F1-180

Grassland Water District

22759 S. Mercey Springs Road
Los Banos, CA 93635
Telephone (209) 826-5188
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July 17, 1997

Kate Hansel
CALFED Bay Delta Program
1416 9th Street
Sacramento, CA 95814

Dear Ms. Hansel:

Enclosed is a proposal for your consideration for Category III funds under the CALFED Bay-Delta Program. The project is entitled "A Real-Time System To Improve Management and Scheduling Of Wetland Discharges To Improve Water Quality In The San Joaquin River".

This proposed project is both complementary and coordinated with the "San Joaquin River Real-time Water Quality Management Program" project proposed by the Department of Water Resources (Figure 1) and will make full use of the enhanced monitoring and water quality forecasting capabilities promised by this project, should it be funded. The proposed project is also complementary and coordinated with project proposals submitted under separate cover, dealing with (a) Stanislaus River water quality monitoring and (b) the development of a real-time temperature and dissolved oxygen model for the entire San Joaquin River System.

Please contact either Nigel Quinn at (916) 979-2325 or me at (209) 826-5188 for any further information you may require.

Sincerely,

Don Marciochi
General Manager

enclosure - Proposal for CALFED Bay-Delta Program

F1-190

Real-time water quality management of wetland discharges to the San Joaquin River.

Submitted by :

Grassland Water District
22759 Mercey Springs Road
Los Banos, CA 93635

In cooperation with :

Lawrence Berkeley National Laboratory
Earth Sciences Division
1 Cyclotron Road
Berkeley, CA 94720

California Regional Water Quality Control Board
3443 Routier Road, Suite A
Sacramento, CA 95827-3098

US Bureau of Reclamation, GIS Service Center
2800 Cottage Way
Sacramento, CA 95825

July 27, 1997

I. EXECUTIVE SUMMARY

(a) Project Title : Real-time water quality management of wetland discharges to the San Joaquin River

Name of Applicant :
Scott Lower, Grassland Water District, (209)826-5188, 76734.1116@compuserve.com
Nigel Quinn, Lawrence Berkeley National Laboratory, (510)486-7056, nwquinn@lbl.gov
Les Grober, California Regional Water Quality Control Board, (916)255-3105, lgrober@davis.com

(b) Project Description :
The Grassland Water District together with the adjacent State and Federal refuges constitute the largest contiguous wildfowl habitat on the Pacific Flyway. Increased water supply allocations under the Central Valley Project Improvement Act (CVPIA), while helping to improve the quality of wetland habitat in the Grasslands Basin can increase the quantity of water returned to the San Joaquin River during the spring months, when seasonal wetlands are drained (Attachments 1 and 2). At the same time the increase in water supply has created opportunities to coordinate the release of this seasonal wetland drainage with the assimilative capacity of the San Joaquin River for salt and boron to help in achieving salt and boron water quality objectives and improve fish habitat in the main stem of the San Joaquin River and Sacramento - San Joaquin Delta. The elevated temperature of all westside discharges to the San Joaquin River can affect the spawning success of salmonids. Improved scheduling of these discharges to avoid critical time periods for fish rearing will also help to remove an important stressor and improve the San Joaquin salmon fishery.

A real-time monitoring and water quality management system is proposed for implementation in the Grassland Water District to improve the coordination of wetland return flows to the San Joaquin River with river assimilative capacity for salt and boron. This system will require the installation of flow and water quality monitoring equipment and cellular telemetry equipment at key locations in the Grasslands Basin. Real-time temperature data will be gathered concurrently with flow, salinity and boron concentration data as input to real-time temperature models of the San Joaquin River.

A GIS-based salt and boron accounting model will be developed for seasonal wetlands in the water district to allow the scheduling of spring-time drainage releases with weekly forecasts of San Joaquin River assimilative capacity for salt and boron. This model will interact directly with the SJRIODAY water quality forecasting model developed by the San Joaquin River Management Program Water Quality Subcommittee. Once fully developed and tested by Grassland Water District staff and project cooperators, this system of real-time monitoring stations and water quality accounting software will be demonstrated to State and Federal refuges within the Grasslands Basin in a number of technical workshops.

During spring 1998 and spring 1998 the project proponents intend to perform a full scale implementation using the decision support system developed for the Grassland Water District with the San Joaquin River water quality forecasting model (SJRIO-DAY). This demonstration will be coordinated through the San Joaquin River Management Program and will seek cooperation from all west side and east side San Joaquin River entities in matching drainage discharge events with forecasted assimilative capacity in the River.

(c) Approach/Tasks/Schedule:
The following tasks will be performed during the 3 year duration of the project;

1. Design a monitoring system for measurement of wetland drainage flow and water quality parameters of concern (flow, EC, temperature).
2. Install real-time EC, flow and temperature sensors in the project area.
3. Develop a GIS-based data management system for storage and analysis of real-time flow, water quality and land use data for analysis of wetland land use, habitat water and drainage requirements and associated management practices.
4. Develop an GIS-based accounting model for estimation and forecasting of residual loads of salt and boron in seasonal wetlands within Grassland WD.

5. Perform active management of wetland releases during spring 1999 and spring 2000 in cooperation with the SJRMP Water Quality Subcommittee using Grasslands and River models.

(d) Justification for the Project and Funding by CALFED

Salinity, boron and temperature have been identified by the CALFED Water Quality Technical Group as water quality stressors of concern in the San Joaquin River. Management of wetland drainage discharges can help to improve San Joaquin River water quality. Management techniques to be employed will include water conservation measures, wetland best management practices and the monitoring of wetland drainage volume and quality. Opportunities will be exploited to improve coordination and scheduling of these discharges consistent with best management practices to coincide with San Joaquin River assimilative capacity. This project provides the basic monitoring information and the decision support tools that will allow this improved coordination to take place. This should help to improve water quality in the San Joaquin River for fish resources as well as improving compliance with State objectives for water quality. This project should have considerable technology transfer value to other agencies that operate seasonal wetlands and also discharge constituents of CALFED concern to the San Joaquin River.

