

# Salton Sea UPDATE

ECOSYSTEM RESTORATION PROGRAM

THE RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES  
DEPARTMENT OF FISH & GAME

JANUARY 2006



## Overview Restoration Planning Process

In 2003, the State legislature passed the Salton Sea Restoration Act which states that "it is the intent of the Legislature that the State of California undertake the restoration of the Salton Sea ecosystem and the permanent protection of the wildlife dependent on that ecosystem." The State Secretary for Resources is to prepare an Ecosystem Restoration Study and a Programmatic Environmental Impact Report (PEIR). These reports are to be submitted to the legislature by the end of 2006.

With the goal of developing an Ecosystem Restoration Study that is based on the best technical information available in an open and public process, the Resources Agency conducted 24 public meetings in the Salton Sea watershed, more than two dozen technical work group meetings, and numerous Salton Sea Advisory Committee meetings. Through this process, the State of California developed a proposed final range of alternatives that will be considered for inclusion in the PEIR.

On December 8, 2005 the Salton Sea Advisory Committee met at the Torres Martinez Reservation to consider the proposed final range of alternatives. At this meeting, the Committee recommended that the State

include in the PEIR a complete analysis of six of the seven proposed alternatives, with some modifications to the Minimal Barrier Alternative. The Advisory Committee also recommended to the State that the Import/Export configuration not be analyzed as a potential alternative.

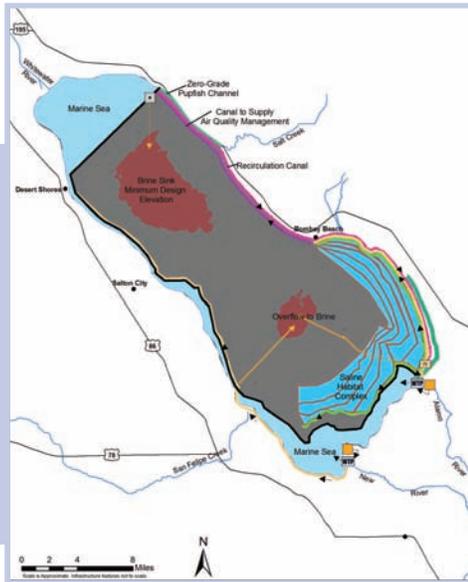
After reviewing comments from the December 8th Advisory Committee meeting and comments received from the upcoming Public Outreach meetings to be held January 18-19, Secretary for Resources Mike Chrisman will make a determination on the final range of alternatives to be carried forward for detailed analysis in the Ecosystem Restoration Study and PEIR.

All of the alternatives discussed at the December 8th Advisory Committee meeting are included in this update. These alternatives are based on a 75-year forecast with average annual inflows of 650,000 acre feet. For those alternatives that include a partial marine sea, the target elevation for the Sea is 230 feet below mean sea level (msl).

*Continued...*

## NORTH SEA COMBINED ALTERNATIVE

The North Sea Combined alternative would provide a deep, marine sea habitat in the northern portion of the Salton Sea. The marine sea would extend to approximately the State Recreation Area on the east side of the Sea, along the entire western shore of the existing Sea, and to the confluence of the Alamo River on the south side of the Sea.



North Sea Combined Alternative

A barrier would be constructed in the northern portion of the existing Sea and perimeter dikes would form the western portion. A brine sink would provide the “outlet” necessary to manage the elevation and salinity of the sea. Up to 39 square miles (25,000 acres) of habitat would be constructed within the existing seabed and air quality mitigation would take place on the exposed areas of the Sea. Water treatment plants may be needed to remove nutrients and selenium from the inflows.

