2005 WATER USE EFFICIENCY PROJECT PROPOSAL

Grant Application for an Agricultural Water Use Efficiency Implementation Project:

Western Canal Water District
Replacement and Automation of
Elevation Control Structure 875

January 2005

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APPENDICES

A-15a. Project Information Form

Applying for: ☐ 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 #9, Automate Canal Structures.
   - ☑ (c) implementation of other projects to meet California Bay-Delta Program objectives, Targeted Benefit Nos. 31, 33, & 38 .
   - ☐ (d) Specify other: _____

2. (Section B) **Urban or Agricultural Research and Development; Feasibility Studies, Pilot, or Demonstration Projects; Training, Education or Public Information; Technical Assistance**
   - ☐ (e) research and development, feasibility studies, pilot, or demonstration projects
   - ☐ (f) training, education or public information programs with statewide application
   - ☐ (g) technical assistance
   - ☐ (h) other

3. Principal applicant (Organization or affiliation): Western Canal Water District

4. Project Title: Replacement and Automation of Elevation Control Structure 875

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

Name, title	Ted Trimble, General Manager
Mailing address	P.O. Box 190
	Richvale, California 95974
Telephone	(530) 342-5083
Fax.	(530) 342-8233
E-mail	tedtrim@aol.com

6. Contact person (if different):	Name, title.	Stan Wangberg, Special Projects
	Mailing address.	P.O. Box 190
		Richvale, California 95974
	Telephone	(530) 342-5083
	Fax.	(530) 342-8233
	E-mail	stanwangberg@aol.com

7. Grant funds requested (dollar amount): $104,929
(from Table C-1, column VI)

8. Applicant funds pledged (dollar amount): $314,786

9. Total project costs (dollar amount): $419,714
(from Table C-1, column IV, row n)

10. Percent of State share requested (%) 25
(from Table C-1)

11. Percent of local share as match (%) 75
(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.

☐ (a) yes

(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.)

☑ (b) no

13. Is your project required by regulation, law or contract?

If no, your project is eligible.

☐ (a) yes

If yes, your project may be eligible only if there will be accelerated implementation to fulfill a future requirement and is not currently required.

☑ (b) no

Provide a description of the regulation, law or contract and an explanation of why the project is not currently required.

14. Duration of project (month/year to month/year)[1]:	June 2006 to May 2007
15. State Assembly District where the project is to be conducted:	Districts 2 & 3
16. State Senate District where the project is to be conducted:	District 4
17. Congressional district(s) where the project is to be conducted:	District 3
18. County where the project is to be conducted:	Butte
19. Location of project (longitude and latitude)	Long: –121.80 Lat: 39.55
20. How many service connections in your service area (urban)?	N/a
21. How many acre-feet of water per year does your agency serve?	300,000

22. Type of applicant (select one):

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

[1] Because this project is within a main conveyance canal, construction would be constrained to the time period of approximately Feb. 1 to April 7, 2007 to avoid interruption of irrigation service to District landowners. The remaining time would be used for project development prior to Feb. 1, and project implementation and monitoring after April 7.

☐ (iii) Specify _____

23. Is applicant a disadvantaged community? If 'yes' include annual median household income.

(Provide supporting documentation.)

☐ (a) yes, _____ median household income

☑ (b) no

A-15b. 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.

Ted Trimble, General Manager

Date

A-15c. Statement of Work, Section 1: Relevance and Importance

Goals and Objectives of the Project[2]

In March 2003 Western Canal Water District initiated a long-term Canal Modernization Plan. This began with participation by District staff in training provided by the Irrigation Training and Research Center at the California Polytechnic State University in San Luis Obispo, and research of canal modernization techniques and equipment by District staff.

District staff subsequently conducted an inventory and inspection of existing canal structures within the District's conveyance system in April 2003. A report and recommended replacement schedule was then submitted to the Board of Directors. The Board concurred with the report's findings, and initiated a 10-year plan for replacement and automation of several aging Main Canal elevation control structures.

The objectives of this plan include immediate, structural improvements to the system and increased efficiency of the delivery infrastructure and the labor resources of the District. The replacement schedule for these elevation control structures reflects the physical condition of the structures, the amount of labor required to operate them, and the operational efficiency of the structures.

Replacement of conveyance facilities having degraded structural integrity is necessary for the continued operation of the District in regard to customer service. Because of the out-dated flashboard design and erosion of the canal invert and the banks adjoining these structures, leakage has become an increasing problem. Leakage makes it difficult to maintain a consistent operating elevation within the canal, which in turn affects the consistency of the head pressure at the delivery turnouts. Also, because of frequent and drastic changes to the volume of flow in the canal, the flashboard design of the existing structures make them very labor intensive to operate.

New, automated elevation control structures are expected to eliminate leakage and stabilize the operating elevations within the canal. This will result in more accurate and consistent water deliveries at the upstream turnouts, enabling customers to make more efficient use of their water. Automated control structures will reduce the labor required for operation to virtually zero. This will free the canal operator to focus on other components of the conveyance system, resulting in more efficient use of District resources both at the new structure and elsewhere in the system.

Another objective is to improve the operations protocol of the canal system. Currently, the operations foreman is required to dedicate a portion of the water within the conveyance system to compensate for leakage at the elevation control structures. (Leakage occurs both through the flashboards and under the sills.) During periods of high demand, much of this water is used at other downstream locations, but invariably at least some of it is lost to the system at spill control points. The problem is exacerbated during periods of low flow, when downstream demand may be nonexistent and all the water leaking past the control structures becomes operational spill.

[2] The elevation control structure to be replaced by this project, the '875' check, is also known locally as the 'Doyle' check.

The planned design of the replacement structures, utilizing deep upstream footings and equipping them with automated Langemann gates, is expected to eliminate virtually all leakage. This will remove the necessity for augmenting the demand flow within the conveyance system, resulting in reduced diversions.

Need for the Project

This project is needed to improve the management of irrigation water, both during its conveyance and its delivery to District customers. This improvement will result in more efficient use of the water diverted for District use, which will in turn allow a decrease in diversions from the Feather River. Decreased diversions will provide a direct benefit to the Feather River ecosystem by leaving more water available for instream flows, and providing more flexibility in regard to the timing of these flows.

Consistency with Local Water Management Plans

Western Canal Water District has prepared a draft Water Management Plan (June 2004), which is currently undergoing review by regional agencies. Section V.A.8 (*Previously Implemented Water Management Practices*) of this Plan describes the steps taken by the District to implement EWMP #9, Automate Canal Structures. This description includes the progress made to date in implementing the long-term Canal Modernization Plan described in the Objective section above.

The Plan also describes the implementation of this water management practice as ongoing, with further structural replacement projects to be undertaken as time and funding allow. Water demand management activities that will be influenced by this project include improved on-farm water use efficiency, and a decrease in operational demand resulting from improved conveyance infrastructure.

There are currently eight elevation control structures in use within the District's Main Canal. At least four of these are slated for replacement and automation in the Canal Modernization Plan. This project (The Replacement and Automation of Elevation Control Structure 875) will include the replacement of the second such structure scheduled for replacement, representing further implementation of the District's Water Management Plan.

A-15d. Statement of Work, Section 2: Technical/Scientific Merit, Feasibility

Background

This proposed project, the Replacement and Automation of Elevation Control Structure 875, is to be preceded by a very similar project, the Replacement and Automation of Elevation Control Structure 535. The 535 project was initiated in August 2003 when District staff began the process of selecting appropriate gate automation equipment. Bids were then solicited, and a firm

selected, to produce preliminary design plans for the structure. After review of the design options, the District's Board of Directors chose a final project design and instructed the design firm to produce construction plans.

A construction contractor was chosen, and the automation equipment ordered from the manufacturer, in November 2004. Construction of the new 535 elevation control structure and the installation of automated gates is scheduled to begin in February 2005. The structure will consist of a concrete weir and two automated Langemann gates, produced by AquaSystems 2000. These gates are a fairly new design, but have been successfully installed and implemented by several water suppliers in the western United States. Western Canal Water District has contracted with an engineer who has previously acted as project manager in Langemann installations to design and oversee the 535 project.

Langemann gates are considered to be efficient, easy to install and operate, and very cost-effective. They require very low power to operate, so the power supply can be provided by a low-cost solar installation.

The proposed project for the replacement of the 875 elevation control structure is envisioned to be developed and implemented in a manner very similar to that of the project now underway. Design engineers familiar with the construction and installation of automated structures will again be contracted for design and oversight. Construction firms with experience in projects of this type, and familiarity with problems unique to this region such as groundwater intrusion, will be sought to provide effective and innovative construction methods.

In view of the fact that the proposed project will represent a phase in a larger, ongoing modernization plan, and that the design and construction of the project will be similar in type and scope as earlier projects, the District's readiness to proceed is very favorable.

