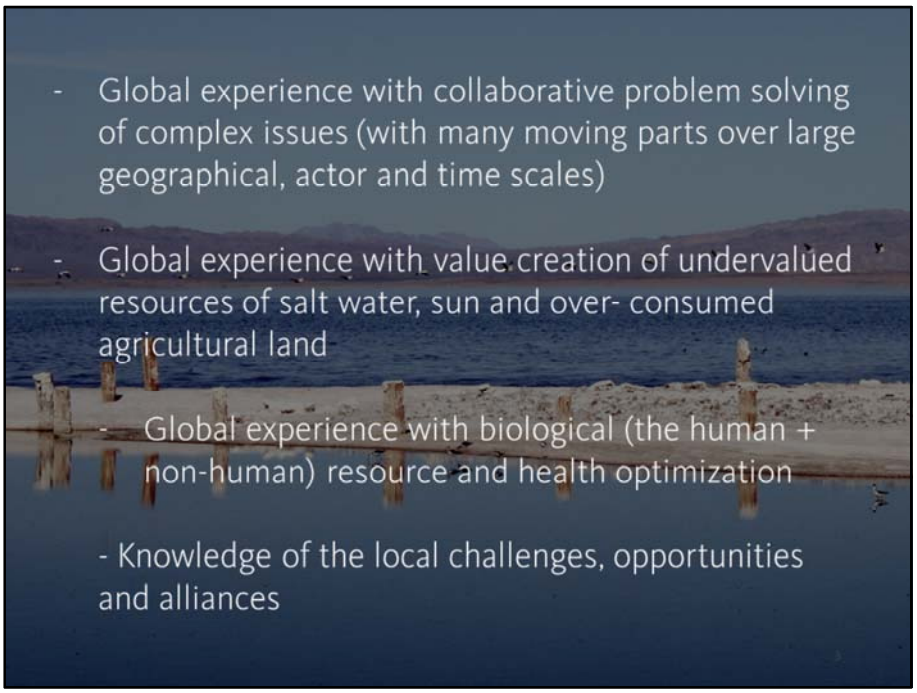
Art Introduces the program and himself.


How Seawater Works' Oceanwater Agriculture proposal uniquely addresses the major challenges confronting the Salton Sea Region


- Global experience with collaborative problem solving of complex issues (with many moving parts over large geographical, actor and time scales)
- Global experience with value creation of undervalued resources of salt water, sun and over- consumed agricultural land
- Global experience with biological (the human + non-human) resource and health optimization
- Knowledge of the local challenges, opportunities and alliances

Today Gensler, a privately owned company, is the number one ranked Design Firm in the world with over 5000 employees and 57 offices in 16 countries and revenues in excess of $1.2 billion. We design and manage the construction globally of over $20 billion of construction each year, serving 2800 clients doing 7500 projects. Our clients include 54 of the Fortune 100 Top Global Firms. These projects inspire people and transform communities.

Recent and current projects include the Shanghai Tower (the second tallest building in the world)

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We have created major land planning and design projects in the United States and China and the Middle East as well.

Art

Art

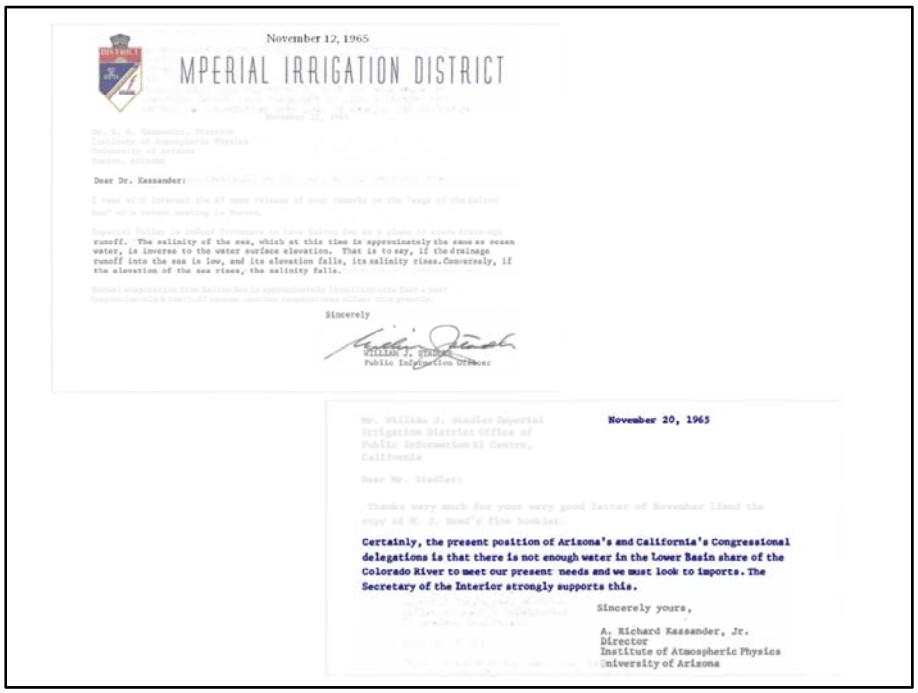
ART

Carl- Thank you Art. We've been working on ocean water related technologies and projects for more thanfifty years.

Carl-

Carl: The oceans cover 2/3 of the Earth’s surface… and they’re all interconnected.

Carl- The Environmental Research Laboratory at the University of Arizona was established in 1965 with funding from the Rockefeller Foundation and the U.S. National Science Foundation.
Support included consideration of ongoing work with the University of Sonora (Mexico) to evaluate and demonstrate the potential of desalinization of ocean water.



November 12, 1965

IMPERIAL IRRIGATION DISTRICT

Dear Dr. Kassander:

I read with interest the AP news release of your remarks on the "saga of the Salton Sea" at a recent meeting in Tucson.

Imperial Valley is indeed fortunate to have Salton Sea as a place to store drainage runoff. The salinity of the sea, which at this time is approximately the same as ocean water, is inverse to the water surface elevation. That is to say, if the drainage runoff into the sea is low, and its elevation falls, its salinity rises. Conversely, if the elevation of the sea rises, the salinity falls.

Normal evaporation from Salton Sea is approximately [illegible] acre feet a year (approximately 6 feet). Of course, weather temperatures affect this greatly.

Sincerely

WILLIAM J. STADLER
Public Information Officer

November 20, 1965

Mr. William J. Stadler Imperial Irrigation District Office of Public Information El Centro, California

Dear Mr. Stadler:

Thanks very much for your very good letter of November 11and the copy of W. J. Dead's fine booklet.

Certainly, the present position of Arizona's and California's Congressional delegations is that there is not enough water in the Lower Basin share of the Colorado River to meet our present needs and we must look to imports. The Secretary of the Interior strongly supports this.

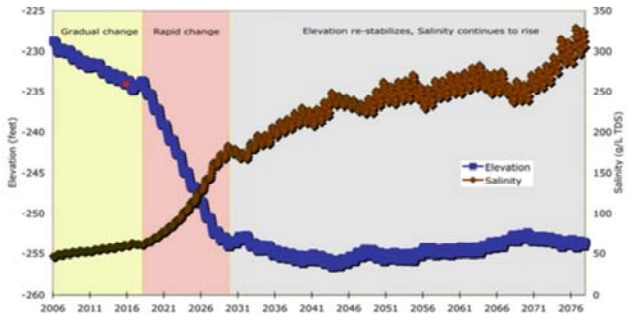
Sincerely yours,

A. Richard Kassander, Jr.
Director
Institute of Atmospheric Physics
University of Arizona

Carl: Concurrent with the establishment of the Environmental Research Lab were initial discussions with the Imperial Irrigation District on the need ultimately for importation of additional water beyond that available form the Colorado River. Here is a November 1965 exchange between William Stadler of the Imperial Irrigation District and Dr. Richard Kassander, my friend and co-author of scientific papers.

Carl: The Puerto Penasco (Sonora, Mexico) multiple effect solar desalting plant demonstrated the value of utilizing a renewable resource for providing desalted water for the community of Puerto Penasco. It also was the location of the first investigations into utilizing direct oceanwater irrigation on plants selected from nature adapted for that purpose.

Salton Sea Elevations and Salinity Levels



- Infrastructure and maintenance cost?
- Energy requirements and costs?
- New treaty with Mexico?
- Stabilize the Salton Sea by 2045?
- Short or long term ecological or public health hazard?
- Funding availability due to many competing priorities at State and Federal levels?

