# Comments on the Salton Sea Restoration Project

# and the

# Salton Sea Restoration Project Draft Environmental Impact Statement Environmental Impact Report

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# Overview

On May 15, 2000, the Pacific Institute for Studies in Development, Environment, and Security submitted the following comments on the Salton Sea Restoration Project and on the January 2000 draft Environmental Impact Statement/Environmental Impact Report (DEIS) and supporting documents. The Pacific Institute is an independent, non-partisan, non-profit center in Oakland, California, created in 1987 to conduct research and policy analysis in the areas of environment, sustainable development, and international security. The Institute has actively participated in the development of the Restoration Project for more than two years, via formal scoping comments and through informal discussions and workshops, as well as the Institute's 1999 report, *Haven or Hazard: the Ecology and Future of the Salton Sea*.

The Pacific Institute welcomes the federal and state efforts to improve the ecological health of the Salton Sea ecosystem. The Salton Sea provides a host of ecological values that are important not only within the Imperial and Coachella valleys but also throughout the historic reach of the Colorado River delta and the length of the Pacific Flyway. The extent and magnitude of these values merits a state and federal level intervention. Significant economic and recreational benefits would likely accrue in the region only if the ecosystems in and around the Sea were returned to a healthy condition.

The Salton Sea Restoration Project has progressed in many respects over the past two years. The funding of scientific research and the integration of this research into the process has benefited the Project, and the understanding of the Sea, tremendously. The Pacific Institute supports the on-going research proposed under the auspices of the Strategic Science Plan. Deferring the construction of large-scale infrastructure fixes until Phase II is also a positive step, allowing for the opportunity to better understand the impacts of such actions.

Yet the Salton Sea Restoration Project continues to be hampered by two major conceptual flaws and a general design flaw. These flaws, summarized below, raise significant questions regarding the ability of the proposed alternatives to achieve the project's target objectives:

1. **The problems of the Salton Sea are broader in scope than those addressed by the Project.** The continuing focus on salinity and elevation, to the virtual exclusion of other factors such as nutrient and selenium loading that affect the Sea's health, will not markedly improve conditions at the Sea, squandering the public trust. The chronic occurrence of mortality and disease at the Salton Sea demonstrates that current conditions are unsustainable and unacceptable. Even if the Project alternatives were able to reduce salinity significantly, birds and fish would continue to die at the Sea in large numbers.

2. **The Restoration Project prioritizes the limited economic potential of the Sea over national-level ecological values.** Project alternatives targeted to preserve and enhance economic and recreational values around the Sea would cost roughly half a billion dollars, equivalent to a generous estimate of the total assessed value of all property within 15 miles of the Sea, while at the same time destroying valuable avian habitat on the Sea's southern shore. Rather than investing federal dollars on project elements that would have negative ecological impacts, the Restoration Project should focus on project elements that protect and enhance the ecosystem, via the construction of treatment wetlands and structures to preserve existing shoreline and near-shore habitat.

3. **The proposed Project alternatives will not satisfy the Project goals or objectives.** According to the DEIS' own analysis, the project alternatives would satisfy only one of the project goals and none of the project objectives under the two reduced flow scenarios. Additionally, the DEIS suggests that the dikes featured in three project alternatives would not be seismically stable for the 30 year life of the Project, with potentially catastrophic results.

Regrettably, the Restoration Project continues to rely on diverting flood flows from the Colorado River. Such flood flows presently sustain critical native riparian habitat in the upper reaches of the Colorado River delta below Morelos Dam, freshen wetlands in the Rio Hardy system, and help to re-create the estuarine conditions necessary for the survival of several endangered species in the delta wetlands and Upper Gulf of California. Many environmental groups have already expressed their opposition to diverting flood flows. During a public meeting in Tucson in early May, the Deputy Secretary of the Interior noted that the Department of the Interior does not endorse diverting flood flows. Furthermore, the reliance on Colorado River flood flows violates the Salton Sea Reclamation Act. This ecologically and politically unviable option should be removed from the Project.

The Bureau of Reclamation and the Salton Sea Authority have applied considerable talent and skill over the past several years to address the problems of the Salton Sea. However, despite this effort, the restoration plan fails to identify an alternative that would satisfy the project goals and objectives for the Sea as a whole. A more appropriate and viable approach to improving the Sea's ecological health and preserving avian habitat and the sport fishery, and in turn the recreational and economic goals that depend on these, may be to focus on managing the conditions of a small portion of the Sea, rather than the Sea as a whole. Such an approach would involve constructing dikes within the Sea near the north and south shores to capture inflows and maintain elevation near current levels, with excess waters flowing through pipes in the dikes to the main body of the Sea. These impounded north and south shore areas would transition to brackish, estuarine conditions. Such impoundments would have to be coupled with treatment wetlands, to reduce nutrient and selenium loading, and the implementation of management practices to reduce nutrient loads from agricultural, municipal, and industrial sources.

## Summary


The Salton Sea Restoration Project's integration of the work of the Science Subcommittee is a welcome and positive step towards addressing the problems facing the Salton Sea.

The information provided in the Draft Environmental Impact Statement/Report (DEIS) indicates that none of the five proposed restoration alternatives would satisfy the Restoration Project's own stated goals.

Even if a proposed alternative were to reduce and stabilize the salinity and the elevation of the Salton Sea, large-scale fish and birds die-offs would continue, discouraging recreational uses and economic redevelopment.

The Restoration Project fails to offer any real solutions to the critical problem of nutrient loading, either in Phase I or in Phase II.

The discussion of the Fish Harvesting common action is limited to preliminary estimates, though even these suggest that the impacts of fish harvesting on nutrient levels in the Sea would be small.

The assumptions used to model inflows to the Sea under the two reduced flow scenarios are unsubstantiated, generating projections that overstate the alternatives' potential impacts on salinity and elevation.

If inflows to the Sea decrease as expected, the proposed alternatives would require the import of additional water to meet the target elevation. In Phase I, the Project would rely on Colorado River flood flows, in violation of the Salton Sea Reclamation Act of 1998 (PL 105-372).

