



Salton Sea Independent Review Panel Screening Report

Independent Review Panel Screening Report

Evaluation of Water Importation Concepts for Long-Term Salton Sea Restoration

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Agreement # 4600014042

April 2022

Acknowledgements

The Panel acknowledges each of the 18 Request for Information (RFI) respondents. Each of the responses provides a unique perspective on this challenging issue, and led to fruitful discussions on the merits of potential solutions.

The Panel also acknowledges the Support Team's contribution to the preparation of this report:

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Table of Contents

<i>List of Tables</i>	<i>ii</i>
<i>List of Figures</i>	<i>ii</i>
<i>List of Appendices</i>	<i>ii</i>
<i>Acronyms and Abbreviations</i>	<i>iii</i>
Section 1: Introduction	1-1
1.1 Purpose of the Report.....	1-1
1.2 Review Process.....	1-1
Section 2: Background on the Salton Sea Region	2-1
2.1 Salton Sea Background.....	2-1
2.2 Quantification Settlement Agreement.....	2-3
2.3 Population.....	2-3
2.4 Restoration Efforts.....	2-4
Section 3: RFI Responses	3-1
Section 4: Screening of Responses	4-1
4.1 Screening Criteria.....	4-1
4.2 Screening Results.....	4-2
4.2.1 Response R1.....	4-2
4.2.2 Response R3.....	4-3
4.2.3 Response R11.....	4-3
4.2.4 Response R17.....	4-3
4.2.5 Response R18.....	4-4
Section 5: Summary and Next Steps	5-1
<i>References</i>	<i>i</i>

List of Tables

Table 3-1:	RFI Responses	3-1
Table 4-1:	Screening Criteria	4-1

List of Figures

Figure 1:	Salton Sea area map. From “Restoration of the Salton Sea Summary Report” USDI 2007.....	2-2
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List of Appendices

Appendix A:	Independent Review Panel Biographic Summaries
Appendix B:	2021 Request for Information issued by the Independent Review Panel

Acronyms and Abbreviations

ac	Acre
AF	Acre-feet
BoR	Bureau of Reclamation
CADFW	California Department of Fish and Wildlife
CADWR	California Department of Water Resources
CDFG	California Department of Fish and Game
CDPH	California Department of Public Health
CDWR	California Department of Water Resources
CNRA	California Natural Resources Agency
DWR	Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Ecological Society of America
ft	Feet
IID	Imperial Irrigation District
M	Million
NGO	Non-Government Organization
Panel or IRP	Independent Review Panel
ppm	parts per million
Q&A	Questions and Answers
QSA	Quantification Settlement Agreement
R.O.N.D.A.	Reclamation of Native Desert and Agriculture
RFI	Request for Information
SB-654 (2003)	Senate Bill No. 654
SSA	Salton Sea Authority
SSMP	Salton Sea Management Program
TBL	Triple Bottom Line
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WET	Water and Environmental Technology
yr	Year

Section 1: Introduction

This report is a product of the Independent Review Panel (IRP) evaluating long-term water importation solutions to the problems of the Salton Sea, located in southern California. The Panel was convened as part of Agreement # 4600014042 between the State of California Salton Sea Management Program (SSMP) and the University of California, Santa Cruz (Brent Haddad, Ph.D., PI).

1.1 Purpose of the Report

This report is the first product of the Panel (Appendix 1). On two occasions (2017 and 2021), a public Request for Information (RFI) was issued asking for water-importation-based approaches to restore the Salton Sea. A total of 18 concepts were submitted. They are being reviewed by the Panel with the assistance of a research and analysis support team. The review process includes the following steps:

- Screening the 18 responses for compliance with RFI requirements (this report).
- A substantive fatal flaw analysis of the remaining responses.
- Detailed feasibility studies compiled in a feasibility analysis of the remaining responses.
- A Summary Report with conclusions on the feasibility of the remaining responses. The conclusions may include a recommendation by the Panel of an alternative plan that draws from the responses and from other research and from analyses conducted by the Panel.

This Screening Report is the first filter for the 18 responses. Responses that do not pass the screening process described below will not be considered further by the Panel. However, if the Panel decides to submit an alternative project recommendation, it is possible that elements from responses that did not make it past the screening process will be included and acknowledged in the recommendation. This process may also be true for concepts that, in their entirety, do not survive the fatal flaw analysis.

1.2 Review Process

The Panel is proceeding in their review of the RFI responses in two steps: screening and feasibility. In the screening process, documented in this Report, the Panel screened responses for conformance to the RFI (see Section 3). Responses that satisfy the screening criteria will be evaluated for feasibility. The feasibility analysis will begin with a fatal flaw analysis. Those responses judged by the Panel to have no fatal flaws will be subjected to a detailed analysis of their technical and economic feasibility. Results of the feasibility analysis will be documented in a Feasibility Report. Finally, the Panel will provide a Summary Report describing the review process, outcomes of the screening and feasibility analyses, preferred alternatives, and possible next steps.

Section 2: Background on the Salton Sea Region

This section provides a brief summary of the history of the Salton Sea region and restoration and remediation efforts to date.