(e) Budget Costs and Third Party Impacts : (3 year duration) : Total cost : $ 496,500

TASK NO.	GRASSLAND WD	LBNL	CRWQCB	USBR	EQUIPMENT /SUPPLIES
Task 1	20,000	28,000	12,000	16,000	5,000
Task 2	60,000	34,000			104,000
Task 3		28,000	24,000	32,000	
Task 4	10,000	20,500		20,000	1,500
Task 5	30,000	13,500	12,000		6,000
TOTALS	120,000	144,000	48,000	68,000	116,500

(f) Applicant qualifications

The team members include Grassland Water District staff, LBNL and CRWQCB personnel all of whom have worked in the Grasslands Basin for more than a decade. The USBR Geographic Information Support Unit has a national reputation in the development of GIS-based modeling tools for project planning and analysis. Key personnel include :

GWD	LBNL	CRWQCB	USBR (GIS)
Scott Lower Don Marciochi Veronica Woodruff Dean Kwasny	Nigel Quinn	Les Grober	Tom Heinzer

(g) Monitoring and Data Evaluation

The monitoring and data gathering required for successful completion of this project will complement the existing compliance monitoring program being undertaken by the cooperating agencies in the Grasslands Bypass project and the routine monitoring performed by the CRWQCB and Grassland Water District.

(h) Local Support/Coordination with Other Programs

This proposed project is a component part of a comprehensive proposal to establish a real-time monitoring and water quality forecasting system in the San Joaquin Basin including all the major east-side tributaries, the west-side agricultural water districts and the main stem of the San Joaquin to Stockton in the Delta (See Attachment 3).

II. TITLE PAGE

(a) Project Title : Real-time water quality management of wetland discharges to the San Joaquin River

(b) Name of Applicant:

Scott Lower : (209) 826-5188
Grassland Water District, 22759 Mercey Springs Road, Los Banos, CA 93635

Nigel Quinn : (510) 486-7056
Lawrence Berkeley National Laboratory, 1 Cyclotron Road, Berkeley, CA 94720

Les Grober : (916) 255-3105
Regional Water Quality Control Board, 3443 Routier Road, Suite A, Sacramento, CA 95827-3098

(c) Type of Organization and Tax Status Water District formed under the California Water Code.

(d) Tax Identification Number 94-2348958

(e) Technical Contact Person

Dr. Nigel W.T. Quinn
Lawrence Berkeley National Laboratory, 70A-3317K
1 Cyclotron Road, Berkeley, CA 94720
(510) 486-7056 : nquinn@mp405a.mp.usbr.gov

(e) Financial Contact Person

Ms Veronica Woodruff
Grassland Water District
22759 Mercey Springs Road
Los Banos, CA 93635
(209) 826-5518 : 76734.1116@compuserve.com

(f) Participants/Collaborators in Implementation

GWD	LBNL	CRWQCB	USBR (GIS)
Scott Lower Don Marciochi Veronica Woodruff Dean Kwasny	Nigel Quinn	Les Grober	Tom Heinzer

g. RFP Project Type : Other Services.

III. PROJECT DESCRIPTION

Project Title: **Real-time water quality management of wetland discharges to the San Joaquin River**

(a) Project description and Approach:

The major water quality problems on the lower San Joaquin River are caused by high loadings of selenium, boron and salt. The average annual salt load carried by the San Joaquin River is approximately 920,000 tons of which the east-side tributaries contribute 16%, Salt Slough 33% and Mud Slough 11%. The remainder of the salt load is comprised of groundwater (21%), and surface drainage downstream of Mud and Salt Sloughs (16%). Mud and Salt Sloughs contain a mixture of surface and subsurface agricultural drainage, flood flows and wetland discharges. Seasonal drainage from approximately 50,000 acres of seasonal wetlands within the Grassland Water District (Attachments 1 and 2) contribute a portion of the salt load discharged from Mud and Salt Sloughs to the San Joaquin River

The Grassland Water District together with the adjacent State and Federal refuges constitute the largest contiguous wildfowl habitat on the Pacific Flyway. Increased water supply allocations under the Central Valley Project Improvement Act (CVPIA), while helping to improve the quality of wetland habitat in the Grasslands Basin can increase the quantity of water returned to the San Joaquin River during the spring months, when seasonal wetlands are drained. At the same time the increase in water supply has created opportunities to coordinate the release of this seasonal wetland drainage with the assimilative capacity of the San Joaquin River for salt and boron to help in achieving salt and boron water quality objectives and improve fish habitat in the main stem of the San Joaquin River and Sacramento - San Joaquin Delta. The elevated temperature of all west-side discharges to the San Joaquin River can affect the spawning success of salmonids. Improved scheduling of these discharges to avoid critical time periods for fish rearing will also help to remove an important stressor and improve the San Joaquin salmon fishery.

A real-time monitoring and water quality management system is proposed for implementation in the Grassland Water District to improve the coordination of wetland return flows to the San Joaquin River with river assimilative capacity for salt and boron. This system will require the installation of flow and water quality monitoring equipment and cellular telemetry equipment at key locations in the Grasslands Basin. The temperature of inflows to the San Joaquin River can affect the spawning success of certain fish species during critical times of the year. Real-time temperature data will be gathered concurrently with flow, salinity and boron concentration data as input to a real-time temperature forecasting model of the San Joaquin River. A project proposal to develop a real-time temperature forecasting model for the San Joaquin River has been submitted under separate cover and is part of a comprehensive real-time monitoring system proposed by members of the San Joaquin River Management Program Water Quality Subcommittee for the San Joaquin River (see Attachment 3).

