Executive Summary

Introduction

The Bureau of Reclamation (Reclamation) has undertaken two primary activities since preparing the San Luis Drainage Feature Re-evaluation Plan of Action in April 2001. First, previous studies were reviewed and preliminary options and alternatives were developed for providing drainage service to the San Luis Unit (SLU) of the Central Valley Project (CVP). Second, project scoping was initiated to seek agency and public comments on the scope, process, and alternatives for the Feature Re-evaluation effort. This Preliminary Alternatives Report (Report) summarizes the results of these two activities.

This report identifies the range of preliminary alternatives that could be utilized to meet the court's order to provide drainage service to the SLU. Reclamation has set the broadest possible range of screening criteria in this effort to include the greatest number of options identified in previous studies and public scoping. The options described in this report meet Reclamation's broad initial screening criteria in that each option (1) meets the court order and (2) utilizes proven technology. Future Re-evaluation activities will evaluate the potential benefits, costs, and adverse impacts that could result from these preliminary alternatives.

- Sections 1 and 2 of the Report provide an overview of the Feature Re-evaluation and the Study Area.
- Section 3 describes Reclamation's evaluation of the anticipated drainage need, including the potential for drainage management and land retirement activities to reduce the volume or improve the quality of drain water from the SLU.
- Section 4 describes Reclamation's approach to formulating alternatives, considering the anticipated drainage service need and treatment and/or disposal options.
- Section 5 considers and presents options for managing, treating, and/or disposing drain water.
- Section 6 describes the preliminary alternatives.
- Section 7 summarizes the comments and issues identified during agency and public scoping meetings and in written comments to Reclamation.

Purpose and Background

The purpose of the San Luis Drainage Feature Re-evaluation is to identify for prompt implementation a measure or combination of measures to provide drainage service to the SLU. Drainage service is a requirement for sustainable agriculture in the region. At its basic level, drainage service is defined as removing water from irrigated fields to maintain long-term, sustainable salt and water balance in the root zone of irrigated lands. In the SLU, high water tables seriously threaten farmlands. The drain water, however, contains

concentrations of naturally occurring elements (salts, selenium, and boron) that pose a threat to the environment and water quality. In providing drainage services, the challenge is managing and disposing of the drainage water and its constituents while avoiding or mitigating such impacts.

Reclamation has worked to provide agricultural drainage facilities serving the San Joaquin Valley since the mid-1950s. The San Luis Act (1960) authorized the construction, operation, and maintenance of the SLU, provided for construction of San Luis Dam, San Luis Canal, Coalinga Canal, San Luis Drain (Drain), distribution systems, drains, pumping facilities, and other related works. By 1975, 83 miles of the planned 188-mile San Luis Drain had been completed, but construction of the remaining portion was suspended pending determination of the final point of discharge. In 1984, waterfowl deaths and deformities at Kesterson Reservoir were linked to elevated levels of selenium in drainage water, and the Drain was closed. During the ensuing years, Reclamation has continued to pursue efforts to provide drainage service to the SLU.

In 2000, a Ninth Circuit Court of Appeals decision reaffirmed Reclamation's obligation to provide drainage service and allowed consideration of options in addition to completion of the Drain. The court's directive stressed the need to act promptly: "Reclamation…shall without delay, provide drainage to the San Luis Unit, pursuant to the statutory duty imposed by section 1(a) of the San Luis Act" (December 2000). The Feature Re-evaluation will formulate and implement a plan that support sustainable agriculture by providing agricultural drainage service to the SLU that achieves long-term, sustainable salt and water balance in the root zone of irrigated lands.

Reclamation has completed several steps toward implementing a drainage service plan (see Figure ES-1). In April 2001, Reclamation submitted its Plan of Action, which included the proposed schedule for plan formulation, impact analysis, and implementation. In this Report, Reclamation has identified potential alternatives. Now these alternatives must undergo a screening process that will distinguish a preferred alternative. Reclamation is moving forward expeditiously, with full consideration for the issues and concerns expressed by the public and agency representatives.