### Facts and Figures

#### Marine Sea:

- Salinity: Similar to typical ocean water (30,000 to 40,000 milligrams per liter (mg/L))
- Surface area: Over 62 square miles (40,000 acres)

#### Barrier and Perimeter Dikes:

- Barrier located 14 miles north of the middle of the existing Salton Sea
- Length: 50 miles (total)
- Volume of Material: 100.5 million cubic yards (total)

#### Saline Habitat Complex:

- Salinity: Ranges about half to nearly double the salinity of typical ocean water (20,000 to 60,000 mg/L)
- Surface area: wetted area, 28 square miles (18,000 acres); total area, 39 square miles (25,000 acres)

#### Brine Sink:

- Salinity: much greater than 200,000 mg/L – about 6 times greater than typical ocean water
- Elevation: 265 to 275 feet below msl
- Surface area: Over 34 square miles (22,000 acres)

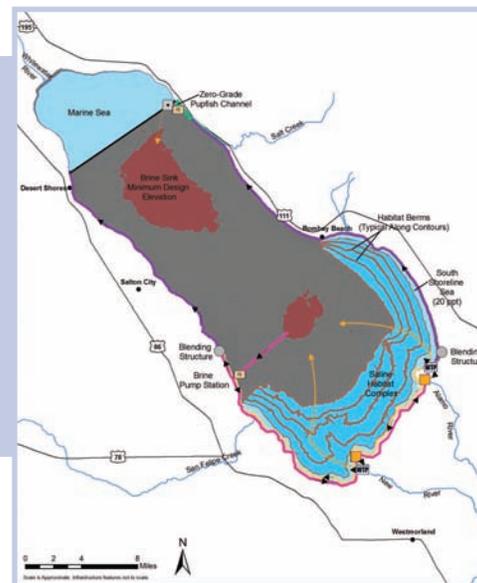
#### Air Quality Management:

- Total area of exposed playa: over 237 square miles (152,000 acres)
- Area with irrigated vegetation: about 118 square miles (76,000 acres – 50 percent of total area exposed)

Estimated Capital Cost: \$10 billion

## NORTH SEA AND MINIMAL BARRIER ALTERNATIVE

This alternative is intended to provide a deep, marine, open-water habitat in the northern portion of the Salton Sea and saline habitat in the southern portion of the Sea. A shoreline sea area at the southern portion of the existing Sea would be created with berms and related facilities to provide habitat.



North Sea And Minimal Barrier Alternative

Up to 78 square miles (50,000 acres) of habitat would be constructed within the existing seabed and a brine sink would provide the “outlet” necessary to manage the elevation and salinity in the marine sea. Canals would be excavated along the western edges of the Sea to provide water for air quality management. Water treatment plants may be needed to remove nutrients and selenium from the inflows.

### Facts and Figures

#### Marine Sea:

- Salinity: Similar to typical ocean water (30,000 – 40,000 mg/L)
- Surface area: Over 42 square miles (27,000 acres)

#### Barrier and Perimeter Dikes:

- Barrier located 13 miles north of the middle of the existing Salton Sea
- Length: 10 miles (total)
- Volume of Material: 82.3 million cubic yards

#### Saline Habitat Complex:

- Salinity: Ranges from about half to nearly double the salinity of typical ocean water (20,000 to 60,000 mg/L)
- Surface area: wetted area, 59 square miles (38,000 acres); total area, 78 square miles (50,000 acres)

**Shoreline Sea:**

- Salinity: Ranges from about half to the same as typical ocean water (20,000 to 35,000 mg/L)
- Surface area: 11 square miles (7,000 acres)

**Brine Sink:**

- Salinity: much greater than 200,000 mg/L – more than 6 times typical ocean water
- Elevation: 265 to 275 feet below msl
- Surface area: Over 34 square miles (22,000 acres)

