2004 Water Use Efficiency Grant Proposal

for the

Deer Creek Agricultural Water Use Efficiency Program

Long-term System Improvements Feasibility Investigation

Submitted by
Deer Creek Irrigation District
in association with
Stanford Vina Ranch Irrigation Company

To the
California Department of Water Resources

Pursuant to the

Final 2004 Water Use Efficiency Proposal Solicitation Package

Section B:

Research and Development; Feasibility Studies, Pilot or Demonstration Projects; Training, Education or Public Information; Technical Assistance

January 2005

Notes to Reviewers

The following notes are provided to reviewers to assist in their navigation of the document and evaluation of the materials submitted:

1) The major sections of the proposal and all of the attachments referred to from the body of the proposal are separated with labeled, tabbed dividers.

2) All text is presented in 12-point font. To the extent possible, tabular information was also presented in 12-point font; however, exceptions were made in some cases to allow related information to be presented on one page rather that divided into two or more pages.

3) Tables and figures are presented following the page on which they are first referenced.

4) Benefits and costs are presented in one consolidated section (Section IX).

5) Additional information referenced from the main proposal sections is included in 9 Attachments, designated A through I.

6) The page count for the complete proposal, Sections I through IX, is tabulated below for convenient reference. The count does not include the proposal cover, table of contents, divider pages, these "Notes to Reviewers", nor Table C-1 in Section IX. (Note: By telephone consultation on January 5, 2005, at 3:25 PM, Debra Gonzales stated that Table C-1 would not be included in the page count.)

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Attachments

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C Deer Creek Irrigation District RAP Report
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Abbreviations

CBDA	California Bay-Delta Authority
CD's	Compact Discs
CEQA	California Environmental Quality Act
CIMIS	California Irrigation Management Information System
DCFEP	Deer Creek Flow Enhancement Program
DCID	Deer Creek Irrigation District
DCWC	Deer Creek Watershed Conservancy
DCWEP	Deer Creek Water Exchange Program
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
ET	Evapotranspiration
ET_{aw}	Evapotranspiration of Applied Water
ET_o	Reference Evapotranspiration
ET_p	Evapotranspiration of Precipitation
EWP	Environmental Water Program
FWS	United States Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positional System
IID-MWD	Imperial Irrigation District and Metropolitan Water District of Southern California
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969
PSP	Proposal Solicitation Package
SCADA	Supervisory Controlled and Data Acquisition
SVRIC	Stanford Vina Ranch Irrigation Company
WUE	Water Use Efficiency

I. 2004 Water Use Efficiency Proposal Solicitation Package 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 _____
   - ☐ (c) implementation of other projects to meet California Bay-Delta Program objectives, Targeted Benefit # if applicable _____
   - ☐ (d) Specify other: _____

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

3. Principal applicant (Organization or affiliation): Deer Creek Irrigation District, in association with Stanford Vina Ranch Irrigation Company

4. Project Title: Deer Creek Agricultural Water Use Efficiency Program Long-term System Improvements Feasibility Investigation

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

Name, title	John Edson, DCID President
Mailing address	P.O. Box 156
	Vina, CA 96092
Telephone	(530) 839-2365
Fax.	None
E-mail	edsonappraisals@sbcglobal.net

6. Contact person (if different):

Name, title.	Same as above
Mailing address.	
Telephone	
Fax.	
E-mail	

7. Funds requested (dollar amount): $368,332
(from Table C-8, column II)

8. Applicant funds pledged (dollar amount): $0 (applicant qualifies as disadvantaged)

9. Total project costs (dollar amount): $368,332
(from Table C-1, column II, row I)

10. Is your project locally cost effective?

Locally cost effective means that the benefits to an entity (whether in dollar terms or qualitatively) of implementing a program exceed the costs of that program within the boundaries of that entity.
(If yes, provide information that the project in addition to Bay-Delta benefits meets one of the following conditions: board transferable benefits, overcome implementation barriers, or accelerate implementation)

☐ (a) yes
☑ (b) no

11. Is your project required by regulation, law or contract
if no, your project is eligible ☐ (a) yes
if yes, the project is eligible if it is not currently requires ☑ (b) no

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

_____
_____
_____
_____

12. Duration of project (month/year to month/year): Dec 2005 to Dec 2007

13. State Assembly District where the project is to be conducted: Assembly District 2

14. State Senate District where the project is to be conducted: Senate District 4

15. Congressional district(s) where the project is to be conducted: 2nd District

16. County where the project is to be conducted: Tehama

17. Location of project (longitude and latitude) 122º 03'west longitude 39º 56' north latitude

18. How many service connections in your service area (urban)? Not Applicable

19. How many acre-feet of water per year does your agency serve? DCID 11,500 AF/yr SVRIC 23,000 AF/yr

20. 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.
  - ☐ (iii) Specify _____

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

- ☑ (a) yes, $31,307 annual median household income
- ☐ (b) no

Statewide median household income = $47,323
80% of statewide = $37,858
(See Section VI)

2004 Water Use Efficiency Proposal Solicitation Package
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.

Signature	John W Edson Name and title Pres DCID	12-13-04 Date

III. Statement of Work, Section 1: Relevance and Importance

Introduction

Working together pursuant to the terms of a memorandum of understanding (MOU), Deer Creek Irrigation District (DCID) and Stanford Vina Ranch Irrigation Company (SVRIC), are submitting two grant applications under the Final 2004 Water Use Efficiency Proposal Solicitation Package (PSP). One application is being submitted under Section A for implementation of near-term distribution system improvements that are urgently needed and would provide immediate Bay-Delta benefits; the second proposal is being submitted under Section B to conduct a feasibility investigation of long-term irrigation distribution system improvements that would further increase Bay-Delta benefits. While the greatest benefit to the Bay-Delta would result from approval of both the Section A and Section B applications, approval of only one of the applications will not jeopardize the viability or ability to conduct the other. This section discussing the relevance and importance of the projects is the same in both applications.

DCID and SVRIC are located on the east side of the Sacramento River, approximately midway between Chico and Red Bluff (Figure 1). The small, unincorporated town of Vina is located within the SVRIC service area boundary.

Project Goals & Objectives

The fundamental goal of implementing water use efficiency improvements to the DCID and SVRIC distribution systems is to enable the two entities to participate meaningfully and effectively in ongoing, cooperative efforts to increase Deer Creek instream flows during critical fish migration periods. At the same time, these improvements will help to ensure local water supply reliability and could lead to improved irrigation service to landowners. In pursuit of these goals, the entities have established two fundamental objectives:

- Construct appropriate, cost-effective water use efficiency improvements to provide the ability to better manage and control Deer Creek water diversion and distribution systems
- Develop operations criteria and practices, based on sound science and appropriate monitoring, that contribute to improvement of Deer Creek fish transportation issues, on a cooperative, voluntary basis.

The proposed Section A and Section B projects would contribute directly to achievement of these goals and objectives.

Project Need

Declining populations of several anadromous fish species have led to the 1999 State and Federal listing of spring-run Chinook salmon (Oncorhynchus tshawytscha) as a threatened species, the 2000 Federal listing of steelhead trout (Oncorhynchus mykiss) as a threatened species, and the 1999 State listing of the fall-run and late-fall run Chinook salmon as species of concern. Deer Creek represents one of the State's largest undammed watersheds in the Sacramento River Basin and is widely regarded as having unique habitat features that make it an important resource for recovery of anadromous fish in the Basin. Increasing Deer Creek flows during critical periods of fish passage is that primary need.