2.1 Salton Sea Background

The Salton Sea is located in central southern California in the Imperial Valley. The Salton Sea is California's largest lake, with a surface area of over 200,000 acres (ac) and a volume of approximately 4.8 million (M) acre-feet (AF). As of January 2022, the Sea had a water surface elevation of -239 ft (USGS, 2022). The Salton Sea has no outflow other than nearly six vertical feet of net evaporation annually (Cohen, 2013). The Salton Sea was formed in 1905 when a water diversion point along the Colorado River was overcome by floodwaters allowing river water to flow into the Salton Basin. The resultant high waterflow continued for 18 months, flooding the Salton Basin until the Colorado River was successfully redirected back towards the Gulf of California. At present, agricultural runoff, stemming from use of Lower Colorado River water, continues to supply water to the Salton Sea. Prior to 1905, there is evidence of historic occurrences of lakes in the Salton Basin such as Lake Cahuilla, which existed in the late Pleistocene and Holocene (Ross, 2020).



Figure 1: Salton Sea area map. From “Restoration of the Salton Sea Summary Report” USDI 2007.

By the 1930s, the Salton Sea had become an important migratory bird stopover along the Pacific Flyway. The Salton Sea Wildlife Refuge was established in 1930 to protect migratory and resident water birds. More than 400 avian species have been recorded in and around the Salton Sea to date (USFWS, no date). The Federally endangered Desert Pupfish has a large part of its remaining habitat within the Salton Basin, being predominately restricted to Salton Sea tributaries and using the Sea for dispersal between tributaries.

In the 1940-50s, while the Sea had a fairly stable surface elevation and salinity level, the region became a tourist destination known for fishing, boating and other recreational activities. In 1955, the Salton Sea State Park was designated, and by the mid-1960s it attracted more visitors than Yosemite National Park (Holdren, 2014). Around this time, communities began to develop around the Salton Sea, including Salton City (Archbold, 1971). However, rising salinity levels, water quality degradation, and fish die-offs discouraged visitors and slowed community development starting in the 1960s (Sheikh and Stern, 2021).

In the 1980s-90s, the water quality of the Salton Sea began to be of concern. Selenium levels were rising in fish, 150,000 Eared Grebes died in 1992, and avian botulism killed large numbers of

American white and brown pelicans in 1996 (Moreau et al., 2007). Efforts to restore the Salton Sea began in the late 1990s as agricultural runoff inflows began to decrease. In 2000, the Salton Sea Authority and the Bureau of Reclamation (BoR) released a restoration plan (SSA and BoR, 2000).

2.2 Quantification Settlement Agreement

In 2003, the Quantification Settlement Agreement (QSA) came into force. California's surplus rights to the Colorado River declined when the State of Arizona began to take its full allotment of Colorado River water. California was forced to reduce its water diversions from 5.2 M to 4.4 M acre-feet per year (AF/yr). To meet the water demands of growing populations, the Imperial Irrigation District (IID) – the main water supplier to the agricultural land that drains to the Salton Sea – transferred 200,000 AF of water per year to the San Diego County Water Authority and 103,000 AF of water per year to the Coachella Valley Water District and the Metropolitan Water District (IID, no date). The recipient water districts paid IID to line the All-American Canal and improve agricultural irrigation efficiencies, thereby increasing the amount of water transferred to the San Diego County Water Authority and the San Luis Rey Indian Tribes by 67,000 AF/yr (IID, no date). The QSA also required IID to mitigate the transfer of water by maintaining inflows to the Salton Sea until 2017 (Cohen, 2013). The mitigation inflow varied year to year, ranging from 15,000 to over 153,000 AF for a total of 730,182 AF over 14 years (IID, 2019). The three water districts involved were required to pay \$30 M to the Salton Sea Restoration Fund (SB-654, 2003). In exchange for these concessions, the State of California agreed to assume responsibility for the costs of Salton Sea Restoration that exceed \$133 M, while IID, the Coachella Valley Water District, and the San Diego County Water Authority are liable for costs up to \$133 M (SB-654, 2003).

By 2018, as a result of the QSA and reduced inflow from Mexico, inflow to the Salton Sea decreased by a third (Holdren, 2014), the Salton Sea water elevation declined to -235.7 ft, and the salinity increased to 62,927 ppm (TetraTech, 2000). The resultant exposed lakebed, known as playa, and high salinity levels led to numerous problems for local communities and wildlife, including poor air quality and large fish die-offs.

2.3 Population

The 2020 U.S. Census Bureau reported a population of about 367,000 residents living in the Salton Sea region in the Imperial and Coachella valleys, most of whom are Hispanic or Latino with a median household annual income ranging from \$35,000 to \$48,000 depending on location (U.S. Census Bureau, 2019; U.S. Census Bureau, 2020; Fogel and Schwabe, 2021). Due to the rising salinity and environmental degradation, recreational and tourism revenue has decreased significantly. The decreasing water elevation exposes playa to strong desert winds, causing fine particulate matter to become airborne. Many factors through the years have contributed to a decrease in air quality around the Salton Sea, among them particulate matter mobilized from the desert by wind, farming, and emissions from vehicle traffic. Decreasing air quality has resulted in high asthma rates for residents (Maheshwari et al., 2021). The childhood asthma rate in Imperial

County is 20-22% higher than the California State average of 14% (Biddle et al., 2021; California Department of Public Health (CDPH, 2019).