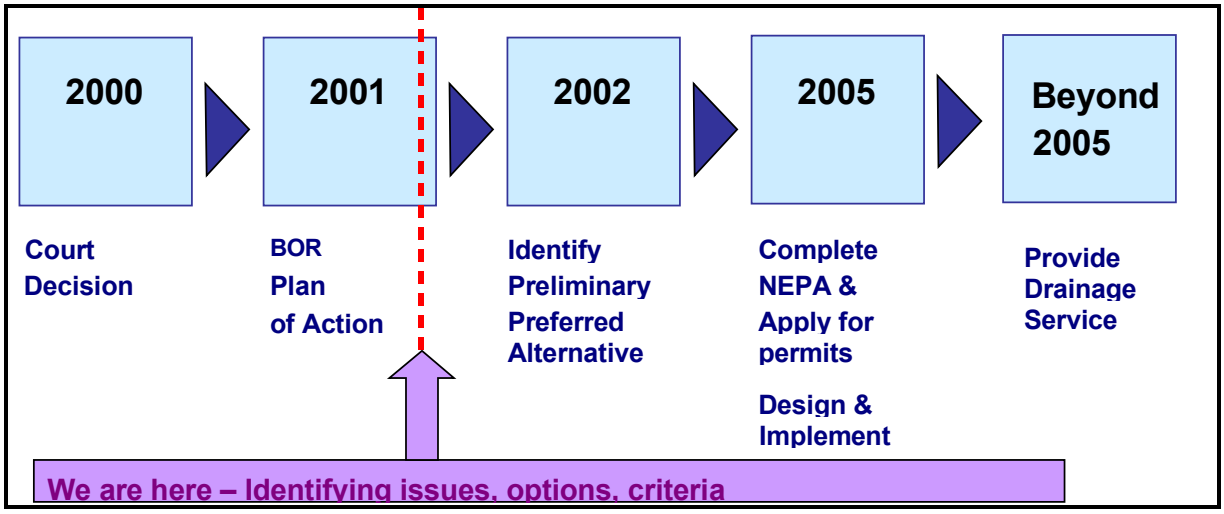

FIGURE ES-1
Project Timeline

Drainage Service Needs, Alternatives, and Options

Alternatives Formulation Approach

The strategy to determine a preferred alternative begins with the drainage management and land retirement options. The level at which these are utilized will determine the level of drainage service that is needed for the SLU. From this determination of needed drainage, Reclamation is developing and refining alternatives by combining treatment and disposal methods for three drainage service concepts:

- In-Valley Disposal
- Out-of-Valley Disposal
- Beneficial and/or Commercial Use

Over the next year, Reclamation will evaluate and refine these alternatives and identify a preferred alternative.

Drainage Need

Within the process of developing alternatives and options, Reclamation needed to estimate the amount of drainage service needed. Regardless of the combinations of treatment and disposal considered, it is necessary to estimate the "raw" (or unimpaired) drainwater volume and quality that would be discharged if drainage service were provided. Reclamation based estimates of drainage need on these parameters:

- Drainage service area
- Drained area (acreage within the drainage service area that would actually have tile drains installed)
- Drainage rate or average flow of drainwater discharged from the drained area

The drainage water volume and quality estimates are primarily based on previously completed studies. Reclamation found that the range of drainage rates required by those areas in need is 0.3 to 0.5 acre-foot per acre. An average rate of 0.3 acre-foot per acre was used to represent conditions with highly efficient on-farm irrigation systems and aggressive management. The 0.5 acre-foot per acre is intended to represent traditional drainage system capacity. Reclamation will review and refine these drainage estimates during the alternatives development process in 2002 and impact analysis in 2003-04.

Drainage Service Alternatives

Reclamation explored a wide range of drainage service options. The preliminary alternatives are not necessarily the most desirable or least costly — that judgment will not be made until more detailed evaluation and impact assessment are completed in the next phase of the re-evaluation. None of the preliminary alternatives developed in this Report has been screened out during this phase.