A GIS-based salt and boron accounting model will be developed for seasonal wetlands in the water district to allow the scheduling of spring-time drainage releases with weekly forecasts of San Joaquin River assimilative capacity for salt and boron. This model will interact directly with the SJRIODAY water quality forecasting model developed by the San Joaquin River Management Program Water Quality Subcommittee. Once fully developed and tested by Grassland Water District staff and project cooperators, this system of real-time monitoring stations and water quality accounting software will be demonstrated to State and Federal refuges within the Grasslands Basin in a number of technical workshops.

During spring 1998 and spring 1998 the project proponents intend to perform a full scale implementation using the decision support system developed for the Grassland Water District with the San Joaquin River water quality forecasting model (SJRIODAY). This demonstration will be coordinated through the San Joaquin River Management Program and will seek cooperation from all west side and east side San Joaquin River entities in matching drainage discharge events with forecasted assimilative capacity in the River.

Project Approach/Tasks:
The following tasks will be performed during the 3 year duration of the project ;

1. Design a monitoring system for measurement of wetland drainage flow and water quality parameters of concern (flow, EC, temperature).
   (a) Survey Grasslands drainage system and verify drainage hydrology.
   (b) Determine GIS data needs, base maps and data layers.
   (c) Design flow structures or AVM sensor setup at key monitoring sites.
   (d) Identify local weather stations and site new stations if inadequate.

2. Install real-time EC, flow and temperature sensors in the project area.
   (a) Implement a quality assurance/ quality control and maintenance program.
   (b) Perform seasonal mass balance analysis in Basin to ensure complete accounting of the Grassland Water District hydrology.

3. Develop a GIS-based data management system for storage and analysis of real-time flow, water quality and land use data for analysis of wetland land use, habitat water needs, drainage requirements and associated management practices.
   (a) Digitize relevant land use, soils, habitat and wetland management to create GIS maps using ARC-INFO and ARCVIEW.
   (b) Work closely with Grassland WD biologists to develop analytical tools that assist in analysis of wetland water requirements and development of best management practices.

4. Develop an GIS-based accounting model for estimation and forecasting of residual loads of salt and boron in seasonal wetlands within Grassland WD.
   (a) Develop a mass balance model based on basin hydrology (inflow, evaporation, evapotranspiration, seepage, outflow) and water quality (salt, boron).
   (b) Develop user interface to interact with existing San Joaquin River water quality forecasting model to aid scheduling of wetland releases.

5. Active management of wetland releases during spring 1999 and spring 2000 with SJRMP Water Quality Subcommittee using Grassland WD GIS-based accounting model together with SJRMP-WQS San Joaquin water quality forecasting model.
   (a) Demonstration of the benefits of improved coordination and scheduling of return flows coordinated with San Joaquin River Management Program.
   (b) Workshops to demonstrate system use to adjacent State and Federal wildlife refuges.

(b) Location of Project

The Grassland Water District is a 50,000 acre area to the north and south of Los Banos on the west side of the San Joaquin Valley (Attachment 2). The project area includes approximately 90 miles of wetland channels and is bounded by the Main Canal and Delta Mendota Canal to the west and the San Luis Drain to the east. Wetland drainage from the Grassland Water District is conveyed to the San Joaquin River through either Mud Slough (north) or Salt Slough.

(c) Expected Benefits

Salinity, boron and temperature have been identified by the CALFED Water Quality Technical Group as water quality stressors of concern in the San Joaquin River. Increased water supply allocations under the Central Valley Project Improvement Act (CVPIA) has created opportunities to coordinate the release of this seasonal wetland drainage with the assimilative capacity of the San Joaquin River for salt and boron to help in achieving salt and boron water quality objectives and improve fish habitat in the main stem of the San Joaquin River and Sacramento - San Joaquin Delta. Improved scheduling of west-side discharges can assist in avoiding critical time periods for fish rearing and remove an important stressor leading to improvements in the San Joaquin salmon fishery. Management techniques to be employed will include water conservation measures, wetland

best management practices and the monitoring of wetland drainage volume and quality. Opportunities will be exploited to improve coordination and scheduling of these discharges consistent with best management practices to coincide with San Joaquin River assimilative capacity. This project provides the basic monitoring information and provide the decision support tools that will allow this improved coordination to make place. This project should have considerable technology transfer value to other agencies that operate seasonal wetlands and also discharge constituents of CALFED concern to the San Joaquin River.

(d) Background and Technical Justification

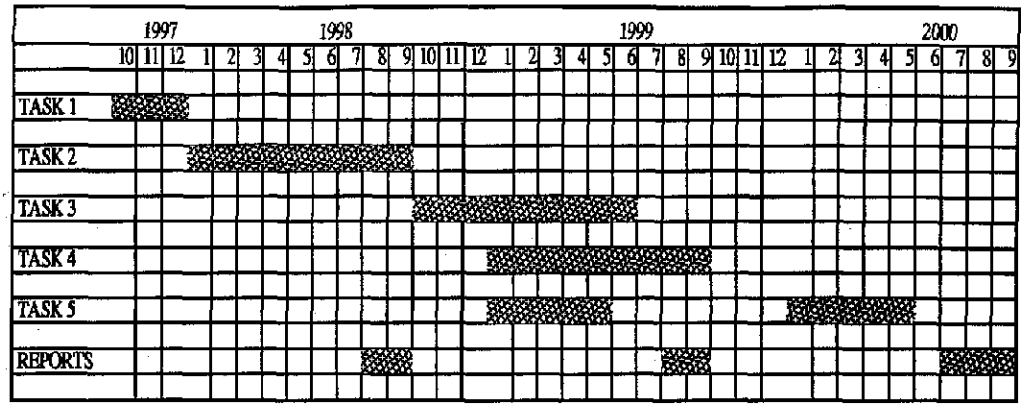
This project ties in directly to the current San Joaquin River real-time forecasting effort that has been supported by the US Bureau of Reclamation under a Challenge Grant for the past three years. The information and decision support tools in this proposed project will help to improve the accuracy of the water quality forecasts made with the SJRIODAY model especially during the spring months when seasonal drainage of up to 50,000 acres of wetlands occurs. At the present time the SJRIODAY forecasting model relies on historic patterns of wetland release in estimating Mud Slough flow, salinity and boron loads. The current program has been successful in demonstrating the potential benefits of a real-time water quality management system. For the 1985 to 1994 period, the electrical conductivity (EC) at Vernalis exceeded the State Water Resources Control Board (SWRCB) water quality objective of 700 us/cm approximately 61% of the time during the irrigation season (April 1 - August 30). The non-irrigation season (September 1 - March 31) EC objective at Vernalis of 1,000 us/cm was exceeded approximately 15% of the time.