(from Michael Cohen)

SEA-TO-SEA QUESTIONS 15

Carl: Our thanks to Michael Cohen of the Pacific Institute for the visual on the problems of the Salton Sea and his six questions which we have used for guidance in this presentation.

Carl: We looked at 700 plants (halophytes) selected from nature and selected 20 for intense domestication and improvement of productivity, The star of the effort is Salicornia, a crop similar to sesame, as it provides a high quality oil and good level protein meal.

Carl: We expanded the work in Puerto Peñasco to Kino Bay, Sonora. Our selection and breeding program produced beautiful crops, particularly of Salicornia.

Carl: Crops were produced for more than 30 years at the same location with no negative effects and great benefit.

Carl: We had numerous distinguished visitors including Mexico's President Vincente Fox.

Carl- This aerial of the research facility in Puerto Peñasco shows the important point that oceanwater from an aquaculture first step of an Integrated Oceanwater System did not return seawater to the ocean, but was utilized inland. The source of oceanwater was from backhoe-dug wells adjacent to the seashore.

Carl- At the invitation of the people of Eritrea, East Africa, we developed an integrated commercial scale farm on the shore of the Red Sea.

Carl: Again, Salicornia was the star of the oceanwater irrigated field crops.

Carl: However, it ultimately had to share its stardom with mangrove forests. This was particularly attractive to the World Bank because of concern with increasing level of atmospheric carbon dioxide and resulting global warming.

Carl: This is a favorite photograph (taken by Howard Weiss who is with us.) It shows high salinity algae production in the foreground, salt production in the middle and local Bedouins bringing their camels to drink from our created freshwater lens (next slide.)

Carl: We developed the roads for two purposes: pathways and catchment of very occasional rainfall, which, when it went sub-surface floated on a base of 60 part per thousand saline water coming from below the irrigated areas of the integrated system.

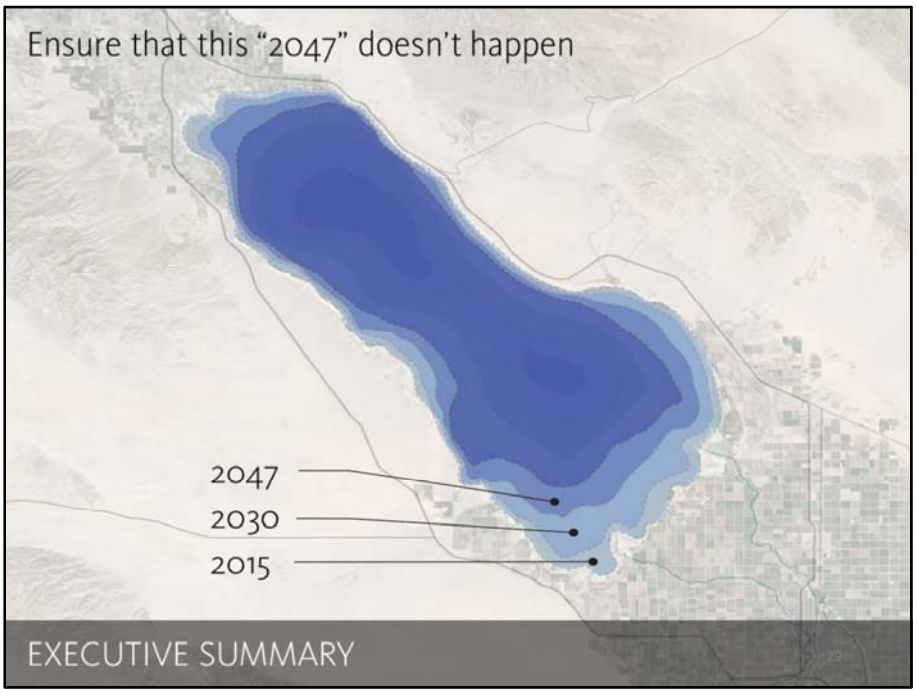
Carl: At Seawater Farms Eritrea we initially utilized hand-dug wells. With commercial success we added a small oceanwater river flowing inland. Two, 25,000 acre feet per year pumps elevated the ocean water from sea level for irrigation throughout the farm. Here Oey Meesook of the World Bank enjoys the excitement of seeing an oceanwater river flowing inland.

Carl: Oceanwater flowing by gravity to the Salton Sea can raise the elevation of the shoreline to a designed level. Mr. Stadler of IID wrote in 1965 that drainage water and elevation of the Salton Sea were related. When we introduce oceanwater, along with drainage water, we dramatically increase the quantity of salt entering into the Salton Sea. This salt can be removed by oceanwater irrigation of crops in new areas around the Salton Sea and possibly exported for high salinity agriculture in the Mexicali Valley. The drainage water from that area can, in a correctly designed system, provide the base on which rainwater floats. The visuals here are of Exportadora de Sal (ESSA) at Guerrero Negro, Baja California. The water taken from Scammons Lagoon (to left) which is supplied by the Pacific Ocean is 40,000 parts per million, however, if water is pulled from lower levels of Scammons Lagoon it is 60,000 parts per million. Lower salinity water floats on top of higher salinity water. Correctly controlling that activity offers possibilities for the Salton Sea. The potential production of salt in either the Imperial Valley or the Mexicali Valley is many times that at ESSA.

Salt is a product of an Integrated Oceanwater Agriculture System. This was true of Seawater Farms Eritrea where salt was sold to Ethiopia.

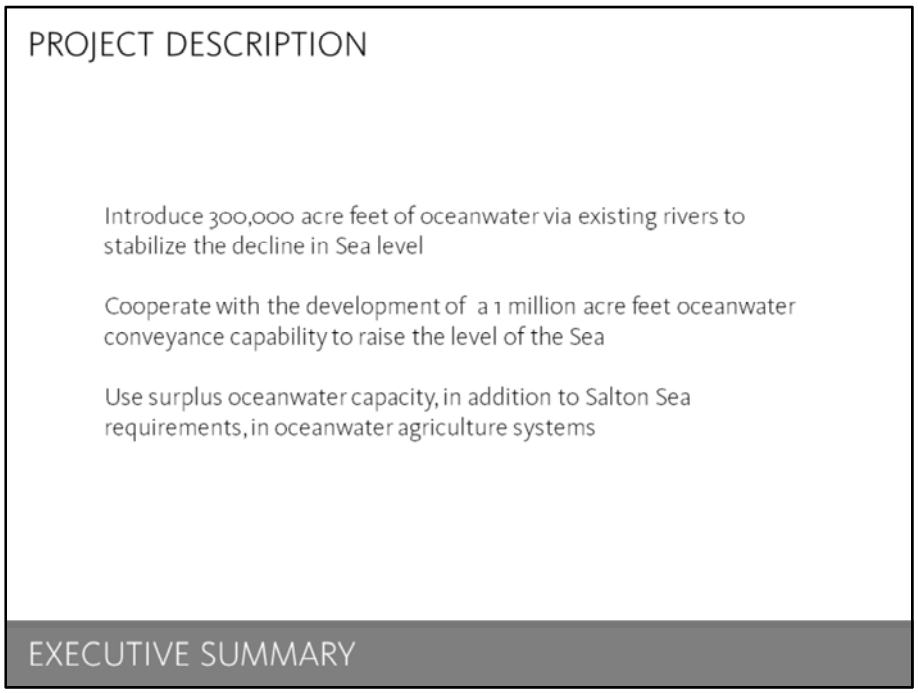
Salt is now recognized as a non-carbon energy source. There is potentially 100 to a 1,000 times as much fossil salt non-carbon energy as there is fossil carbon energy. The bottom right visual is of power production using that non-carbon energy.

Carl: I would now like to turn to the Presentation that Bruce has asked for. This is the opportunity to establish a coherent vision to pursue.



We are all aware of what we wish to avoid, the do nothing scenario, which has been the default position up until recently - but the question is what to do in its stead.