Preliminary Alternatives

The preliminary alternatives are organized initially as broad conceptual alternatives: In-Valley Disposal, Out-of-Valley Disposal, and Beneficial Use. Reclamation formed sub-alternatives under each conceptual alternative that are complete drainage service alternatives. These sub-alternatives listed below led to the generation of incremental cost differences for each of the concepts.

In-Valley Disposal: disposal of drain water and salts in or near the drainage-affected area, possibly with prior treatment to remove selenium or other constituents.

- Drainage based on current irrigation technology going to the evaporation ponds and ultimately disposed in landfills
- Drainage after enhanced irrigation management going to the evaporation ponds and ultimately disposed in landfills.
- Drainage after integrated drainage management going to evaporation ponds and ultimately disposed in landfills
- Land retirement with drainage from the remaining acres based on current irrigation technology going to evaporation ponds and ultimately disposed in landfills.
- Drainage based on current irrigation technology with disposal of drainage using deep well injection

Out-of-Valley Disposal: transport of drain water to the Pacific Ocean, Delta, or San Joaquin River, possibly with treatment to remove selenium or other constituents.

- Delta
  - Drainage based on current irrigation technology going to selenium treatment and ultimate disposal in the Delta
  - Drainage after enhanced irrigation management going to selenium treatment and ultimate disposal in the Delta
  - Drainage from integrated drainage management going to selenium treatment and ultimate disposal in the Delta
- Ocean Disposal
  - Drainage based on current irrigation technology with ultimate disposal going to the Ocean
  - Drainage after enhanced irrigation management with ultimate disposal going to the Ocean
  - Drainage from integrated drainage management with ultimate disposal going to the Ocean
  - Land retirement with drainage from the remaining acres using current irrigation technology with ultimate disposal going to the ocean

Beneficial and/or Commercial Use: use of treated drain water for irrigation, municipal, or other uses and potential commercial use of removed salts.

- Drainage based on current irrigation technology going through reverse osmosis treatment with the brine to evaporation ponds and ultimately disposed inland fills
- Drainage based on enhanced irrigation management going through reverse osmosis treatment with the brine to evaporation ponds and ultimately disposed in landfills and the clean product water going to a beneficial use
- Drainage from integrated drainage management going through reverse osmosis with the brine to evaporation ponds and ultimately disposed in landfills and the clean product water going to a beneficial use
- Land retirement with drainage from the remaining acres using current irrigation technology going through reverse osmosis treatment with the brine to evaporations and ultimately disposed in landfills and the clean product water going to a beneficial use
- Drainage from integrated drainage management going through reverse osmosis treatment with the brine to evaporation ponds, with the dried salts going to a beneficial use and the clean product water going to a beneficial use

Each complete alternative was analyzed to determine drained area and drainage volume, collection and conveyance system, treatment of volume reduction approach, and salt or drained water disposal. This process resulted in a summary of costs representing total capital costs, annual operating costs, and the present worth of these costs over a 50-year period of analysis. Table ES-1 is a summary of the Preliminary Alternatives along with appraisal level costs. Each of the alternatives is described in more detail in Section 6.

Next Steps

Through 2002, Reclamation will evaluate and refine the preliminary alternatives identified in this Report. The alternatives evaluation will include review and verification of the drainage need and evaluation and screening of alternatives to identify a preferred alternative by December 2002. In 2003 and 2004, Reclamation will complete detailed evaluation of the alternatives, including the Environmental Impact Statement. In a parallel process, Reclamation will also be evaluating potential interim or short-term actions that could be implemented soon to provide drainage service.

Reclamation intends for public involvement to be an integral part of the entire re-evaluation process, including planning, impact assessment, and implementation. Reclamation is focusing on a strategy to inform, educate and involve key stakeholders and the public in formulating workable solutions. Agencies and the public will play an important role through 2002 in identifying and screening alternatives.