An initial trial of the concept proposed in this application was performed during January 1996. The Grassland Water District, with the recent acquisition of supplemental water supplies under the Central Valley Project Improvement Act, sought to make an early drainage release of ponded water to reduce the likelihood of downstream salinity impacts and salinity objective violations in the San Joaquin River later in the season. The Water District requested that the SJRMP-WQS provide a forecast of the most advantageous time to make this release. A model forecast, made on January 15, 1996 suggested that the combination of high river flows and an imminent rainstorm might provide the necessary assimilative capacity. The peak wetland release was timed so that it would coincide with the peak flow in the San Joaquin River. Wetland flushing began on January 18 and ended on February 19, with the peak wetland discharge occurring on January 27. Peak wetland discharge reached the San Joaquin River near Vernalis between February 1 and February 11. (Attachment 4 shows a period of rising streamflow between these dates). Flow at Vernalis was 2600 cfs and EC was 800 uS/cm on January 18 before arrival of the wetland discharges. Flow ranged from 5,500 cfs and 11,000 cfs at Vernalis when the peak wetland discharge reached Vernalis. The EC declined from 500 uS/cm to below 300 uS/cm during this time period. Assimilative capacity was positive in the River throughout the simulation period owing to the rainfall-runoff events in the upper watershed. No violations of the EC objective occurred during the trial period and there were no EC violations in the San Joaquin River during March and April, 1996.

(e) Proposed Scope of Work and Schedule

The proposed project will have a three year duration with planning and installation of the monitoring system occuring during year 1, the development of a wetland salt and boron accounting model during year 2, and the field coordination of wetland flows by the SJRMP Water Quality subcommittee in both years 2 and 3 of the proposed project.

The work schedule is shown in the table overleaf. Two progress reports and one final project report will be prepared summarizing the objectives accomplished during the year and results from monitoring activities in the Water District. A number of workshops will be conducted to assist potential users of the computer software developed as part of this proposed project in accessing data from the monitoring system, planning drainage release schedules and developing long-term best management practices for seasonal wetlands within the Water District.



(f) Monitoring, Data Evaluation and Coordination

The monitoring and data gathering required for successful completion of this project will complement the existing compliance monitoring program being undertaken by the cooperating agencies in the Grasslands Bypass project and the routine monitoring performed by the CRWQCB and Grassland Water District.

The San Joaquin River Real-Time Water Quality Management Program proposal will use telemetered stream stage and salinity data and computer models to simulate and forecast water quality conditions along the lower SJR. The primary benefit of this project will be to increase the frequency of meeting SJR water quality objectives for salinity. Real-time Management of Wetland Drainage Releases proposes to monitor wetland discharges in conjunction with adaptive management actions to reduce the adverse impacts from wetland discharge on lower SJR water quality. Assessment of the Stanislaus River Corridor Below Goodwin Dam proposes to identify the processes that contributed to the river's existing condition, and to evaluate how such conditions affect the adaptive management of fall run chinook salmon. Expansion of a Decision Support System for the Lower San Joaquin River Basin proposes to expand the geographic scope and water quality parameters considered in the San Joaquin River Real-Time Water Quality Management Program's current modeling effort. New model parameters include temperature and dissolved oxygen and the new geographic scope includes the east side tributaries upstream to the major reservoirs and downstream to Stockton.

Activities of these individual programs will be coordinated by members of the San Joaquin River Management Program Water Quality Subcommittee. Data will be freely exchanged between the participating agencies and duplication of effort will be minimized.

(g) Implementability

During the past 2 years the Water Quality Subcommittee of the San Joaquin River Management program has held a number of workshops to demonstrate the concepts of real-time water quality management, to encourage the maintenance of real-time flow and water quality monitoring stations and to train potential users in the correct use of the San Joaquin water quality forecasting model SJRIODAY.

IV. COSTS AND SCHEDULE TO IMPLEMENT PROPOSED PROJECT

(a) Budget costs : (Oct 1, 1997 - Sept 30, 2000) : Total cost : $ 496,500

TASK	GRASSLAND WD	LBNL	CRWQCB	USBR	EQUIPMENT / SUPPLIES / TRAVEL
Task 1	20,000	28,000	12,000	16,000	5,000
Task 2	30,000	34,000			104,000
Task 3	30,000	28,000	24,000	32,000	
Task 4	10,000	40,500		20,000	1,500
Task 5	30,000	13,500	12,000		6,000
TOTALS	120,000	144,000	48,000	68,000	116,500

(b) Cost Breakdown Table (Oct 1, 1997 - Sept 30, 2000)

PERSONNEL	TIME (mo)	FY 1998	FY 1999	FY 2000
Engineer/Scientist (LBNL)	12	62,000	68,500	13,500
Hydrologist (CRWQCB)	4	12,000	24,000	12,000
GIS consultant (USBR)	5	16,000	52,000	
Water Master (GWD)	4	10,000	10,000	15,000
Field Technician (GWD)	6	20,000	5,000	
Wetland biologist	6	15,000	20,000	7,500
Office manager / accountant	2	5,000	5,000	7,500

