Attachment B

Salton Sea Accounting Model

SALTON SEA ACCOUNTING MODEL

To effectively evaluate the no action condition and the effects of Salton Sea Restoration Project alternatives, an accounting model of the Sea has been developed. This model is a sophisticated spreadsheet model that resides inside of Microsoft Excel 97 and utilizes an uncertainty package produced by Palisades called @Risk. The Salton Sea Accounting Model incorporates the ability to perform stochastic, deterministic, and sensitivity simulations of the future Salton Sea conditions. The model operates on an annual time step and was designed to meet specific objectives unique to the Salton Sea Restoration Project.

Numerous simulations of the alternatives being studied for the Salton Sea have been performed using the Salton Sea Accounting Model. Simulations have been performed for no action, phase 1 and 2 combination alternatives, and phase 1 only alternatives.

MODEL OBJECTIVES

The objectives behind the development of the Salton Sea Accounting Model were to provide a tool that would allow the effective evaluation of historic and future conditions within the Salton Sea, both with and without proposed Restoration Project alternatives. Specifically, the model was developed to provide predictions of changes in inflow, elevation, surface area, and salinity. The need to effectively evaluate conditions also required the model to simulate the Sea from both deterministic and stochastic points of view, while preserving hydrologic variability. Objectives related to the modeling of Salton Sea Restoration Project alternatives included the need to simulate:

Future reductions in inflow
Future changes in salinity of inflows
Imports of water
Exports of water
Imports of Colorado River flood flows based on probabilities of occurrence
Concentration pond operations
Displacement dike operations

The model takes into consideration historic variability in both rainfall / runoff characteristics, as well as water use and water management practices. The model does not simulate onfarm water use directly. However, variability in water use is preserved.

Another objective of the model is to provide a tool that allows the analysis of sensitivity related to model input parameters. For example, the model can be used to evaluate the range of hydrologic conditions that would exist at the Sea under uncertain levels of future inflows.

MODEL ASSUMPTIONS

There are assumptions built into the modeling approach applied to the Salton Sea Accounting Model. Each is described below.

Time Step

The model operates on an annual time step. This assumes that the mass balance changes relative to water and salts in the Salton Sea do not vary significantly on a monthly basis. Analysis of historic data related to water surface elevations and salinity indicates that this assumption is reasonable.

Historic Water Budget Inflows

Historic inflows to the Salton Sea were computed using a water budget technique whereby inflows are a closure term in a water balance of the Sea. This approach involved the back calculation of inflow as a net term in the following equation:

$$I = S_{t+1} - S_t + E - P$$

Where:

I	=	Historic computed inflow to the Salton Sea in year t+1
S_{t+1}	=	End of year storage in year t+1
S_t	=	End of year storage in year t
E	=	Sea evaporation in year t+1
P	=	Sea precipitation in year t+1

Storage, evaporation, and precipitation records used in the model for the period 1950 through 1971 were taken from the Bureau of Reclamation's and the State of California's 1974 Feasibility Report (Reclamation, 1974). Records for the period 1972 through 1984 were updated by Parsons Engineering in 1985 (Parsons 1985). Records for 1986 through 1997 were updated in this study. For this recent period, storage records were developed through the use of U.S. Geological Survey water surface elevation records in combination with Storage/Elevation/Area information from the Bureau of Reclamation's 1995 survey of the Salton Sea (Reclamation, 1997). Precipitation and evaporation records were provided by the Imperial Irrigation District for the Imperial Weather Station. Table B-1 contains total annual inflows compiled and computed as described above.

Table B-1.–Salton Sea total annual inflows

Year	Total Inflow (1000 af)
1950	1,203
1951	1,358
1952	1,411
1953	1,456
1954	1,365
1955	1,371
1956	1,310
1957	1,193
1958	1,187
1959	1,300
1960	1,387
1961	1,413
1962	1,469
1963	1,644
1964	1,212
1965	1,164
1966	1,312
1967	1,321
1968	1,399
1969	1,392
1970	1,270
1971	1,309
1972	1,317
1973	1,354
1974	1,446
1975	1,475
1976	1,490
1977	1,466
1978	1,507
1979	1,593
1980	1,475
1981	1,292
1982	1,194
1983	1,485
1984	1,392
1985	1,310
1986	1,300
1987	1,382
1988	1,390
1989	1,356
1990	1,301
1991	1,281
1992	1,214
1993	1,506
1994	1,358
1995	1,430
1996	1,414
1997	1,231
Average 50-97	1,363

Salinity of Inflow

The impact of reductions in inflow on the salinity of the inflow waters was analyzed. It was assumed that inflow salinity changes due to any reductions in inflow would be conservatively represented by estimates of salinity changes that would occur as a result of farm conservation measures. For the purpose of estimating how salinity would vary relative to inflow, the following conditions were assumed:

1. Computations were performed in 20,000-acre-foot-per-year increments from the current drainage to the Sea of 1,346,000 acre-feet per year (average for period 1985 to 1995) down to 806,000 acre-feet per year.

2. The area soils are relatively porous and sandy and would not store additional salts or leach salts from the soil profile.

3. The current drainage to the Sea of 1,346,000 acre-feet per year (average for period 1985 to 1995) has a salt concentration of 2,800 mg/L, which discharges approximately 5,124,370 tons of salt per year into the Sea.

4. Colorado River salinity was assumed to be 850 mg/L, which is just below the established salinity standard at Imperial Dam. At this salinity, the salt removed from the drainage to the Sea would be approximately 23,115 tons for each 20,000 acre-feet conserved.

Based on the above assumptions, table B-2 shows the year, the total annual drainage, and the total annual salt load to the Sea, along with the estimated drainage salt concentration. The drainage concentration would be increased by approximately 30 mg/L for the first 20,000-acre-foot increment and about 79 mg/L for the last increment.

These calculations are based on the acres of lands irrigated and the crop water consumption remaining constant. Baseline irrigation and water use has an estimated drainage quality at 2,800 mg/L. As water is removed from the irrigation process at 850 mg/L, it was assumed that this was the only salt removal from the Salton Sea inflows; therefore, the drainage concentration gradually increases from the initial 2,800 mg/L to 3,459 mg/L at 1,000,000 acre-feet of drainage. As water conservation continues down to 806,000 acre-feet per year of inflow, the salt concentration in the drainage water would increase to 4,107 mg/L. These salinity concentration changes are expected to maintain the required salt balance.

Table B-2.—Calculations used to predict salinity concentrations associated with water conservation for use in the Salton Sea Salinity Model

Year	Drainage (acre-feet/year)	Salt load (tons/year)	Drainage salt concentration (mg/L)
0	1,346,000	5,124,370	2,800
1	1,326,000	5,101,260	2,830
2	1,306,000	5,078,150	2,860
3	1,286,000	5,055,040	2,891
4	1,266,000	5,031,930	2,923
5	1,246,000	5,008,820	2,957
6	1,226,000	4,983,710	2,990
7	1,206,000	4,962,600	3,026
8	1,186,000	4,939,490	3,063
9	1,166,000	4,916,380	3,101
10	1,146,000	4,893,270	3,140
11	1,126,000	4,870,160	3,181
12	1,106,000	4,847,050	3,223
13	1,086,000	4,823,940	3,267
14	1,066,000	4,800,830	3,312
15	1,046,000	4,777,720	3,359
16	1,026,000	4,754,610	3,408
17	1,006,000	4,731,500	3,459
18	986,000	4,708,390	3,512
19	966,000	4,685,280	3,567
20	946,000	4,662,170	3,625
21	926,000	4,639,060	3,685
22	906,000	4,615,950	3,747
23	886,000	4,592,840	3,813
24	866,000	4,569,730	3,881
25	846,000	4,546,620	3,953
26	826,000	4,523,510	4,028
27	806,000	4,500,400	4,107
28	806,000	4,500,400	4,107

To test the sensitivity of the calculations on the assumed Colorado River salt concentrations, it was assumed that the concentration was 800 mg/L instead of the 850 mg/L used. This resulted in a change of less than 1 mg/L or a concentration of 2,830 mg/L after the first 20,000 acre-feet of conservation. The reason for the slight increase is that less salt was removed from the drainage to the Salton Sea. This amounts to approximately a 34-mg/L concentration increase in the drainage salinity at 800,000 acre-feet of drainage to the Sea. The modeling experience has shown that the Sea's estimated salinity is not very sensitive to small changes in input water salt concentrations. This is discussed further later in this attachment.

Salinity Impacts on Evaporation

The evaporation equation used in the model to simulate how salinity affects evaporation rates from the Sea is based on the work of Salhotra et al (1985) and Crow (1974). Solhotra evaluated the effect of salinity and ionic composition on evaporation from evaporation pans in the Dead Sea area. He used various concentrations of Mediterranean and Dead Sea water. Crow worked with evaporation data from brine storage reservoirs. Their data was normalized to freshwater evaporation. A curve was fit to the above described data The equation is described as follows (Salton Sea Authority, June 1998):

$$Y = (0.9819 + (-0.00000013982 * X ^\wedge 2.5)) ^\wedge 2)/.9606$$

Y = standardized evaporation in percent of freshwater pan evaporation

X = the water salinity in parts per thousand

This equation is incorporated into the Salton Sea Accounting Model such that evaporation rates decrease as salinity increases in the Sea during model simulation.

Reductions in Inflow

Reductions in inflow to the Salton Sea are likely in the future. Historically, the average annual inflow to the Salton Sea has been 1,363,000 acre-feet per year. The draft California Colorado River Quantification Agreement includes actions that are likely to have an impact on inflows to the Salton Sea. The action that has been identified as potentially having the most impact on inflows to the Salton Sea is the proposed transfer of up to 200,000 acre-feet per year to San Diego. This transfer has options for an additional

100,000 acre-feet per year, which could result in a total transfer of up to 300,000 acre-feet per year. The minimum amount to be transferred would be 130,000 acre-feet per year. The planned rate for the transfers is expected to be 20,000 acre-feet per year. Another possible reason for future reductions in inflow will be less water crossing the border from Mexico. These Mexico related reductions would likely occur due to water reuse projects. No specific schedule has been suggested for such reuse of water in Mexico. The average annual discharges from Mexico that eventually end up in the Salton Sea are currently averaging 165,500 acre-feet per year. Canal lining projects might also have an impact on inflows to the Salton Sea. The combined effect of all these conservation measures (plus others yet to be identified) may eventually reduce inflows to the Salton Sea to around the 800,000-acre-foot-per-year level.

The Salton Sea Restoration Project is analyzing the effectiveness of project and no action alternatives at three different average annual inflows: 1,363,000, 1,063,000, and 800,000 acre-feet per year. The rate of reduction in inflow that is being assumed in project analyses is 10,000 acre-feet per year. These reductions are assumed to begin starting in the year 2002. At this rate, by the year 2031, inflows would be at the 1,063,000-acre-foot-per-year level, and by 2058, inflows would be down to nearly 800,000 acre-feet per year. The 10,000-acre-foot-per-year rate of reduction in inflow represents a reasonable assumption on how changes will be reflected at the Salton Sea. Until the NEPA/CEQA process is completed relative to the proposed conservation projects, it is impossible to identify accurately how such measures might impact inflows to the Salton Sea. This 10,000-acre-foot per-year rate includes a number of considerations that would likely stretch out impacts on inflows to the Salton Sea. These are as follows:

1. It will be difficult to measure impacts on inflows to the Salton Sea due to proposed conservation measures. Bank storage effects are likely to offset minor reductions in inflow. Changes in inflow can only be measured through mass balance computations. As water comes out of bank storage to offset reduced inflow, there will be little or no reductions detectable for a number of years. Eventually, once the Sea reaches a new equilibrium, the full effects of the conservation measures should be detectable. The result of this will be that the overall reductions in inflow will eventually have an impact on the Salton Sea but will be delayed through time.