The DEIS appropriately recognizes that the solubility limit of some of the Sea's salts has been reached, meaning that some of these salts presently are precipitating out of solution. Yet the DEIS uses models that fail to account

for the solubility limits of these salts. These salts will re-dissolve as the alternatives are implemented, reducing the alternatives' effectiveness and extending the amount of time required to reduce salinity to target levels.

The DEIS notes that the high probability of a large-magnitude earthquake means that the dikes used by Alternatives 1, 4, & 5 are expected to fail, reversing the progress made up to that time. These three alternatives therefore would not satisfy even the elevation and salinity objectives over the long term.

The target elevation of –232 feet is arbitrary and, given reduced inflows, would require importing additional water.

To stabilize the Sea at the target elevation with reduced inflows, the Project calls for the construction of a displacement dike on the south shore of the Sea, modifying or destroying an estimated 1,200 acres of valuable shoreline and nearshore avian habitat, including habitat of the endangered Yuma clapper rail.

The construction cost of the displacement dike, used to maintain the Sea's elevation, is estimated at $450 million. According to a 1998 study, the total value of all Salton Sea properties within ½ mile of the shoreline at the current elevation is only $154.8 million. The DEIS liberally estimates the total assessed value of property within fifteen miles of the Sea at $500 million.

The DEIS provides an inadequate description of the economic baseline of the area surrounding the Salton Sea, hampering efforts to assess the potential benefits of any proposed restoration alternative.

The DEIS notes that each of the five proposed alternatives, as well as the Common Actions, would only have "Negligible to slightly positive economic and recreational impacts" to 2050, or through the life of the project.

The assessment of potential impacts on the Colorado River downstream of the point of diversion are inaccurate and inadequate. The DEIS fails to recognize the recent scientific research demonstrating the importance of occasional flood flows for the successful germination of native riparian vegetation in the upper reaches of the delta. The upper reaches of the delta currently sustain some 3500 acres of native willow thickets and cottonwood-willow gallery forests, home to endangered species such as the southwestern willow flycatcher. Current research indicates that this reach of the delta requires flood flows at least every four years; diverting such flows to the Salton Sea would negatively impact this vitally important desert riparian corridor and threaten its long-term existence. Flood flows to the delta would also generate additional benefits, including freshening the Rio Hardy wetlands and the estuary at the mouth of the river.

The description of the no action/no project alternative is inadequate, and fails to allow decision-makers to reasonably compare the effects of the proposed alternatives against the effects of not approving a project.

The five project goals might be achieved by a plan that focuses on managing the salinity, elevation, and water quality of one or more subsections of the Sea, rather than by attempting to manage the Sea as a whole.

# Introduction

The Salton Sea lies 35 miles north of the U.S.-Mexico border in one of the most arid regions in North America. The Sea has the largest surface area of any inland body of water in the state of California. Presently, the Sea is 35 miles long, 9 to 15 miles wide and has a volume of roughly 7.5 million acre-feet; its surface elevation lies approximately 227 feet below sea level. The Salton Sea is a terminal lake; the only outflow for its waters is via evaporation. As water evaporates, salts, nutrients, and other elements are left behind to concentrate in the Sea. Current salinity of the Sea is roughly 44,000 mg/L, about 25 percent saltier than ocean water.

The Salton Sea provides a host of ecological values that are important not only within the Imperial and Coachella valleys but also throughout the historic reach of the Colorado River delta and the length of the Pacific Flyway. The unusually high incidence of disease and mortality currently reported at the Salton Sea threatens these values. Although the Salton Sea is a product of human activity, the Sea and its environs provide a complex mosaic of habitats, ranging from open water, estuaries, and salt marsh to mud flats and riparian corridors. These and other habitats support more than 400 species of birds and a variety of other wildlife, including endangered species such as the desert pupfish and the Yuma clapper rail. These habitats are especially vital given the destruction of wetlands throughout most of southern California and the lower San Joaquin Valley and within the Colorado River delta itself.

A series of problems confronting the Salton Sea has captured the attention of the public and policymakers. These problems include the deaths of millions of fish and tens of thousands of birds, diminished interest in the Sea as a recreational destination, the loss of shoreline and property due to rising levels of the Sea, elevated nutrient levels in the Sea causing frequent algal blooms and subsequent fish kills, and increasing salinity. The federal Bureau of Reclamation and California's Salton Sea Authority are leading an effort to identify potential restoration alternatives for the Sea. In January, these agencies released the draft Salton Sea Restoration Project Environmental Impact Statement/ Environmental Impact Report (DEIS).

The goals of the Restoration Project are:

1. Maintain the Sea as a reservoir for agricultural drainage;
2. Provide a safe, productive environment at the Sea for resident and migratory birds and endangered species;
3. Restore recreational uses at the Sea;
4. Maintain a viable sport fishery at the Sea; and
5. Enhance the Sea to provide economic development opportunities.

The DEIS describes five restoration alternatives designed to reduce and stabilize the salinity and elevation of the Salton Sea. The restoration alternatives would employ in-Sea dikes or land-based enhanced evaporation systems (EES), or a combination of these. The DEIS also includes several "Common Actions" to address the other project goals and to meet the continuing research needs for better understanding the Sea. In addition, the DEIS provides a general, programmatic overview of several proposed "Phase II" actions that could potentially be implemented beginning in the year 2030.

The Salton Sea Restoration Project has progressed in many respects over the past two years. The funding of scientific research and the integration of this research into the process has benefited the Project, and the understanding of the Sea, tremendously. The Pacific Institute endorses the on-going research proposed under the auspices of the Strategic Science Plan. Additionally, the DEIS explicitly notes the importance of addressing nutrient loading at the Sea toward restoring the ecological health of the Sea and the human activities, such as recreation and economic development, that depend on a healthy ecosystem. In deference to public opinion and the recommendations submitted by the Pacific Institute and other organizations and agencies, the Restoration Project now defers the construction of large-scale infrastructure fixes until Phase II, allowing for the opportunity to better understand the impacts of such actions.

