Salton Sea Management Program
Phase I: 10-Year Plan
March 2017

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Introduction

Under the leadership of Governor Edmund G Brown Jr., the 2014 California Water Action Plan set forth a vision for California water management that balances statewide water supply security with the protection of public, economic and ecological health. The Salton Sea offers a unique opportunity to preserve these values by leveraging a convergence of support from federal, state, and local stakeholders for a smaller and sustainable sea achieved through the projects outlined in this plan.

The Salton Sea is California's largest lake. Thirty-five miles long and 15 miles wide, the desert lake extends from the Coachella Valley into the Imperial Valley. Though saltier than the ocean, the Sea supports an abundance of fish, a food source for millions of migratory birds on the Pacific Flyway. Managing the Sea's natural, agricultural, and municipal water inflows to maximize bird and fish habitat and minimize fine-particle air pollution will allow California to protect regional health, ecological wealth and a stable water supply.

The Salton Sea formed in the Salton Trough in Imperial and Riverside counties. Much of the trough is below sea level and has a long history of periodic inundation from the shifting delta of the Colorado River or from infrequent storm events. The last Colorado River inundation of the area occurred in 1905 when an irrigation canal inlet gate failed and flooded much of the area. Since then, lake inflows have been primarily from agricultural activities in the area. Inflows from the New and Alamo rivers are primarily farm return flow water, although there is some inflow from Mexico, particularly during large precipitation events. Over the last several decades, water levels at the Salton Sea have declined and salinity concentrations have increased due to climate fluctuations, agricultural conservation measures, cropping practices and reduced inflows from Mexico. Recent water transfers from the Imperial Valley have further accelerated the rate of lake elevation decline and have increased the rate of salinity concentration. Declining lake levels threaten important bird habitat and pose public health risk due to particulate air pollution.

Over the last 40 years numerous ideas and plans have been proposed by various entities to restore the Salton Sea. None have been implemented for a variety of reasons, including lack of a shared vision, funding constraints, and reduced inflows.

In 2015, Governor Edmund G. Brown Jr. formed the Salton Sea Task Force with principle staff and members of various state agencies to identify short- and medium-term goals to respond to air quality and ecological threats at the Salton Sea. The Task Force developed actions for the Salton Sea that included:

- Develop and implement the Salton Sea Management Program through departments within the California Natural Resources and Environmental Protection Agencies
- Improve public outreach and local partnerships
- Accelerate project implementation and delivery

- Meet a short-term goal of 9,000 acres to 12,000 acres of dust suppression and habitat projects
- Establish a medium-term goal of 18,000 acres to 25,000 acres of dust suppression and habitat projects.

The State's Salton Sea Management Plan (SSMP) has several phases of development to protect air quality and ecosystem values at the Salton Sea. This draft technical memorandum prepared by the State of California outlines the SSMP's first, 10-year phase (Phase I Plan). It will guide State and federal actions to meet the commitments outlined in the Memorandum of Understanding (MOU) executed on August 31, 2016, and amended on January 18, 2017 by the Department of Interior (DOI) and the California Natural Resource Agency (CNRA). The MOU, among other things, identified a goal of developing projects to protect or improve air quality, wildlife habitat, and water quality as necessary to minimize human health and ecosystem impact at the Salton Sea in the mid-term. While guided by the MOU, the SSMP is a longer-term process that has been developed and will be implemented by the State of California. This first phase of development has been planned to expedite construction of habitat and to suppress dust on areas of playa that have been or will be exposed at the Salton Sea by 2028. The Phase I Plan outlines the process for developing additional management measurements for the Salton Sea that will be implemented in later phases.

The Phase I Plan also addresses the requirements of Assembly Bill 1095 (Garcia 2015) by including those projects deemed "shovel-ready projects" and including estimates of cost. Those projects include:

- Water backbone infrastructure, which will provide conveyance of river and Salton Sea water to air quality and habitat projects.
- SSMP air quality and habitat projects associated with the water backbone infrastructure
- The CNRA's Phase I Species Conservation Habitat Project (saline impoundments along the southern shore to support fish and wildlife)
- Red Hill Bay Project, an effort of the U.S. Fish and Wildlife Service and Imperial Irrigation District to restore habitat on the southeastern shore
- Torres-Martinez Wetland project, an effort of the Torres Martinez Desert Cahuilla Indians to build shallow wetlands along the northern edge of the Salton Sea.

The Phase I Plan considers the implications of the 17-year drought on the Colorado River. The drought may force reductions of Colorado River water to the Lower Basin States, which in turn could impact inflows to the Salton Sea. The U.S. Bureau of Reclamation, seven Colorado River basin states and key principals of several water management agencies have been developing a Drought Contingency Plan (DCP) that includes implemented and proposed actions to address the potential water shortage. The Department of Interior Order No. 3344 - *Actions to Address Effects of Historic Drought on Colorado River Water Supplies* (DOI, January18, 2017) further outlines the details of the DCP. One component of the Phase I Plan is to evaluate the current

hydrologic modeling for the Salton Sea and to include some of the proposed actions in the model to evaluate their potential impact to Salton Sea inflows.

As the *Air Quality Planning and Implementation* section of this document notes, the air quality mitigation will consist of measures to keep exposed playa wet or vegetated. A series of Best Available Control Measures (BACM) are being evaluated by the Quantification Settlement Agreement (QSA) Water Transfer mitigation program, which was created under a 2003 agricultural-to-urban water transfer agreement involving the State of California, the Imperial Irrigation District, Coachella Valley Water District, and the San Diego County Water Authority. The work of determining these best strategies will be paid for by the QSA Joint Powers Authority. The Phase I Plan involves coordination among Imperial Irrigation District, Imperial County Air Pollution Control District, South Coast Air Quality Management District and other agencies to ensure that the latest information about how lakebed exposure may affect air quality is included in the development of BACM pilot projects.

In order to provide ample time for public input into this plan, the SSMP will schedule several regional workshops to solicit input from community members and stakeholders as well as provide necessary time for general public comment. This process will be announced via the program's website http://resources.ca.gov/salton-sea/.