2. The use of surplus water from the Colorado River is likely to continue for the next 10 to 15 years. Returns to the Salton Sea from the use of surplus water will offset impacts to the Sea as a result of conservation

measures. Full impacts of the conservation measures will not be detectable until the use of surplus flows is curtailed.

Groundwater / Bank Storage Changes

The water budget approach discussed above relative to computing Salton Sea inflows accounts for both inflows from local aquifers and losses from the Salton Sea to the aquifers. The impacts of these water budget terms are included in computed total inflows to the Salton Sea. The use of these inflows in conducting future simulations of the Salton Sea assumes that such groundwater interactions will not change significantly in the future. The effects of bank storage on Salton Sea elevations as a result of reductions in inflow are modeled indirectly as discussed above under “Reductions in Inflow.”

Unmeasured Inflows

All unmeasured inflows to the Salton Sea from tributaries without stream gauges are also included in computed total inflows to the Salton Sea. The use of these computed inflows in conducting future simulations of the Sea assumes that such unmeasured inflows from tributaries will not change significantly in the future.

Colorado River Flood Flows

The Salton Sea Accounting Model can simulate quantities of Colorado River flood flows that might be divertible to the Salton Sea. The determination of such divertible flows is discussed below.

Projected excess releases from Hoover Dam were determined using Reclamation's CRSSEZ computer model of the Colorado River system of reservoirs. The model uses historical virgin runoff and future water use schedules and applies reservoir operating criteria to determine possible future reservoir contents and releases for downstream use. For a detailed discussion of the CRSSEZ model, an overview/users manual is available from Reclamation's Boulder City operations office.

The virgin runoff is based on the historical observed runoffs from 1906 to 1998 that have been adjusted for historical use. This sequence of historical runoff is used as inflow for the simulated future 61-year period (2000 to

2060). A total of 93 possible 2000-2060 periods (traces) were generated by keeping the runoff sequence order and starting each simulation 1 year later in the sequence. When the needed historical runoff period exceeds 1998, then the sequence picks up again with 1906 to complete the simulated period.

Operating criteria for the reservoirs and "Law of the River" were applied by the model to the virgin inflows to meet scheduled water uses and to make flood control releases. Depending on the storage in Lake Mead, a surplus-, a normal-, or a shortage-water use condition is determined in the Lower Basin. Flood releases are made as the system of reservoirs fills and flood control criteria require. The flood control criteria are those of the Field Working Agreement of 1984 between Reclamation and the U.S. Army Corps of Engineers.

For each year of the simulation, there are three possible diversions for Southern Nevada Water System (SNWS) and Central Arizona Project (CAP) and two possible diversions for Metropolitan Water District (MWD) and others. Others refer to all other uses in the three States but SNWS, CAP, and MWD. During a surplus-water use condition, full needs are met as scheduled by the user. During a normal-water use condition, needs are only met up to that provided by each State's basic apportionment, not to exceed a total of 7.5 maf. During a shortage-water use condition, CAP is reduced by about 0.4 maf to 1.0 maf, and SNWS is reduced by 4 percent of CAP's reduction or about 0.017 maf. MWD and others are not reduced below their normal schedule during shortage. CAP has agreed to bare MWD's share of shortage in exchange for support in constructing the CAP. Others have priority rights that precede CAP and SNWS and, therefore, are not shorted.

Reclamation has not adopted formal criteria for determining surplus, normal, or shortage conditions in the Lower Basin. Three different surplus criteria were used to provide a range of possible criteria. The most conservative surplusing criteria proposed so far, 70-percent assurance of avoiding spills (70R1), and two liberal criteria were used. The two liberal criteria, CAL44 and 6STATES, include proposed transfers of water use in the Lower Basin.

The shortage criteria used protects Mead elevation 1050 feet (Nevada intakes) as opposed to minimum power head (elevation 1083 ft) or emptying Lake Mead (elevation 930 ft). Shortage is declared with 80-percent assurance of not dropping Mead elevation below 1050 feet and is triggered at Mead elevations, increasing from elevation 1060 ft in the year 2000 to 1140 ft in the year 2060 as uses in the Upper Basin increase.

Average excess release for all 93 traces for the three cases were computed. The average value is the average of 61Years * 93Traces = 7673 values. Average excess release due to flood control for the 61-year period ranged from 0.569-0.629 maf per year for the three surplus cases. Average annual excess ranged from 1100 kaf in the near future to 300 kaf in the out-years as the Upper Basin water uses are developed. The probability of an excess release occurring ranged from 38 percent in the near future to 15 percent in the out-years.

Probability distributions were computed in 5-year increments for each of the three cases and then averaged for incorporation into the Salton Sea Accounting Model. These resultant probability distributions are sampled randomly during model simulations on an annual basis. The samplings provide an indicator of what might be available for diversion to the Salton Sea. Diversions are not made every year. Consideration is also given to how much can be reasonably diverted given diversion and conveyance constraints by comparing against available capacities in existing conveyance structures. These structures are the Coachella and All-American Canals. Water carried in the All-American Canal would be discharged into the Alamo River. A 1,250-cfs total capacity would be needed to divert flood flows into the Salton Sea. This corresponds to taking 300,000 acre-feet in 4 months (September-December) when Reclamation makes excess releases to make room for anticipated runoff. Such releases in anticipation of having to make flood releases is common and offers the greatest opportunity for the Salton Sea Restoration Project to take advantage of flood flows in the Colorado River. It appears that in many years, Imperial Irrigation District diverts flood flows into the All-American Canal to make power, then returns it to the Colorado River. For the purposes of this project, the water would continue down to the Alamo River. Significant channel improvements would be required along the Alamo River. It is proposed that up to 700 cfs be carried in the Coachella Canal and up to 550 cfs be carried in the All-American Canal. Information provided by the Imperial Irrigation District to the Salton Sea Authority indicates that 550-cfs capacity may be available in the All-American Canal. Coachella Valley Water District (CVWD) claims that all the evacuation gates along the Coachella Canal are large enough to divert the 700 cfs of flood flows proposed to be carried in the Coachella Canal. In addition, CVWD indicates that 700-cfs capacity exists in the Coachella Canal and that it would also be available. They claim that the best gates to use will be the ones at Detention Channel #1 which has a channel capacity of 300 cfs and the gate at Salt Creek which can easily carry the remaining 400 cfs.

The average distributions used within the model are provided in table B-3 and charted in figure B-1. A sample chart of flood flows that might be available in the future, compared to those flood flows that might be diverted into the Salton Sea, is presented in figure B-2. This chart represents one possible future out of an infinite number. The sample is based on the random selection of flood flows from probability distributions presented in figure B-1. This chart depicts that future availability of flood flows is expected to decrease through time. Each curve represents probabilities of flood flows under water use conditions that are expected in the years 2010, 2015, 2020, 2030, and 2040. The information relative to flood flows shown in table B-3 and figure B-1 represents those flows that are beyond all legal requirements to Mexico. In figure B-1, it can be seen that if water use conditions that are projected to exist in the year 2010 continue into the future, 90 percent of all years will have flood flows less than or equal to 3,100,000 acre-feet. Flood flows would not be available 77 percent of all years if 2010 conditions were to continue. For conditions that are expected in 2040, there would be less flood flows available. Under these conditions, there would be zero flood flows available 81 percent of all years and less than 1,000,000 af of flood flows available 90 percent of all years.

The Salton Sea Accounting Model was used to model the availability of Colorado River flood flows based on the distributions presented in figure B-1.

Table B-3

Availability of Colorado River Flood Flows for the Salton Sea
Distributions in 5 Year Increments:

Rank	Probability	2000	2005	2010	2015	2020	2030	2040
1	0.0108	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0215	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0323	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0430	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0538	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0645	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0753	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0860	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0968	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.1075	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.1183	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.1290	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.1398	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.1505	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.1613	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.1720	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.1828	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.1935	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.2043	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.2151	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.2258	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.2366	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.2473	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.2581	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.2688	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.2796	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.2903	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.3011	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.3118	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.3226	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.3333	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.3441	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	0.3548	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	0.3656	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.3763	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	0.3871	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	0.3978	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	0.4086	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	0.4194	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	0.4301	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	0.4409	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	0.4516	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	0.4624	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	0.4731	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	0.4839	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	0.4946	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	0.5054	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	0.5161	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	0.5269	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	0.5376	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	0.5484	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	0.5591	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	0.5699	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	0.5806	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	0.5914	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	0.6022	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	0.6129	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	0.6237	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	0.6344	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.6452	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	0.6559	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	0.6667	0.0	40.3	0.0	0.0	0.0	0.0	0.0
63	0.6774	0.0	160.7	0.0	0.0	0.0	0.0	0.0
64	0.6882	260.0	254.3	0.0	0.0	0.0	0.0	0.0
65	0.6989	327.3	335.3	0.0	0.0	0.0	0.0	0.0
66	0.7097	363.7	430.0	0.0	0.0	0.0	0.0	0.0
67	0.7204	428.3	455.0	0.0	0.0	0.0	0.0	0.0
68	0.7312	698.7	479.3	0.0	0.0	0.0	0.0	0.0
69	0.7419	723.7	567.7	0.0	0.0	0.0	0.0	0.0
70	0.7527	804.7	672.3	0.0	0.0	0.0	0.0	0.0

Table B-3 (Continued)

71	0.7634	831.7	739.3	0.0	0.0	0.0	0.0	0.0
72	0.7742	1500.7	753.7	69.0	79.3	31.7	0.0	0.0
73	0.7849	1780.7	809.0	258.3	371.0	82.0	0.0	0.0
74	0.7957	1880.7	919.0	361.7	626.0	312.7	0.0	0.0
75	0.8065	1929.7	1285.7	397.3	728.0	350.0	0.0	0.0
76	0.8172	2266.7	1356.3	564.0	801.3	413.7	0.0	161.3
77	0.8280	2304.7	1634.3	878.3	832.7	495.3	32.0	354.0
78	0.8387	2368.7	2086.7	1081.0	856.3	580.7	73.7	515.0
79	0.8495	2387.7	2687.3	1166.0	891.3	709.0	389.0	552.0
80	0.8602	2838.7	2815.7	1479.0	1074.0	738.7	711.3	608.7
81	0.8710	2955.7	3253.7	2372.3	1289.7	1054.7	968.0	687.0
82	0.8817	3060.7	3814.7	2716.0	1901.3	1192.3	1064.0	806.3
83	0.8925	3065.7	4028.7	2933.3	2350.3	1593.0	1698.7	995.0
84	0.9032	3077.7	4109.7	3214.3	2540.3	2297.0	1867.7	1054.3
85	0.9140	3140.7	4282.7	3512.3	2963.3	2644.0	2211.3	1833.7
86	0.9247	3218.7	4956.0	4101.0	3584.7	3279.3	2478.3	2007.3
87	0.9355	3239.7	5503.3	4507.7	3805.0	3638.7	2760.0	2436.0
88	0.9462	4244.7	5577.0	5008.3	4726.7	4187.7	3393.0	3122.3
89	0.9570	4336.7	5634.0	5253.7	5155.7	4770.7	4140.3	3867.0
90	0.9677	4968.7	5716.7	5367.0	5289.3	5023.0	4707.3	4218.3
91	0.9785	4999.7	7559.3	6040.3	5913.0	5806.0	5050.0	4358.0
92	0.9892	5906.7	7598.3	7290.7	7173.3	7072.3	6957.0	6791.3
93	1.0000	6433.7	8495.7	7546.7	7514.3	7233.7	6996.0	6822.3

These are the probability distributions sampled in simulations of the Salton Sea Model