Project Tasks and Schedule

2006	Task
June-July:	1. Solicit preparation of preliminary design plans
July-August:	2. Review and select final design plan
	3. Conduct site investigations/soil testing/surveying
September-December:	4. Prepare final construction plans
	5. Select construction contactor
	6. Execute necessary contracts
	7. Order automation equipment from manufacturer
2007	
January:	8. Dewater canal
	9. Receive and assemble automation equipment (gates)
	10. Develop site access
	11. Preconstruction Administration (June `06-Jan. `07)
	12. Project Legal/License Fees (June `06-Jan. `07)
February-March:	13. Construct weir & install automation equipment
April-May:	14. Reoperate canal, monitor structural functions

Task	Deliverables	Task	Costs
1.	Preliminary design options	1.	$ 8,000
2.	Preliminary design plan	2.	$ 4,000
3.	Geologic profile	3.	$ 3,380
4.	Final construction plans	4.	$ 12,000
5.		5.	$ 2,000
6.	Signed contracts	6.	$ 1,500
7.		7.	$ 500
8.		8.	$ 0
9.	Langemann gate assembly(s) and related equipment	9.	$ 108,184
10.	All-weather access to site	10.	$ 3,800
11.		11.	$ 17,864
12.		12.	$ 2,000
13.	Weir structure w/gates	13.	$ 249,686
14.		14.	$ 6,800
			$ 419,714

Preliminary Plans and Specifications and Certification Statement

Attached as *Appendix A* are preliminary plans for the proposed structure including dimensions, a list of materials and approximate quantities, a description of the project location, and a Certification Statement to verify that the project is feasible.

Environmental Documentation

Section 21084 of the Public Resources Code requires that California Environmental Quality Act Guidelines include a list of classes of projects which have been determined not to have a significant effect on the environment and which shall, therefore, be exempt from the provisions of CEQA. *(Article 19.Categorical Exemptions, §15300, State CEQA Guidelines 1991.)*

The proposed project is of a class included in this list: §15302 of CEQA Guidelines describes as exempt a project that *"…consists of replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced…"* As such, the proposed project would not have a significant effect on the environment and would be categorically exempt from the provisions of CEQA.

A-15e. Statement of Work, Section 3: Monitoring and Assessment

Pre-project Conditions and Data Baselines; Accuracy of the Data

The need for this project and the quantifiable benefits, both local and Bay-Delta, are based on two components of water use efficiency related to District conveyance operations and the timing

and volume of customer demand. The primary purpose of the elevation control structure that would be replaced as a result of this project is to maintain water levels within the canal at a consistent operating elevation to facilitate gravity flows through the diversion turnouts. The customers who divert water upstream from this facility use the water for the production of rice. The rate of flow for each diversion throughout the growing season is determined by each customer based on such factors as weather, the life stage of the crop, and the application of fertilizers and other chemical materials. A request for the desired flow is then relayed to District operations personnel who facilitate the delivery of this flow to the grower.

In a gravity conveyance/delivery system such as this, accurate and consistent deliveries of the water requested by each customer is dependent on unchanging head pressure within the system. Any change in the operating elevation of the water within the conveyance canal necessarily changes the flow at each diversion turnout. These inconsistencies will result in the customers getting more or less water than desired, requiring frequent adjustments to avoid inappropriate irrigation flows. Current operations require the canal operator to monitor the water level at Elevation Control Structure 875 throughout the day, and to insert or remove flashboards to maintain the desired elevation. Also, when operational demand necessitates a change to the total diversion into the canal, the canal operator must again insert or remove flashboards in the structure to maintain the desired elevation.

The operational component that would be affected by the replacement of this structure with an automated structure is system loss. System loss occurs at this structure in two ways: slow response to changes in the water level within the canal, and downstream leakage through the structure. Because the existing structure requires manual operation, any increase in elevation results in excess water flowing over the structure until flashboard adjustments can be made. As downstream demand for water is closely met at all times by diversions ordered by the operations supervisor, excess water is lost at operational spill points or is inadvertently diverted through customer turnouts as a result of increased head in the supply canal. Water that leaks downstream through the structure is normally accounted for in the supply/demand calculations; but during periods of low demand downstream from this structure, most of this water is lost to the system as operational spill.

Western Canal Water District is a fully metered District. Each turnout is monitored with an inline propeller-driven meter that measures both flow, in cubic feet per second, and volume in acre feet. Customers are billed on their accumulated water use throughout the irrigation season, based on the volume of water recorded by each meter. Two brands of meters are owned and used by the District—Water Specialties and Sparling. Both manufacturers guarantee the accuracy of their meters to be ±2% at any flow.

Diversions into Western Canal Water District conveyance facilities are provided by the Department of Water Resources (DWR) from two points within the Thermalito Afterbay. District personnel request the desired flow, in cubic feet per second, from the Department's Operations Division. The diversion facilities operated by the Department are rated for flow, and a monthly summary of both flow and volume are provided to the District by DWR. These flow reports closely match the measured outflows resulting from District operations, and are assumed to be accurate.

Methods to Assess Project Results

As discussed in the previous section, improvements related to two components of water use efficiency can be introduced by this project; on-farm use of applied water and reductions to conveyance system losses due to structure response time and leakage. As these improvements are proportional to the quantity of water diverted into, and out of, the District's conveyance system, the systems used to measure these flows would be the foundation of project result assessment.

To assess improved efficiency of on-farm use of applied water as a result of this project, the turnouts upstream from the 875 Structure would be charted for water use on a per-acre basis. As all of these turnouts are supplied water on a metered basis, and billed according to the total volume delivered, this data is currently available. There are 17 deliveries upstream from and integrated with the 875 Structure, comprising approximately 7,250 acres of irrigated rice land, or about 12% of the District's irrigable acreage. These records of use go back many years; for the purposes of this monitoring plan, records from the previous five years would be used as a baseline.

To assess the change in the unplanned volume of water passed by the structure, resulting from slow response to elevation changes and from leakage, pre- and post-project comparisons would be made to downstream operational spills. There are two operational spill points downstream from the 875 Structure—one at Butte Creek and one at Little Butte Creek. The Butte Creek spill structure is a concrete box within the canal fitted with flashboards, which are removed to permit spill and to facilitate measurement of the water flowing through each bay. The spill into Little Butte Creek is a steel screw gate that releases flow as an undershot; this flow is measured by the use of a rated gauge mounted to the gate.

The operational spills at both of these points are measured and recorded three times daily throughout the irrigation season as a matter of course. Again, these records are available dating back many years. For the purposes of assessing project results, post-project spills would be compared to data acquired during the previous five years of operations.

Evaluating Success in Relation to Project Goals and Objectives

Development of five-year baselines for the two components of improved water use efficiency afforded by this project will allow very straightforward evaluation of the success of this project. The data for these baselines is already available, and future data gathering related to on-farm water use and operational spills will continue as a component of normal District operations. Comparisons of these pre- and post-project data sets will concisely define the success of this project in relation to improved water use efficiency.

External Factors

It is clear that external factors, particularly changes in weather and cropping programs, could affect the pattern of water use and the timing and flow of applied water on District lands.

However, these factors are not likely to influence, to any measurable degree, the overall water use of District customers.

The Mediterranean climate of this region is characterized by hot, dry summers and cool winters. While summer temperatures may vary from extremes as low as 40ºF and as high as 115ºF, these extremes are very rare. Temperatures during the growing season for rice, from May through September, are generally much more moderate and are conducive overall to the production of rice. While it is possible that weather patterns could shift, rice has been grown successfully in this area for about 100 years; a substantial, sudden change that would affect rice production is highly unlikely.

Flat topography and low soil permeability within the WCWD service area are conditions conducive to rice production. These same conditions render this area unsuitable for many other crops. While it is impossible to predict the future of any federally- or state-sponsored crop programs, large-scale changes in cropping patterns in the District's service area are considered highly unlikely. If major changes were to occur as a result of crop programs, given the limited suitability of these soils, the most likely outcome within the District would be the idling of farmland. Idling of farmland would result in a proportional reduction of overall use of applied water, but for the purposes of project evaluation, per-acre use and monitoring of system losses would remain valid methods of assessment.

Availability of Project Data

The project data will comprise the following components:

- Five-year baseline of per-acre use of applied on-farm water at turnouts integrated with the project facility.
- Five-year baseline of operational spills (2 locations) downstream from the project facility.
- Annual post-project per-acre use of applied on-farm water at turnouts integrated with the project.
- Annual post-project operational spills (2 locations) downstream from the project facility.

This data will be compiled by District staff in a spreadsheet format, from District operations data, and will be stored in the District's permanent files. It will be reported to DWR as a component of the annual reports required by any contract resulting from a successful grant application. As a public agency, all data acquired and stored by the District must be made available to any member of the public or to any outside agency upon request.

Implementation Costs

The estimated costs associated with the implementation of the monitoring and evaluation plan are $6,300.

A-15f. Qualifications of the Applicants and Cooperators

Project Manager

The Project Manager for this proposal is Stan Wangberg, Special Projects, Western Canal Water District. The resume of the Project Manager is attached as *Appendix B*.

External Cooperators

External cooperators that will be used for this project include; SHN Consulting Engineers of Redding, California who have done the preliminary design and will be contracted to complete the final design; and Syblon Reid of Sacramento, California who will be contracted to complete construction of the project facility.

Previous Grant Projects

Western Canal Water District has been approved for grant funding for three projects in recent years. The first was funded by DWR, the second by CALFED, and the third by Proposition 13. All were administered by DWR.

The Department of Water Resources partnered with Western Canal Water District to investigate the aquifer system properties within a portion of Butte Basin. This project (Western Canal Water District Aquifer System Characterization Program) is a multi-year low-level program to perform aquifer performance tests at various locations throughout the District. Aquifer performance testing provides a valuable data set that can be used to calculate aquifer parameters such as aquifer transmissivity and aquifer storage. These tests also provide data that are used to identify hydrologic boundaries within the aquifer system, such as no-flow boundaries or recharge conditions. The information collected as part of this program will allow Western Canal Water District to better manage their groundwater resource and provide valuable insights on how the aquifer may respond to future stresses that may be placed upon it.

