Wetlands Biofilter

Project Information

1. **Proposal Title:**

   Wetlands Biofilter

2. **Proposal applicants:**

   Duke Foster, National Grants
   Kevin Emigh, Contra Costa County

3. **Corresponding Contact Person:**

   Duke Foster
   National Grants
   19221 Red Hill Mine Road Pine Grove, CA 95665
   209 296-5657
   duke@volcano.net

4. **Project Keywords:**

   Hydrodynamics
   Sediment Generation, Movement, and Accumulation
   Wetlands Ecology

5. **Type of project:**

   Research

6. **Does the project involve land acquisition, either in fee or through a conservation easement?**

   No

7. **Topic Area**:

   Floodplains and Bypasses as Ecosystem Tools

8. **Type of applicant:**

   Local Agency

9. **Location - GIS coordinates:**

   Latitude: 39.9818

   Longitude: -122.6721

   Datum:

Describe project location using information such as water bodies, river miles, road intersections, landmarks, and size in acres.

Sunset Road and No Name Slough (Knightsen & Veale Tract, Contra Costa County)

10. **Location - Ecozone:**

    1.4 Central and West Delta

11. **Location - County:**

    Contra Costa

12. **Location - City:**

    Does your project fall within a city jurisdiction?

    No

13. **Location - Tribal Lands:**

    Does your project fall on or adjacent to tribal lands?

    No

14. **Location - Congressional District:**

    7

15. **Location:**

    California State Senate District Number: 7

    California Assembly District Number: 11 & 15

16. **How many years of funding are you requesting?**

    3

17. **Requested Funds:**
    a) Are your overhead rates different depending on whether funds are state or federal?

       No

       If no, list single overhead rate and total requested funds:

       Single Overhead Rate: 22

       Total Requested Funds: 134000

    b) Do you have cost share partners already identified?

Yes

If yes, list partners and amount contributed by each:

EPA 50,000

c) Do you have potential cost share partners?

No

d) Are you specifically seeking non-federal cost share funds through this solicitation?

No

If the total non-federal cost share funds requested above does not match the total state funds requested in 17a, please explain the difference:

18. **Is this proposal for next-phase funding of an ongoing project funded by CALFED?**

No

Have you previously received funding from CALFED for other projects not listed above?

Yes

If yes, identify project number(s), title(s) and CALFED program.

WSP01-0052 Walnut Creek Watershed Watershed

19. **Is this proposal for next-phase funding of an ongoing project funded by CVPIA?**

No

Have you previously received funding from CVPIA for other projects not listed above?

No

20. **Is this proposal for next-phase funding of an ongoing project funded by an entity other than CALFED or CVPIA?**

No

Please list suggested reviewers for your proposal. (optional)

George Molnar LSA 510-236-6810

Scott Clemons WCB 916-497-0434

Craig Stowers DFG 916-691-2122

21. **Comments:**

Environmental Compliance Checklist

Wetlands Biofilter

1. **CEQA or NEPA Compliance**
   a) Will this project require compliance with CEQA?

      No
   b) Will this project require compliance with NEPA?

      No
   c) If neither CEQA or NEPA compliance is required, please explain why compliance is not required for the actions in this proposal.

      Research only

2. **If the project will require CEQA and/or NEPA compliance, identify the lead agency(ies).** *If not applicable, put "None".*

   CEQA Lead Agency: Contra Costa County
   NEPA Lead Agency (or co-lead:) None
   NEPA Co-Lead Agency (if applicable): None

3. **Please check which type of CEQA/NEPA documentation is anticipated.**

   CEQA
   XCategorical Exemption
   -Negative Declaration or Mitigated Negative Declaration
   -EIR
   -none

   NEPA
   XCategorical Exclusion
   -Environmental Assessment/FONSI
   -EIS
   -none

   If you anticipate relying on either the Categorical Exemption or Categorical Exclusion for this project, please specifically identify the exemption and/or exclusion that you believe covers this project.

   None

4. **CEQA/NEPA Process**
   a) Is the CEQA/NEPA process complete?

      No

      If the CEQA/NEPA process is not complete, please describe the dates for completing draft and/or final CEQA/NEPA documents.

Approx. April 15, 2002

b) If the CEQA/NEPA document has been completed, please list document name(s):

None
None
None

5. **Environmental Permitting and Approvals** (*If a permit is not required, leave both Required? and Obtained? check boxes blank.*)

LOCAL PERMITS AND APPROVALS

Conditional use permit	Obtained
Variance	Obtained
Subdivision Map Act	Obtained
Grading Permit	Obtained
General Plan Amendment	Obtained
Specific Plan Approval	Obtained
Rezone	Obtained
Williamson Act Contract Cancellation	Obtained
Other	Obtained

STATE PERMITS AND APPROVALS

Scientific Collecting Permit	Obtained
CESA Compliance: 2081	Obtained
CESA Compliance: NCCP	Obtained
1601/03	Obtained
CWA 401 certification	Required
Coastal Development Permit	Obtained
Reclamation Board Approval	Obtained
Notification of DPC or BCDC	Obtained
Other	Obtained