2.4 Restoration Efforts

A no-action scenario predicts salinity in the Salton Sea will increase to 295,902 ppm and the water elevation will decline to -259 ft by 2045 (CH2M, 2018; Ajami, 2021), further exacerbating the health problems experienced by local residents and habitat degradation for fish and wildlife.

Between 2006 and 2013, a number of studies with restoration evaluations were released. The Salton Sea Ecosystem Restoration Study and a Programmatic Environmental Impact Report (EIR) was released in 2007 by the California Resources Agency. The EIR contained an analysis of alternative restoration options in response to the QSA and concluded that the best alternative was one that created or maintained a diversity of habitats defined by salinity, implementation of playa mitigation actions, and designation of recreational areas (CDWR and CDFG, 2007). Feasibility, funding, and other issues stopped the plan from being carried forward (Buchholz, 2021). In 2013, the State of California released a Final Environmental Impact Report/Environmental Impact Statement recommending the creation of the Species Conservation Habitat Project to act as a near-term solution to habitat creation and as a guide for future restoration decisions (CADWR and CADFW, 2013).

Small-scale restoration efforts began in 2006 with the Species Habitat Pond Complex designed to evaluate effectiveness and feasibility of constructing ponds with islands as a way to restore habitat (Holdren, 2014). In 2016, the Red Hill Bay Project began, planning to restore 500 ac of shallow aquatic habitat and suppress exposed playa dust in the Sonny Bono National Wildlife Refuge (CDWR, 2022). The IID Air Quality Mitigation Program planned to mitigate 5,300 ac of exposed playa via surface roughening or vegetation planting to improve air quality. By 2019, 1,535 ac were completed (IID, 2021). In 2017, the SSMP established the 10-Year Plan (2018-2028) with a goal of 30,000 ac of dust suppression and habitat creation, 755 ac of which were completed in 2020 (Sheikh and Stern, 2021). Numerous dust suppression and revegetation projects were launched and advanced in 2021, including the 4,100 ac Species Conservation Habitat program at the southern end of the Salton Sea (CNRA, 2022).

In addition to the 10-Year Plan, the SSMP has convened a long-range planning committee to develop a plan to protect or improve wildlife habitat, air quality, and water quality, and to prevent or reduce environmental and health consequences anticipated from long-term recession of the Salton Sea. Development of the long-range plan will include evaluation of in-sea restoration options including those identified in the EIR as well as input from this Panel on the feasibility of water importation.

Section 3: RFI Responses

The SSMP issued a RFI for Salton Sea Water Importation Projects on December 8, 2017. Eleven responses to the RFI were received. Following the establishment of the Panel, an updated RFI was issued on August 13, 2021 to allow respondents to provide updates to their responses and to solicit additional responses. The updated RFI, which includes the original RFI, is provided in Appendix B. In total, 18 responses were received, including updates to the original 11 responses and seven new responses. Responses are available on the SSMP website via: <https://saltonsea.ca.gov/planning/>. Each response was assigned a random number for ease of reference in this report. The 18 responses (R1-R18) are summarized in Table 3-1.

Table 3-1: RFI Responses

Response Number	Response Title	Prime Respondent
R1	Response to Request for Information for Salton Sea Water Importation Projects	AECOM
R2	Tres Lagunas Restoration: Salton Sea, Laguna Salada & Sea of Cortez	AGESS, Inc.
R3	RFI Response ¹	CIM Group, LLC
R4	Salton Sea Water Importation Project	Cordoba Corporation
R5	Bi-National Canal for Salton Sea Restoration and Colorado River Augmentation	GEI Consultants, Inc. and Michael Clinton Consulting, LLC
R6	Harnessing Energy and Water in the Salton Sea	Geothermal Worldwide, Inc.
R7	Wi. Ñy-Wey Maātap: The Living Stone Canal	Quadrant, LLC
R8	Sea to Sea Canal Project	Sea to Sea Canal Company
R9	Water Import Salt Extraction Revenue	Sephton Water Technology, Inc.
R10	Super Salton Trough Interconnection Project	New Water Group, LLC
R11	Salton Sea Water Restoration: Engineering Disclosure & Pilot Feasibility Proposal	Transform Water & Power
R12	The Salton Sea: The Best Days are Ahead of Us	E2Eden, LLC

Response Number	Response Title	Prime Respondent
R13	The Sustainable Solution for Remediation and Restoration of the Salton Sea	Global Premier Development, Inc. and Salton Power, Inc.
R14	Salton Sea Management Plan: Recycled Water Importation	Online Land Planning, LLC
R15	Transalton Project: Transoceanic proposal for massive fresh water imports to the Salton Sea and the lower Colorado River basin from South Mexico rivers	Transoceanic, LLC - USA
R16	Water Importation to the Salton Sea	Water Train, Inc.
R17	Save the Coachella Valley Basin Project Proposal	Quantum Consultations
R18	R.O.N.D.A.: Reclamation of Native Desert and Agriculture	Jeff B. Geraci

1. No title was provided

Section 4: Screening of Responses

This section details the screening process and results.