The first round of aquifer tests performed as a component of this project was completed in October, 2001, and a report on this round of testing was compiled by DWR, Northern District in July, 2002. All work scheduled to be completed under this program to date has been completed on time and within budget. Another round of testing is ongoing at this time, and should be completed in the fall of 2004.

Under “Recommendations,” on page 5 of the project report by DWR, Northern District, is the statement “It is recommended that this program be continued with Western Canal Water District so that additional tests can be performed in other areas of the district. The Department will continue to work with the district to schedule the next round of testing…”

The second project for which the District received grant funding was the Western Canal Water District Water Use Efficiency Project, funded by CALFED. This project consisted of two components— water management software and a water meter calibration station. This project was intended to enable the District to create a relational database to track water use efficiency

within the District and ensure accurate on-farm delivery to users, thereby reducing diversions from the Feather River.

This project was originally scheduled for 6 months beginning in mid-2001. Because the meter calibration station was a construction component that was located in a waterway and was included in a larger adjoining project, scheduling was adjusted for construction to occur in 2002. This project was under time constraints resulting from in-stream environmental construction permits and District irrigation needs, as well as those from grant funding, and was completed within the allotted time.

Another component of this phase of the project was streambed restoration, as required by US Army Corps of Engineer and US Fish & Wildlife Service permits. The environmental components of the restoration were completed in compliance with the time constraints of the permits after construction, and the required restoration reports have all been submitted on time as required.

The water management software, hand-held scanner/data recorders, and central computer were purchased in 2001, and put into District use in 2002. This package also included technical support for training for use of the software and recorders, and upgrades for the system.

The budget for this project was for a total of $265,524, with an additional local share of $20,000. All components of the project were completed within this budget, and the final programmatic report was submitted in April, 2003.

The Western Canal Water District Tailwater Recovery System Feasibility Study was began in May, 2002 with a budget of $100,000 and an additional local share of $10,000. This project was completed in May, 2004.

The purpose of this project was to determine if it is technically feasible to construct and operate a tailwater recovery system. This would require the evaluation of the relative cost effectiveness of reusing recovered tailwater within the District, quantifying the amount of tailwater generated, and monitoring the quality of the tailwater to determine if it meets District standards for reuse.

In 2002 and 2003 District staff, in participation with MBK Engineers of Sacramento, installed and operated electronic monitoring equipment at locations where District tailwater exits District lands. Transducers equipped with dataloggers were installed at these sites and programmed to record water elevations at 15 minute intervals. The acquisition of monitoring equipment, the installation and maintenance of elevation control structures in conjunction with the equipment, and data gathering and analysis of this data were the major components of this project. All components of this project, including the Final Report, have been completed. DWR accepted the Final Report without comment.

All components of this project were completed within the scheduled time and within the allotted budget.

A-15g. Outreach, Community Involvement, and Acceptance

The proposed project is for the replacement of a similar, existing structure and will not result in any changes to the District's overall operation, or to any physical changes to the environment outside the project area. Therefore, it is expected that no groups or individuals will be affected by this project. Adjoining landowners will be notified of the project by direct mail, and the following local government, community, and watershed groups will likewise be notified:

- Butte County Department of Water and Resource Conservation
- Butte Basin Water Users Association
- Butte Creek Watershed Conservancy
- Cherokee Watershed Alliance

Letters expressing support of this project are included in *Appendix C*.

No potential third party impacts have been identified as a result of this project, nor has any opposition to the project been presented.

A-15h. Innovation

Automated Langemann gates will be incorporated into the elevation control structure proposed for this project. These gates provide a durable, reliable, and cost effective manner of automated elevation control within the waterway. They are designed to require very little power to operate, utilizing a ½ horsepower electric motor powered by a small array of solar panels. No other power supply is required, so utilization of this design is not limited to sites with outside power supplies. The benefits of automated elevation control structures—quick response to flow changes and more consistent upstream diversion flows—would contribute to improved efficiencies in almost any water conveyance system in the State.

A-15i. Benefits and Costs

Project Implementation Costs (Budget)

The budget for this project is included in *Appendix D*, Table C-1.

The following is an explanation of labor costs including consultants, equipment, supplies, and travel included in the budget:

Salaries and wages will cover time for project preparation by District management and staff that will include, but may not be limited to, the following components:

- Solicit and select engineering firm(s) to prepare preliminary project design.
- Negotiate and finalize design service contract.
- Review design options; select final design.
- Assist design engineer in geologic site investigation including soil and bore samples, surveying, and measurements.
- Negotiate and finalize contract for the manufacture and delivery of automated gates and related equipment.
- Create and implement site preparation plans.

- Solicit construction bids.
- Review construction bids; select successful bid applicant.
- Negotiate and finalize construction contract.
- Designate and fund a project manager.
- Provide any necessary assistance to construction manager for site access/mobilization.

Equipment costs will include the mobilization and operation of any equipment required for site access preparation, and geologic site investigation including soil and bore samples, surveying, and measurements.

Consulting services will include site suitability analysis, design review, analysis of the effect of groundwater on project operations, and review of project site dewatering plans.

Travel expenses will include costs incurred by consulting personnel and District staff engaged in the project components described above.

Annual Operations and Maintenance Costs

Includes annual administration, operations, maintenance, and other costs of the project. See Table C-2 in *Appendix D.*

Total Annual Project Costs

Total annual project costs are derived from annual project implementation costs and annual operations and maintenance costs. See Table C-3 in *Appendix D.*

Capital Recovery Factor

The capital recovery factor is used in Table C-1 to convert all capital costs to present value. See Table C-4 in *Appendix D*.

Project Annual Physical Benefits (Qualitative and Quantitative)

The qualitative physical benefits that would result from this project include those related to both the quantity and timing, and the quality of in-stream flows. In-stream flows and timing would be enhanced in the Feather River downstream from Oroville as a result of decreased diversions made possible by improved water use efficiency both on-farm and within the conveyance system of Western Canal Water District (Targeted Benefit #38). (Components of the project that would provide these benefits are discussed at length in Section A-15e. of this document.)

The automated elevation control structure proposed for this project would provide more consistent head pressure than the existing facility for the 17 upstream turnouts served by this structure, resulting in more efficient on-farm use of applied water (Targeted Benefit #33). Improvements to infrastructure and operations efficiency would be provided in two ways: faster gate response to flow changes within the canal, and elimination of leakage through the control

structure. Both of these factors would result in reduced system losses through downstream operational spills. The resulting reductions in system demand would provide increased flows in the Feather River: these flow increases would be directly proportional to the decreased demands for diversions into the Western Canal system.

The Western Canal Water District conveyance system is operated continuously each year from about mid-April to mid-January. Decreased diversions to the 12% of District lands served by the proposed structure would provide DWR with improved flexibility for the timing of releasing this saved water into the Bay-Delta system for approximately nine months of the year. The Feather River below Oroville is characterized by artificial flow releases from stored water, and water conserved by this project could be utilized during periods of greatest need.

Another important benefit of this project would be improved water quality in the waterways within and adjacent to the District. As indicated by the recent imposition of discharge requirements for irrigated agriculture by the Central Valley Water Quality Control Board, there is widespread concern about the impact of agricultural runoff on the quality of surface water within the state. The provision of more consistent flows at on-farm turnouts made possible by this project will decrease unnecessary runoff from irrigated lands served by this structure. This will result in reduced opportunities for waste constituents to be discharged into adjoining waterways (Targeted Benefit #31). These constituents could include sediments, pesticides, fertilizers, and concentrations of naturally occurring elements. Reduced runoff from rice fields would also contribute to lower, more desirable water temperatures in the affected drains.

Reduced system losses and the associated reduction in operational spills would also improve water quality downstream of District operations. While water provided by Western Canal is of high quality in respect to chemical constituents and temperature, reduced spills would result in a proportional reduction in sediments deposited in downstream waterways.

These improvements to water quality and temperature would occur within a portion of the 48 miles of primary drains within District boundaries; within adjoining waterways outside the District; and within the Butte Creek ecosystem into which these drains ultimately discharge. These benefits would occur throughout the period of time during which the Main Canal is in service—from mid-April to mid-January.

The reduced diversions that are expected to result from the implementation of this project would provide direct benefits to the Bay-Delta system. Benefits would occur as a result of conserved water being made available for use within the Feather River system below Oroville. The volume of water available for downstream release would be increased, flexibility for the timing of increased downstream flows would be improved, and use of the cold-water pool within the Oroville Reservoir could be shifted to provide extended habitat for anadramous fish in the Lower Feather River as a direct result of water conserved by this project. Improved water quality in the Butte Creek watershed would provide enhancement of the riparian and aquatic ecosystem conditions upstream from the Delta including resident microorganisms, amphibians, fish, and plants.

Water quality monitoring is currently done in the Sacramento River Basin on a regional basis; that is, well downstream from District operations. More localized monitoring is scheduled to begin in 2005 as a component of the Central Valley Regional Quality Control Board's conditional discharge waiver for irrigated agriculture. Until more localized monitoring and reporting is completed and a baseline of discharge constituents is established, quantification of improved water quality resulting from this project is not possible.

Improved water use efficiency provided by this project will allow reduced diversions from the Feather River that can be quantified. These reductions will occur as a result of improvements to two components of District operations: on-farm use of applied water, and reduced system losses through operational spills.