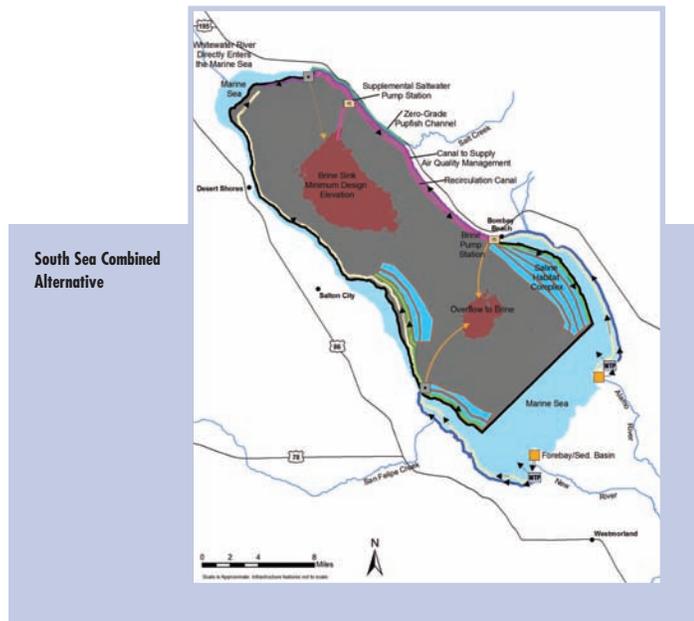
**Air Quality Management:**

- Total area of exposed playa: Nearly 216 square miles (138,000 acres)
- Area with irrigated vegetation: 108 square miles (69,000 – 50 percent of total area exposed)

**Estimated Capital Cost: \$9.8 billion**

**SOUTH SEA COMBINED ALTERNATIVE**

The South Sea Combined alternative is intended to provide: a deep, marine sea habitat in the southern portion of the Salton Sea; a shallower marine habitat along the western shoreline; a smaller marine sea along the northern shoreline; and a saline habitat complex in the southwestern and southeastern portions of the Sea.



The marine sea would be located predominately in the southern portion of the existing Salton Sea, with extensions to approximately Bombay Beach on the east side, and beyond the confluence of the Whitewater River in the west and north sides of the Sea. A barrier would be constructed in the southern portion of the marine sea and perimeter dikes would form the eastern and western portions. Canals would be constructed to enhance circulation and salinity management within the marine sea. A brine sink would provide the "outlet" necessary to manage the elevation and salinity in the marine sea.

The marine sea would preserve much of the Sea's existing shallow water and shoreline habitat. Up to 39 square miles (25,000 acres) of habitat would be constructed within the existing seabed.

Canals would be constructed along the eastern and western edges of the Sea to provide water for air quality management. Water treatment plants may be needed to remove nutrients and selenium from the inflows.

**Facts and Figures**

**Marine Sea:**

- Salinity: Similar to typical ocean water (30,000 – 40,000 mg/L)
- Surface area: Over 62 square miles (40,000 acres)

**Barrier and Perimeter Dikes:**

- Barrier located 10 miles south of the middle of the existing Salton Sea
- Length: 60 miles (total)
- Volume of Material: 77.3 million cubic yards

**Saline Habitat Complex:**

- Salinity: Ranges from about half to nearly double the salinity of typical ocean water (20,000 to 60,000 mg/L)
- Surface area: wetted area, 28 square miles (18,000 acres); total area 39 square miles (25,000 acres)

**Brine Sink:**

- Salinity: Much greater than 200,000 mg/L – more than 6 times typical ocean water
- Elevation: 265 to 275 feet below msl
- Surface area: Over 34 square miles (22,000 acres)

**Air Quality Management:**

- Total area of exposed playa: Nearly 240 square miles (152,000 acres)
- Area with irrigated vegetation: 120 square miles (76,000 acres – 50 percent of total area exposed)

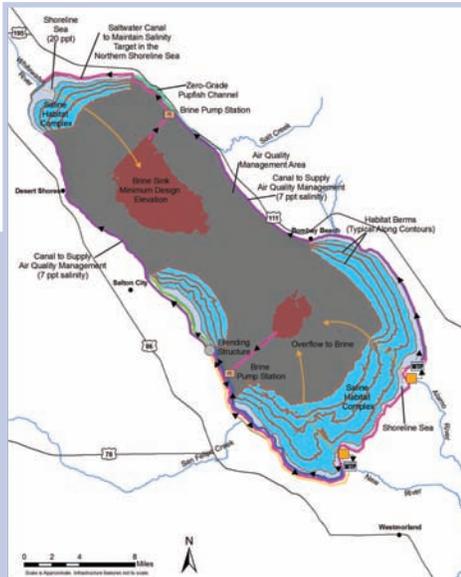
**Estimated Capital Cost: \$9.2 billion**

**MINIMAL BARRIER ALTERNATIVE**

This alternative would provide a substantial amount of saline habitat areas along the outer portions of the Salton Sea. These areas would replace the eventual loss of existing shallow water and shoreline habitat as the Sea recedes. A shoreline sea area at the southern portion of the existing Sea would be created with berms and related facilities to provide habitat and connectivity for the desert pupfish.