Carl: We understand that the Short and Medium Term Salton Sea Management Plan is continuing to be developed and implemented. This plan includes a (relatively) low salinity Coastal Lake which provides a habitat for fish and supports a corresponding bird population and is being pursued in conjunction with a variety of other small projects designed to address habitat concerns and make some contribution to the major playa exposure problem. In terms of the main body of the Salton Sea itself, the current plan leads to a shrinking brine lake. We would question however the ability of this solution to successfully meet all the objectives. The next alternative is a pump in pump out approach. Whilst this is not something that we should ever fully rule out, nevertheless, we believe that it does not address the immediate pressing issues and due to the scale of the project would be both very expensive and protracted. We are therefore proposing a third option, namely to Pump in ocean water and stabilize



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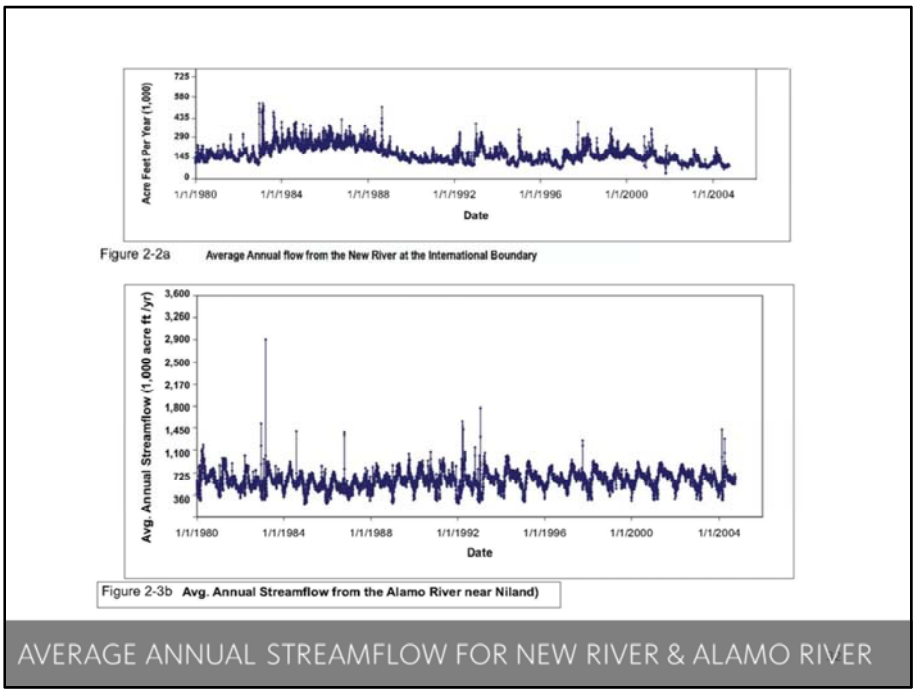
Carl: "The three key elements of our proposal that we would like to stress are

Firstly, to introduce 300,000 acre feet of oceanwater per year via existing rivers to stabilize the decline in Sea level

Secondly with the development of a 1 million acre feet oceanwater canal to raise the level of the Sea

Thirdly to use the surplus oceanwater capacity, in addition to raising the Salton Sea to its design level, for oceanwater agriculture systems



Carl: Here are the average annual flows for the New River and the Alamo River for the years 1980 through 2004. This data was taken from the New and Alamo River Master Plan. That beautifully prepared study proposes water quality improvement by the development of more than 4,000 acres of wetland along the pathways of the Imperial Valley Dilution of the water flowing in the two rivers can be combined with other water quality improvement efforts. Seawater Works, in cooperation with oceanwater farmers in the Mexicali Valley will add pulses of oceanwater to the New River. It is intended, with adequate cooperation, that these pulses be drawn into the existing Brawley Wetlands for evaluation. There appears to be adequate capacity in the two rivers to provide oceanwater flow from the beginning of 2018 to make up for the termination of Colorado water being added to the Salton Sea as the result of the Quantification Settlement Agreement (QSA).

Carl: We were invited by the Egyptian government to address the problems of the over subscription of the Nile River waters by the nine countries having rights to that water. Under President Mubarak we were offered a 125,000 acre site on the Red Sea Coast of Egypt. That project is now on hold awaiting evolution of the current political situation. The analogies of the oversubscription of the Colorado River by the US states and Mexico are important. We offer the design experience of the New Nile project to this committee and others concerned with the problems of the Salton Sea.

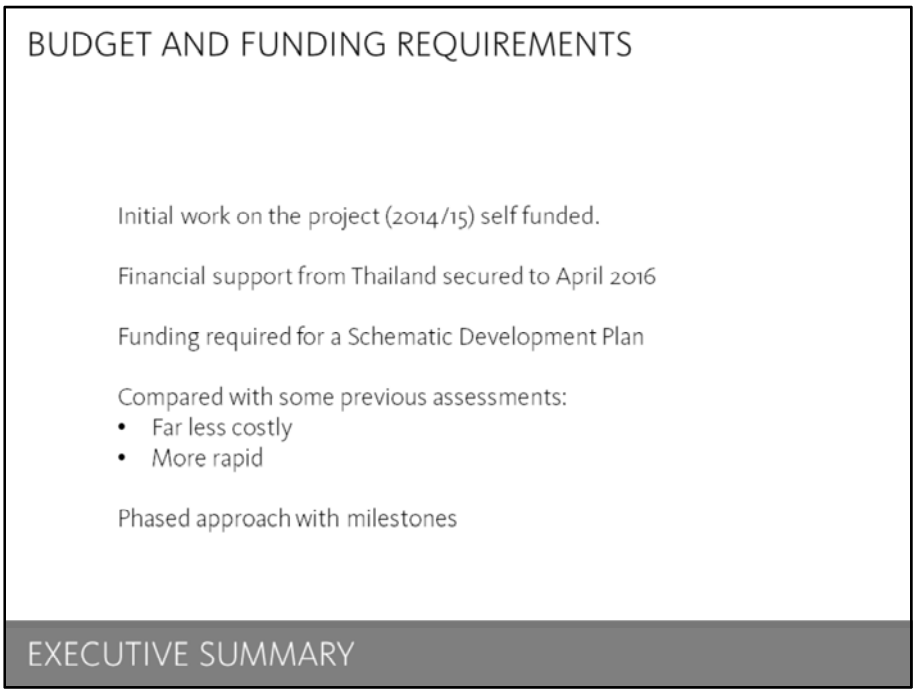
Carl: Phase 1 of the New Nile Project is 50,000 acres. However there were two earlier steps: a Research and Development with the American University in Cairo, and a 500 acre start at the Phase 1 site. We have established a research and development effort at the Imperial Valley Research Center (IVRC) in Brawley. And have done conceptual designs for starting both at IVRC and in areas near the Gulf of California in the Mexicali Valley.

Carl: “The aim of the ocean water agriculture is to take advantage of the local conditions of desert land, hot sun and access to oceanwater to transform some desert land around the Salton Sea into green productive oceanwater farm land, drawing on the long farming tradition in the area.”

Carl: The purpose of our proposal is to protect human health by covering the playa with oceanwater.

Carl: We intend to meld the introduction of ocean water with the current plans to restore and protect key eco-systems

Carl: …and thirdly secure water supply reliability at the Salton Sea and in the region. This photograph is a part of the Colorado River water being added directly to the Salton Sea. In 2017 that will be 150,000 acre feet at a cost of $20 million. We believe we can begin replacing that Colorado River water with oceanwater in 2019. And we propose increasing that to 300,000 acre feet/year to stop the decline of the coast line of the Salton Sea.



Carl: We have funded our Initial work on the project over the past couple of years through internal resources. More recently, we have secured some funding from MQDC of Thailand for help in the development of this proposal. What we propose as a next step, from July 2016 is the development of a Schematic Development Plan. We do not wish to prejudge that Plan with coming up with figures that are not based upon sound analysis .Suffice it to say that we believe that by including the water technologies we introduce the outcome of the Schematic Development Plan would be far less costly and more timely than some previous assessments of oceanwater proposals