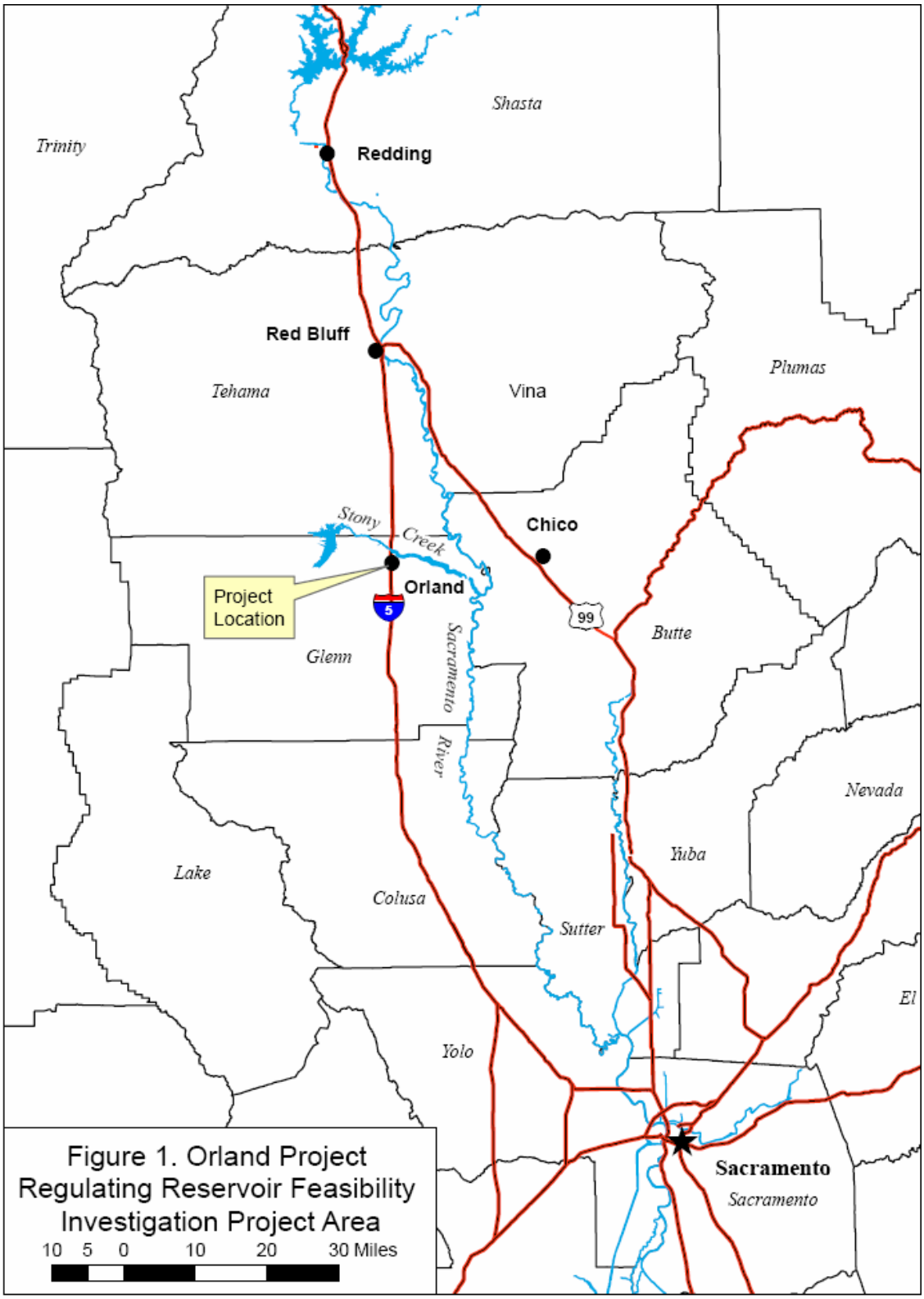


Figure 1. Orland Project Regulating Reservoir Feasibility Investigation Project Area

Of primary concern are irrigation diversions that reduce flows in the Deer Creek, making passage difficult for fish during late spring and fall, critical periods of in-migration for spawning as well as out-migration. Over the years, voluntary actions by diverters on Deer Creek have provided for pulsing of flows during critical periods, demonstrating the willingness of local water users to adjust water management practices to achieve ecosystem benefits. However, the DCID and SVRIC diversion and distribution systems are old and limit the degree to which fish-friendly practices can be implemented. The proposed Section A and Section B water use efficiency projects would contribute to the ability integrate instream flow management with irrigation operations.

Conceptual Framework - Deer Creek Flow Enhancement Program

In an effort to provide local assistance to the Deer Creek water right holders, the California Department of Water Resources (DWR) has developed a conceptual framework for a Deer Creek Flow Enhancement Program (DCFEP). This framework is designed to fulfill the water needs of local agricultural and domestic water users, while achieving the fisheries flow objectives in Deer Creek. The framework has four components that will be designed to work together to provide the water to achieve targeted fish flows.

- Efficiency improvements to the DCID and SVRIC distribution systems
- Supplemental water supply development
- Compensation for DCID and SVRIC
- Adaptive management and monitoring programs

The proposed Section A and Section B projects are in integral component of the DCFEP, which is described in detail in Attachment A.

Relationship Between DCID and SVRIC

Consistent with their cooperative participation in the development of the DCFEP, DCID and SVRIC are working to coordinate the planning and implementation of water use efficiency improvement to be made to their respective systems. The two entities have formalized their relationship in the MOU (Attachment B). According to the MOU, DCID will act as lead agency for purposes of contracting with DWR, if either or both proposals are funded. Thus DCID will administer the grant contracts, pursuant to decisions made jointly by a simple majority of the combined Boards of both entities, consistent with the terms of the DWR grant agreement.

Relationship Between the Section A and Section B Grant Proposals

Reconnaissance-level water conservation investigations have been completed for both the DCID and SVRIC systems (Attachments C and D). These investigations have confirmed the potential to improve water use efficiency through system improvements and identified the general types of improvements that are needed. Building on these reconnaissance investigations, the entities have developed preliminary plans and specifications for specific near-term improvements that are urgently needed and would contribute immediately to achieving Bay-Delta benefits. They are applying for funding under Section A for funds to implement these near-term improvements. An important factor in selecting near-term improvements in that they be compatible with the improvements to be identified in the long-term plan.

DCID and SVRIC are also applying for Section B funding to develop coordinated, comprehensive water use efficiency programs through a Long-term System Improvements Feasibility Investigation. The

Feasibility Investigation would be an intensive program to provide definitive estimates of additional amounts of water that could be conserved, and to develop feasibility-level plans and cost estimates for further system improvements that are needed to achieve the targeted levels of diversion reduction under the DCFEP.

Linkage with California Bay-Delta Authority Targeted Benefits

The California Bay-Delta Authority (CBDA) Water Use Efficiency Program has established two targeted benefits for Deer Creek. ***Targeted Benefit 10*** is to increase streamflow in Deer Creek from October through June to improve habitat for anadromous fish. ***Targeted Benefit 16*** is to reduce water temperatures in Deer Creek to achieve temperatures conducive to all life stages of anadromous fish. Although CBDA has not expressed these targeted benefits in terms of quantifiable objectives, a minimum Deer Creek flow of 50 cfs has been tentatively adopted as a target minimum instream flow for planning purposes among the agencies and entities engaged in the cooperative efforts to provide fish transportation flows. This target flow will be evaluated as monitoring programs are developed under an adaptive management approach.

Both the Section A (Near-term System Improvements Project) and Section B (Long-term System Improvement Feasibility Investigation) projects contribute directly to the accomplishment of Targeted Benefits 10 and 16. The Section A project will implement selected system improvements that will enable DCID and SVRIC to reduce diversions during critical fish migration periods. Increased instream flows will result in lower water temperatures than would otherwise occur. However, the Section A improvements will realize only a portion of the potential diversion reduction that is ultimately possible through system efficiency improvements. The Section B project will identify an integrated package of system improvements that could be implemented to complement the Section A facilities and realize the remaining targeted diversion reduction.

"Phase 8" (Sacramento Valley Water Management Program)

DCID is among the more than 40 signatories to the Short-term Settlement Agreement and proposed a project under the Short-term Sacramento Valley Water Management Program to contribute up to 1,000 AF to the targeted project capacity of 185,000 AF. The DCID project was based on constructing one groundwater well with 1,500 gpm capacity. Water produced from the well would be used for local water supply, enabling DCID to reduce Deer Creek diversions by an equivalent volume during critical fish passage periods. Although intended primarily as an instream flow project, the project would also produce flow that otherwise would not contribute to Delta outflow, and therefore was accepted into the Short-term Program. The water use efficiency improvements being pursued under the Section A and Section B projects would work in conjunction with flow augmentation to produce local instream and regional water supply benefits.

IV. Statement of Work, Section 2: Technical/Scientific Merit, Feasibility

Methods & Procedures

Historically, investigations into irrigation system modernization have been conducted with sufficient rigor to satisfy only local decision-making needs. For example, directors of a local water district, spending district funds, might decide to fund a canal lining project based solely on the opinion of operators who think that a particular canal segment is leaky. While this approach may be sufficient for local purposes, it is not sufficient to support the expenditure of public funds intended to achieve certain public benefits.

Experience gained over the past 10 to 15 years during the implementation of major water transfers in California provides clear guidance for how to approach comprehensive water use efficiency planning. Most notable among these efforts is the landmark long-term water transfer agreement between Imperial Irrigation District and Metropolitan Water District of Southern California (IID-MWD), implementation of which was initiated in 1988 and completed in 1997. In that case, the water savings attributable to the various water use efficiency measures (conservation projects) had to be quantified with sufficient reliability to satisfy junior Colorado River appropriators that they would not be harmed by the water transfer. The quantification process was called "water conservation verification". As the IID-MWD water transfer project was being implemented, conservation verification strategies were integrated with the project planning, thereby providing reliable estimates of probable water savings *prior to project construction*. This process was documented in a journal article entitled "Verification-based Planning for Modernizing Irrigation Systems" (Burns, et al, 2000), authored by certain individuals involved with IID-MWD verification work, including the proposed Project Manager for the Feasibility Investigation.

Verification-based planning will be used to implement the proposed Feasibility Investigation. The objective of verification-based planning is to develop reliable predictions of the amounts of water that will be saved, *prior to project implementation*, so that the benefits used to justify the project will actually be achieved. The key features of verification-based planning are highlighted below, and are manifest in the task descriptions presented later in this section.

<u>Key Features of "Verification-based Planning for Modernization of Irrigation Systems"</u>

- Use of quantitative water balances to characterize the existing irrigation system and its operation
- Identification of the water balance flow paths targeted for change through modernization improvements (in this case, primarily the canal seepage and spillage flow paths)
- Collection of sufficient pre-project flow data to enable quantification of *without-project* and *with-project* targeted flow paths
- Analysis of pre-project flow data to synthesize *with-project* targeted flow path quantities (because with-project conditions cannot be measured before the project is implemented)

Development of the water balances will be supported by a comprehensive flow monitoring program focused primarily on measurement of existing spillage losses and a rigorous canal seepage testing program to support district wide estimates of canal seepage. The canal seepage test program will follow standard procedures developed and documented by the U.S. Bureau of Reclamation (USBR, 1968).