EQUIPMENT AND SUPPLIES	Unit cost			
Flow monitoring construction	$ 4500	23,500		
EC, stage, temperature sensors	$ 2,500	12,500		
Datalogging and telemetry	$ 2000	10,000		
Site maintenance per month	$ 1000	12,000	12,000	12,000
Computer and miscellaneous		8,000	5,000	5,000
TRAVEL		66,000	17,000	17,000
Local travel and conference		7,500	4,500	4,500

SUBTOTAL		243,500	175,500	77,500
TOTAL (3 years)	496,500			

(c) Schedule Milestones

Oct 1 1997 - Sept 30 1998	Construction of flow monitoring stations Installation of sensors, telemetry Data acquisition and compilation
Oct 1, 1998 - Sept 30, 1999	GIS-based model development and testing
Jan 1, 1998 - Jun 1, 1998	Forecasting and management of first year wetland drainage
Jun 1, 1998 - Sept 30, 1999	Further refinement of model
Jan 1, 1999 - Jun 1, 1999	Forecasting and management of second year wetland drainage
Jun 1, 1999 - Sept 30, 2000	Workshops and demonstrations of real-time management system to State and Federal Refuges.

(d) Third Party Impacts

No significant third party impacts are anticipated as a result of this project.

V. APPLICANT QUALIFICATIONS

The team members include Grassland Water District staff, LBNL and CRWQCB personnel, all of whom have worked in the Grasslands Basin for more than a decade. Scott Lower and Don Marchioci understand the complex plumbing of the flow and drainage distribution system in the District, knowledge that is essential for the development of a monitoring plan and salinity accounting model. Nigel Quinn and Les Grober both have extensive modeling backgrounds and have been working together and independently on selenium fate and transport experiments in the District for the past 5 years. The USBR Geographic Information Support Unit has a national reputation in the development of GIS-based modeling tools for project planning and analysis and has already developed many of the base coverages for the Grasslands basin that will be used in this project .

Scott Lower *(Water Superintendent, Grassland Water District)*

Scott Lower is the water master for the Grassland Water District where he has worked since 1983. Scott's duties at the Water District involve managing the water distribution system within Grassland Water District, accounting for water deliveries to Water District contractors and overseeing the District's monitoring program. He previously owned his own printing business for 8 years prior to working for the Water District. Scott earned a BA degree in Graphic Arts from San Jose State University in San Jose, California and has an AA degree from Cabrillo Junior College.

Nigel Quinn (Geological Scientist, Lawrence Berkeley National Laboratory / Water Resources Engineer, US Bureau of Reclamation)

Nigel Quinn received a BSc (Hons) in irrigation engineering and hydrology from the Cranfield Institute of Technology in England and spent the early part of his career as an irrigation engineer for Tate and Lyle Inc. designing and troubleshooting irrigation systems in England and in Africa. He left England for Iowa in 1978 where he taught agricultural water management, rural water supply engineering and surveying courses for three years, earning an MS in Agricultural and Civil Engineering and conducting research in soil erosion under crop canopy. In 1981 he took a position at Cornell University where he worked on various projects ranging from earthworm vermicomposting, pesticide model development and water supply and sanitation policy in developing countries, co-taught classes in surveying and computer programming and earned a PhD in civil and environmental engineering in 1987. He then joined the San Joaquin Valley Drainage Program, retaining a faculty affiliation with Cornell, and took responsibility for development of groundwater and drainage models to support the Drainage Program's planning effort. With the sunset of the Drainage Program he has continued his work with the US Bureau of Reclamation dividing his time between monitoring efforts in support of the Grasslands Bypass project, development of real-time forecasting tools for the San Joaquin River and selenium fate and transport research projects. He has been affiliated with Lawrence Berkeley National Laboratory for the past 6 years. Nigel is the author of over 50 publications and reports on various aspects of water resources and drainage engineering.

Leslie Grober (CRWQCB-CVR Associate Land and Water Use Analyst)

Leslie Grober's duties and responsibilities with the CRWQCB are as follows : (1) run the forecasting model and review DWR's forecasting model results, (2) supervise staff conducting water quality sampling described under Task 3, (3) participate in workshops to solicit interest and participation by stakeholders in Program activities, and (4) assist in the documentation of Program activities and accomplishments on the Internet through the future SJRMP home page and through annual hard-copy status reports to CALFED.

Leslie Grober has earned a B.S. in Geology, a M.S. in Hydrologic Science, and is currently pursuing a Ph.D. in Hydrologic Science from the University of California, Davis. He has extensive

background in hydrologic, hydraulic, and water quality modeling. He currently provides flow and water quality monitoring support for the CRWQCB program that monitors agricultural discharges in the SJR Basin, updates and maintains the San Joaquin River Input Output (SJRIO) water quality model, and provides modeling support to state and local agencies to evaluate the impact of management strategies on SJR water quality (e.g., to the SJRMP Water Quality subcommittee for the SJR Real-time Water Quality Management Demonstration Project and to the SWRCB to evaluate programmatic alternatives in the SWRCB's draft Environmental Impact Report to implement requirements in the 1995 Bay-Delta Plan.)

Tom Heinzer (Consulting GIS Analyst, U.S. Bureau of Reclamation)

Tom Heinzer earned a B.S. Chemical Engineering from U.C. Berkeley in 1982 and has worked for USBR in different capacities for 13 years. He transferred to the GIS project (MPGIS) in 1986, where he was responsible for application development and analysis, and remains so to this day. During the last several years, Tom has worked extensively to develop techniques to interface GIS software to environmental models. Although most of his research has focused water modeling, specifically 1 and 2-D hydrodynamic models (DAMBRK, IGSM, MIKE21, others), and ground water models (mainly MODFLOW), he has also been involved in other types of modeling such as visibility analysis, allocation, terrain and archeological site prediction.