On-farm use of applied water includes the evapotranspiration rate of applied water for the crop being grown–in this case, rice–and water use attributable to cultural practices. Improved on-farm water use efficiency within the District has been observed since the early 1990's, resulting from such factors as leveled fields and reduced operational spills. Growers in the District have proved to be very efficient irrigators, making further water use reductions more difficult as their efficiency improves. Based on past improvements, it is estimated that use of an automated elevation control structure could improve on-farm water use efficiency by .20 acre foot per acre of irrigated land. The structure proposed for replacement serves about 7,250 acres of land, for a quantified benefit in reduced diversions of 1,450 acre feet per year.

Operational spills within the District currently average about 50 cfs throughout the nine-month period that the system is in service. Water savings resulting from improved gate response time to flow changes within the canal are difficult to estimate, but system losses resulting from leakage through the existing structure can be quantified. The existing structure requires a flow of approximately 25 cfs, with no spill over the top, to maintain the desired operating elevation. This amount flows downstream after leaking through the structure. At periods of low downstream demand, all of this water is lost as operational spill; the percentage of loss decreases as downstream demand increases. The quantifiable benefit from project implementation will be based on the following assumptions:

- The structure is in service 270 days per year.
- Downstream demand is at zero 25% of the time (67 days).
- Downstream system loss of leaked water will equal 10% during periods of higher demand (203 days).

Thus, 25 cfs for 67 days equals 3,350 acre feet, and 10% of 25 cfs for 203 days equals 1,015 acre feet. This results in total system losses through operational spills as a result of leakage at the existing structure of 4,365 acre feet.

Water conserved by improved on-farm efficiency and reduced operation spills as a result of this project is thereby estimated to be 5,815 acre feet per year. (See *Appendix D*, Table C-5.)

Project Annual Local Monetary Benefits

The automated elevation control structure proposed for this project would save about 30 minutes of labor per day for operation and maintenance; over the annual service period of 270 days, this

totals about 135 hours of labor. Calculated at $30 per hour, this results in savings of $4,050 per year. Replacement flashboard lumber for the existing structure requires about 215 board feet per year; at $1.25/board foot, the proposed structure would result in annual savings of $270 for lumber. The total project annual monetary benefits would be $4,320 (see *Appendix D*, Table C-6).

Local Monetary Benefits and Project Costs

See *Appendix D*, Table C-7.

Applicant's Cost Share and Description

The applicant is requesting that the State share 25% of the total cost of this project (see *Appendix D*, Table C-8). The estimated 25% cost share would be $104,929. Direct benefits would be provided by this project to both the Bay-Delta system and the District. The Bay-Delta would benefit through increased instream flows, improved timing of flows, and water quality, while the District would benefit through reduced labor and maintenance supply costs. Indirect benefits to the District would include improved customer service and increased flexibility in the distribution of labor resources.

The 25% cost share was derived from the value of revenue calculated to be lost to the District over the life of the project resulting from decreased demand as a result of improved water use efficiency provided by the project, as compared to the direct and indirect benefits that the project would provide the District. The estimated decrease in demand of 5,815 acre feet per year would represent a reduction in District water sales of $17,445; offsetting annual labor and supply cost savings of $4,320 would result in an annual reduction of revenue of $13,125.

The indirect benefits to the District that would result from project implementation are not quantifiable in dollar amounts, but certainly provide value. The State share requested in this proposal, $104,929, would help offset the expected loss of District revenue that would result from project implementation; in return, the Bay-Delta system will be provided an estimated 290,750 acre feet of additional conserved water over the life of the project.

2005 WATER USE EFFICIENCY PROJECT PROPOSAL

Grant Application for an Agricultural Water Use Efficiency Implementation Project:

Western Canal Water District
Replacement and Automation of
Elevation Control Structure 875

January 2005

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APPENDICES

A-15a. Project Information Form

Applying for: ☐ 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 #9, Automate Canal Structures.
   - ☑ (c) implementation of other projects to meet California Bay-Delta Program objectives, Targeted Benefit Nos. 31, 33, & 38 .
   - ☐ (d) Specify other: _____

2. (Section B) **Urban or Agricultural Research and Development; Feasibility Studies, Pilot, or Demonstration Projects; Training, Education or Public Information; Technical Assistance**
   - ☐ (e) research and development, feasibility studies, pilot, or demonstration projects
   - ☐ (f) training, education or public information programs with statewide application
   - ☐ (g) technical assistance
   - ☐ (h) other

3. Principal applicant (Organization or affiliation): Western Canal Water District

4. Project Title: Replacement and Automation of Elevation Control Structure 875

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

Name, title	Ted Trimble, General Manager
Mailing address	P.O. Box 190
	Richvale, California 95974
Telephone	(530) 342-5083
Fax.	(530) 342-8233
E-mail	tedtrim@aol.com

6. Contact person (if different):	Name, title.	Stan Wangberg, Special Projects
	Mailing address.	P.O. Box 190
		Richvale, California 95974
	Telephone	(530) 342-5083
	Fax.	(530) 342-8233
	E-mail	stanwangberg@aol.com

7. Grant funds requested (dollar amount): $104,929
(from Table C-1, column VI)

8. Applicant funds pledged (dollar amount): $314,786

9. Total project costs (dollar amount): $419,714
(from Table C-1, column IV, row n)

10. Percent of State share requested (%) 25
(from Table C-1)

11. Percent of local share as match (%) 75
(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.

☐ (a) yes

(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.)

☑ (b) no

13. Is your project required by regulation, law or contract?

If no, your project is eligible.

☐ (a) yes

If yes, your project may be eligible only if there will be accelerated implementation to fulfill a future requirement and is not currently required.

☑ (b) no

Provide a description of the regulation, law or contract and an explanation of why the project is not currently required.

14. Duration of project (month/year to month/year)[1]:	June 2006 to May 2007
15. State Assembly District where the project is to be conducted:	Districts 2 & 3
16. State Senate District where the project is to be conducted:	District 4
17. Congressional district(s) where the project is to be conducted:	District 3
18. County where the project is to be conducted:	Butte
19. Location of project (longitude and latitude)	Long: –121.80 Lat: 39.55
20. How many service connections in your service area (urban)?	N/a
21. How many acre-feet of water per year does your agency serve?	300,000

22. Type of applicant (select one):

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

[1] Because this project is within a main conveyance canal, construction would be constrained to the time period of approximately Feb. 1 to April 7, 2007 to avoid interruption of irrigation service to District landowners. The remaining time would be used for project development prior to Feb. 1, and project implementation and monitoring after April 7.

☐ (iii) Specify _____

23. Is applicant a disadvantaged community? If 'yes' include annual median household income.

(Provide supporting documentation.)

☐ (a) yes, _____ median household income

☑ (b) no

A-15b. 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.

Ted Trimble, General Manager

Date

A-15c. Statement of Work, Section 1: Relevance and Importance

Goals and Objectives of the Project[2]

In March 2003 Western Canal Water District initiated a long-term Canal Modernization Plan. This began with participation by District staff in training provided by the Irrigation Training and Research Center at the California Polytechnic State University in San Luis Obispo, and research of canal modernization techniques and equipment by District staff.

District staff subsequently conducted an inventory and inspection of existing canal structures within the District's conveyance system in April 2003. A report and recommended replacement schedule was then submitted to the Board of Directors. The Board concurred with the report's findings, and initiated a 10-year plan for replacement and automation of several aging Main Canal elevation control structures.

The objectives of this plan include immediate, structural improvements to the system and increased efficiency of the delivery infrastructure and the labor resources of the District. The replacement schedule for these elevation control structures reflects the physical condition of the structures, the amount of labor required to operate them, and the operational efficiency of the structures.

Replacement of conveyance facilities having degraded structural integrity is necessary for the continued operation of the District in regard to customer service. Because of the out-dated flashboard design and erosion of the canal invert and the banks adjoining these structures, leakage has become an increasing problem. Leakage makes it difficult to maintain a consistent operating elevation within the canal, which in turn affects the consistency of the head pressure at the delivery turnouts. Also, because of frequent and drastic changes to the volume of flow in the canal, the flashboard design of the existing structures make them very labor intensive to operate.

New, automated elevation control structures are expected to eliminate leakage and stabilize the operating elevations within the canal. This will result in more accurate and consistent water deliveries at the upstream turnouts, enabling customers to make more efficient use of their water. Automated control structures will reduce the labor required for operation to virtually zero. This will free the canal operator to focus on other components of the conveyance system, resulting in more efficient use of District resources both at the new structure and elsewhere in the system.

Another objective is to improve the operations protocol of the canal system. Currently, the operations foreman is required to dedicate a portion of the water within the conveyance system to compensate for leakage at the elevation control structures. (Leakage occurs both through the flashboards and under the sills.) During periods of high demand, much of this water is used at other downstream locations, but invariably at least some of it is lost to the system at spill control points. The problem is exacerbated during periods of low flow, when downstream demand may be nonexistent and all the water leaking past the control structures becomes operational spill.

[2] The elevation control structure to be replaced by this project, the '875' check, is also known locally as the 'Doyle' check.

The planned design of the replacement structures, utilizing deep upstream footings and equipping them with automated Langemann gates, is expected to eliminate virtually all leakage. This will remove the necessity for augmenting the demand flow within the conveyance system, resulting in reduced diversions.

Need for the Project

This project is needed to improve the management of irrigation water, both during its conveyance and its delivery to District customers. This improvement will result in more efficient use of the water diverted for District use, which will in turn allow a decrease in diversions from the Feather River. Decreased diversions will provide a direct benefit to the Feather River ecosystem by leaving more water available for instream flows, and providing more flexibility in regard to the timing of these flows.

