWA and each agencies' public outreach program. Each agency operates an extensive public information program and associated schools program, which provide materials, speakers, and outreach activities to the general public.

Outreach activities will include publications and Web site development, public meetings, RWA and its member agencies participation at community events, multimedia campaigns, interagency partnerships, corporate environmental fairs, professional trade shows, water conservation workshops and seminars and a speakers bureau.

Summaries of the results and benefits of this project will be developed by RWA staff to be submitted in the Final Report to DWR and will also be made available to agency's customers. Project information will also be included in billing mailer inserts, newsletters, and agency Web sites, as appropriate.

APPENDIX A

Water System Distribution Maps

Preliminary Plans, Specifications, and Certification Statements

INSERT CARMICHAEL WATER DISTRICT MAP

INSERT CITY OF FOLSOM SYSTEM MAP

Preliminary Specifications and Plans

(Items 1-6 for installations will be developed. Example Project Control Forms for Item 2 and 7 are provided in Appendix D. A draft of Item 8 is included. Vendor equipment specifications are presented in Appendix B)

1. Leak Detection Survey Plan
2. Leak Detection Reporting Requirements
3. Flow Monitoring Station Installation
4. Flow Metering Equipment
5. Correlating Data Loggers Installation
6. Correlating Data Loggers Equipment
7. Leak Repair Reporting Requirements
8. Leak Repair Requirements

Improvement Standards

1. General Conditions for Private Work – Pipeline Extension Agreements and Service Orders

Section T – Technical Provisions

1. Piping and Plumbing
 - 1.1 Treated Waterline Piping
 - 1.1.1 Ductile Iron Pipe
 - 1.1.2 Polyvinyl Chloride (PVC) Pressure Pipe
 - 1.1.3 Steel Pipe
 - 1.1.4 Bedding and Backfill
 - 1.1.5 Cathodic Protection
 - 1.2 Treated Water Service Piping
 - 1.2.1 Copper
 - 1.2.2 Polyvinyl Chloride (PVC)
 - 1.2.3 Polyethylene
 - 1.6 Installation and Testing
 - 1.6.1 Location of Existing and New Utilities
 - 1.6.2 Quality Control
 - 1.6.3 Laying of Pipe
 - 1.6.4 Bedding and Backfill
 - 1.6.5 Connections to Existing Pipelines
 - 1.6.6 Abandonment of Existing Facilities
 - 1.6.7 Hydrostatic Testing
 - 1.6.8 Disinfection/Chlorination and Flushing
 - 1.6.9 Continuity Testing
 - 1.6.10 Drilling Service Taps

Section T – Technical Provisions (continued)

- 3. Earthwork
 - 3.1 Scope
 - 3.2 Trench Excavation
 - 3.3 Trench Width
 - 3.4 Special Foundation Bedding Treatment
 - 3.5 Trench Backfill
 - 3.5.1 Bedding and Backfill
 - 3.5.2 Sand Slurry Backfill
 - 3.5.3 Compaction
 - 3.6 Embankment Construction
 - 3.7 Structure Backfill

Standard Drawings

- SA4 Standard Service Connection, Meters 1” and Smaller
- SA5 Standard Service Connection, Meters 1-1/2” and 2”
- SA10 Pipe Trench Bedding and Backfilling
- SA11 Water/Sewer Crossing and Parallel Pipe Construction

Standard Specification/Drawing Revisions

- 1.2 Treated Water Service Piping
- 3. Earthwork
 - SA4 Standard Service Connection, Meters 1” and Smaller
 - SA5 Standard Service Connection, Meters 1-1/2” and 2”
 - SA10 Pipe Trench Bedding and Backfilling
 - SA11 Water/Sewer Crossing and Parallel Pipe Construction

Certification Statements

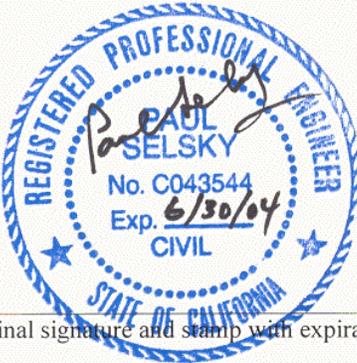
Engineering feasibility statement

I, Paul Selsky, a California registered civil engineer, have reviewed the information presented in support of this application. Based on this information, and any other knowledge I have regarding the proposed project, I find that it can be designed, constructed, and operated to accomplish the purpose for which it is planned. There is a sufficient water supply for the project. The information I have reviewed to document this statement is included (provide list, e.g., feasibility studies, engineering design studies, water rights permits, etc.).

Documents Reviewed:

Project work plan.