FEDERAL PERMITS AND APPROVALS

ESA Compliance Section 7 Consultation	
ESA Compliance Section 10 Permit	Obtained
Rivers and Harbors Act	Obtained
CWA 404	Obtained
Other	Obtained

PERMISSION TO ACCESS PROPERTY

Permission to access city, county or other local agency land. Agency Name: contra costa county	Obtained
Permission to access state land. Agency Name: None	Obtained
Permission to access federal land. Agency Name: None	Obtained
Permission to access private land. Landowner Name:	Obtained

6. **Comments.**

ceqa & nepa not required nor are other permits because this is a research/study proposal

Land Use Checklist

Wetlands Biofilter

1. **Does the project involve land acquisition, either in fee or through a conservation easement?**

   No

2. **Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?**

   No

3. **Do the actions in the proposal involve physical changes in the land use?**

   No

   If you answered no to #3, explain what type of actions are involved in the proposal (i.e., research only, planning only).

   This is a study only

4. **Comments.**

Conflict of Interest Checklist

Wetlands Biofilter

Please list below the full names and organizations of all individuals in the following categories:

- Applicants listed in the proposal who wrote the proposal, will be performing the tasks listed in the proposal or who will benefit financially if the proposal is funded.
- Subcontractors listed in the proposal who will perform some tasks listed in the proposal and will benefit financially if the proposal is funded.
- Individuals not listed in the proposal who helped with proposal development, for example by reviewing drafts, or by providing critical suggestions or ideas contained within the proposal.

The information provided on this form will be used to select appropriate and unbiased reviewers for your proposal.

Applicant(s):

Duke Foster, National Grants
Kevin Emigh, Contra Costa County

Subcontractor(s):

Are specific subcontractors identified in this proposal? No

Helped with proposal development:

Are there persons who helped with proposal development?

Yes

If yes, please list the name(s) and organization(s):

Kevin Emigh Contra Costa County

Allison Knapp Contra Costa County

Comments:

None

Budget Summary

Wetlands Biofilter

Please provide a detailed budget for each year of requested funds, indicating on the form whether the indirect costs are based on the Federal overhead rate, State overhead rate, or are independent of fund source.

Independent of Fund Source

Year 1												
Task No.	**Task Description**	**Direct Labor Hours**	**Salary *(per year)***	**Benefits *(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
2	Field testing & observations	34	3270	inclusive	60	150	21930	0	0	25410.0	0	25410.00
3	Refinement of wetland concept, site selection & alternative	124	13120	inclusive	240	0	39880	0	0	53240.0	0	53240.00
4	Assessment of hydrologic impacts from wetland system	270	25300	inclusive	60	0	4320	0	0	29680.0	0	29680.00
5	Wetland planning, permitting & cost estimates	LS	LS	inclusive	60	0	12800	0	0	12860.0	0	12860.00
6	Project coordination	191	13400	inclusive	0	0	0	0	0	13400.0	0	13400.00
		619	55090.00	0.00	420.00	150.00	78930.00	0.00	0.00	134590.00	0.00	134590.00

Year 2												
Task No.	**Task Description**	**Direct Labor Hours**	**Salary *(per year)***	**Benefits *(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Year 3												
Task No.	**Task Description**	**Direct Labor Hours**	**Salary *(per year)***	**Benefits *(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Grand Total=134590.00

Comments.
The ’Salary per Year’ category was very misleading. Please understand these are estimates.

Budget Justification

Wetlands Biofilter

Direct Labor Hours. Provide estimated hours proposed for each individual.

Principal 18 hrs, Sr. Associate 124 hrs, Graphics/CADD 5 hrs, Hydrologist 276 hrs, Sect. 5 hrs, Project coordinator (county) 200 hrs.

Salary. Provide estimated rate of compensation proposed for each individual.

Principal $145, Sr. Associate $122, Graphics/CADD $78, Hydrologist $90, Sect. $50, Project coordinator (county) $70.

Benefits. Provide the overall benefit rate applicable to each category of employee proposed in the project.

Overall rate is approximately 15%

Travel. Provide purpose and estimate costs for all non-local travel.

Field surveys $420

Supplies & Expendables. Indicate separately the amounts proposed for office, laboratory, computing, and field supplies.

Office supplies $150

Services or Consultants. Identify the specific tasks for which these services would be used. Estimate amount of time required and the hourly or daily rate.

Subconsultant - LS $78930, Messenger - 10 hrs, LS $100

Equipment. Identify non-expendable personal property having a useful life of more than one (1) year and an acquisition cost of more than $5,000 per unit. If fabrication of equipment is proposed, list parts and materials required for each, and show costs separately from the other items.

None

Project Management. Describe the specific costs associated with insuring accomplishment of a specific project, such as inspection of work in progress, validation of costs, report preparation, giving presentatons, reponse to project specific questions and necessary costs directly associated with specific project oversight.