Up to 117 square miles (75,000 acres) of habitat would be constructed within the existing seabed. Berms would create numerous cells with saline habitat of varying depths, salinities, and structural features, simulating historical marine-like conditions. A pump station would be required to blend and convey water within these areas. A brine sink would provide the "outlet" necessary to manage the elevation and salinity in the saline habitat complex and shoreline sea area.

Canals would be constructed along the eastern, western and southern edges of the Sea to provide water for air quality management. Water treatment plants may be needed to remove nutrients and selenium from the inflows.



**Minimal Barrier Alternative**

## Facts and Figures

### Saline Habitat Complex:

- Salinity: Ranges from about half to nearly double the salinity of typical ocean water (20,000 to 60,000 mg/L)
- Surface area: wetted area, 101 square miles (65,000 acres); total area 117 square miles (75,000 acres)

### Shoreline Sea:

- Salinity: Ranges from about half to the same as typical ocean water (20,000 to 35,000 mg/L)
- Surface area: Northern – 3 square miles (2,000 acres); Western and southern – 14 square miles (9,000 acres)

### Brine Sink:

- Salinity: Much greater than 200,000 mg/L – more than 6 times typical ocean water
- Elevation: 265 to 275 feet below msl
- Surface area: Over 34 square miles (22,000 acres)

### Air Quality Management:

- Total area of exposed playa: Nearly 210 square miles (135,000 acres)
- Area with irrigated vegetation: 105 square miles (67,500 acres – 50 percent of total area exposed)

**Estimated Capital Cost: \$7.3 billion**

## CONCENTRIC RINGS ALTERNATIVE

The Concentric Rings alternative is designed to preserve and expand existing shoreline habitat at the Salton Sea. Two concentric water bodies, or rings, would be constructed. Shoreline habitat would be preserved and expanded in the proposed rings.

The outer ring, or First Perimeter Ring, would consist of a brackish water body approximately 10 feet deep that would preserve the existing shoreline habitat around the Sea.

The inner ring, or Second Perimeter Ring, would consist of a marine water body approximately 10 feet deep that would be created by constructing a dike around the Sea. Additional habitat features would be included in this ring, and a brine sink would provide the “outlet” necessary to manage the elevation and salinity in the rings.

Canals would be constructed around the Sea near the Second Perimeter Ring to provide water for air quality management. Water treatment plants may be needed to remove nutrients and selenium from the inflows.

## Facts and Figures

### First Perimeter Ring:

- Salinity: About half of typical ocean water (20,000 mg/L)
- Surface area: 47 square miles (30,000 acres)
- Perimeter dike located at 240 feet below msl

### Second Perimeter Ring:

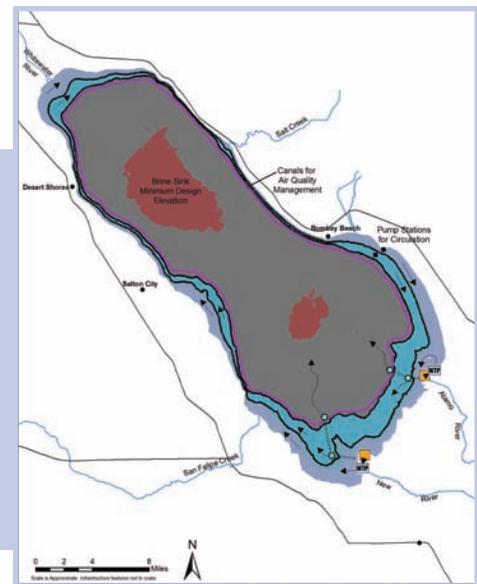
- Salinity: About the same as typical ocean water (35,000 mg/L)
- Surface area: 56 square miles (36,000 acres)
- Perimeter dike located at 250 feet below msl