Salton Sea Elevation and Exposure Modeling

A key issue at the Salton Sea is exposure of previously submerged lakebed, known as playa, as the lake surface shrinks. This playa exposure is subject to wind erosion and can be a source of fine airborne dust smaller than 10 micrometers, known as particulate matter 10, or PM10; as well as a source of PM 2.5. The dust is a significant health hazard and can contribute to respiratory illness in humans. It can also damage agricultural crops and wildlife and harm the region's tourism industry.

Understanding the extent, type and location of the exposed playa is important in developing a program to address playa emissivity. There also are regulatory requirements to provide an emission inventory, the creation of which demands an understanding of the extent of exposure possible over the course of the Phase I Plan.

The following is a brief explanation of the process used to create the playa exposure assumptions included in this 10-year plan.

Hydrology Inflow Modeling

As part of the initial environmental evaluation of the Imperial Irrigation District Water Conservation and Transfer Project (QSA water Transfer), the Salton Sea Accounting Model (SSAM) was used to estimate inflows and salt concentrations at the lake for the up to 75-year term of the QSA Water Transfer. This evaluation resulted in a series of mitigation measures designed to address water quality and to maintain the salinity trend at the lake. The measures also had a secondary effect of reducing the water elevation decline at the lake.

In 2012, in response to concerns over the results of the previous modeling, the Salton Sea water inflow and salt balance projections were reevaluated using the Salton Sea Analysis model (SALSA), originally developed in 2006 for the California Department of Water Resources' Salton Sea Ecosystem Restoration Program's environmental documentation. The SALSA model was integrated into the GoldSim modeling platform to provide an interface that would more easily allow for alternative scenario comparisons, allow for customized simulations, and provide for a stochastic simulation mode to evaluate uncertainty. The revised model results were compared/correlated with the additional years of measured elevation data available from 2003 to 2012 (latest available information). Since then, Imperial Irrigation District (IID) has revised the model based on new data and those revisions are included in the exposure projections presented here. Since there is some difference of opinion on the results of the latest hydrology, the State will evaluate the hydrologic model, compare the results with earlier versions and make it available for review as part of the preparation of the SSMP.

Along with the original parameters of the model (agricultural return flow water, mitigation water delivered to the lake, precipitation, groundwater inflow from the Coachella Valley, evaporation, etc.), the revised model has inputs for water use by the Species Conservation Habitat Project and for water-dependent air quality mitigation. The water demands for the habitat and water-dependent air quality mitigation components are determined based on surface area, evapotranspiration rates, total dissolved solids concentrations, and flow-through volumes. These variables can be manipulated in the model inputs to mimic various management scenarios. The various assumptions integrated into the model will be provided to stakeholders as part of the review of the hydrology model. The State will complete a revision/calibration of the SALSA hydrology model. Additional field data will be integrated into the model.

Initial conditions for the model are from the United States Geological Survey (USGS) stream gauge data from December 31, 2012, which measured the lake elevation at -231.35 feet below mean sea level (MSL) based on the North American Vertical Datum of 1988 (NAVD88). The baseline for the salinity concentration is approximately 52.7 parts per thousand (ppt) based on the average of samples taken by the U.S. Bureau of Reclamation at three fixed locations in the lake in February 2012.

A Monte Carlo simulation (stochastic process) is used to provide multiple runs with changes to multiple variables, based on their probability distribution. The runs are then statistically analyzed and an end-of-year Salton Sea water elevation is calculated for each year. The inflow data is combined with lakebed topography (bathymetry) to estimate playa exposure around the lake.

Salton Sea Bathymetry

The revised Salton Sea bathymetric data was developed by consultants from a variety of sources including light detection and ranging (LIDAR) survey technology and boat-based acoustic sonar imagery. This data was manipulated to develop bottom contours for the lake and immediate shore area. It also was used to estimate sediment depth and composition around some areas of the lake. Data relating to the bathymetric model was

converted to NAV88 using the National Geodetic Survey's VERTON calculator and a standard conversion factor of 2.113 feet.

In order to evaluate the accuracy of the playa exposure model, satellite (Landsat 5, 7 and 8)imagery of the Salton Sea was captured and a spectral water index was used to identify areas covered by water. This was then compared to the results of the playa exposure evaluation model and the existing data from the USGS gauge to compare the results. In general, the results were comparable. But the evaluation identified differences in areas around the bays of the New and Alamo rivers. This is likely the result of errors in the bathymetric data caused by limitations of acoustical sonar data in shallow water areas (while these areas are currently dry, portions were flooded with shallow water during the sonar survey). The bay areas that were exposed in 2016 have been included in the exposure acreage, and the revised hydrology will evaluate the issue and determine if the bathymetric data need to be further adjusted. This information will be included in the revised hydrologic model review process.

Salton Sea Playa Exposure

Based on the above data, Table 1 summarizes the predicted year by year playa exposure from late 2018 to 2028, which totals approximately 48,300 acres. Additional hydrologic analysis will be completed to include potential impacts from the DCP that may revise inflows to the lake, which in turn will cause changes to the exposure profile. Revisions to the hydrology will change the estimated exposed acreage. It is likely that revisions will be made on an annual basis, as new information becomes available, and the revisions will be made available for review by stakeholders.

The original estimates for total playa exposure from the QSA water transfer were approximately 45,000 acres, and the model had the lake stabilizing in approximately 2035. The environmental documentation for the QSA recognized that the amount of exposure might change, and included requirements in the air quality mitigation program that additional modeling be conducted to further evaluate exposure.

Table 1. 2018–2028 Annual Exposure (Acres/Year)

YEAR	ACRES
2018	3,500
2019	4,200
2020	5,000
2021	5,600
2022	5,500
2023	5,300
2024	4,900
2025	4,300
2026	3,900
2027	3,300
2028	2,800
TOTAL	**48,300**

The exposure projections currently listed for the 10-year period differ from the projections for the original 2003 and later environmental document prepared as part of the QSA Water Transfer. As was noted previously, the State will evaluate the latest hydrology data and make the results of that evaluation available for review. There will be periodic comparisons of the actual playa exposed against what the model predicts will be exposed.

The SSMP Phase I Plan will be implemented within the exposed areas on the south and north ends of the lake. Some of the exposed area may not be emissive and will not require action from the Phase I Plan. The implementation process for the Phase I Plan is outlined in the *Implementation* section of this document.