Preliminary plans and specifications



(Original signature and stamp with expiration date)

APPENDIX B

Background Information

Cost Estimate, Equipment Specifications and Cost Quotations

Table B-1. Cost Estimate for Leak Detection Project

LABOR	Number Crew	Labor hours per crew member	Dollars/hr	Labor Dollars
LEAK DETECTION				
3 Days training from vendor*	9	24	26	6,000
Plan for locations to survey		720	26	20,000
Plans and Specs Development				12,000
Installing Monitoring Stations	3	591	26	50,000
Pinpointing Leaks	9	758	26	25,000
Leak Detection Subtotal				113,000
LEAK REPAIR				
Leak Repair Subtotal	3	400	26	32,000
Total Labor				145,000

EQUIPMENT/MATERIALS	No. of Items	No. Agencies	Equipment, Material & Installation Costs	Total Equipment, Material & Installation Cost
LEAK DETECTION				
Flow Monitoring Stations Equipment	240	combined	150	36,000
Flow Monitoring Stations Materials and Installation	240	combined	75	20,000
Flow Meters Equipment	4	3	5234	65,000
Correlating Data Loggers (8)	1	3	20,000	60,000
Leak Detection Subtotal				181,000
LEAK REPAIR				
Leak Repair Materials	50	combined	500	30,000
Leak Repair Equipment Leasing	400	hours	150	60,000
Leak Repair Subtotal				90,000
Equipment, Materials & Installation Total				271,000

OVERHEAD AND ADMINISTRATION	(15% of total project cost)	65,000
	Contingency (10%)	50,000
TOTAL PROJECT COST		531,000

Leak Detection Labor and Equipment Rate = 4,664 \$/leak (70 leaks detected)
Leak Repair Labor and Equipment Rate = 3,090 \$/leak (50 leaks repaired)

Assumptions:

Information from Utility Services Associates, Seattle Washington January 2002

Number Stations (per mile) = 3

Miles inspected = 70

Number of leaks found per mile = 1

* DWR Sacramento Leak Detection Workshop will provide training to be taken currently planned for Fall 2002 with agencies paying costs of attendance and labor for 9 staff (3 persons per agency)

Carmichael Water District cost to repair leaks = \$1,500 per leak

Assume no land purchase or other costs

1 week for 2 people from each agency's team to determine locations for each of 3 years 2002, 2003, 2004

\$5,000 for 3 agency in house plan and specs development

Assume 2000 feet between 2 monitoring stations for 70 miles of pipe inspected = 300 stations with 2.5 hours per installation

800 hours divided by 9 crew members setting equipment and analyzing data logger data

Used 4 weeks for 2002 winter and then again for 2003 winter and 2004 winter

**Cost Estimate for Leak Repair
Carmichael Water District
February 2002**

MAIN LINE REPAIR
Cost For Main Line Repair Account 6630.21

Per MLV	Description	Cost
1	Full Circle Repair Band	\$ 70.00
2	Barrel Flex Couplings @ \$35.00 ea.	\$ 70.00
4 ft	Class 52 D.I.P. 2 \$9.00/ft	\$ 36.00
	Material Cost	\$ 176.00
	Labor	
4 hours	Three Person Service Crew @ \$26.00 hr	\$ 312.00
	Supervisor @ \$26.00	\$ 26.00
	Total for Labor	\$ 338.00
	Aggregate	
2 yrd	Road Base A/B @ \$10.45 per yrd	\$ 20.90
1 yrd	Sand @ \$10.10 per yrd	\$ 10.10
	Total for Aggregate	\$ 31.00
	Landscaping	
1 yrd	Cut Back @ \$37.35 per yrd	\$ 37.00
30 sq/ft	Finish Paving @ \$9.00 per sq ft 40% require (a)	\$ 270.00
16 sq/ft	Concrete @ \$19.00 sq/ft 10% require (b)	\$ 304.00
	Total for Landscaping (a)	\$ 307.00
	Total for Landscaping (b)	\$ 341.00
	Total for (a)	\$ 815.00
	Total for (b)	\$ 849.00

**Cost Estimate for Leak Repair
Carmichael Water District
February 2002**

2" SERVICE LINE REPLACEMENT COST*

	unit	price per	quantity	sub total
pvc pipe	ft	\$ 0.37	3	\$ 1.11
copper tubing	ft	\$ 5.45	40	\$ 218.00
meter	ea	\$ 261.00	1	\$ 261.00
meter setter	ea	\$ 251.00	1	\$ 251.00
meter gasket	ea	\$ 1.50	2	\$ 3.00
meter box	ea	\$ 58.25	1	\$ 58.25
saddle	ea	\$ 42.15	1	\$ 42.15
meter box lid	ea	\$ 73.75	1	\$ 73.75
pvc adp slp x thrd	ea	\$ 6.20	2	\$ 12.40
brass adp cts x mip	ea	\$ 19.75	2	\$ 39.50
pvc bushing	ea	\$ 2.90	2	\$ 5.80
corp stop	ea	\$ 67.08	1	\$ 67.08
flex coupling	ea	\$ 18.21	2	\$ 36.42
misc pvc parts	as whole	\$ 7.60	1	\$ 7.60
hose clamps	ea	\$ 0.47	2	\$ 0.94
tracing wire	ft	\$ 0.14	5	\$ 0.70
galv pipe	ft	\$ 1.11	2	\$ 2.22
3/4" A/B road base	yrd	\$ 10.45	1 yrd	\$ 10.45
Cut back	yrd	\$ 37.35	1/3 yrd	\$ 12.45
Sand	yrd	\$ 10.10	1/2 yrd	\$ 5.05
Top soil	yrd	\$ 10.35	1/2 yrd	\$ 5.18
Crushed rock	yrd	\$ 11.35	5 gal bkt	\$ 0.50
Sod	roll	\$ 4.84	1 roll	\$ 4.84
Grass seed	box	\$ 11.84	1/3 box	\$ 3.95
Compost	bag	\$ 3.22	1 bag	\$ 3.22

* Note no equipment leasing costs included.