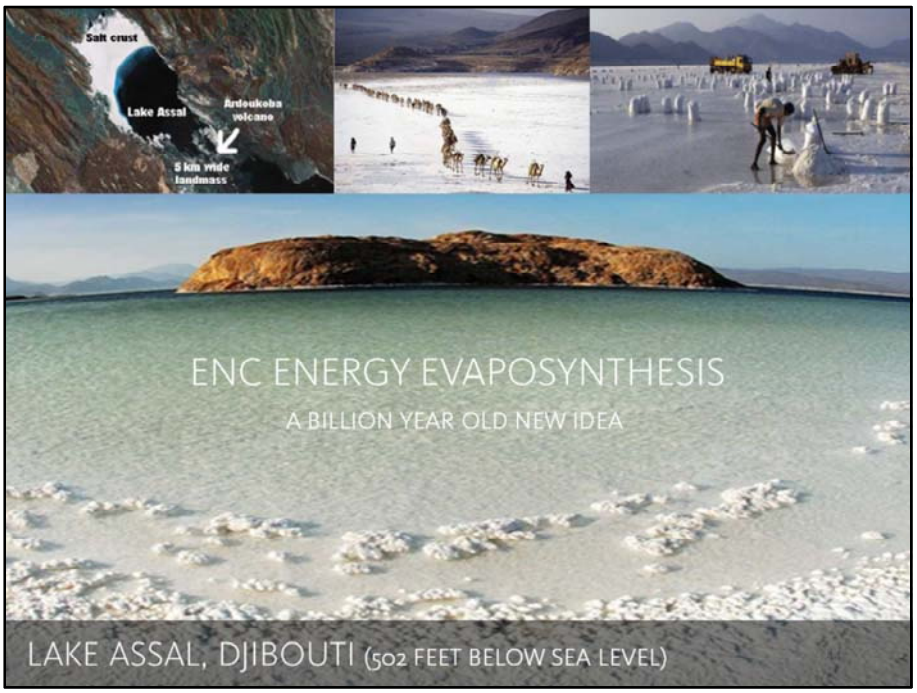
SCHEDULE WITH MILESTONES

PROJECT DESCRIPTION

Carl: Comments on importance and experience of the teams we work with.

We have looked at areas below sea level that have some of the potential of the Salton Sea. Most dramatically, the World Bank has just approved $900 million to bring Red Sea oceanwater to the Dead Sea.
There are two places along the route where desalinization occurs.

Carl: The Qattara Depression in Egypt is particularly interesting in that it has been studied since the 1920's for its power production potential using its elevation of 400 ft. below sea level. This model, developed at the University of Arizona utilizes the Grace Satellites to consider this project's contribution for reducing sea level rise.

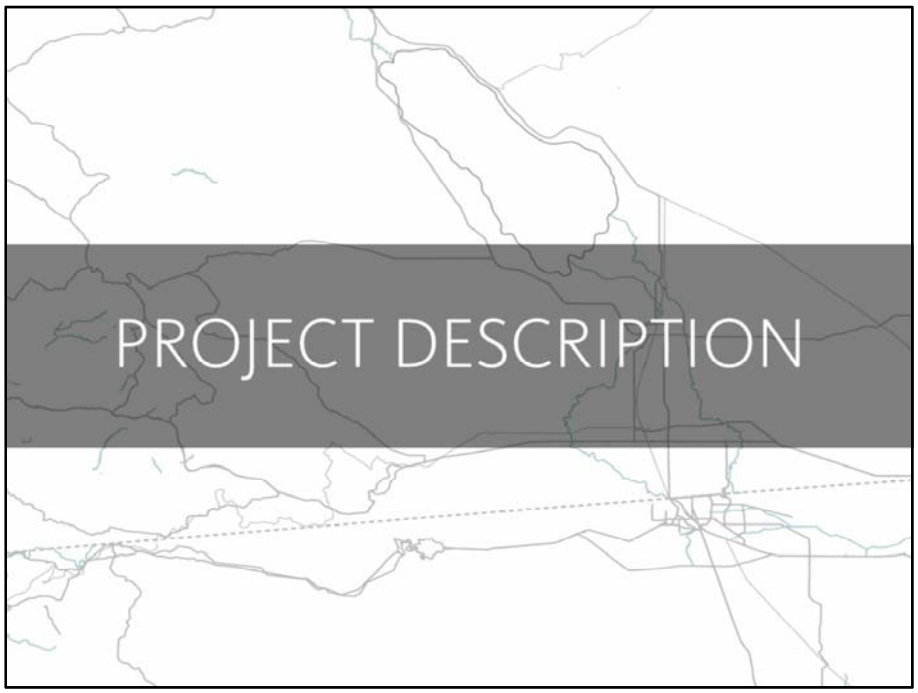


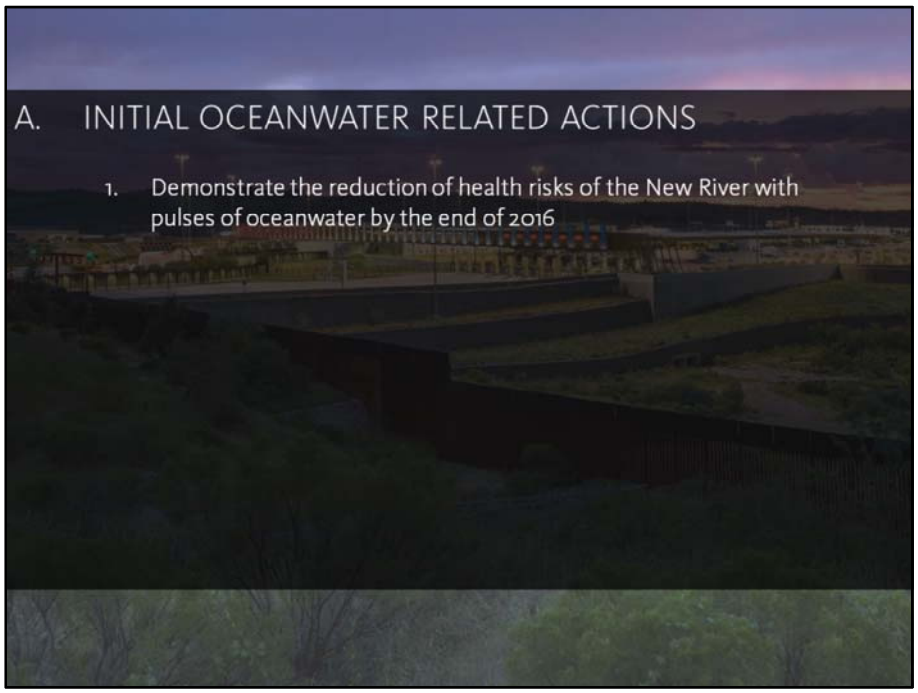
Carl: Lake Assal, Djibouti provides a unique example where oceanwater “leaks into” the lake which is 500 feet below sea level. Seawater Works has studied the salt production from the natural flow of seawater into Lake Assal.

Carl: The Salton Sea area in the US and Mexico utilizes gravity for distribution of Colorado River water for irrigated agriculture. That same opportunity exists for oceanwater agriculture.

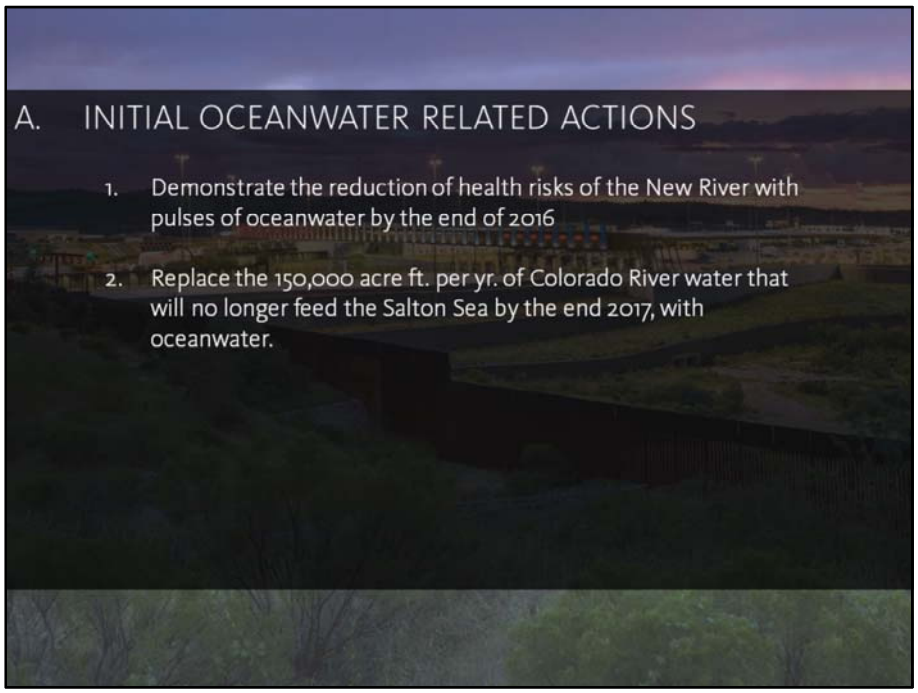
Carl: Gary Jennings, to the right of the flip chart, organized a meeting with the Cucopah community to discuss the Laguna Salada as a component of the pathway for oceanwater to flow to the Salton Sea.