Assuming a project start date of December 2005, the DCID and SVRIC water balances will be developed for 2006 conditions. It is recognized that the 2006 water balances will need to be *normalized* so that they represent the range of hydrologic conditions that would be expected over a long time period. For example, if 2006 is a normal year, the water balances will need to be adjusted to represent both dry and wet conditions. The objective will be to develop representative water balances that enable characterization and quantification of the main water balance flow paths over a range of hydrologic conditions. Emphasis will be on developing reliable estimates of canal seepage and spillage over a range of conditions, as a means of estimating diversion reduction potential of canal lining and spillage reduction measures. These estimates will also support evaluation of potential environmental impacts of the planned water use efficiency measures.

Canal spillage measurements will be recorded on an hourly or more frequent interval to enable analysis of temporal patterns, leading to identification of the factors that cause spillage. This methodology (Davids, 1995) involves developing both times series and flow frequency plots of actual spillage as a means of identifying spillage tendencies. For example, modest but persistent spillage flows are indicative of "buffer" flows (or base spillage) that operators divert through the system for convenience or to compensate for insufficient operations staff or operational information. In contrast, large but infrequent spillage flows indicate that operators are having difficulty with the timing of delivery changes from one user to the next. Understanding the factors that cause spillage reveals how to approach spillage reduction. In the above examples, base spillage is typically approached through operator education and by providing more accurate and timely monitoring and control of system flows using SCADA. Delivery timing changes often point to the need for additional regulating reservoir capacity.

In summary, using the water balance approach with careful flow measurement to quantify potential water savings, and supporting analyses to normalize the water balance results and align system losses with water use efficiency measures, ensures development of an effective system improvements program with reliable pre-project conservation estimates. This approach is manifest in the following descriptions of project tasks.

Implementation Approach

DCID and the SVRIC are very small organizations, each having one staff person who operates and maintains the irrigation distribution system under direction of a 5-person Board of Directors. Neither organization has the staff nor institutional capacity to implement the proposed Feasibility Investigation. Therefore, the project will be implemented with contract services, including the services of a registered Civil Engineer who will provide engineering and project management services. The Civil Engineer/Project Manager will work under the direction of a joint board of directors comprised of all five directors from both boards.

This implementation approach is reflected in the project scope (see Task List, following) and estimates of project costs presented later in this section.

Task List

The tasks and subtasks that would be performed for the proposed Long-term System Improvements Feasibility Investigation are described in the following sections.

Task 1 – Develop Project Mapping and Surveys

Overview: Various maps are needed to enable execution and reporting of the Feasibility Investigation, including topographic and land use maps. All maps will be prepared in GIS or AutoCAD format, maximizing the use of publicly available data sets. Detailed site maps will be prepared for selected locations, especially for existing irrigation structures and features identified for modernization.

Description of Work:
Subtask 1.1 – Acquire Pertinent, Publicly Available GIS Coverages. Review map and geo-data coverages compiled to date by public agencies. Research and acquire additional pertinent data, including aerial imagery, soils, land use and other hydro-geographic data. Organize and inventory data and related metadata. Plot draft maps for field data collection and validation in next subtask.

Subtask 1.2 – Conduct Field Collection and Validation. Using aerial photos, GPS technology and field inspection, validate and correct as needed the locations of canals, structures, roads and other infrastructure.

Subtask 1.3 – Prepare GIS Base Map/Layers. Develop working maps at suitable scales to support project tasks.

Subtask 1.4 – Conduct Site Surveys and Maps. For key, selected sites, conduct detailed topographic surveys to determine structure and operating water surface elevations.

Deliverables:
- Various maps for working and report purposes.
- All digital data acquired stored on CDs

Task 2 – Conduct Facilities Inventory

Overview: A complete inventory of all canals and structures comprising the DCID and SVRIC systems is essential, basic information needed to conduct the Feasibility Investigation. All data will be digitized and stored in a database for convenient reference during the performance of engineering tasks.

Description of Work:
Subtask 2.1 – Conduct Initial Field Reconnaissance. Conduct site visits to inspect the various existing types of conveyance and control structures.

Subtask 2.2 – Develop Criteria for Evaluating Structure Condition and Functionality. Develop a list of facilities attributes that will be systematically recorded

Subtask 2.3 – Conduct Structure Inspections. Visit each structure; assign site identification reference; GPS location; evaluate condition and functionality; measure structure dimensions; take site photos.

Subtask 2.4 – Develop Facilities Database. The observations, records and photographs collected at each site will be digitized and stored in a Microsoft Access database. Simple queries will be programmed to allow non-technical persons to access the data in useful ways.

Subtask 2.5 – Prepare Facilities Inventory Technical Memorandum (TM 1). Prepare a brief technical memorandum documenting the inventory process and results.

Deliverable:

- Microsoft Access database containing the data for each structure/canal reach, with accompanying technical memorandum (TM 1).

Task 3 – Design & Implement Flow Monitoring Program

Overview: The existing flow measurement facilities and records maintained by DCID and SVRIC are not adequate to support development of a verification-quality water balance in Task 5. The purpose of this task is to design and implement a flow monitoring program that is adequate for purposes of the Feasibility Investigation. This will concentrate on boundary flow measurements, including creek diversions and drainage outflows, although some internal measurements might also be pursued.

Description of Work:

Subtask 3.1 – Develop Water Balance Structure. Develop a water balance structure that identifies the flow "accounting centers" and related flow paths that will need to be quantified to enable reliable estimation of system losses. Although primary emphasis will be placed on the distribution systems, the balance will be constructed to reveal useful information about on-farm water use.

Subtask 3.2 – Compile, Quality Control and Analyze Existing Flow Data. Available historical data will compiled and reviewed for reliability, including field inspections of measurement sites and review of stage-discharge relationships. Corrections to historical data, if any, will be documented. Quality-controlled data will be analyzed utilizing time series and statistical approaches.

Subtask 3.3 – Conduct Operator Interviews and Field Inspections. The water balance structure will be reviewed with operators, using maps, aerial photos and field investigations, to identify the various locations where flows will need to be measured to quantify the water balance flow paths with sufficient accuracy.

Subtask 3.4 – Design and Install Flow Monitoring Sites. Flow measurement installations will be designed with a view of balancing cost against measurement accuracy and longevity. It is not envisioned that the structures be permanent installations, although they need to be durable enough to last at least five years.

Subtask 3.5 – Operate and Maintain Flow Monitoring Sites. The flow monitoring sites will be maintained as a project activity during calendar year 2006, following which they will be maintained as part of ordinary operations and maintenance. As a minimum, the sites will be operated though 2012 to support the five annual report of costs and benefits following project completion. Sites will be visited at least twice monthly to ensure unobstructed measurement and to swap out data loggers. Consideration will be given to adding the sites to the respective SCADA systems to support daily operations and to enable sharing the data with other interested parties.

Subtask 3.6 – Collect, Quality Control and Compile Flow Data. Data collected from the field will be subjected to quality control procedures to identify missing and out of range values. The raw records will be preserved so that all quality control can be reviewed and re-performed if issues are identified later. Quality-controlled data will be loaded into data bases as mean hourly flow rates and daily flow volumes.

Subtask 3.7 – Prepare Flow Monitoring Technical Memorandum (TM 2). A technical memorandum will be prepared to document the work completed for the preceding tasks and to accompany the flow data.

Deliverable:

- Microsoft Access database containing raw and quality-controlled water level and flow data, with accompanying technical memorandum (TM 2).

Task 4 – Conduct Canal Seepage Investigations

Overview: Seepage is typically an important pathway for water lost from irrigation distribution systems. Seepage may or may not be "lost" for subsequent beneficial use depending on whether it flows into usable or unusable groundwater. Nevertheless, all seepage adds to diversion requirements and diversion requirements can be reduced if seepage is reduced. The DCID and SVRIC systems consist of lined and unlined canal reaches. Much of the existing lining is old and cracked and no longer is effective in controlling seepage. The purpose of this task is to measure the seepage rates from selected, representative canal reaches as a means of developing a reliable system wide seepage estimate and formulating a cost-effective seepage reduction program.

Description of Work:

Subtask 4.1 – Inventory Canal System by Seepage Potential. Using information gathered in Tasks 1 and 2, prepare maps of the distributions systems that show the location, geometry and condition (unlined, lined/good condition, lined/poor condition) of canals relative to soil characteristics and topographic conditions. Based on judgment, visual inspections and discussions with operators, designate between 2 and 5 categories of canals that can be expected to have different seepage characteristics, due to differences in canal geometry, condition, soils or topography. Assign the various canal reaches within the systems to the identified seepage categories.

Subtask 4.2 – Conduct Canal Seepage Tests. Select three canal reaches within each category for seepage testing. Conduct the seepage tests according to standard, accepted procedures (USBR, 1968). Whenever possible, replicate tests 2 or 3 times. Compile and analyze test data; compute representative seepage coefficients for each reach; document results.

Subtask 4.3 – Compute and Validate Systemwide Seepage Estimates. Compute systemwide seepage rates and volumes using the seepage coefficients and canal inventory data developed from preceding tasks. Validate the systemwide seepage estimates in the context of the districtwide water balances described in Task 5.

Subtask 4.4 – Prepare Canal Seepage Technical Memorandum (TM3). Prepare brief technical memorandum documenting the seepage tests and results.

Deliverable:

- Canal Seepage Technical Memorandum (TM3).