Don Marciochi (General Manager, Grassland Water District)

Don Marciochi has been employed by the Grassland Water District since October 1973 and has served as the District's General Manager since 1983. He led the District's efforts to secure a firm water supply by active participation in the development of the refuge provisions of CVPIA and similarly was involved in bringing about the implementation of projects to remove selenium contaminated drainwater from the District's water supply. Don has a degree in history from California State University in Fresno.

Veronica Woodruff (Executive Secretary / Office Manager / Treasurer, Grassland Water District)

Veronica Woodruff currently fills multiple roles in the Grassland Water District as Executive Secretary, Office Manager and Treasurer and has worked with the District since 1989. She attended Merced Junior College and has gained the majority of her skills through on-the-job training together with a number of computer training, software and programming courses. Veronica has a strong background in data processing.

Dean Kwasny (Wildlife Biologist, Grassland Water District)

Dean Kwasny has recently joined the Grassland Water District as a full-time Wildlife Biologist. He has worked with Ducks Unlimited and the State Department of Fish and Game and holds a MS degree in wildlife management from Humboldt State University. Dean's thesis studied the impacts of cattle grazing on breeding grassland birds at the Humboldt Bay National Wildlife Refuge. For the past 4 years he has worked in several coastal wildlife areas, putting in place management strategies for waterfowl and other wetland related species.

REFERENCES

Quinn N.W.T., C.W. Chen, L.F. Grober, J. Kipps and E. Cummings. 1997. Real-time management of water quality in the San Joaquin River. California Agriculture. September/October Issue.

Quinn N.W.T. and J. Karkoski. 1997. Potential for real time management of water quality in the San Joaquin Basin, California. Submitted to the Journal of the American Water Resources Association.

Karkoski J., N.W.T. Quinn, L.F.Grober, J.E. Chilcott, A. Vargas. 1995. Selenium transport in the Grasslands watershed. Poster session. Selenium in the Environment: Essential Nutrient, Potential Toxicant. Cooperative Extension and U.C. Veterinary Medical Extension Conference, June 1,2 1995, Sacramento.

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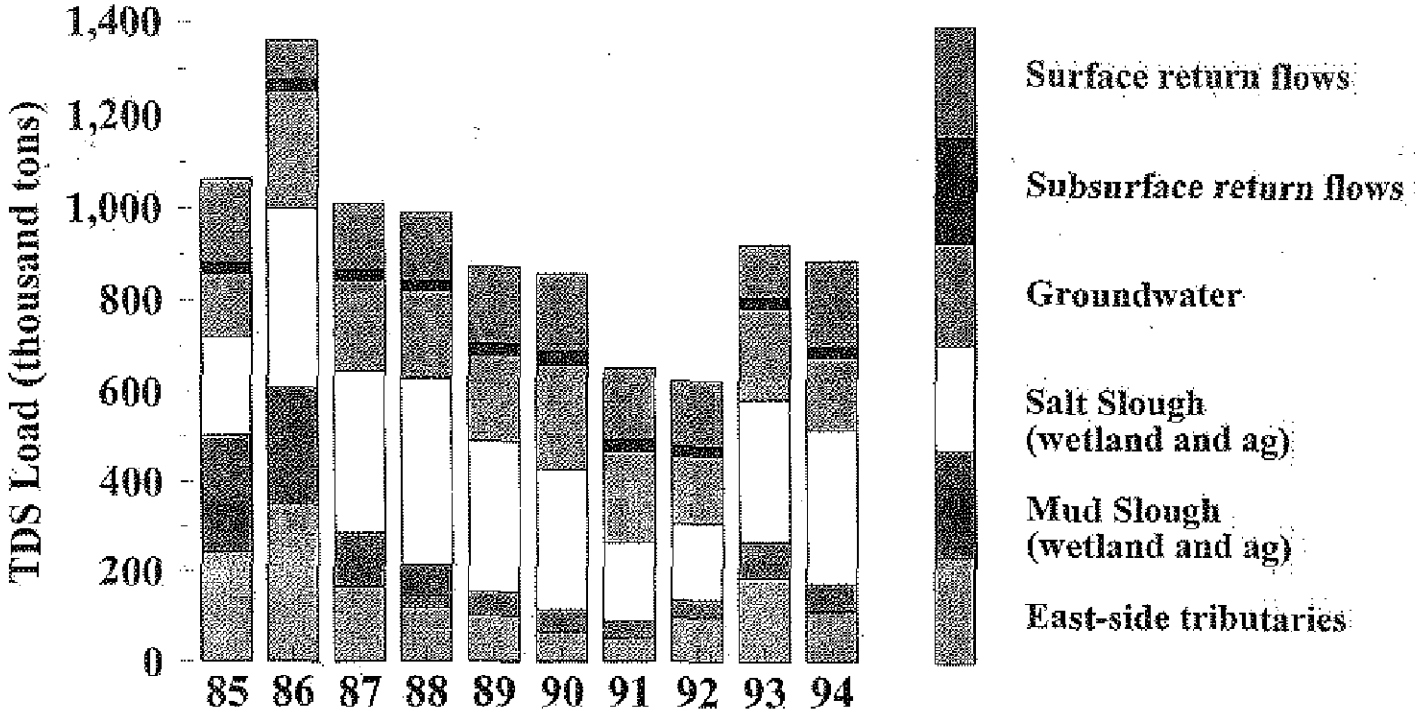
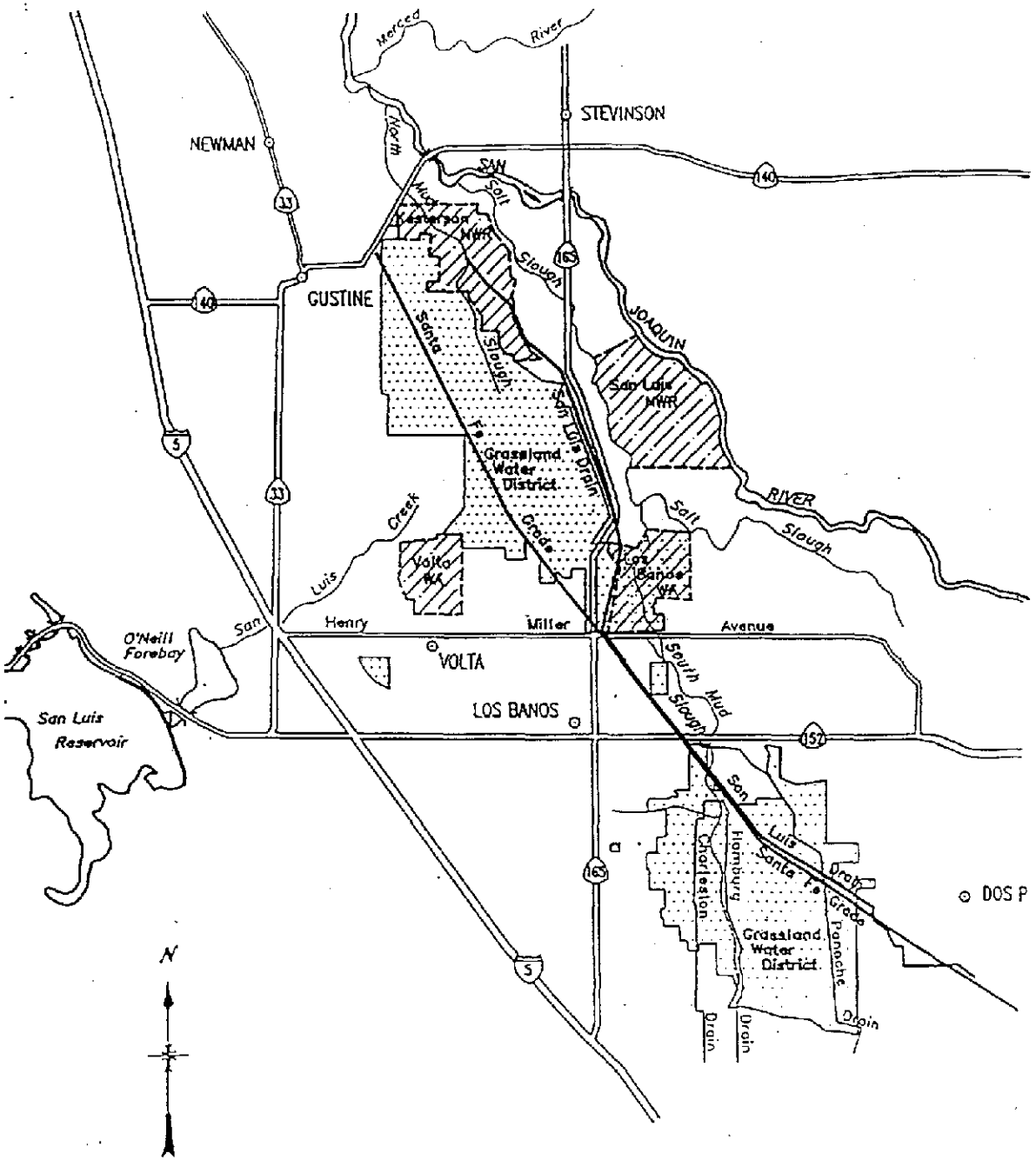