Carl: The history of agreements, arranged by meetings at Los Pinos provides precedence for successful bi-national endeavors.

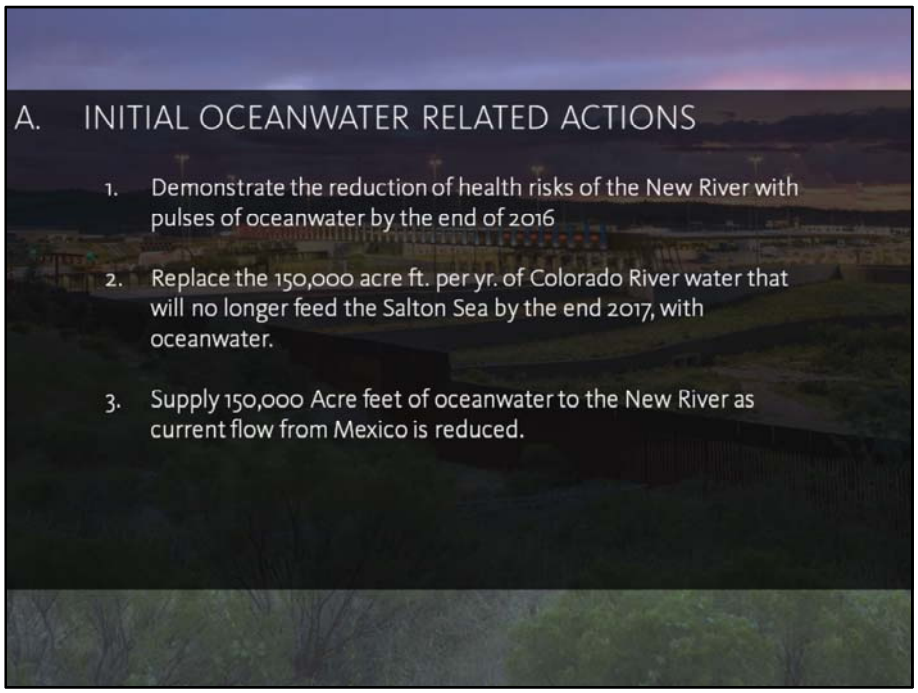

PROJECT DESCRIPTION



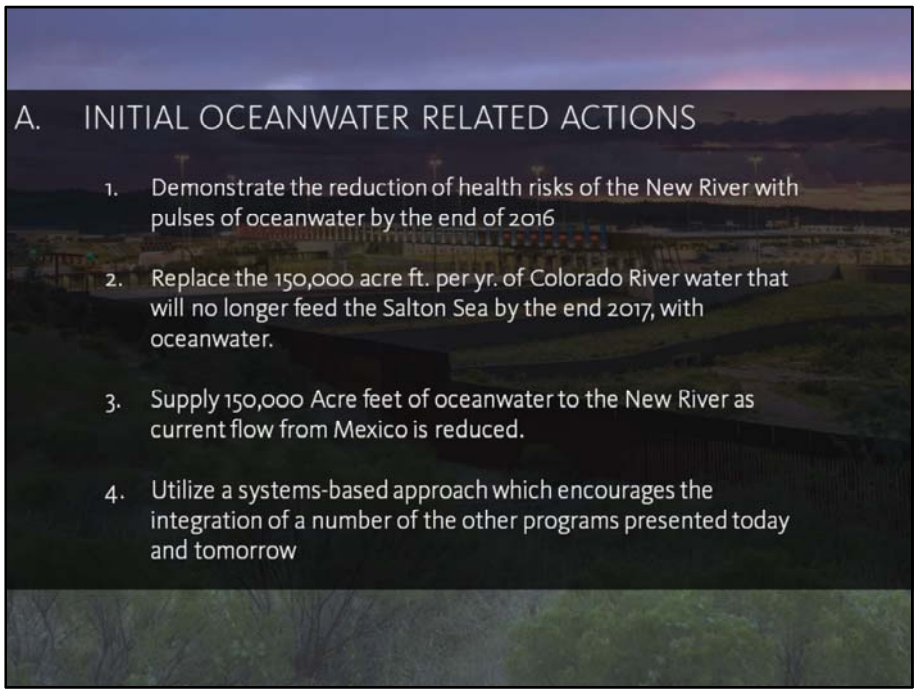
We see this in three distinct strands, namely
A. Our initial ocean water related actions



Secondly we will replace the 150,000 acre ft. per yr. of Colorado River water that will no longer feed the Salton Sea at the end 2017 with oceanwater.

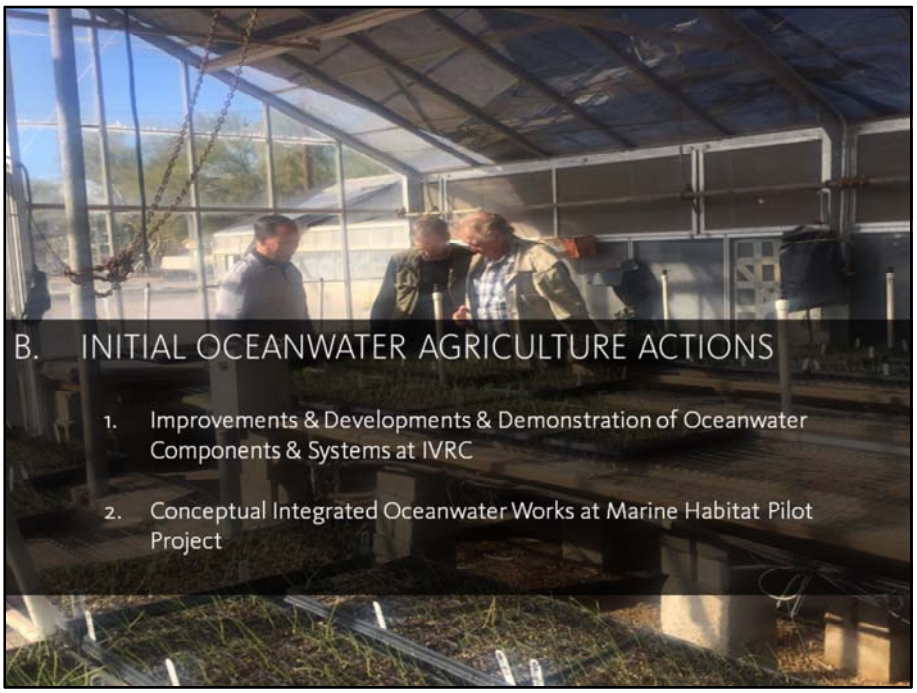


Thirdly we will supply 150,000 Acre feet of oceanwater to the New River as current flow from Mexico is reduced.



Fourthly, we plan to utilise a systems based approach which encourages the integration of a number of other programs presented day and tomorrow.

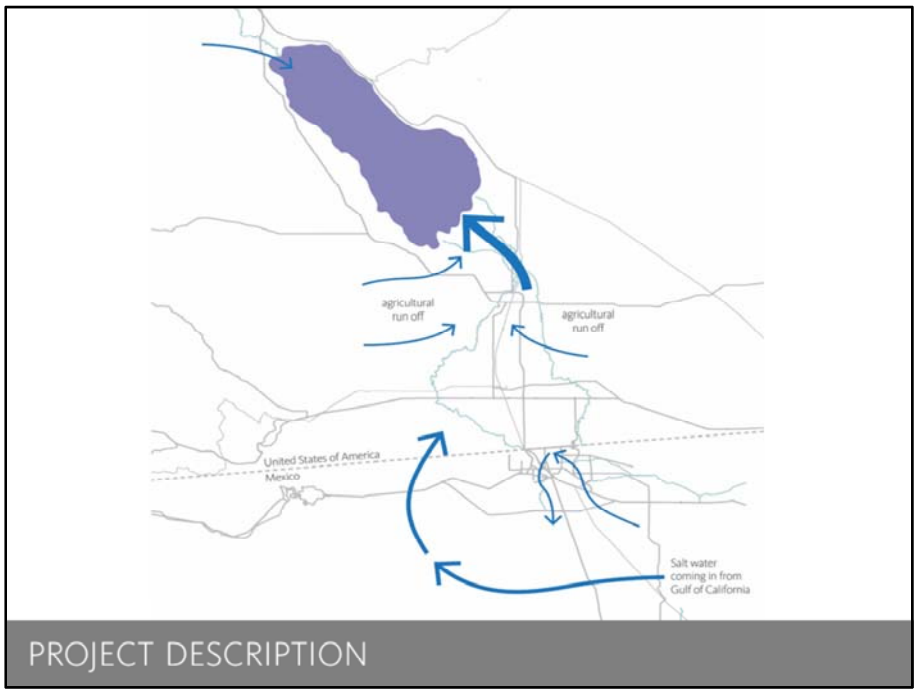
Carl: Jim Wood, the manager of the IVRC is with us today. Jim hosted the group from MQDC of Thailand. They were impressed with (as am I) with the potential of IVRC as a world center for the continuing development and demonstration of oceanwater technologies.