Consistency with Local Water Management Plans

Western Canal Water District has prepared a draft Water Management Plan (June 2004), which is currently undergoing review by regional agencies. Section V.A.8 (*Previously Implemented Water Management Practices*) of this Plan describes the steps taken by the District to implement EWMP #9, Automate Canal Structures. This description includes the progress made to date in implementing the long-term Canal Modernization Plan described in the Objective section above.

The Plan also describes the implementation of this water management practice as ongoing, with further structural replacement projects to be undertaken as time and funding allow. Water demand management activities that will be influenced by this project include improved on-farm water use efficiency, and a decrease in operational demand resulting from improved conveyance infrastructure.

There are currently eight elevation control structures in use within the District's Main Canal. At least four of these are slated for replacement and automation in the Canal Modernization Plan. This project (The Replacement and Automation of Elevation Control Structure 875) will include the replacement of the second such structure scheduled for replacement, representing further implementation of the District's Water Management Plan.

A-15d. Statement of Work, Section 2: Technical/Scientific Merit, Feasibility

Background

This proposed project, the Replacement and Automation of Elevation Control Structure 875, is to be preceded by a very similar project, the Replacement and Automation of Elevation Control Structure 535. The 535 project was initiated in August 2003 when District staff began the process of selecting appropriate gate automation equipment. Bids were then solicited, and a firm

selected, to produce preliminary design plans for the structure. After review of the design options, the District's Board of Directors chose a final project design and instructed the design firm to produce construction plans.

A construction contractor was chosen, and the automation equipment ordered from the manufacturer, in November 2004. Construction of the new 535 elevation control structure and the installation of automated gates is scheduled to begin in February 2005. The structure will consist of a concrete weir and two automated Langemann gates, produced by AquaSystems 2000. These gates are a fairly new design, but have been successfully installed and implemented by several water suppliers in the western United States. Western Canal Water District has contracted with an engineer who has previously acted as project manager in Langemann installations to design and oversee the 535 project.

Langemann gates are considered to be efficient, easy to install and operate, and very cost-effective. They require very low power to operate, so the power supply can be provided by a low-cost solar installation.

The proposed project for the replacement of the 875 elevation control structure is envisioned to be developed and implemented in a manner very similar to that of the project now underway. Design engineers familiar with the construction and installation of automated structures will again be contracted for design and oversight. Construction firms with experience in projects of this type, and familiarity with problems unique to this region such as groundwater intrusion, will be sought to provide effective and innovative construction methods.

In view of the fact that the proposed project will represent a phase in a larger, ongoing modernization plan, and that the design and construction of the project will be similar in type and scope as earlier projects, the District's readiness to proceed is very favorable.

Project Tasks and Schedule

2006	Task
June-July:	1. Solicit preparation of preliminary design plans
July-August:	2. Review and select final design plan
	3. Conduct site investigations/soil testing/surveying
September-December:	4. Prepare final construction plans
	5. Select construction contactor
	6. Execute necessary contracts
	7. Order automation equipment from manufacturer
2007	
January:	8. Dewater canal
	9. Receive and assemble automation equipment (gates)
	10. Develop site access
	11. Preconstruction Administration (June `06-Jan. `07)
	12. Project Legal/License Fees (June `06-Jan. `07)
February-March:	13. Construct weir & install automation equipment
April-May:	14. Reoperate canal, monitor structural functions

Task	Deliverables	Task	Costs
1.	Preliminary design options	1.	$ 8,000
2.	Preliminary design plan	2.	$ 4,000
3.	Geologic profile	3.	$ 3,380
4.	Final construction plans	4.	$ 12,000
5.		5.	$ 2,000
6.	Signed contracts	6.	$ 1,500
7.		7.	$ 500
8.		8.	$ 0
9.	Langemann gate assembly(s) and related equipment	9.	$ 108,184
10.	All-weather access to site	10.	$ 3,800
11.		11.	$ 17,864
12.		12.	$ 2,000
13.	Weir structure w/gates	13.	$ 249,686
14.		14.	$ 6,800
			$ 419,714

Preliminary Plans and Specifications and Certification Statement

Attached as *Appendix A* are preliminary plans for the proposed structure including dimensions, a list of materials and approximate quantities, a description of the project location, and a Certification Statement to verify that the project is feasible.

Environmental Documentation

Section 21084 of the Public Resources Code requires that California Environmental Quality Act Guidelines include a list of classes of projects which have been determined not to have a significant effect on the environment and which shall, therefore, be exempt from the provisions of CEQA. *(Article 19.Categorical Exemptions, §15300, State CEQA Guidelines 1991.)*

The proposed project is of a class included in this list: §15302 of CEQA Guidelines describes as exempt a project that *"…consists of replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced…"* As such, the proposed project would not have a significant effect on the environment and would be categorically exempt from the provisions of CEQA.

A-15e. Statement of Work, Section 3: Monitoring and Assessment

Pre-project Conditions and Data Baselines; Accuracy of the Data

The need for this project and the quantifiable benefits, both local and Bay-Delta, are based on two components of water use efficiency related to District conveyance operations and the timing

and volume of customer demand. The primary purpose of the elevation control structure that would be replaced as a result of this project is to maintain water levels within the canal at a consistent operating elevation to facilitate gravity flows through the diversion turnouts. The customers who divert water upstream from this facility use the water for the production of rice. The rate of flow for each diversion throughout the growing season is determined by each customer based on such factors as weather, the life stage of the crop, and the application of fertilizers and other chemical materials. A request for the desired flow is then relayed to District operations personnel who facilitate the delivery of this flow to the grower.

In a gravity conveyance/delivery system such as this, accurate and consistent deliveries of the water requested by each customer is dependent on unchanging head pressure within the system. Any change in the operating elevation of the water within the conveyance canal necessarily changes the flow at each diversion turnout. These inconsistencies will result in the customers getting more or less water than desired, requiring frequent adjustments to avoid inappropriate irrigation flows. Current operations require the canal operator to monitor the water level at Elevation Control Structure 875 throughout the day, and to insert or remove flashboards to maintain the desired elevation. Also, when operational demand necessitates a change to the total diversion into the canal, the canal operator must again insert or remove flashboards in the structure to maintain the desired elevation.

The operational component that would be affected by the replacement of this structure with an automated structure is system loss. System loss occurs at this structure in two ways: slow response to changes in the water level within the canal, and downstream leakage through the structure. Because the existing structure requires manual operation, any increase in elevation results in excess water flowing over the structure until flashboard adjustments can be made. As downstream demand for water is closely met at all times by diversions ordered by the operations supervisor, excess water is lost at operational spill points or is inadvertently diverted through customer turnouts as a result of increased head in the supply canal. Water that leaks downstream through the structure is normally accounted for in the supply/demand calculations; but during periods of low demand downstream from this structure, most of this water is lost to the system as operational spill.

Western Canal Water District is a fully metered District. Each turnout is monitored with an inline propeller-driven meter that measures both flow, in cubic feet per second, and volume in acre feet. Customers are billed on their accumulated water use throughout the irrigation season, based on the volume of water recorded by each meter. Two brands of meters are owned and used by the District—Water Specialties and Sparling. Both manufacturers guarantee the accuracy of their meters to be ±2% at any flow.

Diversions into Western Canal Water District conveyance facilities are provided by the Department of Water Resources (DWR) from two points within the Thermalito Afterbay. District personnel request the desired flow, in cubic feet per second, from the Department's Operations Division. The diversion facilities operated by the Department are rated for flow, and a monthly summary of both flow and volume are provided to the District by DWR. These flow reports closely match the measured outflows resulting from District operations, and are assumed to be accurate.

Methods to Assess Project Results

As discussed in the previous section, improvements related to two components of water use efficiency can be introduced by this project; on-farm use of applied water and reductions to conveyance system losses due to structure response time and leakage. As these improvements are proportional to the quantity of water diverted into, and out of, the District's conveyance system, the systems used to measure these flows would be the foundation of project result assessment.

To assess improved efficiency of on-farm use of applied water as a result of this project, the turnouts upstream from the 875 Structure would be charted for water use on a per-acre basis. As all of these turnouts are supplied water on a metered basis, and billed according to the total volume delivered, this data is currently available. There are 17 deliveries upstream from and integrated with the 875 Structure, comprising approximately 7,250 acres of irrigated rice land, or about 12% of the District's irrigable acreage. These records of use go back many years; for the purposes of this monitoring plan, records from the previous five years would be used as a baseline.

To assess the change in the unplanned volume of water passed by the structure, resulting from slow response to elevation changes and from leakage, pre- and post-project comparisons would be made to downstream operational spills. There are two operational spill points downstream from the 875 Structure—one at Butte Creek and one at Little Butte Creek. The Butte Creek spill structure is a concrete box within the canal fitted with flashboards, which are removed to permit spill and to facilitate measurement of the water flowing through each bay. The spill into Little Butte Creek is a steel screw gate that releases flow as an undershot; this flow is measured by the use of a rated gauge mounted to the gate.

The operational spills at both of these points are measured and recorded three times daily throughout the irrigation season as a matter of course. Again, these records are available dating back many years. For the purposes of assessing project results, post-project spills would be compared to data acquired during the previous five years of operations.

Evaluating Success in Relation to Project Goals and Objectives

Development of five-year baselines for the two components of improved water use efficiency afforded by this project will allow very straightforward evaluation of the success of this project. The data for these baselines is already available, and future data gathering related to on-farm water use and operational spills will continue as a component of normal District operations. Comparisons of these pre- and post-project data sets will concisely define the success of this project in relation to improved water use efficiency.

External Factors

It is clear that external factors, particularly changes in weather and cropping programs, could affect the pattern of water use and the timing and flow of applied water on District lands.