4.1 Screening Criteria

The criteria listed below relate to responses' conformance to the RFI guidelines. Failure of a respondent's project concept to pass the screening phase does not constitute a judgment on the ability of the respondent to perform the submitted project, or the merit of the technologies and participants, rather, it reflects its lack of adherence to the RFI guidelines.

Components of responses that do not pass the screening process may be revisited by the Panel at a later date. The Panel may choose to evaluate and/or recommend certain aspects of responses that do not pass screening for use in interim and/or long-term solutions.

Table 4-1: Screening Criteria

No.	Screening Criterion
1	The submission must have a water importation component.
2	The submission must be complete, providing information for the five sections detailed in the RFI: <ol style="list-style-type: none">1. Identification of Project Team2. Narrative description of project concept and how/when it will benefit the Salton Sea3. Planning and design process of the project4. Cost projection5. Plan for funding of the proposed project

The Panel selected these criteria for the following reasons:

1. *The submission must have a water importation component.*

The charge of the Panel is to review project concepts for a water importation project, as stated in the RFI (emphasis added):

"This Request for information (RFI) outlines the information requested by California Natural Resources Agency (CNRA) to evaluate proposals for a water import project to meet long-range goals of the SSMP. The intent of the RFI process is to gather information on the proposed water import projects."

Responses that do not have a water importation component are outside the Panel's charge, and will not be considered in the Feasibility Study.

2. The submission must be complete, providing information for the five sections detailed in the RFI:

- 1. Identification of Project Team**
- 2. Narrative description of project concept and how/when it will benefit the Salton Sea**
- 3. Planning and design process of the project**
- 4. Cost projection**
- 5. Plan for funding of the proposed project**

Incomplete responses do not have sufficient information to be individually evaluated or compared to other responses within the feasibility analysis. However, if the Panel and Support Team can extrapolate from the materials submitted reasonable and consistent answers to all five sections, then the response is considered sufficient.

4.2 Screening Results

Each of the 18 responses was evaluated utilizing the two screening criteria described above. Of the 18 responses, five were found to be non-compliant with the criteria: R1, R3, R11, R17, and R18. The following sections provide additional details on this determination.

4.2.1 Response R1

Response R1 was submitted in 2018 in response to the original RFI. R1 was found to be deficient in both screening criteria.

Criterion 1

This response does not include a project concept that includes water importation. The response instead proposes to “revisit the previous plans and assumptions with the focus on looking at all of the work done to date, and identify how innovations and new technologies and alternative sources that could shift the balance to make imported water to the Salton Sea financeable.”

Criterion 2

The response does not satisfy the following sections of the RFI:

Narrative description of project concept and how/when it will benefit the lake: No project concept is presented. Instead, the respondent proposes to “revisit the previous plans and assumptions with the focus on looking at all of the work done to date, and identify how innovations and new technologies and alternative sources that could shift the balance to make imported water to the Salton Sea financeable.”

Planning and design process of project: No project concept is presented. Instead, the respondent details a 12-month study of previously proposed alternatives and value engineering services.

Cost Projection: The cost for a project concept is not presented. In this section, the respondent details cost management and cost estimation services that would be leveraged during the study identified above.

4.2.2 Response R3

Response R3 was submitted in 2018 in response to the original RFI. R3 was found to be deficient in both screening criteria.

Criterion 1

This response does not include a project concept that includes water importation. No project concept is presented. The response identifies the project team, with all other sections of the response listed as “Proprietary Response” with no further information provided.

Criterion 2

The response identifies the project team, with all other sections of the response listed as “Proprietary Response” with no further information provided.

4.2.3 Response R11

Response R11 was submitted in 2018 in response to the original RFI. R11 was found to be deficient in both screening criteria.

Criterion 1

This response does not include a project concept that includes water importation. The response proposes feasibility and pilot studies of a technology to capture water vapor above the Salton Sea to reduce water loss from evaporation.

Criterion 2

The response does not satisfy the following sections of the RFI:

Planning and design process of project: The response proposes feasibility and pilot studies of a technology to capture water vapor above the Salton Sea to reduce water loss from evaporation. The response does not address impacts of the proposed technology on the salinity of the Salton Sea.

Plan for funding of proposed project: The response does not identify funding sources for planning, design, or construction of the project.

4.2.4 Response R17

Response R17 was submitted in 2021 in response to the updated RFI. R17 was found to be deficient in Criterion 1.

Criterion 1

This response does not include a project concept that includes water importation. The response proposes shoreline and habitat restoration in the Salton Sea area.

4.2.5 Response R18

Response R18 was submitted in 2021 in response to the updated RFI. R18 was found to be deficient in both screening criteria.

Criterion 1

The response proposes revegetation of exposed playa. The response indicates “importation of <100 AF/yr of Colorado River Water, and the temporary utilization of New River and Alamo River water ... for the purpose of providing habitat for pupfish, and for providing “drinkers” for terrestrial wildlife.” The QSA confirmed Colorado River water allotments of 3.1 M AF/yr to the Imperial Irrigation District and 330,000 AF/yr to the Coachella Valley Water District. The annual discharge of the Alamo and New Rivers combine to average roughly 760,000 AF/yr, and range from 350,000 – 3,400,000 AF/yr. The Panel does not consider the proposed <100 AF/yr included in this response for habitat restoration, plus temporary other inflows, as a water import project per the RFI. It is a minor reallocation of existing inflows, which demonstrates an important point about the potential value of water reallocation measures, but does not meet this criterion.