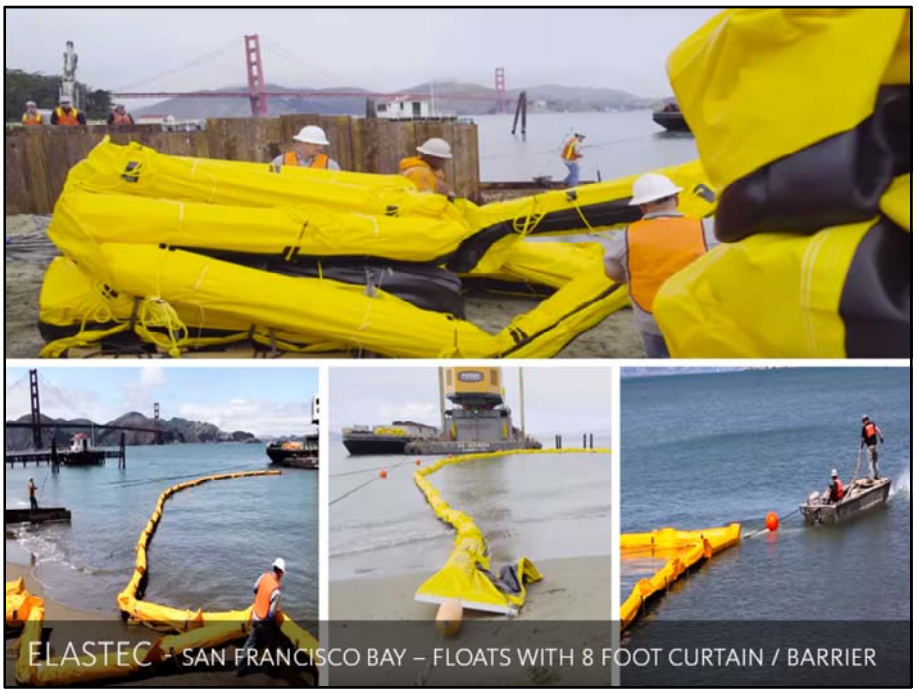
Carl: This is a photograph of Jim on the left, Robert Whitfield from London and me examining one of the five glass greenhouses of IVRC

Carl: Dr. Wit Soontaranun, Dr. Jittapat Choruengwiwat, and Saritorn Amornjaruchit and the Seawater Works team overlook the Brawley wetlands. They are looking from an elevated position of IVRC. Dr. Wit has his Ph.D. in Chemical Engineering from London. He has a personal interest in the potential of salt as a future non-carbon energy source.

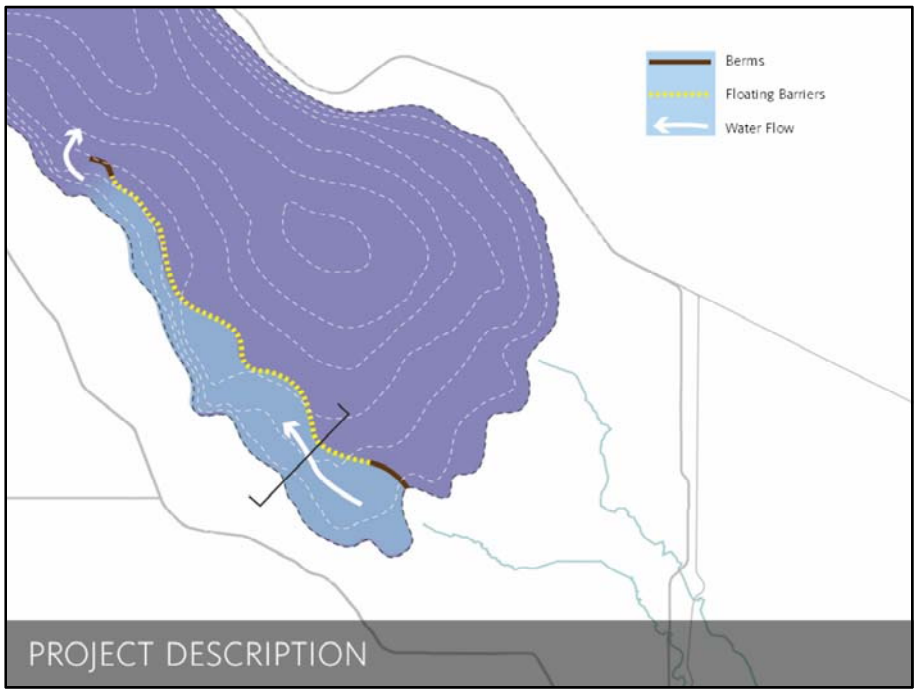
Carl: We have been co-operating on the development of a 1+ Million acre ft./ yr. canal to convey oceanwater from Mexico. This supply system will include hydro-electric power generation. As this oceanwater comes on stream, the prime initial focus will be filling the Sea till it reaches its design level. As and when demand develops for ocean water agriculture, an initial supply of oceanwater can be diverted to support the oceanwater agriculture - and increasingly as the Sea nears its target level, increasing amounts of the supply can be used for oceanwater agriculture,



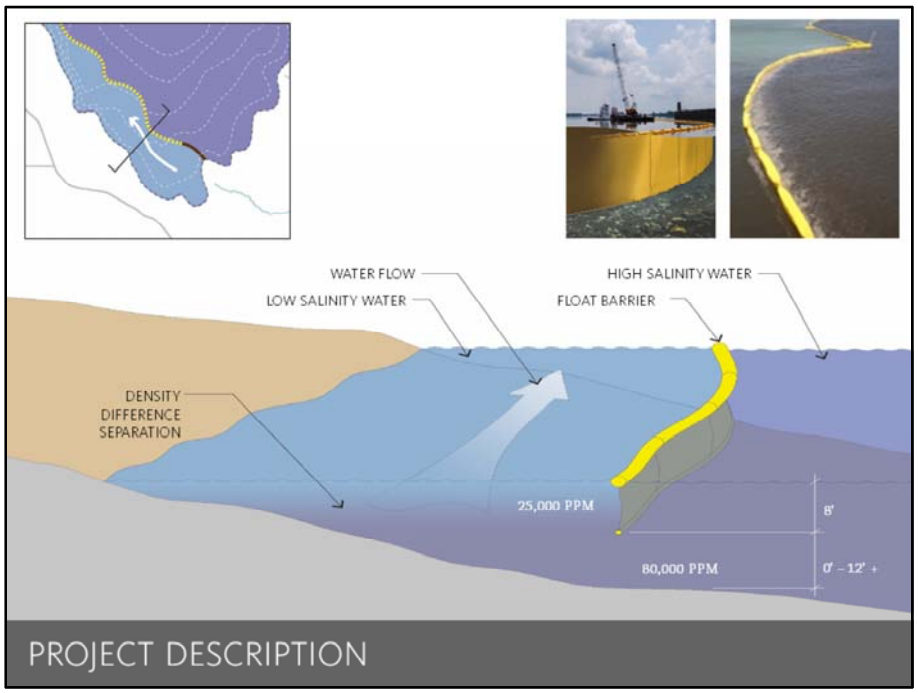
Seawater Works has carefully reviewed the current and projected inflow and evaporation of water at the Salton Sea. We also have studied near-term and mid-term plans for solving the problems. In considering how we bring experiences from past oceanwater developments to cooperate with current plans, we studied the potential of utilizing floating salinity barriers. We believe that a joint effort with the addition of floating salinity barriers for evaluation of different combinations of permanent levies and floating barriers between sections thereof will be valuable.



This is an example of an eight foot curtain hanging below a floating barrier in San Francisco Bay. The cost of a similar barrier for Salton Sea is of the order of $150,000 per mile.



