Summary

The preappraisal level alternatives presented in this report were identified to reduce salinity in Salton Sea (Sea), to maintain an acceptable water surface elevation, and to be of proven technology. Estimated implementation costs are presented for use in future screening of these alternatives. No conclusions have been made about the desirability of retaining any alternative for further consideration.

Purpose and Need

Salton Sea is in the Salton Sea basin, which extends from Palm Springs, California, on the north to near the Gulf of California on the south. The Sea is about 35 miles long and 15 miles wide. At its current elevation of about -227 feet mean sea level (m.s.l.) (1996), the Sea has a maximum depth of 51 feet, with an estimated surface area of 240,000 acres (376 square miles). The lowest elevation it has reached has been approximately -278 feet m.s.l.

The Salton Sea has an average annual volume of approximately 7.5 million acre-feet. Annual inflows of approximately 1.3 million acre-feet contribute about 5 million tons of additional salt.

Purpose

The purpose of this study is to develop alternatives that would reduce salinity to no more than 40 parts per thousand (ppt) and to maintain a water surface elevation in the Sea of about -232 m.s.l., using proven technology.

Since water has been imported for irrigated agriculture, the water surface level of the Sea has risen steadily to its present level of approximately -227 feet m.s.l. Because no natural outlet for this largest manmade water body exists, salinity concentrations also have risen to about 44 ppt—about 25 percent higher than average ocean salinity of 35 ppt.

High water surface elevations and salinity have contributed to declines in land, recreation, economic, and ecological values.

Authority

This study was conducted under an agreement between the Salton Sea Authority, a joint powers authority established under California law, and the Bureau of Reclamation. Over the past 25 years, many proposals have been suggested for managing salinity of the Sea; however, to ensure inclusion of all possible solutions to the salinity and water surface elevation problems of the Sea, media announcements and public meetings during 1998 were used to invite submission of new alternatives.

Scope of Study

The alternatives developed and presented in this report were based on fulfilling three criteria:

- Achieving and maintaining a target salinity level of up to 40 ppt
- Achieving and maintaining a water surface elevation of -232 m.s.l.
- Using a proven technology that does not involve research

The Science Subcommittee, established by the Secretary of the Interior, is examining the needs of the biological habitat and many other important science-related issues of the Sea. Therefore, biology is outside the scope of this report.

Alternatives

Many alternatives, representing a wide variety of solutions, were considered during this study and in a previous study (draft September 1997). After evaluation of all alternatives submitted for consideration, 33 alternatives were selected for presentation in this document, costs were developed, and an initial analysis of the potential success was determined using the Salinity Model. This document presents the results of that analysis.

The alternatives described in this report are presented in three categories:

- Pump-out/pump-in alternatives
- Desalinization plants and solar pond alternatives
- Diked impoundment alternatives

Table S-1 presents the preappraisal costs for the Salton Sea alternatives, as well as a limited description of the alternatives.

The main report provides additional details of the alternatives to be further analyzed, and it provides an analysis (using a salinity model) of the potential success of various representative alternatives.

Identification of a preferred alternative would be dependent on many factors. The environmental effects of all reasonable alternatives would need to be analyzed to select an alternative that would bring the greatest overall benefit to the area. In addition, biological, chemical, and pathogenic studies would have to be performed to provide assurance that correcting the salinity and elevation problems of the Sea would also minimize mortality events and maintain a safe environment for migratory and resident wildlife. These studies would contain sufficient detail to secure construction financing and complete State and Federal environmental compliance processes.