### Perimeter Dikes:

- Volume: 60.8 million cubic yards

### Brine Sink:

- Salinity: much greater than 200,000 mg/L – more than 6 times typical ocean water
- Elevation: 265 to 275 feet below msl
- Surface area: Over 34 square miles (22,000 acres)



**Concentric Rings Alternative**

### Air Quality Management:

- Total area of exposed playa: Nearly 225 square miles (144,000 acres)
- Area with irrigated vegetation: 112.5 square miles (72,000 acres – 50 percent of total area exposed)

**Estimated Capital Cost: \$7.9 billion**

## IMPORT/EXPORT ALTERNATIVE GULF OF CALIFORNIA OR PACIFIC OCEAN

The Import/Export alternative is intended to provide a whole sea alternative that maintains a stable marine sea at an elevation and salinity that is similar to current conditions. This alternative relies on importing water from the Gulf of California or the Pacific Ocean to make up the eventual loss of inflows, and exchanging Sea water with the Gulf or Ocean to maintain a marine salinity in the Sea.

Waterway to the Gulf



To maintain the target salinity of the Sea, Gulf or Ocean water must be imported to the Sea and Sea water must be exported to the Gulf or Ocean. This is needed because ocean water contains a much higher salt load, and therefore, would substantially increase the salt loading to the Sea. Export of Sea water reduces this excess salt load. Over 3.36 million acre-feet per year would be imported and over 2.73 million acre-feet per year would be exported.

This alternative would include the construction of multiple pipelines and/or canals and pump stations to convey water from the Salton Sea to the Pacific Ocean or Gulf of California. Similarly, a system to convey Gulf or Ocean water to the Salton Sea would also be necessary. The route to the Pacific Ocean would involve significant lift over the Santa Rosa Mountains, or would require extensive tunneling through the mountain range (over 4,500 feet elevation difference). The route to the Gulf of California would require between 400 to over 1,500 feet of lift, depending on the route selected and the conveyance system chosen. Both options would require a substantial amount of electricity to pump the water; however, some power recovery is possible.

Filtering water might be required on the Salton Sea export flows. Additional water treatment may be needed if these processes are not sufficient to reduce impacts.

There are various unique considerations that would need to be addressed for this alternative that would not need to be addressed for the other alternatives. These are:

- **International Project:** For the route to the Gulf of California, over half of the facilities would be constructed in the Republic of Mexico. Approval from and close coordination with Mexico would be required. Additionally, there is uncertainty over whether or not the State of California can own and operate facilities in another country. Under U.S. Federal law and regulations, any formal discussions with the Republic of Mexico need to be coordinated through the U.S. Department of State. The U.S. and Mexico federal governments would be critical partners to implementing this alternative.
- **Species Exchange:** For both the Gulf of California and the Pacific Ocean routes, the exchange of water between two ecosystems (the Sea and the Gulf or Pacific Ocean) may facilitate the exchange of non-desirable plants and animals between these ecosystems, and the introduction of invasive and exotic species.
- **Environmental and Biological Impacts:** Both routes would need to comply with existing environmental regulations including the

California Ocean Plan and similar criteria. Project activities in Mexico would also need to comply with California and U.S. Federal environmental laws and regulations, and environmental laws and regulations in Mexico. In addition, the Colorado River Delta and the upper Gulf of California have been designated as a biosphere reserve by the Republic of Mexico, is recognized by the United Nations Educational, Scientific and Cultural Organization's Man and Biosphere program, and was recently designated a World Heritage Site. Activities in the reserve are substantially limited and require approval from various international organizations.

## Facts and Figures

### Marine Sea:

- Salinity: About 25% higher than ocean water (44,000 mg/L)
- Surface area: 340 square miles (218,000 acres)

### Import/Export Pipelines and/or Canals:

#### Gulf of California:

- Import:
- Pumping plants needed : 4
- Pipelines: 8 @ 12.5-foot diameter, each about 74 miles long
- Canals: 104 miles, concrete lined
- Export Facilities
- Pumping plants needed: 5
- Pipelines: 6, 12.5-foot diameter, each about 74 miles long
- Canals: 104 miles, concrete lined

#### Air Quality Management:

- No exposed playa below 235 feet below msl – some air quality management above this level may be needed