Carl: The floating salinity barrier could be attached between sections of constructed solid berms. Such as illustrated here for the New River component of a future Coastal Lake.



Carl: The water on the low salinity side of the floating barrier will be the salinity of the mixture of the current flow of water in the New River and introduced oceanwater. The center section of the Salton Sea side of the barrier will continue to increase in salinity higher than its current 55,000 PPM.


ELASTEC - SAN FRANCISCO BAY – FLOATS WITH 8 FOOT CURTAIN / BARRIER

Carl: The first Phase of 50,000 acres of New Nile project include Salicornia, mangrove and salt production and a considerable area of created wetlands. That design experience is in use and will be shared with others who will benefit from the introduction of our oceanwater technologies.

SCHEDULE WITH MILESTONES

PROJECT DESCRIPTION

Human health will be protected as a result of early stabilization of the level of the Salton Sea, by conveying oceanwater in the rivers flowing north to the Sea

Covering the playa with oceanwater, following:

the early conveyance of 300,000 acre feet p/y of ocean water via the two rivers flowing north to the Sea

and the subsequent establishment of a canal bringing 1 + million acre feet p/y to the Sea and raising the Sea to the design level.

2. Habitat protection and restoration

•The coastal lake would be supported and allowed to evolve as the low salinity element of a Whole Sea

•The habitat projects would be integrated with the overall design and supported by the increased availability of water

3. Water supply reliability:

•Water supply reliability at the Salton Sea and in the region would be underpinned by the introduction of an additional course of water – oceanwater.

- Economic growth

–Economic growth would benefit from a totally new source of agriculture (ocean water agriculture), to complement existing freshwater agriculture.
–The ocean water agriculture would make use of the supply infrastructure established to address the primary objectives

•Carbon Free Energy

–The area could be developed as a center for renewable energy proving and production (geothermal, salinity gradient ponds etc)
–The availability of salt could in time become a significant asset as a component of Salinity Gradient Power.

•Mexico

The Mexican link would offer cross border benefits, creating sustainable livelihoods by facilitating oceanwater agriculture in Northern Mexico

Timing of benefits

Benefits	Timing of benefits
Human health	From 2019
Habitat protection and restoration	From 2019
Water supply reliability	From 2019, with major boost a few years later
Economic Growth	In line with expansion of oceanwater ag., from 2020/25
Carbon free energy	From 2020's
Mexico	May help funding 2017-2023

67

The primary benefits for the Salton Sea should start to accrue from 2019 as the level of the Sea starts to be stabilized and the habitat projects and new oceanwater supply are developed together. The cross border funding benefits could be realised as and when the main oceanwater conveyances need to be funded, whilst the broader economic benefits will start to accrue in line with growth in oceanwater agriculture and tourism.

•Seawater Works has made a preliminary assessment of the Project Feasibility, though further work will need to be performed in the next Phase.

Seawater Works proposes the application of several proven technologies to the problems of the Salton Sea. Key technologies are:

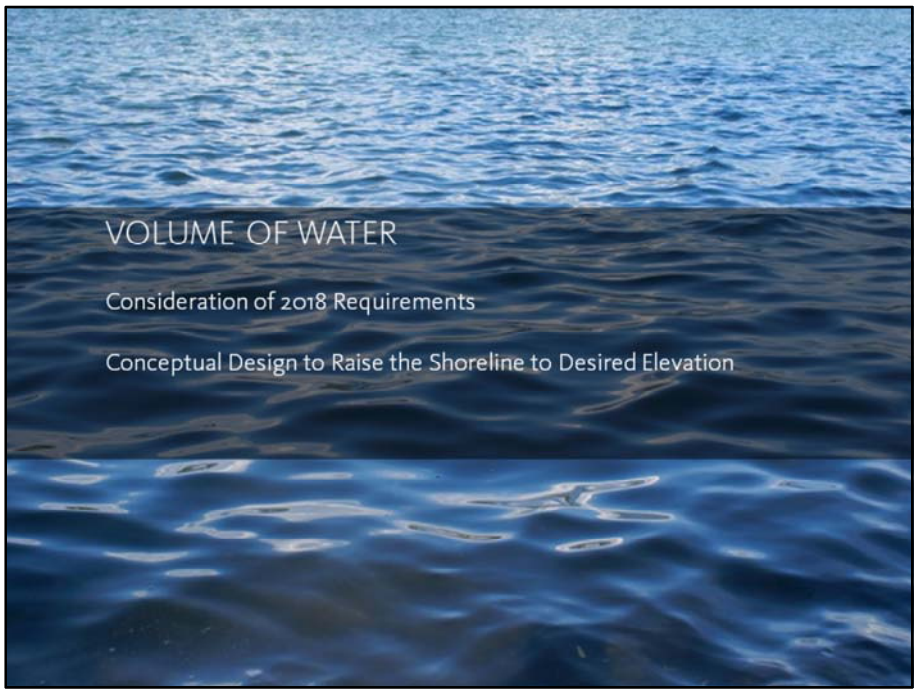
- Oceanwater Irrigated Agriculture, - to help address the shrinking Salton Sea
- Freshwater lenses
- Floating salinity gradient barriers

Environmental issues considered include:

- Integration with habitat projects to gain full benefit from them
- Design of inlet structures to minimise / eliminate adverse impacts on the Gulf of California
- Desert pupfish able to move between drains / creeks in the Salton Sea
- Reduced risk of red tide bacteria with by sand filtering where appropriate

Property related issues such as rights of way will be an important factor.
However, the problems can be mitigated by

- The use of the river bed(s) for the initial urgent supply of ocean water
- Ensuring that major land-owners benefit from the scheme.
- The enthusiasm expressed by one major Mexican land own
- The reduced time pressure for the canal route

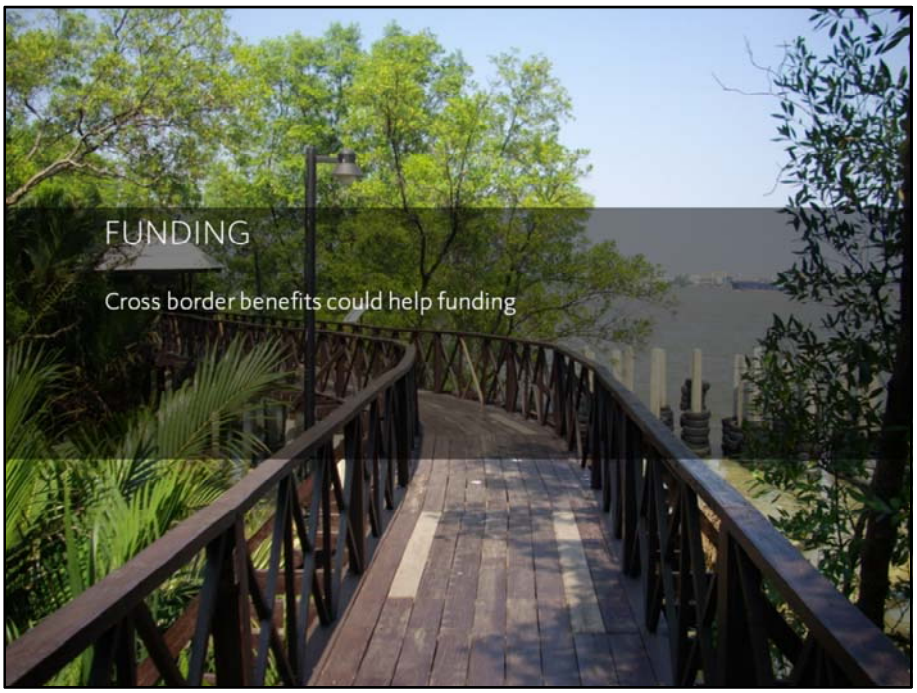


Initial volume of water required determined by the immediate need to stop the Sea from shrinking any further. Time is of the essence.

- An initial 282,000 acre feet p.a,
  in one or two steps

Second sizing relates to the need to raise the Salton Sea to cover the playa.

- 1 million + acre feet p.a. via a canal



Given the cross border benefits of the project, financing the cost of the Mexican component could benefit from funds from the private sector and both national and international sources.

There are a number of project constraints and requirements that we have considered but none appear insuperable.

Yes, we are likely to need some form of treaty with , but it is worth bearing in mind that Mexico was at the origins of oceanwater agriculture and has been very supportive.
Mexico could itself benefit from conveying oceanwater north, by benefiting from the potential of oceanwater agriculture.
Enabling agriculture to be re-established in areas in the Colorado delta where it has declined.
Mexican collaborators are keen to support the use of Gulf of California oceanwater.
The issue would be raised at Presidential level at an early stage.