Criterion 2

The response does not satisfy the following sections of the RFI:

Identification of Project Team No project team is identified.

Planning and design process of project While the water source is identified as the Colorado River, with New River and Alamo River water being temporarily utilized, no documentation is provided from the water rights holder that establishes the willingness of the water rights holder to allow use of their water right, nor is there a detailed description of the process to establish water rights. No discussion of land use permission, Salton Sea salinity, project development schedule, or operation schedule is provided.

Cost projection No cost information is provided.

Plan for funding of proposed project No plan for funding is provided.

Section 5: Summary and Next Steps

The SSMP solicited input on concepts for water import projects for potential inclusion in the long-range plan for the Salton Sea in 2017, with an updated RFI issued by the Independent Review Panel in 2021. Eighteen responses were submitted and are actively under review by the Panel.

The Panel committed to follow up on any submission that had insufficient information to the point of being a fatal flaw, and invite its Principal Investigator to fill in any information gaps. This was the case for R3. The Panel made repeated efforts to identify who made the submission at the two large companies listed as partners in R3 but was unsuccessful. The remaining four concepts listed as having insufficient information were intentionally not importation concepts. They were a proposed review/recommendation based on past importation concepts (R1), a water vapor capture/return pilot program (R11), and restoration activities (R17, R18). For these, the lack of information on a specific importation concept was intentional on the part of the submitters. They were, therefore, not invited to fill information gaps.

The Panel is conducting the review in two phases: Screening and Feasibility. The screening phase, documented in this Report, consisted of evaluating the responses for conformance to the requirements of the RFI. Of the 18 responses, five were deemed to not conform to the RFI and will not be considered in the feasibility analysis.

Failure of a respondent's project concept to pass the screening phase does not constitute a judgment on the ability of the respondent to perform the submitted project, or the merit of the technologies and participants. Additionally, components of responses that do not pass the screening process may be revisited by the Panel at a later date. If the Panel chooses, the Panel may evaluate and/or recommend components of responses that do not pass screening for use in interim and/or long-term solutions.

The 13 responses that conformed to the requirements of the RFI will be considered in the feasibility analysis. The feasibility analysis will consist of a fatal flaw analysis followed by a detailed analysis of technical and economic feasibility of responses that satisfy the fatal flaw analysis criteria.

References

- Ajami, H. (2021). Chapter 2 Watershed Hydrology: Hydrology and Water Resources in the Salton Sea Watershed in Crisis at the Salton Sea: The Vital Role of Science. University of California Riverside Salton Sea Task Force, EDGE Institute and Center for Science to Policy. https://zenodo.org/record/5149222#.Yg2H8N_MJPY
- Archbold, J.C. (1971). *A Recreational Geography of Salton Sea, California* (Order No. 7208623). Available from ProQuest Dissertations & Theses A&I. (302604482). Retrieved from <https://www.proquest.com/dissertations-theses/recreational-geography-salton-sea-california/docview/302604482/se-2?accountid=14523>
- Biddle, T.A., Li, Q., Maltz, M.R., Tandel, P.N., Chakraborty, R., Yisrael, K., Drover, R., Cocker, D.R. 3rd, and Lo, D.D. (2021). Salton Sea aerosol exposure in mice induces a pulmonary response distinct from allergic inflammation. *Sci Total Environ*, 792:148450. doi: 10.1016/j.scitotenv.2021.148450.
- Buchholz, G. (2021). Personal Communication, Oct 6, 2021.
- Bureau of Reclamation (2007). Restoration of the Salton Sea: Summary Report. Bureau of Reclamation, U.S. Department of the Interior. Available online at: <https://www.usbr.gov/lc/region/saltnsea/FinalSummaryRpt.pdf>
- CA Department of Public Health (2019). Lifetime asthma prevalence in Imperial County compared to California (2015–2016), by age group. County Asthma Data Tool, California Breathing, Environmental Health Investigations Branch, California Department of Public Health. Last updated: April 30, 2019. Accessed on Sept 22, 2021. Available online at: <https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHIB/CPE/Pages/CaliforniaBreathingCountyAsthmaProfiles.aspx>
- CADWR and CADFW (2013). Salton Sea Species Conservation Habitat Project, Final Environmental Impact Statement/Environmental Impact Report, U.S. Army Corps of Engineers Application No. SPL-2010-00142-LLC, State Clearinghouse No. 2010061062. Prepared by the California Department of Water Resources and California Department of Fish and Wildlife for the California Nations Resources Agency. Available at: http://ww.water.ca.gov/saltonsea/docs/eir2013/FinalEIS_EIR_complete.pdf
- CDFW and USFWS (2017). Salton Sea Fisheries Long-term Monitoring, Sampling Report: Summer 2017. Jointly conducted by California Department of Fish and Wildlife and United States