Salton Sea Salinity

One of the measures incorporated into the QSA Water Transfer mitigation program was the revised Salton Sea Habitat Conservation Strategy, which required delivery of 800,000 acre feet of water to the Salton Sea to maintain the salinity trend at the lake. The delivery of this water mitigates to a large extent the decline in elevation of the lake. Delivery of this so-called “mitigation water” ends December 31, 2017.

The original and revised SALSA models calculate the salt concentration for the lake based on a simple mass balance algorithm. Salinity was modeled and then compared with measured salinity data from the U.S. Bureau of Reclamation’s salinity surveys conducted in February 2012. The model estimates that the salinity of the lake will be approximately 63.4 parts-per-thousand (ppt)at the end of 2018, and approximately 153.1 ppt in 2045. The most recent measurements of salinity (Reclamation 2016) recorded slightly over 59 ppt, which is higher than some of the model predictions.. Additional modeling will be conducted to confirm salinity trends and show any difference between the modeled and measured salinity. While the salinity projections may change based on the modeling, current projections can still be used for planning purposes.

Phase I – Background

Phase I is designed to address playa exposure by developing habitat or dust suppression projects on exposed playa. The location of habitat projects will be determined primarily based on site logistics such as water availability, soil suitability, and compatibility within the overall habitat landscape. If the primary objectives are met, location of habitat will be further informed by emissivity potential of the playa. Determination of playa emissivity will drive the location of the dust suppression projects. The development of new methods for evaluating emissivity is part of the QSA Water Transfer Air Quality Mitigation Program and the Phase I Plan. The process for determining more advanced methods of measuring emissivity is an ongoing process that is being coordinated with the two local air districts and the California Air Resources Board. More detail regarding measurement of emissivity is included in the *Air Quality Planning and Implementation* section of this document.

The projected playa exposure acreage is based on data from IID's revised hydrology model and will be reviewed by the State and other stakeholders. Figure 1 (all figures are contained in Appendix 1) illustrates the projected lake elevation in 2003, 2018, 2023 and 2028. The exposed playa acreage included in the Phase I Plan is depicted as shaded areas (zones) on the north and south end of the lake. Figures 2 and 3 are of playa exposure at the New River. Figures 4 and 5 depict exposure at the Alamo River, and Figure 6 depicts exposure at the north end of the lake. For graphical and design development purposes, the area encompassed in the Phase I Plan is divided into three increments of playa exposure by year: 2003–2018; 2018–2023 (green shading); and 2023–2028 (blue shading). However, the Phase I Plan addresses annual exposure of playa areas, as noted in Table 2, starting in 2018. The habitat projects will be concentrated in the 2018–2023 and 2023–2028, exposure zones. BACM pilot projects and the water management ponds will be located in the 2003–2018 exposed zone because they require exposed playa, and the water management ponds are located to facilitate gravity flow. Appendix 4 includes a preliminary implementation schedule that will be updated as design advances.

Table 2 summarizes the projected exposure and the amount of treatment of exposed emissive playa on an annual basis. There is lag time between playa exposure and construction of habitat or dust suppression techniques. This delay accounts for the seasonal elevation change of the lake (water elevations during a given year vary based on seasonal changes in inflow volumes), wave action wetting the exposed playa, and desiccation of the playa soil after exposure. Initial evaluations by the air quality management program suggest that the lag time is approximately 1.5 years to two years. A two-year lag time will be used for the purposes of developing annual target numbers. There will be periodic calibrations to assure that the predicted exposure is accurate.

Table 2. 2018–2028 Exposure and SSMP Phase I Projected Construction

YEAR	EXPOSED ACRES	PROPOSED CONSTRUCTION
2018	3,500	500
2019	4,200	1,300
2020	5,000	1,700
2021	5,600	3,500
2022	5,500	1,750
2023	5,300	2,750
2024	4,900	2,700
2025	4,300	3,400
2026	3,900	4,000
2027	3,300	4,000
2028	2,800	4,200
TOTAL	**48,300**	**29,800**

Table 2 notes more exposed playa area than proposed constructed area. Phase I concentrates on the north and south ends of the playa where the exposure is more pronounced. The proposed construction acreage is all of the shaded areas noted in Figures 1 to 6. The additional exposed area is primarily along the east and west sides of the lake. These areas are outside of the backbone water management infrastructure and will require additional development of water sources to be converted to habitat areas. These areas may require dust suppression methods to address emissions.

Some exposed areas around the lake may not require treatment, as they will be non-emissive or used for some other purpose, such as access for renewable energy projects or agriculture.

The Phase I Plan includes many of the concepts identified in the *Salton Sea Restoration and Renewable Energy Initiative* (Initiative) developed by IID and Imperial County in 2015 and revised in the IID's Backbone Infrastructure Concept Design memo of August 2016. Though the Initiative was developed primarily as a potential solution for exposed playa areas on the south end of the lake, the concept can also be applied to other areas around the lake. Phase I will incorporate two priority elements of the Initiative: 1) maintaining access for the development of renewable energy (primarily geothermal), and 2) incremental construction based on playa access and funding availability. The Torres-Martinez Desert Cahuilla Tribal nation (Torres) has developed plans for several projects on the north end of the lake that will be a part of Phase I. Habitat design will be informed by State and federal wildlife agencies, as well as academic and non-profit partners.

Dust suppression projects will be coordinated with the *Salton Sea Air Quality Mitigation Program* (IID/JPA July, 2016), the Imperial County Air Pollution Control District (ICAPCD), the California Air Resources Board (CARB) and the South Coast Air Quality Management District. The State will continue to coordinate with the Salton Sea Authority

(SSA), the Water Transfer Joint Powers Authority, IID, and ICAPCD on the development of BACM pilot projects per Imperial County's recent request for letters of interest from affected landowners and the SSA's Natural Resource Conservation Service grant process. The *Air Quality Planning and Implementation* section of this document provides additional detail.

To expedite Phase I, the SSMP design team will include State staff and outside consultants developing the design criteria for the water backbone infrastructure, as well as habitat and dust suppression projects at the north and south end of the lake. The team will work closely with State agencies, IID, SSA, SSMP Committees, the QSA water transfer agencies, and other stakeholders during the development of the project plans.

SB 839 (Statutes of 2015-16) grants the Department of Water Resources design/build contracting authority for the SSMP. This authority will expedite and provides a more flexible design and construction process as well as potentially reducing project costs. Design criteria and preliminary construction design will be used to develop and advertise for a design/build consultant to implement Phase I projects.