Figure B-1

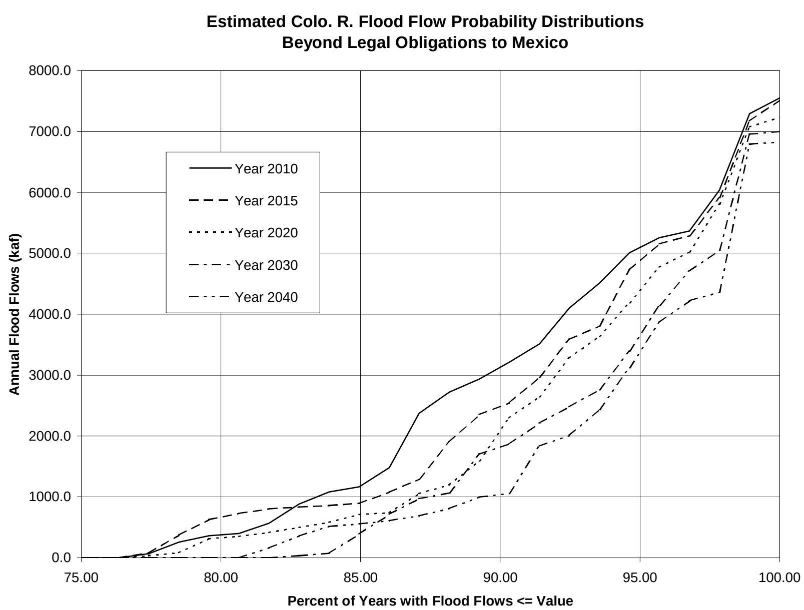
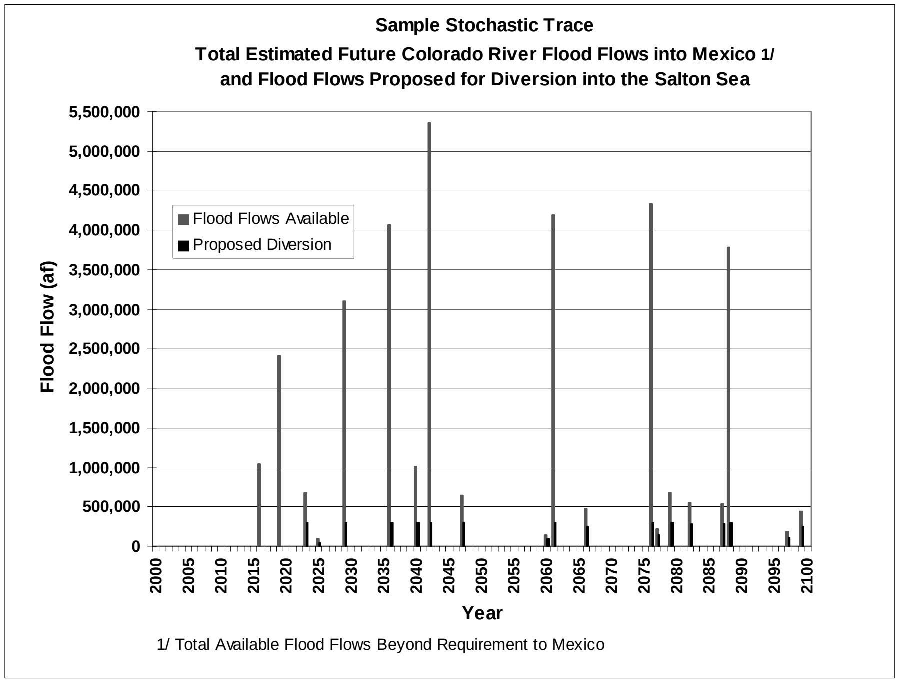


Figure B-2



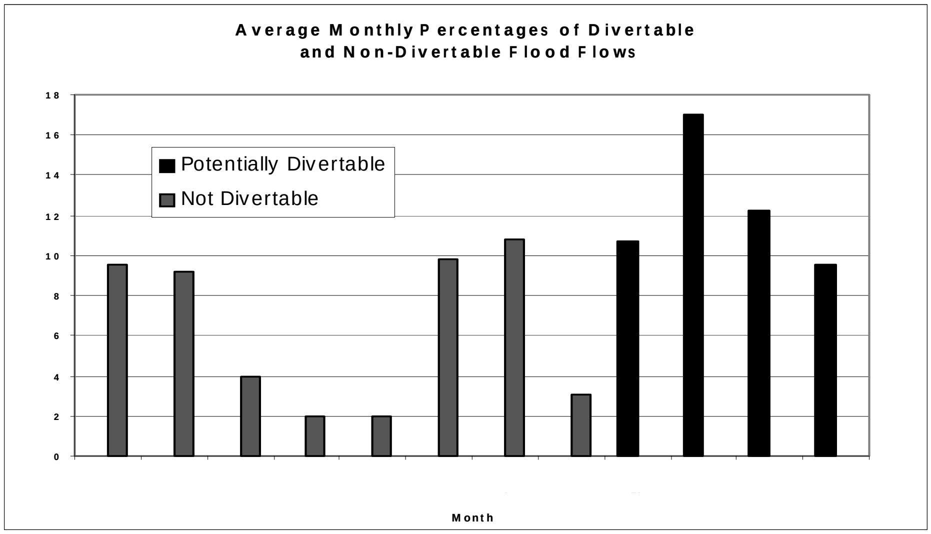
An analysis of monthly flood flows that would be expected to pass into Mexico was performed to develop a pattern of how flood flows would occur on a monthly basis. This analysis was performed using the most conservative of the three cases to develop the above probability distributions. To determine how much of the annual flood flows would be available on a monthly basis, the sampled annual flood flows were allocated using the following pattern:

Monthly Flood Flow Pattern
Fraction of Total Annual Flood Flow

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
.09	.09	.04	.02	.02	.10	.11	.03	.11	.17	.12	.10

This monthly flood flow pattern, in combination with knowledge described above relative to when capacity is available in the All-American and Coachella Canals, is combined into figure B-3. This figure displays the monthly fraction of total flood flows that are either divertible or not divertible.

Figure B-3



Model simulations of all alternatives result in 10 percent of the total flood flows that are available being diverted into the Salton Sea over a 100-year period. of time.

ELEVATION / AREA / CAPACITY DATA

In 1995, the Bureau of Reclamation conducted an extensive survey of the Salton Sea (Reclamation, 1997). The purpose of the survey was to develop underwater topography and compute area/elevation/capacity relationships for the Sea. This survey did not incorporate existing levees around the shoreline of the Salton Sea. As a result, the area/elevation/capacity data that was developed was not accurate at higher elevations. In the summer of 1999, Reclamation updated this survey data to reflect the influences of the existing levees on the area/elevation/capacity relationships. This was accomplished through the digitization of the Salton Sea shoreline from digital orthophoto quadrangles. Levees were identified along this shoreline and assigned an elevation of -220 feet. The two resulting elevation data (shoreline and levees) were merged into the 1995 survey data. New area/elevation/capacity data were then computed using Reclamation's reservoir survey software. Table B-4 contains this data. This information was incorporated into the Salton Sea Accounting Model for the purpose of computing elevations and surface areas for each year of model operation.

Table B-4 - Area / Elevation / Capacity Data
Includes Influences Due to Shoreline Levees Not Included in Original 1995 Survey

Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)
-278.6	0	0	-275.5	17626	20016	-272.4	52416	127310	-269.3	88765	346460	-266.2	108550	654946
-278.5	1	0	-275.4	18573	21826	-272.3	53527	132607	-269.2	89598	355378	-266.1	109068	665826
-278.4	9	1	-275.3	19508	23730	-272.2	54652	138016	-269.1	90441	364380	-266	109576	676759
-278.3	27	2	-275.2	20479	25729	-272.1	55837	143541	-269	91260	373465	-265.9	110072	687741
-278.2	70	7	-275.1	21439	27825	-272	57012	149183	-268.9	92038	382630	-265.8	110574	698773
-278.1	193	20	-275	22315	30013	-271.9	58201	154944	-268.8	92798	391872	-265.7	111075	709856
-278	441	52	-274.9	23193	32288	-271.8	59399	160824	-268.7	93524	401188	-265.6	111580	720989
-277.9	789	114	-274.8	24086	34652	-271.7	60602	166824	-268.6	94241	410576	-265.5	112096	732172
-277.8	1209	214	-274.7	25087	37111	-271.6	61814	172945	-268.5	94916	420034	-265.4	112590	743407
-277.7	1681	358	-274.6	26113	39671	-271.5	63089	179190	-268.4	95606	429560	-265.3	113076	754690
-277.6	2145	549	-274.5	27254	42339	-271.4	64343	185562	-268.3	96313	439156	-265.2	113563	766022
-277.5	2619	787	-274.4	28712	45138	-271.3	65495	192053	-268.2	97003	448822	-265.1	114034	777402
-277.4	3168	1077	-274.3	30247	48086	-271.2	66672	198662	-268.1	97668	458555	-265	114510	788829
-277.3	3734	1422	-274.2	31717	51184	-271.1	67870	205389	-268	98332	468355	-264.9	114981	800304
-277.2	4341	1826	-274.1	33113	54425	-271	69137	212239	-267.9	98966	478220	-264.8	115453	811825
-277.1	5001	2293	-274	34430	57803	-270.9	70342	219213	-267.8	99580	488148	-264.7	115925	823394
-277	5705	2828	-273.9	35638	61306	-270.8	71507	226305	-267.7	100199	498137	-264.6	116398	835010
-276.9	6439	3435	-273.8	36765	64926	-270.7	72618	233512	-267.6	100834	508188	-264.5	116872	846674
-276.8	7273	4121	-273.7	37864	68658	-270.6	73722	240829	-267.5	101448	518302	-264.4	117345	858385
-276.7	8088	4889	-273.6	38998	72501	-270.5	74768	248253	-267.4	102038	528477	-264.3	117818	870143
-276.6	8897	5738	-273.5	40144	76458	-270.4	75837	255783	-267.3	102632	538710	-264.2	118300	881949
-276.5	9666	6666	-273.4	41296	80530	-270.3	76913	263421	-267.2	103206	549002	-264.1	118772	893802
-276.4	10409	7670	-273.3	42395	84714	-270.2	78140	271174	-267.1	103780	559351	-264	119248	905703
-276.3	11130	8747	-273.2	43498	89009	-270.1	79448	279053	-267	104350	569758	-263.9	119723	917652
-276.2	11793	9893	-273.1	44578	93413	-270	80635	287057	-266.9	104909	580221	-263.8	120187	929647
-276.1	12438	11105	-273	45669	97925	-269.9	81786	295178	-266.8	105448	590739	-263.7	120653	941689
-276	13115	12382	-272.9	46712	102544	-269.8	82977	303416	-266.7	105977	601310	-263.6	121108	953777
-275.9	13858	13731	-272.8	47797	107270	-269.7	84276	311779	-266.6	106513	611934	-263.5	121580	965912
-275.8	14718	15160	-272.7	48941	112107	-269.6	85610	320273	-266.5	107020	622611	-263.4	122042	978093
-275.7	15699	16681	-272.6	50094	117058	-269.5	86826	328895	-266.4	107527	633339	-263.3	122494	990320
-275.6	16692	18300	-272.5	51265	122126	-269.4	87852	337629	-266.3	108031	644116	-263.2	122931	1002591

Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)
-263.1	123362	1014905	-260	135199	1416184	-256.9	145399	1851301	-253.8	155220	2317466	-250.7	164257	2812727
-263	123787	1027263	-259.9	135553	1429722	-256.8	145739	1865858	-253.7	155523	2333003	-250.6	164553	2829167
-262.9	124200	1039662	-259.8	135899	1443294	-256.7	146069	1880448	-253.6	155830	2348571	-250.5	164850	2845638
-262.8	124619	1052103	-259.7	136244	1456902	-256.6	146395	1895071	-253.5	156139	2364169	-250.4	165147	2862137
-262.7	125031	1064586	-259.6	136583	1470543	-256.5	146718	1909727	-253.4	156445	2379798	-250.3	165436	2878667
-262.6	125439	1077109	-259.5	136920	1484218	-256.4	147036	1924415	-253.3	156748	2395458	-250.2	165723	2895225
-262.5	125840	1089673	-259.4	137259	1497927	-256.3	147360	1939134	-253.2	157046	2411148	-250.1	166013	2911811
-262.4	126235	1102277	-259.3	137597	1511670	-256.2	147681	1953886	-253.1	157337	2426867	-250	166300	2928427
-262.3	126618	1114920	-259.2	137936	1525446	-256.1	148009	1968671	-253	157631	2442615	-249.9	166588	2945071
-262.2	127008	1127601	-259.1	138268	1539257	-256	148330	1983488	-252.9	157923	2458393	-249.8	166876	2961745
-262.1	127401	1140321	-259	138598	1553100	-255.9	148655	1998337	-252.8	158211	2474200	-249.7	167174	2978447
-262	127796	1153081	-258.9	138926	1566976	-255.8	148975	2013219	-252.7	158497	2490035	-249.6	167476	2995180
-261.9	128191	1165880	-258.8	139254	1580885	-255.7	149289	2028132	-252.6	158782	2505899	-249.5	167785	3011943
-261.8	128576	1178719	-258.7	139580	1594827	-255.6	149601	2043076	-252.5	159067	2521791	-249.4	168090	3028738
-261.7	128959	1191596	-258.6	139902	1608801	-255.5	149918	2058052	-252.4	159351	2537712	-249.3	168397	3045561
-261.6	129340	1204511	-258.5	140221	1622807	-255.4	150233	2073060	-252.3	159634	2553662	-249.2	168702	3062416
-261.5	129715	1217463	-258.4	140547	1636845	-255.3	150543	2088099	-252.2	159918	2569639	-249.1	169008	3079301
-261.4	130089	1230453	-258.3	140874	1650916	-255.2	150853	2103168	-252.1	160200	2585645	-249	169311	3096217
-261.3	130464	1243481	-258.2	141196	1665020	-255.1	151172	2118270	-252	160481	2601679	-248.9	169621	3113164
-261.2	130837	1256546	-258.1	141520	1679156	-255	151497	2133403	-251.9	160764	2617741	-248.8	169932	3130141
-261.1	131214	1269649	-258	141849	1693324	-254.9	151832	2148570	-251.8	161045	2633832	-248.7	170249	3147150
-261	131581	1282788	-257.9	142171	1707525	-254.8	152158	2163769	-251.7	161326	2649950	-248.6	170567	3164191
-260.9	131946	1295965	-257.8	142492	1721758	-254.7	152476	2179001	-251.6	161613	2666097	-248.5	170892	3181264
-260.8	132311	1309178	-257.7	142813	1736024	-254.6	152786	2194264	-251.5	161901	2682273	-248.4	171222	3198370
-260.7	132672	1322427	-257.6	143132	1750321	-254.5	153092	2209558	-251.4	162185	2698477	-248.3	171553	3215509
-260.6	133034	1335712	-257.5	143449	1764650	-254.4	153397	2224882	-251.3	162471	2714710	-248.2	171889	3232681
-260.5	133398	1349034	-257.4	143773	1779011	-254.3	153697	2240237	-251.2	162763	2730972	-248.1	172225	3249886
-260.4	133759	1362391	-257.3	144092	1793404	-254.2	154000	2255622	-251.1	163059	2747263	-248	172565	3267126
-260.3	134123	1375785	-257.2	144415	1807830	-254.1	154305	2271037	-251	163361	2763584	-247.9	172911	3284400
-260.2	134483	1389216	-257.1	144739	1822287	-254	154611	2286483	-250.9	163662	2779935	-247.8	173266	3301708
-260.1	134843	1402682	-257	145065	1836777	-253.9	154915	2301959	-250.8	163961	2796316	-247.7	173639	3319054

Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)
-247.6	174005	3336436	-244.5	185646	3893530	-241.4	197570	4488430	-238.3	207554	5116905	-235.2	216669	[illegible]
-247.5	174361	3353854	-244.4	186042	3912115	-241.3	197924	4508204	-238.2	207865	5137676	-235.1	216929	[illegible]
-247.4	174720	3371308	-244.3	186450	3930739	-241.2	198281	4528015	-238.1	208175	5158478	-235	217196	[illegible]
-247.3	175073	3388798	-244.2	186860	3949405	-241.1	198638	4547860	-238	208485	5179311	-234.9	217466	[illegible]
-247.2	175423	3406323	-244.1	187288	3968112	-241	198993	4567742	-237.9	208793	5200175	-234.8	217731	[illegible]
-247.1	175775	3423883	-244	187726	3986863	-240.9	199349	4587659	-237.8	209112	5221070	-234.7	217987	[illegible]
-247	176129	3441478	-243.9	188174	4005658	-240.8	199707	4607612	-237.7	209438	5241998	-234.6	218238	[illegible]
-246.9	176484	3459108	-243.8	188619	4024497	-240.7	200058	4627600	-237.6	209765	5262958	-234.5	218483	[illegible]
-246.8	176844	3476775	-243.7	189073	4043382	-240.6	200411	4647624	-237.5	210098	5283951	-234.4	218722	[illegible]
-246.7	177212	3494478	-243.6	189532	4062312	-240.5	200747	4667682	-237.4	210427	5304977	-234.3	218956	[illegible]
-246.6	177591	3512218	-243.5	189966	4081267	-240.4	201075	4687773	-237.3	210759	5326036	-234.2	219188	[illegible]
-246.5	177968	3529996	-243.4	190376	4100304	-240.3	201402	4707896	-237.2	211106	5347130	-234.1	219416	6015131
-246.4	178350	3547812	-243.3	190767	4119361	-240.2	201726	4728053	-237.1	211467	5368258	-234	219640	[illegible]
-246.3	178738	3565666	-243.2	191145	4138457	-240.1	202043	4748241	-237	211809	5389422	-233.9	219861	[illegible]
-246.2	179109	3583558	-243.1	191516	4157590	-240	202360	4768461	-236.9	212136	5410619	-233.8	220082	[illegible]
-246.1	179483	3601488	-243	191887	4176760	-239.9	202678	4788713	-236.8	212449	5431849	-233.7	220299	[illegible]
-246	179860	3619455	-242.9	192255	4195967	-239.8	202992	4808997	-236.7	212743	5453108	-233.6	220515	[illegible]
-245.9	180242	3637460	-242.8	192632	4215212	-239.7	203297	4829311	-236.6	213028	5474397	-233.5	220729	[illegible]
-245.8	180621	3655503	-242.7	192994	4234493	-239.6	203608	4849657	-236.5	213309	5495714	-233.4	220943	[illegible]
-245.7	181000	3673584	-242.6	193364	4253811	-239.5	203916	4870033	-236.4	213582	5517058	-233.3	221149	[illegible]
-245.6	181378	3691703	-242.5	193735	4273166	-239.4	204218	4890439	-236.3	213852	5538430	-233.2	221354	[illegible]
-245.5	181754	3709860	-242.4	194105	4292558	-239.3	204518	4910876	-236.2	214120	5559829	-233.1	221553	[illegible]
-245.4	182127	3728054	-242.3	194469	4311986	-239.2	204819	4931343	-236.1	214385	5581254	-233	221752	[illegible]
-245.3	182499	3746285	-242.2	194841	4331452	-239.1	205123	4951840	-236	214646	5602705	-232.9	221952	[illegible]
-245.2	182868	3764554	-242.1	195204	4350954	-239	205426	4972368	-235.9	214910	5624183	-232.8	222151	[illegible]
-245.1	183245	3782859	-242	195554	4370492	-238.9	205725	4992925	-235.8	215165	5645687	-232.7	222350	[illegible]
-245	183640	3801204	-241.9	195894	4390064	-238.8	206027	5013513	-235.7	215417	5667216	-232.6	222547	[illegible]
-244.9	184040	3819588	-241.8	196229	4409671	-238.7	206331	5034131	-235.6	215668	5688770	-232.5	222744	[illegible]
-244.8	184454	3838012	-241.7	196560	4429310	-238.6	206630	5054779	-235.5	215917	5710349	-232.4	222941	6391211
-244.7	184868	3856478	-241.6	196899	4448983	-238.5	206932	5075457	-235.4	216168	5731954	-232.3	223138	[illegible]
-244.6	[illegible]	[illegible]	-241.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	216419	[illegible]	[illegible]	[illegible]	[illegible]

Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)	Salton Sea Elevation (ft)	Salton Sea Area (acres)	Salton Sea Capacity (af)
-232.1	223535	6458182	-229	229868	7160886	-225.9	236510	7883682	-222.8	243497	8627612
-232	223734	6480546	-228.9	230077	7183883	-225.8	236730	7907344	-222.7	243727	8651974
-231.9	223934	6502929	-228.8	230286	7206902	-225.7	236950	7931028	-222.6	243958	8676358
-231.8	224134	6525333	-228.7	230496	7229941	-225.6	237171	7954734	-222.5	244190	8700765
-231.7	224335	6547756	-228.6	230705	7253001	-225.5	237392	7978462	-222.4	244421	8725196
-231.6	224536	6570200	-228.5	230916	7276082	-225.4	237613	8002212	-222.3	244653	8749650
-231.5	224737	6592663	-228.4	231126	7299184	-225.3	237835	8025985	-222.2	244885	8774126
-231.4	224939	6615147	-228.3	231337	7322307	-225.2	238057	8049779	-222.1	245118	8798627
-231.3	225141	6637651	-228.2	231549	7345451	-225.1	238280	8073596	-222	245351	8823150
-231.2	225344	6660175	-228.1	231761	7368617	-225	238502	8097435	-221.9	245584	8847697
-231.1	225547	6682720	-228	231973	7391803	-224.9	238733	8121297	-221.8	245818	8872267
-231	225750	6705285	-227.9	232185	7415011	-224.8	238957	8145182	-221.7	246052	8896860
-230.9	225953	6727870	-227.8	232398	7438240	-224.7	239180	8169088	-221.6	246286	8921477
-230.8	226157	6750475	-227.7	232611	7461491	-224.6	239404	8193018	-221.5	246521	8946118
-230.7	226361	6773101	-227.6	232825	7484763	-224.5	239629	8216969	-221.4	246756	8970782
-230.6	226565	6795748	-227.5	233038	7508056	-224.4	239854	8240943	-221.3	246991	8995469
-230.5	226769	6818414	-227.4	233253	7531370	-224.3	240079	8264940	-221.2	247227	9020180
-230.4	226974	6841101	-227.3	233467	7554706	-224.2	240304	8288959	-221.1	247463	9044914
-230.3	227180	6863809	-227.2	233682	7578064	-224.1	240530	8313001	-221	247699	9069672
-230.2	227385	6886537	-227.1	233898	7601443	-224	240756	8337065	-220.9	247936	9094454
-230.1	227592	6909286	-227	234113	7624843	-223.9	240983	8361152	-220.8	248173	9119260
-230	227798	6932056	-226.9	234329	7648266	-223.8	241210	8385262	-220.7	248410	9144089
-229.9	228004	6954846	-226.8	234546	7671709	-223.7	241437	8409394	-220.6	248648	9168942
-229.8	228210	6977657	-226.7	234763	7695175	-223.6	241664	8433549	-220.5	248886	9193818
-229.7	228416	7000488	-226.6	234980	7718662	-223.5	241892	8457727	-220.4	249125	9218719
-229.6	228622	7023340	-226.5	235197	7742171	-223.4	242121	8481928	-220.3	249363	9243643
-229.5	228829	7046212	-226.4	235415	7765701	-223.3	242349	8506151	-220.2	249602	9268592
-229.4	229036	7069106	-226.3	235633	7789254	-223.2	242578	8530398	-220.1	249842	9293564
-229.3	229243	7092020	-226.2	235852	7812828	-223.1	242807	8554667	-220	250082	9318560
-229.2	**229451**	**7114954**	**-226.1**	**236071**	**7836424**	**-223**	**243037**	**8578959**			
-229.1	**229659**	**7137910**	**-226**	**236290**	**7860042**	**-222.9**	**243267**	**8603274**			