The DEIS persuasively presents the need for the ecological restoration of the Salton Sea. The Salton Sea provides critical habitat for tremendous numbers of birds, including many species dependent on wetland habitat and others dependent on the Sea as an open-water resource for fishing. The challenge is to ensure that such habitat values remain paramount in the restoration process. The fish harvesting, shoreline cleanup, and the integrated wildlife disease program "common actions" are specifically directed at preserving or improving ecological values. The North Wetland Habitat and Pupfish Ponds, both mitigation measures, also offer the potential for preserving or improving ecological values and preserving habitat.

The Pacific Institute offers the following comments in the hopes that they might benefit the Restoration Project and the Salton Sea ecosystem. The following narrative comments evaluate the concepts and assumptions driving the Restoration Project; page-specific comments are offered on the attached comment form. These narrative comments employ several sets of criteria in evaluating the merits of the Salton Sea Restoration Project. These criteria include the project's own stated goals and objectives, as well as the principles set forth by the Pacific Institute's February 1999 report entitled *Haven or Hazard: The Ecology and Future of the Salton Sea*:

1. The primary goal of any restoration plan must be to provide for a healthy ecological system and protect human health.
2. Any restoration plan should be firmly grounded in a scientific understanding of the ecology of the Salton Sea and related ecosystems.
3. Any restoration plan should address all of the water quality factors responsible for the current problems at the Salton Sea.
4. Parties responsible for the current problems facing the Salton Sea and beneficiaries of its restoration should bear an equitable share of the costs.
5. Any restoration plan must be compatible with region-wide water conservation and voluntary reallocation programs.
6. Any restoration plan for the Salton Sea must be compatible with protection and restoration of the Colorado River delta, the upper Gulf of California, and other ecosystems in the region.
7. The Restoration Project must be transparent, inclusive, and fully integrated with other actions impacting the Salton Sea.

These comments are also guided by several general assumptions, the most salient being that the Salton Sea offers critically important avian habitat of national interest and therefore warrants federal and state intervention to restore and protect this habitat. Other assumptions informing these comments are that inflows to the Sea will decrease in the future, due to a variety of factors; that recreational and economic development in the immediate area will not occur without improvement of the Sea's overall health; and that the problems of the Sea should not be exported.

As discussed in detail in the following, the DEIS is deficient in several major respects, precluding a conclusive assessment of the five proposed Restoration Project alternatives. These deficiencies include the assumptions used for projecting inflows (exaggerating estimates for reducing and stabilizing elevation and salinity), the failure to provide estimates of earthquake-generating dike failure, the cursory description of the socioeconomic data for the study area, and the failure to adequately describe conditions under a no action alternative. Even so, the information presented in the DEIS indicates that none of the five alternatives would satisfy all of the five project goals.

## Restoration Project Overview

The lead agencies selected alternatives based on their ability to achieve the project objectives of reducing and stabilizing salinity and elevation. Current estimates suggest that a selected project would need to remove nine million tons of salts from the Sea each year to meet the Project objectives. Four of the proposed alternatives employ enhanced evaporation systems (EES), a technology untested on the scale required to address the salinity of the Sea. Particular areas of concern, as noted in the DEIS, include the potential for birds to collide with EES towers and lines under conditions of low visibility, problems with salt drift into neighboring agricultural communities and fields, energy consumption, the aesthetics of the design, and the usable lifetime of the system.
As the DEIS itself notes, salinity is but one of several factors implicated in the massive die-offs of fish and birds at the Sea. Nutrient loading appears to be more directly linked to these die-offs. The Restoration Project continues to be hampered by the narrow parameters established by the Project's own objectives and by the Salton Sea Reclamation Act of 1998 (PL 105-372), requiring that an alternative reduce and stabilize the Sea's elevation and salinity. The lead agencies attempt to broaden the effectiveness of the proposed alternatives with a set of "common actions," designed specifically to address project goals such as wildlife health and recreational opportunities. The fish harvesting common action could offer the opportunity for the development of a commercially viable industry, reduce the density of the Sea's fishery, and remove as much as 10 percent of the phosphorus that enters the Sea each year. However, as the DEIS notes (p. 5-2), "in order for the harvesting of tilapia to have a more pronounced effect on nutrient levels it must be coupled with significant reductions in the nutrient input levels into the Sea." Other common actions include "Improved Recreational Facilities," "Shoreline Cleanup," "Integrated Wildlife Disease Program," "Long-term Management Strategy," and "Strategic Science Plan." The Pacific Institute supports the last three of these, which represent an important commitment to addressing the continuing ecological health needs of the Sea and would provide a strong framework for meeting the future scientific needs of the Salton Sea Restoration Project. "Fish harvesting," "Improved Recreational Facilities," and "Shoreline Cleanup," as described in the DEIS, would each require a stable Sea elevation, for access to piers and off-loading facilities. Yet, as described in a following section on inflows, the elevation of the Salton Sea is not expected to stabilize until roughly the year 2040, precluding the construction of such facilities or the implementation of these common actions.

Four other project features would be implemented if inflows to the Sea decrease as expected. These are the North Wetland Habitat, Pupfish Ponds, the Displacement Dike, and Flood Flows. The North Wetland Habitat would attempt to preserve the valuable snag and low island habitat near the mouth of the Whitewater River by constructing two dikes isolating these areas from the Sea and pumping Sea-water into these areas. Pupfish Ponds are an effort to enable endangered pupfish to continue to move between agricultural drains, access that would otherwise be blocked due to the construction of several of the alternatives. The DEIS does not explain why the North Wetland habitat dikes are not constructed so as to capture the flows of the Whitewater River and then allow these flows to pass through the habitat, rather than requiring pumps to maintain the level of water within the dikes. As explained in detail in the following sections, the Pacific Institute opposes the use of flood flows and the location of the displacement dike.