- Fish and Wildlife Service. Available online at: <https://resources.ca.gov/CNRALegacyFiles/wp-content/uploads/2018/01/Salton-Sea-Fisheries-Long-Term-Monitoring-Sampling-report-Summer-2017.pdf>
- CDWR (2022). Red Hill Bay. Salton Sea Unit, Integrated Regional Water Management, Programs, California Department of Water Resources. Available online at: <https://water.ca.gov/Programs/Integrated-Regional-Water-Management/Salton-Sea-Unit/Red-Hill-Bay>
- CDWR and CDFG (2007). Salton Sea Ecosystem Restoration Program Final Programmatic Environmental Impact Report. Prepared for State of California, The Resources Agency, by California Department of Water Resources and California Department of Fish and Game.
- CH2M (2018). Salton Sea Hydrological Modeling and Results prepared for Imperial Irrigation District. Available online at: <https://www.iid.com/home/showdocument?id=17299>
- CNRA (2022). California Natural Resources Agency Annual Report on the Salton Sea Management Program (February). Available to download at: <https://saltonsea.ca.gov/2022/02/ssmp-annual-report-submitted-to-state-water-board-2/>
- Cohen, M.J. (2013). Water Brief 2, Past and Future of the Salton Sea, p.127-138, in (eds). Gleick, P.H. and Cohen, M.J. *The World's Water 2008-2009: The Biennial Report on Freshwater Resources*, Island Press, 5 March 2013, pp.432. ISBN: 1597269662, 9781597269667
- Cohen, M.J. (2014). Hazard's Toll: The Costs of Inaction at the Salton Sea. Pacific Institute. ISBN: 1893790576. Available online at: https://pacinst.org/wp-content/uploads/2014/09/PacInst_HazardsToll.pdf
- FEIS/EIR (2013). Salton Sea Species Conservation Habitat Project, Final Environmental Impact Statement/Environmental Impact Report, US Army Corps of Engineers prepared for California Natural Resources Agency by the California Department of Water Resources and Department of Fish and Wildlife, July. Available online at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Integrated-Regional-Water-Management/Salton-Sea-Unit/Salton-Sea-Species-Conservation-Habitat-Project-EIR-EIS/SaltonSea-Species-ConservationHabitat-Project-Final-EIS-EIR-2013_ay_19.pdf
- Fogel, M.L. and Schwabe, K.A. (2021). Chapter 1 Water Policy: Framing the Crisis Unfolding at the Salton Sea, Crisis at the Salton Sea: The Vital Role of Science, University of California Riverside Salton Sea Task Force, EDGE Institute and Center for Science to Policy, UC Riverside, July, p.20-27. Available online at: <https://doi.org/10.5281/zenodo.5149222>

- Holdren, G.C. (2014). The Salton Sea: An Uncertain Future for California's Largest Lake. Terminal Lakes, *LakeLine*, Fall, p.15-20. Available online at: <http://www.nalms.org/wp-content/uploads/LakeLine/34-3/Articles/34-3-5.pdf>
- IID (no date). QSA – Water Transfer, Water, Library. IID. Accessed on Sept 13, 2021. Available online at: <https://www.iid.com/water/library/qs-water-transfer>
- IID (2019). Water & QSA Implementation Report 2017-2018. Annual Water Report, Imperial Irrigation District, pp.73. Available online at: <https://www.iid.com/home/showdocument?id=18426>
- Maheshwari, S., Castillo, D. D., & Lo, D. D. (2021). Chapter 6: Health Disparities and Respiratory Illness in Salton Sea Communities. Crisis at the Salton Sea: The Vital Role of Science. University of California Riverside Salton Sea Task Force, EDGE Institute and Center for Science to Policy. <https://doi.org/10.5281/zenodo.5149222>
- Moreau, M.F., Surico-Bennett, J., Vicario-Fisher, M., Gerads, R., Gersberg, R.M., and Hurlbert, S.H. (2007). Selenium, arsenic, DDT and other contaminants in four fish species in the Salton Sea, California, their temporal trends, and their potential impact on human consumers and wildlife, *Lake and Reservoir Management*, 23:5, 536-569, DOI: 10.1080/07438140709354037
- Ross, J.E. (2020). Formation of California's Salton Sea in 1905-07 was not "accidental". Proceedings of the 2020 Desert Research Symposium, p.103-116.
- Sacks, A. and Ryan, A. (2017). Revitalized Salton Sea: Analysis of Potential Economic Benefits, Tourism Economics, An Oxford Economics Company, Greater Palm Springs Convention & Visitors Bureau. December. Available online at: https://s3.amazonaws.com/tourism-economics/craft/Latest-Research-Docs/Revitalized_Salton_Sea_Benefit_FlipBook_1217_b41de714-d5f0-4317-a008-b6237bb551c5.pdf
- SB-654 (2003). Senate Bill No. 654, Chapter 613, SB-654 Water: Salton Sea: Colorado River. (2003-2004), Machado, California Legislative Information, 29 Sept. 2003. Available online at: https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=200320040SB654
- Sheikh, P.A. and Stern, C.V. (2021). Salton Sea Restoration, Congressional Research Service, Updated 28 July, R46625. <https://crsreports.congress.gov/product/pdf/R/R46625>
- SSA and BoR (2000). Draft Salton Sea Restoration Project Environmental Impact Statement/Environmental Impact Report, Prepared by Tetra Tech Inc, for Salton Sea