MODEL SIMULATION MODES

Deterministic simulations of the model assume that the hydrologic variability of the Sea will repeat in the future exactly in the same pattern as occurred historically. Hydrologic conditions that occurred from the period 1950 to 1997 are assumed to occur again in the future, repeating over a 100-year time span. During stochastic simulations of the Salton Sea, random samples from normal distributions representing historic inflows, evaporation, and precipitation are performed such that each 100-year trace (model iteration) is unique. In this mode, the model is typically executed 1,000 times and statistics-related model results are compiled. These statistics include for each year mean values, mean values plus one standard deviation, mean values minus one standard deviation, 5 percentiles, and 95 percentiles. The data are to be interpreted as follows:

> *95 Percentile*: 95 percent of all model traces resulted in values less than or equal to the indicated values
>
> *5 Percentile*: 5 percent of all model traces resulted in values less than or equal to the indicated values
>
> *Mean*: Mean of all traces
>
> *-1 Standard Deviation*: Values representing one standard deviation below the mean
>
> *+1 Standard Deviation*: Values representing one standard deviation above the mean

In simulations involving evaluation of sensitivity, it is possible to provide input to the model in the form of probability distributions. For example, if a parameter is known to vary between a minimum, a most likely, and a maximum, then random samples can be taken from the triangular distribution defined by this information. If a parameter has no most likely value, then a uniform distribution can be used whereby a parameter varies from a minimum and maximum value. The resulting stochastic model simulations would then take into consideration uncertainty in the parameter being analyzed. This mode of operation is useful in evaluating the sensitivity of model parameters associated with assuming future conditions.

MODEL PARAMETERS

The Salton Sea Accounting Model requires as input:

Input: Inflows – water budget computations (acre-feet)
Evaporation – historic records (inches)
Precipitation – historic records (inches)
Initial Conditions for:
- Salinity in the Sea (mg/L)
- Water surface elevation (feet)

Other Simulation Parameters:
- Import rates (acre-feet/yr)
- Starting date for imports (year)
- Import salinity levels (mg/L)
- Export rates (acre-feet/yr)
- Starting date for exports (year)
- Target operating water surface elevations (feet)
- Target operating salinity levels (mg/L)
- Rate for deductions in inflow (acre-feet/year)
- Starting date for reductions in inflow (year)
- User selection of stochastic or deterministic simulation modes (on/off)
- User selection to include Colorado River flood flows (on/off)
- User selection to turn on or off mode to operate to meet target elevation or salinity levels (on/off)
- User selection to turn on or off mode to operate concentration ponds
- User selection to turn on or off mode to operate displacement dikes
- Concentration pond maximum operating elevation

The Salton Sea Accounting Model provides the following parameters as annual output:

Output: Water surface elevation (feet)
Water surface area (acres)

Water in storage (acre-feet)
Change in storage (acre-feet)
Total salts in storage (tons)
Salinity (mg/L)
Imports (acre-feet)
Total inflow (acre-feet)
Salinity of inflow (mg/L)
Total salts in inflow (tons)
Evaporation (acre-feet)
Precipitation (acre-feet)
Total salts exported (tons)
Water exported to concentration ponds (acre-feet)
Total salts exported to concentration ponds (tons)
Water in storage in concentration ponds (acre-feet)
Total salts in storage in concentration ponds (tons)
Water surface elevation in concentration ponds (feet)
Water surface area in concentration ponds (acres)

ACCOUNTING MODEL VERIFICATION

The Salton Sea Accounting Model was applied to simulate historic conditions. The model was run with a starting elevation and salinity equal to -239.6 feet and 38,100 mg/L, respectively. These values correspond to those reported by the Imperial Irrigation District for the year 1950. The model was executed for the period 1950 to 1997. Figures B-4 and B-5 present a comparison of simulated historic and historic measured elevation and salinity, respectively. The charts clearly depict that the Salton Sea Accounting Model can adequately simulate historic conditions. Correlations performed between historic and simulated historic elevation result in a correlation coefficient of 0.97. Correlations performed between historic and simulated historic salinity result in a correlation coefficient of 0.80. The model does not simulate historic conditions 100 percent accurately because the model includes assumptions about the salinity of inflows to the Sea for which there are no historic records to verify. However, the results of these comparisons are considered very good, giving support to the assumptions built into the model. Based on these favorable results of comparisons to historic conditions, the model is assumed to be accurate for simulating future conditions.

Figure B-4

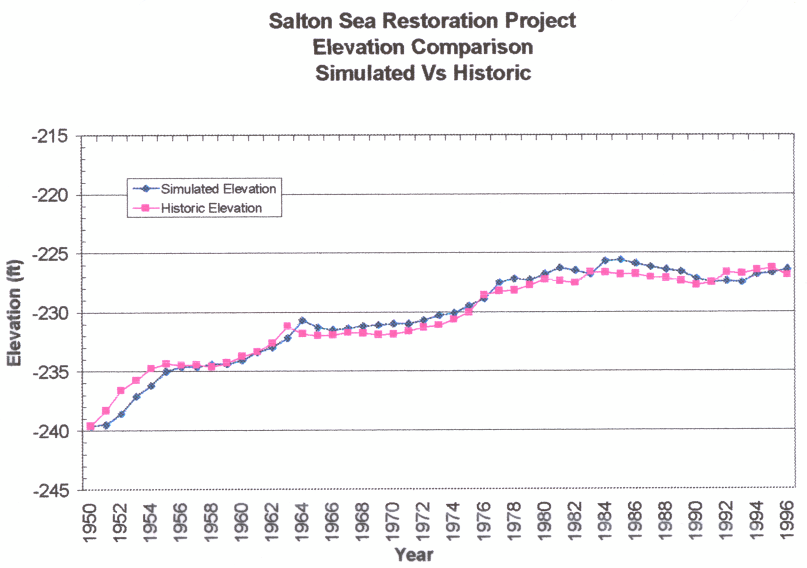
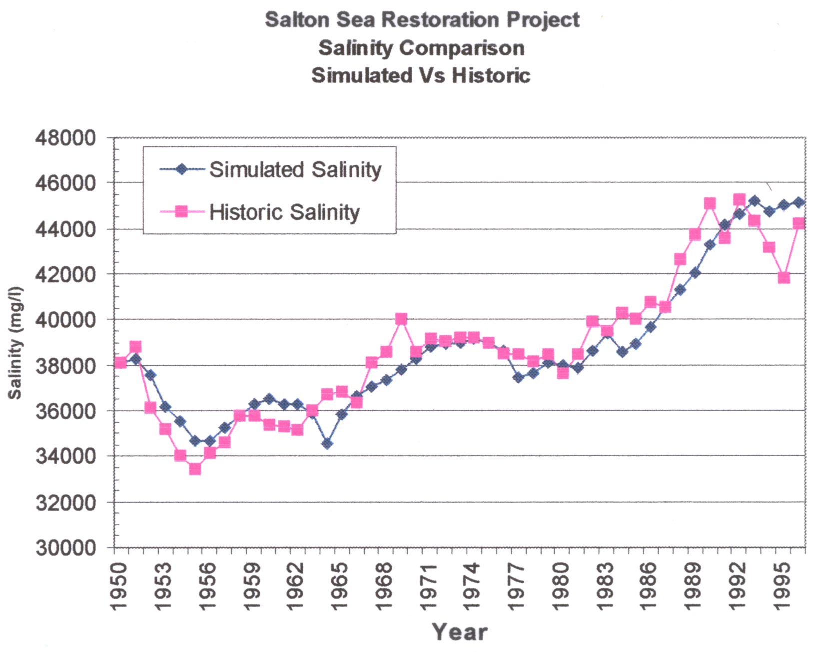


Figure B-5



MODEL SENSITIVITY ANALYSES

The Salton Sea Accounting Model was used to study the sensitivity of model results under a wide variety of conditions. These conditions are divided into two categories. The first category involved comparisons with and without various Salton Sea Restoration Project alternative features. Following is a summary of these comparison studies:

1. Comparisons with and without Colorado River flood flows

2. Comparisons with and without Central Arizona Salinity Interceptor (CASI) import water

3. Comparisons with and without CASI import water and Colorado River flood flows

4. Comparisons with and without the displacement dike

The results of comparisons with and without project features are included in the next subsection.

The second category of sensitivity analyses involved analysis of the model results to model input parameters and assumptions. Attachment D contains charts depicting the results of the sensitivity analyses to model input parameters and assumptions. Each analysis is the result of 1,000 simulations of the model with only the specific sensitivity parameter changing according to the ranges of values listed below. Most of the analyses were performed using present level inflow conditions. Some were based on reductions in inflow to 1.063 maf per year, either because reductions were involved in the sensitivity parameter or because simulation results would have resulted in elevations greater than -220 feet msl. Following is a summary of these studies:

1. **Sensitivity to assumptions about salinity impacts on evaporation (present level 1.363 maf/yr of inflow).**
   - Simulations were performed with reduction factor for salinity adjusted anywhere from -5 percent to +5 percent.
     Conclusion: (Figure D-1) Minor elevation changes < 1 foot, Minor salinity changes < 3000 mg/L.
2. **Sensitivity to rates of reductions in inflow (reduction to 1.063 maf/yr of inflow).**
   - Simulations were performed with inflow reduction rates of anywhere between 10,000 and 20,000 acre-feet per year.

Conclusion: (Figure D-2) Moderate elevation changes < 3 ft, Moderate salinity changes < 7,000 mg/L.

3. **Sensitivity to the year that reductions in inflow begin (reduction to 1.063 maf/yr of inflow).**
   - Simulations with the year reductions begin equal to anywhere between 0 and 10 years.

     Conclusion: (Figure D-3) Moderate elevation changes < 3 ft, Moderate salinity changes < 5,000 mg/L.
4. **Sensitivity to the Starting Salinity of Salton Sea (present level 1.363 maf/yr of inflow).**
   - Simulations with the starting salinity of the Sea anywhere between 43,000 and 45,000 mg/L.

     Conclusion: (Figure D-4) Negligible elevation and salinity changes.
5. **Sensitivity to the relationship defining salinity of inflow (present level 1.363 maf/yr of inflow).**
   - Simulations with the salinity of inflow waters being adjusted anywhere from+500 mg/L and -500 mg/L.

     Conclusion: (Figure D-5) Minor elevation changes < 1 foot, Moderate salinity changes < 7,000 mg/L.
6. **Sensitivity to precipitation rates (present level 1.363 maf/yr of inflow).**
   - Simulations with annual precipitation values being modified such that the average annual precipitation is anywhere between 2.0 and 3.0 inches.

     Conclusion: (Figure D-6) Minor elevation changes < 1 foot, Minor salinity changes < 3000 mg/L.
7. **Sensitivity to evaporation rates (present level 1.363 maf/yr of inflow).**
   - Simulations with annual evaporation values being modified such that the average annual Sea evaporation is anywhere between 69 and 71 inches.

     Conclusion: (Figure D-7) Minor elevation changes < 1 foot, Minor salinity changes < 3000 mg/L.
8. **Sensitivity to area/capacity/elevation relationships (present level 1.363 maf/yr of inflow).**
   - Simulations with surface areas selected from area/capacity/elevation data (presented earlier in this attachment) were adjusted anywhere from -5 percent to +5 percent.

     Conclusion: (Figure D-8) Minor elevation changes < 1 foot, Minor salinity changes < 3000 mg/L.