Phase I Planning and Design

The State of California will use the amount/rate of playa exposure (subject to lag time and other constraints) to plan and implement each year's annual increment of construction of projects in the Phase I Plan. Each year at a specific timeframe (likely December), the State will determine actual playa exposure using methods similar to those described above for evaluating the playa exposure model's accuracy and adjust the hydrology model if needed. The evaluation will include measuring the emissivity and potential for toxic emissions of the playa to determine if the exposed area requires mitigation. The Phase I Plan will require a certain amount of adaptive management, as there may be seasonal fluctuations at the lake or changes in annual exposures that may require adjustments to Plan implementation.

The exposed area to the west of the New River (Figures 2 and 3, Appendix 1) is identified as the first site to be developed because much of the area was included in the Species Conservation Habitat Project (SCH) environmental documentation and will not require significant additional regulatory compliance effort. The second area developed will be to east of the New River (Figures 4 and 5, Appendix 1). This area will be developed after construction of the SCH is substantially completed. (The SCH serves as both habitat and the water management pond for the SSMP projects on the east side of the river.) Additionally, the Torres project located on the north end of the lake will be developed (Figures 10 and 11, Appendix 1). Permitting work on other areas is underway and will be completed prior to planned construction dates,. The State is currently trying to determine the most expedient process for regulatory compliance and will make every effort to utilize existing California Environmental Quality Act and permitting documentation in that process.

Areas around the Alamo River (Figures 6, 7, 8, and 9, Appendix 1) will be developed later in the Phase I Plan, as they involve more access issues associated with geothermal development. The Red Hill Bay project is underway on the west side of the Alamo River (Figures 6 and 7, Appendix 1) and will be completed in 2017.

The development of the Phase I Plan is divided into water backbone infrastructure, habitat, and air quality components, as described in the following sections.

Water Backbone Infrastructure Design

The water backbone infrastructure (backbone) is part of the *Salton Sea Restoration and Renewable Energy Initiative* (IID 2015 and revised 2016), and is designed to supply agricultural return flow water for dust suppression, habitat projects and other potential land uses on the south end of the lake. The backbone will consist of a series of outlets from the Alamo and New rivers that supply agricultural return flow water to water management ponds located along the edges of the lakeshore adjacent to the rivers (Figure 1, Appendix 1). The water management ponds will include an inlet for Salton Sea water. The two water sources will be blended in the water management pond, and the resulting brackish water will be used for the habitat areas. The project water distribution system will deliver the brackish water from the water management ponds for habitat and dust suppression.

The Audubon report *Quantifying Bird Habitat at the Salton Sea - Informing the State of California's Salton Sea Management Plan*, October, 2016, details salinity levels tolerated by various avian species.. The Audubon report will help determine specific locations and salinity for the various habitat areas based on target species. Location of the various habitat types will be developed as part of the work planning effort that begins in March 2017.

The backbone is divided into sections based on the agricultural return flow water source. The New River is depicted in Figures 2 and 3 in Appendix 1, and the Alamo River is depicted in Figures 4 and 5 in Appendix 1. The river sections are further subdivided based on the location of the playa that will be served by each section, with the New River divided into east and west, and the Alamo River divided into north and south.

The State team (which includes various SSMP Advisory Committees), along with IID, the QSA Water Transfer agencies, and other stakeholders, will collaborate to develop design and construction standards for the Phase I water backbone delivery system. IID will be involved in the review and approval of the backbone system, as it will be connected to IID infrastructure. The criteria for the backbone water delivery system may include the following:

Geotechnical Evaluation

Utilizing existing data where practical, determine suitable substrate materials available for berm foundation and berm construction. This will be a limited evaluation similar to what was done for the SCH.

River Delivery System

Evaluate the construction and operation cost of a pump system versus the development of a river check dam structure to facilitate gravity flow from the river.

Identification of Existing Habitat Areas

Evaluate existing habitat and vegetation along the eastern side of the lake to determine if portions can be stabilized or enhanced (Figures 8 and 9). Vegetation, ponded water, and saturated soils in these areas are likely caused by natural or artificial blockage of the agricultural drains in the area. Consider the potential for water quality issues (selenium) in these areas and the potential for impacts to desert pupfish.

Design Criteria

Determine process for assessing the value of engineering of projects with an emphasis on developing standards that compare project longevity against the costs of building and maintenance.

Design-Year Storm

Determine the appropriate design year storm and develop flood control measures to accommodate that flow. The evaluation may include the development of sacrificial berms, cutouts or armoring of the channel to pass large volumes of water from the river channel to the Sea.

Channels

Evaluate the potential for pipe systems instead of open channels for the distribution system. Evaluate size, structure and composition (lined vs. unlined) of the distribution system.

Water Management Ponds

Determine the final structure, size, and location of the water impoundment ponds. Determine sediment control system. Evaluate berm construction parameters (material, compaction etc.).

Easement and Lease Protocols

To the extent practical, develop standardized easement and lease agreements for IID parcels and other parcels that will be used for SSMP projects.

Develop Contingency Plan for Funding Shortfalls

Develop a program to prioritize certain aspects of the Phase I Plan if funding is not available for the complete implementation. Considerations will include human health concerns, potential impacts to agricultural activities, and ecosystem management.

Operation, Maintenance, and Monitoring

Develop cost estimates for operation, maintenance, and monitoring activities associated with constructed facilities. The State will be responsible for implementing the operation, maintenance, and monitoring of the project. The DOI/CNRA MOU (Appendix 2) identifies federal funding for these activities for a ten-year period.

Compatibility with IID Draft Water Transfer Habitat Conservation Plan

The Phase I Plan will be developed to be compatible with the mitigation measures for desert pupfish, marsh birds, and other Salton Sea or drain species included in the draft Habitat Conservation Plan developed for the water transfer mitigation program.

Compatibility with IID/JPA Water Transfer Air Quality Mitigation Program

The State will coordinate with IID and their consulting team, ICAPCD, Water Transfer Joint Powers Authority, and South Coast Air Quality Management District (SCAQMD) to integrate compatible BACM pilot projects into Phase I of the SSMP. The State will coordinate with Water Transfer Joint Powers Authority partners to implement its air quality mitigation program. Efforts are underway to determine if accelerating portions of the air quality mitigation program are warranted. This coordination will be conducted through the existing Water Transfer Joint Powers Authority budget process and the existing mitigation development program for the water transfer.