Task 5 – Prepare District Water Balances

Overview: The purpose of this task will be to prepare detailed 2006 water balances for DCID and SVRIC, respectively, to support quantification of system losses and estimation of water savings that could be accomplished by the various alternative system improvements programs evaluated in Task 7.

Description of Work:
Subtask 5.1 – Compile Historical Land Use and Water Requirements. The best available land use data will be compiled from available records including periodic DWR land use surveys from about 1970 to date. Water requirements will be computed based on California Irrigation Management Information System (CIMIS) reference (ETo) and published crop coefficients and a root zone water balance simulation run to parse total (ET) into the portions met from precipitation and from applied irrigation water. This will be performed for each crop on a monthly basis over the period of analysis.

Subtask 5.2 – Assemble 2006 Water Balances. Separate water balances will be prepared for DCID and SVRIC, including provisions for accounting for exchanges of flows between the two (primarily return flows from DCID flowing into SVRIC). The balances will incorporate the 2006 measured flows from Task 3, the estimated seepage losses from Task 4 and the crop water requirements from the preceding subtask. The various assumptions needed to complete the balances, which involve on-farm irrigation efficiency and groundwater use, will be reviewed and validated with local farmers and specialists.

Subtask 5.3 – Normalize 2006 Water Balance to Represent Different Hydrologic Conditions. Recognizing that the 2006 water balance represents only 2006 hydrologic conditions, it will be adjusted to represent the range of conditions that occurs over the long term. This will be done by analyzing historical Deer Creek runoff and diversions together with historical crop water requirements from Subtask 5.1. For example, if 2006 is a "normal" year, water balances will be prepared that depict "wet" and "dry" hydrologic conditions, and the frequency of wet, normal and dry-year occurrences likely based on the Sacramento River Basin Index.

Subtask 5.4 – Estimate Long-term Canal Seepage and Spillage Losses. Based on the forgoing subtasks, characterizations of long-term canal seepage and long-term canal spillage will be developed. This will provide the foundation for estimating the potential diversion reduction associated with the water use efficiency improvement alternatives considered in Task 6.

Subtask 5.5 –Prepare Diversion Reduction Technical Memorandum (TM 4). Prepare brief technical memorandum documenting development of the water balance and the estimates of seepage and spillage over different hydrologic conditions.

Deliverable:
- Water Balance Technical Memorandum (TM 4).

Task 6 – Formulate and Compare Alternative System Improvement Programs

Overview: The goal of this task is to identify the most appropriate program of system improvements for the DCID and SVRIC systems, respectively, to accomplish the targeted levels of diversion reduction and local water supply reliability. This will be done by comparing and contrasting alternative system efficiency programs in terms of relative costs and benefits and other meaningful indicators.

Description of Work:
Subtask 6.1 – Develop Alternative Conceptual Designs and Costs Estimates. Broad alternative approaches will be formulated for applying water use efficiency improvements to the DCID and SVRIC systems. These will range from various degrees of modernization of the existing canal systems to total replacement

of existing canals with closed (pipeline) distribution systems. Although the two distribution systems are currently operated and maintained separately, modernization/conservation opportunities involving system inter-ties will be examined; for example, it may be more cost effective to recover DCID return flows for use in the SVRIC system that to reduce losses from the DCID system. Reconnaissance-level designs and cost estimates will be developed to enable screening in the next subtask.

Subtask 6.2 – Develop Screening and Ranking Criteria. Working with the Boards, landowners and interested parties, criteria and measures will be developed for screening and ranking the conceptual alternatives developed in the preceding subtask. It is anticipated that emphasis will be placed on the total effectiveness in meeting diversion reduction and water use efficiency goals, capital and O&M costs and overall implementability, including and initial environmental screening.

Subtask 6.3 – Conduct Alternatives Screening Workshop. A ½- day workshop with the joint Boards and selected individuals will be conducted to review and score the alternatives. The objective will be to narrow the field to between two and four alternatives to be developed in detail.

Subtask 6.4 – Refine Selected Alternatives. Appraisal-level designs and cost estimates will be developed for the selected alternatives. This information will provide definitive estimates of the amounts of water that could be conserved, contributions to local water supply reliability, estimates of capital and O&M costs and environmental impacts.

Subtask 6.5 – Conduct Preferred Alternative Workshop. A second ½-day workshop will be conducted with the joint Boards and selected individuals to score and rank the various alternatives. The goal will be to identify a single alternative to carry into feasibility-level design.

Subtask 6.6 – Prepare Alternatives Screening and Selection Technical Memorandum (TM 5). A brief technical memorandum will be prepared documenting the criteria and decisions made to identify the preferred alternative.

Deliverable:

- Alternatives Screening and Selection Technical Memorandum (TM 5)

Task 7 – Prepare Feasibility-level Designs and Cost Estimates for Preferred Alternative

Objective: Develop designs and cost estimates for the preferred alternative at the feasibility level of detail, including appropriate contingencies and allowances for engineering, legal, financing and management services during construction.

Description of Work:

Subtask 7.1 – Develop Feasibility-level Designs and Cost Estimates. Feasibility-level designs and cost estimates will be prepared for the preferred alternative. This will include a project description that explains project features and operational parameters and requirements. It will also include drawings of all major structures, general specifications for all equipment and constructed facilities activities, estimates of procurement/construction quantities, estimation of unit costs and total construction costs. A final estimate of the diversion reduction under various hydrologic conditions and over the long-term will be prepared.

Subtask 7.2 – Develop Implementation Plan & Schedule. Alternative means of project financing and implementation phasing will be investigated and evaluated. An implementation plan will be developed that provides the most feasible course for DCID and SVRIC moving ahead with water use efficiency improvements.

Subtask 7.3 – Conduct Preferred Alternative Workshop. The preferred alternative will be presented to the joint Boards in a third ½-day workshop. Comments and suggested revisions will be incorporated in the Comprehensive Final Report.

Deliverables:

- Workshop material and notes.
- Note: the Preferred Alternative will be documented in the Comprehensive Final Report

Task 8 – Environmental Compliance

It is not anticipated that environmental compliance is needed for the conduct of the proposed feasibility investigation, since no changes to facilities, operations or maintenance will be made. However, water use efficiency improvements are an integral component of the broader DCFEP, which will require both programmatic and site-specific environmental documentation. The environmental compliance plan for this broader activity is discussed at the end of this section. It is anticipated that DWR and the FWS will be the lead agencies for CEQA and NEPA compliance, respectively, and will bear all related costs.

Task 9 – Outreach & Community Involvement

Objective: DCID and SVRIC have been continuously involved in public outreach and community involvement activities since 1994 in connection with ongoing efforts to improve fish flows in Deer Creek. Outreach and community involvement for the proposed Section B Feasibility Investigation would be conducted within this broader context and employ the communications channels and conventions established through past efforts. It is expected that community involvement would focus primarily on the DCID and SVRIC Boards and interested landowners and agency representatives, while overall progress and major program decisions with implication to other program elements would be disseminated to a larger group, for informational purposes. (See Section VII for additional information on Outreach.)

Description of Work:

Subtask 9.1 – Community Outreach. Three ½-day workshops are scheduled are key junctures during the feasibility investigation, mainly to make important decisions regarding the screening and selection of water use efficiency alternatives to be evaluated. These workshops would involve the joint DCID and SVRIC Boards along with interested landowners and agency representatives. In addition, two broader public meetings have been identified thus far to support the project: (1) a kick-off meeting to inform stakeholders about the grant award and provide specific information about the scope and schedule for the investigation; (2) a meeting near the conclusion of the investigation to review findings and recommended actions and discuss next steps and funding options.

Subtask 9.2 – Information Dissemination. The information of greatest importance stemming from the feasibility investigation are linkages and implications to other elements of the DCFEP. Careful attention will be given to identifying these linkage points and in communicating with the appropriate individuals. To the extent that there is a broader public that expresses interest in the project, information will be shared freely by the most effective means.

Task 10 – Project Reporting, Management & Administration

Objective: The Project Manager, working under the direction of the joint DCID and SVRIC Boards, will provide all project management and administration. He will be responsible for ensuring the smooth, timely completion of work, documenting project accomplishments and communicating progress and implementation issues, if any, to DWR. This will include preparation of all reports required under the grant agreement, including quarterly progress reports, the comprehensive final report and review and submittal of all technical documents prepared.

Subtask 10.1 – Prepare and Submit Quarterly Reports. The project Manager will prepare quarterly fiscal and programmatic reports to DWR, as specified in the Agreement Requirements. These will be submitted and reviewed by the joint Boards before being submitted to DWR. A standard report format that emphasizes a tabular reporting structure will be developed and submitted to DWR for review immediately after project startup. The approved format will be used throughout the course of the project.

Subtask 10.2 – Review and Submit Technical Memorandums. The joint Boards will review all technical memorandums prepared by the consultant, and submit approved TMs to DWR.

Subtask 10.3 – Prepare and Submit Comprehensive Final Report. The Project Manager will be responsible for preparing the Final Comprehensive Report near the end of the project. The final report will draw substantially on the five technical memorandums plus work completed in Tasks 7 and 8. Following review by the joint Boards, a draft report will be submitted to DWR for review. DWR comments will be incorporated into the Final Comprehensive Report.

Subtask 10.4 – Provide Technical Coordination and Project Management. The Project Manager will be responsible for providing overall project management and direction and for providing day-today coordination among technical tasks.