## Inflows

Calculated annual inflows to the Salton Sea averaged 1.36 million acre-feet (MAF) from 1950-1997. An estimated 85 percent of these inflows come from agricultural sources. The DEIS lists 19 past, present, and reasonably foreseeable future projects that could impact the quantity and quality of inflows to the Salton Sea, many of them due to the implementation of measures to conserve agricultural water. The net impact of these various actions would be to reduce the quantity of water flowing into the Salton Sea. Rather than projecting the impacts of these various projects individually, the DEIS developed two reduced flow scenarios, in an effort to capture their cumulative effects. These two reduced flow scenarios project annual decreases in inflows, to 1.06 MAF/year for one scenario and to 0.8 MAF/year for the second. The Pacific Institute assumes that the net effect of the various actions listed by the DEIS, as well as other potential future actions such as the proposed San Diego/Tijuana Aqueduct, will be a reduction in inflows to the Salton Sea. The Salton Sea Reclamation Act of 1998 similarly recognizes the likelihood of such reductions, directing the Secretary of the Interior to

> apply assumptions regarding water inflows into the Salton Sea Basin that encourage water conservation, account for transfers of water out of the Salton Sea Basin, and are based on a maximum likely reduction in inflows to the Salton Sea Basin which could be 800,000 AF or less per year.

The two reduced flow scenarios aggregate expected reductions in inflows due to the IID-San Diego transfer (the planned rate of transfer is expected to increase by 20,000 AF/year, to a minimum of 130,000 AF/y and a maximum of 300,000 AF/y), reductions in wastewater flows from Mexico (23,000 AF/y), reduction in seepage from the lining of the All-American Canal (23,000 AF/y), and other projects. These reductions are expected to be mitigated to a limited extent by the implementation of the Coachella Valley Water Management Plan, which based on historic levels of consumption may increase run-off to the Sea by as much as 60,000 AF/y, though actual increases will likely be much less than this due to increased demand driven by regional population growth. The two reduced flow scenarios aggregate the impacts of the above projects as increasing at a rate of 20,000 AF/y, yielding a progressively decreasing quantity of inflows.

Yet the DEIS uses a water balance accounting model (described in the Bureau of Reclamation's Draft Alternative Appraisal Report) for the two reduced flow scenarios that projects inflows to the Sea as decreasing by a rate of 10,000 AF/y, rather than the 20,000 AF/y described above. The Bureau of Reclamation lists two factors to account for this buffering effect: inflows from bank storage and returns to the Salton Sea from the use of surplus Colorado River water. The DEIS states that "one of the effects of lowering the elevation of the Sea would be to induce more groundwater to flow toward the Sea from storage in the aquifer…. The magnitude of these effects cannot be accurately predicted with the information available" (4-39). Despite this uncertainty, the model assumes an unspecified amount of inflows to the Sea from bank storage, presumably large enough to reduce by half the expected reduction of 300,000 AF of inflows after 15 years.

The Bureau of Reclamation's Draft Alternative Appraisal Report (p. B-8) states that:

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

This statement is troubling, especially coming from the Bureau of Reclamation, one of the agencies expected to monitor the Imperial Irrigation District's implementation of conservation measures. The IID's own March 2000

*Project Newsletter* states that "the proposed project consists of conservation by IID of up to 300,000 AF/y of Colorado River water and the subsequent transfer of all or a portion of the conserved water to the San Diego County Water Authority." Yet the Bureau of Reclamation apparently does not expect that IID will reduce its consumption of Colorado River water to the same level that is being transferred to San Diego. Put another way, the Bureau's statement means that San Diego will pay the IID to implement conservation measures and transfer water, even though Reclamation apparently does not expect to be able to confirm that IID is reducing its consumption of Colorado River water.

The Bureau of Reclamation's assumptions are also inconsistent. The model accounts for no change in the buffering effects of these two factors after 2015, despite the above assumption that the masking effect of surplus Colorado River water will be removed by then. Presumably, the assumption is that inflows from bank storage would account for the difference. Yet that would mean that, by the end of Phase I (year 2030), the model assumes inflows from bank storage would equal 300,000 AF/y, or roughly half the total current inflows from the Alamo River.

The inconsistent and speculative assumptions of the water balance accounting model mean that the elevation and salinity projections included in the DEIS are flawed. This is a significant deficiency of the DEIS. The effect of the DEIS' inaccurate models is to overstate the alternatives' efficacy. Although the water balance accounting model can not be expected to account for the expected variations in the rate of decrease of inflows to the Sea, it very likely understates the impacts of the 19 listed projects presumed to change inflows to the Sea. This means that inflows to the Salton Sea will very likely decrease at a faster rate than projected in the DEIS, indicating that the alternatives would take more time to reduce salinity to target levels, and that they might not ever achieve such a reduction. This in turn would affect the environmental consequences of Phase 1 actions, particularly for surface water resources, groundwater resources, fisheries and aquatic resources, avian resources, socioeconomics, and recreation resources.

## Elevation

The current surface elevation of the Salton Sea is about 227 feet below sea level (elevation fluctuates annually by as much as a foot due to seasonally varying inflows and evaporation rates). The Restoration Project's target elevation for the Salton Sea is +/- 230 feet below sea level. The DEIS states that meeting this target elevation is necessary to satisfy all the project goals except #4. However, maintaining a minimum elevation of the Sea is not relevant to the first goal: the actual objective is to limit the maximum elevation of the Sea to a level required to ensure adequate drainage. Decreasing inflows would reduce the elevation of the Sea, satisfying Goal #1. The elevation of the Sea is relevant to goals 2, 3, & 5. The Sea's current elevation supports an extensive array of shoreline habitats that in turn support a great diversity of birds and other wildlife. Reducing the elevation of the Sea would adversely impact much of this habitat, and would also expose a land bridge connecting Mullet Island, an important rookery, exposing nesting birds and their chicks to predation. Reducing the elevation of the Sea might also isolate populations of pupfish in agricultural drains by limiting their ability to move back forth through the Sea. Some recreational uses of the Sea (Goal #3) require a stable elevation, for the construction of recreational facilities such as piers and boat-loading ramps, though the actual elevation itself is less relevant. Economic development (Goal #5) similarly requires a stable elevation, presumably one that would not reduce the value of existing properties.