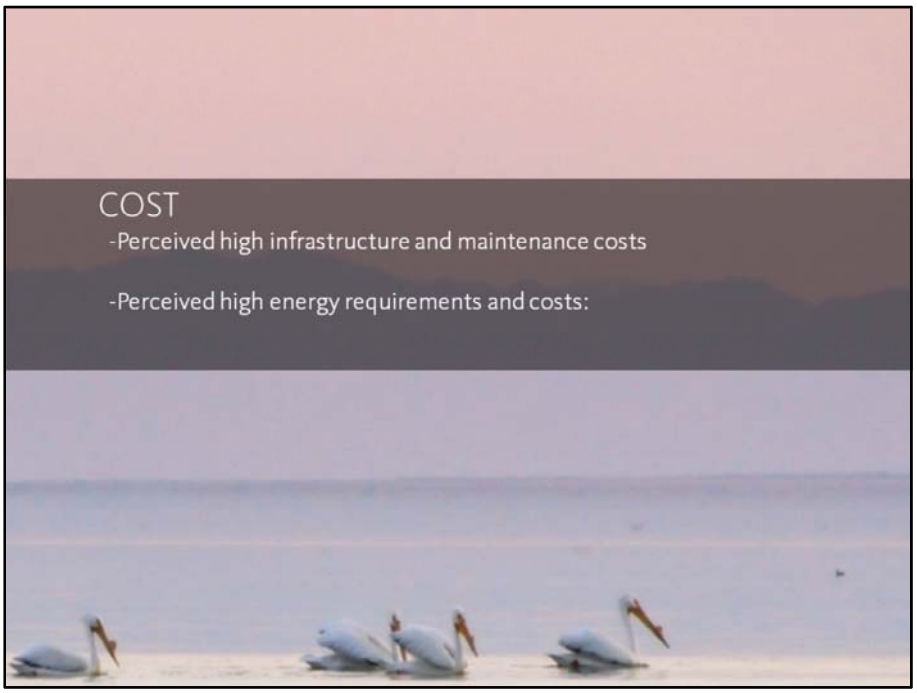
In contrast to some previous schemes, this proposal involves early oceanwater to the Salton Sea.

Using the New River for oceanwater conveyance would enable the immediate ecological and public health hazards to be addressed

It enables the decline in Sea level to be arrested rapidly and the short-term and medium term ecological and public health hazards mitigated

Salton Sea could then be restored to the design level once the additional ocean water supply has been established.

Limited scale of construction would enable the additional supply to be provided some years later



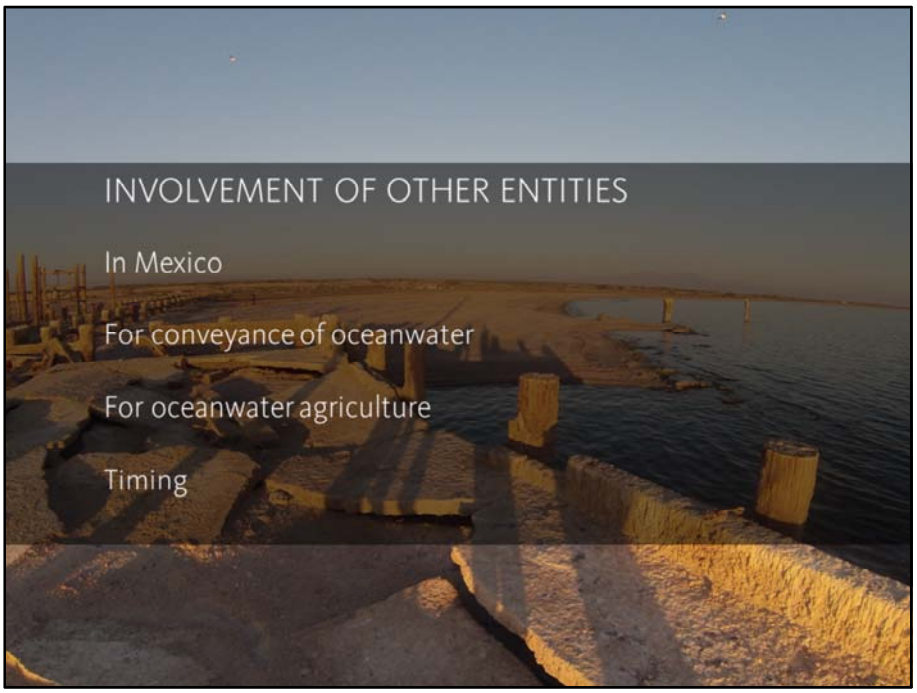
Cost

•The cost of infrastructure and maintenance costs has been conceived as high for ocean water projects, but:

- Use of plastic pipes, canals and where possible existing water courses will keep costs to a minimum.
- Infrastructure shared w/ oceanwater agriculture
- This proposal is much less expensive than previously estimated pump-in pump out models.

- Similarly the energy requirements and costs have been perceived as high, but:
  - Initially the flow of oceanwater into the New River will be via canals to oceanwater revitalization of abandoned farm land in the Mexicali Valley. In two years those canals will be expanded and will be the source of Oceanwater in the New River
  - Coming from the Gulf of California and flowing by gravity from Mexico to the Salton Sea will make the project energy generating. The approach will be the same as electricity

production on the All American Canal and would make the project a net energy generator.



Other entities involved

In Mexico, possible collaboration with the governments of Baja Norte, Sonora and private sector interests.

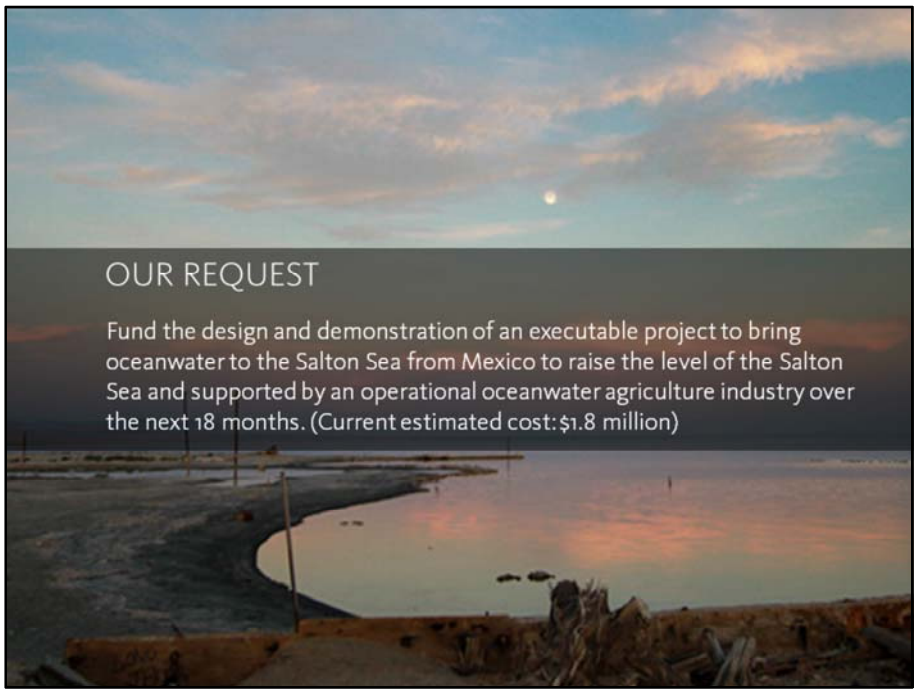
For conveyance, develop collaboration with other presenters.

For oceanwater agriculture in the Salton Sea region, possible collaboration with

IID and current farmers, and on behalf of future generations

Encourage cooperation as exemplified by MQDC

These relationships would need to be developed before and during the next Phase.



Our request::

Fund the design and demonstration of an executable project to bring ocean water to the Salton Sea from Mexico to raise the level of the Salton Sea and supported by an operational ocean water agriculture industry over the next 18 months. (Current estimated cost: $1.8 million)


CONCLUSION
Our aim: to be funded to prepare for this project a Schematic Development Plan.
Estimated duration: 18 months
Cost: depends upon level of support available from previous work – current estimate: $1.8 million
Proposed next step: meet to review assumptions and agree a price for this next phase.


SEAWATER WORKS
81