Task Schedule

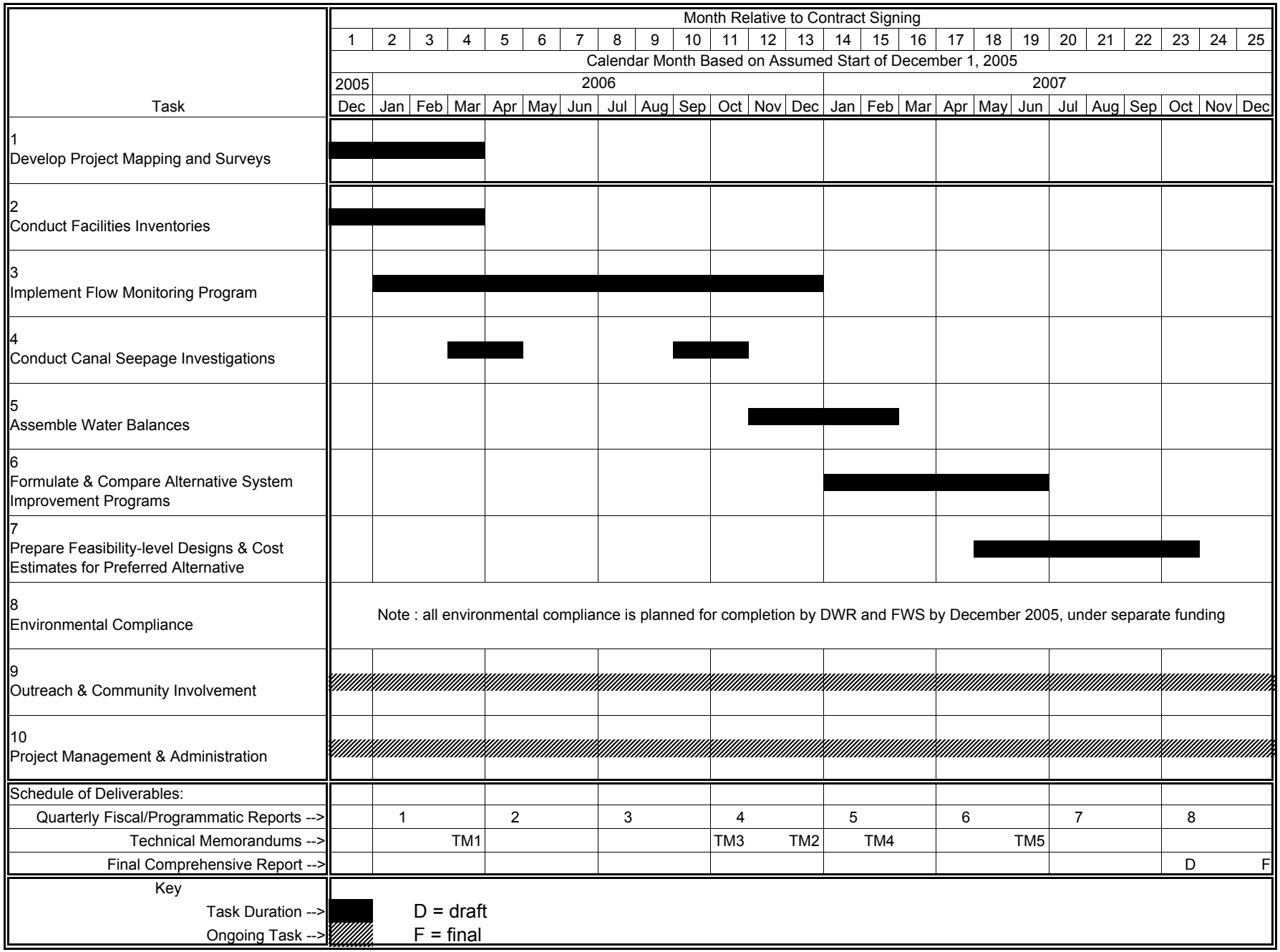
DCID and SVRIC are prepared to initiate work upon signing of a Grant Agreement (assumed to be December 2005, according to the PSP) and to complete the Investigation within a period of 25 months (by December 2007). A two-year project schedule is needed because the first year is devoted primarily to flow measurement and development of the water balances needed to enable the verification-based planning methodology. The second year is dedicated primarily to formulation and evaluation of project alternatives and preparation of feasibility-level designs and cost estimates for the preferred alternative.

The schedule for each task is depicted in Figure 2, along with the dates for completion of project deliverables, including the quarterly fiscal/programmatic reports required by DWR, five technical memorandums and the Comprehensive Final Report (draft and final).

Tasks 1 through 3 would be initiated simultaneously at the project start, with priority placed on Task 3 to ensure that the flow monitoring program is ready for implementation before the start of the 2006 irrigation season.

It is anticipated that the canal seepage tests to be performed under Task 4 would be split into two periods, one at the start and another near the end of the irrigation season. This is because it is not practical to

Figure 2. Proposed Schedule for Long-term System Improvements Feasibility Investigation (Section B)



interrupt irrigation deliveries to conduct the tests during the peak period of the irrigation season (May – September).

Estimated Project Costs

The estimated cost to conduct the proposed Feasibility Investigation is $368,331. Nearly 40 percent of the total cost ($138,639) is associated with Tasks 3 through 5, which are related to the water balances and quantification of potential water savings. This reflects the higher cost associated with use of the verification-based planning approach; however, experience shows that the higher level of rigor is necessary. From the standpoint of local water users, the extensive measurement program and quantitative approach is what provides the confidence that their water needs will not be jeopardized when flows are left instream for fish. And, from the standpoint of the broader public, the higher level of rigor ensures that the expected benefits to fish will actually be accomplished. It is always more difficult and time consuming to link water use efficiency actions with ultimate benefits to water users and the environment; however, this is a fundamental tenant of the Water Use Efficiency Program, which the proposed investigation embraces completely.

A summary of task costs is presented in Table 1; detailed costs by subtask are presented in Attachment E.

Environmental Documentation

As previously described (see Section III), the Section A and Section B water use efficiency projects being proposed by DCID and SVRIC would be implemented in the context of a broader, integrated program to improve fish passage conditions in Deer Creek. Other program components include groundwater development for water supply augmentation, payments to DCID and SVRIC to offset increased operations and maintenance costs and an adaptive monitoring and management program. It is recognized that a programmatic environmental document is needed to address potential environmental impacts.

It is anticipated that both State and federal funding will be used to implement the program components described above and that a programmatic document will provide specific coverage for actions funded through the 2004 WUE PSP projects and programmatic coverage for the overall program. The programmatic document is expected to be completed as a joint effort between DWR and the United States Fish and Wildlife Service (FWS) with costs shared by the agencies. During a site visit in December 2004, environmental compliance staff from both DWR and FWS agreed that the appropriate level of National Environmental Policy Act of 1969 (NEPA)/California Environmental Quality Act (CEQA) compliance for the program would be an Environmental Assessment/Initial Study. The EA/IS is expected to be complete by December 2005.

Based on the site inspections conducted in December 2004, an Environmental Compliance Work Plan for the Deer Creek Water Use Efficiency Program has been prepared (see Attachment F). That program addresses CEQA, NEPA and permitting requirements, and includes a preliminary environmental checklist.

Table 1. Summary Budget by Task

Project Task	Labor Costs						Direct Costs					
	Labor Hours by Staff Level						Cost Item					
	Project Manager/ Principal Engineer	Senior Professional Engineer	Professional Engineer/ GIS Specialist	Staff Engineer/ Surveyor	Project Assistant/ Secretarial	**Labor Costs Subtotal ($)**	Vehicle	Computer	Communications	Miscellaneous/ Other	**Direct Costs Subtotal ($)**	**Total Cost ($)**
	Hourly Rates[1]						($/mile)	($/hour)	at cost	at cost		
	$150	$120	$96	$80	$45		0.4	7				
1 -- Develop Project Mapping & Surveys	4	2	50	112	6	**$14,870**	1,000	104	50	175	**$1,356**	**$16,226**
2 -- Conduct Facilities Inventory	10	10	36	112	34	**$16,646**	400	80.8	$50	$200	**$976**	**$17,622**
3 -- Design & Implement Flow Monitoring Program	24	44	164	476	70	**$65,854**	2,904	283.2	$240	$10,000	**$13,384**	**$79,238**
4 -- Conduct Canal Seepage Investigations	24	12	112	120	40	**$27,192**	800	123.2	$65	$3,200	**$4,447**	**$31,639**
5 -- Assemble Water Balances	24	30	60	144	40	**$26,280**	0	178.8	$40	$100	**$1,392**	**$27,672**
6 -- Formulate & Compare Alternative System Improvement Programs	56	28	120	172	34	**$38,570**	440	205	$50	$250	**$1,911**	**$40,481**
7 -- Prepare Feasibility-level Designs & Cost Estimates	36	14	160	240	24	**$42,720**	440	284.4	$75	$340	**$2,582**	**$45,302**
8 -- Environmental Compliance[2]	0	0	0	0	0	**$0**	0	0	$0	$0	**$0**	**$0**
9 -- Outreach & Community Involvement	56	0	56	0	0	**$13,776**	600	44.8	$150	$350	**$1,054**	**$14,830**
10 -- Project Reporting, Management and Administration	288	16	216	240	156	**$92,076**	100	458	$0	$0	**$3,246**	**$95,322**
Totals	522	156	974	1616	404	**$337,984**	6684	1763	$720	$14,615	**$30,348**	**$368,332**

Notes:
[1]Hourly rates are forward priced to Calendar Year 2005
[2]DWR and FWS are
preparing environmental

V. Statement of Work, Section 3: Monitoring and Assessment

As described in the preceding section, monitoring and assessment utilizing a verification-based planning approach is an integral feature of the Feasibility Investigation. Specific techniques that will be used to ensure successful monitoring and assessment measures are described in detail below.