However, these factors are not likely to influence, to any measurable degree, the overall water use of District customers.

The Mediterranean climate of this region is characterized by hot, dry summers and cool winters. While summer temperatures may vary from extremes as low as 40ºF and as high as 115ºF, these extremes are very rare. Temperatures during the growing season for rice, from May through September, are generally much more moderate and are conducive overall to the production of rice. While it is possible that weather patterns could shift, rice has been grown successfully in this area for about 100 years; a substantial, sudden change that would affect rice production is highly unlikely.

Flat topography and low soil permeability within the WCWD service area are conditions conducive to rice production. These same conditions render this area unsuitable for many other crops. While it is impossible to predict the future of any federally- or state-sponsored crop programs, large-scale changes in cropping patterns in the District's service area are considered highly unlikely. If major changes were to occur as a result of crop programs, given the limited suitability of these soils, the most likely outcome within the District would be the idling of farmland. Idling of farmland would result in a proportional reduction of overall use of applied water, but for the purposes of project evaluation, per-acre use and monitoring of system losses would remain valid methods of assessment.

Availability of Project Data

The project data will comprise the following components:

- Five-year baseline of per-acre use of applied on-farm water at turnouts integrated with the project facility.
- Five-year baseline of operational spills (2 locations) downstream from the project facility.
- Annual post-project per-acre use of applied on-farm water at turnouts integrated with the project.
- Annual post-project operational spills (2 locations) downstream from the project facility.

This data will be compiled by District staff in a spreadsheet format, from District operations data, and will be stored in the District's permanent files. It will be reported to DWR as a component of the annual reports required by any contract resulting from a successful grant application. As a public agency, all data acquired and stored by the District must be made available to any member of the public or to any outside agency upon request.

Implementation Costs

The estimated costs associated with the implementation of the monitoring and evaluation plan are $6,300.

A-15f. Qualifications of the Applicants and Cooperators

Project Manager

The Project Manager for this proposal is Stan Wangberg, Special Projects, Western Canal Water District. The resume of the Project Manager is attached as *Appendix B*.

External Cooperators

External cooperators that will be used for this project include; SHN Consulting Engineers of Redding, California who have done the preliminary design and will be contracted to complete the final design; and Syblon Reid of Sacramento, California who will be contracted to complete construction of the project facility.

Previous Grant Projects

Western Canal Water District has been approved for grant funding for three projects in recent years. The first was funded by DWR, the second by CALFED, and the third by Proposition 13. All were administered by DWR.

The Department of Water Resources partnered with Western Canal Water District to investigate the aquifer system properties within a portion of Butte Basin. This project (Western Canal Water District Aquifer System Characterization Program) is a multi-year low-level program to perform aquifer performance tests at various locations throughout the District. Aquifer performance testing provides a valuable data set that can be used to calculate aquifer parameters such as aquifer transmissivity and aquifer storage. These tests also provide data that are used to identify hydrologic boundaries within the aquifer system, such as no-flow boundaries or recharge conditions. The information collected as part of this program will allow Western Canal Water District to better manage their groundwater resource and provide valuable insights on how the aquifer may respond to future stresses that may be placed upon it.

The first round of aquifer tests performed as a component of this project was completed in October, 2001, and a report on this round of testing was compiled by DWR, Northern District in July, 2002. All work scheduled to be completed under this program to date has been completed on time and within budget. Another round of testing is ongoing at this time, and should be completed in the fall of 2004.

Under “Recommendations,” on page 5 of the project report by DWR, Northern District, is the statement “It is recommended that this program be continued with Western Canal Water District so that additional tests can be performed in other areas of the district. The Department will continue to work with the district to schedule the next round of testing…”

The second project for which the District received grant funding was the Western Canal Water District Water Use Efficiency Project, funded by CALFED. This project consisted of two components— water management software and a water meter calibration station. This project was intended to enable the District to create a relational database to track water use efficiency

within the District and ensure accurate on-farm delivery to users, thereby reducing diversions from the Feather River.

This project was originally scheduled for 6 months beginning in mid-2001. Because the meter calibration station was a construction component that was located in a waterway and was included in a larger adjoining project, scheduling was adjusted for construction to occur in 2002. This project was under time constraints resulting from in-stream environmental construction permits and District irrigation needs, as well as those from grant funding, and was completed within the allotted time.

Another component of this phase of the project was streambed restoration, as required by US Army Corps of Engineer and US Fish & Wildlife Service permits. The environmental components of the restoration were completed in compliance with the time constraints of the permits after construction, and the required restoration reports have all been submitted on time as required.

The water management software, hand-held scanner/data recorders, and central computer were purchased in 2001, and put into District use in 2002. This package also included technical support for training for use of the software and recorders, and upgrades for the system.

The budget for this project was for a total of $265,524, with an additional local share of $20,000. All components of the project were completed within this budget, and the final programmatic report was submitted in April, 2003.

The Western Canal Water District Tailwater Recovery System Feasibility Study was began in May, 2002 with a budget of $100,000 and an additional local share of $10,000. This project was completed in May, 2004.

The purpose of this project was to determine if it is technically feasible to construct and operate a tailwater recovery system. This would require the evaluation of the relative cost effectiveness of reusing recovered tailwater within the District, quantifying the amount of tailwater generated, and monitoring the quality of the tailwater to determine if it meets District standards for reuse.

In 2002 and 2003 District staff, in participation with MBK Engineers of Sacramento, installed and operated electronic monitoring equipment at locations where District tailwater exits District lands. Transducers equipped with dataloggers were installed at these sites and programmed to record water elevations at 15 minute intervals. The acquisition of monitoring equipment, the installation and maintenance of elevation control structures in conjunction with the equipment, and data gathering and analysis of this data were the major components of this project. All components of this project, including the Final Report, have been completed. DWR accepted the Final Report without comment.

All components of this project were completed within the scheduled time and within the allotted budget.

A-15g. Outreach, Community Involvement, and Acceptance

The proposed project is for the replacement of a similar, existing structure and will not result in any changes to the District's overall operation, or to any physical changes to the environment outside the project area. Therefore, it is expected that no groups or individuals will be affected by this project. Adjoining landowners will be notified of the project by direct mail, and the following local government, community, and watershed groups will likewise be notified:

- Butte County Department of Water and Resource Conservation
- Butte Basin Water Users Association
- Butte Creek Watershed Conservancy
- Cherokee Watershed Alliance

Letters expressing support of this project are included in *Appendix C*.

No potential third party impacts have been identified as a result of this project, nor has any opposition to the project been presented.

A-15h. Innovation

Automated Langemann gates will be incorporated into the elevation control structure proposed for this project. These gates provide a durable, reliable, and cost effective manner of automated elevation control within the waterway. They are designed to require very little power to operate, utilizing a ½ horsepower electric motor powered by a small array of solar panels. No other power supply is required, so utilization of this design is not limited to sites with outside power supplies. The benefits of automated elevation control structures—quick response to flow changes and more consistent upstream diversion flows—would contribute to improved efficiencies in almost any water conveyance system in the State.

A-15i. Benefits and Costs

Project Implementation Costs (Budget)

The budget for this project is included in *Appendix D*, Table C-1.

The following is an explanation of labor costs including consultants, equipment, supplies, and travel included in the budget:

Salaries and wages will cover time for project preparation by District management and staff that will include, but may not be limited to, the following components:

- Solicit and select engineering firm(s) to prepare preliminary project design.
- Negotiate and finalize design service contract.
- Review design options; select final design.
- Assist design engineer in geologic site investigation including soil and bore samples, surveying, and measurements.
- Negotiate and finalize contract for the manufacture and delivery of automated gates and related equipment.
- Create and implement site preparation plans.

- Solicit construction bids.
- Review construction bids; select successful bid applicant.
- Negotiate and finalize construction contract.
- Designate and fund a project manager.
- Provide any necessary assistance to construction manager for site access/mobilization.

Equipment costs will include the mobilization and operation of any equipment required for site access preparation, and geologic site investigation including soil and bore samples, surveying, and measurements.

Consulting services will include site suitability analysis, design review, analysis of the effect of groundwater on project operations, and review of project site dewatering plans.

Travel expenses will include costs incurred by consulting personnel and District staff engaged in the project components described above.

Annual Operations and Maintenance Costs

Includes annual administration, operations, maintenance, and other costs of the project. See Table C-2 in *Appendix D.*

Total Annual Project Costs

Total annual project costs are derived from annual project implementation costs and annual operations and maintenance costs. See Table C-3 in *Appendix D.*

Capital Recovery Factor

The capital recovery factor is used in Table C-1 to convert all capital costs to present value. See Table C-4 in *Appendix D*.

Project Annual Physical Benefits (Qualitative and Quantitative)

The qualitative physical benefits that would result from this project include those related to both the quantity and timing, and the quality of in-stream flows. In-stream flows and timing would be enhanced in the Feather River downstream from Oroville as a result of decreased diversions made possible by improved water use efficiency both on-farm and within the conveyance system of Western Canal Water District (Targeted Benefit #38). (Components of the project that would provide these benefits are discussed at length in Section A-15e. of this document.)

The automated elevation control structure proposed for this project would provide more consistent head pressure than the existing facility for the 17 upstream turnouts served by this structure, resulting in more efficient on-farm use of applied water (Targeted Benefit #33). Improvements to infrastructure and operations efficiency would be provided in two ways: faster gate response to flow changes within the canal, and elimination of leakage through the control

structure. Both of these factors would result in reduced system losses through downstream operational spills. The resulting reductions in system demand would provide increased flows in the Feather River: these flow increases would be directly proportional to the decreased demands for diversions into the Western Canal system.