9. **Sensitivity to estimates of average annual inflow (present level 1.363 maf/yr of inflow).**
   - Simulations with annual inflow values being adjusted such that the average annual inflow to the Sea is adjusted between -5 percent and 0 percent.
     Conclusion: (Figure D-9) Large elevation changes <5 feet, Large salinity changes <12,000 mg/L
10. **Sensitivity to estimates of flood flow availability.**
   - Simulations with availability of Colorado River flood flows (as determined from the probability distributions presented earlier in this attachment) being reduced anywhere from 0 percent to 50 percent.
     Conclusion: No chart shown. No significant changes.
11. **Sensitivity to estimates of water volume and salinity relationships (reduction to 1.063 maf/yr inflow).**
   - Simulations with adjustments made to the volume of water in the Sea being increased anywhere from 0 percent to 10 percent.
     Conclusion: (Figure D-10) Moderate elevation changes < 3 ft, Negligible salinity changes

Comparisons With and Without Project Features

The Salton Sea Accounting Model was used to demonstrate conditions within the Sea with and without various Salton Sea Restoration Project alternative features. Figure B-6 depicts comparisons of Alternative 2 at 1.063 maf/yr inflow for various combinations of imports and flood flows. Comparisons for other alternatives are similar in nature but not shown. Charts are provided for elevation, salinity, and surface area for the following conditions:

Without CASI imports and with Colorado River flood flows
Without CASI imports and Colorado River flood flows
Without Colorado River flood flows and with CASI imports
With CASI imports and Colorado River flood flows
Without CASI imports and Colorado River flood flows After 2030

Figure B-7 shows elevation, salinity, and surface area charts for Alternative 2 at 0.800 maf/yr of inflow for the same combinations of inflow conditions.

Figures B-6 and B-7 demonstrate that conditions in the Salton Sea in the future will be significantly sensitive to whether or not CASI water will be available as an import. At an average annual inflow level of 1.063 maf/yr, elevations in the Sea will be up to 13 feet lower and salinity will be more than 10,000 mg/L higher for extended periods of time if CASI water is not available. The model indicates that the Sea will not be as impacted by unavailability of Colorado River flood flows. Elevations would only be impacted 2 to 3 feet without the flood flows at 1.063 maf/yr of inflows. Salinity would be, at most, 2,000 mg/L higher without flood flows. If flood flows were available only through the year 2030 (without CASI imports), it can be seen that elevations could temporarily be raised 2 to 3 feet and salinity could be reduced in the Sea by 4,000 to 5,000 mg/L. At 1.063 maf/yr of inflows, the combination of not having access to both flood flows and CASI import water would have the largest effects on the Sea, whereby peak salinity values would be nearly 20,000 mg/L higher and elevations would be greater than 15 feet lower.

Figure B-8 depicts comparisons of Alternative 2 at 1.063 maf/yr of inflow with and without the proposed displacement dike. Comparisons for other alternatives are similar in nature but not shown. Charts are provided for elevation, salinity, and surface area. Figure B-9 shows the same comparison at 0.800 maf/yr of inflow to the Salton Sea.

At average annual inflows of 1.063 maf/yr, the lowest elevations in the Sea would be about 4 feet higher with the dike than without it. The peak salinity would be about 5,000 mg/L lower with the dike. Salinity would be lower because, with the displacement dike in place, the surface area of the Sea would be about 15,000 acres less. This reduction in surface area provides a smaller surface for evaporation to occur, thus reducing the concentration effect that evaporation has on salinity within the Sea. Figure B-10 presents area-elevation relationships of the Salton Sea with and without the proposed displacement dike. At an elevation of -230 feet, the Sea would have about 15,000 fewer surface acres of area with the dike than the Sea would have without it. The displacement dike would reduce the surface area of the Sea to lesser degrees as Sea elevations drop. At elevation -257 feet, the surface area of the Salton Sea would be the same with and without the proposed displacement dike.

Figure B-6

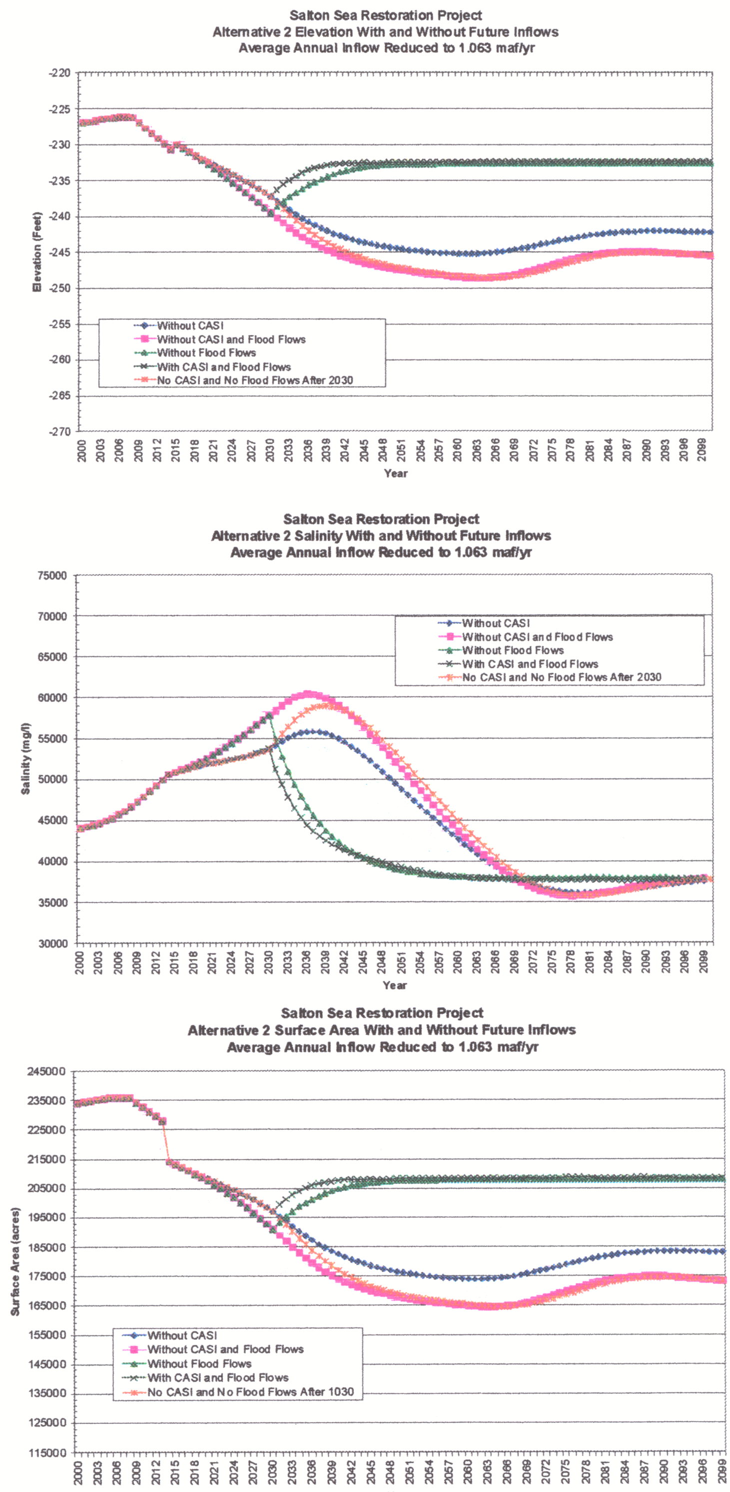
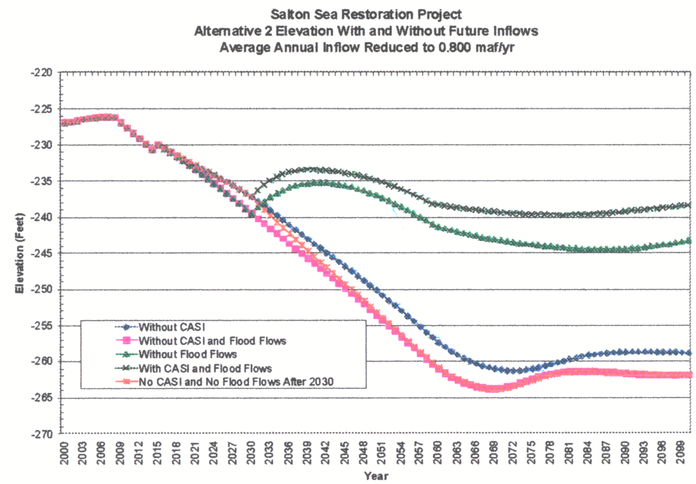
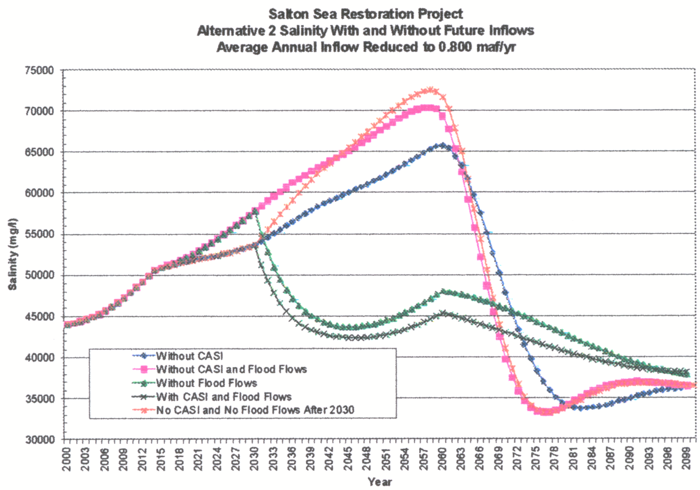

Salton Sea Restoration Project
Alternative 2 Elevation With and Without Future Inflows
Average Annual Inflow Reduced to 1.063 maf/yr
Elevation (Feet)
Year
Without CASI
Without CASI and Flood Flows
Without Flood Flows
With CASI and Flood Flows
No CASI and No Flood Flows After 2030
Salton Sea Restoration Project
Alternative 2 Salinity With and Without Future Inflows
Average Annual Inflow Reduced to 1.063 maf/yr
Salinity (mg/l)
Year
Without CASI
Without CASI and Flood Flows
Without Flood Flows
With CASI and Flood Flows
No CASI and No Flood Flows After 2030
Salton Sea Restoration Project
Alternative 2 Surface Area With and Without Future Inflows
Average Annual Inflow Reduced to 1.063 maf/yr
Surface Area (acres)
Year
Without CASI
Without CASI and Flood Flows
Without Flood Flows
With CASI and Flood Flows
No CASI and No Flood Flows After 1030

Figure B-7


Salton Sea Restoration Project
Alternative 2 Elevation With and Without Future Inflows
Average Annual Inflow Reduced to 0.800 maf/yr
Elevation (Feet)
Year
Without CASI
Without CASI and Flood Flows
Without Flood Flows
With CASI and Flood Flows
No CASI and No Flood Flows After 2030


Salton Sea Restoration Project
Alternative 2 Salinity With and Without Future Inflows
Average Annual Inflow Reduced to 0.800 maf/yr
Salinity (mg/l)
Year
Without CASI
Without CASI and Flood Flows
Without Flood Flows
With CASI and Flood Flows
No CASI and No Flood Flows After 2030

