

## Chapter 3

# Costs of the Alternatives

Costs included in this report are comparative costs. They should only be used to compare the relative differences in costs among the alternatives.

The costs shown as construction field costs were based on estimated quantities. Minor items were handled by adding a percentage (15 percent) of the overall cost. The total construction field cost also includes contingencies of 25 percent.

The costs do not include the expense of purchasing water to be delivered to the Salton Sea. A cost may be charged for water other than ocean water. Pumping plant costs (capital and OM&R) were determined using computer programs and equations developed for planning estimates. Program input included head (pressure), discharge flow, and other factors.

The alternative designs assumed the presence of electrical transmission lines and energy prices typical of the local area. These are current energy costs and not marginal energy costs. The rate used was \$0.0725 per kilowatthour (kWh), which is an average of the following rates:

Winter:

Offpeak: \$0.037 per kWh (37 mills)  
Onpeak: \$0.103 per kWh (103 mills)

Summer:

Offpeak: \$0.037 per kWh (37 mills)  
Onpeak: \$0.113 per kWh (113 mills)

Operation, maintenance, and replacement (OM&R) costs include those for operating and maintaining the pumping plants and replacing components as required. OM&R costs do not include energy costs.

Present worth calculations are based on a project life of 100 years and annual interest of 7.125 percent. The design assumes that, where required, salt removal is a one-time event. The estimator assumed that trucks would haul the salt to the ocean. Salt trucked to the ocean would be mixed with ocean water, dissolved, and discharged through a dispersion pipe into the ocean; therefore, the salt would not stockpile over the 100-year period.

Table 2.—Preappraisal costs for the Salton Sea restoration

<b>Pump-out / Pump-in Alternatives</b>								
<b>1.346 M ac-ft/yr Drainage inflow -- Reach 40 ppt salinity in 15 years</b>								
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)
1	700	Camp Pendleton	600	Camp Pendleton	3,500	478	8	486
2	700	Gulf of California	600	Gulf of California	3,300	42	0.7	43
3	700	Hyperion	600	Hyperion	4,700	359	6	365
4	250	Point Loma	153	Point Loma	1,500	153	5	158
5	250	Hyperion	153	Hyperion	1,850	117	4	121
6	250	Gulf of California	153	Yuma 3	1,150	12	0.5	13
7	250	Palen Lake	153	Point Loma	2,682	105	4	108
8	250	Palen Lake	153	Hyperion	2,852	102	4	106
9	250	Gulf of California	153	Point Loma	1,450	70	3	73
10	250	Gulf of California	153	Hyperion	1,550	56	2	59
<b>1.346 M ac-ft/yr Drainage inflow -- Reach 40 ppt salinity in 30 years</b>								
11	400	Camp Pendleton	303	Camp Pendleton	2,100	262	6	268
12	400	Gulf of California	303	Gulf of California	2,100	26	0.6	26
13	400	Hyperion	303	Hyperion	2,800	199	5	203
14	170	Point Loma	73	Point Loma	1,050	94	5	99
15	170	Hyperion	73	Hyperion	1,250	73	4	77
16	170	Gulf of California	73	Yuma 3	800	9	0.4	10
17	170	Palen Lake	73	Point Loma	1,807	61	3	64
18	170	Palen Lake	73	Hyperion	1,887	55	3	58
19	170	Gulf of California	73	Point Loma	980	38	2	40
20	170	Gulf of California	73	Hyperion	1,050	32	2	34
<b>1.346 M ac-ft/yr Drainage inflow -- Reach 43 ppt salinity in 90 years</b>								
21	100	Camp Pendleton			420	39	2	41
22	100	Gulf of California			470	6	0.4	7
<b>1.000 M acre-ft/yr Drainage inflow -- Reach 40 ppt salinity in 30 years</b>								
23	205/120	Gulf of California	405/345	Yuma 3	1,300	7	0.3	8
<b>Desalinization Plants and Solar Pond</b>								
<b>1.346 M ac-ft/yr Drainage inflow -- Reach 40 ppt salinity in 30 years</b>								
24	110	Desalt plant & brackish pipe to the Gulf			932	47	17	64
25	94	Solar pond, desalt plant & brackish pipe to Gulf			1,006	14	18	32
<b>Dikes</b>								
No.	1997 Report Alternative No.	Surface Area Of Dike (mi <sup>2</sup> )						
26	1	50	Dike		840	-	-	- <sup>2</sup>
27	2	40	Dike		660	-	-	- <sup>2</sup>
28	3	127	Dike		700	-	-	- <sup>2</sup>
29	4	47 Total	Two Ponds		1,100	-	40	40 <sup>2</sup>
30	5	25/127	East / North Ponds		1,250	-	-	- <sup>2</sup>
31	2*	40	Earthquake Design 1		1,950	-	-	-
32	6	30	Dike only		610	-	-	- <sup>2</sup>
33	7	30	Dike only		610	-	-	- <sup>2</sup>
<b>New Combination Alternatives</b>								
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 4				1,748	64	3	67
38	Out-of-Sea Concentrator / Pipeline 4				1,370	64	3	67
39	South end off-shore dike							

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

<sup>1</sup> Similar to No. 2 but designed to withstand earthquakes.

<sup>2</sup> Costs do not include cost of repairing dike failures caused by earthquakes.

<sup>3</sup> See Chapter 5, "Pump-in Sources" for availability of water.

<sup>4</sup> Similar to No. 9 but designed with concentrator.

Table 2 shows the costs of the alternatives that were determined to meet the three evaluation criteria previously discussed. The table includes not only construction costs but also energy, operation, maintenance, and replacement costs. Chapters 4, 5, and 6 describe the items included in these costs and their derivation. Please remember the designs and costs are for relative comparison among the alternatives.

As stated, table 2 shows the costs for complete pipeline systems. Figure 2 illustrates field costs as a function of discharge. It shows individual pipelines flowing in only one direction.

*Figure 2.—Pipeline field costs as a function of discharge flowing in one direction.*

It may be difficult to understand how the costs of a particular alternative (from table 2) compare with other alternatives. Figure 3 shows all alternatives' complete costs— field costs versus annual costs. Figure 4 shows the same information, but only for the alternatives with lower costs.

*Figure 3.—Construction field costs are displayed on the horizontal axis and the annual costs of operation, maintenance, repair, and energy on the vertical axis. Pump-out/pump-in pipelines are shown as circular dots.*

Comparing pump-out/pump-in alternative Nos. 1 through 10 and Nos. 11 through 20 allows the reader to understand the effect of reaching a salinity of 40 ppt in two different timeframes.

Figure 5 (Cost of Salinity) compares the cost of reaching various salinity concentrations in 30 years. This curve is based on inflow of 1 million acre-foot per year, 2.8-inch-per-year precipitation, and a pump-in salinity of 4 ppt.

*Figure 4.—The same field costs and operation, maintenance, replacement, and energy costs as in figure 3 are displayed on the horizontal and vertical axis, but only for the lower cost alternatives—a small portion of those in figure 3.*

The curve is also based on a pipeline going to and from either Camp Pendleton or the Gulf of California. The costs are approximate but accurate enough to portray the cost of reaching various salinity levels in 30 years from the end of construction. The lower the salinity concentration to be achieved, the higher the cost would be to achieve that level of salinity under these circumstances.

*Figure 5.—The construction field cost decreases as the target salinity increases. This illustrates the relationship based on a fictitious pipeline going to and from the Gulf of California or Camp Pendleton. Other parameters are discussed in the text.*