Pre-project Conditions and Data Baselines

Pre-project and baseline conditions will be established through development of water balances representing the DCID and SVRIC systems, respectively, during 2006. Recognizing that the hydrologic conditions that occur in 2006 will not be representative of the range of water supply and hydrologic conditions that occur over time, the 2006 water balance will need to be adjusted to reflect that range of conditions. Development of the water balance and applying adjustments to it to represent a broader range of conditions is discussed in the following paragraphs. Emphasis is placed on canal seepage and spillage, the two principal flow paths that will be targeted to achieve increased fish passage flows.

Water Balance Development

A conceptual water balance structure suitable for characterizing both the DCID and SVRIC systems is presented in Figure 3. The main accounting centers are the Distribution System, Irrigated Lands and Sloughs. Flow exchanges between these accounting centers and Deer Creek, the Groundwater System and the Sacramento River are represented, but complete balances will not be prepared for these systems. The means of quantifying the flow paths for the main accounting centers is discussed below.

Distribution System

- Diversions: measured, rated structure with data logger
- Evaporation: calculated based on estimated evaporative area, CIMIS ET_o and evaporation coefficient
- Seepage: calculated based on canal seepage tests
- Farm Deliveries: calculated by closure, validated by spot measurements where possible
- Spillage: measured or inferred from measured records

Irrigated Lands

- Precipitation: calculated as measured precipitation depths times irrigated land area
- Farm Deliveries: transferred from Distribution System balance
- Private Groundwater Pumping: back-calculated as the total applied water requirement minus farm deliveries; total applied water requirement calculated as ET_{aw} (see below) divided by irrigation efficiency. Irrigation efficiency will be estimated based on grower interviews observation of selected irrigation events. Private pumping calculations will be validated against an inventory and estimated capacity of private groundwater wells.
- ET of Applied Water (ET_{aw}) and ET of Precipitation (ET_p): total ET calculated from CIMIS ET_o and crop coefficients for the areas of each crop. Total ET parsed into ETaw and ET_p based on monthly root zone simulation model.
- Deep Percolation of Precipitation: calculated within monthly root zone simulation model
- Tailwater: estimated from observation of selected irrigation events
- Deep Percolation of Applied Water: calculated by closure based on efficiency estimate

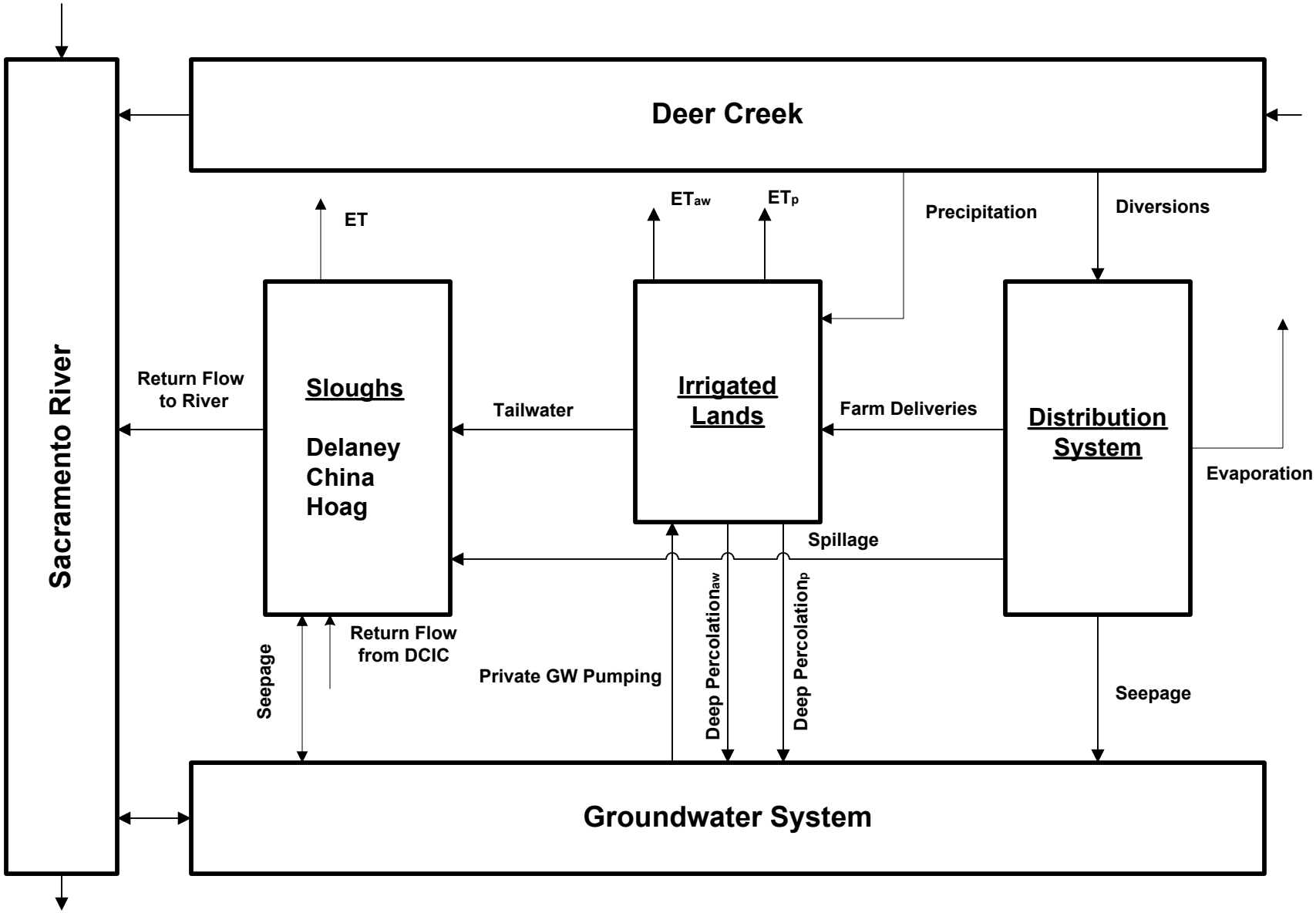


Figure 3. Conceptual Water Balance Structure for Deer Creek Irrigation District and Stanford Vina Ranch Irrigation Company

Sloughs

- Tailwater: transferred from Irrigated Lands balance
- Spillage: transferred from Distribution System balance measured or inferred from measured records
- ET: calculated from CIMIS reference ET times riparian vegetation ("crop") coefficient times the sough area estimated from aerial photographs
- Seepage: calculated by closure
- Outflow: measured or inferred from measured record

Anticipated Accuracy

The various flow paths will have different levels of accuracy associated with them because they are quantified in different ways. It is anticipated that measured values, such as creek diversions and spillage flows can be established within 10% error at the 95% confidence level. In contrast, it is estimated that calculated flow path values will carry twice the error of measured flow paths, or 20%, at the 95% confidence level. The error associated with canal seepage will depend on the number of seepage tests performed and the variability in seepage rates. A systematic process will be used for assigning confidence levels to all flow paths in the water balance, concentrating on canal spillage and seepage, the two primary flow paths targeted for change.

Water Balance Adjustment (Normalization)

The exact procedures for adjusting the 2006 water balances to represent the full range of hydrologic conditions cannot be determined until the 2006 balance has been developed. However, the general procedure, assumptions and considerations are as follows:

1. Review Deer Creek historical flows and, based on the frequency distribution of annual runoff, assign each year of historical record a year type designation, such as dry, normal or wet. (note: Also consider using the Sacramento River basin index to do this.)

2. Assign 2006 to a year type based on annual runoff volume.

3. Correlate available historical diversion records with year type and characterize how diversion volume to DCID and SVRIC, respectively, varies with annual runoff.

4. Compute historical ET and ET_{aw} and correlate with year type. Characterize how ET and ET_{aw} vary with annual runoff.

5. Interview selected growers to determine how private pumping practices vary with diversion volume and year type.

6. Assume that canal seepage rates are relatively insensitive to diversion volume and year type. Calculate seepage by year type based mainly on differences in length of irrigation season among year types.

Considering the above relationships, engineering judgment will be used to make adjustments to the 2006 water balance to create "typical" water balances for other year types.

Monitoring Methodologies

Conventional, proven methodologies will be used to measure, record and quality-control all measured flow paths. This will include use of standard measurement structures where possible, with a preference for broad-crested and sharp-crested weirs as primary flow measurement devices. Non-standard structures might also be employed, provided that consistent stage-discharge functions can be developed through current metering.

Flow monitoring studies on other irrigation systems (Thoreson, et al, 2000) indicate that several measurements are required daily to adequately capture the variability in flow inherent to irrigation operations. The plan is to automate data recording at standard intervals of about 15 minutes, and in no case more than hourly. This will provide estimates for calculating monthly flow volumes for the water balance that are as reliable as the error in the basic measurement, and will enable analysis of hour-to-hour flow patterns needed to design spillage reduction measures.

Flow measurement sites will be visited at least bi-weekly to check site conditions, swap data packs (unless and until sites are added to SCADA systems) and conduct site maintenance.

