PANOCHE DRAINAGE DISTRICT

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February 21, 2002

Dan Castleberry
Ecosystem Restoration Program Manager
CALFED Bay-Delta Program
1416 9th Street, Room 1155
Sacramento, CA 95814

Dear Mr. Castleberry,

I am pleased to report that the CALFED Drinking Water Quality Program has recommended funding in the amount of $750,000 for our project entitled *Irrigation Drainage Treatment for Selenium and Nitrate Removal: Intermediate-Scale Experiments at the Panoche Drainage District*. The CALFED Drinking Water Program has recommended that the Panoche Drainage District provide or find match funding in the amount of $362,000. We submitted a proposal for a similar but longer-term project to the Ecosystem Restoration Program in October 2001.
Panoche would like to explore the possibility of using the CALFED Drinking Water Quality Program award as match funding for the CALFED Ecosystem Restoration Program if we are fortunate enough to receive a positive response to our October 2001 proposal

The CALFED Drinking Water Quality Program funds, and the CALFED Ecosystem Restoration Program funds if awarded, will support planning, design, and construction of an intermediate-scale Algal-Bacterial Selenium Removal (ABSR) Facility. As you know from our proposal, the new intermediate-scale ABSR Facility will have a treatment capacity of one acre-foot of drainage water per day representing a 16-fold scale-up of the existing pilot-scale ABSR drainage treatment facility. It will also permit vital experiments on the influence of pond depth on selenaceous particle formation and removal, experiments that are not possible to conduct in the shallow ponds of the pilot ABSR Facility.

Operational guidance and research for the intermediate-scale ABSR Drainage Treatment Facility will be provided by researchers at the Lawrence Berkeley National Laboratory and the University of California, Berkeley and will further develop and optimize a drainage treatment process that affordably and reliably removes selenium and nitrate from irrigation drainage and contributes to the District's integrated drainage management plan. Through demonstration and outreach, this project will build local capacity for operating such drainage treatment facilities.

By itself, the Panoche Drainage District does not have sufficient funds to provide all of this Drinking Water Quality Program recommended match of $362,000 over the next two years. The District's 2001-2002 annual budget is $953,200, and of that budget the District will spend $534,012 on drainage control projects--$250,000 for the San Joaquin River Water Quality Improvement Project, $275,012 for the Grasslands Bypass Project, and $9,000 annual debt payment for the Harza Engineering treatment project. As such,

we respectfully request that the Ecosystem Restoration Program fund our October 2001 proposal *Agricultural Drainage Treatment for Selenium & Nitrate Removal* (Ecosystem Restoration Proposal #107) in order to complete the full project funding ($1.9M) and to extend the operation, research, and monitoring period for two years from the currently unfounded six month period proposed in the proposal submitted to the Drinking Water Quality Program.

Panoche Drainage District is committed to the development and implementation of improved drainage management techniques, and we will continue to apply for match funding for the subject ABSR Drainage Treatment Project. We recently submitted a pre-proposal to the Proposition 13 SWRCB Nonpoint Source Pollution Control Program as well as the Proposition 13 CALFED Drinking Water Quality Program on February 1, 2002. With support from the CALFED Ecosystem Restoration Program and complementary programs mentioned above, we will continue to lead in development of improved drainage treatment for the efficient and affordable removal of selenium and nitrate.

I would appreciate the opportunity to discuss our ongoing research, demonstration and funding efforts with you. Thank you for your kind consideration.

Sincerely yours,

Dennis Falaschi
General Manager
PANOCHE DRAINAGE DISTRICT

cc: John Andrews, CALFED Drinking Water Quality Program
Dan Ray, Ecosystem Restoration Program Grants Office
William Oswald, Lawrence Berkeley National Laboratory

Comments to CALFED Proposal

entitled

"Full-Scale Demonstration of Agricultural Drainage Water Recycling Process Using Membrane Technology"

Submitted: October 5, 2001

Comments provided by:

Scott Irvine, Environmental Engineer
Frank Leitz, Chemical Engineer
U.S. Bureau of Reclamation
Water Treatment and Engineering Research Group
Technical Services Center
Denver, Colorado 80225

1. The calcium sulfate precipitation process, so-called "preferential precipitation," is the key that will cause the proposed plant to succeed or fail. Tubular modules are the most appropriate configuration because of the openness of the flow path and the relative ease of cleaning of the membrane surfaces. In nanofiltration, where divalent ions are rejected, the highest concentration of Ca^{++} and SO_4^{--} ions will occur at the membrane surface. For this reason, the membrane surface is where precipitation is most likely to occur despite the presence of $CaSO_4 2H_2O$ crystals in the bulk liquid. In addition, fluid flow through the membrane will carry solid particles toward and hold them against the membrane surface. Finally calcium sulfate is a difficult material to clean off membrane surfaces. For these reasons, one must not be too optimistic about the potential for success of this process.

2. One suspects that there will be a critical membrane flux below which the process works well and above which it works badly. The critical flux is probably well below that which the membrane manufacturer normally uses. To sweep the solids from the membrane surfaces, there will have to be a very significant concentrate recycle flow. If it is necessary to clean the membranes periodically, the average resistance to flow may be greater than normal. As a result, the calculated capital and operating costs may be higher than the original esumates.

3 The reference to magnesium sulfate crystals on the feed side seems inappropriate since magnesium sulfate is very soluble.

4. Proposer refers to selecting RO membranes for high boron rejection capabilities. An

outlet concentration of < 2mg/L with a feed of 11 mg/L will require a rejection of at least 80%. At the natural pH of the water (7.5), H_3BO_3 is almost completely un-ionized, which does not usually lead to high rejection. Addition of base to increase the degree of ionization is not shown in Figure 4 and is inconsistent with the desire not to add chemicals expressed on Page 11.

5. While the investigation of preferential precipitation as a potential method of removing hardness has merit, the proposed scale and expense of conducting this investigation are far greater than what is needed and appropriate. As noted on Page 11, although this technology was invented and tested about 20 years ago, there are no commercial applications to date. The paltry track record suggests a high level of uncertainty as to its potential success in the San Joaquin Valley.

   The scope and depth of the proposed research along with the level of uncertainty in its outcome are not commensurate to a test apparatus that is described as a 250-gpm, full-scale facility. This investigation should be conducted using a 5-gpm, pilot-scale system. The water treatment industry normally performs water treatment research using pilot systems of this size, and membrane manufacturers provide 2.5-inch diameter elements for this purpose. The proposed research could be accomplished at a substantially lower cost using a smaller pilot-scale facility. For example, Reclamation's Water Treatment Engineering and Research Group routinely conducts pilot-scale water treatment studies for a total cost between $300,000 and $500,000.