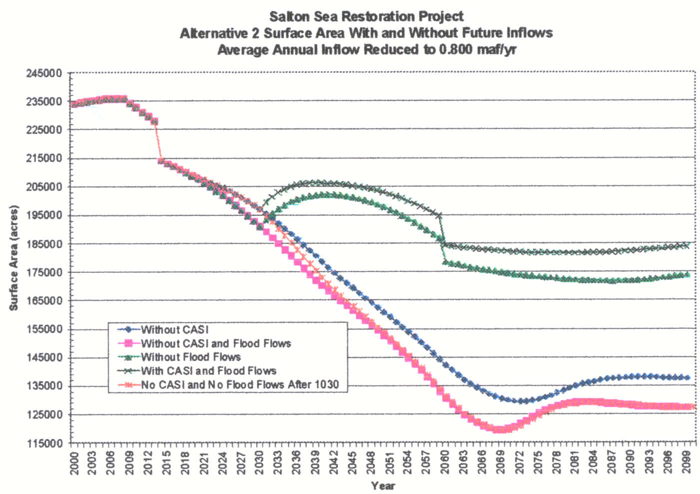
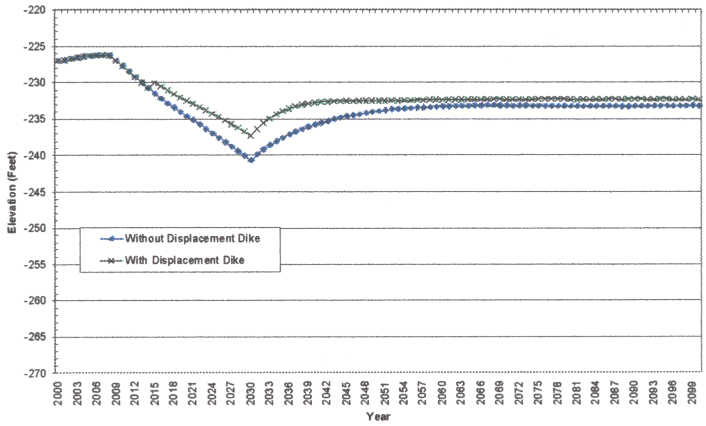
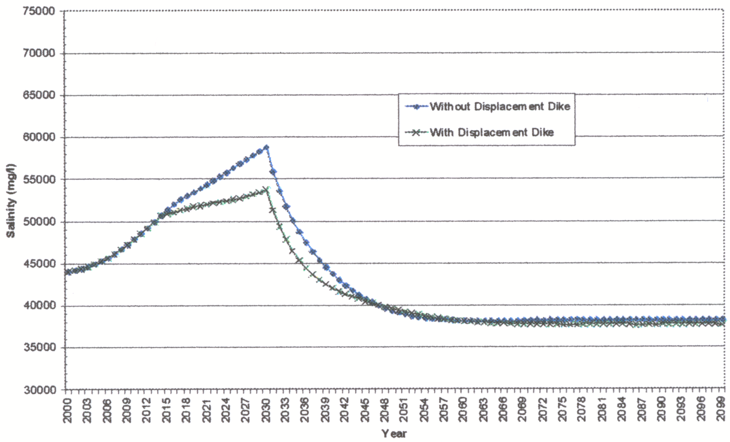

Salton Sea Restoration Project
Alternative 2 Surface Area With and Without Future Inflows
Average Annual Inflow Reduced to 0.800 maf/yr
Surface Area (acres)
Year
Without CASI
Without CASI and Flood Flows
Without Flood Flows
With CASI and Flood Flows
No CASI and No Flood Flows After 1030

Figure B-8

Salton Sea Restoration Project
Alternative 2 Elevation With and Without Displacement Dike
Average Annual Inflow Reduced to 1.063 maf/yr



Salton Sea Restoration Project
Alternative 2 Salinity With and Without Displacement Dike
Average Annual Inflow Reduced to 1.063 maf/yr



Salton Sea Restoration Project
Alternative 2 Surface Area With and Without Displacement Dike
Average Annual Inflow Reduced to 1.063 maf/yr

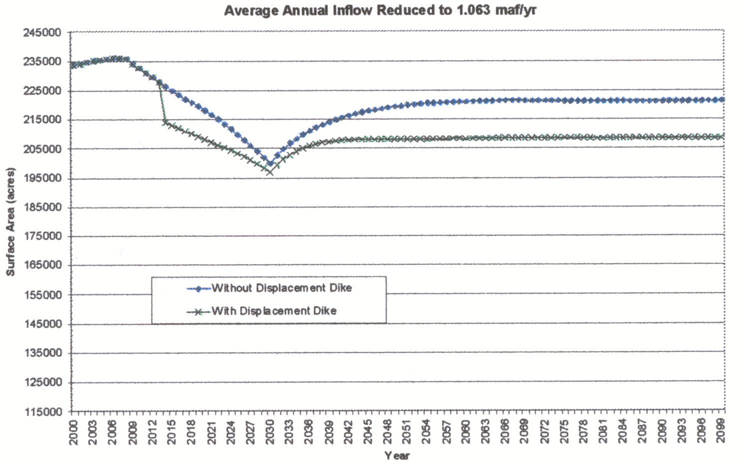
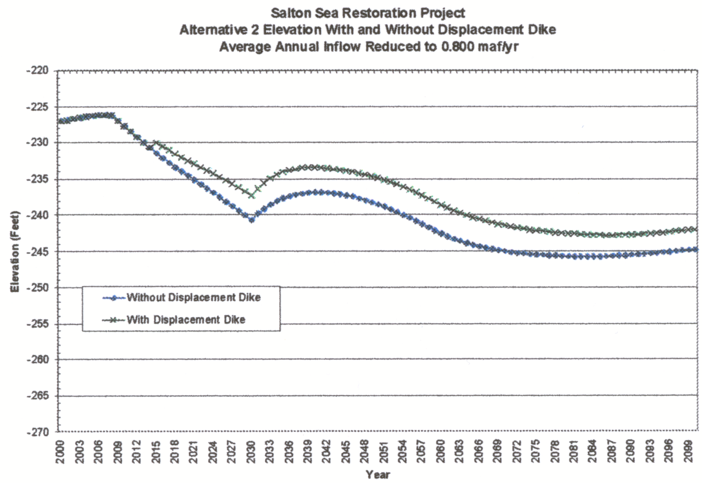
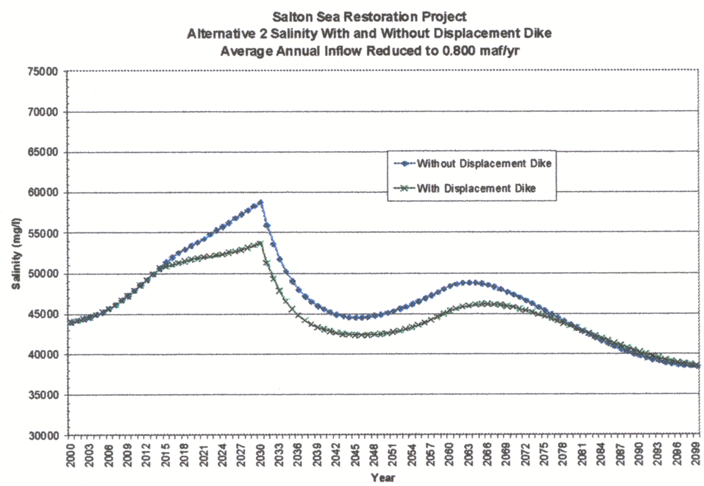
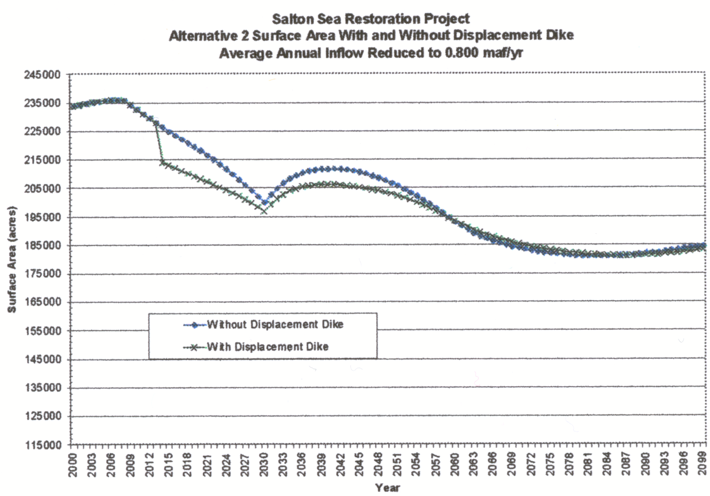


Figure B-9


Salton Sea Restoration Project
Alternative 2 Elevation With and Without Displacement Dike
Average Annual Inflow Reduced to 0.800 maf/yr
Elevation (Feet)
Year
Without Displacement Dike
With Displacement Dike


Salton Sea Restoration Project
Alternative 2 Salinity With and Without Displacement Dike
Average Annual Inflow Reduced to 0.800 maf/yr
Salinity (mg/l)
Year
Without Displacement Dike
With Displacement Dike


Salton Sea Restoration Project
Alternative 2 Surface Area With and Without Displacement Dike
Average Annual Inflow Reduced to 0.800 maf/yr
Surface Area (acres)
Year
Without Displacement Dike
With Displacement Dike

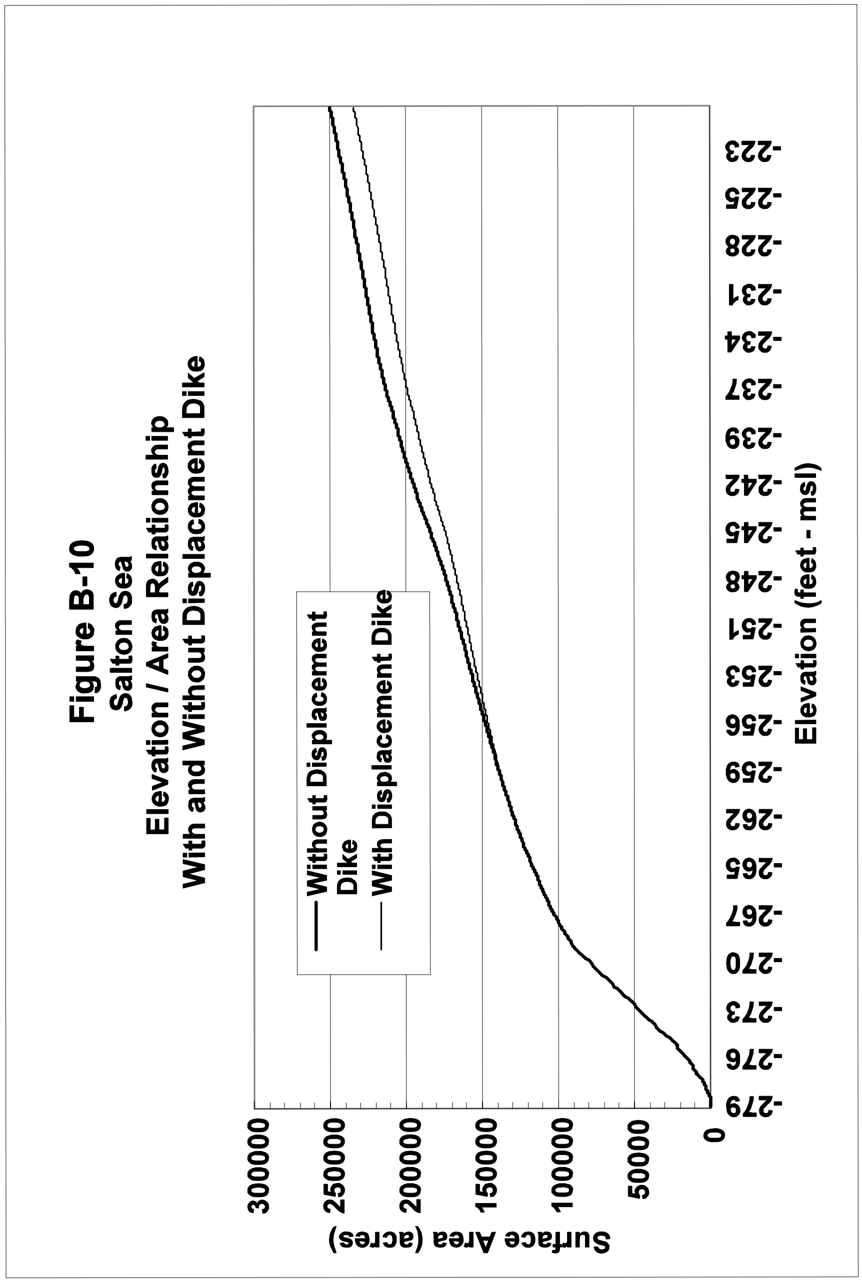


Figure B-10
Salton Sea
Elevation / Area Relationship
With and Without Displacement Dike
Without Displacement Dike
With Displacement Dike
Surface Area (acres)
300000
250000
200000
150000
100000
50000
0
Elevation (feet - msl)
-279
-276
-273
-270
-267
-265
-262
-259
-256
-253
-251
-248
-245
-242
-239
-237
-234
-231
-228
-225
-223

SALTON SEA PROJECT ALTERNATIVE SIMULATIONS

No Action Simulation Assumptions and Initial Conditions

Table B-5 summarizes the No Action Alternative simulations that were performed with the listed assumptions and initial conditions. Attachment C contains charts depicting the results of the No Action Alternative simulations.