Evaluating Success in Achieving Project Goals and Objectives

The Feasibility Investigation will provide the basis for quantifying the potential and achievable volumes of diversion reduction through implementation of water use efficiency measures, for project planning purposes.

Normalization for External Factors

It is acknowledged that agricultural water use is influenced by many factors, including weather, cropping patterns, and economic conditions (production costs and prices). The technique that would be used to normalize for these factors was previously discussed (see Water Balance Adjustment [Normalization]).

Data Handling, Storage and Reporting

Flow data will be uploaded into Access databases, with quality control algorithms applied to check for erroneous data. Data gaps will be filled with appropriate estimating techniques, so that flow volume estimates are complete and representative.

Monitoring and Evaluation Costs

Tasks 3 through 5 presented earlier represent the effort that will be directed into project monitoring and evaluation. The cost of these tasks is estimated to be $138,639 (Table 1), or nearly 40 percent of the total project cost. This reflects the higher cost associated with use of the verification-based planning approach; however, these efforts increase the confidence that the project will actually accomplish its targeted goals to improve local water supply reliability and diversion reduction for improved fish passage conditions.

Feasibility Investigation Progress and Success

Both technical and budgetary progress will be tracked and reported by the project manager. Reporting will include task level detail reflecting technical and budgetary progress during the proceeding month. Progress will also be demonstrated through the submittal of deliverables as described earlier. Project success will be measured by the acceptance of the preferred alternative by the stakeholders and ultimately by funding and construction of that alternative.

VI. Qualifications of the Applicants and Cooperators

DCID is the applicant for this grant proposal and is cooperating with the SVRIC for implementation of the proposed Feasibility Investigation. The provisions of the cooperative agreement between the two entities are expressed in a Memorandum of Understanding that has been officially endorsed by both Boards of Directors. The MOU is attached to this application for convenient reference (Attachment B).

Role of External Cooperators

DCID and SVRIC are both very small organizations, each with one employee who operates and maintains the distribution system. Seasonal labor is hired as needed for certain maintenance tasks. The entities have engaged Davids Engineering to provide consulting engineering services and plan to use Davids Engineering to manage and execute the work identified in the Feasibility Investigation, subject to the direction of the joint Boards.

Grant Davids would serve as Project Manager, reporting directly to the joint Boards. Mr. Davids is a registered civil and agricultural engineer in California with nearly 30 years of experience in irrigation and water resources planning and engineering. Among his qualifications are more than 12 years of extensive service to the IID-MWD water conservation program, which concentrated on verification of water savings achieved by various water conservation measures, including canal lining, system automation and regulating reservoirs. Mr. Davids' resume is attached to this proposal for convenience reference (Attachment G).

Both DCID and SVRIC have established cooperative working relationships with representatives of DWR's Northern District over the past several years. Similarly, trusted relationships have been forged with representatives of the CBDA Environmental Water Program. It is expected that these relationships will be maintained and will continue to provide benefit to the direction and execution of the Feasibility Investigation.

Previous WUE Grant Experience

Neither DCID nor SVRIC has participated in a previous water use efficiency grant projects.

Disadvantaged Community Status

The project area is located in rural Tehama County, approximately midway between Chico and Red Bluff. The unincorporated town of Vina (estimated pop. 250) lies within the study area. The most recent census statistics available for Tehama County are for 2002, at which time the median household income in the County was reported to be $31,307. In the same year, the California statewide median household income was reported to be $47,323. Tehama County qualifies as a disadvantaged community, since its median household income is less than 80% of the statewide median household of $37,858 ($47,323 x 0.8 = $37,858). The official U.S. Census Bureau references reporting these figures are attached to this application (Attachment H).

VII. Outreach, Community Involvement and Acceptance

Introduction

DCID and SVRIC have been actively engaged in outreach and community involvement activities since 1994 in connection with ongoing efforts to improve fish passage issues in Deer Creek, including the Deer Creek Water Exchange Program (DCWEP) and 2003 Pilot Water Exchange Program. These efforts have been inclusive and transparent and have worked to gain wide support for Deer Creek initiatives. Outreach and community involvement for the proposed Section B Feasibility Investigation would be conducted within this broader context. It is expected that community involvement would focus primarily on the DCID and SVRIC Boards, interested landowners and selected agency representatives, while overall progress and major program decisions with implication to other program elements would be disseminated to a larger group, for informational purposes.

Ongoing outreach activities are described below, along with additional discussion of planned community outreach and information dissemination activities described earlier in the scope of services. The broad local support that has been cultivated for the proposed project is also discussed, including reference to letters of support received from a variety of organizations. Finally, some of the benefits that would result from the project are discussed.

Ongoing Public Outreach and Community Involvement

Since 1994, DCID and SVRIC have worked cooperatively with DWR and DFG to look at agricultural water use efficiency improvements as part of the DCWEP, a set of activities designed to increase transportation flows for spring-run salmon in Deer Creek. Since that time, DCID and SVRIC have conducted outreach and worked cooperatively at local and regional levels. In 2002-03 DCID participated in drilling a deep aquifer production well and operating the well during the 2003 Deer Creek Water Exchange Pilot Program. Public outreach for the Pilot Program was conducted by forming a Water Advisory Committee comprised of all interested stakeholders and agency representatives and conducting monthly meetings with internet posting of program results.

Subsequent to the Pilot Program, DCID and SVRIC have continued to participate in outreach activities and have helped to develop community support of ongoing efforts to develop a DCFEP. The draft concept paper describing the Program (see Attachment A) represents a collaborative effort between the DCID, SVRIC, Deer Creek Watershed Conservancy (DCWC), DWR, DFG, Tehama County, and the FWS. A major element of the conceptual Program is agricultural water use efficiency improvements to the DCID and SVRIC distribution systems.

In 2003, Environmental Water Program (EWP) and DWR representatives held meetings with key individuals, groups and local agencies within the Deer Creek watershed to inform them of the ongoing fishery enhancement efforts that would incorporate water use efficiency, groundwater exchange and compensation for bypassed water. The meetings were carried out in an open and transparent process. Stakeholders were notified via mail and email of local team meetings at a minimum of two weeks prior to each meeting, and provided with meeting agendas and minutes from the previous meeting. Documentation of meeting dates and attendance lists are provided in Attachment I.

Community Involvement & Information Dissemination Plan

It is expected that community involvement would focus primarily on the DCID and SVRIC Boards and interested landowners and agency representatives, while overall progress and major program decisions with implication to other program elements would be disseminated to a larger group, primarily for informational purposes. The extensive mailing and e-mail lists (see Attachment I) that have been compiled since 1994 will be used for this purpose. The Project Manager will continue to engage interested individuals and entities throughout the course of the feasibility investigation.

Two formal public meetings have been identified thus far to support the project: (1) a kick-off meeting to inform stakeholders about the grant award and provide specific information about the scope and schedule for the investigation; (2) a meeting near the conclusion of the investigation to review findings and recommended actions and discuss next steps and funding options. In addition, three ½-day workshops are identified in the project scope (see Section IV). These would primarily involve the DCID and SVRIC Boards and interested landowners and agency representatives. At the discretion of the joint boards, the Project Manager, working with or through the DCWC, could provide newsletter coverage to the watershed residents and the broader public audience. This possibility will be evaluated as the project ensues.

To the extent that there is broader interest, information derived from the feasibility investigation will be shared freely and openly, potentially through one or more of the following active websites: DCWC, DWR, Tehama County, EWP. Appropriate project materials, such as newsletters, progress reports, technical reports, meeting notices and meeting summaries, will be posted at these websites for public access. Under the direction of the joint Boards, the Project Manager will coordinate outreach efforts with the DCWC, Tehama County Department of Public Works, DWR, DFG and FWS.

Support for the Project/ Letters of Support

Broad support has been generated for the Feasibility Investigation through ongoing outreach and community involvement. This support is manifest in the DCID-SVRIC MOU (Attachment B) and the many letters of support provided by local, regional, state and federal organizations including DFG, Tehama County, DCWC, NCWA, The Nature Conservancy and FWS (Attachment I). The vast majority of local stakeholders recognize the social and economic benefits of making their systems more efficient and improving Deer Creek fish flows. As information has been disseminated throughout the community and meetings have been conducted regarding flow enhancement initiatives in Deer Creek, a small minority of stakeholders have expressed concerns about how participation with state programs by either the DCID, SVRIC or individual water right holders could threaten existing water rights and erode local control. These concerns will continue to be addressed. It is expected that these fringes of opposition will persist but it will not impact the implementation of this project or the broader, on-going efforts to improve Deer Creek fish passage conditions.

Estimated Benefits

Outside of advancing the overall DCFEP, the proposed Feasibility Investigation itself will provide limited social or economic benefit to individuals or organizations. It will, however, strengthen the cooperative bond between DCID and SVRIC and expand the institutional capacity of both organizations. Ultimately, if viable comprehensive water use efficiency programs are identified for both systems, the ensuing construction will provide temporary financial benefits to local contractors and the improved systems will provide broad, lasting benefits for local landowners and Deer Creek fish passage. In addition, the DCID and SVRIC system operators will be trained to operate and maintain SCADA technology.

VIII. Innovation

There are a number of features of the DCID and SVRIC proposals, and the broader, ongoing efforts to improve fish passage conditions in Deer Creek, that demonstrate innovation and serve as a model for how to approach complex resource management issues. Two of these features, one managerial and another technical, are discussed below. These features apply to both the Section A and Section B proposals being submitted by DCID in association with SVRIC.