The selection of the target elevation affects inflow requirements for the Sea. Under the reduced inflow scenarios, additional sources of water would need to be imported. The DEIS does not explain why the specific target elevation was selected. Presumably, the target elevation could be several feet lower and still satisfy goals 3 & 5. As noted above, Goal #3 is only partly dependent on elevation, and could be satisfied with essentially any reasonable stable elevation. Goal #5 is discussed in the socioeconomics section.

The DEIS states that implementing the proposed alternatives would have little impact on nearshore avian habitat compared to the no-action alternative, although under the reduced flow scenarios the alternatives are projected to reduce the elevation of the Sea one to three feet *below* the no action alternative elevation by the year 2030 (Table 4.4-1), generating a greater loss of habitat than under the no action alternative. The DEIS fails to project the amount of avian habitat lost under each of the proposed alternatives, a significant deficiency.

The DEIS would address the habitat impacts of reduced flows with the proposed North Wetland Habitat area, to preserve about 1,000 acres of snag and low island habitat near the mouth of the Whitewater River. The displacement dike, designed to maintain elevations near target goals under reduced flow scenarios, would significantly modify avian habitat in the very middle of the region designated as "areas of heaviest avian use" (Figure 3.7-1). The dike itself would disturb or occupy approximately 520 in-Sea acres (2-26) and would modify or destroy an estimated 8.5 miles of shoreline, significantly impacting an estimated 1,200 acres of valuable nearshore and shoreline avian habitat (Figure 3.8-2), including area protected as part of the National Wildlife Refuge and Yuma clapper rail habitat (3-90), potentially jeopardizing an endangered species. For ecological and financial reasons, the displacement dike as described in the DEIS is objectionable. The Pacific Institute opposes the inclusion of the Displacement Dike as a Project element.

The following table compares the net area exposed under the reduced inflow scenarios in the year 2030 with that exposed under the no action alternative. Table 4.4-1 of the DEIS does not include land exposed within the displacement dike. The following table estimates the area exposed behind the dike to be at least 1,100 acres; this total is included in the estimates for each of the alternatives.

The table shows that none of the proposed alternatives would meet the target elevation (a change of -3 feet) by 2030, the end of Phase 1, even assuming the diversion of Colorado River flood flows into the Sea. This suggests that the selected target elevation is not realistically achievable and should be replaced with one better suited to the expected level of inflows to the Sea. **DEIS Figure 2.4-2 shows that the elevation of the Sea would not stabilize until roughly 2040 under the 1.06 MAF/year reduced flow scenario, and would *never* stabilize within the 100 year project horizon under the 0.8 MAF/year reduced flow scenario, *even with the displacement dike, the reliance on Colorado River flood flows, importation of CASI water, and Phase II actions*.** Even if elevation never stabilizes, Goal #1 would still be met, but none of the other goals would be achieved under reduced flow scenarios, at least until 2040.

**Summary of Water Level and Exposed Area by 2030**

| Alternative | Change in water surface level (ft) | Net Area Exposed (acres) | Relative to "No Action" (acres) |
|---|---|---|---|
| No Action | -7 | 15,527 | 0 |
| Alternative 1 | -10 | 28,411 | 12,884 |
| Alternative 2 | -10 | 37,053 | 21,526 |
| Alternative 3 | -10 | 37,053 | 21,526 |
| Alternative 4 | -8 | 26,272 | 10,745 |
| Alternative 5 | -9 | 22,650 | 7,123 |

All of the proposed alternatives would use the displacement dike under the reduced flow scenarios. The dike "is designed to essentially reduce the total area of the Sea, effectively displacing enough water to maintain elevations if

annual inflows are reduced to 1.06 MAF/y" (2-25-26). Yet, as noted above, even with the displacement dike, the target elevation would not be met until roughly 2040. The cost of the displacement dike is estimated at $450 million. This does not include the ecological cost of modifying or destroying an estimated 1,200 acres of valuable avian habitat, as described above. Yet even with these tremendous costs, the elevation of the Sea would not stabilize, precluding shoreline economic development and investment in public boat ramps and other related recreational projects. (This implies that the "Improved Recreational Facility" and the loading dock for the "Fish Harvesting" Common Actions are inappropriate given reduced inflows.)

Valuable shoreline and nearshore habitat depends upon a Salton Sea elevation close to its current level. Yet, as discussed above, the Project alternatives and additional common elements designed to stabilize elevation would not meet target objectives until the year 2040, under the reduced flow scenarios. This suggests that a more realistic and viable option would be to focus on preserving the valuable shoreline and nearshore habitats on the northern and southern ends of the Sea, rather than on the Sea as a whole. This limited-scope restoration alternative is discussed in more detail at the end of these comments.

## Flood Flows

To meet the target elevation under the two reduced flow scenarios, Alternatives 2-5 would require the diversion of Colorado River flood flows by the year 2015. The Restoration Project's reliance on Colorado River flood flows to maintain the Sea's elevation at the target objective under the two reduced inflow scenarios violates the Salton Sea Reclamation Act. Section 101(b)(2)(C) of the Act states that the feasibility study shall not include any option that (i) relies on the importation of any new or additional water from the Colorado River; or (ii) is inconsistent with the above provision.

The DEIS' assessments of potential impacts on the Colorado River downstream of the point of diversion of Colorado River flood flows are inadequate, inaccurate, and unsubstantiated. The DEIS fails to recognize the scientific literature demonstrating the critical importance of occasional flood flows for the successful germination of native riparian vegetation in the upper reaches of the delta. The upper reaches of the delta currently sustain more than 3,500 acres of native willow thickets and cottonwood-willow gallery forests, home to endangered species such as the southwestern willow flycatcher. Current research indicates that this reach of the delta requires flood flows at least every four years; diverting such flows to the Salton Sea would negatively impact this vitally important desert riparian corridor and threaten its long-term existence. Flood flows to the delta also generate additional benefits, including freshening the Rio Hardy wetlands and the estuary at the mouth of the river. The DEIS also fails to note or discuss the potential impacts of diverting Colorado River flood flows on the Upper Gulf of California.