Field testing & observation - $25200, Refinement of wetland concept, site selection and alternatives analysis - $53000, Assessment of hydrologic impacts from wetland system - $29620, Wetland planning, permitting & cost estimates - $12800, Project coordnation of all services (review, approve & counsel) - $13,400. This information is repeated in greater detail in the narrative.

Other Direct Costs. Provide any other direct costs not already covered.

None

Indirect Costs. Explain what is encompassed in the overhead rate (indirect costs). Overhead should include costs associated with general office requirements such as rent, phones, furniture, general office staff, etc., generally distributed by a predetermined percentage (or surcharge) of specific costs.

Approximately 15% for general overhead on ALL costs

Executive Summary

Wetlands Biofilter

Executive Summary Knightsen is located in unincorporated eastern Contra Costa County west of Veale Tract and south of Rock Slough. The project type is research. This project will be a continuation of phases necessary for the evaluation and reseasrch of a wetlands biofilter for agriculture lands adjacent to the delta. The eventual implementation of this system will deal with tail waters, flood waters and storm waters which eventually impact the Bay Delta. The second objective is habitat restoration through this unique process. Other outcomes that are expected will be improved water quality, and restoration of vegetative cover in areas currently dedicated to open Ag. land. The Approach & Technical Feasibility will be the use of current best management practices to achieve the desired results. The selective measures of reserach were determined by collaborative efforts and input from various projects throughout the state utilizing the biofilter process. Uncertainties are minimal due to the success of similar projects. Extensive studies confirm the proposed study has validity for effectively dealing with sediment capturing and ecosystem/habitat restoration. Expected Outcome will be the immediate and long-term reduction in point and non-point source pollution, sediment production into the area and associated waterways which eventually impact the Bay Delta. The project relates to CALFED goals of #2 Ecological Processesses, #4 Habitats, #5 Nonnative invasive species, and #6 Water and Sediment Quality.

Proposal

National Grants

Wetlands Biofilter

Duke Foster, National Grants
Kevin Emigh, Contra Costa County

Knightsen Hydrology/Wetlands Biofilter

A. Project Description Project Type – Research

Geographic Location

Knightsen is located in unincorporated eastern Contra Costa County west of Veale Tract and south of the Rock Slough intake for the Contra Costa Water District.

The Problem

The community of Knightsen does not have a municipal sewer system and relies on septic tanks for sewage treatment. The residents of Knightsen also depend on wells for their drinking water. There are concerns that during flood events, the septic tanks might overflow, mix with floodwaters and contaminate drinking water supplies and drainages leading to the delta. This also can potentially contaminate Rock Slough as this water migrates to the Rock Slough levee. In addition, to protect their property during flooding events, some property owners pump storm water from their properties into other facilities like the nearest roadside ditch or East Contra Costa Irrigation District canals. Pumping into these facilities typically creates additional problems for downstream property owners and ecosystems in the region.

Justification, Hypotheses & Uncertainties

Philip Williams & Associates (PWA) have initiated a feasibility study for this project under a grant received from the Environmental Protection Agency (EPA). In essence, the EPA has approved the biofilter feasibility study and additional funding is necessary to complete the process. Task 1 (existing conditions and field tests and observations have been funded). Tasks 2, 3, 4, 5 & 6 will be completed under this request. Previous work accomplishments have diminished uncertainties relative to biofilters. Upon implementation of the project tasks, a progressive approach narrows the problematic issues. Our efforts begin with general to specific assessments, we identify hydrologic models appropriate to the site and eventually perform field tests, analysis, impacts and further assessments and modifications of the corrective measures proposed.

Constructed storm water wetlands are shallow, vegetated wetland impoundment's engineered and constructed to mimic the structure, water quality function, wildlife habitat, and aesthetic value of naturally occurring wetlands. Although design configuration options are relatively flexible, constructed wetlands generally feature relatively uniformly vegetated areas with depths of one foot or less and open water areas (25-70% of the total area) nor more than about 4 feet deep. Wetlands vegetation is comprised generally of a diverse local source selection of aquatic plant species. Constructed wetlands can be designed on-line or off-line and generally serve relatively smaller drainage areas than wet ponds. The use of a pretreatment sediment trap is recommended.

Sitting and Operational Considerations- Constructed storm water wetlands are applicable in development situations where sufficient baseflow, groundwater and/or contributing drainage area is available to maintain year-round wet conditions and adequate pool elevations for survival of aquatic vegetation. Shallow depths and relatively small capture volumes generally prevent the use of constructed wetlands for larger watersheds due to the need for a very large facility footprint area.

Site considerations include water table depths, soil/substrate, and space requirements. Shallow water table depths can mitigate the need for consistent baseflow inputs to the facility. If runoff is the only source of inflow for the wetlands water levels can fluctuate significantly and establishment and maintenance of vegetation may be difficult. The soil or substrate of an artificial wetland should be loose loan or clay. A greater amount of space is required for a wetland system than is required for a detention facility treating the same amount of area. For small watersheds, wetlands may occupy as much as 20 percent of the tributary area.