Local Leadership/Regional Resources

The most highly-vested stakeholders involved with the solution to fish transportation issues in Deer Creek are the long-term water rights holders in DCID and SVRIC. These rights for irrigation and stock water use are the economic and social foundation of the local community. Recognizing that a top-down, prescriptive problem-solving approach would be polarizing and would appear as a threat to local water rights, the agencies have allowed and encouraged local leadership in the formulation of solutions and in reaching out to affected and interested parties. This was not a natural role for local interests, but over time the entities, Board members and certain landowners have asserted leadership and taken on increasing responsibility for overall direction. Agency staff should be recognized for encouraging and fostering local leadership, while bringing the resources of their agencies to bear on problem solving. Addressing complex resource management issues calls for cooperation among local landowners, water right holders and interest groups and state and federal agencies. All of the individuals, entities and agencies that are engaged in efforts to improve conditions in Deer Creek are cooperating on a voluntary basis.

Verification-based Planning Approach

The technical methodologies featured in both the Section A and Section B proposals embrace a technique called "verification-based planning" for modernization of irrigation systems. This is an emerging technique that fuses traditional infrastructure planning with principles of water conservation verification, resulting in reliable estimates of water savings (or, more generally, flow path changes) along with recommended irrigation system upgrades. While verification-based planning is conceptually simple, awareness of the methodology is limited, its application is challenging and there are few cases worldwide where it has been systematically applied and demonstrated[1]. Impediments typically include the extra cost and time needed to adequately establish pre-project conditions through flow measurement and related analytical work.

Verification-based planning directly addresses a major challenge in accomplishing water use efficiency objectives through incentive-driven programs, which is to establish a uniform basis for comparing the costs and benefits of alternative water use efficiency "investment" options, and selecting the most cost-effective projects with confidence that predicted benefits will actually be achieved. The scopes of work for both the Section A and Section B proposals both demonstrate verification-based planning, in the context of generating water to increase instream flows in Deer Creek during critical fish transportation periods. In addition, verification-based planning provides a factual basis for alleviating local concerns about water supply reliability and for confirming public benefits.

[1] Verification-based planning is an outgrowth of the techniques that were developed for quantifying water savings associated with the 1988 Imperial Irrigation District/Metropolitan Water District water conservation and transfer agreement. It was further developed in relation to water conservation planning in Egypt during the 1990's and was systematically applied for purposes of irrigation system modernization in Benton Irrigation District, Yakima Basin, Washington.

IX. Benefits and Costs

The immediate, tangible benefit that will result from the Feasibility Investigation is a clear plan to improve the efficiencies of the DCID and SVRIC irrigation distribution systems, including sufficient monitoring and assessment to ensure that the projected benefits, in terms of improved local water supply reliability and improved conditions for fish passage in Deer Creek, can be achieved at the estimated cost of improvements.

While the plan alone would be a significant accomplishment, it does not result in actual benefits to water users, the environment, or the Bay-Delta system. Therefore, the decision of whether to fund the proposed investigation should take into consideration the ultimate potential for water savings, and the probability of those savings contributing to the CALFED targeted benefits, production of water for contribution to the Sacramento Valley Water Management Program or other valuable objectives. Ordinarily this is not possible; however, in this case, preliminary investigations have been completed that provide the basis for developing reconnaissance-level estimates of water savings.

Potential Benefits from Water Use Efficiency Improvements

Estimates of losses from the SVRIC distribution system were estimated from water balances developed for the Rapid Appraisal of Water Conservation Opportunities (Attachment D). Under normal hydrologic conditions, the sum of seepage and spillage losses from the SVRIC system was estimated to be 8,700 AF annually, and under dry conditions to be 6,400 AF annually. If the assumption is made that losses from the DCID system represent equivalent proportions of the amount diverted, the corresponding volumes of combined system loss would be about 50% of the volumes reported for SVRIC. This a based on the fact that the DCID diverts about 50% as much as SVRIC does, pursuant to the Deer Creek adjudication.

These estimates are summarized in Table 2 along with the estimated monthly pattern of loss, expressed as a flow rate in cfs. These values, subject to an estimated error of -40% to +20% (see Attachment D), represent the total potential savings associated with water use efficiency improvements. Assuming that an aggressive, cost-effective conservation program could accomplish between 50% and 80% of the potential, it is clear that water use efficiency improvements are an important component of any flow enhancement program, something that has been obvious to local landowners for many years.

Table 2. Existing Combined System Losses to Seepage and Spillage in Normal and Dry Years (from water balance analysis, rounded to whole cfs and nearest 100 af

Month	Normal Year Conditions (cfs)			Dry Year Conditions (cfs)		
	SVRIC	DCID	Total	SVRIC	DCID	Total
April	15	8	23	12	6	17
May	28	14	42	21	11	32
June	36	18	53	27	14	41
July	29	14	43	22	11	33
August	22	11	33	18	9	27
September	21	11	32	16	8	24
October	4	2	6	3	2	6
Annual Volume (AF)	8,700	4,300	13,000	6,400	3,200	9,600

Potential Environmental Benefits

It is specifically intended by all the cooperators in the DCFEP that the water conservation volumes discussed above be managed to contribute to improving fish migration conditions in Deer Creek (CBDA Targeted Benefits 10 and 16) and to improve local water supply reliability for farmers. Initial investigations have shown these benefit objectives to be compatible due to differences in the timing of fish flow and irrigation needs.

When agricultural water use efficiency improvements are viewed in the context of the DCFEP, along with water supply augmentation by groundwater development, opportunities are created to generate new water supplies for regional benefit, while simultaneously improving fish passage conditions. New water supplies could be used to contribute toward Phase 8 obligation or for other regional purposes. These opportunities to achieve double benefits in environmentally sensitive areas make Deer Creek a very attractive water use efficiency investment option.

Costs (Table C-1)

Estimates of project costs were developed around the tasks presented in Section IV (see Table 1 and Table E-1 in Attachment E). The costs presented in Table 1 were cross-referenced with the cost categories used in Table C-1, as summarized below:

- Consulting services/administration is comprised of the portion of Task 10 associated with project management (Subtask 10.4) totaling $32,859 (9%)
- Planning/Design/Engineering is comprised of Tasks 1, 2, 6 and 7, totaling $119,630 (32%)
- Other (Outreach) is comprised of Task 9, totaling $14,830 (4%)
- Monitoring and Assessment is comprised of Tasks 3 through 5, totaling $138,549 (38%)
- Report preparation is comprised on Subtasks 10.1 through 10.3, totaling $62,463 (17%)

The total cost of the proposed feasibility investigation is $368,331, with nearly 40% of the project cost associated with Monitoring and Assessment (Table C-1). As previously discussed, the project area qualifies as a disadvantaged community under the PSP criteria; therefore, no applicant cost share is contributed. Because the project is a study, no cost contingencies were included.

References

Burns, J.I., G.G. Davids, A.K. Dimmitt, J. Keller. 2000. Verification-based Planning for Modernizing Irrigation Systems. *Challenges Facing Irrigation and Drainage in the New Millennium*. Proceedings from the USCID Water Management Seminar, Denver, CO. pp. 51-63.

Davids, G.G. 1995. *District Water Conservation: Concepts and Misconceptions*. Irrigation Water Conservation – Opportunities and Limitations. Proceedings of the USCID Water Management Seminar. Sacramento, CA. pp. 21-31.

Thoreson, B.P., J. Eckhardt and A.J. Divine. 1999. *Correlation Between Sampling Interval and Volume Calculations.* Benchmarking Irrigation System Performance Using Water Measurement and Water Balances. Proceedings of the USCID Water Management Conference. San Luis Obispo, CA. pp 121-134.

United States Department of the Interior, Bureau of Reclamation, 1968. *Measuring Seepage in Irrigation Canals by the Ponding Method.* Irrigation Operation and Maintenance Bulletin No. 65.

Applicant: Deer Creek Irrigation District (Section B)

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		0	$0	$0	$0			
	Fringe benefits		0	$0	$0	$0			
	Supplies		0	$0	$0	$0			
	Equipment		0	$0	$0	$0			
	Consulting services	$32,859	0	$32,859	$0	$32,859			
	Travel		0	$0	$0	$0			
	Other		0	$0	$0	$0			
(a)	Total Administration Costs	$32,859		$32,859	$0	$32,859			
(b)	Planning/Design/Engineering	$119,630	0	$119,630	$0	$119,630			
(c)	Equipment Purchases/Rentals/Rebates/Vouchers		0	$0	$0	$0			
(d)	Materials/Installation/Implementation		0	$0	$0	$0			
(e)	Implementation Verification		0	$0	$0	$0			
(f)	Project Legal/License Fees		0	$0	$0	$0			
(g)	Structures		0	$0	$0	$0			
(h)	Land Purchase/Easement		0	$0	$0	$0			
(i)	Environmental Compliance/Mitigation/Enhancement	$0	0	$0	$0	$0			
(j)	Construction		0	$0	$0	$0			
(k)	Other (Specify)	$14,830	0	$14,830	$0	$14,830			
(l)	Monitoring and Assessment	$138,549	0	$138,549	$0	$138,549			
(m)	Report Preparation	$62,463	0	$62,463	$0	$62,463			
(n)	**TOTAL**	$368,331		$368,331	$0	$368,331			
(o)	Cost Share -Percentage				0	100			

1- excludes administration O&M.