The Project also relies on Central Arizona Salinity Interceptor (CASI) water to maintain the Sea's elevation under these same scenarios. Yet the CASI is still in its early planning stages, making availability of CASI water uncertain and reliance on such water premature. Thus, when inflows to the Salton Sea decrease as expected, the Project would rely on the illegal importation of additional Colorado River water and the potential availability of water from a proposed project that has yet to be approved, much less completed, to attempt to stabilize the level of the Salton Sea at an arbitrary elevation.

## Seismicity

As noted in the DEIS, the Salton Sea lies in a very seismically active region. Since 1900, 15 earthquakes measuring 6.0+ on the Richter scale and another 53 of estimated magnitude 5.0+ have occurred in or near the Salton Sea, according to the USGS. The west side of the Salton Sea is moving at about 8 cm/year relative to the east side, and the ground level on the south shore of the Sea is subsiding at a rate of more than 2 cm/year. This could have significant impacts on structures such as dikes built in the area, increasing maintenance costs and compromising their long-term integrity and resilience in the face of earthquakes.

The DEIS notes that a sufficiently large earthquake could cause a catastrophic breach in one of the dikes, or temporarily disrupt the operation of an Enhanced Evaporation System (EES). According to the DEIS, breaching a dike would "reverse the beneficial effects of salinity reduction" (4-20), an understated way of saying that some or all of the progress made in reducing salinity up to that time would be lost. Dike failure could result in larger-scale die-offs than would a gradual increase in salinity without the evaporation ponds, because organisms would not be able to adapt to the rapidly changing conditions. This is a critical point in assessing the utility of alternatives 1, 4, and 5, all of which rely on dikes to contain brine. Yet the DEIS fails to provide a probability for dike failure, stating only that "The probability of a large magnitude earthquake in the Salton Sea area is relatively high, but the probability of a dike failure cannot be estimated from existing information" (4-20). Yet, on page 6-3, the DEIS reads, "The ponds in alternative 1 [and Alternative 4, by reference] are assumed to be unusable for salinity control after 30 years under the assumption that they have failed due to seismic events."

Dike failure would increase the time required to reduce and stabilize salinity and elevation, potentially making such objectives unachievable with any of the three alternatives that include dikes as part of the project design. The DEIS notes that the numerical water balance accounting model used in the report can perform stochastic (random) simulations (2-5). Presumably, this feature could be adapted to predict potential dike failure due to earthquakes. Accounting for the likelihood of earthquakes would greatly improve the predictive power of the model, providing a more accurate picture of the Sea's salinity and elevation in future years and allowing for a more informed assessment of the value of the proposed alternatives.

## Socioeconomics

Salton Sea Restoration Project goals 3 & 5 call for economic development in the Salton Sea basin. Restoring recreational uses (Goal 3) applies to a broad population base, potentially drawing visitors from San Diego and Los Angeles and points further. The geographic scope of providing economic development opportunities (Goal 5) pertains more to the immediate environs of the Sea. None of the proposed alternatives are expected to satisfy goals 3 & 5 by the end of Phase I. Table 7-1 of the DEIS notes that each of the five proposed alternatives, as well as the Common Actions, would have "Negligible to slightly positive economic and recreational impacts" to 2050 or through the life of the project. The DEIS notes that "a faster decline in salinity, *if accompanied by reduced eutrophication and other improvements in water quality,* could promote a faster recovery in the recreational use of the Sea and associated commercial development" (6-25 – emphasis added). The failure of any of the proposed alternatives to achieve the target elevation, as well as the failure to address nutrient loading and thus the large-scale fish and bird die-offs at the Sea, leads to these negligible to limited benefits.

The DEIS fails to provide a table summarizing the costs of the proposed alternatives. We have constructed a table that summarizes these costs, based on estimates provided in the DEIS and, where these are not provided, based on costs provided in the draft Alternative Appraisal Report. [This table is included on our website as a separate file, in Excel format, denominated "Costs," http://www.pacinst.org/water.html#salton]. Costs reported for 2003 reflect

The DEIS provides an inadequate description of the economic baseline of the area surrounding the Salton Sea, hampering efforts to assess the potential benefits of any proposed restoration alternative. The DEIS inconsistently measures potential ecological and economic benefits across a variety of scales, variously described as the "primary study area" (1-5), the "Phase 1 study area" (3-112), the "area of primary influence" (3-112), and the "study zone" (3-120). The DEIS liberally estimates the total assessed value of property within fifteen miles of the Sea, which includes the communities of Indio, Coachella, Mecca, Calipatria, Westmorland, and Brawley, at $500 million. According to Bazdarich's 1998 study, the total value of all Salton Sea properties within ½ mile of the shoreline at the current elevation is $154.8 million. Total population within five miles of the Salton Sea, estimated from 1990 census tract data, is fewer than 15,000 people. An appropriate assessment of the economic impacts of the proposed alternatives should present such data.

As noted in the section on elevation, the target elevation is most closely associated with achieving Goal #5 (ecological considerations regarding elevation are partly addressed by the North Wetlands Habitat, while the Displacement Dike would modify or destroy avian habitat). The potential benefits generated by the restoration alternatives versus the costs of generating those benefits should be assessed by the DEIS, especially since the economic development is a specific goal of the Restoration Project. The DEIS fails to present such an assessment. As noted above, the projected benefits of any of the alternatives are negligible to slightly positive in the next 50 years. Total value of all Salton Sea properties within ½ mile of the present shoreline, property that will be most directly impacted by restoration efforts, is less than $160 million. The construction cost of the displacement dike, used to maintain the Sea's elevation, is estimated at $450 million. The DEIS projects an additional $10 million for diverting flood flows to the Sea. Total direct costs associated with meeting Goal #5 are thus almost three times the value of the property it is intended to preserve.