Constructed wetlands can provide physical, chemical, and biological water quality treatment of storm water runoff. Physical treatment occurs as a result of decreasing flow velocities in the wetlands and is present in the form of evaporation, sedimentation, adsorption, and/or filtration. Chemical processes include chelation, precipitation, and chemical adsorption. Biological processes include decomposition, plant uptake and removal of nutrients, plus biological transformation and degradation.
The character of basin hydrologic inputs is one of the most influential factors in pollutant removal due to its effects on retention time and flow velocities which impact sedimentation, aeration, biological transformation, and adsorption onto bottom sediments. The presence of organic material increases pollutant removal and retention.

Constituent Removal – Wetlands remove pollutants from storm water through sedimentation of particles and through biological and chemical processes. Developing a standard removal efficiency rate is difficult because the wetland design varies so widely. The design parameters that determine the pollutant removal efficiency include vegetation type, and pool volume.

The Objective

The CALFED Veale/Byron Tract Work Group has worked with the community of Knightsen to develop a plan to relieve the community from flooding, develop a plan for some what stable ecosystems and improve drinking water quality. The intent of this proposal is to study existing hydrological information, identify any pollutants in the community stormwater, and do a feasibility study for a wetlands biofilter to filter stormwater and irrigation tailwater flows from Knightsen before they are discharged into the Delta. The feasibility study will also determine costs to construct drainage improvements to convey stormwaters to the wetlands biofilter. The biofilter will serve as a critical element in overall ecosystem restoration within a region primarily of an Ag nature. In essence, agricultural and low flow stormwaters from the Knightsen area would drain into the wetlands biofilter and be filtered prior to its discharge into No Name Slough. High flow stormwater would bypass the wetlands. The East Contra Costa Irrigation District has indicated they will be able to supply agricultural tailwater during the dry summer months to maintain the wetlands.

The Approach & Technical Feasibility

Emerging problems and public dissatisfaction with traditional flood control designs has created a demand for new approaches. Our approach is to first gain an understanding of the natural hydraulic and hydrologic processes influencing the site. We then work with biologists and planners to determine the environmental opportunities and constraints affecting a site before developing a specific technical solution. Application of this approach streamlines the approval process and results in projects, which are recognized as a community asset.

PWA's approach to flood hazard analysis will focus on the management goals of Contra Costa County. In contrast to traditional single-purpose solutions (including artificially straightened, unvegetated or concrete channels), our approach addresses the reduction of safety risks and property damage due to flooding in conjunction with wider planning goals. Applying a broader perspective, we view flood management as a system with structural, nonstructural, operational, maintenance, and monitoring components. This has prompted PWA to develop innovative and cost effective solutions for flood protection and reduction of flood damages. In addition, our approach extends beyond simplistic, "clear flow" assumptions to include all the processes that affect flood risk, such as sediment transport, potential debris obstruction, channel migration, and river bed scour or deposition. To accomplish these objectives, we integrate the science of natural rivers - fluvial geomorphology - with hydrology and engineering hydraulics.

We have learned, through experience, that efforts intended to correct hydrologic problems must include ecosystem enhancements and restoration. Not only will this research address immediate problems, we will direct our attention to ecosystem stability as it affects the Knightsen Region.

Expected Outcome & Performance Measures

All tasks for this project are shown below. Tasks 1 has been funded. Tasks 2 through 6 require funding.

Task 1: Existing Conditions

Task 1.1 Gather and review existing maps and hydrological information

Philip Williams & Associates (PWA) will gather and review available information to assess existing and historic drainage conditions. This data review process shall include analyzing available base maps and aerial photos and establishing a project GIS database. PWA shall also collect hydrologic information including observed (or recorded) surface flow and groundwater data to characterize baseline hydrologic conditions. PWA will coordinate with Contra Costa County (County) staff to acquire data and also meet with the Knightsen TAC and other community members to obtain local information on drainage conditions.

Task 1.2 Install piezometers and initiate shallow groundwater monitioring program

Three piezometers will be installed to monitor shallow groundwater levels in the project area between central Knightsen and No Name Slough. An understanding of groundwater elevation and its seasonal variations will help address initial wetland feasibility issues (Task 1.6) such as possible wetland locations and wetland depth. Piezometers will be installed prior to the winter rainy season to establish baseline conditions at the end of the summer dry season. This new data will supplement data by Luhdorff & Scalmanini (1999) on groundwater conditions in the project area.

Task 1.3 Assess topographic baseline and survey data

General topographic conditions as well as specific elevations of drainage features will be required to develop the surface hydrology model (Task 1.5). PWA will review available topographic information for the project area and assess data adequacy for developing the surface flow model. It is understood that 10-ft contour interval data is currently available from the County and that this data can be interpolated to generate 2-ft contour intervals. The availability of survey information for channels, ditches, swales, and other conveyance features in the project area is less certain. Spot elevations and cross sections of conveyance features will be field surveyed to provide input for the surface hydrology model. This survey data will also provide a better understanding of opportunities and constraints for a wetland design in the project area. Up to 2 days of field crew data collection has been allocated to this task. Permission for access will be the responsibility of the County and the Knightsen TAC.