Reclamation will utilize a collaborative approach to Feature Re-evaluation with two primary elements, technical evaluation and public involvement. The two-track technical evaluation will consist of (1) drainage service solutions and completion of the required NEPA documentation (the Feature Re-evaluation process) and (2) consideration of interim actions that could be expanded or implemented before 2005. Additionally, Reclamation will

TABLE ES-1
Cost Summary

Alternative Designation	Alternative Description	Area Served (acres)		Collected Volume (AF)	Capital Cost ($Million)[a]				Annual O&M&R and Energy ($Million)[a]				Total Present Worth ($ million)
		Drained	Retired		Conveyance[b]	Treatment	Disposal	Land Retirement	Conveyance	Treatment	Disposal	Water Sales[c]	
In-Valley Alternatives													
1A	Evaporation Ponds to Landfill	260,600	0	78,180	555	41			5	4	57		$2,140
1B	Evaporation Ponds to Landfill	260,600	0	130,300	555	68			5	7	57		$2,227
1C	Integrated Drainage Management to Evaporation Ponds to Landfill	260,600	0	78,180	555	98			5	6	57		$2,238
1D	Large Scale Land Retirement to Evaporation Ponds to Landfill	60,600	200,000[d]	30,300	129	16		480	1	2	8		$805
1E	Selective Land Retirement to Evaporation Ponds to Landfill	210,600	50,000	105,300	449	53		120	4	5	45		$1,884
1F	Integrated Drainage Management to Deep Well	260,600	0	78,180	555	94	16		5	5	2		$908
1G	Large Scale Retirement to Deep Well	60,600	200,000[d]	30,300	129		61	480	1		9		$846
Out-of-Valley Alternatives													
2A	Selenium Treatment to Delta	260,600	0	78,180	491	156	370		5	4	12		$1,397
2B	Selenium Treatment to Delta	260,600	0	130,300	491	260	370		5	7	20		$1,742
2C	Integrated Drainage Management to Delta	260,600	0	130,300	491	313	120		5	18	4		$1,471
2D	Ocean	260,600	0	78,180	491		320		5		12		$1,119

TABLE ES-1
Cost Summary

Alternative Designation	Alternative Description	Area Served (acres)		Collected Volume (AF)	Capital Cost ($Million)[a]				Annual O&M&R and Energy ($Million)[a]				Total Present Worth ($ million)
		Drained	Retired		Conveyance[b]	Treatment	Disposal	Land Retirement	Conveyance	Treatment	Disposal	Water Sales[c]	
2E	Ocean	260,600	0	130,300	491		320		5		20		$1,308
2F	Selenium Treatment to Ocean	260,600	0	78,180	491	156	320		5	4	12		$1,351
2G	Selenium Treatment to Ocean	260,600	0	130,300	491	260	320		5	7	20		$1,696
2H	Integrated Drainage Management to Ocean	260,600	0	130,300	491	313	150		5	18	4		$1,498
2I[e]	Large Scale Retirement to Ocean	60,600	200,000[d]	30,300	491		150	480	5		9		$1,331
Beneficial Use Alternatives													
3A	Reverse Osmosis with Brine to Evaporation Ponds to Landfill	260,600	0	78,180	555	41			5	57	57	(9)	$3,214
3B	Reverse Osmosis with Brine to Evaporation Ponds to Landfill	260,600	0	130,300	555	16			5	90	57	(15)	$3,853
3C	Integrated Drainage Management to Reverse Osmosis with Brine to Evaporation Ponds to Landfill	260,600	0	130,300	555	279			5	18	57	(1)	$2,661
3D	Integrated Drainage Management to Reverse Osmosis with Brine to Evaporation Ponds to Salt Reuse	260,600	0	130,300	555	158			5	18		(1)	$1,166

TABLE ES-1
Cost Summary

Alternative Designation	Alternative Description	Area Served (acres)		Collected Volume (AF)	Capital Cost ($Million) [a]				Annual O&M&R and Energy ($Million) [a]				Total Present Worth ($ million)
		Drained	Retired		Conveyance[b]	Treatment	Disposal	Land Retirement	Conveyance	Treatment	Disposal	Water Sales[c]	
3E	Large Scale Land Retirement to Reverse Osmosis with Brine to Evaporation Ponds to Landfill	60,600	200,000 [d]	30,300	129	4		480	1	21	8	(3)	$1,183

[a] Although some mitigation costs are accounted for, alternatives to be considered in more detail will require coordination with regulatory agencies and the public to determine an appropriate level of mitigation.