- Authority and US Department of Interior Bureau of Reclamation, Jan 2000. Available online at: <https://www.usbr.gov/lc/region/saltnsea/deistoc.html>
- TetraTech (2021). Salton Sea Accounting Model. Update of Draft 21, Jan, 2000.
- U.S. Census Bureau (2019). American Community Survey 5-year estimates. Retrieved from Census Reporter Profile page for Coachella Valley CCD, Riverside County, CA. Available online at: <http://censusreporter.org/profiles/06000US0606590520-coachella-valley-ccd-riverside-county-ca/>
- U.S. Census Bureau (2020). Imperial County, California. Quick Facts, United States Census Bureau. Available online at: <https://www.census.gov/quickfacts/imperialcountycalifornia>
- USGS (2022). Lake or reservoir water surface elevation above NGVD 1929, feet. USGS 10254005 Salton Sea Nr Westmorland CA, National Water Information System: Web Interface, Operated in cooperation with Imperial Irrigation District and USGS, USGS. Most recent instantaneous value published 12 Jan 2022 at 9:45 PST. Available online at: https://waterdata.usgs.gov/ca/nwis/uv?site_no=10254005
- USFWS (no date). The Sonny Bono Salton Sea National Wildlife Refuge holds the distinction of having the most diverse array of bird species found on any national wildlife refuge in the west. Fish and Wildlife Service. Available online at: <https://www.fws.gov/uploadedFiles/Bird%20list.final.pdf>

This version of the report, posted online May 2, 2022, corrects minor spelling and grammatical errors found in the original version posted April 6, 2022.

Appendices

Appendix A: Independent Review Panel Biographic Summaries

The Panel Chair was identified by Principal Investigator Prof. Brent Haddad of University of California, Santa Cruz. Subsequent panelists emerged from a search process led by Chair Rominder Suri in consultation with Prof. Haddad. All nominees, including the Chair, were submitted for review to the Salton Sea Management Program leadership. If there were no objections, the Panelists were seated. The Panel is independent in the sense that there is no communication between panelists and state employees and contractors working on the Salton Sea, and any communication between the Panelists and other interested parties are kept in recorded or written records. The Panel's research, analysis, deliberations, findings, and reports are produced independently with the assistance of the Support Team.

Panel Chair

Dr. Rominder Suri is Professor and Chair of the Department of Civil and Environmental Engineering at Temple University, and founding director of Water and Environmental Technology (WET) Center at Temple University. Dr Suri has led research efforts around water, technology and engineering and is a recognized expert in water quality and purification. Specifically, Dr. Suri has studied extensively traditional and novel water treatment processes and pollutants, and has published numerous research papers. Dr. Suri also has extensive experience working with a wide range of stakeholders and facilitating collaborative processes from his academic tenure as well as his work with the WET Center.

Panel Members

Robert Raucher, Ph.D., has had a distinguished career as a consultant on environmental and water economics, focusing on benefit-cost analysis. His focus has been on systematic approaches for including the full range of Triple Bottom Line (TBL) benefits and costs of water sector projects, to better reflect ecosystem, public health, recreational, climate risk, and other impacts beyond the direct financial costs and benefits.

Professor Julie Lockwood is an internationally recognized expert in ecology and Chair of the Department of Ecology, Evolution, and Natural Resources at Rutgers University. She is an elected Fellow of the Ecological Society of America (ESA), which is a recognition of the many ways in which its members contribute to ecological research and discovery, communication, education and pedagogy, and management and policy. Professor Lockwood has contributed to the United Nations Program on Biodiversity and Ecosystem Services, and several national programs in biodiversity conservation.

Dr. Adina Paytan is a Research Scientist at the Institute of Marine Sciences at University of California, Santa Cruz. She obtained her B.S. double major in Biology and Geology from the Hebrew University in Jerusalem and a M.S. degree in science education at the Weizmann Institute of Science in Rehovot. In 1996 Dr. Paytan got her Ph.D. in oceanography from the Scrips Institute of Oceanography in San Diego and her research lays in the fields of biogeochemistry, chemical oceanography, and paleoceanography. An overarching goal of her research is to link changes observed in the earth and ocean systems to global changes in climate and tectonics with an emphasis on human impacts.

Professor Robert Glennon is the Regents Professor Emeritus and Morris K. Udall Professor of Law and Public Policy Emeritus at the University of Arizona's James E. Rogers College of Law. He received a J.D. from Boston College Law School and an M.A. and Ph.D. in American History from Brandeis University. Professor Robert Glennon is one of the nation's preeminent experts on water policy and law. The recipient of two National Science Foundation grants, Glennon serves as an advisor to governments, corporations, think tanks, law firms, and NGOs looking to solve serious challenges around water sustainability and planning. Glennon is the author of *Unquenchable: America's Water Crisis and What To Do About It*, and *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters*. In 2014, Glennon and two co-authors wrote a report for the Hamilton Project at the Brookings Institution. *Shopping for Water: How the Market Can Mitigate Water Shortages in the American West* explores solutions to broken federal and state laws that are contributing to worsening water shortages in California and other Western states. Glennon's writings have appeared in the *New York Times*, *Los Angeles Times*, *Washington Post*, and *Wall Street Journal*.