This process will follow the four-step air quality mitigation guidelines outlined in the QSA Water Transfer environmental documentation.

Compatibility with Renewable Energy Projects

With the notable exception of the Red Hill Bay project, the initial projects described for Phase I are either outside or at the edges of the Known Geothermal Resource Area (KGRA). However, the remainder of the Phase I projects are within this zone. The State will continue to coordinate with the geothermal developers, regulatory agencies, and land owners to design the SSMP projects to minimize or eliminate conflicts with renewable energy development. Currently, the Phase I design assumes access provisions will be accommodated by the existing drain outlet corridors spaced approximately every half mile along the southeast portion of the lake. This may change as development proceeds.

Phase I – Implementation

Water Backbone Infrastructure Implementation

The 2018–2023 water management ponds will be the first facilities constructed as part of the water backbone infrastructure, followed by the habitat and dust suppression projects associated with each individual pond. The water management ponds likely will be constructed at the highest ground elevation on the playa as is practical to facilitate gravity delivery of water to the habitat and dust suppression water distribution system. The ponds will provide a blend of agricultural return flow water and Salton Sea water to the habitat and water-dependent dust-suppression project areas in the 2018–2023 zone exposure area. A second water management pond will be constructed in each section later in the Phase I Plan progression after the air quality and habitat projects in the 2018–2023 playa exposure zone have been started (*Appendix 4: Project Schedule*). Construction of the second water management pond will be completed prior to playa exposure in the 2023–2028 playa zone so that it can be used to supply water to habitat and air quality projects in that zone. To the extent practical, the water management ponds will be designed and constructed to provide fishery habitat.

Initial construction will start in the area to the west of the New River (Figures 2 and 3, Appendix 1) to take advantage of existing permits and authorizations. As the construction design for the area west of the New River is completed, the environmental documentation will be finalized for the remaining sites, and implementation will follow on the east side of the New River (Figures 4 and 5, Appendix 1) and the north end of the lake (Figures 10 and 11, Appendix 1). As an access plan for renewable energy is developed on the areas around the Alamo River, the water management ponds will be sequenced, with the initial pond providing water to the 2018–2023 zonecompleted first, and the second pond completed as the lake continues to recede, exposing more playa.

The habitat and dust suppression project distribution system will consists of a series of channels or pipelines that will distribute water from the water management ponds to the various habitat and dust suppression cells. The system will be designed to provide access corridors for renewable energy development. The State will coordinate with IID, Imperial County, geothermal developers, and others to assure that adequate access is maintained.

Habitat Descriptions

The State has partnered with numerous state and federal agencies along with the SSA, IID, Imperial County, Audubon, the University of California, and other academic organizations to develop and fund habitat and dust suppression projects around the Salton Sea.

The State also contracted with Audubon to develop the Audubon technical report, *Quantifying Bird Habitat at the Salton Sea* (Audubon, November 2016). The report identifies and quantifies the current acreage of each habitat type comparing it to the

amount of habitat in previous years, and will be used to guide habitat program design. It should be noted that development of the habitat types listed below (with the possible exception of playa habitat) also will provide adequate dust suppression in those areas. The different habitat types identified by the report, their importance, and their potential development opportunities are as follows:

Permanent Wetlands with Vegetation

This habitat type is primarily located around the Salton Sea where the agricultural drains back up and flood or where land is deliberately flooded for habitat. Vegetation varies from invasive species such as tamarisk to cattails and bulrush. It is unclear if this habitat type will persist or be recreated at the Salton Sea. The current selenium bioaccumulation mitigation process is to maintain salinity of the various habitat types at a level that precludes or significantly reduces the growth of vegetation within the habitat areas. The SSMP planning process will evaluate the existing areas and the potential for developing additional areas.

Dry Playa Habitat

Exposed dry playa provides some specific nesting and general foraging habitat value, particularly near the water shoreline. This habitat type will tend to follow the receding shoreline and will likely always be part of the Salton Sea ecosystem in areas immediately upslope of the existing shoreline. However, as the salinity of the center lake area increases, it could change the invertebrate population, thus reducing the forage opportunity for the lake's existing bird population.

Therefore, additional playa habitat might be created or marginal habitat may be enhanced with small woody debris and sparse vegetation to further promote nesting areas. These areas could be incorporated into the shallow habitat cells by fluctuating water elevations on the shoreward edge of the cell, or less emissive playa areas might be identified and developed as habitat.

Mudflat, Sandflat, and Beach Habitat

This habitat type is the water/land interface (from wet substrate to less than 0.5 feet of water depth) along the lake shoreline. This habitat type is likely to continue at the lake as the water elevation decreases. The beach areas are normally high in invertebrate populations (insect and other arthropods) and provide foraging habitat for birds, but the extent and quality of the habitat may be degraded by increased salinity. As salinity increases, the invertebrate population may change from less salt-tolerant species to more salt-tolerant species, though it is unclear how, or if, this colonization will occur. Changes in the invertebrate population in turn may impact bird species with specific diets.

The Red Hill Bay project, currently under construction, will contain areas of this habitat type as a foraging area for shore and wading birds. The SCH will have areas of this habitat type along the shallow shoreline and around some of the island structures. The

SSMP shallow water habitat will contain areas of this habitat type along the shallower end of each pond.

Mid- and Deep-Water Habitat

The Audubon report described mid-water and deep-water as two different habitat types; they are combined here because it may be easier from a construction and management perspective to have both habitat types in one cell. The water depth in this habitat ranges from half a foot to more than 6 feet in depth. This type of habitat provides forage and refuge for fish and marine invertebrate populations. While there will be a considerable amount of mid- to deep-water habitat at the lake, the increases in salinity will likely render this habitat unsuitable for fish reproduction.

The areas noted below are designed, or could be modified, to provide initial mid- and deep-water habitat.

Species Conservation Habitat Project (SCH)

SCH is specifically designed as fish and avian habitat and will have areas that are more than 6 feet deep to accommodate a sustainable fishery. The project is located to the immediate east of the New River on exposed playa. It will be supplied water from an adjacent mixing basin that receives agricultural return flow water from the New River and saline water from the Salton Sea.