The Western Canal Water District conveyance system is operated continuously each year from about mid-April to mid-January. Decreased diversions to the 12% of District lands served by the proposed structure would provide DWR with improved flexibility for the timing of releasing this saved water into the Bay-Delta system for approximately nine months of the year. The Feather River below Oroville is characterized by artificial flow releases from stored water, and water conserved by this project could be utilized during periods of greatest need.

Another important benefit of this project would be improved water quality in the waterways within and adjacent to the District. As indicated by the recent imposition of discharge requirements for irrigated agriculture by the Central Valley Water Quality Control Board, there is widespread concern about the impact of agricultural runoff on the quality of surface water within the state. The provision of more consistent flows at on-farm turnouts made possible by this project will decrease unnecessary runoff from irrigated lands served by this structure. This will result in reduced opportunities for waste constituents to be discharged into adjoining waterways (Targeted Benefit #31). These constituents could include sediments, pesticides, fertilizers, and concentrations of naturally occurring elements. Reduced runoff from rice fields would also contribute to lower, more desirable water temperatures in the affected drains.

Reduced system losses and the associated reduction in operational spills would also improve water quality downstream of District operations. While water provided by Western Canal is of high quality in respect to chemical constituents and temperature, reduced spills would result in a proportional reduction in sediments deposited in downstream waterways.

These improvements to water quality and temperature would occur within a portion of the 48 miles of primary drains within District boundaries; within adjoining waterways outside the District; and within the Butte Creek ecosystem into which these drains ultimately discharge. These benefits would occur throughout the period of time during which the Main Canal is in service—from mid-April to mid-January.

The reduced diversions that are expected to result from the implementation of this project would provide direct benefits to the Bay-Delta system. Benefits would occur as a result of conserved water being made available for use within the Feather River system below Oroville. The volume of water available for downstream release would be increased, flexibility for the timing of increased downstream flows would be improved, and use of the cold-water pool within the Oroville Reservoir could be shifted to provide extended habitat for anadramous fish in the Lower Feather River as a direct result of water conserved by this project. Improved water quality in the Butte Creek watershed would provide enhancement of the riparian and aquatic ecosystem conditions upstream from the Delta including resident microorganisms, amphibians, fish, and plants.

Water quality monitoring is currently done in the Sacramento River Basin on a regional basis; that is, well downstream from District operations. More localized monitoring is scheduled to begin in 2005 as a component of the Central Valley Regional Quality Control Board's conditional discharge waiver for irrigated agriculture. Until more localized monitoring and reporting is completed and a baseline of discharge constituents is established, quantification of improved water quality resulting from this project is not possible.

Improved water use efficiency provided by this project will allow reduced diversions from the Feather River that can be quantified. These reductions will occur as a result of improvements to two components of District operations: on-farm use of applied water, and reduced system losses through operational spills.

On-farm use of applied water includes the evapotranspiration rate of applied water for the crop being grown–in this case, rice–and water use attributable to cultural practices. Improved on-farm water use efficiency within the District has been observed since the early 1990's, resulting from such factors as leveled fields and reduced operational spills. Growers in the District have proved to be very efficient irrigators, making further water use reductions more difficult as their efficiency improves. Based on past improvements, it is estimated that use of an automated elevation control structure could improve on-farm water use efficiency by .20 acre foot per acre of irrigated land. The structure proposed for replacement serves about 7,250 acres of land, for a quantified benefit in reduced diversions of 1,450 acre feet per year.

Operational spills within the District currently average about 50 cfs throughout the nine-month period that the system is in service. Water savings resulting from improved gate response time to flow changes within the canal are difficult to estimate, but system losses resulting from leakage through the existing structure can be quantified. The existing structure requires a flow of approximately 25 cfs, with no spill over the top, to maintain the desired operating elevation. This amount flows downstream after leaking through the structure. At periods of low downstream demand, all of this water is lost as operational spill; the percentage of loss decreases as downstream demand increases. The quantifiable benefit from project implementation will be based on the following assumptions:

- The structure is in service 270 days per year.
- Downstream demand is at zero 25% of the time (67 days).
- Downstream system loss of leaked water will equal 10% during periods of higher demand (203 days).

Thus, 25 cfs for 67 days equals 3,350 acre feet, and 10% of 25 cfs for 203 days equals 1,015 acre feet. This results in total system losses through operational spills as a result of leakage at the existing structure of 4,365 acre feet.

Water conserved by improved on-farm efficiency and reduced operation spills as a result of this project is thereby estimated to be 5,815 acre feet per year. (See *Appendix D*, Table C-5.)

Project Annual Local Monetary Benefits

The automated elevation control structure proposed for this project would save about 30 minutes of labor per day for operation and maintenance; over the annual service period of 270 days, this

totals about 135 hours of labor. Calculated at $30 per hour, this results in savings of $4,050 per year. Replacement flashboard lumber for the existing structure requires about 215 board feet per year; at $1.25/board foot, the proposed structure would result in annual savings of $270 for lumber. The total project annual monetary benefits would be $4,320 (see *Appendix D*, Table C-6).

Local Monetary Benefits and Project Costs

See *Appendix D*, Table C-7.

Applicant's Cost Share and Description

The applicant is requesting that the State share 25% of the total cost of this project (see *Appendix D*, Table C-8). The estimated 25% cost share would be $104,929. Direct benefits would be provided by this project to both the Bay-Delta system and the District. The Bay-Delta would benefit through increased instream flows, improved timing of flows, and water quality, while the District would benefit through reduced labor and maintenance supply costs. Indirect benefits to the District would include improved customer service and increased flexibility in the distribution of labor resources.

The 25% cost share was derived from the value of revenue calculated to be lost to the District over the life of the project resulting from decreased demand as a result of improved water use efficiency provided by the project, as compared to the direct and indirect benefits that the project would provide the District. The estimated decrease in demand of 5,815 acre feet per year would represent a reduction in District water sales of $17,445; offsetting annual labor and supply cost savings of $4,320 would result in an annual reduction of revenue of $13,125.

The indirect benefits to the District that would result from project implementation are not quantifiable in dollar amounts, but certainly provide value. The State share requested in this proposal, $104,929, would help offset the expected loss of District revenue that would result from project implementation; in return, the Bay-Delta system will be provided an estimated 290,750 acre feet of additional conserved water over the life of the project.

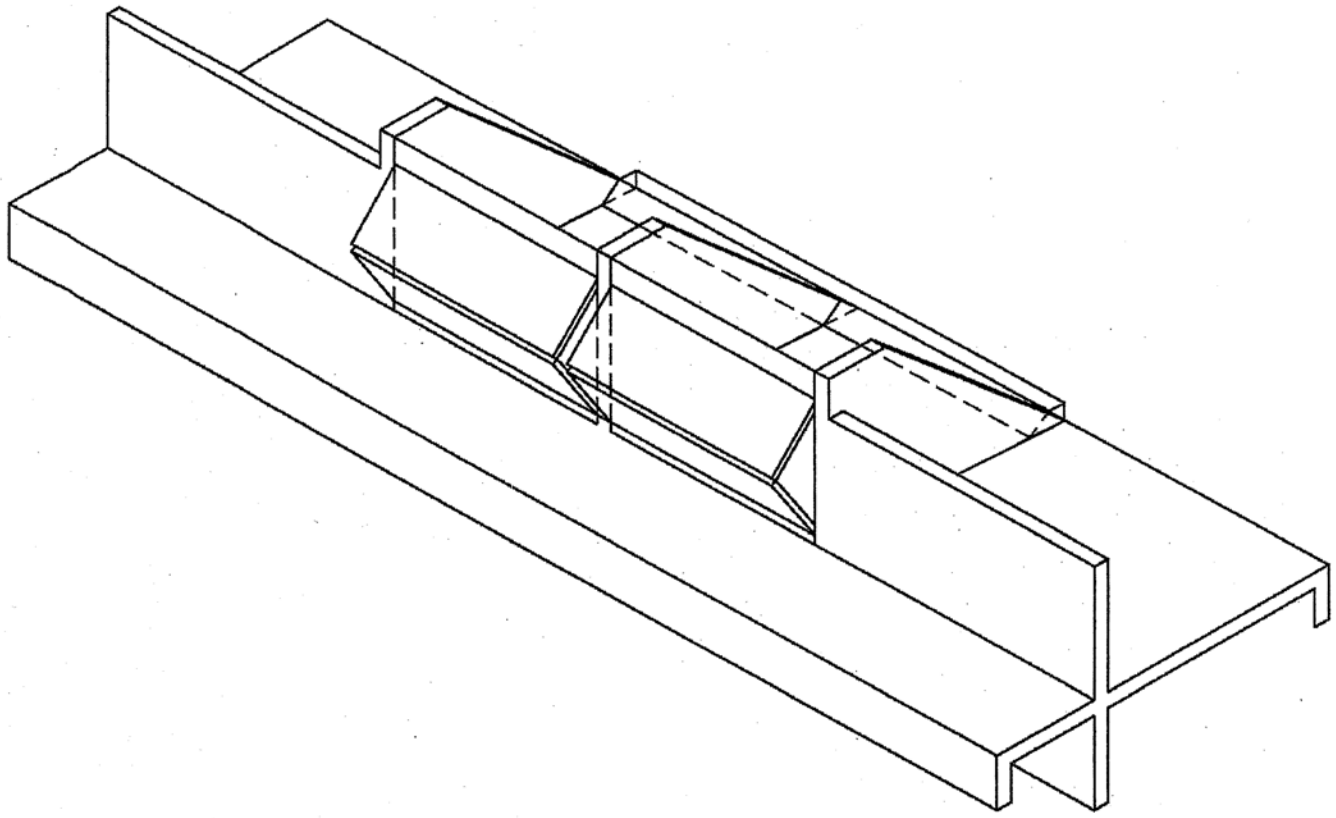

Figure 2: Alternative One (3-D view)

APPENDIX A

- Materials
- Preliminary Plans and Specifications
- Certification of Feasibility

Materials: Types and Approximate Quantities to be Used in the Construction of Elevation Control Structure 875

Concrete, 6-sack mix: ..... 200 cubic yards
Re-enforcement steel, 0.75” diameter: ..... 5.3 tons
Crushed rock, 1 ½”: ..... 36 cubic yards

(1) 24’ Automated Langemann gate

Location

One hundred feet downstream from the intersection of the Western Main Canal and Durnel Road, ½ mile north of Nelson Road, Butte County, California.