### Estimated Capital Cost: \$49 billion

#### Pacific Ocean:

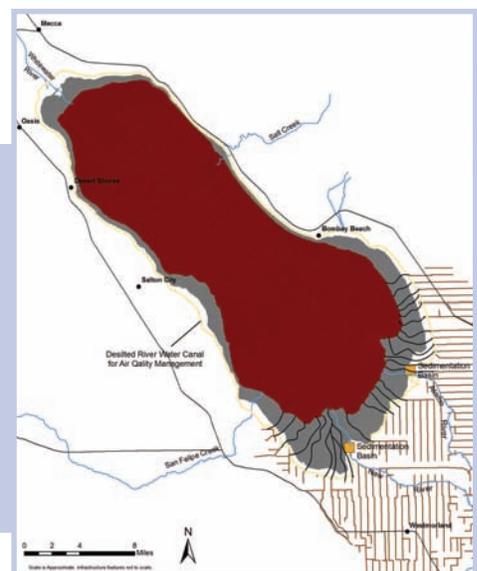
- Information not available at this time.

### Estimated Capital Cost: Costs not developed at this time.

## NO ACTION ALTERNATIVE/NO ACTION VARIABILITY

The No Action alternative provides a basis for the evaluation of the impacts of the other proposed configurations. While it is termed "No Action", this alternative includes mitigation for desert pupfish and air quality management of the exposed seabed, and it includes facilities to achieve these mitigations.

No Action Alternative/No Action Variability



The No Action Variability alternative includes the same features as the No Action alternative with the variation based on lower future inflows of 650,000 acre feet per year.

This alternative does not stabilize the salinity or elevation of the Sea, nor would it provide additional new habitat. With no active management, salinity will continue to increase to more than 6 times typical ocean water. Evaporation will continue to exceed inflows causing the elevation to decline over time and the Sea to decrease in surface area. Air quality management will be implemented as the seabed drops below 235 feet below msl.

### Facts and Figures

*At Annual Inflows of 950,000 acre-feet*

Sea/Brine Sink:

- Salinity: Much greater than 200,000 mg/L – more than 6 times typical ocean water
- Elevation: 249 feet below msl
- Surface area: Over 265 square miles (170,000 acres)

Air Quality Management:

- Total area of exposed playa: Nearly 100 square miles (63,000 acres)
- Area with irrigated vegetation: 50 square miles (31,500 acres – 50 percent of total area exposed)

**Estimated Capital Cost: \$1.1 billion**

*At Annual Inflows of 650,000 acre-feet*

Sea/Brine Sink:

- Salinity: Much greater than 200,000 mg/L – more than 6 times typical ocean water
- Elevation: 263 feet below msl
- Surface area: Over 194 square miles (124,000 acres)

Air Quality Management:

- Total area of exposed playa: Nearly 170 square miles (108,000 acres)
- Area with irrigated vegetation: 8.5 square miles (54,000 acres – 50 percent of total area exposed)

**Estimated Capital Cost: \$1.9 billion**

## Next Steps and Future Meetings

It is anticipated that the final range of alternatives will be selected at the January 31, 2006 Advisory Committee meeting in Sacramento. These alternatives will subsequently be analyzed in more detail as part of the PEIR and Ecosystem Restoration Study. Public input is a critical

component of this process. Please share your comments and suggestions on the recommended final range of alternatives at the next round of public outreach meetings on January 18 and 19, 2006. We look forward to and encourage your participation.

### January 18, 2006 Palm Desert

9:00 – 11:00 AM  
Coachella Valley  
Association of Governments  
73-710 Fred Waring  
Drive, Suite 119  
Palm Desert

### January 18, 2006 Bombay Beach

2:00 – 4:00 PM  
Bombay Beach Community  
Services District  
9590 Avenue C  
Bombay Beach

### January 18, 2006 Brawley

6:00 – 8:00 PM  
Elks Lodge #1420  
161 South Plaza  
Brawley

### January 19, 2006 Salton City

2:00 – 4:00 PM  
West Shores Senior Center  
1375 Borrego Salton  
Seaway (S-22)  
Salton City

If you have questions or need accommodations due to disability please contact us at (888) 621-1430



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