Torres- Martinez Wetland Project

The Torres-Martinez project on the north end of the lake is a mid- and deep-water habitat that should be suitable for fish. This project and the SCH will be used to evaluate construction and operation techniques to inform later development of mid- to deep-water habitat.

Water Management Ponds

The water management ponds included in the water backbone infrastructure may also serve as habitat for fish. These ponds will have berms that are six feet or less above the ground surface and likely will not impound water much higher than five feet above the ground surface. However, much of the material to build the berms will be excavated from the interior of the management pond and the total water depth will be deeper.

Red Hill Bay

While Red Hill Bay is generally considered shallow water habitat, there will be some areas of deeper water within the ponded areas. Additional evaluation is necessary to determine if these areas will sustain fish populations.

Habitat Implementation

Habitat projects associated with the first water management ponds will be concentrated in the 2018–2023 playa exposure zone based on the annual exposure, although some habitat or dust suppression projects might be included in the lower elevations of the 2003–2018 playa exposure zone, depending on actual playa exposure and site logistics.

The Red Hill Bay and the SCH are located in the 2002–2018 playa exposure zone. Along with the planned water management ponds, they will cover portions of the 2003–2018 playa exposure zone as they dry, thus reducing or eliminating potential dust emissions from those areas. The State will work with ICAPCD and IID to locate BACM pilot projects in the 2003–2018 playa exposure zone to further reduce the potential for dust emissions. Additional habitat will be planned for the 2018–2023 and 2023–2028 exposed areas. To the extent practical, the SSMP will strive to provide multiple benefit projects that combine dust suppression with habitat enhancement and other positive benefits.

From approximately 2019 to 2021, the second series of water management ponds will be constructed on 2003–2018 exposed playa zone to provide water to the 2023–2038 playa exposure zone. Actual construction of habitat and dust suppression projects in the 2023–2028 zone will commence when portions of that area are dry enough to allow equipment access.

Air Quality Planning and Implementation

The SSMP air quality component is modeled after the IID/Water Transfer Joint Power Authority air quality mitigation program (*Salton Sea Air Quality Mitigation Program*, IID July 2016) for the Imperial Irrigation District Water Conservation and Transfer Project. The SSMP recognizes the four-step process outlined in the final EIR/EIS and concentrates on *Step 2 – Implementing a Research and Monitoring Program* to define the parameters of dust suppression needs and identify solutions, and *Step 4 – Implementing Feasible Dust Suppression Projects* (BACM pilot projects) at the Salton Sea.

The State's SSMP air quality mitigation program will include coordination with IID, Coachella Valley Water District, QSA Water Transfer Joint Powers Authority, SCAQMD, ICAPCD, and CARB to develop BACM and to further develop and implement the emission monitoring process. The *Salton Sea Air Quality Mitigation Program* (IID July, 2016) contains more details on the air quality mitigation effort.

The SSMP envisions a mix of both water-dependent and waterless dust suppression projects in all phases of the SSMP. Ongoing evaluations of the criteria for determining which dust suppression techniques will be used in specific areas will continue as the QSA Water Transfer Air Quality Mitigation Program and the SSMP are developed. Some of the techniques, such as enhanced vegetation, could be considered waterless

measures if designed to intercept the groundwater level, but they would require surface water for establishment. Many of these techniques are currently being evaluated for efficacy and longevity in the 2003–2018 playa exposure zone. Most of the methods have not been in place long enough to determine longevity or durability, but evaluations will continue.

Water Dependent

The water-dependent dust suppression includes all water impoundment areas (both water management ponds and habitat) as well as vegetation enhancement techniques, and salt or surface crust formation areas. Currently, the SSMP design team is evaluating the potential for seasonal flooding of some areas to provide habitat during migration or nesting seasons, and then reduction of water levels to keep the surface near saturation, which should provide dust suppression. Vegetation enhancement requires some amount of water to irrigate the plant material and leach salts out of the upper portion of the root zone.

Salt crust formation requires some amount of water to form the crust and periodic inundation to stabilize the crust. Initial evaluations of naturally formed salt and surface crusts around the sea (DRI and IID PISWERL results) suggest that the surface crusting weakens with conditions of lower temperature and higher humidity (approximately December - March). More evaluation is needed to determine if the weakening of the crust is sufficient to cause those areas to fail stability testing. Additional evaluation of salt crusts and the development of better emissivity determination techniques, already underway as part of the QSA Water Transfer Mitigation program, will continue as part of the initial phases of the SSMP.

The following table summarizes the projected unit costs for water-dependent dust suppression methods. These costs will likely change as the evaluation process continues.

Table 3. Projected Cost for Water-Dependent Dust Suppression Techniques

DUST SUPPRESSION METHOD	COST PER/ACRE
Vegetation Enhancement	$9,000
Vegetation Swale	$17,000
Managed Vegetation	$25,000
Shallow Flood	$25,000
Brine Stabilization	$21,000

The State, IID, Torres-Martinez, and other landholders are also considering groundwater wells that tap the shallow aquifer to supply water to the enhanced vegetation areas. Much of this aquifer is a result of perched water from agricultural irrigation. While there are some concerns with water quality, this process may provide water to some areas that lack access to a surface water supply. The north end has the most potential for near-surface groundwater, but there are other areas where the

techniques may be used. The costs for this dust suppression technique have not been developed. The IID/Water Transfer Joint Power Authority air quality management team is currently monitoring groundwater elevations in a number of sites around the lake.

Waterless

The waterless dust suppression techniques may require an initial application of water, but generally do not dependent on periodic application of surface water. Some of these treatments cost less than some water-dependent treatments, but may require more operation and maintenance. Projected unit costs for these methods are noted below. These preliminary cost estimates will change as more information is developed. Some of these methods are currently under evaluation for longevity and efficacy in several areas around the Salton Sea.