Table B-5.—No Action Alternative simulation assumptions and initial conditions

Simulation identifier	Average annual inflow (maf/yr)	Year simulation begins	Starting Sea elevation (feet)	Starting Sea salinity (mg/L)
No_Action_136	1.36	2000	-227.0	44,000
No_Action_106	1.60	2000	-227.0	44,000
No_Action_080	0.80	2000	-227.0	44,000

Combined Phase 1 and 2 Simulation Assumptions and Initial Conditions

Table B-6 presents combined phase 1 and 2 alternative simulations that were performed with the listed assumptions and initial conditions. Attachment C contains charts depicting the results of the combined phase 1 and 2 stochastic simulations.

Table B-6.—Combined phase 1 and 2 simulation assumptions and initial conditions

Alternative number	Simulation identifier	Avg. annual inflow maf/yr	Year simulation begins	Starting Sea elevation feet	Starting Sea salinity mg/L	EES capacity kaf/yr	Year EES is in operation	Discharges to single concentration pond kaf/yr	Discharges to double concentration ponds kaf/yr	Year pond(s) in operation	Number of years pond(s) in operation	Year use of flood flows begins	Maximum flood flow diversion kaf/yr	Salinity of Colo. River flood flows mg/L	Year displacement dike in operation	Year CASI import begins	CASI import kaf/yr	Target salinity mg/L	Target elevation range (feet)
1	Alt1_136_2 Pnds_XExp	1.36	2000	-227.0	44,000	150	2015		98	2008	30							37,500	-230 to -235
1	Alt1_106_2 Pnds_XExp	1.06	2000	-227.0	44,000	150	2015		98	2008	30				2015	2030	304.8 2/	37,500	-230 to -235
1	Alt1_080_2 Pnds_XExp	0.80	2000	-227.0	44,000	150	2015		98	2008	30	2030	300	800	2015	2030	304.8 2/	37,500	-230 to -235
2	Alt2_136_ EES	1.36	2000	-227.0	44,000	150	2008											37,500	-230 to -235
2	Alt2_106_ EES	1.06	2000	-227.0	44,000	150	2008					2015	300	800	2015	2030	304.8 2/	37,500	-230 to -235
2	Alt2_080_ EES	0.80	2000	-227.0	44,000	150	2008					2015	300	800	2015 3/	2030	304.8 2/	37,500	-230 to -235
3	Alt3_136_ EES	1.36	2000	-227.0	44,000													37,500	-230 to -235
3	Alt3_106_ EES	1.06	2000	-227.0	44,000	150	2008					2015	300	800	2015	2030	304.8 2/	37,500	-230 to -235
3	Alt3_080_ EES	0.80	2000	-227.0	44,000	150	2008					2015	300	800	2015 3/	2030	304.8 2/	37,500	-230 to -235
4	Alt4_136_ EES_Pnd	1.36	2000	-227.0	44,000	100 150	2008 2030	68		2008	30							37,500	-230 to -235[
4	Alt4_106_ EES_Pnd	1.06	2000	-227.0	44,000	100	2008	68		2008	30	2015	300	800	2015	2030	304.8 2/	37,500	-230 to -235
4	Alt4_080_ EES_Pnd	0.80	2000	-227.0	44,000	100	2008	68		2008	30	2015	300	800	2015	2030	304.8 2/	37,500	-230 to -235

Table B-6.—Combined phase 1 and 2 simulation assumptions and initial conditions

Alternative number	Simulation identifier	Avg. annual inflow maf/yr	Year simulation begins	Starting Sea elevation feet	Starting Sea salinity mg/L	EES capacity kaf/yr	Year EES is in operation	Discharges to single concentration pond kaf/yr	Discharges to double concentration ponds kaf/yr	Year pond(s) in operation	Num. of years pond(s) in operation	Year use of flood flows begins	Maximum flood flow diversion kaf/yr	Salinity of Colo. River flood flows mg/L	Year displacement dike in operation	Year CASI import begins	CASI import kaf/yr	Target salinity mg/L	Target elevation range (feet)
5	Alt5_136_ EES_InPnd	1.36	2000	-227.0	44,000	150 4/ 300 1/	2008 2030	185 4/		2008	23							37,500	-230 to -235
5	Alt5_106_ EES_InPnd	1.06	2000	-227.0	44,000	150 4/ 300 1/	2008 2030	185 4/		2008	23	2015	300	800	2015	2030	304.8 2/	37,500	-230 to -235
5	Alt5_080_ EES_InPnd	0.80	2000	-227.0	44,000	150 4/ 300 1/	2008 2030	185 4/		2008	23	2015	300	800	2015 3/	2030	304.8 2/	37,500	-230 to -235

1/ Increase of 150 kaf/yr based on need for additional export. This additional export could to an EES or to some other method.
2/ Salinity of CASI import water is expected to be 4,400 mg/L. This value was used in the listed simulations.
3/ Additional displacement dike or additional import would be required starting in year 2060.
4/ This alternative includes an EES in a concentration pond. Within the simulation it was assumed that water would be pumped out of the concentration pond and into the EES. The amount of water that can be discharged into the concentration pond (185 kaf/yr) is therefore higher in this alternative than for alternatives.

Combined Phase 1 and 2 Salt Export Rates

Table B-7 displays salt export rates for each of the five alternatives at three different inflow levels studied. These results are from the combined phase 1 and 2 simulations described in table B-6. Export rates in tons per year are presented for years 2008, 2015, and 2030. The rates shown are total for all elements of each alternative that remove salt from the Salton Sea. For example, Alternative 4 export rates are for both the concentration pond and EES operations.

Table B-7.—Salton Sea Restoration Project alternative salt export rates (millions of tons/year)

	Average annual inflow 1.363 maf/yr	Average annual inflow 1.063 maf/yr	Average annual inflow 0.800 maf/yr
Alternative 1			
2008	6.1	6.2	6.2
2015	14.5	15.7	15.7
2030	12.5	15.5	15.5
Alternatives 2 and 3			
2008	9.4	9.5	9.5
2015	9.6	10.4	10.4
2030	9.3	10.9	10.9
Alternative 4			
2008	10.5	10.6	10.6
2015	10.1	10.9	10.9
2030	8.1	9.7	9.7
Alternative 5			
2008	11.6	11.8	11.8
2015	11.4	12.4	12.4
2030	8.4	9.4	9.4

Phase 2 No Action Simulations

Phase 2 options include both future imports and exports of water. To evaluate impacts on the Salton Sea due to phase 2 actions, it was necessary to perform stochastic simulations of the Salton Sea assuming that phase 2 actions would not occur. Impacts due to the Phase 2 actions could then be evaluated by comparing these simulation results against the combined phase 1 and 2 simulation results.

Table B-8 presents combined phase 2 No Action Alternative simulations that were performed with the listed assumptions and initial conditions. Attachment C contains charts depicting the results of the phase 2 No Action Alternative stochastic simulations.

Table B-8.—Phase 2 No Action Alternative simulation assumptions and initial conditions

Alternative Number	Simulation Identifier	Avg. Annual Inflow maf/yr	Year simulation begins	Starting Sea elevation feet	Starting Sea salinity mg/L	EES capacity kaf/yr	Year EES is in operation	Discharges to single concentration pond kaf/yr	Discharges to double concentration ponds kaf/yr	Year pond(s) in operation	Number of years pond(s) in operation	Year use of flood flows begins	Maximum flood flow diversion kaf/yr	Salinity of Colo. River flood flows mg/L	Year displacement dike in operation	Target salinity mg/L	Target elevation range feet
1	Alt1_136_2 Pnds_XExp	1.36	2000	-227.0	44,000				98	2008	30					37,500	-230 to -235
1	Alt1_106_2 Pnds_XExp	1.06	2000	-227.0	44,000				98	2008	30				2015	37,500	-230 to -235
1	Alt1_080_2 Pnds_XExp	0.80	2000	-227.0	44,000				98	2008	30				2015	37,500	-230 to -235
2	Alt2_136_ EES	1.36	2000	-227.0	44,000	150	2008									37,500	-230 to -235
2	Alt2_106_ EES	1.06	2000	-227.0	44,000	150	2008					2015	300	800	2015	37,500	-230 to -235
2	Alt2_080_ EES	0.80	2000	-227.0	44,000	150	2008					2015	300	800	2015	37,500	-230 to -235
3	Alt3_136_ EES	1.36	2000	-227.0	44,000											37,500	-230 to -235
3	Alt3_106_E ES	1.06	2000	-227.0	44,000	150	2008					2015	300	800	2015	37,500	-230 to -235
3	Alt3_080_E ES	0.80	2000	-227.0	44,000	150	2008					2015	300	800	2015	37,500	-230 to -235
4	Alt4_136_E ES_Pnd	1.36	2000	-227.0	44,000	100	2008	68		2008	30					37,500	-230 to -235[
4	Alt4_106_E ES_Pnd	1.06	2000	-227.0	44,000	100	2008	68		2008	30	2015	300	800	2015	37,500	-230 to -235
4	Alt4_080_E ES_Pnd	0.80	2000	-227.0	44,000	100	2008	68		2008	30	2015	300	800	2015	37,500	-230 to -235

Table B-8.—Phase 2 No Action Alternative simulation assumptions and initial conditions

Altern-ative Number	Simulation Identifier	Avg. Annual Inflow maf/yr	Year simul-ation begins	Starting Sea eleva-tion feet	Starting Sea salinity mg/L	EES capa-city kaf/yr	Year EES is in opera-tion	Discharges to single concen-tration pond kaf/yr	Discharges to double concen-tration ponds kaf/yr	Year pond(s) in oper-ation	Num. of years pond(s) in oper-ation	Year use of flood flows begins	Maxi-mum flood flow diver-sion kaf/yr	Salinity of Colo. River flood flows mg/L	Year dis-place-ment dike in oper-ation	Target salinity mg/L	Target eleva-tion range feet
5	Alt5_136_EES_InPnd	1.36	2000	-227.0	44,000	150 4/	2008	185 4/		2008	23					37,500	-230 to -235
5	Alt5_106_EES_InPnd	1.06	2000	-227.0	44,000	150 4/	2008	185 4/		2008	23	2015	300	800	2015	37,500	-230 to -235
5	Alt5_080_EES_InPnd	0.80	2000	-227.0	44,000	150 4/	2008	185 4/		2008	23	2015	300	800	2015	37,500	-230 to -235

2/ Salinity of CASI import water is expected to be 4,400 mg/L. This value was used in the listed simulations.
3/ Additional displacement dike or additional import would be required starting in year 2060.
4/ This alternative includes an EES in a concentration pond. Within the simulation it was assumed that water would be pumped out of the concentration pond and into the EES. The amount of water that can be discharged into the concentration pond (185 kaf/yr) is therefore higher in this alternative than for alternatives.