Sub	\$ 1,126.56
Loaded Cost	\$ 1,552.74
Labor	\$ 624.00
TOTAL	\$ 2,176.74

Insert equipment specifications and cost quotations (several pages)

APPENDIX C

Reference Documentation

Insert IWA Publishing website document

Insert City of Philadelphia water audit document

APPENDIX D

Example Project Control Forms

Insert 5 pages of forms

Appendix E

Resume

Insert Charlie Pike's Resume

APPENDIX F

Letters of Commitment

Insert Letters of Commitment in this order:

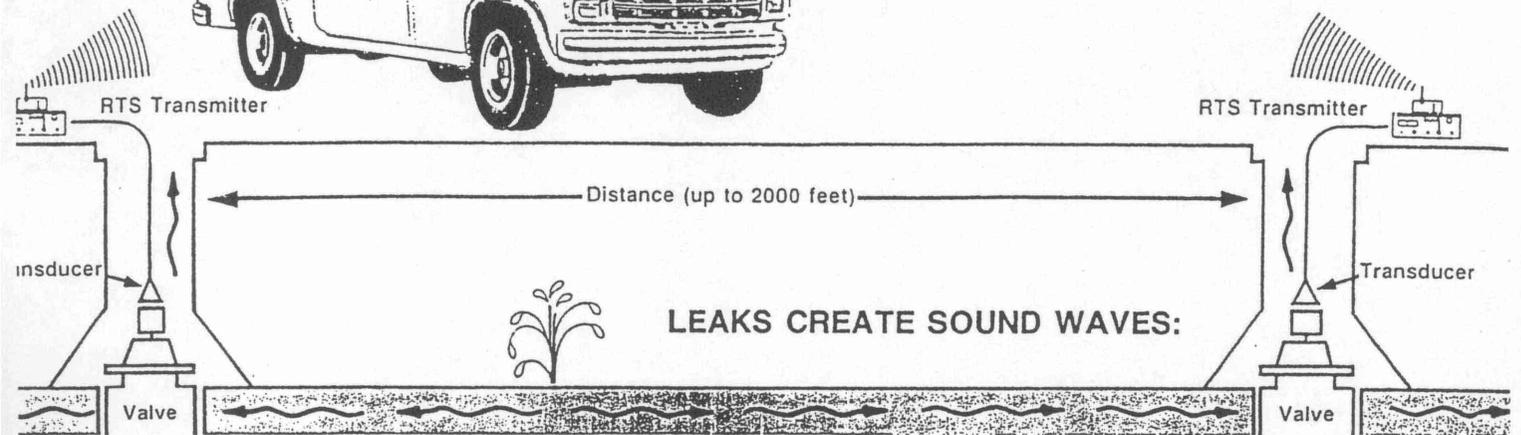
- Carmichael Water District dated Feb 21, 2002
- City of Folsom dated Feb 21, 2002
- Elk Grove Water Services (no date)

APPENDIX G

Letter of Support

Insert Letter of Support from Water Forum dated Feb 22, 2002

CORRELATOR RECEIVER VAN



WHAT DO WE DO ???

We are a service company dedicated to surveying for and pinpointing leaks. When leaks are eliminated in your system, the savings in power and treating costs as well as excavating costs will ultimately outweigh the initial cost of our service.

HOW DO WE DO IT???

Our qualified Leak Consultants use the most technologically advanced equipment available to pick up leak sounds. Then during a leak survey of a given area, we determine leak location. By entering type, size and length of pipe into the correlator, we pinpoint the leak by analyzing the speed of sound from the leak to the sensors and this displays a graph of the leak. A report is compiled listing survey area, type of leaks and leak location. Our associates specialize in reviewing your entire system. Let these trained professionals help you determine the best solutions for your water loss.

LOST WATER MEANS LOSS OF A VALUABLE RESOURCE		
Calculated at 50 PSI & Gallons		
LEAK SIZE O.D.	LOSS PER MO.	GALLONS PER YR.
1/16	38,580	462,960
1/8	156,360	1,876,320
1/4	626,400	7,516,800
1/2	2,496,960	29,963,520
3/4	5,616,000	67,392,000
1"	9,979,200	119,750,400
2"	39,960,000	479,520,000

This chart does not allow for friction losses or restrictions through irregular shapes.

WE FIND WATER LEAKS

Don't Let Dollars Leak Away!!
The technology for leak detection has come of age!

Utility Services Associates
Seattle, Washington
206.725.3441
1.800.621.9292
fax 206.725.5932