Table 4. Projected Cost for Waterless Dust Suppression Techniques

DUST SUPPRESSION METHOD	COST PER/ACRE
Surface Roughening	$400
Moat and Row	$14,000
Suppressants/Surface Stabilizers	$2,000
Gravel Cover (2 inch)	$36,000
Gravel Cover (4 inch)	$48,000

Projected Costs and Funding

Project Costs

Cost projections for the various components of the Phase I Plan have been developed with the best available information. Projected costs include planning and design costs that are concentrated in the first years of the plan. The developed designs will be used throughout the 10-year implementation of the Phase I plan. The estimates are based on developing habitat in all of the shaded areas (except for renewable energy access or other identified land uses). These projections will change as additional information becomes available on site logistics and on the actual costs of the initial projects. Costs for the Red Hill Bay project and the SCH are not included in the projected costs as they are funded under other sources.

Appendix 3 includes a cost breakdown based on unit costs for each year. Annual costs, constructed acreage and funding availability are summarized in the following table:

Table 5. Projected Annual Cost, Acres Constructed, and Funding of SSMP Phase I 10-Year Plan

YEAR	NEWLY EXPOSED ACRES	PROPOSED CONSTRUCTION	PROJECTED TOTAL COST	AVAILABLE FUNDING	BALANCE
2018	3,500	500	$10.0 M	$10.0 M	($0.0) M
2019	4,200	1,300	$27.0 M	$27.0 M	($0.0) M
2020	5,000	1,700	$35.5 M	$35.5 M	($0.0) M
2021	5,600	3,500	$43.5 M	$7.5 M	($36.0) M
2022	5,500	1,750	$33.5 M	-	($33.5) M
2023	5,300	2,750	$35.5 M	-	($35.5) M
2024	4,900	2,700	$34.0 M	-	($34.0) M
2025	4,300	3,400	$42.5 M	-	($42.5) M
2026	3,900	4,000	$47.5 M	-	($47.5) M
2027	3,300	4,000	$37.5 M	-	($37.5) M
2028	2,800	4,200	$36.5 M	-	($36.5) M
TOTAL	**48,300**	**29,800**	**$383.0 M**	**$80.0 M**	**($303.0) M**

Expenditure Reporting and Process Accountability

CNRA will report each fiscal year on prior year expenditures made for SSMP implementation, availability of funds for future expenditures, and changes to the SSMP program.

Existing Funding

Water Bond Funding (Proposition 1)

Proposition 1, the $7.5 billion water bond passed by California voters in 2014, provided $80.5 million to fund development, permitting, and implementation of the SSMP. This funding is available over the next several years. The expenditure of these funds is reflected in the existing funding column of Table 5 above.

Wildlife Conservation Board Funding for SSMP Projects

The California Wildlife Conservation Board (WCB) approved a $14 million grant in November 2016 to help fund the SSMP's SCH. The grant, along with approximately $21 million from Proposition 84, will fund the construction of an approximately 640-acre aquatic habitat area to support a fishery and provide habitat for Salton Sea avian species.

In 2013, the WCB funded the design and construction of the electrical power distribution system through a grant to IID. The WCB also awarded an approximately $1.85 million grant to the IID to begin work on the Red Hill Bay project, a joint venture project with IID, U.S. Fish and Wildlife, Sonny Bono Salton Sea National Wildlife Refuge, and the State of California.

U.S. Department of Agriculture

The U.S. Department of Agriculture (USDA) recently approved the Salton Sea Regional Conservation Partnership Program to address habitat, air, and water quality on agricultural lands around the Salton Sea. The SSA will administer the $7.5 million grant for water conservation, wetland creation, and air quality mitigation. The wetland creation and air quality management portions of the grant will be used to develop pilot BACM projects and wetland habitat projects on parcels with an agricultural history.

The USDA funding is not included in the projections above. As the program is finalized and grantees are identified, the funding will be accounted for in the annual expenditure reporting process. The success of this grant program is intended to be a proof-of-concept for potentially larger-scale USDA funding. This program could be expanded to include non-agricultural lands at the Salton Sea.

Potential Funding Sources

Water Transfer Joint Powers Authority

The State will work with the members of the Water Transfer Joint Powers Authority to determine if funding included in the existing mitigation program can be utilized for SSMP projects that further the goals of the Water Transfer mitigation program. Currently the

State and IID are exploring acceleration of air quality mitigation efforts that will benefit both programs. The cost of the additional research into determining playa emissivity and methods that suppress dust are projected to range from $5 million to $8 million..

DOI/CNRA Memorandum of Understanding Funding

The MOU between DOI and the CNRA identified a framework for collaboration at the Salton Sea. The MOU calls for $30 million in federal funding over the next ten years for activities associated with the SSMP.

The amendment to the MOU further defines State and federal responsibilities related to dust emissions from the exposed playa at the Salton Sea.

Philanthropic Organizations

The Water Funder Initiative, a collaborative of leading philanthropic organizations, has committed to raise $10 million over the next five years to support implementation of a comprehensive plan to protect public health and the environment and promote renewable energy development at the Salton Sea.

Water Resource Development Act Funding

The Water Resources Development Act (WRDA) of 2016 maintains the $30 million funding identified in the 2007 WRDA bill. The U.S. Army Corps of Engineers (Corps) administers the part of the program pertinent to the Salton Sea. The 2016 Act recognizes the SSA as a preferred partner for funding agreements with the Corps. The 2016 Act also streamlines the methodology for the development and approval of related projects. This funding has not been appropriated.

USDA Partnerships and Funding

After successful implementation of the USDA/SSA grant noted above, additional funding may be possible through development of a partnership between the USDA and the SSMP using the Farm Bill (the Watershed Protection and Flood Prevention Act [PL566]). This program could address air quality, water quality and habitat on non-agricultural lands on and adjacent to the Salton Sea playa. This could include allowing public lands that endanger public health to be included in the USDA's Reserve Enhancement Program or the Environmental Quality Incentives Program.

Additional State and Local Funding

Funding and in-kind support may be available through future state appropriations, water agencies, local infrastructure financing districts, geothermal leases, and other public and private sources. The State will describe its ongoing evaluation of potential funding sources in the annual expenditure reporting process

Development of Planning Criteria for Additional Phases of the SSMP

The State is committed to continuing the SSMP process and will also work with the SSMP Science Committee, other committees, and stakeholders to evaluate concepts for later phases of the SSMP. The evaluation will include a hydrologic analysis to estimate inflows to the lake and water quality concerns that might impact both the current and later phases of SSMP. Specific areas of concern for evaluation by the Science, Project, and Long Range Planning Committees include:

Determine Habitat Functional Values

State and federal wildlife agencies, Audubon, and other stakeholders, in cooperation with the Science Committee, will develop additional analysis to evaluate the carrying capacity of created habitat versus existing habitat.