Note:
The preliminary design plans and specifications on the following pages will be altered to utilize one 24' Langemann gate, instead of two 18' gates.

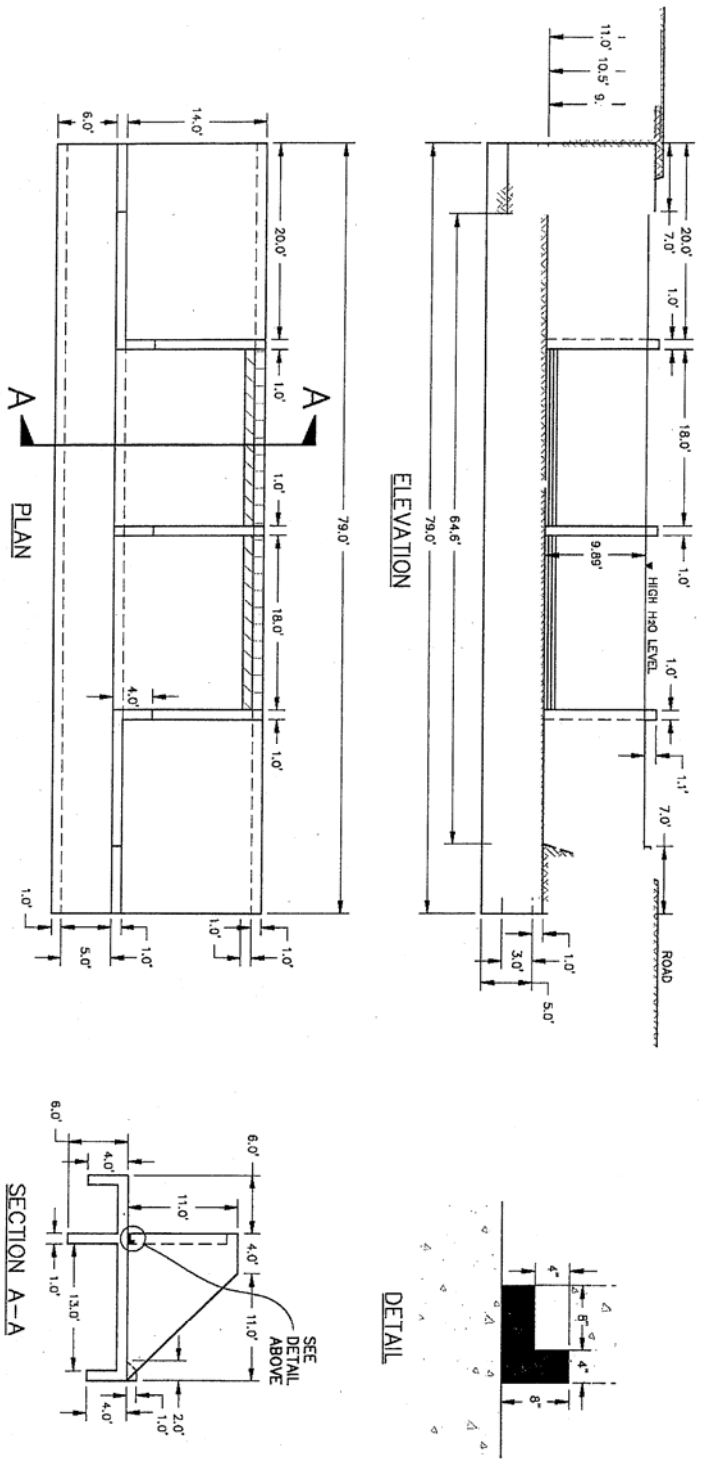

Figure 1: Alternative One (2-18 ft gates with no side bays)

CONSULTING ENGINEERS & GEOLOGISTS, INC.
480 Hemsted Dr. • Redding, CA 96002-0117 • 530-221-5424 • FAX 530-221-0135

Reference: 503084

December 10, 2004

California Department of Water Resources
Office of Water Use Efficiency
P.O. Box 942836
Sacramento, California

Subject: Certification of Feasibility to Construct an Automated Check Structure

Dear California Department of Water Resources:

Stan Wangberg has asked on the behalf of the Western Canal Water District (WCWD) that SHN Consulting Engineers & Geologists (SHN) certify to the feasibility of constructing an automated check structure at the site of the existing Doyle flashboard check structure. Specifically, WCWD plans on constructing a new automated check structure utilizing automated, solar powered Langemann gates.

Based upon an SHN field visit to the site and experience of SHN personnel in automated check structure design, SHN does hereby certify to the feasibility of constructing an automated check structure at the Doyle site.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

Dale Allen Roper

Dale Roper
Senior Civil Engineer

DAR:mmc

Applicant:

THE TABLES ARE FORMATTED WITH FORMULAS: FILL IN THE SHADED AREAS ONLY

Section A projects must complete Life of investment, column VII and Capital Recovery Factor Column VIII. Do not use 0.

Table C-1: Project Costs (Budget) in Dollars)

	Category (I)	Project Costs $ (II)	Contingency % (ex. 5 or 10) (III)	Project Cost + Contingency $ (IV)	Applicant Share $ (V)	State Share Grant $ (VI)	Life of investment (years) (VII	Capital Recovery Factor (VIII)	Annualized Costs $ (IX)
	Administration[1]								
	Salaries, wages	$19,000	0	$19,000	$19,000	$0	0	0.0000	$0
	Fringe benefits	$19,000	0	$19,000	$19,000	$0	0	0.0000	$0
	Supplies	$0	0	$0	$0	$0	0	0.0000	$0
	Equipment	$0	0	$0	$0	$0	0	0.0000	$0
	Consulting services	$150,000	0	$150,000	$75,000	$75,000	0	0.0000	$0
	Travel	$0	0	$0	$0	$0	0	0.0000	$0
	Other	$0	0	$0	$0	$0	0	0.0000	$0
(a)	Total Administration Costs	$188,000		$188,000	$113,000	$75,000			$0
(b)	Planning/Design/Engineering	$0	0	$0	$0	$0	0	0.0000	$0
(c)	Equipment Purchases/Rentals/Rebates/Vouchers	$0	0	$0	$0	$0	10	0.0000	$0
(d)	Materials/Installation/Implementation	$0	0	$0	$0	$0	0	0.0000	$0
(e)	Implementation Verification	$0	0	$0	$0	$0	0	0.0000	$0
(f)	Project Legal/License Fees	$0	0	$0	$0	$0	0	0.0000	$0
(g)	Structures	$0	0	$0	$0	$0	0	0.0000	$0
(h)	Land Purchase/Easement	$0	0	$0	$0	$0	0	0.0000	$0
(i)	Environmental Compliance/Mitigation/Enhancement	$0	0	$0	$0	$0	0	0.0000	$0
(j)	Construction	$0	0	$0	$0	$0	0	0.0000	$0
(k)	Other (Specify)	$0	0	$0	$0	$0	0	0.0000	$0
(l)	Monitoring and Assessment	$0	0	$0	$0	$0	0	0.0000	$0
(m)	Report Preparation	$0	5	$0	$0	$0	0	0.0000	$0
(n)	**TOTAL**	$188,000		$188,000	$113,000	$75,000			$0
(o)	Cost Share -Percentage				60	40			

1- excludes administration O&M.

Applicant: **Eastern Municipal Water District**

THE TABLES ARE FORMATTED WITH FORMULAS: FILL IN THE SHADED AREAS ONLY

Table C-5 Project Annual Physical Benefits (Quantitative and Qualitative Description of Benefits)

	Qualitative Description - Required of all applicants[1]				**Quantitative Benefits - where data are available [2]**
	Description of physical benefits (in-stream flow and timing, water quantity and water quality) for:	Time pattern and Location of Benefit	Project Life: Duration of Benefits	State Why Project Bay Delta benefit is Direct[3] Indirect [4] or Both	Quantified Benefits (in-stream flow and timing, water quantity and water quality)
Bay Delta	Reduction of demand on Bay-Delta System	Unknown	Unknown	Indirect	0
Local	Reduces Total Demand	Unknown	Unknown	**Not applicable.**	

[1] The qualitative benefits should be provided in a narrative description. Use additional sheet.

[2] Direct benefits are project outcomes that contribute to a CALFED objective within the Bay-Delta system during the life of the project.

[3] Indirect benefits are project outcomes that help to reduce dependency on the Bay-Delta system. Indirect benefits may be realized over time.

[4] The project benefits that can be quantified (i.e. volume of water saved or mass of constituents reduced) should be provided.