[b] Cost includes installation and maintenance of on-farm drainage systems.

[c] For the purpose of this report, it was assumed clean product water would be worth $150 per acre-foot.

[d] This reflects Westlands Water District's proposal to retire 200,000 acres of land.

[e] Designs for disposal of drainwater to the Delta or the ocean have not been completed in previous studies for this size.

implement a three-tiered outreach approach to form the framework for public review and collaboration on the evaluation efforts. The three-tiered outreach and collaboration strategy aims to encourage the involvement of decision-makers and opinion leaders, agency and organization specialists, and interested and affected individuals from the general public. Scheduled briefings will keep decision-makers and opinion leaders informed of program objectives, process, issues and preliminary decisions. Reclamation intends to establish a working group of key stakeholders to review and discuss the elements that will shape and refine the alternatives through 2002. Through these activities, participants will be actively involved in determining screening criteria, alternative selection, interim actions, and other re-evaluation processes. Additional public meetings will ensure that the general public and affected communities and landowners have an opportunity to review and comment on Feature Re-evaluation activities (see Figure ES-2).

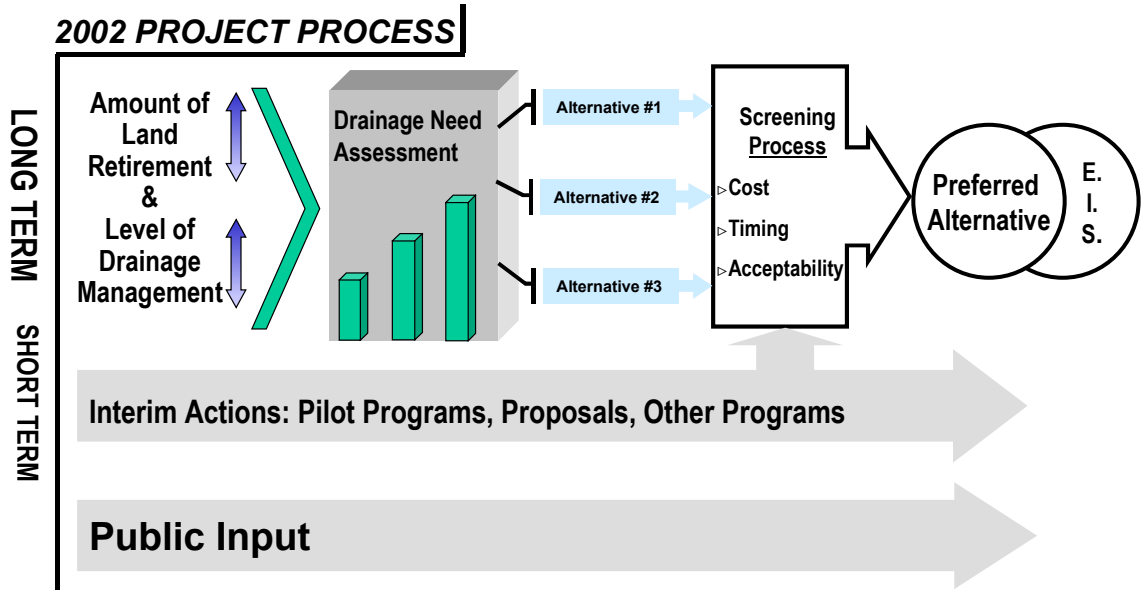

FIGURE ES-2
2002 Project Process

Comments

Reclamation welcomes comments on the Report and the alternatives presented.

Contact Information

Michael Delamore
Chief, San Joaquin Drainage Division
Bureau of Reclamation
South Central California Area Office
1423 N Street
Fresno, CA 93727
559-487-5039

Jason Phillips – Project Manager
U.S. Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825
916-978-5070

Marian Echeverria
Public Affairs Office
Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825
916-978-5105