Task 1.4 Assess existing watershed conditions

PWA will gather existing land-use, vegetation, and soil information. This information, along with topographic information collected in Task 1.3, will be incorporated into the project GIS in preparation of developing the surface hydrology model (Task 1.5).

PWA will review existing watershed hydrology and drainage studies as available. Input parameters from past analyses, as well as output results, will be assessed for use in developing or verifying the current runoff model.

The development of a hydrology model to conduct the feasibility analysis shall be in accordance with the level of effort allocated in the project cost estimate.

Task 1.5 Develop surface hydrology model

PWA will develop a surface hydrology model for the Knightsen area based on input parameters collected in Tasks 1.1, 1.3, and 1.4. The purpose of this hydrology model is to provide information regarding current drainage conditions and to also provide an analytic tool to evaluate the hydrologic requirements for a potential treatment wetland.

PWA will identify the preferred model for development. The EPA-SWMM model may be the appropriate choice to model surface drainage conditions in Knightsen. A surface hydrology model should include the complete known drainage network including irrigation and drainage ditches, natural swales, and channels. Flow capacities of conveyance features within the network will be determined and the magnitude of stormflow delivery to No Name Slough will be evaluated. Dry season agricultural flows will be characterized based on field observations, general water balance calculations, or other available information.

Task 1.6 General assessment of wetland feasibility

Findings from Tasks 1.1 through 1.5 shall be integrated to provide a general feasibility assessment of creating a wetland biofilter in the Knightsen area. Results from the surface hydrology analysis and shallow groundwater monitoring program will guide concepts regarding required wetland size, potential wetland locations, and required modifications of existing drainage features to accommodate a wetland. PWA and RBF will develop a preliminary wetland concept based on these findings. This wetland concept will be developed more thoroughly into project alternatives in a subsequent phase of work.

Task 1.7 Initial siting discussion for potential wetland

PWA and RBF staff, in strong coordination with representatives from the County and the Knightsen TAC will identify and evaluate potential wetland sites based on the findings of the previous tasks and the concept generated in Task 1.6.

Task 1.8 Project reporting, meetings, and presentation

PWA (and RBF where appropriate) shall attend project meetings (up to 3) with representatives of the County and Knightsen TAC. Project updates will be communicated to the project team at key times during Tasks 1.1 through 1.5. At the conclusion of Phase I, PWA and RBF shall provide the project team with a summary report and presentation. This report will include the methods and results of the hydrology analysis and general feasibility study and will also provide an appropriate wetland concept capable of being developed in subsequent stages.

SCOPE OF WORK
PHASE II

Note- Project tasks for Phase II (out of scope) are given below at this time to offer a more complete understanding of how the tasks and work products of Phase I (above) fit within a continuing wetland feasibility study. Depending upon the findings of Phase I, the project tasks described below may change.

TASK 2: FIELD TESTING AND OBSERVATION

Task 2.1 Adaptive monitoring of groundwater focused on potential wetland sites.

The groundwater-monitoring program initiated in Task 1.2 shall continue, but piezometers may be relocated to potential wetland sites as suggested in Task 1.6 to provide site-specific information.

Task 2.2 Assess storm water quality conditions

Background data will be collected to assess the current stormwater flow conditions from the tributary watershed areas. Previously completed studies by Contra Costa County stormwater program will be reviewed to verify consistencies or any anomalies of the field sampling data. Initially, grab sampling is recommended for characterization of the basic constituents and comparison with other published studies for similar watersheds. Continuous sampling with stream auto-samplers could be implemented subsequently if the need is identified. However, we believe a "BMP" approach is preferred at this time.

Field sampling will be completed by collecting grab samples at minimum of four times during the water year to characterize both dry weather and wet weather periods. The specific annual sampling schedule is as follows:

Wet weather seasons – two samples
Dry weather seasons – two samples

Laboratory analysis of the samples will be completed for the following:

Acute toxicity using Ceriodaphnia dubia (freshwater zooplankton) and Pimpehales promelas (larval fish)
Metals (Copper, lead, zinc, cadmium, nickel, mercury, selenium, chromium)
Organics scan (Organic priority pollutants scan)
Organophosphate low-level pesticides scan
Carbamate low-level pesticides scan
Total and Fecal Coliform, E. Coli, Enterococcus

Task 2.3 Evaluate soil moisture conditions

PWA will collect information on soil moisture and saturation conditions for potential wetland sites. This information regarding soil moisture conditions and infiltration potential in the project area will be used to assess project feasibility.

TASK 3: REFINEMENT OF WETLAND CONCEPT, SITE SELECTION, AND ALTERNATIVES ANALYSIS

Task 3.1 Review successful examples of wetlands biofilter systems

Previous data from constructed stormwater water quality treatment basins developed by the PWA/RBF team can be summarized related to construction, operational issues, removal efficiencies, and costs. Current monitoring data from pilot constructed stormwater wetlands features will be presented (i.e. CalTrans BMP retrofit project – San Diego constructed wet basin) discussing criteria and conclusions. In addition, the ASCE *National Stormwater Best Management Practices (BMP) Database* will be utilized to survey similar functioning constructed wetlands in the State and similar watershed conditions. The database is helpful to water quality professionals across the U.S. learn about successful BMP's and apply proven methods to local water quality projects. Our experience on functioning wetland treatment systems we have designed will provide important insight on the critical elements of design selection and operation difficulties.