Sharon D. Kenny, PMP is a founder of KLVN International LLC consulting firm. She holds a bachelor's degree in Geology from the University of Puerto Rico at Mayagüez; and master's degrees in Geochemistry and Civil Engineering from the University of Florida, and the University of Colorado at Boulder, respectively. Sharon is an expert in hazardous waste remediation and on the impacts of large-scale industrial activities on land and water. She has extensive experience in the areas of risk assessment, cost-benefit analysis, and project management. For the last several years Sharon has led teams in the applications of geospatial modelling and analysis, as an expert and invited instructor. Although currently employed with USEPA to provide quality management reviews and conduct quantitative analysis of data related to environmental releases in the mid-Atlantic region, she is undertaking this work in her capacity as a principal with KLVN International.

Mr. Philip Burgi, P.E. is an internationally recognized expert in the field of hydraulics and water resources engineering with over 50 years of experience. He is a Distinguished Member of the American Society of Civil Engineers recognizing his eminence in the field of hydraulic engineering. His contributions to understanding the performance of hydraulic structures and equipment, such

as dams, spillways, outlet works, fish ladders, gates, and valves have added to the body of scientific knowledge for hydraulic engineering. His engineering practice ranges from civil engineering service in the Peace Corps (Chile) in the late 60's to researcher and manager for the Bureau of Reclamation's Hydraulic Laboratory for 30 years, construction engineer for small-medium sized irrigation projects in Peru (Inter-American Development Bank) and, more recently has served as Peer Review Board member for the Panama Canal Authority's Gatun Lake Spillway design. He has also served as consultant to US Army Corps of Engineers review of damage to Seven Oaks Dam River Outlet Works, and consultant to Bureau of Reclamation on Risk Assessments for Ochoco Dam – Seismic Issue Evaluation.

Appendix B: 2021 Request for Information issued by the Independent Review Panel

Updated Request for Information

Date: August 13, 2021
To: All Interested Parties, and Participants in the 12/08/17 Request for Information for Salton Sea Water Importation Projects
From: Chair, Independent Review Panel Evaluating Water Import Options for Long-Term Restoration of the Salton Sea
Re: **Independent Review Panel's Follow-up to the 2017 Request for Information**

On December 8, 2017, the California Natural Resources Agency issued a Request for Information (RFI) to assist the Salton Sea Management Program (SSMP) in identifying approaches to water importation to meet the long-range goals of the SSMP. An Independent Review Panel (Panel) has been tasked to review the eleven submissions to the RFI and solicit additional ideas for water importation. The chair of the Independent Review Panel, Dr. Rominder Suri, is issuing an updated RFI with the following purposes:

1. To invite parties that did not participate in the 2017 RFI to make a submission now,
2. To invite the eleven original participants to update their submissions if they so wish, and
3. To invite both new and original submitters to make a presentation to the Panel on their submission.

1. New Submissions

The original RFI is attached to this follow-up for Information. The Panel asks that all new submissions follow the original Request format with the following exceptions:

Section 4 of the original RFI, Cost projection: In order to facilitate the Panel's comparison of proposals, the Panel requests that new submissions complete the attached spreadsheet to present an Engineer's Opinion of Probable Costs at a concept-level.

Providing maps in GIS-compatible formats (e.g., .kml), would also be welcome.

Deadline: Responses to this RFI should be sent to Azucena Beltran at azrbeltr@ucsc.edu by October 12, 2021. If you intend to submit materials, please email Ms. Beltran by September 10.

2. Updates to Original Submissions

It is not mandatory for original submissions to be updated. However, in order to facilitate the Panel's comparison of proposals, the Panel requests the original eleven participants to complete the attached spreadsheet to present an updated Engineer's Opinion of Probable Costs at a concept-level. If the original submission had more than one alternative, please provide a separate spreadsheet for each alternative.

The Panel will also accept an addendum with any new or updated material for the eleven original submissions. Providing additional information, including maps in GIS-compatible formats (e.g., .kml), would be welcome. The addendum does not have to follow the original RFI format.

Deadline: Responses to this RFI should be sent to Azucena Beltran at azrbeltr@ucsc.edu by October 12, 2021. If you intend to submit updated materials, please email Ms. Beltran by September 10.

3. Invitation to Present to Independent Review Panel

Each new submission and original submission participant is invited to present to the Independent Review Panel. A 30-minute virtual time slot will be identified with presentations occurring during October 20-22, 2021. The participants can use this time as they wish to present and clarify their submissions. Up to 15 minutes for Q&A will follow each presentation.

Questions: Questions or requests for clarification on the content of this follow-up should be directed to Azucena Beltran at azrbeltr@ucsc.edu. The question period closes on **September 10**; questions received will be posted with answers on the Independent Review Panel's web page located at: <https://saltonseaca.gov/planning/water-importation-independent-review-panel/>.