## Salinity

The threat that increasing salinity poses to fish is one of the driving forces of the Salton Sea Restoration Project. Loss of all or parts of the Salton Sea fishery would have profound impacts on fish-eating birds, such as brown and white pelicans and cormorants, that rely on the Sea for food. Loss of fish from the Sea would also eliminate the sportfishery and decrease opportunities for recreational and economic development. Yet increasing salinity is a natural phenomenon for terminal lakes such as the Salton Sea, meaning that efforts to reverse such increases will require continuous intervention and management. This is the reason for the two-phase approach. Phase I actions are interim stop-gap measures, while the Phase II actions are intended to function indefinitely.

Salinity of the Salton Sea is reported at 44,000 mg/L, roughly 25 percent saltier than ocean water. The chemical composition of Salton Sea water differs from ocean water, in part due to higher concentrations of calcium and magnesium sulfates and calcium carbonate. Limited understanding of the dynamic relationships governing precipitation rates at the Sea challenge efforts to project the future composition of Salton Sea water. The DEIS notes that the chemical constituents listed above will precipitate out of solution as the Sea's salinity increases, decreasing the overall rate of increase of salinity. Solubility for some salts may have already been reached. This would partly explain why the Sea's salinity has increased at a lower than projected rate over the past 30 years.

That salts are precipitating out of solution has significant ramifications for the Restoration Project. This means that the salinity of the Sea will increase at a lower rate than projected by the DEIS. And, especially pertinent for the five alternatives proposed by the Restoration Project, efforts to reduce the salinity of the Sea will be slowed by the buffering effects of the precipitated salts dissolving back into Salton Sea water. Additionally, the implementation of

any of the alternatives would change the chemical composition of the Sea, increasing the concentration of calcium and magnesium sulfates relative to sodium and potassium chlorides, which would be disproportionately removed via the EES or the evaporation ponds. The impacts of these changes are not discussed in the DEIS, even though they could have significant impacts on the Sea's biota and the birds that feed on them.

The modeling assumptions in the DEIS fail to account for the precipitation of salts, despite the fact that the DEIS states "it would have the effect of reducing the salinity compared to the model projections" (4-15). This is a significant deficiency of the DEIS. The failure to account for the precipitation of salts in projecting future salinity of the Sea means that the salinity projections included in the DEIS are inaccurate. Such inaccuracies presumably magnify as projected salinities increase and the further that salinity is projected into the future. The effect of the DEIS' inaccurate models is to overstate the alternatives' efficacy. Accounting for the precipitation of salts means that the alternatives would take more time to reduce salinity to target levels, and that they might not ever achieve such a reduction. This in turn would affect the environmental consequences of Phase 1 actions, particularly for surface water resources, fisheries and aquatic resources, avian resources, socioeconomics, and recreation resources.

## Nutrient Loading

The Salton Sea suffers from the misperception that it is dying. The opposite is closer to the truth: the Sea is an extremely productive body of water. The lead agencies claim that the Salton Sea may be the most productive fishery in the world. Several factors contribute to this productivity, the most important of these being the extremely high levels of nutrients present in the water flowing into the Salton Sea, creating eutrophic conditions. These nutrients are used in fertilizer and are also present in effluent from dairy and cattle operations, as well as in municipal and industrial effluent. Nutrient-rich conditions promote algal growth and conditions conducive to the transmission of disease. Algal respiration and the decomposition of dead algae consume large quantities of oxygen, decreasing concentrations of dissolved oxygen (DO) in the Sea, asphyxiating fish.

The fish harvesting common action is the sole effort of the Restoration Project to address the eutrophication of the Sea and the nutrient loading that generates this condition. Yet the impacts of fish harvesting are speculative, and unlikely to remove more than 10 percent of the phosphorus that enters the Sea each year. As the DEIS notes (5-2), "in order for the harvesting of tilapia to have a more pronounced effect on nutrient levels it must be coupled with significant reductions in the nutrient input levels into the Sea." One of the more promising means of reducing nutrient input levels into the Sea would be through the implementation of best-management practices designed to meet the Total Maximum Daily Loads (TMDL) established by the Regional Water Quality Control Board. The failure of the Restoration Project to address nutrient loading in any meaningful way means that the chronic die-offs of fish and birds at the Sea will continue, despite the investment of hundreds of millions of federal and state tax dollars and the public's expectation that the Project will improve current conditions at the Sea.

As noted previously, four of the five Project goals depend upon restoring the ecological health of the Salton Sea. As the Executive Director of the Salton Sea Science Subcommittee has noted, "The recent increase in disease occurrence, magnitude of losses, and variety of disease is indicative of an ecosystem under severe stress" (3-75). The high salinity of the Sea stresses many of the organisms there, but the failure to address the other factors causing this ecosystem stress, most notably nutrient loading, means that the Restoration Project will not restore the health of the Sea, and therefore will not promote recreational and economic development.

## Selenium

Selenium toxicity can lead to reproductive failure, deformities, and death among aquatic organisms and birds, and can also adversely affect people. The DEIS does not adequately discuss the potential threat to people posed by their consumption of Salton Sea fish with elevated levels of selenium. The Sea provides subsistence fishing for Native Americans (3-113) and may also contribute to a significant portion of the diet of others in the area, despite the California Health Advisory Board's posted warning discouraging people from consuming more than four ounces of Salton Sea fish in any two-week period. If the Restoration Project increases recreational and subsistence fishing, human exposure to fish with elevated levels of selenium would increase. The DEIS also notes that recent preliminary studies show increased selenium levels in white and brown pelicans, and that increased selenium levels may suppress the functioning of avian immune systems, making them more susceptible to disease, though this is still not fully understood (3-75, 3-77).

Despite the threat selenium poses to human and avian health, the Restoration Project offers no direct mechanism for addressing selenium. The Restoration Project could exacerbate selenium-related problems at the Sea, due to the construction operations associated with the displacement dike, the north wetland habitat, two of the common actions, and three of the five restoration alternatives. Such construction would disturb the Sea floor, resuspending selenium and other contaminants found there, some of which would enter the food chain.