Task 3.2 Refinement of wetland concept

Based on the results of the baseline hydrology analysis (Task 1), collected field data (Task 2), the initial concept proposed in Phase 1, and site specific opportunities and constraints, PWA and RBF will refine the wetland design concept to provide a specific wetland concept for the identified potential project sites.

Task 3.3 Identify location of proposed wetlands biofilter

Potential locations or sites will be evaluated through a screening process which utilizes a weighted decision matrix. Criteria significant for the long-term success and operation of the wetland/biofilter will be assembled from a variety of critical design area. The siting criteria will be then be assigned a weighting factor to emphasize more important selection. Some of the criteria that can be used include:

- Annual baseflow or water supply source
- Space availability requirements
- Water table
- Soil/substrate characteristics
- Topography
- Biological
- Maintenance access
- Tributary watershed
- Minimizing drainage conveyance system

As part of this process, RBF will evaluate existing land use facilities and utility locations. RBF subscribes to USA's on-line service that provides existing utility info within the limits of a given project. The web site provides a list of all known utilities and the names of contact persons for each. RBF will then send utility notifications or request utility maps, as-built plans, etc. from the utility companies directly.

Field inspection of the potential site locations will be performed to develop assessments and characterize locations as input for the matrix. Detailed topographic information beyond what is currently available may be required to successfully conduct the feasibility analysis.

Task 3.4 Alternatives analysis

Develop alternative constructed wetlands utilizing conventional design criteria for the initial conceptual layouts. The conceptual plan formulation and feasibility will focus on defining different configurations and elements of the system which will result in different levels of treatment and costs. A "feasibility" evaluation will be performed which addresses the (1) economic suitability, (2) constructability, (3) acceptability so that many of the conceptual alternatives can be eliminated from further investigation. The alternatives selected for further refinement will have preliminary engineering design performed to develop the layout and configuration. The preliminary analysis will (1) evaluate the grading design requirements, (2) drainage conveyance system, (3) flow diversion facility, (4) operational requirements and hydraulics, (5) integrating design features to enhance removal efficiencies, (6) conceptual planting requirements, (7) pretreatment features, (8) vector control and maintenance elements, (9) water level control design feature. Preliminary "rough order magnitude" construction cost estimates will be developed which also include the annual maintenance and monitoring.

Task 3.5 Identify potential hazards and legal responsiblities

An assessment of community issues and potential liability concerns associated with the installation of a wetlands/biofilter. These items of concern will be evaluated based upon typical installations and historical problems which have occurred in different communities from a global survey of these facilities from the ASCE database and contacting various flood control agencies in the state. Some of the potential hazards and legal liabilities that will be investigated include:

- Public safety
- Access restrictions
- Vector control
- Sediment toxicity
- Flood hazards
- Attractive nuisance

Task 3.6 Select preferred alternative

A recommended alternative will be selected from the preliminary alternatives investigated utilizing a weighted decision matrix that evaluates critical selection item criteria. Criteria will be assigned a weighting factor to emphasize more important selection and some of these items can include:

- Initial and long term costs
- Land acquisition
- Treatment effectiveness
- Anticipated degree of success
- Impacts to the community

TASK 4: ASSESSMENT OF HYDROLOGIC IMPACTS FROM WETLAND SYSTEM

Task 4.1 Assess project impacts on surface water hydrology

PWA will use the surface hydrology model developed for Task 1 to assess the influence of the proposed wetland system on winter stormflows. The impact of dry season irrigation return flows on the treatment efficiency of the proposed wetland will also be evaluated.

Task 4.2 Identify project impacts on FEMA flood plain designations

PWA will use the surface hydrology model developed for Task 1 to map new floodplain boundaries as a result of the proposed project. These project related floodplain boundaries will be compared to the designated FEMA floodplain.

Task 4.3 Assess project impacts on groundwater, septic tank leach fields, and water wells

PWA will assess the impact of the proposed wetlands system (and surface flows draining to it) on groundwater quantity and quality in the Knightsen project area. In addition, PWA will use the groundwater information gathered in previous tasks to determine potential impacts on septic tank leach fields and water wells.

Task 4.4 Assess required drainage facilities

PWA will use integrate the proposed wetland into the hydraulic model and evaluate optimal locations and dimensions of conveyance channels (or other facilities) to connect the constructed wetland with the drainage network.