Table S-1.—Preappraisal costs for the Salton Sea alternatives

Pump-out / Pump-in Alternatives

No.	Pump-out Discharge (k ac-ft/yr)	Pump-out To	Pump-in Discharge (k ac-ft/yr)	Pump-in From	Construction Field Cost ($M)	Energy Costs Annual ($M)	Other OM&R Annual ($M)	Total OMR&E Annual ($M)	Total Present Worth ($M)
1.346 M ac-ft/yr Drainage inflow -- Reach 40 ppt salinity in 15 years									
1	700	Camp Pendleton	600	Camp Pendleton	3,500	478	8	486	10,314
2	700	Gulf of California	600	Gulf of California	3,300	42	0.7	43	3,902
3	700	Hyperion	600	Hyperion	4,700	359	6	365	9,813
4	250	Point Loma	153	Point Loma	1,500	153	5	158	3,717
5	250	Hyperion	153	Hyperion	1,850	117	4	121	3,548
6	250	Gulf of California	153	Yuma [3]	1,150	12	0.5	13	1,328
7	250	Palen Lake	153	Point Loma	2,682	119	678	797	13,859
8	250	Palen Lake	153	Hyperion	2,852	116	678	795	13,992
9	250	Gulf of California	153	Point Loma	1,450	70	3	73	2,468
10	250	Gulf of California	153	Hyperion	1,550	56	2	59	2,370
1.346 M ac-ft/yr Drainage inflow -- Reach 40 ppt salinity in 30 years									
11	400	Camp Pendleton	303	Camp Pendleton	2,100	262	6	268	5,861
12	400	Gulf of California	303	Gulf of California	2,100	26	0.6	26	2,466
13	400	Hyperion	303	Hyperion	2,800	199	5	203	5,653
14	170	Point Loma	73	Point Loma	1,050	94	5	99	2,437
15	170	Hyperion	73	Hyperion	1,250	73	4	77	2,326
16	170	Gulf of California	73	Yuma [3]	800	9	0.4	10	935
17	170	Palen Lake	73	Point Loma	1,807	71	462	533	9,277
18	170	Palen Lake	73	Hyperion	1,887	65	462	526	9,264
19	170	Gulf of California	73	Point Loma	980	38	2	40	1,546
20	170	Gulf of California	73	Hyperion	1,050	32	2	34	1,522
1.346 M ac-ft/yr Drainage inflow -- Reach 43 ppt salinity in 90 years									
21	100	Camp Pendleton			420	39	2	41	1,001
22	100	Gulf of California			470	6	0.4	7	564
1.000 M acre-ft/yr Drainage inflow -- Reach 40 ppt salinity in 30 years									
23	205/120	Gulf of California	405/345	Yuma [3]	1,300	7	0.3	8	1,406

Desalinization Plants and Solar Pond

No.	Pump-out Discharge (k ac-ft/yr)	Description	Construction Field Cost ($M)	Energy Costs Annual ($M)	Other OM&R Annual ($M)	Total OMR&E Annual ($M)	Total Present Worth ($M)
1.346 M ac-ft/yr Drainage inflow -- Reach 40 ppt salinity in 30 years							
24	110	Desalt plant & brackish pipe to the Gulf	932	47	17	64	1,822
25	94	Solar pond, desalt plant & brackish pipe to Gulf	1,006	14	18	32	1,453

Dikes

No.	1997 Report Alternative No.	Surface Area Of Dike (mi²)	Description	Construction Field Cost ($M)	Energy Costs Annual ($M)	Other OM&R Annual ($M)	Total OMR&E Annual ($M)	Total Present Worth ($M)
26	1	50	Dike	840	9.7	352	361	5,908 [2]
27	2	40	Dike	660	9.7	351	361	5,722 [2]
28	3	127	Dike	700	9.7	796	806	11,996 [2]
29	4	47 Total	Two Ponds	1,100	9.7	352	361	6,167 [2]
30	5	25/127	East / North Ponds	1,250	9.7	797	806	12,555 [2]
31	2*	40	Earthquake Design [1]	1,950	9.7	351	361	7,012
32	6	30	Dike only	610	- -	- -	-	610 [2]
33	7	30	Dike only	610	- -	- -	-	610 [2]

New Combination Alternatives

No.	Description	Construction Field Cost ($M)	Energy Costs Annual ($M)	Other OM&R Annual ($M)	Total OMR&E Annual ($M)	Total Present Worth ($M)
34	Salt Pond / Shipping Channel / Canals / Desalting Facility					
35	Gulf of California Pump-in / Pump-out / Diking / Treating Inflows					
36	Phased Approach -- Ph.1: Salt Stabilized, Ph.2: Pump-in					
37	In-Sea Concentrator / Pipeline	1,748	64	3	67	2,690
38	Out-of-Sea Concentrator / Pipeline					

Costs do not include cost of obtaining water or cost reductions for pumping cut backs..

[1] Similar to No. 2 but designed to withstand earthquakes.

[2] Costs do not include cost of repairing dike failures caused by earthquakes.

[3] See Chapter 5, "Pump-in Sources" for availability of water.