Determine Water Use

There is no issue with water availability for the Phase I Plan. However, water demands for the later phases must be calculated and compared to the revised inflow models to determine water availability in the longer term.

Salinity

The Science Committee will work with the stakeholders to evaluate the impact of salinity on the various habitats at the Salton Sea. While a range of salinity has been established for the habitat areas, the Science Committee will evaluate that range to determine its effectiveness.

Water Quality in Constructed Habitat

The Science Committee will evaluate the potential water quality issues associated with the constructed habitat. The water quality parameters will include an evaluation of methods to control nutrient concentrations, metal concentrations, biological/chemical oxygen demand, and other water column constituents. The evaluation of various water quality treatments (treatment wetland cells, bioreactors, algal uptake, and chemical treatments) may also be evaluated.

Selenium Management

Currently, the management of selenium bioaccumulation is based on managing salinity to reduce or eliminate vegetation, thus interrupting, or at least restricting, the bioaccumulation pathway. The Science Committee will look at other potential methods that might be more effective in selenium management.

Development of Best Available Control Measures

The State will work with IID and ICAPCD to integrate the development of BACM into the habitat design.

Harbor and Ancillary Facilities

Evaluate the potential for reconnecting, inundating, or treating harbors and boat docks along the east and west sides of the lake as part of the SSMP, and for reducing odor and vector issues. In some cases, this could include making the harbor functional for shallow draft boats.

Water Import Projects

Before consideration by the SSMP, the State will require that any water import project proposal include an engineering and logistic feasibility study conducted on behalf of the proponent by an accredited or licensed engineering, planning, or equivalent organization recognized by the State of California. The criteria for consideration of any such proposal will include the following requirements: (1) identify planning, development, construction, and operation costs, and (2) identify the funding source for each. Specifics on how the proposal would address salinity and other water quality concerns will also be required. Schedules detailing the phases and funding needs of each project must be provided.

Adaptive Management, Monitoring, and Contingency Planning

Adaptive management will be fundamental to the success of the SSMP. The adaptive management program will include review by the SSMP Science Committee, the other SSMP committees and the Salton Sea stakeholders. The program relies heavily on the early development of projects (SCH, Red Hill Bay, and other areas) to test aspects of design, construction, and management. These early lessons learned will be valuable in the efficient and economic development of later phases of the SSMP.

An adaptive monitoring program is under development and will be implemented by the State. It will include the identification of a fish stocking program for the SCH (and later habitat), development of a monitoring and management program for existing avian and fishery habitat, and a water quality monitoring program. It is anticipated that a draft of the plan will be available in 2017. Additionally, the California Department of Fish and Wildlife is in the process of evaluating a potential wider-scale monitoring program for the lake that could be combined with the current U.S. Bureau of Reclamation monitoring efforts and ongoing efforts of others. The monitoring program will be developed in compliance with the USGS guidelines for the Salton Sea monitoring and will utilize existing data to the extent practical.

At this point, the Phase I Plan is not fully funded. The State will continue to monitor the existing and potential funding sources and measure those against the projected costs for the projects in the implementation plan. Adjustments may be required to the plan to maintain adequate dust suppression in some areas while delaying the construction of water infrastructure and habitat (the more costly components). The State will coordinate with the stakeholders as adjustments to the Phase I Plan are considered.

The development of this contingency process will be evaluated starting in 2018 and will be done in two- to five-year increments over the course of the Phase I Plan. As part of the initial tasks undertaken in Phase I, a series of specific metrics will be developed to help assess funding opportunities and match them against projected costs for Phase I.

Outreach

The State is committed to a transparent and open process in the development and implementation of the SSMP. To that end, a set of advisory committees has been formed that meet periodically to discuss specific topics. Those committees include a Science Advisory Committee and committees on air quality, long-range planning, and a public outreach committee. The Public Outreach Committee conducted a series of 13 public outreach meetings around the greater Salton Sea area from April to August 2016 to introduce the SSMP to the public and to solicit input on Salton Sea issues and concerns.

The UC Riverside and UC Irvine Salton Sea programs conducted a series of voluntary surveys of meeting participants (pre- and post-meeting) to gauge the effectiveness of the communication effort. Approximately 43 percent of meeting attendees participated in the surveys. Approximately 36 percent felt they had gained knowledge on the Salton Sea and indicated an increase in their belief that the State was actively addressing issues at the Salton Sea. When asked to prioritize the issues of concern at the Sea, they identified environmental health, public health, and nature as their top three concerns.

One of the things identified after the last series of meetings was the difficulty in contacting some communities and the need to have more robust environmental justice outreach. CNRA, with support from State Water Resources Control Board, developed a communication plan that addresses those concerns and will help guide future outreach efforts. The State is working with several outreach firms and is developing a social media outreach program.

In order to provide ample time for public input into this plan, the SSMP will schedule several regional workshops to solicit input from community members and stakeholders as well as provide necessary time for general public comment. This process will be announced via the program's website http://resources.ca.gov/salton-sea/.

Conclusion

As the Salton Sea shrinks for a variety of reasons, air quality in Riverside, Imperial, and surrounding counties suffers, because particulates small enough to be dangerous to human health are picked up by the wind from the exposed lakebed. Huge populations of resident and migratory birds are at risk, too, especially the fish-eating birds that depend upon the tilapia that will no longer be able to survive in the Salton Sea if it grows increasingly salty. Sustainable habitat and air quality management at the Salton Sea is critical for the protection of regional public and ecological health, as well as the management of a stable Colorado River supply for California.

This draft Phase 1 Plan aims to protect public health and wildlife by focusing on the north and south ends of the sea where playa exposure is expected to be greatest and availability of agricultural return flows facilitate lowest cost habitat and air quality project development. The draft plan also includes a process for identifying management strategies for implementation in later phases.

As inflows to the Salton Sea decline over the next decade, this 10-year draft plan aims to mitigate harm to communities and ecosystems. The State is committed to leveraging resources, coordinating with a multitude of other agencies, engaging stakeholders, managing adaptively and learning as much as possible from the wildlife habitat and dust suppression projects now or soon to be underway.