TASK 5: WETLAND PLANNING, PERMITTING, AND COST ESTIMATES

Task 5.1 Identify right of way and access easements

Utilize assessor parcel data and County GIS parcel information to develop a legal constraints overlay of legal parcel and property ownerships, including existing easements associated with the project limits. The preliminary legal constraints map will be based upon existing data provided by the County Surveyors office records, however, the County may request a title search on the project limits as defined in the preliminary drawings to provide a more detailed evaluation of legal constraints. Proposed land acquisition requirements for the construction of the permanent facilities will be determined based upon the preliminary drawings for the recommended project, including the drainage conveyance system as well as the wetlands biofilter. Temporary construction easements for channel excavation, pipeline installation, temporary stockpile locations, or staging areas will also be identified. The amount of permanent and temporary right-of-way acquisition will be quantified and identified on a parcel-by-parcel basis for cost determinations.

Task 5.2 Identification of agency jurisdictions

Review the project activities and limits to assess the potential different jurisdictional agencies involvement. The agency jurisdiction will be determined based upon:

Local and regional government

Utilities
Transportation
Environmental
Construction activities
Long-term facility operation
Water-use and quality

After the various agency jurisdictions have been identified then the specific permitting requirements will be evaluated. A detailed matrix will be compiled which indicates the specific requirements and time schedule associated with the agency approval process.

Task 5.3 *Permit identification and requirements*

Assess the potential impacts of the project from both (1) temporary and permanent construction impacts, and (2) long operational impacts to both the community and environment. Construction impacts will be based upon the footprint of the proposed project and identify permanent disturbance of existing habitat. Anticipated construction processes will be conceptually developed for implementation of the project during peak construction. Additional impacts and mitigation measures to be considered may require a qualitative assessment and can include:

- Vector
- Public safety
- Floodplain modification
- Odor
- Construction disruption
- Water use

Task 5.4 *Develop contruction and maintenance cost estimates*

Develop preliminary engineers estimate of the anticipated construction costs for the drainage conveyance system to the constructed wetlands. The preliminary costs will include (1) drainage facility construction, (2) public facility replacement, (3) excavation, (4) land acquisition, (5) utility interference, (6) dewatering. Additional items to be evaluated include potential annual maintenance costs and environmental permits or mitigation for the construction of the facility.

Task 6 *Project coordination*

Review and approve all above mentioned tasks, on and off site visits with contractor, special meetings as required, consultation with key county staff members and preparation of update memos and reports.

Relationship to CALFED Goals

The following goals established by CALFED apply to this proposal:
Goal 2: Ecological Processes , Goal 4: Habitats, Goal 5: Nonnative Invasive Species, Goal 6: Water and Sediment Quality. This is discussed further under the section of CVPIA Priorities.

Value of Products

The value of outcomes generated by this work will go far in achieving the establishment of a hydrology and wetland biofilter within lands dominated by agricultural use. This project will be a great tool in educating farmers the importance of collecting and treating tailwaters and flood waters. We are aware of other problems in the areas near Veal Tract and Rock Slough which could benefit greatly through the implementation of biofilters. The local reclamation district could utilize this approach in dealing with continued sediment flows into Discovery Bay and the associated delta.

Data Handling & Storage

All reports and data necessary for this project will be maintained by the consultants and Contra Costa County. All information by the county is public information and as such, will be readily available for all to review.

Expected Products & Reports

The following materials will developed based upon studies and assessments made by the survey and research team:
Weighted decision matrix, conceptual plan, alternative analysis, surface hydrology model, groundwater quantity and quality, ROW access easements, permit requirements, construction and maintenance cost estimates and ancillary reports critical to a successful design. These products will be made available as the work progresses.

Work Schedule

The specific dates for start and completion of the following tasks is dependent upon the notice to proceed from CALFED.

Task Name	Duration/Days
Task 2 – Field testing & Observation (cont'd)	
Task 2.1 – Groundwater monitoring	25
Task 2.2 – Stormwater quality	100
Task 3 - Identification of wetlands biofilter impacts	
Task 3.1 – Review wetland systems	30
Task 3.2 – Refine wetland concept	25
Task 3.3 – Identify wetland location	25
Task 3.4 – Alternative analysis	60
Task 3.5 - Identify hazards and legal	25

Task 3.6 – Select alternative	25	
Task 4 – Assessment of Hydrologic Impacts from Wetland Systems		
Task 4.1 – Assess hydrology impacts	35	
Task 4.2 - Identify FEMA floodplain	20	
Task 4.3 – Assess impacts on groundwater	25	
Task 4.4 – Assess drainage facilities	40	
Task 5 – Wetland Planning, Permitting and Cost Estimates		
Task 5.1 – Right of Way and access	25	
Task 5.2 – Agency jurisdictions	20	
Task 5.3 – Permit requirements		20
Task 5.4 - Develop construction and maintenance cost estimate	25	
Task 6 – Project Coordination		25

B Applicability to CALFED Goals

CVPIA Priorities

The following goals and objectives established by CALFED apply to this proposal:
Goal 2: Ecological Processes – Objectives 1, 5 & 6. Goal 4: Habitats – Objectives 1, 3 & 4. Goal 5: Nonnative Invasive Species – Objectives 5 & 7. Goal 6: Water and Sediment Quality – Objectives 1, 2 &3.