## Air Quality

The DEIS inadequately addresses the air quality impacts of both the construction phase and the potential for airborne dispersion of exposed lakebed particulate matter. Activities associated with the construction phase would markedly reduce air quality in the region, both in terms of exhaust (4-75) and fugitive dust emissions (4-76). The construction phase ranges from 36 to 48 months, with an additional 48 months of construction-related activities associated with the displacement dike. Assuming a 10-hour workday (4-73), the construction of project elements would require 1.6 to 3.5 trucks per minute hauling aggregate as much as 50 miles from borrow sites near Salton Sea Beach, or as much as a truck every 17 seconds. In addition to air quality considerations, this quantity of vehicular traffic would also significantly increase noise levels in the area, reducing aesthetics.

## No Action Alternative

The DEIS states (2-8) that "Project alternatives must be evaluated against a scenario that could reasonably be expected to occur in the foreseeable future if the project is not approved." The depiction of expected conditions at the Sea without a project is needed to provide a baseline for comparison against the projected impacts of any of the project alternatives. These comments are not meant to suggest that the Pacific Institute endorses a no action alternative, but rather that an adequate description of a no action alternative is a necessary and important tool for evaluating the other alternatives. An adequate description of a no action alternative would describe physical, biological, and socioeconomic changes that might occur without a project.

The DEIS fails to meet such a standard. The DEIS focuses on the hydrologic changes that would be expected under a no action alternative, offering only cursory descriptions of potential biological and socioeconomic changes. The discussion of the no action alternative should include a general narrative overview of the changes that could occur if no project is implemented, summarizing the information provided in the subsequent sections on the affected environments. The DEIS presents the information in a disjointed, piecemeal fashion, challenging efforts to develop a clear understanding of what might occur at the Sea in future years. For example, in the section on the impacts of

Alternative 1 on fish resources, the DEIS (4-108) notes that "creation of hypersaline environments in the ponds could promote high primary productivity of the phytoplankton, accompanied by high secondary production of invertebrates…. These organisms serve as protein sources for many fish and waterbirds." This information is clearly relevant and applicable to a no action description for the Sea as a whole, yet it is not included in a pertinent section.

## Partial Intervention

In her remarks at the January 2000 Salton Sea Symposium, Marta Brown stated that a restoration plan for the Salton Sea should be "holistic, sustainable, and visionary." The Salton Sea Restoration Project may be visionary, but it is neither holistic nor sustainable. As described in the DEIS and the Alternatives Appraisal Report, the proposed alternatives are interim measures that, in the likely event of reduced inflows, will require the massive infrastructure fixes of Phase II to export Salton Sea brine out of the basin and pump in replacement water. Yet even the Phase II proposals fail to address nutrient loading and selenium. Such a fix is neither holistic nor sustainable.

The DEIS' own assessment strongly indicates that the Restoration Plan will not achieve its own stated goals or objectives. Given the considerable talents and skills applied to the problem by the lead agencies and the contractor over the past two years, it appears very unlikely that the project goals can be reasonably achieved for the Sea as a whole.

A more appropriate and viable approach to improving the ecological health of the Salton Sea and preserving avian habitat and the sport fishery, and in turn the recreational and economic goals that depend on these, may be to focus on managing the conditions of a small portion of the Sea, rather than the Sea as a whole. Such an approach would involve constructing dikes within the Sea near the north and south shores to capture inflows and maintain elevation near current levels, with excess waters flowing through pipes in the dikes to the main body of the Sea. These impounded north and south shore areas would transition to brackish, estuarine conditions. Such impoundments would have to be coupled with treatment wetlands, to reduce nutrient and selenium loading, and the implementation of management practices to reduce nutrient loads from agricultural, municipal, and industrial sources. Dikes constructed along the –245 foot contour, connecting to the current shoreline near San Felipe Creek and Bombay Beach

These impounded areas would require monitoring and management to ensure that contaminant levels do not rise to dangerous levels. Such impounded areas would strand most of the existing shoreline communities and the State Recreation Area as the elevation of the main body of the Sea decreases, potentially necessitating compensation for property owners, though such costs would be significantly less than the construction cost of the displacement dike alone. The probability of dike failure due to earthquakes would be similar to that of the proposed alternatives. Dike failure would result in some or all of the impounded water flowing out to the main body of the Sea. The impounded area would fill in less than a year after the dike is repaired, though it could take several years for the fishery to rebound to previous levels. The loss of most of the fishery would significantly decrease the availability of food for open-water fish-eating birds, such as pelicans and cormorants, though the impounded areas would continue to provide a source of fish for these birds. The construction of dikes in the northern and southern parts of the Sea would increase the volume of the Sea. If inflows to the Sea do not decrease, this proposal would therefore increase the elevation of the Sea, flooding shoreline communities and adjacent agricultural areas.

Such a limited approach would satisfy a narrow interpretation of the stated goals of the Restoration Project and the Reclamation Act, though it would not address the condition of the Sea as a whole. Yet such a limited approach, if implemented in conjunction with efforts to limit inflows of nutrients and selenium, could preserve a significant amount of avian habitat and promote recreational and economic development in the immediate area.

## Conclusion

The Salton Sea is an ecosystem under severe stress. Despite the accidental nature of its creation and the non-natural source of its inflows, it continues to provide valuable habitat for a broad array of migrating and resident birds. The ecological values the Sea offers are of national interest, warranting a broad federal intervention to improve the health of the Sea. Yet the current Restoration Project would do little to attenuate the frequency and magnitude of the massive die-offs of fish and birds that first attracted public attention. Rather than constructing a massive engineering project that would require continuous maintenance and operation to counter the natural processes in evidence at the Sea, a more appropriate and sustainable option would be to address the conditions in a smaller section of the Sea, in conjunction with basin-wide programs to reduce the quantity of pollutants entering the system.

# Appendix

# Pacific Institute Comments on Draft Environmental Impact Statement/ Environmental Impact Report

**Note: These comments are available on our website as a separate file: http://www.pacinst.org/water.html#salton**