ATTACHMENT 1. Contribution to salinity loading from various sources in the Grasslands Basin.



ATTACHMENT 2. Location of project area relative to the San Joaquin River and Bay-Delta. Mud and Salt Slough convey all wetland drainage to the San Joaquin River.

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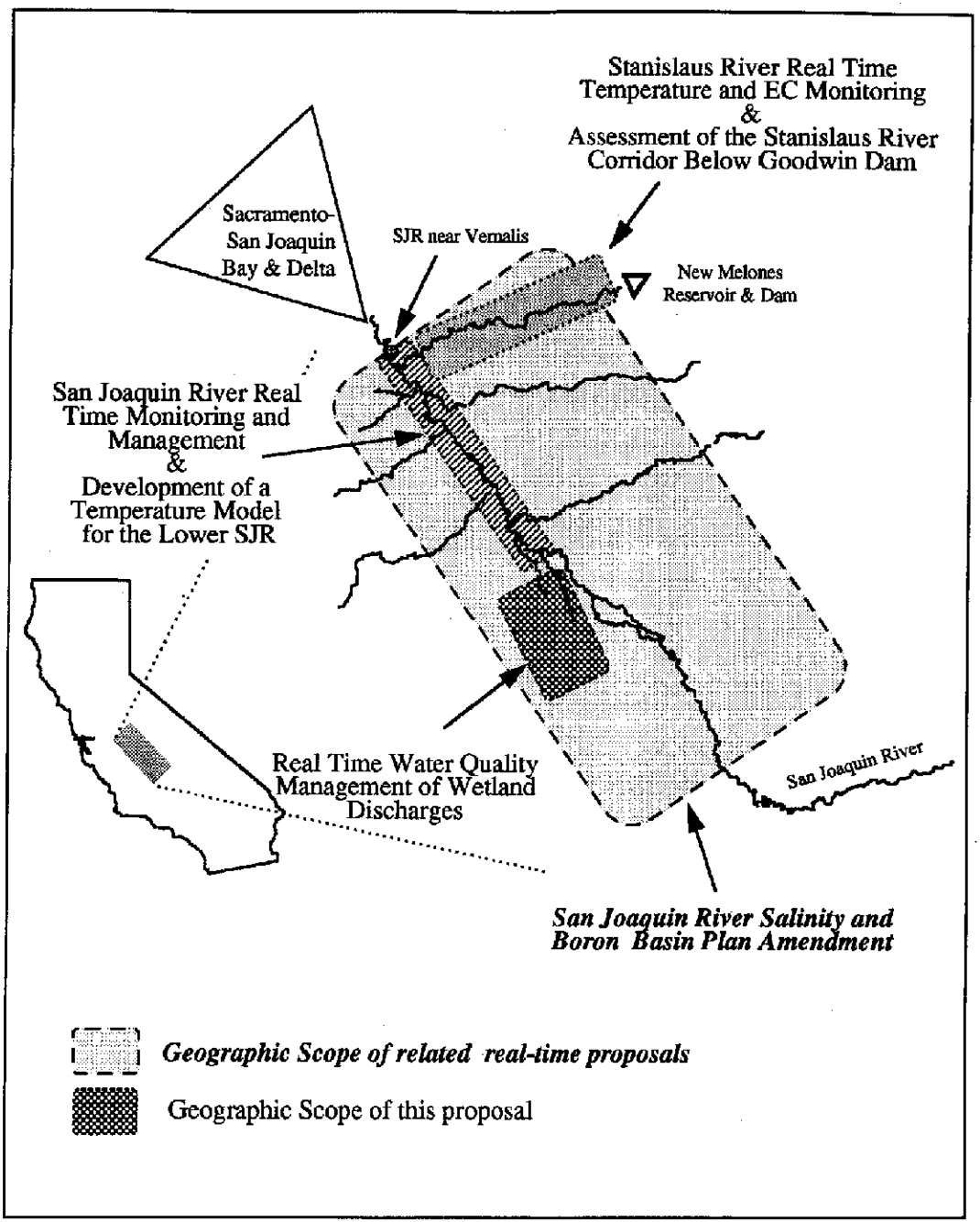
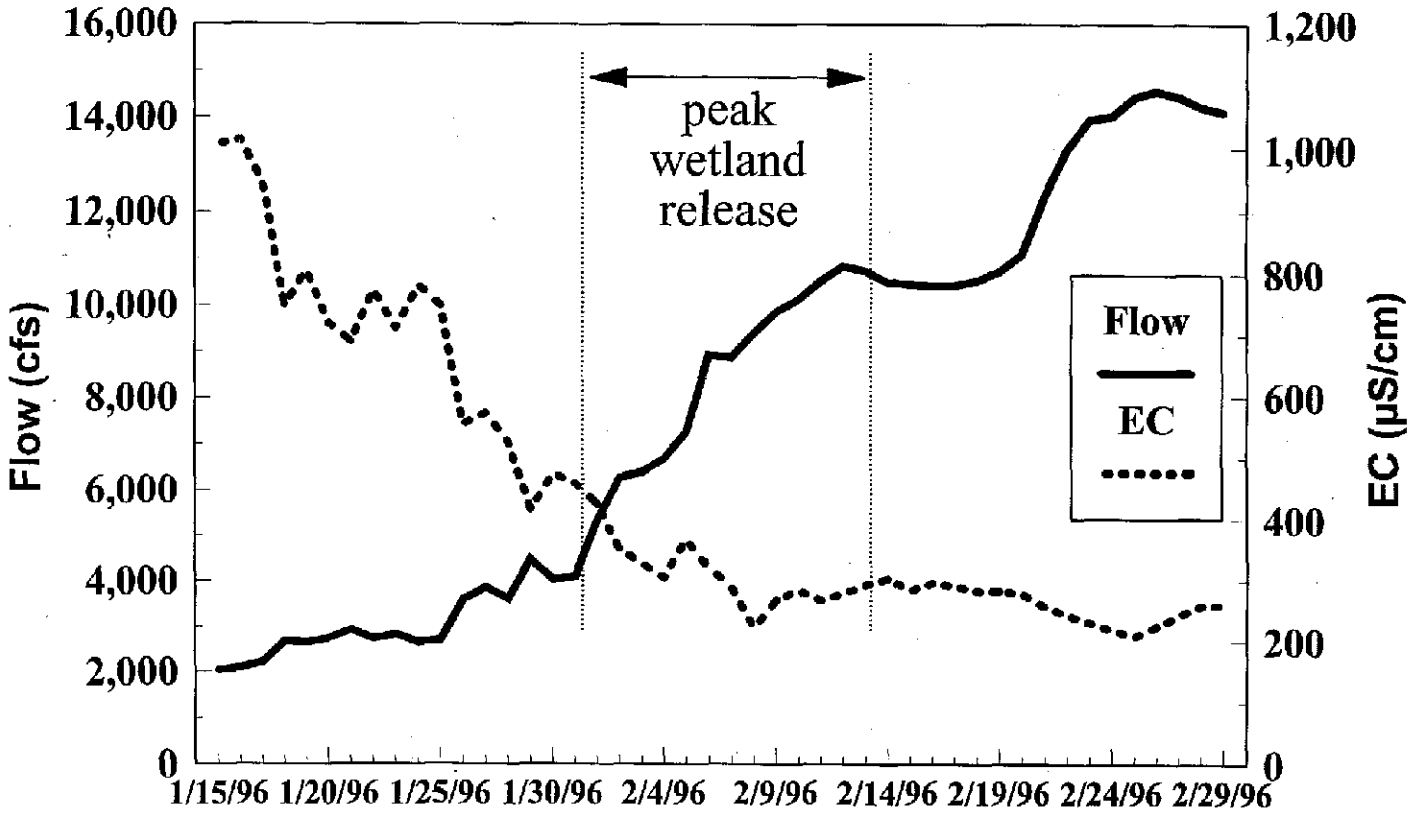


ATTACHMENT 3. Scope of Related CALFED Real-Time Project Proposals



ATTACHMENT 4. Flow and salinity (EC) in the San Joaquin River at Vernalis resulting from the scheduled early wetland release during January and February 1996.

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Item 8

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME
GRASSLAND WATER DISTRICT

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME
Don Marciochi

DATE EXECUTED	EXECUTED IN THE COUNTY OF
July 25, 1997	Merced, California

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE
General Manager

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME
Grassland Water District

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