The over-all project, after the study, if implemented will result in progress toward the above priorities by wetland restoration efforts. We will re-establish wetland plant communities and related fauna (Habitat restoration). The project includes improved water quality and control to drainages and downstream impacts. Nonnative invasive species will be removed from the wetland site. Only native plants will replace those removed. We will incorporate restoration of vegetative cover.

We will implement immediate and long-term reduction in point and non-point sediment production into waterways eventually impacting the Bay Delta. The project will also reduce erosion and soil loss, improve water quality within and beyond the watershed.

Detrimental hydrologic regimes will be altered for improved water flows during winter flooding and a wetlands biofilter will be incorporated into the Knightsen Area which will serve to enhance the flora and fauna of the area.

Relationship to other Ecosystem Projects

This project will study the feasibility for the development of a future wetlands biofilter in the Knightsen Area. It is unknown at this time the relationship to other projects but this will be viewed by numerous water agencies and reclamation districts as a prototype for dealing with hydrologic problems specific to the Ag lands south and west of the delta.

Request for next phase funding

Depending on the outcome of this project, we will most likely apply for funds to perform construction elements once the analysis has been complete and the collaborators approve.

Previous CALFED funding

We were recently approved for funding under the CALFED Watershed Program for Proposal # WSP01-0052. As of this date we have received a telephone message from CALFED for additional information prior to a notice to proceed.

System wide ecosystem benefits

By initiating a biofilter in the Knightsen Area, we feel confident that this project will serve as a strong indicator for ecosystem restoration. Agencies throughout the area will be able to utilize such a system for enhancing wetlands within agriculture properties adjacent to the delta and neighboring watersheds.

Land Acquisition

This project is for research and does not involve acquisition at this time.

C. Qualifications

The lead group for this project is Philip Williams & Associate (PWA). PWA has teamed with RBF Consulting which have combined to make up a team which provides a diverse range of professional services. As hydrologists, geomorphologists and engineers, they have completed extensive work dealing with fluvial and esturine processes, hydrodynamics of coastal lagoons, wetlands restoration, stream design and erosion control projects, fluvial system flood control, and general urban storm water quality management.
The projects undertaken include: Dougherty Valley 4 Stream Restoration, Llagas Creek Flood Control Project, Tres Pinos Creek Sediment Transport Study, Shoreline Erosion Protection, Hill Slough Tidal Wetland Restoration, Demonstration Project for Restoring Freshwater Tidal Wetlands I Diked Subsided Areas of the Sacramento-San Joaquin Delta, and the list continues. For further details of numerous projects, please see the Knightsen Hydrology & Wetland Biofilter Feasibility Study by PWA dated May 25, 2001.

D. Costs - Detail Budget

Please see budget sheets.

Cost sharing

Approximately $50,000 was awarded from the Environmental Protection Agency for first phase funding of this project.

E. Local Involvement

Collaboration will continue with the Knightsen Technical Advisory Committee, Contra Costa County, CALFED, Contra Costa County Irrigation District and other interested parties.

F. Compliance with Standard Terms & Conditions

The county and associated consultants will comply with Standard Terms & Conditions determined appropriate for this project.

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G. Literature Cited – Publications & Presentations

Schwarz, K.M., 1997. *Variable hillslope erosion in a post-fire chaparral environment,* Abstracts, Fall Meeting,
Schwarz, K.M. and A.& Onne, 1999. *Estuarine behavior and reorganization during an El Nino year, Malibu Creek,* California, Abstracts, 93rd Annual Meeting, Honolulu, Hawaii: Association of American Geographers.
Schwarz, K.M., 1999. *Hydrolo@y and Morphodynamics, 199 7-1998:* In R.A. Ambrose and A.R. Onne, Lower Malibu Creek and Barrier-Lagoon System: Resource Enhancement and Management, California State Coastal Conservancy and U.S. Environmental Protection Agency, P. 2-2 to 2-112.
Ambrose, R., Callaway, J., Schwarz, K.M., Strecker, E., and Sudol, M., 2000. Restoring an Urban Coastal Wetiand: Ballona Wetlands Symposium, Science Advisory Panel Presentation and Discussion of the Ballona Wetlands Restoration Plan, Los Angeles, May 17-18, 2000.

Callaway, J., Schwarz, K.M., and Weisberg, S., 2000. Symposium of the Southern California Wetlands Recovery Project, Science Advisory Panel Presentation and Discussion, San Diego, October 19-20, 2000.
Schwarz, K.M., 2000. *Dynamic Geomorphology of Malibu Lagoon,* Abstract, Preserving Coastal Envirorunents, California Shore and Beach Preservation Association (CSBPA) and CalCoast Annual Conference, Monterey, November 2-4, 2000.
Schwarz, K.M., 1994. *Postfire erosion in the Santa Monica Mountains,* Field Trip Leader, Annual Meeting, Northridge, California: Association of Pacific Coast Geographers.
Schwarz, K.M., 1996. *Variable hilislope erosion in a post-fire chaparral environment,* Abstracts, 90th Meeting, Charlotte, North Carolina: Association of American Geographers.
San Francisco, California: American Geophysical Union